POST OFFICE

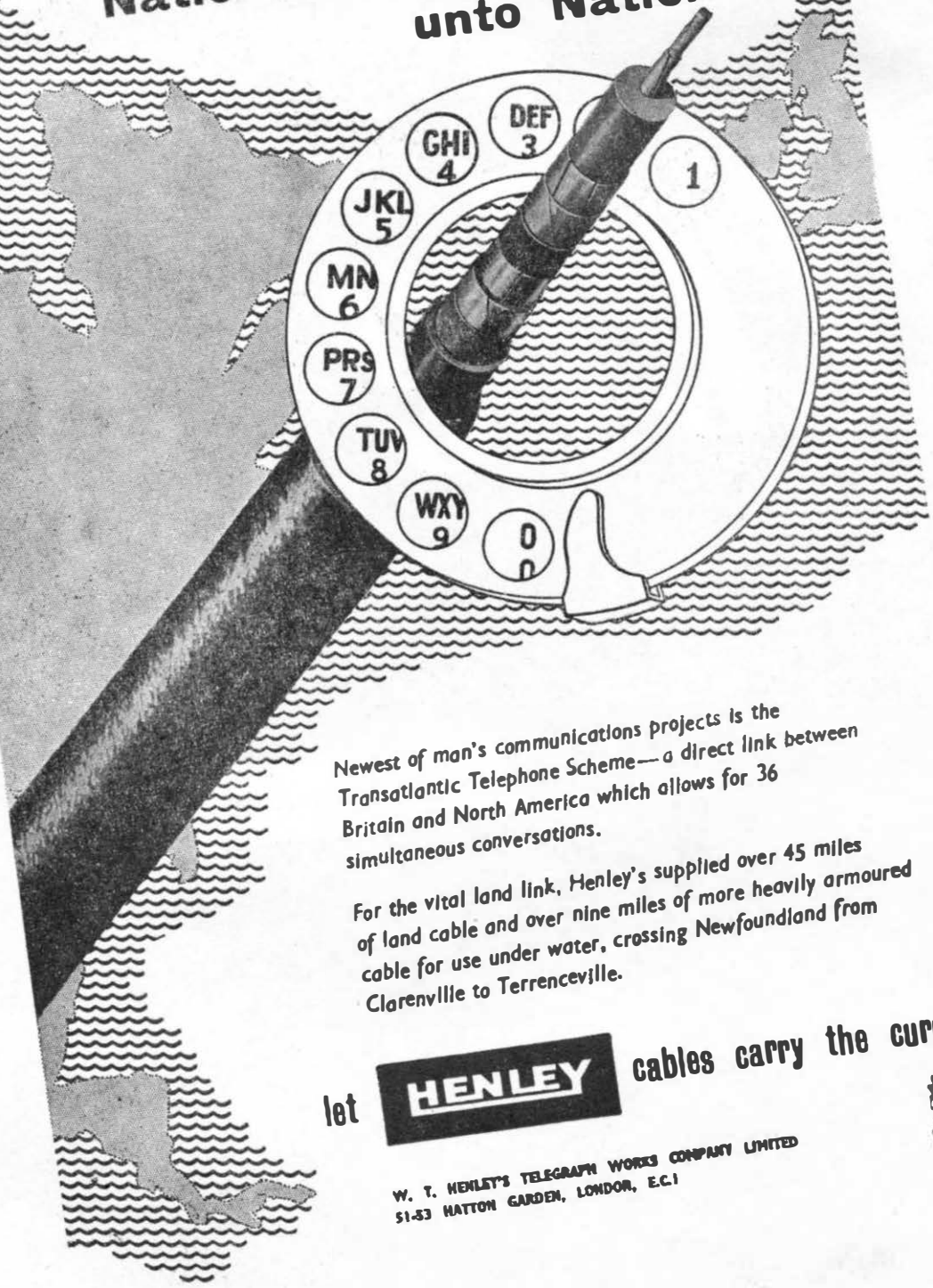
telecommunications

JOURNAL

ONE SHILLING
AND
SIXPENCE

WINTER 1958

Nation shall speak unto Nation



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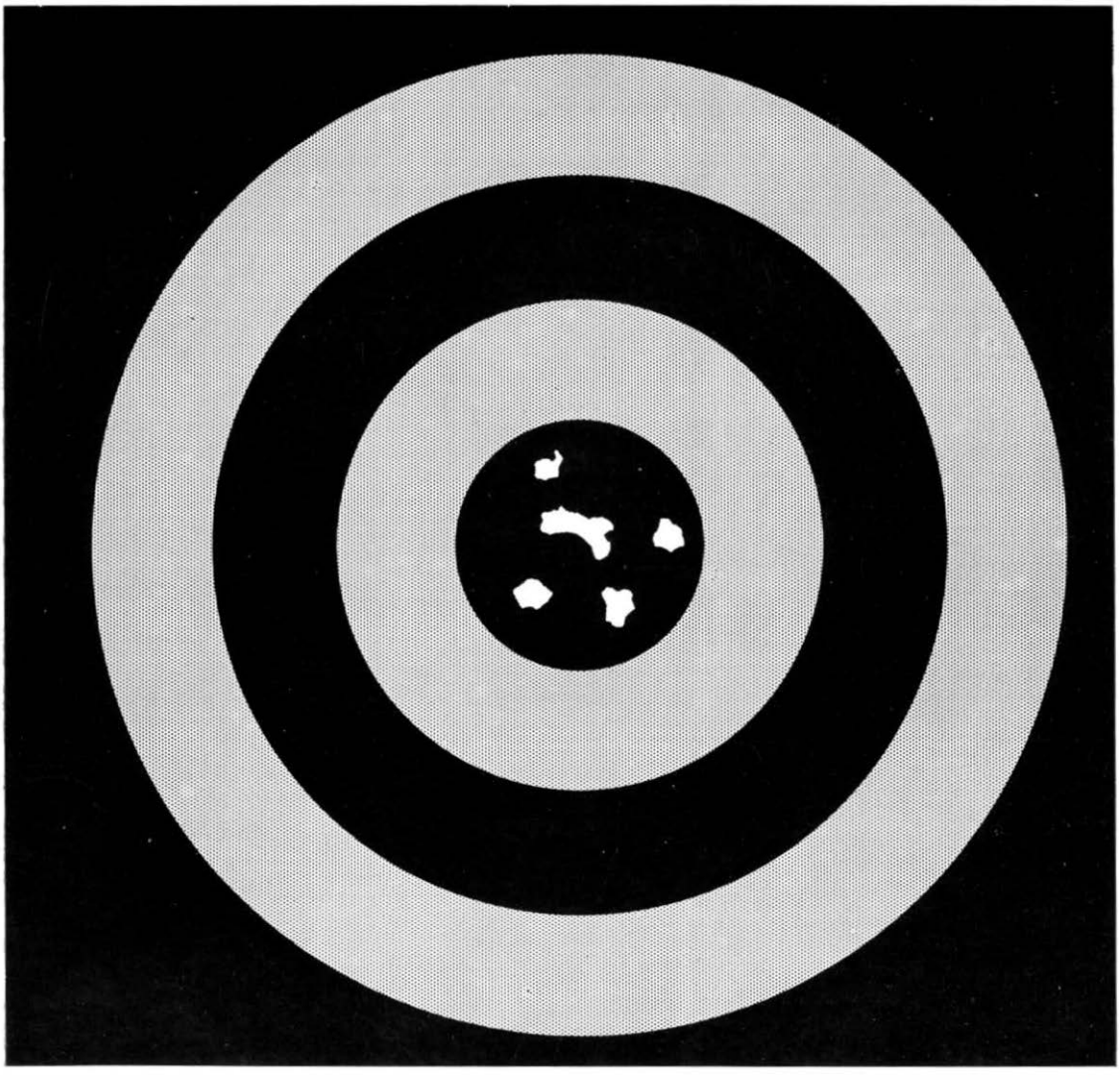

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Post Office Telecommunications Journal

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Contents

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A Year of Progress and Preparation

1957 HAS BEEN A YEAR OF PROGRESS AND PREPARATION. Notable improvements were made in the public telecommunications services. Additional facilities were introduced, including new greetings telegrams and new telephone information services. Nor should we overlook the new tariffs—burdensome not only to the subscribers who pay them but also to the staff who had to bring them into effect. All these things are important because they affect the quality and prices of the goods which are now on offer. But even more important are the measures to give the public still better value for its money in the future.

Group charging stands out as the most fundamental and far-reaching administrative change since the telephone service was nationalized in 1912. Fitting the tariff to the machine instead of vice versa has opened the way for a self-service telephone service. 1957 prepared the way for a new era in telephony.

But this is not all. In his speech on the Post Office Money Bill the Postmaster General spoke of other current developments: line connectors to reduce cabling costs; the Joint Electronic Research Committee to design electronic telephone exchanges; twice as many conversations from existing coaxial cables. In all these developments the preparatory work done in 1957 will pay dividends in the future.

Finally, there is the new automatic telex system. Prototype equipment is now being installed in London and Leeds and will be ready for service in 1958. Within a few years the whole system will be fully mechanized. The work of 1957 prepared the way for the transformation of the telex service which will speed the communications and therefore increase the productivity of industry and commerce.

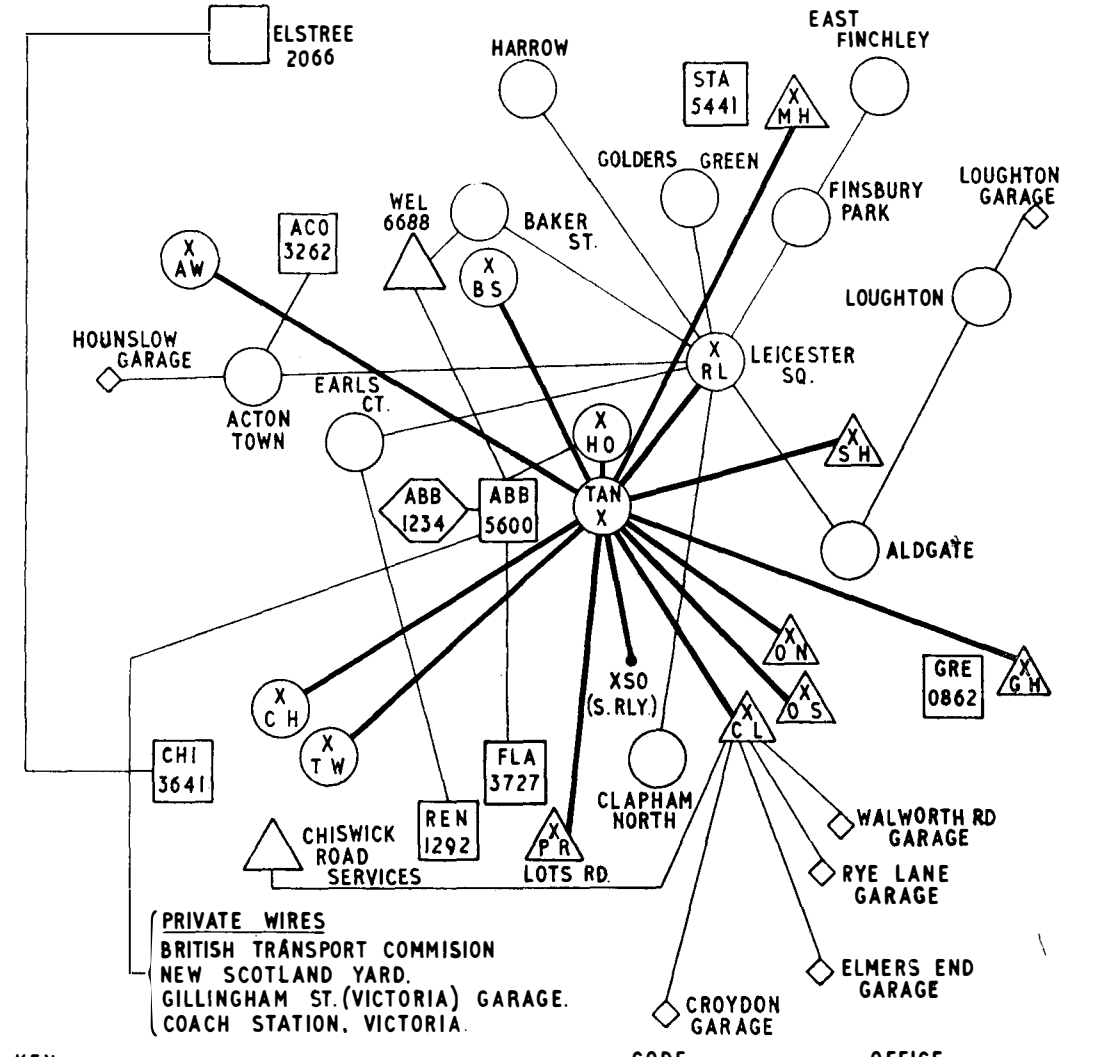


Fig. 1 : Telephone junction network, London Transport Executive

Telecommunications Network for London Transport

F. W. Gilby

THE TELECOMMUNICATIONS NETWORK OF THE London Transport Executive is equalled in size and complexity by that of few other private or public services in the country. It comprises several manual P.B.Xs supplied and maintained by the Post Office, some manual P.B.Xs owned and maintained by London Transport, and an automatic network with some 20 linked P.A.Xs. In addition, there are many point-to-point telephones and a radio station transmitting and receiving to and from mobile radio equipment. The privately owned and maintained networks alone handle about 8,000,000 calls a year, and the Executive's telephone lines extend over an area of nearly 2,000 square miles round London radiating as far as Epsom, Uxbridge, Chesham, Ongar, Upminster and Dartford. This intricate network of public and private telephones is vitally necessary for organizing and controlling all the public bus and rail transport (other than main line railways) in the greater London area and beyond.

In the description of the system which follows, only a brief reference has been made to many features which in themselves would be suitable subjects for other articles. The whole field of communications has for convenience been examined in several separate parts but, as will be seen, there can be intercommunication between the different types of services provided and the efficiency of one section of the whole communications system may depend a great deal on the other sections.

The Administrative Departments are served by Post Office P.B.Xs at the Head Office, Broadway, Westminster (ABBey 5600) with a 10-position C.B.9 type multiple switchboard, and there are other Post Office P.B.Xs at Baker Street, Griffith House, Chiswick Bus Works, etc., and, as will be seen in Fig. 1, some of these are interconnected by private wires. In addition, Head Office has six private wires to the British Transport Commission and one to the Metropolitan Police Headquarters. At the Head Office, intercommunication is possible between extension telephones and the P.A.X. telephone network via the switchboard and private wires which are connected between the P.A.X. and the Post Office switchboard. Similarly, the P.A.X. extensions can obtain access to the Head Office switchboard and be connected to an extension although exchange service beyond this point is barred.

Until a few months ago, the exchange lines serving ABBey 1234 terminated on the Head Office switchboard; thus all public telephone enquiries concerning tube trains and buses were first handled by the switchboard operators and this method gave rise to some complaint, especially from the "unfortunate" caller who did not receive attention as quickly as he could have wished. Liaison between the switchboard operators and the enquiry clerks was difficult and the authorities wisely decided to segregate enquiry traffic to a separate telephone number and avoid the intervention of the switchboard operator. To most people in London with a travel problem, the number ABBey 1234 is very familiar and because the number of calls had increased over the years until more than half of the total calls received at the Broadway Headquarters were public enquiries, it was evident that the number ABBey 1234 must be retained for such calls. The first step was to separate the administrative calls by providing another group of lines on ABBey 5600 to the switchboard.

Call Queueing

In conjunction with the General Electric Company, the Signal Engineering Division of London Transport designed and equipped a call queueing system to deal with the public enquiry calls. This is designed to connect a call to ABBey 1234 direct to an enquiry clerk, each clerk being provided with a telephone fitted with lamp signalling. When all the clerks on duty are engaged, subsequent calls are "queued" in the order of their arrival, until an enquiry clerk's telephone becomes free when the first call in the queue is connected. The supervisor of the Enquiry Office is provided

Fig. 2 : Supervisor's desk and delay indicator panel

with a panel indicating the number of calls connected, the number of calls queueing, and the number of free enquiry clerks.

Facilities are also available for transferring calls between the call queueing system and the Post Office switchboard so that administrative calls misdirected to ABBey 1234 can be transferred to the operators for connexion to the appropriate extension telephone. Complete failure of the automatic call queueing equipment is provided for by a manual switchboard which can be staffed in such an emergency, and replaces the automatic operations. The layout of the supervisor's position with the dial indicator lamp panel is shown in Fig. 2.

Private Automatic Telephones

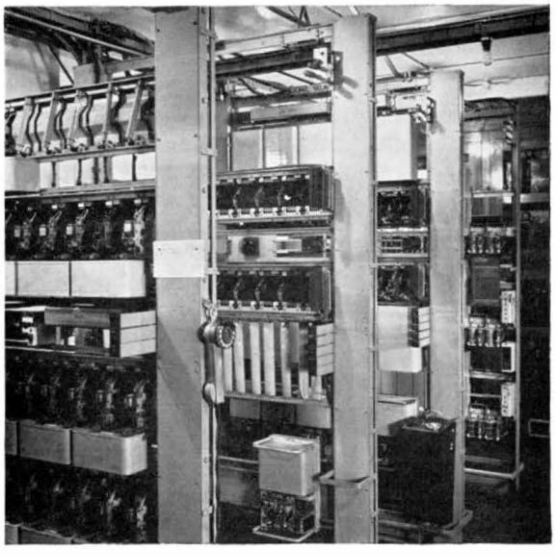
The railway section of the automatic telephone network installed in 1939 is centred on non-director equipment at Leicester Square Underground Station. This P.A.X. is on three separate floors constructed in a disused lift shaft; in World War II it was well protected from H.E. bombs. Dial telephones located throughout the railway system at points such as power sub-stations, signal cabins, platforms and booking offices are linked by 40 lb. cables with 11 automatic exchanges on the railway system and have access to five others serving administrative offices through a central switching tandem. Calls on the railway system are obtained by merely dialling the appropriate telephone number as in a multi-office area, but calls obtained via tandem are prefixed by the code "X" and two other code digits—for example, "HO" for Head Office, or "AW" for Acton Works.

Power to operate the exchanges is supplied by the Executive's power station. The batteries are nickel cadmium type giving long life and requiring less maintenance than lead-acid batteries. The voltage variation of each battery is controlled to give an average of 50 volts. Facilities are also provided at the tandem exchange for switching to seven manual switchboards, and direct connexions to British Railways (Southern Region).

Tandem "X" exchange (Fig. 3), the centre of the Executive's automatic network prior to the installation of the railway (RL) system at 55 Broadway, Westminster, serves 15 routes to P.A.Xs and P.M.B.Xs and so on. Group control equipment seen in the foreground of Fig. 3 accepts the last two digits of the 16 routing codes—for example, XRL, XCH, XON—and marks the appropriate junction group on the banks of high speed machine switching uniselectors. The uniselectors hunt for and seize a free outlet within the period of interdigital train pause and pass the dialled number digits over junctions to the objective P.A.X.

Later extensions of tandem equipment have been provided by 2,000 type group selectors serving as markers and working in conjunction with ordinary uniselectors for junction hunters. Apparently no difficulty has arisen by using both methods on a common outgoing junction multiple. The 2,000 type selectors can be seen in Fig. 3 on the rear racks. When, for example, a call is made from

Fig. 3 : Tandem "X" exchange: automatic switching equipment



Acton Works (XAW) to another telephone at Baker Street (XBS) the caller dials XBS followed by the appropriate extension number (for this call, three digits) and his connexion is made via the tandem exchange. Some of the P.A.Xs have direct routes also and calls do not route via tandem unless the direct lines are engaged.

On the railway (RL) system, level 2 at Leicester Square P.A.X. is reserved for a special purpose—to call the Railway Traffic Controller. Anyone wishing to do this from a railway automatic telephone merely dials "C" (for Controller). If, by any chance, all the lines to the Controller are engaged the caller may, in an emergency, dial "CE" which brings the Controller on to the line and cuts across any other caller who may already be connected. The use of "CE" is necessarily restricted.

Private Toll Calls

Long extension lines from P.A.Xs, often several miles from the equipment, make toll calls possible without the use of the G.P.O. services. For instance, a Signal Department officer at Earl's Court can dial the Chesham signal cabin direct from his office telephone.

Within the railway network centred on the Leicester Square P.A.X. a system of satellite working is used. A typical arrangement is that of Loughton P.A.X. which is parented on Aldgate P.A.X. which in turn is parented on Leicester Square. When an extension telephone at Loughton originates a call, a local (final) selector at Loughton, a junction to Aldgate, an incoming group selector at Aldgate, and a junction to Leicester Square are seized simultaneously. Discrimination then takes place at Aldgate and Loughton according to the digits dialled. The numbering scheme at Leicester Square is 4400-4799, at Aldgate 5300-5599 and Loughton 5200-5299. Other levels of the first numerical selectors at Leicester Square route calls to tandem (X = 9), Earl's Court (8), etc.

If the first digit dialled at Loughton is 5, local discrimination at Aldgate is effected on this digit and the junction to Leicester Square and the incoming selector are released. Further digits (except 2) connect the call to Aldgate numbers. If, however, the second digit is 2, local discrimination on the second digit (2) is effected at Loughton, and the Aldgate junction and the incoming selector are released. Subsequent digits then connect to Loughton numbers. If the first digit dialled is other than 5, junction discrimination will be effected at both Loughton and Aldgate. Calls beyond Leicester Square are switched via level 9 for tandem "X" or via other levels for P.A.Xs within the railway system.

Because direct dialling with multi-switching on such a large scale would be unsatisfactory digit regeneration is introduced where necessary at incoming selectors at the Leicester Square P.A.X. This method of trunking and switching is used in the railway network because it increases the speed with which connexions can be made, and it makes it possible to use the single digit C for calls to the Controller, since these are routed direct from level 2 at Leicester Square. The seizure of unwanted junctions for local calls increases the traffic on these routes, but this is of little consequence for the Signal Department have already provided their circuits on a much higher grade of services than is used for Post Office lines. It is, of course, vitally important that operational calls should not suffer delay by circuit congestion, and the railway network is designed to provide a high factor of safety so that sudden rises of traffic due to an emergency can be handled without difficulty.

London Transport's own telephone cables are laid on bearers on the railway verges and through the tunnels, and for that reason the cost of providing and maintaining them is much less, even with the heavy gauge wires, than cables, like those of the Post Office, routed via underground ducts and jointing chambers.

No operators are employed; there is no manual assistance board. Faults are reported to and handled at a central fault control located at Earl's Court. The code INF routes calls to the Traffic Controller's office where a single position is provided for the information clerk. The clerk deals with routine reports and general enquiries on matters concerning the work of the Controller's office.

Railway Controller's Network

The railway train system has a Traffic Control Office at Leicester Square where traffic controllers make any necessary alterations to train services, etc. These traffic controllers have their own magneto telephone system consisting of direct lines from their desks to important points on the railway. The control is divided into four groups, each with a separate control panel (Fig. 4). Most of the telephone lines terminate on calling lamps, and associated two-position keys will connect to or originate calls from either of two telephones on each desk. As already said, controllers can be

obtained from any telephone in the railway telephone network by dialling the single digit "C". If the traffic controller is busy when the "C" call is instituted and the caller considers his message to be sufficiently important he can follow with the digit "E" which causes an emergency red lamp to flash on the control office desk and the call thus receives prior attention.

In addition to the magneto telephone lines to key points in the railway system traffic controllers have access to the automatic telephone network and special lines direct to other railway regions, police, and emergency breakdown services.

Special Telephone Services

A parallel pair of bare wires along all tunnels, to which a motorman may attach a special hand telephone set, can be used in an emergency to remove the traction current (Fig. 5). Connexion of the telephone action-operates a short circuiting device controlling circuit breakers in the power sub-station which remove the traction current and sound an alarm in the sub-station. On hearing this alarm the sub-station attendant, after checking that the traction current has been removed, operates a telephone key on his control panel and is able to converse through special equipment with the motorman who has his handset connected to the tunnel lines. These tunnel lines are also so connected that they act as safety devices and any faults which may appear in the service cause the traction current to be removed.

More recently the tunnel lines have been extended in their usefulness by the addition of tapping equipment and amplifiers at Leicester Square so that the motormen can now talk direct to the Traffic Control Office where a loudspeaker is operated (see Fig. 4). This communication is possible without the removal of traction current. Speech currents from the motorman's telephone are picked up at the power sub-station on voice frequency amplifiers and transmitted to the controller's office through normal telephone cables from the section concerned. The controller talks to the motorman through a special microphone on his desk and is heard in a small moving coil loudspeaker in the train driving cab. In this latest development the most difficult part technically was the suppression of electrical interference caused by the traction power supply. The use of elaborate VF amplifiers and LF filters installed at Leicester Square has overcome this transmission difficulty,

Fig. 4 : Traffic Control Office

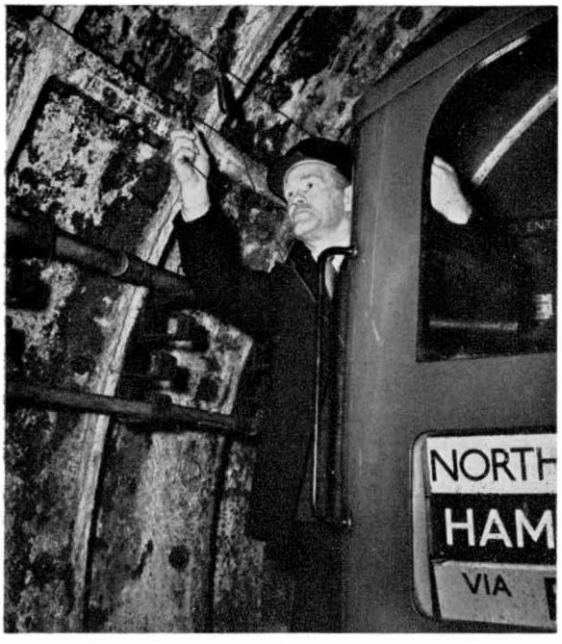


Fig. 5 : Motorman clips on to tunnel lines

and the quality and volume of reception both at the control office and in the trains is very good. Naturally all the tunnel lines and the associated equipment are thoroughly and systematically tested daily.

The clerk who attends the INF desk has two other important duties. He is responsible for broadcasts at loudspeaker strength of messages direct to all ticket office staff, giving details of any changes in the services which the traffic controller has arranged. The microphone and transmitting equipment is housed in a cabinet adjacent to the INF room (Fig. 6) and the receiving sets with loudspeakers are located in the booking offices. The distribution of the signals is through an omnibus land line. The whole system is tested at hourly intervals by broadcasting a time signal.

In the reverse direction the railway staff at stations and elsewhere may get up-to-date information about the running of the train services. They dial "19" from any automatic telephone on the railway system to hear a tape recording of the latest state of train running on the whole London Tube system. The recording is made by the INF clerk using a second microphone in the broadcasting cabinet. The tape recorders are located at Leicester Square Station. They are operated by remote control, old messages being erased and new messages recorded without the removal of the tape from the machines. This message recorder has been in use for several years and the Signal Department are justly proud of this. The telecommunications network available to the traffic controller also includes two teleprinters for disseminating routine information to many key points, including the Traffic Enquiries Office and the administrative departments.

In addition to the telephone networks already described there are many point-to-point telephone lines connecting signals to signal cabins, telephones at platforms directly connected to the next station and used for station-to-station working, local lines from signal cabins to yardmasters, shunters, depot engineers, etc., all of which have some specific operating purpose but nevertheless form a very important part of the general telecommunication system. The telephones used for such purpose are now of a standardized central battery type although some magneto-magneto point-to-point telephones still remain. In modern signal cabins these circuits, together with others in the controllers' and automatic networks, appear on a small console situated adjacent to the signalman's operating position. The most usual method of termination is

Fig. 6 : Broadcast message and recorder cabinet

Fig. 7 : Driver talks by radio to transport base

by calling lamp associated with two-way telephone keys. Thus two signalmen having separate consoles may use the circuits on alternative handset telephones.

The telecommunications services for road transport in the London area are based on several manually operated private exchanges accessible from the administrative and railway automatic network via tandem "X". The largest are both at Oval Station with the dialling codes "XON" and "XOS", and they serve, roughly speaking, north and south of the Thames respectively. There are, however, other road services switchboards at Camberwell "XCL", Manor House "XMH" and Shoreditch "XSH". Local garages are served by P.B.Xs subsidiary to the main switchboards and calls from all parts of the road system are received from some twelve hundred roadside telephones which are connected to the nearest switchboard, either by the Executive's own cables on trolley-bus routes or by Post Office cables from points on bus routes.

In recent years some of the small garage manual switchboards have been replaced by 20-line P.A.Xs. These may be parented on a larger manual switchboard; for example, Walworth, Rye Lane, Elmers End and Croydon garages are served from the Camberwell switchboard. Some others, such as Hounslow and Loughton garages, have 20-line P.A.Xs parented on sub-satellite P.A.Xs within the railway automatic telephone network.

Among the interesting features of these small P.A.Xs is the regular pattern of numbering. For example, the chief depot inspector is extension 4, and the day foreman is extension 8 at any garage. Another unusual feature is the facility for dialling-in to the garage P.A.X. via the sub-satellite. After the appropriate extension number on the sub-satellite has been connected by the final selector, instead of ringing tone the caller hears repeated chimes—"ding-dong, ding-dong". This special dialling signal at the smaller P.A.Xs indicates to the caller that the final identifying extension number may be dialled. These small P.A.Xs were initially designed, constructed and installed by the Signal Engineer's Department from modified existing switching apparatus.

In an emergency, a driver or conductor can get into communication immediately with electrical or traffic control points by means of this vast network of roadside telephones. Traffic inspectors use them daily to assist them in their arduous work in keeping the buses "on schedule".

There is a 100-watt short wave transmitter in a tower above 55, Broadway, Westminster, used in connexion with breakdown services. The main radio receiving station is with the central radio control equipment at Earl's Court Signal Headquarters. Vans equipped with short wave radio transmitters and receivers can have both-way telephone conversation with the main stations within a radius of about 12 miles of Earl's Court. Outside that radius the weaker signals from the vans are picked up by fixed regional receivers at outlying points and relayed by land line to the Earl's Court radio station. Railway breakdown road vehicles are also fitted with short wave receiving and transmitting radio sets. Some breakdown recovery vehicles of the road transport services are similarly equipped. At the scene of a breakdown "walkie-talkie" radio sets are used in inaccessible places and communication is possible to the main breakdown van radio up to a distance of one mile. The Signal Department planned and now controls the London Transport radio network.

The most recent development in the use of radio telephony is an extension of the existing telephone system. Radio signals from transmitters in breakdown vans or even "walkie-talkies" can be picked up and relayed to the telephone system through the radio control centre at Earl's Court.

Apart from their great importance in handling breakdowns the radio links coupled with the telephone extensions to all parts of the Executive's undertaking provide a great help to signals

executives on their travels about the job. They can get news of the progress of work and give instructions for their depot to forward to the men on the spot while they are still many miles away.

One further use of radio service has been in road traffic control. It was first tried out at Epsom races in 1948, and the success which it achieved has lead to its use in further experimental schemes on similar lines. In practice, the area in which the passenger concentration is expected can be patrolled by a van fitted with radio receiver and transmitter in communication with a fixed radio transmitter at a central point—for example, a country garage. The van visits various points in the area so that the transport inspector travelling with the van can observe the requirements at each bus stop on one or more routes. If necessary, he can send a message to the bus station so that relief measures can be organized. It is possible by these means for relief buses to reach the desired point within ten minutes of the congestion occurring, and passengers are thus saved a long and sometimes fruitless wait for the next regular service bus. The radio equipment used on such occasions is a 10-watt radio telephone with a 5-valve transmitter and 11-valve receiver on a frequency range 27–132 mc/s.

In preparing this account of London Transport telecommunications I have been greatly helped by, and I am much indebted to, the Signal Department Telecommunications Office, the *London Transport Magazine* and the Press and Publications Department.

Post Office Commercial Accounts

THE POST OFFICE COMMERCIAL ACCOUNTS FOR 1956-57 show that the telephone service made a surplus of £0.1 million, income being £162.7 millions against expenditure of £162.6 millions. The surplus was lower by £4.8 millions than the surplus for 1955-56.

The trading results of the postal and telegraph services, however, showed deficits of £1.7 millions and £1.5 millions respectively, so that the net deficit realized on General Account (comprising all three services) was £3.1 millions. In 1955-56 the General Account showed a surplus of £2.3 millions.

The results for 1956-57 are not, however, directly comparable with those of previous years, as the 1956-57 Commercial Accounts reflect for the first time the new financial arrangements announced in the White Paper *Report on Post Office Development and Finance* (1955). Thus the accounts now include a fixed annual contribution of £5 millions to the Treasury and provision for depreciation of plant on the basis of current value instead of historic cost.

Under the terms of the White Paper, any surplus or deficit remaining after these provisions have been made is carried forward by the Post Office in a Reserve Account, in contrast to the former procedure whereby the whole of the surplus (old style) accrued to the Treasury. The Reserve Account has thus opened with a deficit of £3.1 millions which will require to be made good in future years.

In the 1955-56 accounts £29.9 millions were allocated for depreciation "at historic cost", plus a special provision of £1 million. In the 1956-57 accounts the "historic cost" provision is £28.4 millions, plus a supplementary provision of £16.7 millions, making a total of £45.1 millions to provide for depreciation at current values. Of this total, £43 millions (£26.8 millions "at historic cost" and £16.2 millions supplementary) is provided for depreciation of telephone assets.

The following table shows the results of the telegraph and telephone services for 1956-57 and 1955-56:—

	1955-56 £m	1956-57 £m	*Difference* £m
Telegraph Account—			
Income	17.7	18.3	+ 0.6
Expenditure	18.8	19.8	+ 1.0
Deficit	1.1	1.5	+ 0.4
Telephone Account—			
Income	138.1	162.7	+ 24.6
Expenditure	133.2	162.6	+ 29.4
Surplus	4.9	0.1	— 4.8

Telegraph Service

Inland telegraph traffic again fell substantially, being 17.8 per cent. lower than in 1955-56; the number of staff hours spent on inland telegraph

TELEPHONE SERVICE: 1956-1957

	1955-56	1956-57
NUMBER OF LOCAL EXCHANGES AT END OF YEAR		
Automatic	4,662	4,784
Manual	1,282	1,196
Total	5,994	5,980
NUMBER OF AUTO-MANUAL AND SEPARATE TRUNK EXCHANGES AT END OF YEAR	272	276

	1955-56 '000	1956-57 '000
NUMBER OF EXCHANGE CONNEXIONS AT END OF YEAR		
On automatic exchanges	3,216	3,429
On manual exchanges	1,049	1,045
Total	4,265	4,474
ANALYSIS OF EXCHANGE CONNEXIONS UNDER RENTAL CATEGORIES, &C.		
Business Rate —exclusive service	1,587	1,622
shared service	152	153
Residence Rate—exclusive service	1,468	1,539
shared service	935	1,034
Post Office Service	55	56
Call Office	68	70
Total	4,265	4,474
NUMBER OF STATIONS AT END OF YEAR		
Exchange Service	6,830	7,167
Private Circuits (telephone and telegraph)	57	59
Total	6,887	7,226
NUMBER OF APPLICATIONS FOR EXCHANGE CONNEXIONS DURING THE YEAR	474	388
NUMBER OF APPLICATIONS FOR EXCHANGE CONNEXIONS OUTSTANDING AT END OF YEAR	344	246
TRAFFIC—NUMBER OF CALLS		
Inland:—		
Trunk	333,369	321,356
Local	3,865,000	3,743,000
Total	4,198,369	4,064,356
Overseas:—		
Continental cable services:—		
Outward	1,956	2,091
Inward	1,826	2,025
Transit	30	36
Radiotelephone services and Extra-European cable services:—		
Outward	108	148
Inward	113	158
Transit	27	112
Short range calls with ships:—		
Outward	9	10
Inward	62	75
Total	4,131	4,655

work fell by 20 per cent. and income fell from £4.4 millions to £3.7 millions.

The revenue from inland telex services rose from £0.4 million to £0.7 million with the continued development of the service.

Income from the oversea telegraph services rose from £7.0 millions to £8.1 millions. Transit traffic increased by 6.4 per cent. but traffic originating or terminating in the U.K. remained at about the same level. A decrease in European traffic was offset by an increase in the more remunerative traffic with other countries.

Oversea telex traffic rose by 30 per cent.

The accounts show that of every £1 of expenditure on the telegraph services, 14s. 5d. went on staff costs, 2s. 2d. on capital charges, and 3s. 5d. on other items. The overall deficit was made up of a loss of £3.1 millions on inland telegrams partly offset by profits of £1.4 millions and £0.2 million on inland private wires and oversea services respectively.

Telephone Service

The increase of £24.6 millions in telephone service income came predominantly from higher charges, increased business accounting for only £2.4 millions. Local call traffic was 3 per cent. and trunk call traffic 4 per cent. lower than in 1955-56. Subscribers' inland trunk calls brought in an income of £44.4 millions (against £43.3 millions in 1955-56), realizing a profit of £12.6 millions. There were profits also on the inland private wire rentals (£1.5 millions) and oversea telephone services (£0.6 million), but, despite an income of £53 millions (against the previous £42.3 millions), exchange line rentals resulted in a loss of £9.8 millions. Subscribers' local calls, with an income of £35 millions (£25.6 millions in 1955-56) resulted in a loss of £1.7 millions, and call office receipts, although rising from £10 millions to £10.9 millions, resulted in a loss of £3.1 millions.

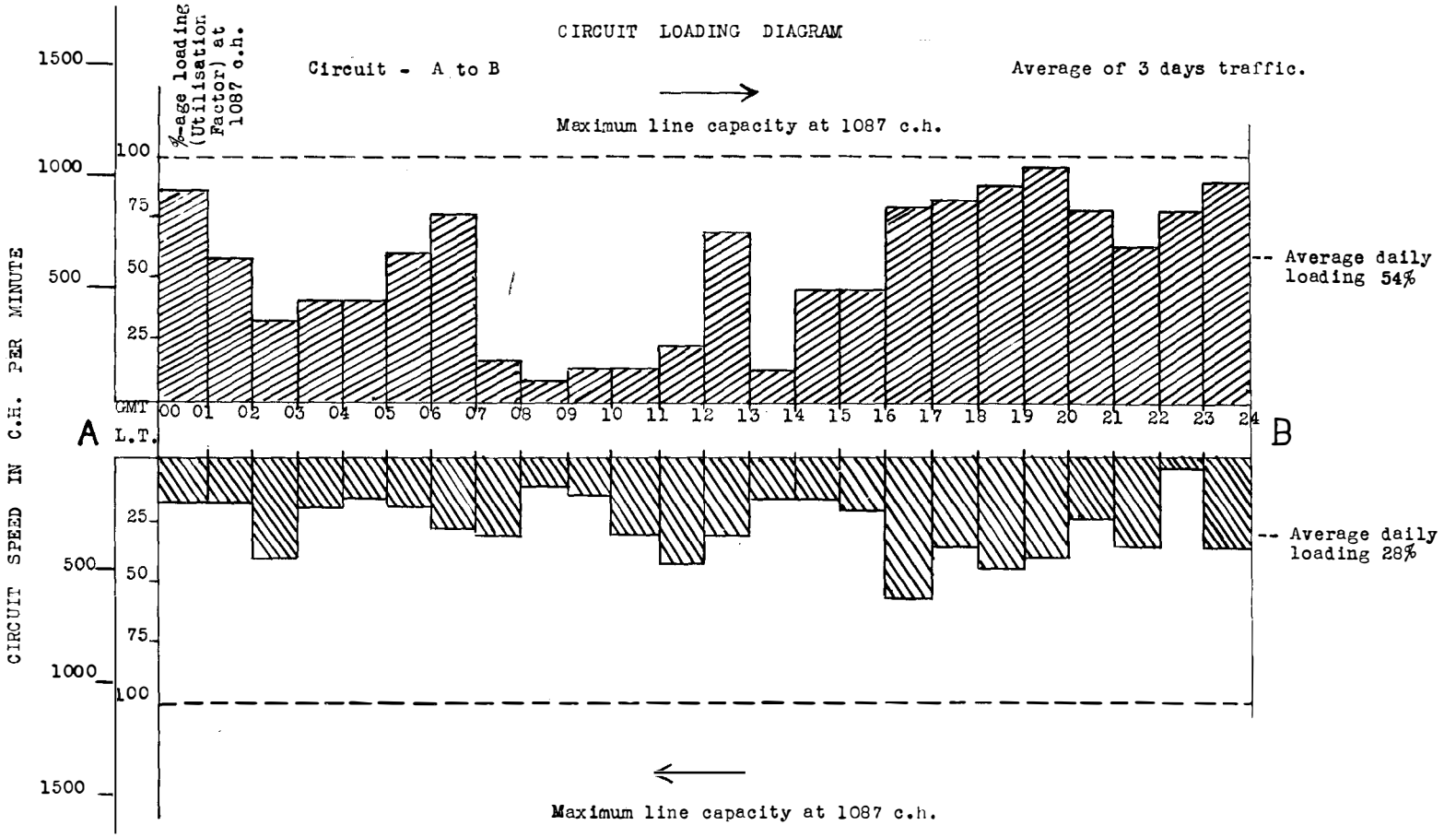
Of each £1 of expenditure on the telephone services, 9s. 7d. went on staff costs, 7s. 11d. on capital charges, and 2s. 6d. on other items.

Among notes on the telephone services, the Accounts contain the comment that the new (and first) transatlantic telephone cable, which was opened for public service on September 25, 1956, has completely revolutionized transatlantic communications. Uninterrupted conversations are possible on demand, or with very little delay, over the 35 high-quality circuits available. The volume of transatlantic telephone traffic doubled almost at once and has increased steadily since.

The changes made necessary by the White Paper provided an opportunity for a thorough review of the form and content of the Commercial Accounts in order to bring them more into line with the best commercial practice, to cut out unnecessary detail and to present the facts in a more attractive way. To this end the advice of a leading firm of accountants was sought and the majority of their recommendations were implemented in the 1956-57 accounts.

A great deal of detail has been eliminated, the layout improved, and the accompanying report on the Accounts has been illustrated with diagrams. Also, the traditional Post Office red has been adopted for the cover in place of the usual "Blue Book" blue. A new feature in the report is an analysis of each of the three main services to show the income and profit or loss on each subsidiary service—for example, exchange line rentals, inland telegrams, and so on. Despite these improvements, the price has been reduced from 3s. 6d. to 2s. 3d. and copies may be obtained at or through Stationery Office bookshops or any bookseller.

Medallion recording the first prize award for the film made by Creed's in association with the Post Office. "Atlantic Link" (T.A.T.) was honourably mentioned



Circuit loading diagram of a theoretical circuit: a method of charting the circuit efficiency of cable chains, sections of chains and circuits, hour by hour, day by day. GMT is used to enable comparison, but the overseas station inserts its own local time (LT)

Organization and Method in Cable and Wireless Limited

A. T. Stokoe

ALTHOUGH ONLY IN RECENT MONTHS HAS it been accorded departmental status in the Head Office hierarchy, Organization and Method is not new to the Company and has been practised, in varying forms, for many years.

The competitive character of the Company's business has always made it necessary that every means of promoting economic working procedures, coupled with efficiency, be kept constantly under review, and in pursuance of this policy the Management, five years ago, approved the formation of a Work Study Committee with broad terms of reference.

The Committee had permanent representatives nominated from four Head Office departments: Chief Accountant's, Engineer-in-Chief's, Staff, Traffic Manager's: with authority to co-opt representatives from other departments when the need arose.

Before starting its investigations, certain members of the Committee attended lectures and meetings on Work Study and kindred subjects arranged by Imperial Chemical Industries, who are recognized to be in the forefront on such matters. Subsequently, members of the group attended courses at the Work Study School, Cranfield, Bedfordshire, the University of Birmingham, and the College of Production Technology, Ashford, Kent. In addition they visited numerous commercial organizations and exhibitions.

With this background, detailed examinations of many aspects of the Company's activities have been undertaken and standards of working set for staff engaged on such telegraph duties as:—

Counter duties
Despatch of telegrams
Delivery procedures
Billing Customers' Accounts
Statistizing telegraph traffic
Circuit working
Keyboard operating

The main task of collecting the necessary data, presentation of facts, figures and so on for the consideration of the Work Study Committee was allocated to a small sub-group within the main Committee and in the early months this was its full-time occupation.

From the outset the feature of all discussions has been that each representative on the Committee should freely express his personal views without being tied to a departmental approach to the particular problem being examined, and as a result reports have been produced with firm recommendations on numerous subjects.

Between 80 and 90 per cent. of the Committee's recommendations have been put into effect, with resultant increased efficiency. Also, substantial savings have been possible consequent on retirements and resignations without replacements, reduction of overtime, and the handling of increased traffic without additional staff.

Work Study in Cable and Wireless Ltd., because the Company's operations extend throughout the world, cannot be applied in so straightforward a manner as in an organization whose activities and labour force are centred in one country. The Company has branches in some 60 countries and islands and, before new or modified procedures are introduced, the personal susceptibilities of the staff concerned, national pride and feelings, local labour laws and the views of strong staff unions have to be carefully considered.

At the outset investigations were based on an assessment of facts available in Head Office or on information obtained from overseas branches, but it soon became clear that to get a true appraisal of conditions overseas, teams of Work Study Officers should be made available and sent abroad to inspect branches.

After the selection of two suitable officers, followed by a course of training in Work Study and full briefing by the Head Office Committee, the first experiment was initiated in Brazil. Some fears were felt about the success of this experiment, but they proved groundless as the two officers were given a warm welcome by all sections of the staff throughout this area. The team introduced new methods of accounting and statistizing, and modernization procedures in the telegraph offices,

resulting in considerable savings, and today the Manager in Brazil has two Work Study Officers permanently allocated to his office in Rio de Janeiro. They are at present investigating the merit operation of every circuit in Brazil.

One of the heartening facts about the original exercise was the sense of humour it induced and the two officers concerned were quickly referred to as "OMO" and "TIDE".

In view of the success of the Brazilian visit the Management decided to extend the activities of oversea inspectors and today O. & M. Officers, as they are now called, are working in the Far East, the West Indies and South America.

On September 1, 1957, the Work Study Committee was raised to adult status by the creation of a department known as O. & M. Though this has meant some modification of procedure, the main Committee continues to operate for discussion on matters of major importance thrown up by reports and recommendations submitted by O. & M. Officers working overseas.

Today the activities of the O. & M. Department include such subjects as plans for new offices, modifications to old ones, the standardization of methods and procedures and, last but not least, the gradual introduction of more automatic methods of working with the goal of full automation. The last is one in which there is particular interest and the Committee has produced a method of charting the circuit efficiency of cable chains, sections of chains and circuits hour by hour, and day by day.

In Head Office as well much has been done to examine the work of each department to ensure that the most efficient methods are in operation, that there is no duplication of effort, and that establishments are correct as regards numbers and gradings. In connexion with establishments an "Assessment Key" for assisting in determining the appropriate grading for each post has been evolved and is proving of considerable value. The application of "Assessment" principles to clerical operations was one of the subjects recently discussed at the Annual Conference of the Institute of Personnel Management and is being found useful to industry as a tool for helping to determine relative staff gradings within an organization.

The O. & M. Department has also investigated, with success, the introduction of modern types of office furniture in certain Head Office departments, with the object of providing additional office space for the expansion of the section handling mechanized statistical records and mechanized accounting. Extra accommodation has also been made available to the Engineer-in-Chief's Department for staff employed on the development of plans for the extended mechanization of overseas telegraph services.

Much of the work of O. & M. is merely the application of organized common sense, but to be successful those engaged on such duties must be prepared, at all times, to suffer criticisms and rebuffs willingly and then come up again with a smile.

It has been my pleasure to guide the work of a team of such enthusiasts.

Nuffield Talking Book Library for the Blind

In London there is a vast library for the blind containing several hundred titles. They are neither in Braille nor in raised letters but in sets of gramophone records: where the usual library stores a book, this one stores a set of records on which a whole book is recorded. A large book such as *David Copperfield* requires 46 records but *Great Expectations* is a more average size at 22 records. The records are the long playing type, and blind people use a portable electric or battery gramophone especially designed for the work.

There are a number of problems in operating these sets, the two major ones being instruction and maintenance. Most of the readers are old and may never have seen or previously handled a set of this nature. In one distressing case, the reader had been listening to the needle scratch for three days, not realizing that the equipment had to be switched on to hear it properly. In another, the complete set was smashed in transit back to London: all that was wrong with this set was a broken flex which in any case had been left behind unseen in the house.

There are over 4,000 blind people in Britain trying to enjoy this Talking Library and any readers of the *Journal* who can spare time to help them understand the working of the set, or to mend a fault, will be welcomed to the ranks of voluntary helpers by the Honorary Organizer. He is Mr. D. Finlay-Maxwell, Messrs. J. Gladstone & Co. Ltd., GALASHIELS, Selkirkshire, and he will give particulars of the needs of any district if you write to him.

Magnetic Drum Director on Trial at London Exchange

(Courtesy A.T. & E. Co. Ltd.)

BRIGADIER SIR LIONEL H. HARRIS, POST Office Engineer-in-Chief, officially inaugurated at Lee Green Exchange, London, new electronic telephone controlling equipment employing a magnetic drum storage device similar to those used in the latest types of computers.

The magnetic drum director has been developed by Automatic Telephone & Electric Company. It consists of a bronze cylinder some 12 inches in diameter and about three inches deep. Its working surface is coated with approximately two ten-thousandths of an inch of nickel which forms the medium for the magnetic records. The records consist of sequences of magnetic "dots" which can be packed closely enough together to obtain 100 dots to the inch of circumference and at least 10 similar circumferential "tracks" of dots to the inch of depth. The total capacity of the drum for dots is at least 110,000. In operation the drum rotates at about 1,800 revolutions per minute and dots may be recorded or reproduced at a rate of about 100,000 dots per second.

The magnetic dots are coded into machine language to allow numbers and instructions to be built up in Binary Code; thus, four dots are required to record a single digit, and seven sets of four dots to record a seven-digit number such as a caller would dial.

Some of the 30 tracks are used for remembering the translations likely to be required—about 700 in all. These records are virtually permanent in the sense that they are changed only when, for administrative reasons, it is necessary to alter a translation. The remainder of the tracks are used as control tracks: some provide the means for synchronizing the operation of the complete equipment; the others provide individual memories for switch control units of which there are 114.

The electronic equipment associated with the drum contains a scanner, driven by the synchronizing tracks, which, among other things, causes each switch control unit to be associated in turn with the particular portion of one of the tracks allotted to it. The switch control memory tracks provide means for keeping a running record of the state of each control unit and by continuously checking this running record the electronic equipment can determine what action is next required in each case.

The running record is kept up to date merely by recording the most recent record in place of the old one. In this way the electronic equipment and the drum can be time shared over 114 switch control units in as little as 17 milliseconds each without interfering with any other. Moreover each of the 114 control units can be rescanned every 17 milliseconds so that changes of state of up to 60 changes per second each are recognized. This permits considerable economies in apparatus and is one of the reasons for developing the trial equipment. The translation tracks are referred to whenever a switch control unit reaches an appropriate condition.

The New Charging System for Telephone Calls

In our Autumn issue we reproduced the full text of the White Paper on Full Automation of the Telephone Service, *which the Postmaster General laid before Parliament on November* 13, 1957.

The White Paper outlined two big new steps which the Post Office is taking towards its objective of the best service at lowest cost: Step I, Simplified Charges; Step 2, Automation. *As readers will know, Step I was introduced on January* 1 *this year.*

In the following series of articles the principles of the new system are explained in greater detail than was possible in the White Paper and the story is told of some of the arrangements made to launch one of the most radical changes in the history of the telephone service in this country.

Simplified Charges

H. A. Longley

SINCE 1912, WHEN THE FIRST AUTOMATIC exchange opened, said the introduction to the White Paper, progress towards full automation has been held back by a system of charges designed for manual operation.

It was at Epsom in 1912 that the first automatic exchange in this country was opened. In the same year the Post Office took over the National Telephone Company's and other telephone systems. There were at that time throughout the country a great variety of methods of charging for service and for calls. These were swept away in 1921 by a major tariff revision.

The main features of the tariff introduced by the 1921 revision were:

(*a*) a message rate (that is, a charge for each call instead of a flat rate for calls included in the rental);
(*b*) a uniform local call charge throughout the country;
(*c*) point-to-point calculation of distances; and
(*d*) concessionary call charges in the five largest cities, balanced by higher rentals there than elsewhere.

A local fee area of five chargeable miles radius was also introduced at that time, with a second fee area of 5–7½ miles, beyond which calls were timed. The third and fourth fee areas were added in 1935. This system of charges has been applied practically unaltered until January 1 this year.

How then has this system held back automation? Our predecessors in 1921 would probably claim to have planned for automation though only of local and junction calls, but we now know that a system involving a different set of call charges for each exchange—which was inherent in the point-to-point system—was incompatible with the economics of automatic working. At many exchanges subscriber dialling was limited to the area that could be reached for a unit fee. Even at exchanges where this limitation did not apply, subscriber dialling within the multi-fee area was restricted because of the complexity and cost of the equipment that would have been needed to bring all the multi-fee charges to account. In spite of this we should nevertheless be grateful that the new call tariff structure had to be built on the foundations laid in 1921 and not on the sands of 1912.

One might well expect such difficulties to become excessive with national subscriber dialling. As the White Paper said:

The Post Office now has some 6,000 *exchanges. Each has its own list of charges. . . . To have* 6,000 *charging units is to have too many. They will be reduced . . . leaving only about* 600. *This will be done by combining exchanges into* 600 *charging units which will be called 'GROUPS'.*

Step 1 *paves the way for full automation.*

We must look rather closely into the implications of Step 2 for the reasons justifying such a fundamental change in our charging practice.

It would have been quite practicable to develop a fully automatic national subscriber dialling system while retaining most or all of the features of the old charging system; indeed, during the

studies of this problem during the past few years, several such plans have been seriously considered.

Retention of point-to-point charging could however mean that (*a*) separate equipment to identify the fee must be provided for every exchange, and (*b*) this equipment must be able to differentiate between over 6,000 different codes and identify a charge for each. Not only would the equipment to do this be unduly expensive, but its separate provision for every exchange, and its use on a considerable number of quite short distance calls, would greatly increase the cost of the new system.

By dividing the exchanges for charging purposes into some 600 groups, these difficulties are largely removed; equipment for subscriber trunk dialling can be located centrally for each group and the same equipment can be shared by all the exchanges in the group. What is more, any distant group can be identified by a code of not more than three digits. These features will greatly simplify the apparatus and reduce cost and increase reliability.

Moreover, by adopting group charging for short as well as long distance calls, the problems arising under the old point-to-point system of charging have also been solved. The routing of a call to the central switching point in the distant group can also be looked after by the 3-digit code: one or two additional digits in the code will identify the exchange required. Thus the stage is set for the close association of the charge for a call and the routing of the call, which is a sounder and more economical principle than point-to-point charging.

Why is the number of groups "about 600"? This number is fixed primarily by the way in which the codes are to be allotted. Clearly a maximum of a 1,000 code is available but for the convenience of subscribers and to economize in switching equipment it will be best to have short codes where there is most traffic. London is therefore to have a single digit code, and the five cities of Birmingham, Edinburgh, Glasgow, Liverpool and Manchester will each have 2-digit codes. Some 80 of the largest towns of the country will have 3-digit codes, and this means the use of a second 3-digit code for many groups, to reach the smaller exchanges. There are other reasons which necessitate the use of two codes for some groups. The actual number of groups established is 639, which leaves a modest, but we hope adequate, margin of usable spare codes.

The grouping (of exchanges) will usually reflect local community of interest.

Since the charging and routing equipment is to be at a central point for each group all exchanges in a group must be connected to the central point by line plant; hence, a typical group is formed of a principal city or town and the surrounding smaller towns and villages. Where there is "community of interest" there is telephone traffic, and where there is traffic there is line plant; so grouping is mainly based on line plant layout but it also reflects community of interest. If, however, line plant were the sole factor in the formation of groups they would vary excessively in size—a large town would have a much bigger group than a small one, and if the disparity in size were too great it would be inequitable for charging purposes. Part of the solution to this problem was to break up the areas served by the largest cities into several groups of average size; this means that, at least at the outset, the common equipment for charging and routing may be at an exchange outside the group itself, though it will nevertheless be entirely separate for each group.

All exchanges in a group will have the same list of charges. All distance will be measured from and to a central point.

Miss Watson and Mr. Chandler, Telephone Mechanization Branch, Post Office Headquarters, check a charge

This is not an entirely new principle within the Post Office system, for it has applied for many years on long distance calls between the largest cities and towns. But its general application throughout the whole country is new, and it is clearly a vital feature of the new plan. Normally the charge point is an existing exchange centrally placed in the group. Although designed as a prelude to full automation of the trunk system, the reduction in the number of different charge lists to one-tenth of the previous number has effected a worthwhile simplification in manual and auto-manual exchange records, and other economies.

For 3d. any subscriber, whether he has a dial telephone or not, will be able to call any other subscriber (a) within his own group and (b) within all adjoining groups (with very few exceptions).

This simple statement represents the solution to a host of problems that arose during development of the new plan. First, as the Post Office had decided to adopt the periodic metering system for trunk calls with its manifold advantages to the subscriber (as described in the White Paper under 'Step 2'), it was inevitable that the multi-fee tariff should be abandoned; otherwise a short duration multi-fee local call could cost much more than a trunk call of the same duration.

Secondly, a fundamental principle of group charging is that calls between exchanges in the same group shall be at a uniform charge. If the boundary of the group were to be a charge step (as in most continental applications of the group system) the charge for calls between nearby exchanges on opposite sides of a boundary might be increased appreciably and exchanges close to the boundary would have an extremely anomalous distribution of call fees: a subscriber might have to pay a much higher fee for a call to one neighbour than to another. In continental countries this difficulty has been met by various expedients, complications of or exceptions to the rules of charging, but we desired to avoid these if possible in the United Kingdom. By forming a local call area for the exchanges in a group from the group itself and the adjacent groups, the problem largely disappears.

Naturally, however, the groups will be of various shapes and sizes but the average radius will be 7 miles.

By the shape of a group is meant, of course, the shape of the territory served by the exchanges in the group. Since every square foot of the United Kingdom—whether unpopulated moor and mountain or densely populated town—has been allocated to one exchange or another, the shapes made by the group boundaries are in many cases strange. Roads and rivers also affect the distribution of population and therefore the line plant layout and the shapes of groups.

For long distance calls variety in the shapes and sizes of groups is not important because each charge step covers a wide band. For short range calls the shapes of groups are more important, but the combining of groups to form local call areas tends to iron out the peculiarities.

Fig. 1 shows the outlines of the set of groups that form the local call area for Crewe, which was

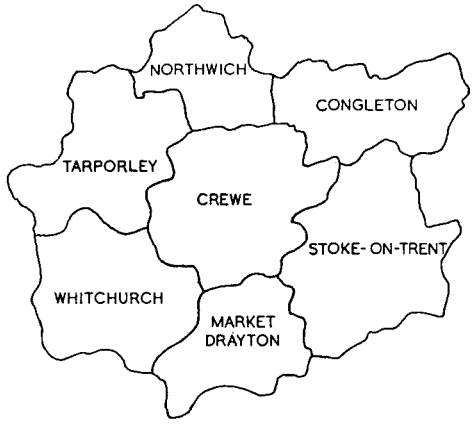


Fig. 1 : Crewe local call area

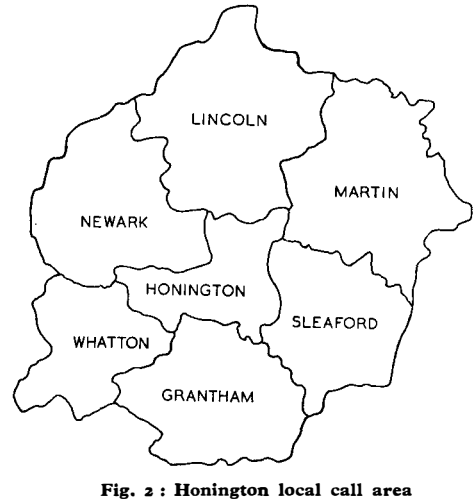


Fig. 2 : Honington local call area

The area diagrams, Figs. 1 to 6, are not all to scale relative to one another

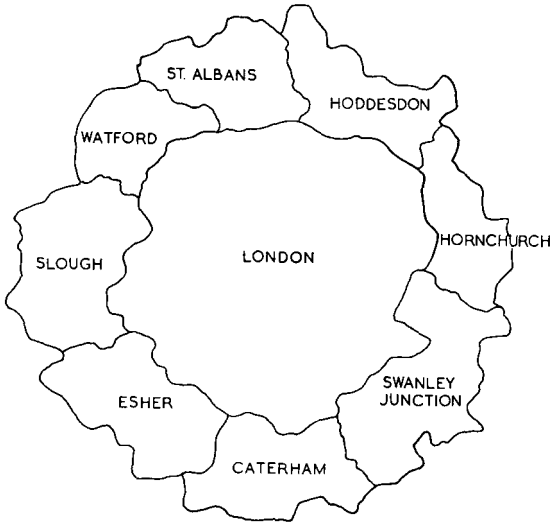


Fig. 3 : London local call area

Fig. 4 : Birmingham local call area

used as an example in the White Paper. These are among the more regularly shaped groups in the country. Fig. 2 shows the same for the Honington group and shows how the combination of groups around an irregularly shaped group often produces a regularly shaped local call area. Fig. 3 shows the local call area of the London group—in this instance the comparatively large London group (comprising the London director area) is surrounded by small groups to produce an area which, overall, is not far from the average. The corresponding map for Birmingham is shown in Fig. 4.

From 1921 until last January the four large cities and London enjoyed larger unit fee areas than elsewhere, and the subscriber paid higher rentals in compensation. Under the group system the local call areas of these cities differ little from the average, and the difference in rentals is no longer justified; the geographical differentials were in fact abolished in October, 1957, when uniform national rentals were introduced.

The extremes of irregularity are naturally found in districts with mountains and lakes, and Fig. 5 shows such an area—the local call area for Fortrose. These diagrams show that generally the shape of the home group affects the shape and size of the subscriber's local call area hardly at all.

Fig. 6 shows a typical grouping to form a coastal local call area—that of Barry. Obviously for coastal groups the boundary of the home group is also partly the boundary of the local call area—and a surprising number of groups in the United Kingdom are coastal. This does mean that between groups on opposite sides of a wide estuary the unit fee will not apply, and this is reasonable because calls are almost always carried over long inland cables between such groups. Similar considerations apply where wide mountain ranges intervene between groups. These are the few exceptions mentioned in the White Paper.

Today a 3*d. call covers about* 80 *square miles. After* 1*st January this will be enlarged to about* 900 *square miles on the average.*

These figures relate to a typical inland group. The figures for a coastal group would both be proportionately less. The average area of an inland group is about 150 square miles, but there is some difference in the average for different parts of the United Kingdom. Thus the areas served by the groups tend to have a larger average in Scotland than in England.

Today calls to exchanges 5–15 *miles away cost* 6*d.*, 9*d.*, *or* 1*s.* 0*d. After* 1*st January most of them will cost* 3*d.*

Still thinking in averages we may observe that the average shape of an inland group is a hexagon, and on the average seven groups make up an inland local call area. Seven times 150 square miles is more than the 900 square miles quoted above. There are several practical reasons for this. The main one is that a large number of inland local call areas include one or more coastal groups whose average is lower than 150 square miles.

The general effect of group charging on a

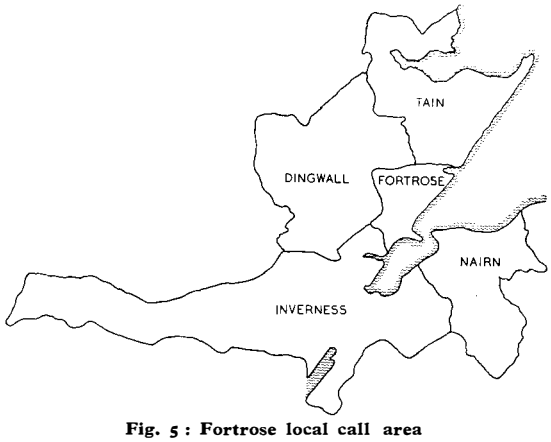


Fig. 5 : Fortrose local call area

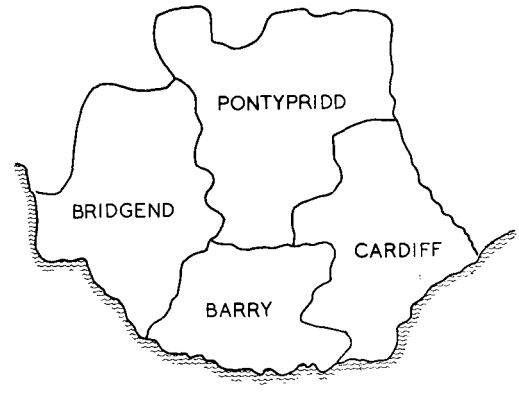


Fig. 6 : Barry local call area

particular subscriber's call charges depends considerably on whether he is served by an exchange near to the centre or the border of his group. It is interesting to consider this effect in respect of a theoretical local call area consisting of seven hexagons each of average radius seven miles. Fig. 7 shows a main exchange A which is at the centre of a hexagonal group. This and the surrounding six groups form the local call area of exchanges in the central group. Superimposed on this idealized layout are the call charges that applied before January 1. It will be seen that the whole of the old local call area is within the new local call area, and that an area previously in the trunk call range also comes into the new 3d. range.

Fig. 8 shows the same arrangement of groups but the pre-1958 charges for an exchange B—close to the border of the group—are superimposed. In this case the range over which subscribers on exchange B can call for the unit fee is curtailed in one direction, perhaps as low as eight miles, while in the opposite direction the range may be as much as 27 miles. Disparities of this order are fundamental to group charging even under the most ideal conditions. However, what the subscribers on exchange B lose in the one direction they should gain in the other; moreover, they can now reach the main town A for 3d. instead of 6d.

In this figure, the pre-1958 local call area of B overlaps the new local call area and some calls previously 9d. and 1s. 0d. fall in the new trunk range. Many of these calls are in fact dialled and until Subscriber Trunk Dialling facilities are available they could not be timed without withdrawing subscriber dialling. These calls are therefore charged not as trunk calls but at a uniform rate of four units a call (1s. 0d.) and included in the total of local calls on subscribers' accounts.

Charges for trunk calls . . . will be reduced. Here are the rates:

Chargeable mileage	Before 1.1.58	From 1.1.58
15–20	*1s. 0d.*	*If within l.c.a.* *3d.*
20–25	*1s. 2d.*	*Otherwise* *1s. 0d.*
25–35	*1s. 6d.*	
35–50	*1s. 10d.*	*1s. 9d.*
50–75	*2s. 3d.*	*2s. 3d.*
75–120	*3s. 0d.*	*3s. 0d.*
125+	*3s. 9d.*	*3s. 6d.*

This comparison of present and previous charges is, of course, subject to the qualification that the distances are now between the centres of groups instead of between exchanges as previously. The combination of the first three charge steps into one step at 35 miles was necessary because narrow charge bands are not satisfactory with group charging. If the charge bands are narrow it is too often a matter of chance whether the charge point for a group comes within a particular band. The net result of these tariff changes is a reduction in the number of charge steps from 11 to six, with an inevitable steepening of the earlier steps. The new, pre-1958, and pre-war tariffs are compared diagrammatically in Fig. 9, though it will be appreciated that, because of the group charging principle the comparison does not apply to individual calls; moreover, the charge step from 3d. to 1s. is shown at the average radius of a local call area, $17\frac{1}{2}$ miles.

The net result of all this is that most trunk calls will be cheaper; some will stay as they are; and a few (about 3 per cent.) will be slightly dearer.

The effect of these changes on the revenue at particular exchanges and on the bills of particular subscribers may vary appreciably but overall the public benefits, because call charges are reduced by a total of £2 million more than was produced by the increase of the unit charge from 2½d. to 3d. on October 1 last year.

The new simplified charges will enable existing equipment to be fully used for the first time. . . . 150 million calls a year now handled by operators will be dialled direct by subscribers.

These benefits flow directly from the abolition of the multi-fee tariff and the extension of the new local call areas into the old trunk call range. The effect will, however, differ greatly in different parts of the country. In London and elsewhere where multi-fee calls were being dialled by the operators, advantage can be taken of the new situation at once. But in many places some additional switching equipment will be needed before the new tariff can be exploited to the full. On short distance traffic the operating costs absorb a high proportion of the call fee, and savings from enabling subscribers to

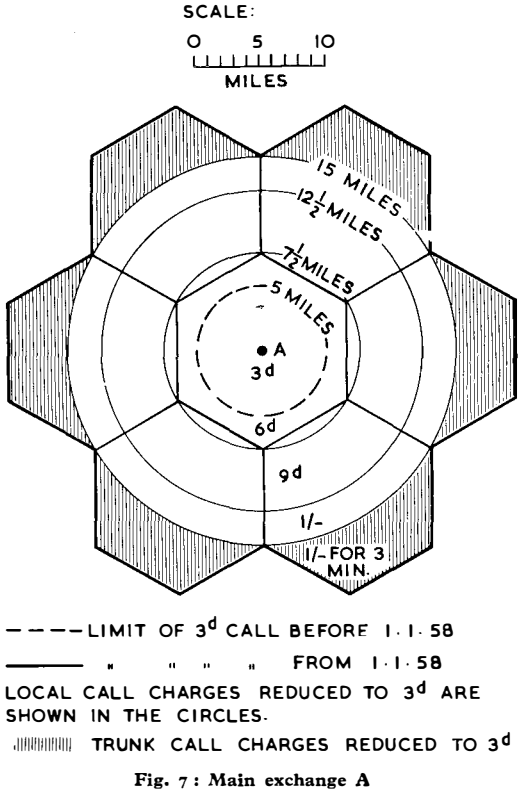


Fig. 7 : Main exchange A

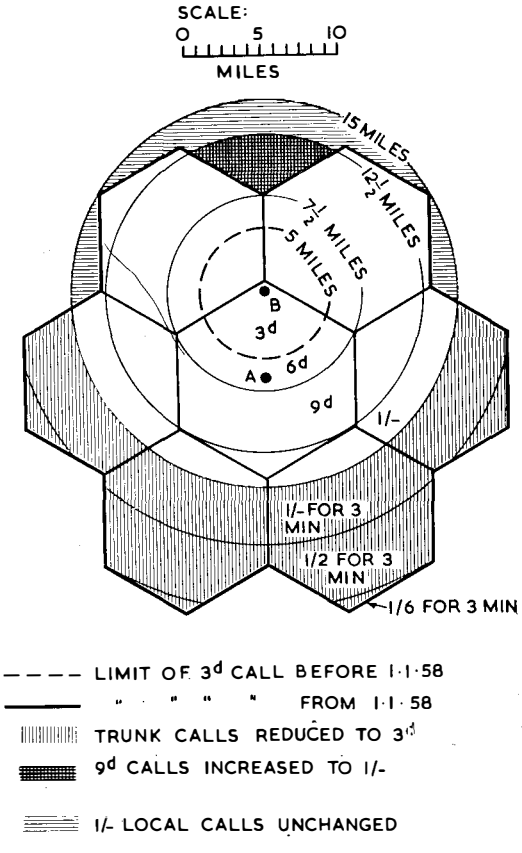


Fig. 8 : Main exchange B

dial more calls will pay for the concessions in the trunk call tariff mentioned above, besides which the subscribers will have the advantage of automatic service. There will also be some simplification of accounting work.

In view of the many advantages of the new plan one may well ask whether it could not have been introduced before. The answer is that certainly something like the new scheme could have been introduced earlier, but we may consider it fortunate that the change was not made until the plans for subscriber trunk dialling had reached the stage when the new tariff could be made to fit the national dialling plan.

Preparing for the tariff change that took place on January 1 was an enormous operation. The work of defining the 639 groups meant a detailed study of every part of the country and involved the staff of several Headquarters Departments, the

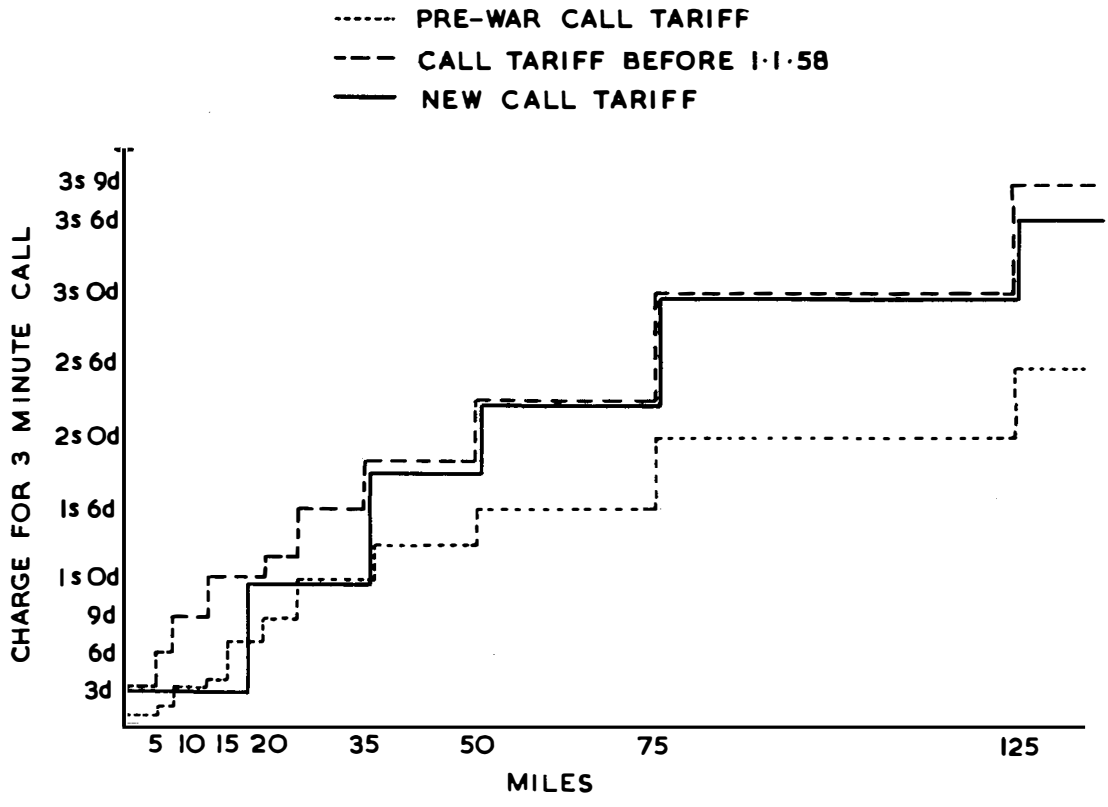


Fig. 9 : Comparison of tariff charges

Regions, and Telephone Areas for many months. It meant revising 10 million call charges, preparing and printing $4\frac{1}{2}$ million new charge lists in 640 varieties for issue to subscribers, with $4\frac{1}{2}$ million letters. A million and a quarter new insets for automanual exchange visible index files, and 100,000 new call office notices, were prepared and printed. The achievement of all this work within the timetable was only made possible by tremendous efforts of all the staff concerned.

Step 1 was entitled *Simplified Charges*. We should perhaps conclude this review with a summary of the simplifications in charges that took effect under Step 1 on January 1:—

(*a*) The multi-fee tariff and multi-metering were abolished in favour of a uniform local call fee over a wider area.

(*b*) The number of possible charges for calls between individual exchanges was reduced to about one-hundredth of the previous number.

(*c*) The number of charge steps was reduced from 11 to six.

(*d*) Common charge lists now apply to all the exchanges in each of the 639 groups.

(*e*) Many trunk calls were brought into the local call range.

(*f*) The concessionary call fees, together with their complications, in the five large cities were abolished; as a concomitant, the higher rentals in these cities were no longer justified; (uniform national rentals were introduced on October 1 last year).

Above all, the United Kingdom now has, for the first time, a call charge tariff geared to automatic rather than to manual working.

The stage is now set for Step 2 of the plan, which starts at Bristol at the end of this year and which, besides the début of GRACE, will involve even more striking developments in the method of charging for telephone calls.

Revising the Exchange Charging Records

A. E. Harvey and F. Cox

THE INTRODUCTION OF GROUP CHARGING involved a complete revision of all call charging records held in exchanges. To illustrate the nature and size of the operation involved in changing over from the previous system in which each exchange carried its own charges to some 6,000 other exchanges, it is desirable to outline the procedure by which call charges were determined.

Under the old system telephone calls were priced in accordance with the "chargeable distance", which was usually the distance in miles between the exchanges serving the calling and called subscribers. The call charge tariff was based on charge steps, each of which was known in exchanges by a "charge letter". Thus, a call between exchanges 32 miles apart fell in the charge step 25-35 miles, and was identified by the charge letter F.

The vast amount of work necessary to calculate the charge letter between every possible pair of exchanges was never undertaken as a single task; the charges for the more frequently made calls were calculated when the system was first introduced as a procedure was devised whereby the records were allowed to expand with the growth of the system. Exchange operators calculated the charge as each call not shown in the record was made for the first time, entering the charge letter in their record and advising the distant exchange so that the charge letter for the reciprocal call could be entered in its record.

Except between nearby exchanges distances were not measured on a map. Instead, index numbers were allotted to each exchange from a grid drawn on a master map, the scale of which was one inch to a mile. A "Table of Differences" was published by means of which charge letters were found from the arithmetical differences between the index numbers of the exchanges.

Charge letters were recorded in loose-leaf charging files (Fig. 1), which became the master charging record held on Route and Rate Quoting (R.R.Q .) positions in all group centre exchanges.

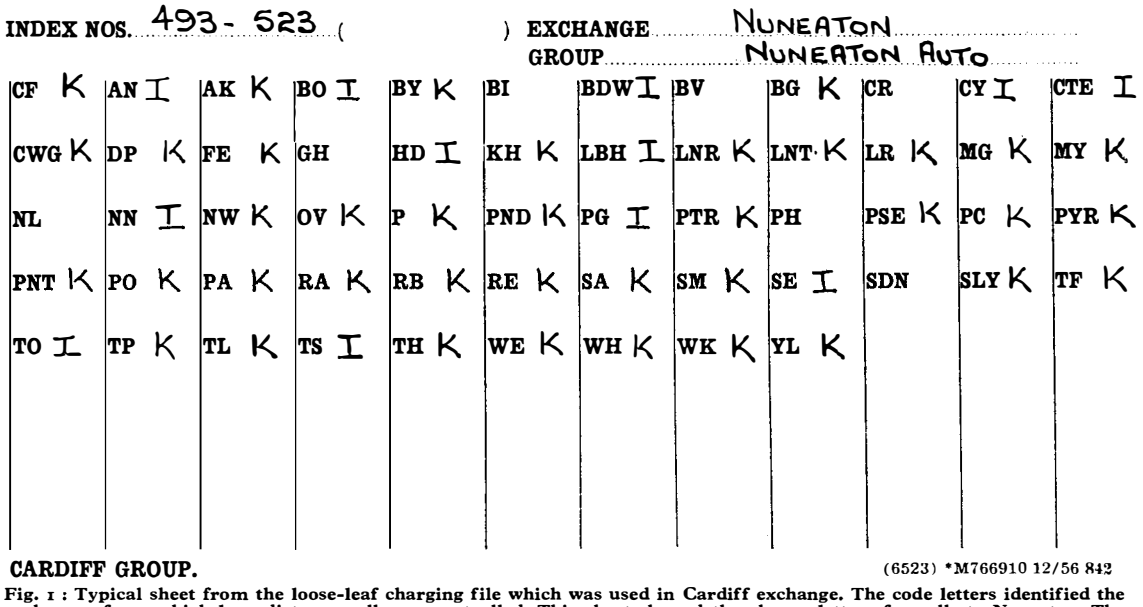


Fig. 1 : Typical sheet from the loose-leaf charging file which was used in Cardiff exchange. The code letters identified the exchanges from which long distance calls are controlled. This sheet showed the charge letters for calls to Nuneaton. The complete file contained several thousand of these slips

WORMLEY

Ch Gp/Index Nos	EXCHANGE/RCO	Group Centre/Exchange	LE	LO	QU	HK	MY	OK
HC 45	WORMLEY (Surrey)	Guildford	K	K	K	K	K	K
HC 62	WORMSHILL	Maidstone	K	L	L	K	K	K
HC 44	WORPLESDON	Guildford	I	K	K	I	K	I
WB 64	WORTHEN	Shrewsbury	H	H	H	H	I	I
HC 96	WORTHING	Worthing		MAXIMUM				
SW 76	WORTH MATRAVERS	Bournemouth		MAXIMUM				
SW 29	WOTTON-UNDER-EDGE	Dursley	I	I	I	H	I	I
NE 43	WRAGBY	Lincoln	H	H	H	H	G	H
HC 54	WRAYSBURY	Staines	I	I	I	I	I	J
HC 58	WRENTHAM	Lowestoft	K	K	L	L	K	K
HC 80	WRESTLINGWORTH	Hitchin	H	H	H	H	H	G
WB 72	WREXHAM	Wrexham	I	I	H	I	H	I
SW 78	WRINGTON	Bristol	K	K	K	K	L	L
HC 23	WRITTLE	Chelmsford	I	K	K	I	I	I
SW 67	WROUGHTON	Swindon	I	I	I	H	I	I
HC 69	WROXHAM	Norwich	K	K	K	K	I	I
HC 8	WROXTON ST. MARY	Banbury	G	G	G	F	H	G
M 11	WYBUNBURY	Crewe	H	H	H	H	H	I

WYBUNBURY

460

Fig. 2 : Typical sheet from the new Telephone Routing and Charging file, showing charge letter columns completed in manuscript for calls controlled at Leicester. The codes at the head of these columns refer to charging groups

References to R.R.Q. were kept to a minimum by providing controlling operators with routing and charging information for practically all the larger exchanges.

Group charging implies the association of an average of about 10 exchanges into a group, with common charges to all other groups. The old call charge tariff was greatly changed for local calls, but the significance of the charge letters for trunk calls remained the same except that chargeable distances between groups were measured from central points in each group. Nearly everywhere these central points were existing telephone exchanges.

It will be apparent that group charging did not necessitate the wholesale *recalculation* of charge letters. In general, it sufficed to select from existing records the charge letters between call charge point exchanges and to apply these letters to all the exchanges within the various charging groups. To enable this to be done, schedules detailing the composition of and charging points for all the charging groups throughout the country were distributed from Headquarters to every Telephone Manager. The work of writing in the new call charges, although simple in principle, took considerable clerical labour and, as with all the other preliminaries to the introduction of group charging, had to be completed urgently.

The Telephone Routing File, A5243, in which were listed in alphabetical order all the exchanges in the United Kingdom and Irish Republic, has been re-named the Telephone Routing and Charging File (Fig. 2) because it now provides not only routing information but also the charge letters appropriate to the charging groups from which calls are controlled at the group centre. Form A5243 is a national publication: it was consequently not possible to print charge letters, so columns were provided for local completion in manuscript.

The new A5243 provides on a single record all routing and charging information. It also provides for the identification of the charging group which includes any distant exchange, and an Appendix lists the name of the charging group

Issue 1 — AB 1

Ch'ge L'tr AB	FU	PJ	EXCHANGE	PRIMARY	ALTERNATIVE
Maximum			Abbey	L/F.A3B:No	L/K.821:No
I	L	K	Abbeyhill	"EH.72 No	GW-"
I	L	K	Abbey St.Bathans	"EH-Coldstream	GW-"
F	F	G	Aberchirder	HY	
Maximum			Aberdare	GW-CF.132-X	L/K.48.132-X
I	K	K	Aberdour	EH.701	GW-EH
I	K	I	Aberfeldy	PH-X	EH.813-X
K	L	L	Aberfoyle	GW.19	
Maximum			Abergavenny	GW-CF.88.12	L/K.48.88.12
Maximum			Abergele	GW-"CS.75	EH-"
I	L	K	Aberlady	EH	GW-EH
G	I	H	Aberlemno	DE-"Forfar	EH.84+"
G	G	H	Aberlour	EN	
H	K	I	Abernethy	PH	EH.813
H	K	I	Abernyte	DE	EH.84+
Maximum			Abersoch	GW-"CS.79.82	EH-"
Maximum			Abertillery	GW-CF.88.858	L/K.48.88.858
Maximum			Aberystwyth	GW-CF.14+	L/K.48.14+
Maximum			Abingdon	L/K.525+	
Maximum			Abinger	L/K.528.71	
L	M	M	Abington(Lanark)	GW.111	
E	H	G	Aboyne	AE	
Maximum			Abson	GW-BS	EH-BS
Maximum			Accrington	GW-MR.201	EH.03.201
M	M	M	Achahoish	GW-Lochgilphead	
L	M	M	Achateny	GW+"Ft William-Strontian	IV-"
L	K	L	Achiltibuie	IV-Ullapool	
L	M	M	Achnamara	GW-Lochgilphead	

ACHNAMARA

Fig. 3: Combined routing and charging inset in use at Aberdeen, showing routing details and charges from the three main charging groups

and gives the index numbers of the group call charge point. The old loose-leaf charging file is no longer required, but a small fraction of its contents is being retained for the time being to provide for calls to the Irish Republic which have not yet been changed over to group charging. In view of the congestion in enquiry operators' positions the removal of some six to ten loose-leaf binders per file has provided most welcome relief.

An incidental benefit of group charging has been the abolition of separate charge lists for call offices which are more than five miles from the nearest exchange. These call offices are now ordinary kiosks on the exchanges to which they are connected and this enables charging and routing records to be further simplified. There are a few interesting exceptions in Scotland, where some rural call offices on islands have retained their separate charges because they are connected to a distant exchange (by a radio link) which is outside the group in which the call office is included for charging purposes.

Simple as the new system is compared with the old, it was quite impossible to contemplate that, with the introduction of group charging, all long-distance calls should be priced by reference to R.R.Q.

The Visible Index File records available to every long-distance operator in the country had therefore to be reprinted.

Each telephone switchboard operator is supplied with routing and charging information in respect of calls from all exchanges for which she controls traffic, to nearly half the exchanges in the country. At most exchanges, and certainly at all zone and group centres, this information is printed on thin cards (known as "insets") which are accommodated in a quick-reference Visible Index File (V.I.F.) one of which is fitted on each operating position. The routing and charging information in the V.I.F. is, of course, different for each exchange; for example, the Birmingham V.I.F. could not be used at, say, Edinburgh, nor could the Edinburgh V.I.F. be used at Bristol and so on.

The V.I.F. contains all the information an operator needs for the expeditious connexion of the majority of calls, for the collection of correct charges for calls from call office and coin box lines, and for advising callers of call charges. On only a small proportion of the calls does the operator need to refer to the centralized enquiry point in her exchange.

Typical insets, one showing routing details and the charges from the three main charging groups and the other showing the charges from the remaining charging groups, are illustrated in Fig. 3 and Fig. 4.

Before the introduction of group charging, there were about 50,000 different combined routing and charging insets and about 30,000

Issue 2 — AB 1

AE	AF	BA	BF	BY	EL	EXCHANGE	I	IS	MU	OM	SD	SN
I	I	I	K	I	K	Abbeyhill	I	I	K	K	I	I
I	K	I	L	I	K	Abbey St.Bathans	K	K	K	K	K	I
F	D	F	lu	F	F	Aberchirder	D	lu	E	Ref	lu	C
E	E	C	C	lu	lu	Aberdeen	lu	E	F	lu	C	lu
H	I	H	K	I	K	Aberdour	I	I	K	I	I	I
H	H	C	I	H	I	Aberfeldy	I	H	I	I	H	H
I	I	H	K	I	K	Aberfoyle	K	K	K	K	I	I
I	I	I	K	I	K	Aberlady	I	I	K	I	I	H
F	C	F	H	F	H	Aberlemno	C	C	H	H	C	F
F	E	F	F	C	C	Aberlour	F	E	C	F	D	H
H	H	C	I	H	I	Abernethy	H	H	I	I	H	H
C	H	F	I	C	H	Abernyte	H	H	I	H	C	C
K	L	K	M	K	L	Abington(Lanark)	L	L	M	L	K	K
lu	lu	lu	C	lu	F	Aboyne	Ref	D	C	E	lu	E
L	L	K	M	L	M	Achahoish	M	L	M	M	L	L
K	K	I	L	K	L	Achateny	L	L	L	L	K	L
K	K	I	I	K	K	Achiltibuie	K	K	K	K	I	L
K	L	K	M	L	M	Achnamara	L	L	M	L	K	L
K	K	I	K	K	L	Achnasheen	K	K	L	K	I	L
K	K	I	K	K	L	Achnashellach	K	K	K	K	I	L
K	K	K	L	K	L	Adderstone	K	L	L	K	K	I
F	E	E	C	C	C	Advie	C	F	C	C	lu	C
I	K	I	L	I	K	Airdrie	K	K	L	K	I	I
I	I	H	K	I	K	Airth	K	K	K	K	I	I
K	K	I	L	K	L	Alexandria	K	K	L	L	K	K
lu	lu	E	F	lu	E	Alford(AB)	lu	lu	F	D	lu	F
I	I	H	K	I	K	Alloa	I	I	K	K	I	I

ALLOA

Fig. 4: Separate charging inset in use at Aberdeen, showing charges from other charging groups

different separate charging insets, distributed among the 250 zone and group centres throughout the country, in addition to the insets in minor exchange V.I.Fs. Most of the insets had been printed letterpress by commercial printers, but a start had been made in January, 1957, with a programme of printing V.I.F. insets by photo-lithography, using Flexoprint master panels, which was not only very much more convenient operationally but also very much cheaper. Although there had been nothing wrong with the quality of letterpress printing, the system had proved unable to cope with the need for the frequent reprints occasioned by large-scale changes arising from trunk mechanization. The time taken to print a V.I.F. was about eight to ten weeks and it took about two years to reprint all the V.I.Fs in the country.

During this period of two years, each V.I.F. had to be kept up to date by manuscript amendment, which made it very difficult for an operator to decipher some of the entries after a V.I.F. had been in use for a while. The new method of printing using Flexoprint provides for each inset submitted for amendment to be reprinted and returned to the exchange within a week. Thus, the need for manuscript amendments to V.I.F. insets is largely eliminated and, because each inset is amended and reprinted as required (subject to a certain programme), it never becomes necessary for Telephone Managers' Traffic staff to prepare new copy for a complete reprint of the V.I.F., as for letterpress printing. In effect, the Flexoprint scheme for amending insets results in each V.I.F. being reprinted—a few insets at a time—up to four times a year.

When the decision was made to introduce group charging on 1st January this year it was realized that controlling operators, would have to be provided from the outset with charging information at least as complete as they had held under the previous system. This meant that a considerable number of V.I.F. insets would have to be completely reprinted before January 1. Before the actual printing work could be started, Telephone Managers' staffs had to prepare and submit copy. This task, a formidable one in itself, could not be undertaken before complete information about the principles of group charging and the composition of the groups had been decided and promulgated. Consequently, the work could not start until mid-June and there was, therefore, under 6 months in which to do it. It was, of course, impossible in the time available to reprint all V.I.F. insets in the country—these amounted to approximately 80,000 different insets, with an average of 60 copies of each giving a total of nearly 5,000,000 "pieces of paper". Fortunately, this was not necessary.

A plan was devised which would, within the limits of the total printing capacity available (both letterpress and Flexoprint) ensure that by January 1, V.I.Fs would contain at least as much "group" charging information as existed for "old" charges and, for the majority of exchanges, would also contain up-to-date routing information. This plan provided for reprinting more than 20,000 different V.I.F. insets which, at an average of 60 copies of each, meant about $1\frac{1}{4}$ million "pieces of paper".

To achieve this output, an immediate increase in the equipment and staff at the Flexoprint Centre was necessary. The electric typewriters in current use were unobtainable in this country, as they had been manufactured in Canada, and additional machines could not be obtained for six to nine months. Four machines had, therefore, to be purchased from another manufacturer. Additional Flexoprint Units were established at Edinburgh and Cardiff where the Flexoprint master panels were typed and assembled, and then despatched to London for subsequent photolithographic printing.

At the time this plan was being formulated it was known that major alterations to nearly all V.I.Fs in the country were due to be made before Birmingham trunk mechanization was introduced towards the end of 1957. At this stage a firm opening date for the Birmingham scheme could not be forecast, nor was it absolutely certain that group charging would be introduced on January 1, 1958. From the V.I.F. printing aspect it would have been ideal if the dates of both these major changes could have been arranged to coincide, but this proved impracticable and, in the end, plans had to be made on the assumption that Birmingham trunk mechanization would be introduced about six weeks before group charging. It would have been an impossible task to reprint some thousands of different V.I.F. insets to cater for the routing amendments caused by the Birmingham scheme and then to reprint most of them again, perhaps, within only a few weeks, to include group charging amendments. On the other hand, controlling operators had to have complete information in respect of both changes

at their respective dates of introduction.

No neat solution to this problem was possible but a reasonably satisfactory way out was found by printing supplementary booklets for use with the V.I.Fs during the period between the opening of Birmingham trunk mechanization and the introduction of group charging. New V.I.Fs which contained up-to-date information in respect of Birmingham trunk mechanization and group charging were then introduced at the majority of exchanges on January 1.

Because of the routing changes arising from Birmingham trunk mechanization the V.I.Fs for all minor exchanges in the Birmingham zone had to be reprinted, but the printing programme could not allow for the reprinting of any other minor exchange V.I.F. However, within the last four or five weeks of 1957 it was found possible to reprint some minor exchange V.I.Fs, but other minor exchanges were supplied with copies of the home group centre's V.I.F. which contained group charging information applicable to each minor exchange.

Altogether, a vast quantity of exchange records had to be amended between June and December, 1957, and in particular, about 22,000 different V.I.F. insets (or approximately 1,300,000 "pieces of paper") were reprinted. All exchanges were supplied with the minimum of reprinted V.I.F. insets provided for in the original plan but, in addition, it was possible to reprint some minor exchange V.I.Fs and to bring up to date in time for January 1 some thousands of combined routing and charging insets that would otherwise have had to be amended in manuscript. All this called for a tremendous effort from the staff in the field and particularly from the Supplies Department and the V.I.F. Flexoprint Units, who worked at high pressure for the whole period. Great credit is due to them for the fact that all the work was completed on time.

Telling the Subscriber

F. H. Crewe

ONE OF THE JOBS ARISING FROM THE introduction of group charging on January 1 was the despatch to every telephone subscriber of an explanatory letter from the Postmaster General with a call charge list, which, for London, also showed the new dialling codes.

The London Telecommunications Region's share of this work amounted to the preparation for despatch of some 1,300,000 letters. Folding, enveloping, addressing and despatching such a large number of letters would put a heavy burden on Telephone Managers at any time, but this task came when Area staffs, in addition to handling the normal peak of work which occurs near Christmas time, were also dealing with a roughly comparable despatch of tariff revision leaflets. Moreover, as a result of the tariff revision, they were also faced with the amendment of every subscriber's accounting records. In total a serious problem arose and its solution not only justified the use of special machinery but posed a problem of organization in itself.

With the help of the Central Organization and Methods Branch of Post Office Headquarters, who obtained the equipment, a Machine Centre was set up to carry out the work for the whole Region. The Centre was in hutments at London Bridge Street, S.E.1., previously occupied by the Telephone Manager, South-East Area, but now vacant. At short notice the premises were cleaned, power points were supplied, and furniture and fittings were provided.

Seven Bandafold and—at first—three, but later five B.E.M. (Business Efficiency Machines) Ertma machines were used for folding and enveloping the letters. Bandafold machines were already being introduced into Area Offices and those intended ultimately for L.T.R. Areas were diverted to the Machine Centre.

The main function of the Bandafold is to fold paper. Up to four folds can be made in a piece of paper, and five variations are possible. The machine is fitted with an automatic friction feed and operates on what is known as the "tray" folding principle, the top sheet of paper being

Bandafold machine

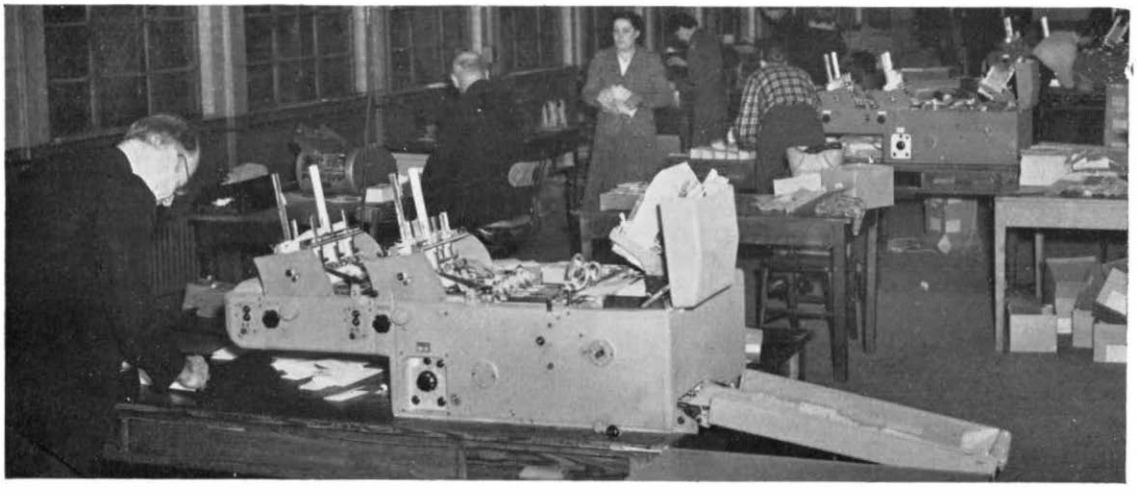
drawn between two rollers into a grooved guide tray. The leading edge of paper moves forward until it hits a pre-set stop. The paper feeding through the roller cannot go beyond the stop and moves down the circumference of the lower roller until it is gripped by a third roller. The gripping results in the paper folding and reversing out of the grooved tray. If a second fold is required, a second grooved tray is fitted on the other side of the third roller and the process repeated. The folded paper is ejected on a short conveyor belt which stacks the completed work neatly and in sequence. Folding at a rate of 10,000 pieces per hour is practicable on the Bandafold.

The B.E.M. Ertma machines used at the Centre were hired for the occasion. They can be used to insert up to six items into an envelope and seal the envelope as a continuous process.

The Ertma consists basically of two conveyor belts at right angles to each other. The machines used at the Centre were fitted with two hoppers on the first conveyor belt, the first hopper being used for the call charge list and the second for the Postmaster General's letter. The insertions were drawn down to the conveyor belt by suction discs operated by vacuum.

The second conveyor belt had one hopper which was used for envelopes. The envelopes were drawn down to the conveyor belt by suction discs; a further set of suction discs, pivoted on a lever, held open the flap of the envelope which was then moved along the conveyor belt under the influence of a guide arm. A spray arrangement moistened the flap of the envelope before it moved into position to receive the inserts from the first conveyor band. Further suction discs held the body of the envelope open while the inserts were slid into the envelope. The envelope was then gripped by tongs which in pivoting downwards closed the flap against the sloping edge of the machine. Finally, the envelope was sealed by being passed through rollers and out on to a conveyor belt hopper.

A rate of some 2,000 filled envelopes an hour was achieved at the Centre, but by using standardized stationery designed especially for use with



Machine centre in hutments: B.E.M. Ertma machine in foreground

the machine an output of about 4,000 an hour is possible.

The general plan was to have four operators working as a team with three machines, two Bandafold and one Ertma, the Bandafold machines supplying respectively the folded call charge lists and the letter in readiness for enveloping by the Ertma machine. (Because supplies of the charge lists were received before the letters a large number of them were folded and stored until the letters arrived.)

One operator was employed on each Bandafold

"Bagging up"

and Ertma machine and one on packing the output from each Ertma machine into boxes of 400 or 600 envelopes.

By arrangement with the London Postal Region, two postmen bagged-up the boxes of envelopes into mail bags (1,200 envelopes to one bag) and despatched them to the eight L.T.R. Area Offices. These special despatches left the Centre at 11.30 a.m. daily (Monday to Friday) and arrived in Area Offices during the afternoon. The illustration gives an indication of the postings involved.

Because different letters and call charge lists were issued for automatic and manual exchanges whether inside or outside the director area and as each non-director exchange had its own call charge list, special arrangements were necessary to ensure that letters and leaflets were assigned to the right exchanges.

The allocation of materials to machines was therefore carefully controlled: that is, all manual director and non-director area literature was stored entirely separate until that for the automatic exchanges in the director area (the majority) had been despatched. Additionally each box of filled envelopes was marked with the name of the exchange to which its contents referred. The same information appeared on the address label on each mail-bag, with a warning that the bag was not to be opened *en route* to Area Addressing Groups.

The penultimate stage of the work was the printing of subscribers' names and addresses on the envelopes. Readers may wonder why envelopes were not addressed first and filled afterwards. The reason was that a percentage—very small—of the envelopes passing through the Ertma machines were spoiled—mainly because of variations in the stationery. To avoid both the risk that subscribers would not receive the correspondence and the need to prepare fresh envelopes by hand, envelopes were filled first and then addressed.

To assist Areas with the printing five addressing machines were supplied by C.O.M.B. and two were lent by the Stationery Office. One Area was unable to accommodate additional printing machines and for it a quota of enveloped material had to be worked out to fit in with its daily addressing capacity. To help operate the additional addressing machines the London Postal Region lent a number of postmen.

The final stage of the work was to hand over the addressed envelopes to the London Postal Region for delivery to the subscribers. The essential feature was to ensure that the leaflets should be on the subscribers' breakfast tables on January 1. From December 15 to 26, however, the L.P.R. were dealing with the customary rush of Christmas mail. To avoid this period it was agreed that all despatches of group charging material should be handed over by December 13.

Output from the Centre had to be carefully scheduled to ensure that each Area Office would receive sufficient envelopes to enable it to complete its addressing work by December 13. To allow the Areas some margin, minimum daily quotas were based on a completion date of December 6, and a daily output from the Centre of 66,000 envelopes. Actual output climbed slowly from 23,550 on November 8, when three Ertma machines were brought into use, to 102,210 on November 22. Subsequently output averaged 56,000 and the final despatches were made on December 6.

Planning National and Local Publicity

THE INCREASED RANGE OF THE THREEPENNY call which came into operation on January 1 was good Post Office news and the Public Relations Department ensured that the widest possible publicity was given to it.

Under conditions of great secrecy it was arranged that nearly 400 different meetings with the Press should be held throughout the country at the time the Postmaster General was making his announcement to the House of Commons.

In London the Postmaster General, Mr. Ernest Marples, immediately after his Parliamentary statement, hurried back to Headquarters, where he spoke to many representatives of the newspaper and technical Press. Round the walls in the Conference Room were representative maps of the new group charging areas and the Postmaster General used a large scale map of London, Crewe and Stoke to illustrate his points. The Engineering Department had specially designed an illuminated map which the Postmaster General was able to light up in sections to illustrate how far the 3d. call would go.

Sound and Television Interviews

Mr. Marples also gave special television and sound radio interviews using the illuminated map on TV to illustrate the new proposals.

The crown folio poster, Cheaper Telephone Calls, was produced in an exceptionally short time for display in all offices during December and January. Large supplies of leaflets were also printed for sending to subscribers.

In the Regions, Telephone Managers were provided with background material in advance of the day for their conferences with Head Postmasters and the Press, as described in the next article. Six hundred different maps illustrating the changes in local exchange areas were prepared, and distributed with appropriate details by Telephone Managers and Head Postmasters at their local conferences.

The organization was outstandingly successful. No other publicity has for many years received such newspaper coverage. Practically every newspaper, large and small, from Land's End to John O'Groats—and in Northern Ireland—gave prominent publicity to the plan.

Demonstrating the Local Effects

The following note summarizes Telephone Managers' efforts to demonstrate the local effects throughout the Midland Region as an example of the effort made throughout the country.

TELEPHONE MANAGERS IN THE MIDLAND Region received only short notice of the Postmaster General's impending announcement and they organized the release of the information with great enthusiasm and initiative.

One of the biggest jobs was preparing a large quantity of special maps showing the local call area for the principal towns in each Area. Drawing Office staff drew and reproduced the maps very quickly for issue to M.Ps and the Press.

One or two days before the public announcement each Telephone Manager held a conference of Head Postmasters to put them in the picture, so that they would be able to answer any questions. On Wednesday, November 13, the date of the announcement, each Telephone Manager held a conference of representatives of newspapers in his Area immediately after the Postmaster General made his announcement in the House. In addition to giving the official statement and maps of local charge areas to the Press, Telephone Managers prepared for the conference cut-out maps to demonstrate how the local fee area was to be enlarged from a five-mile circle to the area of the home and adjacent charge groups.

In several places the secretary of the local Post Office Advisory Committee attended the conference, and in one Area the local Mayor was present at the Telephone Manager's invitation. Newspapers, and secretaries of local Advisory Committees, who were not able to attend the Telephone Managers' conferences, received details of the announcement by hand or by post. In some districts remote from the Headquarters town, Head Postmasters informed the Press.

Several Telephone Managers followed up their Press conference by talks to local Rotary Clubs, and in some areas meetings of exchange supervisors were held to ensure that they understood the scheme and could deal with any questions from the public or from the operators. One Telephone Manager arranged for local area maps to be displayed in Head Offices and Crown Offices in his Area.

VI British Empire and Commonwealth Games, 1958

R. F. Bradburn

ON A COLD BLUSTERY MORNING IN MARCH, 1955, Mr. C. E. Newham, O.B.E., the newly appointed Director of Organization to the VI British Empire and Commonwealth Games to be held in Wales in 1958, called at Post Office Headquarters, Cardiff, to discuss the Post Office aspects of this very important event. At that time we knew little about the organization of the Empire Games, as they are colloquially known. Soon we were to realize that they cover a smaller field than the Olympic Games, for they have only nine sports: athletics, boxing, swimming, fencing, weightlifting, rowing, lawn bowls, wrestling and cycling.

At that stage the problems facing both the Empire Games authorities and the Post Office were somewhat nebulous. It was hoped that the 1958 Games would be at least as big as those held in Vancouver in 1954, when 789 competitors and team officials participated. It was expected that, because the event was to be held in one of the home countries, the attendance might even exceed the Vancouver record, and the original plans were based on an estimate of 1,000 competitors and officials. This figure soon went by the board, and present indications are that 1,500 competitors and officials will enter for the 1958 British Empire and Commonwealth Games. This compares favourably with the 1936 Olympic Games.

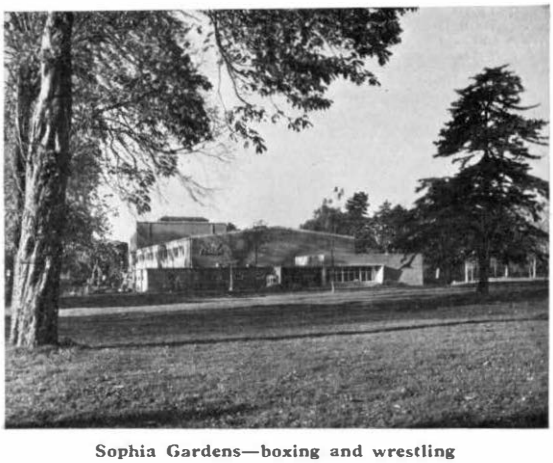
When Mr. Newham called, the problem seemed large enough with only 1,000 competitors. A first-class velodrome—the official term for a cycle track—existed, but there was no sports stadium of sufficient size, neither had Cardiff a swimming pool of international standard. A suitable stretch of water had to be found for the rowing events, and there were problems connected with most of the other sports, but by far the biggest anxiety was the financing of the Games; at least £100,000 was then thought to be needed. In addition to the task of raising this sum, the various problems of acquiring and adapting sports stadiums, providing accommodation for athletes and visitors, preparing ceremonial and procedure details, promoting the necessary publicity campaign, and a mass of other organizational matters, had to be faced.

Maindy Stadium—cycling events

In the past three years, however, a large organization, consisting almost wholly of voluntary workers, has been built up under the direction of Colonel Sir Godfrey Llewellyn, Chairman of the Organization Committee, and the Director of Organization. The total cost of the Games is now estimated at £250,000, of which nearly £100,000 has already been raised. The organization is virtually complete, with more than 30 main committees and innumerable subcommittees, and preparations are fairly advanced.

In the planning work the Post Office has had to make considerable contribution, for there were no communications of the size needed for such an important event as the Games at the places selected for the various sports. The importance of the communications work of the Post Office was recognized at a comparatively early stage, and, in fact, the Committee set up to look after Post Office interests in connection with the Games was invited to act as the Empire Games Communications Committee. This arrangement—although perhaps somewhat unorthodox—has been invaluable for both the Post Office and the Empire Games Organization. The Post Office Chairman of the Communications Committee has to sit on the main committees. As a result, the Post Office is able thoroughly to understand the needs of the organizers and to obtain decisions on the spot without the need for voluminous correspondence. Without this knowledge it is difficult to see how the Communications Committee would have worked efficiently.

Although the Post Office arrangements are not yet finally settled, it is clear that three temporary telephone exchanges and at least one temporary Post Office, will be needed. The Empire Village Exchange, as its name implies, will serve the athletes' village at St. Athan, where the 1,500 competitors and officials will live. As the area concerned is served by a small manual exchange, now virtually exhausted and due to be converted to U.A.X. No. 13 within the next 12 months, the temporary exchange was inevitable.



Sophia Gardens—boxing and wrestling

The main events, except rowing, are to be held either in Cardiff or its immediate neighbourhood, and an Empire Games Exchange is being provided to cater for the use of officials at all the Cardiff venues. Automatic exchange lines are to be used to give direct communication by dialling, but with special trunking from the "O" level to obtain access to the British Empire Games switchboard. Rowing is to be held on Lake Padarn, Llanberis, near the foot of Snowdon, and here again, as Llanberis is served by a U.A.X. 13, a temporary manual exchange is being considered.

At each of the sports venues an internal communications system is being devised to control the various events; a full description of the arrangements at Cardiff Arms Park, which will be the main stadium for track and field events, will be published in the next issue of the *Journal*. Much attention has had to be given to the problems of collating information about the results and disseminating them to other centres, the Press and the B.B.C.

Last, but by no means least, the needs of the Press at a special Press Centre which is being set up adjacent to Cardiff Arms Park and the Cardiff A.T.E., have to be planned in detail; communications have to be provided, not only within Great Britain, but as far afield as Australia, New Zealand and Canada, where interest in the Games is most keen. All the problems have not yet been solved, but plans are taking shape, and it is hoped that, by the opening day, July 18, full facilities will be available to all interested parties.

New "Journal" Representative

Mr. J. Atkinson, M.I.E.E., an Assistant Staff Engineer in the Post Office Engineer-in-Chief's Office, is now *Journal* representative of the Engineering Department. Mr. Atkinson is author of the two-volume *Telephony*, published by Pitman.

Mr. N. V. Knight, B.Sc., M.I.E.E., has been seconded by the Post Office to become General Manager of the Singapore Telephone Board.

Lines for the London Fire Brigade

C. T. Brown

THE LONDON FIRE BRIGADE, CONTROLLED BY the London County Council, is responsible for all fires occurring throughout an area of more than 100 square miles. To deal efficiently with such an area a Brigade Headquarters has been set up in Lambeth, south of the River Thames, from which control of 58 land and three river fire stations is exercised. These stations are organized into four Divisions, each with its own headquarters; two are south of the Thames at Clapham and New Cross, and two north at Manchester Square in the West End and Clerkenwell in the City.

Nearly all calls giving an alarm of fire are now received by telephone, for since 1949 street fire alarms have been progressively abolished and the last are being taken out of commission as this article goes to print.

Callers to the Fire Brigade originate their calls by dialling 999, or the exchange name followed by 2222. If 2222 is dialled, the call is routed to the exchange manual board in the same way as a 999 call; the call appears next to the 999 signals on a red calling signal, sounds the emergency buzzer and lights the emergency lamp, thus ensuring that it will receive priority attention.

Having received the request for the Fire Brigade, the exchange operator checks the caller's number and connects him with a direct line in the outgoing multiple to Brigade Headquarters. By checking the caller's number, the telephonist is able to advise the Fire Brigade of the origin of the call should the caller clear the line before the address of the fire has been given to the Fire Brigade; as a further precaution, the operator monitors the call until she is sure that the Brigade has all the necessary details. Each telephone exchange in the L.C.C. area served by the London Fire Brigade has a direct line to the "fire board"—a total of 68 circuits.

The control room at Brigade Headquarters, which can truly be called the Brigade's nerve centre, is equipped with a six-position fire board on which all calls received on the direct lines from telephone exchanges are handled, and from which the appropriate station is alerted and mobilized. This board is of a special design and was assembled in the Brigade's own workshops from some old CB No. 9 positions. The alterations carried out considerably reduced the height, since a large outgoing multiple was not required, and the number of cord circuits was also reduced, thus increasing the writing space available to the operator. The direct lines from the Post Office exchanges terminate in the bottom row of jacks, as in a normal answering multiple, and these circuits are fitted

—but it all depends on efficient communications

with red calling signals. The lines are unilateral and cannot be used for outgoing calls. A group of RELiance numbers give exchange operators a secondary route to the Brigade.

All six positions have identical circuits appearing on them, the answering and calling jacks being ancillaried on each position. During normal periods of activity, four positions only are staffed, the remaining two being brought into use during periods of heavy pressure.

In addition to the four firemen manning the board as operators, two men stand ready to act as "index operators". Their responsibility on an alert of fire is to consult large rotary index files, two of which are between the two pairs of switchboard operators. These files contain cards for each street in the L.C.C. area, and enable the operator to discover quickly the district in which the Brigade's assistance will be needed. The card indicates which station to mobilize and predetermines, in sequence, the nearest 10 stations to be used if reinforcements are required for a large fire. Other information is also given concerning the appliances which will be sent to answer a call, and the location of the nearest "special" appliances (crash tenders, etc.) to the scene of an incident.

The salutation used by the Fire Brigade operator is simply "London Fire Brigade". The switchboard operator obtains from the caller the address at which assistance is required, and unless the address is obvious—for example "Selfridges, Oxford Street"—will ask for the name of the road to be spelled and the nearest main road to be given. Where the call is in a very long main road he will ask for the nearest side turning to fix the position of the call. The index operator, having heard the repetition of the address, rapidly turns up the respective card in the revolving index file and instructs the operator which stations and which appliances to order. The number and types

of appliances are predetermined according to the risk, height of buildings, etc., in the particular street. This information is given in the form of a letter indicating the Division and a number indicating the station within the Division. Thus the first attendance for Pinchin Street in the borough of Stepney is three appliances from B30 Station (Whitechapel) and one appliance from B31 Station (Shadwell).

Each of the 58 land stations controlled by Brigade Headquarters is connected to the fire board by a both-way private wire, having a lamp, jack and associated press button, placed directly in front of the Brigade Headquarters' operator above the lines from the Post Office exchanges already mentioned. The fire board operator calls the required station merely by inserting one of his calling plugs; at the same time he can alert the watch at the station by depressing the button, which automatically sounds the station's alarm bells. The call is answered by the dutyman at the station to obtain particulars of the location and the nature of the emergency and to indicate, by lamp signals controlled by keys from his own position, the appliances required to set out. The dutyman gives the address of the call, written on a slip, to the officer in charge of each appliance. If the call is on a matter of administration the Headquarter's operator does not press the alarm button.

The Brigade's vehicles turn out on average 68 times daily as a result of approximately 80 calls. It will be appreciated that several calls may be received for one incident.

The control of the largest Fire Brigade in the country calls for a considerable amount of administration, and to handle administrative telephone calls the London County Council has, in addition to the fire board already described, a suite

The Fireboat "Massey Shaw"

of three PMBX1A positions, with exchange lines on RELiance Exchange which form a tertiary route for telephone exchange operators in case of need. For administrative purposes these switchboards are connected by tie lines to the "fire switchboards". A fire call arising for a particular station obviously takes precedence over any administration call that may be in progress.

Other circuits provided to deal with any emergencies which may arise are private wires from the fire board to Scotland Yard, the London County Council Ambulance Service Headquarters, London Transport Executive—who control all London's buses and underground railways—the Salvage Corps and the City of London Police Headquarters.

All telephone lines and private wires rented by the L.C.C. for fire brigade purposes are afforded emergency fault treatment at all times and, as a further precaution, the Brigade Control Room, containing the fire board and administration board, is in protected accommodation.

Radio Room

Brigade Control also includes a radio room, from which contact is maintained with all appliances which are on the move away from their home station. Messages from the scene of the fire, including requests for reinforcements, are dealt with in this way. The radio transmitters are at Hampstead in north London, with relief transmitters at Shooters Hill, near Woolwich, and Fire Brigade Headquarters itself. These transmitters are linked by Post Office maintained landlines to Brigade Headquarters, and use Very High Frequency (VHF) radiotelephony, amplitude modulated. All pump-escapes, pumps, fireboats and senior officers' cars and special appliances are radio equipped. A duplex system is used, separate frequencies being employed for transmission and reception. The radio control room maintains a continuous listening watch on the receiving frequency. On receipt of a call from a mobile station, the transmitter automatically transmits a "busy" signal to prevent other mobile stations from interrupting. The only occasion on which a mobile transmitter may interrupt when the "busy" signal is being transmitted is when an urgent call for additional assistance at the scene of a fire is required, when the message is prefixed by the word "priority".

Much thought has been given to the layout, lighting and equipment of the control room by the L.C.C. and the resulting set-up is regarded as a model of what is required under modern conditions.

To deal with the special problems of ship and waterside fires in the Port of London the Brigade normally has three river stations, one of which is temporarily closed because of manpower shortage. Two fireboats, the *Massey Shaw* and the *James Braidwood* (both named after famous chief officers of the nineteenth century), are on the river from pontoons at Lambeth and Woolwich.

Each river station has its own watch room (on the pontoon) and is linked to the nearest land station by a both-way private wire which can be extended to the fire switchboard at Brigade Headquarters. However, the river stations do not need the same complicated switchboard as at the land stations, since there is no choice of appliances.

Fireboats, like the land station appliances, are provided with both-way radio communication with Brigade Headquarters. In addition, they carry "walkie-talkie" transreceivers over which communications with the Brigade Mobile Control Unit on shore are possible. This Mobile Control attends all major fires and normally controls operations by radio.

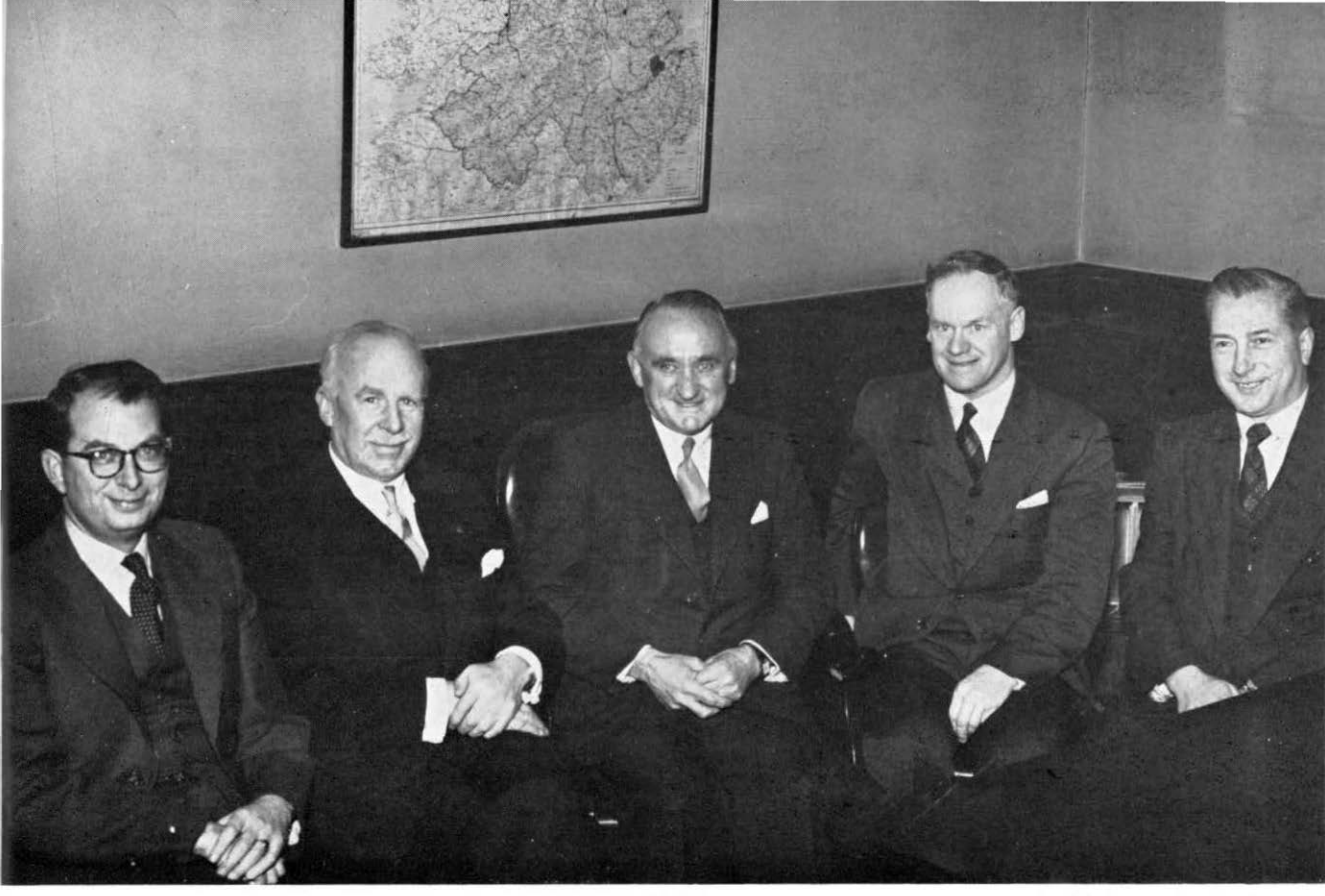
The *Massey Shaw* was commissioned in 1935: tonnage 50½; draught 3 ft. 9 ins., enabling her to navigate the river at any state of tide; beam, 13 ft. 6 ins., enables her to be used in narrow canals. In 1940 she made three trips to Dunkirk, working as a ferry from the beaches to vessels moored at sea. She also brought back a total of 106 soldiers.

RURAL TELEPHONE KIOSKS

The Post Office plans to provide over 420 telephone kiosks during 1958-59 in the rural parts of the United Kingdom at an estimated direct cost of more than £81,000. The sites for these kiosks will be selected in conjunction with the local authorities.

NEW PERTH EXCHANGE

Builders have made a start on the foundations of an automatic exchange for Perth (replacing the present manual) to cost about £400,000 and to be ready, probably, about middle or late 1962. It will be equipped for subscriber trunk dialling.



The Post Office in Northern Ireland

THE ANCIENT NAME OF ULSTER IS COMMONLY applied to the territory administered by the Government of Northern Ireland. Donegal, Monaghan and Cavan—which formed part of the historic province of Ulster—are in the Irish Republic. However, popular usage tends to defy the pedants and in everyday speech Ulster has become synonymous with Northern Ireland.

As a political, administrative and legal unit Northern Ireland is characteristically and clearly distinguishable from the other countries which go to make the United Kingdom of Great Britain and Northern Ireland. The separate identity of Northern Ireland was established in 1921 by the Government of Ireland Act of 1920. Under this Act the legislative power for a wide range of local affairs, including administration of the social services, was devolved to the Government of Northern Ireland. Part of the control of public affairs and public services was, however, retained by the Imperial Parliament at Westminster and included among these reserved services was the Post Office. The inhabitants of Northern Ireland send representatives not only to the Parliament of Northern Ireland, but also to the Imperial Parliament at Westminster.

The existence of an independent Northern Ireland Government functioning at Parliament Buildings, Stormont, calls for the closest collaboration between its various Ministries and the Post Office. The Post Office must examine in advance all Acts and Bills before they are formally passed by the Northern Ireland Government so that any terms or conditions which might affect the Post Office in its day-to-day activities receive early consideration departmentally. In particular, close co-operation with the Ministry of Finance is essential. The Works Division of this Ministry

The Directorate (*left to right*): Mr. G. H. CLEMITSON, Finance Officer; Mr. J. JOHNSTONE, Postmaster Controller; Mr. L. J. TAYLOR, Director; Mr. N. C. C. de JONG, Regional Engineer and Telecommunications Controller; Mr. E. K. MAY, Staff and Buildings Controller.

is responsible in Northern Ireland for those functions which fall to the Ministry of Works in Great Britain.

Northern Ireland has an area of 5,238 square miles. At the time of the 1951 Population Census it had a population of 1,371,000. There was an average population density of 262 per square mile, compared with 755 per square mile in England and Wales and 172 in Scotland. About two-fifths of the total population are in Belfast and the surrounding towns and villages; this emphasizes the part this compact area must play in the social and economic life of the Province.

The industrial structure of Northern Ireland has three outstanding features. These are: first, the predominance of agriculture, which is by far the biggest single industry, whether judged by the number of persons gainfully occupied or by the value of net output; secondly, the almost complete lack of natural industries apart from agriculture; and, thirdly, the high degree of concentration of industrial workers in a very few industries. It is estimated that one-sixth of the number of persons gainfully occupied are engaged in agriculture. The predominant form of agricultural organization is the small farm worked mainly by the farmer and his family and calling on outside labour only at busy seasons of the year.

One of the pre-war poster series described Northern Ireland as an outpost of Great Britain, and certainly Belfast is, in many respects, an industrial outpost in an Irish agricultural setting. In Belfast and the immediate neighbourhood lie the shipyards and linen mills, the ropeworks, the tobacco factories, light engineering firms and the like. Because of the lack of domestic sources of coal and of the principal minerals required in the basic heavy industries, it follows that industrial development is directed mainly towards industries wherein the material content is low and the labour content is high.

From Strabane in the west to Newtownards in the east are scattered many small towns which supply the farmers' needs and form collecting points for their dairy produce, potatoes and cattle *en route* to Belfast and the cities across the water.

The Northern Ireland Directorate is unusual in that it has only one telephone area. There are nearly 200 exchanges, but the majority of these are small; only 22 are still manual. There are nearly 70,000 exchange connexions, and of these about 65 per cent. are served by exchanges parented on Belfast. Chargeable trunk calls total about 6,500,000 per year. There are 50 telex subscribers in service in Northern Ireland. The postal needs of the territory are catered for by about 750 post offices.

Although not the smallest administrative area geographically, the fact that it sustains only about 2.4 per cent. of the population of the United Kingdom does reflect its relative size in terms of traffic. At the higher Directorate levels the normal Chief Regional Engineer and Telecommunications Controller posts are merged into one, titled "Regional Engineer and Telecommunications Controller"; the Head Postmastership of Belfast and the Postal Controller posts are held by one officer, styled "Postmaster Controller". The Director, like those of Scotland and Wales, is a member of the Post Office Board.

Men and Women Can do More than Automation

John Diebold, described as the "American Elder Statesman of automation", told the British Institute of Management:—

"Month in, month out the American business man reads that the ultimate in automation is the computer.

"This machine, he is told, is the answer to the personnel manager's prayer because it never makes a mistake or gets a headache in the middle of the afternoon or leaves the department to get married.

"A computer by itself is not automation, however big and fancy and expensive it may be.

"Anything machines can do to relieve the shortage of clerks is trivial to what they could do to improve the way a business runs".

★ ★ ★

Frequency Allocation Committee.—Sir Lawrence Bragg, O.B.E., M.C., F.R.S., is Chairman of the new Committee which is to advise the Postmaster General on broad aspects of frequency allocation. The PMG has also appointed to the Committee members representative of the radio industry, users' organizations, and Government Departments.

The Committee should enable both users and industry to be associated more closely with frequency planning. It should also be of assistance to the radio industry in its development work.

57% Capital Needs from Own Resources

P.M.G. Reviews Telephone Services

MOVING THE SECOND READING OF THE POST Office and Telegraph (Money) Bill on December 5, the Postmaster General said that the Post Office would be spending about £180 million on capital expenditure during the next two years. Of that, £105 million will be by way of depreciation and ploughed back into the business. So 57 per cent. of the capital requirement would be found from internal resources and the £75 million balance borrowed from the Treasury by way of the Bill.

Of the £180 million, £167 million would go to telecommunications, £6 million to telegraphs, mostly telex, and £7 million to the postal services.

Reviewing the telephone service the Postmaster General continued:—

Proper Use of Science

The amount of money that we in the Post Office have for telephone investment has never been enough in the past, is not enough now and never will be enough in the future. That applies to almost every expanding business. Debates in the House have raged round that point for many years, but I suggest that we have missed two things. The first is whether we are getting value for money. It is no good deciding to give so many millions of pounds to a business unless we know that that business is spending it wisely. I wonder whether we have had purposeful direction of pure science and shrewd timing of applied science in the past. We should look at the long-term programme very carefully, therefore, and that is what I propose to do today.

Secondly, when we have an asset, do we use it to the maximum of its possibilities? Quite frankly, we have not done so in the past. For example, in the White Paper "Full Automation of the Telephone System", which was introduced on November 13, we started a new set of telephone charges from January 1 next. I tried to explain to the House how we arrived at the method of making the charges cheaper. There were two stages. The first stage was the stage which is to start on January 1 and the second stage was the subscriber trunk dialling, which is to start next year. I do not think that the House quite appreciated how the first stage came about. Therefore, I will try to explain again.

At present, if a person dials from Sloane, or Mansion House, or Holborn he is allowed to dial to a very small area. The dialling is done automatically and the charge is registered on a meter which is very like a speedometer. If a person wants to dial to Watford in the north, Croydon in the south, or Slough in the west the machine is capable of dialling those numbers but, because of the complicated charging system, the Post Office has insisted that the subscriber dials the operator first. The operator then gets the call, and that is expensive. Secondly, the operator records the call on a slip of paper and times it. That is expensive. Thirdly, clerks have to sort out these calls afterwards, bill them and charge them to several million accounts. There are 150 million slips of paper every year, which make a formidable task.

Fourthly, and even more important, the Post Office has to keep people on duty for 24 hours a day just in case a person makes a call to one of these places. It is the most wasteful feature of all, particularly as machinery already installed can actually dial the required number automatically. Therefore, by an alteration of the charging system we have done a great deal to simplify matters.

Sevenfold Extension

At present, one can dial direct at Keighley to six exchanges. As from January 1, with existing equipment and without one pennyworth of additional capital, people will be able to dial to 28 exchanges, or almost five times as many. At present, one can dial to 7,999 subscribers, of whom I hope the hon. Member for Keighley (Mr. C. R. Hobson) is one, but after January 1, one can dial to 59,902, which is more than seven times as many, with the existing equipment.

Another specific example is that from Keighley, in Yorkshire, to Burnley, in Lancashire it will be possible to dial direct after January 1 for 3d. Hitherto, it has been done manually for 1s. I claim that that shows how we have not been using our existing methods to the full.

All this means, from the point of view of the Post Office, that in the year beginning January 1, 1958, we shall save £2 million in wages and salaries. Secondly, and even more important, is the fact that £10 million worth of equipment—and that is a very conservative estimate—would have been scrapped under the old system, but now can be used for many years. That gives the Post Office a great deal more money to play with in other directions. Therefore, I maintain that value for money in what we spend now and the maximum use of our existing assets is as important as the capital sum that one manages to squeeze out of a reluctant Chancellor of the Exchequer, to whatever side of the House he belongs.

Cables are Biggest Single Asset

I have found that in business the first question asked is, "Where is your largest asset and what use are you making of it?" I found, in the Post Office, something which, frankly, surprised me. It was that the biggest single asset that the Post Office possesses is the cables which lie buried under the streets. The Post Office has £150 million worth of money buried under the streets, and it is adding to it at the rate of £11 million a year. The first question to be asked is, "Can we make more use of that equipment, in the same way as we have already made more use of the exchange equipment?"

What I found on the question of these underground cables was most illuminating. With electricity, if there is a main trunk running through the street each house can tap off that main trunk quite easily. The same applies to gas mains, but that does not apply to telephone cables. Every telephone subscriber must have two wires which run direct to the exchange from his house. They are his exclusively, whether he is two miles or three miles away, or just one mile away. The House will see how expensive that can be.

The scientists have not yet found a way of doing with telephones what is done with gas and electricity. Therefore, one comes to this: how can we use to the best advantage the existing wires which are buried under the street? Let us assume that at present there are 20 subscribers in a street two miles from the telephone exchange. They have 20 pairs of wires, a pair each, going to the exchange two miles away and back again.

I wonder whether we could bring a tiny bit of the exchange to the end of that street, connect the subscribers to that particular part and then run four pairs of wires, instead of 20, to the exchange, thus saving 16 pairs of wires for the most part of two miles? If we did that, we would use to the maximum capacity the wires we buried. That is one of the moves that we are now tackling to bring this tiny bit of equipment—it is called the automatic line concentrator—into operation, and we are intending to press on with that just as fast as we possibly can.

I come to another point. I wonder whether the House knows how much it costs the Post Office to connect a telephone subscriber. The following figures are very rough, but they will at least give the House an idea of the magnitude of the cost. The telephone itself costs £9, the equipment at the exchange costs £16, but the wires under the road cost £85. That is a total of £110. It is, therefore, quite clear that any saving that can be made could best be made on the wires.

Thinner Wires

We have found in the Post Office that it would be possible to use thinner wires and lose efficiency but, at the same time, get a better telephone which is more efficient and so make up for the loss of the signal in the wire itself. As we can make a better telephone for the same cost as the existing one, we shall save a considerable amount in the cost of wire.

We shall save not only on the wire itself, but on the method of laying that wire. We have, under the roads, ducts which now house a certain number of thick wires. If we have thinner wires we can get far more of them into an existing duct. One of the most expensive operations in the world is civil engineering, as I well know, as one who has had something to do with civil engineering. I am doing great injury to the private enterprise interests I represent, because we shall not tear up those metalled roads and put in bigger ducts, but will put in thinner wires and get half as many again into the existing ducts. That will save an immense amount of money.

All-electronic System

Now I should like to look at the exchange itself. In all business affairs a person wants to keep in his mind what is his ultimate aim. He may never achieve it, but he wants to know what it is so that all the intermediate steps will be in that direction. The aim with the exchange equipment is that we should have an all-electronic system, suitable not only for tiny laboratory experiments but such as will withstand the rigours of day-to-day wear in the public service.

In 1960, at Highgate Woods, we hope to have the first all-electronic exchange in operation.

We want an all-electronic exchange, first, because it is cheaper to produce. Electronic equipment, unlike mechanical equipment, is not precision made. Secondly, it is cheaper to maintain which, as most hon. Members will know, is of prime importance. Then, it takes slightly less room to house and is lighter which means that the foundations—and again I am taking away from the civil engineering industry—will also be lighter. Finally, it is more adaptable to the automatic line concentrator that I have already mentioned. That is what we aim to get.

How has this exchange equipment been achieved? It has been achieved by what is known as the Joint Electronic Research Committee. J for joint, E for electronic, R for research and C for committee. It is known as J.E.R.C. The Joint Electronic Research Committee is a partnership between the Post Office and private enterprise, with the Post Office in the chair. We have pooled ideas, and have allocated specific tasks, some to the Post Office and some to various private firms. We have avoided duplication and have concentrated our efforts.

Coaxial Cables

The Dollis Hill research engineers have done a fine job of work, in co-operation with private enterprise—which is what I think should happen. I do not see why we should always have competition between a nationalized industry and private enterprise when, in point of fact, they can be complementary and not competitive.

I come to a third point about telephones, which is better known than the two I have already mentioned but, again, looks into the future rather than mirrors the past. It has been spectacular, and the dividends have been greater, especially for the trunk calls. I refer to the coaxial cable, introduced long before my time. It has immense possibilities. Before the war there were two pairs of wires for every conversation on trunks, and one pair for local conversations. But a single coaxial cable can now actually carry 960 conversations at the same time, by using different frequencies.

The problem we shall face in the future when subscriber trunk dialling comes in will be this. We shall want more trunk lines than we now have, and we shall want them because, next year, it will be possible to 'phone from Bristol to Aberdeen—a short conversation—for a few pence—about 5d. or 6d. Therefore, when we let the public loose on dialling on trunks as they now dial for local calls we shall want more lines, but the question is, "What shall we do?"

There are two things that we can do. The first is to put in another duct and another coaxial cable. An alternative is to make better use of the existing coaxial cable, which, as I say, with repeaters at every six miles, conveys 960 conversations. If, instead of laying another cable, we put in an extra repeater—that is, a repeater every three miles—one of two things happens. First, we can double the number of conversations from 960 to 1,920, or we can have the existing 960 conversations plus a television channel.

I do not know whether hon. Members quite realise that television is not just as simple as relaying from a transmitter to a receiver. The Post Office is called upon to take very good programmes and to give good definition from Manchester and Birmingham to London, from the studios to the transmitter, and so on. What we really want is to get interchangeability, on the lines we have, between telephone calls and T.V. and sound broadcasting.

Best Network in Europe

By the use of these repeaters we shall double the capacity of the existing investment buried under the ground, instead of putting more investment there. We have the best network of coaxial cables in Europe, and I hope that when subscriber trunk dialling starts we shall ultimately save £15 million a year by getting the subscriber to dial for himself, instead of having it done through an operator. The ultimate aim of the Post Office should be defined, because we ought to know which way we are going with telephones.

I think we should arrive at the position where anyone anywhere can pick up a telephone and speak to anyone anywhere else, subject to three conditions. He should be able to do it quickly, clearly and at reasonable cost. We can do that only if we have a long-term plan clearly defined, if we sweat the equipment and not the men, and if we make decisions now to stand for a long time ahead.

As hon. Members will see if they have studied the recent White Paper carefully, decisions have now been taken on policy for the next decade. We have settled group charging, which starts on January 1, which will alter the whole telephone system. Dialled trunk calls will start next year from Bristol and will spread rapidly afterwards. For the next ten years the way of telephone policy is charted. Provided

that we work hard enough, we shall have a telephone system to be proud of; one which will give us extremely good service at reasonable cost.

I want to say something about telephone exchange equipment. This is what happens now. The Post Office erects a building at Bournemouth as an exchange building to last for 20 years and cover all the requirements for that period and then install equipment to last for five years. Much of the building is wasted completely as a capital investment because it will not be used for 20 years. There will be no revenue from it and, what is more, there will be the expenditure of maintenance, and so on.

I want to try to get 2,000 or 3,000 lines of exchange equipment completed, together with the building, and erect it so that it can be extended by units. We require standardization in building while, at the same time, paying due regard to aesthetics. Standardization and mechanization do not necessarily mean ugly buildings, although people may think they do. Take letter boxes for example, for which we have now decided on a standard pattern with the right type of aperture, and so on. The Council of Industrial Design, for which I have a great regard, has helped. I am grateful to my hon. Friend the Member for Cheadle (Mr. Shepherd) for persuading me to consult the Council.

I hope to do something about telephone kiosks. The present cast iron kiosk was first constructed in 1920 to a design by Giles Scott. I think that the idea was absolutely brilliant at the time, but during the intervening 30 years we have found new materials, which would enable us to construct the thing differently; and it is the structure which decides the line, the aesthetic line, which can be adopted. With the Council for Industrial Design and the Royal Fine Art Commission, we have decided on three designers who will submit designs for a new type of kiosk. We will erect a number of samples and ask people what they think of them. If they do not like them, we will not have them; if they are good, we will. I cannot say more. The three people who are submitting designs are Misha Black, Neville Conder and Jack Howe, all eminent in their respective spheres. This is the first time it has been announced.

The Postmaster General added that he had appointed a committee, with Sir Leonard Sinclair, Chairman of Esso, as Chairman, "to advise him" on the future place of the inland public telegraph service as part of the communication facilities of the United Kingdom.

Telecommunications Statistics

	Quarter ended 30th September, 1957	*Quarter ended 30th June, 1957*	*Quarter ended 30th September, 1956*
Telegraph Service			
Inland telegrams (excluding Press and Railway Pass)	4,118,000	3,765,000	4,630,000
Greetings telegrams	892,000	814,000	1,011,000
Telephone Service			
Gross demand	76,379	104,594	89,711
Connexions supplied	84,309	96,938	92,029
Outstanding applications	209,903	238,548	296,711
Total working connexions	4,518,815	4,521,361	4,357,610
Shared service connexions	1,189,344	1,201,677	1,135,390
Total inland trunk calls	86,262,000	82,887,000	82,733,000
Cheap rate trunk calls...	20,961,000	19,349,000	21,460,000
Telex Service			
Total working lines	3,962	3,748	3,066
Total inland calls	662,000	637,000	493,000
Total overseas calls	401,000	371,000	314,000
Staff			
Telegraphists (including staff employed on Telex)...	5,925	5,959	6,363
Telephonists	45,482	46,168	48,523
Engineering workmen...	64,403	63,774	63,779

OUR CONTRIBUTORS

R. F. BRADBURN ("VI British Empire and Commonwealth Games, 1958") is Senior Assistant Telecommunications Controller and Regional Representative for the *Journal* in Wales and Border Counties. Joining the Post Office as Assistant Traffic Superintendent in 1926, after service in Edinburgh and West Yorkshire he transferred to North Eastern Regional H.Q. soon after it was opened. Subsequently he was promoted to Traffic Superintendent, Class II, Bristol, Assistant Controller of Telecommunications, Class II, South Western Region and Class I, North Eastern Region. He has been actively associated with the *Journal* for most of the time since its inception and has contributed previously. He is Chairman of the Empire Games Communications Committee, and a member of the main Executive and Organizing Committees.

C. T. BROWN ("Lines for the London Fire Brigade") is a Telecommunications Traffic Superintendent in L.T.R., South East Area. He joined the Post Office as a Youth-in-Training in 1936, and from 1942 to 1946 served with the Royal Signals as a Line Mechanic Instructor. On demobilization he continued in this capacity at the Research Station, Dollis Hill, until 1949, when he became an A.T.S. at L.T.R. Testing Section, traffic testing new automatic exchanges and extensions to existing ones. At present he is Service Superintendent for Brixton, Macaulay, Reliance and Rodney Exchanges.

FRANK COX (joint author, "Revising the Exchange Charging Records") began his career in the Post Office as a draughtsman at Newcastle upon Tyne. In 1939 he went to the Scotland West Telephone Manager's Office at Glasgow as an Assistant Traffic Superintendent, and was later employed at Middlesbrough. He was promoted in 1948 to Assistant Inspector of Telephone and Telegraph Traffic at Headquarters and since 1955 has been employed in the Organization and Methods Division of the Inland Telecommunications Department.

F. W. H. CREWE ("Telling the Subscriber") is an Executive Officer in the Finance Branch of London Telecommunications Region. Entering the Post Office in 1936 as a Boy Messenger at the Eastern District Office, London Postal Region, he went to the Central Telegraph Office in 1939 as a Telegraphist and was regraded Postal and Telegraph Officer in 1946. Appointed Clerical Officer in 1947, he was transferred first to City Area and then to Telephone Branch, R.H.Q. Promoted Executive Officer in 1953 in Telephone Branch and transferred to Finance Branch in October, 1956.

F. W. GILBY ("Telecommunications Network for London Transport") is the Senior Telecommunications Superintendent on the P.B.X. (planning, equipment and lines) Traffic Section in the Telephone Manager's Office, Centre Area, London Telecommunications Region. Entering the Engineering Department as a Probationary Inspector at Coventry in 1925, he was later transferred to the Engineer-in-Chief's Office. In 1931 he was appointed Assistant Superintendent of Traffic, Class II, in L.T.R. During the war he was loaned to Coventry but returned to London in 1945 on promotion to Traffic Superintendent, Class II.

A. E. HARVEY (joint author, "Revising the Exchange Charging Records") has been in the Inland Telecommunications Department, Operations Branch, since 1954. He entered the Post Office in 1937 as an Assistant Traffic Superintendent in the Western District. From 1939 to 1946 he served with the Royal Signals in North Africa, Italy and the Middle East. Returning in 1946 to the Plymouth Area, he joined Post Office Headquarters in 1950 as a Senior Telecommunications Superintendent in the Overseas Telecommunications Department and was transferred to the External Telecommunications Executive on its formation.

H. A. LONGLEY ("Simplified Charges") is a Principal in the Telephone Mechanization Branch of the Inland Telecommunications Department, having previously spent some years in the Subscribers' Services Branch in charge of the Public Services Division. In December, 1955, he visited the U.S.A. for the Post Office to study American practice in respect of telephone subscribers' apparatus, including the American authorities' attitude to attachments. He entered the Post Office Engineering Department in 1924 and the London Traffic grades in 1929. He was seconded in 1932 to the Government of Malta to assist with the modernization of the telephone service on the island. He joined Headquarters in 1942 at the time of reorganization of the Telephone Branch, and became Principal in 1950.

A. T. STOKOE ("Organization and Method in Cable & Wireless Ltd.") is the Company's Deputy Staff Manager and Chief Organization and Methods Officer. He joined Cable & Wireless Ltd. in 1920, being trained at Hampstead Training School. During his overseas career he served at Malta, Alexandria, Suez and Ascension Island and on the west coast of Africa. Between 1936 and 1947 he was successively Assistant Manager (Personnel), Superviser and Traffic Controller in London Station. He joined the Head Office Staff Department in 1947 as Assistant Staff Manager, becoming Deputy Staff Manager in 1952 after two years in the Establishment and Personnel departments of Post Office Headquarters. He has been specially interested in work study for many years.

New Lightweight Telephone Cable Being Tested

H.M.T.S. *Monarch* left London on January 28 for laying trials of the new lightweight telephone cable developed by the Post Office Research Station to be used in the new United Kingdom–Canada link to be laid in 1961.

The trials were to be carried out for about four weeks in depths of about 2,700 fathoms in the North Atlantic.

The new cable was briefly described (and illustrated) on page 16 of our Autumn issue. *Monarch* will lay the line on behalf of Cable & Wireless Ltd. and the Canadian Overseas Telecommunications Corporation.

Mobile Call Office Proved Its Worth at Lewisham

The Mobile Call Office Unit, designed after the Harrow train disaster in October, 1952, had shown the need for mobile telephone services in emergencies, proved its value after the train collision at Lewisham on December 4 last. The Unit was described in the August, 1955, *Journal*.

First news of the Lewisham disaster came at about 7 o'clock in the evening, over B.B.C. television. No details were given. About 20 minutes later the supervisors of telephone exchanges in London Telecommunications Region, South East Area, began to ring the Chief Traffic Superintendent to say that the exchanges were being swamped with calls arising from the accident. The C.T.S., trying to ascertain the seriousness of the crash, rang Scotland Yard, who arranged for the local police to supply the information direct.

A little later the police reported that the accident was very serious, and the Chief Traffic Superintendent, still receiving reports of exceptionally heavy telephone traffic, called out the Unit after consulting the Telephone Manager.

The Unit is stationed at Watford. Unfortunately, the journey to Lewisham was delayed, because the usual driver could not be contacted and the relief driver, who lives at Whetstone, had to be called out.

The Unit left Watford for Lewisham soon after 11 o'clock. To make matters worse, there was a dense fog, but a 10-cwt. Morris van, which has much better vision, piloted it to Lewisham. There was considerable congestion at the scene of the accident because of the larger number of ambulances, fire engines, breakdown tenders and so on, but by about two o'clock in the morning the Unit was finally in position with six lines working, which the Assistant Commissioner of Police considered would be sufficient.

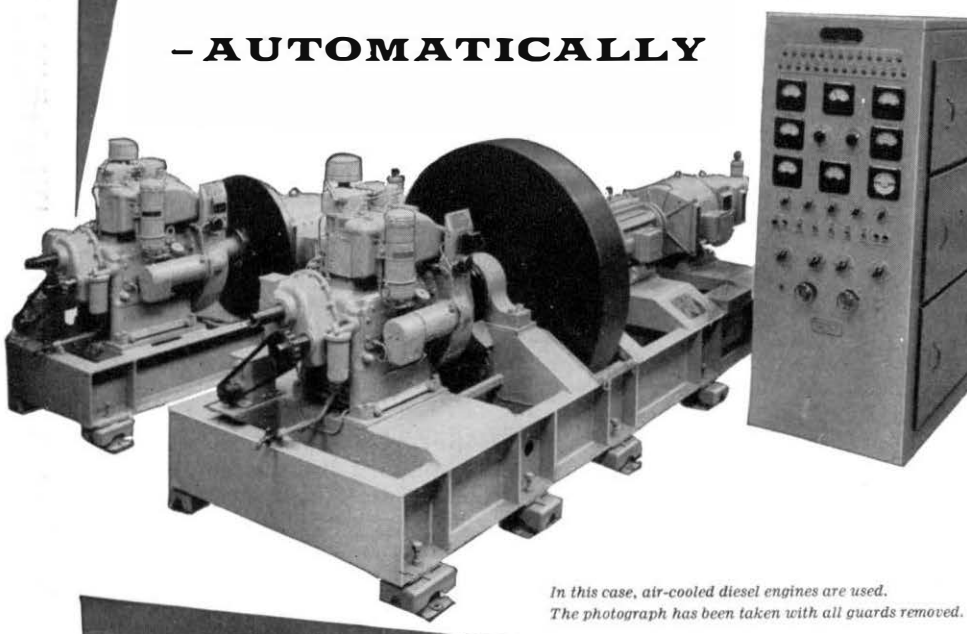
In the meantime, the police cordon was extended and this placed the Call Office vehicle out-of-bounds to the general public. It, therefore, became a police control point, and was used only by medical, police, Civil Defence and railway breakdown officials. For this reason the lines were joined up as ordinary exchange lines, instead of the usual multi-coin box lines, which work only with the insertion of coins.

The Unit on site proved to be of invaluable assistance. It remained in position until 3 o'clock in the afternoon of December 6. Later the Regional Director received a letter of thanks and appreciation to all concerned from the Metropolitan Police.

In the August, 1955 article, we wrote "Within a few seconds of the Harrow railway disaster . . . the telephone services in the neighbourhood were congested with calls for doctors, medical supplies, ambulances and hospitals, and by control calls from the railway people and the police. The Post Office then realized that a Mobile Unit, containing several call boxes which could be rushed to such scenes and plugged in, would be immensely valuable".

Lewisham, 1957, proved the wisdom of the decision to be prepared.

Power without fail
– AUTOMATICALLY



In this case, air-cooled diesel engines are used. The photograph has been taken with all guards removed.

This mains standby plant is one of seventeen manufactured for Standard Telephones and Cables Ltd. and is for installation overseas.
It comprises two fully automatic units controlled by a single switchgear cubicle. One unit is a Regenerative Flywheel 'No break' set, the other a 'Normally Stationary' set. Dual standby is provided because of site conditions and the vital need for continuity of supply.

This is what happens

1. *Mains within limits.* The three-phase electric motor drives both flywheel and alternator of the 'No-Break' set (foreground), the alternator supplying regulated single phase current to the telecommunications equipment.
2. *Mains outside limits.* The electric motor is disconnected, the diesel engine starts automatically and when up to speed is connected to the alternator by the magnetic clutch. During this cycle, stored energy in the flywheel drives the alternator, thus maintaining a continuous power supply within the closest limits of frequency and voltage.
3. *Mains restored within limits.* The electric motor is automatically reconnected and resumes the drive, the magnetic clutch opens and the diesel engine shuts down.
4. Should the 'No-Break' set develop a fault, the 'Normally Stationary' set (background, left) starts and takes over supply to the equipment. The sets are designed to restrict the supply interruption to the minimum possible under the circumstances of the fault. Manual paralleling of the two sets is provided for maintenance periods.

CONTROL. Automatic controls and indicators are provided to ensure reliable operation in accordance with designed limits.

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Telecommunications Staff Honoured

In the New Year Honours List, Mr. A. Kemp, Assistant Secretary, Inland Telecommunications Department, who has been a member of the Editorial Board of the *Journal* since 1949, became a C.B.E.; Mr. H. E. Chapman, Telegraph Manager, External Telecommunications Executive and Mr. W. T. J. Donovan, Telephone Manager, Long Distance Area, London Telecommunications Region, received the O.B.E., while Mr. L. W. Sharp, Assistant Engineer, Reading, and Mr. F. C. Wright, Assistant Engineer, Liverpool, became Members of the Order of the British Empire.

Six B.E.M's

The British Empire Medal was awarded to Mr. H. F. Collins, Technical Officer, Reading; Miss G. A. Dodge, Supervisor (Telephones), Welwyn Garden; Miss I. Fox, Chief Supervisor (Telephones), Tipton; Mr. C. Keogh, Chief Supervisor (Telephones), Leeds; Mr. M. M. Lowe, Technical Officer, Edinburgh; and Mr. G. J. Plant, Supervisor (Telephones), Pinner.

Twenty-five Years.—The Silver Jubilee issue of the *Quarterly Journal* of London Centre, Associate Section, Institution of Post Office Electrical Engineers, appeared in a red cover, printed silver and black. Mr. C. W. Brown, first President, 1932-1936 contributed his views on the Section's progress, but the major part of the 52-page issue consisted of technical articles on current developments and practices, some of which—the transistor and microwave radio, for example—were hardly thought of when the Section was launched 25 years ago.

★ ★ ★

Chromatics in Kiosk.—A London man has bought a surplus telephone kiosk from the Post Office, to practise his accordion in without annoying the tenants in the flats of which he is caretaker.

★ ★ ★

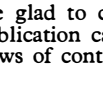
The Editor regrets that on page 22 of the Autumn issue, the British-type repeaters in the Newfoundland-Nova Scotia telephone cable were described as flexible. They are, of course, rigid as in the first transatlantic cable.

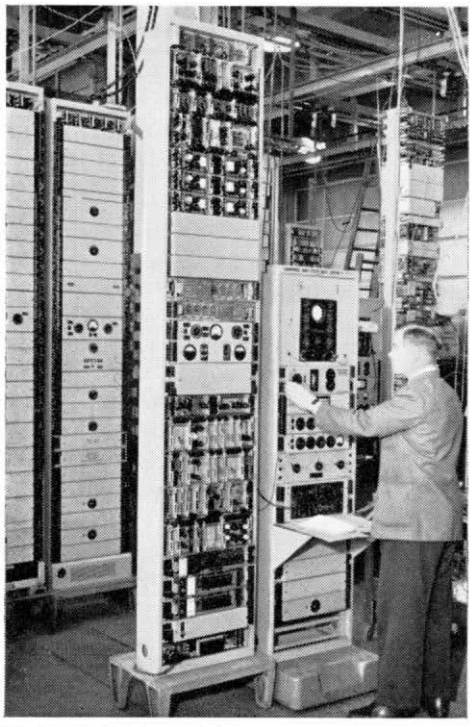
Publication and Price. This *Journal* is published in November, February, May and August. Price 1/6. The annual postal subscription rate is 6/6 post free to any address at home or overseas.

Advertisements. No official responsibility is accepted for any of the private or trade advertisements included in this publication. Communications, advertisement copy, etc., should be addressed to Sawell & Sons, Ltd., 4 Ludgate Circus, London, E.C.4 (Telephone: FLEet Street 4353).

Contributions. The Editorial Board will be glad to consider articles of general interest within the telecommunication 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 Department.

Communications. Communications should be addressed to the Editor, Post Office Telecommunications Journal, Public Relations Department, Headquarters G.P.O., London, E.C.1. Telephone: HEAdquarters 4345. Remittances should be made payable to "The Postmaster General" and should be crossed "& Co."





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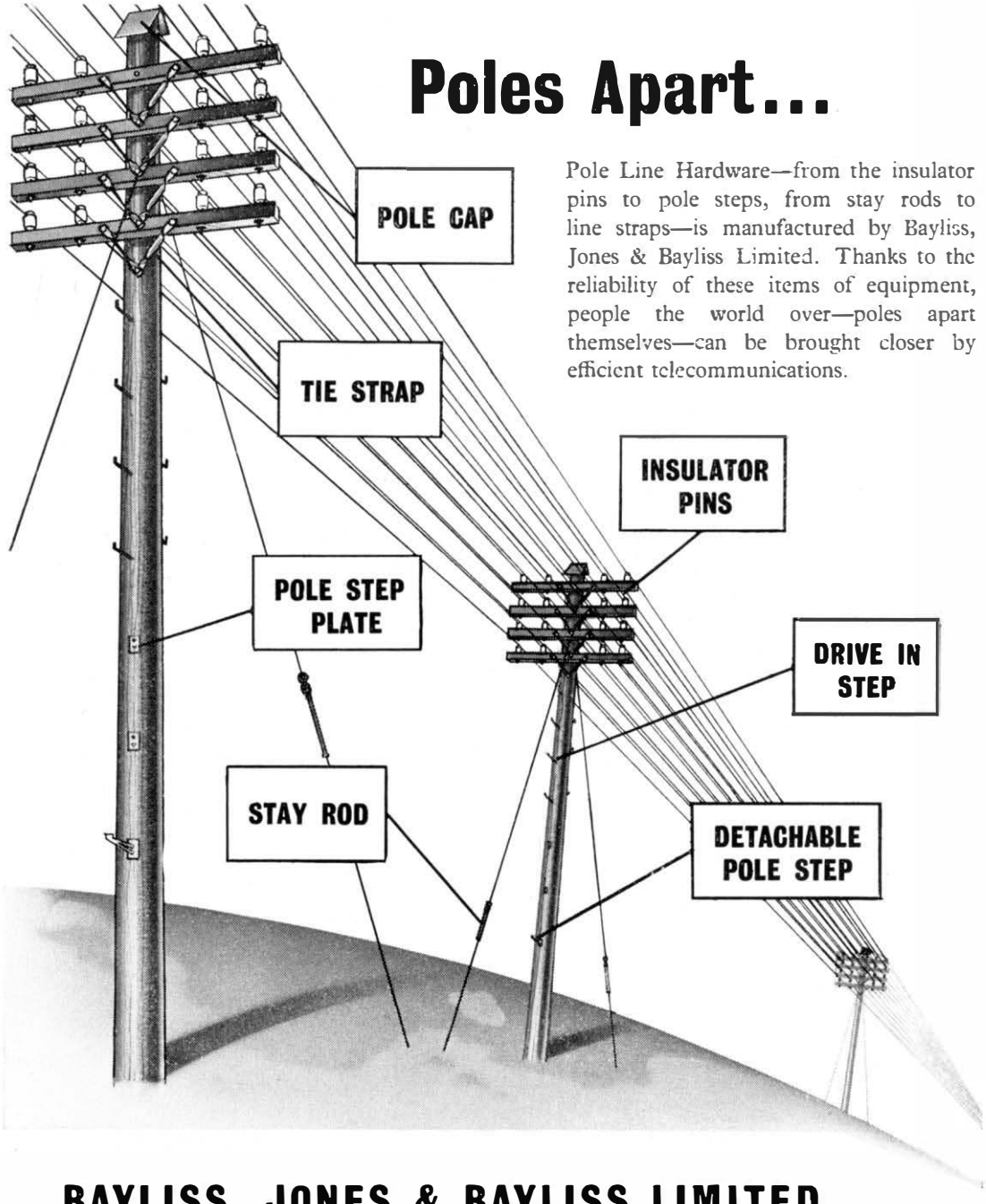

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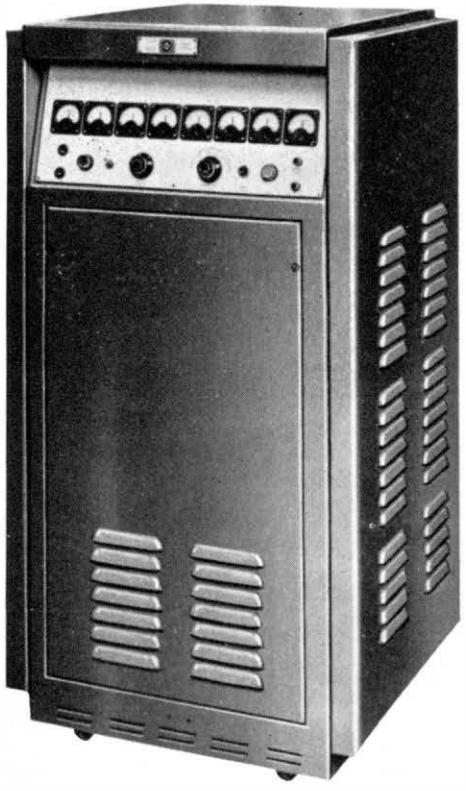

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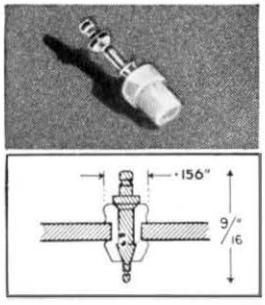

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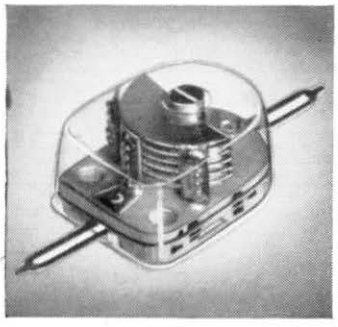

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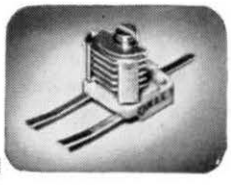

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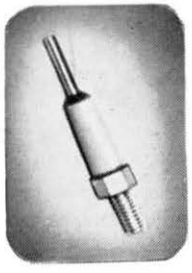
Type approved to RCL 141.
Base ¾ in. square with fixing holes for 10 B.A. ¾ in. apart.
Capacities up to 13 pF in. ·007 in. gap and 8 pF in. ·011 in. gap.
Acetate dust cover optional.

All Components are illustrated approximately actual size.



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