Post Office Telecommunications Journal

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Contents

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Comment

THIS ISSUE CONTAINS AN ARTICLE DESCRIBING THE work of the recently opened Post Office Factory at Cwmcarn in Monmouthshire, the establishment to which in June the Postmaster General and many local government officials paid a formal visit. Apart from contributing to the provision of greater industrial diversity in South Wales, it constitutes a step forward to the forefront of modern developments. For instance, for the first time, the flow-line moving belt technique is being applied to the repair of telephone instruments.

The bulk system of breaking down telephone equipment into its component parts, the careful inspection of each one, for repair, cleaning or replacement, with the subsequent system of re-building and testing the completed items by a series of co-ordinated operations, saves labour in the field and in the factory. Combined with the general aim towards greater productivity, the modern layout and methods of the new factory show advances of considerable significance.

Despite the need for economy and the re-use wherever possible of repaired items of telephone equipment, replacement is often inevitable.

It is a great satisfaction in these days of raw material shortage to know that replacements do not mean that the materials used for the original plant are not used again.

The Supplies Department, in its latest survey on the recovery and disposal of scrap materials, refers to the salvaging during the past year of 18,000 tons of lead and 6,000 tons of copper and copper alloy, which is fed back for industrial re-use.

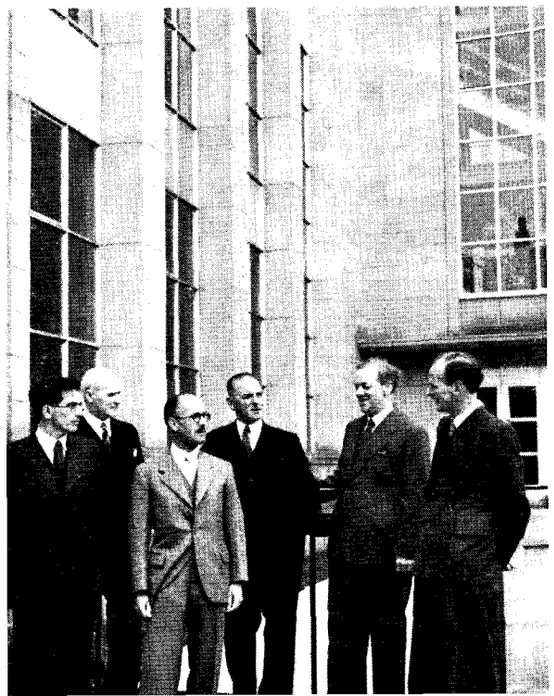
Scientifically organised repair work and the utilisation of the unrepairable residue constitute a combination helpful both to the Post Office and the National Economy.

From left to right: E. O. FISH, Senior Sales Superintendent; T. A. P. COLLEDGE, B.Sc., A.M.I.E.E., Area Engineer (Installation and Maintenance); Miss D. MANNING, Secretary; W. G. LUXTON, M.I.E.E., Telephone Manager; Lt.-Col. W. E. GILL, T.D., M.I.E.E., Area Engineer (Planning and Construction); H. WALKER, Chief Clerk; Mr. E. G. S. SMITH, Chief Traffic Superintendent.

CHESTER TELEPHONE AREA

From the Dee Estuary to the Isle of Anglesey and south to historic Harlech, the Chester Area covers some 2,250 square miles. The scene is one of sharp contrasts; the coal mines and the Trading Estate around Wrexham give way to the great steel works at Shotton, while along the North Wales coast are famous holiday resorts such as Rhyl, Colwyn Bay and Llandudno. Crowning all is lovely Snowdonia, centre of the first National Park in Wales, land of wild grandeur and beauty, with its snow-capped peaks and lovely mountain streams.

The Telephone Manager's headquarters are in Chester, the gateway to North Wales on the banks of the Dee—a famous garrison town even in Roman days, and now a busy commercial and shopping centre served by a fine modern telephone exchange. In such a widespread Area, many of the 1,050 staff are outstationed, particularly at Bangor and in Colwyn Bay and Llandudno. There are 144 exchanges serving the Area (99 of them automatic) with over 51,000 stations, at which more than 600 operating staff are employed.



EDINBURGH TELEPHONE AREA

The main work of the Area is centred in Edinburgh, capital city of Scotland, famous for its medical school and its now firmly established international festival of music and drama, and birthplace of Graham Bell. The 2,615 square miles of the Area also embrace most of the historic Border country with its ruined abbeys and thriving and world-famous industry of tweeds and knitted garments, and both sides of the estuary of the Forth. It is in these areas of the Lothians and Fife that the future of the coal industry of Scotland lies. One of the most outstanding landmarks of the Area is, of course, the Forth Bridge.

Edinburgh has the highest telephone density of any city in the country outside London. It is also unique among Provincial Areas in that the operating staff in the city itself comes under the direct control of the Telephone Manager. In the whole Area 165 exchanges, of which 114 are automatic, serve 73,106 lines and 114,661 stations. It maintains 449,123 miles of wire underground and 42,322 miles of wire overhead. The total Area staff, including Engineering, Operating and Office, is over 2,000.

The photograph alongside, taken outside the new Fountainbridge Automatic Exchange, shows *(left to right)*: G. BEALBY, A.M.I.E.E., Area Engineer (Construction); A. TODD, Chief Clerk; M. W. RAMSAY, B.Sc., A.M.I.E.E., Telephone Manager; S. W. RUSSELL, Senior Sales Superintendent; J. W. BRANSON, A.M.I.E.E., Area Engineer, (Maintenance); W. D. KAY, Chief Traffic Superintendent.

The Medresco Hearing Aid

by F. C. Carter. B.Sc. (Eng.). M.I.E.E.,

Engineer-in-Chief's Office

Possibly one of the lesser known, but nevertheless important, benefits of the National Health Service is that of assisting those people who have difficulty with their hearing. In the majority of instances, particularly those in which there is no serious damage to the fundamental mechanism of the ear, very great relief is obtained by the use of a Medresco Hearing Aid. It may not be generally appreciated that the Post Office played a large part in the development of this Aid and is still responsible for its design and production, and this article describes some of these activities.

It is interesting to reflect that despite the great scientific advances that have been made during the last 100 or 150 years, the applications of this knowledge in giving direct assistance to the human senses are still limited to two, i.e. sight and hearing. In fact, the use of spectacles or lorgnettes was known even before that time, although it is probable that they have become available economically to the bulk of the population only in the present century.

Hearing, like sight, tends to deteriorate with advancing years and probably the first attempts to give assistance to this faculty were ear trumpets, which, at the turn of the century, were often used pictorially to denote a "Granny".

With the subsequent development of the telephone instrument, and particularly with improvements in the sensitivity of microphones and receivers when associated with batteries, it was natural that these devices should be considered for use in overcoming difficulties in hearing. Such aids, using a small low-voltage battery, really did magnify or amplify the required sounds. Unfortunately the amount of magnification possible was limited, probably to the order of 20 times, and this, as we now know, is quite insufficient to be really effective in most cases.

It was not until the later 1920's that the idea of inserting a thermionic valve between the microphone and receiver emerged to provide a much greater amplification of sound.

Although the amplification so achieved was substantial, the quality of reproduction was very poor, owing to the use of a carbon microphone. The next step was the replacement of the carbon microphone by one of much higher quality, but of reduced sensitivity, and for effective and satisfactory results a three-stage amplifier became necessary. These aids required both high-tension and low-tension batteries for their operation and as they had to be carried by the user they were made as light and small as possible. Unfortunately the life of a battery tends to fall with decrease in size and the majority of the batteries lasted only a few hours. They were often made in special sizes and as the numbers in use were small replacements were expensive.

The aids themselves were expensive—a good one might cost between £20 and £50—and they were, therefore, beyond the reach of the majority of the sufferers.

In 1943, the Ministry of Health, in considering plans for a comprehensive National Health Service, gave special attention to the needs of the deaf and approached the Medical Research Council for advice upon the matter. The timing of this approach seems to have been a particularly fortunate one, since it coincided not only with advances which were being made in the medical field in the treatment of ear affections, but also with the development of new electrical equipment and, in particular, of miniature valves and telephones which might be specially suitable for use in improved forms of hearing aids.

In 1944, the Medical Research Council appointed three committees to plan and co-ordinate the necessary investigations. These were (i) the

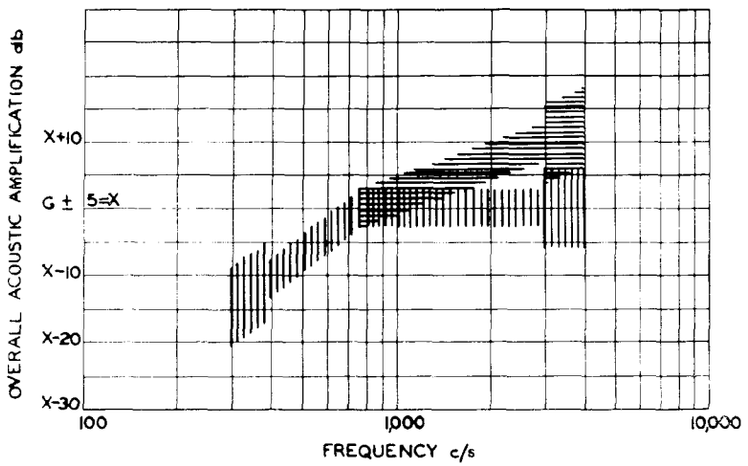


FIG. 1. GRAPH OF FREQUENCY RESPONSE CHARACTERISTICS

Committee upon Medical and Surgical Problems of Deafness, (ii) The Committee on the Education of the Deaf, and (iii) the Electro-Acoustics Committee.

The first two committees were primarily concerned with clinical investigations concerning the causes of deafness, the best types of remedial measures and their means of application, while the last was concerned chiefly with the practicability of developing such measures at a reasonable cost.

Dr. W. G. Radley, Controller of Research of the P.O. Engineering Dept. (now Deputy Engineer-in-Chief) was appointed Chairman of the third Committee, which also included two officers of the P.O. Research Station at Dollis Hill.

Its terms of reference were as follows:—

"To advise upon the design, performance and application of electro-acoustic equipment used in the investigation and alleviation of deafness, and to institute such fundamental investigations as may be considered necessary in this connection."

In 1947, this Committee issued a report, published by the Medical Research Council as Report No. 261. In this report they surveyed many types of commercial aids manufactured in Great Britain and in the U.S.A. Also, as a result of practical tests made upon some hundreds of persons suffering from

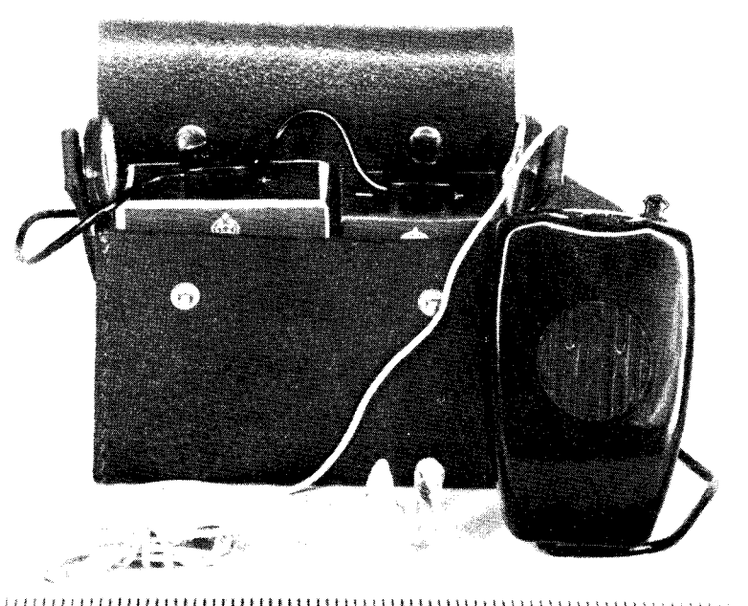


FIG. 2. MEDRESCO HEARING AID — RECEIVER, EARMOULD AND BATTERY POUCH

varying degrees of deafness, they included a specification for an original design of a hearing aid incorporating three thermionic valves and based upon the best available components then in production, of which models had been constructed and subjected to practical trials in clinics both in London and Manchester. The design included, in particular, Raytheon miniature valves, a small crystal microphone and a crystal insert receiver, all of which were available only in the U.S.A.

The Committee also recommended that the design should cater for two alternative ranges of frequency response and that the maximum overall acoustic amplification should be not less than 40db. measured at 750c s., that is that the overall magnification of the sound power should be not less than 10,000 times. Figure 1 shows the overall frequency response characteristics which were recommended. A recommended design for an aid with an external type of magnetic receiver was also included.

The committee drew attention to the fact that to obtain the full benefit of the above magnification it was essential for the receiver to make a very good acoustic fit to the ear and that this could best be accomplished by the use of ear plugs or individual earmoulds. (Figure 2 shows clearly what is meant by "earmould".)

The Committee also made a survey of audiometers which could be used for assessing the deafness of patients and a specification for a proposed audiometer which could be used in clinics was included.

The Ministry of Health accepted this report in principle and asked the Ministry of Supply to arrange for the production of 50,000 complete hearing aids, which were to be delivered by 1st July, 1948, the date of the introduction of the new National Health Service. The aid was given the name Medresco as an abbreviation of the title of the Medical Research Council. Provision was also to be made of certain testing equipment, e.g. audiometers for diagnostic centres and test gear for clinics.

Development contracts were placed for the production in the United Kingdom of British equivalents to the principal American components, but in order that production of aids should be established quickly it was agreed that a limited number of American components were to be available in this country.

The development of equivalent British valves proceeded satisfactorily and a new factory was established for large-scale production. At this time it was estimated that the vibration and shock to which the aids would be subjected in being carried by the wearer would cause a high rate of valve mortality. Spares were estimated to be necessary and were provided for on the basis of a life of six months.

The establishment of British production of crystal receivers, however, proved to be more difficult than had been expected, while importation from America was cut by dollar shortages. Eventually, in August, 1948, further dollar expenditure was stopped and the Post Office was asked to accept responsibility for the production in 1949 of 100,000 aids. They were to meet the specification laid down by the Medical Research Council and to be wholly of British manufacture.

After consideration of all the factors involved and bearing in mind the production difficulties, it was considered that an electro-magnetic type of receiver offered more advantage than a crystal type. It was decided, therefore, to develop a magnetic receiver of the insert type for production in this country. As this would have different electrical characteristics from the crystal type, it would be necessary to modify the design of the microphone and the amplifier so that the overall performance of the complete aid would be substantially unaltered.

By this time also a limited number of aids incorporating American components had been constructed and distributed to the public and as a result of this practical though somewhat limited experience, it was also decided to develop improved types of volume controls and switches. All these new components were incorporated in the design, together with several other mechanical improvements which had been found to be desirable, and although the external appearance remained substantially unaltered, for stocking and maintenance purposes these aids were designated Mark II. Production commenced in April, 1949, and quickly reached the required figure of 2,000 per week. All the specified requirements were met and as a matter of fact the maximum overall acoustic amplification of the insert type exceeded 100,000.

Figure 2 shows a complete Medresco Aid with insert receiver, individual earmould and battery pouch.

These aids operated with the same batteries as the Mark I types, but while the Post Office was not concerned with choosing the size of the bat-

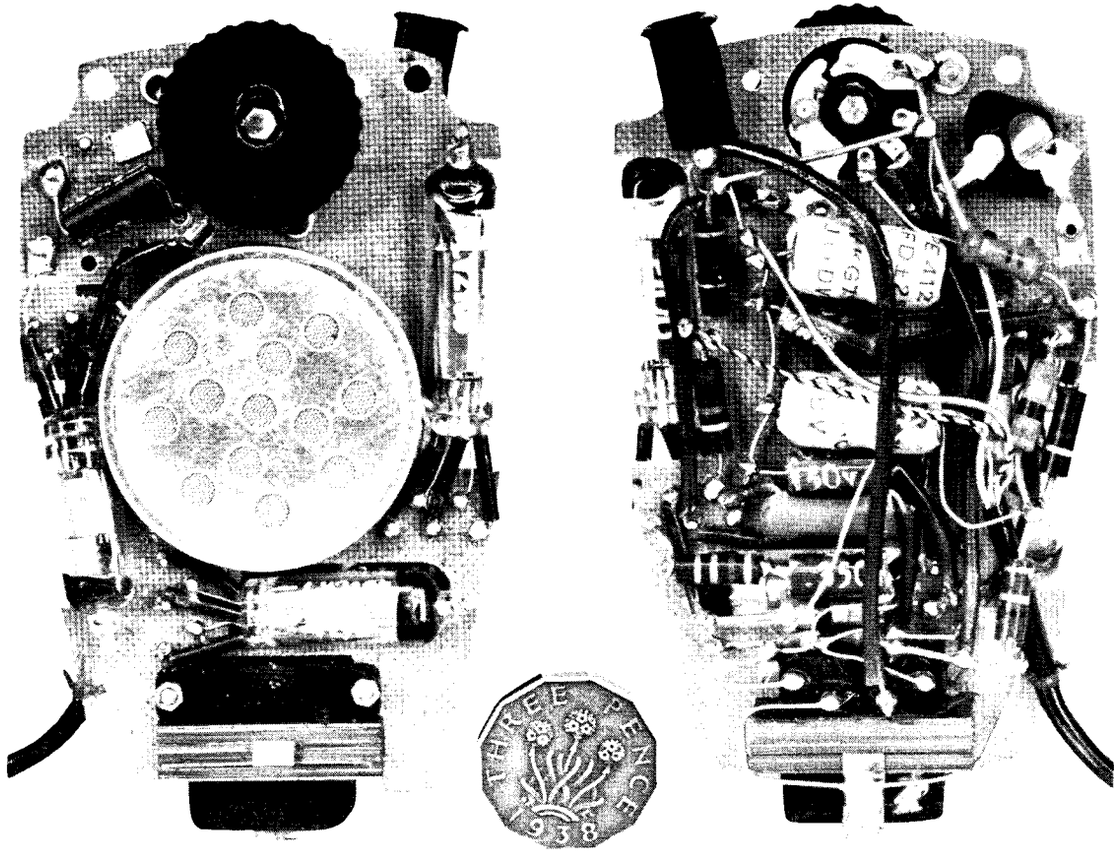


FIG. 3. THE RECEIVER—COMPACTNESS ITSELF

teries, the decision as to the actual size presented some difficulty. A compromise was necessary between the desire of the user on the one hand, who naturally wanted to carry around the smallest possible batteries, and the administrative and financial aspect on the other. Smaller batteries involved more frequent visits to clinics for renewals and they were but little less costly than the larger types.

The sizes finally decided upon are such that under average conditions of use an L.T. battery lasts for about 10 days and an H.T. battery for six weeks. Although smaller H.T. batteries can be manufactured, they are liable to serious deterioration if stored for a long period and are not recommended for the Health Service at present.

The battery plugs are both non-interchangeable and non-reversible, so that there is no possibility of damage to the Aid or failure to operate due to wrong connections.

By mid-summer, 1949, the question of placing further orders for Hearing Aids had to be considered, to ensure continuity of production, and detailed specifications and drawings were therefore prepared for competitive tendering. As it was then expected that further improvements, particularly in valve efficiency, would become available, the Ministry of Health agreed to limit additional

orders to a further six months' supplies, i.e. 50,000 Aids. It is interesting to note that as a result of the above efforts the design had been made so suitable for bulk production that these Aids were purchased at a fraction of the cost of a commercial aid. The new range of valves (shown in Figure 3), besides being smaller, showed an economy of 40 per cent. in the filament current consumption and were incorporated in a modified design of the Aid known as Mark IIA. Although the external appearance was again subtsantially unchanged, advantage was taken of the redesign to incorporate numerous small but important improvements which experience, both in production and in service, had shown to be desirable. These included the redesign of the terminations of both ends of the receiver cords, the soldered termination to the Aids being replaced by a new miniature plug and socket and the receiver slide plug being redesigned to improve the contact. The battery plugs were also both completely redesigned, the cord grip strengthened and the wiring simplified. After a number of these Aids had been given practical tests, the Ministry of Health asked the Post Office to purchase 37,000 for production in the latter half of 1950 51. Subsequently, further orders for 85,000 were placed for production in 1951 2.

Figures 3 and 4 show the two sides of the complete chassis assembly of the Mark IIA design. On the one side will be seen the microphone, the three valves and combined volume-control and switch, and on the other, at the top, the miniature socket and the screw head for adjustment of the frequency response characteristic. It will be noticed also that to keep the size to the minimum the chassis has been cut away to allow the valves to be recessed.

In parallel with the above work, experiments were made to determine how far it was practicable or economic to modify the original Mark I design so that some use could be made of the stocks that had accumulated by being returned as faulty by the users. Eventually a rather novel system of graduated repair and conversion was evolved. Close statistical control has shown that some 70 per cent. of the Aids can be made suitable for reissue at a reasonable cost.

Individual earmoulds are supplied by the hospital which issues the Aid. The Post Office is not brought into the manufacture, as the techniques are more akin to those used in dentistry. The actual procedure is that a plaster cast of the patient's ear is taken at the local clinic and sent in a sealed container to the moulder. Individual moulds are made from these casts in a material known as methyl methacrylate (Diakon) and sent in individual containers to the clinics. The original cast is destroyed in the moulding process, so that if any losses in transit or errors in identification occur, new casts have to be taken from the patient.

Some of the original forecasts of the fault liability of the Aids and life of the components have not been confirmed in practice. The valve, which had been feared to be the weakest link, has turned out to be far the most robust and reliable, and replacements have been less than 0.1 per cent. It is now confidently expected that the valves will outlive the Aids. On the other hand, the cords, which have been deliberately made small and light, have quickly become faulty, involving rather tedious repairing at clinics, and although, as already mentioned, all the terminations have been completely redesigned, they are still probably one of the weakest parts.

As a measure of the technical progress that has been made during the time that the Post Office has been associated with the work, it is of interest to note that the filament consumption of the three Raytheon-type valves recommended in the Medical Research Council Report was 80 mA, whereas that of the latest Mark IIA Aid is only 30 mA.

Further advances in the development of improved components are constantly occurring and will be incorporated as opportunity offers, since it is known that the ultimate limit of increased efficiency and reduction in size of the Aid has by no means been reached.

To conclude, while the activities described in this article cannot strictly be regarded as falling within the field of telecommunications, the Post Office can claim that it has played a big part in a project which is of real value to the community and in a field remote from that usually associated with the Post Office in the mind of the public.

Voices from the Sea

by Eric R. Delderfield *

A NARROW BUT GOOD ROAD FROM Dartmouth town, leaving the Castle on the left, leads up to the headland where the Coastguard Station is situated. It is about a mile and a half from the town, and the road built on the edge of the cliff offers a beautiful view of the mouth of the Dart.

From the Coastguard Station a winding path leads down to Compass Cove, some 400 feet below. The name conjures up smuggling affrays of the past, and the final drop to the sandy cove itself, with its ancient worn steps, emphasises the possibilities for that ancient game, but if in fact it was used to "run cargoes", history has left it unrecorded.

Yet, 90 years ago, there began in this quiet spot an adventure which has continued through the years and—even in these highly scientific days—is basically the same as when it was first commenced, though up-to-date improvements are being constantly added.

It is not easy for us to appreciate that when the first proposal to lay a submarine telegraph cable between Great Britain and America was mooted, it was scoffed at by the majority of people and described as a mad freak or, alternatively, a gigantic swindle. Even the Astronomer Royal of that

* This article is based on material appearing in Mr. Delderfield's latest book, "Cradle of the Sea Dogs" (Raleigh Press, Exmouth; 4s. 6d. limp, 6s. cloth).

time stated that it was *a mathematical impossibility to submerge the cable at so great a depth in safety.* The first attempt was made in 1857*, but it was not until 1866 that the project became a proved success, and the telegraph was at last working across the Atlantic Ocean.

But Compass Cove came into the picture six years before that, for in 1860 a cable ship floated one end of a submarine cable ashore on barrels. It was laid in a deep trench up the beach, whence, like a powerful snake, it ascended the cliff and entered an insignificant little building perched on the cliff side a hundred feet or so from the sea. Thus Compass Cove became the terminal point of one of the earliest submarine telegraph cables that connected the Channel Islands to this country.

It is as well to have some yardstick, in order to appreciate the magnitude of this feat and to see it in its proper perspective. Great Britain had only just launched its first ironclad battleship, the *Warrior*; Garibaldi, the Italian liberator, was freeing Southern Italy; in America, the Southern States seceded from the Union and Civil War was about to break out. Sixteen years were to elapse before Graham Bell invented his telephone.

Little is known about this early pioneering private company or about the working of the Channel Island cable until 1870, when the Post Office took it over and made it a telegraph link between St. Peter Port, Guernsey, and Exeter, to which city it was carried by overhead wire from the Compass Cove hut.

In 1884 the cable was replaced by a new one. Sixty seven and a half nautical miles (80 land miles) in length, it was laid by the cable ship *Monarch* to Fort Doyle, Guernsey. It was repaired about 50 times but remained in service until June, 1940, when the cable ship lifted it up somewhere in mid-ocean and severed it, for the Germans had occupied the Channel Islands. It was repaired again in 1945.

From the same small building above the cove, the Post Office laid another cable to Plemont, Jersey, in 1914, and it was somewhat of a feat, for the ninety-one nautical miles were covered in the space of eight days. This was a comparatively cheap operation, as a section of a German-owned line to the Azores had been captured early in the First World War.

* The Commander of the British ship used for the purpose was Vice-Admiral Preedy. A window to his memory is to be seen in the chancel of East Budleigh Church, where Sir Walter Raleigh, the first attempt colonisation of America, worshipped as a lad.

In 1930 the cable was cut into, for a connection to be made to Saints Bay, Guernsey, and the entire line was adapted to provide a telephone service between Jersey and Guernsey, and also, for the first time (1931) a telephone service with the mainland.

As the years went on, so the ingenuity of engineers was constantly brought to bear on improvements and in 1934, by laying an underground cable from the Cove to Torquay, direct submarine and underground working of telegraph and telephone all the way to London was finally achieved.

In 1938 and 1940 two cables were laid to Fort Doyle, and these, the only ones now in use, are capable of carrying both telegraph and telephone circuits. When the cable comes ashore it is about 1 inches in diameter and the exterior is of spirally wound steel wire. Inside is a compound insulating material of parragutta, which protects the copper wire in the core.

The peak period for traffic on the telegraph to the Channel Islands was years ago, when the potato and tomato marketing seasons were at their height. The traffic over the cables was intense and continuous, and the very thought of those days brings back to the old Post Office workers nostalgic memories of augmented staffs, who worked at high pressure for the whole of their spell of duty.

In this insignificant building over Compass Cove (it is only about 10 by 14 feet), which for ninety years has housed these cables, there is little for the layman to see which explains the miracle of speech and telegraphy under the sea to land eighty miles away. The original cable is still there, severed and hanging with its wires bare. All that can be seen of the modern cables is their inner sheath, which is about one inch in diameter, where they enter the building, for the outer armoured skin is dispensed with when the rigours of the sea are no longer to be feared. The actual connection to the land line is a wire, one-eighth of an inch thick, yet through it run 13 London to Guernsey bothway telephone circuits, several teleprinter circuits for telegrams and a music circuit which is used solely by the British Broadcasting Corporation for broadcasting purposes. The other cable supplies practically the same number of lines between London and Jersey. By the means of two wires, only an inch or two of which are visible, as many as forty-eight people can carry on their conversations day in, day out, night after night.

Below the wire in the cable hut is a small box enclosing coils of fine gauge wire, which in recent

years has become a necessity, for it acts as a choke against radio interference pick-up in the cable. Without it radio signals which are attracted to the cable from transmitting stations all over the country would make transmission of telephone signals impossible. It is as if a more modern invention were trying to strangle its predecessor.

Like all skilled technicians, the Post Office engineers become lost in a jargon of their own. They talk of mixing frequencies, bands of speech, carrier circuits, line amplifiers, oscillators and a strange standard of measurement called "decibels".

It is difficult for the interested layman to retain a grasp of these higher intricacies, but briefly and simply it would seem that the many circuits over one wire are made possible by a series of frequencies. In order that the messages can be heard after their journey under the Channel, they need boosting, for on arrival they are hardly audible, and so between Compass Cove and London there are repeater stations about every 12 miles. The first of these is just outside Dartmouth, where the power is boosted about a thousand times to carry the message on its next stage.

All the telegraphic and telephonic communications from the Channel Islands via Compass Cove go direct to London through the Dartmouth repeater station. Whenever the mighty British Broadcasting Corporation relays a broadcast from Jersey or Guernsey, it is routed through this insignificant little building above the cove and onwards through the Dartmouth repeater station.

As if it were a purely local call, the writer was permitted to pick up a telephone and found himself in direct conversation with a telephonist at Guernsey.

At intervals the sea uncovers the cables as they lie in the sand of Compass Cove. Loops of the two-inch armoured wire appear for all the world like a strange sea monster.

The capacity of the telephone cable for awakening a sense of wonder is today somewhat dimmed by the achievements of radio telephony, but the cable has many advantages which still make it a necessity in filling the needs of modern communications. Radio communications are subject to interference by atmospherics; they have a tendency to fade out and there is above all a lack of secrecy as far as everyday use is concerned.

The Post Office engineers have more improvements ready for the submarine cable. Shortly a system will be in operation for the Channel Islands cable, by which a metal canister, dropped in the ocean midway between the two terminals, will act as a connection between the two halves of the cable and will be fed with current from Dartmouth, so that it will serve as a mid-Channel boosting station. The latest type of coaxial cable will shortly be installed for the land section, which will enable as many as sixty circuits to be worked over the two submarine cables.

In this highly scientific age, we are apt to accept too easily the wonders of the telephone and to dismiss all too lightly the constant and inventive genius that make possible almost instantaneous connection with our friends scores of miles away.

(*The photograph used at the beginning of this article shows H.M.T.S.* Monarch, *the most modern cable ship in the world.*)

New London Trunk Telephone Exchange

On 30th April, 1951, the Postmaster-General, Mr. Ness Edwards, opened a new trunk telephone exchange at Judd Street, London, W.C.1 (near Kings Cross). He was accompanied by the Minister of Works, Mr. Stokes, who opened and named the building, which has been specially designed and built to accommodate the exchange.

This new exchange, known as Trunk Control North, will control demand trunk calls from subscribers on certain London exchanges. It is part of a scheme for decentralising the control of trunk traffic and will relieve Faraday Building, which was originally the control centre for all trunk calls originating in the London area. At the outset, only 40 switchboard positions will be in service, but these will be increased by stages to two 150 switchboard position units, planned to be in operation in the summer of 1952.

In addition to the telephone exchange, the new building will later also accommodate automatic teleprinter switching equipment, part of the national network, which will serve teleprinter offices in Central London.

Training a Telephonist

by C. S. Loades.

Inland Telecommunications Department

TELEPHONE STAFF REQUIREMENTS are normally forecast for a period of four months ahead, and from time to time vacancies occur because of growth of work and wastage.

An applicant for a post as Telephonist is interviewed usually by representatives of the Head Postmaster and Telephone Manager, together with the Supervisor of the local telephone exchange. Immediately after the interview, the candidate takes tests of sight, colour vision, hearing, diction, writing and manipulative ability.

The successful candidate receives a letter inviting her to report for training, usually at the nearest Telephone Wing Training Centre, for a course of four or six weeks, depending upon the type of exchange to which she will ultimately be sent.

At the Wing Centre, as well as ordinary instruction in the class room, the training includes demonstration, practice and individual coaching. Considerable time is spent on the correct preparation of tickets, with special blackboards designed for this purpose. By the end of the course, the trainee has in her notebook specimen tickets for most types of calls she is likely to meet. At the end of each week, a test is set to show how the class is progressing and the opportunity taken to eliminate any weaknesses it shows up. The trainee is given plenty of time to study and revise.

The trainee gets a lot of practice, first with dummy traffic on practice positions, and later as far as possible on live traffic. Very close supervision is given at this period, and to begin with one instructor looks after every two trainees. At the end of the course, there is a final test.

Post-School training usually takes place in the exchange in which the trainee will take up her permanent duty and lasts for two or three weeks, according to the type of exchange. This training is designed to consolidate the knowledge acquired during the Wing Course, to foster self-confidence and to improve speed and manipulative ability. The more complicated types of calls are also taught during this period and the trainee is introduced to the local conditions. During this period there is careful supervision, a special post-School instructor being used where there are two or more trainees.

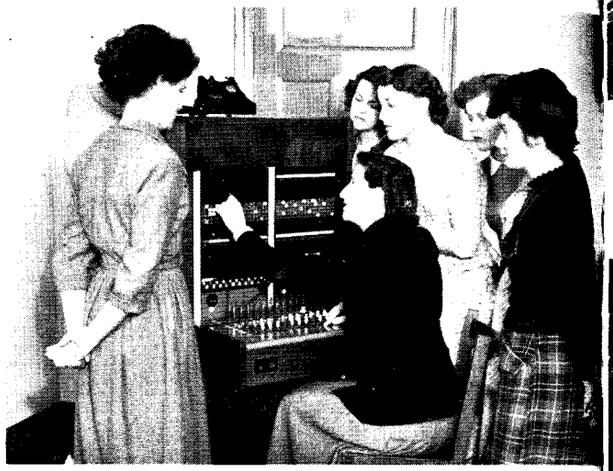
An applicant . . . is interviewed. . . .

. . tests of . . . hearing, diction, . . . manipulative ability.

. . . a letter, inviting her . . .

. . . to report for training . . .

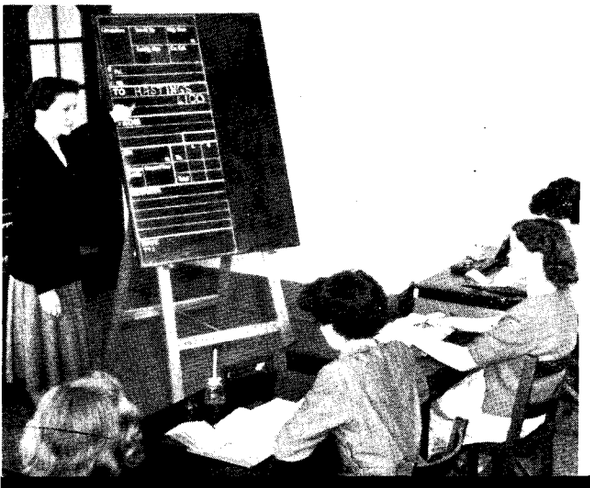
. . . instruction in the class room. . . .



. . . the training includes demonstration .

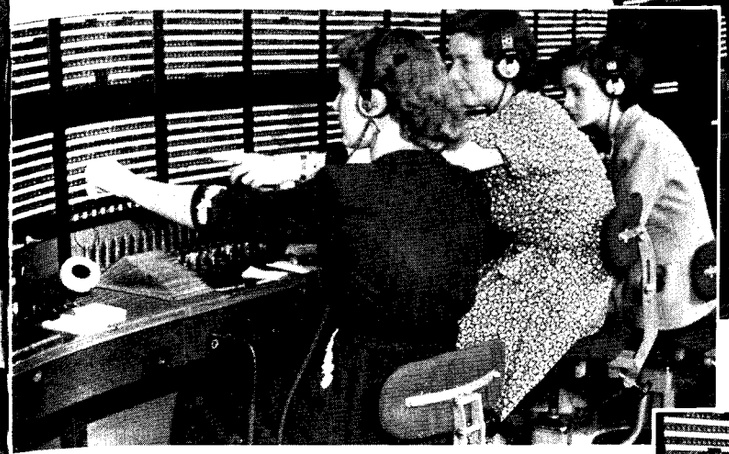
. . . the correct preparation of tickets. . . .

. . . time to study and revise



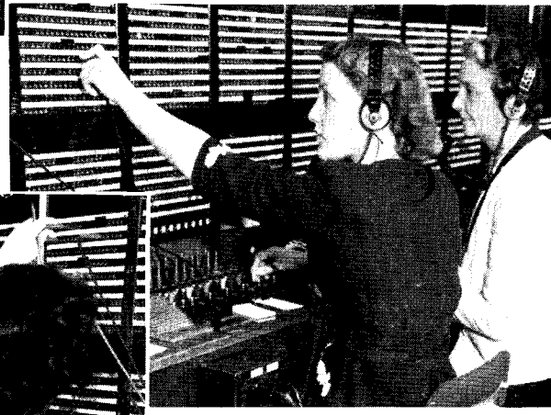
right . . . practice . . . on live traffic.

below Post-School training . . . for two or three weeks . . .



right . . . takes a qualifying test . .

below . . . takes up duty in the exchange.

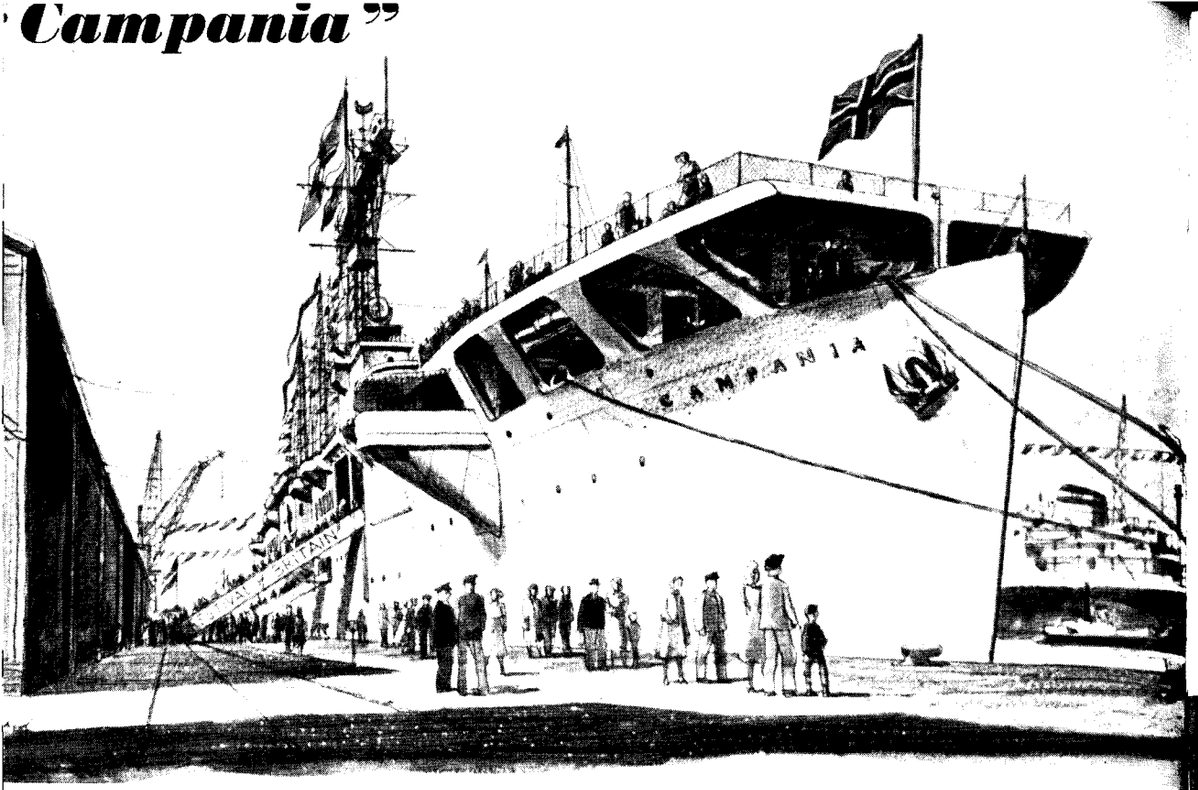


Towards the end of the post-School period, the student takes a qualifying test, in which she has to maintain a set standard of operating efficiency and accuracy. This test is conducted by a supervising officer.

At the end of post-School training, if she passes the qualifying test, the telephonist takes up duty in the exchange. It is only after some months that she reaches her maximum efficiency.

Becoming an efficient operator does not mean the end of training for a telephonist. There are changes in procedure to be learnt and weaknesses in operating to be overcome. To this end, each telephonist receives regular refresher training. Later, the more intricate and specialised duties of the exchange, such as the monitorial, directory, accounts and clerical duties, have to be learnt, and eventually the telephonist is given further training for the more responsible duties of supervising her former colleagues.

"Campania"



by F. E. Ferneyhough,
Public Relations Department

THE GREAT PROJECT OF THE FESTIVAL of Britain was mooted by His Majesty's Government in 1947. It was always intended that the Festival should be nation wide. Many independently organised events of particular local interest have been arranged at long distances from the main hub of events—the South Bank. The story told at the great London centre, however, was thought to be fundamental to the whole Festival theme and it was decided to create special versions of the Exhibition so that the story might be brought to many populous centres other than London. The proposals, in fact, reversed the moral of the old adage, for the inspiration of the Festival ship *Campania* savoured somewhat of bringing the Mountain to Mahomet.

There has been no previous occasion on which an exhibition of such a size has been organised afloat. She—the *Campania*—was originally laid down as a merchant vessel and after conversion during the war to a ferry carrier, was lent by the Admiralty to the Festival authorities for two years. Her 300-foot hangar deck made her an obvious choice for the present assignment and she was converted to a floating Festival Exhibition by Cammell Laird of Birkenhead to the plans of Sir Charles Lillicrap, Director of Naval Construction, and Mr. J. Holland, F.S.I.A., the Exhibition's Chief Designer.

As far back as June, 1950, the Post Office was asked by the Festival Management Committee for assistance in providing the telephonist staff for

the lengthy tour. It was this request which gave rise in March, 1951 to the national invitation notice for telephonists willing and wishing to serve as operators of the telephone exchange and public address system of the *Campania*.

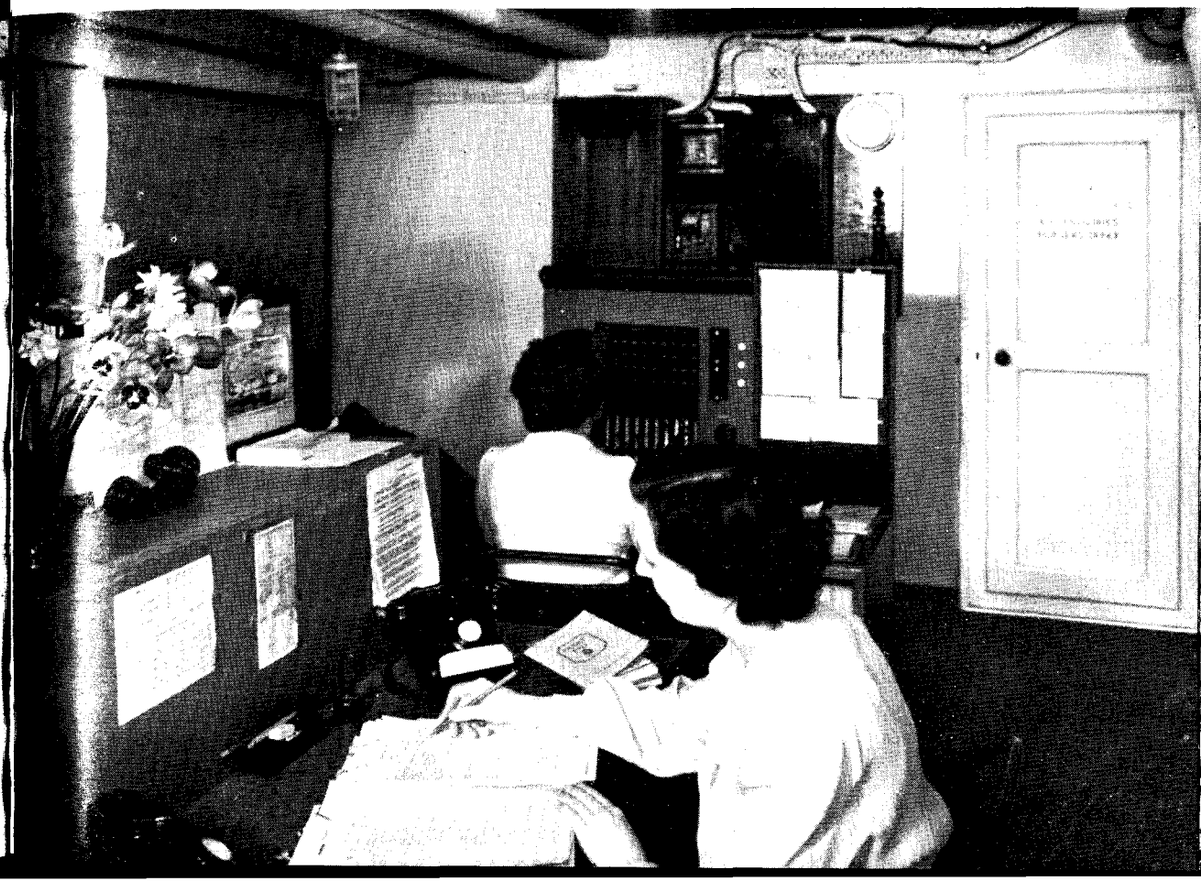
The unusual requirements, and no doubt the touch of romance, resulted in a very large number of applications, from which five telephonists and a supervisor were selected.

They took up duty on April 24th, and from that date until October the *Campania's* contact with the inland network and the control of the large crowds on board has been, and will continue to be, one of their responsibilities.

The telephone equipment, installed by the staff of the Liverpool Telephone Manager, is relatively simple, consisting of a single 10 × 50 line P.B.X. unit fitted in what was, during the special wartime service of the ship, the damage control room, and having divided cord circuits to ensure non-through clearing arrangements. This was necessary to facilitate connecting the ship to the various telephone systems of the ten Exhibition ports-of-call. The necessity for connecting the ship to such automatic systems as those of Belfast, Glasgow and Southampton and to such manual systems as Cardiff and Wallasey, made the provision of non-dialling extension instruments necessary and the use of standard through-clearing P.B.X. facilities impracticable. Dialling facilities on the P.B.X. board and power ringing have been provided.

It was the large number of extensions required which governed the switchboard size and although accommodation for ten lines exists, three circuits

Supervisor and telephonist in the *Campania* switchroom



to the inland system at each port have proved adequate. Additional provision has been made at each docking point for a direct fire line to the nearest fire station.

Aboard the ship the extension wiring follows the usual block wiring system, but the exchange line pairs have been cabled to a main distribution case amidships, from which parallel wiring has been taken to two specially protected distribution cases; one on the starboard and one on the port side of the hangar deck. This parallel arrangement was necessary to enable dockside connections to remain unaffected by the ship's dockside mooring arrangements. This wiring and cabling was installed by the Admiralty.

As the exhibition ship would obviously be of great interest to the B.B.C., and as many items would have to be broadcast from the ship itself, the needs of the B.B.C. were anticipated in the early stages. At the hangar deck distribution points, specially protected sockets have been provided to accommodate plugs for association with the flexible microphone leads used by the B.B.C. staff for live and recorded programme items.

A ten-pair flexible cable is carried on the ship for connecting the exchange lines, fire line and B.B.C. sockets from starboard or port side distribution case to the quayside "ships in dock" connection point, if this latter facility is available at the particular port of call.

At Newcastle this was not the case. The use of the ship's cable was dispensed with. A length of interruption cable was slung by the staff of the Newcastle Telephone Manager from a nearby distribution pole over warehouse roofs direct to the ship's starboard distribution case.

Forty-seven extensions are distributed throughout the ship and serve the ship's company as well as the Exhibition management staff: in several exposed points, "cab-rank" type hand microphones are used.

A public address system was of course the most vital adjunct to such a project as this, where, in a relatively confined space, 3,000 visitors as well as many of the *Campania's* staff might be on the top three decks at any one time. It is necessary in order to control the crowds; to announce the "non-smoking" rule in the Exhibition space, where much damage might be caused by carelessness; to prevent enthusiasts handling the exhibits; and to make the many personal announcements which always arise where children and parents congregate in large numbers. There is also the need for broadcasting light music during the period between announcements.

To meet this need, over 100 loud speakers are distributed throughout the ship, the wiring and equipment for which was installed by the Marconi Company.

The Post Office staff, after training, have operated the public address system with its microphone and amplifying equipment, together with the automatic music broadcasting installation.

The fire prevention arrangements and the direct fire line were in action at a very early stage in the *Campania*'s exhibition career. At Southampton, the fire line had been connected to the Southampton Docks Fire Brigade Headquarters. On May 9th the P.B.X. operator received an urgent call from an attendant on the hangar deck and in the telephone supervisor's logbook occurs this cryptic but interesting entry:—

> "5.57 p.m. smoke belching from exhaust forward point of hangar amidships. Fire Brigade advised 5.58. P.A. Extension 22, Captain Extension 25 and Chief Officer extension 38 advised. All clear 6.3 p.m. and music resumed."

It is a fact that the Docks Fire Brigade staff were on board the ship in just over one minute from the receipt of the call. Although the smoke screen set up between the ship and the quayside from the exhaust explosion gave a more serious impression of events than subsequently proved to be the case, the rapid exchange staff action, both in notifying the Fire Brigade and the responsible officers, drew forth the commendation of the ship's captain and his staff.

The number of demand trunk calls handled by the P.B.X. staff per day averages about 60, with the addition of about 250 local calls. There is also a considerable amount of telegraph traffic.

With the 300 staff aboard, with full-scale catering arrangements and numerous other matters connected with such a unique project, it is not surprising that constant contact with various parts of the country is necessary. The ship's programme is full and widespread and it includes docking at the following ports:—Southampton, Dundee, Newcastle, Hull, Plymouth, Bristol, Cardiff, Belfast, Birkenhead and Glasgow.

South Bank Exhibition

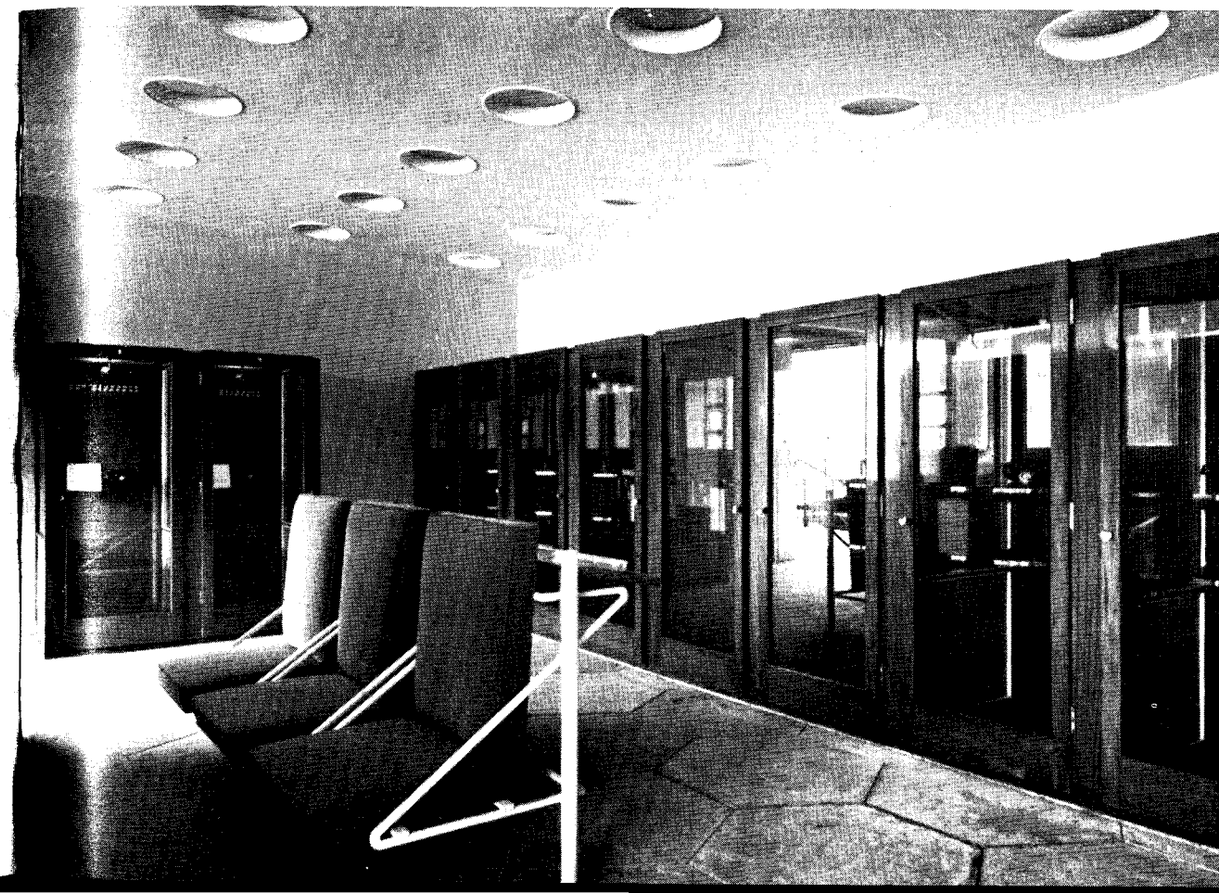
Call Offices of a New Design

THE TELEPHONE CALL OFFICES IN the Telephone Hall adjoining the Festival Post Office were specially designed for the G.P.O. by Architects' Co-operative Partnership. The framing to the roof and walls is in African mahogany, cellulosed where exposed. The solid panels to the ceilings and partition walls are in -inch painted plywood.

The glazed portion of the partitions between the kiosks consists of two sheets of plate glass inch and $\frac{1}{4}$ inch thick, with a $\frac{3}{4}$-inch air space in between. The purpose of this is to reduce noise transmission.

The doors, which are framed in cellulosed African mahogany, are glazed in $\frac{1}{4}$-inch Georgian wired polished plate glass and provided with brass cylinder-type closers finished in satin chrome.

This suite of call offices is operated from a central P.B.X., where Post Office staff are also available for enquiries. Four of the call offices (two of which appear in the photograph below) are reserved for Long Distance and Overseas services.



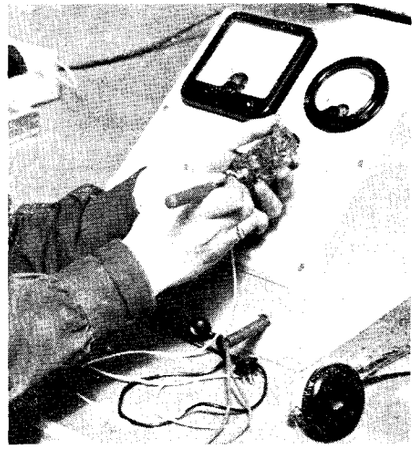
Cwmcarn

by A. Newsome, Controller, Post Office Factories Department

On Friday, 15th June, the Postmaster General paid his first visit to a new Post Office Factory at Cwmcarn, in Monmouthshire.

The factory is a contribution by the Post Office to the national policy of introducing a greater variety of industry into the development area of South Wales.

THE POST OFFICE FACTORY AT CWMCARN IS A contribution by one of the biggest employers of labour to the national effort to introduce greater variety of industry into the new development areas. The benefit of this new installation will be felt, it is hoped, throughout the area set up in South Wales and Monmouthshire. Although differing greatly by virtue of its rural surroundings from other the Post Office factories in London and the highly industrialised area of Birmingham, the new factory at Cwmcarn will undertake the same kind of work as is done at the older-established factories. This is primarily repair work. It includes the renovation by up-to-date methods of large quantities of apparatus used in the telephone service and, in addition, this factory has undertaken the renovation of the Hearing Aids supplied by the Ministry of Health.



Adjusting N.H.S. Hearing Aid

Dual coil-winding machines

The decision that the Post Office Factories Department should make this particular contribution was taken in 1947. Plans and specifications were drawn up for the suitable modification and equipment of a modern standard factory building to be erected by the Wales and Monmouthshire Industrial Estates Ltd. The factory covers approximately 45,000 sq. ft.

Occupation of the building began on the 2nd January, 1950. The factory now employs 250 people. The number will be raised to 350 as new workpeople are trained.

The employment provided is of various kinds. At present, the largest outputs of repaired equipment are of standard telephone instruments. The bell sets used in conjunction with the telephones will be repaired at Cwmcarn later.

When the instruments removed from subscribers' homes and offices by Post Office engineers are in need of repair, they are sent to the Factories Department. At Cwmcarn a team of women, working with pneumatic tools alongside a travelling belt, strips the instruments down to their main parts. Most of the parts can be cleaned, repaired and re-finished. The telephones are then rebuilt on an assembly line, readjusted and tested by another team of women. They are then as good as new.

The factory also carries out a number of other operations. Examples are coil-winding and the repair of telephone cords. The manufacture of "cable-forms" to provide the inside wiring of certain telephone apparatus is also undertaken.

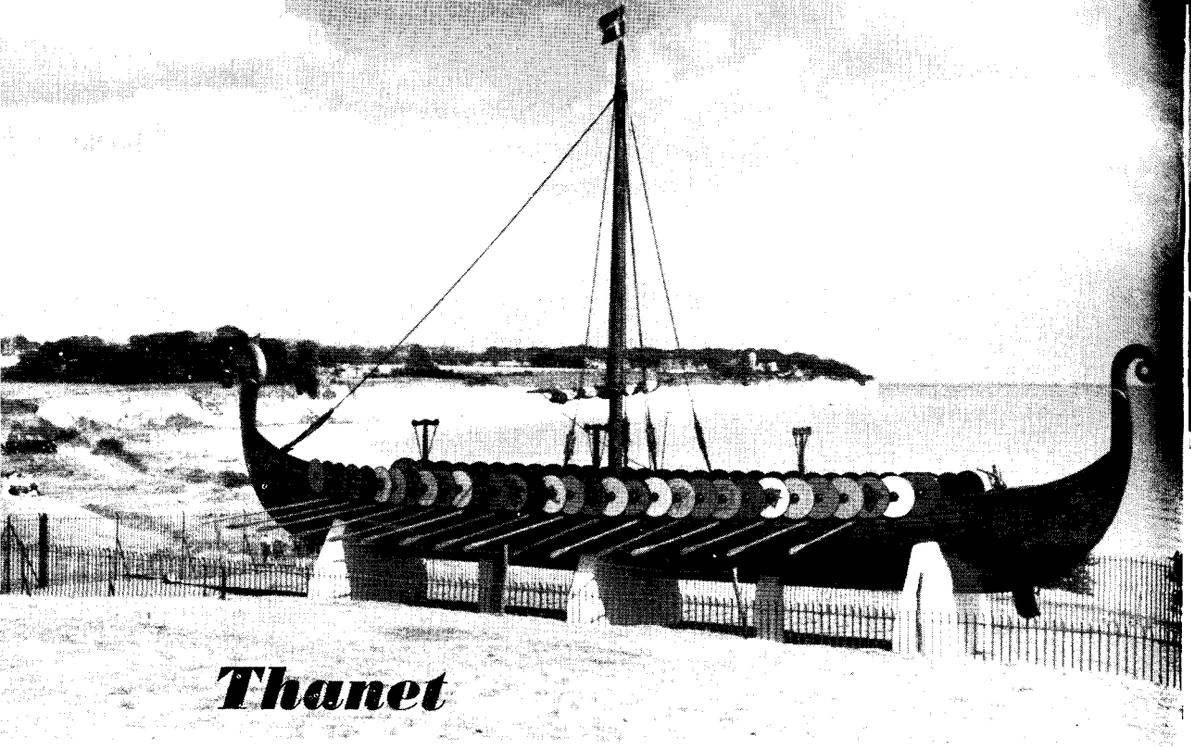
The work described is mostly of a repetitive kind and is carried out by women and girls. A limited amount of plastic moulding is also done, in this case by men.

The building outside the main factory will house a small woodworking shop and an up-to-date plating, polishing and enamelling plant.

The canteen is run on club lines and managed by a committee mainly elected by users, two members being appointed by the management. Although the canteen was opened only a few months ago, it is in vigorous health. A social club has been formed to develop recreational facilities for the staff.

The management has been greatly helped by the friendly spirit shown by everybody whose aid was necessary to set up and prepare the factory for operation and, in particular, is indebted to the Board of Trade, the Wales and Monmouthshire Industrial Estates, Ltd., and the officials and members of the Abercarn Urban District Council.

Telephone assembly flow-line



Thanet

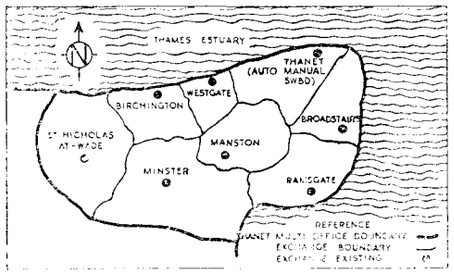
(*Photo by courtesy of Sunbeam Photo, Ltd.*)

by W. H. Scarborough, A.M.I.E.E.
Telephone Manager, Canterbury

THE ISLE OF THANET, SITUATED IN THE north-east corner of Kent and noted for its bracing air, is approximately ten miles in length and four in breadth and is an "island" formed by the course of the River Stour, between Reculver and Birchington on the north, and the exit of the river on the east coast at Sandwich Bay. In earlier days, the Wantsum Channel divided it from the mainland.

The story goes that Hengist and his brother Horsa landed at Ebbsfleet, just south of Ramsgate and north of Sandwich Bay, in A.D. 449. It is from this period that the name "Thanet" is derived. The landing is commemorated by the Danish Viking ship *Hugin*, which stands on the spot at Ebbsfleet. It sailed to Broadstairs on the 28th July, 1949, and was presented by the Danish people to the towns of Ramsgate and Broadstairs jointly exactly one year after.

Map of Thanet Area.



It is worthy of note that a name which goes back so far in the history of Kent has been adopted for a modern automatic telephone service.

Opening Ceremony

At 3.30 p.m. on Monday, 4th June, 1951, the Assistant Postmaster General, Mr. C. R. Hobson, M.P., performed the opening ceremony of the new

The opening ceremony

Thanet exchange by switching over the remaining junctions between each of the five old exchanges (Margate, Ramsgate, Broadstairs, Westgate and Birchington) and the new exchange. On the table in front of the Assistant Postmaster General was a small cabinet with five keys similar to those used on the telephone switchboard, and the same number of lamps were associated with the keys. On the left of the cabinet was an old type magneto telephone representing the obsolete system which, until the 31st May, 1951, had been used in part of the Thanet area, and symbolic of the original type of telephones used during the latter part of the last century. On the right of the cabinet stood the latest type of automatic telephone instrument, indicative of the modern system in operation in Thanet. The operation of the five keys in the cabinet effected the switching of the few remaining junctions, and the lighting of coloured lamps indicated the completion of the final arrangements.

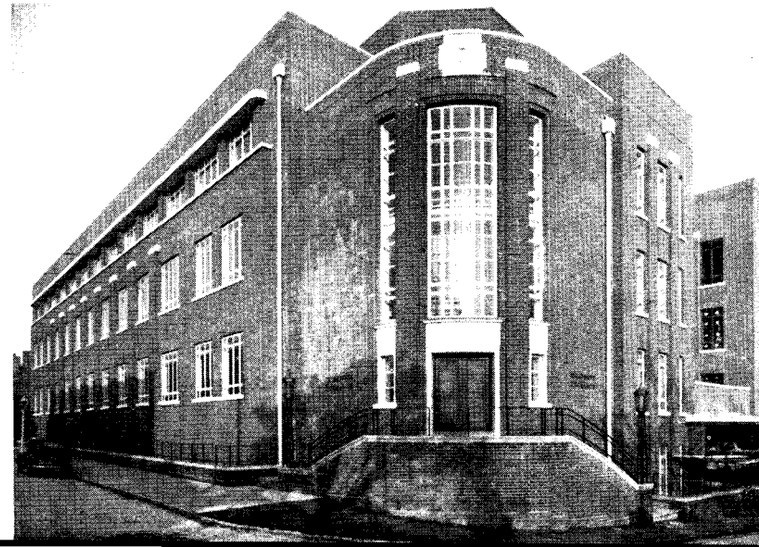
The size of the old manual exchanges in Thanet varied from 600 to 3,000 subscribers; Margate was the largest of the exchanges and functioned as the Group Centre. The new automatic exchange is known as "Thanet" Exchange and serves all the subscribers previously connected to the five exchanges mentioned above, which hitherto had their own distinctive names.

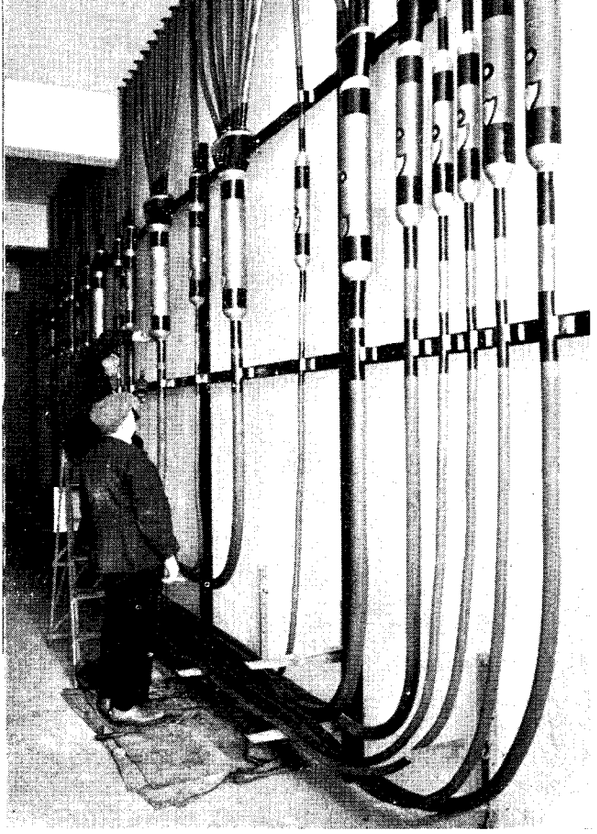
The main transfer of subscribers to the new automatic exchanges took place at 1.30 p.m. on the 31st May, 1951, and marked the culmination of the efforts of many people over many years. The planning and design of the buildings, the provision of equipments, cable layout and many other details have called for team work at Headquarters, Regional and Area level. All concerned have worked in a grand way with untiring energy and sound co-ordination to overcome difficulties brought about by shortage of equipment and personnel. This spirit of co-operation has also prevailed between the G.E.C. Contractors and Post Office staff associated with this vast undertaking, with the result that the transfer was achieved by the date planned many months earlier.

Pre- and Post-War Preparations

The erection of the Thanet building was started before the war, but during 1939-45 it remained a steel edifice in which birds nested; grass and moss flourished on what appeared to be an ancient ruin

"Thanet" Telephone Exchange





The cable chamber below "Thanet" test room

or bombed site. The exchange buildings at Ramsgate, Broadstairs, Birchington and Westgate were completed just prior to the war.

Immediately after the cessation of hostilities, efforts were made by the Ministry of Works to obtain a Contractor to complete the Thanet building, but the Winter Gardens and other works necessary to restore Margate to pre-war grandeur took precedence over this work. However, during 1948, the work was put in hand, the aim being to have the building ready for the General Electric Company to commence the installation of automatic equipment by the summer of 1949. Some of the apparatus was manufactured before the war and stored in various exchange buildings in the Home Counties Region.

In preparation for the Post Office external engineering work for the provision of cables to serve the new automatic exchanges, contractors began to lay the necessary duct tracks in Thanet in June, 1948. The cables were drawn in and jointed by Post Office staff as the new ducts became available. Approximately 38 miles of cable, equivalent to nearly 12,000 miles of single-wire conductors, were provided. To maintain continuity of service in the old exchanges and switching facilities to the new equipment for testing purposes and final transfer arrangements, it has been necessary to rearrange approximately 146,000 wires in cable joints during the past two years.

Automatic Scheme

The Thanet Automatic Scheme was planned in 1935 with the main exchange at Margate and four satellite exchanges at each of the towns concerned.

Owing to its geographical position, the Margate telephone group was very compact and included only the "Thanet" exchanges. The unusual feature of all calls within a group being effected automatically is provided as a result of the conversion. The only telephone operators in the group are at the new Group Centre automanual exchange, "Thanet".

"Thanet" automanual boards, during construction

Five-figure numbers are used throughout the Area.

Numbering Scheme

	Thanet	
Present Exchange	*Numbering Range*	*Multiple*
Margate	20000-23999	4000
Westgate	31000-32199	1200
Birchington	41000-41999	1000
Ramsgate	51000-53599	2600
Broadstairs	61000-62999	2000

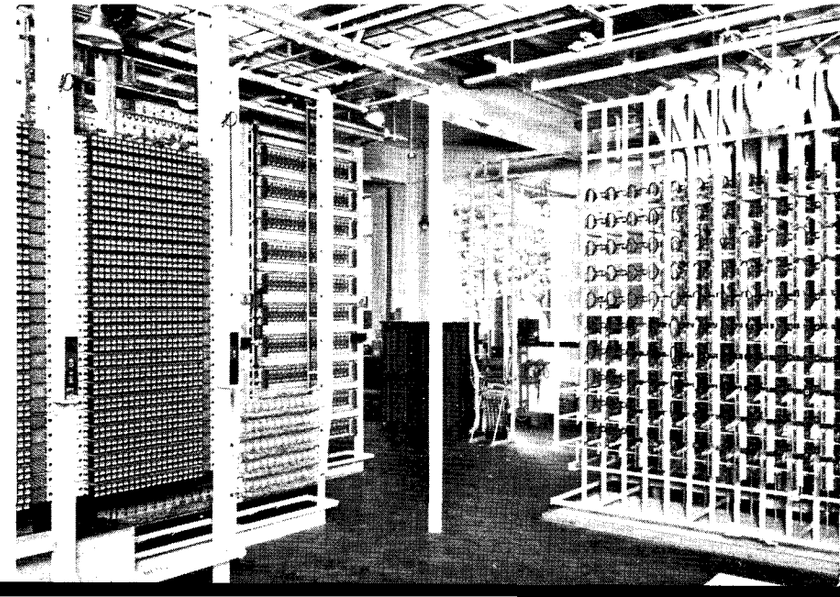
It will be seen that the numbering scheme is common to the main exchange and satellites, with calls entirely within the Area having a single unit fee. In addition, there are three U.A.X's—Minster, Manston and St. Nicholas-at-Wade, all of which form part of the Isle of Thanet.

With the merging of the separate exchange identities, a single measuring point for charging purposes—actually at Westgate—has been fixed, and the overall charging arrangements are therefore simple and straightforward. This has made it possible to provide the operators with Visible Index Files showing charging and routing information in respect of all exchanges in Great Britain and N. Ireland, thus reducing enquiries between the switchboard and the monitors' positions. The separate charging insets which are a feature of most Visible Index Files are made unnecessary.

Exchange Equipment and Switchroom

The equipment is housed on three floors—the power plant and batteries on the ground floor; the main and intermediate distribution frames, test desk, automatic switching equipment and repeater amplifier units on the first floor. The whole of the second floor is set aside for the automanual operating positions and clerical room, staff welfare accommodation being on the third floor.

The design of the switchroom has been given careful consideration to provide the maximum improvement of operating conditions. To minimise sound effects within the switchroom, the floor is covered with Dunlop rubber flooring. The ceiling has received acoustic treatment and the walls are decorated peach colour with pastel green shade surrounds.



Apparatus room, Broadstairs (satellite) Exchange

Satellite Exchange Equipment

The general equipment arrangements are common to each of the four satellite exchanges. On a call originated by a satellite subscriber, the dial impulses are stored in a regenerator, which is incorporated in the discriminator associated with special satellite first selectors.

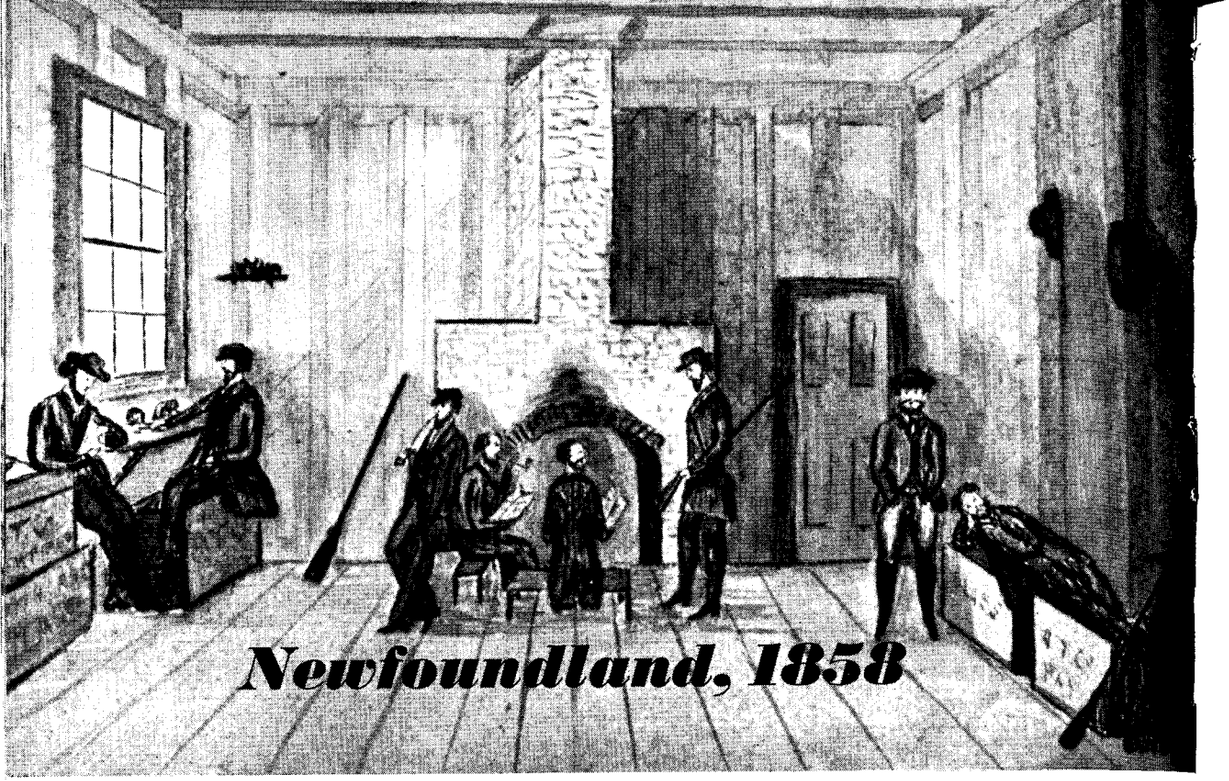
The discriminator is released when the call has been registered on the calling subscriber's meter in both cases.

The discriminators give facilities for multi-metering and route barring.

Conclusion

Subscribers in the Thanet area were for many years less fortunate than those in other parts of the country. It is fitting, in view of the past, that Thanet should now not only be so up to date, but should be in the forefront of new exchange design experiments.

Owing to the excellent accommodation available, it has been decided to use "Thanet" for the introduction of the pilot cordless-type switch-board, with key-controlled connecting circuits, which supersedes the cord-type automanual board. This will work in parallel with the existing switchboard during an experimental period, after which it will probably replace the cord-type switchboard entirely.



Newfoundland, 1858

by J. H. Ricketts,
Public Relations Department

IT WAS WITH THE GREATEST PLEASURE THAT THE British Post Office received the latest addition to its already large collection of historic documents—the diary, private papers and cable slip specimens of the late Mr. Joseph May, a former employee of the Atlantic Telegraph Company. Mr. May had the privilege of being one of those fortunate persons whose lot it is to be present at the making of history. He was sent out, after interview by Doctor O. W. Whitehouse, the Company's "Electrician", to Newfoundland to await the landing of the shore end of what was to be, after several previous unsuccessful efforts, the first effective Atlantic Cable—that cable which after failure, disappointment and mishap was eventually laid successfully by the joint efforts of the British ship, H.M.S. *Agamemnon*, and the U.S. Frigate *Niagara*, thereby justifying the faith which Cyrus Field had had in the possibility of such an enterprise. It is perhaps of particular significance at the present time that the first direct link which was physical rather than sentimental between the two countries should have been laid by two vessels, one British and one American, starting from a point midway between Britain and America.

The documents referred to were presented by Mr. Joseph May, the son of the diarist. Mr. May, himself also a member of the Telegraph Construction and Maintenance Company, the successor of the Gutta Percha Company who were concerned in the making of the original cable, felt that the documents should be in the keeping of the Company

rather than in private possession, but the Company decided that, in spite of the great pride and interest which they had in these records, the papers were of such importance that their proper home was in the official records of the nation and, moved by this unselfish sentiment, they presented them to the General Post Office, in whose archives they will join the personal papers of such men as Rowland Hill, Anthony Trollope and many other famous names.

The diary, although primarily of historical significance, is not by any means a dreary official document, as can be seen from some of the extracts quoted. It is the diary of one of the people who received the first telegraph signals transmitted across the Atlantic, but it is equally the daily account of a young man of 20, recording his impressions of the journey across the Atlantic, his first sight of an iceberg and his sightseeing and visiting in a strange, well-nigh uninhabited country. His entries cover subjects as widely varied as the fact that the quantity of iron in the local water made the charging of cells difficult, and personal comments such as the following, which he recorded on the 29th June, 1859:—

"Was introduced to Miss . . . and Miss . . ., and several other very nice young ladies—and left St. Johns very well pleased".

The following extracts will be of interest:—

"May 20th, Thursday—Left Plymouth by ½ past 6 am Train. Dined at Bristol. Left Bristol at 3 pm arrived at Liverpool by ½ past 10.

"22nd Saturday—Met Mr. Saunders and Huy at McIvers at 12 noon. Went on board the America at ½ 1. Weighed anchor at 3 pm.

"30th Sunday—About noon sighted an iceberg of very great size. Weather exceedingly cold on passing it. Passed several whales.

"June 7th, Monday — Arrived in St. Johns harbour at 4 pm.

"18th Friday—Left Carboneau for New Perlican at 11 am. We left with the Courier. The road is very hilly. We could not ride above 2 m. The distance was 12 miles there. Nothing to be seen but wood and barren. Not 1 house the whole of the way. Quite a wilderness. Arrived at New Perlican by 3 pm.—wet through to the skin.

"23rd Wednesday—Left at 4 am. arrived at Bay Bulls Arm by 3 pm. Found the house was but just commenced. The whole country like a marshland. Mud over our ankles. None of the interior of the country is inhabited.

"July 17th, Saturday—Come to live at the house and assisted in getting batteries, etc. ready for the reception of cable. The 'Victoria' brought round several merchants from St. Johns, but they left before the cable arrived. There were several other small boats. I went on board one of them and spent a very pleasant evening. We had two violins and we sang and danced until 2 in the morning. They also went before the cable arrived, thinking it would not come.

"Thursday, August the 5th—The 'Niagara' entered Trinity Bay. The weather was clear and beautiful.

"6th August—We awoke at about 1 am by Cyrus Field and some sailors, and told to get up as the cable was arrived. We was taken quite by surprise as that was the first warning we had of the cable being near Newfoundland. I immediately commenced and got into working order ssculls (?cells), but had great trouble with them as the water here containes iron. As soon as they are up they commence local action.

"6 am.—Cable was landed and all hands commenced dragging the end up the house and we tested and found the cable was perfect.

"9 am.—Captain Hudson of Niagara read prayers outside the house.

"8th August.—Sunday,—the Captain read service, standing behind a box over which was thrown a flag of each country,—the American Stars and the English Union Jack. Spent morning merry with Sams, Mac, Min and Mor, fishing, boating, etc. Sams, myself and Knight went out to shoot and having shot away all our shots in chase of a large duck we was obliged to fire away part of a silver pencil case, but that did not kill it, so we had but one thing left, which was to fire away the buttons from off my waistcoat, which happened to be brass ones, but we didn't kill the bird with them, so we had to come in without the prize that we had given chase for 3 hours.

"Wednesday May 15th 59.—Received orders about going home. Left Bay Bulls June 26th, 12.30 pm."

The material given into the keeping of the Post Office also included the actual slip bearing the Morse symbols first received over the Atlantic cable. This, however, well-preserved as it is, was too frail for reproduction. Also included were two sketches made by Mr. May at Bay Bulls Arm station, one of which is reproduced at the head of this article.

Telecommunication Services in the Houses of Parliament

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by M. A. R. Kenyon,
London Telecommunications Region

IT IS THE PURPOSE OF THIS ARTICLE TO TELL something of the history of telecommunication services in the Palace of Westminster; in a later article it is hoped to describe the reconstructed telecommunication arrangements introduced at the time of the opening of the rebuilt House of Commons in October, 1950.

It is not always appreciated that the Houses of Parliament are only a part of the Palace of Westminster, which, although no longer a royal residence, is still a royal palace and as such is under the charge of the Lord Great Chamberlain, who, for official purposes, must be regarded as the subscriber. Moreover, the Palace itself covers an area of eight acres, has approximately eleven hundred rooms, a hundred staircases and two miles of passages and, as may well be imagined, offers considerable scope for ingenuity in the matter of telecommunication facilities.

Development, 1877-1914

In order to provide telephone service to satisfy, on the one hand, Ministers of State, Members in Office and the permanent officials of the House and, on the other, the main body of Members of Parliament, telecommunication facilities in the Palace of Westminster have developed along two main channels. For nearly half a century, a private

branch exchange of one type or another has catered for the telephone requirements of Ministers and permanent officials, while the needs of the main body of Members have been met by the provision of telephone call offices under the control of Call Office Attendants. This trend is recognisable, in retrospect, from the early 1880's, when a wall-pattern telephone was installed by the National Telephone Company for the use of Members at the Palace Yard Entrance, until 1907, when the Post Office assumed responsibility for the provision of telephone service by way of a private branch exchange and attended call offices. During that period, a House to House system of 12 telephones and a supplementary group of five telephones connected to an intercommunication switch in the Hall Porter's Box gradually developed, to provide internal facilities for the permanent officials of both Houses, to whom three direct exchange lines—terminated on telephones in specified offices within the Palace—gave access to the Westminster Exchange. Meanwhile the needs of Members were met by the provision of direct exchange lines terminated on counter switches under the control of counter attendants, who, when necessary, extended the lines to telephone cabinets.

In 1877, Graham Bell's representative in the United Kingdom, a certain Colonel Reynolds, who subsequently was to assist Bell in selling the idea of telephonic communication to Queen Victoria, had arranged for a portion of a House of Commons debate to be sent by telephone from the Gallery to the office of the *Daily News* in Bouverie Street. The first telephonic transmission from the House had been achieved. "The effort", history records, "was attended with success and on the following day the information thus transmitted was published in the *Daily News*." Despite this achievement, however, three years elapsed before *The Times* obtained permission from the Speaker to establish permanent telephonic communication between the Reporters' Gallery and *The Times* office. In the same year (1880) the Crown's case against the Edison Telephone Company was heard in Westminster Hall. The Crown lawyers held that telephonic communications were telegrams within the meaning of the Telegraph Act of 1869, and the defendants—the United Telephone Company, in which the Edison Company was incorporated—set up, ostensibly for evidence but more probably for publicity, a telephone circuit between Westminster Hall and the Company's exchange at Palace Chambers, Westminster. A considerable amount of telephone apparatus was displayed in court, and from this and the evidence of eminent scientists who appeared as witnesses, Members of Parliament were able to obtain—practically in the House itself—first-hand knowledge of the much maligned telephone system. On the 1st September, 1883, the illustrated weekly, *The Graphic*, gave further publicity to the use of the telephone in the House by publishing, in conjunction with a double-page article entitled "The Telephone Exchange in London", an illustration of a reporter transmitting a report by telephone from the House. The success of these and other publicity efforts may be judged by the fact that in February, 1885, all-night service — chiefly for the use of Members of Parliament — was introduced at the Westminster Exchange.

The telephone had "caught on" with the Members, but—and this will come as no surprise to those familiar with the early history of telecommunications in the United Kingdom—the anticipated expansion of telephone facilities in the House did not materialise, and more than two decades passed before the foundations were laid for an adequate and efficient service.

In April, 1907, the Serjeant-at-Arms provided the Post Office with a room—a painter's store—for telephone purposes, and after protracted negotiations a requisition was placed in October, 1907, for a Switchboard Branch Exchange 10 · 120/130 Type 250G, on which it was proposed to accommodate 4 direct lines to Victoria Exchange, 1 to Treasury Exchange and some 40 extensions. The annual operating costs—two female operators and one male for evening duty—were estimated at £84 per annum! When the switchboard was brought into service, coincident with the opening of Parliament on the 29th January, 1908, the Clerks and Reporters, no doubt having in mind the increased facilities which were available for the asking, immediately submitted applications through the Serjeant-at-Arms for additional extensions to be provided for the Journal Offices and Press Galleries. This example was quickly followed by other officials, and a period of rapid growth ensued.

By the end of 1910, conditions warranted the addition of a second position to the P.B.X., and a move to a new switchroom on the Upper Committee Corridor became necessary. The installation in the new switchroom was completed by Whit Monday, 1911, and the target date—Coronation

Day, 22nd June, 1911—was achieved. However, traffic handled at the new P.B.X. increased in step with the general expansion of telephone service, and before twelve months had elapsed additional exchange lines had to be provided on the P.B.X., which by now, April, 1912, had a well established primary number in Victoria 6240, although the installation itself was perhaps better known by the easily decipherable telegraph code HMK. This increase in exchange lines brought the total connected to the switchboard to 27, 6 of which were switched, during certain hours, to the "House" Post Office. The number of extensions had reached a total of 134 and the two operators were now handling approxiately 900 calls between 9.30 a.m. and 8.0 p.m. daily.

Requests for improved facilities continued and, if anything, were on the increase. A Government Whip who applied, about this time, for the provision of tie-lines to the Western, Paddington and Hop exchanges, on which many of the Government Members rented exchange lines, explained in his application that, in the event of an unexpected division, such facilities would enable prompt communication to be effected with these Government Members—the old order changeth. . . . ! The required tie-lines were provided and brought into service towards the end of 1912, during which year it had become apparent that although the two-position switchboard had capacity for 40 exchange lines and 240 extensions, the traffic, because of unpredictable peaks, was occasionally beyond the capabilities of the two operators. Consequently, in order that a higher standard of service could be rendered, the addition of a third position was suggested. Treasury authority was obtained for the estimated cost, £118, and on the 5th January, 1914, the two-position switchboard was replaced by three C.B. No. 9 positions, on which three operators were to be employed during the busier times of the day.

During the four years in which the P.B.X. had grown from one to three positions, the demands of Members, Press correspondents and visitors for improved call-office facilities had correspondingly increased. Additional telephone cabinets had been installed to meet these demands, and, as a special feature, three cabinets—served by extensions from the P.B.X.—had been installed in a small room opposite the Members' cloakroom. This installation was known as the Telephone Room. The Attendant in charge, in the course of his duties, was responsible for the safe delivery of incoming telephone messages, and in order to verify that a required Member was on the premises, he followed the rather unorthodox procedure of visiting the cloakroom to ascertain whether the Member's hat or coat was on its respective peg. It is typical of the House that even these cloakroom pegs have historical interest, inasmuch as each peg still carried a loop of red tape to hold the Member's sword. With that loop of red tape in mind, it is perhaps fitting to conclude this chapter, a chapter covering, as it does, the 'eighties and 'nineties, during which "red tape" impeded telephone development to such extent that, in 1898, a Select Committee appointed by the House of Commons reported: "The Telephone Service was not of general benefit either in the United Kingdom at large or even in those limited portions of it where exchanges existed."

World War I

On the 1st January, 1912, when the Post Office took over the telephone service from the National Telephone Company, unity of control of practically all telephone systems in the United Kingdom was established and the opportunity arose for standardisation and development on modern lines. Immediate advantage was taken of this opportunity and, as mirrored by the telephonic development in the Houses of Parliament, steady progress was made. The first World War, however, prevented the full exploitation of the situation, and, in common with the telephone system generally, there was little change in the facilities in the House during the war years.

The capacity of the three C.B. No. 9 positions installed in January, 1914, proved adequate for the war-time needs of the permanent officials. In fact, events were to prove that no major extension of the P.B.X. would take place until 1923. In January, 1917, however, the inception of a new fire-alarm system brought about the introduction of all-night staffing of the switchboard, which has been manned continuously ever since.

During the early months of the war, the removal and centralisation of certain telephone cabinets was considered. These cabinets, six in number, were to be sited in a room adjacent to the Members' cloakroom suite, thereby increasing the facilities available in the Telephone Room. A small switchboard

with lines to the P.B.X. and to the cabinets was to be installed for the use of the Attendant. The Assistant Serjeant-at-Arms considered, however, that as many Members were absent on active service and the House would not be dealing with party matters, the proposals should be held in abeyance. As a result, no change in the disposition of cabinets took place until many years later and, except for minor alterations, call-office facilities remained very much as they were.

The Years Between

The stultifying effects of the 1914-18 war on the telephone system generally, and especially that in London, added urgency to the need for telephonic development in the post-war years. Consequently, in the next decade—during which automatisation was to give rise to the evolution of an efficient and modern system—there was a period of considerable expansion in the telephone facilities at the Palace of Westminster.

Shortly after the war, many rooms formerly used in the Palace for residential purposes were made available for the various Committees and Royal Commissions set up by the Government. Demands for increased telephonic facilities became the order of the day, and the number of working extensions on the P.B.X. increased beyond all expectation. By 1923, the traffic capacity of the switchboard was exceeded and the installation was enlarged to five positions. A further extension in 1937 brought the capacity to 40 exchange lines and 360 extensions and this satisfied requirements until the outbreak of World War II. Meanwhile, with the opening of Whitehall (Automatic) Exchange, the opportunity had been taken, in 1931, to provide automatic facilities on incoming calls. Lines from Whitehall Exchange had replaced the incoming lines from Victoria and the number Victoria 6240 had given way to Whitehall 6240, by which the P.B.X. is known to-day. The introduction of automatic facilities on both incoming and outgoing routes came later, in 1934, when, by extending the Whitehall group of lines, similar facilities were also provided on certain call offices in the Members' Telephone Room.

Concurrently with the expansion of P.B.X. facilities, the call office arrangements in the House underwent considerable change, and during the fifteen years 1919-1934, the fundamentals of the present-day system evolved.

When Parliament assembled after the 1914-18 war, it became obvious that whilst Members were making far more use of the telephone, many new Members were not aware of the extent of the telephone facilities afforded to them. Also, the increase in work on Royal Commissions and Committees had given rise to a number of Members' attending at the House when the House was not sitting and to their being absent from the Chamber when the House was sitting, and, in general, considerable difficulty was being encountered in tracing Members on incoming calls.

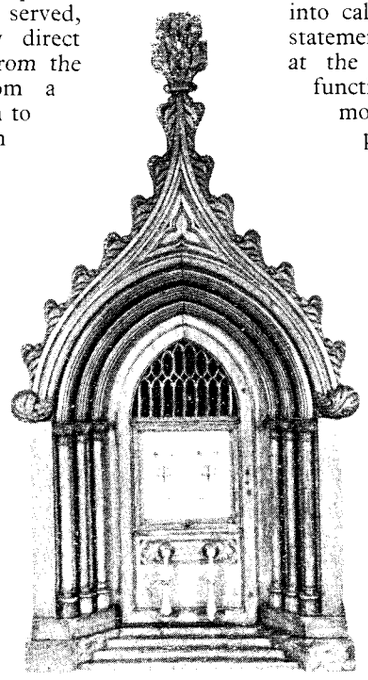
In May, 1919, there was a total of eight suites of from two to four telephone cabinets on various sites within the Palace. The control of three suites rested with the staff of the London Telephone Service; two with the staff of the London Postal Service; two suites of three cabinets were connected direct to the P.B.X.; and the eighth suite comprised two coin-box cabinets. The incoming message service, which had been augmented by a message card system, was firmly established and widely used. Not only was the Attendant now expected to ascertain that the required Member was in the House, but, in addition, he was responsible for the preparation of a message card and, if necessary, its subsequent passage to a messenger at the door of the Chamber for delivery. If the required Member was not in the Chamber and his whereabouts were not immediately ascertainable, the message card was passed to the House of Commons Messenger service and "paged" with others through the library, smoking rooms, dining rooms etc. at intervals of ten minutes. At the end of the day, all undelivered cards were sent to the Assistant Serjeant-at-Arms' office for posting to the members' private addresses.

The scheme for ameliorating the difficulties being encountered did not include, strangely enough, the centralisation proposals put forward in early 1914—a direct result probably of the economy axe which was wielded in those post-war years. As a first step, however, the L.T.S. relieved the L.P.S. of the control of a suite of two cabinets in the Committee Lobby, placed an Attendant in charge and provided him with private-wire facilities to the Attendant in charge of the Members' cloakroom suite. This arrangement, which ensured that incoming messages for Members sitting on Committees and Commissions received expeditious treatment, proved so satisfactory that the Committee Lobby suite was increased to four

cabinets. Subsequently the Attendant was provided with a Control switchboard with lines to the P.B.X. and, for the first time, a degree of flexibility was established between the two call office suites used mainly by Members.

The centralisation project came to fruition some years later, when with the consent of the Serjeant-at-Arms, a room in the Cloisters leading to the Commons Lobby was appropriated for the Members' Telephone Room. Eight cabinets were installed, three of which were reserved primarily for toll and trunk calls and connected direct to Victoria Exchange. The remaining five cabinets, used for local calls only, were connected as extensions on the P.B.X. Thus, once again, the Attendant was deprived of his control switchboard and his job re-acquired the personal touch whereby he "shepherded" Members to the telephone, obtained their calls and, if the Member was not a "monthly-account" user, collected due fees on timed calls. Actually, no firm policy on the vesting of control of calls with the Attendant was ever laid down at the House, and an interesting feature of the call office development is that, over a period of many years, the telephone cabinets used by Members were served, in changing circumstances, by direct exchange lines, by extensions from the P.B.X. or by extensions from a control switchboard. A reversion to "Attendant" control took place in 1934, when, as already mentioned, automatic facilities were introduced in the Members' Telephone Room. The control switchboard installed at the time had outlets to Whitehall (Automatic) Exchange, Victoria (Manual) Exchange and the P.B.X., and the Attendant could exercise control over all incoming and outgoing calls. As the cabinets reserved for local calls were fitted with dials, however, the Whitehall lines—which were "barred trunks" — were normally connected through to the cabinets, and it became the practice for Members to dial their own local calls. Full advantage has been taken of this practice, and present-day policy is for all local-call cabinets to be served by direct exchange lines.

Consequent on the alterations carried out in 1934 and the addition of three cabinets and the provision of direct lines to Trunks in 1935, the Members' Telephone Room and its associated incoming Message Service had definitely "arrived" by the middle 'thirties. In "The Story of the Telephone", J. H. Robertson, writing of this period, says "The industry (Telecommunication) had reached maturity. The Post Office had attained efficiency. Telecommunications in this country came into calm and prosperous waters". This statement was equally true of conditions at the Palace, where the P.B.X. was functioning as an integral part of a modern system and the facilities provided in the Members' Telephone Room were fully utilised and appreciated. Small wonder that in 1938, when — after eighteen months' work—the engineers completed the re-wiring of the premises, the future of telecommunication services in the Houses of Parliament was regarded with equanimity and optimism, but these feelings were soon to be rudely shattered by the events which are to be described in a later article.



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Cooke and Wheatstone Two-needle Telegraph of 1846.

Technically, this instrument is of the type introduced by Cooke and Wheatstone in 1838. *This particular instrument was designed with a Gothic style case to conform with its surroundings in the House of Commons, where it was installed in* 1846.

It is not known exactly how long it remained in service at the House of Commons, but it was transferred by the G.P.O. to what is now the Science Museum in 1884.

The Radio Interference Service

by G. A. C. R. Britton, A.M.I.E.E.
Engineer-in-Chief's Office

The Early Days

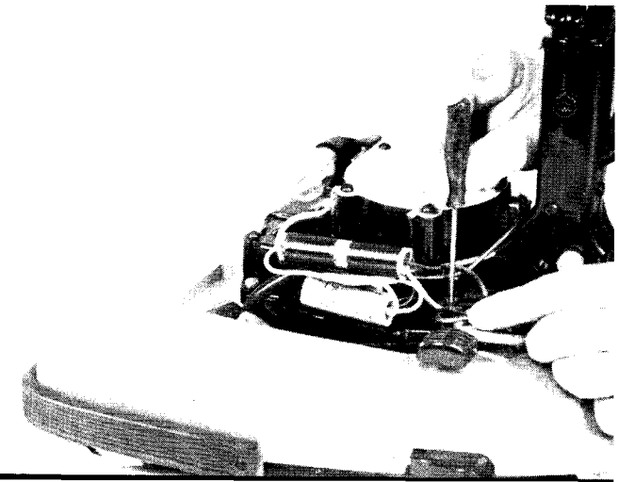
APART FROM "JAMMING" BY UNWANTED transmissions or "atmospherics", interference with broadcast reception was at first rare, though some trouble was experienced from ordinary receivers used in a radiating condition either unwittingly or in an effort to obtain the maximum amplification. Such misuse was in fact an infringement of the conditions of the licence and when complaint was made, the Post Office had to investigate and educate and/or admonish offenders. This type of interference later became less frequent with the introduction of sets of improved performance. Up to this time, the work devolving on the Post Office in keeping interference under control was negligible and field investigations were carried out in the evening, after normal hours of duty.

Then came the great growth in popularity of broadcast entertainment and the general expansion of electricity supplies. Mains-operated radio sets rapidly came to the fore, as well as the multitude of electrically-operated industrial, commercial and domestic appliances and machinery, which help to speed up production in industry, reduce drudgery in the home and add generally to the amenities of modern life. Nearly all this apparatus is a potential source of interference if used in the vicinity of a broadcast set. The complaints reaching the Post Office increased steadily and the work of investigating interference complaints could no longer be properly and economically carried out by telephone and telegraph staff in their "spare time".

The Organisation Takes Shape

Gradually staff became employed for an appreciable part of their normal hours of duty on radio-interference work. Many weary miles were covered, on foot and by public transport, by men loaded down with a portable receiver in one hand and a bag of tools in the other. In 1932, it was decided that the work should be done by full-time radio-interference investigation officers (I.O.'s) in the field, who should have the rank of Skilled Workmen, Class I. The first major steps towards efficient organisation were taken in 1933-1935, when the Engineer-in-Chief arranged the provision of special motor-vehicles, apparatus and training courses. The vehicles, which had non-metallic bodies to permit the use of aerials contained within the vans, carried not only the portable receivers used for tracing interference to its source, but also an extensive range of standard suppressors, which were used primarily for demonstrating but upon request were also sold to owners of apparatus causing interference. All staff employed regularly on the work were required to obtain special qualification by means of courses in R.I. run by the Training School and Radio Branch in collaboration. For many years the Radio Branch decided the syllabus and provided the lecturer for R.I. courses, as well as much of the equipment, the School pro-

FIG. 1
SUPPRESSOR BEING FITTED TO A VACUUM CLEANER.



viding basic instruction, facilities and accommodation. The I.O.'s had assistants where warranted and were attached to the Sectional Engineer, usually under the supervision of an Inspector on a maintenance or power duty. It was recognised that the latter could not be expected to be a radio expert, and technical supervision was vested in the Superintending Engineer, whose office, in most cases, had one or more Inspectors who were R.I. specialists, and who made frequent visits to Sections to co-operate with the local field staff.

In addition, a "Broadcast Interference Group" was established within the Radio Branch of the Engineer-in-Chief's Office. Its main responsibilities were training, provision of apparatus and transport, dealing with radio exhibitions, technical advice to district staff, and frequent visits to them. In fact, at one time the endeavour was made to visit each I.O. once a year.

The Coming of Television

An experimental low-definition television service opened in 1929. Pictures were crude and small, transmission times very limited and programmes unambitious, so it is not surprising that they had little public appeal. The real public service at high definition began in November, 1936. Right up to the war, receivers were not exceptionally sensitive and they were used only at short distances from the transmitter. Few complaints of interference (T.V.I.) were received. Over 40,000 complaints of R.I. and over 100 of T.V.I. were received per annum in the years just before the war. During the war, the R.I. service was kept going in skeleton form. Bad R.I. cases were dealt with, the aim being to enable listeners to receive the B.B.C. "Home" programme reasonably satisfactorily, and much work was done for the Services and Government Departments, whose many radio and radar installations in this country were, on occasions, subject to interference.

The Post-War Years

As the country readjusted itself to conditions of peace, broadcast reception of sound resumed its normal position in daily life, and the television service restarted. The latter at once made rapid progress, and it has made even more rapid progress since. With the opening of the Sutton Coldfield station, the B.B.C. began the extension of service to the provinces. We now have to deal with 77,000 sound and 28,000 television interference complaints a year. The possibility of eliminating unnecessary complaints, which are an appreciable proportion of the total, and of increasing the efficiency of the service is being investigated very carefully.

The original single training course given to I.O.'s has now been replaced by separate courses in basic radio theory, radio (i.e. sound broadcasting) interference and television interference. All are now run wholly by the Training Branch at the Central Engineering Training School at Stone. Under full regionalisation, the visits from the Engineering Department to Technical Officers have been discontinued, though the Engineering Department continues to collaborate with them in the more difficult field investigations. Regular conferences between the Engineering Department and radio staff at Regional Headquarters are now held. The introduction of standard suppressors for television began several years ago and the whole range is now available to the I.O.

The vast majority of owners of interfering apparatus has always co-operated willingly with the Post Office and had suppressors fitted at its own expense. There has however always been the uncooperative minority, and to deal with such people the Wireless Telegraphy Act 1949 now gives the Postmaster General power to make and enforce regulations which prescribe what have been regarded by an impartial committee as reasonable arrangements for countering interference.

Some Data and Technicalities

For several years, detailed records of the types of apparatus causing interference have been kept by Telephone Managers and summarised by the Engineering Department. The present period is one of change and development, which is reflected in the annual analyses of returns. The principal causes of complaint in the 12 months ended 31st December, 1950, are given in the Table. The most striking feature in each case is the large number of fruitless complaints, i.e. those in which the interference is intermittent and never occurs during the I.O.'s visits; or it is of such short duration as to defeat all efforts to track it to its source. In some of these cases, the interference is undoubtedly due to impending breakdown of an electrical appliance or

FIG. 2—IGNITION INTERFERENCE WITH TELEVISION RECEPTION.

machine; no doubt the actual breakdown occurs, skilled maintenance is given and both fault and interference are eliminated before the Post Office investigator comes near.

Interference Suppressors

Except in a few special cases, practically all interference results from sudden changes or discontinuities in electrical circuits, such as may be caused by the operation of commutator-type motors, the making and breaking of contacts, and the discontinuities inherent in operating gaseous discharge devices such as fluorescent lamps. The circuit-changes impress on the electricity supply mains sudden changes of potential or current, which contain components at even very high radio frequencies; in addition, radio-frequency energy is radiated into space. These components are known as "radio noise" voltages, currents and fields. Practically all electrical apparatus contains the elements essential to generating interference. In fact, the most severe and widespread interference is caused by the noise voltages and currents fed back into the electricity mains by low-power apparatus. The problem of suppression, once the source has been located, is therefore generally one of attenuating the noise voltages and currents and restricting the circulation of the latter to the immediate vicinity of their source. This can be done by inserting in series, between the apparatus and the mains, impedances (or suppressors) which are negligible in their effect on the power-current driving the apparatus, but have a value as high as possible at the radio-frequencies concerned; also by shunting between the mains and the framework of the apparatus, impedances as low as possible at the radio-frequencies but extremely high at the frequency of the power-current (in the United Kingdom, usually 50 c s).

Figure 1 shows suppressors being connected to a

THE MOST FREQUENT SOURCES OF INTERFERENCE WITH RECEPTION OF SOUND BROADCASTING, EXPRESSED AS A PERCENTAGE OF CASES CLOSED.

	SOUND		TELEVISION	
	*	%	*	%
Unknown ; interference not observed by P.O. staff ...	(18,018 complaints)	23·8	(7,068 complaints)	29·2
Inefficient aerial/earth systems	15,246	20·1	947	3·9
Faulty receivers	9,507	12·5	1,972	8·2
Faulty wiring of buildings	5,029	6·6	234	0·9
Refrigerators	2,255	3·0	331	1·4
Fluorescent tubes	1,787	2·4	—	—
Radiation from T.V. receiver time base ccts.	1,725	2·3	—	—
Radio transmitters	1,469	2·0	1,007	4·2
Bedwarmers	1,423	1·9	—	—
Motors, misc.	1,334	1·8	315	1·3
Sewing machines	1,162	1·5	2,374	9·8
Overhead power lines	900	1·2	632	2·6
Drills	791	1·0	221	0·8
Radiation from I.F. oscillators of radio receivers	622	0·8	156	0·6
Misoperation of receivers	539	0·7	204	0·8
Thermostats misc.	539	0·7	184	0·7
Smoothing irons	528	0·7	—	—
Vacuum cleaners	527	0·7	257	0·9
Neon sign tubes	503	0·7	192	0·8
Underground mains	492	0·6	—	—
External cross modulation	414	0·5	—	—
Fans	391	0·5	521	2·1
Calculating machines ...	353	0·5	150	0·6
Hairdryers	292	0·4	697	2·9
Motor car ignition	—	—	1,096	4·5
Medical apparatus (valve-operated)	—	—	306	1·2
Filament-type lamps	—	—	305	1·2

* The figures in the first and third columns do not necessarily represent the number of complaints received. For example, the fourth item from the end means that of the complainants whose sound-reception problems were solvec, 0·4% had been collectively troubled by interference from 292 hairdryers.

domestic vacuum cleaner. In this particular instance, it has been necessary to use one unit to be effectual at the low frequencies used for sound broadcasting and another for the higher television frequencies.

The electrical ignition system of a motor car has the characteristic of producing interference which is negligible at low frequencies and does not become severe until the television frequency band is reached (Figure 2). The interference is produced solely by radiation, there being no electric mains to convey the interference energy away from its source. Suppression is obtained, without adverse effect on the performance of the car engine, by

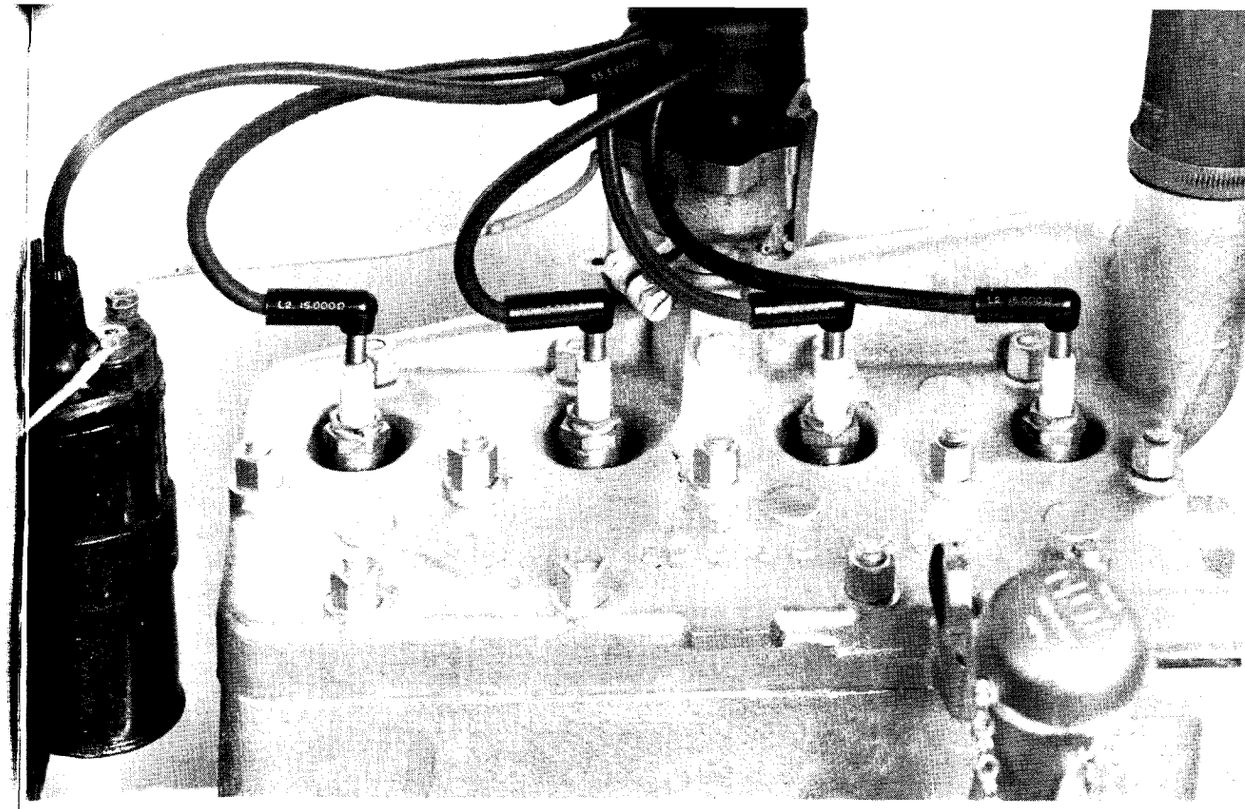


FIG. 3—MOTOR CAR ENGINE WITH SUPPRESSORS FITTED.

connecting one or more resistors in the high-voltage ignition leads, to "damp out" oscillation. In many cases, one resistor is adequate, though some vehicles require more. Five are shown fitted to the engine in Figure 3.

Personal Matters

The radio interference I.O. is something of a "lone wolf" among the staff, practically all of his work being carried out away from Post Office premises, in the open air and in premises of complainants and owners of "suspected" apparatus. Technically also, the I.O. is comparatively isolated; he may be the only Post Office man in his headquarters town to be employed on radio duties. His work brings him into intimate daily contact with the public and he has to be at one and the same time a technician, sleuth and diplomat. The qualities required of a good I.O. are therefore somewhat different from those required of the majority of engineering staff. The main requirements are that the I.O. should be self-reliant and able to "get on well" with complainants and plant-owners, and that he should have an adequate technical knowledge and "flair" for locating sources of interference.

Interference of considerable duration, which is sufficiently obliging to be present during the I.O's visit, is not particularly difficult to localise and suppression is usually straightforward. Interference of intermittent occurrence and short duration is another matter entirely, and it is here that the "natural" investigator, whose instinct and past experience are used to reinforce the process of observation and deduction, has a chance to excel: does the interference occur only after dark?—on early-closing days?—when the weather is wet—or dry—or hot—or cold?—when there is a strong wind? All such factors not only can and do come into play, but to the knowledgeable I.O. they may give a valuable clue to the probable nature of the source of the interference, and hence to the type of premises on which it is most likely to be found. Not all intermittent interference is accompanied by

FIG. 4—INVESTIGATION OFFICERS TRACING INTERFERENCE WITH DIRECTION-FINDING EQUIPMENT.

such pointers, however: imagine, for example, the feeling of hopelessness which must pervade the I.O. shown in Figure 5, who is seeking, among a large collection of high voltage electrical plant, for one loose connection or corroded joint which he believes to be the cause of widespread interference with television reception. The work undoubtedly has its attractions, though, and few members of the radio interference staff would willingly change to other duties. The extreme variety of work encountered is alone a constant source of interest; the man who is dealing one day with interference at a power station may encounter, in consecutive jobs, interference from a small electric shaver in a home, the lift in a block of flats, the neon signs outside the local cinema, and so on.

Nor are pathos and humour entirely absent. Dealing with the lighter side, the listener who thinks the soil in the flower-pot indoors to be a satisfactory earth for the radio set exists not merely in the imagination of a music-hall artist: he is encountered in real life from time to time.

Perhaps the most curious incident the writer has heard of recently is the "barking-dog" case, for details of which he is indebted to the Coventry radio staff.

As the story runs, several residents in a village near Coventry were troubled by dog-barks, which were heard via the loud-speakers of their radio sets, and one of the affected residents registered a complaint with the G.P.O. The experiences of the local radio staff were decidedly out of the ordinary. One listener visited asserted that she heard the dog-barks on her radio set. No set was visible and it transpired that the loud-speaker was embedded in a wall that had just been re-papered. It was also learnt that when a certain handbell was rung, the

(continued on page 168)

NOTES AND NEWS

Ideas by Post Office Staff - Explosives Save Manpower - Stevenage Exhibition - Post Office Festival Booklet - Miniature Slides for Training - Inland Telegraph Traffic - New Radiotelephone Service - Firemen's Alarm Systems, etc.

Ideas by Post Office Staff.—During the quarter ended 31st March, 1951, the General Post Office Awards Committee granted awards amounting to £822 for 342 suggestions made by Post Office men and women for improving the services. There were 123 awards ranging from £1 to £10, one award of £25 and one of £200 for adopted suggestions and 217 encouragement awards ranging from £1 to £3. The highest award for the quarter was one of £200 shared between a Technical Officer and a Technician Cl. II in the Brighton Telephone Area, for a modification to the meter circuit fitted to subscribers' terminations at C.B. exchanges to reduce installation costs.

The second highest award of £25 was paid to a Storekeeper in the Supplies Department for a suggestion concerning the methods used in despatching uniform clothing to local offices.

Since the G.P.O. Awards for Suggestions Scheme was introduced 45 years ago, more than 138,000 suggestions have been received and some £47,000 paid as awards. Thousands of suggestions contributing to the improvement of Post Office services have been put into operation. Every Post Office servant is at liberty to submit a suggestion and even although it may not be suitable for adoption, the suggestor is often given an encouragement award.

★ ★ ★

Explosives Save Manpower.—Gelignite, which has been used for many years for blasting holes in rock for telegraph poles and other plant, is now being used in some parts of the country for blasting holes in soft soil for telegraph poles.

Experiments carried out by Post Office engineers have shown that in soft soil it takes only five minutes to blast a hole of the required depth of 4 ft. 6 ins. The method employed ensures very little disturbance above ground and also the muffling of the explosion.

In view of the considerable saving in manpower, which is very important under present conditions, this method of excavation is likely to be extended to other rural areas in the country where conditions are suitable.

★ ★ ★

Extract from the "Nottingham Evening Post" dated 7th May, 1951.—"I have had a complaint of interference with radio from a Bulwell reader, and he has my sympathy. I know how you feel about speaking to neighbours when you suspect them, and what an awkward predicament it puts you in. However, there are always the Post Office engineers to whom you can make your complaint by filling in the appropriate form obtained from the Head Post Office.

"And you need not be afraid of these P.O. engineers. They will, as always, use the utmost tact in dealing with any complaint and in a high percentage of the cases investigated I can tell you they manage to effect a cure, and without causing friction anywhere. People in this area may rest assured that in the local anti-interference engineers we have one of the finest bodies in the country."

Exhibition of Engineering Services by the Stevenage New Town Development Corporation.—Readers will recall that in our August, 1950 issue there appeared an article describing the model telephone exchange which had been constructed by the Factories Department for use at the Headquarters Traffic Training School. They may now be interested to learn that in response to an invitation to participate in an exhibition of engineering services, being staged at Stevenage in conjunction with the Poplar Festival of Britain planning exhibit of the New Towns, the Post Office arranged for this model telephone exchange to be lent to the Stevenage Development Corporation and has agreed that it shall be suitably displayed for the duration of the exhibition (May—September, 1951).

★ ★ ★

Post Office Festival of Britain Booklet for Distribution to Visitors from Overseas.—A booklet entitled "Britain Welcomes You—The Post Office at your Service" has been prepared and made available for distribution to visitors from overseas during the Festival of Britain period. It contains particulars of the Postal, Telephone and Telegraph rates for the Commonwealth and other overseas countries and other useful information, and pictures the coins (1d., 6d. and 1s.) mostly used in making telephone calls.

The booklet has been distributed to hotels, boarding houses etc. in those places to which visitors are likely to resort, i.e. London and other places putting on special events for the Festival; the main sea and air ports; provincial cities and places of interest; and travel and shipping agencies. It is hoped to get the booklet into the hands of tourists disembarking from ships or landing at air ports.

It is also available at main Post Offices where visitors are likely to be numerous, and counter officers at the Post Offices will proffer a copy to any person transacting Post Office business who is clearly a visitor to this country.

★ ★ ★

Miniature Slides for Telephone Training.—The use of slides in telephone training is of course not new, but in the past they have usually been prepared by enthusiasts in local offices. A central library of miniature slides is, however, now being compiled by the Inland Telecommunications Department, and already contains about 250 carefully selected slides (in duplicate). Slide carriers, to fit the film strip projectors already held, are being issued to Regions and to Telephone Areas where there is sufficient use for them. With the aid of a detailed index, instructors will be able to choose and borrow the slides they require to illustrate their talks. In addition, local staff will be encouraged to prepare their own slides, which, if of general interest, can be included in the central library. For the more informal types of training, the scheme should overcome some of the limitations imposed by the use of film strips, which are moreover rather expensive and difficult to adapt to constantly changing conditions.

★ ★ ★

Speaking Clock.—Arrangements are in hand for a limited extension of the Speaking Clock service to those towns at which extension could be engineered at relatively small cost.

★ ★ ★

Inland Telegraph Traffic.—Since November last, when the Greetings Telegram Service was re-introduced, the downward trend of telegraph traffic, which has been a regular feature in the post-war years, has been arrested, and during the six months ending in April, 1951, the number of inland telegrams was 2% higher than in the corresponding period a year before. The rise in phonogram traffic has been particularly noticeable and frequently the number of phonograms has exceeded the number of telegrams accepted at counters. Greetings telegrams have proved to be even more popular than in pre-war days, and during the Easter period the weekly total reached a peak of 155,000. The average number during recent weeks has been 85,000.

★ ★ ★

New Radiotelephone Service.—Public communication facilities between the United Kingdom and Cyprus were extended on the 1st May when a radiotelephone service with the island was inaugurated. The first call over the new service was made by His Excellency the Governor of Cyprus, Sir Andrew Wright, who exchanged greetings with the Secretary of State for the Colonies, the Rt. Hon. James Griffiths, M.P. The radio terminal in Cyprus is being operated by Cable and Wireless, Ltd.

Leeds-Sydney Telephone Call.—In order to inaugurate a campaign for the sale of Australian honey in this country, the Australian Government Honey Executive recently asked the Post Office to provide facilities for an exchange of greetings between residents of Leeds and their relatives and friends who had emigrated to Australia.

The ceremony was held at Lewis's Store in Leeds on the 15th of January, and the conversations were reproduced on loud-speakers to an audience of 500 people at the Store. The Lord Mayor of Sydney, who was visiting this country, took the opportunity of speaking to his wife, and, to the great pleasure of the Yorkshire audience, Len Hutton, the cricketer, attended the Sydney studio to speak to Mrs. Hutton, who was present at the Leeds gathering. Another conversation which was widely reported in the north country press was that between an old lady of 80 and her son, whom she had not seen or spoken to since he emigrated to Australia in 1928.

This highly successful ceremony lasted 69 minutes.

★ ★ ★

Distress Signals from Ships at Sea.—A distress call sent out by ships navigating in the seas round the British Isles invariably finds its first shore contact at one of the Post Office wireless coast stations. All these coast stations maintain a continuous watch for distress calls from ships at sea and when such a call is received the station immediately ceases all commercial transmitting and directs its attention to establishing communication with the ship concerned. The nature of her distress and the assistance needed is passed at once to the appropriate authorities, who provide all neccessary measures for effective help. During 1950, Post Office coast stations dealt with 295 Distress Calls.

In addition to Distress Calls, 219 Medical Messages were handled by Post Office coast stations during 1950 under the important service known as Medical Advice to Ships at Sea.

★ ★ ★

More Cheap Rate Trunk Calls.—A quarter of all trunk calls being made today are being charged at the cheap evening rate, compared with one fifth in 1945. This is one of the results of the extension of the cheap rate period which was effected on the 7th October, 1950.

The cheap rate now applies from 6 to 10.30 p.m. Before the change, the period was 6.30 to 9.30 p.m. (5.30 p.m. to 9.30 p.m. for call office calls.) The peak traffic level (7 to 7.30 p.m.) has fallen to 15% of the total evening (6 to 10.30 p.m.) traffic, compared with 19% in 1947-49 and 23% in 1939, when the cheap rate period started at 7 p.m. The more even distribution of calls throughout the evening should enable more efficient and satisfactory staffing arrangements to be made.

★ ★ ★

Firemen's Alarm System.—The Post Office Engineering Department has developed a new system, for use with manual exchanges, for the remote control of call bells and alarm sirens in places where there is no permanently manned fire station. Calls from unattended fire station areas will be put through to the appropriate fire headquarters by the telephone exchange operator. On receipt of the report, the fire headquarters will call a special telephone number at the unattended fire station responsible for the area concerned. This will make call bells ring at the firemen's homes at any hour during the day and night and in daytime will also sound a siren. The first fireman to reach the fire station will call the fire headquarters to find out where the fire is.

An improved system is also being developed for use with automatic exchanges.

★ ★ ★

Chatterers in Call Boxes.—Prolonged telephone conversations can be a source of great annoyance to persons waiting impatiently outside to put through an urgent call, particularly in isolated areas where perhaps only one kiosk is available. The problem has not been overlooked by the Post Office, although research has shown that roughly 60% of calls from coin box telephones are of under three minutes duration.

In recent years the question of installing an automatic time check has been thoroughly examined. The design presents no difficulty in itself, but additional engineering and operating costs would be incurred and these outweigh any advantage that would be secured.

Scribbling in Kiosks.—The present standard kiosk, introduced in 1936, was designed by Sir Giles Gilbert Scott to be almost proof against disfigurement by writing. It has a cast-iron framework and a back-board of black glossy bakelite which serve to resist damage by wanton scribbling. The notices on the back-board are protected by glass.

The problem of writing in kiosks is a long-standing one and from time to time brings forth suggestions from the public, one of which is that a writing plaque should be provided. Unfortunately there is no entirely suitable material for a plaque that will stand up to hard wear and at the same time take pencil and ink marks which can easily be erased. The only alternative is to supply small pads of paper. A facility of that kind, however, would be liable to widespread misuse and a large staff would be needed to maintain supplies. Apart from the present shortage of paper, the cost would be prohibitive.

★ ★ ★

Call Office Dials.—As announced in the August 1950 NOTES AND NEWS, a field trial of dials having the numbers 8, 9 and 0 luminous is being carried out. The three figures have been treated so that the caller can see a continuous glow throughout the dialling operation. Over 100 new dials have been fitted in unlighted public call offices in London, the Home Counties, N.E. England, Scotland and Wales. Reports so far received show that during the first six months the glow has not deteriorated and some favourable comments have been received from the public.

Book Received

SIGNAL VENTURE, by L. H. Harris; Gale and Polden, Aldershot 1951: 278 pp., 21 photographs, 1 map: 18s.

"His helmet now shall make a hive for bees", quotes Brigadier Harris in winding up "Signal Venture" by describing a 1947 visit to the Arromanches Mulberry, but this is the sole regretful note in his book. He had considered writing a history of the long distance communications planning and execution for D-day and after. We are led to infer that the amount of research and reference which he found to be necessary made him abandon this intention.

We are fortunate, therefore, on two counts. If he had stuck to his original intention, we should still have been awaiting a book from him. We should also have missed his reminiscences of farming life in Australia, of service with the Australian Signals in the 1914–18 war and, of particular interest to us in the Post Office, his experiences in the Research and Telegraph Branches of the Engineering Department between the wars. Nevertheless about half the book is taken up with the 1939–45 war.

Our author's style can well be described as racy and his intense interest in all that he notices and does prevents him from becoming either pontifical or artificially modest. Post Office names crop up all over the place for, if we didn't know it before, we soon learn from this record that the Royal Signals owe much to the Post Office, even if they are not officially so closely connected as their predecessors were under Major Webber, when the Post Office took over the country's telegraph systems in 1870. The owners of these names, too, are old friends to most of us and we are pleased to meet them in these pages. He does not appear to be at all reticent, but that doesn't mean that he is indiscreet. His report on D day plus 8, for instance, is a model of its kind.

This book, produced at quite a reasonable price by the well-known military publishers, is worth a place in the library of anyone interested in records of the last war or in telecommunications. If the first should complain that telephones are given far more space than tanks, the second can point out to him that modern wars depend more and more on telecommunications and that so far as our own defence is concerned, these in their turn depend more and more on the Post Office.

Letter to the Editor

From C. Marland, late of London Telecommunications Region.

Your February issue came into my hands as I was on my way to visit the central telephone building of Helsinki. That building contains one feature which I do not remember to have seen during my time of office as Assistant Superintendent of Traffic in London, before my retirement in 1939. It is a room devoted entirely to a telecommunications library. My friend happened to be the assistant librarian—her sole employment. She had arranged my visit and for one of the chief engineers to show me over the building.

Here are a few things which I can remember about my visit.

All exchanges in Helsinki were installed before the last war. The very first auto exchange was built in 1924.

In addition to "Miss Clock", as the Finnish girl with the golden voice is called (by the way, it is a soprano rather than a contralto like Miss Jane Cain's), they have a similar machine to deal with changes of number, the voice saying "look at the directory".

The time machine is operated by dialling 06 or 07 (for announcements in Finnish or Swedish, respectively) and is used to the extent of 800,000 calls a month, that is, of course, for Helsinki (Helsingfors is the Swedish spelling), which has a population of about 400,000.

The operators' positions are connected to a Supervisor's listening-in panel, but I was told that it is never used, as the operators "work better without it".

The building is remarkably clean and brilliantly lighted with neon lighting which creates a sunshine brightness. There are rooms for indoor sports and social gatherings.

For a Burglar Alarm system, a subscriber pays 2,400 marks a year. At present, 646 marks equal one pound.

There is no "street directory", but perpendicular cylinders with metal holders are in use at the enquiry positions. 20,000 people are waiting for telephones in Helsinki, but it is hoped to satisfy all demands by the new equipment which is being installed, within a year.

There are now 65,064 subscribers in Helsinki, the normal growth being about six per cent. per annum.

The 90 kiosks in the streets are made of clear glass top to bottom on three sides.

An interesting thing about it is that the telephone service is run by a private company or corporation. It makes no profit. A subscriber may become a shareholder, and his charges for service may thereby be reduced. Normally all calls are paid for at a rate of two marks per call in addition to rental.

At the conclusion of my visit, I was invited to coffee and cakes at the midday coffee time with the Chief Engineer and the "Technical Manager" and many of his staff, who signed their names in my journal before we sang Auld Lang Syne (in English, of course) with hands joined, around the table.

If the *Telecommunications Journal* is sent to Helsinki, it will be welcomed in the library.

It may interest some of my old colleagues to know that since I retired in 1939 I have found a new vocation—teaching English in the Scandinavian and Baltic countries—and I am hoping for similar possibilities in Leningrad. That is what has now brought me to Finland—still in the grip of winter when I arrived in April. Greetings to all old colleagues.

A similar device to the one mentioned by our correspondent—the recorded voice that gives advice of change of number—has recently been tried experimentally in Edinburgh. Kiosks similar to those referred to by Mr. Marland are in use at the South Bank site of the Festival of Britain.—Editor.

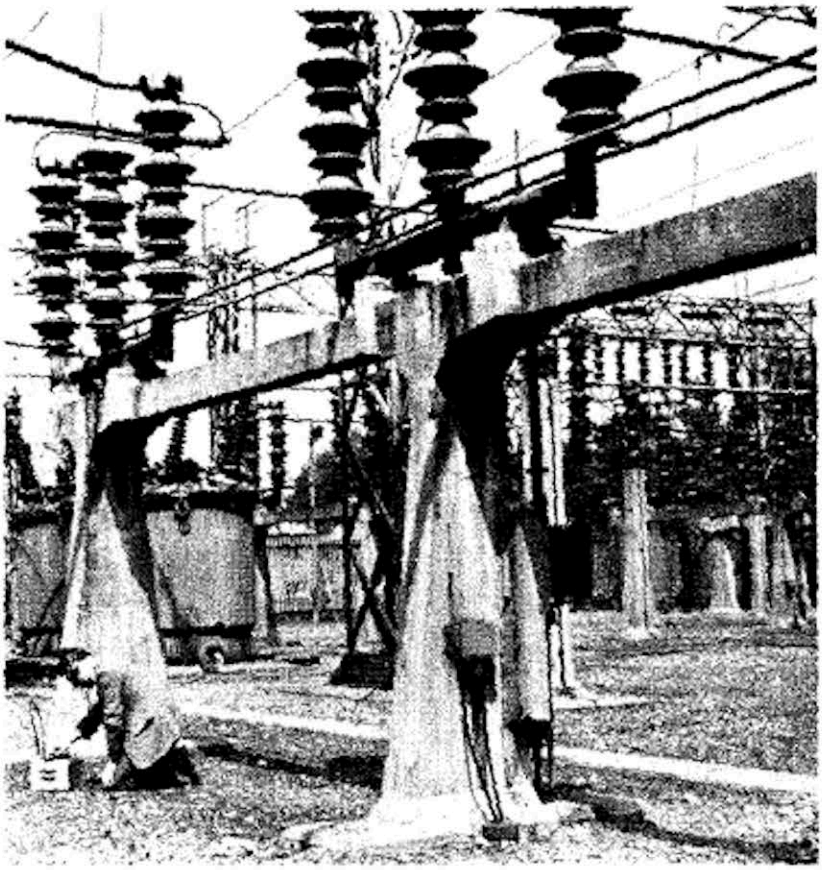


FIG. 5—SEEKING THE SOURCE OF INTERFERENCE IN AN E.H.T. SUB-STATION.

(continued from page 162)

ringing could be heard in radio sets nearby. The local electricity distribution is overhead, and the radio staff found that crackling noises could be heard in a portable receiver in the vicinity of the power line. This suggested a defect in the line or in a consumer's installation connected to it. While tracing along the line, the I.O. heard barking on his portable receiver and traced it to a shed at the side of a house, where the dog was barking furiously. Investigations in the immediate vicinity led to an electric pump-motor, the earth wire of which had broken away from the frame of the motor and lay loosely across it. Evidently the loose contact functioned as a microphone and sound occurring in the vicinity modulated the radio-frequency currents induced in the overhead wiring by the local broadcast transmission. Subsequent re-radiation could account for the usual type of interference. The trouble disappeared when the earth wire was properly connected.

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