Post Office Telecommunications Journal

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Contents

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Comment

IN OUR ISSUE OF AUGUST, 1949, WE PUBLISHED A brief account of the provisions of the Commonwealth Telegraph Act, 1949. As a result of the provisions of that Act the scope of Post Office operations has been widened as from April 1 by the addition of the services formerly carried out by Cable & Wireless Limited as operated in the United Kingdom.

The staff, numbering over 4,000, at the operating centre at Electra House, London, the various branch offices and the wireless stations throughout the United Kingdom are thus brought into the Post Office organisation. No one will wish to minimise what the disturbance of their established routine means to our new colleagues in terms of human values. Company organisation and grading of staff were very different from that of the Post Office. The task of fitting the United Kingdom part of the Company's service operations into the Post Office organisation, has presented many points of difficulty, which have, however, been greatly simplified by the ready co-operation on the part of the Company and its representatives, and between the Unions representing the Company's staff and our own staff associations. Detailed negotiations have been carried out in an atmosphere of great good-will with the result that the transfer arrangements have been smoothly effected. We offer greetings and a friendly welcome to our new colleagues, noting in passing that there are some 70 of them who were formerly Post Office employees who now return to the ranks of the Post Office.

Tradition and Progress in Cable & Wireless

(The Oversea Company)

by John L. Young, Deputy Public Relations Officer, Cable & Wireless Ltd.

A student at the Cable & Wireless London Training School using a Wheatstone Bridge to determine the position of a fault in a long submarine cable

A student at the Cable & Wireless London Training School making a wiped joint in a lead-covered paper-core cable

"*QUARRELLING . . . IS STRICTLY prohibited . . . . When spacing badly, or there is any other fault, the receiver should good-humouredly advise, and the sender in the same spirit make, the necessary alterations. It is only by a cordial understanding among and between the members of the staff that business can be properly and pleasantly carried on.*"

★ ★ ★

Sixty-seven years ago, in the 1883 Rule Book given to all new entrants into the Service, Sir James Anderson, Managing Director of the Eastern Telegraph Company, thus emphasised the need for the "family" spirit in operating the submarine cable system; as Captain Anderson of the *Great Eastern* on her 1865 and 1866 transatlantic cable-laying expeditions, he knew well the value of a "happy company". It was under his managing directorship, with "Cable King" Sir John Pender as Chairman, that the Company became affectionately known all over the world as "Father Eastern". Through all the changes of succeeding years—expansion, technical development, merger with wireless and with other cable services, the tradition has been maintained. "Cable and Wireless Ltd.", the oversea company, is not merely a name in a Somerset House registry or an act of Parliament; it is the co-operative activity of a family of some 9,600 men and women of 57 different races working in 73 countries to provide and maintain the largest and most reliable oversea telegraph service in the world.

Since the perfected Regenerator was installed at most of the principal oversea stations between 1923 and 1927, enabling automatic re-transmission at intermediate stations, there have been progressively fewer British operators overseas. There are still, among the 4,000-odd United Kingdom staff who have been transferred to the Post Office, some 300 operators, supervisors and other grades in London Station who, in their younger days, saw service in many parts of the globe, and worked as young men in stations in the Mediterranean, the Red Sea, the Far East, the South Atlantic, Latin America and the West Indies.

Other London Station operators are men who joined the Company as messengers or clerical assistants—now known as Telegraph Clerks—who have taken advantage of the facilities provided by the Company to learn touch-typing in their spare time, have passed the appropriate examinations, and have qualified for work in the instrument rooms.

Most of the oversea operators today are local men working under British engineers and managers who have entered the service at the age of 17 or 18, and have spent their first 18 months receiving a thorough grounding in electricity and magnetism, operating, workshop practice, cable maintenance and other related subjects, including "Etiquette in the Service", in the Company's own schools. The aim of the training course is to fit them, after a few years' consolidation and experience in the field, to take sole electrical charge of a branch.

The young men of today do nine months in the London Training School and a further nine months at the School which has been re-opened at the Porthcurno Cable Station in Cornwall. "PK", a tiny, but beautiful, sandy cove surrounded by granite cliffs, is six miles from Land's End, and eleven miles from the nearest railway station at Penzance. It is, in atmosphere, an oversea station, where a youngster will learn to live as he will abroad. After a first tour of service as Junior Assistant Engineer in one of the larger oversea stations, he will return home for further training. If he is intended to specialise in radio he will spend three months or so on a special wireless course. By experience, hard work and successive examinations, he may rise to be Assistant Engineer, Manager-Engineer, Branch Manager or Divisional Manager, able to cope with the multifarious problems of technique, traffic, social life and so on which present themselves in oversea stations.

Wherever they are, Cable & Wireless men become an integral part of the local business and social life. They have a unique knowledge of the industrial and trading life of the country in which they live. They are prominent in the sports and social clubs. They maintain friendly relations with Ambassadors. They dine with Governors and may receive Royalty in their stations. They are capable of coping with all emergencies; when Malta was besieged in 1940 and the cables from Gibraltar were down, the Company's engineer augmented the existing wireless equipment with odd pieces, including a copper coil from a bombed geyser, to enable him to open service with London.

Many officials employed now in Head Office are former "Foreign Service" men brought home to apply their intimate knowledge of oversea stations to their specialised jobs.

The cable system is historically the basis of Cable & Wireless Ltd. Complicated as the network may appear, it may briefly be described as taking three main directions from Porthcurno:—

1. Eastward through the Mediterranean to Egypt and Aden, whence cables connect with the East Coast of Africa, and with India, Ceylon, Singapore, Malaya, Hongkong, Indonesia, Australia and New Zealand.
2. Westward across the Atlantic to Canada and then, via trans-Canadian landlines, to Vancouver and across the Pacific to New Zealand and Australia.
3. Southward to Ascension Island in the South Atlantic, and thence to South America on the one side and South Africa on the other.

Both north and south Atlantic branches link in a circle through the West Indies. The South African route is prolonged across the Indian Ocean to form a third route to Australia.

Most of the Company's cables are single-core unloaded cables, working duplex (that is, both directions simultaneously). Only the Indian Ocean cable from Cocos to Cottesloe, laid in 1926 by the Eastern Extension Company, and the old Pacific Cable Board's 1926 cable from Bamfield via Fanning Island to Fiji, are loaded.

The cable system does not operate as a number of cables from port to port but as a few long chains sending messages instantaneously between distant points. Such "through" working is available between, for example, London and Hongkong, London and Capetown and London and Buenos Aires. The London-Singapore section of the Hongkong chain is put through to Australia at week-ends, via Singapore, Djakarta (Batavia) and Cocos.

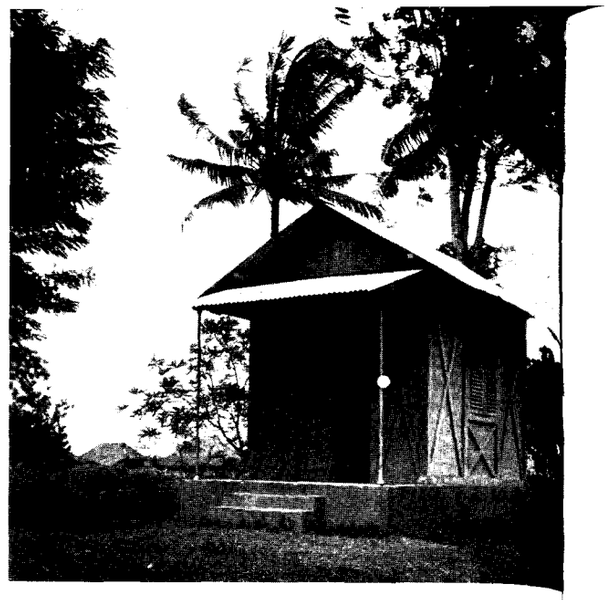
Chain working is more than a mechanical operation; it is a fascinating art of "chasing the sun round the world". The Central Telegraph Station operator on the London-Hongkong

cable chain may see the red glow of the rising sun over the City at 8 o'clock on a January morning; looking imaginatively down his line he will see that it is mid-morning in Egypt and almost blazing noon at Aden and mid-afternoon at Singapore, but that in Hongkong the red glow over the Bund comes from the sun setting in the west.

These time-differences over a world telegraph service have a practical effect which may be illustrated by a highly simplified example.

The London-Hongkong cable chain passes through Porthcurno, Carcavelos, Gibraltar, Malta, Alexandria, Suez, Port Sudan, Aden, Seychelles, Colombo, Penang and Singapore. The London operator on this chain knows that normal delivery hours in Hongkong are between 11 p.m. and 1 p.m. G.M.T., or 7 a.m. and 9 p.m. local time; but that normal deliveries in, for example, Singapore, are made between 11.30 p.m. and 2 p.m. G.M.T., or 7 a.m. and 9.30 p.m. local time. All London evening traffic for Hongkong must therefore be transmitted before 11 p.m., for delivery early in the morning, but at that same time in London there is half-an-hour in hand for transmitting telegrams to Singapore for early morning delivery. But during the day in London, expedition of traffic for Hongkong can cease shortly before 1 p.m., although there is still an hour available for immediate delivery in Hongkong.

With these factors in mind the operator will take



Cable Hut, Djakarta, Indonesia

rom the top of his bench the appropriate roll f tape, pre-perforated with a "call sign" that ill open or close the onward circuit at inter-ediate stations, and will thus clear the traffic or Singapore or Hongkong as may be desirable t the moment.

his simplified example illustrates an extremely omplicated process that continues throughout he day and night all over the world and between any distant stations. Many other factors may ome into the question, including the com-arative speed of various cables, and one-way orking on a high-speed loaded cable; the irect route, geographically speaking, may not lways be the quickest route for disposing of a able. The incidence of Summer Time in arious parts of the world adds further seasonal omplications. In normal practice, the oper-tor operates the chain at his discretion, eporting to the supervisor only in case of delay r other difficulties.

he number-checks flashed from each station t midnight emphasise the diurnal drama of ight sweeping across the globe. The Christ-nas Eve shift see this drama at its height, for ach station, as midnight strikes, adds to its umber-check a message of Christmas goodwill.

Several stations in the network are remote islands that produce virtually no traffic but constitute essential links in the chain. In these places the corporate "family" life of the oversea staff is even more prominent than elsewhere.

On Ascension Island in the South Atlantic, for example, 65 British (including wives and families) and 125 St. Helena staff are the only inhabitants. The Company's Manager is Resident Magistrate under the Governor of St. Helena, who provides two native policemen to assist him. The staff, complete with Doctor and Matron (and a St. Helena butcher) run their own clubs—social, sports, cinema—including a club that manages two cottages up on the "mountain" where members take turns for week-end leave. Also on the "mountain" is the Company's farm for supplying fresh meat and vegetables. The Company has sent out rams to improve the sheep stock; hides and skins and wool clips are sent home for the sales. At one time, the Company held the contract for supplying turtles to provide the famous Turtle Soup at the Lord Mayor of London's annual banquet.

Except for their own farm produce, the Ascension staff are dependent on home supplies

Cable & Wireless Station, Aden Married Staff Quarters

Tanjong Lagoon, Cocos

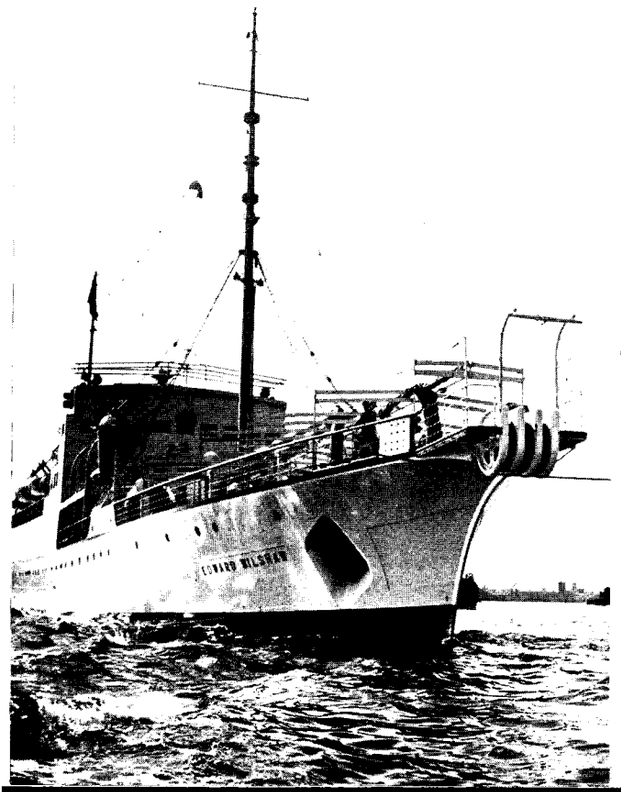
for almost everything. Food and personal and household goods are sold in the canteen, members' accounts being deducted from pay. Films are provided by a distributing organisation in South Africa.

Normally, men posted to Ascension do a two-year "tour" on this 38-square-mile island whose nearest neighbour is almost a thousand miles away. They receive mail and supplies only about once every two months, when a Union Castle liner calls on its way between London and the Cape.

But the staff on Cocos in the Pacific see a supply ship only about four times a year, though passing liners occasionally drop a barrel containing mail which the men pick up from boats. In January this year, two Cable & Wireless men (among others) set out to meet a P. & O. liner; their boat capsized in a violent squall and the liner rescued them: next stop, Fremantle, Australia, about 1,500 miles away!

The Cocos staff are slightly less lonely than those on Ascension; they are the only people on Direction Island, where the station is situated, but about two miles away is Home Island, where the Clunies-Ross family ("Kings" of Cocos) live; and occasionally they go there for an evening's entertainment. The eight British engineers employ about 20 Chinese from Singapore, for whom special food has to be included among supplies. Direction Island consists of dead coral and is only about five to seven feet above sea level. Periodically, supplies of earth from Christmas Island are sent over to enable the staff to grow fresh vegetables, but the earth is soon washed away. From the time they land on Cocos until they leave, the men do not handle any money; they need none. Their accounts for drinks and tobacco are deducted from their pay. Fishing—probably the finest in the world—sailing, tennis and billiards are their recreations; with an occasional visit to Home Island, or a day or so at a "picnic" point some eleven miles away. Normally, British staff spend only about a year at Cocos before being posted to another station.

Cable Ship *Edward Wilshaw*



A special section of the Contracts Department at Head Office looks after supplies for these and other islands, including Fanning Island in the Pacific, Rodrigues in the Indian Ocean, Grand Turk in the West Indies, Hongkong and St. Helena. Apart from providing technical equipment, the Contracts Branch is, in effect, a miniature department store—on paper, that is, for goods are ordered, on the local Manager's request, to be sent direct from suppliers to ships.

Among the Cable and Wireless staff are about 180 British merchant marine officers and petty officers, and 450 Indian, Spanish, Brazilian, West Indian and Malayan seamen who man the Company's eight cable-repair ships. As far as possible each ship is allotted to a particular area, though at times a ship may change base for a special job. During the post-war years, with the urgent need to restore war-damaged cables, and to effect repairs delayed by the war, the cable fleet has been inadequate. It has been augmented by the purchase of two ex-Admiralty cable ships and the provision of one new vessel, C.S. *Edward Wilshaw*, the largest ship afloat built solely for cable-repair work. H.M.T.S. *Monarch* and other Post Office cable ships have been chartered for various repairs as have Admiralty cable-repair ships.

Cable & Wireless Station, Colombo (Interior: Porthnode Receiving Station)

The Cable and Wireless ships fly the Company's house flag—St. George's Cross in red superimposed on a golden cross on a dark-blue round, a golden crown in one quarter, the letters C. & W. opposite. This was designed in 1939 to replace the flags flown by the various constituent companies. The Eastern Telegraph Company's original red-gold-white flag was based on that of the old East India Company.

With the cable network, the Company operates more than 80 oversea radiotelegraph services connecting many British colonial and foreign countries with the principal cities of the world and other places.

Although the Company is no longer responsible for operating the terminals of the radio services between Britain and the Dominions, its stations at Barbados, Ascension, Nairobi and Colombo will continue to play an important part in these services. All four are relay stations for radio messages from Britain, to Australia, Canada, New Zealand and the Far East, for diurnal or occasional use when the direct beams fade.

The wireless log at Hongkong Station in 1949 reflected the swift advance of the Communist armies; circuits were opened with Chiang Kai-Shek's forces in various Chinese towns; as each town fell, a new circuit was opened with the next town on the line of retreat. At the moment of writing, Chiang maintains contact with the outside world through a wireless circuit between his headquarters at Taipeh, Formosa, and Cable & Wireless in Hongkong.

When the late Count Bernadotte was seeking to negotiate peace between the Jews and Arabs, the Cable & Wireless station at Athens opened a service with his headquarters at Rhodes, also providing both equipment and advice. In Palestine itself, the "Blue Train" mobile unit—which had followed the liberating armies through Italy from Naples to Innsbruck—stayed in Jerusalem, operating in the No Man's Land of Battle until the British departed and left it unprotected. The crew drove it off to Amman, where it remains, working wireless telegraph and radiophoto circuits to London.

One of the main tasks during the 21 years since the 1929 merger has been to integrate the cable and wireless systems into a single service. By applying to radio the "Cable Code" modification of the original Morse Code, methods have been developed by which messages can be automatically fed from radio to cable at intermediate points between two terminals. Cable and radio rates, which differed considerably in 1929, have been largely assimilated, one advantage of this being that today, users normally leave it to the Company to transmit their telegrams by either service, according to which is more expeditious at the moment, judged by general conditions and current traffic load.

In addition to the telegraph services, the Company operates two-way radiophoto services with London from Athens, Barbados, Bermuda, Colombo, Malta, Nairobi and Singapore. The Bermuda Station also operates a radiophoto circuit with New York; and London-ward services are operated at Amman and Singapore. In Cyprus, the Company operates not only the cable and wireless services but also the inland telephone and telegraph services, and aeronautical radio communication at Nicosia Airport. Internal telephone services are also operated at Kuwait, Bahrein and Muscat in the Persian Gulf and Lima in Peru, and aeronautical radio communication at Bermuda and Bahrein. The Company's wireless station at Nairobi operates the Kenya Broadcasting Service, planning programmes as well as broadcasting them. Before the war, Cable & Wireless was almost wholly a telegraph company; besides the 155,000 nautical miles of cable routes and the 200,000 miles of wireless circuit, it operated only six radiotelephone circuits. Within the past few years it has opened a close network of radiotelephone services throughout the British West Indies and British West Africa, and provides

circuits linking those areas with distant countries. Radiotelephony is also operated at Athens, Bermuda, Malta, Nairobi, Bahrein, Colombo and Hongkong.

Recently, the Company has changed from double side-band to single side-band (SSB) working on many radiotelephone circuits. Further stations will make the change as equipment can be installed. The anticipated improvement in quality, where SSB has been introduced, is being realised.

Cable & Wireless and its predecessors have been continually active in research, invention and development. The present Contracts Manager, Mr. H. V. Higgitt (formerly Assistant Engineer-in-Chief), filed the original patent for the Double Current Cable Code (DCCC) when, during installation of the Regenerator (for which also he was largely responsible), chain-working was being developed. Mr. R. Keen, until recently Manager of the Brentwood wireless receiving station, is author of the standard work entitled *Wireless Direction-Finding*. The first model of the Direct Printer was produced in the Company's workshop in 1939, Mr. F. Warburton, who is still in the Engineers' Department, being responsible. A recent summary of workshop activity showed progress on, *inter alia*, new types of sending and receiving units for the DCCC channelling system, a new device for Verdan or repetition working, a new two-channel splitting and combining unit to supersede the existing cable channelling gear, a new cable code transmitter of the converting type, a new type of distortion recorder and analyser, a convertor by which teleprinted messages can be automatically converted from 5- to 7-unit code prior to wireless transmission, and an electronic regenerator.

All staff, whether at home or abroad, are encouraged by a "Suggestions Scheme", to put forward schemes for improving the Company's service. Those rewarded for suggestions adopted in 1948 ranged from a member of the Secretary's Office in London to Mr. Ho Bun Yew of Singapore.

In 1948, the St. Vincent-Pernambuco cable was partly renewed (by H.M.T.S. *Monarch* and C.S. *Lady Denison-Pender*) with Telcothene insulation instead of the traditional gutta-percha; Telcothene is a brand of Polythene, a plastic developed by the Imperial Chemical Industries from polymerised ethylene.

The Company is co-operating with the Post Office in experiments, off Porthcurno, for the adaptation of submarine repeaters to deep-sea cables, but it is probable that co-axial cables only will be suitable for this device; Cable & Wireless do not normally use co-axial cables but it is planned to lay approximately 620 nauts experimentally, to contain five or six repeaters, between Carcavelos (Portugal) and Madeira.

One service, Ionosphere Prediction, conducted by Cable & Wireless from Head Office, has proved so valuable in promoting efficient use of radio channels throughout the world that, whereas at the beginning of 1949, only 120 stations were co-operating, to-day there are 240, both Company and others. Charts graphing the best usable frequencies for four weeks ahead, based on data supplied by the National Physical Laboratory at Teddington, are sent out monthly to the 240 stations, who return them with curves showing their actual experiences during the month. Both the predictions, and the comparison of predictions with experience, are proving valuable aids to better radio service.

British as Cable & Wireless is, it operates in more foreign than Commonwealth countries. Of the 164 offices and stations, 70 are in 39 Commonwealth and Empire countries, and 94 in 34 non-Commonwealth countries. Telegraphic traffic between Commonwealth countries, before integration, was about 46 per cent. of the total; between Commonwealth and foreign countries, 44 per cent.; and between foreign countries, 10 per cent.

The merger of 1929, by which the Eastern Associated and the Imperial Cables, the Pacific Cable Board's communications, Marconi's Wireless and the Post Office "beam" services were amalgamated under a single operating concern, did not mean the disappearance of all the old names. Cable & Wireless operates under its own name in most places but in others the old companies, although they exchanged their communications assets for shares in Cable & Wireless, have continued to operate on behalf of the parent company.

Thus, for example, the Western Telegraph Company operates the cables from the Argentine, Brazil and Uruguay across the South Atlantic to Madeira, and a trans-Andean landline connects them with cables in Chile, Bolivia and Peru operated by the West Coast of America Telegraph Company on behalf of Cable & Wireless. The Eastern Telegraph Company

operates at Carcavelos and Lisbon in Portugal, at Vigo in Spain, at Tangier and Port Sudan; the Eastern Extension Australasia and China Telegraph Company at Manila.

At Bermuda and the West Indies both cable and wireless are operated by a subsidiary, Cable & Wireless (West Indies) Ltd.; the Pakistan cable service is under Cable & Wireless (Mid-East) Ltd.; in France, cable services are operated by the Eastern Telegraph Co. (France) Ltd.; and in Belgium by the Société Anonyme Belge de Cables Télégraphiques. By arrangement, the cables at Alexandria and Suez are operated by the Marconi Radio Telegraph Company of Egypt.

These variations on the Cable & Wireless theme are largely the outcome of historical development. They have resulted, also, in differences in routing indications within the system. Although considerable progress has been made towards making the "via Imperial" writ (first introduced over the ex-German transatlantic cables operated by the Post Office from 1919 to 1929) run throughout the system, the routing indication in Algeria and Portugal remains "via Eastern"; in Egypt it is "via Eastern" for cable transmission and "via Marconi" for transmission by wireless; in Belgium the routing indication is "via Belgo-Imperial" and in Greece, "via Radio-Athens".

Because of this historical development the staff are, commercially, of many different origins—Eastern, Western, Pacific Cable Board, and so on—but for nearly 21 years they have worked together as a united company. They and their colleagues in the stations have handled more than 700,000,000 words in a year. With the corresponding company in the United States they have exchanged share market messages between broker and broker in 60 seconds and less. They have carried a message round the world in 80 seconds—still a world record.

The writer of an old guide to Cornwall emphasised the "clubbishness" of the Eastern Company telegraphists at Porthcurno, in the old pre-regenerator days when operator staffs were large. Scattered as the members of the staff are in 73 countries, endeavours are made to maintain their community of interest not only by a constant flow of information in the form of "CQs" but also by the monthly magazine *Zodiac*, edited at Head Office but containing contributions from the staff in various parts of the world. Oversea managers also receive every two or three months a Confidential News-Letter, from the Managing Director, outlining technical and managerial developments throughout the system; this not merely keeps them in touch, but also provides "talking points", at discretion, for conversation with local friends.

Many of the oversea staff, when on furlough in the United Kingdom, stay as residents at the "Exiles Club" at Twickenham; most of the staff, home and foreign, are members of this Club, near to which is their own sports ground for cricket, soccer, rugger, bowls, hockey, netball and tennis. Head Office (and London Station) messengers and clerks may join the Cable & Wireless Band which, despite the difficulties caused by frequently-changing personnel, has gained many awards in national brass band competitions.

The Directors and Head Office officials undertake frequent tours to inspect various areas within the system and to make personal contacts with staff overseas. The Chairman, Sir Stanley Angwin (formerly Engineer-in-Chief at the Post Office), recently visited Spain and Portugal. In 1947, Mr. John Innes, then Managing Director, who was previously Director of Telecommunications at the Post Office, visited stations on the East Coast of Latin America with Mr. N. C. Chapling, Traffic Manager, who extended his tour to Chile; and Mr. Innes also undertook a Mediterranean tour. Major-General Nicholls, now Managing Director, has travelled more than 60,000 miles on the Company's business during the past three years, visiting the West Indies, the Far East, the Mediterranean and (with Mr. C. Carpenter, then Deputy Traffic Manager) Palestine. The Engineer-in-Chief, Mr. J. A. Smale, has toured the West Indies, East Africa and Ceylon, and the former Assistant Engineer-in-Chief, now Contracts Manager, Mr. H. V. Higgitt, recently visited Cyprus.

Divided though they are from their colleagues who are now operating the services in the United Kingdom, the 9,600 men and women of Cable & Wireless Ltd. will continue to play their part towards retaining Britain's leadership in the field of telecommunications. They are the heirs to a great tradition of service and they will do their utmost to ensure that, in the words of Sir James Anderson, the business shall be "properly and pleasantly carried on" in a spirit of "cordial understanding".

From left to right: H. S. PATE, A.M.I.E.E., Area Engineer; G. A. BEAUMONT, Chief Traffic Superintendent; R. R. WALKER, Telephone Manager; C. WRIGHT, Area Engineer; C. C. AYTON, Chief Clerk; W. STAFFORD, Senior Sales Superintendent.

BELFAST TELEPHONE AREA

This widespread Area embraces the six counties of Northern Ireland covering 5,237 square miles. The main town is the City of Belfast, which is well known for shipbuilding and engineering. It is also the centre of the famous Irish linen industry. The remainder of the Area is mainly agricultural, and is renowned for its beauty spots.

There are 198 exchanges, of which 156 are automatic, 43,366 lines, 70,139 stations, 309,378 miles of underground wire and 51,740 miles of overhead wire.

The total staff, excluding operating force, is 1,435 including 1,110 engineering.

EXETER TELEPHONE AREA

Exeter Area is wholly contained in glorious Devon of contrasting loveliness. This pleasant County stretches from the rain and wind-swept Atlantic seaboard in the North to the southern shore over moorland, tor and fell, down the sylvan valleys of Exe, Teign and Dart and then to the rich, red alluvial farmlands whose meadows seem perennially lush-green in the mild, equable climate. It is essentially a dairy farming county. Devon's agricultural industry makes a most important contribution to the nation's food supply. The Exeter Area takes in 1,580 square miles. It employs a staff of just under 1,000, and it has 116 exchanges (99 of them automatic) with 39,000 exchange connections and 55,000 stations. The installation of telephones for Devon farms has been a major post-war task. During the past two years, over 1,400 telephones have been connected, involving the erection of nearly 8,500 poles. Devon's southern coastal resorts attract hundreds of thousands of holidaymakers each summer. Small wonder, therefore, that Torquay, Queen of the English Riviera, has been chosen as the venue this year of the International Conference on Tariffs and Trade. This will involve the provision of 1,000 new telephones.

From left to right: R. P. GLOVER, B.Sc.(Eng.), A.M.I.E.E., Wh. Sch., Area Engineer; J. E. MORLEY, B.Sc.(Eng.), A.M.I.E.E., Area Engineer; E. NOBLES, Chief Clerk; H. G. DEAN, Telephone Manager; W. M. HODGKINSON, Senior Traffic Superintendent; H. M. BURNS, Acting Senior Sales Superintendent.

Can the Post Office Telephone Service take further steps to meet the economic situation?

by J. E. Golothan, South Western Region

DURING THE POST-WAR YEARS, WE HAVE become accustomed to a chorus of voices—warning, pleading, threatening, cajoling—and the theme is the economic plight of the country and the measures that ought to be taken to remedy matters. That the situation is critical, and is likely to remain so for years to come, admits of no denial.

The effects of the financial situation on the telephone service are well known. The demand for service continues to be much higher than before the war and there is a widespread shortage of equipment. There are restrictions on building new exchanges or increasing the size of those now in service, and delays in providing all the trunk, junction and subscribers' local cables which are needed. There are limits to the amount of labour to be employed. The consequences are seen in the undiminished length of the waiting lists, and, at some exchanges, in a deterioration of the quality of service given to subscribers. In addition, the Post Office, rightly or wrongly, is now commonly regarded as a vehicle of taxation and not merely as a revenue-earning Department.

What more can the Post Office hope to do to help meet the situation and, at the same time, satisfy the public demand for telephone service? Here some examination of the role played by the telephone service in the economic life of the country becomes desirable. In providing those essential telecommunications which are, broadly speaking, meeting the needs of industry, business and public administration, the Post Office plays a vital part. The brutal fact has then to be faced that, in so far as it meets the non-essential telephone demand, the Post Office, economically speaking, is to that extent a consumer of material, capital and labour resources which might be diverted to the export drive. It is perhaps fortunate for some applicants for service that economic considerations do not—yet—reign entirely supreme. Nevertheless, the Post Office clearly has two conflicting interests to satisfy; firstly to make the minimum call upon the country's economic resources, and secondly to satisfy the public demand for telephone service.

Previous articles in this Journal, describing Post Office policy in assisting the export of telecommunications equipment, show that these conflicting interests are well appreciated, as much of the exported equipment could have been utilised to satisfy pressing demands at home. This policy, however, seems to be only a partial answer to the problem with which the telephone service is faced, and it is hardly likely that future action will be so narrowly confined. More drastic measures seem necessary.

CAN FURTHER MEASURES BE JUSTIFIED?

If an analysis is made of the way in which the telephone service utilises material and labour, three principal points emerge—local line plant, trunk and junction cables and exchange and repeater station equipment. Looking at each of these, can the demand on them be reduced?

(1) Local Line Plant.—Between every subscriber's telephone and his exchange there has to be a pair of wires. To meet this condition, every exchange has a network of cables, great or small, radiating to all parts of the area which it serves. During the last few years, the margin of spare wires in these cables has been very small. As a way of making the most use of the wires and increasing the number of people who have a telephone, a system of "shared service", whereby two subscribers can share one pair of wires back to their exchange, has been adopted, and there are now nearly 200,000 subscribers with this type of service. Extensive use of this system can lead to a substantial reduction in the size and cost of subscribers' local cables. With this consideration in mind, it now seems desirable, for planning purposes, that we should assume that shared service will be with us for a very long time, long enough for

it to influence the size of cables which have to be laid for future development in residential areas.

(2) Trunk and Junction Cables and (3) Exchange and Repeater Station Equipment.—Exchange equipment and trunk and junction circuits (the number of which dictates the growth of the main cable network) are provided to meet "busy-hour" traffic requirements. At the great majority of exchanges, the busy-hour is in the morning between 9.30 and 10.30 or 10.0 and 11.0. During this period, telephone traffic is at its peak and reaches levels which are not usually approached during the remainder of the day. Generally, therefore, there are idle circuits and equipment for 23 hours out of 24, and meeting busy-hour requirements is an expensive, but inevitable, policy to follow. Most public utility services are faced with this problem of meeting the "rush hour" or the "peak period" and, like the Post Office, find it almost impossible to devise ways and means of reducing the busy-hour load. Two methods open to the Post Office appear to me to be worthy of consideration.

A fairly large proportion of residential subscribers is not vitally concerned in originating calls during the busier hours of the day, say, 9.30 a.m.-noon, and 2-4.30 p.m., though no doubt these subscribers originate calls—particularly local calls—whenever it is convenient to do so. Their main interest is in making social calls during the evening. If such subscribers could be debarred from making calls during these busier hours there would be a reduction in busy-hour requirements, and an appreciable saving in exchange equipment, operating costs and local junction circuits. Possibly small savings in longer circuits would also accrue. Such savings would result in a reduction of capital expenditure and would prolong the life of existing buildings and exchanges. I believe some such form of restricted service has been in operation at one or two London exchanges and, unless experience there has proved to the contrary, it seems to me that this type of limited service would at least assist in relieving the acute equipment problem that prevails in so many exchanges at the present time. Incoming service is not affected at any time. The engineering arrangements at staffed exchanges would be fairly simple, the operation of a switch at the requisite times being sufficient, as in war-time, to cut out outgoing service or to restore it. Arrangements at unattended exchanges would be more difficult, but some form of remote control does not seem beyond engineering ingenuity to devise. As and when extensions to exchanges are completed, or new exchanges opened, a reversion to normal full-time service would take place.

The second, and even more advantageous, method of reducing demands on lines and equipment would be the adoption of differential call charges. Each exchange presents three busy-hours, morning, afternoon and evening, of which the first is normally the greatest. The evening peak is sustained almost from 7.0 to 9.30 and results from the concentration of the long distance social traffic of the country into the cheap rate period from 6.30 to 9.30 p.m. To secure the maximum revenue from existing equipment, and to reduce the expenditure of meeting busy-hour requirements, it is theoretically desirable for a fairly even flow of telephone traffic to be maintained from, say, 8.30 a.m. until 9.30 p.m. To make the telephone habits of subscribers conform to such theoretical requirements would not be easy. Even so, differential call charges might be a strong inducement! It is suggested that the following maximum charges (for 3-minute periods) could be adopted at varying times of the day:—

Morning	9.0 a.m.-12.30 p.m.	Rate 1. 4/6 (present maximum 3/9)
Afternoon	12.30 p.m.- 6.0 p.m.	Rate 2. 3/- (present maximum 3/9)
Evening	6.0 p.m.-11.0 p.m.	Rate 3. 1/6 (present maximum 1/6 applies for a shorter period)
Night	11.0 p.m.- 9.0 a.m.	Rate 2. 3/- (present maximum 3/9)

These maximum charges could be reduced according to distance, and, using three related charging rates and possibly a smaller number of charging steps than the present system, it is also thought that the present methods of ticket pricing in exchanges could be simplified. The present proposal is, in principle but not in detail, a reversion to pre-war arrangements.

REVENUE

While some reduction in rental charges would need to be conceded with restricted service, as

(Continued on page 119)

Balance Sheet 1948 — 1949

Post Office Headquarters, London

Everyone employed in a big undertaking likes to know how the business stands. Here, in brief, are the results of the year's working of the Telecommunications Services of the United Kingdom Post Office. They are taken from the recently published Commercial Accounts (Stationery Office, price 9d.). It is interesting to compare the figures with those in the article " Financially Speaking " in the May, 1949 issue of the Journal.

★

£190.295.908

The total income for the year shews the Post Office as a major industry. This table gives the overall picture of the three main Post Office services.

	General Account £	Postal Account £	Telegraph Account £	Telephone Account £
Income	190,295,908	101,989,968	6,519,285	82,336,045
Operating Expenditure	165,853,871	90,923,123	10,282,391	65,197,747
Operating Profit or *Loss*	24,442,037	11,066,845	*3,763,106*	17,138,298
Surplus or *Deficit**	15,221,636	11,019,892	*3,937,524*	8,139,268

* After charging interest on the capital liability in respect of plant and stores.

Total Surplus £15.221.636

Postal £11.019.892
Telegraph Deficit £ 3.937.524
Telephone £ 8.139.268

Where the Money Goes

Expenditure in the Postal and Telephone Services has increased as a result of expansion of business and higher costs of operation, e.g., increased rates of pay, higher prices of materials and, in the Telephone Service, higher charges for depreciation and interest arising from the increased capital employed. In accordance with the practice adopted in the accounts 1946–47 and 1947–48, the normal provision for depreciation of telephone plant has been increased by a special allocation to provide a reserve for meeting the heavy costs of renewal of plant, which will have to be incurred in future years. The special allocation in the telephone account for 1948–49 is £2,500,000, representing about 25 per cent. of the surplus after providing for interest on capital and normal depreciation. In the Telegraph Service, the staff savings resulting from declining traffic and technical improvements were more than off-set by increases in rates of pay and the employment of Junior Postmen on delivery of telegrams.

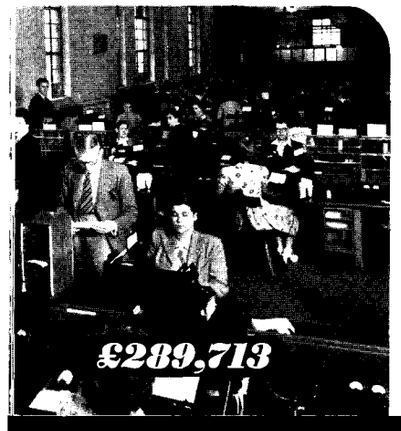
The disposal of each £1 of income for the year is analysed below.

	General	Postal	Telegraph	Telephone
	s. d.	s. d.	s. d.	s. d.
Operating and Administrative Staff Costs (including Pensions)	10 2	12 11	22 2	5 8
Conveyance of Mails (including Post Office (London) Railway)	1 5	2 7	—	—
Maintenance of Plant	1 11	—	3 0	4 2
Accommodation Costs	1 0	10	2 3	1 2
Depreciation Provision	1 10	—	9	4 2
Miscellaneous Expenses	1 1	1 6	3 5	8
Interest on Capital	1 0	—	6	2 2
Total Expenditure	18 5	17 10	32 1	18 0
Surplus or *Deficit*	1 7	2 2	*12 1*	2 0
Total Income	20 0	20 0	20 0	20 0

★ ★ ★

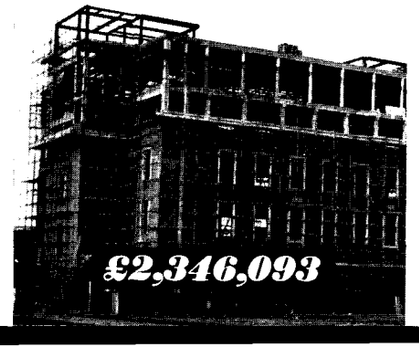
Out of a total capital expenditure of £25,541,558 on development of services

Telegraphs took



£289,713

Sites and Buildings took



£2,346,093

Telephones took

£22,338,675

Telegraph Service

Of the total income of just over £6½ million, over £5¼ million came from Message fees, Abbreviated Address fees and Wire rentals; £709,000 was credited in respect of Broadcast Receiving Licences Management. The operating loss was £3,763,106 which, after allowance for interest on capital (telegraph plant), resulted in a deficit for the year of £3,937,524.

★ ★ ★

Inland Ordinary Telegrams

12,133,000

(a decrease of 9 per cent. on 1947–48 and 12 per cent. on 1938–39)

★

Heavy decline in business telegrams due to telephone competition, but social telegrams increased. Staff shortages prevented introduction of Greetings Telegram Service.

★

Extension of use of motor cycles ridden by Junior Postmen, a new grade replacing the Boy Messengers, helped to improve speed of delivery.

★

Teleprinter manual switching scheme was further expanded and the quality of service improved.

★

Overseas Telegrams (including Radiotelegrams)

10,265,000

An increase of 30 per cent. above pre-war. Radiotelegrams (743,000) represented an increase of 70 per cent. above pre-war.

★

Telex Service extended to three more European countries, making eight in all.

★

Telephone Service

Out of a total income of nearly £82½ million, over £29 million came from the rental of exchange lines by subscribers and Government Departments; trunk calls accounted for over £32 million, local calls for £16½ million. The call office contribution to these sizable totals were, local calls over £3 million and trunk calls just under £2 million.
The operating profit was £17 million which, after allowing for interest on capital (telephone plant) of nearly £9 million, produced a surplus for the year of over £8 million.

★ ★ ★

Inland Service

Over 260,000 telephones (6 per cent.) added to the system. By the end of the year, March 31, 1949, we were serving 4,919,000 compared with 4,653,000 in March, 1948 and 3,235,000 in 1939.

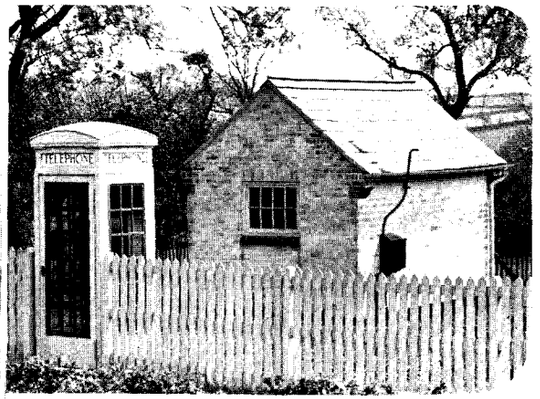
★

132,000 were sharing service (compared with 63,000 a year previously).

★

But the waiting list increased by over 64,000 to 508,992. This was due to the severe restriction on supplies of plant for the home use in order to release the maximum amount for export.

★



2,000 new call offices (compared with 600 last year) brought into service.

★

630,000 more local calls per day were handled than in 1947–48, 8½ per cent. increase and 37 per cent. more than in 1938–39.
Total: 2,911,000,000.

★

28,000 more trunk calls per day. 4½ per cent. more than 1947–48 and above twice as many as in 1938–39.
Total: 226,286,000.

★

Overseas Service

Total: 1,996,000 compared with 1,612,000 in 1947–48.

★

Telegraphs— What of the Future?

by H. A. Penn, Inland Telecommunications Department

★ ★ ★

The following article contains the substance of an address delivered by Mr. Penn to the Post Office Telephone and Telegraph Society in the Lecture Theatre of the Institution of Electrical Engineers, Victoria Embankment, London, W.C.2, on November 2, 1949.

★ ★ ★

Present Position of the Public Telegraph Services

THE PRESENT POSITION IN THIS COUNTRY is that there is a manual switching network, exploited to almost full capacity, which enables a total of about 240 offices to send telegrams to one another without retransmission. Normally, one and sometimes two switchings are required to set up inter-office connections on this network. The effect of this scheme has been to bring down the average number of transmissions per telegram from a wartime peak of four to two. There are, however, still many offices which it is not worth while to connect to the network, and a smaller number which cannot be connected at present. This means that a large number of telegrams pass over one or more circuits, either before or after reaching an office on the switching network, and sometimes both. In addition to the work involved in these transmissions, telegrams have to be received from and delivered to the public.
With these arrangements it costs just over 3/- to handle a telegram and, as the revenue per telegram is of the order of 1/8, it is evident that something pretty drastic will need to happen if the traffic handled on the public network is to pay its way.

Telex and Private Services

In addition to the normal public service, there are two other types of telegraph facility available; these are telex service and private wires. A telex subscriber is provided with a teleprinter, a voice frequency converter, to make the teleprinter signals suitable for transmission over telephone lines, and a line to his local exchange. Telex subscribers should be able to communicate with one another by teleprinter signals, which produce a typed message at both ends of a connection at the same time. In practice, it has been found that transmission conditions do not always permit this, and, before any new subscriber is connected to the service, he has to say with what other subscribers he wishes to communicate. He is then told to what extent his wishes can be met. This restricted availability of the service coupled with full telephone charges for telex calls has resulted in a small number of subscribers, most of whom make very few trunk calls. We cannot retain in its present form a service which brings us little revenue and gives the subscribers little satisfaction.
Telegraph private wires, on the other hand, seem to give satisfaction to their renters and, during the last few years, quite a few private networks of considerable size have been built up. Although there are *pros* and *cons*, it is a matter of regret to the telegraph man that the profit on these private wires, apart from those rented by Cable Companies and the Press, goes to swell the telephone surplus rather than to mitigate the telegraph deficit.

Trend of Telegraph Traffic

Many people think that telegraph traffic is falling, and it is true that the traffic handled by the Post Office is declining, and it may be that it will continue to decline. There are, however, in this country more than 1,000 telegraph private wires and, as each of these probably handles at least 50 telegrams a day, the total flow of private telegraph traffic items must be upwards of ten million a year. It is clear that the figure is growing. Some large organisations are finding it a paying proposition to divert trunk telephone traffic to their teleprinter

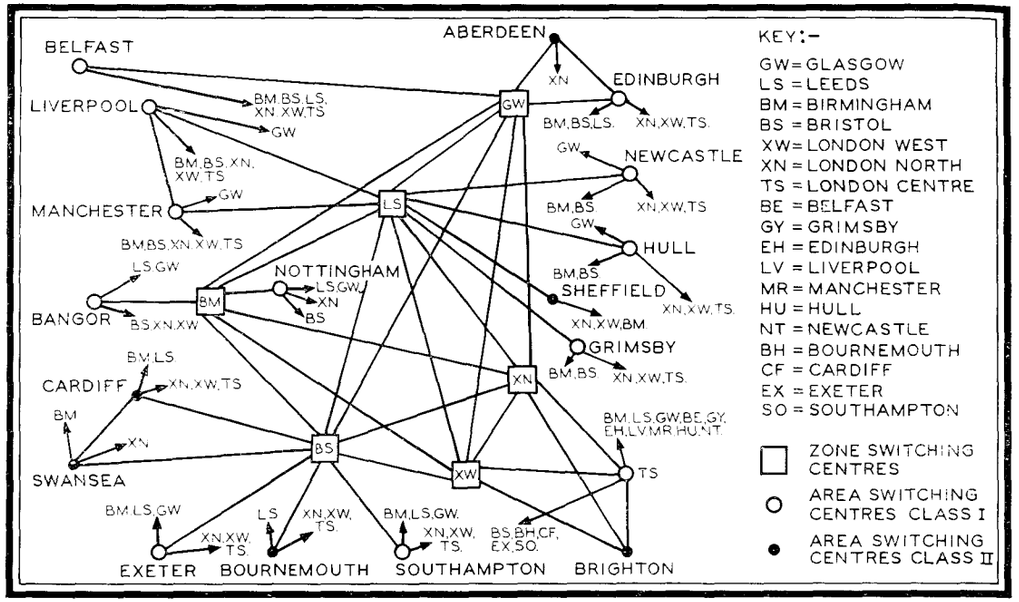


Fig. 1. Teleprinter automatic switching network

networks, and at least one combine has taken the view that it is more efficient, and no more expensive, to use its teleprinter network for correspondence in preference to the post.

Teleprinter Automatic Switching

The first major step towards a solution of the deficit problem is the introduction of automatic switching. So far as can be seen, about 450 offices will be connected to the 24 switching centres of the automatic network, and the general lay-out of the country is represented in figure 1. The scheme will start on a smallish scale this year and will take a further three or four years to complete. When it is completed, an operator in any one teleprinter office will be able to dial a few digits, normally not more than six, and thus obtain connection to any other teleprinter office. The numbering scheme used will be based on giving to each office a code corresponding to the switching centre to which it is connected followed by the number which it has on the switching equipment of that centre. When an operator receives a telegram for transmission by teleprinter, it will bear the code and number of the office of destination. By using the information supplied on her dialling unit (figure 2), the operator will convert the letter code into a figure code and will then dial the figures followed by the number of the distant office. The time taken to set up a connection by this means will be of the order of ten seconds, and, after sending her message, the operator will be able to clear almost instantaneously merely by pressing a button.

The number of offices thus provided with intercommunication without retransmission will be rather more than twice as great as for the manual scheme; moreover, connections will take slightly less time to set up and far less time to clear than with a manual arrangement. Another advantage of the automatic scheme is that the distribution of outgoing traffic is very simple, since any operator at an outgoing position can dispose of any message, whereas, with the manual scheme, traffic has to be distributed over teleprinter circuits in accordance with the switchboards to which they are connected. Thus, when traffic slackens, the auto scheme enables messages to be concentrated on a smaller number of outgoing positions, whilst with the manual scheme operators continue to staff the same number of positions by moving about. One more advantage of the automatic scheme is that it will save the whole of the existing switchboard staff.

Concentration of Delivery

In conjunction with automatic switching, arrangements are being made for reducing the number of delivery offices in large towns. The first experiments are now in course of being set up in London and Birmingham. It is expected that there will be extension to most of the large towns later. The present high cost of hand delivery arises from the small number of messages delivered per messenger, per day. Concentration of delivery should permit more efficient use of staff and supervision, and, by using motor cycles, the delivery service should not be materially worsened. As, however, automatic switching will reduce transmission time to very small proportions, a little extra time spent in delivery will not be noticed. Savings under this head are not predictable but the scope for saving is very large. At present we spend well over £1,000,000 a year in direct staff payments for hand delivery and only about £70,000 on motor vehicles.

Fig. 2. Dialling unit

Automatic Phonogram Distribution

We next come to development in the acceptance of telegrams from the public. There is nothing in sight to simplify the job of the counter officer, but nowadays half of our telegrams are accepted by telephone and in this field, an entirely new design of phonogram equipment is being tried.

An experimental equipment (figure 3) which has been installed at Newcastle distributes calls in cyclic order to free operators and, if there is temporarily no operator free, calls are queued

Fig. 3. Experimental phonogram equipment at Newcastle

in order of arrival. An indication of the state of the queue is given to each operator by a lamp display; a "queue-full" lamp is also provided. The length of the queue can be regulated either manually or automatically, and, with either control, the object is to ensure that if a subscriber is likely to have to wait a long time before getting an answer he receives busy-tone. With all positions staffed, any call entering the queue should be answered within 10-15 seconds, but when the staff is cut down in the slack hours, a sudden rush of traffic may produce times to answer of the order of two minutes, under the worst conditions. With a normal flow of traffic and correct staffing the queue is seldom of any length and often for an hour or so a high proportion of calls is answered on arrival without queueing. In these conditions a speed of answer of something under two seconds is given.

Some manipulative work by the operator is saved and there can be no doubt that a better service is given to the public. The ability to use a reasonably robust typewriter on this type of position has a value which cannot yet be gauged, but the typing produced from our old portable machines undoubtedly has an adverse effect on the morale of the operators.

New Telex Service

We have come to the conclusion that, as telex is essentially a telegraphic service and as, in any case, it does not work properly on the telephone network, it is time that it was put on to telegraph circuits. The only available method of doing this at an early date is to go ahead with an entirely separate manually-operated network, using internationally-accepted signalling arrangements, which are, of course, already in use on continental telex. A new type of switchboard has been designed for this service (figure 4) and notable features of its equipment are:—

(*a*) the use of a new type of combined lamp, cap and label to economise in multiple space;

(*b*) the provision of ticket slots instead of the normal clips;

(*c*) the provision of timing facilities on all cord circuits;

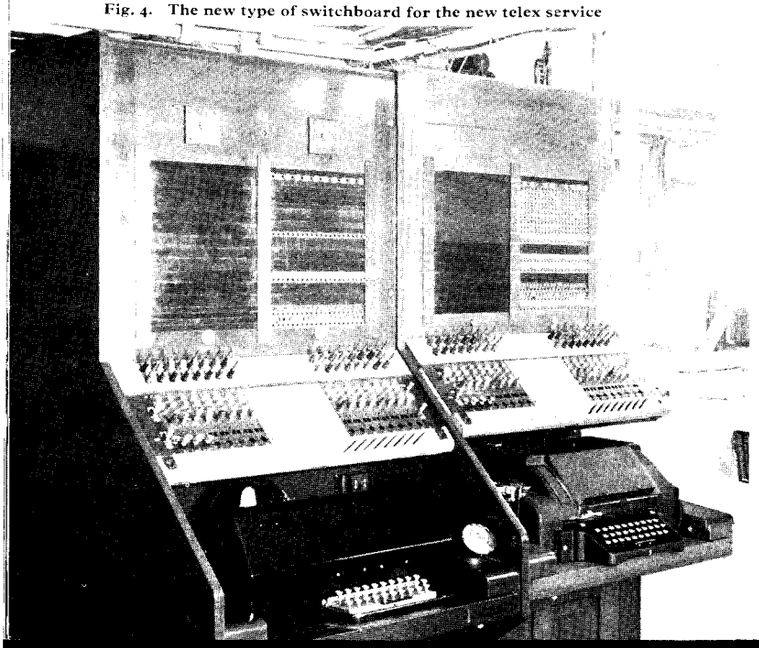
(*d*) the provision of a writing space for ticket preparation located centrally on the key shelf.

Signalling is entirely automatic and an interesting through-clearing feature is provided. When the subscriber clears, which is done by pressing a key, the whole connection is released; and although plugs remain in the jacks on the board, both the subscriber's line and the trunk circuit can be picked up from other multiple appearances without causing a double connection. This, of course, has the advantage of reducing the unpaid holding time of circuits to a minimum.

Another interesting feature is the engaged-test arrangement. The operator has no telephone and thus cannot hear an engaged click when testing. Instead, when she taps the tip of her plug on the bush of a jack, a pair of engaged pilots flash if the circuit is engaged.

Before making this service available to the public, it is intended to have a large-scale field trial. The arrangement envisaged is the replacement, by a skeleton of the new telex network, of the existing private wires used by Government Departments and perhaps nationalised undertakings. This field trial should start in the summer or autumn, but there will be more switching positions to install and more facilities to be designed before public service can begin, and it will probably be a further two years before this happens.

Fig. 4. The new type of switchboard for the new telex service



Facsimile Transmission

We have had under consideration for some time the possibility of producing a means of sending telegrams from small offices which occupies less staff time than the telephone, and which involves less special training than does the use of the teleprinter. The Engineering Department is engaged with development contractors in the design of a facsimile system which will fulfil both these requirements, and which they hope will show considerable advances over earlier designs produced in the United States. The American Telefax apparatus used for sending messages operates in a manner akin to the normal picture transmitter. All that the sending operator has to do is to insert the message in a machine and press a start switch. The message is automatically wrapped round a drum which then rotates and moves axially so that a light spot scans the message. The light reflected from the message is directed on to a photo-electric cell which produces varying current to line, corresponding to the changing density of the impression on the message form. At the receiving end, this current passes to a stylus which is scanning another form on another drum moving in correspondence with that at the sending end. The paper on the receiving drum has a metallized backing and is impregnated with a chemical which darkens when current passes through it. The varying line current thus produces a correspondingly varying density of impression at the receiving end.

The Americans have since developed a simple version of this facsimile equipment in which a voltage-carrying stylus is used for scanning the sent copy. The current variation is produced in this system by using print which is either more or less conductive than the paper medium on which it appears. The receiving arrangements are the same as for telefax. The quality of the received message is not very high.

The developments going on in this country aim at obtaining a higher quality of reproduction, a lower operating voltage on the live parts of the instrument and a higher degree of reliability. If this system can be developed it will provide considerable cost savings. It will eliminate the need for training in teleprinter working a number of people in small offices who cannot maintain proficiency because the average level of traffic is so low. It will reduce the occupied time per message of the staff at both the sending and receiving offices to something less than that needed for a teleprinter transaction, and very much less than that for telephoning a message. These savings promise to be large in total but there is, of course, a limit to the economic use of facsimile because the transmission time, which engages a line but not an operator, is rather high. This means that with reasonably heavy traffic it will remain economic to use teleprinter working.

Tape Punching by Phonogram Operators

In our search for means of reducing the cost of handling telegrams, we have been struck by the fact that after a phonogram operator has taken down a message on a typewriter the message has to be retyped on a teleprinter. This looks like an unnecessary duplication of effort, and it has been suggested that, if the operator's typing could produce a punched slip suitable for passing through an automatic transmitter, a material saving in staff time could be effected. Investigation is proceeding but there seems to be little hope of true economy in this idea.

American Developments. Tape Relay

Now to have a look at the problems of a rather different telegraph organisation, the Western Union Telegraph Company of America. Despite an increase in rates since the end of the war Western Union is faced, as is the United Kingdom Post Office, with a deficit on its telegraph operations. The emergence of this loss has been foreseeable ever since the post-war tendencies for traffic to decline and wages to rise have been apparent. During the first seven months of last year Western Union had a deficit of over five million dollars. This was more than four times the loss on 1948 operations.

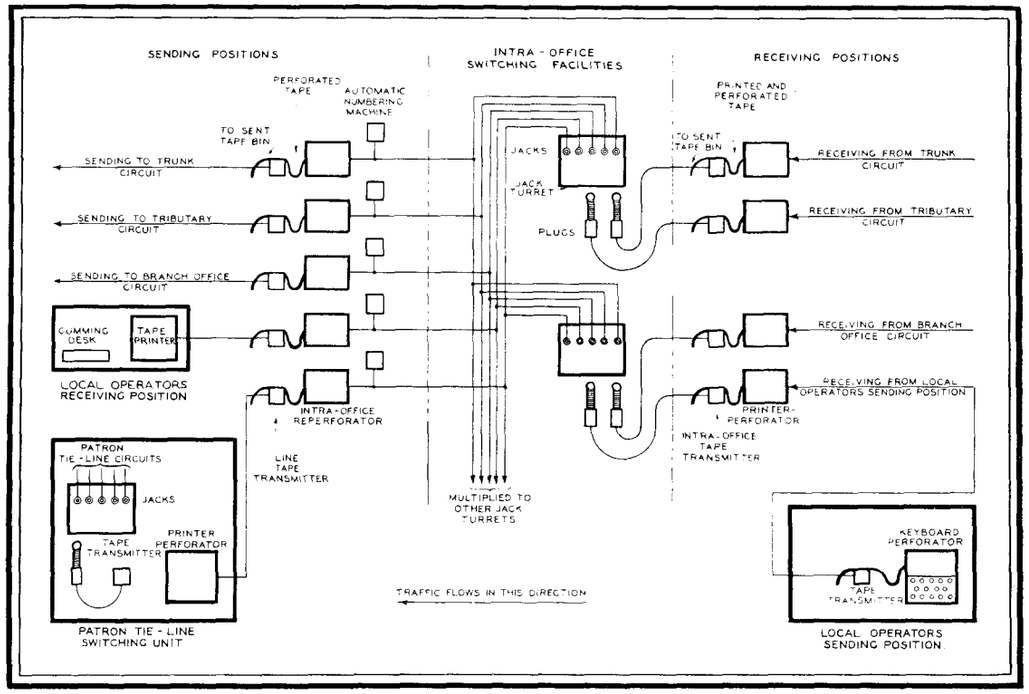
In order to cope with this situation, Western Union have pursued two lines of action. First, a large-scale revision of their handling methods, and second, the closing of small and uneconomic delivery offices and agencies in remote rural areas. These two steps parallel closely our introduction of switching and concentration of delivery. In their attempts

to economise, the Americans are faced with a problem fundamentally different from our own, because the distances over which they work are very much greater and because their telegraph lines which form an entity entirely separate from the telephone network are few in number and, outside large towns, mainly on overhead routes. The result of these differences is that to the Americans, line plant economy is as vital as staff saving. This means that switching, as we know it, with low levels of loading on circuits, is not acceptable in the United States.

The Western Union Company has therefore introduced a retransmission technique which involves a minimum of staff handling and reprocessing of messages and provides a high level of line exploitation. Traffic coming into an office for retransmission is recorded by a printing reperforator in the form of tape which bears the printed message as well as being punched with the five-unit code. This tape passes into an automatic transmitter on a receiving position. The operator notes the destination and plugs into a jack connecting to a cross-office circuit to a further receiving reperforator at the sending position for the required outgoing route. As soon as this receiving reperforator is free, the cross-office circuit is picked up and the automatic transmitter at the receiving position starts. The tape at the sending position passes from the receiving reperforator into an automatic transmitter and the signals thus go to line.

It will be appreciated that if the messages are arriving in a steady flow at the receiving position, tape will accumulate there, between the reperforator and the automatic transmitter, during the intervals when a cross-office circuit to the required sending position is not available. Thus, even one heavily-loaded outgoing circuit could produce tape accumulation at a number of receiving positions if cross-office circuits worked at the same speed as external circuits. To overcome this difficulty these internal circuits are

Fig. 5. Schematic diagram shewing connections through a tape relay office



operated at about twice the speed of the external ones. The arrangements for taking traffic received for delivery out of the through stream and injecting traffic handed in for forwarding into the stream are apparent from figure 5.

In an endeavour still further to reduce staff, the scheme shown has been modified, first by replacing the plug and cord connections with push buttons, and later by arranging for the cross-office switching to be made fully automatic.

The scheme has considerable advantages over normal retransmission technique and these can be summed up briefly as follows:—

(*a*) between any one office in the network and any other, however many retransmissions may be needed, a message is not handled manually, and accuracy of retranscription is not affected by human error;

(*b*) little staff is required to handle through traffic with any of the schemes and none at all with the final scheme;

(*c*) so long as traffic for an outgoing circuit is coming into an office it is being offered to that outgoing circuit;

(*d*) all external circuits are worked on a duplex basis at a steady speed of 66 words per minute, which is well above the average speed obtainable by manual operation of teleprinters. Optimum loading of circuits is thus achieved.

The basic disadvantages of the system are:—

(*a*) the very high cost of the mass of equipment necessary for each retransmitting office;

(*b*) the delay which any retransmission technique involves, accentuated by the need to keep messages waiting for each outgoing circuit if that circuit is to be continuously loaded;

(*c*) the large and technically-skilled monitoring staff required to prevent pile-ups, by rerouting or emergency fault clearance.

Ultrafax

The most sensational, but not necessarily the most useful, recent technical development in the United States is called "ultrafax". This appears to be based on a 20-year-old invention of J. L. Baird, the television pioneer. The general idea is that each message, page of print, picture, or whatever it may be desired to send, is treated as a television picture. The resulting signals may be sent by television cable or ultra-short wave radio, using relays as necessary, to a television-type screen at the distant end where the images produced are photographed by a high speed camera working in synchronism with the rate of presentation at the sending end.

With this scheme it is modestly claimed that a word speed of one million per minute can be achieved, but in an actual demonstration, the well-known thousand-page novel "Gone with the Wind" was despatched at much more than wind speed, arriving at the receiving end in two minutes twenty-one seconds, that is, at roughly 200,000 words per minute. This is all very exciting, but no indication has yet been received of the processes necessary to prepare material for transmission at the sending end or for delivery at the receiving end. It may be that some form which would look rather like the war-time airgraph will replace airmail, or even ordinary mail, over routes where this system can do the job economically. Until we know more about the system it is difficult to predict its usefulness but it seems likely that the normal telegraph, or sorting office, superintendent would scarcely welcome the arrival of telegrams or letters at rates of from 10 to 50,000 a minute, which appears a possibility if we can cram 1,000 words into a page and send a legible copy.

Summary

Although automatic switching, facsimile transmission from small offices, and concentration of delivery, will not bring the public telegraph revenue and expenditure accounts into balance, they may go some way towards attaining that end. It seems unlikely that any public telegraph service can be made to pay except where its major revenue comes from an expensive greeting service using luxury stationery. This may come in this country, but probably not yet owing to the prevalent atmosphere of austerity. It does seem possible, however, that the expansion of private wire user and the development of a successful and remunerative telex service may produce additions to revenue which, if credited to the telegraph account, may well bring us within sight of an overall balance. This may become a possibility of the next five to ten years.

Looking further ahead, there is discernable in the crystal of the future the chance that development of ultrafax technique, coupled with very brief periods of user of television links or wide band cables, will enable us to offer a service encroaching on what are at

(continued on page 119)

A Capital Project

(By courtesy of "The Scotsman")

The Conversion of Edinburgh Non-Director System to Director Working

by G. H. Weatherly and T. Hamid,
Edinburgh Telephone Area

APART FROM BEING THE CAPITAL OF Scotland, the City and Royal Burgh of Edinburgh has many other claims to distinction. Every year its severe, classical beauty is admired by thousands of tourists from all parts of the world. Since the end of World War II, it has promoted with phenomenal success an annual International Festival of Music and Drama, which is already recognised as an event of world-wide importance. For Post Office servants it has the added interest of being the birthplace of Alexander Graham Bell and of holding first place among provincial towns for its degree of telephone density.

It is, therefore, not unfitting that Edinburgh should lead the country in pioneering the first large-scale changeover of a multi-exchange area from the non-director to th director system of automatic working.

The Problem

When it became evident in 1937 that the present non-director 5-digit numbering scheme would be exhausted within a few years, a series of meetings was held between Headquarters and Area representatives. Various expedients for extending non-director working were examined and rejected before the war necessitated a temporary suspension of such schemes. The discussions were resumed in 1945, and the decision was speedily reached to replace the entire non-director Siemens 16 (S.16) system (consisting of 13 exchanges) by a standard director scheme employing three-letter codes

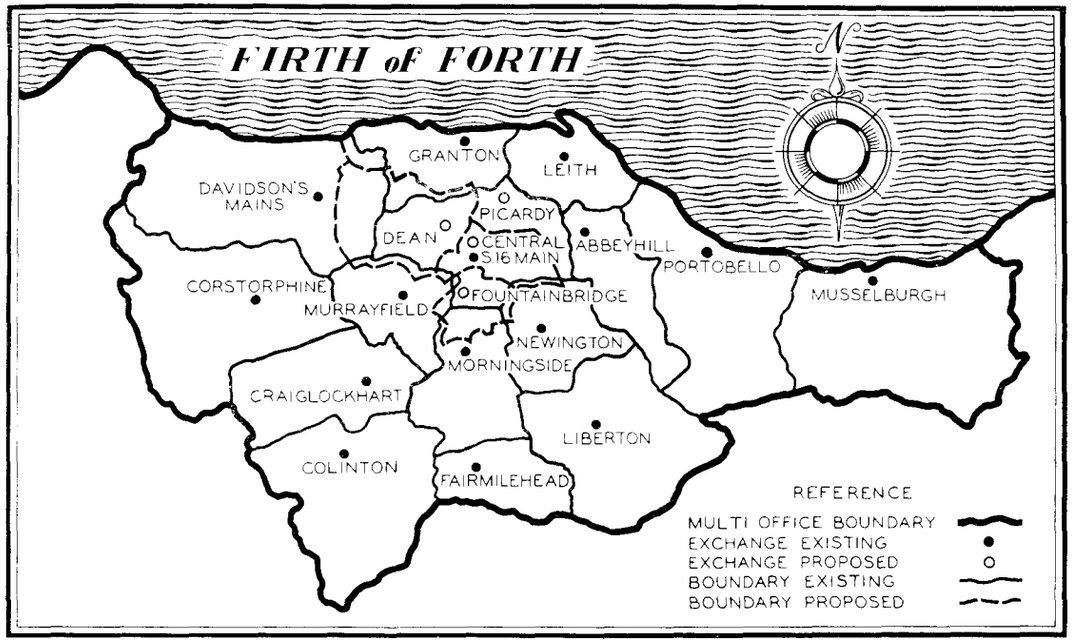


Fig. 1. Boundaries of Exchanges in Edinburgh

and four digits. It was subsequently decided to include Musselburgh within the director area on conversion.

With the release, at the end of hostilities, of the pent-up demand for telephone service it was found necessary to open relief manual exchanges; one (named Bypass) in the already over-grown central area, and two others (Jubilee and Peggy's Mill) in the rapidly developing residential areas of Morningside and Davidson's Mains, respectively. In order to relieve the extending suburban areas of Murrayfield and Colinton, a new director exchange, CRAiglockhart, was opened in July, 1946, and in February, 1949, FAIrmilehead (serving a residential area near the foot of the Pentland Hills) was converted to director working.

At the beginning of 1950, therefore, the position was as shown by the solid lines in figure 1. Calls from the non-director exchanges to CRAiglockhart and FAIrmilehead were obtained by dialling "59" and "70" respectively, followed by the required 4-digit number. In the reverse direction, director subscribers dialled "21" followed by the appropriate 5-digit number.

By this time, many of the exchanges had developed in such a way that their theoretical centre was a considerable distance from the exchange building; others had exceeded or would, within the planning period, exceed the normal director exchange capacity of 10,000 lines. In particular, it was decided that the S.16 Main exchange area should be split into three new areas. New exchange boundaries have been indicated in figure 1 by means of broken lines.

The Order of Conversion

Building restrictions were an important factor in deciding the method of approach to the problem of converting the Main exchange. Sufficient space was, however, acquired in a basement (of sub-standard height) adjacent to the S.16 Main Exchange to accommodate a temporary 7,000-line director exchange.

The next stage of the conversion programme was to clear working lines off those number ranges

which began with three digits required as letter codes in the group of new director exchanges. It was decided to clear 6,100 numbers from the S.16 Main exchange, transferring the subscribers to the new director exchange and at the same time giving them new exchange names, CENtral, DEAn, and FOUntainbridge. The S.16 numbering ranges to be cleared are 20000-23699; 27200-27999; 30600-30999; 32400-32499; 32800-32899; and 33000-33999. The clearance of these numbers serves a three-fold purpose:—

(*a*) releasing all the director codes required for exchange names in the early part of the programme, including CENtral, DEAn, FOUntainbridge, CRAiglockhart and FAIrmilehead;

(*b*) clearing space to accommodate a 2,100-line director exchange (see later);

(*c*) clearing space for a small increase of non-director tandem and other internal exchange equipment.

The new director exchange jointly serving CENtral, DEAn, and FOUntainbridge subscribers will be in service by the time this article is in print. Some features of the conversion arrangements may be of interest to readers and they will be dealt with later. In the meantime, let us pursue the conversion programme to what we hope is its better (not bitter!) end.

Since calls from non-director to director exchanges must circulate via the S.16 Main exchange, the availability of codes has largely determined the sequence of events. For example, the director code 534 for LEIth is not available until after the conversion of Morningside non-director exchange which at present occupies levels 51-58.

Immediately after the opening of the joint CENtral, DEAn, FOUntainbridge director exchange (known as "George Street" within the service), the freed S.16 apparatus will be recovered, reconditioned and used to extend the remaining non-director exchanges. In the space vacated, the installation of a new 2,100-line director exchange will immediately begin and this should open in July, 1951. It will be known in the service as "Rose Street" and will initially serve DEAn subscribers transferred from George Street exchange. As soon as this transfer is effected, a further clearance of subscribers from the S.16 Main exchange will be made. These subscribers will be transferred to their appropriate director exchange: CENtral and FOUntainbridge lines to George Street, DEAn lines to Rose Street. Once more we repeat the cycle of operations, that is, recover S.16 equipment and extend the Rose Street director (DEAn) exchange until we have built up two director units of 7,000-multiple (George Street) and 8,000-multiple (Rose Street). The latter will be cleared by the opening of DEAn exchange in new premises.

It will be seen that the new DEAn exchange will have an adventurous career at the outset; starting in George Street it will move to Rose Street about a year later, and after that to a new building not yet begun. The subscribers will know nothing of the moves, or, if they do, at least we hope they will not be inconvenienced.

In a building at present under construction, a new 7,300-line FOUntainbridge director exchange will be opened early in 1952 (see figure 2). This building will also house:—

(i) the local (director area) tandem (switching) exchange;

(ii) a 50-position relief automanual exchange (named Talisman);

(iii) a 14-position Directory Enquiry Bureau.

FOUntainbridge exchange will serve all subscribers proper to the new FOUntainbridge area: some will be transferred from George Street; some from the remaining levels of S.16 Main exchange and the rest from adjacent exchanges (for example, Morningside).

Fig. 2. Fountainbridge Telephone Exchange under construction
(By courtesy of the Ministry of Works)

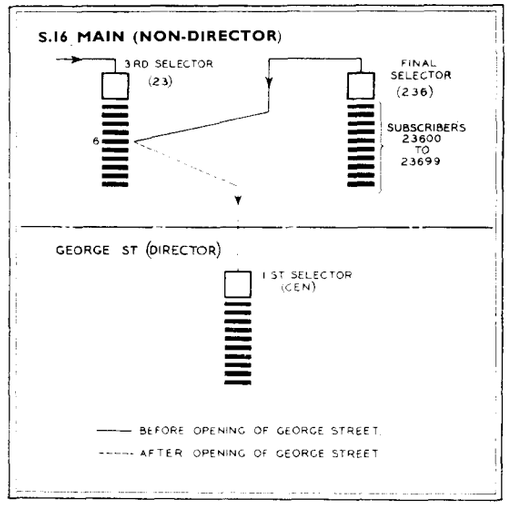


Fig. 3. Routing alterations at the main non-director exchange

The final stage in regrouping the central area is completed with the opening of a new director exchange (shown as "Picardy" in figure 1 although this name is not settled) to serve the eastern part of the area. The temporary George Street exchange will then be closed, leaving Rose Street and Picardy to share the S.16 Main area development, as reduced by DEAn and FOUntainbridge.

Subsequent conversions will proceed according to a prearranged scheme based largely, as already mentioned, on the dates when various director codes are freed. The programme is scheduled for completion by 1957, but manpower, equipment and building restrictions are slowing down operations and it is unlikely that the whole scheme will be completed before 1960.

Dialling Arrangements

With the opening of George Street exchange in March of this year, it became possible to rationalise the subscribers' dialling instructions in the Telephone Directory preface as follows, so that no further alterations will be necessary during the remainder of the conversion programme:—

(i) calls from non-director and director to director: dial 3 letters and 4 digits;

(ii) calls from non-director and director to relief manuals: dial 3 letters and ask for number;

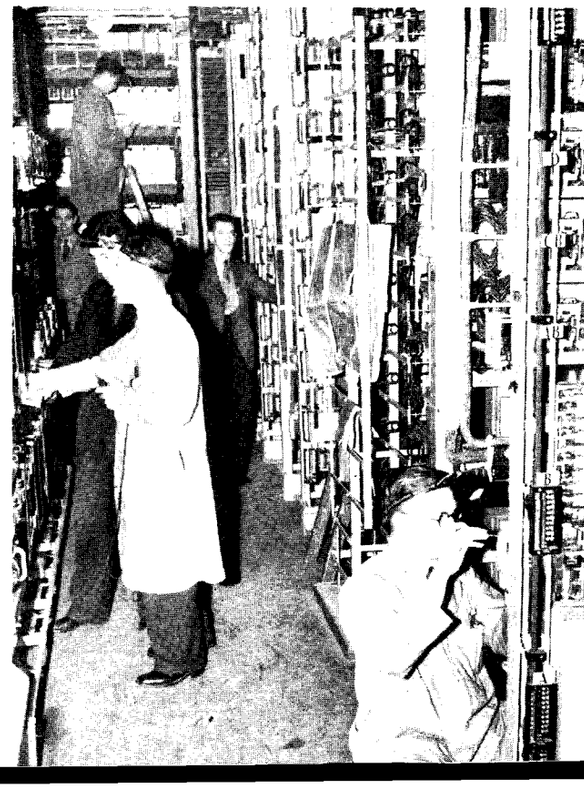
(iii) calls from director to non-director: dial "21" and 5 digits;

(iv) calls from non-director to non-director: dial 5 digits.

All non-director subscribers have been given director-type dials in preparation for the opening of George Street, but coin-box dials will be changed at the last possible moment.

For miscellaneous services, both non-director and director subscribers at present dial 3-digit codes developed from their standard 2-digit counterparts, for example, 901 for Telegrams, 911 for Enquiries, and so on. With the exception of the "specialist" code TLX (Telex), director service codes such as TEL, INF, TIM, and so on, do not become available until very late in the conversion programme. In order to maintain uniform operating instructions for subscribers on both non-director and director exchanges, therefore, the present numerical codes will probably remain in use until a date

Fig. 4. Installing equipment at the new George Street, Edinburgh telephone exchange *(By courtesy of the Edinburgh Evening News*



when all the director service codes can be introduced simultaneously.

Call offices are being converted at the same time as the exchanges on which they work, with the exception of those in the city centre. The latter kiosks will remain on S.16 equipment until it is possible to transfer them *en bloc* to their appropriate director exchanges, thus maintaining uniformity of operation in the main tourist area.

Opening of George Street Director Exchange

The conversion of part of a non-director main exchange to director working is such a novelty that some detailed aspects of it may be of interest.

To intercept calls to the old numbers of subscribers being transferred to George Street director exchanges would have required a staff of 44 operators, not to mention the accommodation for welfare and equipment: the lack of accommodation alone ruled out interception. Five of the S.16 Main levels, namely, 236 (CEN), 272 (CRA), 308 (FOU), 324 (FAI) and 332 (DEA) will be re-used for tandem routing of calls to director exchanges, and it is, therefore, impossible to apply any form of interception or warning on calls misdialled to these numbers (see figure 3). On the remaining numbers it was originally intended to apply "Number Unobtainable" tone, but an eleventh-hour suggestion to use verbal announcements was approved by Headquarters. An experimental model of a magnetic tape recording machine constructed by Electric and Musical Industries, Ltd., and capable of reproducing short announcements continuously, has been obtained for the purpose. Both the recording and reproducing functions are embodied in the same unit, which is of "suit-case" dimensions. At the moment of going to press, this apparatus is being installed. Although a competition has not yet been held to select a "golden-voiced" operator, we hope to do so, and the verbal announcements will advise callers to consult the current directory for new numbers. Should this apparatus fail, due, for example, to breakage of the tape, "Number Unobtainable" tone will be automatically substituted for the verbal announcements.

As is not unusual in such cases, the preliminary letters to subscribers resulted in many demands from the business community for additional facilities, such as extra exchange lines, private branch exchange boards, and so on. They also brought to the surface indisputable evidence of the fact (well-known to all Traffic Staff) that we are, by and large, a superstitious people. New numbers containing the ill-omened figure 13 (for example, 2213) and numbers which added up to 13 (for example, 3532) were indignantly rejected by the recipients. Obviously the Department should seriously consider making an extra allowance on auto multiple calculations to cater for this idiosyncracy!

In spite of wide Press notice, the fact that number changes are being made on a "numbering range" basis instead of on a "territorial" basis gave rise to many written and oral enquiries. Members of the public were naturally unable to understand at first why their next-door neighbours were getting a change of number, while they themselves were not affected!

An issue of the Edinburgh Area directory was distributed shortly before the transfer. It embodies a novelty in the form of a theatre-programme type of seal on which is printed a request not to use the directory before the time of transfer and a reminder that many numbers have been changed. This type of seal is being used experimentally as a substitute for the standard yellow band. Experience of the latter in this Area has shown that it is too easily slipped off or broken in the course of delivery. The new type of seal has the advantage that, even if it is cut or broken, the essential message remains attached to the front cover of the directory.

Space does not permit of a detailed exposition of the many special factors involved in designing George Street exchange and in distributing the lines over the multiple. Readers will, however, readily appreciate some of the complications. The allocation of numbers, in particular, was somewhat of a headache, special regard having to be paid not so much to loading as to the subsequent movement of subscribers from George Street to DEAn (via Rose Street) and to FOUntainbridge, each with different numbering ranges, private branch exchange units and so on. An article of this nature is bound to omit many points of detail. It is hoped, however, that it succeeds in giving readers a reasonably clear picture of the problems and processes involved.

Radio Amateurs and the Post Office

by J. Piggott, B.Sc. (Eng.), A.M.I.E.E.,

Engineering Department

A typical aerial used by an amateur

IN THE AUGUST, 1949 ISSUE OF THE JOURNAL, there was published an article which describes some features of the activities of amateur radio operators as seen from the Post Office standpoint. Some quite pleasant things were said about these enthusiasts, and in the following paragraphs the writer, a holder of a Post Office wireless transmitting licence, looks at this matter from the licencee's angle.

Of course, no controlling and licensing authority can please everybody all the time and it must always err on the side of caution when some facilities are to be granted universally. This is especially so for the transmission of wireless signals since, by nature, a transmitter is a powerful instrument able to make itself heard over a wide area, stirring up a lot of trouble if used selfishly or for some nefarious purpose.

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What qualities can amateurs in this field of communications claim to possess? The value to a country of a body of men—and, incidentally, a few women—with knowledge of the science and production of high frequency and very high frequency radio has been amply demonstrated in the war years, and, apart from this, there is the undoubted value of the scientific work which has been undertaken (admittedly by a minority, but that is true of any body of men). For example, a few months ago, amateurs in England and New Zealand celebrated the 25th anniversary of the first morse and telephony signals ever to be exchanged between that most distant Dominion and the Homeland. Those signals were sent by amateurs. Reports of occasional reception of the London television programmes, both vision and sound, have recently come from an amateur in the Union of South Africa; who but a keen amateur would be so enthusiastic as to have a receiver there with which to try?

The Post Office in this country can hardly be expected to accept the idea that the Amateur Service is a valuable communication network to be used at times when the normal services of telephone and telegraph have failed. After all, the United Kingdom is a crowded and compact community having to contend with very few natural disasters. The Post Office communication system seldom requires any help from outside. There have been isolated small-scale disasters when floods have isolated a few people and an amateur has been able to provide a communication link for rescue or for medical services, but, generally speaking, the occasions when such help is required are rare. The amateur in the United Kingdom therefore realises that he cannot, except in a disaster of colossal magnitude, be of direct assistance to the Post Office. However, he is always ready to help should any occasion demand.

In the United States, South and Central America and in many British lands overseas, amateur radio stations are of considerable direct use to the Authorities, and especially in countries where public communications are sparse or are liable to be interrupted frequently. In the wake of every hurricane and after every earthquake, all amateurs in the districts affected put their emergency plans into action so that

relief and reconstruction work can commence at the earliest possible moment. Amateur co-operation with Government and other services in such places as Florida and in the districts around the Caribbean after devastation has been caused makes thrilling reading and also thrilling listening when the messages can be heard elsewhere. It may be, therefore, that the value to the public of the Amateur Service is less obvious here in Britain than in some parts of the world. The Postmaster General's licence certainly restricts the British amateur's opportunities for helping others, but he accepts the limitation on the scope of his activities as part of the price to be paid for the more equable climate and the very reliable public telecommunication services!

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It is to be hoped that the Post Office will always remember that those of us at home are part of a world-wide fellowship and that it is vital that we should be given as much freedom of action as possible to maintain our position in the international Amateur Service. Many amateurs consider that where it may not be expedient for some new or added facility to be made available to all, without exception, the licensing authorities might consider granting special facilities additionally to old-established and experienced amateurs of proved character. This might, of course, cause some slight administrative difficulties but these should hardly be insurmountable ones. Before the war, the 80-metre band was the preserve of the most expert of operators (those who wished to apply), but such distinctions have been swept away by making this band available to all British amateurs. Is it too much to ask to have new allocations for those who have held licences for, say, ten years, or for those who are prepared to undertake some definite line of scientific research, failure to publish or report results being made the reason for loss of the special rights?

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The amateur bands, the groups of frequencies or slices of the frequency spectrum allocated for this service, are becoming thoroughly overworked. These bands have always been crowded with signals, especially in the evenings and at weekends. This pressure of business has resulted in amazing improvements in reception techniques and it is no idle boast that the most expert in the art and science of reception are to be found in the ranks of the amateurs. The prize of "working"—that is, exchanging messages—with an unusual station, say the weather station on Pitcairn Island in the South Pacific, or perhaps an American airman on Guam, or a fellow from one's own town who is away in Central Africa, or just a friend in a Cornish village, is usually quite sufficient to encourage the operator to put forward the greatest possible concentration on the task of winkling out his own individual message. Few commercial operators would care to copy such signals from afar amongst a welter of others much stronger. The amateur often contends with noise-to-signal ratios and not those of signal-to-noise. Is it to be wondered at, therefore, that when interference is at its zenith and when the amateur tunes his receiver past the solid wall of signals into the apparently empty kilocycles lying adjacent but belonging to another of the radio services, that he sighs for an enlargement of his reserve? (In this connection he may be forgiven for forgetting that sometimes a channel must remain empty for long periods ready for instant use by some other service when required.)

The efforts of the Post Office to retain the traditional bands for amateur use in the face of the claims of other Governments have been realised and are very much appreciated. But, whilst it is evident that the air must be full of the signals from broadcasting services, fixed and mobile air and sea services, fixed governmental and other communications services with which no chance of interference is allowed, the amateur considers that the amateur communications service might well be permitted to use some, if not all, of the parts of the spectrum allocated for non-communication purposes such as diathermy, model control and so on. Although there might not be freedom from interference with reception on these frequencies, it would give him some further "elbow room" in which to send his signals with less risk than at present of their being "jammed".

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The protection afforded the Amateur Service by the insistence by the Post Office on high technical qualifications and on ability to operate efficiently before granting a licence, has ensured a high standard of achievement. It has provided the means whereby those interested in

radio techniques can obtain practical and individual experience in them and also enrich their appreciation of the world around them. Anyone who listens to signals going around this earth soon appreciates the real existence of the world community, and distance and horizons take on a new meaning. Because of their special interest in communications, Posts and Telegraphs people all over the world are prominent in the varied ranks of amateur operators. Both technical and non-technical officers of the British Post Office, who hold amateur permits, regularly exchange messages with some of their colleagues who have left this country for Post Office appointments overseas. The pleasure of talking from a back room in a London flat with an old friend who has been transferred perhaps to a remote telephone repeater station in the Rockies is typical of the many everyday events which make amateur radio the fascinating hobby it is. Oddly enough, perhaps the greatest assistance given to the Amateur Service by the Post Office is that once having laid down the general conditions of the transmitting licence, with the common good in mind, the Authority leaves that service alone except for very unobtrusive monitoring and periodical inspection, and advice when required. The amateur is given facilities and allowed to pursue them in any way he pleases provided he works within the prescribed boundaries. Extra facilities are freely given, without excessive "red tape", for portable operation and for the National Field Day when hundreds all over Britain (with other countries participating too) are licensed to operate from camps. There is always close co-operation between the Post Office and those who are appointed by amateurs to represent their cause in all matters of mutual interest, and much advantage results from this collaboration.

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Many facets to this hobby have not been mentioned in this article, and there are undoubtedly many points which might have been elaborated. For example, the present difficulties caused by amateur interference with television reception might well have provided subject matter for an article much longer than this one, but that must wait for another day. Suffice to say that the Post Office helps the amateurs in this and many of his other problems, and the amateur is grateful for the help. By and large, the amateur does not find the present licensing arrangements too irksome, and he is happy that the Post Office and not any other authority is responsible for the control of amateur radio in this country.

CAN THE POST OFFICE TELEPHONE SERVICE TAKE FURTHER STEPS TO MEET THE ECONOMIC SITUATION?

(continued from page 100)

with shared service, it is not thought that the proposals outlined above would lead to any decrease in the present net revenue—possibly the reverse would be the result. By working along these lines, however, the Post Office would, it is advocated, be making a further endeavour to reconcile the conflicting interests described earlier. The efficiency of essential telephone communication would not be lowered, and the greatest number of non-essential subscribers would be given service at minimum cost. Admittedly, there would be some falling away from the facilities and standards offered to residential subscribers pre-war. This is, however, regarded as inevitable, indeed justified, in present day circumstances.

TELEGRAPHS—WHAT OF THE FUTURE?

(continued from page 111)

present postal preserves. If suitable processing arrangements could be made it might well be possible to dispose of large volumes of mail received very late at night, in good time to achieve night mail delivery the next morning in large towns all over the country. Similarly, use of ultrafax, coupled with the resumption of afternoon postal delivery, would perhaps permit items posted in large towns in the morning to be delivered in others some hundreds of miles away during the afternoon. The cost would probably need to be more than for a normal letter, but that would depend very largely on the quantity of matter handled.

Post Office exhibit at the Baltic Exchange, London

Fifty Years' Progress in Marine Wireless

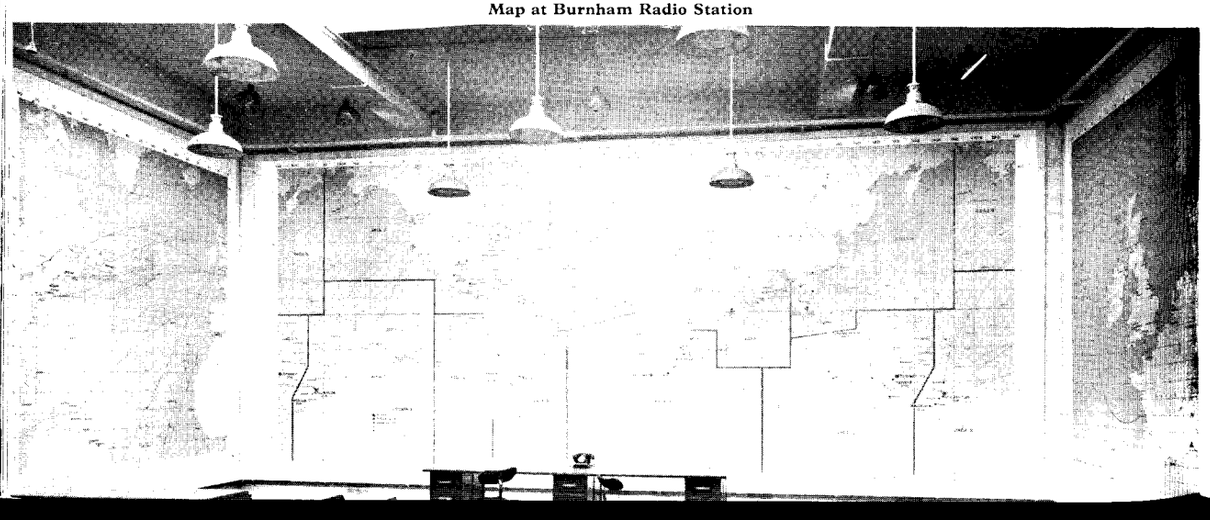
THE MARCONI INTERNATIONAL MARINE Communication Company in celebrating its jubilee, has just staged at the Baltic Exchange in St. Mary Axe, London, an exhibition of half a century of progress in the sphere of wireless communication with ships at sea. In acknowledgment of the part played by the United Kingdom Post Office in marine communication, one of the operating positions of the Burnham (Portishead) Radio Station was staged.

Mr. H. C. Van De Velde (Managing Director of the Marconi International Marine Communication Company), in his speech to the Press before the opening of the exhibition, paid tribute to the Post Office, and in particular to Sir William Preece, who was Chief Engineer at the time of the original experiments of the Marchese Marconi. Unlike many of his contemporaries, Sir William had confidence in Marconi's experiments, and placed at his disposal the resources of the Post Office to enable him to continue. That first co-operation was in 1896, and three years later, at the close of the century, long distance communication at sea by wireless telegraphy became a fact when a message was sent from the Isle of Wight to the S.S. *Saint Paul* when she was sixty-six miles out at sea.

The exhibition set out to show the achievements in the marine-radio world since the success of November, 1899. The Post Office stand reflected the close association of the United Kingdom Post Office with research in the radio field and in the practical applications of its results. The sixty-six miles of 1899 have now been extended so that through the Post Office Radio Station at Burnham, communication by wireless telegraphy is possible with shipping in any part of the World. The latest developments in radio equipment are employed at this station. An interesting feature of the system is a large-scale steel wall map on which ships' positions are plotted by use of small magnets as ships. A replica of this map was displayed at the exhibition: it made a fitting appendage to an exhibition which started with a ship's radio-cabin of fifty years ago, and thence by stages to the radio-cabin of an up-to-date liner.

Burnham, besides having world-wide range, is also one of eleven radio stations maintained by the United Kingdom Post Office on the coasts of Britain. They are there for safety of life at sea and handling commercial messages. This exhibition emphasised the atmosphere of co-operation, and indeed comradeship, which has always existed between Post Office radio operators on shore and their colleagues at sea.

Map at Burnham Radio Station



Calling up a Thames River Tug

by G. R. Bulman

London Telecommunications Region

Above: **The Thames River Tug *Gull***

ON JULY 1, 1949, THERE WAS BROUGHT into public use a new radiotelephone facility to which was given the title "Thames Radio Service". It is quite independent of the short-range radiotelephone service with coastal ships.

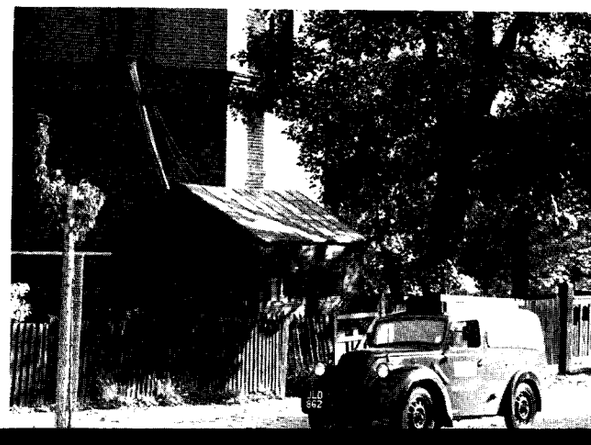
The initial investigations into the possibility of providing such a service resulted from an enquiry originated by the Port of London Authority, which exercises maritime control of the river between Teddington Lock (just North of Kingston-on-Thames), and the Nore Buoy (South-East of Southend-on-Sea). In this long, winding stretch of the river are included the Medway ports and all the well-known "Reaches" which the names of Woolwich, Blackwall, Greenwich, and Limehouse have made famous and which, with their mazes of associated docks, culminate in a place more famous than any—the "Pool".

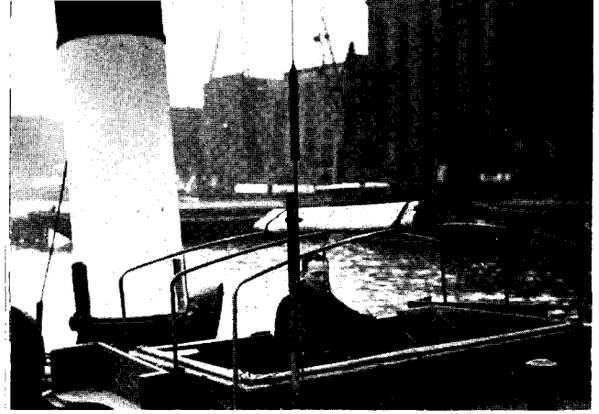
Up and down the river, loading here and discharging there, hundreds of river craft ply like buses, but unlike buses, they require prompt human assistance for the stowage and discharge of their cargoes at the point of call. It is the prompt control of this factor, made possible by the simplicity of telephonic operation, which will ensure the success of any new facility. This has been fully appreciated by the Engineering Department, who have devised a scheme whereby calls can be made between suitably equipped small river craft and shore, using a simple operating procedure similar to that which might be employed in setting up a unit-fee call on any sleeve control switchboard, and which provides similar both-way speaking facilities.

The service is available to any subscriber in the

Below: **The aerial on top of the water tower at Shooters Hill**

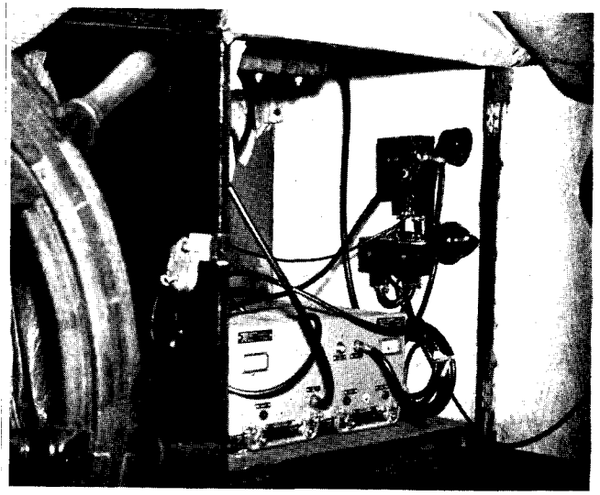
Below: **The radio hut at the foot of the water tower at Shooters Hill**



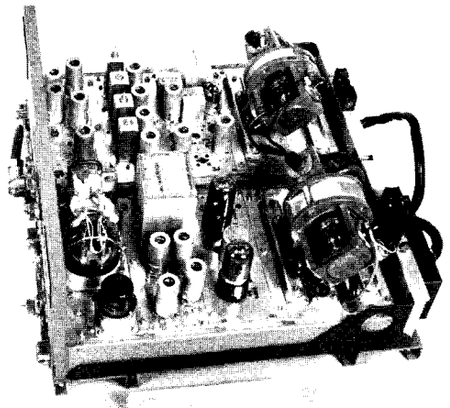


Above: **The aerial on the tug *Gull***

Below: **Part of the equipment on the bridge of the tug *Gull***



Below: **The transmitter/receiver unit of the ship's equipment**



London Toll Area and to licensed river craft within the limits of Hammersmith Bridge and Southend without the need for wireless-trained personnel.

Calls are not accepted from call-office lines; a ship to ship service is not available and personal calls are not accepted.

Description of the Apparatus

A 4-wire circuit is provided between Shooters Hill (near Woolwich), and International Exchange, where it is converted to a 2-wire circuit and terminated on a normal operating position in the switch-room. The aerials at Shooters Hill are fixed to the top of a water tower and are 530 feet above low water. The radio station at the foot of the tower is normally unattended. The apparatus at Shooters Hill and at Wood Street, where International Exchange is situated, were described by Messrs. J. Neale and D. W. Burr in the January, 1950 issue of the *Post Office Electrical Engineers' Journal.*

The license charge for each ship's set is £5 per annum and licensees are responsible for the installation and maintenance of their own radio equipment which is provided by well-known radio firms to Post Office specification. The equipment comprises a transmitter/receiver unit (normally installed in the engine-room of the vessel), a loudspeaker, hand-telephone and control box (all normally installed on the bridge) and an electricity supply. The question of overcoming the lack of electricity supply on many small river vessels is receiving attention.

Full duplex working on amplitude-modulated carrier frequencies near to 160 megacycles per second is provided with a common aerial for receiving and transmitting. This is the first mobile system in this country to be so provided.

How a Shore-to-Ship Call is Made

A shore-to-ship caller dials "MONarch 0221" or asks his local operator for "Thames Radio, Monarch 0221", and the call is connected to the "Thames Radio" operator in International Exchange. The "Thames Radio" operator plugs into the radio channel jack and is connected to the automatically energised transmitter. A stand-by transmitter is automatically connected in the event of the "main" transmitter failing.

The operator calls the ship by broadcasting "Thames Radio calling (name of vessel)". The broadcast call will be received on the loudspeakers of all properly equipped vessels within range whose receivers have been switched on and the red lamp, fitted to the control box of all such receivers which are switched on, will glow. (It is hoped to provide selective calling facilities in the near future.) When the called ship's hand-telephone is lifted off its hook in order to answer the call, the monitoring loudspeaker on board is disconnected, the ship's mobile transmitter being brought into operation.

If no reply is received from a vessel after the operator has repeated the broadcast call for two minutes the caller is so advised. A further attempt is made 30 minutes later if requested by the caller. It has been found in practice that about 70 per cent. of the calls receive a reply from the required ship.

How a Ship-to-Shore Call is Made

If the "channel engaged" lamp on the control box is not glowing, and if no call is heard on the loudspeaker to be in progress, the hand-telephone is lifted. This automatically energises the ship's transmitter, connects up the land line via Shooters Hill radio station, and lights the calling lamp in International Exchange.

Calls are normally completed "on demand", but the "interrupt" procedure is brought into operation in the event of the required subscriber being engaged on a call.

Emergency Calls

All distress calls from ships or calls for emergency help are connected to the Tilbury Dock Superintendent's Office where special arrangements are in force. Class "A" Night Service is available for the completion of such calls received at any time after normal business hours.

Other Details

Visual and aural alarm conditions have been provided at International Exchange to indicate a failure of the main and/or stand-by radio transmitter at Shooters Hill.

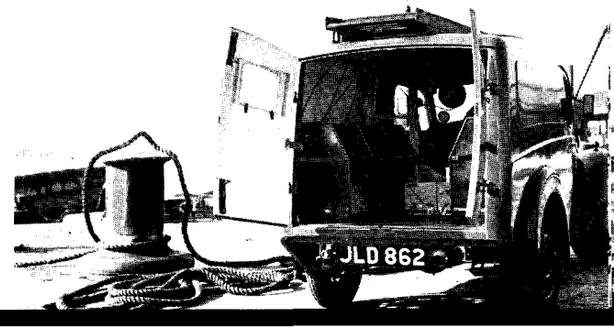
It is obviously unnecessary to retain the operator control of the service on high-revenue earning positions at International Exchange and a local exchange nearer the radio station is being considered as the alternative centre. The name ESTuary has been reserved in the director code

(continued on page 130)

Above: **Skipper of the tug *Gull* answering a call**

Below: **River Service position at the International Exchange, Wood Street, London. Operator connecting a call from a subscriber to a ship**

Below: **Test and maintenance van**



Letters to the Editor

Delayed Traffic Problems

From L. T. Andrew, Assistant Inspector, Inland Telecommunications Department.

As many readers already know, the opportunity has been taken during the recent review of telephone exchange call values, to direct fresh attention to the proper proportion of waiting time (indirectly occupied time in current terminology) to be included in the exchange value, in order to ensure that, over a number of busy hours, the average time-to-answer will approximate to some predetermined policy standard.

The problem is akin to that considered by Mr. Longley and Mr. Mellor in earlier issues of the Journal. In seeking a theoretical background, we naturally turned to Erlang. The practical aspects were, at the same time, tackled by Operational Research in the exchanges and it quickly became apparent that there was a real discrepancy between theory and practice; a discrepancy which, in fact, was reduced to manageable proportions by Mr. Longley's suggestion that the average delay on all calls, that is, the time-to-answer, was one half of that posed by Erlang.

Exact agreement between the operator problem with its human imponderables and the theoretical approach is not to be expected. Nevertheless, the nature of the variations and their consistency threw some suspicion on the theory. In order to obtain a fresh angle on this, we have recently made extensive (and laborious! !) artificial traffic studies with up to ten operators (or channels) and, while the results for the proportion of calls delayed show no great divergence from the Erlang expression, the average delay is less than his prediction, at least over the range tested. These tests, which were comprehensive and covered both variable and constant holding times, showed that if the average delay on calls delayed is expressed in the form h k(x-A) then (*a*) with constant holding times of the order of 60 seconds and fairly heavy headings (60-80 per cent.), the values to be attributed to k to achieve the artificial traffic record results range from about 2 for one or two operators to 1.5 for 10; (*b*) with an exponential distribution of holding times, the results follow the same pattern but the divergencies are smaller, k varying from something over 1.5 to about 1.1 over the same field. Also, there is a suggestion that with a small number of operators the proportion of calls delayed is rather less than theory predicts, although as x increases the agreement becomes good.

In practice, of course, the distribution of operator holding times is by no means homogeneous nor does it follow any simple law. Nevertheless there would seem to be a real headache here worthy of further study and research both on the theoretical and practical sides.

Finally, I would make a plea that the Journal should continue to find space from time to time for articles of a theoretical or mathematical nature. Although their appeal is limited, the stimulus to original thought and research which results is invaluable in the solution of our many outstanding problems.

Mechanisation or Service?

From J. W. Whiston, Assistant Telecommunications Controller, Class II, Midland Region.

I read with interest Mr. Bradburn's article on "Mechanisation or Service?" I agree with him that before we mechanise fully we should consider whether this would provide the best service for subscribers. It may be that a better trunk service would be given by providing a high grade auto-manual service and to achieve this by arranging that all traffic controlled by operators is completed automatically and by the addition of other operating aids. However, evidence shows that on junction traffic at least subscribers will dial calls themselves if the service is offered to them. I think, therefore, that the Department is right in proceeding with subscribers' dialling of untimed traffic and I should like to comment on a few of the criticisms made by Mr. Bradburn. It is not certain of course that the subscribers' reaction would be as favourable if subscribers' dialling is extended and the subscriber is given a longer list of instructions and is asked to do more work.

Subscribers' Use of Dialling Facilities.—The suggestion that subscribers do not make use of

dialling facilities when they are provided has been made before and recently the Inland Telecommunications Department made a check of this and found that the amount of traffic received at manual boards in error was very small. In general the amount of traffic was less than 2 per cent. of the traffic which should have been dialled direct by subscribers. Recently, subscribers' dialling has been introduced between some exchanges in the London five-mile circle and exchanges outside the London director system and from Main (Oldham) exchange to the Rochdale non-director system. In the London scheme, subscribers have to refer to separate instructions and in the Oldham scheme different codes have to be dialled according to the number of digits in the called subscriber's number, and, although the subscribers' instructions are not as simple as one would have liked them to be, 97 and 98 per cent. respectively of the traffic is being dialled by subscribers. Mr. Bradburn does not give the exact date of the figures he quotes for certain unit automatic exchange traffic, but it seems likely that the misrouted traffic may have been unusually high because of the temporary suspension of the issue of telephone directories to residential subscribers which was in force a few years ago.

Code Dialling in Built-up Areas.—The difficulty at Pudsey occurs because the Leeds linked numbering scheme does not include all the exchanges in the Leeds built-up area. The standard arrangement is for a linked numbering scheme (that is, a system without code dialling) to be used for all built-up areas in which the exchanges have a close community of interest, the system being either a non-director satellite system or a director system. Pudsey and Horsforth were at one time satellite exchanges in the Leeds numbering system but, in order to release numbers for growth, these exchanges in the outer area of the system were taken a few years ago from the linked numbering scheme and made separate exchanges. This was necessary unless six-figure numbers or a director system were to be adopted. The same problem arises with all large non-director systems when the five-figure numbering scheme is fully used and additional numbering capacity is required. For example, in 1945 when the Edinburgh system had to be developed to cater for growth, it was decided that within the Edinburgh built-up area direct dialling without codes was essential and director working, which would ensure a common procedure for subscribers in the Edinburgh area, was therefore adopted. More recently it has been decided in order to cater for further growth at Leeds to adopt director working so that the difficulty which Mr. Bradburn mentioned will be removed. Leeds Pudsey/Horsforth is, as far as I know, the only area of its kind in the country.

The Simplified Multi-metering Scheme.—This was introduced in order to remove from manual boards, in as short a time as possible, a large amount of untimed traffic. The connection automatically of tandem traffic and certain traffic directly connected to non-director satellite systems is not permitted in the present scheme but the completion of this traffic is technically possible and no doubt will be dealt with later. I think that it was better to complete as much traffic as possible quickly and cheaply by using equipment registering fixed fees than to wait until a scheme could be launched which would complete the whole of the untimed traffic.

Uniform Call Charges.—Mr. Bradburn's suggestion to have a uniform charge for untimed calls is one which it would not be easy to get accepted by the public, as the multi-fee calls made by a minority of the subscribers would have to be paid for by an increase in the cost of calls made by the majority of subscribers. With fixed fee multi-metering the application of a multi-fee registration instead of a unit-fee registration adds very little to the cost of the equipment. Further, a uniform charge would increase the difficulties which occur at present because of the big charge step between untimed and timed calls.

From J. A. Lawrence, A.M.I.E.E., Executive Engineer, Engineer-in-Chief's Office.

The article on "Mechanisation or Service?" has obviously aroused a good deal of interest among the readers of the *Post Office Telecommunications Journal*. The theme of the article (and most of the ensuing correspondence) seems to be that mechanisation either has already gone too far, or is in danger of going too far. In support of this theme, much is made of the amount of work that already has to be done by a subscriber when dialling his own calls, and of the long and complicated dialling codes that

will one day have to be used if the current trend towards more extensive subscriber dialling is allowed to develop unchecked.

Such arguments are, however, invalid in my opinion. If as mechanisation develops subscribers can obtain more and more of their calls (especially the more numerous cheap calls) by dialling, we are more likely to face unexpected shortages of both line and switching plant than refusals by subscribers to use the dialling service.

This contention is strongly supported by the experience of foreign administrations. A number of European countries have already adopted national numbering schemes and are developing schemes for very extended subscriber dialling, in some cases on a nation-wide scale. Switzerland, for example, has almost completed its scheme for nation-wide subscriber dialling. In Sweden, Holland and Belgium, although nation-wide subscriber dialling is in a less advanced state, there are extensive schemes of subscriber dialling in operation. France also is planning a national numbering scheme which will incorporate a large measure of subscriber dialling, the range of such dialling being the equivalent of eight or nine unit-fee calls in this country.

From the subscribers' point of view, a national number in the cases quoted would require the dialling of eight or nine figures as against four, five or six figures for a local call. A typical local number in Switzerland might be 77300 and the corresponding national number 061-77300. In France, a national number dialled from Paris for, say, Clermont 2.1234 would require the dialling of 16-34-C2-1234 (nine figures and one letter).

Reports from Switzerland show that the national dialling facilities are well used by subscribers and it is the usual experience over the last ten years that when a new trunk route is opened for dialling service, the number of calls which are routed through the operator drops very rapidly, and, after a few weeks, falls to a value of the order of 8 per cent.

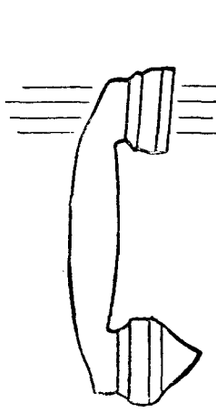
The principal trouble that has been experienced by the Swiss Administration is shortage of plant due to the rapid increase in the traffic which appears to be a direct result of mechanisation. Similar results have been reported from Sweden and South Africa, although in the latter case the information refers to a single route over which long distance subscriber dialling was made available.

Experience in this country confirms the view that subscribers will dial their own calls if given the chance. For example, subscribers connected to an exchange about 13 miles from Oxford Circus have recently been given dialling access to exchanges in the London 5-mile circle (about 70 in number). To make a call they dial the figure "7", followed by a three-figure code such as 213 and the wanted subscriber's number containing four figures. The significant fact is that although a subscriber has to dial eight figures to make a call into the centre of London, the service is being used fully by subscribers, and traffic has been diverted from the manual board with a consequent reduction in the manual board loading.

The benefits of automatic service are undoubtedly appreciated by subscribers. The secret of successful extended subscriber dialling lies, however, in the development of a uniform dialling procedure—the number of figures dialled does not seem to be of the first order of importance so long as similar calls require a similar procedure. To obtain the best results it is therefore necessary to base extended subscriber dialling on a national numbering scheme.

Incidentally, it is worth drawing attention to the fact that in a country such as England a national numbering scheme is unlikely to use any letters in the national numbers and it is worth noting also that this is the rule abroad. So far as directories are concerned the difficulties envisaged are largely theoretical. Most subscribers know the exchange and number they want, either from a letter, a bill or from an advertisement. All they need to look up to make a call by dialling is the dialling code for the wanted exchange to which they then add the wanted number. If they do not know the exchange and number they want and it is in their local directory, they can look it up in the usual way. If they do not have the proper directory, they have to dial "Directory Inquiry" anyway. We have about 6,000 exchanges in this country at the present time, and even if this grows one day to 10,000 exchanges, we could still print all of the dialling codes required in a book very much smaller in size than the *Post Office Telecommunications Journal* and certainly very much handier than say a London directory.

(continued on page 129)



NOTES AND NEWS

Telephone Exchange Supervision - Dial "999" - Heaviside Centenary - Pencils - Telephone Installations - Oil and Cables, etc.

Telephone Exchange Supervision.—Until 1938, the bulk of the night telephonists were part-time employees who were required primarily to handle the heavy cheap rate trunk traffic load between 7 p.m. and 11 p.m. Consequently, much of the supervision of night staff was performed by part-time supervisors, officially styled "telephonists with supervising allowance".

In recent years, more and more work has been given to the night staff and the proportion of full-time staff has increased to five-sixths of the total. The need for full-time supervision has grown proportionately and a scheme is now in operation which will meet that need and apply common standards of supervision to both day and night staff complements.

The scheme has become known as "half-hourly supervision" because the supervising complement is assessed by aggregating the requirements for each half-hour of the day. Major changes in day-time staffs are not expected, but a large number of night telephonists with supervising allowances will become Supervisors or Assistant Supervisors during the next few months.

★ ★ ★

Shared Service.—Until now it has not been possible for the Post Office to divide the charges for directly dialled calls between two subscribers sharing one line on unit automatic type exchanges, because only one meter has been available on the line for recording such calls. Trials of a modified exchange circuit, which will enable separate records to be kept at a large proportion of these exchanges so that the appropriate charge for directly dialled calls can be debited against each sharing subscriber, are progressing favourably and the modification should soon be ready for introduction. This will no doubt be welcomed by subscribers on unit automatic exchanges.

★ ★ ★

—and Satisfaction.—Shared telephone service is growing and there are very few complaints. The Post Office has received the following letter from a shared service subscriber: "May I mention how satisfied we are with the party line. It is an excellent service. We previously had our own line but can notice no difference and have not yet even heard the other party on the line. The men who installed the service were very courteous, quick with the job and clean, which is a change for these days."

The latest reports show that the number of people on shared service is 190,000 and of these 53,000 are business subscribers.

★ ★ ★

Telegraph Working to and from Railway Stations.—The system of interconnecting telegraph offices via a switchboard at a central office to avoid the possibility of errors and delay in retransmission of telegrams is now well established at service offices, but it has not so far been extended to telegraph offices at railway stations. With the object of ascertaining whether such extension is practicable, arrangements have been made for the necessary

teleprinter equipment to be installed at Euston Railway Station telegraph office to enable that office to be connected experimentally to the switching network. By the time this paragraph is printed the experiment will probably have commenced, Euston Station having two circuits to the London switchboard over which traffic is forwarded to all telegraph offices which are directly accessible from that switchboard.

★ ★ ★

Dial "999".—A steady flow of suggestions is received from the public for facilitating the finding of 9 on the telephone dial in darkness or in smoke. The range of ideas includes serrations cut in the circumference of the hole, raised dots round the edge, a flange fitted round the hole, a square hole, and a small pip opposite the figure 9 on the edge of the finger plate. A number of dials incorporating the various suggestions were examined recently at Headquarters and compared with a few other dials which had been treated with luminous paint. The luminous dials appeared to afford the greater assistance in dialling "999" in darkness; but it was surprising to find how inconvenient many of the mechanical devices were to operate. Very few of them proved to offer any advantage over the method recommended in the preface to every telephone directory. Some devices were found to be liable to injure the dialling finger and will obviously have to be rejected.

★ ★ ★

European Long and Medium Wave Broadcasting.—The Postmaster General gave authority for the British Broadcasting Corporation to change the wavelengths of its long and medium wave stations on March 15, 1950, in accordance with the provisions of the convention and plan concluded between Governments of the European Broadcasting Area at Copenhagen in 1948. Re-arrangement of the broadcasting wavelengths in Europe was overdue. The former allocation of wavelengths was based on a Plan agreed by European countries at Lucerne in 1933. A new Plan was agreed in 1939 but could not be introduced because of the war. Broadcasting requirements in many countries have changed considerably since the Lucerne Agreement in 1933, and the new Copenhagen Plan brought the allocation of wavelengths into line with present day conditions. The implementation of the Plan required almost every long and medium wave broadcasting station in Europe to alter its wavelength.

★ ★ ★

Heaviside Centenary.—In Camden Town a hundred years ago on May 18, was born a mathematical genius who, even today, is not widely known outside the telecommunications industry although his name has been given to an ionised layer of the upper atmosphere. Oliver Heaviside, who claimed to have done most of his original work by 1887, and was elected a Fellow of the Royal Society in 1891, did not receive recognition from the Post Office of his contribution to electrical transmission technique till 1910. In a paper read before the Institution of Post Office Electrical Engineers that year[a] is an acknowledgment that the addition of inductance to underground telephone circuits had made all the difference between speaking (from London) to Birmingham with difficulty and speaking to Edinburgh with ease.

"Really," said Bernard Shaw, of the neglect of another genius, "the English do not deserve to have great men." But Heaviside does not seem to have valued greatly the honours that eventually came to him. He was seriously upset, however, at the Royal Society's failure to publish certain of his mathematical papers, on the ground that they were too difficult. He was a short, redheaded man who shunned publicity and, as one of our Engineers-in-Chief said,[b] "was unfortunately not endowed by nature with the faculty of exposition in a diluted form." Later mathematicians[c] have interpreted much of his work to make it widely available. He was in receipt of a Civil pension when he died in 1925 at Torquay.

★ ★ ★

Pencils.—Every telephone call beyond the multi-metering range is separately recorded on a ticket for accounting purposes. Therefore, every operator at an auto-manual exchange has a pencil in her hand for most of her working time, and this has become an indispensable working tool. Experiments with propelling pencils have been made for many years, but the poor quality of the war-time utility pencil accelerated the development of a combined "writing and dialling instrument". The new standard pencil, now in use at most exchanges, incorporates a "dialling top", and is made of ebonite with an aluminium nose. The lead is mounted in a shock-absorbing brass spiral which slides along the barrel and is held in place by an external locking ring; the latter also serves for adjustment.

(a) The Loading of Telephone Cables: A. W. Martin.
(b) Sir T. F. Purves's presidential address, Institution of Electrical Engineers Journal, Vol. 68, 1925).
(c) For example, Heaviside's Electric Circuit Theory: H. J. Josephs (Methuen, 1946).

★ ★ ★

Ship-Shore Radiotelegraph and Radiotelephone Service.—The Post Office, through the eleven Coast Radio Stations, provides facilities for the transmission and reception of radiotelegrams to and from ships in any part of the world. Radiotelephone service is available for calls between subscribers on land and ships in coastal waters and certain transatlantic liners. During 1949, 790,700 radiotelegrams were exchanged with the Coast Stations and 16,410 radiotelephone calls were set up between subscribers on land and ships at sea.

The growth of the long distance (world-wide) service operated from Burnham, Somerset (Portishead Radio), has been most marked since the service was re-introduced in January, 1946. Since 1925, when the long distance service was introduced, nearly 55 million words have been handled by this Station; of this total nearly half has been handled since January, 1946. The Coast Stations also maintain a continuous watch for "Distress" calls sent out by ships navigating in the seas around the British Isles. When such a call is received, all commercial transmitting is suspended by the station, so that full attention can be given to establishing communication with the ship concerned, and the nature of her distress and the assistance she requires is passed at once to the appropriate authorities. In addition, the Coast Stations operate the service known as "Medical Advice to Ships at sea"; they handled 241 Medical Messages in 1949.

★ ★ ★

Telephone Installations.—During 1949, the Post Office installed 716,822 telephones but, in spite of this achievement, the number of applications on the waiting list increased during the year by 27,000 to a total of 548,500. For comparison, the total number of telephones installed during the three years ended December 31, 1938 was 1,170,500 and at the end of that period 4,100 were on the waiting list. Since the end of the war, the Post Office has made the fullest possible use of its restricted resources in manpower and materials to meet the demand for telephone service. Although the rate of installation has been considerably higher than the pre-war rate, it has been insufficient to overtake the much bigger demand for service.

★ ★ ★

Oil and Cables.—The Post Office operates three oil-burning cable-laying vessels, one of which (H.M.T.S. *Monarch*) is the largest of its kind in the world. This vessel has been engaged on charter work and has operated as far away as the South Atlantic, laying and repairing undersea cables.

Voyages of this length entail a heavy consumption of fuel oil, and although the ship's bunkers are capable of storing 2,000 tons of oil, this quantity is insufficient for the round trip, say, to Brazil and back. It has become necessary, therefore, for the Post Office Contracts Department to arrange annual contracts with oil companies in this country who have world-wide distribution facilities, to provide fuel oil up to a total of approximately 8,500 tons, to be made available at 48 hours' notice at any port within or outside the United Kingdom.

★ ★ ★

Mr. F. J. Tickner.—We are sorry to lose the services of Mr. F. J. Tickner, Assistant Secretary in the Telecommunications Department, from the Editorial Board on his taking up the post of Director of Training and Education at the Treasury. Mr. Tickner has been with the Board since the inception of the Journal and his advice and help has been greatly appreciated. Our readers will join with us in wishing him every success in his new post.

LETTERS TO THE EDITOR *(continued from page 126)*

In conclusion, it seems clear that many of the fears about the effects of extended mechanisation are groundless. Why not, therefore, give the subscriber a chance? Automatic service is, in general, cheaper and quicker than manual service and the subscriber is much more willing to dial a number himself than is generally supposed. In return, the Administration would experience a substantial increase in the volume of traffic without a corresponding rise in operating costs. Service, in effect, is the outcome of mechanisation, not the alternative.

CALLING UP A THAMES RIVER TUG

(continued from page 123)

as the exchange name for the service, and should be readily remembered by operators and public alike.

Basis of Charging

Charges for effective calls are made up of two components:—

(*a*) a radio charge of 10d. per minute, with a minimum charge of 2 6 at any time of the day or night;

(*b*) a land-line charge, that is, the normal inland charge (appropriate to the time of connection) for a call from the inland subscriber to Dartford (Kent) Exchange, which is the measuring centre for calls in this service. This particular exchange was selected for charging purposes because of its central geographical location in relation to the shipping offices situated along the river.

Conclusion

It is clear that we have in this service, with its unique facilities, an infant of infinite capabilities, whose capacity for usefulness need not long remain entirely maritime. It only remains for the prototype stage to be satisfactorily surmounted by the firms concerned to permit the service to expand far beyond its present limitation.

Book Review

SHORT-WAVE RADIO AND THE IONOSPHERE: by T. W. Bennington; second edition; published March 30, 1950 at 10s. 6d. (postage 4d.) for "Wireless World" by Iliffe & Sons, Ltd.; 138 pages and 61 illustrations.

All who carry on radio communication over long distances by short waves—whether professionals or amateurs—must be interested in the role of the ionosphere. This book gives comprehensive information in simple form so that it is of use to those with only a limited technical knowledge. The author is a member of the Engineering Division of the British Broadcasting Corporation and has been able to draw freely on the Corporation's experiences in the development of short-wave overseas services. The author has kept the practical side of the subject in mind throughout and shews how existing ionospheric data can be applied to everyday problems of short-wave transmission and reception.

This new edition of the work first published six years ago (under the title *Radio Waves and the Ionosphere*) is an entirely new book.

Publication and Price. This Journal is published in November, February, May and August. Price 1/-. The annual postal subscription rate is 4 6 post free to any address at home or overseas.

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 4330. Remittances should be made payable to "The Postmaster General" and should be crossed "& Co."