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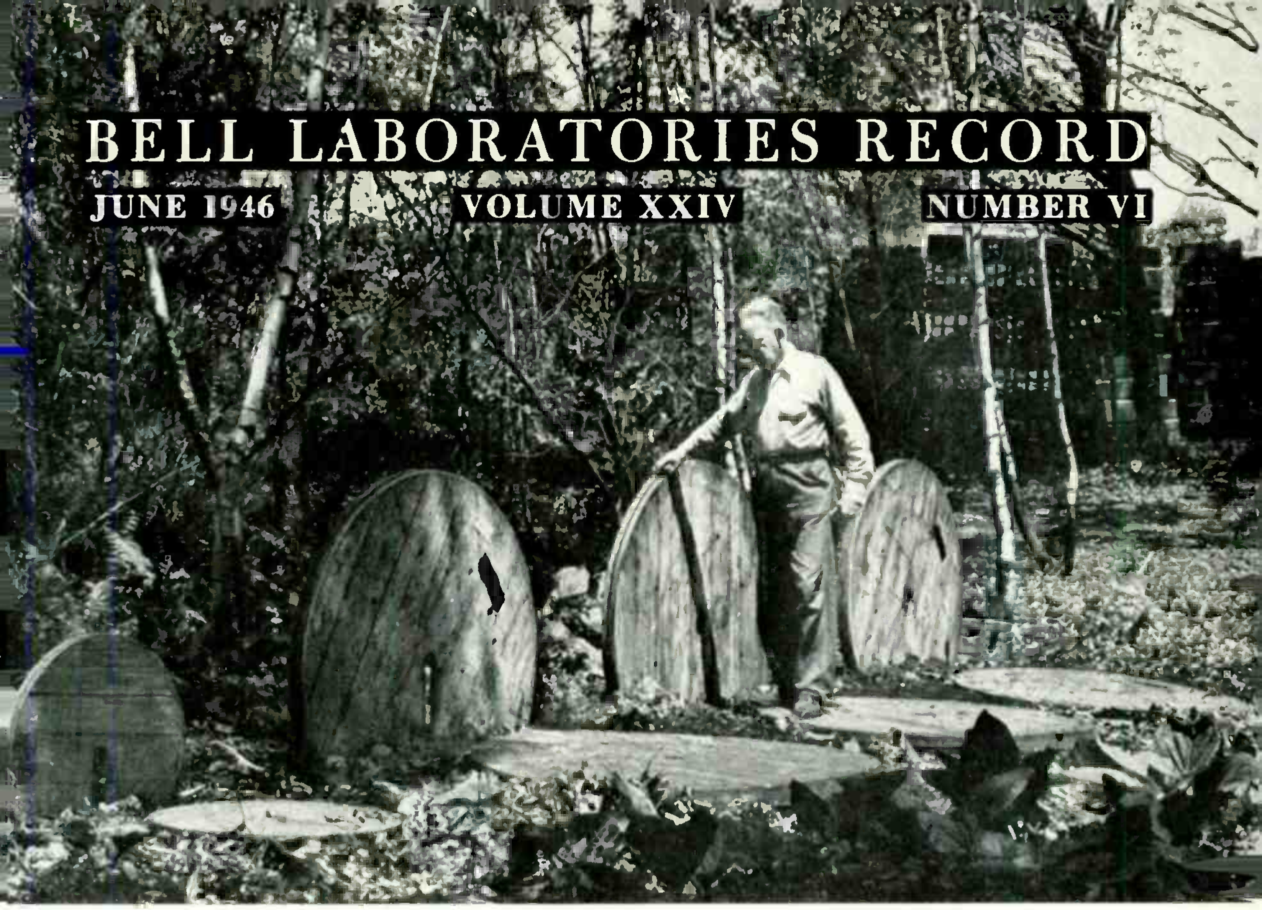


Preservative Treatment of Wood Cable Reels for Tropical Use

By G. Q. LUMSDEN
Outside Plant Development

REPORTS from the Pacific War Theater early in 1945 indicated that wood cable reels were in many cases decayed or damaged there to such an extent that it was extremely difficult, if not impossible, to unwind the lead-covered cable from them at their final destination. The rims of the heads were often so rotten that the nails would not hold the protecting lags in position. Cable losses were reported by the Signal Corps to run from 10 to 20 per cent in several locations.

In preparing for new operations, the reels were often exposed to high temperatures and high humidities for a year or more. Some were stored on low ground which became mud several feet deep after a rainy spell; others were transported from one equatorial operation to another. Untreated wood will not stand up under such conditions. On the basis of these reports, an order was issued by the Signal Corps requiring that the wood parts of all cable reels—heads, drums and lags—should be treated adequately to prevent fungus and termite attack.

Steel cable reels have been used for many years by the Western Electric Company and these, for the most part, have served admirably within the continental United States. The Signal Corps, however, felt that the wood reel was considerably more adaptable to conditions where sections of cable might be cut off at one loca-

Wood cable reel heads under test at the Laboratories' Chester, New Jersey, field station, shown in the photograph above, are examined by R. H. Colley. The counterpart of each head sitting in the ground vertically may be seen partly buried.

tion and then the remainder shipped to other destinations. In such cases the lags are pulled off and then nailed back on the reel at each unloading point.

Preservative treatment of wood reels was practically a new venture and the Western Electric Company engineers therefore sought the help of the Laboratories. On the basis of general experience in finding ways to treat wood materials for outside plant use, it appeared to be better to use a "salt" treatment for the reels rather than creosote. Creosote is a standard preservative for wood poles; and creosoted materials usually inhibit fungus and insect attack effectively. However, they have the disadvantage that they cannot be painted or stencilled satisfactorily with code numbers or other identifying marks. Creosoted materials are also apt to bleed under certain circumstances, particularly under bright hot sun after rains, in other words, under conditions encountered in the tropics.

The Laboratories recommended that a salt preservative, Wolman Salts Tanalith, be applied by pressure methods. Preliminary corrosion tests were made by our Chemical Laboratories to get some idea as to what difficulties might be encountered from corrosion of the lead cable in contact with the preserved wood. These tests indicated that the Tanalith preservative should not cause any serious damage to the lead sheath of the cable.

Proposals that this treatment be used were submitted to the Signal Corps for their consideration. The recommendations were accepted and pressure treatment of all wood reels and lags was initiated five days after the Signal Corps acceptance. Fortuitously, the plant that did the treating with Tanalith in the Kearny, New Jersey, area is located at Port Newark, and this made the treated reels almost immediately available. Hundreds of thousands of board feet of lumber in reel heads, drums and lags were treated for Signal Corps use in the subsequent months for both the Kearny and the Point Breeze plants of the Western Electric Company.

Another wood preservative, pentachlorphenol in petroleum solvent, was also accepted by the Signal Corps for pressure or hot and cold bath submersion treatment after proposals made by the Western Electric Company and Laboratories' representatives. The products of the Hawthorne plant of the Western Electric Company were treated for the most part with the pentachlorphenol preservative. No adverse reports of any kind have been received in connection with either the Tanalith or pentachlorphenol treatments.

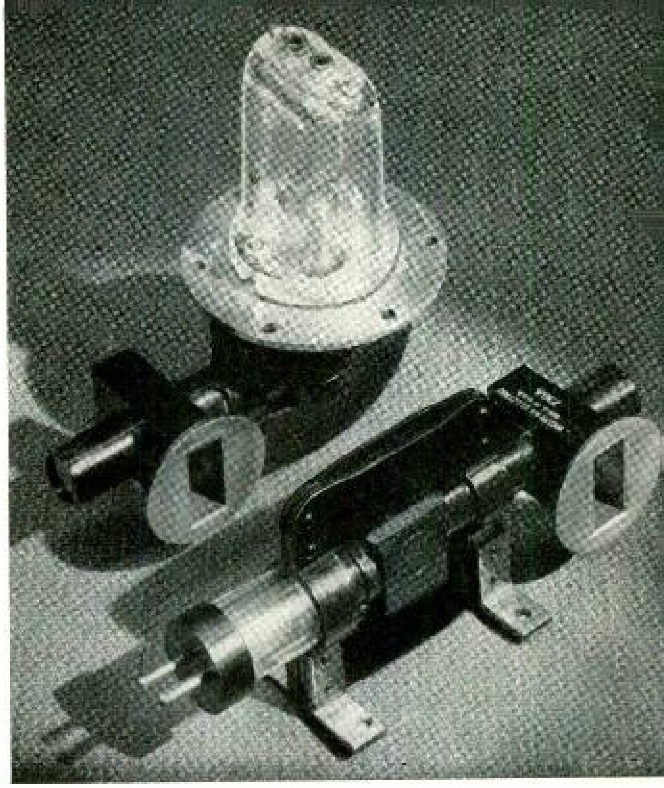
The Laboratories is gratified that it was able to play a helpful part in getting treated reels promptly to the fighting fronts. We may also expect that in years to come the natives of Malaybalay or Zamboanga will be seen seated in front of their nipa hut about a circular table, marveling over the remarkable lasting properties that make it defy tropical rot.

Half-buried wooden reel lags under test at Chester, New Jersey

THE AUTHOR: GEORGE Q. LUMSDEN was graduated from Cornell University with the B.S. degree in 1922. The following year he received the degree of Master in Forestry at the same institution. That year he joined the Engineering Inspection Department of the Western Electric Company to work on timber products. In 1927, when the Outside Plant Development Department was established, he transferred to that Department. Studies of timber products and their preservation, especially new preservatives and field trials of them, have since then occupied most of his time.

The Multi-Cavity Magnetron

A High-Frequency Power Generator for Radar



Western Electric 725A and 730A. Three-centimeter magnetrons using external magnets. The 725A magnetron was used widely in Navy airborne radars and the 730A in Army radars during the bombing of Japan

THE superiority of United Nations radar was due in large measure to success in outdistancing the enemy in the utilization of wavelengths of less than 50 centimeters—popularly known as "microwaves." These very short waves provided the narrow beams, accuracy and target discrimination needed in precision fire-control and bombing. Early radars operated on waves more than a meter in length; progress toward shorter waves was severely limited by the absence of means for generating them at the high-power level that is required.

Then came the multi-cavity magnetron which could generate powerful pulses of waves in the centimeter region. It made possible the reduction of operating wavelengths to 10 centimeters and by the end of the war to well under 3 centimeters. The development and perfection of this type of tube in Britain and the United States was therefore one of the outstanding engineering feats of World War II. In that work the Laboratories played a leading part, particularly in developing the tube to operate at the higher frequencies that were desired and in adapting it to large-scale production.

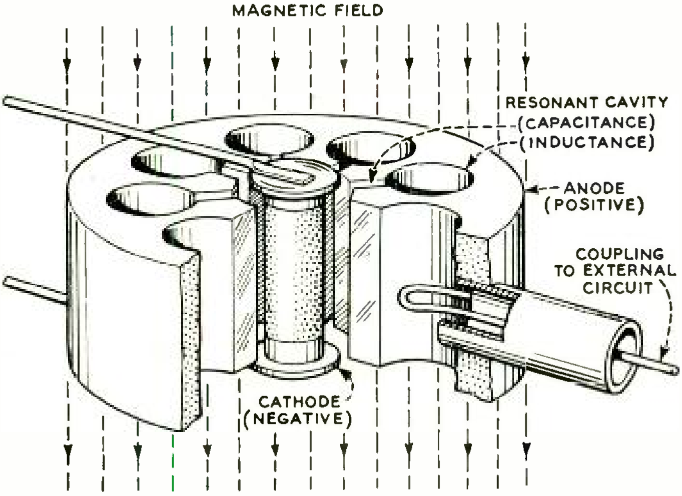
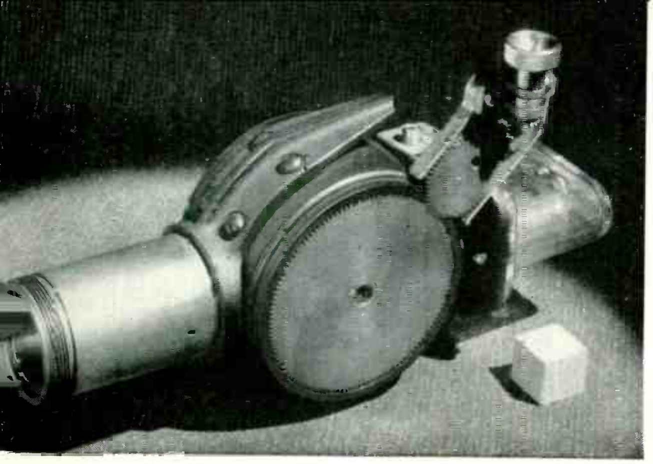
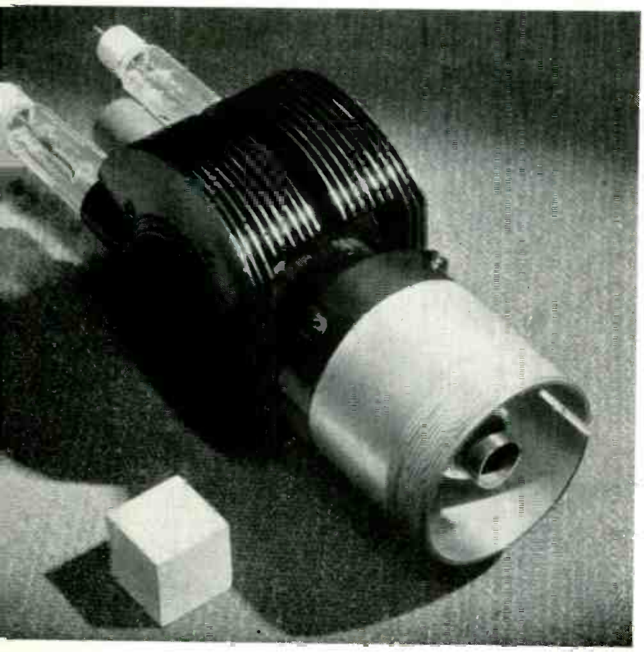


Fig. 1—The magnetron embodies within its envelope a complete transmitter except for power supply and antenna

The multi-cavity magnetron embodies within a single envelope a complete radio transmitter except for power supply and antenna. The inductance and capacitance which constitute the oscillating circuit are supplied by resonant cavities, as shown in Figure 1. The inductance is centered mainly in the wall of the circular portion of the cavity and the capacitance in the walls of the slot. Each cavity, therefore, behaves like an inductance and a capacitance connected in parallel; the combination oscillates at a frequency which depends on the dimensions of the cav-

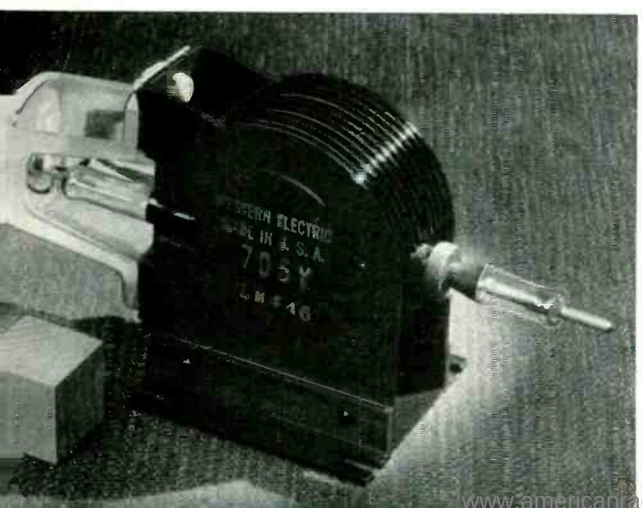


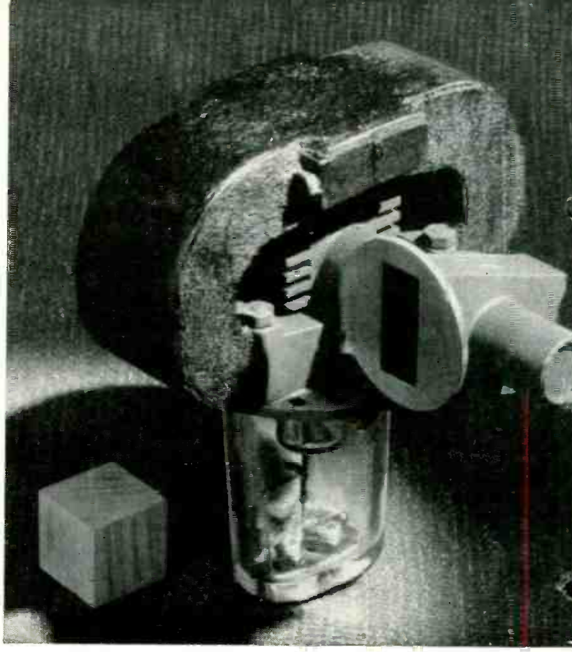
A thirty-centimeter high-power tunable magnetron (Western Electric 4J51)



A ten-centimeter high-power magnetron (Western Electric 720A) with concentric line output connection

A ten-centimeter low-power magnetron (Western Electric 706Y)

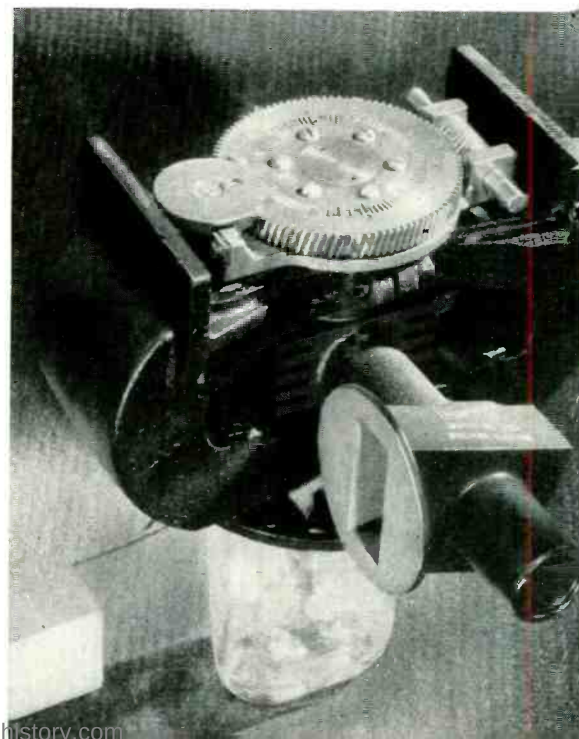




A three-centimeter wavelength magnetron (Western Electric 2J55) with integral magnet and wave-guide output connection

(To indicate relative sizes, a one-inch cube block is shown with these magnetrons)

A three-centimeter magnetron (Western Electric 2J51) with integral magnet and tuning gear (shown at the top)



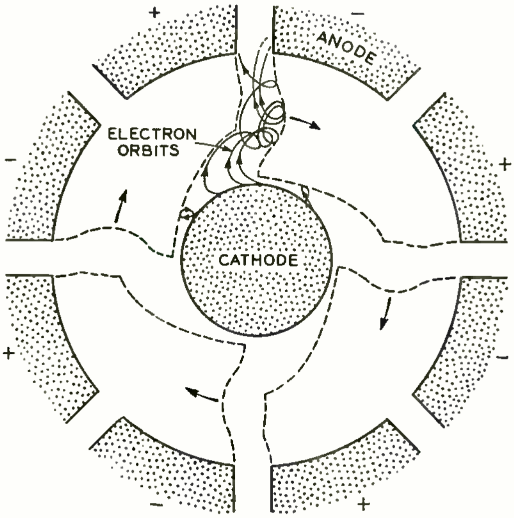


Fig. 2—Calculated configuration of space charge clouds in a magnetron. Curved lines represent electron paths as viewed by an observer travelling with the cloud. Based on the British Committee on Valve Development CVD Report, No. 41

ity and is the operating frequency of the tube. When the tube is in operation, electrons from the oxide-coated cathode circulate past the slots in such a way as to induce oscillating currents around the walls of the cavities. Through a coupling device in one of the resonators, the high-frequency energy is conducted into an output circuit and fed to an antenna through either a concentric cable or a wave guide.

The exact process whereby the electron stream interacts with the cavities to set them in oscillation is too complex for full description in this article, but the broad features may be seen from the following considerations. The electrons are pulled toward the anode by the positive potential; they are also swept sideways around the cathode by the magnetic field which acts downwards, see Figure 1. Under the combined action of the electric and magnetic fields, the electrons are driven along curved paths across the front of the slots. Some of the electrons are swept back to bombard the cathode and this results in the emission of more electrons, a factor which contributes greatly to the very large currents which are drawn from the cathode. Other electrons strike the anode and so pass out into the plate circuit.

For each resonating cavity, one wall of the slot (plate of the resonating capacitance) is always electrically positive when the other is negative. Also the potential between the walls of a particular slot is at any instant the reverse of that for the adjacent slot. As the electrons approach a region of negative potential, they are repelled and slowed down while those behind approaching a positive potential are attracted and speeded up so as to close in on those in front. Thus the electrons do not proceed as a uniform stream, but collect into clouds so as to produce a pattern like the spokes of a revolving wheel in which the spokes represent maximum concentrations of electric charge as shown in Figure 2. Each revolving cloud constitutes a surge of current which induces a corresponding surge of current around the walls of a cavity as it passes by. Phase relationships between the electron clouds and the resonating cavities are such that there is a net transfer of energy to the cavities.

In magnetrons used to produce radar pulses, the voltage is applied and the tube

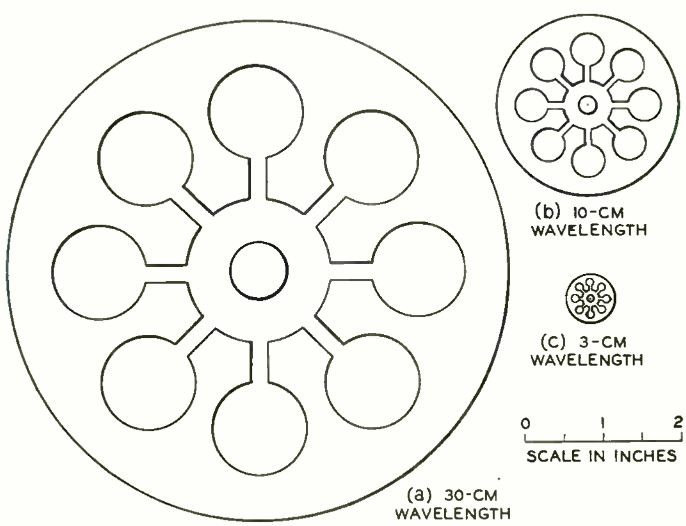
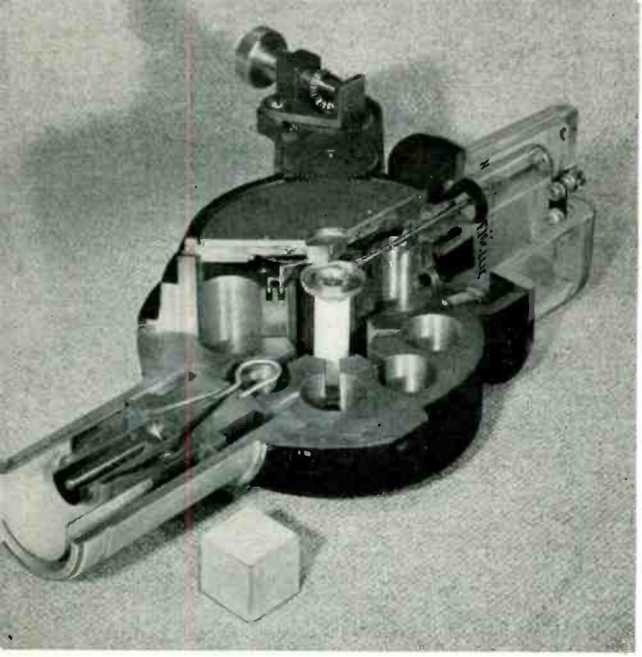


Fig. 3—Relative size of electrode systems in 30-, 10- *and* 3-*centimeter magnetrons*



Cut-away model of the Western Electric 4J51 showing complicated internal structure

oscillates for only a few microseconds at a time, during which the cathode delivers many times the current level normal in other uses. Between pulses the tube remains idle for several hundred microseconds, during which heat is conducted away by the metal enclosure. It is therefore able to generate for short periods enormous amounts of power relative to its size. One high-power L band magnetron delivered 6 microsecond pulses of 1,000 kw with a current of 60 amperes and a plate potential of 30,000 volts.

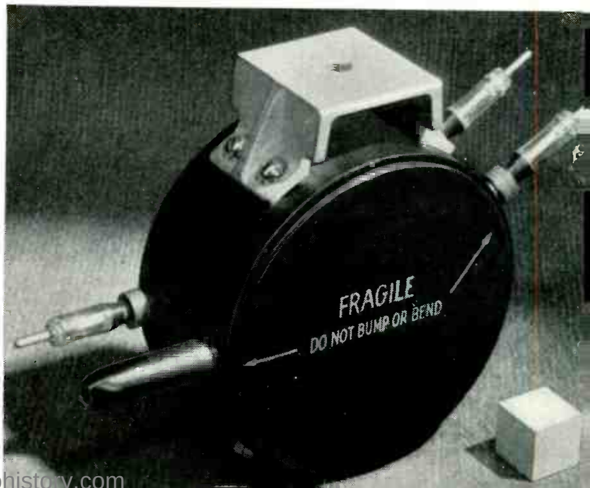
Why a magnetron is a more favorable device for generating high-power energy at higher frequencies than the conventional vacuum tube appears from the following considerations. As is well known, the higher the frequency of operation of a circuit, the smaller the circuit elements become. This is also true of vacuum tubes. By the time that a conventional tube has been made small enough to operate in the centimeter wave region, it is too small to have any power-generating ability. Another consideration is that the time of travel of the electrons from the cathode to the plate needs to be reduced as the frequency of oscillation rises. Transit time can be decreased by employing smaller distances and higher voltages. But in a triode the combination of higher voltages and the smaller spacings becomes impractical at centimeter-wave frequencies.

In a multi-cavity magnetron the frequency-determining elements are provided by the electrodes inside the vacuum envelope. Moreover, the transit time of the electrons does not limit the operation of the magnetron in the same manner as in a triode. Using the magnetron principle, it is, therefore, physically possible to have structures of sizes which are able to oscillate in the centimeter wave region and also able to generate considerable power.

Even so, the magnetron is itself no exception to the rule of decreasing size with increasing frequency of operation, as may be seen from Figure 3, which illustrates the relative sizes of the cathodes, anodes and cavities for wavelengths of 30 cm, 10 cm and 3 cm. Thus for the magnetron as for the triode there is an upper limit on the frequency of operation beyond which it is no longer a practical device. The magnetron, however, has the advantage of taking off from a higher frequency base than the triode. There is no inherent reason why a magnetron should not be used at low frequencies, except that the resonant cavities would be of unwieldy size. In practice triodes are advantageous down to approximately 45 cm and magnetrons for shorter wavelengths.

A limitation on multi-cavity magnetrons that should be noted is that they are essentially fixed-frequency devices and are not adaptable to tuning over as wide a band of frequencies as triodes. This comes about because the frequency-determining elements are inside the vacuum envelope and it is difficult to make extensive changes in

The first magnetron produced by the Western Electric Company. This is the 700A operating at 45 centimeters



Members of the Laboratories who contributed to the development of magnetrons under the leadership of J. R. Wilson and J. B. Fisk

T. Aamodt	J. E. Clark	F. B. Henderson	V. L. Ronci
A. J. Ahearn	L. M. Field	W. Knoop	R. Rudin
H. W. Allison	R. D. Fracassi	J. P. Laico	J. C. Slater
C. J. Altio	M. S. Glass	J. B. Little	H. W. Soderstrom
D. P. Barry	H. Griest	C. Maggs	F. W. Stubner
F. H. Best	H. D. Hagstrum	J. A. Miller	N. Wax
C. Blazier	D. A. S. Hale	G. E. Moore	H. G. Wehe
B. B. Cahoon	P. L. Hartman	A. T. Nordsieck	A. E. Whitcomb
C. J. Calbick	W. B. Hebenstreit	J. G. Potter	C. M. Witcher
P. P. Cioffi			L. A. Wooten

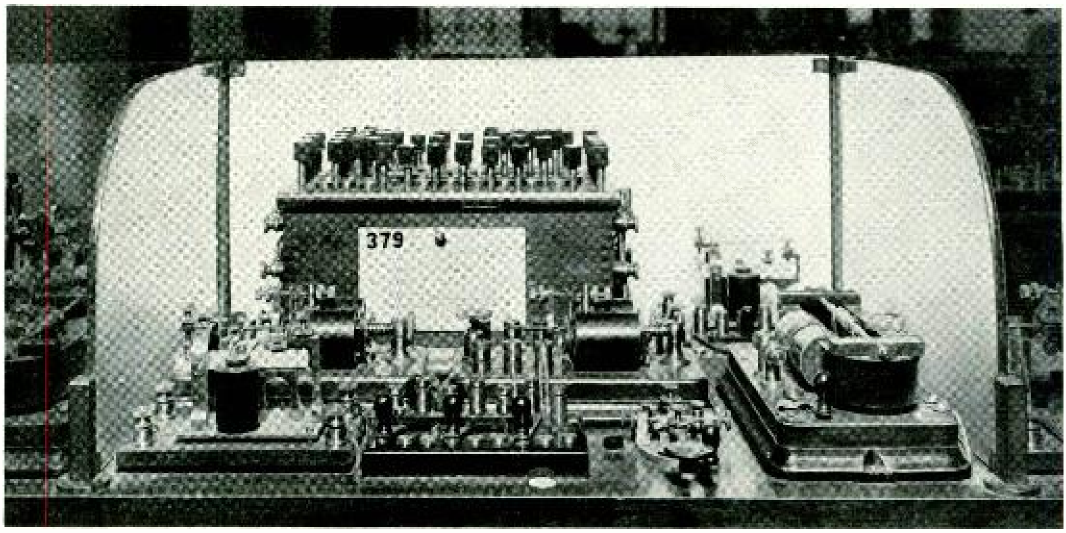
the capacitances or inductances. However, limited tuning adjustment through vacuum seals has been incorporated in several magnetron designs.

The properties of magnetrons and resonant cavities were known long before the war. In Great Britain the multi-cavity magnetron underwent intensive development for radar. A model was brought to the United States in October, 1940, and was duplicated at Bell Telephone Laboratories in about one week, a tribute to the wide knowledge and experience in the electronic field of telephone scientists and the facilities of their laboratories. Almost immediately additional models were made available to the Laboratories' engineers, who were working on radar for the Army and Navy, and to the Radiation Laboratory of the National Defense Research Committee which was then getting under way.

A sizable development group of physicists, electrical engineers, mechanical engineers and chemists was organized to study the tube and exploit its possibilities. Throughout, the Laboratories worked in close coöperation with the Western Electric, whose long experience, not only in tube manufacture, but also in the mass production of precision parts, paid a rich dividend. There had to be means of brazing vacuum-tight joints in the metal enclosures without introducing damaging impurities. There had to be large-scale production methods for machining the electrodes to meet the critical tolerances on the frequency-controlling dimensions of the resonant cavities, especially with the tiny cavities required for the shorter wavelengths. (See Figure 3.)

The first magnetron to be used in a centimeter-wave radar system by our Navy for fire-control was the Western Electric 700A, which was employed in the famous night engagement of the cruiser *Boise* and several other ships off Savo Island when six Japanese warships were sent to the bottom.* In all, seventy-five Western Electric coded designs were developed, ranging from 45 cm to less than 3 cm, and from 10 kw to more than 1,000 kw.

*RECORD, *May*, 1946, *page* 201.



Early Bell System Polar Telegraphy

By B. P. HAMILTON
Systems Development

WITH polar telegraph systems, a polarized relay is used for receiving instead of the neutral relays of the systems previously described.* A polar relay has no retractile spring; the armature is moved one way or the other, depending upon the direction of the current through the winding. If such a relay were connected to one end of a telegraph line, sending at the other end would be accomplished not by opening and closing the line but by applying alternately positive and negative battery. In this case the impedance of the circuit remains the same for the marking and spacing conditions. Also the transmission of current for spacing gives the effect of increased voltage, thus increasing the operating margin of the relay without increasing the current in any part of the circuit or without increasing the potential with respect to ground which is applied to any part of the circuit. Such a system has the additional advantage of an operating symmetry in that the shape of the current wave for the transition from a marking signal to a spacing signal is identical to the shape of the current wave for the space-to-mark transition. Changes in line characteristics thus have the same effect on both marking and spacing pulses, and the relative lengths remain much more stable. Moreover, with the polar relay, the force on the armature is more nearly directly proportional to the current through the winding, and thus variations in current are not magnified in their effect on relay operation as they are with the neutral relay.

Polar systems were already in use by the telegraph companies, having been developed in connection with a system of duplex telegraphy that permitted messages to be sent simultaneously in opposite directions on the same wire. A simplified schematic circuit of an arrangement such as that used by the Bell System is shown at A in Figure 1. This circuit, referred to as the bridge polar duplex, consists of a balanced Wheatstone bridge type of circuit at each station. The windings of the receiving polar relay replace the galvanometer of the ordinary bridge circuit. The line and distant bridge network replace one arm of the bridge and the artificial line replaces the corresponding arm. The other two arms are represented

*Record, *November*, 1945, *page* 419.

by the fixed branches containing inductance and resistance. The send relay armature controls the polarity of the battery connected to the bridge. When the artificial line is adjusted to balance the actual line plus the distant network, it is evident that the operation of the send relay armature will cause no current to flow in the receiving polar relay at the same terminal. It will, however, cause a reversal of current in the windings of the distant receiving relay. The relations are shown more clearly in Figure 2, which represents the circuit as seen from the west terminal. There is a steady current through the west receiving relay which is caused by the east battery. This current will hold the armature of the relay to the marking contact.

If the west terminal starts to send, operating the west sending relay to make the west battery alternately positive and negative, it will have no effect on the west receiving relay. Thus with the two bridges balanced, each station has control over the receiving relay at the other station, but no control over its own receiving relay. It therefore follows that the two stations can transmit telegraph messages to each other simultaneously without interference.

Another form of polar duplex called

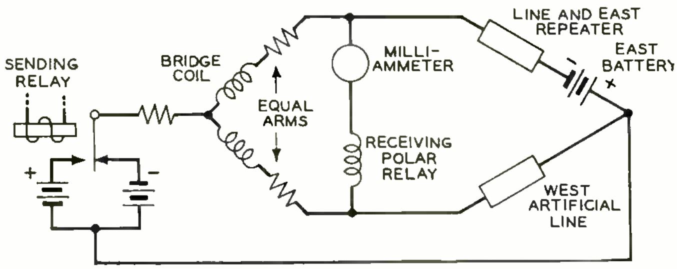


Fig. 2—In the bridge-polar system, simultaneous transmission in both directions is made possible by a bridge type of circuit with the transmitting and receiving circuits connected to conjugate points

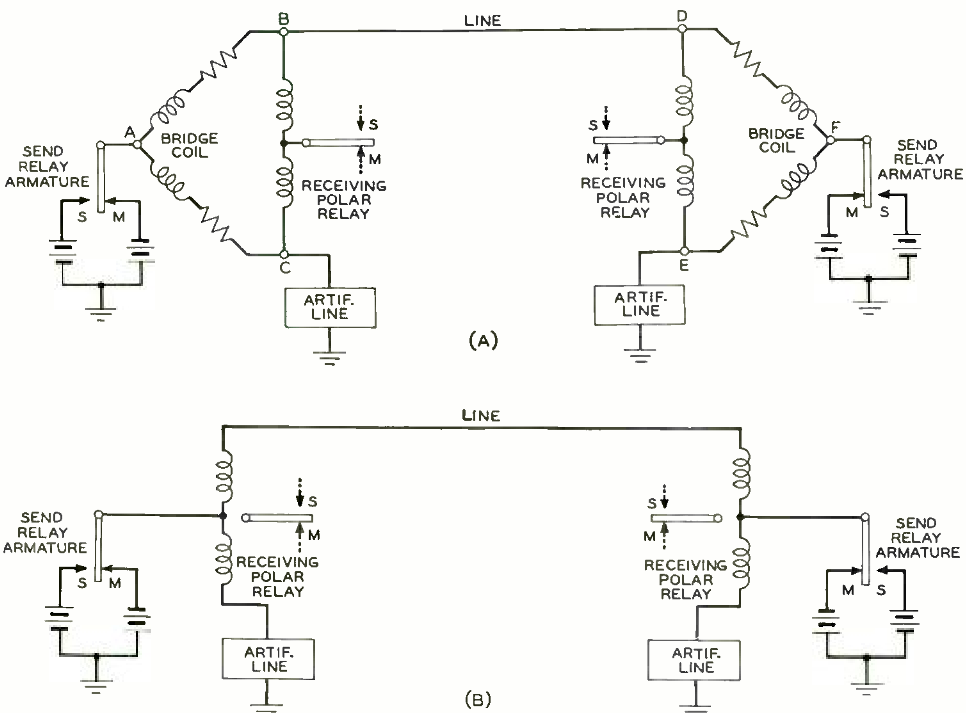


Fig. 1—Polar transmission uses positive and negative pulses passed through a bridge circuit as at A, or a differential relay circuit, as at B

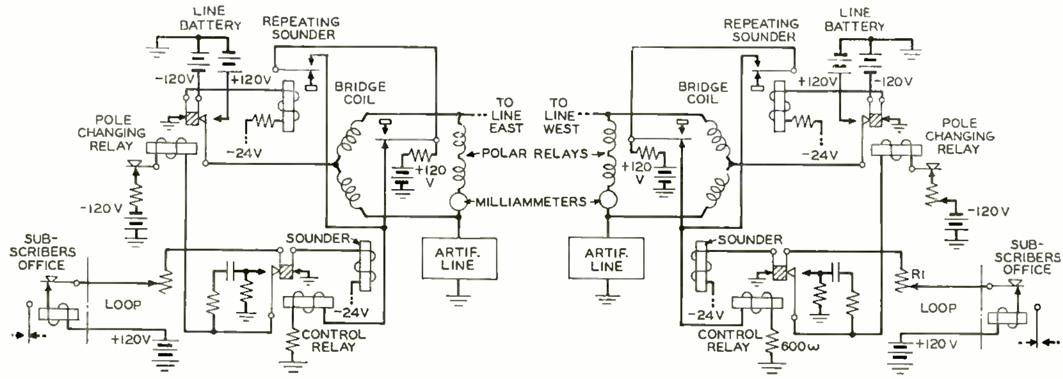


Fig. 3 (above)—A half-duplex system is like the full-duplex system in its transmission features, but provides means for the operator to break transmission from the other end and to send from his end

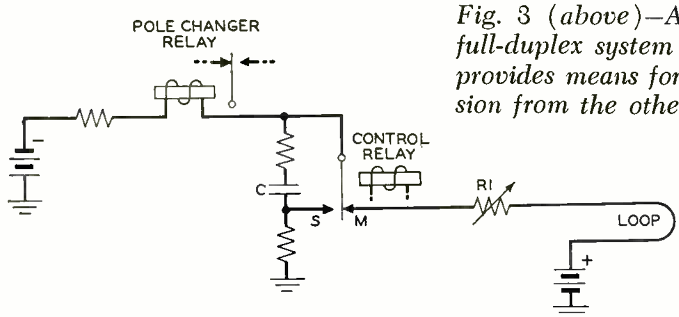


Fig. 4 (left)—With the half-duplex system, a holding circuit is required to prevent the incoming signals from affecting the sending relay

the differential polar duplex is illustrated at B of Figure 1. With it, a balanced winding on the receiving relay combines the function of both bridge coil and receiving relay. Although both systems are employed, the bridge system was the first system to come into extensive use in the Bell System.

With the telegraph companies, polar duplex was apparently adopted primarily to make fuller use of the line facilities. Two loops were employed at each terminal—one for sending and one for receiving. This type of service, known as full duplex, was not particularly suited to the majority of the private-line customers of the Bell System. In a few cases full duplex service was desired and was therefore furnished, but most of the early private-line service consisted in handling market orders or other similar transactions, and only one operator was employed at each end. While transmission was required in both directions, it was in only one direction at a time, and it was necessary that the receiving operator be able to interrupt transmission at any time, as, for example, to ask for a verification. The Bell System, therefore, adopted the polar duplex, not primarily to secure the advantages of simultaneous transmission in both directions, but to secure the improvement in transmission given by the polar system. For the most part, therefore, a half duplex system was used, which permits transmission in both

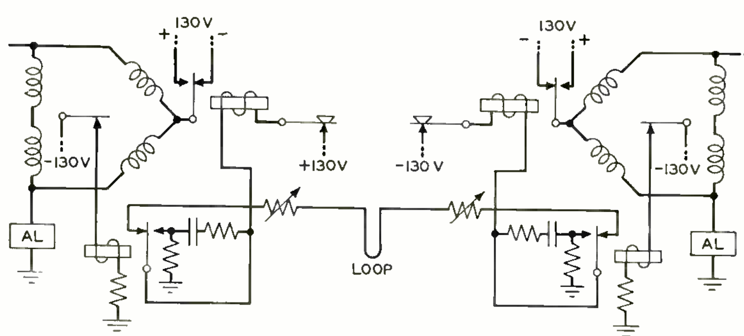


Fig. 5—Repeaters for polar-duplex systems may be formed by connecting two polar terminals face to face

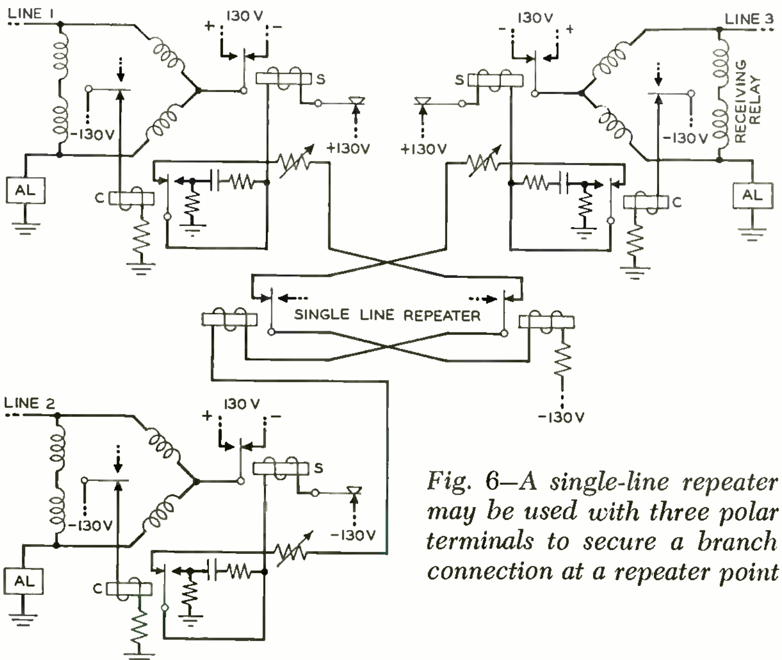


Fig. 6—A single-line repeater may be used with three polar terminals to secure a branch connection at a repeater point

directions, but not simultaneously. This latter system is like the full duplex in all essential transmission features, but differs in incorporating a "break" feature that permits the operator who is receiving to interrupt the transmission, and to send from his end. This form of service, in so far as the operators themselves are concerned, is just like the single-line telegraph used for the private-line circuits of the Bell System from the first. As a matter of fact, the subscriber loops continued for a time to be operated on a neutral basis; the polar duplex equipment was in the central office, and only over the inter-office trunks was the transmission polar.

A half-duplex system is shown schematically in Figure 3. When east is sending, neutral signals from the subscriber's station pass through a front contact of the control relay, which is held closed by the steady marking signal from the west terminal, and operates the pole changing relay. This changes the potential applied by the east terminal as the relay operates and releases without affecting the receiving circuit at the east terminal. When west sends—the east loop being closed—the positive and negative voltages impressed at the west terminal operate the east receiving relay, which in turn operates and releases the control relay, thus sending closed and open pulses over the subscriber loop.

To prevent the pole-changing relay from acting under the influence of these pulses, a holding circuit is employed. When the armature of the control relay is on either its back or front contacts, current flows

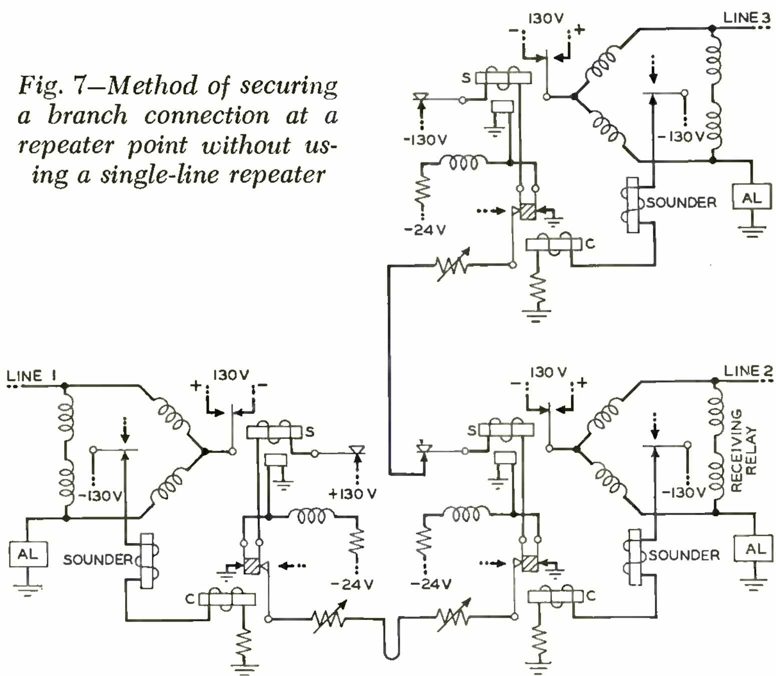


Fig. 7—Method of securing a branch connection at a repeater point without using a single-line repeater

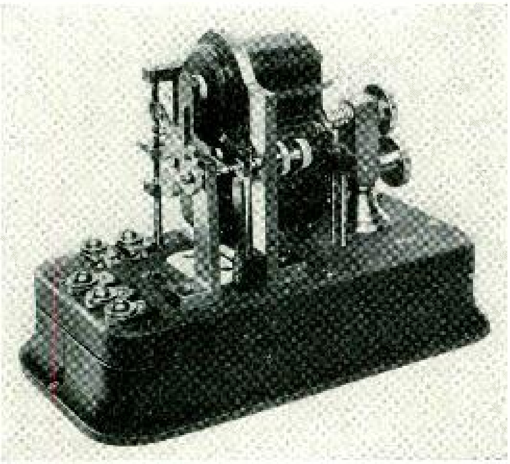


Fig. 8—Neutral pole changer relay for the three-way bridge polar duplex set

through the winding of the pole-changing relay and holds the relay operated. With the armature of the control relay on the front contact, current through the pole-changing relay flows over the subscriber's loop, and with the relay on the back contact, it flows through a resistance to ground. When the armature is between contacts, however, the pole-changing relay would release were it not for the condenser of the holding circuit. The action of this holding circuit may be more clearly seen in Figure 4. When the armature of the pole-changing relay is on either the mark or space contacts, the condenser is discharged. With the armature on the space contact, this is because of the direct short circuit across the condenser and resistance; with the armature on the mark contact, it is because the positive current flowing over the loop and adjustable resistance R1 results in approximately ground potential on the armature, which is connected to one side of the condenser, while the other side of the condenser is connected to ground through another resistance. While the armature of the control relay is in transit between its contacts, current through the winding of the pole-changing relay is maintained by a charging current flowing through the condenser. By these means, current through the pole-changing relay is assured at all times. This feature is not required for the full duplex system, because with full duplex, the sending and receiving local circuits employed are completely independent of each other.

Another feature of the half-duplex system is that which is required to enable the receiving operator to interrupt and then send. This includes a repeating sounder and auxiliary contacts on the pole-changing relay. If, while east is receiving, for example, he wishes to interrupt or "break," he opens his key. This releases the pole-changing relay at the first subsequent marking signal from the west. As a result, the repeating sounder is released, thus holding the control relay operated by shorting the contacts of the receiving relay, and a continuous spacing signal is sent west to interrupt the sending. The repeating sounder is required because for many lines the time required for a signal to pass from one terminal to another is much longer than the duration of a pulse, and before the spacing signal can arrive at the west terminal, a series of spacing and marking signals would be received at the east terminal, which would release and operate the east control relay, and thus with the subscriber's key, when it was open, would send a series of reversed signals to the west instead of the desired spacing signal.

Since single-line repeaters cannot be

THE AUTHOR: B. P. HAMILTON was graduated by Columbia University in 1913 with the E.E. degree. He taught there for two years and then joined the Engineering Department of the American Telephone and Telegraph Company in 1915 to work on equipment design and later on field tests of high-frequency and voice frequency carrier telegraph systems. Mr. Hamilton's work has also involved development problems in connection with the Key West-Havana submarine cable and transcontinental carrier telegraph systems. Since 1930 he has been engaged in developing voice-frequency carrier telegraph systems and applications of these systems to carrier telephone channels.

used for true polar duplex transmission, two polar-duplex sets were used at intermediate repeater points, Figure 5, arranged for half-duplex transmission. At repeater points, however, it is frequently desirable to add in a third-line circuit. This was at first done by adding a single-line repeater to connect to a third duplex set as shown in Figure 6, where the holding circuits for the single-line repeater are omitted to simplify the diagram. To avoid the necessity of using a single-line repeater, development was started in 1912 that resulted in the improved three-way polar duplex set shown in Figure 7. This set uses an auxiliary holding coil on the pole-changing relay to replace the former condenser holding circuit, and permits connecting the local circuit of three or more polar-duplex sets in series without using single-line repeaters.

These various types of terminals and transmission circuits were all in use by about 1915, and with various improvements have continued in use to the present day where conditions rendered them suitable. Changed conditions, new developments, and more severe service requirements, however, have resulted in a number of different systems since then, and although these earlier systems are still in limited use, the bulk of the telegraph traffic is now handled by different methods. These will be described in a forthcoming issue of the BELL LABORATORIES RECORD.

Radio Relay System Between Chicago and Milwaukee

TELEVISION pictures originating in Chicago will be carried to Milwaukee via a new Bell System microwave radio relay circuit scheduled to begin operation in the spring of 1947.

The Laboratories, the Long Lines department of the American Telephone and Telegraph Company, and the Wisconsin and Illinois Telephone Companies are at present preparing to establish the relay system which will transmit on frequencies around 4,000 megacycles. Tests have already been made to obtain information on transmission along the chosen route.

Since microwaves resemble light in that they travel substantially in straight lines, a combination of high towers and hilltop locations are usually necessary to assure an uninterrupted path between antennas located miles apart. Portable aluminum towers 104 feet tall, built of short sections which could be assembled and erected in a few hours, were used to try out possible hilltop sites. To these were attached parabolic "dish" antennas which could be hoisted by a winch to the various testing elevations (see front cover).

The completed system will have three 100-foot steel antenna towers at intermediate points. The terminal antennas will be on the roofs of the telephone buildings.

Preparing for test operation—W. L. Miller of Long Lines holds the antenna guide ropes with which he will point the "dish" toward the distant transmitter, while W. F. Evans, Jr., left, of the Laboratories, sits beside a wavemeter to check frequency. Center, about to turn the hoisting winch, and left background, jotting notes, are other Long Lines engineers

Government Designations

By WILLIAM STUMPF
Apparatus Staff

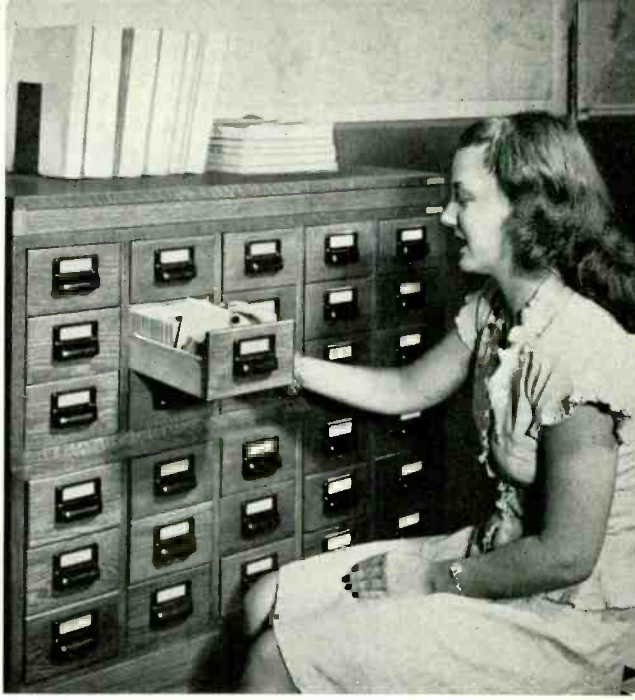
AFTER five years of war and preparation for war, such cryptic words as Mark 4, M-9, SCR538 have a familiar sound to most Laboratories people. On each development job, it is necessary to secure from the Government some such designation for each major unit and for each replacement part. The proper identification of all replacement parts is a matter of vital importance in maintaining the apparatus in the field, and the Army and Navy have rightly insisted that all parts for their stocks be unambiguously identified by Part Numbers that they themselves assign. The same units may be produced by a number of widely scattered manufacturers; if Army and Navy tried to use the manufacturers' own designations, confusion would result. To interchangeable units of apparatus or interchangeable parts for the same apparatus the Armed Forces thus assign single designations regardless of who the manufacturer is that makes them, so that they can be ordered, stocked, and always referred to in the same way.

The photograph at the top of the page shows the group engaged in preparing technical descriptions of apparatus for obtaining Signal Corps Stock Numbers and in disseminating the numbers obtained to our engineers.

Before the Laboratories turns any new design over to the Western Electric Company for manufacture, it must obtain a Government designation for each major unit of the system and for each replacement part. These designations must always be shown on the packages or shipping containers, and in some instances they must be marked on the parts themselves. They must also, of course, appear in instruction books and parts lists or wherever the apparatus or part is referred to.

Different types of designations are employed by the various branches of the services. Thus the Navy Bureau of Ships uses Navy Model Designations for major units and Navy Type Numbers for replacement parts, while the Navy Bureau of Aeronautics employs Navy Stock Numbers for both major units and parts, and the Navy Ordnance Department uses Part Numbers. The Army Signal Corps and Army Air Force, on the other hand, use Signal Corps Nomenclature and Stock Numbers for the major units, and Signal Corps Stock Numbers only for the replacement parts. For some items, several of the services also employ Federal Standard Stock Catalog Numbers. What are known as JAN (Joint Army and Navy) designations have also come into use lately for complete sets of equipment, for major units of such a system, and for standard component parts.

Not only do the types of designations differ widely among the various services, but the methods of procuring the designations also differ. In all cases the Laboratories must prepare for each branch of the Armed Services a separate description of the electrical and mechanical characteristics of the part or unit and of its function, and in addition must show the contractor's name and Part Number and the actual manufacturer's name and Part Number. Each description must also include references to the system or major unit with which the apparatus is associated, and also the Government order or contract number. For some branches of the services, such as the Bureau of Ships, an outline drawing must also be prepared to accompany the request for the assignment of a designation.



Dorothy Benda scanning the cross-reference card file for Signal Corps Stock Numbers

Harry A. Doll at Whippany checking card file of the Government Designations Group for Navy Type Numbers of apparatus on a spare parts list

To secure all the designation numbers needed for the steady stream of new devices developed by the Laboratories, to see that they are made known to all the groups who will use them, to embody them in the catalog of Government designations issued by the Apparatus Development Department, and to maintain suitable records of them so as to avoid duplication, was a major undertaking which was centralized in the Government Designations Group of the Apparatus Development Department. To obtain the requisite data for the apparatus descriptions and outline drawings, it was usually necessary to study and analyze all of the manufacturing drawings and specifications prepared for the project, and frequently to communicate with or visit the plants of sub-contractors and other manufacturers.

These outline drawings must include overall dimensions, schematic diagrams, all information as to electrical and mechanical characteristics, and also the Western Electric Company's designation for the unit or part. After a Navy Type Number has been assigned, the Type Number is added to the drawing and will thus appear in all subsequent issues.

With such a very large number of parts already coded, and with a constantly in-

Part of the group that prepares, issues and distributes the outline drawings

creasing variety of both apparatus units and component parts, it would be easy for duplications to appear. To avoid such situations, a cross-reference card file is maintained by the Government Designations Group of all the various designations that have been assigned. This is referred to before any applications for designations are made. Although considerable work is required to maintain such a card file and in referring to it before asking for additional designations, it is essential to the efficient application of designations.

There has been only limited cross-referencing by the Government of the identifying numbers used by the various branches. A single Government designation or catalog number to be used by all branches of the Army and Navy for a piece of apparatus would greatly simplify this cataloging and reduce the work required of contractors and manufacturers. It would also facilitate the maintenance of equipment in service, since all branches of the Government would thus have the same Part Number for a piece of apparatus required for replacement. A Federal committee, with representatives from the Army, Navy, and Treasury Department, has been formed to devise such a plan.

THE AUTHOR: WILLIAM STUMPF joined the general information service group of the Western Electric Company's Engineering Department in 1916. Here he was placed in charge of the catalog files and the display of development models and samples of competitive apparatus. During this time he studied at Cooper Union and received a B.S. degree in Electrical Engineering in 1921. From 1922 to 1928 he was in the Commercial Relations Department and then transferred to the Western Electric Company at 195 Broadway to prepare information and bulletins for the use of distributors. Late in 1928 he joined Electrical Research Products, and for the next ten years was in charge of production planning, purchasing, and field inspection of apparatus for recording studios and theaters. In 1938 he returned to the Commercial Relations Department of the Laboratories and was occupied in preparing spare parts lists of Government equipment. In 1941 Mr. Stumpf was placed in charge of the Government Designations Group of the Apparatus Development Department.

An address to the Laboratories' recently opened school for

Telephone Switching

by A. B. Clark, Vice President & Director of Systems Development

WE ARE giving this telephone switching course at this time because many men like you, new in the switching business, or rusty because you have just returned from war work, must receive training very promptly so that you can do your part more effectively in the very important switching development job which is ahead of us. We believe that you can be indoctrinated in the principles and practices of switching more rapidly by this course of formal training than by means of any other method.

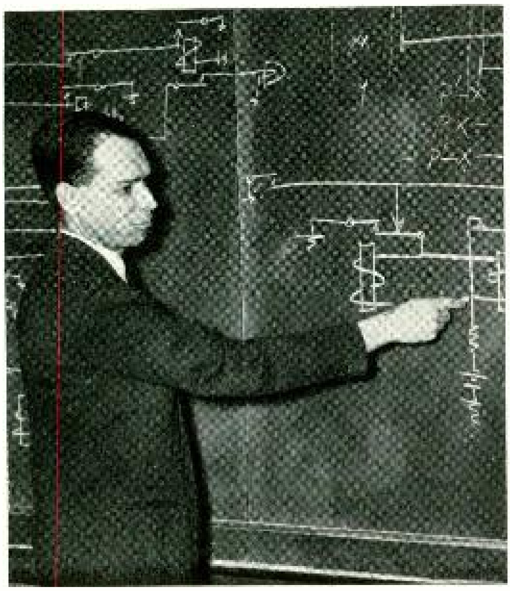
There are other reasons why we are giving this switching course. One is that the war got us into the teaching business, and the results were striking and gratifying. The Bell Laboratories' School for War Training started in April, 1942, and lasted until September, 1945, and during this period gave instruction to more than 4,000 students. The courses covered a variety of subjects—radar, radio, fire control, training of airplane crews, and some secret telephone jobs. Graduates served in all theaters and in all branches of the Armed Services.

We are proud of what the school did to help win the war, but this is not the reason for bringing the subject up now; rather, it is because the School for War Training did two things for us: it impressed us with the great value of formal training; and it developed some very fine teachers. One of the most successful teachers and administrators in the School was John Meszar, who now heads our Telephone Switching Course. He will have on his staff two other very able veterans of the School for War Training: William Keister and A. E. Ritchie. Both of these men taught in the School for War Training for several years. During those years, Mr. Keister developed a "knack" for delivering a most interesting lecture or demonstration on any subject from Ohm's Law to Electromagnetic Wave Propagation. Mr. Ritchie in turn stood out by his precise and clear-cut presentations of some very complex electronic subjects.

We would not have ventured to proceed with this switching course on the short schedules we have been forced to set up had we not had the experience of the School for War Training behind us and, even more important, these men, who played such a prominent part in the School.

We have with us another man, A. E. Joel, who completes the switching staff. Switching has been an avocation of Mr. Joel's beginning with his high school days, and as a result his knowledge of the switching art is very extensive. He has many times ex-

John Meszar



William Keister

pressed dissatisfaction with the apprenticeship method of learning switching. He thinks it should be possible to impart the principles of switching to new men much more rapidly and also much more effectively by a short course of intensive instruction. In this he shares the views of Meszar, Keister and Ritchie. They will now have an opportunity to implement their ideas, and we are expecting that great things will be accomplished. It is your good fortune to be first in having the opportunity of learning the basic principles of switching from them.

A switching system is in many ways analogous to an organization of human beings. Large switching systems or large organizations can be handled effectively only when they are divided into units, each performing a prescribed task. It then becomes possible to direct each unit as if it were a single entity.

In this switching course you will learn about the capabilities and duties of individual relays and other parts useful in switching. You will see how aggregations of relays and other parts can be assembled into units, each able to perform one of the functions necessary to the working of a switching system. You will see how these functional units are given orders and acknowledge them through the medium of communication channels. You will also see how these units obtain information from other units by means of lateral communication channels. You will be given an opportunity to learn a lot about these and other basic principles of switching. However, these will not be presented dogmatically, as something fixed and therefore not subject to improvement. You will be encouraged to suggest sounder approaches to these fundamental principles and also better and more effective methods of presenting the subject.

You will not find complete unanimity among the teachers as to the best methods of attacking a switching problem. For example, some are enthusiastic about the possibilities of Boolean Algebra. Others think that this algebraic method of solving switching problems has quite limited usefulness. I regard this lack of agreement as a good thing; if it does no more, it will help you to develop the very important faculty of critical judgment.

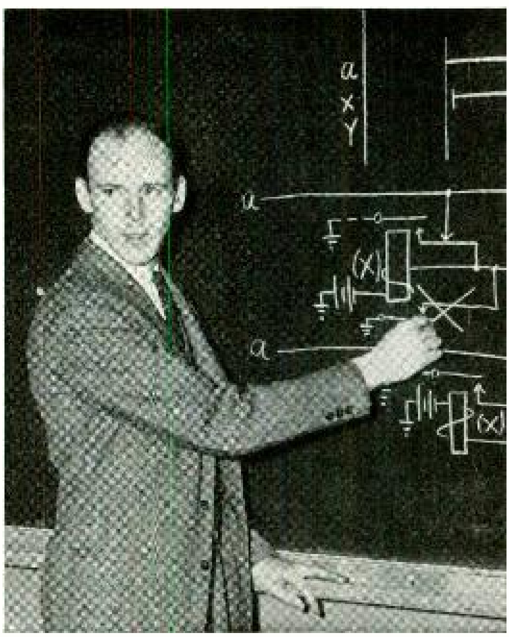
You will be encouraged to develop a constructively critical attitude toward everything involved in switching development. This will, however, in no way detract from proper feelings of appreciation of the work of those who have brought the switching art to its present high state. What we must avoid is smugness of mind, which is bad in any business, and fatal in the business of development.

Interest in switching development will be encouraged because intense interest is a vital and essential characteristic which you must acquire. You cannot be effective and successful if you do not have great interest in what you are doing. This is true, no matter how much or little native ability you may have. Also, without interest in your job, you will have no fun in doing it. After all, your job is a highly important thing in your life, and you must find pleasure in doing it, or you will be apt to miss what ought to be one of your greatest sources of happiness.

Switching is one of the basic necessities of the telephone business. It is the process by which the man who places a telephone call is connected to the person he desires. It will be your job to find ways of establishing these connections more rapidly and more economically, and with even greater accuracy than is now being obtained. You will have an interest in radio and you will find that tying radio into the Bell System plant will introduce many interesting switching problems. It is quite possible that radio actually may some day be called on to help in doing the switching job. Many electronic devices are already being used in switching, and many more will be used in the future. By these and other means, we can look forward to many improvements in our switching plant.

At the present time, the Bell System central-office plant is two-thirds automatic and one-third manual. In the automatic portion, about half the subscribers are served by common-control switching systems, the older ones being panel and the newer ones crossbar. The other half are served in large part by step-by-step systems. From this it will be evident that the pioneering job of changing from manual to automatic operation has been about two-thirds accomplished. Many of the really difficult jobs, however, still remain to be done.

One is to tie all of our telephones into a nation-wide system so that any telephone subscriber in the United States can be reached by direct dialing. In some cases the subscriber will give his toll call to an operator, who will then set up the connection to the desired telephone without the aid of any other operator. In other cases even the long distance operator will not be required. Good basic plans have been laid, but the bulk of the development job still lies ahead.



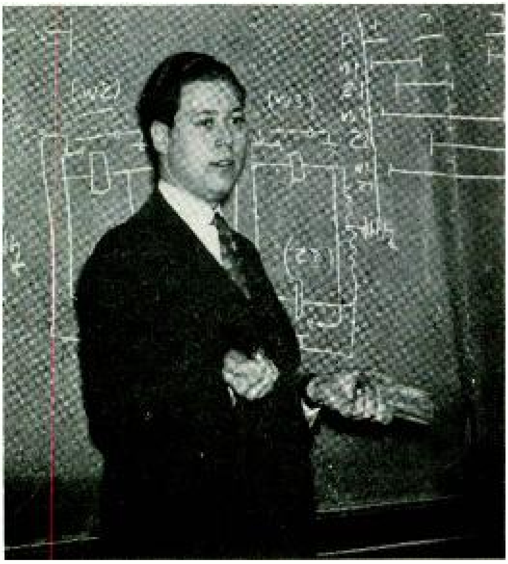
A. E. Ritchie

Another job is to stem the present tide of increasing plant complications, which has been rising higher and higher as the years have gone by. When a new central office is engineered, the circuits in it must be capable of coöperating properly with those in existing offices. In the past, many varieties of central offices, some included in properties acquired by purchase, have had to be integrated into the Bell System plant. In order to avoid costly replacements of the old systems, it has been necessary to complicate some of the features of the new central offices to enable them to connect with these older systems.

It should be your ambition to develop new switching systems, so economical and admirable in their functioning that early replacement of the old systems will become feasible. We would then be really on our way, not only to substantially improving the switching plant, but also to establishing a trend toward simplification. Here then are entirely new fields to conquer.

I would not have you believe that we have not already made some progress toward this goal. One very important result has been arriving at the conclusion that we may some day reach this goal by fully exploiting the possibilities of common control switching. Such a switching system is one in which a telephone subscriber wishing to make a call states the desired destination to a mechanical "brain" contained in the central office. This mechanical "brain" then proceeds to set up the connection, sometimes enlisting the aid of other mechanical "brains" in other central offices near or far away. The manual system was essentially of this type: the operator recording or making mental note of the destination desired and then setting up the connection, sometimes with the aid of other operators at distant points.

The step-by-step system, as used widely in this country, works on an entirely different principle. With this system the sub-



A. E. Joel

scriber's dial guides the setting up of the call, operating one switch for each digit dialed. The process of setting up the call is thus geared to the subscriber's dial.

The step-by-step system has the virtue of simplicity and the many systems now in service attest to its ability to do a good job. However, its very simplicity is a serious limitation when the switching job is difficult, as it is today in large cities, and as it will become much more so tomorrow, when nation-wide dialing becomes a reality. Such difficult jobs demand the use of an electrical brain which can receive and remember a number, lay a plan of action, and proceed accordingly. Moreover, if it finds itself balked when it first attempts to establish a connection, it can revise its plan and set up the connection over an entirely different path or route.

It is, of course, possible to add electrical brains to a step-by-step system, and it then becomes capable of doing such a job. The pros and cons of this system versus other forms of common control switching systems have to do with relative economy and speed of establishing connections, and become too involved to permit further discussion at this time. In general, however, it can be said that the common control used in the crossbar system appears to have many advantages in caring for the requirements of large multi-office city districts and the exchanges in areas near such cities.

The electrical "brains" now incorporated in a modern common control system, such as crossbar, are very fast indeed. They do their required jobs in less than a second, and there is almost no limit to the possibilities of still greater speed. Some of you will, in due course, be helping to produce much faster devices, in which electronic devices will play an important part. Higher speed operation of common control switching mechanisms is very much worth while, offering possibilities both of greater economy, since these mechanisms will then do their jobs faster and hence fewer of them will be required; and of better service, since telephone subscribers will have their connections established more promptly.

Another one of our development ambitions is to some day provide our telephone subscribers with a device which will be superior to the present-day dial, which they can use more conveniently, more rapidly,

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The Author: A. B. Clark, Vice President of the Laboratories and Director of Systems Development, received his B.E.E. degree from the University of Michigan in 1911. Shortly thereafter he joined the Engineering Staff of the A T & T and specialized in transmission. In 1929 he became Toll Transmission Engineer, and with the consolidation of the D & R with the Laboratories in 1934 he continued his responsibility for toll transmission development work as Toll Transmission Development Director. He became Director of Transmission Development in June, 1935. In 1940, when he was appointed Director of Systems Development, he assumed general direction of the switching, transmission, and equipment work of the Systems Department. He was made a Vice President of the Laboratories in 1944, in which capacity he also continues his general direction of the work of the Systems Development Department, which at this time was augmented by the addition of the Outside Plant Development Department.

and with more confidence of having made no error. A push-button device is one attractive possibility. A device which the subscriber can "pre-set" to the desired number and then, after satisfying himself as to its accuracy, flash it to the central office in an instant, is another. The common control method of switching will make it possible to give the subscriber whatever he prefers. Perhaps some subscribers will want one form of device, others another. The electrical "brains" in the telephone central office should be able to satisfy all of the necessary requirements.

With common control, it is not essential that different systems be alike except in the principle of common control. It is not necessary, for example, to continue to use crossbar switches. If a switch superior to the present crossbar type is invented, it can be substituted for the present switch and the overall performance of the common control system will remain essentially unchanged. The same thing is true for the relays and other component parts of the system. This is very important, since it gives free rein to improvement and cost reduction in all elements of the system.

It is desirable that all switching systems use the same codes for transmitting telephone numbers and other information from one telephone office to another in order to set up desired connections. It is also desirable that this system of codes should apply to both local and long distance services, which are becoming every day more difficult to distinguish from each other. Today we have a number of different switching systems in the plant using a variety of signalling codes. So another of our development ambitions is to do away with this "babel" of codes. In deciding what will be the most fitting system of codes for the future, we must consider not only the instrumentalities which are now available, but also those we hope some day to possess.

The many new developments we are planning, and on which you will be working, are not merely minor refinements in an already standardized system. They are fundamental developments designed to equip the telephone system for greater and more extensive usefulness. Although the United States has the highest telephone development of any country in the world, only half of our families have telephones. In contrast with this, three-quarters of the families enjoy electric light, radio sets, or automobiles. These figures are certainly a challenge to our further development efforts.

Long-Span Rural Pole Lines

EXPERIMENTAL trial of the first long-span rural line to carry both telephone and electric power wires is progressing satisfactorily, and indications are that the joint construction method in many instances will prove an economical means of extending telephone and power service to farmers.

The trial is being conducted in the vicinity of Selma, Ala., by the Southern Bell Telephone and Telegraph Company and the Alabama Power Company. Similar trials will be undertaken shortly near Pipestone, Minn., and Webster, S. D., by the Bell System and Rural Electrification Administration coöperatives.

Joint use of poles for both telephone and power wires is fairly common in cities, where the poles are seldom set more than 150 feet apart. More than 6,000,000 such poles are being used jointly by the Bell System and power companies.

Until recently, however, telephone wire suitable for use on the long spans of rural power lines was not available. Now there has been developed a high-strength steel telephone wire that can withstand ice and wind storms even when strung over spans of great length. Concurrently construction, transmission and safety problems peculiar to long-span joint construction have been worked out. The trials are for the purpose of testing these new materials and methods.

In the Selma experiment, the spacings between poles average more than 400 feet, with a few spans more than 500 feet long. The line is approximately 16 miles in length and carries a typical power circuit and three telephone circuits.

President Gifford, at the A T & T
Stockholders' Meeting
on April 27, said in part:

IT IS not without significance that our Annual Report opens with the statement that 'The Board of Directors of the American Telephone and Telegraph Company presents herewith the management's accounting of its stewardship for the information of stockholders, employees, telephone users and the entire American people who have entrusted to private enterprise the responsibility for carrying on this essential national service.'

"There is every reason for the management of your Company to treat equitably each of the three parties concerned, namely, the telephone users, the employees and the stockholders, for in the long run, the interests of these three great groups of people, individually and collectively, are mutual and interdependent.... Well paid employees with steady employment; with opportunities open to all for advancement; and with reasonable protection against contingencies of illness, accident, death and old age is as much to the benefit of telephone users and stockholders as it is to employees. A stable and fair return on the money invested in the business sufficient to attract the new money needed to develop and expand facilities is as good for telephone users and employees as it is for stockholders.

"In short, the aim and responsibility of management is to see that the public receive the most and best possible service at the least cost consistent with good wages and working conditions for employees and a reasonable return for stockholders. . . .

"I could say much about the fact that telephone users have, under the circumstances, had extraordinarily good service during the war years; that, in spite of the fact that the cost of practically everything has gone up, telephone rates have not been increased but, on the contrary, long distance rates have been decreased. I could point out that the stockholders have received their dividends regularly during the war. But today I would particularly like to take pride in the fact that in spite of widespread difficulties throughout the country between management and labor, the managements of your Company and of its Associated Companies in the Bell System have, on the whole, been able to bargain collectively and reach agreements with unions representing the System's hundreds of thousands of employees with relatively little disturbance and misunderstanding. With the best of intentions, I realize it is difficult for management and labor leaders to always be of one mind as to what is fair and equitable, but I see no fundamental reason why, in this particular enterprise, if there is good will and understanding on both sides, the difficulties between management and labor cannot be amicably discussed and satisfactory agreements reached. That this should be so is of vital importance to the public, to the employees and to the stockholders. . . .

"In opening my remarks, I spoke of the position of management in the Bell System. The results over the years could not have been attained without the closest coöperation between management and other employees. I say other employees, for after all management are employees, with different responsibilities, to be sure, but otherwise just the same as the others, only at different stages of their careers. This is especially true in the Bell System. Each one of the Presidents of Bell System Companies—there are 20 of them—started in at the bottom of the ladder and the opportunity for advancement is open to those who are starting at the bottom of the ladder today. I know of no business where teamwork and what we know as the 'Spirit of Service' are so important to success. . . ."

Changes in A T & T Officers

Vice President Charles P. Cooper has been appointed Executive Vice President of the A T & T. He will assist President Gifford in the general overall operation of the business and in coördinating the work of the Headquarters Staff.

Vice President Leroy A. Wilson has been appointed Vice President in charge of finance. He will continue in charge of business research and Bell System Revenue Requirements studies.

Arthur W. Page has resigned as Vice President to take effect on January 1, 1947, when he will open an office in New York as a Consultant. Effective June 1, Vice President Keith S. McHugh is appointed Vice President in charge of the Information Department. Mr. Page has asked that Mr. McHugh take active charge of the Information Department at this time so that he may complete several individual tasks which he has under way. The A T & T has retained Mr. Page as a Consultant beginning January 1, 1947. He remains on the Board as a Director.

Legion of Merit Awards

For outstanding services during World War II, Col. James W. McRae and Lieut. Col. Andrew W. Clement have recently been awarded the Legion of Merit. Citations for the awards are as follows:

Colonel James W. McRae

"Colonel McRae, Signal Corps, Army of the United States, serving in several important capacities in the Office of the Chief Signal Officer from April 1942 to October 1945, demonstrated outstanding technical competence and executive ability which were beneficial in establishing programs in the field of electronics, particularly in the research and development of radar and radar countermeasures."

Col. J. W. McRae Lieut. Col. A. W. Clement

Lieut. Col. Andrew W. Clement

"Lieut. Col. Clement, Coast Artillery Corps, for exceptionally meritorious conduct in the performance of outstanding service during the period December 1941 to January 1946, while a member of the Coast Artillery Board and its successor, the Seacoast Service Test Section of Army Ground Forces Board No. 1. Lieut. Col. Clement displayed outstanding technical ability and judgment in the development, modification and test of radar and other electronic equipment. By his initiative, keen insight into technical and tactical problems, devotion to duty and facility in coöperative action, he made major contributions to the seacoast artillery radar development program."

These former members of the Chemical Laboratories are now serving overseas with the Red Cross. Alice Siegmund (left), the daughter of H. O. Siegmund of the Laboratories, is in India, while Mary Dulany Glenn (right) is in the Southwest Pacific

Posthumous Award to A. L. Thuras

The United States Navy has awarded, posthumously, to Albert L. Thuras, a certificate for Distinguished Civilian Service. An accompanying citation states:

"Albert L. Thuras, while employed as a civilian scientist at the U. S. Navy Underwater Sound Laboratory, displayed an extraordinarily high degree of originality, enthusiasm and initiative in the invention and development of underwater sound listening equipment, which, installed in our submarines, has had a direct beneficial result on our military operations and represents an achievement of unusual value to the Navy."

Mr. Thuras was on leave from the Laboratories as a civilian member of the Underwater Sound Laboratories, New London, at the time of his death last fall.

High-Speed Cameras for Atomic Bomb Tests on Bikini Atoll

J. H. Waddell has been appointed technical adviser to the Army Air Forces to supervise the operation of high-speed cameras that will be used to investigate the atomic bomb tests at Bikini Atoll in July and he is now in the Pacific. Some of the cameras will be carried in planes near and over the site of the explosions while others will be on ships at strategic intervals from the blast point.

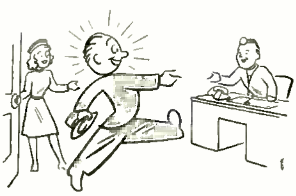
Three separate models will be used in these tests: the standard 16-mm Fastax taking pictures at the rate of 4,000 per second; the 8-mm Fastax taking pictures at 8,000 per second; and the wide-angle Fastax described in the April issue of the RECORD. In all there will be about sixty of these cameras employed.

Periodic Health Examinations

By M. H. MANSON

Medical Director, A T & T Company

Why should I have a periodic health examination if I am not sick? Because it helps uncover diseases in their early stages, even before you are aware of symptoms, and permits taking steps to prevent them developing into serious ailments. It often stops unnecessary worry and fear by revealing conditions to be non-existent or less serious than imagined. If you have a chronic condition, it helps you keep the situation in check and adds years to your life.



How often should I have a check-up? Generally speaking, it is desirable to have an examination annually. However, a safe guide is every three years for normal persons under 30, every two years for those between 30 and 40, every year between 40 and 60, and semi-annually for those over 60.

Of what does a good health examination consist? The original examination should cover a detailed history, physical examination, urinalysis, blood count, and X-ray of the chest. Other special tests would depend on individual need at the time of the examination. A correct estimate of the person's health would suggest that the physician ask the individual how he feels, sleeps, what his food habits are, the nature of his work and home life, whether or not he exercises and what kind of recreation he takes, and what his interests are.

How can I make my check-up effective? You should jot down in advance questions you would like to ask the doctor and health problems you want to discuss. Discuss any troublesome or persistent symptoms, even though you think them trivial.

Why is a periodic examination so important for middle-aged persons? Many ailments such as heart disease, irregularities of the blood and kidneys, growths and tumors, and other physical liabilities which are direct causes of serious and even fatal illnesses, begin to show up in middle age. An examination, wise at all ages, should be a "must" for persons in middle life.

A. L. Samuel Joins Faculty at University of Illinois

A. L. Samuel has left the Electronic Apparatus Development Department to join the Electrical Engineering faculty at the University of Illinois. A member of the technical staff of the Laboratories since 1928 and an authority in the field of electron vacuum tubes, Mr. Samuel had at first engaged in the development of gas rectifiers and thyratrons. Since 1931 he has been active in the development of vacuum tubes for use at high frequencies and has become well known in that field for his patents and technical papers.

The Bell System Radio School Is in Session

The Bell System Radio School, of which A. Tradup is director, opened on April 25 in the Davis Building to provide a training course for the eighty operating telephone company plant instructors in mobile radio-telephone installation and maintenance. The course will provide the men with the basic experience to enable them to instruct others in the installation and maintenance of this equipment which will be placed in service in the near future in connection with the proposed program of urban and highway radio-telephone service. The instruction staff is comprised of six engineers of the Western Electric Company: H. B. Metcalf, the supervisor; R. M. Chamberlin, G. Lamphear, J. P. Lenkerd, J. B. Monear and D. B. Wickline.

Obituaries

C. Gordon Emery of the Switching Development Department died suddenly on April 30. After graduating from Brooklyn Technical High School and attending the Polytechnic Institute for one year, Mr. Emery joined the Repair Department of the New York Telephone Company in 1924 and later transferred to the maintenance group on dial central office equipment in the Brooklyn area. He came to the Apparatus Specification Department of the Laboratories in April, 1944, and last December transferred to the Switching Development Department, where he was engaged in the analysis of circuits for the No. 5 crossbar system.

C. Gordon Emery
1905-1946

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Dr. John S. Waterman, formerly Medical Director of the Laboratories who retired in 1940, died in Jacksonville, Fla., on April 27. Dr. Waterman received his professional degree from Harvard University in 1901. Between 1901 and 1907 he served his internship and was resident surgeon at the Boston City Hospital and the Free Hospital for Women in Boston. From 1907 to 1915 he had a private practice in Providence, Rhode Island. For the two years following he was in charge of industrial surgery in a hospital in Rome, New York. On November 1, 1917, he entered the Engineering Department of the Western Electric Company, now the Laboratories, as a part-time examining physician. He was engaged as a full-time physician in September, 1918. In 1920 he was placed in charge of the medical activities of the Laboratories and under his direction many of the prevailing practices of our Medical Department, such as periodic examinations, were put into effect.

Dr. J. S. Waterman
1875-1946

John M. Fell
1867-1946

John M. Fell, formerly an engineer in the Department of Development and Research of the A T & T, died recently. He had retired in 1932 after nearly forty-one years of service. Mr. Fell joined the Bell System as a member of a line gang in 1891 and began his engineering work in 1896. He started telegraph work about 1898 and continued in that line until the time of his retirement. He obtained a number of patents for inventions which have resulted in arrangements that have contributed considerably to Bell System telegraph facilities.

Bell System Discount on New Western Electric Hearing Aid

More than 500 Bell System employees or members of their immediate families have taken advantage of the 25 per cent discount on Western Electric's Model 63 Hearing Aid since it was first offered in July, 1945. They are available at a discount to Bell System people on the following basis —any employee or pensioner may purchase Hearing Aids of Western Electric manufacture at a discount for his own use or for the use of a member of his family.

Those interested should get in touch with the nearest Western Electric Hearing Aid dealer, whose name is listed in the classified telephone directory under "Hearing Aids." An employee or pensioner should present his Bell System identification card. If a member of the family is making the purchase, he should present the card of the eligible employee. In locations where there are no dealers, write direct to Department 380, Western Electric Company, 195 Broadway, New York 7, N. Y.

R. E. STREBEL J. V. CUNNINGHAM MAJ. MILLS R. B. BURNS LIEUT. SCHMITZ LT. CMDR. FITZSIM

A Welcome to Eighty-One Veterans

Richard E. Strebel, who served aboard the destroyer tender *Blackhawk* and, in foreign waters, aboard the light cruiser *Wilkes-Barre*, was also a repairman for radar electronic gear on Okinawa.

James V. Cunningham operated all electrical equipment including the main controls of the submarine *Sea Horse*, which is believed to have sunk sixteen enemy vessels.

Major John K. Mills held a reserve commission of second lieutenant in Ordnance when he was called to service five years ago. After serving in the West Coast Defense Command, he was sent to Australia with the 59th Ordnance Company and, as ammunitions officer, participated in the Woodlock Island Task Force amphibious landing, the first landing of LST's in the Pacific.

Robert B. Burns spent eleven months in the China-Burma-India theater, where, as a radio operator, he flew C-46's and C-47's, dropping supplies by parachute to guerilla parties.

Lieut. Alfred O. Schmitz, pilot of a B-24 based at Okinawa, completed eight missions to Japan during his eight months overseas.

Lieut. Comdr. Laurence G. Fitzsimmons first commanded a mine sweeper along the east coast of the United States. Later he commanded a subchaser off the east and west coasts of the United States and in the Central Pacific. His final assignment was instructor in applied communications, first at the Post-Graduate School of the Naval Academy and later at Harvard University when the school was moved to Cambridge.

Capt. Charles J. McDonald served for six months in 1941, was released and re-entered service in 1942. Commissioned at Ft. Benning, he was sent overseas, serving with the 32nd Division as platoon leader and company executive officer in Australia, New Guinea, Leyte and Japan.

William G. Smith served with the Signal Corps, first at Arlington Hall, Washington, where he did cryptography work, and later at the Holabird Signal Depot, Maryland, where he instructed in radar.

Lieut. Harold W. Collier commanded a platoon of the 84th Infantry in combat for three months, was then assigned as Battalion Intelligence Officer (S/2), and subsequently became Regimental Assistant (S/3). After V-E Day, as Regimental I and E officer, he operated the Army Educational Program as applied to the 84th Division.

Major William H. Lichtenberger's first assignment, upon being ordered to active duty, was Assistant Officer in charge of Product Engineering at the Signal Corps Laboratories, Fort Monmouth. As such he directed the formulation of engineering requirements governing the production and inspection of communications equipments for ground forces; he pioneered in establishing in 1942 an unprecedented standardization program, starting with joint Army-Navy requirements on electron tubes. Major Lichtenberger became liaison officer between all Signal Corps Engineering Laboratories and the Army-Navy Electronic Standards Agency, and was assistant chief of Components and Matériels branch S.E.C.L. He participated in international standardization with British and Canadian Armies and also served in temporary assignments at Office of the Chief Signal Officer in Washington and at manufacturing plants in the United States and Canada.

Ellsworth A. Lichtenberger, a nephew of Major W. H. Lichtenberger, is back at his drafting board in the Patent Department after fifteen months of duty as a radio operator in New Guinea and the Philippines.

Laboratories men who have availed themselves of educational facilities under the GI Bill of Rights include P. L. HOLLOD and D. F. TUTTLE.

CAPT. MCDONALD W. G. SMITH LIEUT. COLLIER MAJ. W. H. and E. A. LICHTENBERGER LT. COL. CICCOLI






UT. WALSMAN | J. J. BARRETT | G. A. ROE | C. G. PETERSON | MAJ. HINSHAW | LT. COL. KAYLO

Lieut. Col. David F. Ciccolella has returned to Murray Hill Laboratories after five years of military service, most of which was spent in the Air Forces as an Operations Officer coördinating anti-aircraft and air force activities. He was assigned to the Anti-Aircraft School at Fort Bliss, Texas, and later became Director of the Electrical Department at that School. Col. Ciccolella went overseas as Commanding Officer of a searchlight battalion and was transferred from that outfit to the Paratroop Infantry as Battalion Commander.

Lieut. Everett C. Walsman's first naval assignment was temporary duty on a submarine in preparation for training in anti-submarine work which he later took at Patuxent River, Maryland. Subsequently he went to Puerto Rico, as Aide to the Executive Officer; to Tacoma, Washington, to commission the *Commencement Bay*, on which he had temporary duty; and to the Southwest Pacific as Assistant Airplot Officer on the flattop *Gilbert Island*. Returning to the States, he became Administration Officer, Plotting Squad, Air Group 41, and was assigned first to the *Bararoca*, and then to the *Saidor*. After V-J Day, Hellcats aboard the *Saidor* were replaced by jet-propelled planes.

John J. Barrett joined the Navy in June, 1944, and became a teletype transmission maintenance man. He was stationed at Guam during his overseas duty.

George A. Roe's military service was spent at the Alaska Signal Repair Depot at Anchorage, where he repaired and maintained 900 sound motion picture projectors – movies being the sole entertainment for servicemen scattered in isolated positions in the Far North.

Carl G. Peterson fought with the 274th Infantry, 70th Division, through France and Germany. Mr. Peterson has returned to his drafting board in the Equipment Development Department.

Major Foster A. Hinshaw, upon being ordered to active duty, was first assigned as Shipping Officer in the Supply Department at the Signal Corps Radar Laboratory at Bradley Beach and was then transferred to the Shipment Division of the Signal Corps Ground Signal Agency as Signal Property Officer. In 1943 Major Hinshaw was ordered to the Coast Artillery Board at Fort Monroe where he was consultant on matters pertaining to the Signal Corps, most of the work of the Board being of a highly confidential nature. At Fort Monroe he also directed the service testing of communications and radio equipment, radar and high-frequency equipment.

Lieut. Col. Robert L. Kaylor was called to the colors in 1941 with the rank of Captain in the Signal Corps. His first assignment was at the Aircraft Radio Laboratory, Wright Field, where he was Project Officer on aircraft antennas and suppression of radio noise in aircraft. Later he went to New Caledonia as Executive to the Signal Officer, Headquarters U. S. Army Air Forces, in the South Pacific. Col. Kaylor was successively Signal Officer, Headquarters 13th Air Force, and Executive to Communications Officer in the same organization. He supervised operation maintenance and supply of all 13th Air Force communications activities. Before V-E Day he became Evaluation Officer on the Air Evaluation Board, Southwest Pacific Area, in Manila. During his three years of Pacific duty, he also saw service in the New Hebrides, the Solomons, the Admiralties and the Netherland Indies.

Peter F. McGann, who served in the Army for almost four years, was a crewman on 115-mm prime movers in France, Belgium and Holland, and was awarded the Purple Heart for heroic action in the line of duty.

Ensign Bertrand H. Sommer entered the Merchant Marine as a cadet, was graduated as 3rd mate in the Merchant Marine and a member of the U.S.N.R. During three trips on the *Woodstock Victory*, he hit India three times and was in China, Africa and South America.

F. MCGANN | ENS. SOMMER | CAPT. GRAUNAS | LT. COL. OSGOOD | LIEUT. BRENNEMAN | MAJ. OLSE






. R. BROOKMAN

P. H. SHEARER

J. H. HILL

C. ANDERSON

J. P. ROBINSON

C. W. PETERS

Capt. Ernest C. Graunas, ordered to duty at Fort Monmouth, spent a year and a half at that post as Instructor and Commanding Officer of training companies before he went to Camp Crowder to prepare for overseas movement of the 126th Signal Radio Intelligence Company. He went to Australia as Commanding Officer of that outfit and, subsequently, became Staff Officer in Supply at the Signal Office of U.S.O.S. Moving north with troops, he fought in New Guinea and finally in the Philippines, where he was a Signal Supply Officer at Batangas, Luzon.

Lieut. Col. Dexter T. Osgood, when ordered to duty with the Signal Corps, was first assigned to Ft. Monmouth, where he was concerned with the installation of radios in armored vehicles and was then transferred back to the Laboratories for duty on a secret project. His next assignment in the Signal Intelligence Service of the Office of Chief Signal Officer also included temporary duty in the Aleutian Islands for three months. Col. Osgood went to England in 1944 and became Communications Engineer of the Brittany Base Section, which moved to Rennes, France, in August. He was placed in charge of a project on which Bell System cable splicers sent over from the States were used to help restore communications. Subsequently, he was assigned to the Lorraine District in Dijon and in Nancy as Communications Officer and later as Signal Officer. His last assignment was with the Oise Intermediate Section, Rheims, where Col. Osgood was Director of Communications.

Lieut. David E. Brenneman of the Marines served eighteen months in Hawaii, the Marianas and Okinawa, where, as Radar Officer, he was responsible for air warnings.

Major O. C. Olsen held a reserve commission with the Signal Corps when he entered service March 13, 1942. He served at Ft. Monmouth for six weeks, returned for six more to work in uniform at the Laboratories, and then transferred to the AAF Specialized Depot, renamed the 862nd, at Dayton Signal Laboratory, where he completed his Army career. He was the Maintenance Officer in charge of modifications and repair of airborne radio and radar equipment; he was also responsible for the manufacture of quartz crystals.

Paul R. Brookman, after attending Radio Matériel School, was assigned to the *Kearsarge*, an aircraft carrier, but was released from service before she was commissioned.

Peter H. Shearer, a diesel mechanic, spent eight months with a railway battalion operating out of Antwerp. He did railway work at Hanover and Louvain and was an MP before he returned.

Joseph H. Hill, whose hobby is carpentry, was a carpenter on the naval base at Heeia Radio Station on Oahu. Back at the Laboratories, Mr. Hill is now a draftsman in Apparatus Development.

Clarence Anderson's military service was spent at Frankford Arsenal on the identification and coding of fire-control equipment.

John P. Robinson entered service in November, 1942, and trained in this country until he joined the Heavy Automotive Maintenance Company, with whom he went overseas in January, 1945. He fought with the 7th Army in Germany and France.

Charles W. Peterson, in Ordnance attached to the Air Corps, was a machinist in the automotive repair department during his overseas service in Calcutta and in Chengtu and Kunming, China.

Lieut. Warren B. Sage, a navigator on a B-29, had completed two years and five months of military service when he returned to the Equipment Development Drafting Department. His training, begun at Erskine College, included many phases of B-29 work.

Albert C. Reynell was attached to the Eastern Signal Corps School at Fort Monmouth as an instructor in teletype maintenance.

Gustave A. Backman has returned after military service with the Signal Corps in Hawaii,

IEUT. SAGE

A. C. REYNELL

G. A. BACKMAN

M. W. DRING, JR.

E. A. HAKE

P. M. NESS






[.]. Williams J. P. Larimer M. L. Glaab E. J. Yastremski Lieut. Nolan E. H. Bueb

where as staff sergeant he was responsible for a crew repairing radar equipment.

Monroe W. Dring, Jr., of the Navy, son of A. W. Dring, served on Oahu maintaining and repairing transmitters, receivers and some Western Electric teletype gear.

Edward A. Hake, while overseas with the Navy, worked in Manila maintaining a radio teletype multiplex distributor.

Peder M. Ness, with the rank of FC 2/c, served mostly in China and Philippine waters on *LST 1020*, which carried the first troops into Shanghai and also the first Chinese occupational force onto the island of Formosa.

Richard C. Williams began his war training in basic engineering at the Virginia Polytechnic Institute. Following an accident which kept him in the hospital for six months, he was assigned to clerical and administrative duties at the Aberdeen Proving Ground and at the Indiantown Gap Reservation.

James P. Larimer served for nearly three years as a gunner's mate striker on the cruiser *Trenton* and on the destroyer *McKinley* in Pacific waters.

Marshall L. Glaab spent two years in AAF Technical Schools and was in the Asiatic-Pacific Theater of Operations for six months, where he had charge of a radio repair shop at the Air Force Base.

Edward J. Yastremski was a cook in the Army immediately before and after he served overseas. In the interim, he fought as an Infantryman in the 104th Division and stood occupational duty in German territory.

Lieut. Arthur J. Nolan piloted a C-47 transport plane which carried cargo to front line troops. Of 1,000 flying hours to his credit, 650 were spent in the Pacific theater.

Edward H. Bueb was a VHF installation and maintenance man with the 1069th Signal Company in the South Pacific during hostilities. Later, in Manila, he was in charge of the Labor Central Office for the 571st Air Service Group.

Walter Sokolosky divided most of his three years of military service between two jobs, Air Corps supply clerk and airplane armorer, in various East Coast air fields and at Albuquerque, New Mexico. He is now in the Traffic Department.

Lawrence P. O'Donoghue's forte after he entered service in 1943 was radar. A sergeant, he studied and later instructed in large ground-type radar at Camp Hahn, Cal.; airborne radar at Orlando Air Base, Fla.; and naval radar at Sea Girt, N. J. His one trip overseas was to Marseilles just before his release, when he manned the radar on a naval vessel.

Andrew M. Kurutz, in Pacific waters for fifteen months, maintained and operated anti-submarine detection gear, first aboard the *Craven* and later aboard the *John W. Thomoson.*

Gilbert J. Stiles' naval duty overseas was with the Communications Unit for the Port Director at Yokohama. Prior to that he had attended Radio Matériel School at Washington.

David J. Van Slooten, ETM 2/c, spent most of his naval career studying at radio schools in this country, finally becoming a member of the staff of the Advanced Fire Control School where he served until his discharge.

Eugene L. Fieldhammer, a radioman 1st class, served for five months at a Siberian outpost where the United States maintained a weather station. Prior to that he had been an armed guard on a merchant ship and had participated in the battle of Southern France.

Lieut. Frederick J. Hurt enlisted in April, 1941. He was in the first Aircraft Warning Company to train at Ft. Monmouth and afterwards attended O.C.S. Lieut. Hurt studied electronics at Harvard for four months and transferred to the Corps of Engineers. He went overseas with the 170th Combat Battalion to New Caledonia, where they constructed air bases, and later to Luzon to repair railroads and railroad bridges.

[.]. Sokolosky L. P. O'Donoghue A. M. Kurutz G. J. Stiles D. J. Van Slooten E. L. Fieldhammer






G. E. Linehan R. L. Klem C. B. Brown Lieut. Ohl A. E. Aboutok R. Schust

George E. Linehan, a member of the 805th Signal Service Company, studied at the Laboratories School for War Training and then maintained and operated Lab-designed communications equipment in the Pentagon Building before he was assigned to Australia. He also served in Manila and in Tokyo.

Robert L. Klem, who was a radio operator on B-29's for twenty-two months of overseas duty, has returned to the Development Shops group in Building T.

Clayton B. Brown's sea duty was aboard the escort carrier *Guadalcanal,* on which he served as a radio technician.

Lieut. Claire M. Ohl, who studied at the Supply School of Harvard University, spent all of her naval service at Portsmouth Navy Yard, where her final assignment was Inventory Officer.

The Laboratories has employed 940 veterans of World War II

Adele E. Aboutok, after boot training at Hunter, was assigned to the Lakehurst Naval Air Station to do mechanical work on blimp and on fighter and patrol plane engines.

Robert Schuster served in the 41st Armored Infantry Regiment as a Combat Radio Operator in the Ardennes, Central European and Rhineland Campaigns. Following V-E Day, Mr. Schuster attended Shrivenham University for eight weeks.

Warren E. Thacker has returned to the Whippany Laboratory following his discharge from the Army. He served for thirty-one months as a technical aide on the operation, maintenance and repair of radar systems.

Robert W. Dawson, after training at Rutgers University, went to Oak Ridge with the Manhattan Project and later to Santa Fe, where he did electronic work on the atom bomb. In June of 1945 he went overseas with the bomb as far as the Marianas, stayed for three months and returned to Santa Fe until his release from service.

Richard A. Shine's military service was with the Coast Guard, first on patrol off Atlantic City and later aboard the amphibious transport *Samuel Chase* during the invasion of Italy, Normandy, and the invasion of Southern France.

John J. Nichik maintained and repaired radio apparatus aboard the *LST 1050* until V-J Day, when he was assigned to Joint Communications Activities on Guam as a radio operator.

George A. Carlson in thirty-eight months of military service spent fourteen of them at Hickam Field as a weather relay man with the Army Airways Communications System.

Lieut. Glen S. Bishop served with the 3rd Amphibious Marine Corps Signal Battalion on islands of the South Pacific and in Tientsin, China. He was responsible for the wire platoon of Headquarters Company.

Harry C. Meier served for thirty-one months in the AAF, most of it as an instructor in celestial dead reckoning and radio aids to navigation. He also inspected, adjusted, replaced parts and made minor repairs to the Link trainer.

Clinton A. Jaycox was overseas sixteen months in the ETO as an automatic rifleman in the Ardennes and Rhineland Campaigns and as Communications Sergeant during part of the Central European Campaign. In the latter assignment he established and maintained communication with battalion headquarters by telephone and radio.

John J. Carroll during his naval career worked with the Navy Aviation Supply Officer preparing aviation reports for the replacing of essential spare parts in naval station bases and air fields.

W. E. Thacker R. W. Dawson R. A. Shine J. J. Nichik G. A. Carlson Lieut. Bisho






I. C. Meier — C. A. Jaycox — J. J. Carroll — W. P. Harnack, Jr. — W. Bauer — L. C. McDonnell

William P. Harnack, Jr., as a radioman with the 12th Fighter Squadron of the 13th Air Force, repaired radio apparatus for the squadron and operated the radio in flight. Before going to the Philippines he had studied at Virginia Military Institute and had taught in Madison, Wis.

Wilfred Bauer, following a year of work on ship repairs at Tompkinsville, S. I., was sent overseas and spent approximately ten months on the *Bellerophon,* a repair ship which serviced ships on the Magic Carpet Run between West Coast ports and islands in the Pacific.

Laurette C. McDonnell's naval service was with the exterior ballistics group at the Naval Proving Grounds at Dahlgren, Virginia.

Jeremiah J. Doody spent his naval service working out of civilian shipyards on the East Coast expediting materials necessary for the commissioning of Navy ships.

Arthur Brandt of the AAF, who entered military service in 1942, was an instructor in the Instrument Trainer in Texas most of the time. In addition he had attended B-29 gunnery school and had been a drill instructor.

Edward W. Karpen was assigned to maintain radio equipment at the San Francisco UNO Conference. His Army training also included extensive radar training.

George H. Reinhardt has returned to Building T after two years' overseas duty in the ETO where he did telephone maintenance work with the 29th Division from Normandy to Germany.

Robert E. Komuves, a veteran with sixteen months of Army duty in the Pacific, is back again as a mechanic and calibrator in Building T. A carrier and radio repeaterman, he was attached to Seaborne Communications.

Philip E. Watts was with the engineer model-making detachment, attached to SHAEF headquarters, for thirteen months, making terrain models for assault areas.

Leaves of Absence

As of April 30, there had been 1,044 military leaves of absence granted to members of the Laboratories. Of these, 645 have been completed. The 399 active leaves were divided as follows:

Army 184 — **Navy 154** — **Marines 16**

Women's Services 45

There were also 12 members on merchant marine leaves and 1 on personal leave for war work.

Recent Leaves

United States Army

Ralph W. Iltzsche — Donald W. Matchett
Benjamin P. Matterson

Robert W. Mann has returned with Battle Stars for New Guinea, Leyte and Luzon. He served as a cryptographic maintenance man in the 3170th Signal Battalion, after considerable teletype, cryptographic and ASTP training.

Joseph Klieber was assigned to do personnel work in the South Pacific with the 604th Port Company where he earned the right to wear the Presidential Unit Citation.

Herbert L. Smith utilized the training he received as a torpedoman during his assignment at Fort Lauderdale, Fla., where he serviced and maintained torpedo gyroscopes.

James W. Ericsson, a radio repairman, worked on all types of armored vehicles in Europe with the 188th Signal Repair Company of the 9th Army.

Walker D. Elliott, after specialized training at Sampson, was assigned to do stock control work on aviation parts at the Naval Air Testing Station at Patuxent River, Maryland.

Frank J. Gunther served as a mechanic with the Marines in the 18th Anti-Aircraft Artillery Battalion on Saipan and Tinian repairing transportation.

J. Doody — A. Brandt — E. W. Karpen — G. H. Reinhardt — R. E. Komuves — P. E. Watts






News Notes

During the week of April 29, *Echoes in War and Peace,* a Bell System sound picture by John Mills, was shown simultaneously for members of the Laboratories at three locations, West Street, Murray Hill and Whippany. The picture describes the principles underlying radar and sonar, their development in Bell Telephone Laboratories, their production by Western Electric and their application, including scenes contributed by War and Navy Departments.

The Townsend Harris Medal was awarded to William Fondiller in 1944 by the Associate Alumni of City College. Shortage of critical materials delayed the presentation of the medal itself until April of this year

O. E. Buckley went to Washington to attend the April 5 meeting of the National Inventors' Council, of which he is a member. Dr. Buckley attended part of the Bell System General Plant Managers' Conference at Chicago and, on April 10, addressed the group at a dinner held in Stevens Hotel. He also attended the annual meeting of the National Academy of Sciences in Washington from April 22 to 24, and presented a paper on *Some War-Accelerated Developments in Electrical Communication.*

R. W. King addressed the April 18 evening meeting of the A.I.E.E., University of Virginia branch, on the subject *Do Recent Developments Suggest a Shifting Borderline Between Science and Engineering?*

R. L. Jones attended the A.I.E.E. Standards Committee meeting held in Buffalo.

D. A. Quarles' paper, *Radar Systems Considerations,* was published in the April, 1946, *Electrical Engineering.*

At the Monmouth County meeting of the I.R.E., held on April 10 at Red Bank, New Jersey, C. F. Edwards spoke on *Microwave Converters* and W. E. Kock on *Metallic Lens Antennas.*

R. S. Ohl, G. E. Mueller and S. D. Robertson attended the American Physical Society Convention at Harvard and M.I.T.

Demountable Soundproof Rooms, an article by W. S. Gorton, was published in *Communications* for March, 1946.

S. D. Robertson and A. P. King are authors of a paper, *The Effect of Rain Upon the Propagation of Waves in the* 1 *and* 3 *Centimeter Regions,* published in the April, 1946, *I.R.E. Proceedings.* In the same issue is G. E. Mueller's paper, *Propagation of 6-Millimeter Waves.*

L. A. MacColl's book, *Fundamental Theory of Servomechanism,* was reviewed in the April issues of *Waves and Electrons* and *Electronics.*

W. P. Mason is author of *The Elastic Piezoelectric and Dielectric Constant of Potassium Dihydrogen Phosphate and Ammonium Dihydrogen Phosphate,* which was published in the March 1 and 15, 1946, issue of *Physical Review.*

The Cambridge meeting of the American Physical Society and of its New England section was held from April 25 to 27 at Harvard University and Massachusetts Institute of Technology. Members of the Laboratories who contributed papers to the program included G. W. Gilman and F. H. Willis, *Reflection of Sound Signals in the Troposphere;* W. H. Brattain, *Rectification Series;* J. B. Fisk, *Magnetron Generators;* S. O. Rice, *Fourier Series in Random Processes;* G. K. Teal, J. R. Fisher and A. W. Treptow, *A New Bridge Photo-Cell Employing a Photo-Conductive Effect in Silicon. Some Properties of High Purity Silicon;* J. B. Johnson, *Secondary Emission of*

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Thermionic Oxide Cathodes; J. R. HAYNES, *High Velocity Vapor Jets in Sparks at Mercury Electrodes;* J. W. CLARK, A. E. ANDERSEN and A. L. SAMUEL, *Design of Copper Disk Seal TR Tubes;* A. L. SAMUEL and J. W. CLARK, *Recovery Time Measurements on TR Tubes;* A. L. SAMUEL, *An Equivalent Circuit for the Microwave TR Tube;* J. B. JOHNSON, *Enhanced Thermionic Emission From Oxide Cathodes.* K. K. DARROW, Secretary of the Society, presided over the April 25 afternoon meetings.

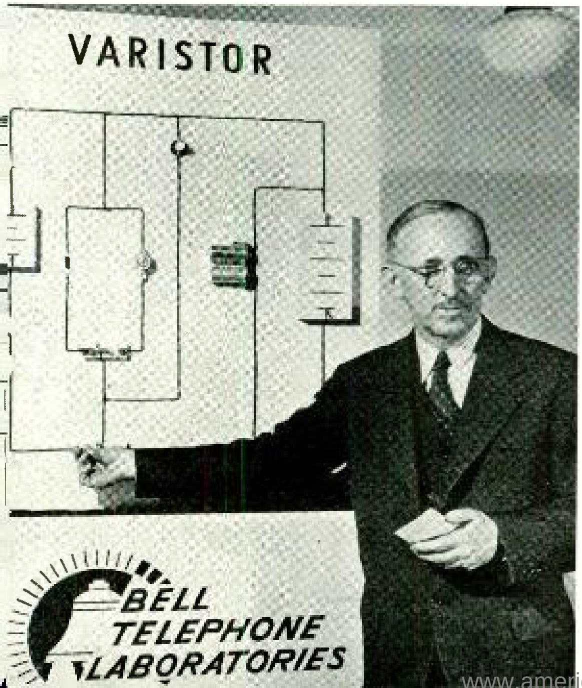
Don't Hoard Food—Conserve Food

RALPH BOWN spoke on *Radio Relay Problems* at the Deal-Holmdel Colloquium, held on May 10 at the Holmdel Laboratory. A dinner honoring H. T. FRIIS was held following the colloquium.

V. E. LEGG and H. A. STONE visited Haverhill for a discussion of retardation coils.

R. E. DRAKE's visit to the Sprague Electric Company, North Adams, Mass., concerned electrolytic capacitors.

R. M. Burns gave a lecture demonstration on "Ceramics in Communications" before the New York Section of A.I.E.E., April 25, and the American Ceramics Society in Buffalo, April 29. He was assisted in the demonstration by J. B. Kelly and R. K. Hansen. The demonstration equipment was designed and arranged by H. J. Kostkos



Engagements

Charles Dupell, Jr.—*Joanne Hoke
Charles F. J. Kindle—*Lucille Brown
Edward P. Moczydlowski—*Mary Lutomski
*Ralph Nelsen—*Marian Greene
Seymour Neuman—*Evelyn Zamichow
Frank Zylius—*Joan Le Moine

Weddings

*Francis P. Dormer—*Mary Cusack
*Angelo Garbarino—*Martha Schroeder
*Bartholomew A. Stiratelli—Frances Manning
Robert Thorpe—*Mary Haring

*Members of the Laboratories. Notices of engagements and weddings should be given to Mrs. Helen McLoughlin, Room 803C, 14th St., Extension 296.

C. R. STEINER, with J. O. Rumph of the Western Electric Company, investigated manufacturing difficulties at the Sprague Electric Company, North Adams, Mass.

W. J. KING conferred on pulse cables and connectors at H. H. Buggie & Co., Toledo.

O. C. ELIASON investigated problems of air conditioning at the Northwestern Bell Telephone Company, Omaha, and at the Illinois Bell Telephone Company, Chicago.

I. E. FAIR consulted Western Electric engineers at Hawthorne on crystal units.

HENRY HOHNER of the Whippany Laboratories has been elected president of the New Jersey Tip Toppers' Club, whose members include men up to six feet eight and women up to six feet four.

E. J. QUINN discussed current orders with telephone engineers in St. Louis, Indianapolis, Columbus, Cincinnati and Pittsburgh.

W. H. BENDERNAGEL and S. C. DEL VECCHIO visited the Langley Memorial Aeronautical Laboratory at Langley Field, Virginia, in connection with the installation of the power plant for a computing system to be installed at the Laboratory.

TOLL SWITCHBOARD STUDIES were made at Cleveland and at Lock Haven, Pa., by G. E. BAILEY.

F. F. SIEBERT discussed machine questions at the Lynn plant of the General Electric Company.

R. H. COLLEY, C. H. AMADON and G. Q. LUMSDEN attended the convention of the American Wood-Preservers' Association recently held in Cincinnati.

The sixteenth Annual Safety Conference and Exposition, held in New York from April 9 to 12, devoted two sessions to a discussion of the rehabilitation of disabled war veterans. J. S. Edwards was vice-chairman of the April 10 panel, which discussed *Weak Spots in Industrial Rehabilitation Programs;* he was also vice-chairman of the evening session devoted to certain problems concerning veterans. Others who attended were F. W. Brunengraber, L. E. Coon, H. E. Crosby, C. F. Flint, L. S. Hulin, C. W. Lowe, D. O'Neill, A. H. Sass, G. B. Thomas and I. W. Whiteside.

J. M. Duguid conferred on generator problems at the Holtzer-Cabot Electric Company, Boston.

A. J. Wier, with telephone engineers, visited the buildings and equipment in the new K-2 carrier stations on the alternate route between Chicago and South Bend.

H. W. Purcell is in Richmond studying the performance of special banks of wipers on trial in step-by-step offices.

G. R. Frantz spoke on *Radar for Bombing* before meetings of the A.I.E.E. at Lake Charles, La., Beaumont, Houston and Dallas; the latter was the Southwest District meeting of the Institute.

J. A. Hall and R. O. Covell were at the Patent Office in Washington during the month of April in connection with patent matters.

F. D. Leamer has been elected to the vice-presidency of the Family Service Association of Summit.

C. D. Hocker attended an A.S.T.M. committee meeting in Pittsburgh to help to plan additional outdoor hardware exposure tests for Committee A-5 approval.

A. P. Jahn inspected samples on the A.S.T.M. test racks that are located at Pittsburgh, State College, Sandy Hook and Bridgeport.

R. J. Nossaman attended the Bell System General Plant Managers' Conference in Chicago.

H. A. Frederick, J. J. Kuhn, D. H. Gleason, J. D. Tebo and F. W. Clayden at Hawthorne discussed switching problems. Mr. Frederick, D. G. Blattner and J. F. Baldwin attended discussions at Hawthorne on terminal strips, protection studies, maintenance facilities and meters.

F. W. Clayden and R. E. Coleman, in connection with step-by-step equipment, observed field trials at Richmond of noble metal banks and contacts and of solderless bank connections. Stereoscopic color pictures were taken of the banks and wipers. J. J. Kuhn, D. H. Gleason and Mr. Clayden were in Scranton, where similar tests were observed and pictures also taken.

L. N. Hampton and W. F. Halloran were in Cambridge, Mass., to close out a war job at the Sanborn Company.

W. J. Leveridge discussed special vacuum pump equipment at the Distillation Products Company in Rochester.

The Laboratories Art Group held its second annual exhibit from May 20 to 24 in the West Street Auditorium. The 150 works of art, exhibited by forty-four members of the Laboratories, were divided into four classes, *Sculpture*, *Oil Painting*, *Watercolors and Pastels*, and *Monochromatic Art Work*. In addition, examples of art work

Rules on "Loose Talk" Still in Effect

During the war, the Laboratories carried on many military development projects of a Secret or Confidential nature, and great care was exercised to guard against any "leaks" of classified information.

While restrictions have been relaxed on some of these projects, many of them are still highly classified. Moreover, the Laboratories is undertaking certain new, long-range, military developments that carry high classifications.

During peacetime, it is perhaps even more difficult to maintain secrecy than during war. It is nevertheless very important to do so since time would be heavily on the side of any agent who might be piecing together scattered bits of information. For this reason, our Government is continuing its energetic enforcement of security regulations, imposing stiff penalties for giving any classified information to unauthorized persons.

All employees are urged to keep up the fine record established during the war by avoiding "loose talk" about classified projects and by strict adherence to security regulations as set forth in Laboratories General Executive Instructions.

done by members of the Laboratories art classes were also shown but were not entered in the competition. The exhibit committee, under the chairmanship of W. A. Depp, was comprised of Frances Dell' Isola, Ruth Lundvall, Carol Linda Vreeland, H. C. Baarens, F. Frampton, and L. Murphy.

W. M. Bacon, in Detroit, discussed with Michigan Bell and Long Lines' engineers new teletypewriter switching arrangements as well as the use of teletypewriters for automotive assembly line operations.

R. D. Parker and E. F. Watson attended conferences during April at the Teletype Corporation, Chicago.

C. W. Lucek, N. A. Newell and A. Ludwig visited Philadelphia and Harrisburg recently in connection with a field trial of an a-c method of transmitting supervisory and dial signals over toll lines.

F. J. Given and R. A. Sykes, at Harrisburg on April 29 and 30, attended the Radio Manufacturers' Association spring meeting.

Papers presented by Laboratories' engineers before the Atlantic City meeting of the American Chemical Society were *X-ray Fine Structure of Synthetic Rubbers* by W. O. Baker, co-authored by N. R. Pape; *Disorder in Linear Condensation Copolymers*, by C. S. Fuller; and *Paper Capacitors Containing Chlorinated Impregnants—Effects of Sulfur*, by D. A. McLean, L. Egerton and C. C. Houtz. Other engineers who attended the meeting were P. P. Debye, G. T. Kohman and W. G. Straitiff.

W. O. Baker delivered one of the Frontiers in Chemistry lectures annually sponsored by Western Reserve University; the title of his talk was *Principles of Structure Within and Among Polymer Chains*.

A. G. Ganz is author of a paper *Applications of Thin Permalloy Tape in Wide-Band Telephone and Pulse Transformers* which appeared in the April issue of *Electrical Engineering*.

Ramshackle Inn, a mystery farce in three acts, was presented by the Morristown Little Theater group from April 25 to 27 at the Alexander Hamilton School in Morristown. Included in the cast were Muriel Lazaer, R. C. Smith, H. M. Watts of the Whippany Laboratories, C. C. Lawson of Murray Hill and David Williamson of Long Lines. T. A. Williams, *production manager*, was assisted by H. A. Stone, *lighting;* Arthur Lince and Robert C. Smith, *sound;* James Johnstone, *scenery;* Shirley Rohner, *art design;* C. C. Lawson, *program;* and Helen Benz, *script assistant*. Besides these, many other members of the Laboratories who belong to the Morristown Little Theater organization worked behind the scenes to help make the affair a success.


J. F. D. Hoge


Helen Craig


S. B. Williams


Harriet Kaiser


J. A. McInty

Retirements

Among recent retirements from the Laboratories were J. A. McIntyre, with 46 years of service; S. B. Williams, 41 years; L. B. Stark, 40 years; E. W. Niles, 39 years; S. H. Everett and Edward Greenn, 36 years; C. I. Baker, 34 years; Frank Wallenius, 31 years; J. J. Paris and H. S. Shope, 29 years; Helen M. Craig, H. S. Enger and A. H. Shangle, 28 years; J. F. D. Hoge and Harriet Kaiser, 27 years; and J. R. Nordstrom, 25 years.

Joseph F. D. Hoge

Mr. Hoge was graduated from Cornell University in 1909. Before coming to the Laboratories in 1918 he had been with the Westinghouse Church Kerr and Company, the American District Telegraph Company and the Maintenance Company. At the Laboratories Mr. Hoge's first work was in the Apparatus Development Department, where he was engaged in the design of telephone repeaters and mounting structures for telephone apparatus. Later, in what is now the Commercial Products Development Department, he became occupied with the design of amplifiers and accessory apparatus for public address systems, sound picture systems, and equipment for the U. S. Navy. Later he specialized on mechanical design problems in connection with the development of battle-announcing systems for the Navy. This work included racks for control equipment, loudspeakers, mounts for high-power reproducers, transmitter control boxes, microphones, and testing equipment. Early in 1945 Mr. Hoge transferred to the Patent Department to assist in handling Government contract engineering problems.

Helen M. Craig

Miss Craig of the Library received a B.A. degree from St. Lawrence University in 1907 and then studied at the Pratt Institute Library School for two years, from which she received the B.L.S. degree in 1942, retroactive. Following six years with the Engineering Societies Library and two years with the Industrial Arts Index, she came to West Street where she started the Technical Library Bulletin. Since then her principal work had been looking up all kinds of information as required by members of the Laboratories and in compiling bibliographies.

Samuel Byron Williams

Mr. Williams, Switching Development Engineer, graduated from Ohio State University in 1905 with the degree of M.E. in E.E. Immediately joining the Western Electric Company, Mr. Williams entered the student training course at Hawthorne and then, in 1907, transferred to the Circuit Laboratory in New York on the development and testing of telephone circuits.

From 1912 to 1918, as Special Studies Engineer in the semi-mechanical section of the Engineering Department, he was concerned with the design and development of a call distributing system that could be applied to a manual as well as to the semi-mechanical switchboard then in development. This work culminated in the installation of trial equipments of the two types of switchboards in Newark and Wilmington. During the latter part of this period he took over the development of step-by-step line-finding equipment and other types of step-by-step equipment.

During World War I he was with a special group engaged in the development of radio equipment and submarine detection devices for the Government. At the termination of the war, Mr. Williams was transferred to the newly created Telephone Systems Engineering Department which was engaged in fundamental development studies. During this period, from 1919 to 1928, he invented a telephone system employing a coördinate switching mechanism.

Mr. Williams, in 1928, became Fundamental Development Engineer of what is now the Switching Development Department. His responsibilities included the fundamental development of manual and automatic telephone circuits and special studies such as the investigation of interference from telephone equipment to radio reception. Since 1938, Mr.

Williams has been Switching Development Engineer with his work directed more particularly to calculating and computing devices and systems. The complex computer was built under his direction.

Harriet Kaiser

After graduation from Eastman's Business College in 1919, Miss Kaiser joined the American Telephone and Telegraph Company. She was at first a typist in the O & E Transcription Department and later, when the D & R was formed, became a stenographer, remaining with the group until it was consolidated with the Laboratories in 1934. Since that time, she had been in Transcription doing specialized typing involving the use of Greek and mathematical equations.

John A. McIntyre

Mr. McIntyre joined the American Bell Telephone Company in 1899, entering its Boston Laboratory. Four years later he came to New York to take part in the inspection activities of the American Bell Company at West Street, and continued in this work after it was taken over by the Western Electric Company in 1907. When the manufacturing organization and its associated inspection activities moved to Hawthorne in 1913, Mr. McIntyre remained at West Street with the Engineering Department, engaging in the construction of transmitter and receiver standards conducted by the Research Department. In 1929 he transferred to what is now the Transmission Apparatus Development Department, where he had since been a member of the repaired apparatus group. Here he was occupied with the preparation of Bell System Practices covering the recovery and repair requirements for transmitters, receivers, induction coils and other subscriber station apparatus.

Harry S. Shope

With six years' experience as local and toll wire chief for the Saskatchewan Government telephone system, Mr. Shope entered the Western Electric Company in 1916 as a specification writer. Three years later he transferred to New York to take part in the standardization of the then new panel-dial system. In 1921 he went into circuit design, and soon was put in charge of groups working on local manual and panel interconnecting circuits. Responsibility for PBX circuits was added in 1923, and in 1930 for step-by-step circuits. Incident to a rearrangement of circuit design groups in 1937, Mr. Shope was given charge of design of all local and manual-toll switchboard circuits and No. 4 toll trunk circuits, together with testing and maintenance facilities for these systems. A major portion of the circuits for the No. 4 toll switching system, the first installation of which was placed in service in Philadelphia in 1943, were developed by groups under his supervision. The groups are now engaged in other four-wire toll switching systems for a nationwide system of intertoll dialing.

Amos H. Shangle

Before Mr. Shangle joined the Bell System he spent eight years with the Shedd Electric Company and a similar length of time with the Watson Stillman Company, both in New Jersey. Coming to West Street, Mr. Shangle spent seven years in the drafting group of the Apparatus Development Department and then transferred to the group investigating and designing apparatus to be manufactured in outside concerns. Part of this work included printing telegraph for which he designed several special attachments, checked machines and followed their general engineering. Since 1929, in what is now the mechanical apparatus group of the Switching Apparatus Development Department, he had been engaged in designing tools and apparatus for general telephone maintenance work. During the war period this work assumed unusual importance because of the heavy traffic load on the telephone plant and because of the inability to replace defective plant apparatus with new. Aside from his efforts in this direction, Mr. Shangle was also engaged in work on the gun director.

Eliot W. Niles

Mr. Niles, of the Station Apparatus Development Department, was graduated from the Massachusetts Institute of Technology in 1904 with the degree of S.B. For two years he was an assistant in Physics at that Institute; then he

H. S. Shope

A. H. Shangle

E. W. Niles

Edward Greenn

S. H. Everett

H. S. Enger

C. I. Baker

J. J. Paris

joined the Engineering Department of the American Telephone and Telegraph Company, later transferring to the D & R at the time it was organized in 1919. In 1934 he transferred to the Apparatus Development Department of the Laboratories. Most of Mr. Niles' work since that time has been concerned with station apparatus, including coin collectors and studies to reduce their susceptibility to fraudulent practices. In this connection he represented the Bell System on an American Standards Association Committee, and represented the Laboratories on a committee on public stations sponsored by the New York Telephone Headquarters Staff Department for the operating areas of that company. Earlier, Mr. Niles represented the A T & T on a National Bureau of Standards Committee on dry batteries. During the war period he supervised the introduction of substitute materials suitable for telephone booths and coin collectors. He continued to supervise the work of the telephone booth development group up to his retirement.

Samuel H. Everett

Mr. Everett came to West Street in 1909 with an E.E. degree from Columbia University and experience in several outside concerns to engage in the design, wiring, and testing of telephone circuits. At that time new windings for circuit apparatus were determined by experiment rather than by calculation, and a large part of his work was the establishment of an exact method of winding design. The importance of this work was greatly increased by the advent of the flat-type relay, which soon largely replaced the older round type and led to the formation of a group in charge of Mr. Everett to calculate windings and specify contact information to meet the conditions fixed by the circuit designers. Later he spent a short time first in the Patent Department, and then in the testing laboratories of the Systems Development Department, where he tested a proposed new type of dial system. More recently in the Switching Development Department he engaged in the design of manual circuits, including those for automatic listening and common-key ringing in the No. 11 Switchboard; in the standardization of magneto switchboard circuits; in the preparation of patent specifications covering new telephone systems; and in probability and time studies.

Edward Greenn

Mr. Greenn of Research Staff joined the Western Electric Company in 1910 after spending seven years as instrument maker with outside concerns. Entering the model shop of the Engineering Department, he spent most of his time until 1916 working on printing telegraph apparatus. He then spent eighteen months at the plant of J. R. Montgomery & Company in Windsor Locks, Connecticut, working with their engineers on tinsel conductors for telephone cords. Returning to the Laboratories during the latter part of World War I, he worked as a mechanic on range finding apparatus. After working in the Model Shop from 1919 to 1929, he became a laboratory technician in the Research Department.

Halvar S. Enger

After attending the College of the City of New York in 1895 and 1896 and then working for outside concerns until 1918, Mr. Enger joined the Western Electric Company at 195 Broadway. Three years later he came up to the trial installation group of the Systems Development Department. In 1925 he transferred to the Commercial Relations Department as an analyzer for shop jobs, handling certain commercial phases of picture-transmission equipment, sound-picture recorders and reproducers, the Musa, transoceanic short-wave transmitters and receivers, announcing systems and other equipments for naval vessels. During World War II, Mr. Enger was concerned with the coördination of model production on various Army and Navy projects which involved translation of engineering requirements into requisitions for purchases, fabrication and assembly, and then maintaining contacts necessary for insuring job progress.

Frank Wallenius

L. B. Stark

J. R. Nordstr

June Service Anniversaries of Members of the Laboratories

40 years

U. S. Ford
R. T. Staples

35 years

J. F. Baldwin, Jr.
F. H. Best
L. P. Ferris
O. S. Markuson
A. H. Schirmer

30 years

S. H. Anderson
J. A. Coy
Harvey Fletcher
E. D. Mead
V. F. Miller
Paul Neill
G. H. Somerville
William Stumpf
L. C. Wescoat

25 years

O. H. Coolidge
R. A. Deller
H. W. Dudley
F. F. Farnsworth
Myron Goddard
E. I. Green
R. O. Hagenbuck
S. J. Harazim
Eleanor Iasillo
Ruth Jennings
C. E. Lane
F. K. Low
W. P. Mason
C. H. McCandless
R. L. Pentland
J. C. Rile
E. M. Smith
I. G. Wilson
H. O. Wright
L. A. Yost
John Zoller

20 years

A. B. Bailey
G. M. Bouton
S. O. Ekstrand
Ellen Flad
H. C. Foreman
W. L. Gaines
H. H. Garlisch
H. L. B. Gould
H. A. Henning
K. M. Hicks
F. A. Hinshaw
Nora Holohan
A. E. Kerwien
L. E. Krebs
A. E. Leitert
W. J. Locke
P. R. Menzel
L. R. Montfort
C. N. Nebel
Margaret Packer
M. R. Purvis
Clarice Repetti
S. A. Schelkunoff
E. B. Stallman
K. M. Weeks
N. S. Whitehead

15 years

J. A. Ashworth
A. L. Hopper
J. F. Muller

10 years

Robert Blaschke
H. B. Guerci
F. J. Herr
Agnes Hirsch
Isolde Holoch
J. B. Howard
F. C. Kozak
J. B. Maggio
Grace Markthaler
C. H. Matthews
W. A. McFadden
R. C. Nance
H. E. Noweck
Jane Otto
Constance Roke
Catherine Roth
Margaret Schiebser
E. F. Schneller
C. R. Schramm
F. J. Schwetje
F. E. Stehlik
F. M. Thomas
W. W. Wallace
V. T. Wallder

John J. Paris

Soon after joining the drafting group of the Western Electric Engineering Department in 1917, Mr. Paris transferred to the Apparatus Development Department, where he was engaged in the design and development of telephone keys, jacks and other manual apparatus. During World War I, Mr. Paris was concerned with the development of apparatus and equipment for submarine and aircraft detection. He then continued the design of manual switchboard apparatus. In the early twenties he transferred to the specification group, where he prepared specifications for mechanical switching apparatus. More recently his work covered manual switchboard apparatus.

Clarence I. Baker

Before joining the Western Electric Company in 1912, Mr. Baker had been with the Singer Manufacturing Company for six years, where he was engaged in drafting work in connection with automatic tool machines. His first work here was in the drafting group of the Engineering Department on machine-switching apparatus. In 1917 he transferred to what is now the Switching Apparatus Development Department, where he became associated with the design and development of apparatus for the panel system. Later he aided in the redesign of step-by-step switches and after that the development of multi-contact relays for the crossbar system. During World War II he was responsible for the development of special instruments for use in the Laboratories design of the Flight Trainer. He also developed tape transmitting and reading mechanisms for gun director test apparatus.

Frank Wallenius

Mr. Wallenius joined the Western Electric Company in 1912 and worked on printing telegraph machines. When the manufacturing organization transferred to Hawthorne, he also went as a group supervisor on the production of these machines. He left the company in 1916 but returned to the West Street Development Shop two years later. Since that time he had engaged in making accurate instruments and intricate tools and dies.

Lansford B. Stark

Mr. Stark of Switching Development, after a short period on equipment drafting work, transferred to Hawthorne in 1907, where he was supervisor of power and circuit drafting. In 1912 he came back to New York to handle the circuit drafting on the semi-mechanical system and supervised the laying out of circuits for the Newark installation which was put into service in 1915. Since that time he had engaged in the development of circuits for the panel and crossbar systems.

John R. Nordstrom

After a short period with the Engineering Department of the Western Electric Company, Mr. Nordstrom joined the old Model Shop as an instrument maker. In 1938 he transferred to Transmission Development as a laboratory mechanic. He first worked on testing equipment for coaxial systems and then, during World War II, was associated with Government projects, particularly radar systems. His precision workmanship contributed greatly to the satisfactory development of several intricate microwave systems.

New Dial Designations for Nassau County

New York Telephone Company has announced that the telephone numbering system now used in New York City will be applied about July 1 to some 45,000 telephones in six central office districts in southern Nassau County. The new designations, consisting of a central office name and a number, will be BAldwin 3, CUrtis 5, FReeport 8, LYnbrook 9, ROckville Center 6 and VAlley Stream 5. They will appear in the next Nassau County directory and will become effective upon delivery of the book to some 37,000 telephone subscribers in the affected districts.

Commercial Marine Radar Operating on Great Lakes

Savings of millions of dollars annually in lost time and accidents is in prospect for Great Lakes ship owners and shippers with the installation of the first experimental commercial radar equipment aboard the S.S. *John T. Hutchinson*, newest and one of the largest vessels of the Lakes fleet. The system was placed in operation on April 24.

It is expected by the Lake Carriers Association, who is sponsoring the program, that following this test all of the 340 large ships presently plying the Lakes will eventually be equipped with suitable radar equipment. Approximately 170,000,000 tons of iron ore, soft and hard coals, grains, and stone are transported across the Lakes annually and because of fogs and storms the carriers may be held up on one trip for as long as two and one-half days at a time and may cost the company as much as $150 for each hour the ship is delayed.

"The Telephone Hour"

NBC, Monday Nights, 9:00 p.m.

June 10	*James Melton*
June 17	*Fritz Kreisler*
June 24	*Blanche Thebom*
July 1	*Bing Crosby*

Aboard the first Great Lakes carrier to be equipped with radar. At the left the antenna is being christened. Below, R. C. Newhouse (right) of the Laboratories explains the significance of the pattern on the radar scope to Hon. Bernard J. Dowd, Mayor of Buffalo, and Hon. Kneeland B. Wilkes, president of the Buffalo City Council