Post Office Telecommunications Journal

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Contents

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Have You Anything to Declare?

THE PRIMARY PURPOSE OF THIS "JOURNAL"—"to promote and extend knowledge of the operation and management of telecommunications"— might be expressed in other terms: to give to all those who are interested in telecommunications, particularly those in the Post Office, a quarterly "picture" of what is going on in this fascinating field and what may be in prospect.

The field of telecommunications is wide and although the people engaged in it know a good deal about their own particular job they are always interested to hear about what is being done by other people. Our articles are written, in the main, by our readers to put other readers "in the picture".

We are sure that many readers who have not yet contributed an article have something interesting to say about their job or about some new project with which they have been concerned, and that other readers would be interested to hear about it.

For instance, the background of service is always an interesting subject. What brings to light the need for a new telephone exchange? Why and how do we go about the compulsory purchase of sites? How do we provide service for Private Branch Exchanges or television transmission? How do we help architects to plan new buildings so that telephone service may be economically installed?

We are always glad to receive articles from new contributors on these and other subjects.

A peaceful street scene in Kuala Lumpur, which has a population of a quarter of a million and is the capital of the Malay State of Selangor as well as of the Federation of Malaya

Communications in Malaya

G. A. Langley, B.Sc., A.M.I.E.E.,

Telecommunications Department, Malaya

THE FEDERATION OF MALAYA IS SLIGHTLY larger in area than England, and is composed of nine Malay States (Johore, Pahang, Negri Sembilan, Selangor, Perak, Kedah, Perlis, Kelantan and Trengganu) and two British Settlements (Penang and Malacca). Four-fifths of the surface of the country is covered by dense tropical jungle: a range of mountains with peaks rising to 7,000 feet in height runs down the Peninsula like a backbone and the principal cleared areas are between the mountains and the mangrove swamps which lie along the West Coast.

Before the Pacific war, telephone and telegraph services were under the control of the Postmaster General. With the liberation of Malaya from the Japanese in 1945, these services broke away from the Postal Services Department and formed the Telecommunications Department which is now responsible for the public telephone and telegraph systems in the Federation of Malaya and the colony of Singapore except for the local telephone systems in Singapore Island and the adjoining town of Johore Bahru, which are operated by a limited liability company under licences. These licences expire at the end of 1954 and the Johore Bahru system is then to be taken over by the Department whereas the Singapore system is to be run by a telephone board responsible to the Singapore Government. An inventory and valuation of these systems is at present being carried out and information generously made available by the British Post Office concerning the taking over of the National Telephone Company is proving of very great assistance.

The Telecommunications Department is also responsible for all the radio networks of the Federation Police Force, radio services for the Meteorological and Civil Aviation Departments and the signalling and communications equipment of the Malayan Railway system. The submarine cable system is operated by Cable & Wireless Ltd.

The total staff employed by the Department is just over 5,000 of whom, at present, 80 are Europeans. As with all other branches of Government service, the "Malayanization" of senior posts has proceeded rapidly since 1945. Already seven Malayans have returned to duty after completing scholarship courses and qualifying for corporate membership of the Institution of Electrical Engineers. There are twenty-one others at present in Britain on scholarships, either studying in colleges or gaining practical experience by working with the Post Office Engineering Department, or with manufacturing organizations.

The training of junior staff is centred on a residential training school in Kuala Lumpur. The school has hostel accommodation for 100 students and courses are held on such varied topics as teleprinters, radio fault finding, automatic telephony, aerial rigging, carrier and subscribers' installation wiring, in addition to basic courses lasting eighteen months and designed to start youths off on careers in telecommunications as technicians.

The Malayan telephone network has been planned on the same lines as the British system, with zone centres inter-connected by low-loss trunk circuits, group centres and minor and dependent exchanges. V.F. dialling is being installed for use on the main groups of long distance circuits. Most of the smaller exchanges are now automatic: the General Electric Company 25-line units similar to the U.A.X. No. 12 gave yeoman service for many years, but have now largely been replaced by General Electric Company units similar to U.A.X. No. 13 in design, but using pre-2,000 type two-motion switches with 3,000 type relays. The largest exchange in the Federation is in Kuala Lumpur, the Federal capital and capital of the State of Selangor; this is a straightforward non-director automatic exchange with 40 enquiry and trunk positions, and a present capacity (including three satellites) of 6,000 lines.

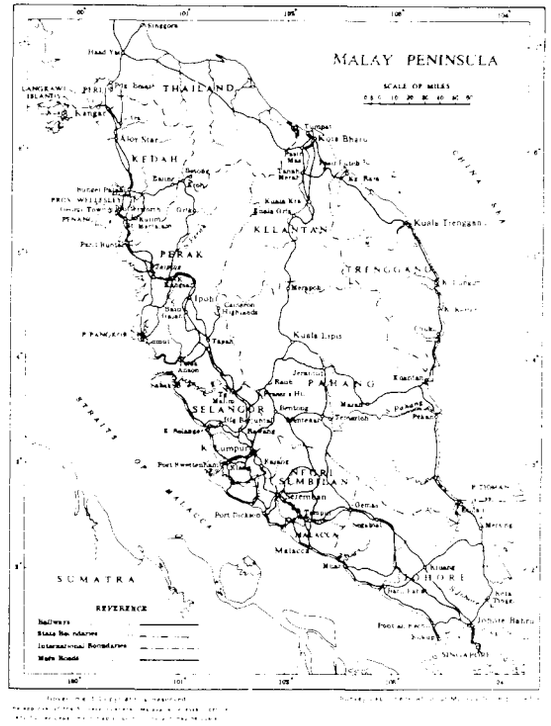
Tropical conditions make the maintenance of communications—especially line communications—one long struggle. Poles are almost all made of iron because no amount of preservative would preserve a wooden pole for more than four or five years; white ants go for wood in a big way and it is not at all uncommon to have to replace planks and floorboards in a house because white ants have somehow got in and eaten away everything except the thin outside layer of paint. It can be very worrying when you find that an ordinary pencil can be jabbed three inches deep into the six-by-six-inch wooden beam which supports your own bedroom roof! In some areas these white ants have been known to eat through the lead sheaths of underground cables, with disastrous effects, and for this reason armoured cables are protected by a layer of brass tape in addition to the normal steel armouring. In the

Trunk switchboard and enquiry positions in Kuala Lumpur. Malay, Chinese, Punjabi, Singalese, Tamil, Fillipino and Eurasian girls work happily together: all can speak two languages fluently and many can manage six!

plains relative humidity is over 90 per cent. most of the time and temperatures rarely go below 70° even at night. Even a drop to 70° is, however, enough to produce heavy condensation and so air-conditioning is standard in all large telephone exchanges, carrier stations, radio maintenance depots and stores. Smaller exchanges are dehumidified only by silica gel units which are reactivated by heating during the technician's maintenance visits.

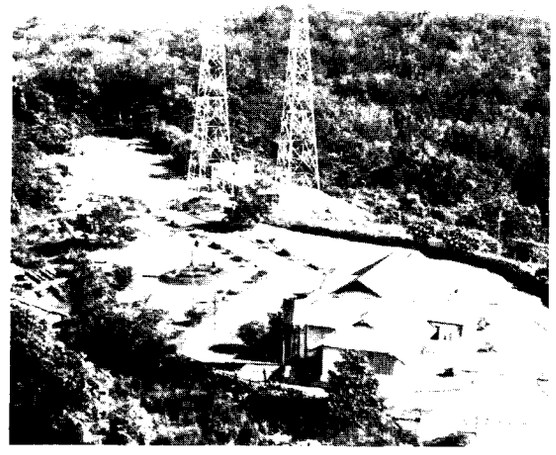
Elephants rather like scratching their backs on iron poles and in some areas uprooted telephone poles used to be quite common. The last reported uprooting was in 1949—a Kuala Lumpur direct exchange line got badly bent when a herd of elephants decided to cross the road less than five miles from the General Post Office. The average Malayan, however, never sees any wild animals apart from those in visiting circuses, and communist terrorists have been the lineman's principal bugbear—there was an average of 108 incidents involving sabotage of telecommunications lines each month in 1951. The steady improvement in the overall emergency situation caused the monthly average to fall to 65 in 1952 and 20 in 1953, so doubtless elephants will soon be making nuisances of themselves again.

Kota Bahru market, Kelantan. The East Coast states are far less developed than those along the West of the Peninsula, but strangely enough the Malay womenfolk in Kelantan not only do the shopping but run the shops themselves, whereas in Selangor and other West Coast states the wives usually stay at home and send their husbands out to do the family shopping



Because of the vulnerability of line plant the Malayan trunk network, which has been mainly 12- and 3-channel carrier circuits on 300 lb. and 200 lb. copper overhead routes is now being changed over to a V.H.F. radio basis. A chain of hill-top V.H.F. stations is already in operation between Singapore and Kuala Lumpur and the extension to Penang is at present being installed. This V.H.F. chain operates in the 160-230 Mc. s. band; Marconi's have provided 10-watt transmitters and receivers with a band width sufficient to support four 12-channel groups on each radio link and Standard Telephones & Cables new equipment practice type carrier equipment is being used for the first time in Malaya.

Each state and settlement in the Federation has its own police V.H.F. radio network with control stations usually attached to combined police-military operations rooms. There are now more than 1,000 outstations, and to give adequate field strength even in remote jungle valleys it has been necessary to build many of the main stations in areas previously unvisited by man. Bulldozers have cut roads through virgin jungle and radio



A repeater station in the V.H.F. radio main trunk scheme being constructed adjacent to a rubber estate manager's bungalow (foreground); protective searchlights shine out into the rubber trees from posts all around the cleared area. This particular station is much closer to civilization than most—over 100 miles of roads with gradients often worse than 1 in 4 have been constructed through the jungle to provide access to other main radio stations

stations have been built on mountain peaks with their own police posts for protection.

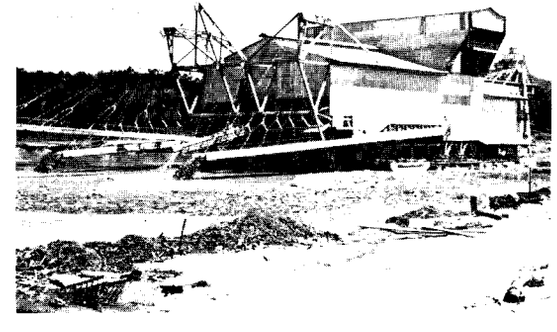
In the west of the Malayan peninsula the maintenance of police radio stations presents no special difficulties; roads are good and travel is easy. In the east coast states, however, most roads are surfaced with laterite—plain red earth to the layman—and vast areas are completely roadless so that the maintenance of some of the isolated police radio stations presents considerable difficulty. If a Royal Navy helicopter happens to be available life is easy, but if not the technicians can only dream enviously of Mercury's winged heels as they begin their back-breaking journeys through the jungle on foot, carrying radio spares. Fourteen days footslogging to clear a fault which turns out to have been caused by a badly soldered connection can be most aggravating, especially if you did the soldering yourself on a previous visit!

The Malayan telegraph system is based on Creed teleprinters working through switchboards in the main centres. There is also a rented teleprinter service with some 80 installations, principally newspapers, rubber merchants and tin agencies. Singapore's position in the Far East as a port and "entrepôt" and the Federation's interest in the rest of the world are indicated clearly by the telegraph statistics:

	To addresses in the Federation	To addresses in Singapore	To other countries
Telegrams originating in the Federation	28 per cent.	25 per cent.	27 per cent.
Telegrams originating in Singapore	53 per cent.	1 per cent.	46 per cent.

Malaya and the British territories in Borneo have recently become Associate Members of the I.T.U.; their volume of international traffic shows that this step is thoroughly justified.

The Department's civil aviation responsibilities include the international airport in Singapore as well as the smaller airports used by internal air services. Even these smaller airports are busy by any standards: Kuala Lumpur, for example, has a 6,000-foot runway and an average of 70 aircraft movements a day.



A typical Malayan tin dredge: Malaya is the world's largest producer of tin—there are over 700 mines in operation and the export of tin has helped Malaya to become the sterling area's greatest dollar earner

A technician clears a fault on a V.H.F. transmitter in one of the Telecommunications Department's air-conditioned radio workshops in Malaya

The operators' retiring room in the Kuala Lumpur Telephone Exchange. Only a few years ago Muslim womenfolk were, except in Kelantan, rarely seen outside the seclusion of their own houses; now they are beginning to play a full part in the economic life of the community

Radio services to ships at sea are provided by the Department via coast stations in Singapore, Penang and Kuala Trengganu, and radiotelephone services link Malaya with the United Kingdom, Hongkong, Borneo, Indonesia and Australia. A radio link with San Francisco is at present undergoing tests and is likely to be put into service shortly.

The Department has a large stores and workshops organization in Kuala Lumpur; over 112,000 stores transactions were made in 1953 and the workshops can handle anything from electroplating surgical instruments to the fitting of armour plate on lorries.

During the 1942 Malayan campaign many telephone exchanges were destroyed to prevent their being exploited by the Japanese. Since the liberation in 1945 the Malayan telecommunications system has not merely been re-built as it was before but has been developed tremendously; more than $M.38 million (£4.5 million) has been spent on new telecommunications installations since 1947 and the Department is now reaping the benefit; as facilities have increased so the revenue has risen from $M.5 million (£0.6 million) in 1947 to over $M.18 million (£2.1 million) in 1953. From the latest available I.T.U. figures for the total number of telephone stations in operation it will be seen that the 15 per cent. expansion during 1952 compares well with 5.3 per cent. in the United States and 4.6 per cent. in the United Kingdom. The Malayan figure for 1953 was 22.8 per cent.

All this development has been possible because Malaya has, since the end of the war and despite the communist terrorists, been a prosperous country. The economic well-being of Malaya depends, however, almost exclusively on the export of tin and rubber. When rubber falls in price in London or in New York the drop very rapidly causes a decline in customs export duties—the principal source of Government revenue—and a lowering of the wages of many of the Malayan peoples.

A Malay peasant who has spent the day as a rubber tapper or working thigh deep in a muddy rice field behind a buffalo and a wooden plough will be quite likely to go to a community listening centre in the evening to hear what Radio Malaya says about the spot price of rubber at the close of the day's market in Singapore. What English farm labourer knows—or cares—if wheat has gone down a point on the London market?

Those who live and work in Malaya are confident that the political and economic difficulties which sometimes seem to threaten them will be overcome and that Singapore and the Federation will continue their steady progress towards independence.

The photographs in this article are by courtesy of the Department of Information, Malaya, and the author wishes to thank them for their co-operation.

Splitting the Birmingham Telephone Area

Telephone House, Birmingham

H. T. W. Millar, B.Sc. (Eng.). M.I.E.E., Midland Region

BIRMINGHAM TELEPHONE AREA, AS IT WAS before April, 1954, could be said briefly to consist of Birmingham, the "Black Country" and a large agricultural area including parts of Shropshire and Worcestershire. Covering over 1,500 square miles, with its quarter of a million telephones and more than 3,000 staff it was a large Area on any count.

Fig. 1 shows the extent of the original Birmingham Area, which is now divided into the new Birmingham and West Midland Areas.

When Telephone Areas, each under a Telephone Manager, were first established one of the aims of the new organization was to provide a unit of such a size that the local manager could maintain adequate contact with the public throughout his Area and take an appropriate place among the other public service officials and in the business life of the district. A further aim was to bring the Clerical, Engineering, Sales and Traffic staffs under unified control without having more divisional units than the Telephone Manager could effectively co-ordinate. Later, Deputy Telephone Managers were appointed in the largest areas to assist the Telephone Managers.

In the post-war years, the volume of work in the Birmingham Area grew to such an extent that, despite the appointment of a second Deputy Telephone Manager (Fig. 2), difficulty was experienced in achieving effective co-ordination and the Telephone Manager found himself becoming too remote from his staff and from the public.

At the same time it became necessary for the Telephone Manager to take a closer personal interest in new developments in Birmingham, such as the mechanization of the trunk service, the expansion of high-frequency trunk systems, new types of switchboard, the concentration of manual operating and television. A strong case also existed for more attention at Telephone Manager level to the problems of Wolverhampton, which had 20 per cent. more subscribers than Coventry or Middlesbrough and many more than Blackburn, Preston, Reading and other Area headquarter towns.

In the Engineering Division the volume of work was proving too heavy for the four Area Engineers and in the Sales Division more Sales Superintendents were needed. The Chief Sales

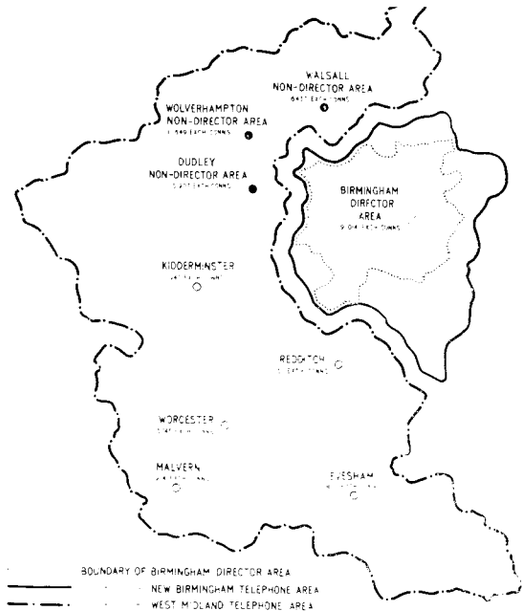


Fig. 1: This gives the number of exchange connections at March 31, 1953

Superintendent, like the Telephone Manager, was tending to become more remote from his public.

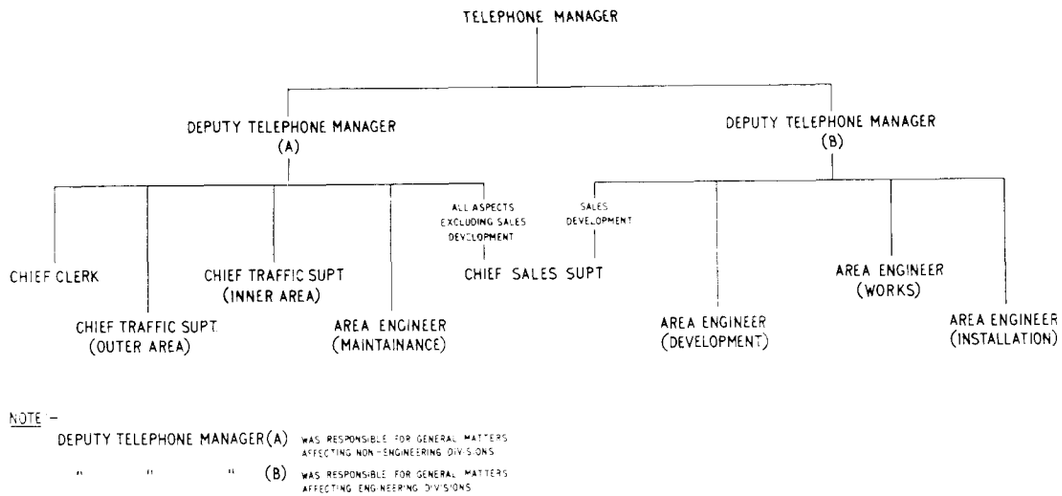
As time went on it became clear that the Area was getting too unwieldy for efficiency and that this was preventing full achievement of the original objectives of Area working. An obvious solution was to split the Area into two smaller units, but this plan was not without its drawbacks, the most important being the resultant increase in management costs. On the other hand, it seemed possible that long term benefits would be achieved as a result of more effective control; it was felt, moreover, that consideration must be given to the nature of the service to the public, and that the economic argument was not the whole story.

After all these questions had been carefully considered it was decided to divide the Telephone Area (Fig. 1). Birmingham Area was to be practically limited to the director area, and a new Area, West Midland, was to take the rest of the old Area.

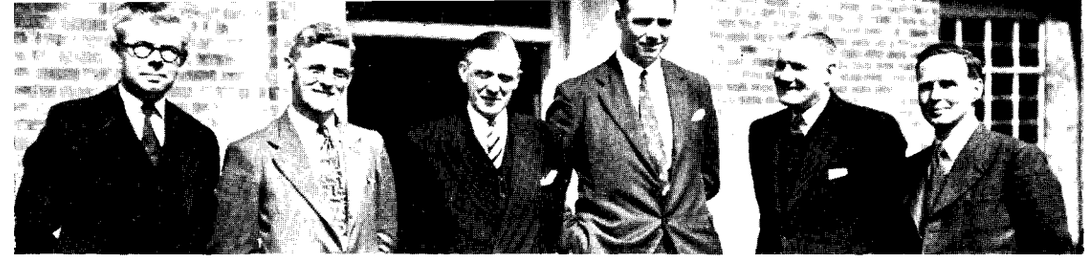
In September, 1953, planning was started with the object of opening the new Area on April 1 this year. A small high level working party directed the efforts with sub-groups of specialists to deal with buildings, engineering and finance. Nearly all of the executive work on the job was done, and done well, by Birmingham Area staff ably supported by the Ministry of Works.

A description of some of the more important work follows; the main principle running through all operations was to split as much of the work as possible on a two-Area basis before April, 1954.

Fig. 2



BIRMINGHAM TELEPHONE AREA
DIVISIONAL ORGANISATION 1953.



WEST MIDLAND TELEPHONE AREA

Left to Right: F. E. HORN, Chief Telecommunication Superintendent; G. JACKSON, A.M.I.E.E., Area Engineer; S. H. CROFT, J.P., Telephone Manager; R. CHIVERS, Chief Clerk; J. G. MANNING, Senior Sales Superintendent, R. A. CROWTHER, B.Sc.(Eng.), A.M.I.E.E., Acting Area Engineer

The first step was to estimate staff requirements in detail so as to ensure that the scheme was reasonable and that the necessary accommodation was available.

Birmingham Area staff was headquartered chiefly in Telephone House (at the centre of Birmingham) and in temporary office buildings about 2½ miles to the west, the rest being in several smaller buildings near the centre. It so happened that the temporary office buildings were in a central position for the West Midland Area and it was accordingly made the new Telephone Manager's Office. Until another Government Department could vacate part of the premises it was necessary to make use of two old manual exchange buildings nearby.

Division of staff

Great efforts were made to divide the staff quickly as so many new permanent records (for example, staff cards) for the two Areas depended upon this. By November the headquarters of all members of the non-engineering staff had been settled and, in January, the destinations of nearly all of the engineering staff. This enabled the work of the Staff, Payslips, Stores and Cash Groups to get a good start.

Every member of the Birmingham Area staff was given the opportunity of stating which of the Areas he or she preferred to work in. The Whitley Committees gave a great deal of help in these matters.

Planning and control

It was unfortunately not possible, because of accommodation difficulties, to plan to open with two full-sized Major Works Controls on April 1 this year. Nevertheless, by February the existing external works control was operating on a two-Area basis.

A start was made in September, 1953, with the division of the Works Order Stores between the prospective Areas, for which two entirely separate centralized tally card systems were prepared, the whole of the work being completed in November, 1953. Estimates for new jobs affecting both of the

BIRMINGHAM TELEPHONE AREA

Left to Right (Standing): H. JENNINGS, B.Sc.(Eng.), Chief Telecommunications Superintendent; R. CLINNICK, Chief Telecommunications Superintendent; E. C. C. PIGGOTT, A.M.I.E.E., Area Engineer; E. W. ATKIN, A.M.I.E.E., Area Engineer; J. HAUGHTON Chief Sales Superintendent; L. HANCOCK, A.M.I.E.E., Area Engineer. *(Seated):* H. W. PEDDLE, M.I.E.E., Deputy Telephone Manager; Brig. F. JONES, C.B.E., M.Sc., M.I.E.E., Telephone Manager; W. SMITH, Chief Clerk; T. TUNNICLIFF, Area Engineer

prospective Areas were prepared separately and existing estimates were split.

By arranging the external work on a two-Area basis the Stores Clerical Group and the engineering staff were able to press on with the division of outstanding requisitions, stores sheets, works expenditure and other records.

Subscribers' accounts

The telephone accounts system is so arranged that approximately equal numbers of accounts are sent out each quarter although each subscriber receives only two accounts a year; some receive accounts in January and July, some in April and October. In any geographical division of an Area, it is only to be expected that, in each part, the balance of accounts sent out will be upset. Birmingham Area was no exception. Some 10,500 subscribers who had received their usual half-yearly accounts in July, 1953, had to be sent further accounts in October, 1953, and now receive their half-yearly accounts in April and October. Similarly 10,000 who had received their accounts in October, 1953, had another in January, 1954.

This operation was carried out smoothly with little complaint from the subscribers, who had been warned a little in advance of the proposed change.

By the time the January accounts were due for issue individual members of the accounts staff were working on the duties they would perform after the Area had been divided.

Sales and Traffic

A start was made in September, 1953, with re-organizing the Divisions for the split, and by November this had been done.

On the Sales side, West Midland work was separated and placed on certain groups, other groups taking only Birmingham work. Incidentally, the changes had to be made while the staff were under great pressure as a result of the special drive to complete new exchange connections during which Birmingham Area achieved record figures.

The Traffic Division was already organized in a way which made the separation of work fairly simple. It consisted of an inner and an outer section each under a Chief Telecommunications Superintendent who was responsible for the service in his district as well as other matters. However, one Superintendent took equipment and lines work for the whole Area, and this work had to be divided. The greatest difficulty was the need for training about a fifth of the staff for work on which they had had no previous experience.

Engineering

Engineering covered the adjustment of boundaries of Installation and Maintenance Controls, the re-organization of main cable maintenance, electric light and power work and so on; the early division of the planning staff and allocation of work according to the future destinations of the staff; a revision of the Section Stock and Works Order Stores arrangements, and many other phases of the work.

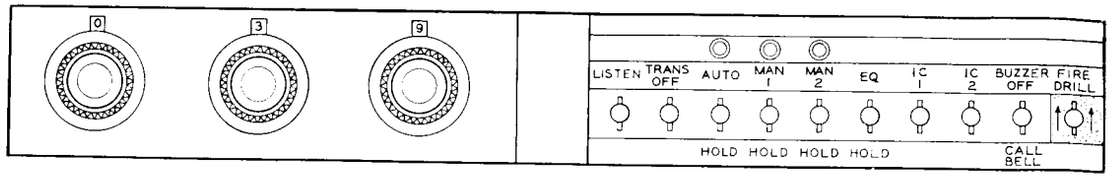
The removal had to be very carefully planned as eight offices were concerned. Some 60 separate removals were involved and the completed operations schedule was very well drawn up. The schedule was available early in February, passed to the Ministry of Works, and a copy given to each supervising officer in the Area for his information. The removal began on March 8 and was completed without a hitch on April 3.

Some idea of the structure of the two Areas can be obtained from the details below.

The new West Midland Telephone Manager's Office was opened, as planned, by the Regional Director. Mr. S. H. Croft, formerly a Deputy Telephone Manager in the old Birmingham Area, took over control and the Area opened in good working order. Birmingham Area, now shrunk considerably in size and by a third in subscribers, carried on after helping generously to get the new Area working.

Area	Number of Local Exchanges					No. of exchange connections	No. of auto-manual exchanges
	Director	Non-director	U.A.X.	Manual	Total		
Birmingham Area ...	39	3	7	7	56	94,899	5
West Midland Area ...	—	18	77	21	116	51,290	7

Number of exchange connections at March 31, 1953.



Panel Lay-out

Re-designing the Supervisor's Desk

C. Evans, B.Sc. (Eng.)
Inland Telecommunications Department

THE SUPERVISOR'S DESK, WITH ITS VERTICAL panel, is a familiar feature in all telephone exchange switchrooms. It was first introduced during the very early days of manual exchanges and its appearance has not materially changed since then. Even automatic working has not affected the physical design of the desk, only minor equipment modifications being necessary to enable it to be used in auto-manual switchrooms.

It has long been felt, however, that the desk is not entirely satisfactory. One of the main disadvantages is the height of the panel, which obstructs the Supervisor's view of the switchroom. Complaints have also been made that the drawer accommodation is not adequate for use by both day and night Supervisors and that the vertical filing shelves and pigeon holes on the desk are not required. It was decided, therefore, to overcome these disadvantages by re-designing the desk, the opportunity being taken to develop a desk the appearance of which would be more in keeping with the modern trend towards brighter switchrooms.

The height of the panel is dictated by the amount of equipment to be accommodated on it, and the question of which facilities are actually needed under present day conditions was therefore first investigated. While opinion was unanimous that too many facilities had been provided in the past, it was not easy to get general agreement on which particular items should be omitted, largely owing to the different ways individual Supervisors perform their duties.

One of the facilities provided enables the Supervisor to listen from her desk to any of the switchboard positions, but, unfortunately, in the past, this has entailed fitting a large number of jacks and labels on the desk to cater for the largest exchange, and there seemed little possibility of reducing the height of the panel while these were included.

Various methods of "streamlining" the equipment were considered and finally a scheme using two or three rotary switches was adopted. Each rotary switch has ten contacts, labelled 0 to 9, the number of the contact on which the switch is standing at any moment being displayed in a small window above each switch. The Supervisor connects herself to the required position by setting up the number of the position in the small windows and operating the listening key. This method of providing the listening facility enabled a considerable reduction in the overall height of the panel.

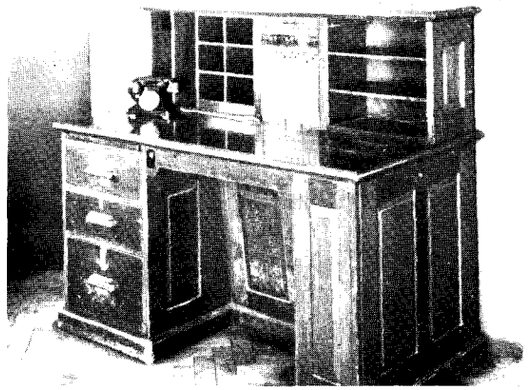
The general appearance of the re-designed desk, which has been called the "Flat" type to distinguish it from its predecessor the "Upright" type, is shown in Fig. 1; the "Upright" desk is illustrated in Fig. 2. It will be seen that the new desk is basically a two-pedestal desk of the normal office type, with a small sloping panel about four inches high directly in front of the Supervisor. On each side of the small sloping panel is a tray for papers. The sloping panel contains, in addition to the rotary switches, capacity for ten lever type keys with their associated labels and the required number of calling signals for the incoming and bothway circuits. A panel lay-out is shown above.

Fig. 1
Supervisor's "Flat" desk Southampton

A hand micro-telephone instrument, with dial, is provided and can be connected with any of the incoming, outgoing or bothway lines on the desk by operating the appropriate lever type key. The hand micro-telephone can also be used for listening purposes. Alternatively, if the Supervisor desires to listen for long periods, an instrument jack has been provided to enable her to use a headgear receiver instead. Safeguards have been incorporated into the design of the equipment on the desk to ensure that the receipt of a call cannot be overlooked if any of the circuit keys, or the buzzer cut-off key, have inadvertently been left operated.

The re-designed desk is at present constructed in wood to harmonize with the operating positions in the switchroom. The possibility of having a metal desk is, however, under investigation, as it is thought that this form of construction might be more economical, particularly as normal commercial type metal office desks can be readily adapted for this purpose. It will, of course, be necessary to ensure that the use of metal desks for Supervisors does not spoil the appearance of a switchroom in which wooden switchboard positions are installed.

Fig. 2
Supervisor's "Upright" desk Wood Street



Previously an ordinary type of table was provided for the use of the Chief Supervisor at exchanges where there were one or more Supervisors. It did not appear logical to give the senior officer inferior desk facilities and it is now proposed that Chief Supervisors should be provided in the future with a desk similar in appearance to the Supervisor's re-designed desk but omitting certain of the facilities, such as the listening facility.

The new type desk, the design of which has been agreed with the Staff Association concerned, is suitable for both director as well as non-director exchanges and it will be provided as standard in all such future exchanges.

News from Jersey

Ten thousand trunk telephone calls are now handled every week between the United Kingdom and Jersey in the Channel Islands; just over twenty years ago there were only 10,000 in a year.

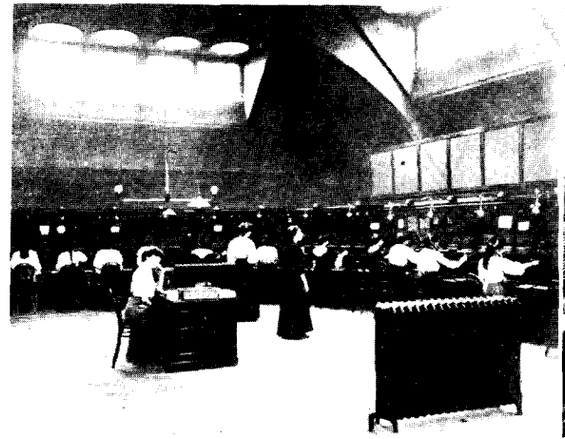
The Postmaster General gave these facts when replying from London to the first call from Admiral Sir Gresham Nicholson, Lieut.-Governor of Jersey, to mark the opening of the island's new telephone exchange in June.

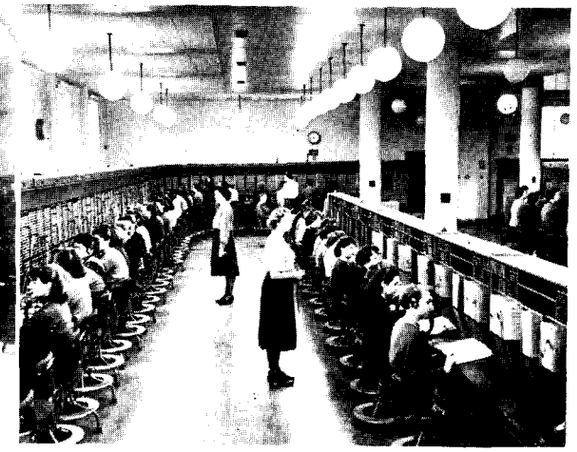
There are now 51 telephone circuits between Great Britain and Jersey; in 1931, there was only one. By 1952 traffic had grown to such an extent that it became necessary to put six under-water amplifiers into the cables.

Rediffusion television service was opened in Jersey on June 25.

The B.B.C. hopes to start direct television service to the Channel Islands in about a year's time, when the Guernsey station now being constructed, should be completed. The Rediffusion service is able to wire television programmes from Wenvoe, Alexandra Palace and Paris.

Southampton Telephone Service





Old and New

F. E. Ferneyhough, Telephone Manager, Southampton Area

THE NEW SOUTHAMPTON CENTRAL TELEPHONE Exchange was opened by the Postmaster General on April 3. The ceremony, though concerned with one of the most complicated technical products of modern science, was, nevertheless, infused by a touch of sentiment arising from history.

In 1940 German air raids destroyed the exchange which, built by the National Telephone Company, had served the town since 1902. Standing as it did in the very centre of Southampton, it escaped the early bombing raids but it could not withstand the fire bomb which pierced the roof, lodged behind the wood panelling (top right hand corner of the photograph) and totally destroyed the top portion of the building, ruining the whole of its contents. Unfortunately, the emergency exchange which had been provided, in advance, to meet these very conditions was also destroyed.

A few hundred yards from the main exchange was a building known as the Coliseum, associated in the minds of Southampton residents with exhibitions and circuses. In 1940 the Coliseum was urgently requisitioned to house emergency switchboards and automatic apparatus, which were rapidly assembled. Withstanding the further raids when the centre of the town became an inferno, the Coliseum continued to serve Southampton and the toll and trunk traffic for the Southampton group of exhanges until April of this year.

Here a word of praise should be given to our operating and engineering staff who, through the years, worked under most uncomfortable conditions: the switchroom divided on two floors, the top one canopied with the unsightly and lofty girder work of the old structure, and the apparatus room dark and congested; and, in recent years, this discomfort was enhanced by large scale building operations, causing an influx of insidious mineral dust which no building, least of all this old relic, could hope to exclude.

The new building, which has replaced the Coliseum, stands cheek by jowl with the charred remains of the old National Telephone Company's

Southampton Telephone Exchange in 1906 *which was fitted with a switchboard capacity of* 4,600 *lines*

The new exchange switchroom showing in foreground the latest design of directory enquiry suite positions
(By courtesy of Southern Daily Echo*)*

Southampton Telephone Exchange, Ogle Road *(By courtesy of the Ministry of Works)*

exchange, recalling not only the history of the telephone service, but also the history of the town.

Southampton is a county borough with a population of 180,000; its growth as a port can be traced from A.D. 43 when, as a settlement, it became linked with the Roman communications of Europe and served Winchester (Venta Belgarum) some 12 miles to the north. The Romans built the first port, the remains of which are still visible in the suburb of Bitterne.

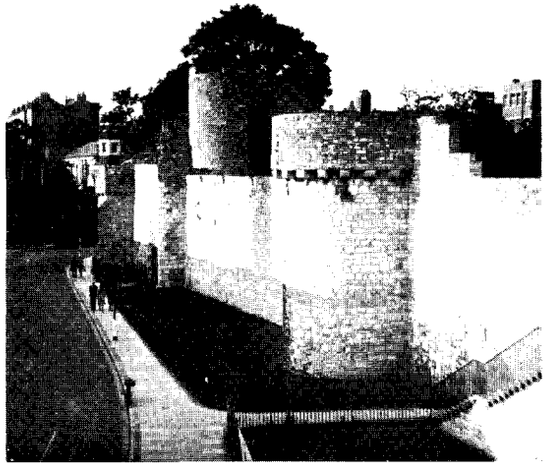
The town of Hamtun or Hamwich grew up following the early years of the West Saxon conquest of the sixth century and the modern form of the name first appears as Suthamtune in a charter of King Edgar's dated A.D. 962. The legend of Canute's encounter with the waves is associated with the town. William the Conqueror established the first walled town with its protecting gates, the finest example of which—the Bargate—still dominates the main street.

The medieval wool and wine trades with Europe and the Orient ensured a period of unrivalled prosperity. Southampton was an important invasion base in military operations against France and was intimately associated with the Crecy and Agincourt campaigns.

The Mayflower set out from the old west quay on August 15, 1620, to found the New England States of America, in commemoration of which event an impressive monument stands by the side of the remaining ancient city walls.

Following three hundred years of eclipse the revival of the town's modern commercial activities began in 1836 with a scheme of construction carried out by the Southampton Docks Company and brought to world prominence by the Southern Railway Company. So, through the centuries, the port has reflected the history of England and, as a development from its natural geographical situation, has been a gateway between this country and the world.

As the port has played such a colourful part in the political and commercial history of this country it is appropriate that it should also have played a part in the beginning of the service of communications. In January, 1878, Graham Bell, who



Catchcold Tower with Arundel Tower behind *(By courtesy of Southampton Corporation, Publicity Department)*

had invented the articulating telephone only three years before, had recently arrived in this country to introduce his invention. At Osborne House on the Isle of Wight, in the presence of Queen Victoria, he gave a demonstration by speaking to Osborne Cottage and to Southampton, where his correspondent was Mr. W. H. Preece (later Sir William Preece) Electrician to the British Post Office.

Thanks to the help of Mr. R. R. Gleave, Editor of the "Southern Daily Echo" I have been able to reproduce an extract from that newspaper's predecessor "The Hampshire Advertiser and County Newspaper" of January 19, 1878, reporting the event. The edge of the cutting is charred showing how nearly this copy, with many thousands of other valuable relics, escaped destruction by a hair's breadth when the newspaper building, like the old telephone exchange, was destroyed.

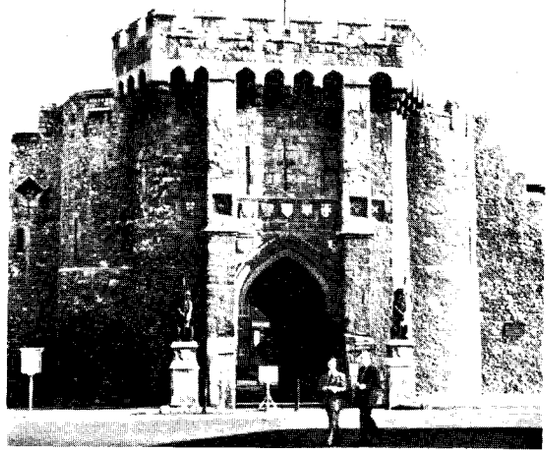
Southampton's telephone history can be traced still further by research into the ancient files of the "Echo" office, for the following report is taken from the "Hampshire Advertiser" of June 23, 1886: —

"Southampton Telephone Exchange

"The Western Counties and South Wales Telephony Company having opened a centre of their exchange system in Southampton—it was inaugurated on Monday at their offices in East Street . . . The exchange system enables any subscriber to be put into immediate and direct communication with any other sub-subscriber to the system. Each is furnished with a set of instruments which are connected with a wire communicating with the exchange and the subscribers all have a number assigned to them by which the name and line are known.

"The exchanges or switchrooms are connected together by trunk lines and each switchroom is provided with a switching apparatus by means of which the attendant can connect any two wires, answer calls and call the subscribers required.

"A subscriber wishing to talk with another calls the exchange to which his wire is attached and on being answered by the attendant he names the number of the subscriber with whom he desires to communicate and his wire is



Southampton's Norman "Bargate" *(By courtesy of* Southern Daily Echo*)*

THE TELEPHONE AT OSBORNE.

By invitation, the telephone was exhibited to the Queen last Monday evening by Professor Bell and Colonel Reynolds, assisted by Mr. C. Wollston. After explaining the mechanism of his invention, Professor Bell held telephonic communication with Osborne Cottage, where Mr. F. C. Ormiston superintended the apparatus. Her Majesty conversed with Sir Thomas and Lady Biddulph, and later Miss Kate Field sang "Kathleen Mavourneen," for which Her Majesty kindly returned thanks telephonically through his Royal Highness the Duke of Connaught. The applause that followed was heard at the cottage end of the line. On again being requested to sing, Miss Field gave Shakespeare's "Cuckoo Song," which was heard through a circuit of five human bodies. She then sang, "Comin' thro' the rye," and delivered the epilogue to *As You Like It*, both being perfectly audible. The next experiments were with Cowes, where Major Webber was in command. A quartette of tonic sol fa singers sang "God Save the Queen,' "Stars of the Summer Night," "Sweet and Low," and "Sir Knight, O whither away?" with excellent effect, the unison being far more complete at Osborne than where the singers were themselves. After his Royal Highness the Duke of Connaught had finished a long conversation with Major Webber, Mr. W. H. Preece, of the Post-office, talked from Southampton with Professor Bell and Colonel Reynolds. Bugle playing from the same town was delightful, but the music of an organ in London was less satisfactory. Uninterrupted conversation took place for two hours between Mr. Wilmot and Mr. Preece. Cheering and laughing in London were heard eighty miles away. Throughout the séance Her Majesty and the Royal Family were exceedingly interested. Experiments were renewed on Tuesday morning between Cowes, Osborne House, and Osborne Cottage, Professor Bell having for his audience and assistants her Royal Highness the Princess Beatrice, his Royal Highness the Duke of Connaught, the Duke of Richmond, Lord John Manners, Lord Ripon, Lady Biddulph, Lady Cowell, Sir John Cowell, and others. In some respects the experiments at Osborne are the most satisfactory yet [illegible]

Report of Professor Bell's first experiments in this country on January 14, 1878
(By courtesy of Southern Daily Echo*)*

immediately connected with the wire of that subscriber. Conversation is then carried on in the ordinary tone of voice and when it is completed each of the subscribers gives the signal that he has finished and the wires are then disconnected. This is accomplished in an instant and the subscriber can on calling again be connected with any other subscriber's line . . .

"The Company started canvassing in Southampton last April and they have five connections Mr. Thomas (fishmonger) 2; Mr. Page, Mr. Shalders and the South Western Hotel and numerous promises from others who were waiting to see the exchange in working order. A radius is taken of a mile from Bargate and beyond this, according to distance, there is a small increased charge which certainly no business man would grudge paying.

"There is no danger whatever to wire being over houses . . . Rather than attracting lightning it protects property. The advantages this Company claim are perfect simplicity in working, no training being required, easy recognition of the voice of the speaker, immediate verbal intercommunication and freedom from liability after payment of rental. The system has been warmly taken up in Bournemouth and after a time it is hoped that Southampton will have a telephonic connection with that town, Portsmouth and London. There was no difficulty at all as regards distance, the only question being one of expense.

"It is beyond doubt that a system which will put all the houses of business, hotels and offices and other places into speaking connection with each other at a moment's notice must prove a great advantage . . ."

The Postmaster General speaking to Miss Trim, Southampton's first telephonist (aged 82) and Miss Rook, who was employed by one of the first five Southampton subscribers (aged 83)

(By courtesy of Southern Daily Echo*)*

Miss Ida Trim, aged 82, who was a telephonist at the first exchange referred to in the preceding paragraphs, and Miss Rook (83) who, employed by Mr. Thomas the fishmonger, received the first call through the exchange, were present when the Postmaster General opened the new exchange.

From such a small beginning the number of subscribers grew until in 1902 the National Telephone Company, who had by this time bought out the Western Counties and South Wales Telephony Company, moved the exchange to a new building, opening it with 800 subscribers. It was this exchange which was destroyed in 1940.

When the Post Office took over the exchange in 1912 there were 1,600 subscribers and in 1923, when the change was made to auto-manual working, there were 2,000 subscribers. By 1931 subscribers' lines had increased to an extent that made it necessary to relieve the exchange by opening two satellite exchanges, and two more were added just before the war.

When the Postmaster General switched over from the old Coliseum to the new building on April 3 last he brought to life an exchange which cost approximately £750,000 and which had taken between four and five years to complete and equip. Some 2,000 trunks and junctions and 3,800 subscribers were disconnected at the old exchange within five minutes of instructions to "cut out". The final "cut over" was completed without a hitch at 1.7 p.m. Immediately after the switch-over the Mayor inaugurated the new Central exchange with a radio telephone call to the Captain of the R.M.S. "Queen Elizabeth", which had sailed from Southampton a few days previously, and was then nearing America. This was probably the first time in history that a Post Office exchange had been inaugurated by a call to an ocean going liner.

The exchange offers to Southampton and a wide area around an improved and more comprehensive service. It is an impressive building of concrete and steel, faced with multi-coloured brick and dressed in Portland stone. Building was started late in 1949 and was completed in time for the first equipment to be installed in the spring of 1952. The total floor area is 47,500 square feet. The basement houses the engine room and cable chamber and on the ground floor are the main frames, test desks and power unit. The first floor houses the automatic apparatus with initial equipment for 8,600 subscribers and an ultimate capacity for 10,000; the second floor the switchroom with 95 operating, 10 monitorial and 14 directory enquiry positions,

The Postmaster General giving signal for "cutting in" the new exchange *(By courtesy of* Southern Daily Echo*)*

and the clerical rooms; and the top floor the dining and welfare rooms.

At the moment the Central Exchange and its four satellites serve 12,000 subscribers in the County Borough area. Trunk calls from a wide area around the town are expected to total about 2,250,000 a year, in addition to, say, 9,000,000 local calls.

The equipment includes facilities that in the near future will allow long distance dialling, both originating and incoming, to several distant centres, including London. Over 300 new dialling channels have been made available to and from outlying exchanges by additional equipment installed in the exchange. Subscribers may now have access to the speaking clock (TIM). The new directory enquiry centre (shown in the switchroom photograph) is a prototype which may become standard for the country and which owes a great deal to the Southampton preliminary experiments. To the operators and the engineering staff, who worked under the difficult conditions in the Coliseum, the new exchange is a dream come true.

The Southampton group of exchanges consists of one auto-manual group centre exchange, seven minor manual exchanges and 29 automatic exchanges (including five non-director satellites) with a total of 20,884 exchange connections at December 31, 1952. It serves districts differing widely in character, from the business, shipping and industrial activites of Southampton and its environs to sparsely populated agricultural areas such as Droxford, King's Somborne, Lockerley and the rural villages of the New Forest. More than 50 per cent. of the exchange connections are served by the Southampton non-director system, and about 65 per cent. by exchanges within the Southampton five-mile circle.

Southampton's docks cover some 400 acres and caters for the world's largest ocean-going liners in addition to smaller vessels carrying goods and passengers to and from the Continent, the Channel Islands and the Isle of Wight. There are facilities for handling and storing cargo, including fruit and other perishable goods. There is accommodation for the overhaul of all types of vessels and ship repair work of all descriptions is undertaken. The George V Dry Dock is the largest in existence. There is a number of ship-building yards, the largest of which is the Woolston Works of John I. Thornycroft and Co., Ltd., which builds both naval and merchant vessels.

All the telephone plant in the docks is owned and maintained by the Docks and Inland Waterways Executive, which operates a private automatic branch exchange serving a number of business premises as well as the requirements of the docks and railway communications. Public exchange circuits in the docks are provided by "rented pairs" from the nearest distribution point outside the dock area.

The Docks Executive have also provided circuit terminations at all the quays used by the ocean-going passenger ships by means of which ship-to-shore call office facilities are available through the Southampton exchange. A call office installation is fitted permanently on board the largest ships,

and portable instruments are used on smaller vessels.

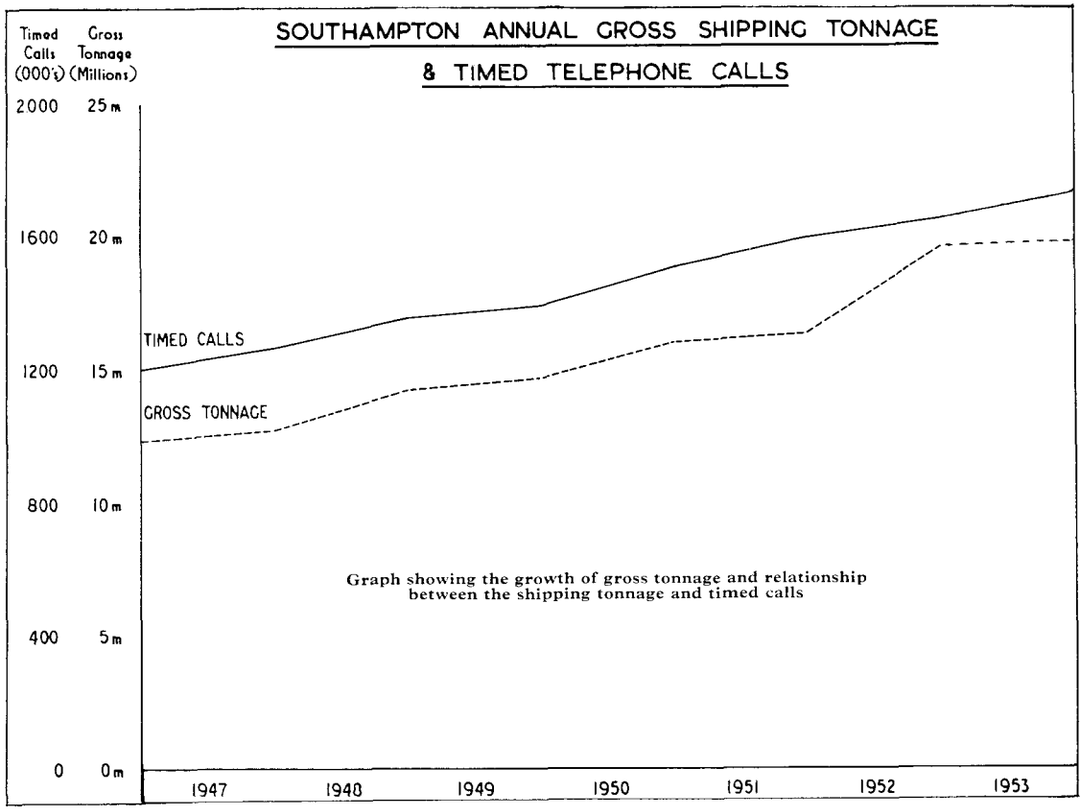
At the Ocean Terminal, the principal passenger berth for Atlantic ships, there are two suites of attended call offices, each provided with a directory enquiry bureau.

The export and import value of goods handled at Southampton last year was about £220 million. The gross tonnage of shipping handled last year (19,637,451) constituted a record for the port; this figure does not include the tonnage handled at the Fawley quays, where 3,600 tankers were dealt with. In the same period over 667,000 passengers passed through the port. Although primarily a passenger port, the cargo trade amounts to more than 1,000,000 tons annually and there is a tendency to encourage its growth. This is illustrated by the recent re-instatement by Elders and Fyffes of banana discharging equipment, followed by the first post-war cargo in February, 1953. The graph below gives the growth of gross tonnage during the years following the war and reflects the relationship between the shipping tonnage and timed calls.

Among the more important industries served by the Southampton group are the Esso Refinery at Fawley, the railway engineering works, Pirelli General Cables and Civil Airport at Eastleigh, and Vickers-Armstrong Aircraft Division at Hursley. The Esso Refinery, which has been in operation for just over two years, is on the south bank of Southampton Water where it has extensive oil quays capable of handling the largest tankers. During its first year over 6,000,000 tons of crude oil (30 per cent. of the national annual consumption) was processed, all of which came by sea and a considerable proportion of the refinery products were also shipped from the Fawley quays. The project has recently been developed for the production of lubricating oils and the extraction of sulphur.

The south bank of Southampton Water is the site of a new power station which is being built at a cost understood to be in the neighbourhood of £10,000,000.

It is satisfactory to know that Southampton now has a telephone exchange worthy of the important area it serves.



Graph showing the growth of gross tonnage and relationship between the shipping tonnage and timed calls

The Mechanization of Trunk Fee Accounting

*C. J. Gill, Inland Telecommunications Department**

N. O. Johnson, Central Organization and Methods Branch

THIS ARTICLE DESCRIBES A METHOD OF mechanical trunk fee accounting which has evolved from experiments conducted in the Canterbury Telephone Area during the past five years. It sets out the conclusions drawn from experience with the evolved method and the factors which might govern its use elsewhere.

The original objectives of the experiments are best seen in relation to the manual process of trunk fee accounting used in Post Office Telephone Areas other than Canterbury.

When a subscriber makes a timed call the operator prepares a ticket of the type shown in Fig. a; she writes the essential accounting information (*inter alia*) on the ticket and a pricing clerk in the exchange subsequently calculates the cost and writes it on the ticket.

The priced tickets are sent daily from each exchange to the Telephone Manager's Office where they are sorted by hand to produce for each subscriber a pile of tickets in date order. Each month the ticket details are listed on the subscriber's trunk statement by means of a hand-controlled listing and adding machine.

This process is repeated each month for six months and results in the familiar six-monthly statements of trunk calls (Fig. b) which are sent to subscribers with their telephone accounts.

The manual process involves a substantial amount of ticket sorting by hand in Area Offices and, to a more limited extent, in telephone exchanges. In the Post Office nearly 300,000,000 trunk call and phonogram tickets have to be handled and sorted every six months, employing several hundred minor clerical staff. One important objective of the experiment has been to eliminate this monotonous and uninspiring work.

The amount of information given to telephone subscribers in their telephone bills, to enable them to identify the calls for which they are being charged, varies from country to country according to custom and to the extent to which call charges are metered. Post Office subscribers are customarily given, in respect of each timed call (that is, a call for which the basic full-rate charge is more than 6d.), particulars of the date of the call, and its cost; additionally, phonogram charges are specially indicated. More information about each call could be given only by incurring additional expense which, in the long run, would have to be borne by subscribers in the charges for service. Comparatively few complaints that the information is inadequate are received, and in the interests of providing the cheapest possible telephone service, the Post Office has so far avoided the expense of providing additional information.

But mechanical accounting, when first considered, appeared to offer prospects of making some additional information available without extra cost. This obviously desirable end was the second objective of the experiment. The additional information it was hoped to give was a description of the type of service supplied (for example, fixed-time call) and the name of the called exchange, so as to enable the subscriber to identify the destination of each call for which a charge was made on his account.

First stage

With these objectives in view a mechanised process using Powers-Samas punched-card machinery was introduced in the Canterbury Telephone Area in 1949. It required no change in the method of preparing tickets in exchanges but, because the call tickets (Fig. c) were to be used to control the subsequent machine operations, they had to be stiffer (consequently more expensive) and somewhat different in lay-out from call tickets in use elsewhere.

The tickets thus prepared were sent daily to the Telephone Manager's Office (Fees Group) where they were given special treatment so that they could operate accounting machinery. For

* *Since writing this article Mr. Gill has moved to the External Telecommunications Executive.*

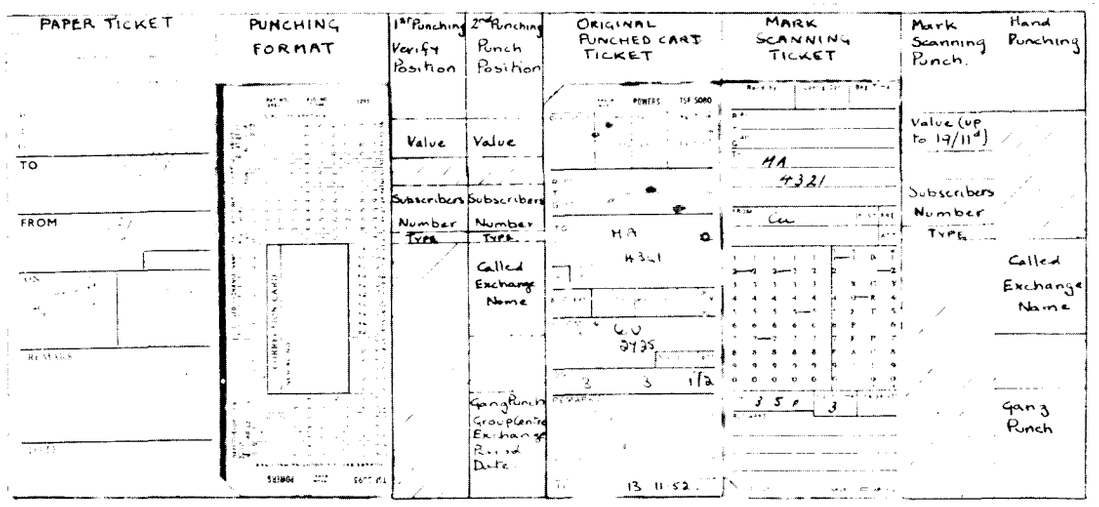


Fig. a Fig. c Fig. e Fig. k

(For Fig. b : see opposite page)

this purpose, the essential sorting and accounting information (that is, the calling subscriber's number, the type of call, the charge details and the called exchange name) was translated into the form of holes in the ticket on which it had originally been recorded in writing, these holes being punched by clerks using hand-controlled punches.

The punched tickets were then mechanically sorted into subscriber's numerical order and used, every two months, to control a tabulating machine which prepared a printed trunk statement for each subscriber.

The process, repeated every two months, resulted in a trunk statement (Fig. d, page 148) similar to that customarily given to subscribers but showing additionally for each call the name of the called exchange and the type of call or service.

An analysis of results in 1949 was disappointing. It had been hoped that the additional information given on the account would reduce the number of enquiries, but the analysis showed that when given more information the subscribers tended to make far more enquiries about their liability for particular calls; in fact, an additional enquiries clerk had to be employed. Since there was no parallel increase in the numbers of disputed charges actually waived, it seemed likely that the effect of giving details of the destination of calls was to provoke subscribers to test their memories, or records, too far.

The analysis showed that the objective of eliminating tedious work had not been fully met, in that the monotonous process of ticket sorting had, to a large extent, been replaced by the routine of hand punch operations. But, most important, it showed that the hopes about the cost of the mechanical process had not been realized; in fact, the process was costing some 90 per cent. more to operate than the manual one.

There were, however, prospects that the cost could be reduced and the remaining monotonous processes virtually eliminated if means could be found of punching the ticket automatically and so avoiding the unduly expensive hand punching of tickets. This required a radical change in the system, by arranging that the operator handling the call should mark essential accounting information on the ticket in such a manner that it could be "read" and converted into punched information by a machine.

The main problem was to find a method of marking the essential information to satisfy the requirements that it should not involve additional operating time in handling calls, that the marked information should be capable of being translated accurately despite variations likely to be unavoidable in practice in the quality and position of marks, and that marking should not be harmful or too troublesome to operators.

Preliminary resolution of the problem required

tests of ticket marking at switchboards to examine the effects on operators and on the service. A full description of the tests and of the developing of ticket design for this purpose has already been given in this *Journal* (February-April, 1954).

Early in these tests it became clear that all available commercial marking systems required marks of a quality which switchboard operators could not always be expected to produce or, alternatively, a size of marking-field which could not readily be accommodated on a telephone ticket suitable for use at standard switchboards. Fortunately, the Post Office Engineering Research Branch was able to suggest a novel method of optical scanning to be used in association with Powers-Samas punching machinery, which was expected to allow considerable tolerance and consequently to reduce strain and time in marking.

Scanning machines

Preliminary small scale experiments early in 1950 in marking tickets designed for optical scanning were sufficiently encouraging to permit the design of a machine to be put in hand. Because the machine design was experimental and it was necessary to proceed cautiously with the introduction of marking at switchboards, the amount of information to be marked and scanned was limited to the call fee type of service (three columns on the punched card).

In the interval, while the machine was being designed, opportunity was taken to conduct further trials of ticket marking at Bexhill in 1951, and King's Lynn in 1952. The King's Lynn experiment was highly successful and removed most of the fears that the marking might prove too difficult for the operators or that it would slow down the service; it also enabled the design of marking fields to be studied and improvements made.

In January, 1953, the three column scanning punch was brought into use at Canterbury. At the same time, in all exchanges in the Canterbury area, a fresh design of ticket was introduced, on which the type of call was to be marked by operators and the price of call by exchange clerks, this information being converted automatically by means of the mark scanning punch into punched holes for use in preparing accounts. The essential sorting information (the calling subscriber's number) and the particulars of the called exchange had still to be hand punched at this stage. This experiment, which ran for six months, gave valuable confirmation of the practicability of ticket marking at switchboards and of the suitability of the optical scanning system.

Fig. b : Familiar six-monthly statement of trunk calls

STATEMENT OF TRUNK AND TOLL CALLS AND TELEGRAPH SERVICES

The total on this statement is carried to the main account

MOU 9999

JANUARY	AMOUNT	FEBRUARY	AMOUNT	MARCH	AMOUNT
		Total brought forward		Total brought forward	

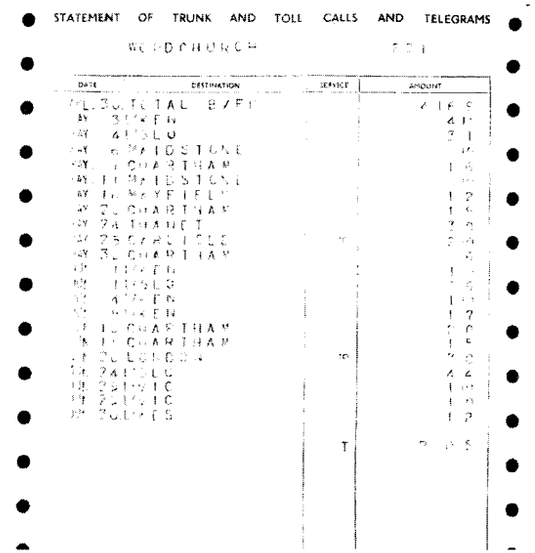

STATEMENT OF TRUNK AND TOLL CALLS AND TELEGRAMS

Fig. d: Trunk statement

The successful progress of the experiments with ticket marking had led to the conclusion that more information could successfully be marked at switchboards, and along with the construction of the three-column scanning punch, the development of an eight-column scanning punch was put in hand. This was brought into use in Canterbury in June, 1953. At the same time, a much altered ticket (Fig. e, page 146) was introduced at all exchanges in the Area.

The important change was that which allowed the calling subscriber's number to be marked at the switchboard and this information, with that of the type and price of call, to be converted automatically to punched holes by the mark-scanning punch.

This information is enough to enable the customary form of trunk call statement (with some additional information about the type of each call) to be prepared by the mechanical process in its current stage of development, without intermediate hand punching or hand sorting of tickets. At Canterbury, however, the trunk statements given to subscribers include the called exchange name for each call, and the information necessary to enable the name to be printed on the account has still to be hand punched on the ticket in the Telephone Manager's Office.

In effect, the hand sorting and listing operations of the manual process are replaced by mechanical sorting and by listing on a fully automatic machine called a "Tabulator". The punching of tickets with the accounting information to control the operation of these automatic machines, is done automatically by the "mark-scanning punch" and the punching of holes to represent the called exchange name, by a hand operated punch known as an "automatic key-punch".

A description of the principal machines follows.

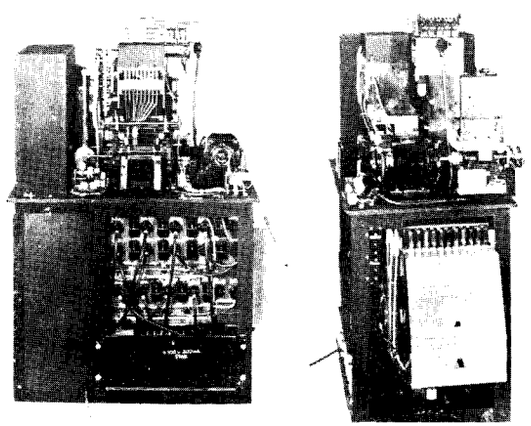
Mark-scanning punch (Fig. f)

This machine converts the marks in each of the eight columns into equivalent punched holes in three stages: scanning, punching and checking. The machine operates continuously, and at any time a different ticket is in each of the three stages. For ease of understanding, the movement of one ticket will be described.

In the first stage, the ticket moves from the feed hopper to the scanning position, where it passes under the scanning lens in eight steps corresponding to the marked columns. At each step, as a mark is "seen", a magnet is energized and operates a punch setting mechanism. There is a mechanical cross connection field between the punch setting and punching mechanism so that the punching pattern, though controlled by the marking pattern, need not be identical with it.

The ticket then moves to the punch position where the pre-set punches are released to punch appropriate holes in the ticket. After punching, it moves to the checking position, where pins cover-

Fig. f: Mark-scanning punch



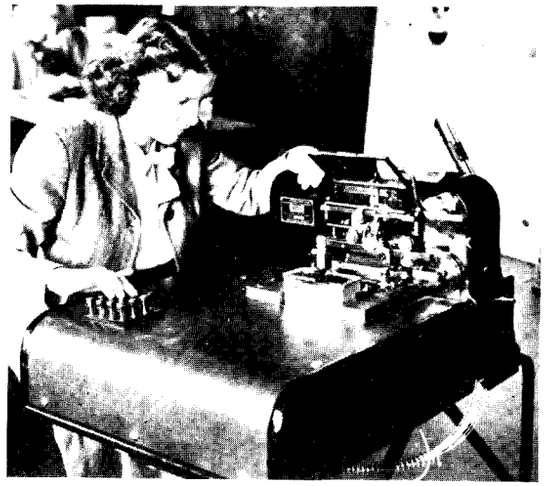


Fig. g: Automatic key punch

ing every possible punching position "feel" for holes in the ticket. If the pattern of holes correspond to a correct condition the ticket passes into a receiving hopper. If not, it is diverted into a second hopper; for example, the machine rejects tickets on which the scanner has missed a mark or has "seen" a fleck on the card.

The machine cannot ensure that operators mark correctly but it does check that the punched holes correspond to the conditions expected from the exchange. The cyclic speed of the machine is 6,000 tickets per hour (t.p.h.) but operating losses reduce this figure and the working capacity is of the order of 4,000 t.p.h.

Automatic key punch (Fig. g)

This is a manually operated keyboard machine, mainly used for punching the called exchange name.

Automatic verifier (Fig. h)

Certain tickets (for example, those relating to transferred charge calls) have still to be punched manually; in these the punching of essential accounting information is repeated in an offset position to ovalize the original holes. These tickets are then passed through the Automatic Verifier (at 12,000 t.p.h.) which rejects those where the two punchings have differed, so that the information can be verified.

Sorter (Fig. i)

A pack of tickets to be sorted, with the appropriate guide cards, is placed in the feed of the machine. Guide cards (one for each working and spare number) are used to control the final sort into "class of subscriber" order and are punched with the subscriber's number and class.

To sort into subscribers' numerical order the tickets are passed through the sorter up to five times, once for each digit. The speed of sorting depends on the size of a batch of tickets and the skill of the operator and varies between 20,000 and 30,000 t.p.h.

To sort into class-of-subscriber order, "repetition" sorting is used, the sorter being set to respond to the guide cards only and the receiving box opened by one guide card remaining open until the mechanism is re-set by the next guide card.

Tabulator (Fig. j)

The tabulator is fed with the piles of tickets produced by the final sorting operation, and automatically prints on continuous stationery a list of the calls made by each subscriber. It adds and prints the total for each subscriber and accumulates the grand total for a group of subscribers for control purposes. If one subscriber's calls are too

Fig. h: Automatic verifier

many for one statement there is an automatic jump to the first line of the next.

The tabulator is normally controlled by changes in the punched holes representing the subscriber's number, but it may be controlled by the subscriber's guide cards (for example, with P.B.X. groups of lines). The machine works at 6,000 t.p.h.

The machines described take their part in the process at Canterbury as follows. Marked timed-call tickets are received daily from exchanges in the Area by the opening duty in the Fees Group, specially packed in fibre boxes to avoid damage in transit. Index cards divide the tickets into suitable categories for subsequent separate handling. The clerks on the opening duty transfer the tickets to trays, labelled with category and date, and pass the trays to the punched card section where a control card is put in each. This card forms a running record of the progress of work on the tickets in the tray.

The tickets in each tray are then fed to the mark-scanning punch. Fig. k (page 146) shows what punching is required and indicates what part of it is completed by this machine. Rejected tickets are examined by the operator and if necessary referred to the originating exchange for further information. After the particulars have been verified, the necessary alterations are made by hand. For example, tickets with extra holes are "repaired" on a machine which sticks a Cellophane patch over each unwanted hole; missed holes are inserted by hand punch.

The tickets (with the general exception of those relating to coin boxes) are then passed to the automatic key punches for hand punching of called exchange names. The tickets, with those received from other Telephone Areas (for example, transferred charge calls), and subsequently hand punched, are then filed until the end of the month in exchange and date order. Punching of coin box subscribers' tickets is deferred until after the repetition sort, since they cannot at this stage be distinguished from public call office tickets for which detailed statements are not generally required.

At the end of the month the tickets are mechanically sorted into subscribers' numerical order. Subsequently subscribers' guide cards, total brought forward cards and coin box additional charges cards are included where appropriate. Using the sorter set to " repetition " sorting and sensing on the "class of subscriber" column, tickets are divided into the following batches :

1. Single line — medium or heavy user.
2. Single line with coin box.
3. P.B.X. line.
4. Single line — small user.
5. New subscribers.
6. Government or Service.
7. Single line — monthly trunk.
8. Single line with coin box — monthly trunk.
9. P.B.X. line — monthly trunk.
10. Public call office line.
11. Spare line.

The subsequent processes for each of these batches vary; the processing of typical batches is as follows :—

Class 1 (single line — medium or heavy user)

The cards and tickets are tabulated at monthly intervals, total brought forward cards being prepared and included after the first month so that the grand total appears on the statement for the final month.

Class 2 (single line with coin box)

The additional charges made for trunk calls have to be computed before statements can be prepared. The operator runs through each subscriber's tickets, calculates the amount due and punches a separate card accordingly.

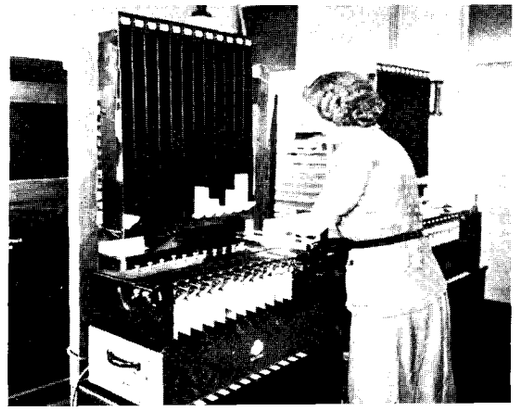
Class 3 (P.B.X. line)

P.B.X. lines are not necessarily consecutive numbers so that a hand collation of the groups of tickets and cards appropriate to each line is necessary. These collated tickets are then sorted into date order and all guide cards except that for the first line of each P.B.X. group withdrawn. Tickets are then tabulated, the "total" control of the tabulator being exercised by guide cards.

Class 4 (Single line — small user)

About half the subscribers in the Area make

Fig. i: Sorter



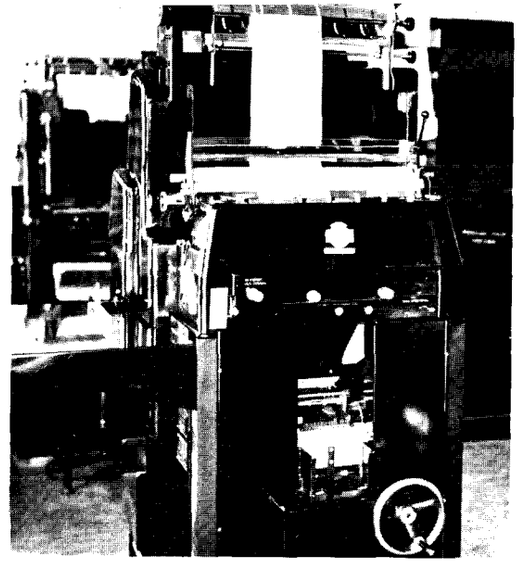


Fig. j: Tabulator

fewer than twenty trunk calls half-yearly and, to save paper, their statements are prepared at the end of the half-yearly accounting period only.

Tabulating for the remaining classes follows the same general pattern as that for class 1 subscribers.

Conclusions

The mechanical accounting process based on the eight column scanning machine has now been successfully operated for the trunk calls originating at all exchanges in the Canterbury Area since July, 1953, including the seasonal months of July and August when traffic at holiday resort exchanges (especially Thanet and Folkestone) reaches a very high peak.

During this period and at each quarter's end exchange and accounting staff work under very heavy pressure, but the system has emerged successfully from this full load test of its capabilities and reliability. The conclusions drawn from an analysis of the first six months of operation are summarized below; during this period about 2½ million timed calls were brought to account and about 50,000 statements prepared.

Cost and office staff

The production, by this process in the Canterbury Area, of subscribers' trunk statements giving additional details about the destination and type of each call, requires about the same number of staff as would be required to produce by manual methods the same number of trunk statements with the "customary" amount of detail.

The cost is, however, about 55 per cent. greater because of the extra cost of accounting machinery and of special stationery and because some higher-paid staff has to be employed; but about three-quarters of this extra cost is incurred, and six people are employed, solely in giving the additional details of calls in accounts, and handling the extra enquiries which arise. The intermediate stages of the mechanical process can probably be improved which would reduce its total additional cost to 37 per cent., of which almost the whole would be attributable to the giving of extra detail.

If the mechanical process were to be used more extensively so that stationery and stand-by machine costs could be reduced, it is probable that trunk statements with the customary amount of detail (Fig. d, page 148) could be produced by the mechanical process at no greater cost than by the usual manual process, but with the advantages that some 18 per cent. fewer staff would be required and that all tedious work would be eliminated from the duties of the remaining staff.

Service and exchange staffing

It is probable that the marking of tickets at switchboards takes a little more time than writing, but experience at Canterbury suggests that the time is marginal and is not reflected in the total time required to complete a call. The exchange service observations have not revealed any worsening of the service given to subscribers at exchanges at which tickets are being marked, nor has it been necessary to employ extra staff beyond the numbers ordinarily required to handle traffic at these exchanges. Operators appear to have no difficulty in acquiring the technique of marking.

Accuracy of accounts

Inaccuracies in accounts can arise from errors in the preparation of tickets and from errors in subsequently bringing tickets to account.

There is always a risk of human error in preparing a ticket, no matter what method is used, but samples have shown that there is no greater apparent likelihood of error in marking than in writing on tickets.

The mark-scanning machine is equipped with a device for checking the completeness and correct positioning of marking. Once the correctness of the information on the tickets has been checked, as far as is possible, the remainder of the process of

sorting and bringing them to account is entirely mechanical and is not subject to the same risk of error as is inherent in the manual sorting and accounting process.

Experience at Canterbury is that the introduction of mark-scanning has not significantly changed the total of charges waived nor the number of charges questioned by subscribers, as compared with the earlier system of mechanical accounting.

Approximately the same office floor space is required for the mechanical system as for its manual counterpart, but a limited amount of sound-proofing of the machine room may be necessary in certain types of building.

Cost and economies

The main elements of cost of the mechanical trunk fee accounting process can be closely adjusted to accord with the volume of accounts work to be handled; these are the staff and stationery costs which together represent about 84 per cent. of the total costs of trunk fee accounting at Canterbury.

The remainder, that is the cost of machines, cannot be so closely adjusted to volume of work since the greater part of it represents the cost of a few main units—tabulators, sorters and mark-scanning punches. The smallest practicable size of installation would include two tabulators, two sorters and two mark-scanning punches although one of the latter could well be shared by two or three very small accounting units; if reasonably adjacent an installation of this size would handle the accounts for an average accounting unit of about 40,000 subscribers, and would, therefore, be wasteful to the extent of about 4 per cent. of the total cost of trunk fee accounting in an accounting unit of about 30,000 subscribers; that is, the smallest in the United Kingdom. There would be similar small over-provision in larger units with numbers of subscribers between 40,000-50,000, 60,000-70,000, 90,000-100,000.

The amount of money involved in the over-provision is not great and such over-provision as is unavoidable might reasonably be regarded as necessary provision for growth of accounts work consequent on development of the telephone system.

Economies, enough to offset this over-provision, might well be possible if a sufficient number of adjacent accounting units were equipped, by holding reserve machines on a pool basis to cater for occasional emergency needs.

The size of an accounting unit, subject to a lower limit of about 30,000 subscribers, may therefore be regarded as having no important effect on the economies of mechanical accounting.

Summing-up

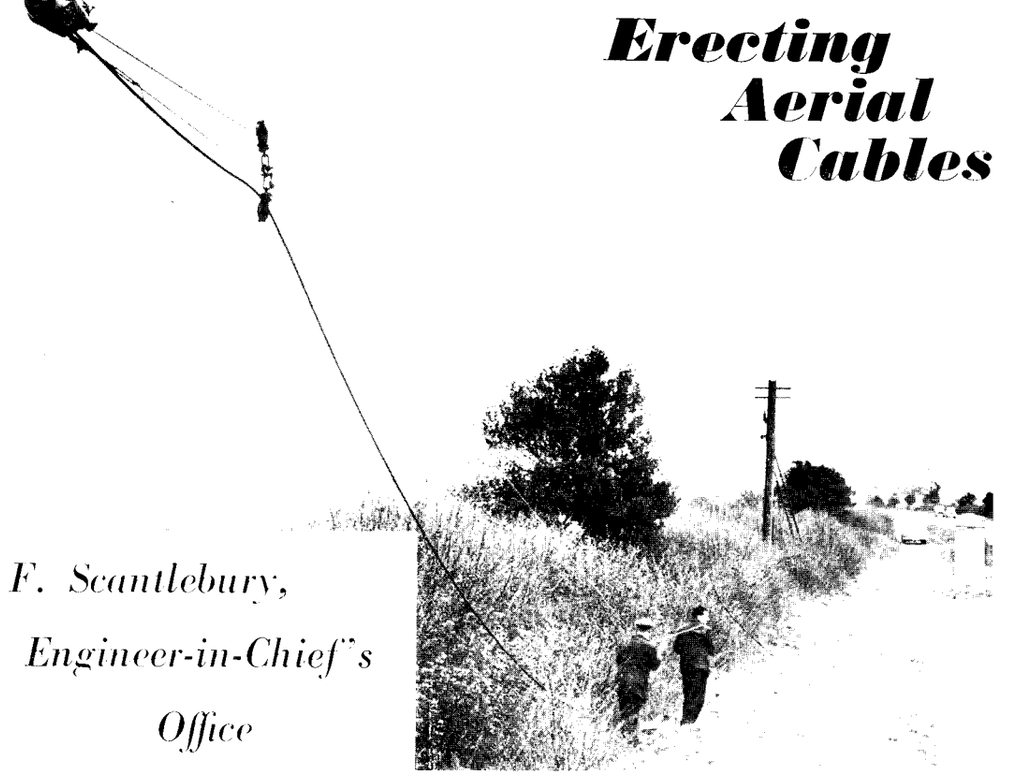
A practical method of mechanising trunk fee accounting has been developed at Canterbury which, if used in a reasonable number of accounting units, could be expected to produce subscribers' trunk statements in the customary amount of detail at no greater cost than that of the equivalent manual method. Its use in this way would have the advantages that a smaller number of staff would be required to handle a given volume of accounts work; and that the work would be more attractive to the staff employed, since they would not be required to perform long periods of tedious and uninspiring duties.

It has the further advantage that it would enable a more detailed account to be given, if that were desired, at about half the additional cost of giving it with the manual process.

Other considerations which will need to be taken into account in deciding whether mechanical trunk fee accounting should be adopted more widely are the possible introduction of subscriber trunk dialling and the method of charging for trunk calls under such a system. If this were to be on the basis of automatic ticketing of call details, it might be possible to arrange for tickets to be produced automatically in punched card form, suitable for subsequent handling by a mechanical accounting process. If, however, a system of multi-metering with bulk billing were to be adopted there would be less scope for a mechanized accounting process.

The development of mechanical accounting to this stage of efficiency and economy has been made possible by the ingenious and novel means of optical scanning perfected by the Post Office Engineering Research Branch, and the development by Powers-Samas of special machinery for use with it. The important features of the scanning device in relation to the present application are its sensitivity, the substantial tolerance it allows in the positioning and quality of marks, and its great accuracy. Because of these features the device is likely to have wider application in accounting and analytical work and, as it is understood to be the first of its kind, it may give British industry a clear lead in this field; in this connection it is understood that Powers-Samas are developing other machines incorporating, under licence, the scanning device.

Erecting Aerial Cables



L. F. Scantlebury,

Engineer-in-Chief's Office

THE USE OF AERIAL CABLES IN THIS COUNTRY expanded considerably during and after the last war, because of the paramount need to augment rapidly the external line plant, both trunk and local, to meet the large demand for service. With the limited man-power and materials available it was necessary to resort to constructional methods which would provide circuits cheaply and speedily, due regard being paid, of course, to subsequent maintenance.

Aerial cable can be erected more quickly and at a much less cost than the provision of underground cable in ducts. There is, however, a greater possibility of faults as it is vulnerable to storms, but against this the cable is accessible and open to inspection and repairs can be readily effected.

Maintenance costs in the past have tended to be high and development has been directed to improving methods of suspension and to developing types of cable less liable to damage by the movement and vibration to which aerial cables are constantly subjected. The point has now been reached when, provided the supporting pole route has been adequately designed and the cable is erected in accordance with the specified practice, aerial cable should prove as satisfactory as underground cable.

The earliest aerial cables in this country, erected at the end of the last century, were made of rubber covered copper conductors enveloped in a bitumen impregnated braided covering. The core of these cables consisted of several strands of steel wire sufficiently strong to support the cable when erected. The need for a separate suspension strand was thus avoided, but the cables were not very satisfactory in service as the steel wires cut through the conductor coverings causing faults.

The use of lead covered cables for aerial work was not favoured in the early days because of the risk of damage to the soft lead sheath, by vibration and fatigue, and there was also considerable prejudice in certain localities against the use of large aerial cables on the grounds that their existence would prove detrimental to local amenities. In London, for example, the use of lead covered aerial cable, was severely restricted by by-laws issued by the London County Council under the Overhead Wires Act of 1891.

It was eventually found that the addition of

small percentages of other metals to lead increased considerably its resistance to fatigue. Tin, calcium, silver and zinc, have been used with reasonable success, but 0.8-0.9 per cent antimony alloyed with the lead is now most generally used for aerial cables (and is also used underground where severe vibration is likely to be experienced, such as on bridges or piers).

The earliest trunk cable to be provided as an aerial cable was erected in 1924 between London and Southend and was a lead sheathed cable consisting of 54 pairs of paper insulated conductors of 40 lb. per mile. It was erected on 28 feet medium and 30 feet stout poles in the ratio of three to one respectively, and suspended by rings from a suspension wire. A further cable was erected on the same poles in 1929.

This was followed in 1931 by the London-Brighton cable, a lead covered cable containing 74 pairs of 10 lb. conductors with an overall diameter of 0.82 inches. This cable was erected with the object of investigating the possibilities of four wire repeater working over aerial cables.

Apart from these the majority of aerial cables erected prior to the last war were for subscribers' circuits and rarely exceeded an inch in diameter.

Design of supporting pole route

The principles followed in designing a new route to carry aerial cable, or in strengthening an existing route, are those already well established for routes carrying open wires. In a straight section of route the pull of the wires or suspension strand on either side of a pole balance, and the main purpose of the supporting poles is, therefore, to resist the wind pressure on wires, cables and poles at right angles to the line of route. At angles in the line the out of balance pull on the pole by the wires or suspension strand must be balanced by stays. Only the horizontal component of the tension in the stay serves any useful purpose in balancing this pull; the vertical component simply tends to push the pole further in the ground and the pole must be strong enough to resist this buckling force.

In determining the forces exerted on the route by wind pressure, no allowance is made for the heavy coatings of ice which occasionally occur on lines. In this country meteorological records show that winds exceeding 80 m.p.h. are exceedingly rare and occur only near the coast and over high ground. In other parts of the country winds

Bo'sun's chair

rarely exceed 60 m.p.h. The simultaneous occurrence of ice coating and high winds is also rare.

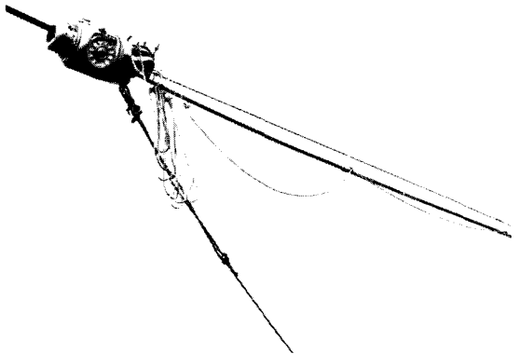
Long experience has shown that it is sufficient for routes in exposed situations to be designed to withstand winds of 80 m.p.h. and for routes in more normal situations 60 m.p.h. In sheltered situations winds of 40 m.p.h. only need be considered. From wind tunnel experiments it has been found that the wind pressure on cylindrical surfaces varies directly with the diameter and with the square of the wind velocity. In addition to withstanding these wind pressure forces the poles must also carry the dead weight of the aerial cable and suspension strand. All these forces, which must be resisted by the poles, can be readily evaluated and suitable poles selected to allow a factor of safety of some three or four under the worst conditions likely to be met in practice.

Erection

Aerial cable is usually supported from a stranded steel suspension wire tensioned to a pre-determined value and secured at each pole. The size of this wire depends on the weight of the cable or cables to be erected and on the length of span. It is terminated at the beginning and end of the cable and also at angle poles where the out of balance pull on the pole would be excessive. The usual type of termination is made by passing the end of the wire twice around the pole and securing it to the main wire by means of clamps. In addition a false termination is made at the ends of spans crossing busy roads, railways and buildings, to give added support. This is made by passing a

length of wire, of the same type as the main suspension wire, twice around the pole and securing each end to the main wire. At all other poles the wire is secured by brackets.

Suspension wire is normally supplied in half-mile lengths on drums and is paid out by mounting the drum on a lorry which proceeds along the route after one end of the wire has been terminated, or spliced to the preceding length. As it is paid out the wire is placed in the brackets on each pole



Erecting aerial cable over busy roads

so as to avoid obstruction to traffic. Where the wire has to be erected on the side of a pole away from the road, this method is not practicable and the drum has to be mounted near the first pole and the wire pulled out along the line. The wire is then tensioned to a pre-determined value, depending on temperature and length of span, using a chain puller and dynamometer. In some circumstances a tension of over 6,000 lb. may have to be applied.

Until recently steel cable rings were used to attach the cable to the suspension wire. They were fixed at regular intervals, usually 20 inches, by a man riding along the suspension wire in a special chair. A draw-rope was enclosed in the rings as they were attached which enabled the cable to be finally drawn through the rings with the aid of a motor vehicle or winch. Movement of the rings during the drawing in of the cable was prevented by the hooks which were shaped to lock the ring in position. Rings did not, however, prove altogether satisfactory and cutting of the lead sheath of the cable by the rings proved troublesome — particularly in exposed areas. Various methods were tried to prevent this trouble, including the use of cradle type rings with and without lead seatings, but without much success.

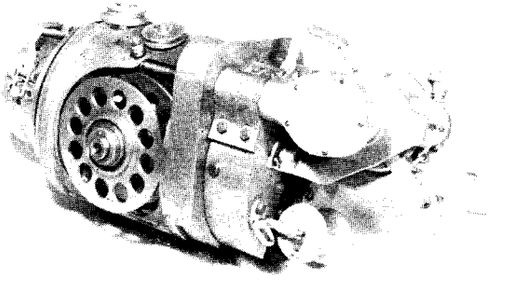
An improved method of supporting the cable has been introduced in recent years by using a cable lashing machine which lashes the aerial cable to the suspension wire. The machine consists of a carriage which runs on the suspension wire and which raises and supports the cable, and a drum carrying a coil of lashing wire which rotates as the machine is pulled along the suspension wire thereby wrapping the lashing wire tightly around both cable and suspension wire.

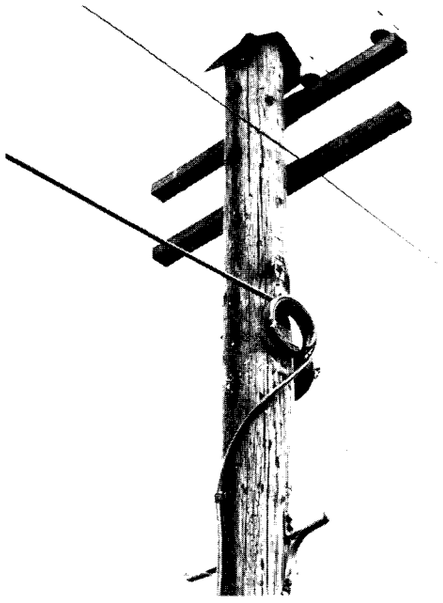
This method has been satisfactorily used for supporting cables of all sizes up to about 2 inches diameter and has proved economical in manpower. It also looks much neater. It is now the standard method of construction for all new work and for existing cables where trouble from ring cutting is experienced.

Where convenient, the cable drum is mounted on a vehicle or trailer which moves along the route. The lashing machine is placed on the suspension wire and connected by a towing rope to the vehicle. As it is drawn along, the cable is lifted by cable lifting rollers at the front of the lashing machine and the rotating drum carrying the lashing wire secures it firmly to the suspension strand. The lashing machine has, however, to be lifted off the suspension strand and replaced at each pole.

Where it is not convenient to use a vehicle or trailer to carry the cable drum, it is necessary to

Cable lashing machine





Termination of plastic self-supporting aerial cable

lay out the cable on the ground and pull the lashing machine along by hand, the cable being supported ahead of the lasher from the suspension strand by snatch-blocks (see photograph in title, page 153). Where large cable is being erected, or where it is necessary to erect cable over busy roads, it is erected temporarily in wire rings and the machine subsequently pushes these away and lashes the cable in position (see photograph on page 155).

The advantages to be derived from an aerial cable capable of supporting its own weight, thus eliminating the need for a suspension strand and supports, and the economies which can thereby result in labour and materials are immediately apparent. A self-supporting cable has been developed in recent years having a sheath of stainless steel formed from a steel strip some three hundredths of an inch thick. The strip is passed through a series of rollers which form it into a tube with longitudinal flanges which are then electrically welded. The core is the same as for a lead sheathed cable with the addition of a final layer of metallized paper to avoid damage by the heat of the welding process.

Jointing adjacent lengths of steel sheathed cable or steel sheathed lengths to normal lead covered lengths presents no difficulty as various fluxes suitable for soldering stainless steel are available. The sheath is "tinned," using one of these special fluxes, and a lead sleeve can then be soldered using the normal "lead to lead" technique.

Only small amounts of this steel sheathed cable have so far been obtainable and its cost including the cost of erection tend to exceed that of lead covered cable and suspension strand. The life and maintenance costs are expected, however, to prove advantageous and justify the more extensive use of this interesting cable.

In the past protection of overhead plant from high voltage power lines has usually been obtained by undergrounding or by the use of cradle guards. Recently the Post Office has agreed to use the "all-polythene" cable developed for subscribers' underground distribution purposes, as an aerial cable at power crossings—a much cheaper method of protection. This cable has conductors insulated with polythene as well as an overall polythene sheath.

It is, however, not self-supporting and a suspension strand has to be provided which must be adequately insulated from the supporting poles as it would be raised to a dangerous voltage if struck by a falling power conductor. The avoidance of such metal work by the use of a self-supporting plastic cable has much to commend it and a plastic sheathed cable containing conductors sufficiently strong to render it self-supporting has been developed. This cable has conductors of cadmium copper weighing 20 lb. to the mile, each insulated with a thin layer of polythene coloured to assist in identification of the wires and pairs. The core is covered with a tape of polythene and aluminium and finally sheathed with polyvinyl-chloride (P.V.C.) of an average thickness of 0.10 inch.

The normal methods of terminating suspension wire by means of clamps are unsuitable for use with this type of cable as the plastic sheath would be damaged. Special supports have, therefore, been designed with helical channels around which the cable is wound for one or two turns and which provide sufficient friction to hold the cable when tensioned. An experimental length of a 10 pair cable of this type has been erected on the Hog's Back near Guildford, and is under observation. This cable is very light, is not expected to prove costly and, if successful, it should lead to considerable economies in installation costs.

Counting the Coins from Public Call Offices

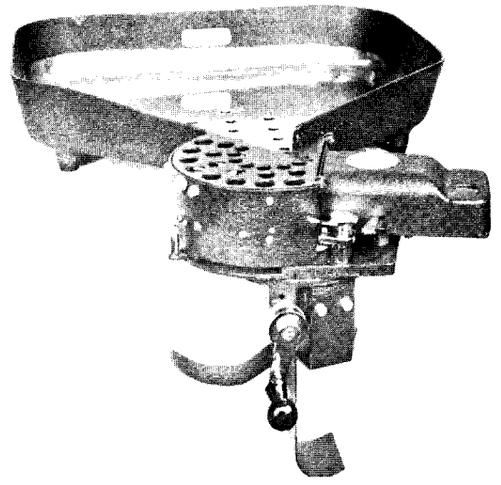


Fig. 1
Hand driven machine

J. Greenall, A.M.I.E.E., Engineer-in-Chief's Office

IN THE NOVEMBER, 1951, ISSUE OF THIS "JOURNAL" a description was given of coin collecting boxes. The value of the money collected annually from public call boxes now exceeds £7,000,000. The majority of the coins collected are pennies, but sixpences and shillings are included, and these have to be separated from the copper coins before the money is deposited with the bank. The number of coins involved exceeds 1,000,000,000 annually. The job of sorting and counting would be tedious and costly if done by hand, and to assist collectors in their task machines are provided at offices where they are justified by the volume of work.

Before the introduction of the machines, most of the money had been counted by hand, although weighing machines were used in some offices. These were standard parcel weighing machines, the scales of which had been marked to indicate from 1s. to 20s.

Machines for separating and counting coins were introduced into the Post Office in 1933. The first machine, a power driven model, was brought into use in May of that year. Mechanically the machine differed little from present day types. It was supported on a wooden cabinet, whereas metal cabinets and trays are now used. A second totalizer meter was not fitted and the coins were discharged direct into a bag held under the discharge chute. In present day power machines, the coins are first stored in the chute and ejected into the bag by moving this chute downwards.

The most commonly used machine counts only coppers. When counting the mixed copper and silver from telephone coin boxes, the Trap Lever is set to the penny counting position. The pennies are then automatically segregated and counted, the silver being rejected for counting by hand.

When counting the coins from stamp selling machines, the Trap Lever is first set to the penny counting position, the pennies are counted and the halfpennies rejected. The Trap Lever is then moved to the halfpenny position, and the halfpennies again fed into the machine when they are counted. The meter reading when counting halfpennies will be twice the actual value of the coins counted; that is, after 60 halfpennies have been counted the meter reading will be 5s. This reading is, of course, divided by two to obtain the correct amount.

At the halfpenny setting the machine does not separate any coins, and all coins whatever their value are recorded as a penny. The machine should not be used at the halfpenny setting for counting mixed silver and copper.

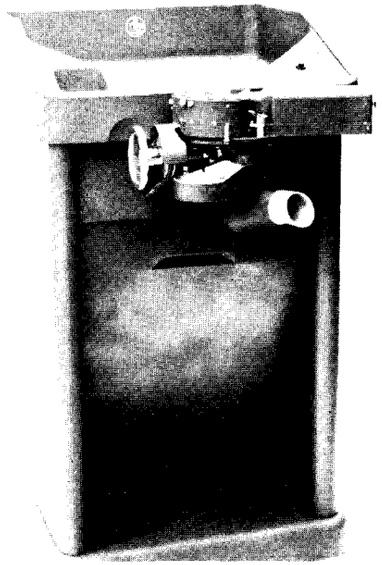


Fig. 2
Motor driven machine

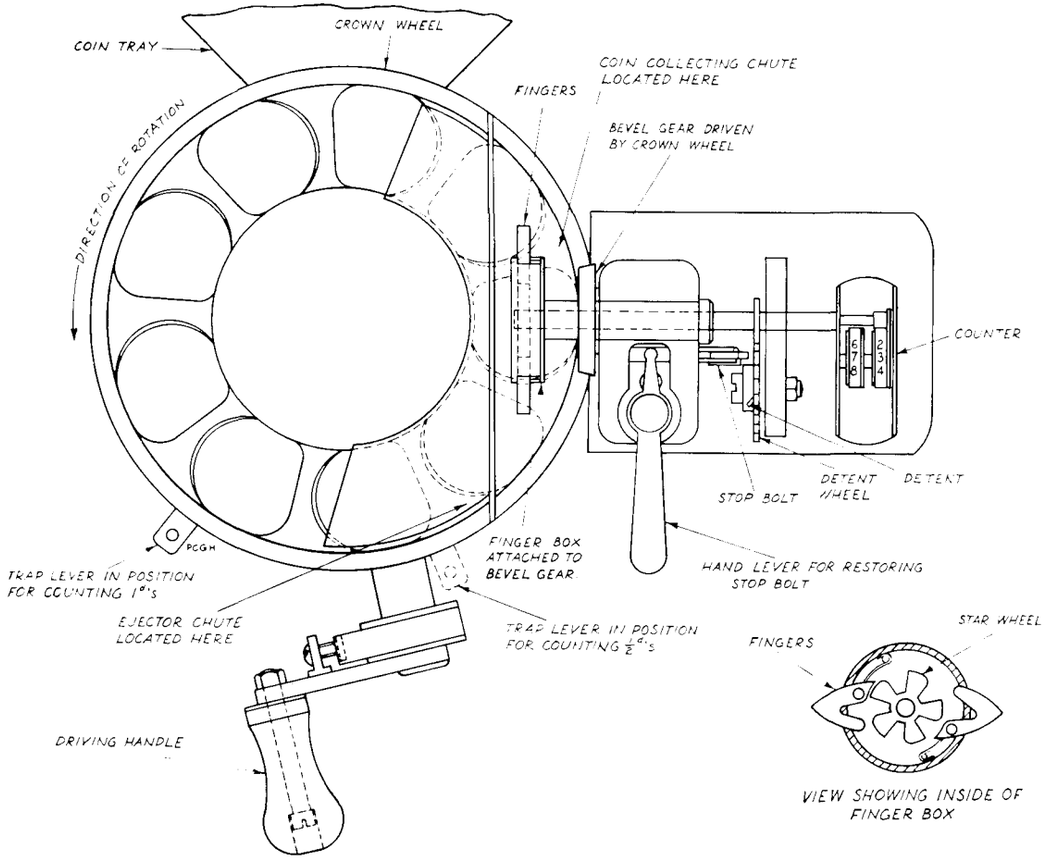
Today, motor driven machines (Fig. 2) are provided at the larger offices and hand models (Fig. 1) at the small offices.

The power machine is complete with its own stand and is placed on the floor in any convenient position, the driving mechanism being enclosed in the sheet metal cover. The hand machine is fixed to a table at convenient height to allow the operator to sit while working the machine. The principle of operation and the facilities provided by the two machines are similar, each counting 60 coins and being automatically stopped when this number is reached.

The power machine differs from the hand in the method of ejecting coins into the bag. It is provided with a totalizer which records the aggregate of all money counted by the machine and a second counter which can be set to zero and used to record the amount collected from each coin box. The hand machine is fitted with one counter which can be reset to zero and reads to a maximum of 10s.

Fig. 3 shows the essential mechanical features

Fig. 3
Mechanical features of the copper counting machine



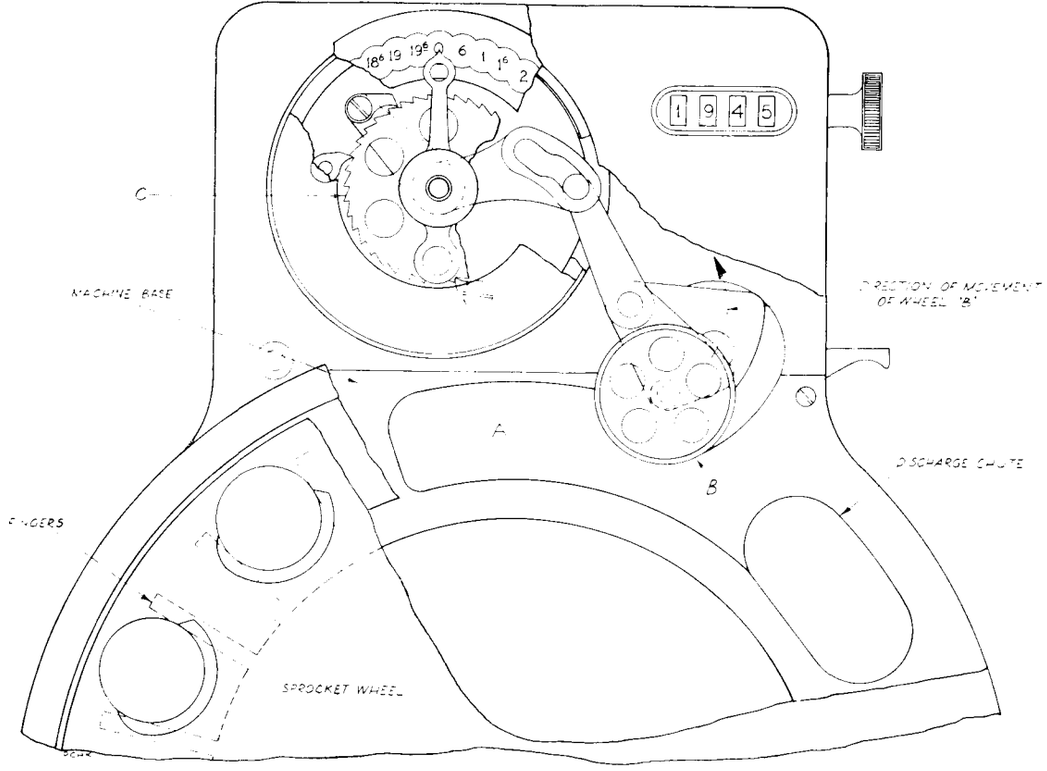
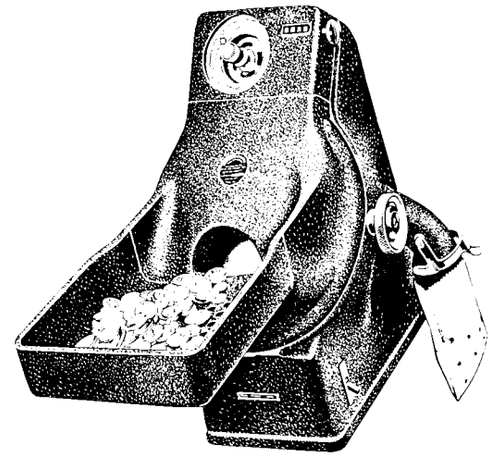


Fig. 4

Below is an illustration of the silver counting machine, while the diagram above shows its operating parts



of the copper counting machine; the means adopted to ensure that not more than one coin at a time is fed to the counting mechanism have been omitted.

The coins to be counted are emptied on a coin tray which has a large number of holes through which small pieces of dirt and other foreign materials can drop. The machine is set to count pennies, and mixed coins are fed by hand from the tray on to the crown wheel which revolves at about 115 revolutions a minute. The coins are tumbled about on the crown wheel until they fall into one of nine holes and move around with it to the counting mechanism. Any coin smaller than a penny drops into the ejector chutes in front of the counting mechanism, pennies being carried forward.

Driving in synchronism with the crown wheel and rotating in a plane at right angles to it is the finger box to which two projecting movable fingers are attached. If a hole in the crown wheel is occupied by a coin as it passes under the projecting finger, this finger is pressed into the

finger box which engages with the star wheel inside the box and causes the star wheel to rotate with the box until the penny discharges into the coin chute, when the finger is released. The shaft of the star wheel is connected to a counter which steps forward one unit during this operation. Should there be no penny in the hole of the crown wheel as it passes under the finger box, the finger is not depressed and counting does not take place. A detent wheel is driven by the star wheel shaft and makes one revolution for every 60 coins counted. When this number is reached, the detent on this wheel moves the stop bolt which engages in a slot in the small bevel gear wheel and counting stops.

In the hand machine the coin drops from the chute direct into a paper bag supported by a bracket under the chute; to restart counting, the machine is unlocked by the hand lever. In the power machines the coins are first stored in the coin chute and when the machine has counted 60 and has stopped, this chute is moved downwards to eject coins into a bag held over its mouth. The chute is spring loaded and, on release, it returns to its original position, this movement unlocking the machine to restart counting.

A small number of silver counting machines and machines counting to special values have also been provided. A silver counting machine and its essential operating parts are shown in Fig. 4. The mixed coins, after being fed by hand from the coin tray, are carried by the sprocket wheel to position "A", when they fall into a recess in the machine base, and are then trapped between the underside of the sprocket wheel and the machine base. Attached to the underside of the sprocket wheel is a plate carrying fixed projecting fingers, which are placed so that a coin falling into the recess drops between two fingers which carry the coin forward into contact with wheel "B". As the coins continue to move round, this wheel is pushed by the coin in the direction indicated by the arrow, the displacement of the wheel "B" depending on the size of the coins being counted. The lever attachment to wheel "B" rotates the ratchet wheel "C" one tooth for each 6d. of value of the coin: that is, one tooth for 6d. two for 1s. four for 2s. and five for 2s. 6d. The pointer attached to the ratchet wheel indicates on the counter the amount recorded. For each revolution of the circular counter, the veeder type counter, located to its right, moves on one unit. After being counted, the coins are ejected into a bag held over the discharge chute.

Counting is automatically stopped at values between £4 18s. 0d. and £5, the actual figure depending on the value of the last coin counted. The figure at which the machine has stopped is then noted and the amount required to bring a bag up to £5 is added by hand.

In the past machines have been obtainable from only one manufacturer and this firm has concentrated since the end of the war on meeting a large demand for new machines. No radical changes in the design of the machines which both separate and count coins have therefore been made. Two new types of machines have recently become available in this country and both these machines are being studied with a view to ascertaining if they are suitable for use in the Post Office.

Coin counting machines are provided and maintained by the Post Office Engineering Department. Maintenance includes regular cleaning and oiling, and periodical overhauls when the machines are stripped down and all worn parts are renewed.

Correspondence

Selling Shared Service?

From Mr. G. G. Connell, Sales Representative, Plymouth Telephone Area

Dear Sir,

The recent article by Mr. Llewellyn on "What does a Telephone Salesman do to-day?" (published in the February-April, 1954, issue of the *Journal*) has stimulated the interest, and what may also be described as a feeling of anticipation, in the minds of many members of the Sales departmental grades of the Post Office.

The day when the Sales Division of the Telephone Area Managers' offices again resume their function of seeking customers for the facilities offered by the Post Office Telephone Service may not be far off. The first facility to be offered, will, I believe, be the new inland Telex service, and many members of the Sales Organisation, in particular the post-war recruits to Sales Representative grade, will welcome this opportunity to test their capabilities as salesmen.

As a post-war recruit I have pondered many times on this problem of selling, and in particular the problems of selling one facility that did not exist in pre-war days; that is, shared service. The question which occurs to me is, "Shall I be able to sell shared service in direct competition with normal exclusive exchange service?"

Public attitude

It may at first sight appear presumptuous of anyone who has not had pre-war experience of selling telephone services to discuss the merits and demerits of existing or proposed "selling points" of shared service. Post-war experience, however, and the efforts of the Sales Division in Telephone Managers' offices to "sell" the supply difficulties to a telephone-hungry public with the primary object of maintaining goodwill, and understanding of the problems which have faced the Post Office, does give the post-war Sales Officer some insight into the present day attitude to shared service, with its several refinements (separate metering, separate numbers, no bell tinkling and so on) and, of course, its disadvantages.

A good deal of evidence is becoming increasingly apparent to the Sales Officer, in his day to day dealings with the general public, that subscribers who have shared service (with separate metering and so on) are satisfied with the facilities provided and with the reduced rental, particularly those residential subscribers who have a very low calling rate. This is true whether this form of service was provided in the first instance because it was the only type of exchange connection available, or the subscriber was transferred from exclusive to shared service either voluntarily or in accordance with the Telephone Regulations.

This growing body of satisfied shared service subscribers is gradually producing a discernible feeling of confidence and is stimulating a demand from applicants for this type of service, and, what is perhaps of equal importance, a demand from existing subscribers on exclusive service for early sharing. The prejudice against shared service is disappearing even in those close knit rural communities, where the question of overhearing has been a bogey which the Sales team often in the past had difficulty in overcoming.

The existing selling point, of a reduction of 7s. 6d. per quarter in favour of shared service, would not in itself be a sufficient inducement for many would-be or potential subscribers with a free choice to elect to rent shared in preference to exclusive service. Carefully directed publicity, stressing (in those areas where this applies) that the rental for shared service is 25 per cent., or a quarter less than the exclusive residential service, would do much to assist the marketing of shared service, and have a stronger appeal than the present publicity line of making a factual statement showing the simple reduction of 7s. 6d. per quarter or 30s. 0d. per annum.

A further reduction in rental for shared service may hardly be expected, but perhaps some form of concession or adjustment to connection charges in favour of shared service might be worth considering.

Connection charges

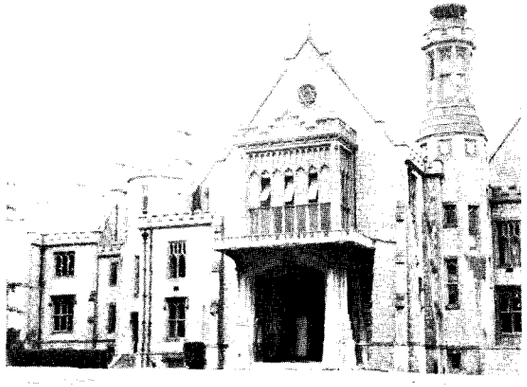
It is understood that difficulties would arise by altering the existing connection charge tariffs, but it might be possible to consider either waiving entirely connection charges for shared service, or maintaining existing charges up to a certain distance from the exchange, and then increasing the connection charges for exclusive service in proportion to the distance from the exhange. Either of these concessions would help to sell shared service. The latter would have the advantage that shared service would attract subscribers in those places where they are most required; for example, in increasing numbers as the line plant extends further from the local exchange.

In conclusion, I am quite certain, despite the disadvantage of not having any pre-war or post-war experience of seeking new subscribers to the telephone service, that shared service could be sold to the public, provided all, or at least some, of the selling points mentioned were available to the Sales Representative should canvassing for shared service subscribers in particular again become one of his functions.

A vigorous and attractive publicity campaign would be necessary.

(Letters on subjects of general interest would be welcomed. They should be as brief as possible. The views of correspondents are not necessarily those of the Editorial Board or of the Post Office.)

TWO SOUTH-WESTERN TELEPHONE AREAS



The Shire Hall, Taunton, where the Assizes are held

TAUNTON

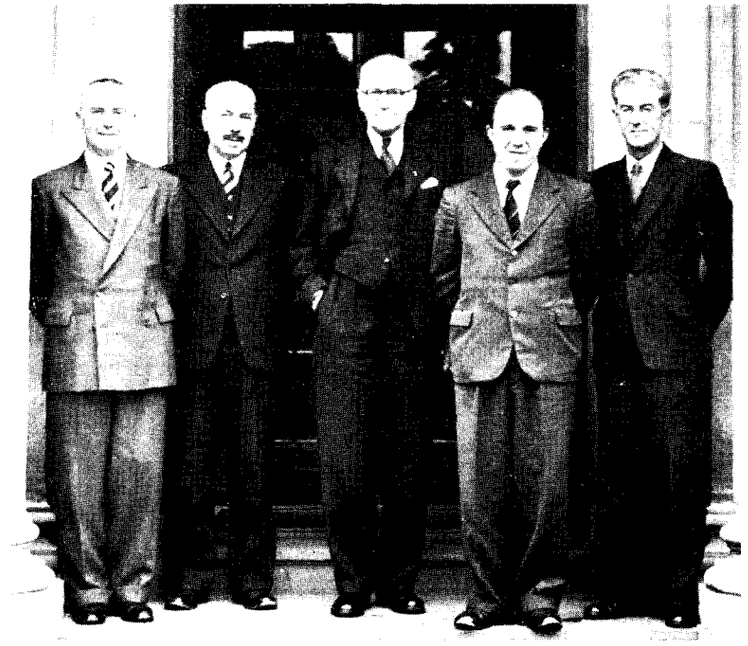
Taunton, dating from Saxon times and the scene of the trial known in history as "The Bloody Assizes", is now best known for its public school and colleges and as a shopping and commercial centre of one of the richest agricultural districts in England.

It is the County Town of Somerset and, lying on the A.38 main road between Bodmin in the west and Derby in the midlands, is a natural communications and touring centre, and one of the principal gateways to the West Country. Another of Taunton's claims to fame is that of being the first town in the country to light its streets by electricity.

The Taunton Telephone Area covers North Devon, most of Somerset and part of Dorset. From Wincanton in the east to Hartland in the west is roughly 100 miles.

Exmoor, rugged and sparsely populated, and the Quantock Hills, both with extensive National Forests, lie to the west and north and on the north coast are Bideford, Barnstaple, Ilfracombe and Minehead well-known holiday resorts.

The rest of the Area is mainly agricultural, but Bridgwater and, in the south, Yeovil are noted for light engineering and glove and aircraft manufacture respectively.



There are 110 telephone exchanges in the Area with 32,441 exchange connections and 48,466 stations. 92 exchanges are automatic and the total staff (excluding telephonists) is 769.

★

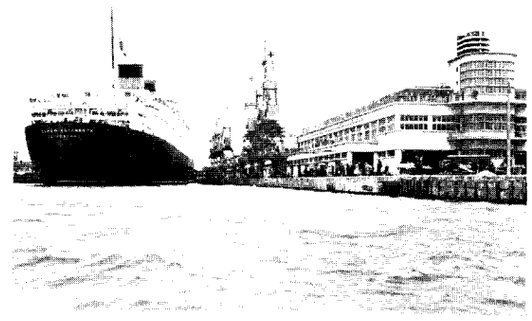
From Left to Right: L. J. L. THOMAS, Senior Sales Superintendent; W. PYPER, Chief Clerk; A. E. SIMS, A.M.I.E.E., Telephone Manager; L. J. Trott, Area Engineer; H. J. Turner, Senior Telecommunications Superintendent

Southampton Telephone Area extends for about 1,200 square miles containing some half a million population. While the headquarters city, Southampton is largely industrial and is one of the biggest ports in the United Kingdom, most of the Area is agricultural. Within its boundaries are two cathedral cities, the defence training ground of Salisbury Plain and part of the New Forest.

On the Avon, twenty-two miles north west of Southampton, is Salisbury, which is the next largest city in the Area, with a population of 33,800. Its ancient cathedral, with its spire rising to 404 feet making it the highest building in England, is the centre of a diocese whose present Bishop is the 98th in order of succession.

Winchester, which was the ancient capital of Wessex and seat of government of Alfred the Great, Canute (who is buried here), and, with London, of William the Conqueror, with 25,790 population, is now a busy county town and home of the oldest public school in the country. The diocese of Winchester includes the deaneries of Jersey and Guernsey.

In the north of the Area is Andover, a small agricultural centre, though with some light industries and serving several Royal Air Force establishments.



S.S. "Queen Elizabeth" docking at the Ocean Terminal, Southampton

(By courtesy of British Railways Southern Region)

SOUTHAMPTON

The Area is served by 103 exchanges and 90 per cent. of the 38,600 exchange connections are automatic.

An article on Southampton and its new telephone exchange appears on page 139.

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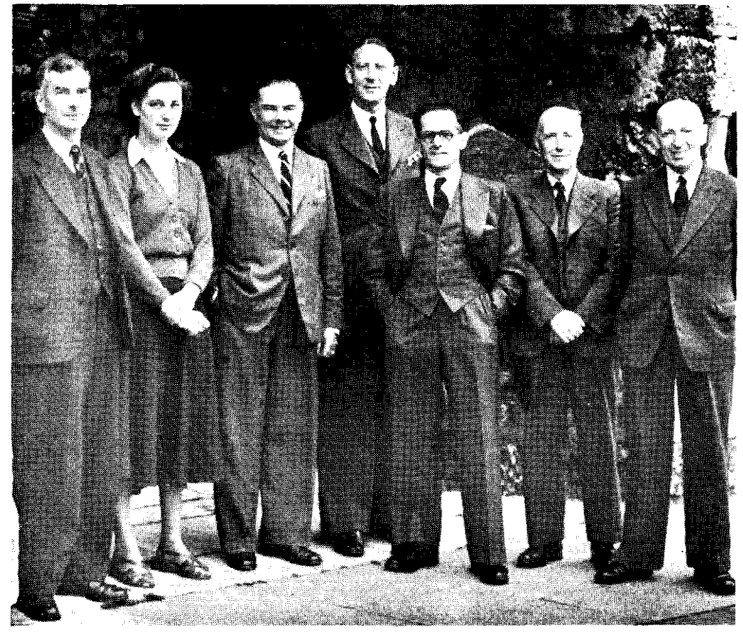

Left to Right: A. C. PITCAIRN, B.Sc.(Eng.), M.I.E.E., Area Engineer; Miss H. LAWSON, Secretary; H. KNEE, A.M.I.E.E., Area Engineer; F. E. FERNEYHOUGH, Telephone Manager; F. N. Thomas, Chief Telecommunications Superintendent; W. G. SKERRITT, Chief Clerk; J. D. HENSHAW, Senior Sales Superintendent

NOTES AND NEWS

Mr. F. I. Ray, Regional Director, L.T.R., speaking at the Barnet Exchange Conversion

The new Barnet, Middlesex, automatic exchange opened on May 27, to serve sections of the Borough of Southgate and the Urban District Councils of Barnet, East Barnet, Enfield and Potters Bar.

Nearly 7,000 subscribers' lines were transferred from the old manual exchange, which had been in operation since 1922, and 500 people who had been waiting for telephones obtained service at the change-over. The exchange is capable of accommodating 9,350 subscribers.

No telephone operators are employed in the new building, the staff being entirely engineering. Subscribers who dial "O" or "TOL" are served by the auto-manual switchboard at Hillside exchange nearby, while "TRUNK" calls will be controlled by the Trunk Control Centre at King's Cross. Exceptionally, "TRU" calls from multi-coin boxes will be dealt with in the Hillside exchange.

Mr. A. Beverley Baxter, M.P. for Southgate, who received the K.B.E. in the Queen's Birthday Honours, was the principal speaker at the reception on June 3 to mark the event. Among the guests welcomed by Mr. E. E. Neal, Telephone Manager, North Area, were representatives of the local authorities and of Standard Telephones and Cables Ltd., the contractors.

Mr. F. I. Ray, C.B.E., M.I.E.E., Director, London Telecommunications Region, in thanking Mr. Baxter for officiating, said how pleased he was that the experience of the manual operators was not to be lost to the service. He welcomed representatives from their ranks.

★ ★ ★

New Transatlantic Telephone.—Submarine Cables Ltd. of Greenwich are fitting a new factory at Erith to manufacture the new transatlantic telephone cable, of which they are making the major part. A large part of the bed of the Thames will be removed from Erith to deepen the river and enable H.M.T.S. *Monarch* to berth alongside for loading the cable.

Announcing this at a luncheon given by the company the Postmaster General, Earl De La Warr, said that many of the fifty-two repeaters in the cable would have to be laid at a depth of two miles below the surface of the ocean. The dimensions of the cable would have to be controlled in manufacture far more closely than had ever been attempted before. The cable, running under the Atlantic for some 2,000 miles, will be ten times longer than the longest existing submarine telephone cable.

★ ★ ★

Royal Homecoming.—Four telephone lines to the Royal Yacht in the Pool of London, and one to the escorting ship, *The Gay Bombardier*, in Shadwell Basin, were installed by Post Office engineers for the Queen's homecoming from her Commonwealth tour.

Special telephone facilities were also provided in conjunction with an R.A.F. Radio Navigational Aid at Erith Marshes for the Fighter Command Fly Past in salute of Her Majesty.

The Post Office also provided for the B.B.C. 37 microphone circuits and 53 private wires for sound broadcasting, and 7 camera points, 11 microphone points and 32 control circuits for television.

★ ★ ★

Honours.—The C.B. was conferred on Mr. W. A. Wolverson, Director, External Telecommunications Executive, in the Queen's Birthday Honours, and Major-General L. B. Nicholls, Chairman, Cable & Wireless Ltd., became a K.C.M.G.

Other honours in the telecommunications field included: Lt.-Col. D. T. Gibbs, E.T.E. (I.S.O.); Miss M. E. Faulkner, Senior Executive Officer, London Telecommunications Region (M.B.E.); Mr. W. G. Collins, Assistant Superintendent, L.T.R. (B.E.M.); Miss M. Edwards, Chief Supervisor (Telephones), Southampton (B.E.M.); and Mr. W. E. Cleaver, Manager, Cable & Wireless Ltd., Training School, Porthcurno (O.B.E.).

★ ★ ★

P.O. T. & T. Society, London.—In October the Post Office Telephone and Telegraph Society will celebrate its 50th anniversary. The earliest recorded meeting of the Society was in October, 1904, and since that date the Society has continued to meet regularly each winter, except in war-time.

★ ★ ★

Tribute to Euston Telephone Exchange.—The General Secretary of an organization served by Euston Telephone Exchange, London, who has had a wide international experience, has written to the Post Office saying: "how very courteous I find the people at the Exchange—it is a great pleasure after battling for many years in foreign countries where one can spend a morning trying to get through to perhaps one person on an urgent matter, to 'phone with ease and to feel confident that there are always those to advise and to help in any difficulty. It is not the least of the pleasures of the old home-country".

★ ★ ★

Electra House Chapel.—The chapel at Electra House, London (Post Office Cable & Wireless Central Telegraph Station), has been re-opened for the private use of the 4,500 staff of the Station, of Cable & Wireless Ltd., and Cable & Wireless (Holding) Ltd. Designed by Mr. F. J. P. Hicks, now Surveyor of the Holding company, it was first opened in 1942, but was destroyed by bombing in 1944. The Archbishop of Canterbury re-dedicated the building in June in the presence of the Postmaster General, Sir Edward Wilshaw (former Chairman of Cable & Wireless Ltd.), Major-General L. B. Nicholls (Chairman) and Mr. N. C. Chapling, Managing Director.

★ ★ ★

Speaking Clocks for Australia.—Improved speaking clocks (TIM) designed by the Post Office Engineering Department and made by the Telephone Manufacturing Co., Ltd., have been supplied to the Australian Administration for Melbourne and Sydney. Additional equipment was made in Post Office workshops and by Muirhead & Co., and special recordings were produced at Dollis Hill Research Station using an Australian male voice for the announcements. Mr. F. A. Milne, a Post Office engineer, is going to Australia to co-operate in the installation.

★ ★ ★

American Appreciation.—An American in Britain has given full credit to the transatlantic telephone service. When he recently spoke from London to his sister in Staten Island, New York, he was impressed by the courtesy and efficiency of the operators, by the speed with which he was connected, and because he and his sister could hear one another so clearly. In a letter to the Post Office he comments that "It is rare, in these days of paying much for little, to receive such value for the expenditure of a relatively small sum".

★ ★ ★

New Cable Ship.—Submarine Cables Ltd., owned jointly by Siemens Brothers and the Telegraph Construction & Maintenance Co., have purchased the s.s. *Empire Frome*, 5,360 tons deadweight, for conversion into a cable ship.

Conversion is expected to take about 12 months to complete, when the vessel will be renamed the c.s. *Ocean Layer*. The ship will be the first British vessel to be fitted with a Pleuger activated rudder.

C.S. *Ocean Layer* will be able to carry 3,750 tons of submarine cable in her four cable tanks, equivalent to 1,200 nautical miles of the lighter

deep-sea type of cable. She will be fitted with gear for laying normal cable as well as the heaviest known types of submarine power cable; also, for laying rigid as well as flexible submersible repeaters.

★ ★ ★

Coventry Clock Circuits.—Mr. W. S. Roddis, Head Postmaster of Southampton, has written to Mr. Baker, following the article on Clocks in our February-April issue, reminding him of a species of TIM service which used to be given in Coventry.

There were several circuits available in the subscribers' multiple terminating in Coventry Town Hall clock tower, with suitable apparatus at the tower end. Subscribers used to call the exchange and ask for "the clock". The call would be passed within a couple of minutes of the hour, and the subscriber would remain in circuit until the hour had struck.

★ ★ ★

Radio Show. The National Radio Show at Earls Court, London, which opens from August 25 to September 4, will include for the first time a demonstration of outside television broadcasts by the B.B.C. as well as studio broadcasts on sound and television. Television programmes from seven different sources, six within the exhibition, will be seen continuously by domestic viewers.

★ ★ ★

Coincidence. A woman motorist who was selected at random and invited to make a free call to open a new telephone kiosk for motorists near Frederick, Maryland, spoke to her aunt, Mrs. David Fairchild, Miami, a daughter of Alexander Graham Bell, inventor of the telephone. The motorist was Mrs. W. Myers, the inventor's granddaughter.

★ ★ ★

London Statistics.—During 1953 the weekly average number of telephone calls made in the Post Office London Telecommunications Region was 32,289,011, representing a calling rate of 28.9 calls a week for each exchange line.

The weekly average of calls in 1952 was 31,977,032 and the calling rate 29.7 calls a line each week.

Some Statistics of the Inland Telecommunications Service

	31st March, 1952	31st March, 1953	31st March, 1954
THE TELEPHONE SERVICE AT THE END OF THE YEAR			
Total telephones in service	5,716,300	5,927,000	6,146,800
Exclusive exchange connections	2,999,000	2,998,700	3,027,200
Shared service connections	464,000	592,200	742,400
Total exchange connections	3,463,000	3,590,900	3,769,600
Call offices	60,400	61,800	64,100
Automatic exchanges	4,297	4,383	4,494
Manual exchanges	1,584	1,507	1,419
Orders on hand for exchange connections	482,000	427,200	376,100
WORK COMPLETED DURING THE YEAR			
Net increase in telephones	290,100	210,700	269,000*
New exchange connections provided	439,000	417,000	464,000
Net increase in exchange connections	172,000	127,900	178,700
TRAFFIC	*(millions)*	*(millions)*	*(millions)*
Inland telephone trunk calls	262	264	278
Cheap rate telephone trunk calls	62	66	70
Inland telegrams (excluding Railway and Press)	38	35	33
Greetings telegrams	6	6	6

**This is the difference between the gross new and the gross ceased. The difference between the telephones in service at March 31, 1953, and those in service at March 31, 1954, does not equal the net increase because the number in service at March 31, 1954, has been adjusted as a result of a special check of working telephones. This check is being made in conjunction with a change in the statistical procedure*

Book Review

THE OSCILLOSCOPE AT WORK. By A. Haas and R. W. Hallows. Published for "Wireless World" by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. 171 pp., 102 diagrams and 217 oscillograms. 15s. 0d.

This book, published for *Wireless World*, is a readable elementary description of the principles of operation of the cathode ray oscilloscope and of its practical application, mainly in the amateur radio field. It is descriptive and non-mathematical and should meet the needs of the amateur radio enthusiast who is building up his own laboratory; it should also interest students studying for the City & Guilds examinations in Telecommunication Principles and Radio.

After a brief description of the oscilloscope the authors show how it can be used for the rough measurement of voltage and impedance, and how frequencies can be compared. Then follows a description of the methods that can be employed to obtain information about the performance of audio and radio frequency amplifiers, including the principles of automatic selectivity curve tracing and the lining-up of superheterodyne sets. The operation of oscillators, rectifiers, modulators, phase changing and wave-shaping circuits is described and is followed by a chapter on oscilloscope troubles and one on the use of the oscilloscope in television receiver maintenance.

Throughout the book the text is well illustrated by photographs of tube traces but it is unfortunate that they are not very sharp. Figures 5.13 and 5.15 should show the two cathodes connected together or drawn as one, but these and other minor inaccuracies should be obvious to many readers.

F. SCOWEN

Radio at Ascot.—Radio timing in a horse race was first used, experimentally, in this country at Ascot in June. A transmitter at the starting gate registered the exact moment of starting and transmitted it to a receiver at the finish.

Cable equipment is used similarly at Newmarket.

Correction. We regret that in the article "Service to Subscribers in the United States" (May-July issue) the captions to Figs. 3 and 4 were by inadvertence transposed. EDITOR.

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 Aubrey W. Hammond, Ltd., Spencers Farm, Horsham, Sussex. (Tel. Horsham 760.)

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."

GPO