POST OFFICE

telecommunications

JOURNAL

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SPRING 1968

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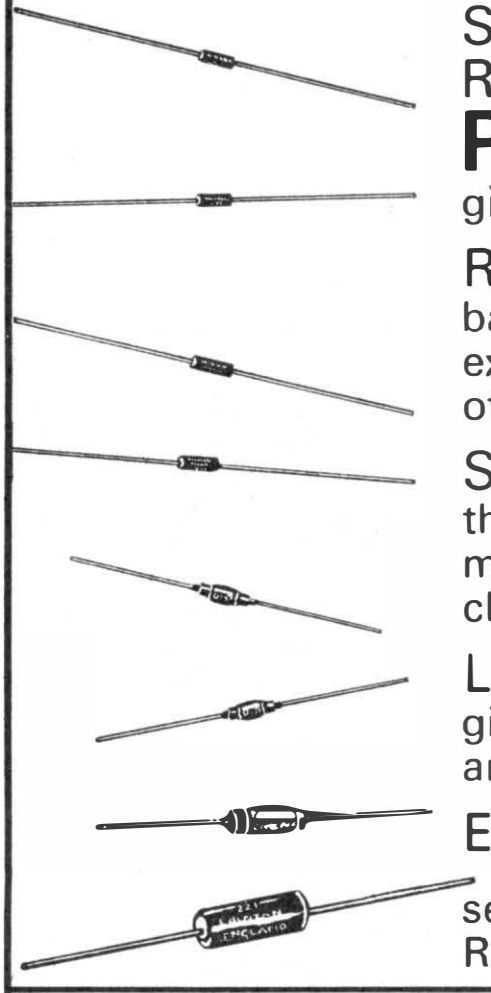

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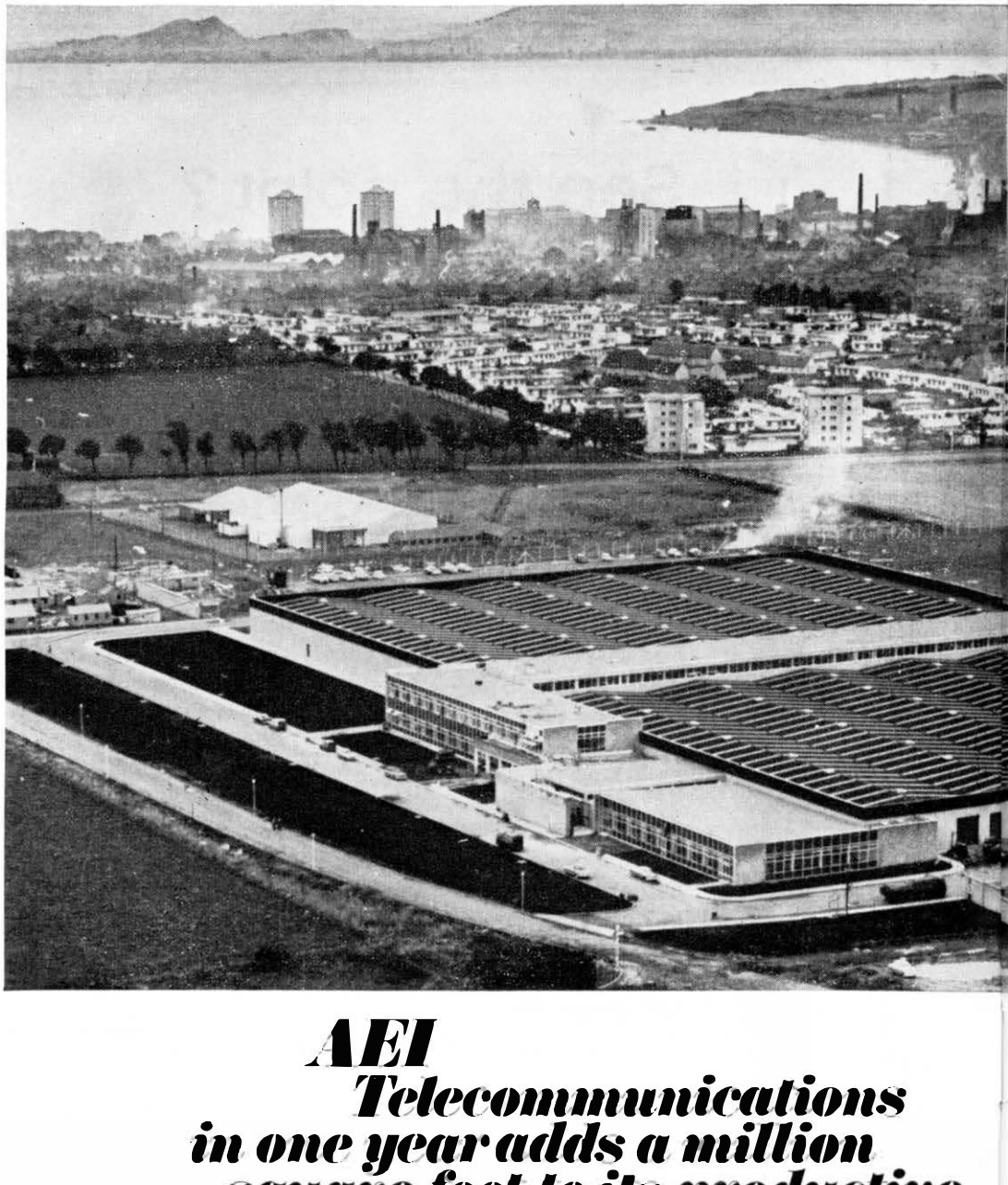

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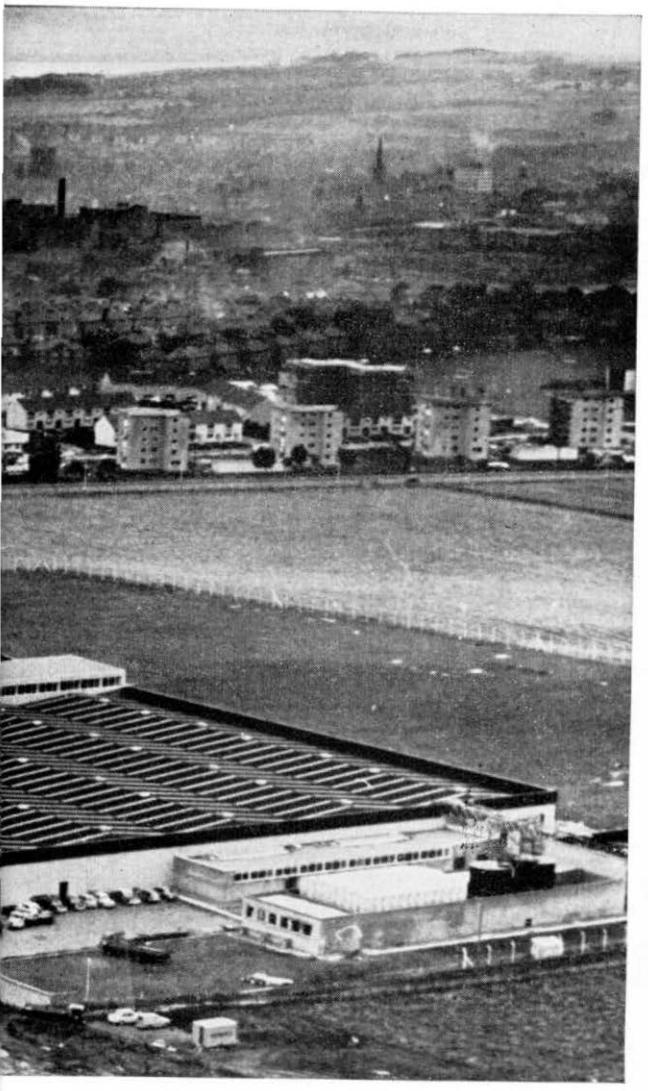
in one year adds a million square feet to its productive capacity to meet BPO demands



The new 258,000 sq. ft. AEI telephone exchange equipment factory at Kirkcaldy, in Fife

A view of the vast rack wiring sections in the new factory at Kirkcaldy.

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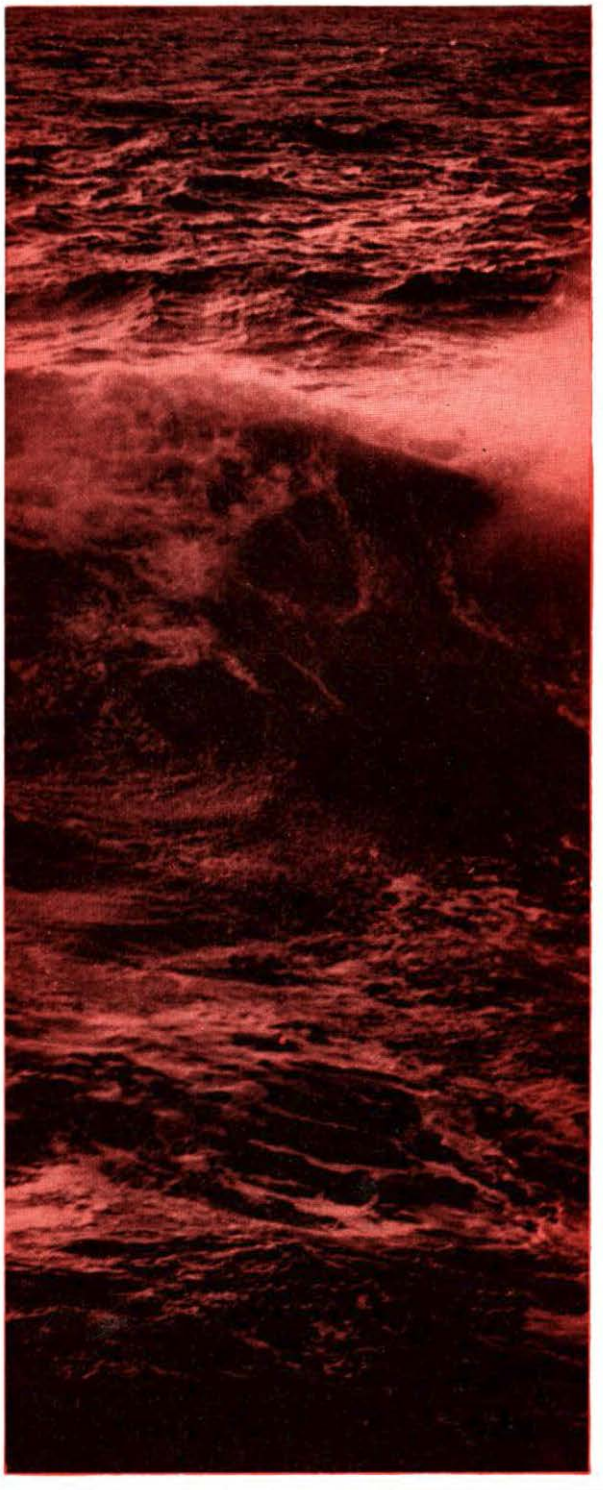

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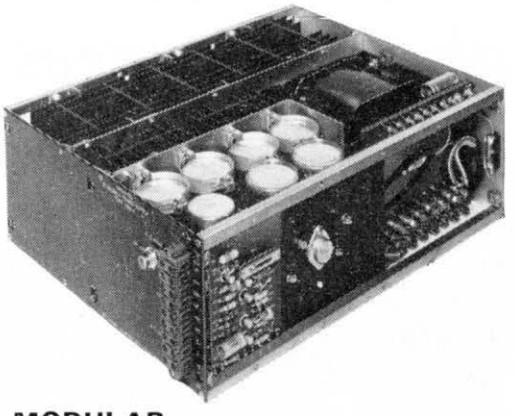

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S152	0—15V 2A	£24	S1530	0—15V 30A	£98
S302	0—30V 2A	£28	M1020	0—100V 200mA	£23
S502	0—50V 2A	£33	M1510	0—150V 100mA	£23
S153	0—15V 3A	£28	M1050	0—100V 500mA	£33
S303	0—30V 3A	£34	M1530	0—150V 300mA	£35
S503	0—50V 3A	£38	M10100	0—100V 1A	£45
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300	0—36V ½A	0·10	7¾ x 6¼ x 6¼	£28
500	0—50V ½A	0·10	7¾ x 6¼ x 6¼	£31
1000	0—100V ¼A	0·8	7¾ x 6¼ x 6¼	£33
1500	0—150V 150mA	2·0	7¾ x 6¼ x 6¼	£33
18V3	0—18V 3A	0·02	11¼ x 9½ x 5⅝	£48
36V2	0—36V 2A	0·03	11¼ x 9½ x 5⅝	£48
60V1	0—60V 1A	0·10	11¼ x 9½ x 5⅝	£55
10A05	0—100V ¼A	0·4	11¼ x 9½ x 5⅝	£55
18V5	0—18V 5A	0·01	11¼ x 12⅝ x 5⅝	£55
36V3	0—36V 3A	0·03	11¼ x 12⅝ x 5⅝	£65
60V2	0—60V 2A	0·03	11¼ x 12⅝ x 5⅝	£65
10A1	0—100V 1A	0·2	11¼ x 12⅝ x 5⅝	£65
18V10	0—18V 10A	0·005	15¼ x 12⅝ x 5⅝	£78
36V5	0—36V 5A	0·02	15¼ x 12⅝ x 5⅝	£78
60V3	0—60V 3A	0·03	15¼ x 12⅝ x 5⅝	£88
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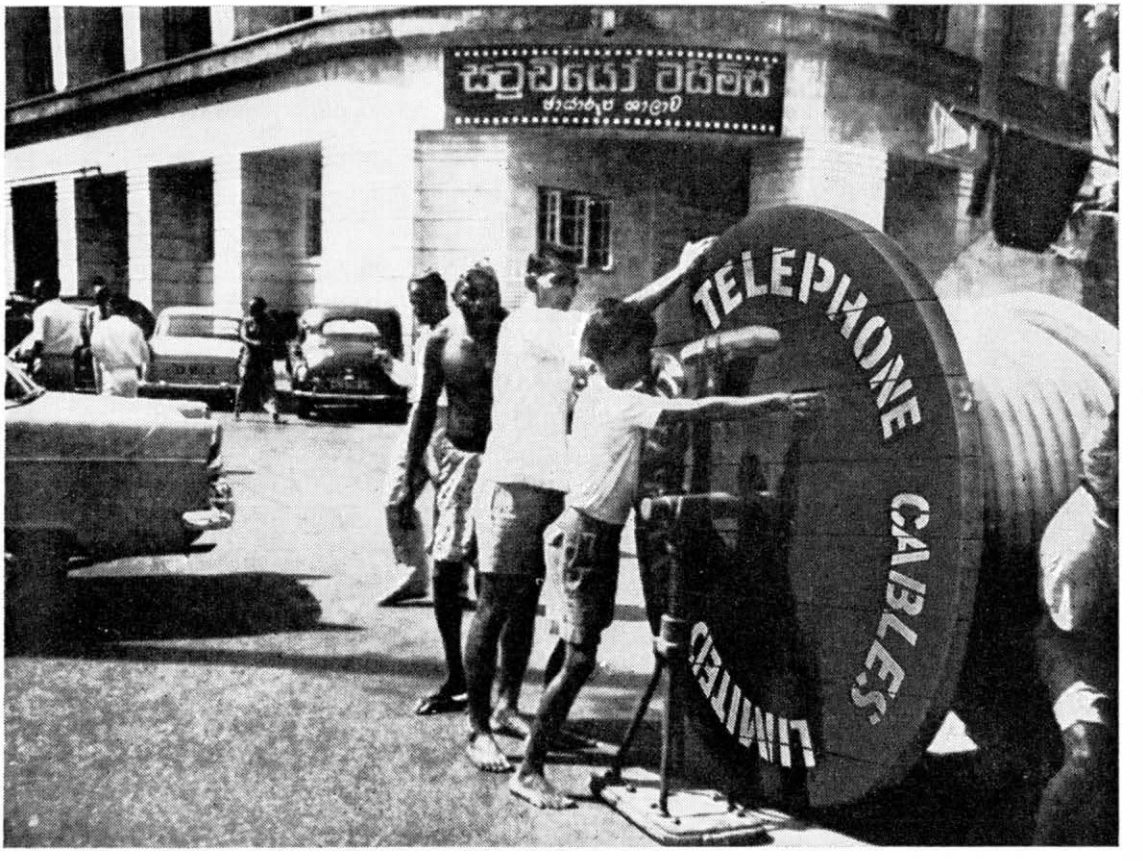

TCL cables being laid in Main Street, Colombo, Ceylon

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Post Office
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The challenge of the £27 million cuts

THE recent announcement of the £27 m. cut in the capital programme for telecommunications in 1968-70 came soon after the news that the target return on net assets was to be increased to 8½% and that charges had been referred to the National Board for Prices and Incomes.

The slower growth in the size of the system implied by the cut will reduce income below previous expectations but will not necessarily mean a reduction in current expenditure. It will thus be more difficult to achieve the new target.

The capital programme has been reduced by £18 m. in 1968-69 and £9m. in 1969-70. These are significant sums but in the two affected years expenditure after the cuts will still be about 15% and 20% above that of 1967-68. Nevertheless, a cut of this order is not easily secured at short notice and, because of priority needs, cannot be spread evenly over the whole programme.

Efforts to improve the service and provide for the needs of new business subscribers must continue and expenditure for these purposes be maintained. So, provision for expanding the trunk and junction networks has been kept at the level appropriate to the present programme. There has been no reduction in provision for developing the overseas services. Additional money has been set aside for the explosive expansion of Datel, and full provision for telex has been maintained.

With these important exceptions, cuts in expenditure have been spread as widely as possible to maintain a balanced programme and minimise the effects on growth. Some reduction in growth potential has, however, been unavoidable.

Growth depends first on the provision of exchange equipment. This absorbs a third of all capital expenditure and it would be very difficult to avoid a reduction in this sector when retrenchment is necessary. Moreover, reduced availability of exchange equipment leads to reductions in expenditure in providing subscribers' circuits and the local line network. In addition to the saving on manpower and stores that this implies there are further savings on motor transport and telephone exchange buildings. Together, they provide a substantial part of the reduction. As far as practicable, the rephasing of the exchange equipment programme will affect centres of mainly residential rather than business growth.

The growth of the telephone system up to March, 1972, is likely to be some 200,000 connections fewer than previously assumed. Nevertheless, the expected growth of 3.4m. connections over five years represents a 50% expansion and the aim of achieving this with no increase in manpower remains.

The new situation underlines the need for carefully controlling manpower to ensure that the benefits of improved productivity are secured promptly and retained. There is also a continuing need for careful stores provisioning to ensure that stocks are adequate for current needs but not more than adequate. Because of the lower rate of growth in the immediate future some saving will be obtained by reduced purchases of stores where stocks are sufficient.

Other economies include deferring vehicle replacements by an average of one year. This reduces demands on national resources for manufacturing motor transport and releases more capacity for exports. Similarly, deferring building work for certain engineering centres and transport workshops will reduce demands on the building industry. Both economies are likely to result in higher maintenance costs.

Cuts in capital expenditure are a disappointing check on plans for the future. But they are a necessary contribution to the nation's economic recovery and provide a challenge to ensure that services are available when required for business needs, that the cuts are phased evenly to produce minimum disruption and that system efficiency and productivity improvement continue to meet all objectives.

We must meet this challenge so as not to put achievement of the new financial target in jeopardy at the start and to keep on the right road to sustain higher rates of growth in the future.

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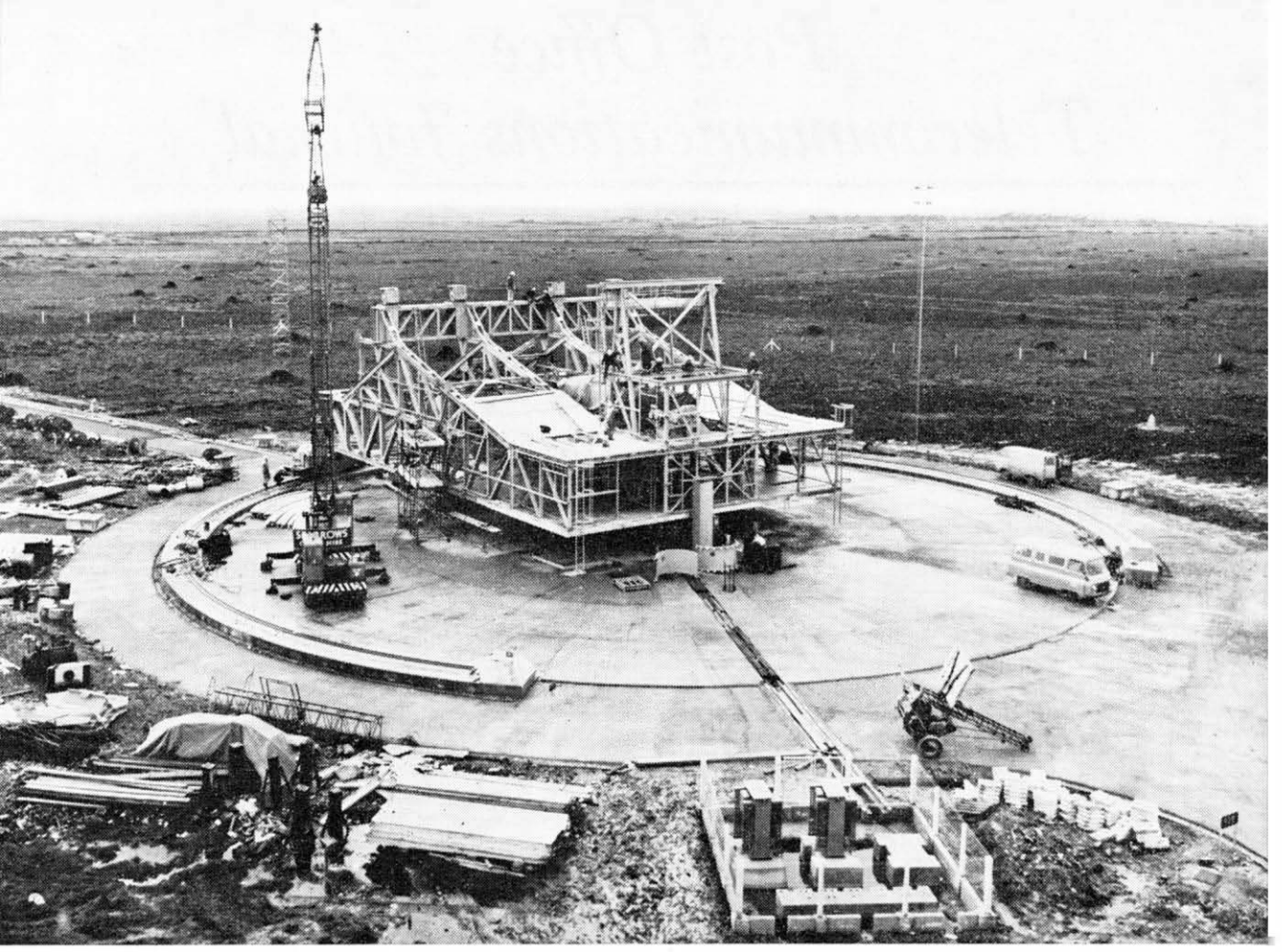


The Goonhilly No. 2 aerial site showing the complex steelwork arrangement of the massive base structure.

Goonhilly's Second Ear

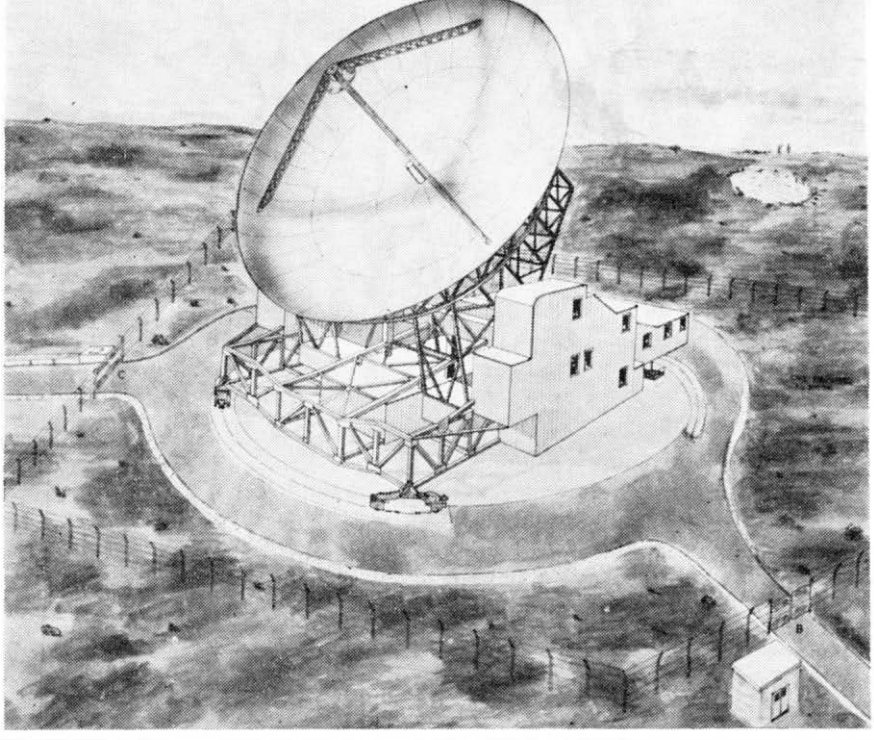
A giant reconstruction job is going on at Goonhilly to provide another aerial and house the equipment needed for Britain's earth station

THE second aerial at the Post Office satellite communication earth station at Goonhilly, Cornwall, is rapidly taking shape.

The greater part of the civil engineering works—the roads, foundations, drains and so on—has been completed and the 151 ft-diameter, 340 ft long track on which the aerial will run has been laid and levelled. Some 200 tons of steel have been used in constructing the aerial base structure which is mounted on a large centre pivot and a pair of bogies which run on the azimuth track. The 25½ ft long screw, weighing about 30 tons, which is needed for the elevation drive, has been fixed to the base structure and the four elevation bearings have been positioned on the massive cross-beam.

Work is also now being carried out on cladding the base structure to provide apparatus rooms for the sophisticated equipment required for a commercially-orientated earth station.

Most of the telecommunications equipment



An artist's impression of the completed new aerial.

The central building complex showing the office and welfare block in the foreground, the new operational control area, the east and west wing extensions and ancillary buildings in the background.

—including the operational control console—is nearing completion and is undergoing initial testing at the contractor's works. Preliminary tests of the wideband high-power transmitters indicate that their performance should meet all requirements for multi-carrier operation in the global system.

The receiving equipment will include a first-stage wideband parametric amplifier cooled by gaseous helium to an operating temperature of about minus 253 degrees Centigrade and demodulators of advanced design which will enable Britain to take full advantage of the increased traffic capacity of the new *Intelsat III* satellite.

Although not yet on site, manufacture of the huge 90-ft diameter stainless steel paraboloidal reflector and its massive backing structure is now well under way.

OVER

An assembly gang prepares part of the reflector backing structure for the new aerial.

The new aerial is needed to work to an improved type of synchronous satellite—the *Intelsat* III—which is due to be launched over the Atlantic Ocean later this year, thus releasing the first Goonhilly aerial from operational duty. The first aerial will then be equipped to work to another *Intelsat* III satellite to be launched over the Indian Ocean in 1969. Goonhilly will then be able to communicate directly with other earth stations which between them will cover well over two-thirds of the earth's surface.

Not all the work required for the second aerial is being concentrated on the actual aerial site. Additional facilities are being provided in the central buildings, including new modulator-demodulator equipment which was installed at the end of February. A television monitoring console has also been provided and racks of associated test equipment have also been completed. This new test equipment, which is being provided directly by the Post Office, will serve for 625 and 525 line standards of black and white and colour systems.

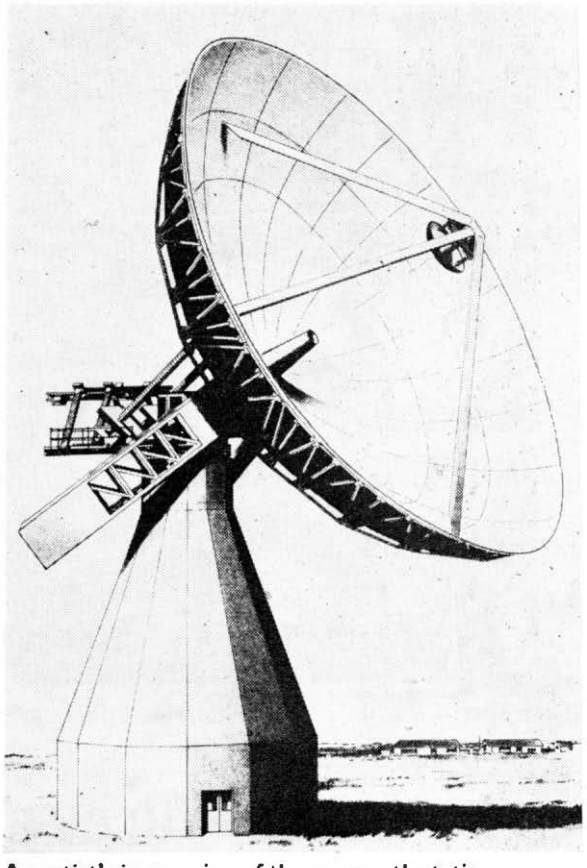
To carry traffic from Goonhilly to London, a permanent microwave radio link has been installed to replace the previous temporary link. Translating equipment to distribute groups and supergroups of telephone circuits between the radio link baseband and the space sector radio equipment is also being provided.

The bulk of the radio and transmission equipment is solid state, a 24-volt, 1,800-ampere battery providing the power. A new branch telephone exchange has also been installed to replace the original smaller exchange and has a capacity of 100 lines.

An engineer tests the new P. 2000 high-power amplifier which will be used with the new aerial

The Post Office has gained invaluable experience from the use of the first aerial at Goonhilly. To help other countries which will be setting up new earth stations and to guide them in the design and operational procedures of satellite communication technology, Britain is organising an international seminar in London in May of this year.

Two more earth stations for the Far and Middle East



An artist's impression of the new earth stations for Hong Kong and Bahrein. They will cost £3.5 m.

THE first two satellite communication earth stations for public service to be owned and operated by Cable and Wireless Ltd—in Hong Kong and Bahrein—will become operational in May, 1969.

The provision and construction of the new stations, including arrangements for services in addition to satellite communication, will cost Cable and Wireless Ltd about £3·5 million. The supply and construction of the aerial structures and associated power and electronic equipment, which is being undertaken by Marconi Company Ltd, will amount to about £2·1 million.

Both stations will operate through *Intelsat* III satellites which are to be launched over the Pacific and the Indian Ocean.

The Hong Kong station will be on the Stanley Peninsula, Hong Kong Island, and the Bahrein station at Abu Jarjur. Both will have a 90-ft diameter aerial dish mounted on a 60-ft tower. All electronic equipment will be fully duplicated to ensure maximum reliability on a 24-hour-a-day working schedule.

Each of the new stations will have a total capacity of 1,200 channels for telephony and data transmission or one channel of 625-line colour TV and a reduced number of telephone channels.

The Bahrein station will be constructed so that in due course communications could be maintained with up to eight other stations and the Hong Kong Station with up to 12 other stations.

*Cable and Wireless Ltd already own and operate a satellite communication earth station at Ascension Island. Its main purpose is to provide circuits to assist the American *Apollo* manned spacecraft missions.

A Police Sergeant at Scotland Yard's new traffic control centre watches the build up of traffic on the television screens. He controls the eight television cameras with the box in his left hand.

The Post Office helps to clear the traffic jams

By C. R. CALLEGARI

THE POST OFFICE is playing a big part in helping to solve London's traffic problems.

It has set up a 625-line closed-circuit television and data network covering eight important road junctions, 70 sets of traffic lights and 30 pedestrian-operated crossings in West London and linked them to television screens and two computers at a Traffic Control Centre in the Metropolitan Police Force's new headquarters in Broadway, SW1. In this way, the Police can watch the ebb and flow of traffic at any moment of the day and night and the computers can set the traffic signals to ease traffic jams.

This new scheme—an experimental one devised by the Ministry of Transport—covers an area bounded by Knightsbridge and Cromwell Road, in the north; Hammersmith Bridge, in the west; Sloane Street and Chelsea Bridge, in the east; and the River Thames to the south. This area was chosen for the experiment because it suffers from

complex traffic problems caused by the vast amount of traffic entering it each weekday morning and evening from and to the six nearby Thames bridges and the A40 and M4 main highways. In addition, the area also contains three exhibition halls and two First Division football grounds.

The Control Centre at the Police Headquarters is equipped with a television suite comprising three operating positions and one master control position from which any one of the eight television cameras mounted above the road junctions can be remotely controlled. Two banks of four monitors continuously observe each camera channel while larger monitors can be switched in to show greater detail.

A centrally-mounted plan of the area indicates the direction of traffic flow at every controlled intersection by repeating the main road green signals. Pre-selected intersections can be displayed on mimic screens adjacent to the larger monitors for more detailed local assistance. The television suite also provides facilities for programming the computers with various traffic plans.

The principal task of the computers is to co-ordinate all the traffic signals so that journey times through the controlled area are reduced to a minimum. The computers can perform this task only if they receive continuously adequate information on the traffic situation.

Before the new scheme was introduced the pneumatic-operated detectors at the approaches of all controlled intersections were adapted to send information on volumes of traffic passing through the controlled area.

Unfortunately, these detectors gave no indication when queues of traffic developed so that it was necessary to install supplementary short- and long-queue detectors. Each short-queue detector was

The new traffic control scheme, which has cost more than £500,000 to set up, covers an area of six-and-a-half square miles where traffic is among the most dense in the world. Along the Cromwell Road alone about 40,000 vehicles a day pour into London.

Traffic-light synchronisation by computer has been tried out successfully in both the United States and other European countries, but in Britain has only so far been introduced experimentally to control 80 traffic lights in the city centre of Glasgow.

The Ministry of Transport estimates that the new West London scheme will cost about £800,000 in the first ten years, but if it reduces traffic delays by as little as five per cent the resultant benefits over the same period will amount to nearly £2 million in extra working time.

OVER

The view seen by the camera perched 80 ft. up on the fire escape of the Hyde Park hotel. Remotely controlled from New Scotland Yard, the camera can "zoom" down to obtain a close-up picture.

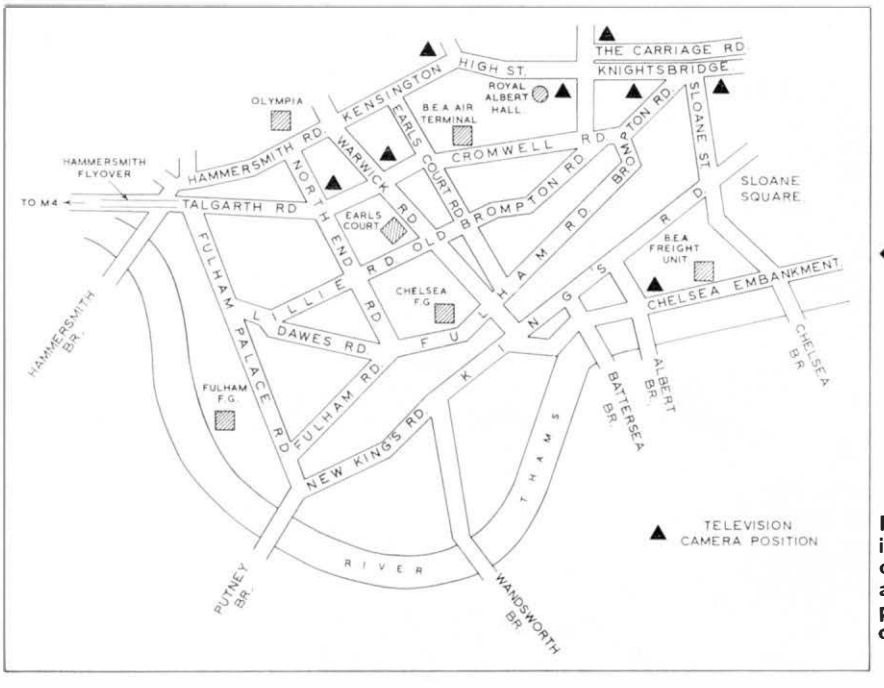
An installation team checks the camera equipment at a busy road junction in Knightsbridge—one of the eight camera positions in West London.

placed about 400 feet from an intersection—the distance normally reached by a queue of traffic against a red signal—and each long-queue detector about 1,000 feet from the road junction. Where signalled intersections are close together a long queue of traffic can extend back to block an earlier intersection and cause severe congestion.

To anticipate this risk, an exit queue detector was placed at a point 150 feet on the exit side of those intersections in danger of being blocked. Operation of one or all of these detectors results in appropriate action being taken by the computers to disperse the traffic and to prevent further traffic joining the queue. A split-phase facility allows the lights to remain at green for traffic flowing in the opposite direction.

A queue detector consists of two inductive loops buried in the road and spaced a short distance apart. Under free traffic flow conditions no signal is sent to the computers. But if both loops are coupled within a timed period—for example, when traffic is slow moving or stationary—a signal is transmitted.

Delay facilities are incorporated to prevent intermittent operation of the detector by traffic moving just below the critical setting of the



Left: the area covered by the new traffic control scheme. It contains 70 sets of traffic lights and 30 pedestrian-operated crossings.

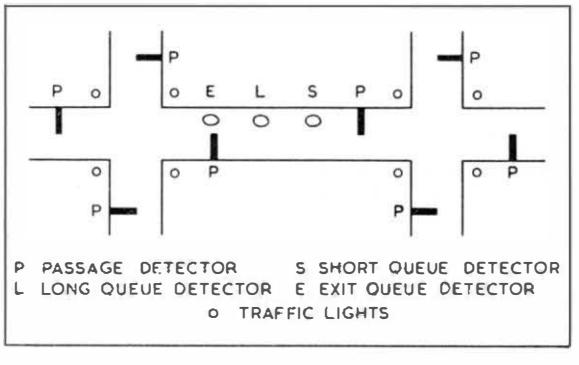
Right: A typical intersection lay-out showing the approximate positions of the queue detectors.

Working from a mobile tower, workmen repair a camera 40 feet above the swirling Knightsbridge traffic.

detector and to cover the short gaps when vehicles start moving immediately after coming to a halt.

The system is extremely versatile, the computers providing progressive control as traffic increases and the existing pneumatic-operated detectors giving valuable support. It is intended to extend the scheme to link some 400 more controlled intersections and 16 additional camera channels.

The 625-line closed-circuit television network provided by the Post Office uses 29 miles of balanced vision cable equipped with 48 transistor video amplifiers. It consists of eight vision links which vary in length from one to six miles. Four of the links are repeatered at one intermediate station and the two longest links are repeatered twice.

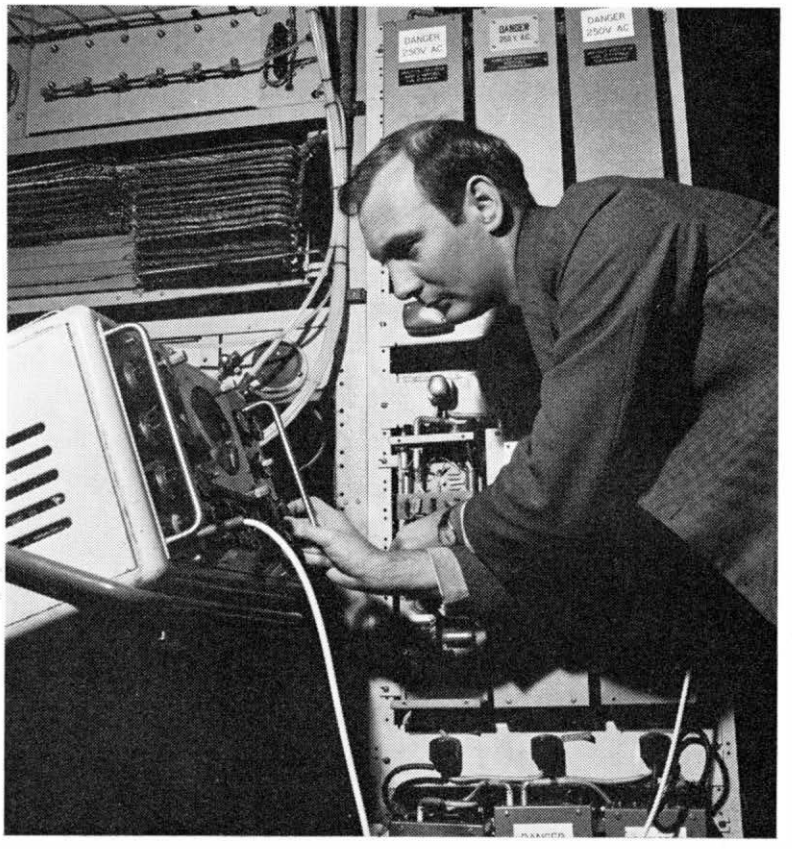


The amplifiers are of Post Office design and mains operated. Where possible they are installed in telephone exchanges or in police stations, but where no suitable premises are available they are mounted in pavement cabinets.

There are two types of amplifier. The first—the Amplifier Video No. 6A—is a send unit used where a 75 ohm unbalanced signal such as the output from a television camera is to be fed into the balanced cable pair. The working send level is 2 volts peak-to-peak into a 140 ohm load.

The other—the Amplifier Video No. 5A—is a receive unit providing the gain and waveform correction for lengths of unbalanced or balanced cable which have losses of up to 28 dB at 5·5 MHz. This is equivalent to one-and-a-quarter miles of the balanced pair cable used for the West London

OVER



Technical Officer A. Stone adjusts the video amplifiers at the Belgravia Telephone Exchange.

Traffic scheme. Two such amplifiers can be connected in tandem for longer cable lengths. The working output level is one volt peak-to-peak into a 75 ohm load.

The cable used in the scheme has been specially developed for this type of service. It comprises two pairs of 40 lb.-per-mile conductors arranged in a star-quad formation and insulated with polythene. An aluminium foil lapping screens the conductors, the assembly being encapsulated in polythene.

Both pairs are suitable for television transmission but for the West London Traffic Scheme one pair is used for the vision signal and the other for pre-selected voice frequencies to operate the camera's teleshift controls (that is, Pan and Tilt, Zoom, Focus, Iris, Wipers and Camera on/off). This pair is also used for maintenance purposes as a telephone channel via suitable low pass filters.

The whole network was completed in four months, well before the target date set by the Ministry of Transport. The success of the operation was very largely due to the co-operation and co-ordination between the London Telecommunications Region which installed the cable and equipment, the Supplies Department, the equipment and cable manufacturers and the Telecommunications Headquarters of the Post Office.

**The Greater London Council has asked the Post Office to prepare plans for a 30-channel closed-circuit television network to cover an area stretching from the West London district up to Liverpool Street and Aldgate High Street.*

Eventually it is hoped that the scheme will be extended south to include Lewisham and Croydon.

THE AUTHOR

Mr. C. R. CALLEGARI *is an Assistant Executive Engineer in the Line and Radio Systems Provision Branch of Telecommunications Business Headquarters (formerly the Main Lines Planning and Provision Branch of the Engineering Department). He joined the Post Office in 1945 as a Youth-in-Training in the London Telecommunications Region's South-East Area.*

A NEW SPEECH LINK . . .

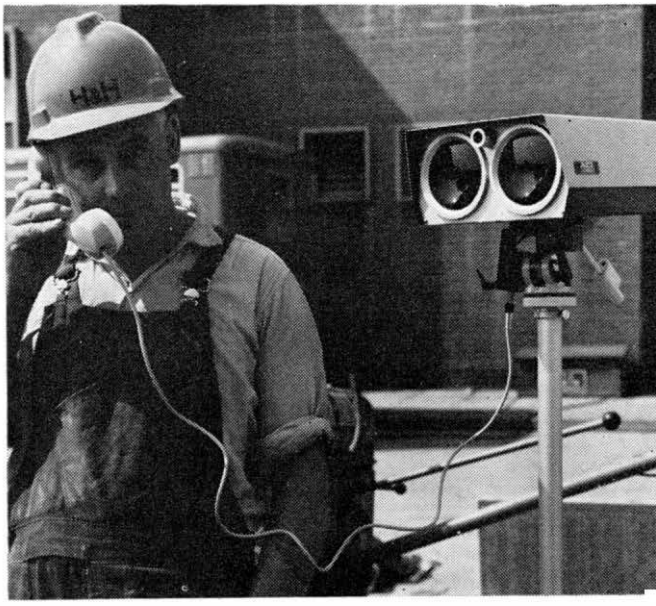
A speech communication system which has no wires and operates without the use of a radio frequency has been put on the market.

Known as the Light-beam speech system, it uses a modulated light beam which can transmit speech over a line-of-sight path up to a mile away. It is recommended for use at such places as airports, where outside radio use has to be kept to a minimum, and on construction sites where it is not possible to have a conventional wire link.

The equipment incorporates two hand sets and transmit and receive units and an infra-red filter which makes the light beam invisible and helps to maintain performance in adverse weather.

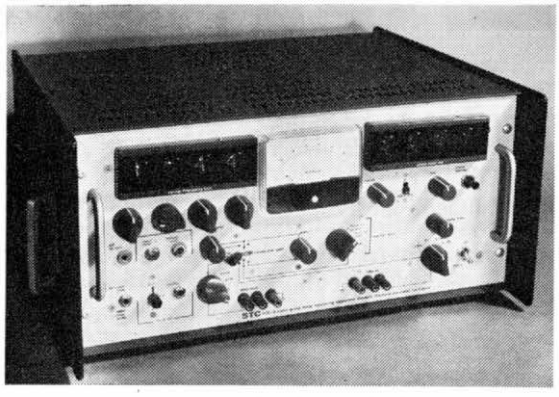
The light beam is transmitted by a lamp modulated by a speech signal by way of solid state circuits working from four one-and-a-half volt batteries.

Weighing only a few pounds, it can be easily removed from site to site and be set up within minutes. It is simple and cheap to operate and costs about £300. The new equipment has been produced by the Associated Electrical Industries Ltd's Division at Leicester.



The new equipment in use on a building site. It has a range of up to one mile and is simple to use.

. . . and new data transmission equipment



This is the new portable Group Delay Measuring Equipment for assessing the suitability of circuits for data transmission. Known as the No. 74257, it can be used on audio, broadcast and multi-circuit telephone systems where the group delay is of prime importance when they are used for transmitting data signals.

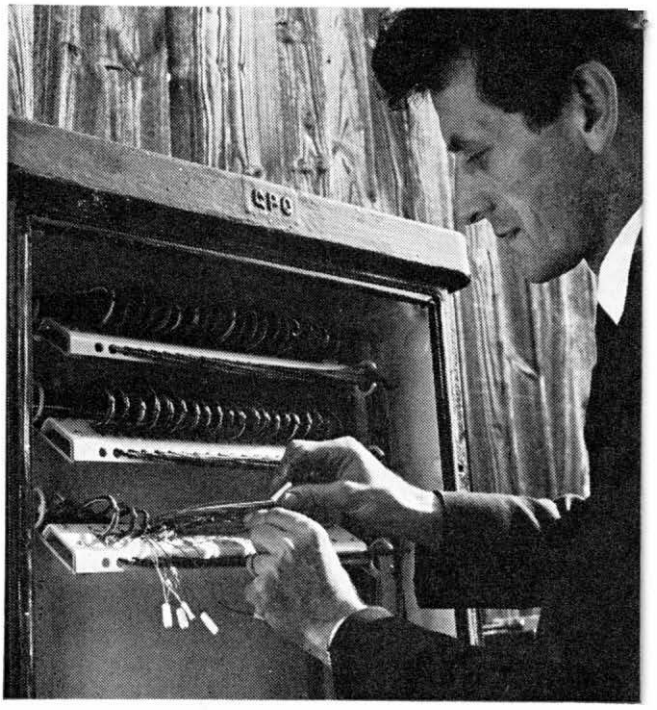
The new instrument, which is being manufactured by Standard Telephones and Cables, weighs 60 lb, is 22¼ ins wide, 9½ ins high and 16 ins deep, and uses solid-state circuits operating from AC mains.

The testing signal is obtained either from an internal oscillator covering the range 200 Hz-29·99 kHz, or from an external oscillator with a frequency range of 200 Hz to 120 kHz. Both the delay time measurement and the internal oscillator frequency are displayed in digital form by indicator tubes, thus dispensing with the need to read meters or dials and reducing the element of human error.

The frequency of the internal oscillator is set by four switches which operate the display directly.

A NEW–AND BETTER–WAY TO CONNECT CABLES

By H. G. GRAY
and R. G. TUNGATE



Right: Technician Mr. A. Pendry working on the experimental cross-connecting point in the Birmingham Area. Each shelf takes 100 customer-side pairs and up to 100 exchange-side pairs.

A COMPLETELY new technique for inter-connecting cables in the local network which has a number of important advantages over the old system, has been successfully adopted in all Areas in the Midland Telecommunications Region.

Basically, the new concept is of a joint enclosed in a cabinet, the jointing of the pairs being controlled and all pairs being formed out systematically so that identification of any pair is simple and can be done without disturbing other pairs.

The new technique is quicker than the system it replaces. It decreases fault liability, cuts provision and maintenance costs and reduces space requirements.

For the past 20 years cross-connection cabinets have been installed above ground in the local cable network to provide readily accessible points at which main and smaller distribution cables can be inter-connected.

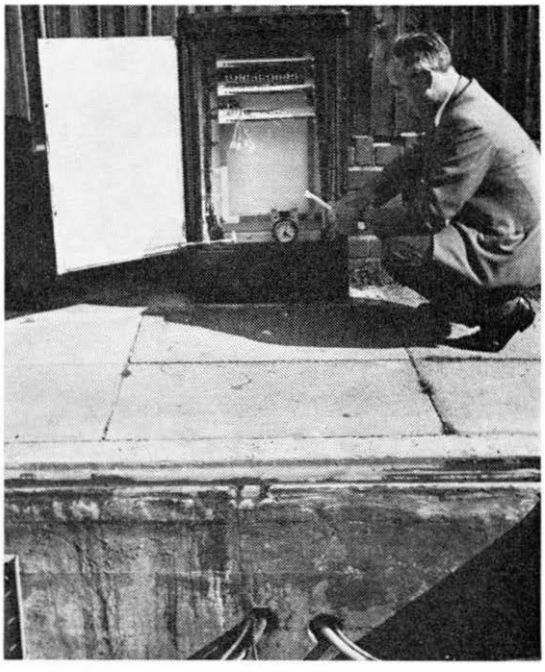
The functional value of these cabinets has been well proved but, at the time they were introduced, it was the practice to provide paper-insulated, lead-sheathed cables which were jointed to a tail cable from terminal assemblies in the cabinet. Cross-connecting the incoming and outgoing cables was carried out by means of jumper wires or wire pins connected under pressure screws.

Although the cabinets were fitted with dessicators to maintain dry conditions, some difficulty was experienced because of low-insultation. The connections were also liable to become loose.

The introduction of polythene-insulated cables (both in the smaller distribution sizes and, more recently, in the larger main cable sizes), together with new types of all-insulated wire connectors prompted staff in the Midland Region to consider leading polythene-insulated conductors directly into the cabinets and jointing them by means of compression-type wire connectors.

It was considered essential to provide some way of readily identifying the cable pairs and maintaining them in an orderly layout. So, in August, 1964, a prototype plastic shelf, with suitably-spaced numbered holes, was made for the purpose. This was further developed to accommodate 100 distribution-side pairs of wires, the shelves being mounted horizontally in the cabinet.

Assistant Executive Engineer Mr. L. G. Broom who, with AEE L. C. Parkes, helped to develop the new system, inspects a cross-connection point at Springfield, Birmingham. The underground joint box would normally contain many joint boxes, but the new method reduces them to the minimum.



At a meeting with the Engineering Department in January, 1965, the Midland Region was asked to carry out a field trial of the new method. The External Plant and Protection Branch and Local and Wire Broadcasting Branch were considering similar methods which, at that time, did not however involve the use of numbered shelves or plates. The trial was at first restricted to the Birmingham Area but has since been extended to all Areas in the Region.

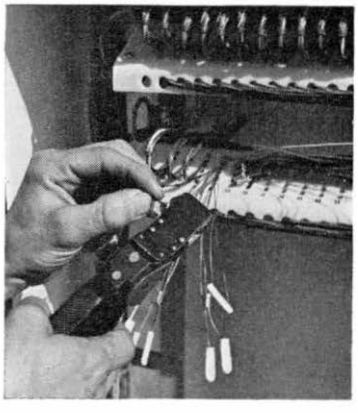
Using the new technique, both main and distribution cables—of any size—are taken directly into the cabinet and pairs from the distributions, whether working or spare, are taken directly to the individually numbered holes in the shelves while the exchange-side pairs are fitted with numbered collets.

To inter-connect pairs, the exchange pair is lead through the same hole as the distribution pair and linked by compressor-type wire connectors. This ensures a positive connection and the complete exclusion of any damp.

After jointing, the pairs, which are long enough to enable them to be rejointed several times if necessary, are folded back. Less space is needed for connecting wires in this way than is required for connecting them with the old-style terminal assemblies.

Facilities are also available for making shared-service connections and for connecting distribution cable pairs when required for such circuits as external extensions.

The new technique has four main advantages. First, the number of joints at the foot of the cabinet is reduced, enabling smaller joint boxes to be provided and saving skilled jointers' time. There is also a freer choice in selecting the size and grouping of cables. Second, fault liability is reduced because of the absence of pins and jumpers and excluding damp is no longer of major importance. Third, provision and maintenance costs are reduced and, fourth, the cabinet space required for a given number of connections is reduced.



Special pliers are used to compress the insulated wire connectors. The connections are afterwards folded back as shown here.

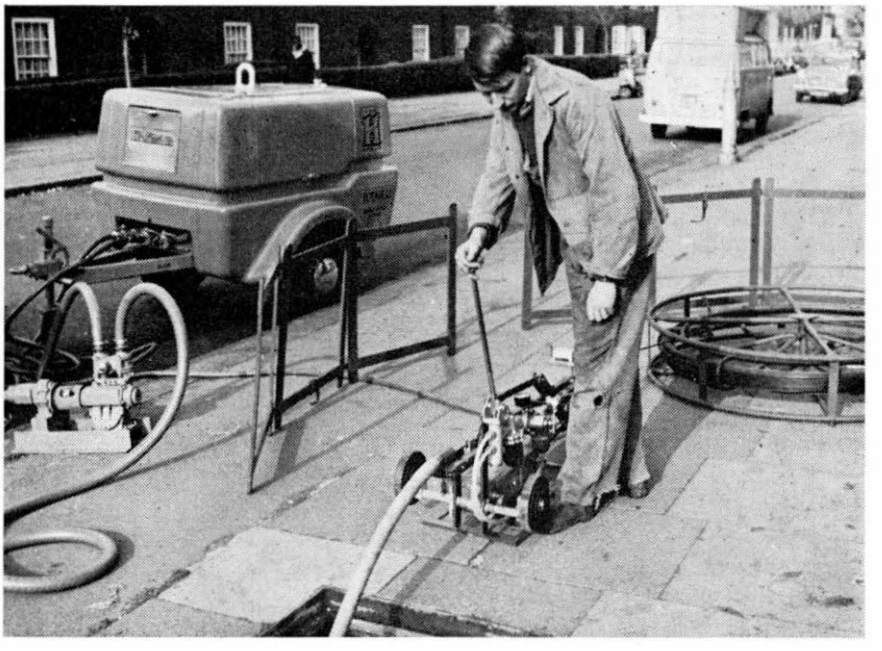
The new technique is being further developed by the Telecommunications Headquarters and it is possible that a cheaper type of cabinet shelf could be designed if further experience shows that it is not essential to seal the interior against moisture.

THE AUTHORS

Mr. H. G. GRAY *is at present Temporary Telephone Manager, Coventry, and* **Mr. R. G. TUNGATE** *an Executive Engineer on Works Practices in the Midlands Telecommunications Region. At the time of the development of the new cabinet they were both engaged on Local Line Planning duties in the Midland Region.*

CABLE LAYING IS SPEEDED AND MADE EASIER

A revolutionary type of duct-rodding machine, invented by a Post Office engineer, does the job in much less time. It is simple to operate and cuts down costs. It can also draw in cable



The new duct-rodding machine, powered by a pneumatic cylinder which develops a 1,000 lb thrust. On the left of the picture is a pneumatic pump used for pumping water out of flooded manholes.

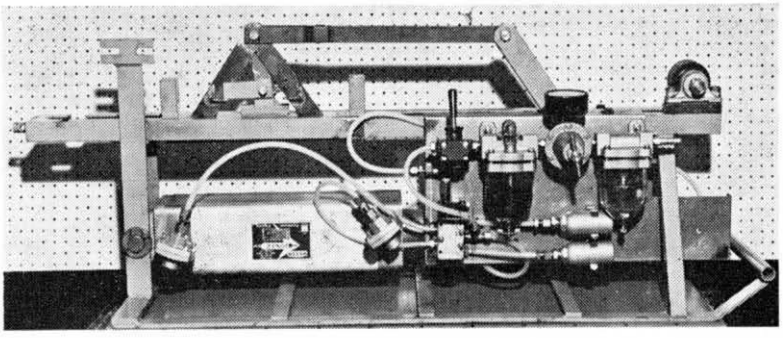
A NEW automatic duct-rodding machine which speeds and simplifies telephone cable laying, cuts costs and can also draw in cable, is now being used by the Post Office throughout the country.

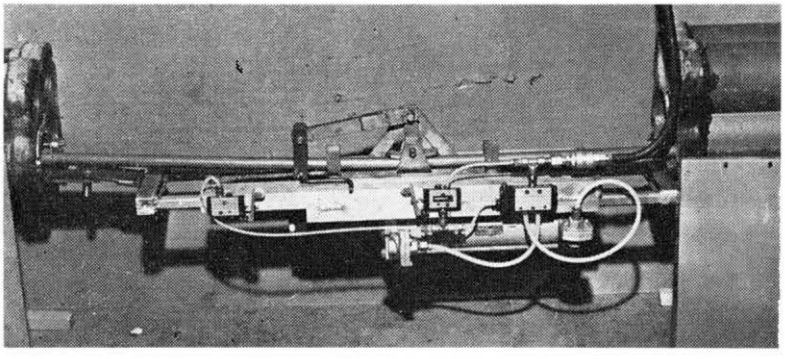
The new machine, which is pneumatically-powered, was developed by Mr. J. E. Deering, an Executive Engineer in the Civil and Mechanical Engineering Branch of the Telecommunications Development Department at Ongar. It replaces the manually-operated duct-rodding machine which Mr. Deering patented in 1962 and which needed the efforts of three men when used to clear a way through an obstructed duct.

The pneumatic duct-rodding machine is more powerful than the machine it has replaced. It can handle up to 300 pair/ten cables and rod up to 200 yards of duct at a single pass.

A number of important refinements and improvements have been made to the machine since it was first introduced. Originally, a lever had to be operated by hand to produce each forward thrust and when withdrawing the rod. Now, the lever is simply placed in one position to give continuous thrusts and in another to withdraw the rod. To obtain this automatic conversion a small control

This picture shows the panel fitted to the existing machine to convert it to automatic.





A compressed-air mechanism is clipped to the duct mouth to drive a plastic rod which is connected to a second machine. In this way continuous rodding is achieved.

panel is fitted to the existing machine.

Similarly, the machine can be converted to take a $\frac{15}{16}$th-inch tubular plastic continuous rod instead of the $\frac{3}{8}$th-inch steel rod. The tubular rod can be adapted to clear silt as it rods by using compressed air or water under pressure.

A further conversion is under trial by which a compressed-air operated mechanism can be clipped into the duct mouth to drive a plastic rod forward to the next joint box where a second machine takes up the drive and so on, thus enabling continuous rodding to be achieved and pulling the draw rope in behind the rod.

Once the length of the plastic rod is in the duct line no further setting up is required. This method offers the fastest rodding cycle so far.

The system lends itself more to the rodding of long lengths of duct, such as occur in the trunk and junction network, rather than in local networks.

In all machines, the rod—whether steel or plastic—passes through twin guide saddles and a rocking cam which is actuated through a linkage by a pneumatic cylinder giving a thrust of up to 1,200 lb. to the rod at a supply pressure of 80 lb. a square inch.

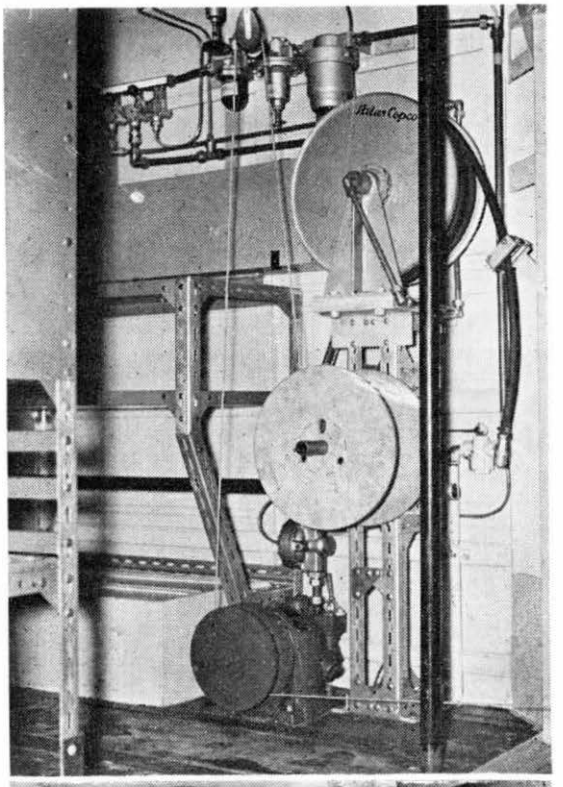
The machines issued so far enable a small cable to be drawn into the duct on the end of the rod. Although the thrust of the machine is about 1,200 lb, it does not follow that the rod can be pushed through any track where silt or tree roots have accumulated.

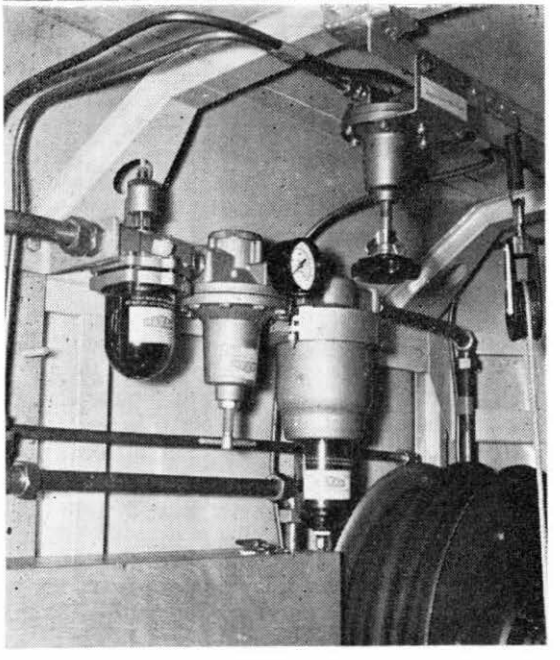
To indicate the exact position of the nose of the rod, a transistorised oscillator has been devised and housed within a $1\frac{1}{8}$th-inch diameter tube, forming part of the normal marrying equipment. This also provides a positive location when excavation is necessary to clear the track if marrying is unsuccessful. The use of the transistor oscillator will supersede the footage counter normally fitted to the machines.

When rodding comes to a halt, attempts to marry up by pushing a rod from the other end are always made before excavation is resorted to. To help this "blind" operation it is intended to fit a transistorised oscillator to the ends of both rods. The oscillators give a "bleep" signal of different tones so that the progress of one rod moving towards the other can be observed by a form of hearing aid and the position for marrying pin-

OVER

These two pictures show some of the new equipment which has been designed for use with the vehicle which will drive it by compressed air. Above: the pneumatic winch for drawing in cable and (below) the speed control unit for the winch.





pointed. Use of the two oscillators will also indicate the extent of blockages.

The present forms of marrying equipment normally attached to each end of the rods are bulky and, in some conditions, can prevent the rods being pushed. A new approach to marrying is now being formulated in which the marrying set is normally the same diameter as the rods. When the point of marrying is reached, the forward section of the rod opens umbrella fashion and is ready to grasp the oncoming rod.

The Post Office is now investigating the possibility of producing an integrated range of equipment for rodding, cable laying and servicing operations by employing a vehicle which can drive all the equipment by compressed air. Such a vehicle will carry rodding machines, de-silting equipment, winching apparatus, pumping and lighting gear, road signs, road breakers and various hand tools—all operated by a small crew of engineers. It is hoped that complete units of this kind will be able to complete cable projects more rapidly and economically.

Work is also going ahead on a portable pump which will extract water from flooded manholes more quickly than before. The pump is driven by a compressed-air motor with a suction lift of some 27 feet—sufficient to clear water from deep workings. It is self-priming and can continuously deal with a mixture of air and water and handle dirty water without being damaged. It can also be used to supply clean water for flushing away dirt and silt.

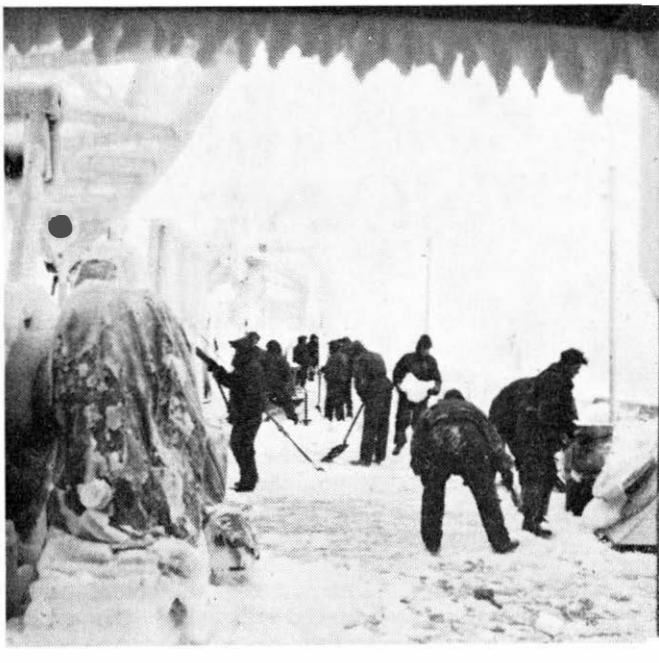
ICE-COLD IN ALERT

The recent loss of several fishing boats off Iceland gives special significance to these graphic pictures.

They were taken by a member of the crew of the Post Office cable ship *HMTS Alert* and show (above) the inches-thick coating of frozen sea water on her superstructure and (right) the crew battling to remove the ice as the ship ploughs through the Cabot Strait, off the coast of Labrador, while on trawler patrol during a three-day blizzard.

At one stage, the weather was so cold that the heavy seas froze solid immediately on impact with *Alert* and built up a cocoon of ice at least 18 inches thick. A smaller ship would have capsized under the weight of the ice. During the blizzard one fishing trawler—the *Blue Light*—was lost without trace and with all hands.

Alert is one of the British, French and Canadian cable ships which patrol the waters off North America warning fishing vessels to keep clear of the trans-Atlantic submarine cables. This extremely important, but little publicised work, demands considerable endurance and navigational skill, particularly during the winter.



At the Portsmouth Computer Centre, where the processing is being carried out, Machine Operator Miss S. J. Quarrington punches the information from tally cards into 80-column punched cards.

Computers Now Help To Control Section Stores

By G. D. CURR

THE Post Office is making big strides forward in its plans to computerise the present manual system for controlling section stocks of engineering stores throughout the country.

Today, a year after the introduction of the first computer techniques, the system has been considerably streamlined and improved. Now, armed with this experience, the National Data Processing Service which has been developing the new system, plans to incorporate a number of further improvements designed eventually to take most of the control work out of human hands and achieve significant savings.

The heart of the computer inventory control system used in the Post Office for section stocks provides the answers to two main questions: when to order more stock and how much to order. The size of the replenishment is called the order quantity (OQ) and the level of stock at which replenishment is sought the order level (OL).

There are two other control figures, or parameters. One is a low stock warning level (called the minimum stock or MS), which enables action to be

POST OFFICE Engineering stores is big business. Apart from an estimated £10 million stocks on average in works order stores earmarked for works, they amount to some £80 million, of which £15 million lies in Area section stock stores.

Records must be kept of some 30,000 separately-coded items, of which 18,000 are in current use, the others being required for spare part maintenance of obsolescent items.

Stores control has to accommodate two extreme attitudes: of those who want enough of every item immediately to hand regardless of cost and of those who rate cost perhaps more highly than service. Thanks to operation research techniques, it is possible to determine the costs of various levels of service, and computer techniques help to keep the level of stocks and to arrange for their replenishment to give whatever the level of service the administration prescribes.

Two inter-linked computer systems are being steadily developed, three stages having been completed in helping to control depot stocks and two stages having been run in together a year ago to help control stores in section stocks. This article outlines the principles used in the section stock system and indicates the next stage to follow it.

At present it is not possible to estimate precisely the reduction in stock which is possible, at the current rate of use, to give a better balanced and higher level of service than is enjoyed now. But the indications are that some £10 million reduction should be possible between the two computer systems.

A crude but cheap and potentially very effective system is being continued for so-called small stores—those with a relatively low item price and low investment value. This is a two-bin system, or its visible equivalent. The storekeeper disregards the daily issues, merely sending in a replenishment order when his second bin, or taped stock, is broached. This can cheaply provide a practically 100 per cent service.

Machine Operator Miss C. M. Chittleburgh feeds 80-column cards into the computer's card reader which can handle up to 600 cards a minute.

taken to avoid stock running out; and the other is a limiting figure to the size of any single withdrawal from stores (called the maximum issue or MI).

Section stocks are local stores intended to give an on demand service for items in daily use, mostly in small lots, many in single units. Demand varies widely and large buffer stocks are required to cater for fluctuations above average. If occasional large withdrawals are superimposed on frequent small ones, the bulk of stock has to be greatly increased and, depending on the pattern of demand, much of it could lie idle for long periods.

It thus becomes more economic to order the less frequent, larger quantities direct from the Supplies Department. The maximum issue figures are designed to protect local stocks from the disrupting influence of relatively large issues of stores.

To arrive at the four main control figures for each item we need to have data about stores movements, their numbers and costs and the rate of use of each item. This is obtained from records kept by storekeepers on tally cards at present.

OVER

This is the tally card kept by storekeepers for recording details about stores movements, numbers and costs, rate of use and so on.

A 521
(STORES, Stkprs, A 0501)

Tally Card No. ..... Item Description. .....

Item Code No. .....

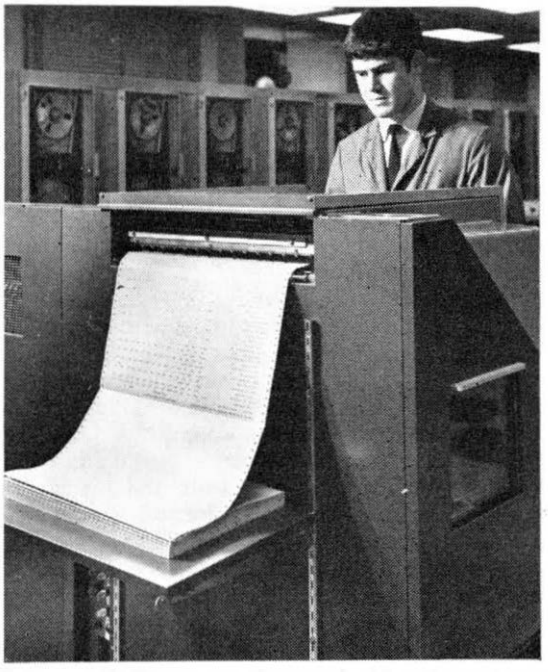
Section Stock .....
Pole Stock

E or RD control or special circulation	Unit of issue	Valuation Group

Order Level ..... Minimum Stock ..... Maximum Issue ..... Order Quantity .....

Monthly issues (excluding stock transfers) during 196..													Lead Time (Weeks)
MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	

Date	Document Reference	Receipts	Issues	Stock Balance	Date	Document Reference	Receipts	Issues	Stock Balance	ON ORDER			
										Date	Requisition Reference	Quantity	Date Rec'd



Portsmouth Computer Centre Machine Operator Mr. M. W. Stephens operates the analex printer as the stock control parameters are being printed. The printer can print up to 160 characters a line of print at a speed of 1,000 lines a minute.

A horizontal row of boxes on the tally card records the net issues each calendar month. The total or actual quantity issued is regarded as a gross figure and is reduced, or netted, by any auxiliary source of supply—auxiliary, that is, to the standard supply from the Supplies Department, for example, reusable recovered items or stores returned as surplus to the needs of a job.

An example of this latter is the gross issue of a complete drum of cable and the return of the unused portion. This provides a figure representing a rate of demand that will be reflected in subsequent replenishment demands on the Supplies Department. For algebraic formulae, the rate of demand is represented as D in unit time. The degree this varies about its average is treated as the root mean square or standard deviation d.

The next important parameter is a time measurement. The time between asking for a replenishment and getting it is known as lead time or L. We now have the following expression:

$$OL = LD + kd\sqrt{L}$$

The right-hand side of the equation is in two parts. The first provides stock sufficient to meet average demand during the lead time. The second provides buffer stock to cater for fluctuations in supply as well as in demand above this average. The lead time is enhanced by a week or fortnight —according to whether the depot delivers weekly

or fortnightly—to insure against an order level reached just after the regular ordering day.

Finally, a value of k is needed which determines the proportion of occasions on which the bin will probably be empty when replenishments arrive. The derivation of k is not explained here; a separate article could be devoted to that subject alone. Clearly, however, the greater its value, the larger the buffer stock, the smaller the chance of running out of stock and the higher the cost of maintaining the service. The balance to be struck between costs and service is one of the most important aspects of inventory control. A 100 per cent service for some items can be very expensive.

In a manual system, the calculations necessary to measure d for each item in each store would be too much for clerical handling and a compromise formula, with a bit of "fat" to be on the safe side, has had to be used pending recourse to computers. The compromise formula for d is $1{\cdot}25\ D^{\cdot 74}$.

Inventory control benefits from mathematical models such as these and a lot more complicated ones which only professional statisticians can handle. But the general reader cannot escape the basic concepts underlying them. To complete a description of the minimum elements of inventory control, however, one further calculation should be explained. The point of local stocking is to give items justifying a demand service a prescribed standard of service at an optimum cost.

This requires balancing the costs of holding stock, perhaps in large quantity, against the costs of replenishment.

These latter two costs include handling the replenishment requisitions and the paper and machine processing trail they lead to as well as of those arising from physically picking, packing, transporting and handling the item in central and local stores. Other factors are the cost of locking up capital in stock and of accommodating that stock and maintaining it in good condition with safeguards against obsolescence.

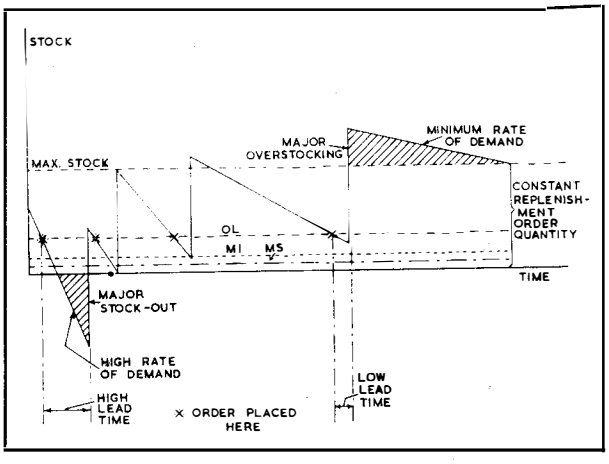
The following expression is used to set the order quantity that represents an economic balance between holding and ordering costs:

$$OQ = \frac{24\ DS}{\sqrt{CI + 2K + M}}$$

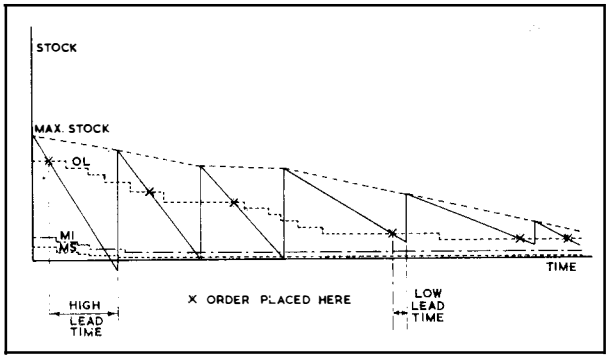
where S = Ordering costs per order
C = Price of one rate book unit
K = Cost of holding one unit
I = Interest rate
M = Cost of maintaining one unit.

This scheme was introduced on a manual basis in one section stock in each Telephone Area in April, 1966, the intention being to extend it to all section stocks by the end of that year. This was not possible, however, so computer assistance was introduced in May, 1967, using the tally cards for

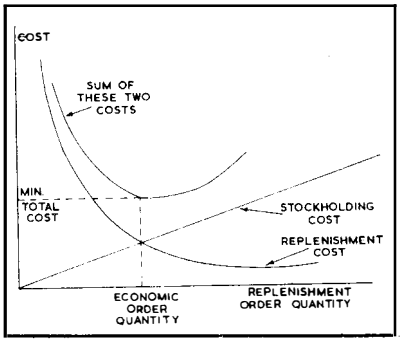
OVER



Above: Variation of stock with variable demand and variable replenishment delivery (lead) time.



Above: Variation of stock with variable order level and variable order quantity.



Left: This graph shows the effect of order quantity on cost.

Left: Customers take delivery of an order at the section store in St. Albans.

the financial year ended March, 1967.

The power of the computer permitted some improvements in the basic formulae. In place of the compromise formula for demand variation we were able to use the "pure" one based on the way the net issue rate of each item in each store actually varied. Again, the manual system used a simple but rather crude method of allowing for trend in setting a forecast to last a year. The computer used the more favourable of two methods: one the line of best fit through plottings of monthly demand (strictly of issues), known as linear regression; the other a system of moving averages giving more weight to more recent figures, known as exponential smoothing, adjusted for trend.

For items with a falling demand we played safe by taking as the year's forecast the level reached at the start of the year, but for those with a rising demand the point was taken that would be reached half way into that year. However, an overload factor was added in the same way as is done in lines estimating—that is, by calculating the effect on the service if the demand increased 25 per cent above the forecast. If this looked likely to lead to an unacceptably low service, extra stock was provided to raise it to an acceptable level. We also kept on the safe side by making ample allowance for supply lead time.

The conversion of data from tally cards to punched cards was a big job and had to be done as quickly as possible. The work was therefore spread over six Post Office data conversion centres. Processing was done at the Portsmouth Computer Centre. After the inevitable difficulties were overcome the multi-analyses that go under the simplified description "annual valuation" and the calculated parameters for each item in each section stock for the following year were printed on large sheets of paper forming a stack several feet high.

The results of the first year's computer run have been very worthwhile. The computer system trapped a number of errors in the data that would have got through the former punched card system and a second run with corrected data was possible in a few hours. Copies of declared holdings, and their values, for every item in every section stock were made available within a few hours, indicating, among other things, just where high holdings with high value lay. They showed that about 20 per cent of all holdings of "working" stock had no movement at all, and 60 per cent with little or no movement, worth £1·5 million.

Months in which there had been no issues because central depots were out of stock were not counted, so long as this had been shown by the local storekeeper.

If the computer assessed parameters are used, and generally fit the whole year's demands, it

Right: Replenishments arrive from the main depot for unloading into the St. Alban's section stock.

seems probable that the same stores service could be given with £2 million less stock. All this ignores cable which was excluded from the system and accounts for a third of the value of these stores.

Benefiting from the experience gained in the first year of running, we shall incorporate a number of improvements in 1968. Cable will be included. Linear regression, which proved unsatisfactory, will be dropped and only exponential smoothing will be used. Some output information will be discontinued as no longer necessary. Other information, for which there is a real need, will be incorporated.

The computer could make an even fuller contribution in the stores field, leaving aside what is already being done for the Supplies Department depots. In theory there is no reason why, if the computer were supplied with the ordinary data thrown up by the present requisitioning and delivery procedures, it could not take stores recording, re-ordering, frequent calculation of parameters, pricing and other work entirely out of human hands.

Given a predetermined grade of service from the Supplies Department, or given the ability to adjust to enduring changes in that service, local stocks could be kept at the level needed to give a pre-determined level of service to the user with an accuracy and reliability unlikely to be met by human beings.

However, at present, because of the higher priority accorded to other projects, it seems probable that we shall have to settle for a simpler interim automatic data processing system which would maintain a section stock record kept up to date by the input of stock movements and provide for a degree of automatic stock replenishment. Requisition pricing also would be automatic.

Periodically the system would call for reports of stocks held and use these to correct the tendency of records to drift out of alignment with physical stocks. Any differences would be analysed and reported to Areas for action. The upheaval of tally card collection once a year would be practically abolished since most of the information would be available on magnetic tape. Our aim is to have this interim system running on an experimental basis in Colchester Area during 1969 but relying on a continuing, locally-kept tally card record.

THE AUTHOR

Mr. G. D. Curr *joined the Post Office as a Youth-in-Training in the Test Branch of the Engineer-in-Chief's office in 1935. He later transferred to traffic duties, subsequently reaching the grade of Chief Telecommunications Superintendent before being appointed Chief Executive Officer in 1964 in the Organisation and Methods Branch of the Clerical Mechanisation and Building Department (now the National Data Processing Service).*

"MORE PRODUCTIVITY IS NEEDED"

. . . says the Prospects White Paper

THE need for greater productivity and for charges to be brought into line with costs is spelled out in the White Paper *Post Office Prospects*, 1968-69 **which was published as the** *Journal* **went to press.**

"The expectation of staffing stability and system growth requires a further substantial improvement in productivity, thus maintaining progress towards the aim of increasing the system by 50 per cent without increasing manpower overall," says the White Paper.

"*This can be achieved only by continued exploitation of technological development, by greater use of mechanical aids and, with the co-operation of the Staff Associations, by improved working practices and manpower utilisation.*

"An increasingly important contribution . . . . will be made from now on by computers for data processing. Telephone billing is already being converted to computer working on a national scale and more major projects are being developed. A Management Services Department has been formed to intensify the drive for improved efficiency and the use of modern management techniques."

The White Paper says that the telecommunications service achieved a notable degree of price stability over the past decade. Strenuous efforts had been made to absorb costs and increase efficiency and further productivity improvements were planned which will make a substantial contribution to the Post Office finances in 1968-69 and later years. "But," it adds, "these improvements . . . . will not be enough to fill the financial gap immediately facing the Post Office. In 1967-68 the return on telecommunications will drop to 7.1 per cent and at present tariffs there will be a further deterioration to 6.7 per cent in 1968-69.

"Charges, therefore, require to be brought into line with costs. This is particularly important at present when a very large and rapidly rising capital programme has to be financed. This will probably cost about £2,000 million over the next five years and can be justified only if a fair balance is held between the finance provided by our customers and the amount borrowed from the Exchequer which, in turn, has to be raised from the general public . . . . This balance is not being maintained."

The White Paper estimates that at present tariffs the profit on telecommunications will fall to £33 million in 1967-68 (compared with £37.7 million in 1966-67) and to £26 million in 1968-69. Capital expenditure at existing tariffs for 1967-68 is expected to be £291.4 million and for 1968-69 £334.4 million.

Reporting in detail on the various services, the White Paper says the rate of growth of inland trunk telephone calls in 1967 recovered after a period of slower increase and in 1968-69 is expected to be 13 per cent. Local call growth—at 4 per cent—may be less than in the current year, reflecting a tendency for the calling rate to fall after a period of some years during which it increased slowly but steadily. "This is a disappointing trend in a country where telephone usage is low," the Report comments. "Telex, on the other hand, maintains a high growth rate of 20 per cent. International traffic continues to be buoyant. The number of telephone calls to the Continent is expected to increase by 15 per cent and inter-continental calls by 20 per cent.

"The telephone service has in general improved in 1967-68 and there will be further improvement in 1968-69. But there are still too many call failures, too many faults and too much congestion in too many places. Improvement of the service for existing customers has priority and will remain the dominant task for 1968-69."

About 12,000 circuits (representing a growth of 18 per cent) will be added to the trunk telephone network during the coming year and a further 62,000 (10 per cent growth) shorter distance junction circuits will be provided. These extra circuits will accommodate the expected rise in traffic and relieve congestion.

Despite a considerable increase in output by the manufacturers, deliveries of much exchange equipment continue to be subject to substantial delay. Some reduction of contract delays is expected in 1968-69 "but, until scheduled dates are met, the position will remain unsatisfactory." Nevertheless, some 234 new exchanges and 605 extensions are expected to be completed during

the year and installation of 204 new exchanges and extension of 542 existing ones will be started.

It is planned to add some 850,000 lines to the local public network and to meet orders for about 1,310,000 connections in 1968-69—some 860,000 by new provision and 450,000 by the take-over of existing installations. The total number of connections at the end of March, 1969, is expected to be 7,710,000 and the total number of telephones in use about 13 million.

Plant is now available for about 83 per cent of orders. More than half the orders for new telephones (excluding those where the customer wants service at some later date) and three-quarters of those for miscellaneous works are being completed within two weeks of the order. Arrangements in many parts of the country by which customers can make appointments for installation of new telephones and extensions will be extended in 1968-69.

The waiting list on 31 December, 1967, was 118,000. Of these, 100,000 were waiting for exchange equipment only; 9,000 for lines to the exchange only; and 9,000 for both equipment and lines. A further 101,000 applications for service were being negotiated or met.

About 80 of the existing 185 manual exchanges will be converted to automatic and by March next year 98 per cent of customers will have automatic service. A further seven per cent of customers will be getting STD facilities so that by the same date 85 per cent of all subscribers will be able to dial their own trunk calls.

Other details from the White Paper are as follows:

●By the end of 1968 nearly 1,000 pulse code modulation systems, which help to keep down costs and improve service by enabling junction circuits to be used more intensively, will have been installed. A time-division electronic exchange which will switch pcm signals from one route to another in digital form, has been designed by the Post Office Research Branch and is being tried out experimentally in public service during 1968.

●The Datel services will continue to be expanded and new facilities, especially in the higher speed ranges, will be developed. The provision of service for computer bureaux and some big users—notably banks—is expected to grow particularly rapidly. The Datel 600 service will be further extended and the Datel 100 and 200 services made available to many overseas points.

●Trials of telephone cables with aluminium instead of copper conductors have proved so successful that orders for aluminium cables in smaller sizes are being stepped up. Because of the high cost of imported copper, the use of aluminium should benefit the economy.

●*An important technological advance affecting development over the next few years is the integrated circuit. It has already been shown possible to build complex circuits in small, reliable and comparatively cheap packages. They have immense potential and both industry and the Post Office are devoting much effort to making them suitable and economic for use in telecommunications systems.*

●International subscriber dialling facilities are planned for extension to Italy and, when the new Anglo-Norwegian cable is completed, to Norway. Further extension to Spain, Austria, Denmark and Sweden is also possible. Plans are in hand, too, to introduce an "on demand" telephone service to North America, initially from London and later from the rest of the country.

●*The inland telex service is expected to have about* 22,000 *lines at the beginning of* 1968-69. *More than* 4,000 *lines will be added during the year. About* 430 *international circuits will be added to carry increased traffic. They will be provided by new submarine cables to the Continent and by way of communication satellites to more distant countries.*

●Fully automated telex service will be extended to more European and extra-European countries and new equipment for recording dialled inter-continental calls will be brought into use to enable accounts to be processed by computer.

●A 480-*circuit submarine cable will be laid between Britain and Portugal during the year and connect with a new Portugal to Capetown cable. Two new* 480-*circuit submarine cables will be laid to Norway and to the Netherlands.*

●The second earth terminal at Goonhilly will be completed in the summer of 1968 and operate with the new American *Intelsat III* satellite to be launched over the Atlantic. The present earth terminal will be re-equipped to work with the *Intelsat III* satellite due to be launched over the Indian Ocean in 1969. Satellite communication will then be possible between Goonhilly and those countries—from Mexico in the west to Australia and Japan in the east—which have earth terminals to operate by way of either of the *Intelsat III* satellites.

OPERATION HURRICANE!

High and dry at Tayvallich—the three fishing boats became entangled with overhead wires.

POST OFFICE engineers throughout Scotland faced the biggest repair operation in memory when a 130 miles-an-hour freak storm swept across the country, leaving behind a trail of death and devastation.

Telegraph poles snapped like matchsticks and many miles of overhead lines were pulled down, isolating 113 exchanges and putting more than 66,000 lines out of action.

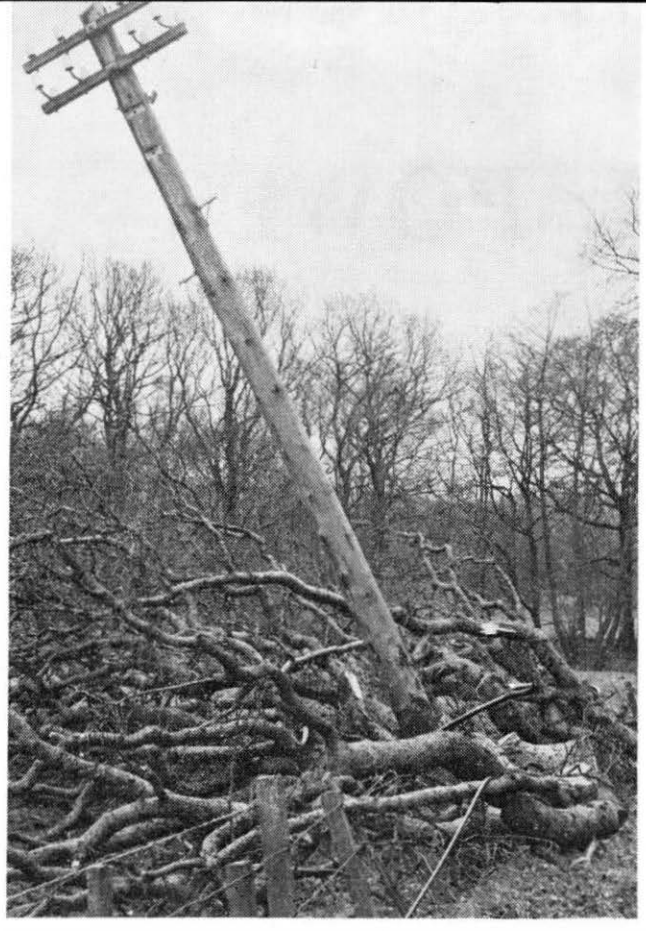
The worst hit area was Scotland West where, at one period, more than 8,000 subscribers' lines were out of order and 50 exchanges were isolated. In the Dundee area 22 exchanges were isolated and 2,190 subscribers lines put out of order. In Edinburgh area 5,051 telephones were out of order and 15 exchanges isolated and in Glasgow more than 8,000 faults were reported.

As damage reports flooded into Telephone Managers' offices, special emergency Storm Control Centres were set up to co-ordinate repair work and all works and installation staff were rapidly switched from their duties to help the repair gangs. Repair gangs from across the border in Lancaster were rushed north to help out Glasgow's overworked engineers and a little later more gangs from the North-Eastern Region arrived to assist in Scotland West, Edinburgh and Glasgow areas.

Working day and night, the engineers soon began to restore order out of chaos. In the county of Midlothian alone, where more than 3,000 telephones were put out of commission, almost half of them were repaired within three days.

A similar pattern of repair work was followed in other counties but so widespread and severe was the damage that normal service throughout the country was not restored until the beginning of February—more than a fortnight after the hurricane struck.

The repair crews worked against formidable odds, hampered by the gale-force rainstorms which lashed the country immediately after the hurricane and the devastation caused by the 130 miles-an-hour winds. Access to many of the remote isolated exchanges was blocked by fallen trees which had to be cleared. In some districts, especially in Glasgow and Greenock, immediate repair work was impossible because of the dangerous state of buildings. Elsewhere, power



On the road from Balmaha to Rowardennan a pole sways drunkenly, its cable torn apart.

An uprooted tree fell across the Dryman to Balmaha junction cable. Normal service was soon restored.

supply failures held up work for hours on end.

The radio repeater stations at Greenlowther and Riddingshill were also badly hit. Horn aerials at both stations were whipped by the hurricane against the giant steel towers and smashed, and at Greenlowther the entire roof of the building was lifted off. But both stations were working again in an astonishingly quick time. A gang from Dumfries was rushed to Riddingshill and, working at the height of the storm, had the station operating again within two-and-a-half hours.

Meanwhile, another rigging gang from Edinburgh dashed to Greenlowther and got that station in action again the same day.

The island of Scarinish, on the west coast, was completely cut off when the submarine cable which links it with Mull was broken by heavy seas. Within hours engineers at the Telecommunications Headquarters in Edinburgh were building and testing radio transmission and receiving units which were then rushed to Scarinish and Mull and linked up at the first try. The shattered cable was subsequently repaired by the Glasgow based Post Office cable ship *Aerial*.

An overhead repair gang from Campbelltown probably had the most unusual problem to solve—disentangling three fishing vessels from overhead cable in the tiny village of Tayvallich on Loch Sween in Argyll.

The three boats, all over 19 tons, were swept ashore when the hurricane-lashed waters rose 30 feet above high water mark.

Telephone operators also played an important part in helping to keep the telephone network operating with the minimum of inconvenience to subscribers. In Glasgow at the height of the hurricane operators handled more than 600 emergency calls in three hours and at the Talisman Exchange in Edinburgh four operators dealt with more than 300 calls—more than ten times the normal number.—*From a report by Robert Hannah, "Courier" Reporter, Scotland.*

THE VITAL POWER

By E. P. JENNER

Electrical energy is the heart of the telephone system. If the power plant which provides it fails the whole system breaks down

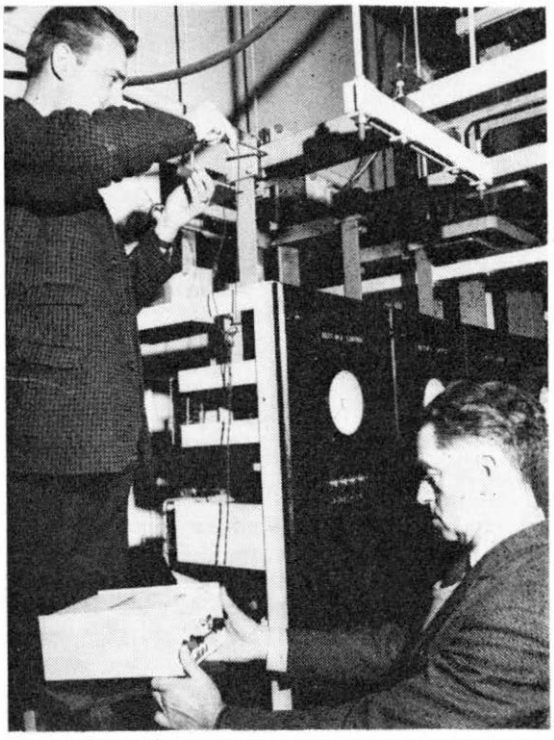
ELECTRICAL energy is the life blood of the telephone system. If current stops flowing through the bus bars all communication stops. Yet the power plant tends to be taken very much for granted.

The design and performance of power plant are the result of many years of research and experience. Over the last 30 years they have evolved from a charge/discharge system with two large-capacity batteries (one at a time being discharged into the exchange load while the other is being charged) to the present float system in which batteries are kept in circuit in a charged state.

On charge/discharge and some of the early float plants, the exchange voltage varied over a range of at least four volts. The present float system has reduced the normal working range to 0·6 volt, leading to a more consistent equipment performance. However, to meet the most onerous conditions, the automatic equipment is still designed to function satisfactorily over a range of six volts.

The standard source of electric power in Britain is the AC mains. The exchange equipment requires a 50 volts negative DC supply for its operation, provided by the power plant.

It consists of three main items. First, DC power plant, comprising rectifier equipment to convert the AC mains to 50 volts DC and a smoothing filter to reduce to an acceptable level the ripple voltage always present in a rectifier output, and which would otherwise appear in the telephone circuits as a hum. At least two rectifiers are used to reduce the risk of complete breakdown if one should fail. All the main components are interconnected on a power board which also contains fuses, alarms and controls. The main control is a sensing device across the exchange bus bars. This, in turn, controls the AC voltage applied to the rectifier, thereby regulating the DC bus bar voltage within the required close limits.



Mr. N. Purseglove, a trainee technician improver, adjusts the voltage relay which controls the busbar voltage. The operation of the power plant depends entirely on the correct setting.

The second main item is the AC power plant comprising a diesel engine coupled to an alternator (AC Generator). The engine starts automatically on a mains failure and replaces the AC mains supplies to the rectifiers and other essential services within ten seconds. There is no break in the 50 volts DC supply, but some equipment racks operate directly from the AC mains. In a telephone exchange, a short break in the supply to these

racks, on mains failure, is accepted as inevitable.

The third main item is a fully-charged battery always connected across the exchange bus bars. This maintains the 50 volts DC supply on a mains failure until the engine alternator replaces the mains.

The battery also acts as a large sponge, absorbing surges, giving additional stability to the bus bar supply and further reducing noise in telephone circuits.

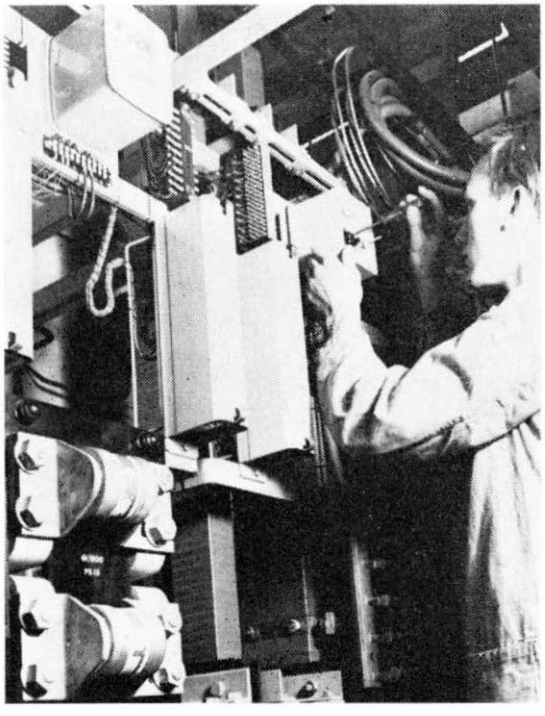
Planning a telephone exchange involves many people in a wide variety of duties. It starts in the Telephone Manager's office with a forecast of the growth of the community and its telephone requirements. This is summarised into traffic data and sent to Regional Headquarters for detailed planning.

From the type and quantity of required equipment and the anticipated traffic flow, the details of the power plant are calculated. The calculations are based on theory and practical experience gained from a knowledge of the power consumption of similar equipment in the past.

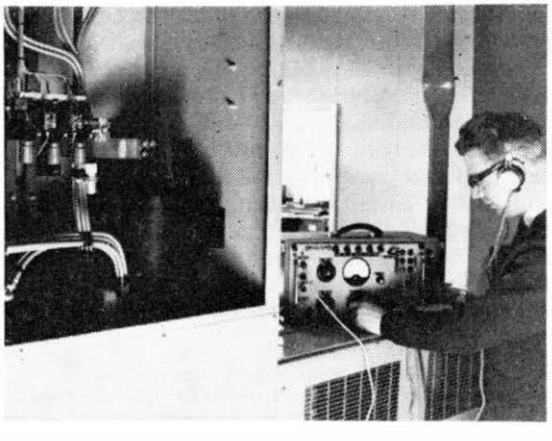
For an exchange extension, the pattern of power consumption in the exchange has already been established and the information from simultaneous power and traffic records is used to determine, with considerable accuracy, the power requirements.

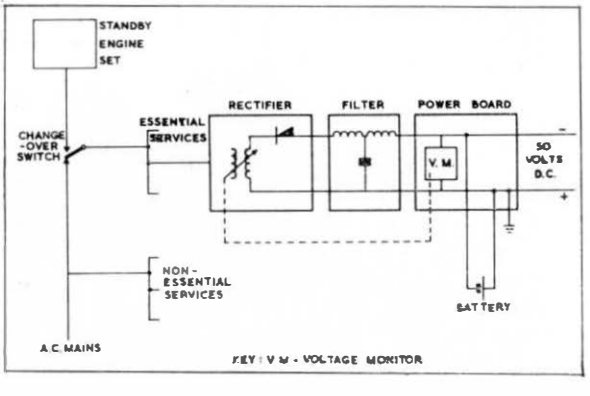
It would be uneconomic to install, initially, power plant of sufficient capacity for, say, 20 years and to run it at a fraction of its rated output for the greater part of its life. It is equally illogical to install a plant which would be fully loaded initially and need to be enlarged a few years later.

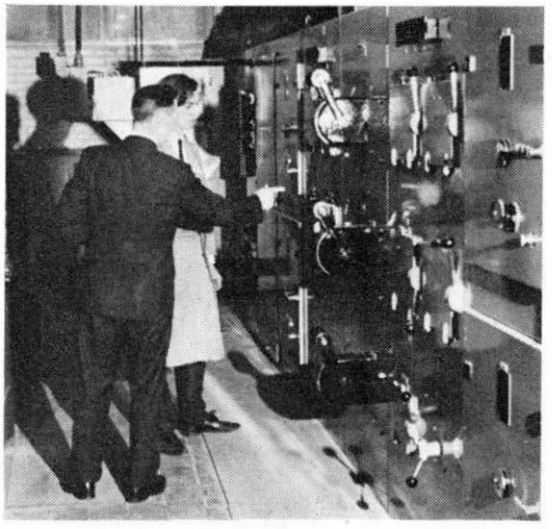
OVER



Above: Assistant Executive Engineer G. Hobbs and Technical Officer S. Plant measure the voltage drop across a busbar joint. A few millionths of a volt makes the difference between acceptance and rejection of the joint. Below (left): Technical Officer R. Atkins using a psophometer to check electrical noise in a rectifier filter. Below (right). A simple schematic diagram of a telephone exchange power plant.







Left: The author, Mr. E. P. Jenner (left) explains how a large power plant operates.

A compromise is reached by installing a power board rated for 20 years and rectifiers for five years so that rectifiers can be added as needed.

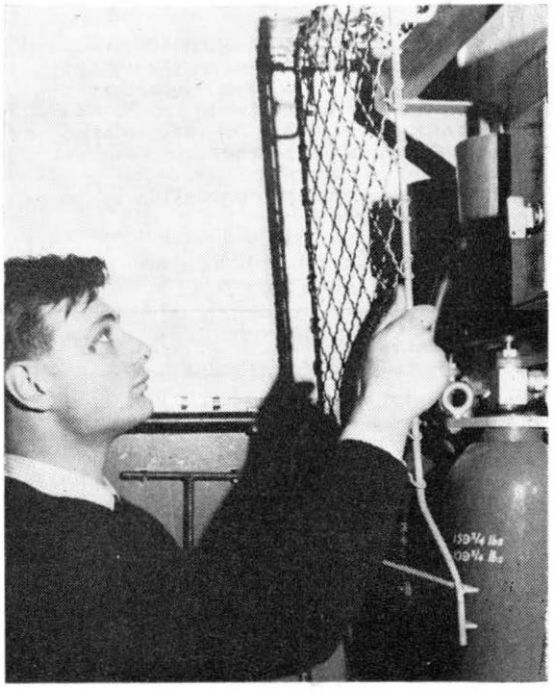
Similarly, battery boxes for 20 years are installed, with plate capacity for ten years since plates are expected to need renewal by that time and the boxes can then be fully plated. The engine set for 20 years is installed at the beginning. On larger installations where more than one set is needed, the complete installation may be spread over a number of years.

To attempt further economy by a more detailed method of short- and long-term assessments is not justified since it is impossible to forecast long-term growth and change with sufficient accuracy.

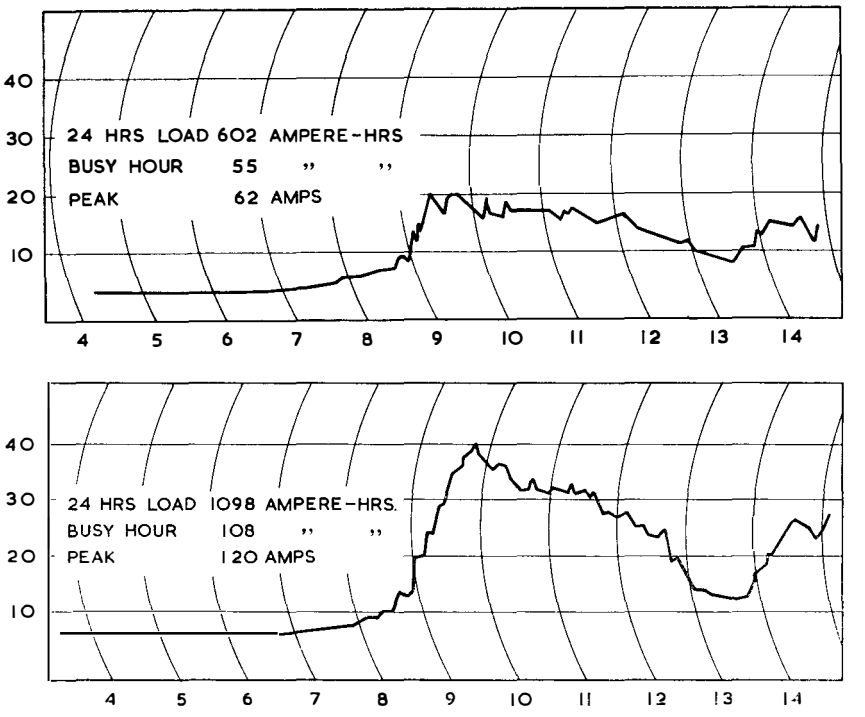
When the exact requirements have been decided, a Regional Contract Supervising Officer is appointed. His job is to obtain all the details applicable to the exchange which are necessary to enable him to write three specifications—for DC power plant, AC power plant and batteries. This calls for close co-operation between various groups in the Regional Office and the Telephone Manager's Office. Very large AC power plants with more than one engine set are dealt with by Telecommunications Headquarters.

The DC power plant contract normally goes to the contractor providing the automatic switching equipment under the Bulk Supplies Agreement. The engine set and battery contracts are competitive.

Time intervals are planned between placing the three orders so that each item will be installed at the correct stage. After each order there follows a period of planning and manufacturing, with close liaison between the contractor and the Contract Supervising Officer throughout. The phasing of the three installations, adjudication of tenders for sub-contracted items, approval of engineering drawings and many other details must be dealt with before installation work can start. During this time, building work continues and the Telephone Manager's Engineering Division prepares the power plant accommodation with the required



Left: Mr. G. Neal, a special faults investigation officer, checks the carbon dioxide pressure in the enclosure containing high voltage switchgear.



These two graphs illustrate how the power load at the Sittingbourne Exchange doubled between July, 1962 (top diagram) and October, 1963. The bottom row of figures are the hours in the day. The number of exchange lines in 1962 was 1,806 and in 1963, 1,972.

facilities and services so that all is ready for installation to begin.

The DC power plant and batteries are required for equipment testing shortly after installation starts.

Satisfactory service performance depends very much on the standard of plant installation. A Clerk of Works on site ensures that the workmanship, materials and plant items meet Post Office requirements, and the contractor's installer co-operates fully with the Clerk of Works to achieve the best possible installation. Problems which cannot be solved on site are referred to the Contract Supervising Officer who deals with the contractor's headquarters.

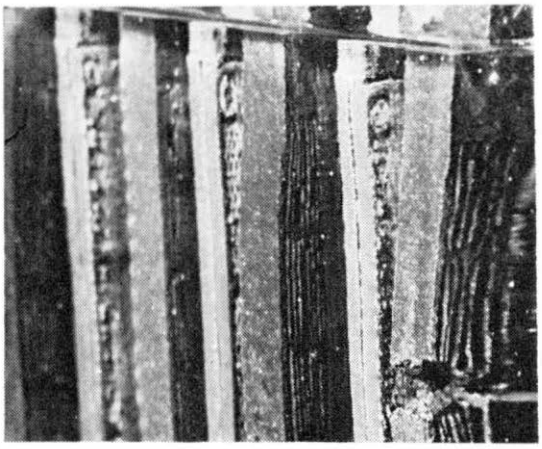
If installation of the power plant is held up it may be necessary for a temporary 50 volts DC supply to be provided for testing. This is done by either the Post Office or the contractor but the use of temporary power plant is avoided wherever possible.

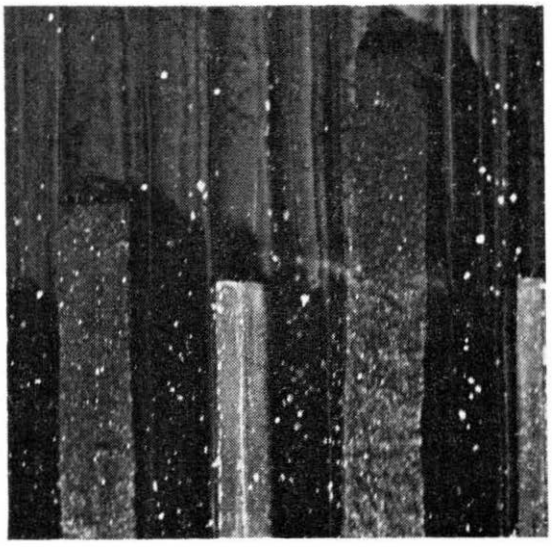
As soon as the rectifiers are ready for use, the batteries are installed. The rectifiers are used for the initial charge necessary on all batteries above 400 Ampere-hours capacity. If rectifiers cannot be used, the Post Office makes alternative charging arrangements.

Since the engine set is not required before the automatic equipment is in service, it is installed later. Before the engine contractor arrives on site, the Clerk of Works ensures that the accommodation is ready. The Ministry of Public Building and Works is responsible for incorporating into the building a buried fuel tank with piping and pumping arrangements to transfer fuel oil to the engine room, a reinforced engine bed, air inlet and outlet openings in the outside walls, and holes for the exhaust system with supports for the exhaust pipe and silencers.

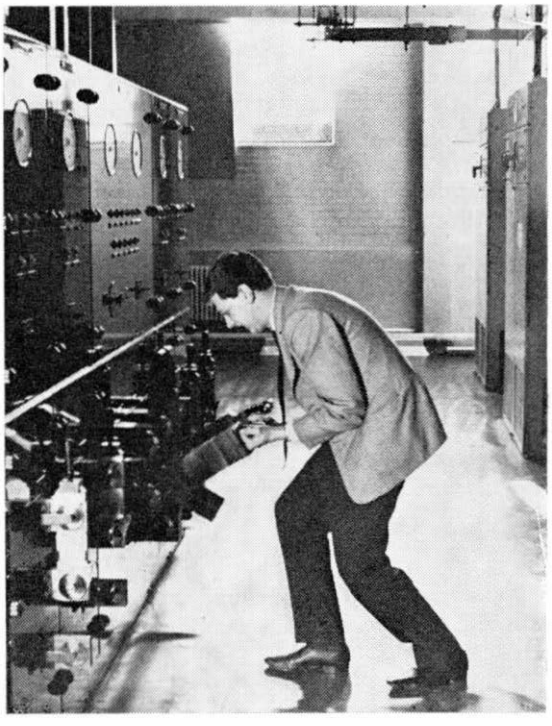
The Clerk of Works must be a "Jack-of-all-trades", particularly for the engine set installation. He is concerned not only with the diesel engine, but also with the electrical controlling equipment, starter battery and charging rectifier, AC genera-

OVER





Above and right: These two pictures of damage to battery cells show what can happen when batteries are topped up with tap water containing chlorine. Below: Technical Officer Mr. R. Smith operates the switch to couple the exchange batteries after a refresher charge has been made to one of them.



tion and distribution, building details, fuel storage and transfer, acoustic noise and many other unplanned and unexpected difficulties.

Acceptance testing is controlled jointly by Area and Regional staff. Division of control varies with the Region, the Area and the type of plant but, whoever is responsible, tests must be carried out thoroughly since this is the last opportunity of finding defects before the plant becomes operational.

The tests are designed mainly to check for adequate rating, correct functioning and safety and take from two weeks upwards to carry out. They are performed by the contractors under the direction of the Post Office testing engineer.

Failure of a relay set, group selector or cable can result in inconvenience or loss of service to a number of customers. A power plant failure can affect a complete Telephone Exchange, with loss to the Post Office of revenue and prestige and the possible isolation of a whole community. A loss of power for a few seconds can produce chaotic results.

The power plant is designed for maximum reliability, but however near to foolproof the design may be, no system can remain so without regular maintenance. The power supplies must remain unbroken for 24 hours of every day, and to this end there is a system of regular maintenance

routines, each one contributing to maximum reliability.

The engine set and batteries are required only as a standby source of power. A great deal of money is spent on providing them for use in an emergency which may not occur for years, and the money is wasted if they fail at the vital moment. Any engine deteriorates over a long period of idleness, so the AC mains supply is disconnected every six months to make sure that the engine set starts automatically and takes over the exchange load. It is then allowed to run for ten hours as near to fully loaded as conveniently possible to ensure that all is still in good order. Temperatures, speed, oil pressure and output are all recorded and any falling off in performance is examined for an advanced indication of a possible future failure.

Similarly, the batteries are fully discharged once a year to ensure that they still have sufficient capacity and to keep the plates in a healthy condition.

Fortunately, power plant failures are rare, but when one does occur prompt action is necessary.

Power plant is the end product of the designer, planner, manufacturer, installer and tester. It is a very necessary part of the exchange installation, costing on average ten per cent of the automatic switching equipment. Its maintenance calls for considerable skill and care.

Only the main power requirements have been referred to in this article. In fact, in addition to the 50 volts negative, DC supplies of 50 volts positive, 30 volts negative and six volts negative are also required, each with its own controlling equipment. Other supplies, tones and pulses are generated or derived within the equipment racks.

The technical complexity of power plant has advanced in line with the automatic equipment and the increasing use of transistors and other solid state devices in the future will call for increased skills from Power engineering staff.

THE AUTHOR

Mr. E. P. Jenner *joined the Post office in 1948 as a labourer in the Canterbury Area, later being transferred to the Home Counties Region. He was promoted Executive Engineer in October, 1966, and is at present engaged on telecommunications planning provision and maintenance at South Eastern Region Headquarters.*

New Apparatus for Lincompex

THE Lincompex (linked compressor and expander) system which is now being used by the Post Office on a number of overseas radio telephone links, has been improved by the introduction of a new transmitting and receiving apparatus.

Known as the TM 2/3 and produced by Standard Telephones and Cables Ltd, the new equipment can be integrated into existing radio-telephone systems in place of present control terminals and uses modular plug-in printed wiring units and silicon semi-conductors.

The transmit and receive channels are each split into speech and control paths. On the transmit side, a fast-acting compressor in the speech path is controlled by an amplitude assessor in the control path, smoothing out all variations of speech volume. The assessor also generates a control signal, the frequency range of which varies according to the speech amplitude.

The control signal is combined with the constant-amplitude speech signal for radio transmission over a nominal 3 kHz bandwidth audio channel.

On reception, the speech and control signal are separated by filters. The speech signal is first amplified by a constant volume amplifier to remove residual fading. It then regains its original volume variations by means of an expander.

The output level depends only on the frequency of the control signal, which is related only to the transmit level, so that a constant overall system loss is maintained. The use of frequency modulation for the control signal minimises the effects of fading. Highly satisfactory results have been obtained from field trials.

The Lincompex system, originally conceived by the British Post Office, provides noise-reduced, high-quality communication over high-frequency radio links used for long-distance radio-telephone circuits.

Voice-operated, anti-singing devices which shut down the return circuit to prevent echoes while one subscriber is speaking, are eliminated by the new system which enables more efficient use to be made of circuit time and extends the period over which commercial operation of poor-quality circuits is possible.

Manchester is turning out the Super Switchboard Girl

By DAVID NORBURY

Many big firms in the North are taking advantage of the Post Office's new courses to "put a polish" on their telephone operators and so improve their organisations' efficiency

During a visit to a directory inquiry bureau, course instructor Mr. G. Hirst, explains to two PBX operators the importance of the DQ service.

BUSINESS and industry in the North of England has responded with vigorous enthusiasm to the introduction by the Post Office in Manchester of advanced training courses for PBX operators. As a result, reports the *Daily Telegraph*, "a new breed of 'super' switchboard girl . . . . is emerging from little telephonists' rooms buried away with lost calls and frayed tempers in the bowels of big business in the North."

The Post Office has always been willing to train customers' PBX operators. This training is aimed at inexperienced staff taking up PBX operating for the first time and concentrates to a large extent on basic operating procedures and switchboard manipulations.

In the North West, however, there was a desire on the part of many firms for a more advanced form of training for experienced operators. To meet this need, a new, advanced PBX course was prepared, designed to "put a polish" on operators already experienced in switchboard work, stressing the vital role they play in the efficiency of their firms, giving guidance on the organisation of their work and seeking to create a wider understanding of the telephone service and how to use it.

An initial approach was made to firms and organisations with larger switchboards in the Manchester, Liverpool, Blackburn and Preston

areas of the North West, inviting applications for places on a series of monthly three-day, 18-guinea courses at a luxury hotel in Manchester. This met with an encouraging response and before the first course had been held, 100 places had been booked.

Following publicity in national newspapers, radio and television throughout the North of England, there was an immediate increase in the number of applications, not only from areas in the North West which had already been canvassed, but also from all parts of the North. Very quickly, the number of applications reached 250 and plans to hold one course each month had to be revised. Arrangements were rapidly made to hold several courses each month and, with applications continuing to be received, indications are that demands for courses will continue during 1968. The 300th student is expected to be enrolled in April.

Among large industrial organisations taking part are the Port of Manchester, Central Electricity Generating Board, Furness Withy and Co., I.C.I., Courtaulds, Shellmex an dBP, Esso, Kodak, BICC, Gulf Oil, IBM, Hawker Siddeley, the United Kingdom Atomic Energy Authority, Manchester Liners, Dunlop Rubber Co. and the National Coal Board.

Groups which have applied for places include the District Bank, Co-operative Wholesale Society, North Western Gas Board, Manchester Business School, Automobile Association, Salford University, Oldham Fire Brigade, Lancashire County Fire Brigade, Manchester City Police and the *Blackpool Gazette and Herald.* There has also been support from local authorities and undertakings.

Post Office publicity announcing the new courses says that every company wants to create the image of a lively and go-ahead organisation. A lot depends on the switchboard operator because today, more than ever, the customers' main contact with firms is through the telephone.

Very often, the firm's switchboard operator is the vital link between the firm and its customers—"but she can also let you down, and it may not be her fault. Telephone techniques are changing all the time—and quickly. For example, subscriber trunk dialling means quicker connections with your customers and suppliers at less cost than ever before. But it can cost you more if used unwisely, or without proper preparation of staff.

"The new courses are specially designed to remedy the switchboard operator's faults, teach her new and more efficient techniques and make her a more useful member of the customer-handling team in your company."

Developments in modern switchboard design are explained to two of the Manchester course students.

The number of students on each course is limited so that as much time as possible can be devoted to discussion and students given the maximum amount of individual attention.

The subjects covered by the course include the importance of the switchboard operator in business; organisation of work at the switchboard; making the best use of switchboard facilities; brushing up on operating procedure; effective speaking; how to deal with a customer.

To help operators speak clearly and helpfully on the telephone—and not to reply with something like "*Eesont'otherlineluv*"—the programme includes advice on effective speaking from Mr. David Willmott, head of presentation, BBC North Region or Miss Sandra Chalmers, BBC North Region chief announcer.

For telephonists/receptionists, there is also advice on good grooming from Miss Susan Gresham, principal of the Lucie Clayton Mannequin School.

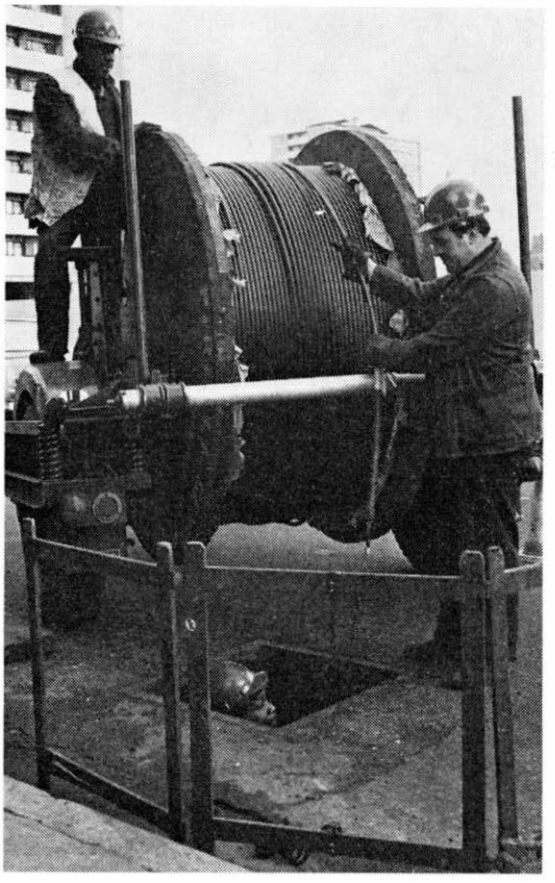
The course programme also includes films and visits to a large telephone exchange, a directory enquiry bureau and fault reporting centre.

THE AUTHOR

David Norbury *is a Press Officer in the North-West Telecommunications Region Headquarters, Manchester.*

THE PROGRESS OF CCTV

By E. A. KINGSLEY



A cable gang draws in closed circuit television cable for schools in the Clerkenwell area.

POST OFFICE activity in the field of closed-circuit television is moving rapidly towards the provision of large permanent networks, particularly for use in commerce and education.

The most recent advances involve the placing of an order to connect up to 300 offices in the city of London and a scheme to transmit educational television programmes to about 1,300 schools in Inner London.

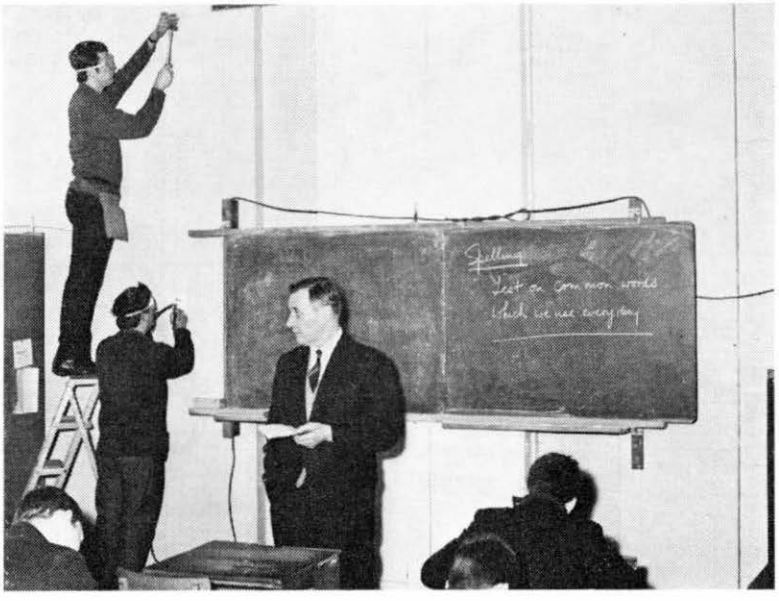
Negotiations for the London offices project, which it is hoped to complete in 1969, are entering their final stages. The scheme will involve linking the brokers and jobbers at the Stock Exchange with their London offices on an 18-channel, 625-line vision only closed-circuit television network. The Post Office plans to provide nearly nine miles of co-axial cable for the TV links.

This project is dwarfed by the very big scheme which the Post Office plans to undertake for the Inner London Education Authority in setting up closed-circuit television links to carry educational programmes from a central control studio to some 1,300 schools. It is believed to be the biggest of its kind in the world.

Thanks partly to a new type of co-axial cable which the Post Office and the manufacturers have developed, the Inner London Education Authority will be able to transmit the programmes on seven channels simultaneously. Two channels, it is planned, will relay BBC and ITA school programmes and the rest will be used for the Authority's own productions.

Work on the Inner London scheme is to be carried out in three stages. The first, which it is aimed to complete by the autumn of 1968, is now going ahead, with London Telecommunications Region's engineers drawing in and jointing the cables and wiring inside the schools to the classrooms where the programmes will be received. It is hoped to have the scheme in operation in 1970.

Such schemes are not being confined to London. In recent months negotiations have taken place with education authorities elsewhere and as far apart as Plymouth and Chelmsford for similar projects. In each case, planning has now reached an advanced stage. A number of other education authorities have also begun to consider the possibility of transmitting educational programmes by closed-circuit television to their schools.



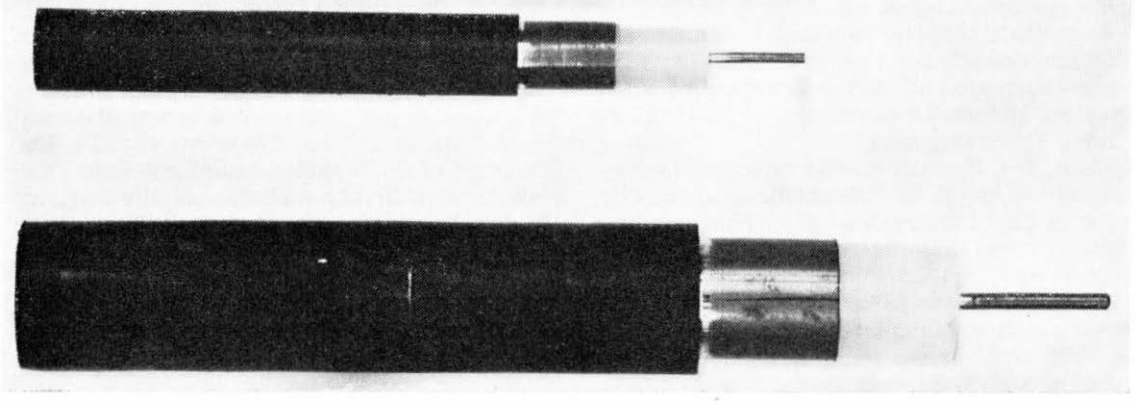
LTR technicians installing internal wiring for closed-circuit television at the Edith Cavell School, North London while pupils get on with their spelling lesson.

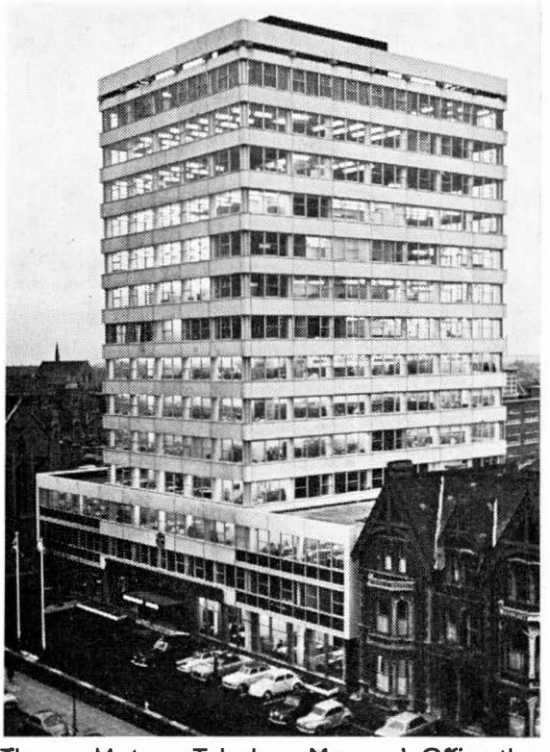
The new co-axial television cable

The new co-axial cable which is being used in the Inner London educational programme scheme differs widely from that normally used for telephony and the national television network.

It is in two sizes—one pair ·345 inch diameter and one pair ·620 inch diameter—and consists of a single copper centre conductor in a solid polythene core surrounded in turn by an argon-welded outer copper conductor and a black polythene outer sheath. It is relatively rugged and can be used in local ducts.

The method of jointing successive lengths of the new cable is akin to the technique used in submarine cable laying. The centre copper conductors are first brazed and a mould is then placed around the joint. Elements in the mould heat the polythene to melting point and the liquid polythene is then injected into the cavity. When the polythene has set, the outer conductor is jointed and the oversheath replaced.





The new 14-storey Telephone Manager's Office, the central home for the first time in 30 years of Cardiff Telephone Area's administrative staff.

A NEW TMO FOR CARDIFF

By W. J. HOUGH

THE new £1 million, 14-storey Telephone Manager's Office in Newport Road, Cardiff—the second largest office block in the city and the biggest single office letting in Wales—will play a big part in improving and expanding the telephone service in the Principality's capital city.

More than 160 feet high and providing more than 100,000 square feet of accommodation, it will house under one roof for the first time for nearly 30 years the entire administrative staff of the Cardiff Telephone Area.

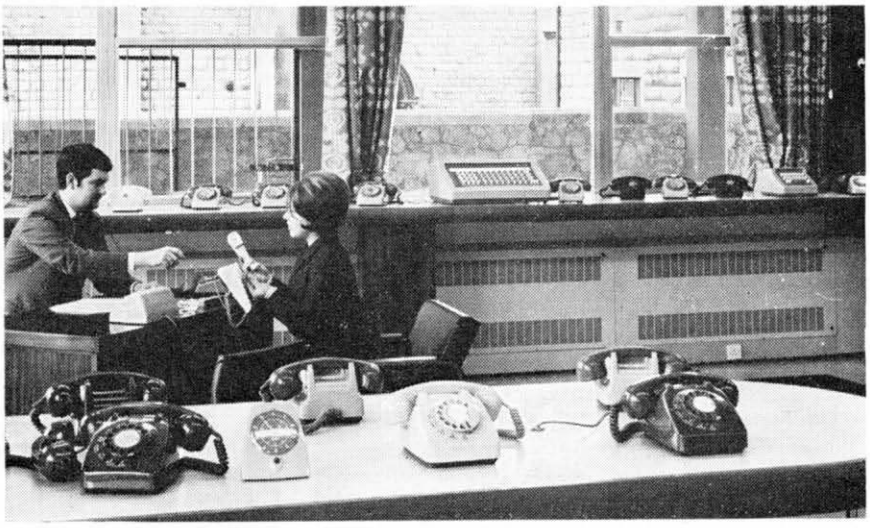
Until now, the staff have been spread over six different buildings in different parts of the city, some of them three miles apart. Now, working from one building, the machinery of control, finance, planning, design and operations will be speeded and improved to the advantage of the Post Office's customers. Telephone House will also help to reflect a more lively and efficient public image of the Post Office.

More than 700 staff will work in the new building which has a number of unusual features. Cloaked in a facade of glass and stone, it has significantly changed the skyline of Cardiff. The main entrance has an external canopy of beaten bronze bearing the words *Telephone House* and above this a 56 ft-long impressionist mural in bronze surmounted by the heraldic device of the developers.

From the ground floor, which also houses the public office, three lifts travel to the top at 800 ft a minute. They are the fastest lifts in South Wales. The entrance hall is decorated in marble with silver and black mirrors and enormous pot plants.

There is a two-tier car park for more than 120 vehicles, the upper level reached by way of a ramp which is electrically heated in severe weather. The latest type of fire detection equipment links Telephone House directly with Cardiff's Fire Service Headquarters.

The whole of the top floor of the building is given over to a staff restaurant (including kitchens and a coffee lounge)—the first new Post Office restaurant in Wales and one of the first in Britain to be opened under the new Departmental Catering scheme.



In the new Sales Bureau Office a potential customer tries out the *Trimphone.*

A fine example of the quality of catering the new restaurant provides was a magnificent iced cake, designed as a map of Great Britain and decorated with models depicting all the telecommunications services provided by the Post Office, for the opening ceremony. The cake was later presented to a local hospital.

The new building contains more than 64 miles of electricity wiring, installed by the Post Office and the contractor; more than 30,000 yards of telephone cable; and 10,000 items of furniture, 6,000 of which are new.

From the top of the building the staff have a striking view of the city and surrounding countryside, with Newport and the twin towers of the new Severn Bridge to the east and Somerset and Devonshire on the other side of the Bristol Channel.

The formidable task of transferring staff from the six separate buildings into Telephone House and fitting out the new building in time was carried out without a hitch and completed two days ahead of schedule.

Telephone House was built by Heron Holdings, a London development corporation, and is on the fringe of the present City centre but in the heart of what is likely to be the new commercial complex within the next ten to 15 years.

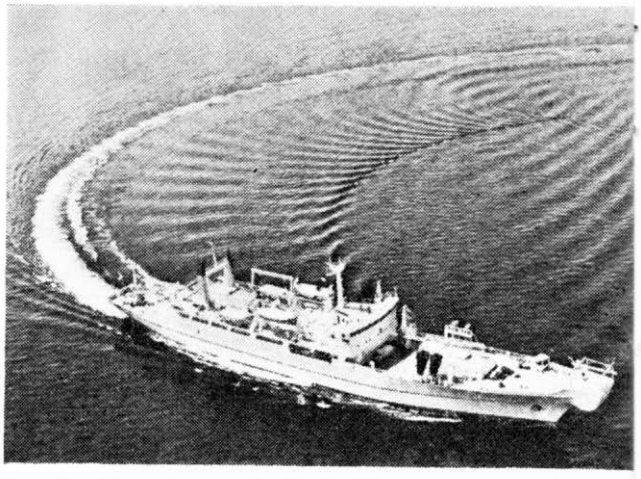
When he opened the new building, Mr. E. E. Neal, Director of Wales and Border Counties, said that Telephone House would contribute to greater efficiency. It had taken 86 years to provide the 120,000 telephone connections in the Cardiff Area. In the past ten years the size of the system had doubled and it would double again in the next nine years.

Sales representative Mr. B. Winkler and Miss Jennifer Knibbs demonstrate the No. 7 E/RP teleprinter in the new soundproof telex demonstration enclosure in the Sales Bureau.

Mr. Neal forecast that by the end of this century most householders in Britain would have a telephone with push-button dialling giving access to all parts of Britain and many overseas countries. There would be picturephones with loudspeaking facilities and subscribers would be able to select their entertainment by dialling into computer libraries for playback on their picturephones of programmes recorded on audio-visual tape.

A NEW CABLE SHIP FOR JAPAN...

Japan has a new cable ship—the KDD Maru *(4,300 gross tons)—which will be used primarily in maintaining and repairing submarine cables in the Pacific area. She can, however, also carry out deep-sea cable laying, being able to take 500 nautical miles of armourless cable and 25 submarine rigid repeaters on board. The* KDD Maru*'s cruising speed is 16 knots and range 7,000 nautical miles. She is equipped with two sets of 2,200-hp diesel engines, three sets of 600 kVa generators for power supply and an evaporator which can produce 20 tons of clear water a day.*



The *KDD Maru* on trials in the Pacific.

. . . and a new Japan Sea Cable

A new 450-nautical mile submarine telephone cable—to be known as the Japan Sea Submarine Cable—is planned to join Naoetsu, Japan, and Nakhodka, in Siberia. It will provide 120 four kc/s voice channels and offer the prospect of an alternative "hot-line" route between Washington and Moscow.

* * *

Plans are nearing completion for a new submarine telegraph cable between Marseilles to Bizerta and Tunis and the setting up of an inland telegraph network between Tunis, Sousse and Cap Bon, in Tunisia. A large capacity telephone cable connecting Kasour-Essaf (near Sousse) and Sfax is also planned.

* * *

A new 250-mile microwave system between Panama City and David, the main city of western Panama, will triple the capacity of the existing communications network in Panama. It will have a capacity of 960 telephone channels and be able to transmit television. A connecting link is to be built from David to Costa Rica.

Four new microwave radio links for television are to be provided in Belgium. They will cover a total distance of some 115 miles and be installed in the north, central and southern parts of the country. Two links will carry television programmes in Flemish and two in French.

* * *

A 750-MILE CABLE FOR AUSTRALIA

Work is shortly to begin on a 750-mile long co-axial cable to be laid between Perth and Carnarvon, Western Australia. A 12 Mc/s system will simultaneously transmit 1,200 telephone calls and a television programme on two of the four lines. Each of the other two lines will be equipped for 960 telephone circuits on a 4 Mc/s system. Wide-band transistorised repeaters of ultra modern design which require the minimum of maintenance will be used. They will be fed by direct current through the inner conductors of the co-axial lines. More than 200 repeater stations will be set up along the route, most of them buried in the ground.

AN EARTH STATION FOR CHILE . . .

Chile is to have a permanent satellite communications earth station to serve as a ground terminal for voice, television and data communications to and from the Intelsat II *satellite in orbit over the Atlantic and the* Intelsat III *satellite scheduled to be launched in* 1968. *It will be sited some* 75 *miles south-west of Santiago, the Chilean capital.*

The new station will have a dish-shaped antenna, weighing more than 200 *tons and some* 30 *metres in diameter. Despite its weight and size, the antenna will be able to rotate one degree a second and track orbiting bodies to within* 2/100*ths of a degree at a height of* 22,500 *miles.*

An international telephone switching centre will also be set up in Santiago to process communications from the national networks and a 75*-mile, three-hop microwave system is to be built to transmit the ground communications between this centre and the new earth station.*

Model with a model of the new Chilean earth station.

. . . and 24 more for Russia

Five new Russian satellite communication earth stations have recently been brought into service at Chita, Yakutsk, Khabarobsk, Norilsk and Ulan Ude. They are part of a network of 24 stations which is being built throughout Soviet Russia.

By the end of October, 1967, there were just over two and a half million telephones in Switzerland—five times as many as in 1945 and more than twice as many as in 1953. With about 40 telephones per 100 of the population Switzerland now stands second in Europe (after Sweden) in this respect.

* * *

A record for Ireland

A record 10,360 *new telephones were installed in the Republic of Ireland between April and September,* 1967, *about half of them in the Dublin area. In the same period* 40 *automatic exchanges were brought into service. Work on the new co-axial cable from Cavan to Mullingar where it joins the main western cable is well advanced and is expected to be in service by the beginning of* 1969. *Good progress is also being made with the setting up of new high-capacity radio links to provide both internal and cross-Channel telephone circuits to Great Britain.*

◀ **Left: The Russian satellite earth station at Chita.**

MISCELLANY

NEW YEAR HONOURS

MR. John Wall, Deputy Chairman of the Post Office, received a knighthood in the Queen's New Year's Honours. Sir John, formerly managing director of EMI, succeeded Sir Ronald German, the last Director General, in 1966.

Nine members of the telecommunications staffs also received honours. Mr. Arthur Knox, Chief Regional Engineer at South Eastern Regional Headquarters, was awarded the Imperial Service Order.

Four were awarded the MBE. They were: Mr. Alexander German, Senior Executive Engineer in the ETE Engineering Branch; Mr. Geoffrey Britton, Senior Executive Engineer in the Radio Planning and Provision (Inland) Branch of the Engineering Department; Mr. Ralph Harris, Executive Engineer in the Telephone Manager's Office, Ealing (LTR); and Mr. Reginald Ibbett, Executive Engineer at the Telephone Manager's Office, Brighton (South Eastern Region).

The BEM was awarded to Miss Gertrude Montgomery, Assistant Supervisor at the Omagh, County Tyrone Telephone Exchange; Mr. Maurice Hewitt, Senior Technician at the Ilford Installation Office (LTR); Miss Phyllis Kitcheman, Chief Supervisor, Huddersfield; and Mr. Frederick Symons, Senior Technician at the Post Office Radio Station at Dorchester, Dorset.

Mr. Ralph Harris, MBE.

Miss P. Kitcheman, BEM.

Mr. M. Hewitt, BEM.

A NEW DIRECTOR

Mr. F. J. M. Laver, formerly an Assistant Engineer-in-Chief of the Post Office and at present Director of Computer Services, Ministry of Technology, will be taking over as Director of the National Data Processing Service on 30 April. He will succeed Mr. C. R. Smith, a former Postal Controller in Home Counties Region and Head of the Organisation and Methods Branch in Post Office Headquarters.

Mr. Laver, a Devonian, joined the Post Office as a Probationary Inspector in 1935, working first at Dollis Hill Research Station and later in the Radio Planning Branch. He was involved in the engineering appraisal of commercial computer systems which began in 1956 and helped to train Post Office engineers in programming, playing a big part in launching the use of computers by the Engineering Department. He transferred to the Treasury in 1963 as an Assistant Secretary in the Organisation and Methods Division and two years later moved to the Ministry of Technology to set up that Ministry's Computer Advisory Service.

★

During the quarter ended 30 September, 1967, just over 193 million calls—some 368 a minute, or six a second—were made by subscribers throughout Britain to the Speaking Clock Service.

In November, the total number of calls made by London users to TIM (now 123) since the Speaking Clock Service was introduced in 1936, passed the 1,000 million mark.

LIGHTWEIGHT HEADSET FOR TELEPHONISTS

Trials are being carried out at a number of exchanges with a new lightweight headset for telephonists which weighs less than an ounce—six times lighter than the ordinary headset.

The new headsets have adjustable headbands so that they can be worn without disturbing a telephonist's hair-style. For those who wear spectacles, the headband can be removed completely, leaving a small unit which clips to the spectacle frame.

In the picture on the right, GPO Personality Girl, Miss Margaret Harwood, is wearing the new headset and Mrs Pamela Wheeler the instrument at present in general use.

PLANNING FOR YEAR 2,000

"The Post Office is now planning the new telecommunications network for Britain for the last two and a half decades of this century. . . It is an immense task. We are assembling a team of visionaries—systems engineers, materials scientists, operational researchers, social scientists and so on—to study not just the technological possibilities but also the ecology of the situation. . . .We are bringing together multi-disciplinary teams in which the technology of, for example, digital electronic manipulation, is being merged with the most advanced matrix and computer technology that we can muster, and also with advanced mathematical model making."—*Mr. J. H. H. Merriman, Senior Director, Engineering, addressing a recent meeting of representatives of the University Appointments Boards.*

FEWER DODGERS

The number of television licence evaders has fallen dramatically following the special measures introduced by the Post Office just over a year ago.

In the year ended 31 October, 1967, the number of new licences taken out rose by 1,080,000 compared with an increase of only 33,000 the previous year. Over the same period, loss of revenue fell from about £10 million to £7 million.

Announcing these figures in Parliament recently, the Postmaster General said that dealers are now obliged to give information about the disposal of sets they sold or rented, adding, "From now on we shall be able to intensify our measures against evaders."

★

Thanks to the Post Office Tower in London, six children's charities are each better off to the tune of 25 guineas.

The money—most of it in pennies—was collected during the past year from the ornamental pool near the public entrance where superstitious visitors had thrown it for luck. It was put aside each day and recently shared out among the six charities.

★

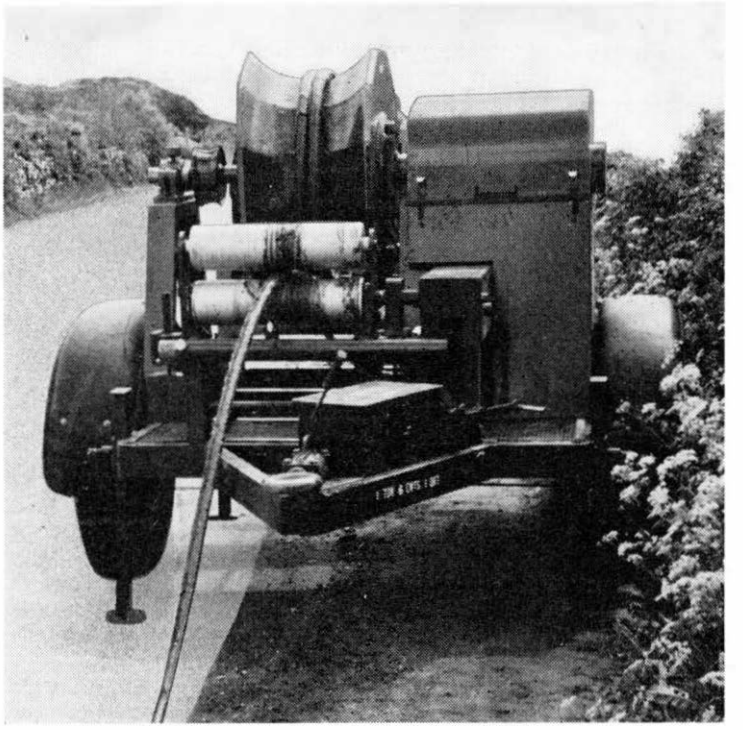
At the end of November, 1967, more than 63,000 trunk circuits were in public service throughout Britain—13·2 per cent more than at the same time in 1966. The rate of increase in the 12 months since November, 1962, was 12·8 per cent.

★

BOUQUET FROM LORD REITH

A postcard containing congratulations from Lord Reith was recently received by the Editor. It read: "*Lord Reith is very grateful to the Editor of the* Post Office Telecommunications Journal *for having the Journal sent to him. There are always articles which interest him greatly—e.g. the one in this issue (Winter, 1967) by the Deputy Chairman.*"

THIS MACHINE SAVES TIME, LABOUR AND MONEY



The new machine, showing the powered rollers through which the recovered cable passes on its way to the pneumatic cutter.

RECOVERING old telephone cables is a long and tedious manual task which until now has accounted for about 25 per cent of the total manhours spent on cabling work.

Recently, however, a machine has been introduced which automatically pulls out, cuts up and palletises old cable at the rate of 20 yards a minute, thus saving manpower, considerably speeding the operation and cutting costs.

Known as the Cable Recovery Unit, the new machine is mounted on a two-wheeled trailer towed by a seven-ton stores carrier fitted with a crane and compressor. The Unit consists of a diesel engine which drives a winch fitted with two bollards.

To recover a cable, a steel rope is attached to the cable and wound round the smaller bollard. When the engine is started up the cable is pulled from its duct and wound round the larger bollard before passing through a pair of powered rollers and guided on to the opensided towing vehicle where it is automatically cut into three-to-four foot lengths by a pneumatic cutter. The cut cable falls into a pallet which is unloaded by a fork lift truck. If the recovered cable is to be used again it is wound directly on to a steel cable drum.

The new machine can recover cables ranging from 0·5 to 3 inches in diameter at the rate of one mile a day in good conditions.

The towing vehicle also carries the cabling crew and all their hand tools, traffic signals, guards and so on.

Supplies of the new Unit have been ordered for use in all Regions.

250,000 'PHONE BILLS A MONTH — BY COMPUTER

Information from punched cards is transferred to magnetic tape in the Charles House computer room.

THE first telephone bills in Britain to be produced wholly by computer are now being delivered to subscribers in the North-West Telephone Area of London at the rate of 250,000 a month.

The new bills, produced by computers at the London Computer Centre at Charles House, Kensington, look no different from previous bills —but they mark an important stage in a gigantic scheme to provide computerised bills for all subscribers throughout the country.

Their production has involved an enormous amount of preparatory work. Before the scheme could get off the ground all the relevant information about each subscriber—his name, address, quarterly rental, special instructions and so on—had to be sifted and assembled and then recorded on magnetic tape at the Computer Centre.

The new system depends on the use of three magnetic tapes. For trunk calls, exchange operators mark blank punched cards with the caller's telephone number, the date and the cost of the call.

These cards are then sent to the Data Conversion Centre at Chiswick for punching, after which they are returned to the Computer Centre for recording on magnetic tape. Dialled calls are recorded on individual meters in telephone exchanges where meter readings are fed to the computer by tape each quarter.

From the three tapes—subscriber's details, trunk calls and dialled calls—a master tape is made and fed into the computer which produces the completed bills.

Fully computerised billing is to be extended to all subscribers in London over the next two years.

Telecommunications Statistics

	Quarter ended Sept., 1967	Quarter ended June, 1967	Quarter ended Sept., 1966
Telegraph Service			
Inland telegrams (including Press, Railway Pass, Service and Irish Republic)	2,634,000	2,257,000	2,847,000
Greetings telegrams	713,000	548,000	727,000
Overseas telegrams:			
Originating U.K. messages	1,808,000	1,760,000	1,907,000
Terminating U.K. messages	1,812,000	1,767,000	1,918,000
Transit messages	1,520,000	1,667,000	1,473,000
Telephone Service			
Inland			
Net demand	182,000	177,000	165,000
Connections supplied	181,000	180,000	188,000
Total orders in hand	219,000	217,000	232,000
Total working connections	7,121,000	7,024,000	6,744,000
Shared service connections (Bus./Res.)	1,364,000	1,359,000	1,338,000
Effective inland trunk calls	260,099,000	253,156,000	233,823,000
Effective cheap rate trunk calls	60,985,000	†55,104,000	55,573,000
Overseas			
European: Outward	*2,412,000	2,389,000	2,073,000
Extra European: Outward	*228,000	227,000	188,000
Telex Service			
Inland			
Total working lines	21,000	20,000	18,000
Metered units (including Service)	57,508,000	52,706 000	46,117,000
Manual calls (including Service and Irish Republic)	28,000	29,000	29,000
Overseas			
Originating (U.K. and Irish Republic)	*3,608,000	3,540,000	3,048,000

*Estimated figures. Figures rounded to nearest thousand. †Amended figure

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Contributions. The Editorial Board will be glad to consider articles of general interest within the telecommunications field. No guarantee of publication can be given. The ideal length of such articles would be 750, 1,500 or 2,000 words. The views of contributors are not necessarily those of the Board or of the Post Office.

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