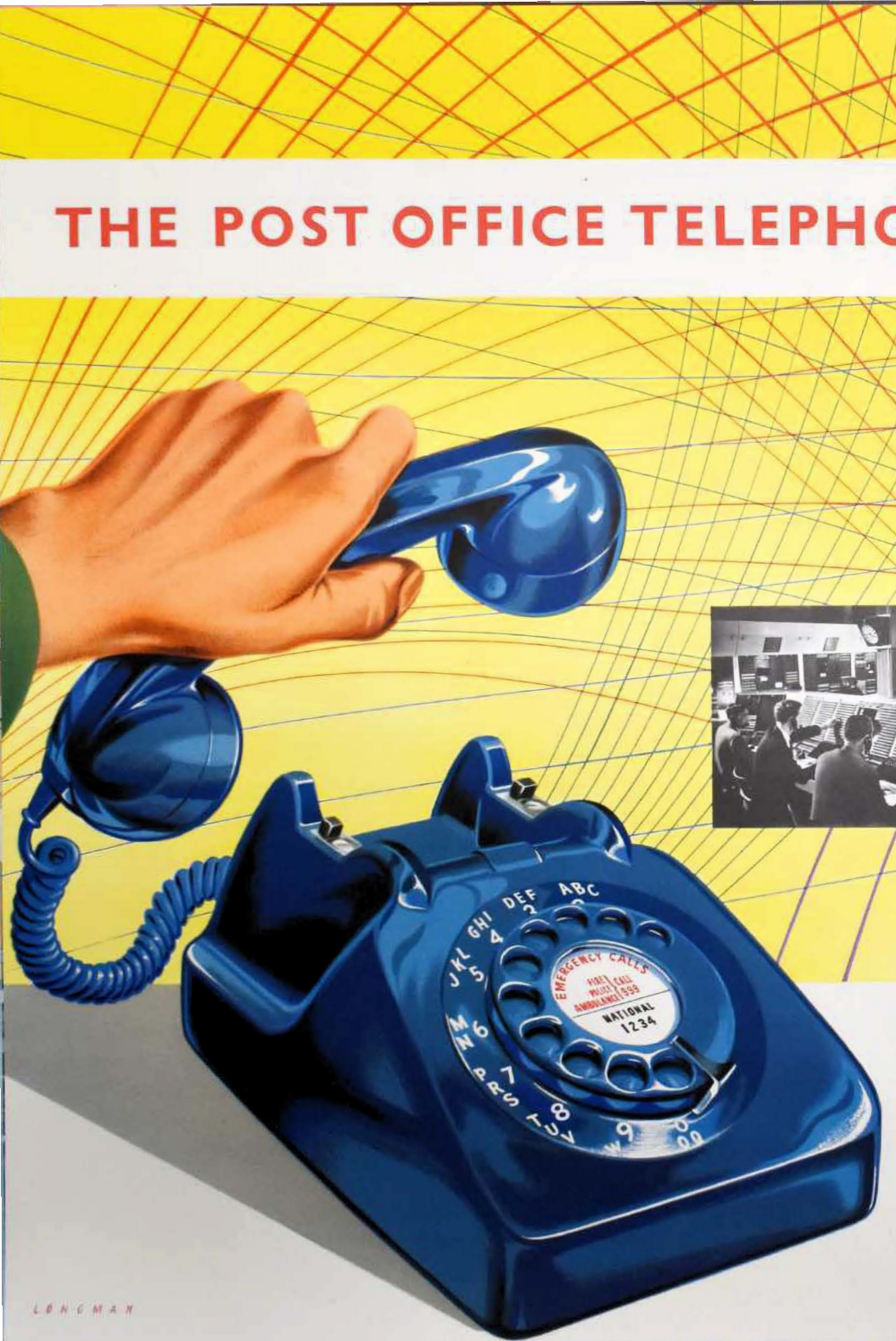
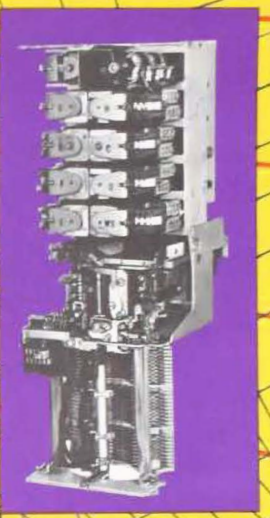
THE POST OFFICE TELEPHONE SERVICE





When you lift a telephone, you have equipment and buildings at your disposal worth more than £1,000 million.
These displays show something of what is involved in a modern national telephone system.

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CONNECTING TELEPHONES TO THE SYSTEM

In Great Britain there are over 8 million telephones. About 60 per cent are in business premises and about 40 per cent in residences. Some 65,000 are kiosk telephones available for use by anyone. Each of these telephones has to be connected, with a pair of wires, to a telephone exchange, although sometimes two telephones share the same pair.

KIOSKS

A kiosk can be connected either overhead or underground, usually the latter. For underground connection, a pair of wires is led through a pipe under the footpath to the telephone and coin-box apparatus in the kiosk.

RESIDENTIAL SUBSCRIBERS

Connection to a house can similarly be underground or overhead. The overhead system is more usual in typical residential estate development (except for blocks of flats). A cable with, say, 15 pairs in it is led underground to a distribution pole. The individual pairs are then led from insulators at the top of the pole to houses requiring service. Modern poles have ring-type heads, like that shown.

BUSINESS SUBSCRIBERS

A large office building will require many telephone lines, and occupiers will need their own internal switching arrangements, or private exchanges, which may have to be altered from time to time. The Post Office co-operates with architects and builders in providing telephone facilities, and frequently cables are led to a basement distribution frame to give scope for altering internal telephone arrangements without extensive rewiring.

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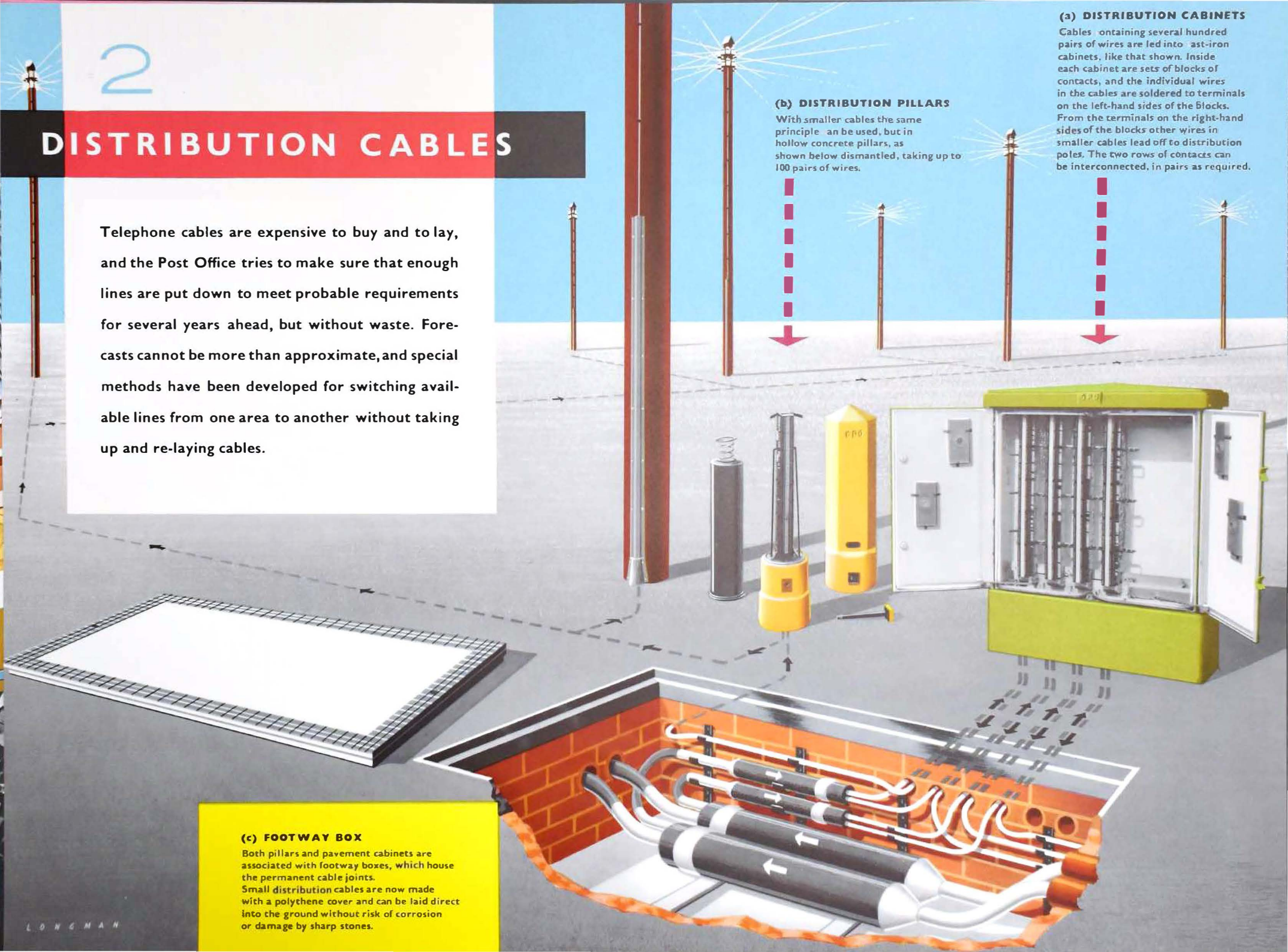
DISTRIBUTION CABLES

Telephone cables are expensive to buy and to lay, and the Post Office tries to make sure that enough lines are put down to meet probable requirements for several years ahead, but without waste. Forecasts cannot be more than approximate, and special methods have been developed for switching available lines from one area to another without taking up and re-laying cables.



(a) DISTRIBUTION CABINETS
Cables containing several hundred pairs of wires are led into cast-iron cabinets, like that shown. Inside each cabinet are sets of blocks of contacts, and the individual wires in the cables are soldered to terminals on the left-hand sides of the blocks. From the terminals on the right-hand sides of the blocks other wires in smaller cables lead off to distribution poles. The two rows of contacts can be interconnected, in pairs as required.

(b) DISTRIBUTION PILLARS
With smaller cables the same principle can be used, but in hollow concrete pillars, as shown below dismantled, taking up to 100 pairs of wires.

(c) FOOTWAY BOX
Both pillars and pavement cabinets are associated with footway boxes, which house the permanent cable joints.
Small distribution cables are now made with a polythene cover and can be laid direct into the ground without risk of corrosion or damage by sharp stones.

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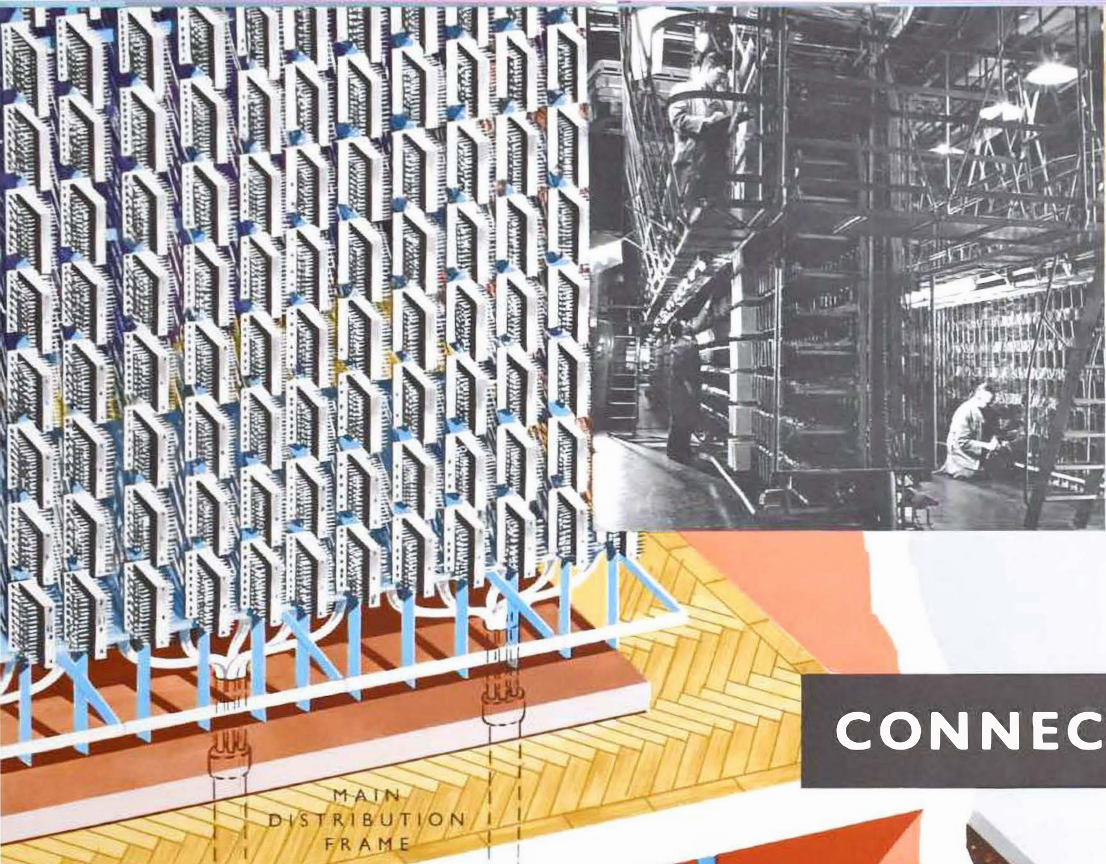

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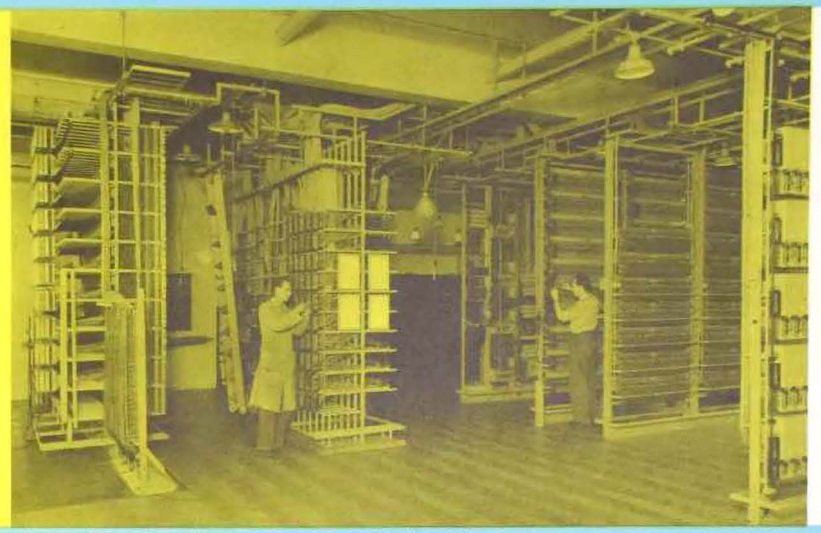
As telephone wires get nearer to the exchange, they are concentrated in large cables, with as many as 1,800 pairs. The wires are made of copper and the cable covering of lead, and such cables are very expensive.

They are laid in earthenware or metal ducts and run eventually into a special cable chamber beneath the telephone exchange. Here they are broken down to smaller cables and the individual pairs of wires are soldered to contacts on what is known as a Main Distribution Frame.

More wires lead from the main frame to equipment in the exchange.

CONNECTING CABLES TO THE EXCHANGE

A modern manual switchboard attached to an automatic exchange



A general view of a small automatic exchange. Distribution frames are on the left, selectors and other equipment on the right.

Reading subscribers' meters in an automatic exchange.

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INSIDE THE EXCHANGE

Of the 6,000 exchanges in the United Kingdom, over 5,000 are automatic.

Manual exchanges must have operators to connect callers to the numbers required: in automatic exchanges switching is done by selectors controlled by the dial of the calling customer's telephone. 50 years of development have produced highly complex apparatus working with great efficiency.

Most of the equipment in an automatic exchange is available for common use, but certain items are required for each separate telephone line.

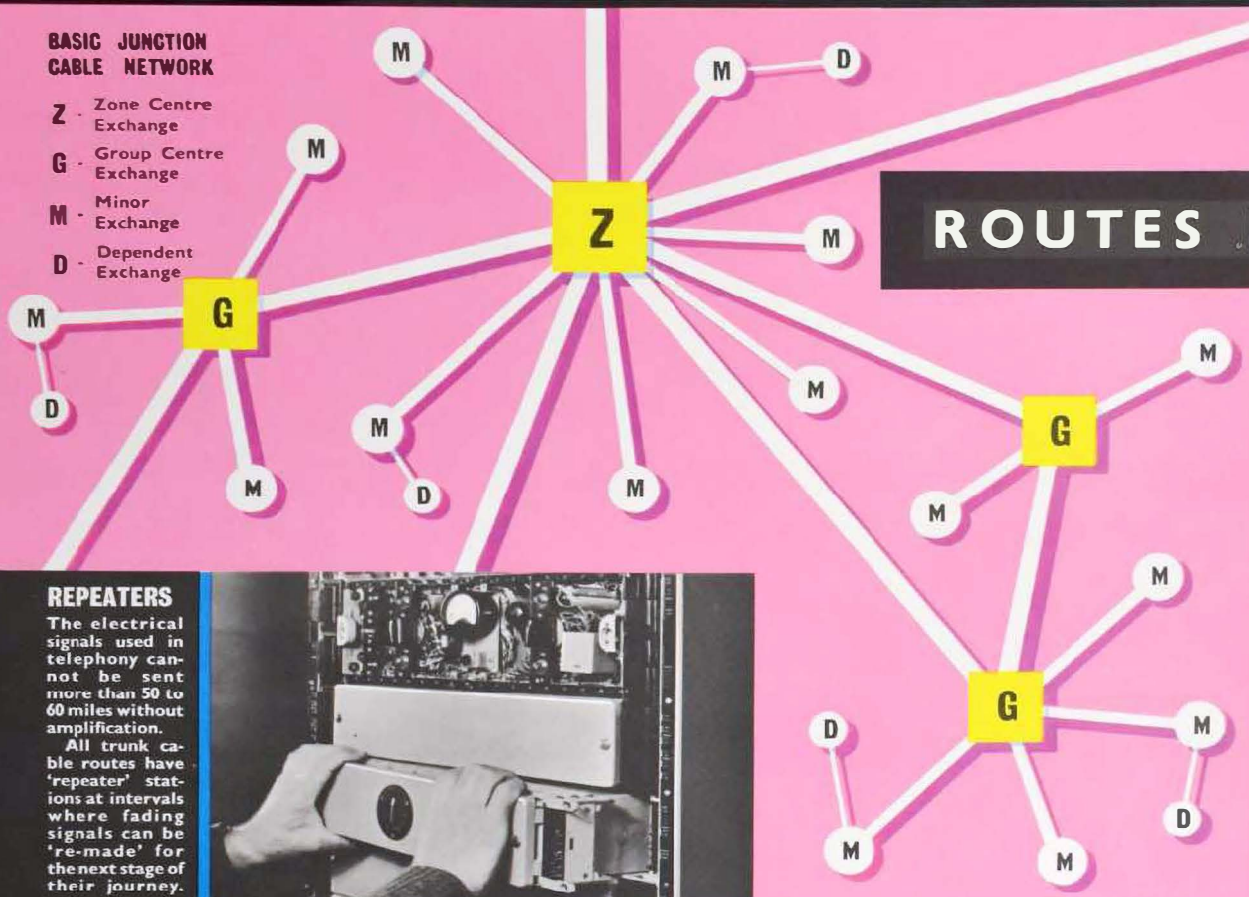
This individual equipment, plus a 'share' of the cost of cables, ducts, poles, footway boxes, etc., brings the average cost of providing and connecting each telephone to about £110.

G.R.A.C.E.

By 1970 most trunk calls in the U.K. will be dialled by customers.

Special equipment, known as Group Routing and Charging Equipment—GRACE for short—makes Subscriber Trunk Dialling possible. It translates dialled numbers into a code to switch the call, and selects the proper charging rate.

This is an electronic form of GRACE used at Bristol in the first exchange to get S.T.D.



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ROUTES BETWEEN EXCHANGES

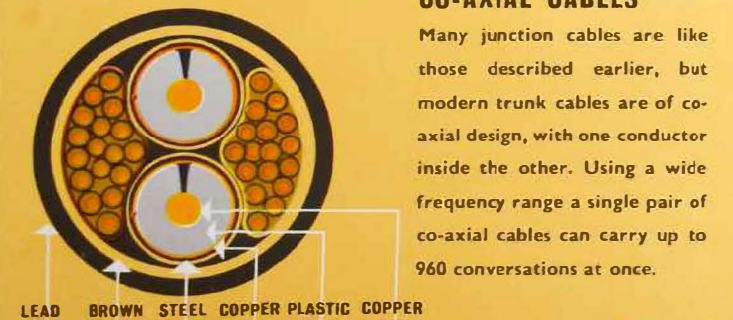
An effective telephone system must allow any one telephone to be connected to any other. It follows that all telephone exchanges must be accessible to one another.

Whether this is arranged by direct cable links or by routing calls via intermediate exchanges, depends on the nature of the telephone traffic from one exchange to another and the extent to which it is expected to grow.

REPEATERS

The electrical signals used in telephony cannot be sent more than 50 to 60 miles without amplification.

All trunk cable routes have 'repeater' stations at intervals where fading signals can be 're-made' for the next stage of their journey.

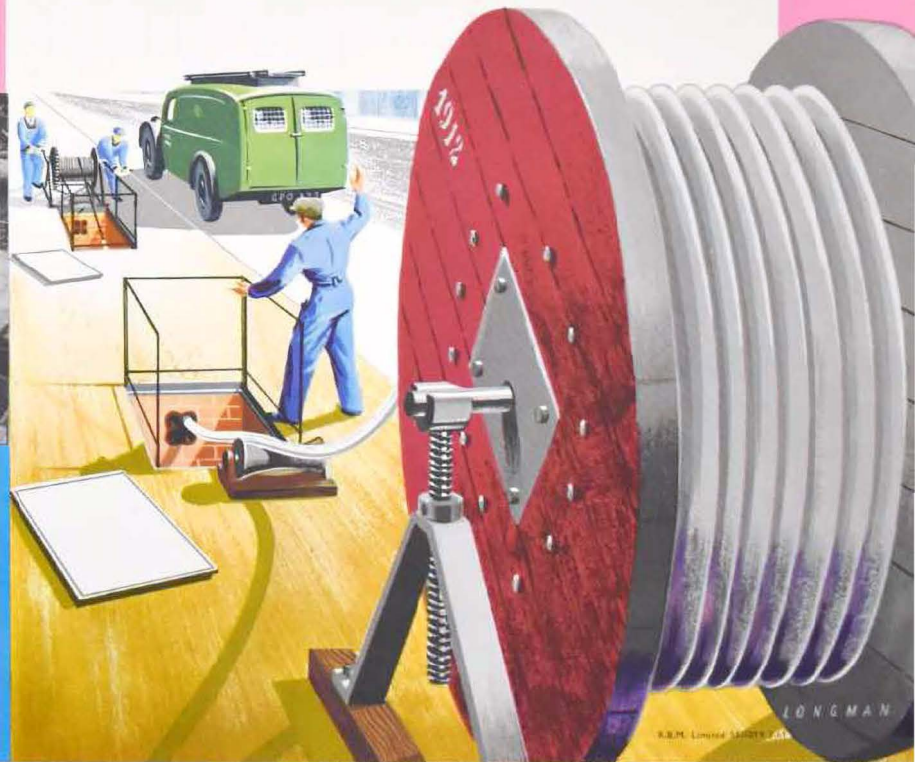


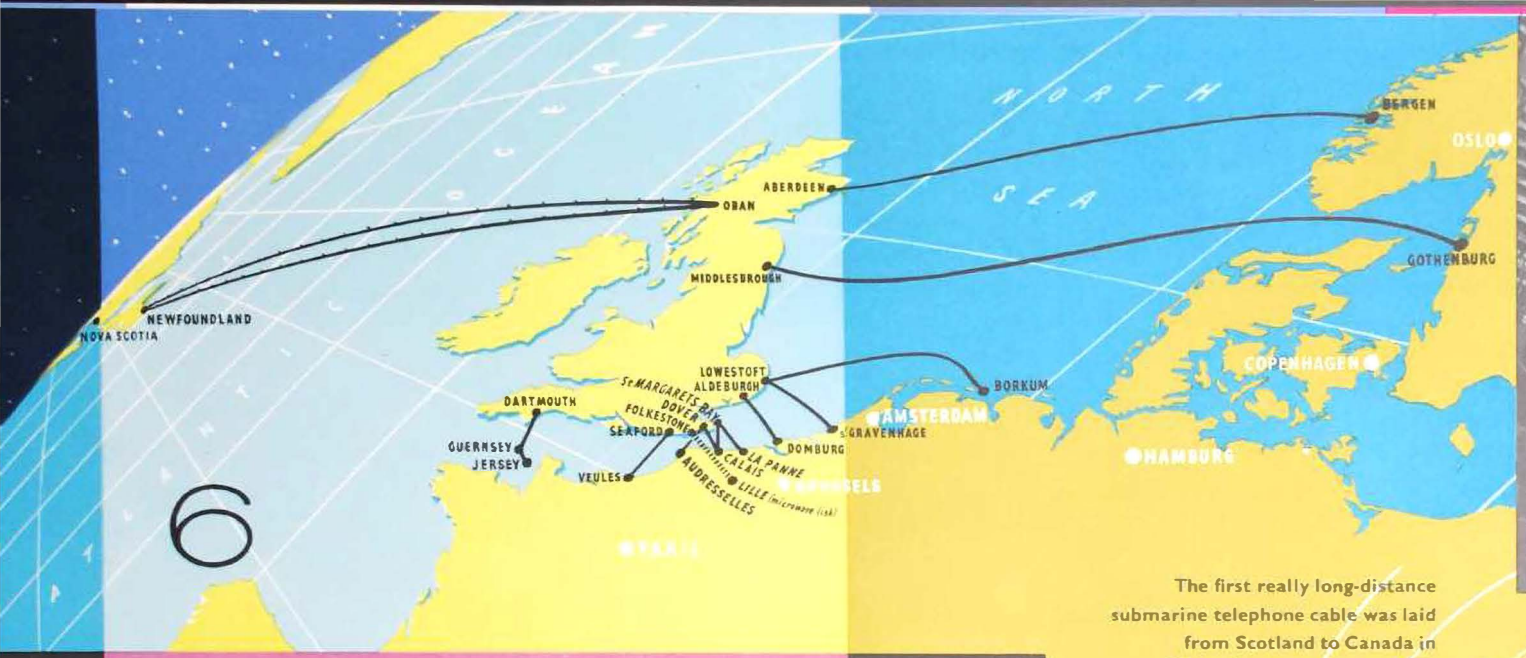
CO-AXIAL CABLES

Many junction cables are like those described earlier, but modern trunk cables are of co-axial design, with one conductor inside the other. Using a wide frequency range a single pair of co-axial cables can carry up to 960 conversations at once.

CABLE LAYING

Laying new cables and maintaining the existing ones is a continuous task for commercial contractors and for Post Office engineers. Here a technician is shown using special equipment necessary to make a joint between two sections of coaxial cable.





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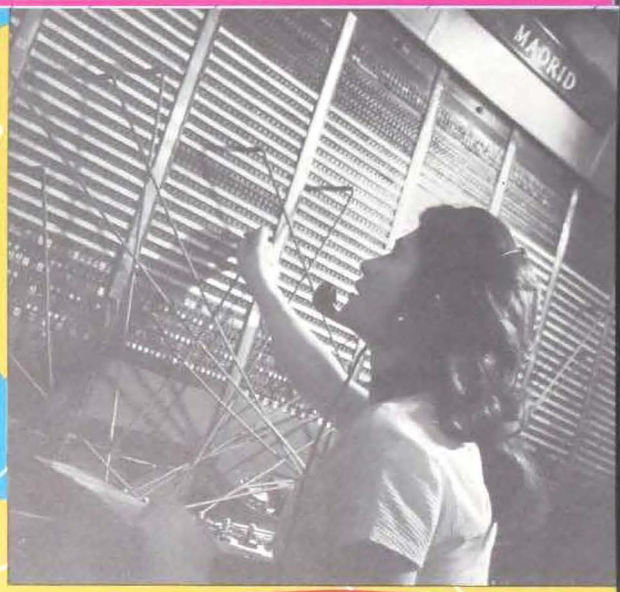


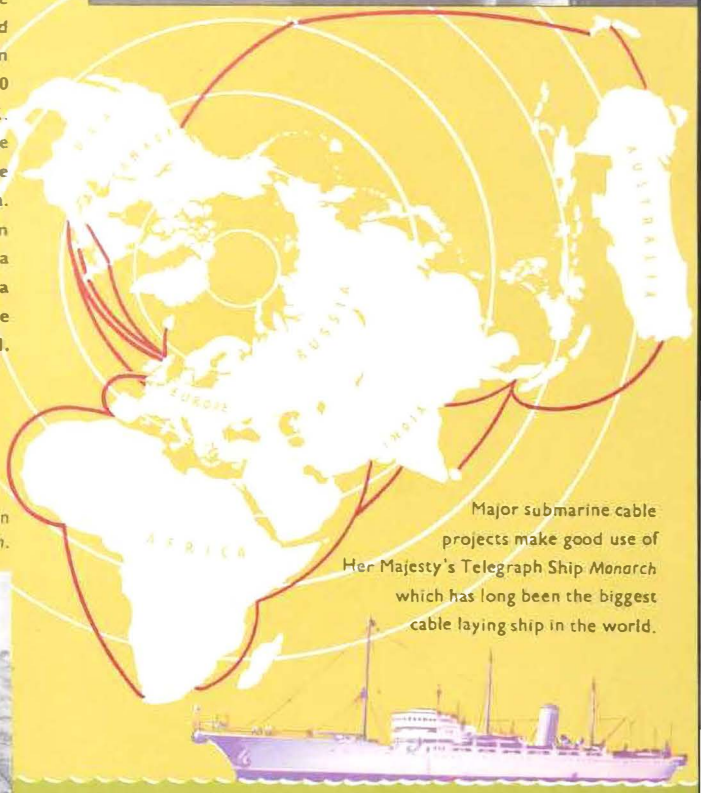
INTERNATIONAL LINKS

Speech signals used in telephony must be amplified every 40 miles or so, and it was not until after the second world war that satisfactory submarine repeaters were developed.

Until then the only under-water telephone cables were to certain coastal islands, Northern Ireland, and on short sea routes to France. The bulk of international telephone traffic was sent by radio.

The new repeaters have made possible cables to the Isle of Man, Holland, Sweden, and North America.

The first really long-distance submarine telephone cable was laid from Scotland to Canada in 1956. It now carries over 700 calls a day from the U.K. By 1963 there will be three telephone cable routes from Europe to North America. There is already a link from North America to Hawaii, and a project is under way for a Commonwealth telephone cable right round the world.



Major submarine cable projects make good use of Her Majesty's Telegraph Ship *Monarch* which has long been the biggest cable laying ship in the world.

The interior of a British "two-way" submarine repeater —gold plated to prevent deterioration.

Paying out a length of cable, with a spliced-in repeater, over the stern of H.M.T.S. *Monarch*.

One of the control consoles at Rugby Radio Station

Workmen inspecting an 820-ft. radio mast at Rugby

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RADIOTELEPHONY

Except for calls to North America and Russia the only means of making telephone contact outside Europe is by radio.

Post Office Radio Stations provide links with almost every country, and with large ships in any part of the world. Radiotelephony is subject to interference from electrical storms, sometimes so severe that communication is impossible. This is one of the main reasons for rapid development of long-distance underwater telephone cables which give much more reliable service.

Most long-distance radiotelephone calls are transmitted by the Post Office Radio Station at Rugby where the masts and aerial arrays cover 150 acres.

A stand-by generator at Rugby, for use if the electricity supply from the grid system should fail

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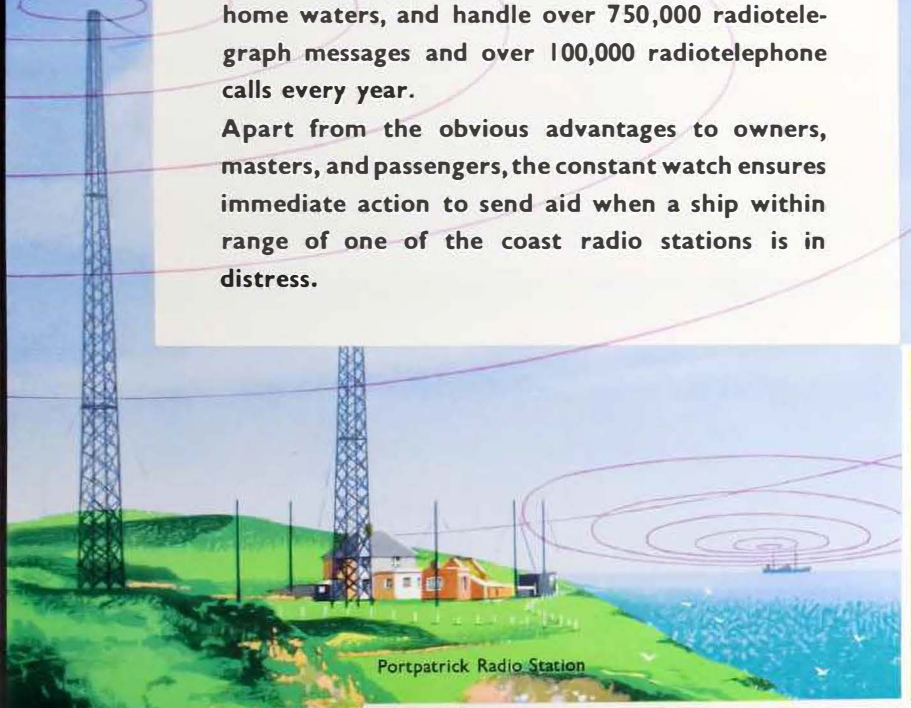
SHIP - SHORE RADIO LINK

An important aspect of Post Office radio is the Ship–Shore Wireless Service—now more than 50 years old.

A number of radio stations round our coasts keep constant watch for messages from ships at sea in home waters, and handle over 750,000 radiotelegraph messages and over 100,000 radiotelephone calls every year.

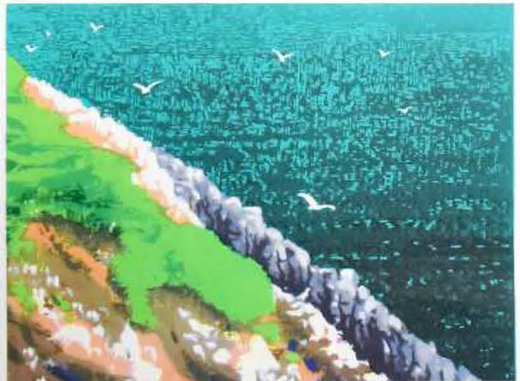
Apart from the obvious advantages to owners, masters, and passengers, the constant watch ensures immediate action to send aid when a ship within range of one of the coast radio stations is in distress.



Portpatrick Radio Station

The Wireless Operator's cabin aboard R.M.S. *Queen Elizabeth*

An operating position at North Foreland Radio Station



MEDIUM-RANGE COAST RADIO STATIONS OPERATED BY THE POST OFFICE

S·O·S

The *Flying Enterprise* in distress in heavy weather

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