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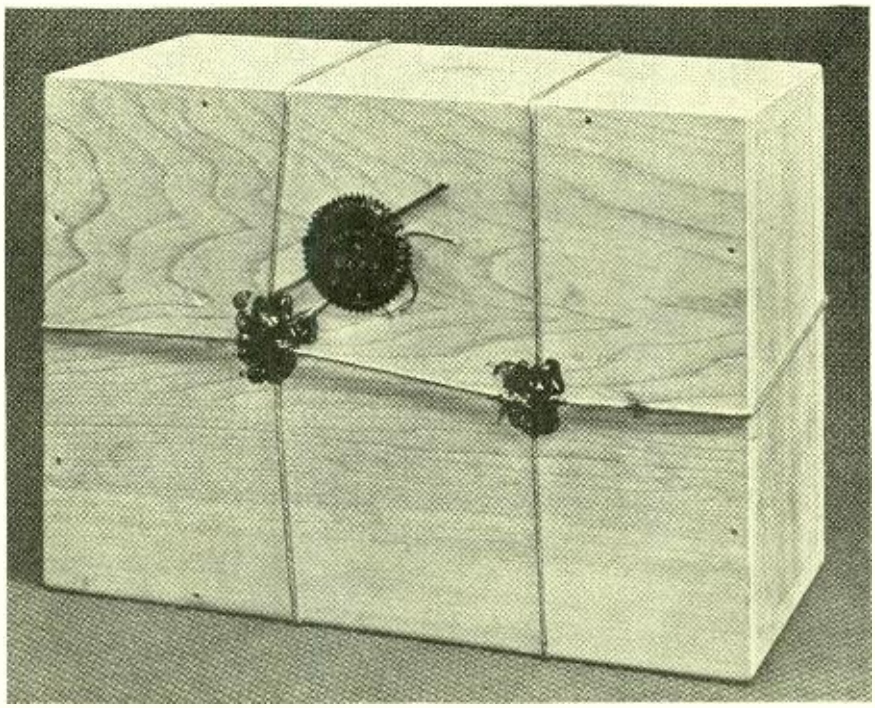


Sealed in this box and deposited in Bell Telephone Laboratories' Vaults for the duration is a special electronic device which in its short service has made history. With it is deposited a letter from the Commanding Officer of a United States war vessel which states that the tube was installed and operated in the Radar of his ship during action in the South Pacific when a number of Japanese ships were sent to the bottom.

The letter continues: "It functioned perfectly at all times before, during and after the engagement, the success of which was heralded as one of the great victories of the present campaign in the Southwest Pacific."

Electron Diffraction by Large Molecules

By K. H. STORKS
Chemical Laboratories

THE relatively large force required to break a single cotton fiber and the ultimate architecture which makes this strength possible has long been a subject for speculation. The cause was pure inference, however, until x-rays were used to probe the structure of the material. Recently a second tool, electron diffraction, has been found helpful in similar studies.

A cotton fiber consists of a large number of particles. Its ultimate atomic units are the elements carbon, oxygen, and hydrogen. These are common to organic compounds but such compounds ordinarily do not possess unusual strength; and it is reasonable to expect that this most striking characteristic of the cotton fiber is dependent on some unique combination of these atoms into molecular groups. These groups are much larger than ordinary molecules and are called macromolecules. Each may consist of several hundred atoms and one of the dimensions is very large compared with the other two. A macromolecule may be visualized as a smaller edition of the fiber itself.

Cotton fiber and its building unit, the cellulose macromolecule, is a complicated structure but simpler materials with generally similar structure can be built in the laboratory with comparative ease. One of these, known as "polyethylene sebacate," has recently been studied by the Laboratories. A macromolecule of this substance may be thought of as a chain composed of many identical links, each one of which may be resolved into twelve carbon atoms and two oxygen atoms. Hydrogen atoms and two extra oxygen atoms also arrange themselves in definite positions along the sides of each link. The average chain, assuming full extension, is between five and six millionths of an inch long. Although extremely small in the light of our everyday experience, this is relatively large for a molecular dimension—approximately sixty times greater than the longest dimension of a molecular unit of ordinary soap and four hundred times larger than a molecule of water.

By the electron diffraction method this material can be examined in the form of films thinner than the total length of a fully extended macromolecular chain and many details of structure clarified. The first step is to satisfy ourselves that the crystal structure of the polymer is the same in thin films as in the more massive fibers and sheets that are examined by x-ray methods.

A film of polyethylene sebacate approximately one-thousandth of an inch thick was prepared by allowing a dilute chloroform solution to evaporate on a microscope slide. A small section of this film, removed from the slide, may easily be stretched or cold drawn to a thickness of approximately two millionths of an inch. When this stretched film is examined with the primary electron beam striking from a direction perpendicular to its front

and back surfaces, the diffraction pattern obtained from the film is that shown in Figure 1A.

This pattern is consistent with x-ray data on thick specimens and contains a number of reflections at relatively large scattering angles that are not usually shown by x-rays. For example, the thirteenth, fourteenth and fifteenth order reflections from crystallographic planes normal to the extension direction of the film can be clearly seen in Figure 1A. They are the two groups of three closely spaced white arcs across the vertical center line of this pattern. These three particular orders are expected if the atoms of the chain are nearly uniformly spaced and extend across the major link of the chain in a tiny zigzag pattern, which extends into the next major link without appreciable interruption. This may be taken as more direct evidence that the chain is fully extended parallel to the stretching direction.

To find out if the chains can be oriented without stretching, a film less than one-millionth of an inch thick, and hence thinner than the length of a

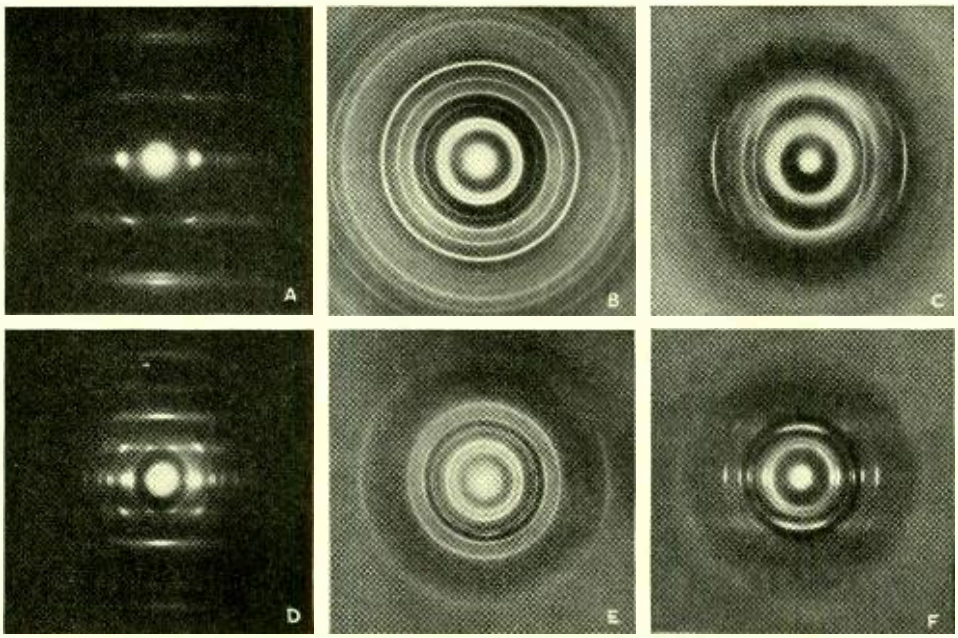


FIG. 1—ELECTRON DIFFRACTION PATTERNS OF CHAIN POLYMERS

A—*A stretched film of "polyethylene sebacate."*

B—*An unstretched film of the same material less than one-millionth of an inch thick and hence thinner than the length of a macromolecule.*

C—*The same sample as (b) but rotated relatively to the primary beam. The difference between (b) and (c) indicates preferred orientation of the crystallites.*

D—Normal electron diffraction pattern of gutta-percha.

E—*Pattern of an unstretched gutta-percha film one-millionth of an inch thick showing that the axes of the major links are perpendicular to that surface of the film.*

F—Gutta-percha pattern with incident electron beam at a large angle with the film surface. Confirms perpendicularity of the links to the film surface.

macromolecule, was prepared and examined in an unstretched condition. A photographic plate exposed with the primary beam incident normally to the surface of this film is shown in Figure 1B. The radii of the observed rings agree with the radii of certain spots in Figure 1A, but there are not sufficient rings to correspond to all of the spots observed. That non-random orientation of the minute crystals or "crystallites" in the film is the cause of this deficiency was shown by rotating the film with respect to the primary beam and exposing another plate. The additional arcs found in the resulting pattern, Figure 1C, would not appear if the crystallites in the film were at random.

A quantitative analysis of these data accounts for the observations, if the long axes of the major links of the chains are approximately parallel to the plane of the thin unstretched film and if the individual crystallites have a preferred direction approximately normal to the surface of the film.

These data enable us to complete the probable architecture of this polymer. The fully extended macromolecules pack into long thin straw-like bundles which constitute the individual crystallite. Until the material is subjected to mechanical treatment these more or less rigid bundles lie in all possible positions provided the thickness of the layer of material is greater than the length of a bundle. Stretching or rolling aligns the bundles in much the same way that hair is straightened by a comb.

The polymer just discussed does not recover spontaneously from the stretched condition. Rubber which is also a polymer has this outstanding characteristic in marked degree, and gutta-percha also possesses it to a lesser extent. Electron diffraction data show differences in these two types of polymers which may account for this difference in their behavior.

Gutta-percha, a polymer produced by nature, has a chain structure but the major links are shorter, and the atom-links are joined differently from those of polyethylene sebacate. Figure 1D is a pattern taken under the same condition as Figure 1A and is the normal fiber pattern for gutta-percha. An unstretched film one-millionth of an inch thick taken at normal incidence is illustrated in Figure 1E. The reflections here correspond only to those in the horizontal center line of

K. H. Storks received the B.S. degree from Coe College in 1930 and joined the Chemical Department of the Laboratories immediately thereafter. He was at first concerned with studies of transmitter carbon and organic insulating materials. Then he worked four years in the Physical Research Department on electron diffraction studies. In 1939 he returned to the Chemical Department to apply diffraction methods to various chemical problems.

Figure 1D. This requires that the axes of the major links of the gutta-percha chain be perpendicular to the surface of the film. Figure 1F is the pattern made with the beam incident at a large angle to the unstretched film and confirms this view. It is necessary to alter the picture of polyethylene sebacate to explain the structure of gutta-percha. The orientation in the latter indicates that the macromolecules fold back and forth like an accordion. This folding probably accounts for the ability of gutta-percha to recover after stretching.

From these studies it may be concluded that various chain polymers have a flexible or inflexible chain depending on the nature of the links and sub-links. The ability of these polymers to recover from mechanical extension is probably associated with the flexibility of the chain, and their mechanical strength is dependent on the existence as well as the nature of the chain structure. These fundamental studies help to explain the characteristics of rubber and similar organic materials which find extensive use in the telephone plant.

Electromechanical Transducers and Wave Filters

This book by Warren P. Mason of the Radio Research Department, published by D. Van Nostrand, was reviewed in the June issue of the "Proceedings of the Institute of Radio Engineers." In part, the review said:

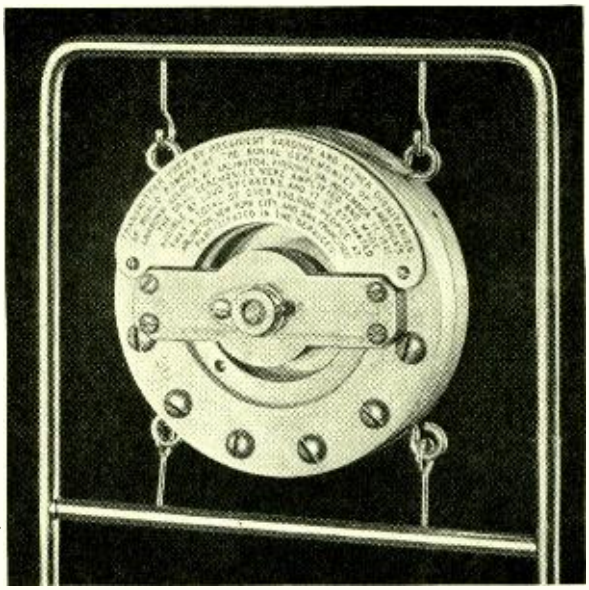
"This volume is a monumental text and reference on the subject of wave filters in general, with intensive treatment of the problems of distributed parameters, mechanical analogs of electrical parameters, and electromechanical coupling. . . .

"After an interesting historical outline, there is a 60-page concentrated treatment of electrical wave filters, with a brief table of the simpler types, their formulas and characteristics. Part of this section is an introduction to filters including transmission lines with their distributed constants.

"The principal subjects involve the analogy between electrical and mechanical systems, and the problems are treated from this point of view. Nearly half of the space is devoted to an excellent treatment of acoustic waves and devices such as telephone receivers, horns, and loudspeakers. The final section is devoted to the field in which the author ranks highest as a specialist, the use of quartz crystals in wave filters to secure great selectivity and frequency stability."

Historic Firsts

The Condenser Microphone



This condenser microphone, now in our Museum, was used at the burial ceremonies of America's Unknown Soldier at Arlington, Virginia, on November 11, 1921

TELEPHONY requires a complex current which has components with vibratory rates and relative intensities corresponding to the component tones of speech. Such a current can be generated directly, as in a sound-powered electromagnetic transmitter, or it can be produced by varying an otherwise steady current, as in a transmitter with variable resistance.

A telephone current can be produced, also, by an electrostatic transmitter in which sound power varies the capacitance of a charged condenser. This was recognized early in the history of the art but was of no practical value because of the inherent insensitivity of such a device. About 1916, however, in Bell Telephone Laboratories E. C. Wente developed a condenser microphone which was to have a very large influence on the further development on all the electro-acoustical arts of communication.

He formed a condenser between a plate and, closely parallel, a stretched diaphragm; and connected a battery to these surfaces. As the diaphragm vibrated there were proportional variations in the battery current and these were amplified by a closely associated vacuum tube. As a result this device faithfully converted acoustic energy into electrical energy.

As the first really high-quality transmitter—for it was essentially distortionless in its response throughout the frequency range of speech and orchestral music — Wente's electrostatic microphone was of great importance as a research tool in investigating speech and hearing. In fact, he originally developed it as a step in the program of acoustic research.

Through its use it became possible for the first time to pick up sounds for transmission, or recording, with such fidelity as to permit reproduction for esthetic purposes with an adequate illusion of naturalness. After its development radio and public address systems could enter their present field of transmitting not merely verbal information but also emotional and esthetic effects. It was the "mike" of the early days of radio broadcasting, of high-quality electrically cut phonograph records and of sound pictures.

Crossbar Terminating Equipment for Multi-Office Operation

By O. H. KOPP
Switching Development

IN CROSSBAR and panel offices, the originating senders, decoders and originating markers, together with outgoing trunks, may be used in common by more than one central office located in the same building. This common usage by more than one office of these expensive circuits in the originating office results in substantial savings. Since in the crossbar system, senders and markers are also used in the terminating office, a corresponding saving may be made under some conditions in the circuits for terminating a call. To take advantage of this situation, the crossbar system has been designed to use a group of common terminating senders and terminating markers to serve more than one central office when in the ultimate the load of the combined offices is light enough to require no more than ten terminating markers, which is the maximum number of terminating marker circuits that it is desirable to use in common. Such common switching equipment for terminating calls is known as a multi-office terminating unit. It provides for serving two number series of 10,000 numbers each. The two 10,000-number series may each include one or two central offices so that a maximum of four central offices may be involved in service to 20,000 numbers.

Without multi-office operation, each 10,000-number series would have its own terminating equipment. In the crossbar system, this involves the incoming-link frames, line-link frames, terminating senders, terminating markers, and the associated connector frames. With multi-office operation savings are made in the quantities of this terminating equipment over what would be required if each 10,000-number series had separate terminating equipments.

The two series of 10,000 numbers served by such a multi-office terminating unit are known as office A and office B. It frequently happens that one of these offices serves a section of subscribers who are outside the local service area. In such a situation, a difference in rate treatment between the two offices may be involved, and if so it is necessary to segregate the incoming traffic in accordance with established rates with respect to the origin of the call. To provide for such situations, the multi-office terminating unit permits the division of the office A and the office B number series into a physical and theoretical office. These offices will each have an office name but they will divide the 10,000-number series between them. The multi-office terminating unit thus permits a variety of arrangements. There may be a single 10,000-number series which includes a physical and a theoretical office. There may be two 10,000-number series with a physical and a theoretical office in one and not in the other, or there may be two

10,000-number series each with a physical and theoretical office. In the first case, there will be two office names; in the second, there will be three; and in the third, four names. But all of these offices will be served by the same terminating markers.

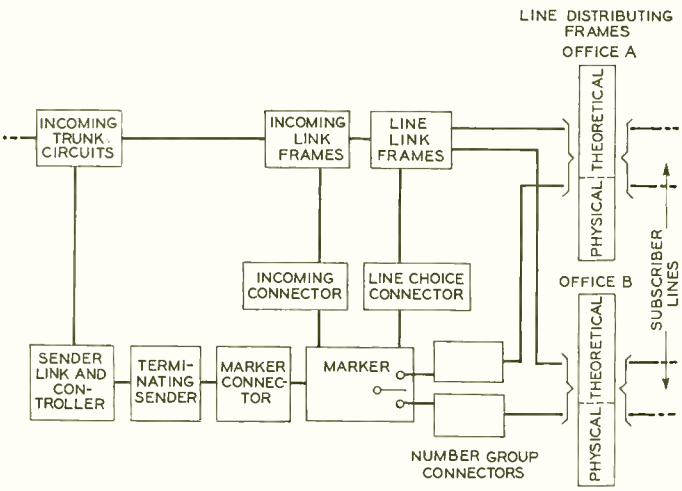


Fig. 1—Schematic of multi-office terminating unit using incoming and line-link frames common to the two offices

The various equipment frames and their interrelation for a multi-office terminating unit are indicated in Figure 1. The incoming and line-link frames are common, but the number-group connector frames are always individual to each 10,000-number series. The terminating marker circuit thus requires an identifying signal to indicate whether the number called is in office A or in office B so that it may select one of the proper set of number groups. The incoming trunks may be individual to each office or common; and when they are individual, the identifying signal is obtained from the sender link and connector by way of the terminating sender. When common trunk groups are used, the signal must come from the originating sender in the distant office. As the circuit is actually arranged, the terminating sender under these conditions receives a signal from both the sender link and the originating sender and, depending on the combination, the sender will signal the terminating marker circuit to select either office A or office B.

The terminating marker circuit is thus enabled to distinguish between the number series for office A and the number series for office B. Where these are divided between physical and theoretical offices, the completion of calls is controlled depending upon whether or not a discrimination must be made between physical and theoretical on account of a difference in rate treatment.

Where there is a difference in the charge for calls to the physical and theoretical offices, the sender completes calls not requiring an additional charge in the regular manner, but it must divert calls requiring an additional charge to an intercepting operator. Certain calls, however, such as those to official lines or those from a toll office, are always completed normally. Whether or not an additional charge is required is determined by checking the particular calling trunk against the office name and number called. To make this possible, the marker receives a signal from the incoming-link frame to identify the trunk and one from the connector to indicate whether the number called is physical or theoretical.

The trunks are divided into three groups: one entitled to make calls

only to the physical office, one, only to the theoretical office, and one, to either. Similarly, there are three groups of numbers: physical numbers, theoretical numbers, and a few called "non-discriminating," which include official lines, which may always be called without charge. The marker receives a signal from the incoming link and connector to identify the trunk, and a signal from the number-group connector indicating whether the line is physical or theoretical, and basing its action on these two signals, either completes the call or passes it to an intercepting operator.

Two sets of three relays in the marker, one set for the trunk and one for the lines, receive these signals and cause the marker either to complete the call normally or pass it to an intercepting operator. The set of trunk relays are designated IP, IT, and IPT. If the calling trunk may be used for calls without extra charge only to the physical office, the IP relay will be operated, while if it may reach only lines in the theoretical office, IT will be operated. If it may make calls to either, IPT will be operated. The three relays associated with the lines are designated PN, TN, and PTN, and they are operated similarly depending on whether the line called is physical or theoretical, or one for which no charge is made. If the two operated relays match, that is, if they are IP and PN, or IT and TN, the call will be completed in the usual manner, while if one is a P and the other a T, the call will be passed to an intercepting operator. If the trunk relay operated the IPT or the line relay PTN, however, the call will be completed regardless of which relay of the other group is operated. If the call is routed to an intercepting operator, arrangements are provided for the use of distinctive groups of trunks where it is desirable for the intercepting operator to know whether a particular call is from a physical or a theoretical trunk group or whether a call is for office A or office B.

When a call originates from an "A" switchboard of the distant office or from the local "B" board, a signal must be sent to indicate to the terminating marker whether it is the A or B office that is wanted. When the trunks are individual to each of the two offices, the signal received by the terminating marker from the sender link frame is sufficient but, when the

O. H. KOPP began as a laboratory assistant in the circuit laboratory and worked there until 1912 when he was sent into the field at Newark and Wilmington on the first installation of panel equipment. Returning in 1916, he worked on the design of sender circuits for several years and later was engaged in the development of automatic testing circuits for senders, and in the development of circuits for terminating equipment in the crossbar system. He is at present engaged on war projects for the Army and Navy.

trunks are common, an additional signal is required from the operator. If the operator is required to place calls through a multi-office terminating unit with common trunk groups, she must have some means of giving the required identifying signal.

A dialing operator gives the identifying signal by dialing an additional digit, the four digits for the called numbers being preceded by a digit to indicate whether the call is for office A or office B. A key pulsing operator does not give an identifying signal, but each of her trunks to the multi-office terminating unit has an office A jack and an office B jack, and the operator will select the proper jack for the call. The jacks cause the office A or office B signal to be transmitted over the trunk to the terminating sender. For a B operator, an additional key is furnished for each of the two offices. The operator presses one of these keys before she operates her key set. In all cases the operator receives a distinctive order tone before she passes the number, and to make sure she transmits the additional identifying signal where it is necessary two types of order tone are provided: one where the identifying signal is needed and the other when it is not.

None of the arrangements required to provide a multi-office terminating unit is expensive. The markers will require an additional set of 500-group relays, since one set is needed for office A and one for office B. Additional keys will also be required at the B switchboard. The savings due to the use of equipment in common, however, is greater than the cost of these arrangements, and the development thus makes considerable economy possible where conditions warrant the employment of multi-office terminating-unit operation.

"The Quarterly of Applied Mathematics"

This is preëminently an age of applied science—of the application of the knowledge gained from scientific research to the practical needs of peace and war. One of the major essentials of this application is the effective and prompt transmission of knowledge from those who discover and organize it to those who will apply it to human needs. Even under the restrictions of wartime conditions, therefore, it has seemed advisable to bring out a new medium for such transmission in a field that heretofore has not been adequately provided for. This medium is "The Quarterly of Applied Mathematics" which made its first appearance with its April issue. It is published under the sponsorship of Brown University and is under the direction of a board of seven editors, one of whom is Dr. T. C. Fry of these Laboratories. It plans to publish original papers in applied mathematics that have an intimate connection with the application of science to industrial needs.

Resistance Lamps

By N. INSLEY
Apparatus Development

BANKS of electric lamps are a familiar sight in central-office equipment. During most of the time they are dark but occasionally one will flash briefly. Their function is to limit the current in a circuit to a safe value; for that purpose they are better than fuses, for brief overloads will not put the circuit out of service as would a blown fuse. As compared with other types of resistors, the incandescent lamp has many advantages; it is cheap, readily available, and absorbs considerable power without creating a fire hazard.

Incandescent lamps with carbon filaments were the only ones made during the early years of telephony and commercial illuminating lamps of this construction, with current and voltage ratings closest to those desired, were chosen for each type of circuit. These included lamps coded as Nos. 1, 2 and 3 in the Apparatus Catalogue of 1904. Later was added the No. 5 lamp, shown in Figure 1 at the extreme left. It had a pear-shaped bulb; Nos. 1, 2 and 3 had long tubular ones.

Development of illuminating lamps with tungsten filaments led to their adoption instead of carbon lamps, which became obsolete. The first tungsten filament lamps, coded Nos. 6 and 7, are shown in Figure 1.

The high positive resistance characteristic of tungsten as compared to the negative characteristic of carbon is a valuable asset in resistance lamps because it limits the increase in lamp

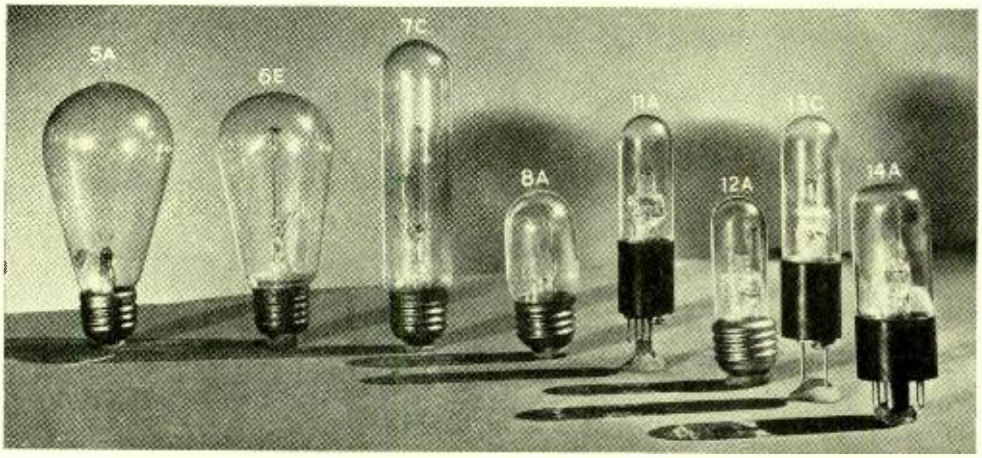


Fig. 1—Resistance lamps used to protect telephone circuits against excess currents caused by accidental grounds. The lamp at the extreme left is an obsolete type with a carbon filament. The next two, also obsolete, have tungsten filaments. The small lamps shown at the right, except the 13C, are gas filled

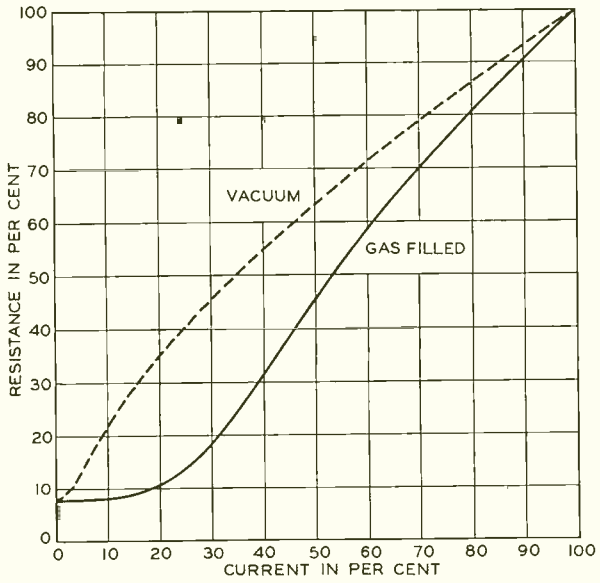


Fig. 2—Comparative current-resistance characteristics of vacuum and gas-filled resistance lamp

current caused by an increase of applied voltage. For example: resistance lamps are used in series with the battery supply to the repeating coils in 48-volt cord circuits. When talking current is fed to a long subscriber's loop, the resistance of the lamp is low, but on short loops when the current might otherwise rise sufficiently to cause transmitter burning and impair transmission, the filament temperature and resistance increase and limit the current to a safe value. If a ground occurs, the resistance increases sufficiently to prevent the current from overheating the repeating coil. When the trouble is cleared, the lamp immediately returns to normal.

When first introduced, all sizes of tungsten lamps were evacuated, but later the larger ones were filled with inert gases, such as nitrogen and argon. Investigation showed that gas-filled resistance lamps would satisfy the circuit requirements for many applications far better than vacuum lamps. In vacuum lamps the energy is dissipated largely by radiation and only a small amount is carried away through the filament mount and support wires. Even a small current causes the filament to rise much above room temperature before there is sufficient radiation to dispose of the small energy input. Since the filament resistance increases in direct proportion to its absolute temperature, the resistance rises sharply on very small currents.

In gas-filled lamps the gas carries off considerable heat by convection and for very small currents the filament temperature remains close to that of the room. As the current increases, the energy input becomes too great for the gas to dissipate it and the filament temperature and resistance then increase. This increase in filament resistance also increases the wattage input for a given current so that the filament temperature rises rapidly until the radiation carries off the energy.

Typical current-resistance curves of a vacuum lamp and of a lamp similar in every respect except that it was filled with a gas at approximately one-half atmospheric pressure are shown in Figure 2. The resistance of the gas-filled lamp remains relatively constant at low currents, then rises sharply with increasing current until most of the energy is dissipated by radiation. The resistance then approaches that of the vacuum lamp. For a given filament the current at which the resistance begins to rise sharply can be controlled over a considerable range by adjusting the gas pressure in the lamp.

For economy of mounting space and circuit wiring, resistance lamps have to be small enough to mount on the same plates with associated apparatus and for protection against breakage they should not protrude beyond adjacent apparatus. To meet these general requirements better than previous designs, the No. 8A lamp shown in Figure 1 was developed to control the current in 48-volt battery-feed circuits. A commercial stem structure and filament were employed, and the electrical characteristics were selected specifically for this circuit. This was the first gas-filled resistance lamp; and the first limited to dimensions of 3 inches long and 1¼ inches in diameter. To take advantage of the space savings which resulted from the small size of the 8A lamp compared with the Nos. 6 and 7 lamps, a complete series similar in form to the No. 8 was developed and standardized about 1927. Included were duplicates of the Nos. 6 and 7 series mounted in the smaller bulbs.

Two 8A lamps were formerly used in each 48-volt battery supply circuit, one on each side of the battery, to limit the current on short loops while keeping the circuit balanced. To maintain the necessary balance, the lamps were held to very close tolerances. If one lamp with two filaments was used, not only would further substantial space savings be made, but adequate balance between filaments would be obtained without the difficulty of meeting severe overall tolerances. Furthermore, if this lamp were equipped with a base for mounting directly on plates which had standard relay drillings, the cost of two sockets would be saved. By equipping the lamps with soldering terminals they could be soldered into the circuit by conventional methods.

A two-filament lamp which fulfilled these requirements was introduced commercially as the No. 11A lamp in 1937. It is equipped with a molded base of phenol plastic and has four soldering terminals, two of which have strapping lugs. It mounts on one-inch instead of 1¾-inch centers as required for the sockets of the 8A lamps. To gain this space economy it was necessary that the bulb of the 11A lamp be not greater than ⅞ inch in diameter as compared with 1¼ inches for the bulb of the 8A.

Corresponding advantages in circuit and equipment arrangements

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Norman Insley graduated from Hamilton College in 1918 and from M.I.T. in mechanical engineering in 1921. He joined the Laboratories the following year and spent the four succeeding years writing specifications and instruction bulletins. Since then the design of ballast lamps, resistance lamps, switchboard lamps, lamp caps and visual signaling equipment have demanded his attention. Mr. Insley has developed photometric methods for small incandescent lamps; also life test equipment and methods for these and larger lamps. He has done general consulting work on the characteristics and performance of commercially available incandescent lamps. At present Mr. Insley is concerned with an investigation of the mechanical features of quartz crystal units.

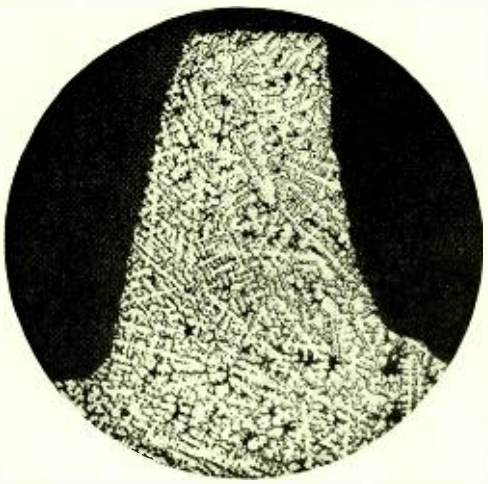
could be gained if all resistance lamps, whether with single or double filaments, were designed like the 11A lamp, and this would also result in economy of manufacture. Lamps equipped with screw bases, however, would also be needed for maintenance purposes to replace the older types. To effect these improvements complete new lines of resistance lamps with soldering terminals and screw bases were developed to replace the No. 8 lamps. Electrical characteristics were revised wherever improved circuit performance could be obtained. For example, the new lamp developed to replace the corresponding No. 8 type for coin-control service permits a substantial increase in the length of the operating loop.

These small lamps are coded No. 12 when equipped with medium screw bases for maintenance use, where No. 8 type lamps are now installed, and No. 13 when provided with molded bases and soldering terminals for economy of mounting and wiring in new installations. Some are evacuated and others are gas filled, according to service requirements.

A double-filament lamp, similar electrically to the 11A, but equipped with a seven-prong octal base, has recently been developed for circuits where easy access for test and adjustment is required. This lamp, coded 14A, is shown in Figure 1 at the extreme right.

All of these new resistance lamps have been designed without the restrictions to size and shape of bulb, type of base, forms of tungsten filament and gas pressure, that were formerly imposed by the use of illuminating lamp parts and processes. Thus the maximum flexibility of design for specific circuit requirements and equipment needs has been attained.

MATERIALS engineering is concerned not only with informing the design engineers about materials which will be adequate for their purpose, but with investigating cases where materials have failed in service. The accompanying photomicrograph, made by F. G. Foster of Materials Engineering, illustrates the structure of an experimental bronze gear which developed excessive backlash during test. The photomicrograph was prepared after sectioning, polishing, and etching with a solution of ammonium hydroxide and hydrogen peroxide. The amount of wear may be noted by comparing the worn profile of the gear with that of the unworn side. The gear shown failed because the casting from which it was cut was not sound and was not chill cast as specified. The remedy suggested was to cast the gear blank more nearly to the finished size and to provide a cast iron "chill ring" to remove the heat rapidly, thus insuring sounder casting.



Neutralizing Induced Voltages in Toll Signaling Circuits

By G. A. PULLIS
Switching Development

EARTH potentials and induced voltages have always been a major factor in limiting the use of grounded signaling circuits. On composited signaling channels, one of the wires of a phantom group is commonly employed to neutralize the effect of earth potentials as already described.* With this circuit, indicated for one leg of a phantom group in the upper part of Figure 1, two line wires of the phantom group—one operating leg and the earth-potential leg—are brought to equal but oppositely poled windings on the CX relay. Equal currents coming in on both wires would thus have no effect on the CX relay, and since approximately equal voltages are induced on all wires of a phantom group by outside disturbing sources, it would appear that this circuit would also serve for protection from induced potentials. The presence of the retardation coil T, however, which is used to minimize disturbances to the voice channels from the signal pulses, unbalances the circuit for induced voltages. To supplement ground potential compensation, therefore, modified circuit arrangements have been developed to neutralize induced a-c potentials for those forms of signaling circuits that are most subject to their effects.

The coil T interposes a high impedance between the CX relay and ground on the operating leg, which results in a difference in current in the operating and earth-potential windings. Moreover, the voltage drop across T tends to make current flow through the winding connected to the balancing network as well, thus further unbalancing the circuit.

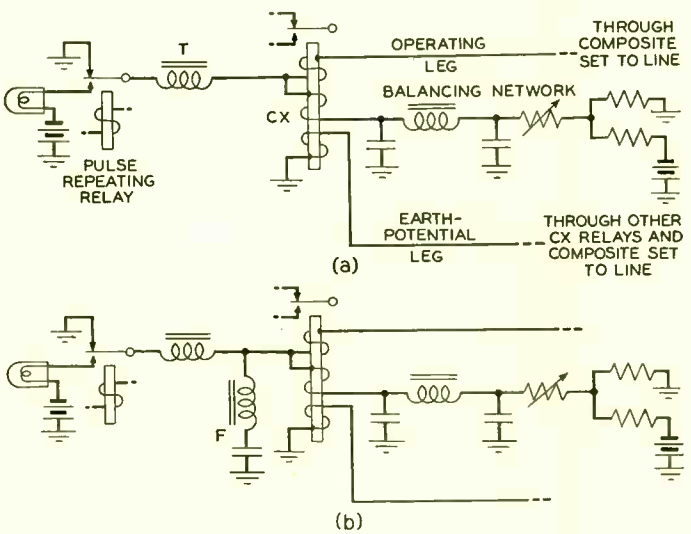


Fig. 1—Simplified schematic of one end of composited signaling circuit. Above, when no provision made for neutralizing induced circuits; below, with a filter F to provide a path to ground shunting the coil T

*RECORD, *July*, 1940, *p.* 337.

This situation is avoided and balance to induced currents restored, by adding the retardation coil and condenser marked F in the lower diagram. These form a 60-cycle resonant path which shunts out coil T at 60 cycles, but has no effect on the operation of the circuit under signaling conditions since its impedance to signaling frequencies and d-c is high.

Where earth potential compensation is not required, the third winding of the CX relay is not used, and a filter placed such as F of Figure 1 would be worse than useless since it would increase the unbalanced induced current flowing over the operating leg. Where earth-potential compensation is not employed, therefore, the filter is placed on the line side of the CX relay as shown in Figure 2. Here it draws off the induced current before it reaches the CX relay. With the filter in this position, however, it is necessary to connect a similar filter to the balancing network to maintain the balance.

In sections of the country where the induced voltages are at 25 cycles instead of 60, this use of filters is not feasible because a filter resonant at 25 cycles would greatly reduce the lower harmonics of the fundamental of the dialing frequency, and thus would distort the signal. Where steps must be taken to reduce 25-cycle induction on composited signaling circuits having ground-potential compensation, the arrangement shown in Figures 3 and 4 is employed, which was suggested by J. M. Dunham of the Protection Development Department. A four-winding retardation coil is used with one winding in the connection from each of the four line wires. These windings are all poled in the same direction for current coming in over the lines. As a result the coil offers high im-

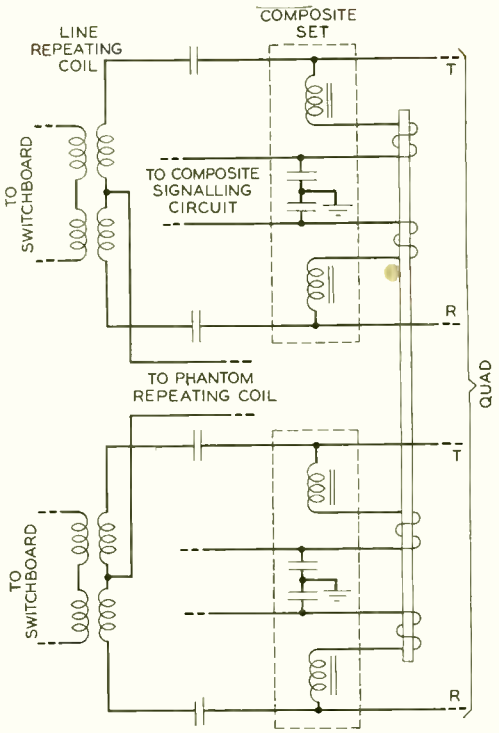


Fig. 3—For reducing induced 25-cycle potentials, filters are not satisfactory, and a more elaborate balancing system is employed

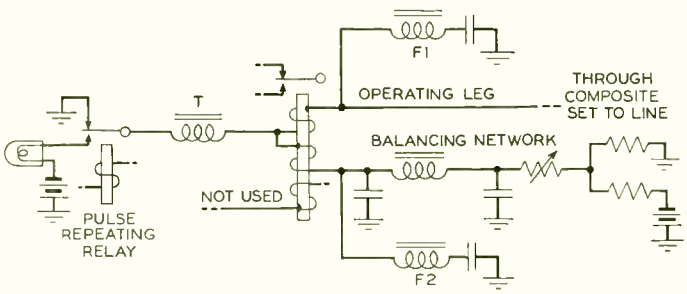


Fig. 2—When earth-potential compensation is not employed, 60-cycle filters are connected to both the operating leg and the balancing network

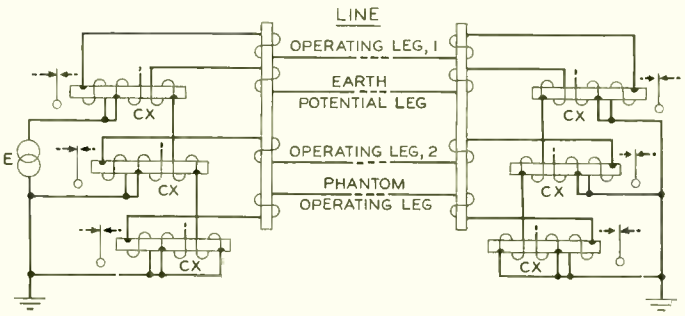


Fig. 4—Connections of four-winding retardation coil used for reducing induced 25-cycle potentials

pedance to equal currents flowing on the four wires at the same time, and thus induced longitudinal currents are greatly attenuated. To a signal passing either in or out on only one wire of the group, however, the coil offers essentially zero reactance; its impedance is practically only that of the resistance of the winding.

Why this is so may be seen with the help of Figure 4, which shows the four-winding retardation coil connected to its associated lines and CX relays. A signal voltage E is shown applied to the No. 1 operating leg. Under these conditions, the retardation coil may be looked upon as a transformer with a single primary winding and three secondary windings. Signal voltage E causes a current I_1 to flow over the No. 1 circuit and this current induces a flux in the retard coil proportional to NI_1, where N is the number of turns on the winding. This flux induces an opposing E.M.F., e, in all four windings. In the winding for operating leg No. 1, e opposes E, and thus the net voltage applied to the No. 1 line is $E-e$, and the current that flows, I_1, is $E-e$ divided by z, where z is the impedance of the line, which is the same under all conditions.

In each of the other three wires, the only voltage acting is e, and the current flowing in each of the other three wires, I_2, is thus e/z. These currents are opposite in direction to I_1 because e is opposite in direction to $E-e$. The current effective in operating the No. 1 CX relay is I_1 through one winding and I_2 through another winding of the same number of turns. These windings are oppositely poled, but since the currents are opposite in direction, they have assisting effects.

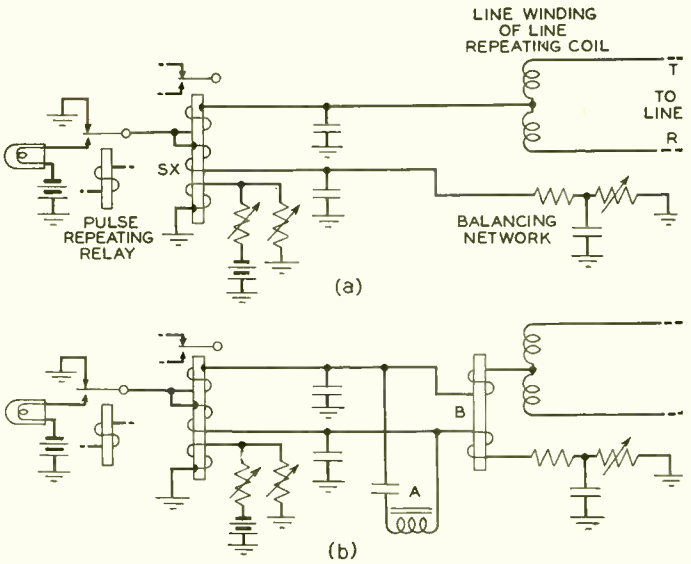


Fig. 5—Simplex signaling circuit where earth-potential compensation is not employed. Above, without protection against induced voltages; below, with protection against 60-cycle induced voltages

The total effective current, I_0 in CX1 is thus I_1 plus I_2. Substituting the values of I_1 and I_2 given above,

$$I_0 = \frac{E - e}{z} + \frac{e}{z} = \frac{E}{z}$$

Thus the effective current in CX1 is the same as though the retardation coils were not in the circuit. Actually, of course, their resistance is not balanced out, but this has only a very small effect on the amount of current flowing. Similarly, signals passing in or out on more than one of the operating legs 1, 2 and 3 with the earth potential leg connected to the CX relay windings, as shown in Figure 4, will encounter essentially zero reactance in the four-winding retardation coil. Also, the CX relays, through which signals are not passing, are not affected by the induced currents flowing in their operating and earth potential windings because these windings are opposing and their currents cancel each other.

The arrangement shown in Figures 3 and 4 is not limited to circuits troubled by 25-cycle induction; it may be used for overcoming induced voltages of any frequency. There are a number of sections of the country where both 25 and 60-cycle voltages are present, and for such locations this method of neutralizing induced voltages may be used. It is more effective than the method indicated in Figure 1, and thus may be employed under some conditions when 60-cycle induction is present alone. Where no 25-cycle induction is present, however, and where the 60-cycle induction is not severe, the method of Figure 1 is more economical to apply.

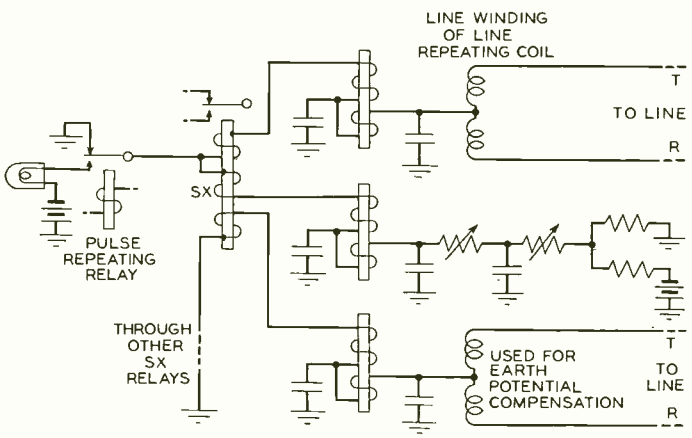


Fig. 6—Use of retard coils to remove 60-cycle induced currents from simplex circuits where it is necessary to employ ground-potential compensation

Composited signal circuits are ordinarily used only for phantom groups. For non-phantomed groups, simplex signaling is generally used, since it does not require composite sets and is considerably less expensive. In the simplex circuit, the signaling current is applied to the mid-point of the line side of the repeating coil, as shown in the upper part of Figure 5, and the current flows longitudinally over both wires of the trunk. Two methods are available for reducing induced voltages: one for circuits not requiring earth-potential compensation, and one for circuits requiring it. The former is shown in the lower part of Figure 5.

With the arrangement shown in the upper part of Figure 5, induced current flowing in on the tip and ring conductors of the line passes through the operating winding of the SX relay, tending to operate it. If the windings of the SX relay are connected in parallel by a circuit tuned to 60 cycles

and consisting of a condenser and retard coil A, as shown in the lower part of Figure 5, current from the line tends to divide equally between the relay windings. Since these windings are opposing, the effects on the relay are greatly reduced. Because of the resistance in the tuned circuit, the net ampere-turns in the SX relay, although decreased by the tuned circuit, require further reduction. This is accomplished by connecting the retard coil B as shown in the lower part of Figure 5.

The windings on retard coil B are poled so that current from the tip and ring of the line, flowing through the upper winding toward the SX relay, induces a current which flows in the lower winding toward the SX relay. This assists the action due to the tuned circuit, and the resultant effect is substantially to equalize the currents in the opposing windings of the SX relay. At low signal frequencies, this corrective equipment has only a very minor effect.

When it is necessary to provide earth potential compensation for simplex circuits, the circuit of Figure 5 will not serve because the third winding on the SX relay, instead of being used as a biasing winding, is connected to a spare simplexed line. For such installations, the filtering arrangement shown in Figure 6 is employed. The two windings on the retard coils are connected opposing, and between their mid-point and ground is a condenser with a capacitance that just tunes the mutual inductance of the coils at 60 cycles. With this arrangement, the only impedance in the shunting path to ground at 60 cycles is the iron loss of the coil, and thus practically all of the induced 60-cycle current is drained off before it can reach the SX relay. The small currents that do reach it are in opposition in the operating and earth-potential windings and thus have little effect. At frequencies other than 60 cycles, the condenser no longer tunes the mutual inductance of the coil, and the impedance of the shunt path becomes high and has little effect on circuit operation. The coil that is connected on the balancing leg maintains the circuit balance.

By one or another of these various methods, induced voltages, within a reasonable range of magnitude, are prevented from having serious effect on toll line signaling.

G. A. PULLIS joined the Laboratories in 1920 as a technical assistant, and with the transmission instruments group first engaged in transmitter and receiver studies. In 1928 he transferred to the toll systems development group, where he worked on the development of voice-frequency signaling for both ringdown and dialing circuits. Later he developed line and balancing circuits, and composite signaling and dialing circuits for dialing and d-c signaling over trunks between toll offices or between operating offices and community dial offices. He is now engaged in the development of equipment for the Armed Forces.

Dr. Buckley Addresses the Supervisory Staff

In a series of talks last month, Dr. Buckley reviewed our war activities for the supervisory staff of the Laboratories, and briefly discussed some of the changed conditions arising from the extensive demands the war has made upon us.

As indicated by requests for our services, the Army and Navy did not wait for the actual impact of war to initiate development needed to bring the fighting services into step with the latest achievements of science. Our development for them began as early as 1935, long before there was any serious indication that war was imminent, and has increased steadily ever since, but at a more rapid rate since Pearl Harbor.

Among our largest single projects are Radar, the Electrical Director, problems in anti-submarine warfare, radio equipment for airplanes, tanks, and artillery units, and wire communication equipment. These are fields in which we are peculiarly fitted to work. We were developing Radar and had practical accomplishments to our credit long before Pearl Harbor. In addition to Radar we also initiated in these Laboratories the Electrical Director. This complex device determines the location of a moving object, carries out all computations to determine the proper direction of fire, and actually controls the aiming of the gun so that it will be on the target at all times. Our leading position in radio communication, both between plane and ground and from point to point on the ground, naturally brought to us demands for the development of radio command sets, and the Western Electric's modern facilities for large-scale production have been of inestimable value in producing these sets in the large quantities needed.

Rear Admiral A. H. Van Keuren of the Naval Research Laboratory, Washington, D. C., visited the Murray Hill and Whippany Laboratories on May 15 with Dr. O. E. Buckley

In quartz crystals also, advanced techniques for grinding and processing have made the Western Electric one of their greatest producers. To date some eight million crystals have left its plant for war equipment. Our work on apparatus for anti-submarine warfare, begun during the last war, was again taken up, and is occupying the attention of several groups. Besides these large fields of work, there are numerous others, some smaller in scope individually but each important to the successful operation of our war establishments.

Ever since late in 1942, practically the entire development effort of the Laboratories has been applied to war projects of one form or another. The Laboratories has also coöperated to the fullest with other industrial organizations as well as with the armed services, and has turned over to them information on all of its developments.

Changes in Organization

Leo Montamat, on reaching the age of 65 during November of this year, will retire from active work in the Laboratories at the end of that month. In anticipation of Mr. Montamat's retirement, the following changes in organization became effective on July 1, 1943.

William Fondiller became Assistant Vice-President succeeding Mr. Montamat in charge of the General Staff Department. Mr. Montamat, continuing as Assistant Vice-President, will for the present remain

William Fondiller has been appointed Assistant Vice-President

in charge of the routine operations of the General Staff Department, transferring these responsibilities to Mr. Fondiller at such times as Mr. Fondiller and he may decide. As Mr. Montamat's time becomes available he will undertake special studies and assignments until his retirement.

R. G. McCURDY became Director of Electrical Apparatus Development, succeeding Mr. Fondiller. All organization units which reported to Mr. Fondiller, with the exception of H. J. DELCHAMPS and his department, will now report to Mr. McCurdy.

R. K. POTTER became Director of Transmission Engineering, succeeding Mr. McCurdy.

H. J. DELCHAMPS, Specifications Engineer, in charge of apparatus specifications, drafting and files, will report, together with these groups, to H. S. SHEPPARD, Apparatus Staff Engineer.

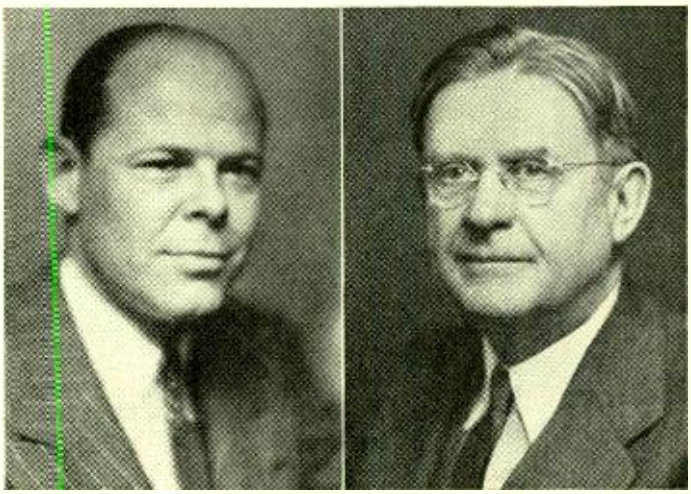
R. F. NEWCOMB RETIRES

At a meeting of the Board of Directors of the Laboratories, held on May 24, the resignation of R. F. NEWCOMB as Treasurer and Assistant Secretary was accepted in anticipation of his retirement on June 30 under the Retirement Age Rule. In a resolution adopted by the Board, it was said of him:

"WHEREAS, through his high sense of duty and loyalty, as well as by the able and effective administration of the responsibilities which have been assigned to him throughout his long service, he has made a memorable and enduring contribution to the best traditions of the Bell System;

"THEREFORE, BE IT RESOLVED, that the members of this board do hereby record their deep appreciation of the faithful and effective service rendered by Rush Frederick Newcomb and express their esteem and affection to him as a trusted officer and their sincere wishes for his future health and happiness."

Mr. Newcomb received his B.S. degree from Dartmouth in 1901 and the following October became a member of the Western Electric Company at the Clinton Street plant in Chicago. He worked for a short period in the stock department and later was engaged in clerical duties in the voucher department. During the next four years he was chief clerk at the Distributing Houses in Cincinnati and Salt Lake City. In 1907 Mr.



Pirie MacDonald

WILLIAM C. BURGER RUSH F. NEWCOMB

Newcomb came to the Western Electric Company in New York and was attached to the Secretary's office. Later he transferred to the Buffalo branch of the New York Distributing House and became stores manager. In 1913 he returned to New York, first as cashier and then as a supervisor in the Financial Department. Upon the formation of the Laboratories in 1925 he was appointed Assistant Treasurer. He served in this capacity until 1938, when he was elected Treasurer and Assistant Secretary.

W. C. Burger Elected Treasurer

Consequent to Mr. Newcomb's retirement, William C. Burger has been elected Treasurer of the Laboratories; George A. Brodley has been appointed Assistant Treasurer; and Mr. Burger appointed Assistant Secretary.

Mr. Burger attended Williams College from which he received his B.A. degree in 1922. He joined the Laboratories the next year and until his appointment as Assistant Treasurer in 1938, he had been engaged in methods, auditing and accounting work and at the time of his appointment had been in charge of the accounting methods group of the Methods and Audits Department.

Mr. Brodley, prior to coming to the Laboratories, had over four years of accounting experience, most of which was with the duPont Company. He joined the expense accounting group of the General Accounting Department in 1924; about a year later he transferred to the Payroll Accounting Department as a supervisor in the income tax group and in 1929 he was made head of this Department. During this time he spent two years studying accounting and finance in evening courses at New York University. In 1940, due to his experience and familiarity with income taxes, employees' payroll deduction plans, Social Security, Unemployment Insurance, Workmen's Compensation laws and benefits, and the operation of the Laboratories' "Plan for Employees' Pensions, Disability Benefits, and Death Benefits," Mr. Brodley was transferred to the Personnel Department as Assistant Secretary of the Employees' Benefit Committee.

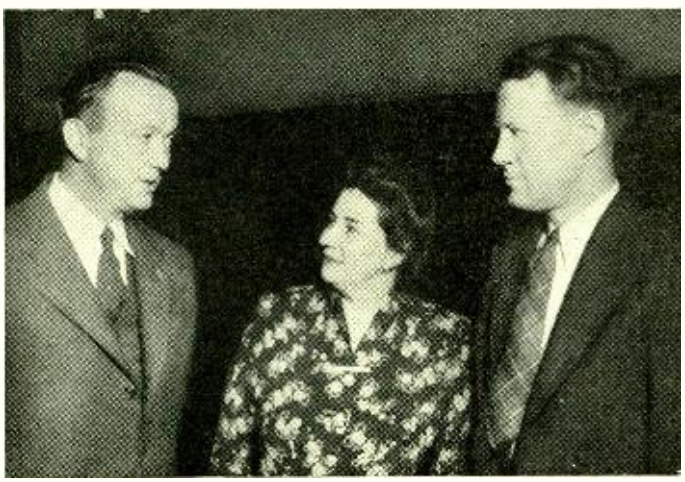
G. A. Brodley

Write Often and Cheerfully to Our Servicemen

Writing to soldiers and sailors in the service is definitely contributing toward winning the war. This is the opinion of General Dwight D. Eisenhower and of Naval officials who know that the right kind of mail is one of the most vital factors in building and sustaining morale. If the members of the Laboratories could read the many letters that come to the Record with the following typical postscript:

"Tell my old gang I'd like to hear from them," more of us would take the trouble to send former associates now in service "round robin" letters such as the Restaurant does, or to write individual letters to the men and women we know.

The Restaurant's plan is a simple one and has worked



These are the new officers of the Bell Laboratories Club: L. P. Bartheld, President; Louise Van Bergen, Second Vice-President; and C. J. Christensen, First Vice-President

satisfactorily so far. Mrs. McIlwraith stamps an envelope and writes the name of a serviceman on it; she starts the ball rolling by writing a sentence or two, encloses a few extra sheets of paper and routes the envelope and paper through her department. Each member of the Restaurant adds to the letter and when finished it is sent to the Personnel Department where it is correctly addressed and mailed.

What do servicemen like to read in their letters? A recent survey shows that they like to hear about the job they left, their friends who are in service, the girls they knew, changes in social relationships (who is marrying whom), and word that their coworkers are doing everything possible to aid the war effort.

There are seventy Laboratories men overseas. The letter you write may give a man the courage that will be the means of saving his life.

Vail Medal Awards

From a group of 28 men and women telephone workers who were selected for doing individual outstanding "acts of noteworthy public service" during 1942, four persons have been chosen for special honor by the award of silver medals plus cash awards of $500 each. The other 24 persons receive bronze medals and $100 each. In addition to the individual awards, two special plaques commemorating acts of public service by groups of Bell System people were awarded. In all cases, the awards were provided by the Theodore N. Vail Memorial Fund, established in 1920.

Those receiving silver awards were Mrs. Jennie Crouse of the Rossville (Ill.) Telephone Company, Miss Lila Wood, Mrs. Evelyn Fujko and Joseph Fujko of the Wisconsin Telephone Company.

The Nervous System of Society

Speaking to the National Academy of Sciences at its recent presentation of the John J. Carty medal to Dr. Edwin Grant Conklin, Dr. Buckley quoted a prophetic remark which Mr. Carty made earlier:

"We are rapidly constructing a wire and radio system of world communications which is destined to become the nervous system of that vast organism or pseudo-organism known as human society. Whether this organism shall be a sane and peaceful one, or whether we are providing it with a nervous system in preparation for a universal brain storm, requires our most serious consideration. The progress of science is now so rapid that in less than another hundred years man will be endowed with power of destruction transcending anything heretofore known. Even half a century hence, communications and transportation may be so far advanced that all of the nations of the earth could be drawn into a war at the end of which the whole world might be in chaos.

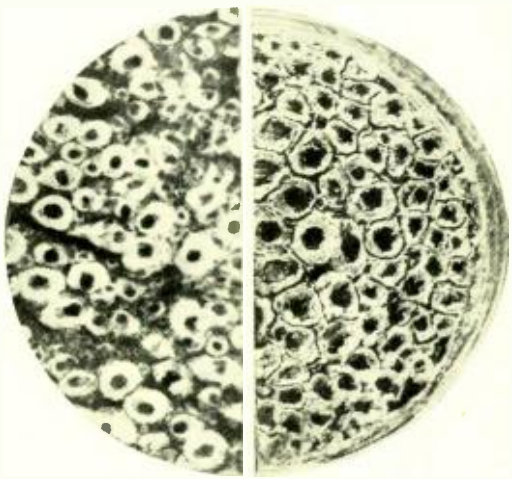


Photo by F. F. Lucas, 1925

Spinal Cord and Telephone Cable

Left, a section of the human spinal cord magnified 200 diameters; right, a full-size section of a telephone toll cable. The nerves are not placed as symmetrically as are wires in cable but they are similarly spaced and each is enclosed in an insulating sheath

"That such a catastrophe is possible I firmly believe, but that it can be averted I also firmly believe. This cannot be done by slowing down our progress in the application of science to material things; but on the contrary we must accelerate our progress in all the physical sciences, for all of the knowledge thus gained will be required in solving the problem presented by man himself as the fundamental unit of the gregarious organism, human society."

In the Nation's Service

As of May 31 there were 514 members of the Laboratories on military leaves of absence. These men and women are divided among the various services as follows:

Navy, Marines and Coast Guard 141

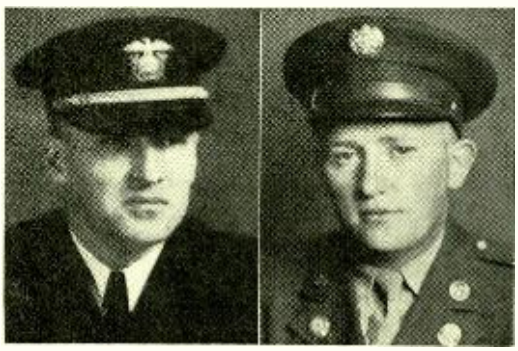
Army 350 Waves 16 Waacs 7

Austin R. Suneson

AUSTIN R. SUNESON of the Development Shop has learned the hardships of war in a nine-month voyage on which his ship was shelled at sea and finally sunk, and he himself marooned at a Russian outpost. As a Merchant Marine Cadet he set out to sea in high hope of adventure only to have his ship pull into Iceland waters and hide for two months. Cold and dreary, the wind howled at 60 miles an hour; the ship swung at anchor only 300 yards from shore; but no one was allowed on land. An American convoy gave them safe passage to Scotland where, after more merchant ships joined them, the British took over the convoy duty.

On Christmas Day at sea Austin had turkey and its trimmings and three kinds of pie, his last good meal for four months. On long trips the food becomes tasteless from refrigeration, he explained, and after a few weeks the men sit down to flat dull meals. On New Year's Eve his ship was attacked by the German cruiser *Von Hipper*, off Bear Island, Russia. Helpless because the enemy guns were heavier, the ship was screened by destroyers while shells broke over her. Although our cruisers drove off the enemy, Austin's ship ran aground and was sunk. Her crew found haven in a Russian outpost where black bread and tea were the fare. After ten days a Murmansk trawler took Austin to port. If he thought tea and bread a tiresome diet he found that the hardy Russian fisherman lived solely on fish and fish soup, his new diet for two weeks. At port he was assigned to one of the American ships at the docks, all of them subject to fierce German air raids daily. Russians flew American planes and the dog fights reminded him of advertising sky writing at home, the air being so cold and the planes so high that all he could see was their exhaust. As the fighting came nearer, the men went into the ship's saloon and sat smoking chain cigarettes while the shrapnel fell like rain on the decks.

On their attempt to leave Russia the convoy was heavily attacked and Austin saw one cruiser blown out of the water. Back in Scotland, he was given leave to trace his brother who was somewhere in England with our Army. The two boys met and spent a few days together outside of London, before Austin returned to Scotland. Three times his ship turned back at Glasgow, once ramming and sinking a tanker, before she finally sailed for Halifax and then for home. Now a midshipman in Officers' Training School at Great Neck, he is preparing for more responsibility on his next trip.



LT. COMDR. DE KAY C. W. PETERSON

Raymond P. Chapman

"I am feeling fine and getting used to roughing it in North Africa. It is surprising how a person can adjust himself to live in ravines, cactus patches, plateaus, in fact any kind of country. We are living on British rations and I sure am getting plenty of pudding! I received another package and the articles were very good. I appreciate the cigars especially and, as you thought, the licorice, raisins and nuts were a swell change. I am using the cigar box right now as a writing pad."

Commander Nels C. Youngstrom

"I am now on duty in Arzen, Algeria, after two years' duty in New York City. I have met many telephone men here in both Army and Navy. The April RECORD just arrived. It is read and enjoyed by the technical and Bell System people in Africa."

Harold Phares

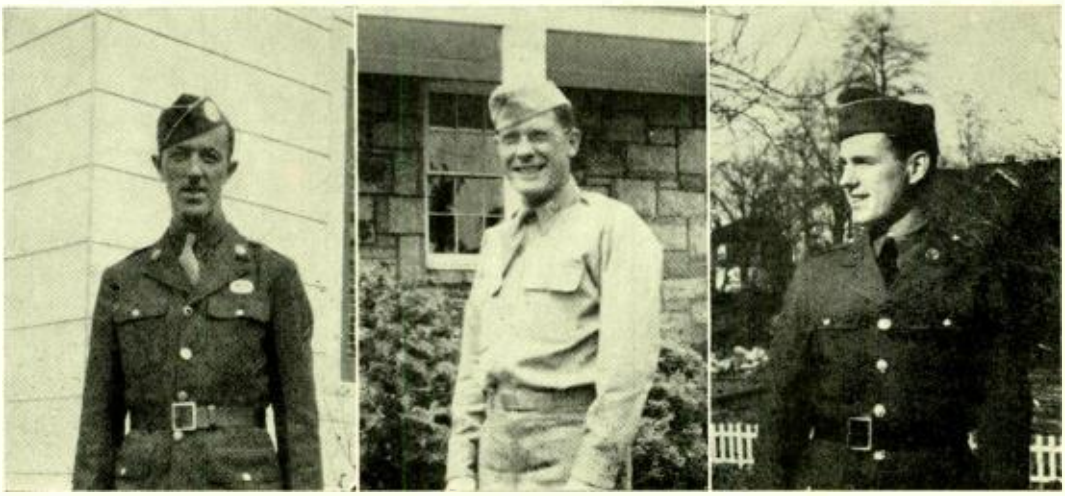
"My school day is divided into two parts. The first part is code. I'll learn various codes, how to operate a telegraph key. The second part is theory, where I'll learn Radio and Electrical Theory. I've had several problems and a couple of tests so far, and have perfect marks. I hope I can keep it up. There are several advanced radio schools that I can go to when I get out of Gunnery School. They are all of a highly specialized nature and the one that I intend to apply for is the 'Radio Locator School' where I will learn to operate, repair and maintain Radar Equipment. At this school, which is surrounded by armed guards, there are no text books and no notes are taken. Everything is memorized. Before I can go to this school I have to be twenty years old, have 85 or better in Radio Theory and submit myself, my family and background to a thorough investigation by the F.B.I. and Military Intelligence. "

(*This letter backs up the notice recently circulated in the Laboratories, that notwithstanding all that has been published recently: "How RADAR works; what its types are; where they are used; how successfully; and in what quantities they are being made—along with other matters—are still military secrets.*")

Lieut. Robert C. Winans

"I have been in Australia for over six months. You'd think I'd begin to get used to it in this time, but I'm longing for the homeland more than ever. Occasionally I see something which had its origin in the Laboratories, and I begin to feel right at home. The only trouble is that I don't see very much of it; however, you aren't to blame for that I know.

"About a month and a half ago LIEUT. COL. HARVEY MISENHEIMER walked into my office. We were both surprised for a while, but soon were exchanging news from back home. He had just arrived over here at that time. He has been transferred to another location, so that I haven't seen him since; he



W. G. SAUER D. F. CICCOLELLA R. P. CHAPMAN

is the first person from the Labs that I have run into since leaving New York.

"I manage to keep informed of activities in the group I was in through the frequent letters from DR. MENDENHALL. I'd be glad to hear from any of my old friends who might care to write. I'll try to answer any letters I may get without too much delay."

ANNE L. KOS

C. T. Bolger

"It sure gives a fellow a big lift to hear from the Labs. Mail comes but once every couple months; so you can readily see how much a letter means. This mail call was a surprise. I didn't expect mail for at least another five weeks. Our position is such that it warrants a cloak of secrecy. I hope you and the readers of the RECORD can understand this. It's yes, in answer to your question about the equipment. I personally use Labs developed equipment every day.

"We eat mostly American food because there is no way to get local foods. Fruit is plentiful; I have a lemon tree two paces from my tent. There is always a bunch of bananas in the tent along with oranges, tangerines and certain native fruits I don't know the names of. I miss the Labs very much and will be very happy to come back to it some day. Keep smiling back there 'cause we are smiling over here."

JOHN J. TURLEY

Capt. Orrin F. Crankshaw

"You can well imagine that I lead a quiet life when I say that I have not spent fifteen dollars in the past five months as there just is nothing to buy here. While you were trying to keep warm I was trying to find ways of keeping cool, swimming and sitting out in the shade. Right now there is a bunch of bright red parakeets flying about in the trees overhead. All of us are hoping that we will be relieved soon and returned to some civilized spot. Out here we have a good deal of equipment for communications that is made by some part of the Telephone System. Naturally the good old telephone itself is in use where any American troops go and it is a real luxury. However, it is a far cry from the fancy and elaborate arrangements that you have back home." (*Dr. Crankshaw, formerly of the Murray Hill Medical Department, is somewhere in the South Pacific theater of war.*)

Thomas O'Neill

"Somewhere miles and miles from the nearest town, in the middle of the Mojave desert; sand and brush for miles around and the Rocky Mountains on all sides standing out like a mighty wall of granite. We are at about sea level here and live in six-man squad tents, sand for a floor and a folding cot and two blankets for a bed. The temperature gets to 140 in the daytime but cools to a snappy breeze at night. Wind and sand storms are not uncommon but are of short duration. We eat from our mess kits and wear our field uniform and helmet at all times. Water is scarce here but we get a shower twice a week. We ride in a truck to a

place about seven miles from here along the Los Angeles aqueduct or pipe line as we would call it in N. Y. It never rains here and this baby-faced boy you all knew is now a red-skinned, leathery desert dog and as tough as the rattlesnakes, scorpions, lizards, tarantulas and fleas that share this happy home with us.

Buy Bonds to Bring Us Back."

Marilyn M. Pearson

"The RECORD keeps crying for reports of my progress to print in their Shamble Sheet. I thought I might revise one of Rupert Brooke's little numbers for them, which would run:

"If I should die, Think only this of me;
That there's some corner of a foreign field
That is forever West Street."

Charles W. Peterson

CHARLES W. PETERSON, recently a visitor at the Labs, is now helping to repair and maintain vehicles at Key Field, Mississippi. One of three men from West Street who signed up to be together in the Army, Charles lost his buddies after two days; a tight pair of trousers separated them, so the boys in 4B say. His story is that because the Q.M. didn't have his size that night he squeezed into a small pair of pants; the C.O. took one look at him when the recruits were marching to the trains and the result was that BRAUN and REIMELS, his buddies, went to Connecticut that night while Charles was left behind. When he finally did get trousers to fit, he went with a company of "A.E.F.'s" — Americans Exiled in Florida.

James L. Smith

"I am now stationed at Newport attending the Electricians' School. Navy life in general isn't bad at all. Our company is a combination of sailors and marines so I will leave it to your imagination what takes place. One thing which I always wait for is the RECORD around the first of the month and after it leaves my hands it makes a trip around the barracks."

* * * * *

THE WAR DEPARTMENT has recently announced the promotion of the following Laboratories men:

H. B. ELY to the rank of *Colonel;* W. J. GALBRAITH, *Lieutenant Colonel;* C. H. GREENALL, *Lieutenant Colonel;* MORTON SULTZER, *Lieutenant Colonel;* H. A. MANKE, *Second*

MILITARY LEAVES OF ABSENCE

UNITED STATES ARMY

Alfred Bertin	Joseph Klieber
Emil Ellingsen	Ethel McAlevey
Joseph J. Emmons	Eugene Miritello
Frank W. Garland	Lt. Donald R. Schoen
Barnett J. Gulkis	Joseph A. Seifert
Robert E. Henneberg	Kensley R. Thompson
Frederick W. Hold	Ernest A. Whelan

UNITED STATES NAVY

George F. Brown, Jr.	Edwina E. Golding
Walter E. Gill	Lt. Comdr. R. H. Miller

Frederick E. Schellhorn

UNITED STATES MARINES

Robert F. Logan

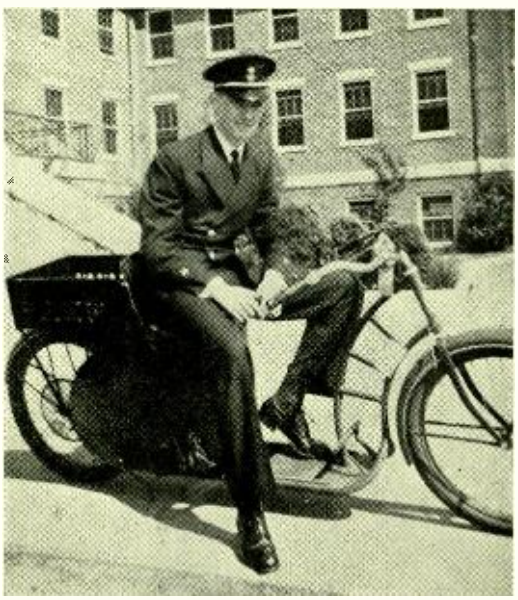
B. H. Sommer was showing snapshots to his former associates when this picture was taken

Lieutenant; and OWEN N. GIERTSEN, *Second Lieutenant.*

HERMAN MANKE, recently commissioned in the Army Air Corps, has returned to Orlando, Fla., for six months' intensive training as a night bomber. Formerly a 4 B Shop man, Manke hopes to get into the fight before it's over in Europe and then to get a crack at the Japs.

MAJOR W. E. STEVENS is now at the Command and General Staff School at Fort Leavenworth. "My course ends June 19, then to Mitchel Field, Hq. 1st Air Force for duty, having been recently transferred from the Engineer Amphibian Command. Was at Camp Edwards, Mass., in the E.A.C. since last June. Both that assignment and the A.F. is in boat training. Yes the A.F. has boats as well as airplanes."

ROBERT E. KOMUVES writes: "It sure is hard to get used to quitting 'civilized' life and being away from old friends but I have a lot of new friends here. I meet some of my fellow 'workmates' of building 'R,' 70 Bethune Street, at Camp Edison; they are MARTIN POULSEN and ANDREW OLSEN. We are within a stone's throw of each other here. I also met GUS BACKMAN here but he is in Florida now. I will end this letter reminding and asking the 'old gang' to write; remember that each letter sent here will build up the morale of three soldiers who are anxiously waiting to hear the latest."



JOHN R BOYLE

James L. Smith (right) of the Plant Department, Murray Hill, with his brother Daniel

FREDERICK B. VREELAND says that the RECORD brings with it fond remembrances of former days spent at the Whippany Field Station. He is in training at Fort Monmouth to be a teletypist.

NICHOLAS BRADY, when home on 24 hours' furlough, told of his travels since joining the Navy last September. He was in Trinidad and Brazil, and then in Africa when President Roosevelt and Mr. Churchill met. His ship was part of the convoy that took the French battleship *Richelieu* from Dakar to Brooklyn.

CAPTAIN WALTER S. GUNNARSON sent this note: "I thought I had better report my latest change of address in all fairness to the mailman, since lately my copies of the RECORD have been reaching me via Camp San Luis Obispo, Calif. I might say that our leaving California was purely involuntary."

A. W. JOHNSON, now in San Francisco awaiting shipment to one of the combat zones, sends his regards to the old crew of the General Accounting Department.

K. ROBERT THOMPSON, undergoing Aviation Student training at Pennsylvania State College under the new Army specialized training program: "I'm glad to have the opportunity of becoming an officer in the Army Air Corps. I miss the gang back at Whippany though and hope to be back with them soon."

ROBERT C. LAMONT, of Murray Hill, now

R. A. Hauslen H. W. Raimert

in Houston studying, in a letter to Mr. Leamer: "I will be glad when once again I will be able to be back with the Labs and will be able to feel that I am making a greater contribution than I was previous to my present training."

William J. Perry wrote that "Someone in the Receiving Department thought I was small to be an M.P. Well you are probably right but they teach us how to handle different kinds of men and they also tell us to reason with men before we use any sort of arms. When and if we do use arms it is the last resort." (*Bill has just been assigned to special studies at the College of the City of New York.*)

Harold W. Raimert set the Record straight on Navy jargon on his first furlough. "Boot" training, we felt, should have read "boat" training until Harold explained that all new Navy men are hailed "Hiya, Boots" because of the leggings or boots they wear. The same Boots are referred to as "Barber's Bait" until after their first G.I. haircut, then "Skin Head" is their name. Harold hopes to become a Radio Technician.

E. A. Lichtenberger is living on the campus of Syracuse University, in a former sorority house. "We're living like kings compared to Atlantic City because it has the reputation of being the 'Alcatraz of the East' down there."

Major D. F. Ciccolella is now Chief Instructor, Fighter-Searchlight Tactics, at Orlando, Fla.

When Anne L. Kos paraded for the President with her Waac regiment, it was the biggest thrill of her life, she writes.

The following members of the Laboratories have also written to us and have asked to be remembered to their old friends:

L. A. Hopper, J. C. Stuhlman, P. E. Watts, S. H. Lovering, C. H. Hamann, O. C. Kanouse, A. T. Stiller, W. P. Harnack, P. P. Melkonian, D. J. Brady, Marie Keough, J. E. Sienko, P. W. Foy, R. D. Long, G. F. Fuchs, F. R. Hulley, J. C. Pfaff, R. A. Dryden, R. W. Walter, R. J. Koechlin, C. R. Schramm.

Frances Elstein, Isabell Maddocks, S. N. Foster, J. de G. Cuyler, D. F. Tuttle, E. J. Bybel, C. W. Muccio, A. H. Lobisser, W. C. Heaton, B. H. Sommer, R. C. Kuenstner, D. W. Mack, R. T. Duffey, J. H. Phillips, C. E. Greene, R. W. Eichhorn, W. J. Conner, B. C. Guinter, H. A. Frederick, Jr., R. Shine, E. H. Bueb.

R. W. Harper, D. F. Cuneo, J. J. Viggers, W. H. Edwards, Marcelle Lesire, R. W. Tomb, J. S. Devanney, R. S. Yerden, J. F. McCarthy, W. V. Hoshowsky, A. F. Bartinelli, H. H. Sharpe, H. T. King, H. G. Reimels, H. E. Earl, H. J. Braun, R. N. Canton, J. J. Turley, J. R. Boyle, W. G. Sauer, R. A. Hauslen.

T. J. Calvani is telling Anne Ashton about his station at Brookley Field, Mobile, Alabama

Congratulations

Recently officials of the Navy Department asked that the production of an electronic device be stepped up to provide delivery in twenty-one days instead of sixty days as originally scheduled. In appreciation of the results, Secretary of the Navy Frank Knox wrote: "Although it meant that extraordinary efforts would be necessary, the Western Electric . . . did actually meet and anticipate the new production schedule. I desire to commend all the officials and employees of the Western Electric Company and of Bell Telephone Laboratories who were concerned in this project, for their intelligent and enthusiastic coöperation with the Navy Department in the production of this instrument. They can be certain that their efforts have been of valuable service to their country."

The project engineer for the Laboratories was W. C. Jones. The equipment design was in charge of R. L. Lunsford with whom were associated L. J. Purgett, R. P. Jutson, C. E. Boman, P. T. Haury and W. J. Wood of Toll Equipment Development and R. H. Kreider, W. H. Bendernagel and J. A. Riley of Trial Installation. In Station Apparatus Development the major part of the work was carried by G. G. Muller and L. Vieth assisted by N. R. Stryker, J. R. Power, W. J. Thayer, H. Eckardt, A. C. Kane, A. F. Conk and N. J. Velardi.

News Notes

Bell System employees in New York City contributed $111,266 to the American Red Cross War Fund Campaign for 1943, as compared with $83,002 for last year. Of this amount $61,902 was given by the New York Telephone Company, $15,443 by the Laboratories, $11,816 by the A T & T Headquarters and $11,627 by Long Lines.

As a contribution to the war effort the New York Public Library held an exhibition, *Technical Books and the War*, from April 15 through May 26, in which were exhibited 250 photographs of scenes of American wartime manufacturing and more than 300 American technical books of current importance in the war effort. Besides contributing photographs, the Laboratories was represented at the exhibit by the Record and by the book, *Protective Coatings for Metals*, by R. M. Burns and A. E. Schuh. The *Bell System Technical Journal* was also on exhibition.

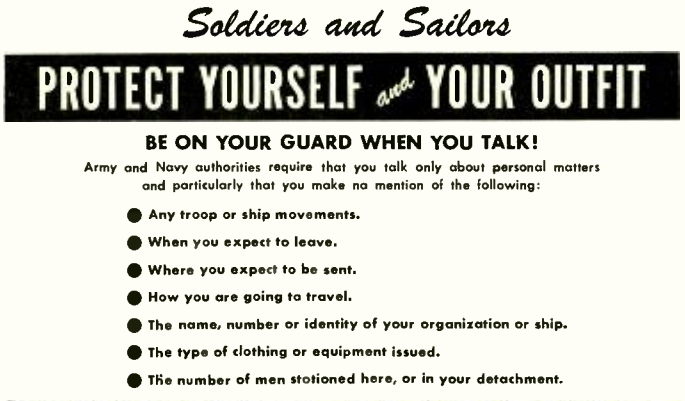
Under the provisions of the new Current Tax Payment Act of 1943, the Laboratories is required to withhold a tax from wages paid on or after July 1. A copy of an "Employee's Withholding Exemption Certificate" has been provided for each member of the Laboratories to enable the Payroll Department to determine the amount of each member's withholding exemption under the act.

Frank B. Jewett was unanimously elected a Charter Trustee of Princeton University at the regular commencement meeting held at Princeton on May 28.

Dr. Buckley has been appointed by the American Philosophical Society to membership on its Finance Committee.

R. L. Jones visited Cleveland on June 4 with S. O. Morgan, C. J. Christensen and A. N. Holden.

The May issue of the *Journal of Applied Physics* carries a book review of *Statistical Methods* by A. C. Aitken. The review was written by E. C. Molina who retired from



This warning, displayed in telephone booths in military establishments, is good advice to service men's friends not to ask such questions

the Laboratories last December and is now with the Office of Scientific Research and Development.

KARL K. DARROW delivered a short-wave broadcast for the American Philosophical Society, June 24, on internationalism in the field of physics.

DURING the first five months of 1943, the following members of the Laboratories were enrolled as members of the Telephone Pioneers of America:

C. A. Bieling	P. P. Kashtelian
D. R. Brobst	Alice Kavanagh
R. M. Burns	Robert Kieran
R. N. Carr	D. H. King
Mary Dolan	Catharine Maull
Mary Fitzsimmons	Helen Mockler
Coke Flannagan	F. J. Prachnaik
Joseph Haverl	P. C. Smith
C. J. Hay	R. V. Terry
A. W. Horton, Jr.	Henry Walther
F. S. Kammerer	W. H. S. Youry

J. A. BECKER attended the ceremonies of the Annual Award of the Mendall Medal to Dr. George Sperti at Villanova College on May 16. Mr. Becker was the recipient of the medal last year.

R. R. WILLIAMS, as a member of the advisory committee of the National Science Fund of the National Academy of Sciences, assisted in the selection of Dr. Charles Huggins as winner of the Charles L. Mayer award presented annually by the Academy for the purpose of stimulating fundamental scientific research.

W. E. CAMPBELL attended a meeting of the subcommittees on friction, lubrication and wear of the National Advisory Committee for Aeronautics. This committee meeting was held in Washington.

E. J. MURPHY, W. A. YAGER and S. O. MORGAN visited the Laboratory for Insulation Research at M.I.T. to discuss dielectric measurements.

E. K. JAYCOX delivered a paper on *Modern Spectrochemical Analysis*, June 19, before the American Physical Society at State College, Pennsylvania.

C. H. SAMPLE discussed finishing and corrosion problems with Western Electric engineers at Hawthorne.

K. G. COMPTON and Mr. Sample visited Wilmington, N. C., to observe the sea water immersion and atmospheric corrosion tests being conducted by the International Metal Company and Dow Chemical Company.

Mr. Compton also visited Hawthorne in connection with finish problems.

B. L. CLARKE attended the meeting of the Advisory Board of the Analytical Edition *Industrial and Engineering Chemistry* at Detroit. Dr. Clarke was appointed to an advisory committee on a *Journal of Analytical Chemistry* of the A.C.S.

T. C. FRY is a member of the Advisory Committee of the Brown University Program of the Advanced Instruction and Research in Mechanics.

WHEN VISITING the Corning Glass Works, A. J. CHRISTOPHER, J. R. TOWNSEND and D. A. MCLEAN discussed the use of glass as a wartime substitute for miscellaneous materials.

E. B. WHEELER visited the Underwriters' Laboratories at Chicago, Hawthorne, and the Chicago Branch House in connection with safety test requirements for special telephone sets and the study of telephone apparatus repair.

J. R. WEEKS went to the Signal Corps Standards agency in Red Bank to advise on capacitors.

H. H. STAEBNER was in Point Breeze on cord development questions.

R. C. PLATOW of the Switching Apparatus Development Department has received the degree of Bachelor of Arts from New York University. Mr. Platow majored in physics and mathematics.

F. W. CLAYDEN was in Washington on a government project.

TRANSFORMER PROBLEMS took R. W. DEMONTE to the Standard Transformer Company and the Thordarson Electric Manufacturing Company, Chicago.

HEADS OR TAILS

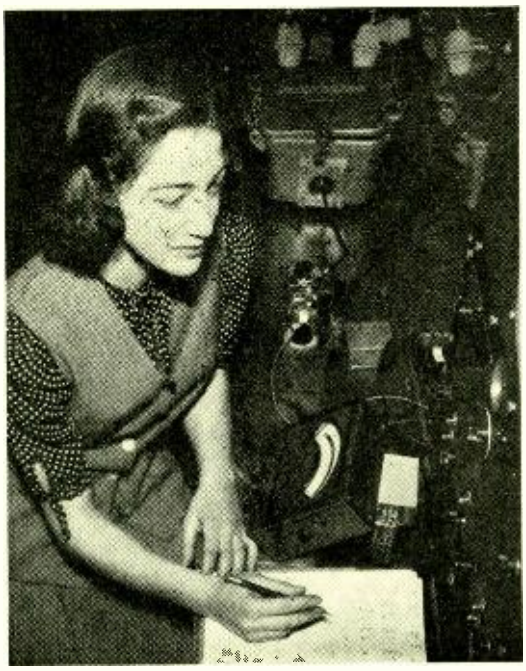
In his talks before the Supervisory Staff of the Laboratories last month, DR. BUCKLEY quoted the following from a card that he had seen in Washington on the desk of Col. Bickelhaupt, formerly Vice-President of the American Telephone and Telegraph Company:

The Lord gave us two ends to use—
One to think with, one to sit with.
The war depends on which we choose—
Heads we win, tails we lose.

Women of the Laboratories

Sarah Margolin is proud of her work. Her pride comes from the knowledge that she is replacing an engineer who is now an Ensign, and upholding as well two of her brothers who are in Service. She is working on the development of coils and transformers for Army and Navy equipment. Sarah assists in the design and preparation of models which are to be made up in the Development Shop. She conducts assembly tests and other electrical tests on them after the winding assembly has been completed and again when they are in the finished state.

Born in Connecticut, an only girl in a family of five boys, Sarah attended public schools in Manhattan, high school in Brooklyn, and graduated in January, 1943, from Brooklyn College. When Sarah decided to major in physics she little realized the opportunities that were to be offered to the girl with a science background. Immediately after graduation she came to the Laboratories as a Technical Assistant. Despite long hours of overtime, Sarah reads many technical magazines and has found time to attend lectures in an ultra high-frequency course at Columbia.



Sarah Margolin

Alice Todd

Growing African violets, fuzzy-leafed green plants with Alice-blue flowers, is Miss Todd's special interest in her home at Far Hills. A native of that town and a graduate of Barnard's High and Ballard Secretarial School, Alice has taught a group of boys at the Dutch Reformed Church since they were in the baby class. Now that they've reached the "dating" stage she often wonders whether they're teaching her or she's teaching them. Besides her violets and her boys, she has several other hobbies—bowling, a flair for tying gift packages so beautifully her friends never like to open them, and such an enviable reputation as a cook, that those who are invited to Alice's dinners find them a treat to be remembered.

A former D and R girl, she came to the Laboratories in 1934 and has done stenotype decoding and such specialized typing as

Greek mathematical equations and long-carriage table work most of the time since. Her contribution to the Red Cross is the scores of socks she knits for the soldiers.

The Telegraph Department

On the Bethune Street side of the second floor at West Street you will find the Telegraph Department. Here Vera Monahan, assisted by Joan Pisano and Lillian Sangberg, handles all incoming and outgoing telegrams and teletypewriter and TWX messages for the Laboratories. Martha Shields, who also reports to Miss Monahan, handles the same general type of work at the Graybar-Varick building.

Martha Shields

The automatic sending and receiving equipment consists of four machines, one Western Union "Teleprinter," one Postal Telegraph "Teletype" and two Bell System "Teletypewriters." One of these teletypewriters is permanently connected through the Western Electric Company's Telegraph Department at 195 Broadway for the handling of messages to and from Hawthorne, Broadway and all Western Electric branch houses and departments. The other teletypewriter is for Exchange Service and is used for the interchange of messages between any TWX subscriber. This machine is equipped with a reperforating machine so that incoming messages for other subscriber departments of the Laboratories, Western Electric or Bell System are relayed through the tape transmitter without rewriting.

Joan Pisano

Nowadays priority messages go through first. It is not unusual for a party to call a TWX subscriber and carry on a conversation over the TWX machine. This accomplishes two important purposes—it relieves

Vera Monahan

the already congested voice circuits and gives each party a written or official account of the conversation. Messages are recorded on paper fed through the machine from a

roll. A hectograph ribbon is used and the message is then duplicated by means of the hectograph process on standard 8½" x 11" message forms for either telegrams or teletypewriter messages. Any number of copies may be made for filing purposes or routing to those concerned.

Before the war, cables were coded and decoded by the group using the Western Electric, Bentley's or Lieber's cable codes but that has been discontinued until the war is over.

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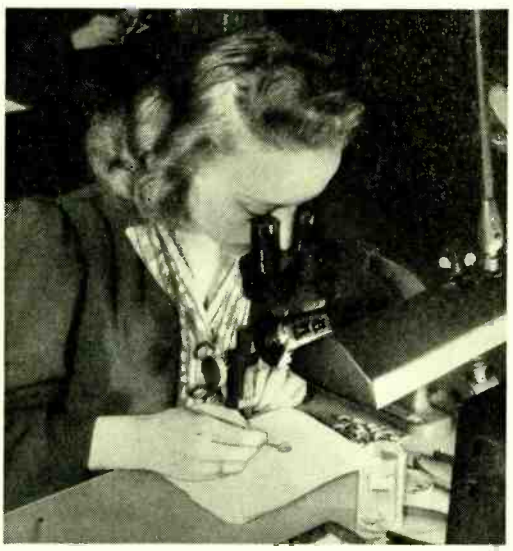
CAROL DENO has worked for the Laboratories at Kearny since 1939. Although she has visited West Street and Murray Hill,



Loretta Maire is glad of the dexterity she learned in three years of jewelry assembling. Now she's helping win the war as a vacuum-tube assembler in the Laboratories. She inspects parts so fine that she uses a double-barreled microscope. In the picture this conceals the service star she wears for her fiancé, a soldier in the Army

she has never been employed at either location. A stenographer in the Outside Plant Development Department, her job has been with the group at Kearny responsible for cable development work and the engineering problems of lead-covered cable.

Carol is a native New Jersey girl, a graduate of St. Rose of Lima's High School

Corinne Steers traces drawings, prepares graphs, charts and prospective drawings, does guide lettering and makes detail drawings of small mechanical parts in the Research Drafting Department. Corinne graduated from the Columbia High School in South Orange in 1940 and then studied for a year at the Newark School of Fine and Industrial Arts

and Drake Business School. She enjoys swimming, horseback riding and dancing, with bicycling and hiking close follow-ups. She also enjoys attending sporting events, operas and concerts.

CAROL DENO

THE WORDS "Expediter" and "Expediting" have come into widespread use since the war began. For some first-hand information, let's talk to JENNIE BRANDUS who is one of the Laboratories' newer members assigned to this interesting phase of war work in the Commercial Relations Department. First of all she will tell you that she works as part of a team—the other half of her particular unit being a former Associated Company engineer who helps Jennie by translating technical requirements into more simple terms.

What does she do? Actually she does any and everything that comes up during a busy day, from placing orders, typing them, looking up available material in suppliers' catalogs and stockbooks to taking telephone orders from an engineer who says, "Hurry up and get this thing-a-ma-jig." All this involves continuing contacts with the Purchasing Department who follow through on orders, or help make substitutes when, for example, Jennie hits a blank wall on delivery; with the Development Shop where

JENNIE BRANDUS

models of apparatus are being made; with Storerooms where hitherto nameless gadgets appear in a new light when Jennie understands their use; and with the Shipping Department who deliver all sorts of urgently needed equipment to her desk, such as the foundry models and gears which she had the day that her picture was taken.

She has an insatiable curiosity about everything that passes over her desk. Until she came to the Laboratories, a condenser and a potentiometer were mere words—no more. But the other day she was playing a game, "What's the name of this gadget?" with one of the Commercial Engineers, and she came out with flying colors—proof of how various backgrounds can be adjusted to the job at hand.

What does an expeditor do after business hours? She just doesn't. All the friends Jennie used to see regularly have dwindled to hurried telephone contacts every now and then. The nights she doesn't work, she trudges home to do some chores before tumbling wearily into bed, to fall asleep before her favorite radio programs are finished.

This is Helen Novick, a graduate of Franklin K. Lane High School, who is responsible for the production of Van Dykes in the Blueprint Department. It is very important that these be of excellent quality because they are used as negatives for the making of thousands of blueline prints

Men of the Laboratories

(Chosen by Lot)

BACK IN THE home-radio-construction days, many an amateur came to BILL KOPP for information about vacuum-tube circuits. The earliest noise-meter, which he used in the New York City Noise Survey; the level-distribution recorder; and an automatic transmission measuring set were products of his skill with wire, solder and vacuum tubes. Then he moved into the study of local transmission problems, a prelude to his war work.

Bill is a native New Yorker; after graduating from Stuyvesant High School in 1929 he entered the Laboratories as a technical assistant. After eight years of evening work he graduated from N. Y. U. as an electrical engineer. For years he has been the superintendent of a Sunday School in Woodhaven, and teaches a class of fourteen-year-olds there. A future member of the school lives in Bill's own home; she is his daughter Ellen, now two and a half. When Bill gets home late, Mrs. Kopp isn't worried; a former member of the Apparatus Files, she knows just how it is.

W. J. KOPP

CHARACTERISTIC of the Laboratories are the groups which lunch together every day; long membership in one of them is proof that the engineer likes people and that people like him. E. C. TORKELSON belongs to such a group in Quality Assurance; the other four men say that "Tork" can hold up his end of an argument, or stand a laugh when he slips, or tell as tall a story as the best of them.

"Tork" worked on his father's farm near Fargo in the summer and lived in town during the winter while he went to school and later to North Dakota State College where he was graduated with the degree of Bachelor of Science in Electrical Engineering. He entered his present department of the Laboratories in 1930. Fundamental responsibility of Quality Assurance is to see that the quality of the equipment and materials furnished to the Associated Companies is such that it will enable the companies to give long term satisfactory telephone service. Torkelson's prime interest at the present time is in connection with vacuum tubes and allied apparatus. Quality Assurance, being at the center of a three-pointed star — designer, supplier and customer — is in a position to bring all three into agreement.

Still calling a spade a spade, "Tork" is a pre-Pearl Harbor gardener, with 1500 square feet under cultivation and the earliest peas of any of his friends. In the winter he does some shop work, plays a little bridge with Mrs. Torkelson and his neighbors; and is an all-year-round air raid warden.

* * *

KENNETH BULLINGTON left the southwest with regret when he journeyed from the University of New Mexico to

Massachusetts Institute of Technology. With a degree from each he entered the Laboratories in 1937. His first assignment was to the trial of the K-carrier between Toledo and South Bend; then he went to the Laboratories' test station at Phoenixville to measure the characteristics of copper-steel wire and work out the theory. In the winter of 1940-41 he went back to the southwest to study the effects of sleet on open-wire transmission at carrier frequencies. At present he is engaged in basic studies of radio transmission.

Mrs. Bullington is active as a Red Cross First Aider and a volunteer assistant to the nurse in a high school near their Forest Hills home. Under the pressure of war work, Ken has few recreations; one of them is to pore over maps and pick places to go when peace is won.

E. C. Torkelson

Kenneth Bullington

News Notes

Special telephone apparatus studies took P. T. Higgins to Edgewood Arsenal, Maryland, several times during May.

G. Q. Lumsden observed vapor-drying tests on hardwood timbers in Spartanburg.

R. H. Colley and W. McMahon went to Savannah to test creosote-petroleum-pentachlorophenol solutions for the pressure treatment of southern pine poles. Dr. Colley also stopped in Spartanburg for conferences on general problems of wood preserving.

C. C. Lawson and C. Shafer, Jr., recently inspected drop-wire installations at Atlantic City.

R. J. Nossaman and D. C. Smith attended trial installations of communication lines by a Field Signal Battalion in Florida in April and May. Mr. Smith returned by way of Chicago where he visited the Mall Tool Company.

J. A. Carr was in Newburgh in connection with cable maintenance problems.

H. F. Dodge addressed a joint meeting of the American Society for Mechanical Engineers and the Institute of Mathematical Statistics on *Sampling Inspection Plan for Continuous Production.*

C. A. Webber and W. J. King each went to Chicago on cable problems during May. Mr. Webber also went to Point Breeze.

R. T. Staples visited the Boston Insulated Wire and Cable Company.

J. W. Corwin was in Denver, Salt Lake City, San Francisco and several outlying areas making observations on the layout of auxiliary stations along the new type-K carrier transcontinental cable. He later spent several weeks at Culver City, California, on the initial installation of automatic ticketing equipment in that area.

BLOOD DONORS

C. F. Benner
B. S. Biggs
G. Bittrich
M. E. Brandin
W. E. Campbell
Mrs. Violet Carmas
Miss L. M. Carter
L. Dorrance
Mrs. E. H. Drake
A. E. Emerson
C. W. Engelke
Miss C. Forrest
E. E. Francois
L. O. Frey
C. J. Frosch
Miss E. H. Graetz
H. W. Guzinski
M. S. Hawley
W. A. Hoefener
A. C. Holetz
Miss N. Holohan
Miss J. Houghtaling
J. B. Howard
C. A. Jaycox
A. Kizelevich
F. C. Koch
J. F. Madden
Miss M. J. Marti
E. J. McCarthy
W. McMahon
J. M. Meehan
W. J. Myles
D. S. Pappas
J. Pecon
Miss L. E. Pugatsky
H. J. Reed
J. H. Riley
T. Rushetski
F. J. Saxton
Miss I. Schultz
G. Seidel
P. J. Sheehan
O. E. Stelter
B. Stiratelli
F. W. Stubner
F. C. Tolley
P. Venneman
J. Vesely
J. M. West
J. M. Wiswall

Among the Laboratories' watchmen recently sworn in as Auxiliary Military Police were H. Gill (left), E. Murphy, E. Hughes and M. McMahon who are shown standing at the entrance of the building at Murray Hill

W. O. Fullerton went to Philadelphia to make studies on the No. 4 toll-crossbar installation.

A. G. Jeffery examined a new 6B information desk being installed in Providence.

Problems of dynamotors took R. H. Humer to the Western Electric in Chicago.

A. E. Petrie, C. S. Knowlton and E. F. Helbing visited The Leland Electric Company and Wright Field, Dayton, Ohio, on power machinery problems. Mr. Petrie also was at the General Electric Company, Fort Wayne, on similar projects.

J. H. White Retires

Following his completion of over twenty-eight years of service, John H. White, in charge of the metallurgical laboratory at Murray Hill, retired on June 6. Mr. White graduated from the Marine Corps Officers' School at Annapolis in 1904 and was in the Marine Corps until 1908. He then became a chemist with the Pacific Coast Syrup Company at San Francisco where he remained until 1915. Early that year he joined the Holmes Electric Protective Company. In October, 1915, he came to the Engineering Department at West Street and since then has been continuously concerned with the development and production of magnetic materials, of aluminum and lead alloys, and of brasses, bronzes and steels for a variety of purposes. Upon joining the Western Electric Company, Mr. White was immediately associated with the development of the first iron dust used in loading coils. Some of the more important projects with which Mr. White has been associated included permalloy dust for loading coils, permalloy tape for continuous loading of submarine cables, rolling very thin metal strips for coils used in coaxial cables, and aluminum alloys for diaphragms. Among the twelve patents that have been issued to him is one which covers the method used to embrittle permalloy so that it may be made into powder, another (with C. V. Wahl) on the method of making the

permendur diaphragm used in all HA1 receivers, and two patents covering cellulose-acetate coated wire which form the basis of a process used in the insulation of all distributing frame wire, switchboard cable and quadded toll cable.

J. H. WHITE

NEWS NOTES

MR. VAN DUYNE of the Power Development Department is the present Chairman of Sub-Committee 5 on Dynamotors of the War Committee on Radio sponsored by the American Standards Association. He was elected chairman at the May 6 meeting of the sub-committee. Mr. Van Duyne recently visited Lima, Ohio, to discuss dynamotors with engineers of Westinghouse.

AT THE BUREAU OF SHIPS, WASHINGTON, J. M. DUGUID and C. T. MILLER discussed motors. Mr. Miller also visited the Century Electric Company at St. Louis.

H. M. SPICER investigated motor-driven timers at the R. W. Cramer Company, Centerbrook, Conn.

H. H. SPENCER visited the K2 carrier station at Terre Haute.

R. R. GAY made a visit to RCA at Camden in connection with control systems.

F. F. SIEBERT conferred on mercury-arc rectifier tubes and motors at the General Electric Company, Lynn.

"THE TELEPHONE HOUR"

(NBC, Monday Nights, 9:00 P. M. Eastern War Time)

July 12, 1943

The Stars and Stripes Forever — *Sousa*
Orchestra
Lover, Come Back to Me from "The New Moon" — *Romberg*
Grace Moore
Take Me Out to the Ball Game — *von Tilzer*
Orchestra
At Parting — *Rogers*
Who'll Buy My Lavender — *German*
Grace Moore
Overture on Russian Themes — *Rimsky-Korsakoff*
Orchestra
Je Veux Vivre from "Romeo and Juliet" — *Gounod*
Grace Moore

July 19, 1943

Ritual Fire Dance from "El Amor Brujo" — *de Falla*
Orchestra
Praise to God — *Beethoven*
Marian Anderson
Chansonette — *Friml*
Orchestra
The Rosary — *Nevin*
Marian Anderson and Chorus
Blow, Blow, Thou Winter Wind — *Quilter*
Marian Anderson
Prologue to Prince Igor — *Borodin*
Orchestra and Chorus
Carry Me Back to Old Virginny — *Bland*
Marian Anderson and Chorus

July 26, 1943

The Last Song — *Tosti*
Ezio Pinza
Time on My Hands — *Youmans*
Orchestra
Le Cor — *Flegier*
Earth Is Enough — *Warford*
Ezio Pinza
España — *Chabrier*
Orchestra
Madamina from "Don Giovanni" — *Mozart*
Ezio Pinza

August 2, 1943

Hallelujah from "Hit the Deck" — *Youmans*
Orchestra
The Nightingale and the Rose — *Rimsky-Korsakoff*
Lily Pons
Badinage — *Herbert*
Orchestra
Martha's Aria from "Tsar's Bride" — *Rimsky-Korsakoff*
Lily Pons
Intermezzo from "Suor Angelica" — *Puccini*
Orchestra
Waltz Medley from "Die Fledermaus" — *Strauss*
Lily Pons

August 9, 1943

Overture to "Donna Diana" — *Reznicek*
Orchestra
Rondo Capriccioso — *Mendelssohn*
Grande Valse Brillante — *Chopin*
Josef Hofmann
Emperor Concerto—Last Movement — *Beethoven*
Josef Hofmann and Orchestra

J. C. Schelleng H. P. Franz

Twenty-Five-Year Service Anniversaries

John C. Schelleng, Radio Research Engineer. Cornell, A.B., 1915. Instructor in Physics, Cornell, 1915-18; Bell Laboratories, 1918. Fel. Am. Phys. Soc.; I.R.E.; mem. A.I.E.E.; Phi Beta Kappa; Sigma Psi; Telephone Pioneers. m. Eleanor Grout; ch. Charles Edward, Florence Louise, John Howard; r. Interlaken, N. J.

Mr. Schelleng's first work was a study of the physics of vacuum-tube oscillator circuits, followed by circuit developments of high-power amplifiers and rectifiers for laboratory use, this paralleling similar advances in the tubes themselves. In 1922 he became concerned with the development of long-wave amplifiers and associated antenna studies at Rocky Point, which resulted in commercial long-wave transatlantic telephony. Two years later he headed up the development of the high-power short-wave amplifier which was subsequently used to carry the first Bell System short-wave transatlantic traffic through the Deal Laboratory; he has also been closely associated with later developments in this field.

Since that period Mr. Schelleng has been in charge of the Deal transmitting laboratory with activities including radio transmitters, antennas and systems; experimental and theoretical investigations of radio transmission, including studies of long-distance transmission in connection with the setting up of transoceanic services; the application of feedback to radio transmitters, including high-power short-wave multiplex transmitters; and studies of ultra-short-wave radio. He has to his credit thirty-one patents and many articles that have been reprinted in the Monograph Series.

Harry R. Jeffcoatt, Research Staff Engineer. Pratt Institute, 1919-21. Erie Railroad, 1916-18; Safety Car Heating and Lighting Co., 1918; Bell Laboratories, 1918. mem. Telephone Pioneers. m. Amelia Willett; r. Short Hills, N. J.

During the latter part of World War I Mr. Jeffcoatt inspected wind-driven generators for airplanes made by the Crocker-Wheeler Company for the Western Electric Company. Following this he joined the group developing power equipment for central offices. In 1922 he transferred to the Commercial Relations Department to handle the commercial phases of trial installations to which was shortly added similar work in connection with the manufacture of vacuum tubes. During 1926 he was associated with the special research group working on the New York-Azores-Emden high-speed telegraph project. Upon completion of this project he returned to his former work. During the F.C.C. investigation Mr. Jeffcoatt acted as one of the commercial contacts for the F.C.C. men at the Laboratories.

Mr. Jeffcoatt transferred to the Research Staff Department in 1937 as Research Laboratory Service Manager. In 1939 he was placed in full charge of that Department.

Andrew L. Matte, Member of Technical Staff. M.I.T., S.B., 1909; Graduate Work, 1912-13. Canadian Siegwart-Beam Co., Montreal, 1909-10; New England Investment and Securities Co., 1910-12; Detroit United Railways, 1913-18; A. T. & T. Co., 1918-34; Bell Laboratories, 1934. mem. A.I.E.E. m. Anna Ryder Greene; r. Summit, N. J.

During Mr. Matte's twenty-five years of service he has been concerned with the transmission aspects of telephone signaling systems; carrier telegraph; double modulation methods for increasing the frequency

H. R. Jeffcoatt A. L. Matte

range of carrier telegraph in cables, the coordination of the transmission characteristics of telephone and telegraph systems superposed on the same circuit; and with laboratory and field testing and maintenance methods. In the course of this work he has been granted over fifteen patents.

Marguerite E. Johnston, Supervisor, Apparatus Files. Vitograph Company of America, 1914-16; Mergenthaler Linotype Co., 1916-18; Bell Laboratories, 1918. mem. Telephone Pioneers. r. Bronx, N. Y.

Miss Johnston's twenty-five years of service have been spent in the Technical Information Files of the Apparatus Development Department. After a few years of general service work she became a supervisor and is now in charge of a group which is responsible for giving service to engineers and draftsmen by making available to them engineering specifications and drawings issued by the Laboratories and by the Western Electric Company. The effective operation of the Files is due in large measure to Miss Johnston's extensive acquaintance with the functions of the filing groups and with the specifications and drafting routines of the Department and of Western Electric.

Alan Hobbs, Service Clerk. Banks College, 1905-6; Temple University, 1906-8. Scott and Williams, 1905-7; J. S. Disston, 1907-9, and United Gas Improvement Co., 1909-18, Philadelphia; Bell Laboratories, 1918-28; 1936- ; E.R.P.I., 1928-36. mem. Telephone Pioneers. m. Marguerite Meyer; ch. Mrs. Janice Hasselbauer; r. Westfield, N. J.

From 1918 to 1928 Mr. Hobbs was in the disbursements group of the General Accounting Department. He then transferred to E.R.P.I. where he was engaged in similar work. Upon his return he was in accounting work until 1941 when he went into the laboratory and stockroom order service group.

Miss M. E. Johnston Alan Hobbs

Lawrence Messer H. S. Enger

Lawrence Messer, Accounting Clerk. Pace Institute, 1918-19; New York U., 1921-23. Olney and Warran, 1904-5; Am. Druggists' Syndicate, 1907-12; O. J. Gude Co., 1912-17; McKesson and Robbins, 1917-18; Bell Laboratories, 1918. mem. Telephone Pioneers. m. Grace Mehrhof; r. Palisades Park, N. J.

Mr. Messer joined the plant accounting group of the General Accounting Department in 1918 and since that time has been concerned with the compilation of plant investment analyses, plant appraisals and the preparation of plant investment reports.

Halvar S. Enger, Staff Assistant. College of the City of New York, 1895-6. Arbuckle Bros., 1900-18; Comptroller's Dept., Western Electric Co., 1918-21; Bell Laboratories, 1921. mem. Telephone Pioneers; President, Board of Health and member of School Board, Englewood Cliffs, N. J. m. Jessie Wood; ch. Phyllis Amelia, Lois Albertine, Halvar Sigfort (now with Air Transport Group in North Africa), Betsey June; r. Englewood Cliffs, N. J.

Following three years with the Western Electric Company at 195 Broadway, Mr. Enger came up to the trial installation group of the Systems Development Department at West Street. In 1925 he transferred to the Commercial Relations Department as an analyzer for shop jobs and since then has handled certain commercial phases of picture transmission equipment, sound picture recorders and reproducers, transoceanic short-wave transmitters, and receivers, announcing systems and other equipments for Naval vessels and the Musa. At present Mr. Enger is concerned with coördination of model production on various war projects. This work involves translation of engineering requirements into requisitions for purchases, fabrication and assembly, subsequently maintaining contacts necessary for insuring job progress.

A. O. ADAM, JR.

J. C. GABRIEL

Armand O. Adam, Jr., Member of Technical Staff. New York Telephone Company, 1917-20; Bell Laboratories, 1918. mem. Telephone Pioneers. m. Grace Sheehan; ch. Armand; r. Maplewood, N. J.

After three years with the New York Telephone Company, Mr. Adam transferred to the Systems Development Department at West Street where he was in laboratory work until 1937. From then until 1942 he designed senders, connectors and routine test circuits for local and toll crossbar systems. Since June, 1942, Mr. Adam has been on the staff of the School for War Training. During this period his experience has included training members of the Army ground forces on maintenance of multi-channeled command sets, training Signal Corps employees on some of the more complicated radar equipments and, during the last few months, preparing books on operation and maintenance of ship-borne radar equipments.

John C. Gabriel, Member of Technical Staff. Columbia, E.E., 1917; New York Professional Engineer's License, 1936. Bell Laboratories, 1918. mem. Telephone Pioneers. m. Sylvia Bauer; ch. Lucille Melbourne, Shirley Wallace; r. Washington Heights, New York City.

Mr. Gabriel's first work at West Street was on the development of radio equipment for aircraft and submarine chasers. Since then he has been continuously engaged in general radio research and in various radio developments for the A T & T. These projects include both long-wave and short-wave transatlantic systems, ship-to-shore telephone, the Cape Charles-Norfolk link, single sideband reception, and the Musa. During the past year Mr. Gabriel has spent a large part of his time at the Point Breeze plant of the Western Electric Company in connection with special apparatus for the Armed Forces.

Bernard Leuvelink, Member of Technical Staff. Crocker-Wheeler Co., 1913-18; Bell Laboratories, 1918. m. Ethel Corbett; ch. Ronald Bernard; r. Morristown, N. J.

After three years in the Apparatus Drafting Department Mr. Leuvelink joined the specifications group. Then in 1928 he transferred to the mechanical design group of what is now the Commercial Products Development Department. Here he specialized in the design of sound recording, reproducing and public address system equipment. Five years later he joined the group responsible for the design of radio broadcasting equipments. Since 1939 he has been at Whippany developing special radio equipment for the Army and Navy.

Frank A. Zupa, Member of Technical Staff. College of the City of New York, 1916-19; Cooper Union, B.S. in E.E., 1922. Bell Laboratories, 1918. mem. Telephone Pioneers. m. Josephine Pompilio; ch. Robert, Frank; r. New York City.

For six years Mr. Zupa was engaged in testing and development work on materials and telephone apparatus in the old Physical Laboratory. This included two years on photomicrographic and microscopic analysis of materials. In 1924 he became associated with the design and development of telephone relays and in this work has made many contributions, particularly on the U, Y and UA types which are extensively used in the crossbar system. For the past year and a half Mr. Zupa has been in responsible charge of a group engaged in the design and development of special apparatus for the Army.

Philip Husta, Member of Technical Staff. College of the City of New York, 1916-18. Bell Laboratories, 1918. mem. A.I.E.E., Telephone Pioneers. m. Anna Henning; ch. Richard Philip, Daniel Edward; r. Great Neck, L. I.

BERNARD LEUVELINK

F. A. ZUPA

Shortly after joining the Laboratories, Mr. Husta enrolled in the S.A.T.C. at New York University. Upon his return he engaged in ringing and low-frequency studies in the local system group. In 1928 he was placed in charge of the panel switching laboratory group responsible for the testing and approval of new and modified switching circuits and for fundamental studies in the panel switching field. For the past year Mr. Husta has been concerned with special equipment for the Army.

PHILIP HUSTA

H. L. MUELLER

Harry L. Mueller, Member of Technical Staff. Penn State, B.S., 1918; Columbia, M.S., 1934. Western Electric Co., 1913-14; Bell Laboratories, 1919. mem. Telephone Pioneers. m. Florence Rogers; ch. Harry Louis, Myron Marshall; r. Bay Shore, L. I.

After various activities in commercial power and railroad work, Mr. Mueller joined the Installation Department of the Western Electric Company. In 1914 he left to go to college and upon receiving his degree he joined the Army, was commissioned a

JUNE SERVICE ANNIVERSARIES OF MEMBERS OF THE LABORATORIES*

Research Department

W. J. Adams, Jr.—25
Evelyn Anderson—15
E. A. Bescherer—15
Mary Casey—15
T. H. Crabtree—20
Alfred Decino—15
C. B. Green—15
J. R. Hefele—20
L. H. Keller—25
A. R. Kemp—25
F. B. Llewellyn—20
R. C. Mathes—30
Otto Mohr—15
N. R. Pape—15
S. E. Reed—15
Winfried Reichle—15
G. C. Southworth—20
E. E. Thomas—15
W. C. Tinus—15

Apparatus Development Department

H. G. Arlt—20
W. L. Daly—25
P. B. Drake—15
W. D. Goodale, Jr.—15
G. L. Johnson—15
A. C. Keller—25
J. M. Melick—25
J. R. A. Mulligan—20
C. D. Owens—15
G. C. Porter—20
G. J. Schaible—15
F. I. Smith—15
Helen Smith—15
W. J. Steiner, Jr.—20

Systems Development Department

A. L. Bonner—20
F. A. Brooks—20
A. A. Burgess—15
H. D. Cahill—20
Lillian Connors—15
E. J. Donohue—15
F. H. Graham—35
S. J. Guss—35
Marion Halbfostor—15
J. W. Jones—15
Reginald Knutsen—15
R. W. Lange—10
A. S. Martins—15
H. A. Miloche—20
Annette Richter—15
Lionel Schott—15
Mildred Thuebel—20
R. A. Vanderlippe—15
Wiley Whitney—20
E. S. Wilcox—35

Patent Department

W. C. Kiesel—35
Anna Muller—20

Personnel Department

W. W. Schormann—15

Commercial Relations Department

Dorothea Dixon—15
J. F. Kearns—25

General Accounting Department

H. O. Abrahamson—15
Marion Haggerty—25
Mildred Molloy—25

General Service Department

R. C. Carrigan—15
Cornelius Coakley—20
Mary Chiara—15

Plant Department

William Bodenstedt—30
C. O. Brosch—15
C. D. Davidson—25
W. J. Distler—20
Ludwig Evers—15
W. J. Goasevski—15
J. E. Johnson—20
J. P. Larson—20
G. V. Ryan—20
Muriel Ryan—15
Thomas Solan—25
E. C. Wintermantal—10

*Biographies of those who have completed 25 years of service will appear in future RECORDS.

Second Lieutenant and served as Personnel Adjutant of the 152nd Depot Brigade until October, 1919. Coming to West Street he has since been with the power development group, supervising power plant standardization for local central offices from 1928 to 1932. He then became associated with power apparatus, responsible for the development of storage batteries and control apparatus for power plants. For the past two years he has been concerned with war projects. Mr. Mueller is a member of the U. S. Coast Guard Auxiliary.

News Notes

Polytechnic Institute of Brooklyn has awarded the degree of B.E.E. to F. M. Pearsall and to A. S. Martins of the Switching Development Department.

To insure safe working habits and to thoroughly educate the personnel of Western Electric Company at Bayonne in electrical hazards, a formal course was conducted for employees working in high voltage areas. A. H. Schirmer and L. S. Inskip assisted the Western Electric Company in this.

The Laboratories were represented in interference proceedings at the Patent Office by J. W. Schmied before the Board of Interference Examiners and by Miss C. Mattice before the Primary Examiner.

A. W. Daschke made visits to the General Electric Company in Lynn to discuss special meters for Signal Corps; to the Brooklyn Navy Yard on type approval of Western Electric meters; and to Hawthorne in connection with portable volt-ohmmeters.

Miss M. C. Brainard, on May 12, spoke to the students of the graduating class in secretarial studies at Columbia on *What the Employer Expects of His Secretary*.

R. A. Deller and H. P. Smith spent four weeks in April and May visiting Bell System Headquarters in western and central parts of the country, primarily to arrange for the loan of engineers to assist the Laboratories in war work.

Ten members of the Laboratories attended the conference *Security of War Plants* of District No. 5, Second Service Command, A.S.F., at the Hotel Stacy-Trent, Trenton, on May 6. Delegates from the Laboratories were: F. Cowan, H. E. Crosby, W. R. Fahringer, E. J. Johnson, J. V. Kelly, F. D. Leamer, L. R. Lowry, J. J. Moravec, W. P. Smith and S. H. Willard.

R. P. Williams of the Transmission Development Department received the M.E. degree from Cooper Union on June 12.

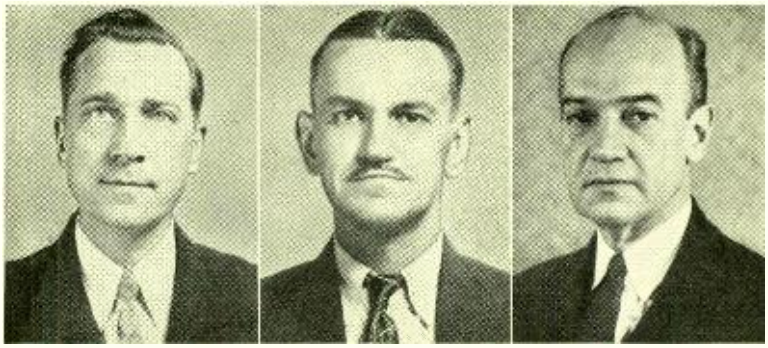
Obituaries

Harry A. Schultz of the Research Staff Department died on May 29. Before coming to the Laboratories in 1925 Mr. Schultz had spent eight years in drafting work with industrial concerns. From 1918-1921 he studied at the City College of New York. He came to West Street as a draftsman and a

Members of the Laboratories to Whom Patents Were Issued During the Months of April and May

G. E. Atkins
H. M. Bascom
C. H. Bidwell
W. M. Bishop
B. G. Bjornson
R. R. Blair
V. F. Bohman
H. A. Bredehoft
C. Depew (2)
A. C. Dickieson
P. B. Drake (2)
C. J. Frosch
W. Gronros (2)
N. I. Hall
G. A. Head
C. N. Hickman
S. C. Hight (2)
B. D. Holbrook
W. H. T. Holden (2)
A. L. Hopper
L. G. Hoyt
Francis A. Hubbard
P. Husta
H. E. Ives
P. V. Koos
W. Y. Lang
W. J. Leveridge
B. F. Lewis (2)
M. A. Logan
G. R. Lum
R. F. Mallina (2)
M. E. Maloney
W. A. Malthaner
W. A. Marrison
R. C. Mathes
L. A. Meacham
P. E. Mills
W. E. Mougey
K. H. Muller
E. A. Nesbitt (2)
E. Peterson
K. W. Pfleger
J. R. Pierce
C. E. Pollard
R. E. Ressler
A. R. Rienstra
V. L. Ronci (3)
A. L. Samuel
L. G. Schimpf (2)
H. O. Siegmund
C. F. Spahn, Jr.
V. G. Sprague
B. S. Swezey
G. M. Thurston
H. W. Ulrich
W. O. Wagenseil
R. O. Wise
W. A. Yager

year later became a Member of the Technical Staff. Since that time Mr. Schultz had been engaged in the mechanical design of laboratory equipment for the Research Department. Among the more important projects he had been associated with and to which he made many important contributions were the continuous furnace constructed for the cyclical heat-treatment of special materials (RECORD, March, 1935), automatic furnaces and other automatic machines for the laboratory production of carbon resistors; and the catephoresis machine for electro-deposition of colloidal particles from a colloidal solution.



HARRY A. SCHULTZ 1897-1943 | GEORGE E. MARRIOTT 1903-1943 | JOSEPH E. ROGERS 1892-1943

* * * * *

GEORGE E. MARRIOTT, an electrician in the Plant Department, died on May 29. Mr. Marriott was in the Installation Department of the Western Electric Company from 1921 to 1933 when he left the company. The next year he joined the Laboratories as an electrician in the Building Shop. Early in 1942 he transferred to the Development Shops and was immediately assigned to the layout and wiring of precision transmission testing and measuring apparatus such as oscillators and detectors.

* * * * *

JOSEPH E. ROGERS of the Transmission Development Department died on May 30. In 1913 Mr. Rogers joined The Bell Telephone Company of Pennsylvania where he was engaged in installation of apparatus and then in central-office maintenance. He came to New York to study the call-distribution system and then went to Wilmington to make pre-cutover and acceptance tests on this equipment. He left the Bell System in 1916 and came to West Street in 1918 and until 1923 was concerned with laboratory testing of semi-mechanical and call-distributing systems, step-by-step systems, and interconnecting circuits for manual, panel and toll offices and PBX's. He then transferred to the circuit design group where he worked on circuits for private branch exchanges. In 1929 he returned to the laboratory test group where he was concerned with testing manual switchboards. From 1935 to 1941 he worked on laboratory equipment for local and toll crossbar systems. Since 1941 Mr. Rogers had been in the Transmission Development Department editing circuit drawings, analyzing drawings for war projects and planning the construction of experimental models of special equipment for the Armed Forces.

* * * * *

PAUL PFLUG, a former pipefitter in the Building Shop who retired in 1940 after twenty-two years of service, died on June 1.

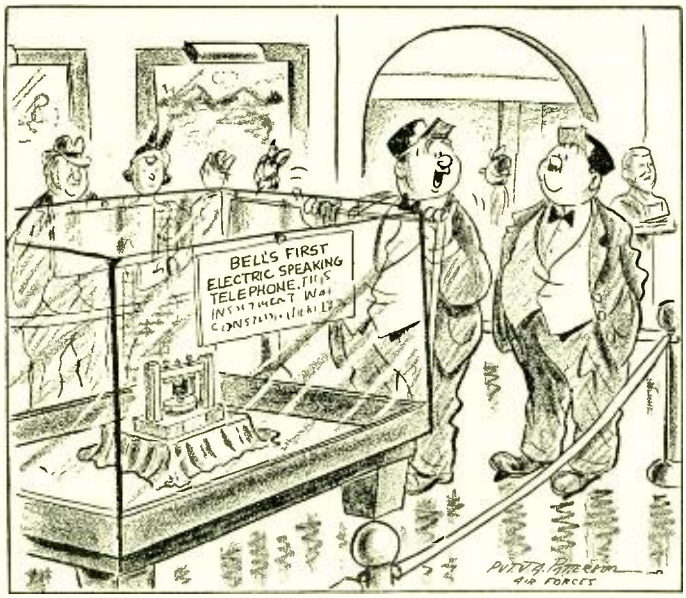
* * * * *

LEE R. LAIRD, a member of the Technical Staff until his retirement in 1933 after 30 years of service, died on June 16.

WE SEE BY THE PAPERS, that

Mr. and Mrs. Stephen Asanio recently announced the engagement of their daughter, MISS ANN MARIE ASANIO, to Pvt. Robert J. Martucci, of New York City. Miss Asanio is a graduate of Emerson High School and is employed by Bell Laboratories, New York City. The prospective bridegroom is an instructor in the Army Air Force. No date as yet has been set for the wedding.—*Hudson Dispatch, Union City, N. J., May* 3, 1943.

Castor oil probably will be used to manufacture synthetic rubber, DR. C. S. FULLER said here yesterday. Dr. Fuller, who with DR. B. S. BIGGS, of Bell Telephone Laboratories in New York City, developed the new synthetic rubber product known as paracon, says it is made of non-edible vegetable derivatives, one of which probably will be



Courtesy Public Utilities Fortnightly

"Yeah, the Telephone Company wants to borrow it back for active service during the shortage."

castor oil.—*Post, Washington, D. C., May* 5, 1943.

Rutherford acquired a new councilman last night. . . . Mayor Martin P. Nelson appointed PAUL W. BLYE to succeed H. Lee Moss on the Borough Council. . . . Blye . . . was sworn in immediately after his nomination by Mayor Nelson was confirmed by council members. A telephone engineer, Blye has been employed with the American Telephone and Telegraph Company since 1919, first in its research department, and later with the Bell Telephone Laboratories. —*Record, Hackensack, N. J., May* 5, 1943.

An outstanding exhibit by the radio class of the Fair Lawn Boys' Club is now on display at the Hotel Commodore, New York City. The Fair Lawn boys, under ROGER C. CARLTON, instructor and radio engineer of the Bell Laboratories, have constructed walkie-talkies; an oscillograph illustrating principles of television radio waves; fidelity modulation receiver; wired wireless; echophone short-wave receiver; 160-meter code transmitter; acorn tube receiver and transmitter; public address system; and a code practice set.—*Record, Hackensack, N. J., May* 6, 1943.

"History will some day record the part radio and the radar have played in giving us fighting superiority over the Axis. But let me give you one instance. On the night of November 24, off Guadalcanal there lay a Japanese battleship. It was a stormy night. Eight miles away was a ship of our fleet. With the use of the radar our ship, with its second salvo, sank the Jap battleship in the blackness of night, eight miles away."—*All papers, June* 1, *from an address by Hon. James F. Byrnes.*

Mr. and Mrs. B. E. Stewart have announced the engagement of their daughter Jean to HARRY E. SEAMAN. Mr. Seaman is with the Bell Telephone Laboratories. — *News, Newark, N. J., May* 11, 1943.

Miss Frances Denison was married Saturday to HAYDEN WILEY EVANS. SHERWOOD KING and HOWARD A. WENK were ushers. The bride was graduated from the Lenox School of Nursing. Mr. Evans was graduated from Ohio Wesleyan University and the University of Michigan. He is a member of Bell Telephone Laboratories.—*Herald, Dayton, Ohio, May* 10, 1943.

The new "Paracon" synthetic rubber which was developed by the Bell Laboratories is expected to find a variety of uses because of its high resistance to heat, light, oxidation and oils—it can be molded into intricate shapes and patterns.—*Financial World, New York, N. Y., May* 19, 1943.

Pin your faith to companies that have good research departments and are really doing research and not merely testing, says JOHN MILLS, Bell Telephone Laboratories' authority on electronics.—*Morning Wall St. Journal, New York, N. Y., May* 20, 1943.

Mr. and Mrs. Edward Mignani have announced the engagement of their daughter, AURORA ELENA, to Santi John Arena. The future bride, who is employed by the Bell Telephone Laboratories, was graduated from Bay Ridge High School in Brooklyn.—*Herald-Statesman, Yonkers, May* 24, 1943.

A new scientific circus, "Trigger Tube," to enable the smallest midgets of electricity

in the world to perform amazing stunts which are extremely valuable for the war effort, came to light today. In order to make it possible for electrons to do some trigger action, that is, start a series of processes by "pulling the trigger," a distinguished physicist and inventor, DR. ALBERT M. SKELLETT, of the Bell Telephone Laboratories, has devised special "trigger tubes."—*Examiner, Los Angeles, May* 24, 1943.

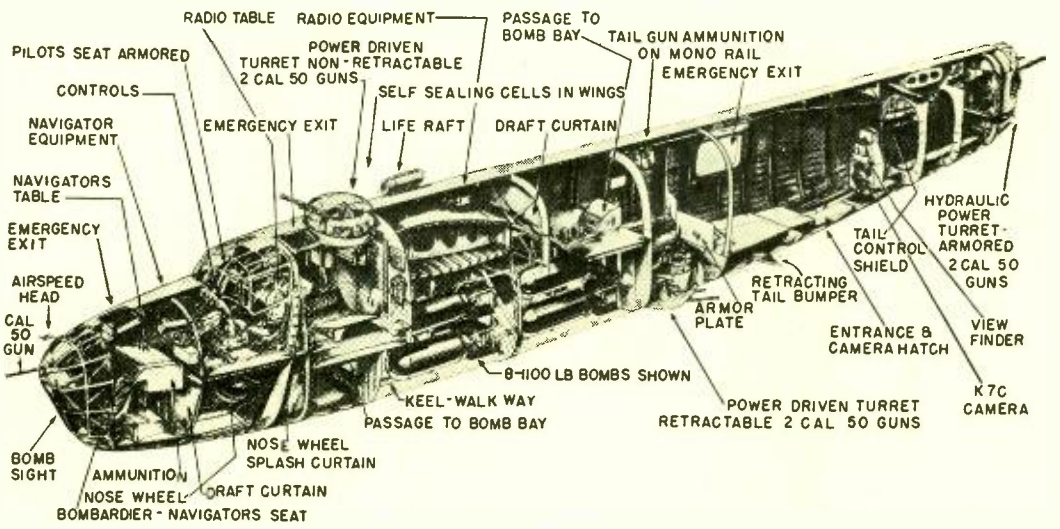
MISS MARY ELIZABETH MOORE of Grasmere received the degree of bachelor of science yesterday from New Jersey College for Women. . . . Miss Moore has been appointed as a mathematical assistant at the Bell Telephone Laboratories in Manhattan and will begin her work there soon.—*Advance, Staten Island, N. Y., May* 27, 1943.

"The Full Carload" has been adopted as the slogan for the newly formed Car Sharing Club committee, on which W. Kelton Evans has been appointed chairman. No community-wide committee will be formed at present, according to Mr. Evans; but employers and individuals will be contacted in order to stimulate coöperation wherever possible. It was pointed out that many Madisonians already share their cars with fellow-workers, particularly those at Bell Laboratories' plants in Whippany and Murray Hill, where group transportation plans have been initiated by the company.—*Madison Eagle, May* 22, 1943.

MISS BEATRICE DOROTHY MEAD has chosen July 10 for her marriage to Lt. Alfred Arthur Hagedorn, Jr., U. S. Army Air Corps. The ceremony will take place in St. Mary's Episcopal Church, Amityville, at 4 o'clock with the Rev. Bayard Goodwin, pastor, officiating. — *Newsday, Hempstead, L. I., May* 27, 1943.

Washington is talking about a new testing gadget [*developed by Materials Engineering*] that may convert mica from critically scarce to plentiful. Ever since Indian supplies were cut off, mica has been a problem in the manufacture of electronic equipment, since domestic sources of India-type mica are scarce. Meanwhile, the standard for mica has been resemblance to the best Indian product. Operations with new testing devices reveal that plentiful domestic black mica has excellent properties for electronics.—*Business Week, May* 29, 1943.

In an article on the measurement of lightning in relation to telephone cables (BELL LAB. RECORD 21, No. 4; Dec., 1942.) J. J. MAHONEY, JR., describes some simple forms of apparatus used to ascertain the magnitude of lightning surges.—*Nature, May* 3, 1943.



Cut-away view of a B-24 Liberator bomber, a four-engine long range ship which carries a crew of six to eight men. Its basic communication system was furnished by Western Electric from designs made by the Laboratories. The interphone system for communication among the crew can be connected to the radio transmitter and receiver. Official photo from OWI

Employee-Member—an editorial by John Mieso

IN THESE days we are often required to fill out personal questionnaires which usually contain space for statement of occupation. What form of wording is suitable for those of us who are in the Laboratories? One wording would be: "with Bell Telephone Laboratories." And another, "member of Bell Telephone Laboratories."

True, we are "employees," that is "those of whose services another makes use," and are "hired," that is paid wages. But we are members of the organization in the same sense as one is a member of an educational institution, a church, a club or a secret society—liable to discipline and expulsion, but also with opportunities for growth and advancement. We are "employee-members" of the Laboratories.

"Employee" is the legalistic expression of the contractual relationship and is important when working conditions and pay are under consideration. But when it comes to the job to be done and to the human associations, the relationship is that of "member."

All of us who are in the Laboratories should think of ourselves, I believe, as members. The Laboratories is what it is because of its members, present and past. Those who belonged yesterday made the institution to which we belong today; and all of us who are here today are making what our successors will inherit. We have responsibility for the present and for much of the future. That responsibility none of us can dodge.

Day by day in actions and decisions, small or large, each of us is delivering products for the present and molding for the future. Some individuals, by special abilities or position, may have more effect than others; but each of us according to ability, energy and influence is shaping the Laboratories. It isn't possible for any of us to be merely passive members — in the way in which sometimes one can continue on the rolls of a church or society for years at a time while being completely inactive. There is no neutral position: either we are helping or else we are hindering.

The Laboratories of which we are members is a formative organization in this rapidly changing world. All its research and development are devoted to meeting present needs of our nation, with most of the work on equipment for the military forces and the small remainder on Bell System services to the public.

In the work of the Laboratories we have opportunities for service to the United States of America of which we are members. And the more definitely we think of ourselves as members of the Laboratories—not merely employees, and as members of the U. S. A.—not merely taxpayers, the more whole-hearted and efficient will be our effort.