BELL LABORATORIES RECORD

Pole test plot at Limon, Colorado, used by the Laboratories to study the relative values of various wood preservatives

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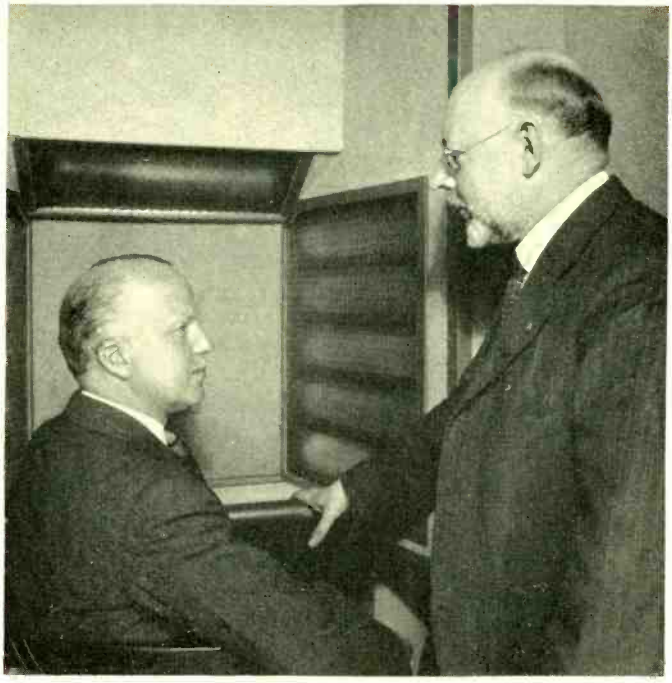


President Gifford, ready for his first television-telephone conversation, receives the technical details from Dr. Ives

ANOTHER step in the development of television was taken on April ninth, when a system was demonstrated which can supplement the usual two-way telephone, permitting the parties to a conversation to see as well as to hear each other.

Special telephone booths were installed at the north end of our Auditorium, and in a room adjacent to the Assembly Room at 195 Broadway. Forty-six representatives of the press, divided between the two places, had an opportunity to see and to converse with their associates. Two days later a similar demonstration was held for the general, technical, and popular magazines, which thirty-five representatives attended.

In the Laboratories' attack on television, this was the fourth advance to be marked by a public demonstration. In April, 1927, persons in Washington and at the Whippany laboratory were seen by individuals and by an audience at West Street, the transmission being by wire and by radio. In July, 1928, persons outdoors were viewed by a direct-scanning system. Television in color was exhibited in June, 1929.

Two-Way Television

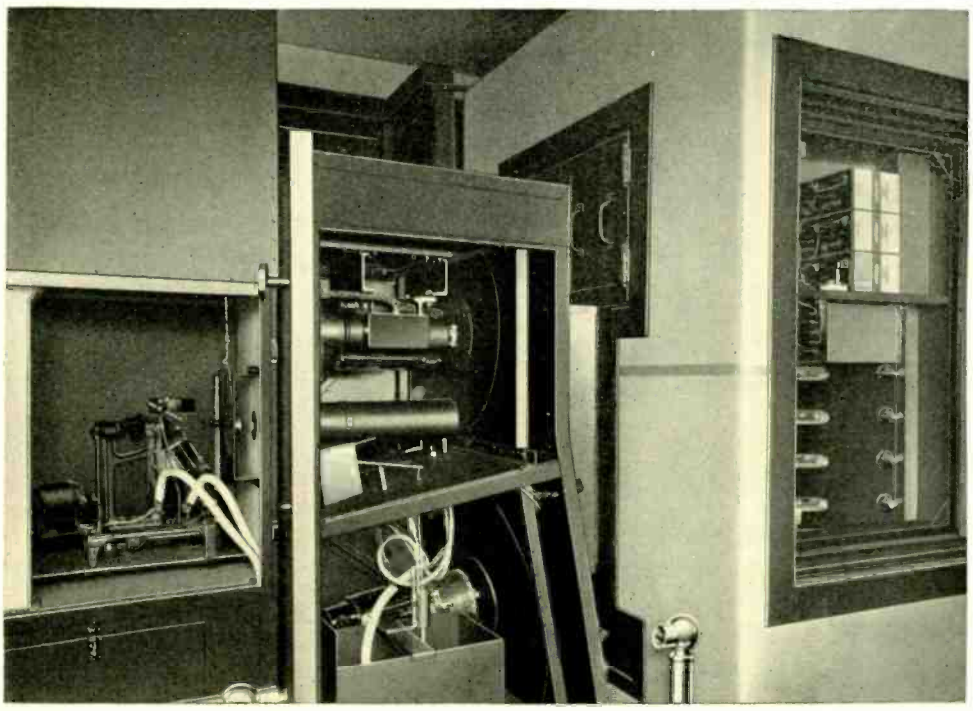
By HERBERT E. IVES
Electro-optical Research Director

EVER since the initial demonstration of television, both by wire and by radio at Bell Telephone Laboratories in 1927, experimental work has been steadily pursued in order to learn the problems and the possibilities of this newest branch of electrical communication. The latest development to be demonstrated is that of two-way television as an adjunct to the telephone. As a result of this development work, there is now set up an experimental and demonstration system between these Laboratories and the headquarters building of the American Telephone and Telegraph Company at 195 Broadway, two miles away. This system makes it possible to experiment with a method of communication in which the parties engaged not only speak with each other but at the same time see each other. Study of this system will serve to give information on the importance of the addition of sight to sound in communication and will give valuable experience in handling the technical problems involved.

In principle the two-way television system consists of two complete systems of the same sort as those used for one-way transmission in the demonstration from Washington to New York City in 1927. In place of a scanning disc and set of photoelectric cells at one end for generating the television signals and a single disc and neon lamp at the receiving end for viewing the image, there are in the two-way system, two discs at each end and a bank of photoelectric cells and a neon lamp at each end. One of the discs, which in the system as constructed, is of 21 inch diameter, serves to direct the scanning beam from an arc lamp onto the face of one of the parties to the conversation. Three banks of photoelectric cells, making 12 in all, are arranged at either side and above the person's face and serve to pick up the reflected light and generate the television signals. The second disc, which is 30 inches in diameter, is placed below the sending disc and exposes through its holes the neon lamp, which the observer sees through a magnifying lens in a position slightly below that of the scanning beam. This neon lamp is, of course, actuated by the signals coming in from the distant end of the system, where there is a similar arrangement of two discs, photoelectric cells, and neon lamp.

The two parties to the conversation take their places in sound-proof and light-proof booths where, sitting in front of the photoelectric cells, they look at the image of the person at the other end at the same time that the scanning beam plays over their faces. A problem of illumination is immediately encountered in that the scanning beam is of necessity intensely bright and tends to dazzle the eyes to the extent that the somewhat faint neon lamp image is hard to see. This difficulty is met by using light for scanning to which the photoelectric cells

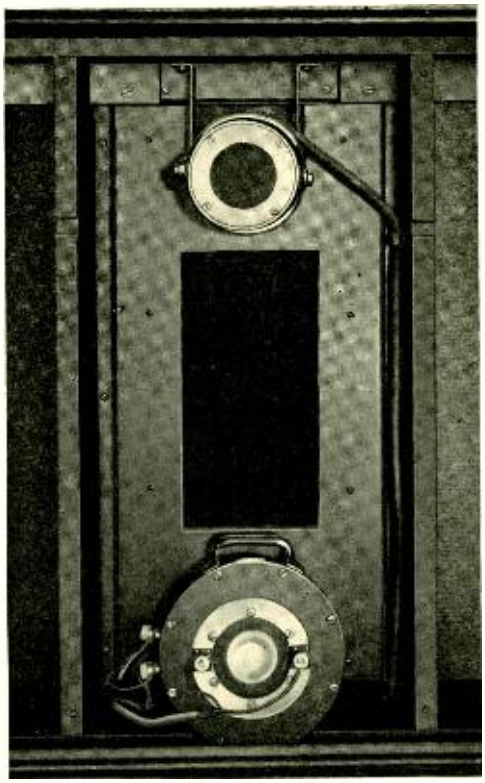
Above, reception room at 195 *Broadway with door to the television booth open. Below, side view of opened television cabinets showing photoelectric cells at the right, motor and scanning disk in the center, and the arc light at the left*



are extremely sensitive, but to which the human eye is relatively insensitive, that is blue light. By interposing a filter in the path of the scanning beam, the spot of light in the lens which projects it is seen as a blue disc of light not bright enough to interfere with clear vision of the neon lamp which provides the image of the person at the distant end.

In our original demonstration of one-way television referred to, scanning discs were used which had fifty holes arranged in a spiral. With this number of holes, it is possible to secure a definitely recognizable representation of the human face. It was decided, however, that for the two-way system a degree of definition should be provided such that faces were rendered in an entirely recognizable and satisfactory manner. Accordingly the number of scanning holes has been increased to seventy-two, which provides just twice the number of image elements. The transmission band is, of course, doubled by this change, requiring wire connections of considerably higher quality than heretofore. When a seventy-two hole scanning disc is used the component frequencies of the image signal encompass a range of from 10 cycles to 40,000 cycles per second whereas intelligible speech may be reproduced by a signal wave whose component frequencies cover a range of 2500 cycles per second. This comparison indicates roughly how much more difficult it is to transmit high quality television images than it is to transmit ordinary speech. In general the electrical features of the new apparatus are similar to those of the apparatus previously used, although in the interval improvements and refinements have meen made in many directions.

Light reflected into the photoelectric cells gives rise to an alternating electric current whose effective value is of the order of a ten-thousand-millionth ampere. The neon glow lamp on which the image is received at the



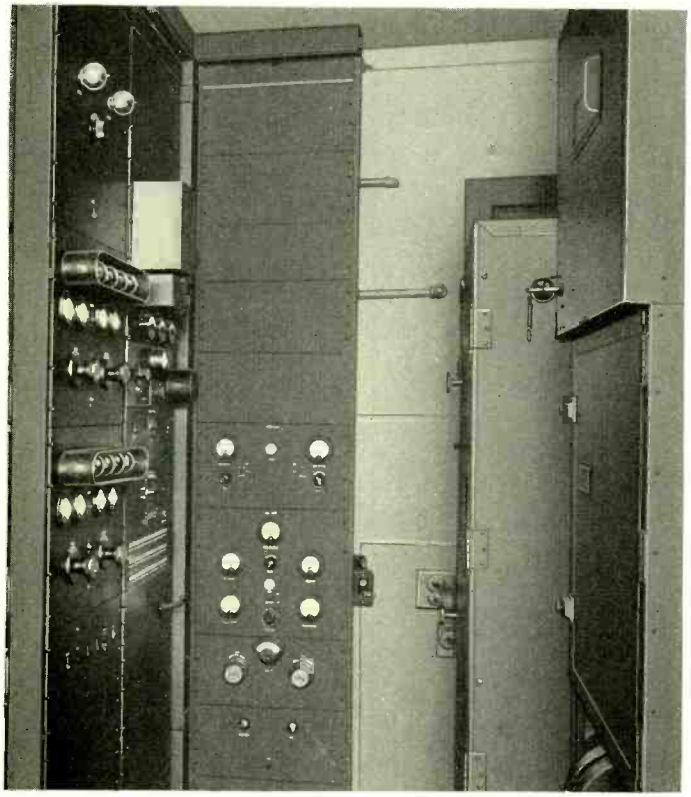
Microphone and loud speaker, which are ordinarily concealed

distant station reproduces the image satisfactorily when the effective value of the alternating current is of the order of one-tenth ampere. This thousand millionfold increase in current variation, considerably greater than that required for the earlier one-way system, is effected by means of amplifiers in which the vacuum tubes are coupled by condensers and resistances. The tubes, which operate at low energy levels, are shielded to protect against electrical, me-

chanical, and acoustical interference.

For the transmission of images between 463 West Street and 195 Broadway, the appropriate stages of the amplifier system are coupled, by special transformers, to telephone cable circuits equipped with special distortion correcting networks which are capable of transmitting the extremely complex current variations without distortion. The amounts of distortion inherent in other parts of the system are either kept small by design or annulled by means of correcting networks.

An indispensable part of a television system is the means for holding several scanning discs accurately at the same speed. For the two-way television system, a simplified and improved synchronizing arrangement is used. The discs at the receiving and transmitting ends, which rotate at a speed of 18 revolutions per second, are synchronized by means of a vacuum tube oscillator located at one end of the line and delivering a frequency of 1275 cycles per second at a low power level. This frequency is transmitted over a separate pair of wires. At the receiving end this frequency, through vacuum tube means, controls the field strength of the motor and thereby holds its speed exactly proportional to the frequency. In the same way, the speed of the motor at the transmitting end is controlled by a similar vacuum tube circuit so that its speed is also proportional to the frequency of the same oscillator, and thus the motors driving the scanning discs at both ends of the line are held in synchronism. By using a frequency of 1275 cycles per second, the degree of synchronization is held within sufficiently close limits to keep the picture at the receiving end central within its frame within a small fraction of the picture width. Novel features of this synchronizing system are the use of mechanically damping couplings between the discs and the motor shafts to improve the steadiness of the im-



Control for the television-telephone apparatus is mounted on three panels. At the left is the bay controlling the synchronous motors, next to it is the speech and line control, and at the back the picture amplifier panels

age, and of electrical phase shifters for framing the images.

The acoustic portion of the two-way television system is unusual in that it permits simultaneous two-way conversation without requiring either person to make any apparent use of telephone instruments. It is obviously desirable to arrange the acoustic system in this way because the ordinary telephone instrument conceals part of the face and would thus prevent the system from approximating to the conditions of ordinary face to face conversation. The elimination of telephone instruments is accomplished by the use of a microphone sensitive to remote sounds and a loud speaker concealed near the television image at each station. The microphone at one station is connected through suitable vacuum tube amplifiers and a telephone circuit to the loud speaker at the other station. This permits conversation in one direction while a similar connection between the other microphone and loud speaker permits conversation in the other direction. The persons using the system then communicate as if face to face and with no telephone system apparently involved.

In order that the transmitted sounds be familiar and natural, distortion in the sound transmission system has been reduced to a minimum. The microphones are of the condenser type used extensively in radio broadcasting and sound picture recording. Being of small size, they are readily concealed near the television image in the most advantageous position for picking up the voice. The loud speaker, also of small size but capable of reproducing a broad frequency range, is likewise concealed near the television image, so that the sounds produced appear to emanate from the image itself. It is of the moving coil type with a small piston diaphragm.

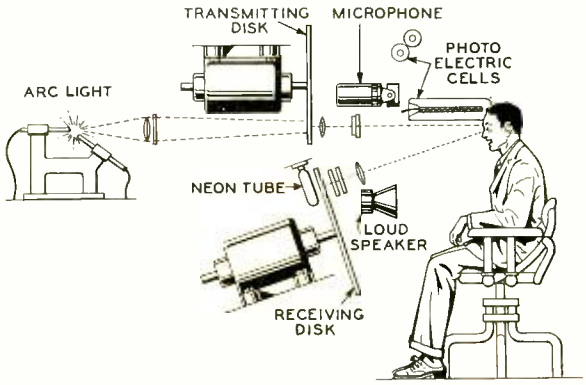


Diagram of television apparatus

In any system such as that described, the microphone is not capable of distinguishing between the sounds from the local speaker or from a speaker at the remote end of the circuit reproduced locally by the local loud speaker. If the sounds from the local loud speaker should be impressed upon the local microphone in sufficient magnitude, "singing" would result, and the system be no longer operable. To prevent this the microphone and the loud speaker are installed in carefully chosen positions and the inner surfaces of the soundproof booths are specially treated to prevent as much as possible the reflection of sounds from the walls into the microphone. Under these conditions, the attenuation of sounds undergoing transmission is of about the same magnitude as would be experienced if the listener were say 10 or 12 feet away but in the same room. This acoustic illusion of distance is in

harmony with the visual appearance of the television image.

In addition to the television synchronizing and acoustic circuits, others are provided for signalling and monitoring purposes. Matters are so arranged that an operator can see both the outgoing and incoming images, and by means of movable lens and prism systems can insure that the scanning beam is properly directed to correspond to the height of the observer and that the magnifying lens in front of the receiving disc directs the image to the observer's eyes.

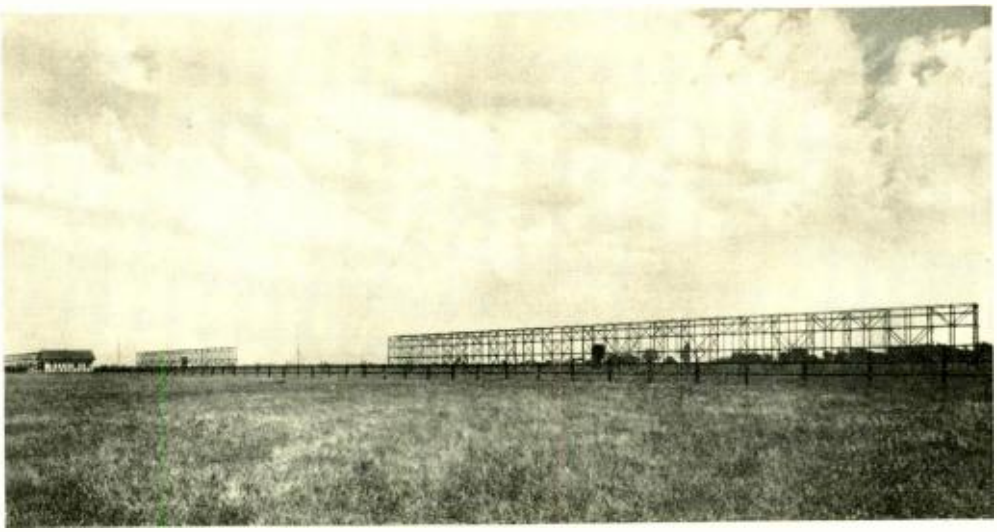
Operating arrangements are made so that the two parties to the conversation, after taking their positions in the booths, do not see or hear each other until adjustments are made, whereupon the operators expose the images and connect the talking circuits simultaneously. The experimental service is arranged on an appointment basis. The two parties to the conversation, having arranged with attendants at the two stations for their time, proceed to the respective booths, where they are ushered into chairs in position before the photoelectric cells and instructed as to the operation of the system. Immediately the attendant closes the booth door; the operators make the necessary adjustments; and the simultaneous sight and sound communication is carried on until, the parties leaving their chairs, the connections are interrupted.

Through the Looking-Glass

"We saw two examples of television, radio and telephone, in the last two days. We watched people wincing as they stepped up before a large camera to be televisioned. They winced as two powerful lights at their right and left hands were flashed in their faces, while the eye of the camera picked up their winces. This phase of television is now on a commercial basis.

"Yesterday we saw a much more highly developed form of television demonstrated by the Bell Telephone Laboratories. It was two-way television. We sat in a booth at No. 195 Broadway and conversed with Barbara Butler, a Daily Mirror reporter, who was in a booth at the Bell Laboratories, Washington and Bethune Streets. Each was visible to the other, there being no telephone mouthpiece to mar the image. The speech was very clear. An inoffensive blue light was shot across the face of the speaker from the camera's eye and picked up by other batteries around the booth. And yet this marvelous invention is still in the laboratory stage, according to the Bell engineers."

—*The Daily Mirror, April* 10, 1930.



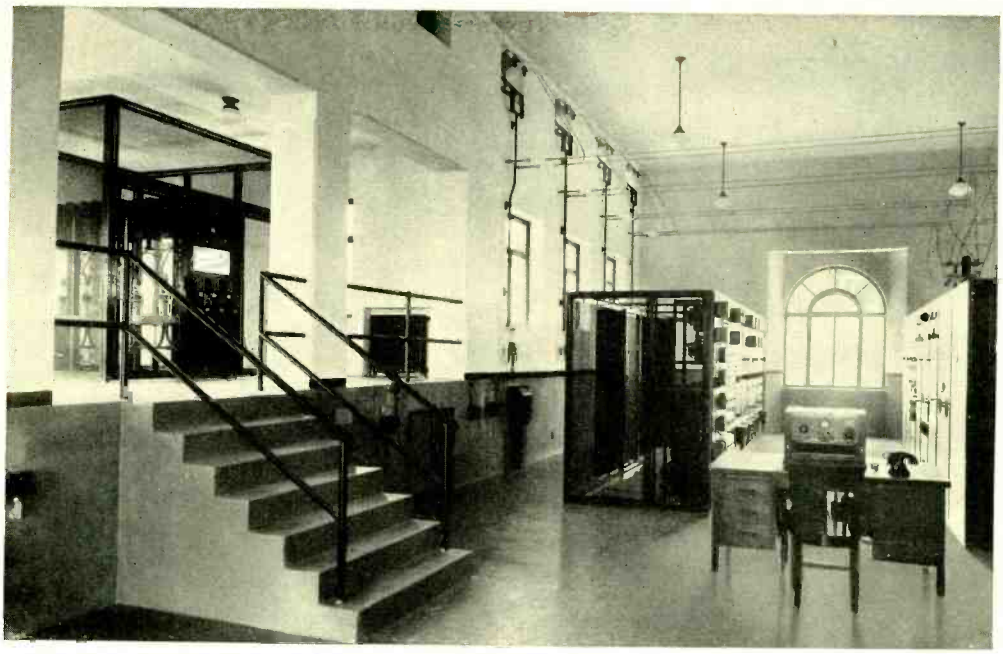
Radio Engineering in Buenos Aires

By E. J. HOWARD
Radio Research

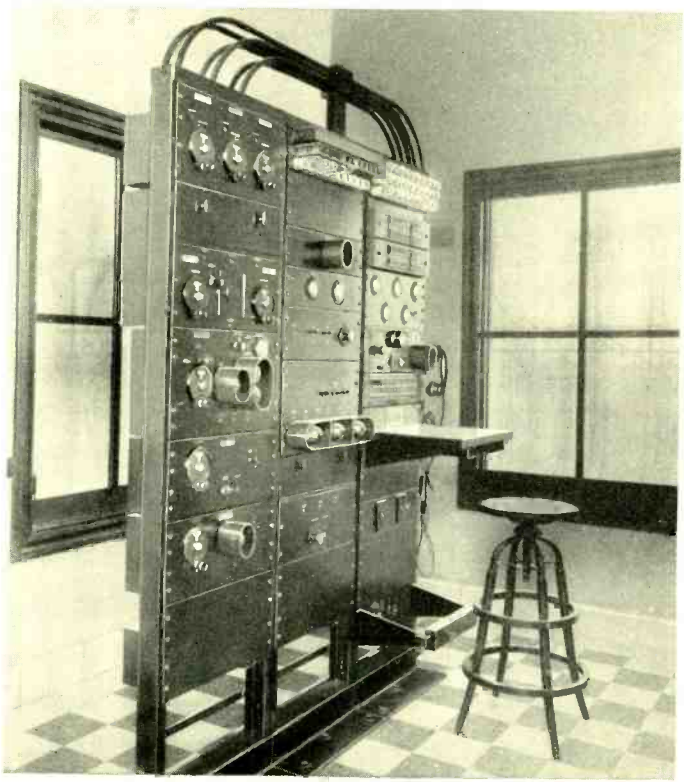
EDITOR'S NOTE: To establish telephone communication between the United States and South America, the International Telephone and Telegraph Company lately arranged with the American Telephone and Telegraph Company to purchase Western Electric transmitting, receiving and line-terminal equipment for use in Buenos Aires. Western Electric called upon these Laboratories to provide short-wave equipment of the type then under development and since installed for the American Company's transatlantic telephone system. For apparatus to communicate with South America, the American Company provided facilities at Lawrenceville and Netcong. The Laboratories despatched E. J. Howard, of the Radio Research group, to Buenos Aires to make field strength surveys of transmission over the north-south path, on signals from Deal. When the final apparatus for the Argentine end, entirely similar to that at Lawrenceville and Netcong, was completed for the International Company in our shops, it was shipped from West Street to Buenos Aires, where Mr. Howard, C. F. P. Rose and G. Eberhardt of the Radio Research Department, and H. M. Pruden and J. E. Cassidy of the Systems Development Department, supervised its installation and test. On April 3, 1930, the system was formally opened for public use, with ceremonies in which high officials of both nations participated.

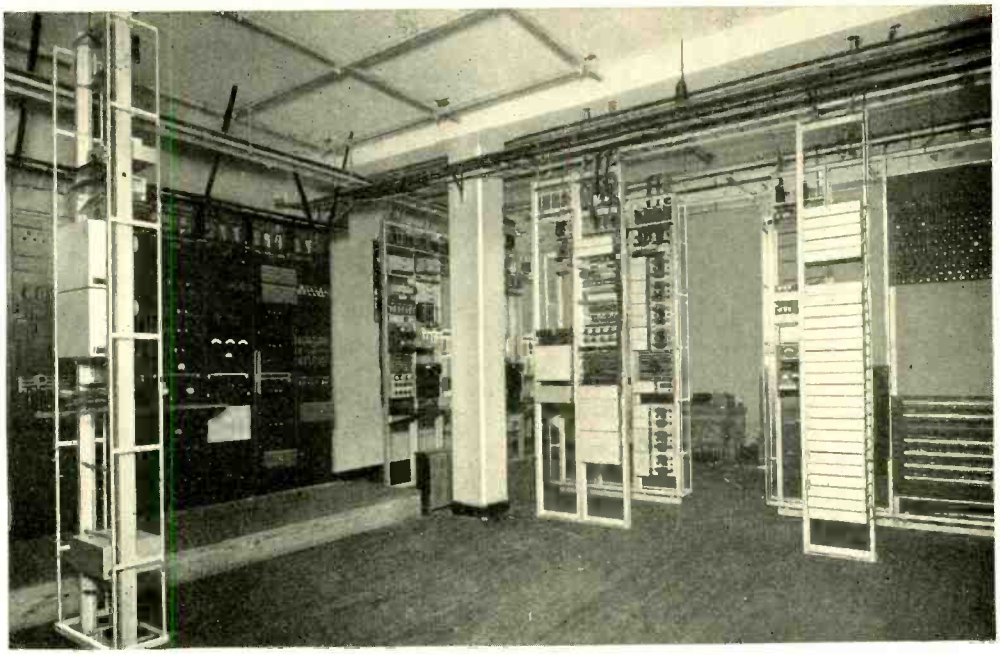
* * * *

TO the average traveller en route from the United States to South America the picturesque mountainous harbor of Rio de Janeiro creates an indelible impression accentuated by almost two weeks' vista of nothing but sky and water. A strange contrast presents itself several days later on arrival at the city of Buenos Aires, a



The layout of the transmitting room at Hurlingham, above, closely resembles that at Lawrenceville. The South American radio receiver, below, is indistinguishable from those at Netcong



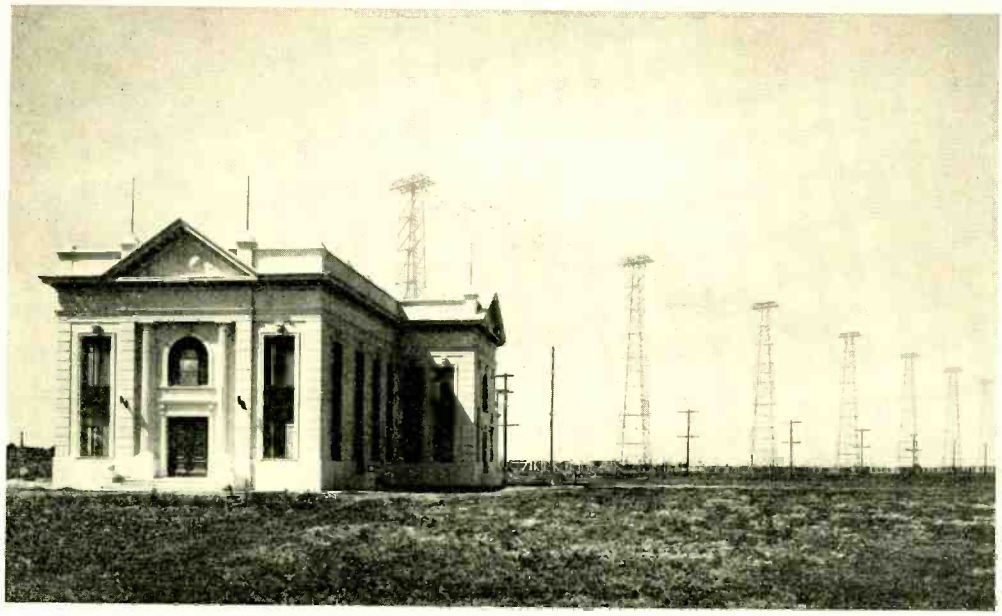


Line-terminal equipment in the control office in Buenos Aires corresponds with that at Walker Street

night's journey up the broad mouth of the Rio de la Plata. The Argentine capital, with two-and-a-half million people, is the gateway to a vast level country distinctly agricultural and devoted to cattle raising. For hundreds of miles about the city extend these alluvial plains built up of alternate layers of silt and sand, richly fertile, and in which not even stones the size of a pebble are to be found. What an ideal place for picking sites for short-wave radio stations it seemed to those of us who arrived in September, 1928!

The disillusionment was swift, for the difficulties grew rapidly. Land in suitable locations is owned in very large tracts and is considered both a safe investment and a possession to be proud of. As far from Buenos Aires as the American short-wave stations are from New York, land was found to cost almost as much, and in some cases more, than nearer the city; and even there prices were several times those expected. Trains run once or twice a day requiring two to three hours. The problem of power supply limited the potential transmitting sites to a small area within which, at Hurlingham, the final plot was located. Obtaining the transmitting site (in January, 1929) further limited the possible locations of land for the receiving station.

In the meantime transmission tests were in progress between New York and Moreno, a small town to the west of Buenos Aires not far from the transmitting site, on a small plot of leased land three kilometers outside the town. Electric power was available in the town but storage batteries had to be charged in Buenos Aires. The roads in the winter were such that after a hard day's rain not a single automobile would be seen although one or two ambitious drivers



The radio-transmitter building at Hurlingham, and the antenna towers for transmission to New York

had also a horse and coach. After dark one always had to walk. Land is fertile here and too expensive for a receiving site.

It began to seem certain that the best location for the receiver, free of interference, would be to the east of Buenos Aires facing the Rio de la Plata. Even this was somewhat doubtful because of the chance of interference from the harmonics of ships passing to Buenos Aires.

In March negotiations were fairly well along for a plot at Platanos, an area of about eighteen hundred acres extending from the railroad to the river bank. It is a level stretch traversed by a few small streams and very similar to the Jersey meadows in appearance. A small house was quickly procured and a field-strength measuring set installed. Comparison tests run between Platanos and the old site at Moreno showed very little difference between the two places. An average of twenty to thirty boats under quarantine, riding at anchor in the channel, caused consternation for a time. But the few harmonics heard from them were not serious, and the quarantine was soon lifted.

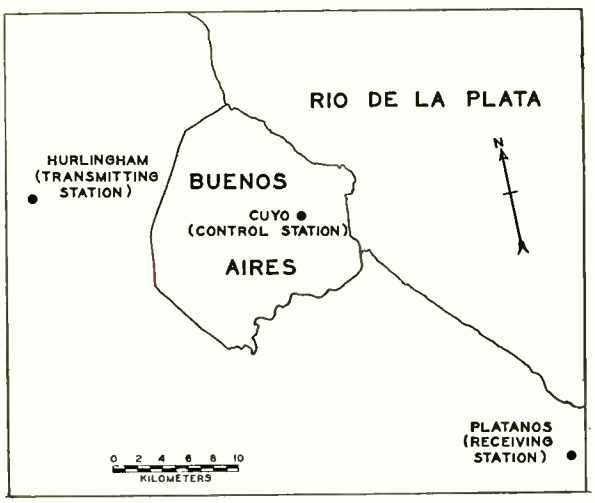
The difficult task of acquiring land accomplished, it was supposed that construction would move rapidly for transmitting and receiving sites were each only about fifteen miles from the city. But many new difficulties were promptly encountered, of which perhaps the greatest, especially at Platanos, was transportation. Construction was begun here in the Spring when the fields between the entrance and the site were a sea of mud. Similarly the roads for several miles around Platanos were impassible except by carts with seven-foot wheels drawn by five to seven horses. Much of the lost time was made up during the construction period by the unstinting cooperation of all the companies and personnel involved, but despite overtime and cancellation of

all holidays, the speed of the work could not come up to expectations.

Installation and testing finally settled down to a normal routine with troubles, "bugs to chase," and all the kinds of overtime characteristic of such jobs. A serious handicap lay in language difficulties; South American workmen are accustomed to working under direct instructions from the engineer, rather than from drawings. Differences between working conditions and customs also began to appear. The Latin temperament, while more excitable, is more likely to question the validity of American bustle and speed. "Mañana" is not just tomorrow but an indefinite future. Holidays are more numerous and are usually observed more seriously than in the United States.

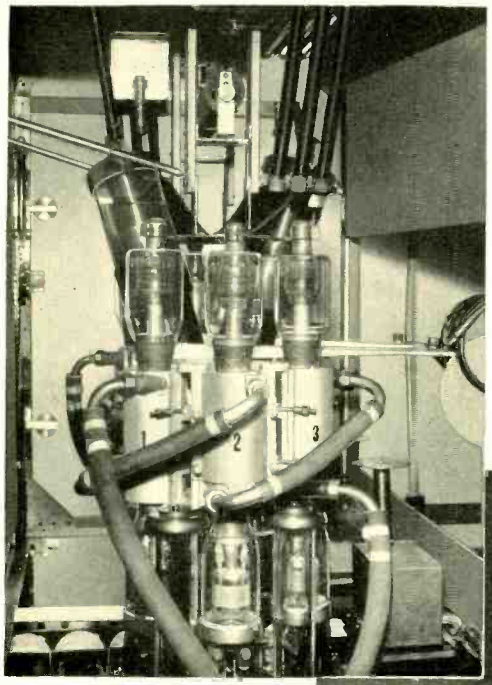
Some of the radio buildings exemplify the most striking feature of Buenos Aires: its architecture, whose European character gives it, by association, the appearance of age. Even in the fine modern buildings the type of construction remains the same. Only the larger, poorer grade bricks are used; and they are faced, often so well as to resemble stone. Consequently the walls are thick, keeping the interior cool in summer and lending an appearance of massiveness. This is particularly noticeable in the older churches and in government buildings. Palm trees in the Plazas indicate a mild climate; but it is not so mild as to warrant the scarcity of good heating systems. School buildings, not plentiful, have often past histories as dwellings or public buildings. In dwellings privacy is secured by metal-shuttered windows and high walls, and patios and gardens are invariably in the rear, in distinct contrast to the American practice.

It seems strange to see in public so large a number of men as compared to women; and the percentage increases greatly after nightfall. Along some of the main streets the cafés, with tables on the sidewalk under large awnings, where people may take refreshment (often black coffee), lend a further Continental charm. There is an air of relaxation, of divorce from nervous excitement and worry. Since there is little manufacturing, and the customs are a major source of government income, only meat and produce are cheap.



Location of Argentine radio-telephone stations

In the city the large number of establishments displaying all types and makes of firearms is amazing; and the purchaser is not questioned. It is not strange, then, to see many armed men in the country, and even in the suburbs. But the favorite weapon of the Argentine cowboy, and ordinary laborer, is the knife, whose sheath is stuck in a sash worn in place of a belt.



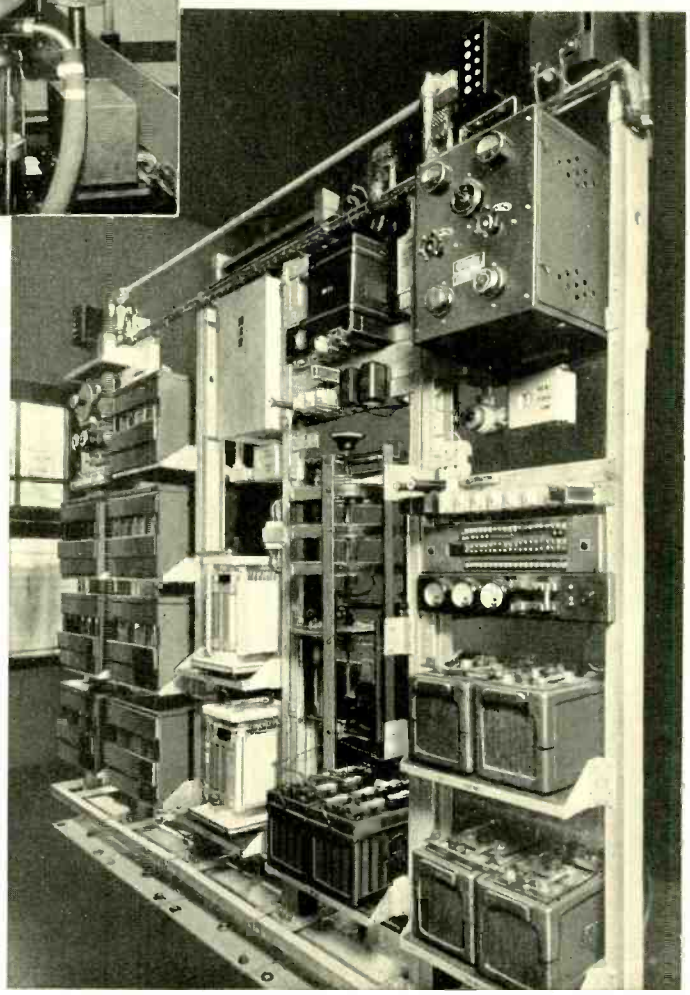
In the radio transmitters at Lawrenceville and Hurlingham, the final stage of radio amplification is now accomplished by six double-ended water-cooled vacuum tubes instead of by two

violent sabotage. Taxicabs are privately owned, yet the chauffeurs are sufficiently organized to go occasionally on a "protest" or sympathy strike.

Obtaining technical assistants was a truly difficult task; the many public service concessions which call for a majority of Argentine personnel absorb the native engineers. Doubly exacting was the desirability, during the construction and test periods, that the assistants speak or at least understand English well.

With the handle of his knife appearing just above the belt in the back, a man may yet present a peaceful front; and indeed his knife is a tool of many peaceful purposes.

Since there is much immigration and a substantial surplus of labor, labor is cheap. Despite this, many unions are strong, often strong enough to win their points, and quite vindictive, resorting to



In the receiving station at Platanos is 24-volt and 130-volt power equipment like that at Netcong

The transmitting station is about three miles from the suburban town of Hurlingham, inhabited in most part by English people who commute to Buenos Aires, on a railroad with good facilities. The construction of homes is similar to that in the city, but the architecture resembles more nearly the English country house with peaked roof than the flat tiled type more common in the south. Here, too, windows are well shuttered so that the interior stays cool and dark and free of flies. Of course there are no hotel nor restaurant facilities, and supplies are furnished by a single general store. Dairy and farm products are delivered by nearby farmers. In the town there is a fine, select club, excellently maintained by the many well-to-do inhabitants.

By way of contrast, Platanos was owned, except for a few small plots with rude shacks, by two or three landowners. On the receiving site itself grazed several hundred head of cattle and horses. There were no living accommodations, nor were supplies obtainable until excellently provided by the Company on the property. For a country so free of hills the poverty of roads seems peculiar until one realizes there is no stone within hundreds of miles. Nevertheless there are plenty of horses and nearly everyone can ride.

In general there is little rainfall but thunderstorms are often accompanied by sudden and violent winds which gather great velocity because unimpeded. Fortunately the storms pass over quickly, inconveniencing the radio circuit only a short time.

The spirit of friendship between North and South America, which a growing interchange of commerce is promoting, should be greatly strengthened by the closer contact afforded by the New York-Buenos Aires telephone link.

Subscriber's Line Finder and District Selector

By A. J. BUSCH
Local Central-Office Development

A SUBSCRIBER'S line finder and its associated district selector in the dial system of the panel type are, in function, substantially the same as the answering and calling cords of the "A" operator of the manual system. Both serve to find the calling subscriber's line, and to extend the telephone connection toward the called destination.

Although the arrangement of the manual system has its counterpart in the panel system, the equipment for the two systems is radically different in appearance. In the manual system, the subscriber's lines and the trunks to other offices appear as jacks in the switchboard in front of the operators. Each jack is accessible to a number of cords, which are equipped with plugs and used to establish connections between the calling subscriber's line and the proper trunk. In the panel system the lines and trunks terminate in multiple sets of small metal lugs or terminals which form a unit commonly referred to as the "multiple bank".

A subscribers' line-finder frame (Figure 1) has ten multiple banks. Each bank has a capacity of forty lines so that the complete frame accommodates a group of 400 lines. As the banks are double faced, the multiple terminals projecting on both sides, the line terminals may be seized on either side of the frame. Each line, therefore, may be selected by any one of a number of idle line finders which are waiting for a subscriber of the associated line group to originate a call. This mechanical arrangement compares to the operator, of the manual system, prepared to serve a calling subscriber by inserting the plug of an idle answering cord into the associated jack of the calling line as soon as the line lamp lights.

When a subscriber of the panel dial system originates a call by removing the telephone receiver from the switchhook, the line relay at the central office operates. This operation changes the electrical polarity of one of the associated line terminals of the multiple bank in which the calling line is located and also gives a signal to an idle line finder that a call is originated. In the manual system this action is duplicated by the lighting of the line lamp and the perception of the signal by the operator.

The signal to the line finder is received through the line, trip, start and link circuits which are indicated in Figure 2. Each line finder elevator is equipped with ten multiple brushes used for connecting to any of the multiple circuits on the frame. As the elevator starts upward to find the calling line, the trip circuit functions in accordance with the line relay signal and causes the proper brush to be tripped for hunting in the particular multiple bank that contains the calling line. The line finder then proceeds to hunt, and when it reaches the terminals of the calling line, which

it recognizes by the polarity of one of the terminals, it stops its upward travel and seizes the line.

At the same time, a pre-assigned link circuit selects an idle sender and prepares the connection from the sender to the line finder. The sender* then transmits the familiar dial tone to the calling subscriber, which signifies that it is ready for service and that the calling subscriber should start dialing. This corresponds to the "Number, please" of the manual operator.

After the sender has received the necessary dialed information, it directs the district selector associated with the line finder to make the proper connection toward the called destination and thus simulates the action of the manual operator in connecting the calling cord to the proper trunk jack upon receiving the called number.

A line finder frame has a capacity of thirty line finder elevators per side, or sixty per frame. Since the traffic for a line group may require more or less than the service of sixty line finders, split banks are used; available multiple arrangements of the frames provide a choice of either 28, 40, 60 or 80 elevators per line group. Each of these groups of line finders is divided into two sub-groups, distinguished as "A" and "B", and each sub-group normally serves half the total lines on the frame. In addition, the lines in each bank are transposed so that the first twenty lines of each bank are accessible as the first choice to the sub-group "A" line finders and the last twenty are first choice to the sub-group "B" line finders. Normally, therefore, it is necessary for a line finder to hunt for the calling line only in the lower half of the bank, which materially reduces the average time of hunting. A feature is provided which automatically causes sub-group

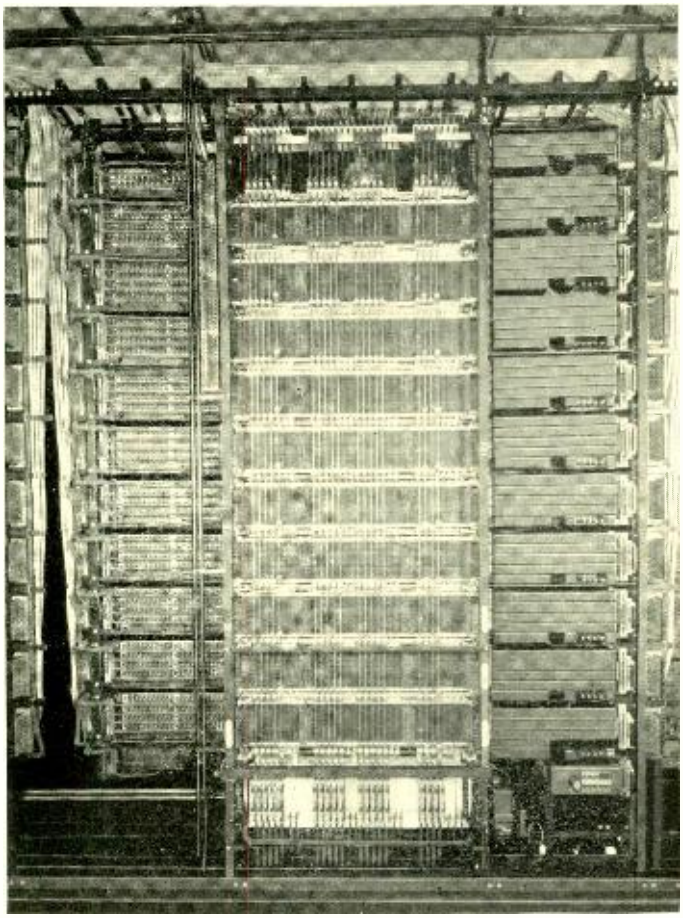


Fig. 1—Line finder elevators have access to four hundred subscribers' lines arranged in ten banks of forty lines each

* Bell Laboratories Record, *Vol. III, No. 3, pp. 78-81, November, 1926.*

"A" lines to be served by sub-group "B" line finders or vice versa when either sub-group of line finders becomes busy or a trouble condition develops. Under these conditions, however, the line finder elevator hunts in the upper half of the bank.

Each line finder elevator is directly associated with an individual district elevator located on a district frame as shown in Figure 3. Each district frame has five double faced multiple banks and accommodates thirty district elevators per side. To provide for different traffic conditions the 100 trunks of each multiple bank are divided into eight groups of eleven, and two groups of six trunks. The top terminals of each group are reserved as "overflow" terminals, and are seized only when all of the trunks in the group are busy. If the outgoing traffic of a trunk group is sufficiently heavy to require a greater number of trunks than is available in a single group, the overflow terminal of the chosen group is provided with a busy condition so that the district elevator will continue automatically to hunt in the next group. By this provision, the district multiple of any bank may be assigned in any desired combination, thus making available for an entire district frame a maximum choice of forty groups of ten and ten groups of five trunks, and a minimum choice of five groups of ninety trunks.

The district elevator rod is equipped with five multiple brushes, one assigned to each bank on the frame. In addition to selecting the proper brush to trip, the sender must also select the proper group. Within the group, the district selector hunts for and seizes the first idle trunk.

The district selector also provides transmission battery to the calling subscriber when required, furnishes the "overflow" tone signal to the calling subscriber when all of the trunks in the trunk group are busy, automatically charges for the call where message rate service is provided, and controls the release of the established connection at the termination of the call. To perform these varied functions the district employs control apparatus such as relays, interruptors, and sequence switches.

As one follows through the operation of the district and line finder with its associated link and sender, the

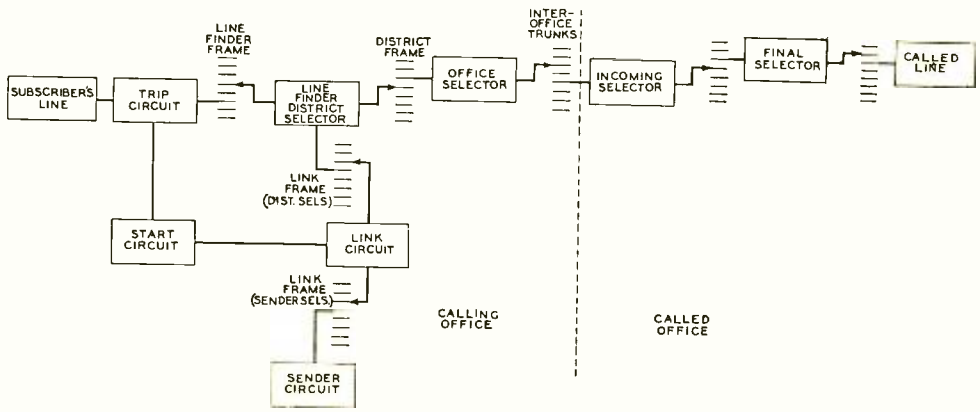


Fig. 2—The principal steps in the completion of a panel call are here graphically shown

parallelism with the manual operator is apparent. The district and line finder are the operator's hands and cord circuit, the link is the nerve system to the brain, and the sender is the brain itself which receives information as to the line that is wanted and sends back over the link nerve-system directions to enable the district to make connection to the proper trunk.

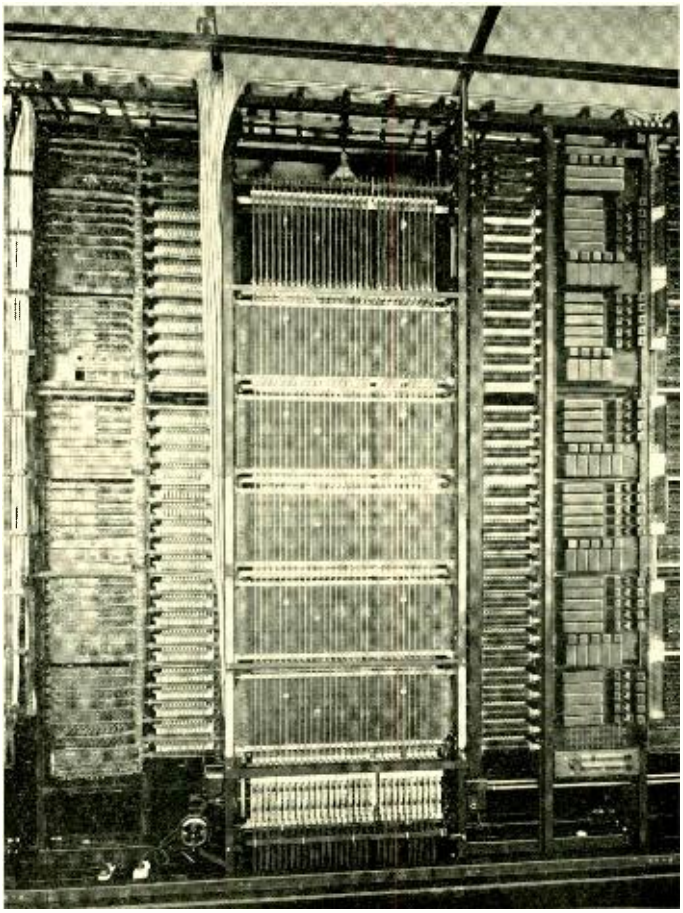


Fig. 3—District selector frames include five banks each of one hundred sets of terminals. At the right are the sequence switches that control the various stages of the call

A Dial PBX For Large Residences

By JAMES G. FERGUSON
Equipment Development

. . . "and I want telephones here and here and here," a recent Telephone Company advertisement pictures a woman saying as she plans her new home. The advertisement calls attention to the fact that many families who were satisfied with a single telephone not so long ago, now realize the advantages of having several.

Even more evident is a growing appreciation of adequate telephone service for very large residences and country estates, where local service between the rooms is almost as useful as central-office service. To supply the telephone needs of such residences at any hour of the day without a special attendant, a new dial private branch exchange has been produced.

On calls from a central office, the butler or one of the other servants commonly answers at a small cabinet in one of the service rooms, and in one of the living rooms another cabinet may be provided at which a member of the family may answer when desired. Local and outgoing calls require no attention, so that the total addition to the servant's duties is slight. The only evidence of the switchboard in a room where incoming calls are answered is a handset and a small cabinet, in appearance a good-looking piece of furniture suitable for installation in any part of the house.

This new PBX is the third of a series, alike in general design but intended for different fields of use. Each of the three comprising a cabinet for answering incoming calls, a power plant, and the necessary switch and relay equipment, serves less than 100 lines. Since the incoming calls are routed from the cabinet to the desired extension by dialing, there is no manual switchboard at which all the extension lines would otherwise appear, after the fashion of larger dial PBX's. In addition, the arrangement for handling incoming calls permits high efficiency on the part of the attendant in combining other duties with the work of answering calls.

The first of the series to be produced was the 740-A PBX, which provides for a maximum of 88 station lines and is intended primarily for business establishments.* Further simplification and economy mark the 740-B which, also mainly for business use, is a smaller form with as many as 38 lines and 10 trunks. These give the same grade of service, and use the same attendant's cabinet. On account of the smaller number of stations, the 740-B is marked by simplified construction, which has been carried over to the new residence switchboard. The most substantial of these savings has been in the terminal banks for the switches and the corresponding wiring; one bank of terminals, instead of two, is adequate for each switch.

The new PBX system, 740-C, resembles the 740-B in many respects,

* BELL LABORATORIES RECORD, *August*, 1928, *pp.* 399-402.

and also provides for 38 extension lines. Since it is intended for residence use, requirements are different. The traffic is normally much less than in a comparable business installation, and on that account fewer switches and central-office trunks are sufficient. In other respects, however, demands are more exacting. The cabinet must match rooms decorated according to a carefully chosen plan, rather than the somewhat plain and undistinguished furnishings common in business establishments.

The attendant's circuit and the central-office trunk circuits have been so arranged that there cannot be a talking connection between the outside line and the extension unless the attendant's telephone is disconnected. After dialing one of the extensions to complete an incoming call, the attendant can talk to the person calling or to the person who answers at the extension or to both of them alternately, but cannot talk to them at the same time.

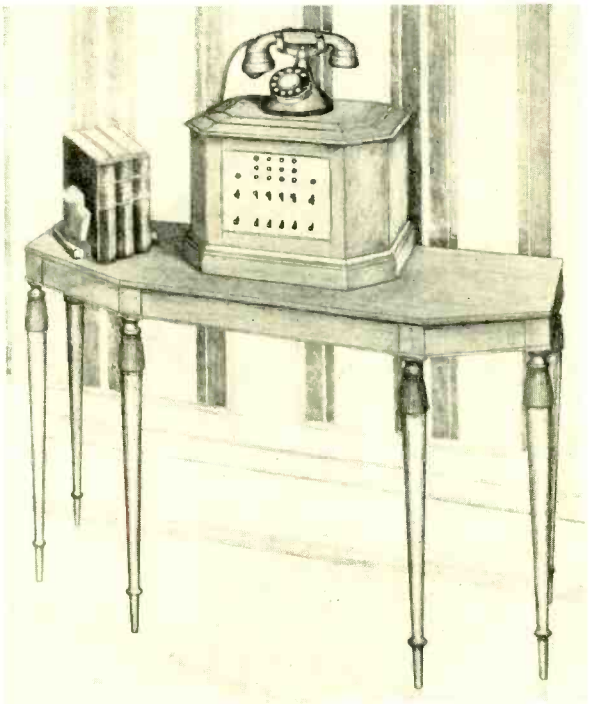


Fig. 1—The small attendant's cabinet, pleasing in appearance, may be placed where convenient

In most large residences it will be desirable to have two attendant's cabinets in different rooms. One of these will be located in the butler's pantry or one of the other service rooms, to be answered by a servant on duty. All calls can be answered there except when its "Switchboard Service" key is operated to transfer control to the second cabinet. This will usually be placed in the lobby, the reception room, the library, the principal bedroom, or some other location convenient for members of the family, but both cabinets may be located in the servant's quarters if such is preferred.

To design a cabinet which would fit into the decorative scheme of any room in which it might be placed, presented quite a problem. A distinctive design of any period or type would of course be unsatisfactory, since it would not harmonize with furnishings of other periods. A mahogany cabinet after Chippendale, for instance, would not be tolerated in an Italian room finished in walnut. Instead of a cabinet for each period, a single cabinet of universal application has been designed. In use it will be mounted on a table, as in Figure 1.

As a basis for the design of the exterior, a survey was made of present trends in furniture. Investigation showed that almost all good furniture is now being made of walnut or ma-

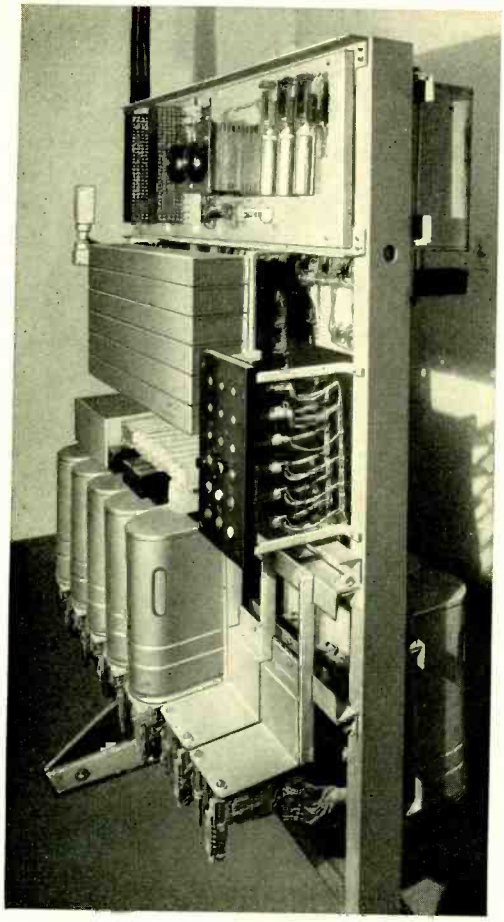


Fig. 2—All the switching equipment is located in a metal cabinet (not shown in photograph) where it is protected yet readily accessible for inspection

hogany, and that appreciable demand for any other wood is at present unlikely. The cabinet is therefore being made of each of these woods. An examination of many pieces of period furniture, originals and reproductions, revealed that finishes vary greatly, but that for each wood it was possible to choose a single finish which would harmonize with almost any setting.

For mahogany, light brown is at present the most popular color, but there is a considerable demand for dark brown as well, and there are indications that dark red may be revived. One very attractive finish shows stripes of light brown and dark reddish brown, so blended that it will harmonize with any of the three finishes most in demand; this treatment was chosen for the mahogany cabinet. Of the walnut finishes, antique walnut is by far the most popular. Since it also harmonizes with the light and dark browns of the single-tone finishes, it was selected for the walnut cabinet. A rich antique walnut finish which was used on an original Queen Anne sideboard has been faithfully reproduced in the new finish. It is particularly striking because of the natural blending of the irregular dark edges into light-colored areas.

Manufacture and installation have been simplified, and at the same time provision has been made for cases where a specially designed cabinet is wanted, by mounting all the control apparatus on an inner frame. Except for the face plate on which keys and lamps appear, this is entirely concealed by the decorative cabinet. The enclosing wooden cabinet is held in place by two concealed thumb-screws, and can be slipped off in a few seconds without disturbing the wiring or apparatus. The main advantage of this construction becomes apparent where an individually designed enclosure for the cabinet is wanted for a room decorated in a unique or unconventional plan. In such cases the inner frame only will be supplied, with the face plate and its fittings finished in accordance with instructions of the subscriber's architect or decorator, and an enclosure will be built by his cabinet maker. In certain other cases, in new residences, there will be a recess in the wall to receive the inner frame of the control cabinet, leaving

only the face plate visible. There, similarly, the standard inner frame will be supplied, unmodified except for the finish of the exposed fittings. Meeting of special demands in this manner means that the only modification of the standard control cabinet necessary under any circumstances is the use of a specially finished face plate and fittings.

While operation is virtually that described previously for the 740-A PBX, and the apparatus within the attendant's cabinet is the same in purpose and in operation, the apparatus mounted on the keyfront has been changed in form to meet the requirements of appearance. Two lever-type key units are used for each trunk circuit, but they are mounted on a single plate which also supports the mountings for the signal lamps, rather than on the customary sheet metal strips. The mounting plate is covered by a face plate which conceals the edges of the lamp sockets and the mounting screws by which the key units are attached, and which gives space for engraved designations at the keys and lamps. Instead of the commonly used key handles of hard rubber, with knurled surface, the handles used are of a shape to harmonize with the cabinet, and are given a metallic finish to match the face plate. With the mahogany cabinet, the surface of the face plate will be statuary bronze, the associated handset will be given a similar finish, and the lamp caps will be green, of the faceted (jewelled) shape. For the walnut enclosure, keys, face plate and handset will be of old brass finish and the lamps will be covered by amber caps.

The step-by-step apparatus is quite similar to that of the 740-A and the 740-B exchanges. A maximum of seven line finders and seven selector-connectors can be mounted on the switch frame, and there is room for relay equipment for four central-office trunks. Thus with all the apparatus installed, seven conversations can be carried on at once, four of them with the outside. Where less traffic is expected, two or three trunks will be installed, and the number of step-by-step switches will also be reduced. In such cases additional pieces of apparatus can be added at any time, should the degree of use increase, without interfering with those previously installed. It is merely necessary to place a trunk unit, or a line finder and selector-connector, upon the supports of the switch frame, and it is ready for service.

Switches and associated apparatus

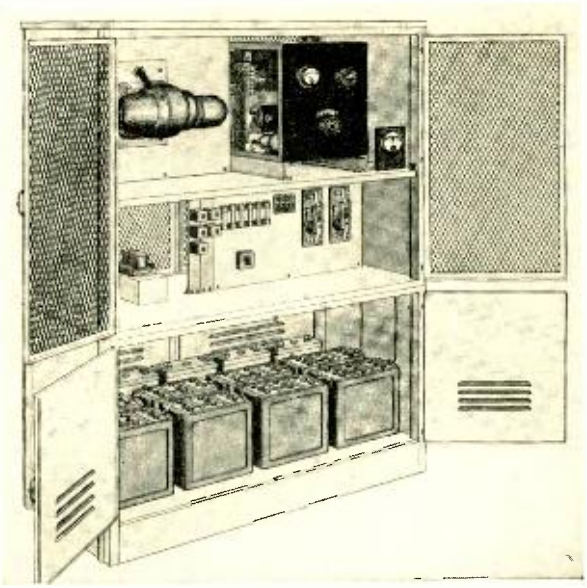


Fig. 3—The compact and self-contained power plant is usually located close to the switching equipment

are mounted on a single frame. On one side are the selector-connectors, the circuits for trunks, and the attendant's circuit. The line finders are mounted on the other side, as are also the line relays for the extensions, relays for transferring the trunk circuits and attendant's circuit from one cabinet to the other, and miscellaneous apparatus.

The power equipment is also like that furnished with the two larger 740-type PBX's, but is arranged somewhat differently. Current is supplied by a 23-cell storage battery, locally charged, and the voltage is maintained automatically between 44 and 50 volts with NAK counter cells. Ringing currents for the extension lines may be secured from the central office to which the PBX is connected or, if a local source is preferable, a motor-generator set may be installed at the PBX to supply alternating current for ringing and signal tones. This set will not normally be in operation, but will be controlled by a relay, and run only when ringing current, dial tone, or busy tone is needed.

Switch frame and power plant will ordinarily be located together, in a part of the house used for storage or for housing mechanical equipment. For each there is an enclosing casing of sheet metal, as a protection from dust. The two cabinets are of the same height and depth, and will ordinarily be placed end to end. Their shape and appearance and their olive-green finish make them attractive and appropriate for any room in which they will be installed.

New Property for the Laboratories

The holdings of the Laboratories in Morris County, New Jersey, have been augmented by the purchase of an eighty-five acre plot known as the Tillou farm and located on the road from Chester to Dover, in the township of Dover. The property will be used by the Outside Plant Development Department in carrying on outdoor exposure tests. A thirteen acre tract adjoining the recently purchased land has been used for the past two years by Outside Plant for experimental work on open wire spacing

The New Telephone Booth

By F. A. KUNTZ
Telephone Apparatus Development

A BILLION and more times during 1928 someone stepped into one of the quarter million booths then in service, and added that experience to the influences forming his attitude toward telephony.

Since the function of a telephone booth is to provide means for calling satisfactorily from a noisy location, or in privacy from a public place, its essential requirements relate to utility under these conditions. Always, however, comfort and convenience for the user, and an attractive and inviting appearance, have been sought. The No. 1 and No. 2 type booths now in service were a marked improvement over their predecessors in these respects. For the fifteen years during which they have been standard, they have proved quite satisfactory in utility, comfort, convenience and appearance.

Of late years extensive development has modified the architecture and appointments of the public places in which booths are located. Concurrently, great increase in the use and number of telephone booths has given them a conspicuous and important status in public interiors. To keep them abreast of their surroundings, modifications and improvements have accordingly been made in the booths, to the point of standardizing a new type.

Two different styles of the new booth are being manufactured: one (No. 5) to accommodate the patron standing, and the other (No. 6) equipped with a seat; the coin collector and shelf are mounted conveniently higher in the former than in the latter. Both are furnished with exterior finishes of dark mahogany, medium mahogany, oak, and walnut, and incorporate features which augment the safety, durability, and at-

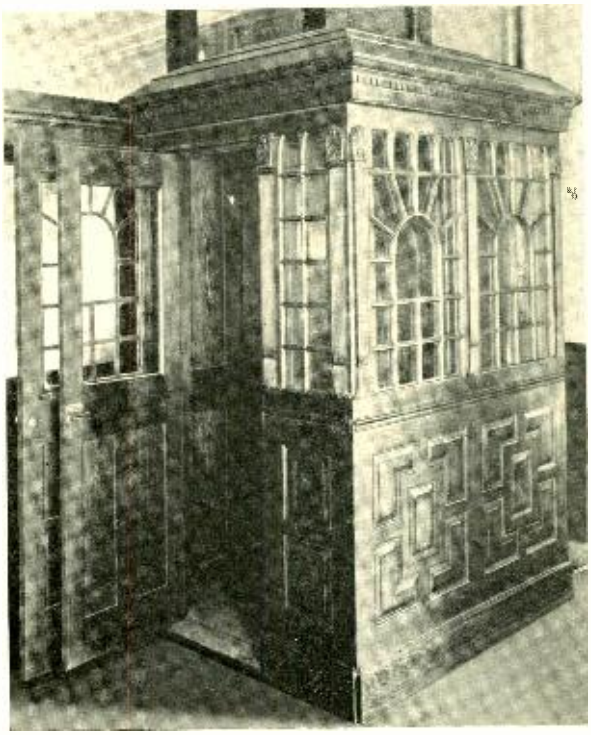


Fig. 1—An early telephone booth, which was a standard from 1890 to 1900

tractiveness of telephone booths and the comfort of their users. Many of the respects in which these improvements have been made are immediately evident on comparative inspection (Figure 2). Some of the other improvements are less obvious.

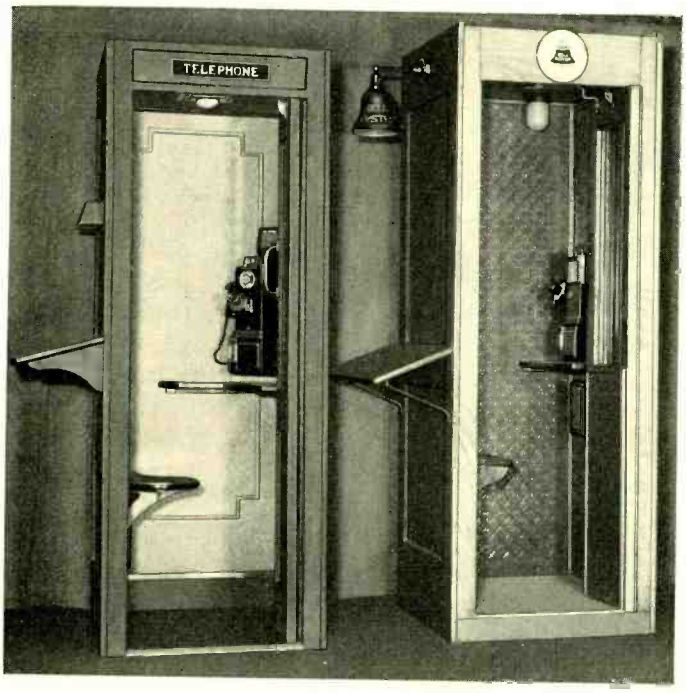


Fig. 2—Telephone booths of the new type (left) are more attractive, serviceable, and comfortable than are those of the present type (right)

A steel floor, employed in the new design, reduces the thickness of the base sufficiently to eliminate the necessity of an upward step in entering the booth. The floor-covering is of a single sheet of quarter-inch rubber, mottled black and white, which will not readily stain or become spotted with cigarette burns. The edges of the sheet are folded upward to form a "base-board" six inches high around the lower portion of the sides and back, serving them as kick plates and as a protection from dampness when the booth is mopped. Bronze binders are used to conceal the edges of this rubber covering.

The interior walls are covered with a steel lining, embossed all over with small irregularly spaced impressions which give the surface a pebbled or stippled appearance; a molding, also embossed, outlines a panel in each side and the back. These linings are attached to the interior of the booth by oval-headed brads, inconspicuous in the general pebbled design, and the edges of the lining are finished by corner moldings. To harmonize with any of the four exterior finishes, the linings are painted a neutral color called "forest drab".

A study of the lighting produced a dome-light in the center of the ceiling, and a door-switch completely concealed above the ceiling and operated by an arm extending upward from the door-hinge. Surrounding the dome-light are slots which permit vitiated air, with the assistance of the heat of the lamp, to escape through the ceiling. Fresh air replacing it enters the booth under the door, which is so hung as to leave a space between it and the tread when it is closed.

The door is made in two folding parts; when open, it folds entirely within the booth. The wooden-column hinge between the two members has been replaced by a bronze piano

hinge which greatly improves the appearance of the booth and makes available more space for glass in the door. Here the use of bevel plate glass further improves the appearance. The lower panels of the interior of the door are now of hard wood, matching the exterior of the booth. Upon the door an attractive bronze handle is used.

A number of the modifications in the interior are especially directed toward the comfort of patrons. The telephone, heretofore attached to the middle of the right side of the booth, has been moved into the rear corner, out of the way of patrons entering

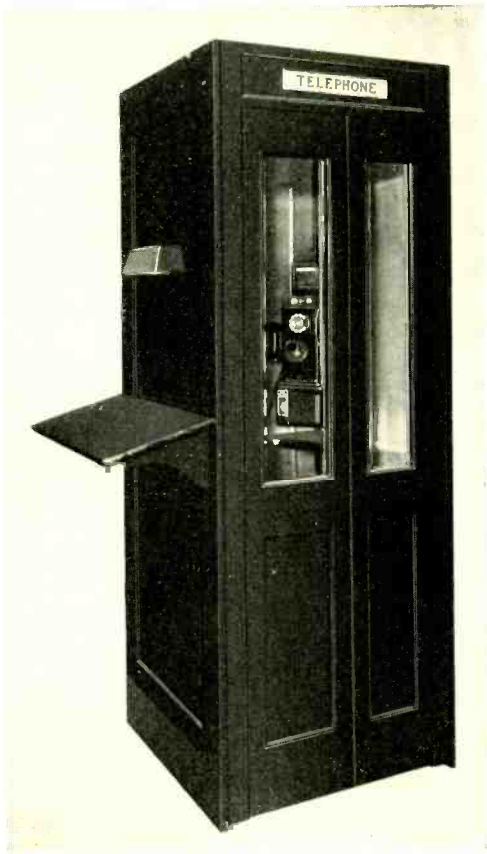


Fig. 2—The new directory light protrudes less, and is nearer the shelf, than the old

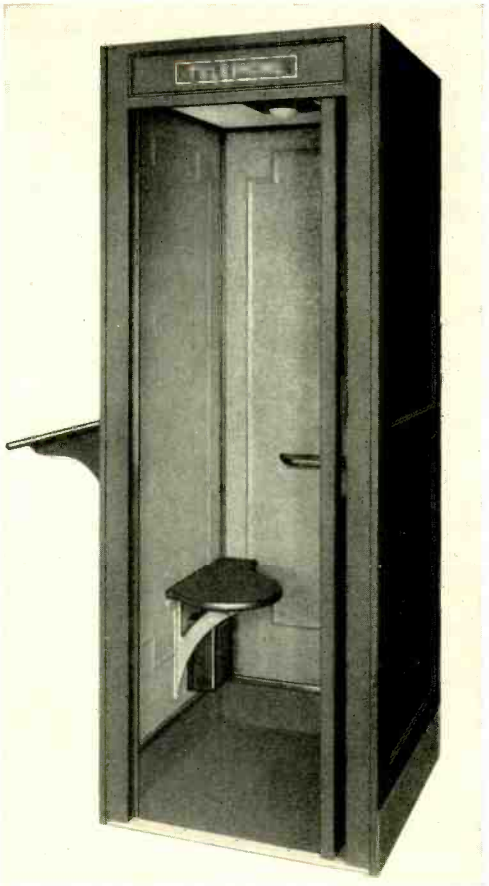


Fig. 3—The seat is stronger and more comfortable, and the bell box is placed out of the way beneath it

and leaving. The seat, for use in the new position, has been made more pleasing in appearance, while the elbow rest and writing shelf have been redesigned for the new arrangement.

Changes have also been made in the exterior of the booth. Above the door a panel has been added to improve the appearance. A bronze sign, "Telephone", can be used in this panel if desired, instead of the enameled Bell seal. The new shelf for the directory books is made entirely of the same kind of hard wood, with the same finish, as the exterior of the booth itself. Mounted in the side of

the booth above the shelf, a new directory light replaces the Blue Bell shade and wall-bracket fixture.

To facilitate installation and reduce the amount of work to be done at the subscriber's premises, the telephone wiring in the walls of the booth is completed at the factory. Only the work of mounting and connecting the coin collector and bell box remains to be done after the booth has been placed.

Although the inside dimensions of the present booth have been retained in the new, its overall height has been reduced about six inches through the saving in the thickness of the floor and a slight reduction in the space between the ceiling and the roof.

The manufacture of approximately 25,000 booths of the new design is planned to meet the first year's demands. Some of the telephone companies are having the present booths, as they come in for repair, reconstructed to conform with the new design insofar as it is economically feasible to do so.

Offer of Additional Shares of A. T. & T. Stock

Stockholders of the American Telephone and Telegraph Company of record at the close of business of May 23, 1930, *are entitled to subscribe for additional stock of that Company in the proportion of one share for each six shares then held as shown by the books of that Company.*

Warrants will be mailed to the stockholders on June 9, 1930. *Subscriptions must be received before the close of business on August* 1, 1930. *Payments may be spread over a period of eight months.*

Ownership of the Ten-Year Convertible Bonds of the American Company does not entitle holders to subscription rights nor will stock issued in their conversion after May 23, 1930, *be entitled to rights under the terms of this offer. The price of stock issued in conversion of the bond is, until the close of business on May* 23, 1930, $180 *per share.*

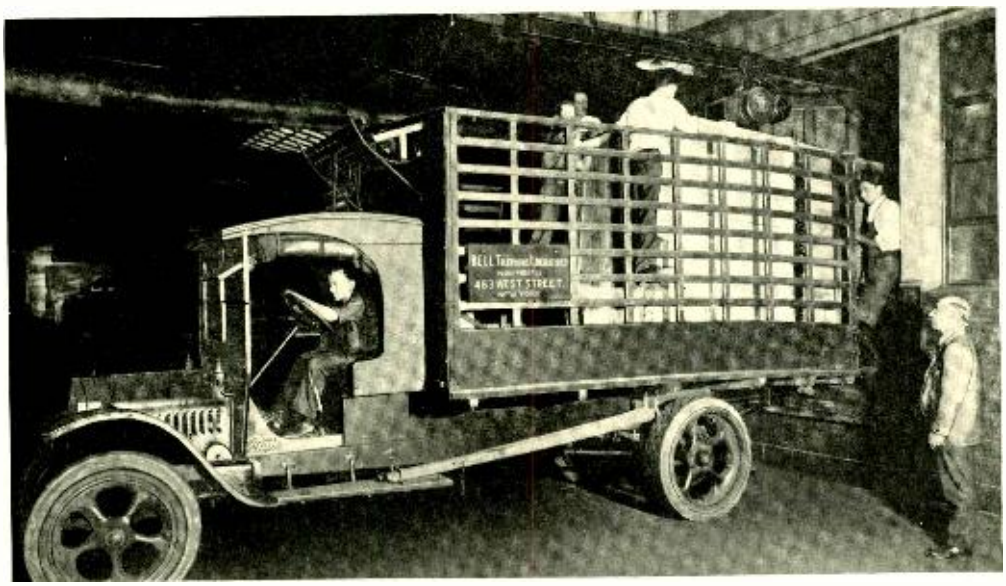
Shipping and Transportation

By C. T. BOYLES
General Service

A COMPLETED product, before it can achieve the primary purpose of its development and begin its life of service, must be safely transported to its destined location. Responsibility for its successful accomplishment, not always so simple a matter as it might seem, falls to the Shipping and Traffic Department. To its headquarters on the street floor of Section A, all finished product is brought. Here it is packed, and subsequently delivered either to its ultimate location if that is nearby, or to a carrier. Here also shipping papers are prepared and forwarded to Hudson Street, Netcong, San Francisco, Buenos Aires, or to whatever place its destination may be.

Limitations of space in the shipping room, and irregularity in the demand for boxes and cases, both in time and size, make it impracticable for us to do our own box making except on rare occasions. An outside source of supply is found to be more economical, and a small range of standard sizes of boxes is purchased and stocked. All unusual sizes, however, are ordered to dimension but the delivery is prompt; completed cases are usually received in from three to six hours after the order is placed.

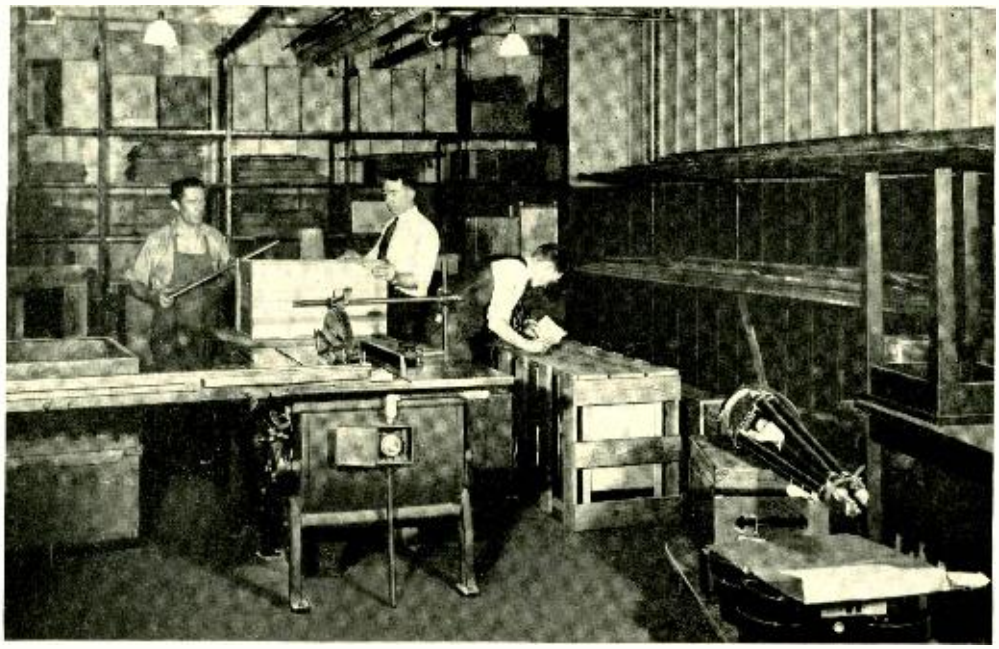
Before being put in the shipping



Part of a South American shipment being loaded on to a leased rack truck by (left to right) G. Cooke, J. J. Connerty, T. E. Roche, and A. H. Welsch. J. Bryson supervising from the court

The Annual Dinner of

he Club Bowling League



A corner of the shipping room showing P. J. Hurley (center) and C. Coakley (left) closing a shipment. E. E. Bowler marking crate at right

cases, all highly finished or nickeled parts are wrapped in tissue; other parts are protected by coppa wadding, canton flannel, or excelsior—depending upon the nature of the shipment. The apparatus is then placed in the case and securely packed to avoid shifting. All delicate shipments are "floated". This means that after the original case has been packed, it is placed within another case six inches larger on all sides, and within this surrounding space excelsior is placed to absorb the many shocks of shipment. For certain export consignments, this outer case is lined with tin in order to keep out the corrosive salt air and water.

In the meantime shipping papers have been typed, mimeograph copies have been made, and copies of them distributed to everyone concerned. If the shipment is for a foreign port, customs papers are prepared, and consular invoices, export declarations, or whatever else is required are made out. In doing this it must not be forgotten that customs regulations differ in many countries; a Canadian invoice, for instance, will not be accepted on a shipment to Newfoundland. Great Britain requires separate values on invoices for all permanent magnets, all blown glassware, and all vacuum tubes. Invoices must also show a separate value for all articles or parts of articles containing silk, and in addition the percentage by value of silk that is present.

Special insurance, covering all risks, is taken out to protect against financial loss. Often the money value is less important than the time required to build duplicate apparatus, and for this reason every shipment is so prepared that it will ride safely and reach its destination in perfect order.

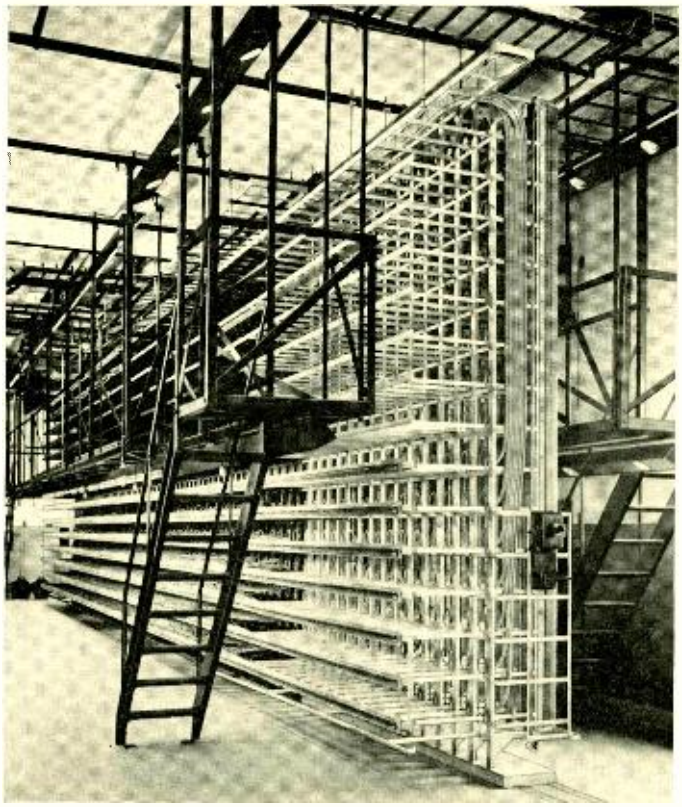
Our trucking service is a very in-

teresting part of the department. Experience has proved the economy of contracting with outside companies rather than maintaining our own trucks. Two one-ton panel-body trucks are in regular daily operation. One two-ton rack truck is also used daily, and a five-ton rack truck as requested. These trucks are maintained in excellent condition and render splendid service. The pick-up and delivery schedule provides both uptown and downtown trucks: two trips daily, leaving the building at 8 A.M. and 1 P.M., are made in each direction, and cover Manhattan Island from South Ferry to 72nd Street.

Shipments routed express are called for daily unless there is an unusually urgent shipment, when delivery is made to the carrier by our own leased trucks. Freight shipments are also delivered to the carrier by our trucks. The major part of our freight trucking, however, consists in picking up material from the different railroads.

With these various services at their disposal and with a personnel trained to render prompt and efficient service, the Shipping Department is prepared for any and all assignments. Shipments, large or small, delicate or rugged, are packed carefully and delivered to the carrier with a maximum of promptness so that there will be as little time as possible between the completion of a product and its beginning of usefulness.

Driver of a Laboratories' panel truck handing shipping ticket to T. Donovan when leaving the building on one of his morning trips



A New Main Distributing Frame for Large Offices

By R. E. NOBLE
Equipment Development

IN connecting outside lines to central office apparatus, provision must be made not only for protecting the inside equipment from excessive voltages or currents which might enter over the outside lines, but for easily changing the connections between apparatus and cable as well. Among other obvious advantages this makes it possible for a subscriber to move to another location within the same office area without having his number changed. This flexibility in making and changing connections is provided by the use of a main distributing frame which in one form or another has been part of central office equipment since the very early days.

The general appearance of a modern MDF, as it is called for short, is shown above in the form used in large offices with mezzanine construction. Along one side, on vertical bars spaced on eight-inch centers, are the protectors. Incoming cables are brought up through the floor and fanned out on the protector strips. Each strip accommodates 101 lines and four of

them, mounted one above another provide capacity for 404 lines on each vertical; half are above the balcony and half below. It is customary, for convenience in maintenance, to terminate a single cable either all below or all above the balcony.

Along the other side of the frame, mounted on horizontal instead of vertical bars, are other terminal strips, without protectors, to which the inside cables from the office equipment are connected. The cables to the horizontal strip come from an intermediate distributing frame, IDF, as shown in Figure 2, rather than directly from the office equipment but this does not affect the function of the main frame.

This type of main frame carries fifteen horizontal rows of terminals. Each separate block is eight inches long and carries terminals for 20 lines so that in each forty-inch length of frame there is space on the horizontals, if the blocks are all mounted

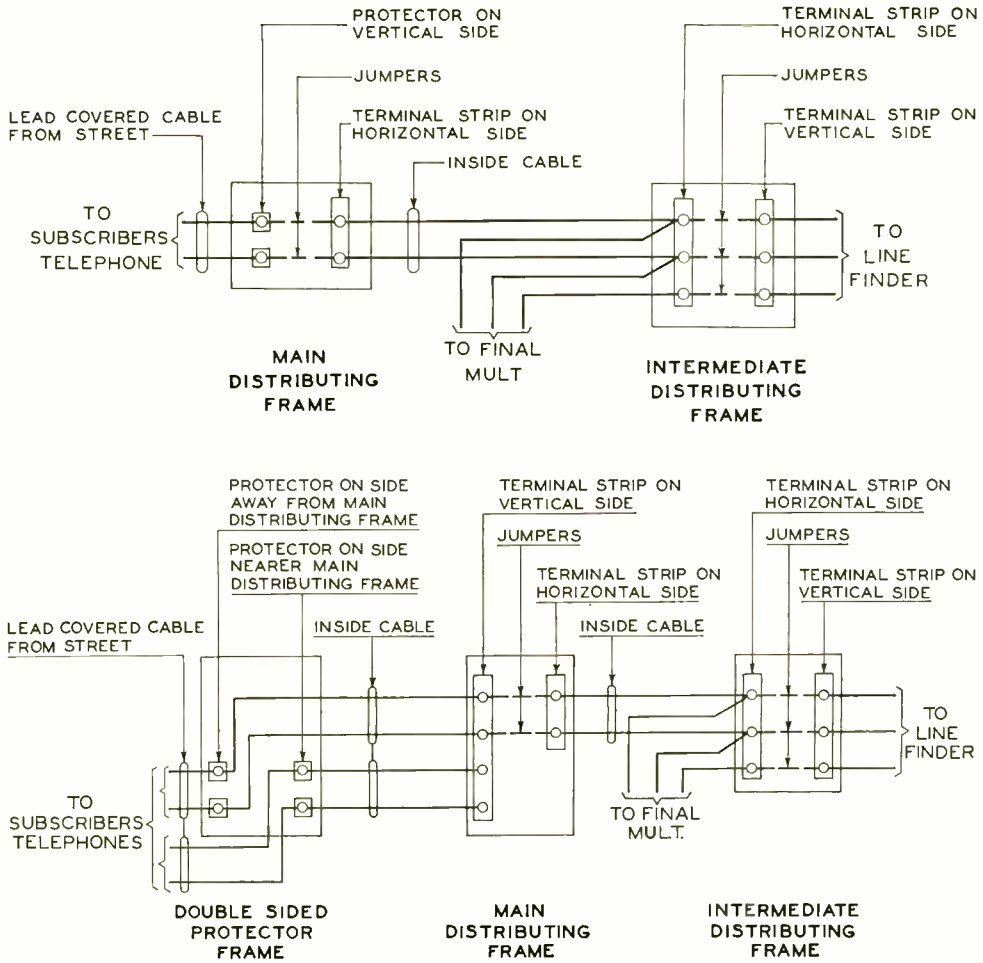


Fig. 2 (above)—Diagram showing MDF, IDF, and ther relation to incoming cables and office equipment. Fig. 3 (below)—The new MDF is a double unit with protector blocks on both sides of one, and terminals on both sides of the other

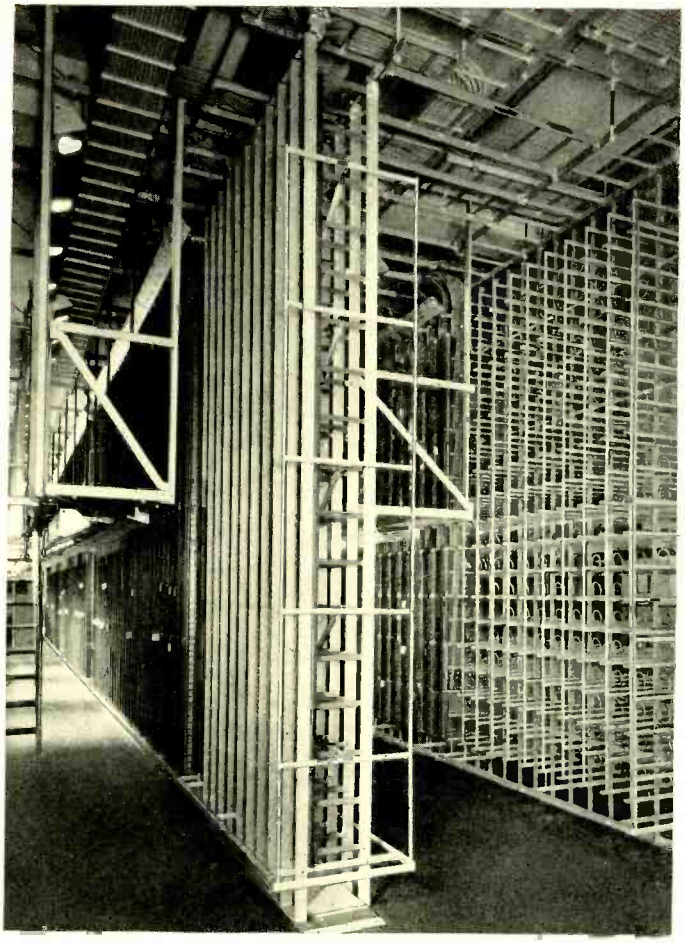


Fig. 4—The thin vertical strips and diagonal bars forming the protector frame are seen clearly at the front and where the protectors are not yet mounted.

close together, for 1,500 lines to office equipment. On the other side, the five verticals included in the forty-inch section have capacity for 2,000 cable pairs.

This ratio of 1,500 to 2,000 is greater than is ordinarily required since 2,000 outside lines do not usually need as many as 1,500 lines to office equipment. Part of this difference in capacity of vertical and horizontal terminals is taken up by private lines that are bridged directly across the verticals and so require no horizontal terminals, but the larger part of it is due to the necessity of providing for growth, and an inevitable uncertainty of exact location of load. At one time certain sections may be heavily loaded and at another lightly, but the permanent cable installations cannot be shifted to meet these changes.

In large cities several central offices are usually located in a single building, and it is customary to use a common MDF where the lines and cables for all the offices are terminated. This permits more extensive cross connecting so that a person may move to any location within the area served by any of the offices and still keep his original number. As a result, however, such main frames become excessively long. At times, they even turn a corner at the end of the building and continue at right angles to the main section, or perhaps double back upon it. Occasionally two or more lines of frames are used and this arrangement requires tie cables which are very undesirable. Anything but a single-line main frame is very objectionable not only because of the additional space required but because of the long jumpers which may even have to turn corners.

To avoid such long jumper runs

and to economize space in these multi-office exchanges, a new type of main frame has recently been developed. The single structure of the earlier frames is split into two: one carrying only protectors for terminating the outside lines, and the other carrying the usual horizontal terminals for the inside cables and vertical terminals which are permanently wired to the protectors. The general arrangement is shown in Figure 3. The protector frame has verticals on both sides, spaced on eight-inch centers; each vertical accommodates 404 pairs so that the linear length of frame is just half what it was for the earlier type of frame for the same number of lines.

To make the most of this saving in length it has been necessary to design the second half of the complete MDF so that it also would accommodate an increased number of lines per unit of length. One of the steps taken was the employment of a new terminal strip for the verticals, shown in Figure 6, which accommodates a hundred lines in the space that would carry but fifty protectors. One vertical equipped with these strips carries 808 lines — the same number as carried by a single vertical on both sides of the protector frame. Perfect symmetry is thus maintained as the 808 pairs terminating in each eight inches on the protector frame are wired to a single vertical on the MDF.

To gain the additional capacity on the horizontal side two changes have been made. The rows are brought closer together so that there are nineteen shelves instead of the fifteen of the earlier frames, and a new terminal strip is used which carries one hundred lines in 32 inches instead of 40 inches as had been done formerly. With the earlier frames the horizontals had 75% of the capacity of the verticals which, as has been noticed, was frequently more than necessary. With

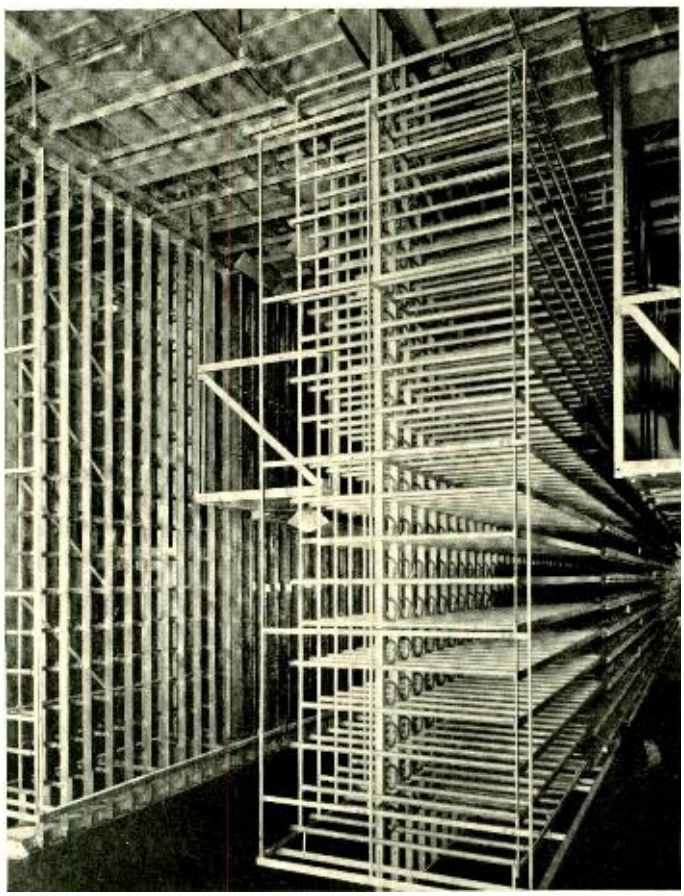


Fig. 5 — The construction of both sections of the complete MDF are here evident

the new arrangement the horizontals have about 60% of the capacity which is sufficient for ordinary installations.

The new protector frame, as may be seen from Figures 4 and 5, is built of comparatively thin bars instead of the 2 x 2 angles of the earlier frames, and stiffness is obtained by welded cross pieces forming a ladder like construction, and by a system of horizontal and diagonal braces. The vertical bars are large enough in cross-section to support the weight of 750 lbs. per vertical so that the new construction economizes in material without detracting from the strength or rigidity.

The new main frame, being built in two parts instead of one, naturally costs a little more for the same number of lines than the older ones. Its use is justified only in those large offices where the slight additional expense is compensated for by the savings accruing from the reduction in the number of main frame lineups or from the avoidance of frames of right-angle or "U" shape. In such offices the saving in jumper length and floor space is an additional inducement to its use.

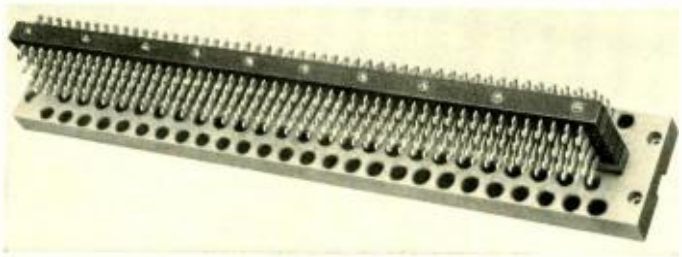


Fig. 6—*By employing a double layer of terminal pairs, the terminal strips on the verticals of the MDF accommodate twice as many lines per unit of length as do the protector terminals*

NEWS AND PICTURES
of the
MONTH
including Club Activities and Biographical Notes

President Hoover, and President Gifford of the American Telephone and Telegraph Company, at the opening of radio-telephone service between the United States and the Argentine

Radio Telephone Service to South America

RADIO-TELEPHONE service of the Bell System first crossed the equator when voice communication was established between North and South America on April 3. President Hoover and the Chief Executives of Chile and Uruguay took part in the opening ceremonies which included Argentina. A radio telephone circuit 5,300 miles in length now links the overseas radio stations of the American Telephone and Telegraph Company in the United States and similar centers of the International Telephone and Telegraph Corporation in the vicinity of Buenos Aires, Argentina.

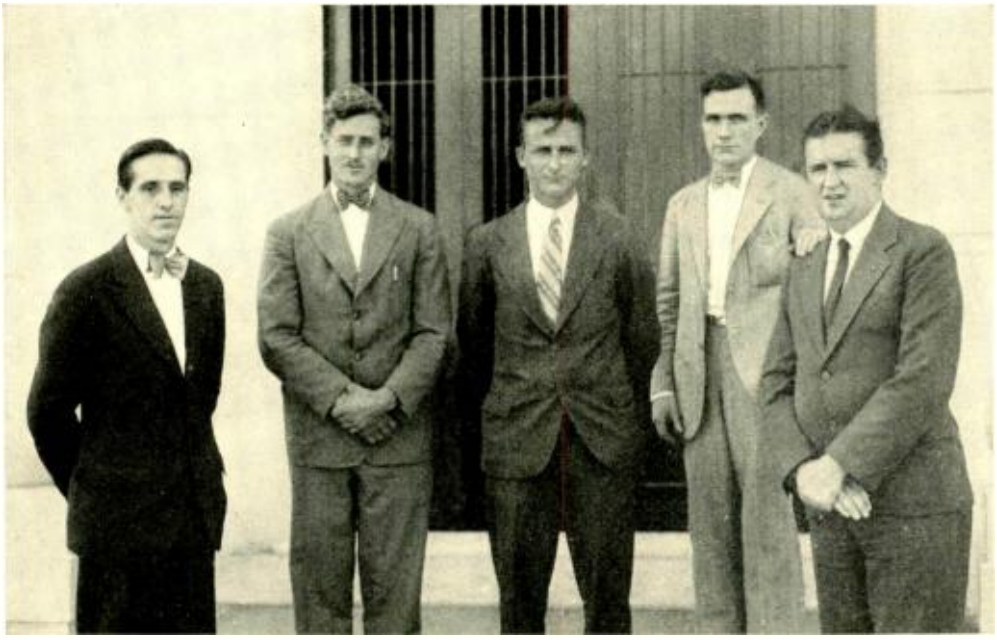
From Washington, where the ceremonies were held, the voice currents traveled over regular land facilities to the long distance offices at 24 Walker Street, New York, and thence over land circuits to the short-wave transmitting station at Lawrenceville, N. J. Here they were sent into the ether by a powerful short-wave radio telephone transmitter, to be picked up by the receiving station at Platanos, near Buenos Aires, and then carried by land wire to the metropolis. Cuyo is the overseas terminal office there, where incoming and outgoing voice currents are converged. Messages to Santiago, Chile, and Montevideo, Uruguay, were carried over land circuits leading out of the Argentine capitol.

The words of the speakers in South America went into the air through another short-wave transmitter at Hurlingham, Argentina, a few miles from Buenos Aires. They were next picked up at the American Telephone and Telegraph Company short-wave receiving center at Netcong, N. J., then carried by land wires to the Long Lines office at Walker Street, New York, and thence on to the national capital.

Immediately after the official ceremonies, the operators began putting through calls already filed by subscribers in both hemispheres. On the first day fifty-one calls were received, five of which were canceled, due to the fact that the person called had already put in a call from the other end of the circuit.

Most of the messages on the initial day came from the United States, the majority being placed between New York and Buenos Aires. However, two calls each passed from San Francisco and Boston, and one from both Los Angeles and Pittsburgh. The Argentine capital called Stamford, New Rochelle, and Cleveland as well. One call was filed from Santiago to Mexico City. Business messages have predominated thus far, according to the press.

The new service is in operation daily from 9 a. m. to 5 p. m., New York time, which is one hour earlier than the time in South America. The charge for a three-minute conversation between New York and the first South American zone — Buenos Aires,



Supervising the Argentine radio and line terminal installations were C. F. P. Rose, G. M. Eberhardt and E. J. Howard of the Radio Research Department, and H. M. Pruden and J. E. Cassidy of the Systems Development Department

or the province of that name—is $36. Charges for calls beyond these points are slightly higher, depending upon the distances involved.

For the present there will be a single talking circuit composed of two radio channels, one for northward and one for southward transmission. These channels will be operated on three different pairs of wave lengths, each pair being used for a different time of day. Running in a direction at a slight angle to the meridian and having its center near the equator, the circuit encounters more favorable average ether conditions than exist on the transatlantic circuits, which makes for more reliable transmission. Because of these generally better conditions and also because of the comparatively short twilight period, extreme variations in quality of transmission over the circuit are materially reduced.

For each of the three wave-lengths to be used in the South American service there is a separate antenna at Lawrenceville. These consist of networks of wires in the form of coarse mesh "curtains", all suspended from seven 180-foot steel towers, in a line broadside to the direction of Buenos Aires. The transmitting set has a power of fifteen kilowatts, and is maintained at the desired frequency by quartz-crystal control.

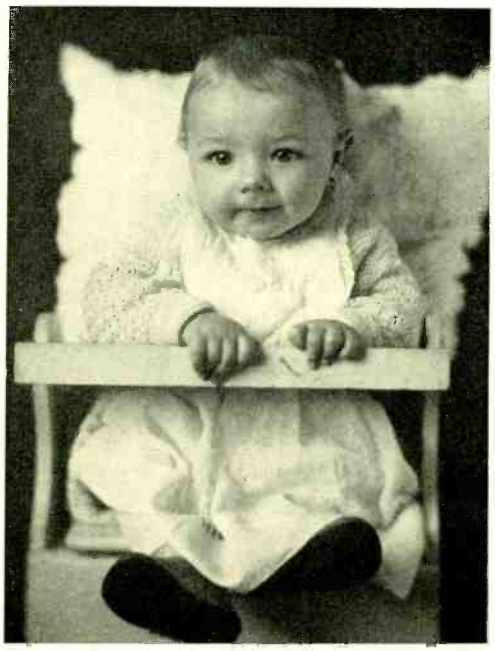
The receiving set at Netcong, N. J., using screen grid tubes and equipped for automatic fading compensation, can be connected, through concentric copper pipes, to any one of the three directive antenna "arrays".

Equipment at Lawrenceville and Netcong for the South American link is similar in all respects to that described in the RECORD of August, 1929, for the transatlantic links.

Baby portrait, junior class, N. C. Norman

Portrait, junior class, R. O. Bieling

Portrait, senior class, J. Popino



Baby portrait, senior class, J. Popino

Some first-prize-winning Club photographs

News of the Month

A BOX telephone, the earliest type of instrument furnished for subscriber's use, was borrowed from the Historical Museum and played a stellar role in the celebration observed by Frederick Stearns & Company in Detroit. The founder of the company, Frederick Stearns, was the first user of the telephone in Detroit and to commemorate this event and the fifty-third year of the use of the telephone by the Stearns Company, David M. Gray, vice-president and secretary of the firm, talked from Detroit over the box telephone to Frederick S. Stearns, grandson of the founder and chairman of the board of directors, at Miami, Florida. Edsel Ford and several business leaders of Detroit participated in the ceremonies and spoke through the old instrument.

The box telephone used in the demonstration is one of the most interesting exhibits in the museum collection. According to W. C. F. Farnell, curator of the museum, the instrument was manufactured about 1877 by the Charles Williams Company in Boston in the building where Alexander Graham Bell first succeeded in transmitting speech by electricity. The patent for the instrument, which used the aperture in the front of the box for both transmitting and receiving, was taken out by Bell. The instrument was long in the archives of the American Bell Telephone Company and came into the Laboratories' collection when the Boston laboratories were moved to New York.

Mr. Gray, who was a clerk in the Stearns store in 1877 said in recounting the installation of this first telephone: "We had a sign in the window, inviting the public to use the telephone. It read, 'come in and talk over the amazing long distance telephone. Throw your voice almost two miles.'

"People flocked in, of course, but most of them were very frankly skeptical. They were sure it was a fake, and that the voice they heard through

Reconstructing an historic scene in Detroit. David M. Gray speaking into an 1877 box telephone

the transmitter was that of someone shouting through a speaking tube from an upper floor. I was in charge of the public demonstrations, and I remember I had a difficult time convincing the Detroiters of '77 that we

weren't trying to put one over, but nevertheless it was a great saving in time and messenger service for our company."

* * * *

BELL TELEPHONE LABORATORIES was prominently represented at the aviation luncheon at the Hotel New Yorker of the New York Junior Board of Trade which was addressed by notables in the aviation industry. W. R. Ehrmanntraut, chairman of the body, addressed the gathering by radio-telephone from the Laboratories' tri-motored plane circling above the New York waterfront. The plane was piloted by Captain A. R. Brooks, and F. S. Bernhard, assisted by F. C. Ward, was in charge of the radio equipment in the plane. R. Zilch and W. Funda also assisted in handling the equipment in the plane.

Those attending the dinner from the Laboratories were: R. L. Jones, O. M. Glunt, E. L. Nelson, F. M. Ryan, D. K. Martin, J. O. Gargan, R. S. Bair, A. F. Weber, E. J. Santry, J. S. Hartnett and P. B. Findley.

ADMINISTRATION

PRESIDENT F. B. JEWETT was at Washington on April 3 to attend opening ceremonies of the South American radio-telephone link. The service was instituted when President W. S. Gifford of the American Telephone and Telegraph Company called Col. William F. Repp, vice-president of the International Telephone and Telegraph Company in Buenos Aires and informed him that President Hoover was ready to open the new service. Connection was then made with the office of President Ibanez of Chile at Santiago and President Campisteguy of Uruguay at Montevideo and the service was formally inaugurated with the interchanging of greetings by President Hoover and the presidents of the two South American republics.

Dr. Jewett was also in Washington on April 8. At noon he attended the ceremonies commemorating the eightieth birthday of Dr. William Henry Welch, noted pathologist of Johns Hopkins University and the "dean of American medicine." That evening he attended the fiftieth anniversary dinner of the American Society of Mechanical Engineers, on which occasion the first award of the Hoover Medal was made to President Hoover. Dr. Jewett is a member of the Hoover Medal Committee of the American Society of Mechanical Engineers.

On April 11, he visited Cleveland on the occasion of the semi-centennial celebration of the founding of Case School of Applied Science and the inauguration of William E. Wickenden as President of Case School. He addressed the Case Alumni at a dinner the following evening.

In talks before the E. J. Hall Chapter of the Telephone Pioneers of America and the Treasury Luncheon Club of the American Telephone and Telegraph Company, he again spoke on his recent trip to Japan. He also presided over a recent meeting of the Science Advisory Committee, Chicago World's Fair, of which he is chairman.

Dr. Jewett has recently been appointed by the Popular Science Institute as Chairman of a Committee of Award which has been formed for the purpose of awarding the sum of $10,000 to be offered annually by *Popular Science Monthly* to the American citizen who has performed the current work in science deemed by the Committee to be of the greatest potential benefit to the public.

Sergius P. Grace and R. M. Pease going over their apparatus in preparation for a demonstration of the latest developments of Bell Laboratories

H. P. CHARLESWORTH was in Washington April 7 and 8, as delegate from Engineering Foundation, Inc., to the celebration of the Fiftieth Anniversary of The American Society of Mechanical Engineers.

OVERFLOWING audiences and marked interest and enthusiasm continued to attend the lecture demonstrations of S. P. Grace on modern communication developments. During the latter part of March, Mr. Grace's two-day program at Pittsburgh was extended to three days so that he could give a third talk and demonstration for the benefit of those whom it was impossible to accommodate at the two previous meetings. Twelve thousand persons applied for admission to the first night's meeting but owing to the limitations of the hall but four thousand were admitted. As one of his demonstrations at the Pittsburgh meetings Mr. Grace's voice was heard with increasing amplification and the audiences were very much mystified when they were unable to observe any pick-up wires or transmitter arrangements. He then revealed that the feat was accomplished by the recently developed pocket microphone which he wore concealed beneath his vest. In speaking at Pittsburgh, Mr. Grace returned to his previous home where he was received by many friends and former associates.

During the middle of April Mr. Grace addressed three large meetings held at Philadelphia. R. M. Pease, of the Apparatus Development Department, was in charge of the demonstrations given at all the lectures.

HERBERT E. IVES and C. J. DAVISSON presented papers at the three-day meeting of the Philosophical Society, Philadelphia, on April 24-26. The meeting which celebrated the 203rd anniversary of the founding of the society by Benjamin Franklin was addressed by noted authorities on the sciences and humanities from all parts of the United States and Canada. Dr. Ives spoke on *The Chromolinoscope Revived* and Dr. Davisson outlined the findings of himself and L. H. Germer on the wave properties of electrons. Earlier in the month Dr. Davisson attended a New York dinner of the society at Hotel Plaza. He also gave a talk on the wave properties of electrons at the Massachusetts Institute of Technology.

"MISS UPTOWN"

Ruth Clough in her booth in our auditorium at the two-way television demonstration

W. E. CAMPBELL visited the Hawthorne plant and the laboratories of the Westinghouse Company and Mellon Institute at Pittsburgh on studies of lubrication.

H. S. DAVIDSON visited the Bureau of Standards at Washington and the Leeds & Northrup Company at Philadelphia to confer on the calibration of an acetone recorder.

J. M. FINCH and M. H. QUELL visited the Corticelli Silk Mills to inspect a process for recovering waste silk.

J. E. HARRIS and E. E. SCHUMACHER were at Point Breeze to discuss metallurgical problems involving cable sheath. They also visited Asbury Park to inspect the installation of the new lead-calcium sheath cable.

C. L. HIPPENSTEEL and C. W. BORGMANN attended the regional meeting of the A.S.T.M. in Detroit. Mr. Hippensteel with V. J. Albano was also at Forked River and Lawrenceville to complete burial testing of drop wire samples.

J. H. INGMANSON visited the H. H. Robertson Company in Pittsburgh to confer on asphalt problems concerned with tape-armored cable. With A. R. Kemp he also attended the A.S.T.M. Committee meeting on rubber covered wire at Detroit.

E. W. KERN and W. L. VAN ARNAM were at the central technical laboratories of the DuPont Company in Philadelphia in connection with wood finishing studies.

A. G. RUSSELL and R. B. MEARS

were at Rochester to attend a meeting of the American Electroplaters' Society.

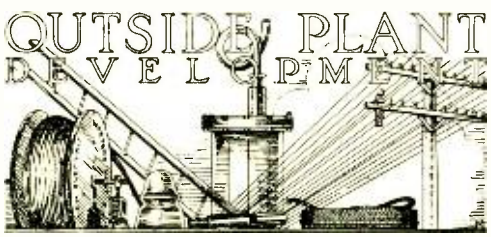
A. E. SCHUH and W. J. CLARKE visited Hawthorne to discuss matters concerned with paint compounding.

R. E. WATERMAN, W. MCMAHON and C. J. FROSCH have returned from Gulfport, Mississippi, where they spent several weeks studying wood preservation.

J. R. HEFELE gave a talk at Cooper Union on vacuum tubes.

M. J. KELLY spoke on communication progress before the Kiwanis Club at Lawrence, Kansas. He stated that probabilities are that within the next ten or fifteen years it will be difficult for telephone interests to find a sufficient number of channels to meet the demands of transoceanic traffic. The new transatlantic telephone cable is being projected to meet this eventuality, he said.

EDWARD GREENN completed twenty years of service with the Western Electric Company and the Laboratories on March 25.



D. A. QUARLES attended the Outside Plant Engineering Conference at Denver. He also visited Union College in Schenectady and Yale University at New Haven on college recruiting work.

W. C. REDDING and J. G. BREARLEY were at Asbury Park to supervise the installation of commercial cable having a new type of sheath. Mr. Brearley was also at Tuxedo, New York, on experimental work on tape armored cable.

"MISS DOWNTOWN"
Anne Kensett instructed the television visitors at 195 *Broadway*

G. A. ANDEREGG and W. E. MOUGEY visited the new cable plant at Point Breeze.

L. W. KELSAY, with several members of the American Telephone and Telegraph Company, made a trip to Philadelphia to inspect the installation of new cable terminal frames in the Pennsylvania Railroad Terminal.

C. D. HOCKER, F. F. FARNSWORTH, and W. T. JERVEY visited the Corning Glass Works at Corning, New York. Messrs. Hocker and Farnsworth then attended the A.S.T.M. convention at Detroit. Mr. Hocker also visited the F. W. Carlisle Leather Tannery at Saginaw.

C. R. MOORE made an inspection survey of linemen's climbers and

strand pullers at the plant of M. Klein & Sons Company in Chicago. On the same trip, he visited the Leach Company plant at Oshkosh, Wisconsin, in connection with cant hooks and peavies and then went to Hawthorne.

W. H. S. YOURY attended an inspection survey conference at the R. H. Buhrke Company plant, Chicago, on body belts, safety straps, and climbers' straps and pads.

J. G. SEGELKEN went to Brunswick, Georgia, where he conducted a series of tests on the commercial impregnation of Southern yellow pine poles by using the eight-pound empty cell method of treatment.

G. Q. LUMSDEN with several members of the Chemical Research Department was at Gulfport on the annual inspection of timber test specimens that have been treated in accordance with various methods.

C. SHAFER, JR., spent several days with C. L. Hippensteel of the Chemical Research Department in making test installations for soil corrosion study at Forked River and at Lawrenceville.

E. H. EISKAMP and R. C. DEHMEL visited the Whitney-Blake Wire Company plant in New Haven to study manufacturing methods.

O. B. COOK visited our Chester, New Jersey, Field Laboratory to investigate a site for tests of pole-top attachments.

C. H. KLEIN visited the Bethlehem Steel Company plant at Lebanon, Pennsylvania, and the Landis Machine Company plant at Waynesboro in connection with the development of insulator pins.

L. H. BURNS visited the eastern territory of the Bell Telephone Company of Pennsylvania to make trial installations of ground clamps.

C. A. CHASE, formerly in charge of Staff and Service of the Outside Plant Department, has been transferred to Tool Development work. R. G. Watling will take over Mr. Chase's work on Staff and Service.

HEDWIG E. REX completed twenty years of service with the Western Electric Company and the Laboratories on March 27.

STAFF

THIRTY YEARS of service in the Bell System were completed by Charles E. Wenzel, foreman of the finishing shop, on February 28. Mr. Wenzel started work in the finishing room of the Manufacturing Depart-

C. E. Wenzel

ment of the Western Electric Company, in the Laboratories' present building. In 1913 he was transferred to the finishing department at Hawthorne and a short time later he installed and was placed in charge of the finishing room in the Clinton Street factory at Chicago. He returned to New York in 1917 and in 1920 set up and assumed charge of the present finishing shop. His thirty years of service have placed him in a position to observe the marked ad-

vances of modern industrial methods as reflected in finishing processes. Mr. Wenzel cites as a single example, the adoption of the spraying process for japanning which is three times as rapid and gives a much better quality of work than the slow and tedious brush and dipping methods which were in vogue during his early years with the Company.

LEO S. LILLIS' twenty-five years of service which began on February 13, 1905, have encompassed a wide range of Bell System activities. He entered the employ of the American Bell Telephone in this building as an inspector of telephone instruments. At that time the American Bell Company inspected, tested and packed the instruments manufactured by the Western Electric for the American Telephone and Telegraph Company. In 1913, after a short period with the New York Telephone Company handling service complaints, he was transferred

L. S. Lillis

to Hawthorne where he assumed charge of the records of telephone instruments returned by the associated companies. In 1918 he was returned to New York and worked on pricing in connection with government contracts for the Western Electric at 195 Broadway. At the termination of the war he was transferred to the Engineering Department in this building and assigned to the cost estimate and price order service groups. In 1924 he assumed his present work in charge of costs and estimates.

H. H. LOWRY and C. W. GREEN spoke on *The Engineering of Multiunit Assemblies* at the colloquium held under the auspices of the Department of Electrical Engineering at Massachusetts Institute of Technology.

C. W. BRITTON spent several days in Harrisburg and Pittsburgh arranging for the installation of improved program transmission equipment.

E. P. FELCH visited Philadelphia to inspect a trial installation of protection for sequence switches.

E. J. JOHNSON visited Rensselaer Polytechnic Institute at Troy on college recruiting work.

C. A. SMITH went to Worcester to observe the new toll and step-by-step central office equipment now being installed there.

R. E. OTTMAN went to Detroit and Milwaukee to inspect the first installations of No. 8 test and control boards and other equipment connected with the new toll installations.

H. W. HEIMBACH attended an Equipment Survey Conference at Hawthorne.

E. J. KANE inspected several recent installations of the No. 360-A

community dial offices at McDonald, Hermine and McAdoo, Pennsylvania.

D. E. TRUCKSESS and R. L. LUNSFORD discussed the layout of improved tungar rectifiers with the General Electric engineers at West Lynn.

F. J. Scudder

FREDERICK J. SCUDDER'S twenty-five years in the Bell System takes in the development of dial systems on which he has been engaged during the greater part of his association with the telephone industry. He entered the employ of the New York Telephone Company on March 12, 1905, and served in various capacities in the Plant Department for five years. He became associated with machine switching development in 1910, first as maintenance engineer engaged in the development of maintenance practices and in the training of maintenance forces on both rotary and panel systems, and later as development engineer on dial systems. He was transferred to the Engineering Department of the Western Electric Company in 1917 and is at present Assistant Fundamental Development Engineer in the Systems Development Department.

WALTER R. LUTHER completed twenty years of service with the Western Electric Company and the Laboratories on February 14.

RAY S. WILBUR, on March 7, completed twenty years of service with the Western Electric Company and the Laboratories.

R. P. JUTSON made tests on the new alarm features recently added to the voice frequency power plant at Lawrenceville, New Jersey.

V. T. CALLAHAN was at Buffalo to aid in the design of radiator units for use with emergency generator sets driven by gasoline engine.

M. A. FROBERG visited New Haven, Connecticut, to inspect a new meter for measuring power plant noise.

J. M. DUGUID was at Hawthorne to confer on introduction of improved interrupters for producing central office tones.

F. K. LOW visited the new toll office at Detroit and then went on to Chicago to inspect the new call announcer machines.

H. W. FLANDREAU made a trip to Atlantic City and Pleasantville, New Jersey, to study a-c—d-c ringing conditions.

W. J. LACERTE visited Pittsburgh, Hazelton, and Wilkes-Barre, Pennsylvania, to investigate small dial offices, and later was at Syracuse in connection with a preselector trial.

L. M. ALLEN was at Albany to arrange for a trial of improved relay armatures and at Philadelphia to make preparations for a trial of an added group of senders in connection with protective network studies.

A. O. ADAM and R. C. PAINE in Philadelphia observed trials of sequence-switch cam and relay contact pitting.

L. F. PORTER and J. MESZAR went

to Detroit in connection with the installation of the new toll switchboard and new No. 8 test and control board.

P. W. WADSWORTH made the trip to Boston on the *S. S. Leviathan* to make tests of the radio-telephone installation giving ship-to-shore service.

CLARENCE E. HOKANSON, a member of the Equipment Development group, died March 22 at West Palm Beach, Florida, where he had gone two months previously for his health. He was 46 years of age.

Mr. Hokanson's career in the telephone industry was devoted to equipment engineering — especially in the development of telephone circuits for use in central offices. During the past ten years he had charge successively of engineering groups engaged in work of this nature for dial systems, and for toll and long distance switchboards of various types. Among his responsibilities during these years was that

C. E. Hokanson

of keeping in touch with field installations of new apparatus made by the Laboratories for trial purposes. This brought him in close contact with telephone engineers throughout the country, and no small part of his contributions to equipment development work was due to his wide experience and acquaintance in the telephone field. He was graduated from the University of Minnesota with an electrical engineering degree in 1906, and immediately entered the Western Electric Company. With the exception of three years spent in outside business, he remained with that company and Bell Telephone Laboratories ever since.

PATENT

DURING the period from March 4 to April 4, 1930, members of the Patent Department visited the following cities in connection with the prosecution of patents: Washington, H. K. Baker, E. C. Laughlin, J. F. McEneany, J. A. Hall, H. A. Flammer, J. W. Schmied, P. C. Smith; Boston, W. C. Kiesel.

FROM December 1, 1929, to March 1, 1930, patents were issued to the following members of the Laboratories:

S. E. Anderson (3)
L. J. Bowne
R. M. Bozorth
W. W. Carpenter
E. H. Clark
R. E. Collis
A. M. Curtis
J. F. C. Dahl
R. C. Davis
A. C. Dickieson (2)
G. W. Elmen (2)
L. A. Elmer
C. R. Englund
J. C. Field (2)
H. Fletcher
J. R. Fry
M. E. Fultz
J. O. Gargan
J. J. Gilbert
J. W. Gooderham (2)
C. L. Goodrum
F. Gray
C. W. Green (2)
E. V. Griggs
J. E. Harris
H. C. Harrison (2)
R. V. L. Hartley (3)
J. T. Hillhouse
E. E. Hinrichsen (2)
H. Hovland
F. A. Hoyt
P. Husta
H. E. Ives (4)
L. H. Johnson
W. C. Jones
A. C. Keller
A. R. Kemp
L. A. Kille
G. V. King
W. A. Knoop
C. D. Koechling
J. A. Krecek
C. E. Lane
F. B. Llewellyn
G. A. Locke
W. A. Marrison
R. C. Mathes
W. H. Matthies (2)
E. D. Mead
C. R. Moore (2)
R. I. D. Nicoll (2)
R. C. Paine
A. E. Peterson
E. J. Pratt
J. C. Schelleng
K. P. Seacord
T. E. Shea
G. H. Stevenson
W. B. Strickler
E. C. Wente
C. H. Wheeler
J. H. White
H. Whittle (2)
R. S. Wilbur
F. S. Irvine

Personnel Department

G. B. Thomas was the Laboratories' spokesman at a recruiting conference held at the University Club of Boston to which the seniors of New England colleges were invited. Representatives of various businesses outlined the work of their organizations and the opportunities offered and later conferred individually with the college men present.

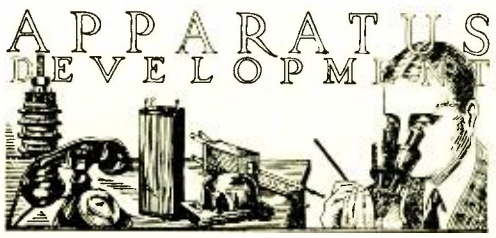
R. A. Deller was the principal speaker at a dinner given by the Engineering Extension Department of Purdue University for the Eighth Annual Telephone Plant Conference of Independent Companies. His subject was *Current Developments in the Art of Communication.* He also attended a dinner given to the faculty of the University of Michigan by the Bell System delegates at which R. I. Rees, Assistant Vice-President of the American Telephone and Telegraph Company, spoke on *Success in College and Business.*

M. B. Long visited Massachusetts Institute of Technology and the University of Pennsylvania in connection with college recruiting work. He also spoke on *Recent Communication Developments* before the engineering students of the University of Maine. In addition he has been at the University of Minnesota, University of Nebraska, Iowa State College and the State University of Iowa on college recruiting work.

R. J. Heffner visited eighteen colleges and universities on the west coast on recruiting work. He delivered a talk on the work of the Laboratories at a dinner given by the Pacific Communication Club. Also on college recruiting work, M. L. Wilson visited Lehigh; W. A. Hyde, Lafayette and Syracuse; and D. P. Barry, Pratt Institute.

Bureau of Publication

Philip C. Jones spoke before the A. I. E. E. at the College of the City of New York on *Electric Eyes and Their Uses in Communication.*



H. C. Curl visited the Fore River Shipyards in Quincy, Massachusetts, to inspect the announcing system installed on one of the United States Navy cruisers. The cruiser, as yet unnamed, is similar to the *U. S. S. Pensacola* recently completed at the Brooklyn Navy Yard.

G. C. Porter was at Albany to install and operate the public address system used at the annual Legislative Press Association dinner.

H. I. Beardsley with E. W. Niles of the American Telephone and Telegraph Company visited the plant of the American Rubber Products Company to observe the manufacture of rubber flooring for telephone booths.

F. A. Kuntz, accompanied by representatives of the American Telephone and Telegraph and the New York Telephone Company, made an inspection tour of new telephone booths installed in the Bronx.

J. M. Hayward visited the plant of the J. S. Popper Company at Union City, New Jersey, in connection with the manufacture of directory holding equipment for use on telephone booths.

S. T. CURRAN visited Kearny on work pertaining to the manufacture of lamp socket mountings for use in toll test boards.

O. F. FORSBERG and H. W. GOFF were in Hawthorne in connection with new dial apparatus developments.

H. O. SIEGMUND visited Hawthorne for conferences on precious metal contacts.

J. C. WRIGHT and H. S. SMITH visited the National Carbon Company's plants at Cleveland and Fremont, Ohio, to observe battery and dry cell manufacture, and then went to Hawthorne regarding switchboard lamps.

D. R. BROBST spent several days at Baltimore supervising the twisting of special wire.

A. C. WALKER inspected the textile purification testing equipment being installed at Baltimore.

G. A. PERSONS was at Philadelphia and Newark testing apparatus to be used in the ground transmitter for commercial aircraft communication.

R. L. ELLIOTT of the Northern Electric Company spent several days at the Laboratories in conference with E. C. Mueller and J. N. Reynolds on manual and dial apparatus manufacturing problems.

J. R. TOWNSEND and C. H. GREENALL were at Asbury Park to observe the installation of aerial and underground lead-calcium cable.

H. N. VAN DEUSEN and W. W. WERRING attended the regional meeting of the A.S.T.M. at Detroit. Mr. Werring also attended a committee meeting on impact testing. W. J. Shackelton was also at the meeting and participated in a committee conference on magnetic properties. H. N. VanDeusen, W. A. Evans, W. W. Werring and E. C. Erickson also attended A.S.T.M. subcommittee meetings at Larchmont, New York.

F. F. LUCAS represented the American Society for Steel Treating at the fiftieth anniversary celebration of the American Society of Mechanical Engineers held in New York and Washington April 5 to 9. He also spoke before the National Academy of Sciences at Washington during the latter part of April. Before the Engineers Club in New York he gave a talk on *Metallography and the Ultraviolet Microscope*.

C. E. NELSON has returned from Harrisburg where he spent several weeks on base-metal contact problems.

R. BURNS and J. A. KOHM visited the Bakelite Research Laboratory at Bloomfield, New Jersey, to discuss the finishing of bakelite parts for handsets.

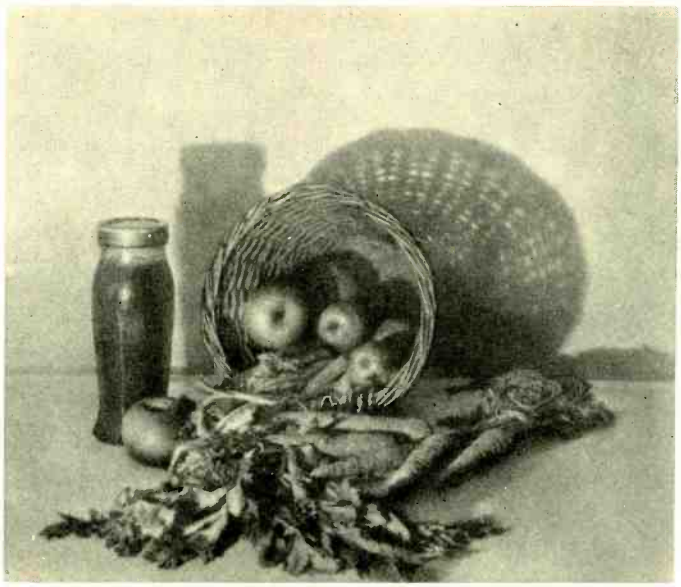
W. A. EVANS and I. L. HOPKINS attended a meeting of the A.S.T.M. subcommittee on condenser paper held at the Engineering Societies Building.

CHARLES W. MCWILLIAMS completed twenty years of service with the Western Electric Company and the Laboratories on February 7.

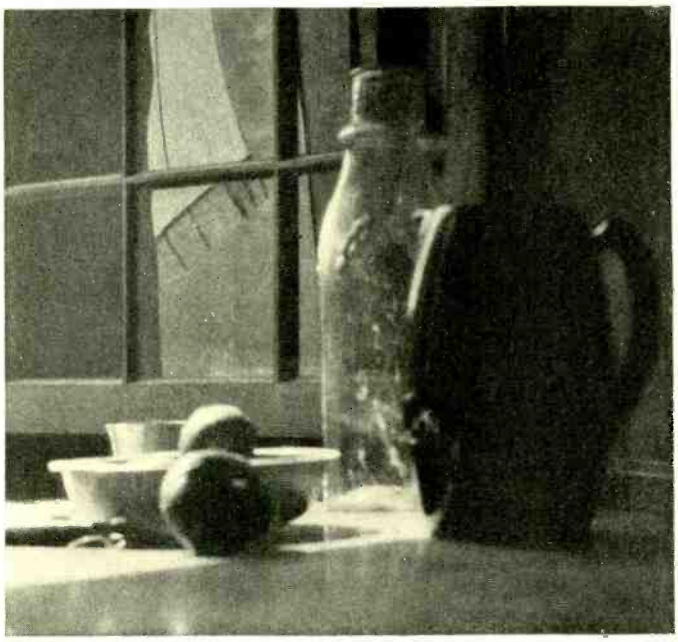
B. R. COLE completed the installations of a 1 kw broadcasting equipment for the Montgomery Broadcasting Company of Montgomery, Alabama, and of an 8-B Speech Input Equipment for the Southern Broadcasting Company of Atlanta. He also made a survey for a 1 kw transmitter which that company proposes to install on the campus of Georgia School of Technology; and inspected stations WSB of the Atlanta *Journal* and WBBR of the Peoples Pulpit Association.

MESSRS. A. B. BAILEY, S. A. Magness, W. P. Fisher and E. Babcock made a field strength survey of a pro-

Winners in the Club Photograph Contest. Above, first prize landscape, senior class, by E. Alenius. Below, first prize still life, senior class, by E. Alenius



Above, first prize landscape, junior class, by G. A. McIntosh. Below, first prize still life, junior class, by J. E. Rogers



posed location at Island Park, Long Island, for the 50 kw transmitter of the Columbia Broadcasting System.

S. H. ANDERSON and A. B. BAILEY represented the Laboratories at a conference on radio power apparatus with Western Electric and General Electric engineers and Graybar representatives at Providence.

J. F. MORRISON and F. H. MCINTOSH supervised the installation of additional speech input equipment for the Houghton and Dutton Studios of station WEEI, Boston. Mr. Morrison directed the installation and conversion for operation on 2452 kc frequency of a 1 kw transmitter for the Cleveland Police Department.

J. C. HERBER supervised the moving of the extensive speech input equipment at station WRVA of Larus and Brother Company, Richmond.

O. W. TOWNER inspected Hale Brothers broadcasting station KPO in San Francisco and visited some of the Los Angeles stations to render engineering service.

W. C. TINUS inspected installations of Western Electric aircraft radio equipment on the Varney Air Lines at Portland, Oregon, and Salt Lake City. He is now at Cheyenne supervising the installation of two-way radio-telephone equipment in the air mail planes of the Boeing Air Transport.

F. S. BERNHARD and P. D. LUCAS have recently made trips in the Ford tri-motor plane to Albany, Hartford and Washington to test aircraft radio-telephone equipment developed by the Laboratories.

MODELS of the 8-A Aircraft Radio Transmitter and associated equipment have been completed and were tested by R. C. Carlton, W. N. Mellor and J. G. Nordahl at the Newark annex of the Philadelphia Instrument Shop.

W. E. REICHLE made a trip to Boston and return in one of the Ford planes of the Colonial Air Transport Company to inspect the installation and test the operation of a Western Electric type 6109-A Radio Receiving Outfit. This equipment is used for the reception of weather reports and radio beacon signals.

E. L. NELSON visited Chicago, Evanston and Urbana, Illinois, on college recruiting work. While in Chicago, Mr. Nelson spoke before the Illinois Bell Radio Club on recent developments by the Laboratories in the broadcasting and aircraft radio fields.

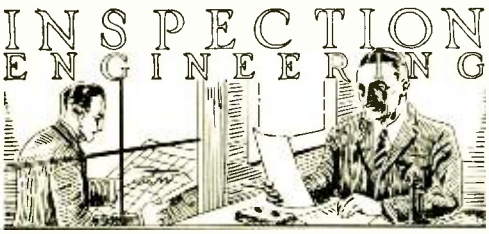
E. B. FERRELL spoke on *Short Wave Transatlantic Radio Transmission* before the Toronto section of the Institute of Radio Engineers at the University of Toronto.

JOHN F. HEARN completed twenty years of service with the Western Electric Company and the Laboratories on March 16.

T. E. SHEA has been named a manager of the New York Section of the Society of Motion Picture Engineers. During the past month he was at Johns Hopkins University on college recruiting work.

R. E. KUEBLER is making investigations of arrangements of various motion picture studios at Hollywood in connection with sound picture development work.

THE AMERICAN SOCIETY for Testing Materials has awarded the Dudley Medal to J. R. Townsend of the Apparatus Development Department, W. A. Straw of the Western Electric Company, and C. H. Davis of the American Brass Company, for their paper, *Physical Properties and Methods of Test for Some Sheet Non-Ferrous Metals.* The medals will be presented at the June meeting.



AT THE INVITATION of the Electrical Engineering Department of Massachusetts Institute of Technolnology, H. F. Dodge and G. D. Edwards led a colloquium on the *Philosophy of Inspection,* held in Cambridge, March 11 and 12. The colloquium was conducted primarily for students of the senior class and for interested members of the faculty. The various phases of quality engineering were brought out by Messrs. Dodge and Edwards including the concept of economic standards of quality, the nature of quality standards for apparatus and equipment in service, the need of controlling quality variations, and the use of statistical methods and probability theory as an aid in setting up quality control.

AT A COMMITTEE MEETING of the American Society for Testing Materials held in Detroit, W. A. Shewhart was elected chairman of the Technical Committee on presentation of data of Committee E-1 on Methods of Testing Materials.

T. C. RICE completed twenty years of service with the Western Electric Company and the Laboratories on March 1, 1930.

E. G. D. PATERSON and W. H. STRACENER attended quality surveys on copper line wire held at the Standard Underground Cable Company, Perth Amboy, the National Electric Products Corporation, Bay Way, and the Safety Cable Company at Baltimore, Maryland.

W. A. BOYD visited the Chicago *Daily News* broadcasting station WMAQ at Chicago. He was also in Hawthorne to discuss quality rating of special products.

C. J. HENDRICKSON attended a quality survey on panel system apparatus held at Hawthorne. R. O. Hagenbuck was present at a similar survey on panel system testing and frame equipment.

H. F. KORTHEUER visited Kearny to attend a quality survey on call indicator equipment.

H. G. EDDY, A. F. GILSON, and R. M. MOODY attended a quality survey on No. 506 PBX's at the Stromberg Carlson plant in Rochester. Mr. Gilson then visited Mathias Klein and Company, and R. H. Buhrke Company at Chicago, the Leach Company at Oshkosh, the United States Rubber Company at Providence and the Seamless Rubber Company of New Haven, to arrange for quality surveys on outside plant tools and equipment furnished to the Bell System by these manufacturers. A few weeks later the inaugural surveys at these plants were attended by E. G. D. Paterson and R. D. Smith.

D. S. BENDER made a trip to the Providence toll office to discuss toll signalling equipment now in the process of installation. He also visited the Long Lines Department at Hartford to investigate toll relay apparatus.

H. K. FARRAR attended a field review conference at Albany.

J. H. SHEPARD was in Port Washington, Long Island, to observe operation of central office power equipment.

I. W. WHITESIDE visited Pittsburgh and Harrisburg for field review conferences. He then went to Wilkins-

burg (Pa.) to investigate crosstalk difficulties experienced in one of the panel offices in that city.

T. A. CRUMP made a trip to Harrisburg to inspect a No. 740 Dial PBX recently installed.

G. GARBACZ visited Columbus and Cincinnati for complaint review conferences and general field matters. He was also in New York discussing field engineering matters with other members of the department.

R. C. KAMPHAUSEN attended a field review conference in Indianapolis. R. C. Koernig visited Denver and Des Moines in the same connection.

C. A. JOHNSON visited Milwaukee, Appleton, Marinette and Madison on general field engineering and complaint matters.

H. W. NYLUND was in Seattle and Portland also on engineering complaint investigation matters.

DURING the early part of March, E. J. Bonnesen visited Wichita, Kansas, to attend the cutover of 22,000 telephone lines when the entire city was converted to step-by-step operation. Mr. Bonnesen then proceeded to Oklahoma City, Dallas, Fort Worth, Houston, Graham (Texas) and Kansas City, to discuss complaint investigation matters. At Red Fork, Oklahoma, he witnessed the laying, as part of the Oklahoma City-Tulsa toll project, of the first six reels of tape-armored cable to be manufactured at the Hawthorne plant.

CLUB NOTES

THE CHESS TEAM of Bell Telephone Laboratories again won the championship of the Commercial Chess League and was awarded the titular cup at the annual dinner. During the past month the team has been engaged in a telegraph chess match against the strong team from the Hawthorne plant.

THE HIKING CLUB has embarked upon an energetic campaign of spring activities and undertook three hikes during the past month. On April 6, the members went on a fourteen-mile hike from Arden to Tuxedo over trails through the Lemon Squeezer and past Hagencamp Mine under the leadership of Ed Fogarty.

On April 12, Phillis Barton led a more leisurely hike over eight miles of dirt roads in the region of Grassy Sprain. Johnny Barton officiated at the first camp fire supper, which was held on April 26 at Rockaway Beach following an eight-mile walk.

A DOUBLES TOURNAMENT to take place the early part of this month has been arranged by the Tennis Committee to inaugurate the court season for the coming year. Singles matches also will be scheduled and team matches with outside clubs and divisions of the local telephone organizations are being planned. The committee for the ensuing year consists of A. M. Elliott, chairman, J. Blanchard, F. S. Entz and W. Kuhn.

A DEPARTURE from the previous plan of scheduling all games on Saturday afternoon has been announced by the club committee in charge of baseball activities. Games this season will be played on Tuesday and Thursday evenings. Twilight ball is becoming increasingly more popular and it was felt that these evening games would be more suitable to the men participating. As in past years the games will be played on Erasmus Field and the opening game will be staged on May 8, when President D. R. McCormack will pitch the first ball.

Contributors to This Issue

R. E. NOBLE entered the employ of the Chicago Telephone Company in 1898 as installer of substations and PBX's. During the following eight years he became general foreman of installation, wire chief, and general inspector. He then joined the Equipment Engineering Department of the Western Electric Company at Hawthorne and became Works Telephone Engineer of the Hawthorne plant in 1909. In 1914 he transferred to New York and was engaged in the development of the panel system until 1925. At this time he was made a supervisor in the General Standards Group of the Equipment Development Department, which position he now holds.

AFTER GRADUATING in electrical engineering from Queens University, Canada, in 1923, JAMES G. FERGUSON spent three years in Montreal, engineering step-by-step equipment for the Northern Electric Co. He then joined the Systems Development Department of the Laboratories where, in the Equipment Development group, he has specialized in equipment for dial private branch exchanges.

AFTER OBTAINING a B.S. degree from the University of Pennsylvania in 1905, H. E. IVES spent two years as a fellow in physics at Johns Hopkins University and from it received his Ph.D. He spent a year as assistant physicist in the Bureau of Standards and in 1909 was appointed physicist to the National Electric Lamp Association of Cleveland. Three years later he became physicist to the United Gas Improvement Company. In 1918 he entered the United States Air Service as captain in charge of methods and instruments for airplane photography. Discharged at the end of the war with the rank of Major, Dr. Ives joined the technical staff of Bell Telephone Laboratories. His first work was on electrical contacts which was followed by investigations of photoelectric cells and of their possible uses

R. E. Noble

J. G. Ferguson

C. T. Boyles

F. A. Kuntz

A. J. Busch

in the communication industry. He was in charge of the general development of picture transmission, first demonstrated in 1924, and of that of television demonstrated in 1927. Dr. Ives later engaged in the development of out-door television and of color television as demonstrated last year. Two-way television demonstrated for the first time last month, is the latest of a very long line of achievements credited to Dr. Ives' inventive ability and supervision.

WITH THE DEGREES of B.A. and B.Sc. and E.E. from the Catholic University of Washington, D. C., and the University of Michigan, and eleven years of practical experience, F. A. KUNTZ entered the Laboratories in 1919. Preliminary work in the drafting and specification groups led to substation apparatus development, in which Mr. Kuntz specialized in telephone booths. Throughout this development he kept in touch with the manufacturing problems through visits to the Turner Armour Company (now the Western Electric Company's Queensboro Works) and the Churchill Cabinet Company.

C. T. BOYLES joined the Laboratories in the spring of 1920. His first year was spent as an electrician in the building shop, and at the end of this period he was made Chief Electrician of the old steam power plant. Two years later he became General Foreman in charge of Building Service, which position he held till 1928. At present he is Supervisor of the Shipping, Receiving, By-products and Traffic Departments.

AFTER THREE YEARS in the Laboratories as a Technical Assistant, first in the Personnel and then in the Research Department, E. J. HOWARD entered Columbia University in 1923. Receiving in 1927 the A.B. degree in physics and mathematics, he returned to the Radio Research group. For the past year he has been in Buenos Aires engineering the radio-receiving equipment for the circuit between South America and New York.

A. J. BUSCH joined the Laboratories in 1922 immediately upon receiving the E.E. degree (cum laude) from the Polytechnic Institute of Brooklyn. After completing the student course, he was engaged in laboratory testing and analysis of both manual and panel telephone circuits for two years. An equal period was spent in designing manual circuits and since 1926 he has engaged in the design of panel selector circuits.