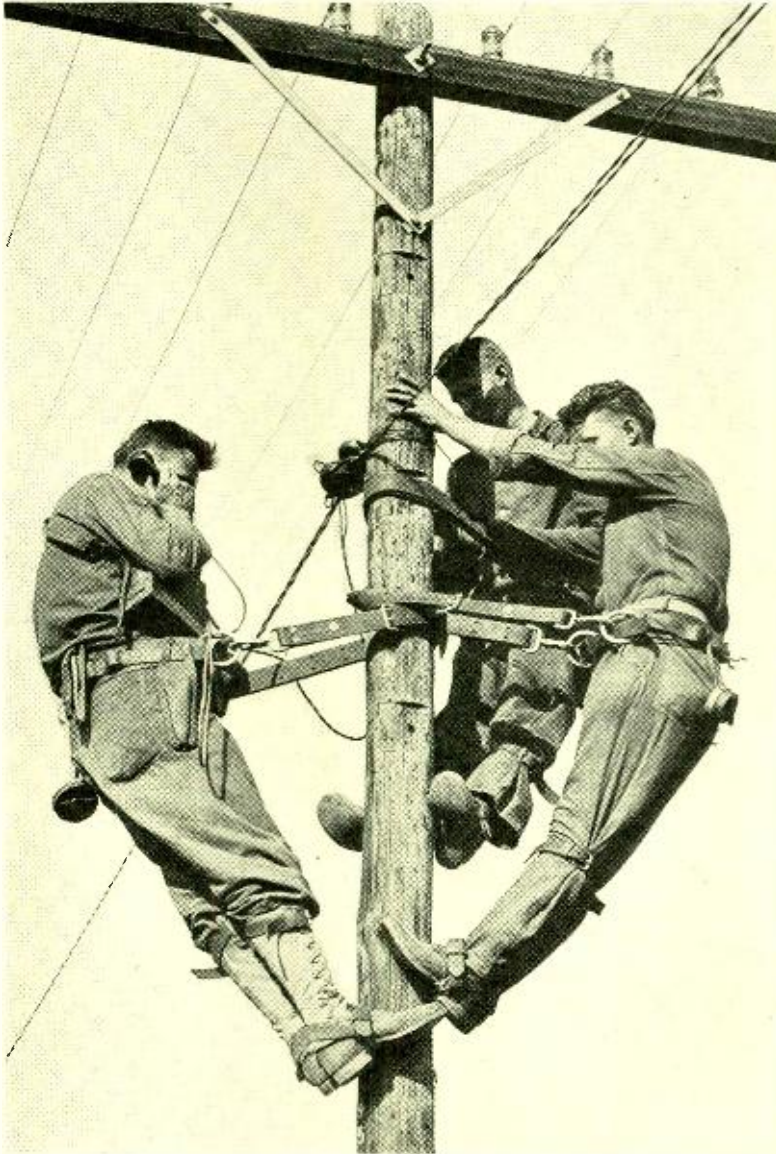


University of California  
Division of War Research  
at the U. S. Navy Radio and Sound Laboratory  
San Diego, California

# BELL LABORATORIES RECORD



MARCH

1943

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*Wire maintenance crew of  
a Signal Battalion in action  
during Army Maneuvers*



## The Signal Corps and the Laboratories

UNTIL the latter half of the last century, the methods of warfare had not changed to any great extent for five hundred years. In the middle eighteen hundreds, however, forces became active that, increasing slowly at first, have progressed at a greatly accelerated rate since 1914, and have caused the present world war to differ from the Civil War in its technique and equipment more than the latter did from the War of the Roses. One of the initial effects of this new trend was the application of steam and armor to warships, but the same underlying forces also resulted in enormous industrial expansions and a surge of invention and scientific study and investigation that is probably unparalleled in historical times.

With the general trend of this change in warfare the public is very well acquainted. The growth and

improvements in submarines, tanks, and airplanes are known in their broad outlines to every schoolboy, and the modifications in armament, artillery, and tactics are known equally well. What is not so well known is the progress in military communication. Modern motorized divisions moving at high speeds and over greatly extended fronts gain much of their effectiveness from the highly intricate, highly efficient and enormously extended communication systems that interlink all the instrumentalities of mechanized war. In the building up of military communication, the Bell System has played an important part, and in the great widening of the facilities that is now under way or will undoubtedly take place in the next few years, it is continuing and will continue the high

Photographs on pages 177 to 181 are official photographs of the U. S. Army Signal Corps.

standards of quality, initiative, and dispatch that has marked its efforts in the past.

It was in June, 1860, that the Signal Corps was organized. Except for the primitive methods that had been used for centuries past, such as messengers, heliographs, and smoke signals, the only medium of rapid communication was the d-c telegraph, which was still in the infancy of its development. Although the Signal Corps grew rapidly during the Civil War, the facilities at its disposal were very limited, and even at the end of the Spanish-American War it numbered only 1,300 men. By April, 1917, this number had increased only to 1,625, including 55 officers and 1,570 men, but by this time the great expansion in electrical knowledge was well under way, and as a result of the available knowledge and the critical need for added facilities, the Signal Corps by May, 1917, comprised 2,712 officers and 53,277 men—a total of nearly 56,000. The following decades of peace saw this total dwindle to 32,357 by July, 1941. With the greatly improved and expanded communication facilities of the present day, including radio in all its forms, the Signal Corps will play a far greater part than ever before and it is expected that several times as many officers and men as in World War I will be required to handle the communication services of our great modern army.

At the beginning of World War I, radio and the airplane—the tank came later—were learning their first steps; and it was recognized that to a large extent success would favor the side that made the most rapid and extensive use of these new facilities. Electrical communication, both by wire and radio, was well advanced from its Spanish War position, and it

March 1943

was realized that it would devolve upon the Signal Corps, not only to provide great quantities of the facilities already available, but to develop and expand them to an unprecedented degree. Not only would extensive telephone and telegraph systems have to be established behind and along an extended and moving front, but effective means would have to be developed for communication between plane and ground by means of the new radio techniques, and for radio communication in general.

It was here that the Bell System, with its extensive research and development groups and its large reservoir of trained communication craftsmen was called on the stage. In January, 1917, Major General George B. Squier, Chief Signal Officer of the Army, called on Theodore N. Vail, President of the American Telephone and Telegraph Company, on Newcomb Carl-



*General Dawson Olmstead, Chief Signal Officer of the Army, uses his new telephone at his new office in the Pentagon Building of the War Department at Arlington, Va.*





*Original Research and Inspection group of the Signal Corps before departure for France in 1917. Left to right: Standing, A. Morris, J. E. Ranges, Charles Wile, F. R. Lack, J. Adams, C. S. Price, H. W. Waite, Ralph S. Bair, Harry Lang, A. H. Leigh, A. H. Inglis, G. T. Ford, A. W. Dring, Clarence Wilson, W. A. Olson, Wm. Kellam and W. A. Bollinger. Sitting, Ed. Bodner, Paul A. Jeanne, John Ash, J. Kendrick, Roy Hart, C. G. Von Zaster, Dave Kerr, W. G. Crawford, W. C. Carpenter, J. Grey, Jeane Bernadou and A. DeStefano*

work, this group also writes a large number of training manuals and instruction bulletins.

By the nature of their work, Bell Laboratories and the Signal Corps are

closely allied. Our facilities and men stand ready to serve their needs. It is largely through them and through similar services of the Navy that we make our contribution to victory.

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### THE MARGIN FOR VICTORY

*The public hears much about production activities, but little about what the research engineers are doing. It might be of assistance to the enemy if the magnitude of research work was discussed, but I can say that great strides are being made in research, and coördination exists between the activities. This story will be of tremendous interest after the War and the results will have far-reaching effect on the improvements which will be adaptable to public uses. This is always the case following a great war.*

*If the war lasts many years, which we pray it will not, the research work now being carried on may prove to be the margin for victory.*

—Rear Admiral Stanford C. Hooper, U. S. Navy,  
before the Institute of Radio Engineers,  
January 28, 1943.

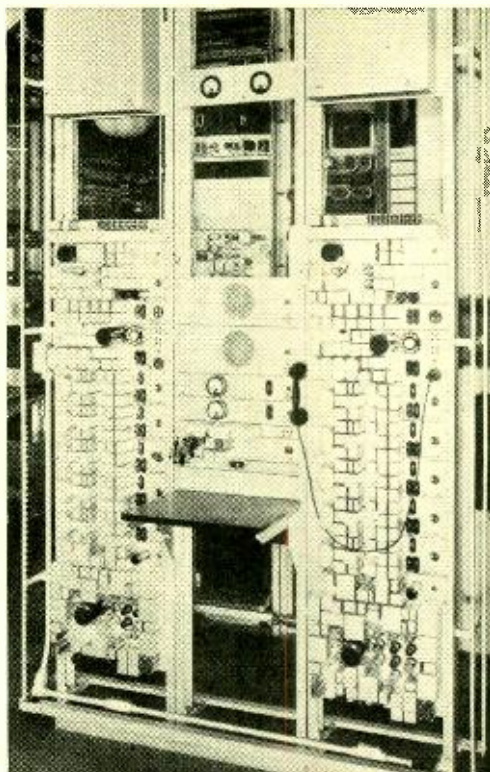
# Coastal Radio Telephone Systems

By H. M. PRUDEN  
*Switching Development*

**D**URING the past decade, radio telephone service between shore and vessels off the coast of the United States or within its harbors has undergone considerable growth and development. Such an extensive commercial service cannot come into existence overnight; the development work leading to the present successful system was begun over twenty years ago. The present installations—differing considerably from the first<sup>1\*</sup>—are the result not only of earlier commercial trials but of extensive research studies of radio transmission between ships and shore stations and of the most effective types of circuits to employ. As a result of all this work a complete coastal radio system is now in use. It consists of fourteen basic shore stations<sup>2</sup> so located as to cover the entire coast from Maine, through the Gulf of Mexico, and up the Pacific Coast to Seattle.

Each of the fourteen shore stations includes a radio transmitter, two or more radio receivers, and terminal equipment for associating each with the other and with their signaling and control circuits. The terminal equipment is installed in the toll office, and two of such terminals in the Long Lines building in New York City are shown in Figure 1. The transmitter is installed in some small building<sup>3</sup> erected for the purpose or in some telephone building or leased property.

\*All references at end of article.



*Fig. 1—Two coastal radio terminals*

The receivers, however, are usually at some distance from the transmitters and are generally mounted on poles. Since the transmitting equipment aboard ship is not so powerful as that on shore, the shore receivers are spaced at shorter intervals than the transmitters. In general the receivers are so placed that any ship that can be reached satisfactorily by a shore station can in turn be picked up satisfactorily by one of the receivers associated with that shore transmitter.

Transmission from the shore stations is at a frequency within the band from 2,504 to 2,600 kilocycles, while the shore receivers operate at frequencies between 2,108 and 2,208 kilocycles. To call a shore station, the desired frequency is selected, the headset aboard ship is lifted, and the

“talk” switch on the handle is pressed. This turns on the ship’s transmitter and the radiated carrier causes a carrier-operated relay in one or more of the shore receivers to operate and light a lamp in front of an operator.

Two methods are available for calling ships. The more completely equipped vessels have a selective signaling system as already described in the RECORD.<sup>4</sup> The operator dials the ship as she would any shore subscriber, and a bell is rung aboard the vessel called. In the earlier installations the operator used a special dial, but a circuit has been developed, and

is now in general use, that permits standard dials to be used. For ships not equipped for dial calling, the operator transmits a 1000-cycle tone over the carrier from the shore transmitter, and then calls the ship by name or by its call letters. Such vessels have a loudspeaker associated with their radio receiver, and the tone serves as an attention signal.

The general method of operating at the shore station is indicated in Figure 2. Each receiver associated with that station is permanently connected to a monitoring jack at the switchboard. By plugging into this jack, the oper-

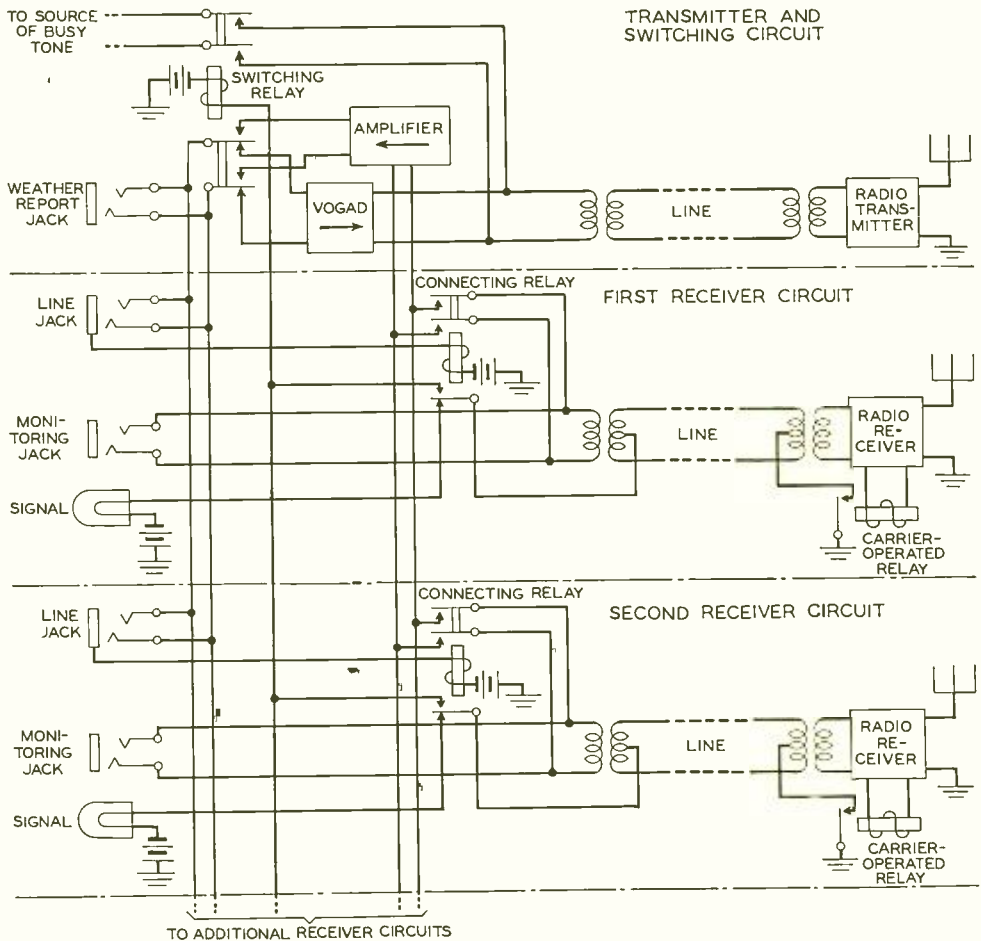
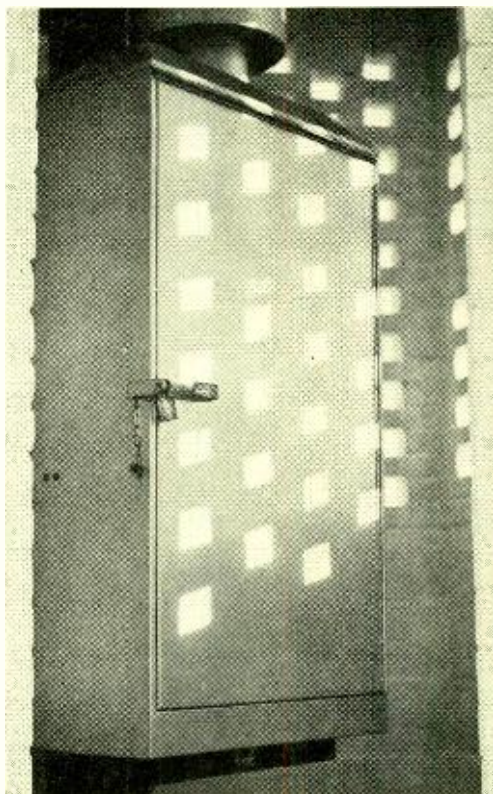


Fig. 2—Simplified schematic of the shore circuit for the coastal radio service



ator can monitor on the receiver at any time, either to identify calls or to select the best receiver for any particular call. Each receiver also has its line lamp, which is lighted when the carrier-operated relay of the receiver operates. When a ship calls shore, it may be so situated that the carrier-operated relays of all the shore receivers of that station operate. When this occurs, the operator may select the receiver which, on the basis of past experience, is generally the best one. If this selection gives satisfactory transmission, the call can be completed. After this is done, the operator may check the reception on the other receivers by plugging into the monitoring jacks. If she finds that another receiver is providing better signals than the one she originally selected, the connection may be quickly transferred.

Plugging into the line jack associated with any receiver actuates a connecting relay that extinguishes the line lamps, turns on the radio transmitter, and connects the receiver to the line jack through an amplifier. Operation of the connecting relay also switches the ground connection from the carrier-operated relay to a switching relay, which operates and remains operated as long as the ship's carrier is on. In its operated position this switching relay connects the line jack to the radio receiver but in its unoperated position it connects the line jack to the radio transmitter. After someone aboard the ship has called shore by turning on his transmitter and announcing the name of the shore station being called, he releases the "press" switch, and listens. This releases the switching relay at the shore station, and the operator answers, gets the number wanted, and completes the connection.



*Fig. 3—A 223A shore receiver in a decorative brick kiosk on the terrace of a hotel*

While the ship is talking, a busy signal is connected to the input of the shore transmitter through contacts on the switching relay, so that should someone on another ship listen before starting to call shore, he would hear the busy tone, and wait until the channel was available. Without this arrangement someone aboard ship picking up his telephone while some other ship was talking would hear nothing, because the ship receivers are tuned to the frequency of the shore transmitter and not to that of the ship transmitter. He might thus assume that the circuit was idle, and call shore, thus interfering with the ship already calling. When the shore station is talking a busy signal is not needed because all ship receivers are

tuned to the shore transmitting frequency, and thus can hear the shore end of the conversation. A weather-report jack is also associated with each station to permit weather re-

ports and hydrographic information to be sent out.

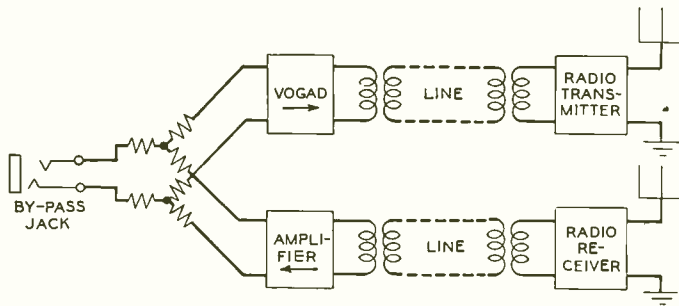


Fig. 4—Arrangement of shore circuit for a ship-to-ship call

ports and hydrographic information to be sent out.

Since the first commercial installation<sup>5</sup> of a coastal radio station some dozen or so years ago, the only major item of equipment that has not undergone substantial modification is the shore transmitter—the 9C. This was a modification of the 9A transmitter,<sup>6</sup> originally developed as a ground station for aircraft radio communication. The shore receiver<sup>7</sup> is a much more recent development, and was designed

as a result of previous experience with this service. It is self-contained, and remotely operated, and maintenance is assisted by use of special circuits.<sup>8</sup> The radio equipment aboard ship varies not only because of the large range in size of the vessels but because of the service they are engaged in and the particular preferences of their owners. The Western Electric Company has made three radio sets available. One of them—the 224B radio telephone equipment<sup>9</sup>—

meets the needs of the majority of coastwise vessels and the larger yachts. The other two—the 226D<sup>10</sup> and 227B—are for small yachts and harbor craft.

Besides completing calls between ship and shore, the terminal facilities also permit radio telephone conversations between ships through a shore station. The operating procedure is for the ship to call shore and ask for a connection to some other ship. The shore operator then calls this other ship, and having reached it, plugs

H. M. PRUDEN joined the Engineering Department of Western Electric during the summer of 1919 and engaged in laboratory work on voice-frequency signaling. In 1924 he became a member of what is now the Switching Development Department to engage in development of voice-frequency signaling and dialing systems, and of voice-operated switching devices and control circuits that are employed in radio systems. At the present time Mr. Pruden is in the Radio Research Department where he is concerned with war work.





into a by-pass jack, which, through contacts not shown, rearranges the circuit as indicated on Figure 4. The output of the radio receiver is connected to the input of the transmitter through a network, so that speech is re-transmitted at a frequency that can be detected by either vessel.

One of the innovations in the new terminal equipment is the ability to make contact with the emergency radio equipment<sup>11</sup> of the telephone companies. This emergency equipment is designed to take the place of wire facilities that are temporarily out of service. The ability of the shore stations to communicate with these emergency sets is very helpful at times in establishing the original connection, since then only one of the emergency sets is required—the shore station taking the place of the other. A second emergency equipment is put into use as soon as possible, however, and the operating frequency changed, so as not to tie up harbor equipment. The shore station radiates carrier continuously while handling calls with vessels, while for the emergency equipment the carrier must be under voice control. To make this possible,

the technical operator is provided with a key that rearranges the circuit as shown in Figure 5. The switching relay operates as in Figure 2, under control of the incoming carrier, to connect the shore circuit to the radio receiver. Under these conditions, there is no speech input to the vogad and hence none to the amplifier-detector. As a result there is no current through the winding of the voice-holdover relay, and a circuit through its back contact disables the radio transmitter. When incoming speech ceases, the switching relay releases, thus connecting the shore circuit to the transmitter. Voice signals from the shore circuit result in a current in the output of the amplifier-detector that operates the voice-holdover relay, and causes the transmitter to radiate carrier. The same current also operates the echo-holdover relay, thus opening the circuit to the switching relay so that incoming speech cannot interfere with outgoing signals.

All references from Bell Laboratories RECORD: (1) Jan., 1930, p. 204; (2) Jan., 1941, p. 166; (3) Dec., 1938, p. 134; (4) April, 1936, p. 255; (5) Nov., 1932, p. 62; (6) Oct., 1930, p. 65; (7) Nov., 1939, p. 76; (8) Nov., 1939, p. 91; (9) June, 1938, p. 358; (10) Sept., 1938, p. 21; and (11) Feb., 1939, p. 198.

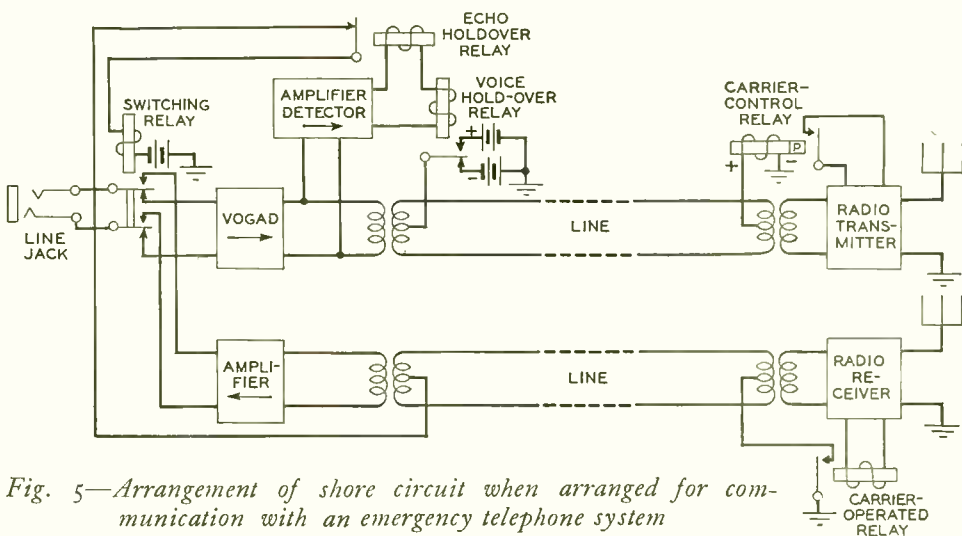


Fig. 5—Arrangement of shore circuit when arranged for communication with an emergency telephone system



## Speeding Communication for the Alcan Highway

By G. F. SOHNLE  
*Special Equipment Development*

**N**EARLY everyone has heard of the famous Alcan Highway that links our fighting forces in Alaska with Canada and the United States. Comparatively few, however, are familiar with the parts the U. S. Army Signal Corps and the telephone industry, including our own Bell Telephone Laboratories, are playing in establishing telephone and telegraph communications for "America's Burma Road," as it is sometimes called, and in connecting these facilities to existing communications networks all over the world. Since the Highway stretches a total of some 2,000 miles through the wildest and most untamed country in North

America, the problems experienced by the road builders face the communication engineer with equal acuteness.

Although plans for the permanent Alcan communication job along the entire route had been in process of formation for some time past, the Army suddenly expressed its need for advance facilities to coincide with the opening date of the Highway. They would link Edmonton, Alberta—the last major outpost of civilization on the edge of a vast wilderness between Northern Alberta and Alaska — and Dawson Creek, British Columbia, which is the railhead of the Northern Alberta Railways and the actual starting point of

the Alcan Highway. Some local telephone facilities were available in the vicinity of Dawson Creek, but no open-wire or cable telephone connection to Edmonton had ever been established. A radio link was tried some years ago by the Alberta Government Telephones with but poor success because of the so-called "magnetic blackouts," which are characteristic of some parts of the North. To establish reliable telephone contact with the Highway, therefore, the Army decided in October to go ahead with the building of an open-wire pole line between Edmonton and Dawson Creek, a distance of about 450 miles, and placed orders late that month with the Western Electric Company for the necessary central-office telephone equipment. To save copper, the Signal Corps specified that a copper-clad steel wire of 30 per cent conductivity would be used outside. This raised special problems from the start, since it was the first time in our experience that such wire had been specified for long distance communication purposes.

The American Telephone and Telegraph Company and the various departments of the Laboratories were consulted by the Army, and a suitable toll line was planned to give satisfactory transmission over the distances involved. The projects discussed were coördinated in the current development group of the Equipment Development Department which furnished the Western Electric Company with the necessary specifications for the various stations on the Highway.

To meet the Army's requirements for portability and flexibility, self-contained vi repeater and ringer bays with built-in power equipment were specially designed, and the services of

other departments of the Laboratories were enlisted as required for the preparation of the necessary circuit schematics and design of a new network to balance the copper-steel line facility. Excellent coöperation from all departments made it possible to forward complete engineering data to Kearny by October 22, 1942.

At the time the advance Alcan job was being planned, the Signal Corps also brought to our attention the need for teletype circuits over another route passing through Edmonton.

On November 5, 1942, Col. W. C. Henry notified the representatives of the various companies gathered at a conference in Montreal that both projects would have to be completed by December 1, 1942, in order to coincide with the formal opening of the Alcan Highway. This date at the time appeared virtually impossible to meet in view of the usual manufacturing and installation schedules normally required for jobs of this nature. The challenge was accepted, however; and all concerned proceeded to break past records, particularly Kearny, where some fourteen tons of equipment required for both projects was assembled under circumstances that only a project of this type could justify.

The importance attached by the Army to these jobs is shown by their ordering all work suspended in the Kearny department affected, except the Alcan and two other war projects, for five days during the manufacturing period. On November 20, 1942, twenty-six days after receiving the orders, all equipment required from the United States with the exception of certain items previously sent by expedited express, was ready and carefully loaded aboard a big, black



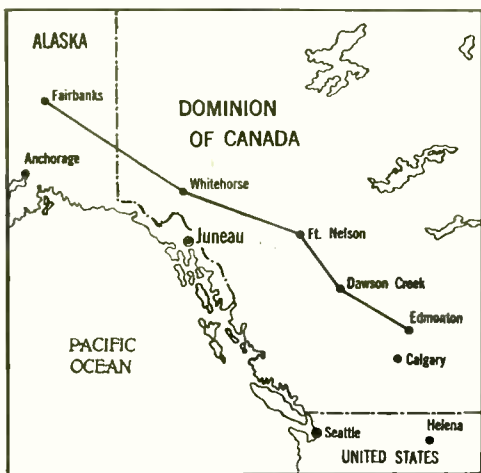
Army transport plane which roared into the skies that night bound for the Northwest.

A few days before this general shipment, it became apparent that the services of a Laboratories engineer, familiar with both projects, would be required on the scene of operations to aid in coördinating these undertakings. The writer was selected to go, and Edmonton was selected as his headquarters, since both projects have this station in common. Stops en route were scheduled at Winnipeg and Regina, however, to permit consultation with representatives of the Signal Corps and the Canadian organizations stationed at these cities.

The stops at Winnipeg and Regina gave an opportunity to get in touch with the various people interested, and to help smooth out the thousand and one difficulties attendant on an unusual undertaking of this kind. The Winnipeg visit was especially highlighted by the arrival of the transport plane from Newark on

Saturday, November 21, 1942, loaded with Alcan material. The crew told us that part of the Alcan material had been transferred to another plane at Minneapolis which was headed directly for Edmonton. There was some confusion at the Canadian Customs in Winnipeg in clearing through the plane and its contents and it appeared for a while that a week-end delay might be incurred, which would have been just about fatal to our schedule. However, the aid of the U. S. Consul's Office was enlisted by the Army, and a release obtained. As soon as refueling was completed, the plane again headed into the crisp, cold Canadian air, bound for the Grande Prairie airport, some 1,000 miles distant. The same crew was still operating, and I was told that their route would be as the crow flies, without recourse to radio range beams, so as to meet their schedule and deliver the equipment Saturday night at Grande Prairie. An Army officer aboard later told me the flight was completed as scheduled, and that it will always remain in his memory as one of the most thrilling he has ever experienced, although accepted as routine by the crew.

My arrival in Edmonton was on the heels of the worst blizzard experienced in that section in forty years. Twenty-eight inches of snow had fallen, accompanied by a howling wind and followed by clear, cold weather which reached a reported low of -72 degrees F. along the route of the projected open wire. Traffic in this sprawling prairie town was paralyzed for a few days, but the Army, with their excellent road-clearing equipment, was of considerable aid to the regular city forces in clearing the streets and roads. Normal life was restored, and Edmonton resumed its seething ac-

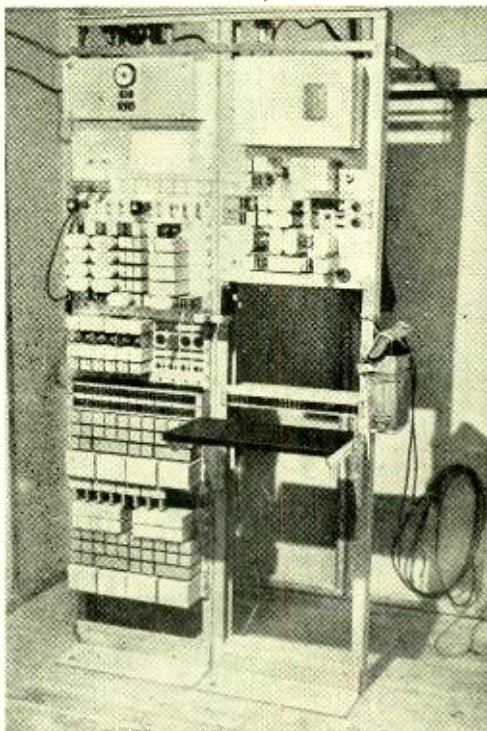


*Zig-zagging up through the Canadian Northwest, the telephone line to Alaska will follow the Alcan Highway north and west to Fairbanks from Dawson Creek, the town where the highway begins*

tivities as the jumping-off place for the North. Hotel space was at a premium. Many hotels set up cots in the public rooms to accommodate the overflow.

The Signal Corps Headquarters was a beehive of activity. The Army had converted a large new public garage into an office building complete with desks, typewriters, PBX and all necessary equipment. A large storeroom in the basement had been stocked with a complete line of arctic clothing and sleeping bags to equip the outside construction gangs. At this time, Wednesday, November 25, 1942, the open-wire route had been surveyed, but construction work had not yet been started because of the time required to assemble the personnel and to secure the necessary wire, insulators, crossarms and other equipment. About 500 of the best linemen available in North America, gathered from the various Bell System and Canadian Companies, were assembled for this task. The job of housing, clothing, and feeding these men along the route was in itself no small undertaking.

With less than one week remaining before the December 1 deadline, work was started on the pole line. Naturally the ground was frozen solid, making it necessary to blast out each hole to take the pole. Each crew was assigned to a particular section with every man concentrating on his own specialty. While some were putting up poles, others would be laying out the wire on the ground preparatory to putting it in place on the crossarms. A spirit of friendly rivalry sprang up with the crews reporting their progress each day in terms of the number of poles erected. It was found that the ground-work of running out the wire could be accomplished satisfactorily at night,



*For portability and flexibility, self-contained VI repeater and ringer bays with built-in power equipment were designed*

and as a result work was possible practically twenty-four hours a day. The numbing cold of from 30 degrees to 40 degrees below zero prevailing along most of the route, with intermittent snow to add to the three feet or so already fallen, did not help to ease the task. To use the Army's favorite expression, it was "pretty rugged" going. Many people freely predicted that the project could not be completed by December 1.

Simultaneously with the start of the open-wire construction, the Army erected small wooden huts along the route, except at Edmonton, for housing the repeaters and portable Diesel engines for generating the primary power. In some instances these buildings served also as the sleeping quarters for the installers and Army main-



*Arctic clothing was standard equipment for the pole line crews who built the line connecting with the Alcan Highway at Dawson Creek*

tenance personnel. Not luxurious by any means, but at least warm (there being no fuel shortage), and each man was equipped with a down-filled sleeping bag suitable for temperatures to 40 degrees below.

Installation of our equipment was started in the offices during the week preceding December 1, and proceeded at a furious pace, finally resolving itself into a race between the inside and the outside forces. Both factions were determined not to be in the position of delaying the December 1 cutover. The advantages of the portable shop-wired voice repeater and ringer-oscillator bays became evident from the decreased installation effort required.

The use of Edmonton as the control point for both projects enabled me to keep in touch with all phases of the work. The various points along the routes had to be visited both before and after cutover. Because of the

generally snowy and bad weather, planes were grounded most of the time, making it necessary to resort to other means of travel, sometimes rather unorthodox. These included rides in jeeps and similar types of Army vehicles, work trains, cabooses and, on one memorable occasion, in company with Lt. John W. Starke, a ride in a locomotive cab through a section of country studded with Canadian spruces and dotted with rugged frozen lakes that looked like a technicolor scene from "Rose Marie." Only Jeanette MacDonald and Nelson Eddy were missing.

After a number of anxious moments occasioned by delays in receiving certain additional items that had to be shipped separately, installation of the office equipment was finally completed, and we were ready to test. Here hard luck dogged our footsteps at every turn. On Sunday, November 29, for example, hoarfrost, the bane of



the North, built up on the open wire south of Edmonton to such an extent that for eight hours it completely killed the C-carrier channel we were attempting to line up to carry the voice-frequency carrier-telegraph circuit. Portable testing equipment, which was to be used at each station in turn, was lost en route in a snow-storm; one of the installers developed pneumonia while using an open "scooter" on the railroad, and almost died; a defective equalizer had to be replaced by one flown clear across the country. Somehow, however, all obstacles were hurdled, and testing proceeded steadily. This also included testing each section of open-wire line for faults as soon as it was completed, an undertaking requiring twenty-four-hour duty.

The first big thrill came late Sunday, November 29, when all faults were cleared on the open-wire section above Edmonton, and we were able to talk and ring Fawcett, about 100 miles north. Progressively other sections were cleared, and by Monday, November 30, we were able to ring and talk to Grande Prairie, the last repeater point south of Dawson Creek.

Excitement now ran high because the December 1 (Tuesday) deadline was only one day away and, while we were close to accomplishing our objective, success still eluded us. The last section of pole line, between Grande Prairie and Dawson Creek, was particularly troublesome, and it was only by working through Monday night to Tuesday afternoon that the last faults were cleared.

With the last line fault eliminated late Tuesday afternoon, December 1, it was with mingled feelings of dread and anticipation that we tried the first test calls through to Dawson Creek. Luck was with us, and by about 7:45 P.M., December 1, Col. Twichell, the officer in charge at Dawson Creek, called Brigadier General Frank E. Stoner at his home in Washington, D. C. A few minutes earlier the last section of the telegraph route had been tied in, and the teletypewriters were clicking over the entire route. The circuits on both routes were soon in regular use, and at once a veritable flood of messages poured over the wires, as though they had been dammed up and then suddenly released.



G. F. SOHNLE joined the Equipment Development Department of the Laboratories in 1921 as a technical assistant and engaged in the preparation of drawings and specifications. After completing the training course, he transferred to the special equipment development group as a trial installation engineer. He continued his studies in the evening at the Polytechnic Institute of Brooklyn, receiving the E.E. degree in 1933. In recent years he has been with the current development group, specializing in the equipment engineering of long carrier and voice repeated toll lines. For some time past all of his work has been along similar lines but on projects for the armed forces.



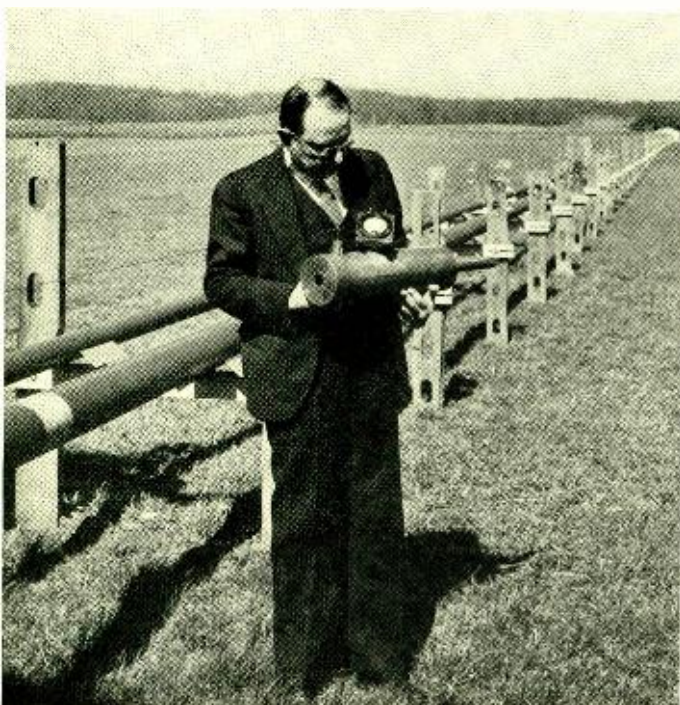
## Ultra-High Frequencies

**H**OW micro-waves are adding to the tools of the communications engineer was told by George C. Southworth to a joint meeting of the Institute of Radio Engineers and the American Institute of Electrical Engineers on January 28. Briefly outlining the conquest of the frequencies from the sixty cycles per second of the power lines through the 15,000 of speech and music, the 1,500,000 of broadcasting and the 10,000,000 of the short-wave range, Dr. Southworth mentioned the need of television and communication in general

for more and wider channels as one of the prime forces in the advance into the micro-waves. Other desirable features of the "micro" region—above a billion cycles per second—are the small size of antennas and their high directivity; and the fact that the waves follow the line of sight and thus do not interfere with signals beyond their own useful range.

Some method of conducting waves from generator to antenna, and from antenna to receiver, is obviously necessary. While ordinary insulated wires can be used through the broad-

cast range and beyond, in the short-wave range special attention must be given to losses in the insulation, to radiation into space and into nearby conductors, and to the effects on tuning produced by stray capacity and inductance. The coaxial line, in which one conductor is formed into a tube, and the other is enclosed in it, is an excellent expedient. If the central conductor is completely removed, it is still possible to transmit energy down the tube which then becomes a wave guide. If the tube is filled with insulating material, even the outer conductor can be removed.

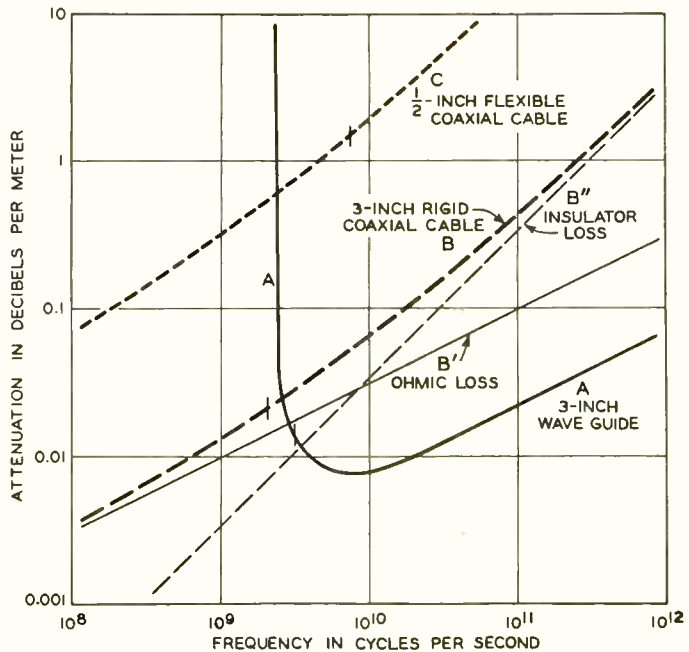


*Dr. Southworth, with a variable resonator. The small hole mentioned in the text is seen in one end of the resonator. In the background are two waveguides installed at Holmdel*

The coaxial and the conducting tube or wave guide are the most promising of these arrangements.

Compared from the standpoint of attenuation losses, the coaxial is better at the lower frequencies; but in the micro-wave region, which is of most importance at the moment, the wave guide has decided advantages. However, below a certain frequency—about  $3 \times 10^9$  for the wave guide—the wave guide cuts off abruptly as shown in the illustration at the right.

Wave guides are decidedly useful for conveying micro-waves from their generator to the place where they will be used. For one reason, they contain no insulating material and so are entirely immune to moisture. Moreover their waves can be radiated by simply flaring out the tube into a horn. A wave guide may also be made into a resonant chamber by blocking one end with a metal plate and closing the other partially by a plate with a hole in it. By varying the length of the chamber, it can be tuned to the precise frequency desired; with a small hole, if the chamber is  $\frac{1}{2}$ , 1 or  $1\frac{1}{2}$  of a wavelength, it will admit energy readily; if  $\frac{1}{4}$ ,  $\frac{3}{4}$  or  $\frac{5}{4}$  wavelengths, it will repel energy, *i.e.*, be anti-resonant. Since the wave pattern in a resonator is fixed, it is possible to locate a detector at precisely the right spot in the pattern in order to obtain maximum response.



Comparison of attenuations for a  $\frac{1}{2}$ -inch coaxial, a 3-inch coaxial, and a 3-inch waveguide. Curves B' and B'' show respectively the loss due to resistance alone, and to dielectric alone, for the 3-inch coaxial

Because they, too, can be guided down a tube, sound waves are strikingly analogous to electric waves in some of the properties just described; for example in radiation from a horn and resonance in chambers. However, any hole in the tube will let out some of the sound energy. One of the most useful forms of the electric wave, on the other hand, can be so oriented to a hole in the tube, or even to a long slot, that no energy escapes, and hence it is possible to insert an electrical probe and move it along the tube. That procedure makes possible the detection of any irregularities in the flow of power.

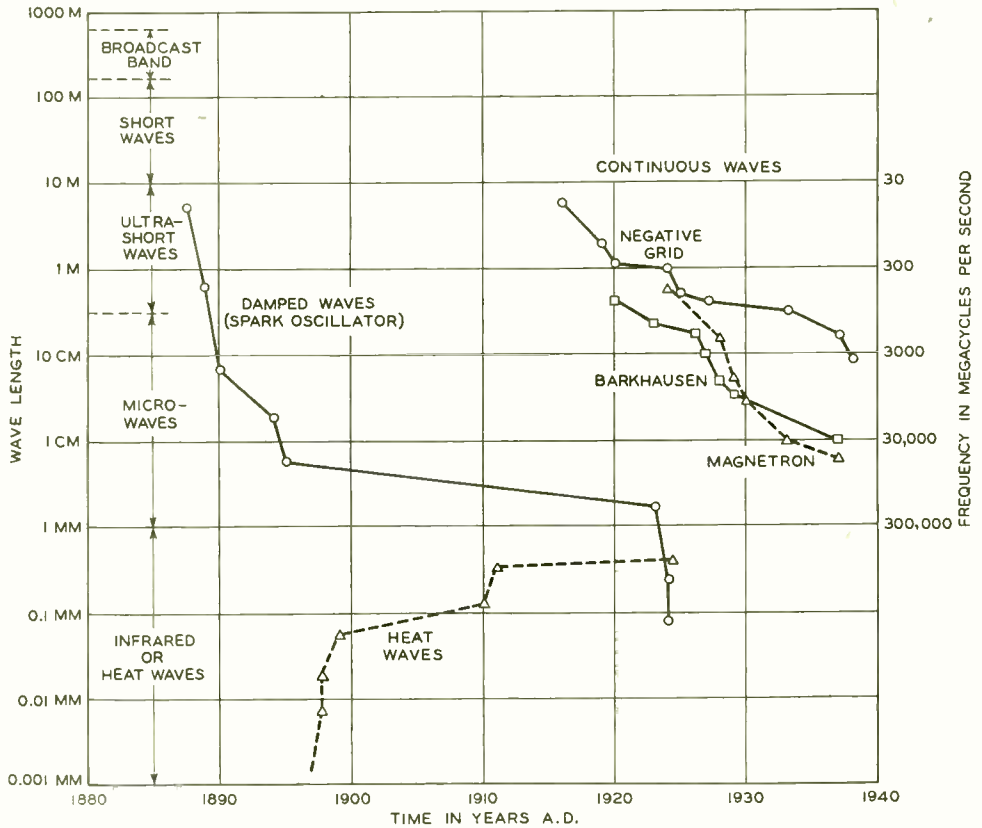
It might be thought that the only way to concentrate all the power into a single point, as for instance a crystal detector, would be by drawing the tube down to a point. However, that



result can be secured by inserting a small "doublet" antenna with the detector at the center, properly placing it longitudinally and orienting it with respect to the wave guide correctly.

Somewhere along the frequency scale in the neighborhood of a billion cycles per second—wavelength about one foot—microwave technic undergoes a marked change. Methods using the conventional go-and-return-conductor type of circuit give way to the

somewhat simpler hollow pipe, or wave guide, circuit. These newer methods seem to be at their best in the centimeter wavelength range. At the longer wavelengths, the component parts become inconveniently large. For shorter waves, it would appear that ability to manufacture small parts would become an important limitation. What the technic will be beyond this point is a matter for the future.



*Year-by-year progress in the high-frequency field*

# NEWS AND PICTURES OF THE MONTH



## BRITISH AIR COMMISSION

1785 MASSACHUSETTS AVENUE  
WASHINGTON, D. C.

TELEPHONE HOBART 9000

February 16, 1943

Mr. Oliver E. Buckley, President  
Bell Telephone Laboratories, Inc.  
463 West Street  
New York, N.Y.

Dear Mr. Buckley,

You may remember a request which was made to the Bell Telephone Labs in the autumn of last year, asking for urgent delivery of a pre-production model of the [REDACTED] for test by the R.A.F. in England.

Your promised delivery date was met exactly and the equipment left for U.K. by ship within one or two days. Progress thereafter was unfortunately slow, but on arrival the equipment was installed in a test aircraft and has now been thoroughly flight tested. Performance figures are not available but we are told that the [REDACTED] performed exceedingly well under conditions which were as tough as could be imposed.

We have been specially asked to express the R.A.F.'s real appreciation of the efforts of the research, development, and engineering personnel who were responsible for the [REDACTED], of the special efforts which made delivery of the first set possible, and of the measures which you were good enough to take to ensure trouble free operation during the trials in England.

Yours very truly,

*R.O. Jones.*

R. O. Jones,  
Air Vice Marshal, R.A.F.



## News of the Month

### LABORATORIES SENDS TYPEWRITERS TO THE GOVERNMENT

Typewriters are needed in all branches of the Service and since other sources have been exhausted, they must come from business firms and private individuals. So the Army and Navy, faced with an acute shortage of typewriters (600,000 are needed immediately), have appealed to the public to release one out of every four for war use. Thousands are needed by the Signal Corps to carry on their work; they are needed by the Navy on submarines—hospital ships—and destroyers and by the Army to send to the front lines where orders must be typed for speed and accuracy. The picture shows a Government representative, J. J. Caufield, with A. E. Pattinson affixing the official label to some of the typewriters that the Laboratories has sent off to war.

If you own a standard typewriter made

after January 1, 1935, and wish to sell it to the Treasury Department, Procurement Division, call Mr. A. E. Pattinson, Office Machine Service, Extension 516.

### BELL SYSTEM AND SIGNAL CORPS AFFILIATED PLAN

Some 3,500 Bell System men, skilled in the communications techniques which a modern army needs, have entered the U. S. Army Signal Corps through the affiliated plan since the war began, says a recent summary sent the War Department by Keith S. McHugh, Vice-President of A T & T. The majority of these men have formed cadres—nuclei of skilled men within an army unit—and thus the Signal Corps has been able to use these men's experience and knowledge in over 200 battalions, companies, and other tactical units more quickly and effectively than could have been done in any other way.

Commenting on Mr.

McHugh's summary, Chief Signal Officer of the Army, Major General Dawson Olmstead made plain his feeling about the Bell System's cooperation and the quality of its personnel, remarking in part: "The splendid qualifications of your employees who have entered the services of their country indicate the excellent training they have previously received through the years of affiliation with the Bell System."

Under the affiliated plan, the Signal Corps has provided a description of the positions it wished filled by qualified volun-



*The Laboratories, complying with the Government's request for typewriters, has rounded up these machines and sent them off to war as tools essential to victory*





*Demonstrating how to lift an Army type stretcher at the Fourth Annual First Aid Conference—victim with fractured right leg. Lifting stretcher, clockwise, E. D. Morris, Katherine Lotz, holding splint, W. G. Smith, H. W. Ericsson and A. C. Holtz. In background, left to right, J. S. Edwards, W. C. Lucey, American Red Cross, L. E. Coon, W. A. Corbitt, New Jersey Bell, and C. R. Kendall, New York Telephone*

teers among telephone employees. Some of the positions were in the office of the Chief Signal Officer or as Post Signal Officers at Army air bases; more of them were in Signal Corps field units. About a third have carried commissions.

### FIRST AID CONFERENCE

The Fourth Annual First Aid Conference was attended by thirty-nine members of the Laboratories who had been specially trained to render First Aid care in cases of accident or emergency sickness arising in locations where medical facilities are not immediately available. After showing and discussing the Red Cross sound film *Before the Doctor Comes*, the conference was devoted to the discussion, demonstration, and individual practice of the skills required in rendering

First Aid care. Later, groups operating as squads were formed to render the required care to victims assumed to have been injured and then to transport these victims to places where medical treatment could be obtained.

G. B. Thomas acted as host at the luncheon and commented on the "Safety Mindedness" of and the good work done by the First Aiders at their work locations. P. C. Schwantes, Jr., Plant Employment Engineer, A T & T, spoke briefly of the value of First Aid training in the Bell System Operating Companies in making the employees "safety conscious." William C. Lucey, Assistant Director of First Aid, Water Safety and Accident Prevention of the American Red Cross, North Atlantic Area, addressed the group on the place and func-

tion of the graduate First Aiders in the Civilian Defense set-up, and also on the progress and outlook for the Red Cross First Aid Program.

The day's program was concluded by Dr. C. E. Martin, Medical Director, who gave a short talk on the types of and treatments for injuries incurred by persons during air raids in England during World War II.

Visitors present at the Conference to observe the Laboratories' methods of training were: Dr. L. D. Bristol, Health Director, P. C. Schwantes, Jr., Plant Employment Engineer, and Erle S. Miner, Safety Engineer, A T & T; C. R. Kendall, Supervisor of Safety Methods and First Aid Training, New York Telephone Company; and W. A. Corbitt, Safety Supervisor, New Jersey Telephone Company.

The program was arranged and directed by L. E. Coon of the Employees' Service Department under the supervision of J. S. Edwards. Mr. Coon was assisted by J. M. Dunham, W. M. Hill, A. C. Holetz, A. L. Johnsrud, R. Pope and M. L. Weber, First Aid Instructors.

## RED CROSS WAR FUND

Now under way is the Red Cross War Fund for 1943, announced to the Laboratories by O. E. Buckley for the management and by E. C. Wentz on behalf of Bell Lab-

oratories Club. For New York City the goal is \$13,000,000, roughly 2½ times that of last year's campaign.

Pictures on the opposite page highlight a few Red Cross activities for men in uniform. As you look at the cross formed by these pictures:

Top row, left, a Red Cross Field Director gives out kit bags—like the hundred filled by Laboratories girls last fall—to soldiers embarking for overseas service.

At the right, a group of volunteers sew on hospital garments. This corps also makes clothing for service men's children.

Center row, left and right, blood plasma follows our boys on jungle trails and over warship decks.

Center, a Red Cross service center in Edinburgh, Scotland.

Bottom, left, occupational therapy helps fingers recover their skill.

Bottom, right, a nurse administers treatment to a disaster victim.

When filling in the pledge card for the Red Cross War Fund remember that over four hundred members of the Laboratories, now on leaves of absence for military service, are looking to the Red Cross for these and many other services. Our generosity must not fail them. Your contribution will be routed to your own community if you give the name of your local Chapter or Branch on your pledge card.

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## PERSONS RENDERING FIRST AID AT LOCATIONS OTHER THAN WEST STREET AND THOSE AT WEST STREET PARTICIPATING IN THE CONFERENCE

<i>Building R</i>	<i>Whippany</i>	C. T. Huhn	W. M. Hill*
Angeline Avitabile	A. L. Johnsrud*	J. J. McMahon	R. T. Holcomb*
C. J. Calbick	J. V. Kelly	A. E. Melhose	A. F. Kane
H. W. Ericsson	A. A. Skene*	R. M. Pease	A. E. Ritchie
A. C. Holetz*		A. F. Pomeroy	P. W. Spence
Katherine Lotz	<i>Graybar-Varick</i>	R. Pope*	R. C. Terry
E. D. Morris	<i>Building</i>	J. E. Tarr	A. E. K. Theuner
W. G. Smith	P. H. Betts	Elena R. Tighe	J. N. Walter
F. W. Stubner	D. W. Bodle	H. R. Vail	
	C. W. Christ	M. L. Weber*	<i>West Street</i>
<i>Deal</i>	F. B. Combs	H. F. Winter	L. E. Coon*
J. P. Schafer*	C. A. Dahlbom	C. R. Yenzen	J. S. Edwards*
	P. J. Doorly		E. D. Jones
<i>Holmdel</i>	J. M. Dunham*	<i>Davis Building</i>	Dr. C. E. Martin
L. J. Barker*	H. F. Gartner	T. M. Benseler*	Ruth O. Robinson*
R. A. Desmond*	O. D. Grismore	Eliz. M. Culbert	Margaret Talbot
L. R. Lowry*	R. C. Hersh	M. C. Goddard	G. B. Thomas
			W. A. Tracy*

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\*First Aid Instructors

# Share in Red Cross Work



# Give to the Red Cross War Fund



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## News from Service Men

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### Corporal John J. O'Shea

"Even though I am so far from my former work there is plenty of other work to be done here in North Africa. I am with the Engineers and no job is too small or too large for us to do—and do well."

### Paul Mallery

"Unfortunately I cannot tell you the most interesting parts of my job as you can well understand. However, I am permitted to say that I am in New Guinea. One thing about this job is that we get plenty of fresh air and sunlight. It takes a while to get used to the tropic heat but after that it isn't so bad. Nevertheless, I shall be very glad to return to New York to push my way through the crowds to the Labs every morning.

"From experience I can say that those men of the Laboratories who designed this equipment we use may well be proud of the job they have done. We'll do our best to make you proud of the way we use it."

### George Wolters

"I left for Camp Upton and remained there for five days. During that time we received all our equipment and also had the military law book thrown at us. You know, a soldier doesn't have to go across to get

shot—this book tells him how in ten easy lessons. On the 24th, due to the rain, we 'swam' from camp with two duffle bags weighing close to 200 pounds over our shoulders. We boarded Pullmans and after riding for two days landed at Camp Shelby in Mississippi.

"After a few days in a field artillery casual company I jumped right into an infantry training battalion and then after several more transfers landed with a regular infantry regiment. We have just been issued our pack equipment in preparation for a ten-mile hike tomorrow. What a beautiful thought before going to bed! Frankly, the Army isn't bad. The food is very good, you get plenty of sleep and plenty of exercise."

### Lieut. Charles R. Schramm

"I'm now motor officer of my Battery and have twenty-six trucks to maintain. (*Lieut. Schramm is in the Field Artillery Replacement Center at Fort Bragg—Ed.*) Of course I never drove a truck in civilian life but now I'm supposed to be an expert in anything from a jeep to a four-ton ten-wheeled truck. It is a lot of fun, however, and I'm learning something every day. It also keeps me out in the open eight hours a day which is okay with me, too."



*Robert C. Eisele, of the Murray Hill Laboratories, was the first 17-year-old Cadet in the country to be sworn as a candidate in the Navy's new flight training program. He is shown taking the oath of allegiance from Lieut. Commander Albert F. Rice who is the Officer in Charge of the Naval Aviation Cadet Selection Board*

### Major William Kes

"I am still stationed in England and managing to see quite a bit of the country. I haven't had any leave for a year, but when I do I have a few very nice places picked out. I am really looking forward to that leave just as I am looking forward to spending next Christmas at the Bell Laboratories."

### Ernest F. Neubert

"Soldiers of the Army . . . sailors of the Navy . . . and gentlemen of the Air Corps," is the way SERGEANT ERNEST F. NEUBERT puts it. Ernie, a gunner on a bomber based at Bardsdale Field, La., is enthusiastic about the Air Corps and on a recent furlough said that he wouldn't leave it even if he could come back to civilian life. A "ten-percenter" himself, he reports that in many of the air fields the entire personnel, to the last man, are investing 10 per cent of their pay in War Bonds. Before enlisting Ernest was head messenger in Central Messenger Service.

### John M. O'Neill

"Just a short line to thank the Company for remembering me at Christmas. I am a member of the Military Police Force here at the Army Air Base at Lincoln, Nebraska. Some time soon I expect to get a furlough and I will be around to see all my friends at the Bell Laboratories. I want to thank you also for the RECORD which I enjoy reading very much."

### Lieut. Walter W. Maas

"Since the first of September I have been Assistant Plans and Training Officer at the Aircraft Warning Unit Training Center, Drew Field, Florida. Our job here is to train the many various technical and administrative specialists that are necessary in this vital branch of the Signal Corps. Much of our equipment was designed by you at the Laboratories."



*"Come on in; the water's fine" says Nils Janson, returning from Rensselaer Polytechnic where he is studying for a Navy Commission. His former pal in Systems Drafting, Bill Lynch, is now awaiting the Navy's call to active duty and enrollment in one of its Air Training Schools*

### Richard A. Shine

"My basic training covered five weeks at the Manhattan Beach Training Station of the U. S. Coast Guard after which I was transferred to the Coastal Patrol Base at Atlantic City. Spent six weeks doing patrol duty on a small sub-chaser and am now stationed at the Base. Will become a seaman, second class, this month and go back to patrol duty."

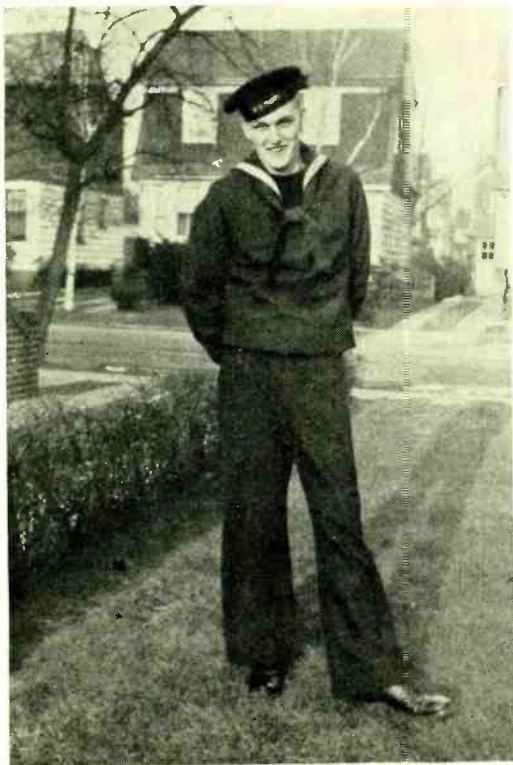
### Sergeant William G. Pimpl

"Everything is going fine—no complaints and no heartaches. I am a First Sergeant in a rather large Battery, a barrage balloon unit in the Coast Artillery on the West Coast. I don't know how long we will be here but when we shove off it will not be for a picnic. In the meantime I hope to go to Officers' Training School."

### Charlie Dalm

"I'm in the Navy now and I like it. We rise (I didn't say shine) at 0600 and turn in at 2200. We pound the books for 11 hours a day and when we're finished we can barely keep our eyes open. Then we dream of





*R. C. Lockwood is in training at the Naval Corps Hospital School, Great Lakes, Illinois*

LIEUT. EINAR REINBERG has had six assignments in the Infantry in a month! He's at Fort Lewis, Washington, now.

ALBERT C. REYNELL, a Corporal in the Signal Corps, is now learning to install and repair teletype machines at Fort Monmouth.

EDWARD J. BYBEL has been transferred to the Air Forces Base Weather Station in California where he hopes to put his weather knowledge to good use. Having been accepted for O.C.S. (Tank Destroyer Branch) he expects to be shipped to Texas for training after a few months.

MICHAEL SHEEHAN is on Desert Maneuvers with the Army Engineers in or around California.

STANLEY H. LOVERING of

the Signal Corps, at Fort Monmouth, has been promoted to the rank of Major.

MARCELLE LESIRE of the WAVES has been graduated from the Naval Radio School at Madison, Wisconsin.

JOSEPH DELANO, formerly of the Murray Hill Restaurant, is now with a Signal Company at Fort Jackson, S. C. He enjoys going to school and "finds it pretty soft except for a hike now and then."

W. L. FARMER has been transferred to the Army Air Force Technical Training School in Lincoln, Nebraska. Bill finds the Army food good. "It may not be fancy but it is all there."

PERSONAL LEAVES of absence have been granted to JAMES H. MOORE to accept a position with the National Defense Research Committee; to T. M. ODARENKO, Bureau of Ships, Navy Department; and to FRANK SARDINHA, U. S. Merchant Marines.

#### SHOP SUPERVISORS MEET

About seventy shop supervisors, including those from Murray Hill, Whippany, Holmdel and Deal, and members of the outside shop service staff, dined in the West Street restaurant on the evening of February 4. Following the dinner S. H. WILLARD wel-



*S. H. Willard, Plant Manager, addresses the dinner meeting of Shop Supervisors. The dinner was held in the Service Dining Room of the West Street Restaurant on February 4*

*March 1943*



comed the group and discussed the functions and work of the Plant Department as part of the Laboratories organization. H. C. ATKINSON, who served as toastmaster, spoke on *Shop's Place in the Laboratories with Particular Reference to Our War Effort and Labor Relations with Our Employees*; D. P. BARRY, *Some Problems of Administration*; GEORGE DOBSON, *Shop Service in New Jersey Locations and Problems of Scheduling*; and A. F. GILSON, *Making Use of Outside Shop Capacity*.

### THROAT "MIKE" CONQUERS SHOP'S INDUSTRIAL NOISE

Industrial noise is being conquered during training activities at the Caldwell plant of the Curtiss-Wright Corporation through the use of throat microphones developed by the Laboratories. Long an essential to military and civilian flyers, the throat "mike" is finding this ingenious new use in Curtiss-Wright's training of student welders. In their application of the Kearny-made device, the instructor wears the microphone while his pupil listens through snugly fitted earphones while he works.



*Throat microphones used in the training of student welders*

Previously instructors had to shout to their pupils who in turn had to stop using their welding torches and lift their protective hoods in order to listen. This meant a serious loss of time in the important job of training new welders.

Throat microphones transmit only the

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### MEMBERS OF THE LABORATORIES GRANTED LEAVES OF ABSENCE TO ENTER THE ARMED FORCES SINCE THE LAST ISSUE OF THE RECORD

#### UNITED STATES ARMY

William E. Archbold  
Arthur M. Beckvar  
Ralph A. Benson  
William H. Burgess  
Ray G. Bussman  
William N. Butler  
Gregory Chabra  
Harold W. Collier  
Gerard E. Davis  
Herbert E. Earl  
George N. Eltz  
Stanley W. Erickson  
James W. Ericsson

Edward Filipovits  
Robert F. Flinn  
Philip W. Foy  
John K. Gardner  
Frank R. Hanlon  
Robert F. Healy  
Thomas B. Horton  
John J. Lordan  
Stanley P. Maschke  
Paul P. Melkonian  
Emile H. Munier  
Anthony J. Osinski  
Arthur J. Palmer

Miss Louise M. Parietti  
Miss Kay R. Parsons  
Harold Phares, Jr.  
John G. Phillips  
William F. Rauchle  
George A. Roe  
Donald R. Scheiderman  
Robert L. Tambling  
Everett T. Urbanski  
Philip E. Watts  
David W. Webster  
Lieut. Ernest A. Whelan  
Joseph C. Young

#### UNITED STATES NAVY

Ensign Thomas M. Bray  
Miss Grace Connor  
James W. Cunningham  
Ensign Donald S. Duguid  
Miss Carole M. Finch

Michael F. Griffin  
Joseph T. Grissom  
Eugene A. Hulst  
John P. Manning  
Charles H. Matthews

John R. Nelson  
Harold W. Raimert  
James L. Smith  
Albert L. Vabulas  
Lieut. Everett Walsman

speaker's voice, eliminating outside noises, so that the instructor can talk to his students in an ordinary tone of voice, as if they were assembled in a quiet classroom. These microphones were supplied by the U. S. Army Air Force to Curtiss-Wright.

### IMPROVED TELEPHONE SERVICE FOR SERVICEMEN

To afford the best telephone facilities to our Armed Forces, the Bell System installed 70 attended public telephone locations in military and naval establishments in recent months, bringing the number to 108, with plans definitely made for 84 more. The men enjoy the personal attention and courtesy of trained attendants when they ask for rates, change or assistance in placing calls. A man no longer has to wait by the hour in a booth for a toll call while a queue of servicemen waste their free time waiting for the same booth. After giving his call to the operator he can relax or read in the pleasant sur-

roundings in these stations until the operator has completed his call.

Besides the increased number of attended locations in military and naval establishments, 24 public telephone locations operated by attendants were also installed in railroad and bus terminals, in U.S.O. and Servicemen's Clubs and in other locations where servicemen gather. Plans for 20 more stations at such locations have been made to give the kind of telephone service that the boys require.

### ANTIMONY REPLACES SOME OF THE TIN IN WIPING SOLDER

Shortage of tin in the present emergency has made it necessary to conserve this material wherever possible. A great saving was made by the introduction of the "victory joint" at splices in lead-covered cable but efforts to use less tin have continued. By the addition of 2 per cent antimony to the wiping solder, it has been possible to reduce the tin content several per cent. The antimony provides more fluidity during the wiping operation than the solder would otherwise have with its reduced tin content. Laboratory tests and extensive field trials indicate, however, that the new solder is an acceptable substitute and that it requires no marked change in wiping technique.

### NEWS NOTES

THE THIRD REPORT of the War Policy Committee of the American Institute of Physics, on which DR. BUCKLEY is serving, was published in the January issue of the *Journal of Applied Physics*. The report covers the importance of physics in modern war; strategic considerations, such as the possible length of the war, time available for training and the value of superior weapons; types of training; availability of teachers and students; and recommendations for a definite working program.



*"Advance and Be Recognized." John Stuparich, one of our watchmen, challenges R. W. Chesnut as he approaches a restricted area*

IN JANUARY, 1943, the Laboratories was engaged on 228 projects for the Army, 150 for the Navy and 22 for N.D.R.C. About 80 per cent of the Laboratories total outlay was for government account.

ALBERT H. REIBER, vice-president in charge of development and research for the Teletype Corporation of Chicago, died on February 1. Mr. Reiber was born in New York on April 13, 1894, and graduated from the Stevens Institute of Technology with a degree in mechanical engineering in 1916. He was a development engineer in the Western Union Telegraph Company from 1916 to 1920 and was in sales engineering work in the Kleinschmidt Electric Company of Long Island City from 1920 to 1925 at which time this company was merged to form the Morkrum-Kleinschmidt Corporation of Chicago. The latter company later became the Teletype Corporation.

AT THE REQUEST of the War Production Board, HOWARD W. DIPPEL, Purchasing Agent, is serving as a member of the WPB Research Laboratory Advisory Committee. Mr. Dippel attended the first Committee meeting in Washington on February 2.

ALL DONATIONS to the Red Cross blood bank are made through specially trained units. The Red Cross have some mobile units but do not make use of them in Manhattan. In order to make a blood donation in Manhattan, it is necessary to make an appointment with the American Red Cross Blood Donor Service, 2 East 37th Street, New York City, Telephone, Murray Hill 5-6400. It is suggested that you telephone for an appointment rather than go in to the headquarters. The offices are open for donations from 10:30 A.M. to 8 P.M., Mondays through Fridays, and from 10:30 A.M. to 4 P.M. on Saturdays.



"Mr. Smith walks to save tires, but he wants people to know he owns a car"

J. A. BECKER, I. H. GERMER, C. J. DAVISSON, C. B. GREEN and G. F. HULL, JR., attended the annual meeting of the American Physical Society held at Columbia University on January 22 and 23.

J. A. BECKER and G. L. PEARSON participated in a conference on *Characteristics of Varistors* during the winter convention of the American Institute of Electrical Engineers.

I. H. GERMER, on January 19, gave a talk on *Applications of Electron Diffraction* before the local section of the Optical Society of America at Rochester. Dr. Germer was elected Vice-President of the American Society for X-Ray and Electron Diffraction at its January meeting. He will give two lectures at Western Reserve University on April 9 on the subject *Electron Diffraction and Its Applications to the Examination of Surfaces Including Catalysts*. They are part of a course on *Frontiers in Chemistry*.





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## Chosen by Lot

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This month the RECORD presents the following biographies of members of the Laboratories chosen by lot.

\* \* \* \* \*

HISTORY is often the basis of new developments and so extensive files are an important part of the Laboratories' equipment. JEAN SEAL's job is to keep the Room 702 files of circuit sketches and drawings in order so that engineers can refer to them at any time.



JEAN SEAL

When Jean graduated from Plainfield High School in 1941, the placement advisor suggested she try the Laboratories. On coming to West Street she became a messenger and in a few months was assigned to Circuit Folder Files.

Knitting, horseback riding, tennis, and particularly dancing are Jean's leisure time interests. She goes to U.S.O. dances at nearby Fort Kilmer and also invites the boys to parties and dinners at her home.

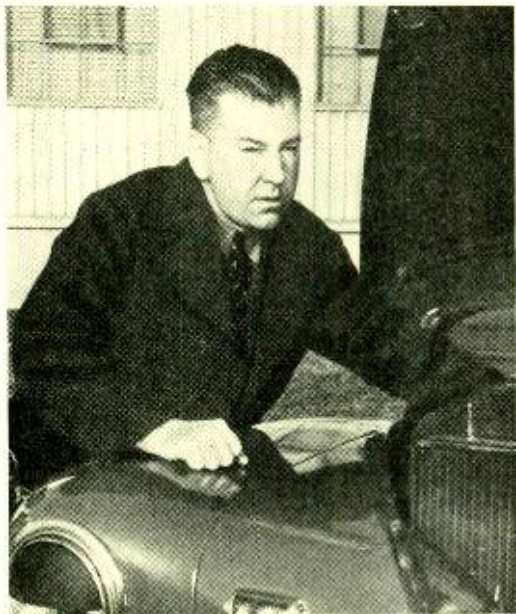
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ERNEST BABCOCK keeps the motors whirling smoothly at Whippany, a job less difficult now than it was thirteen years ago, in the mud and ruts out there when he first came. Ernie has seen the place grow, with hard-surfaced roads, graveled parking areas, and a fleet of "suburbans," which he maintains with plenty of skill. With his back turned, he can tell which one of his eight identical cars is being driven up and parked, and by which engineer! And he does a lot of the driving too.

Cars have always been his hobby—except when he whittles out airplane models with his 14-year-old boy. Sonny is the expert, however, in that line, Ernie says. In the Morris Plains home where they live, Ernie's wife must be doing an expert maintenance job herself judging by our auto maintenance man's excellent physical condition.

\* \* \* \* \*

PHIL SCHMITT has had a varied career since he joined the Laboratories in 1926 as a messenger after graduation from Stuyvesant High School in New York City. Two years later found him in the Metallurgical Laboratory making castings of magnetic and non-magnetic alloys. About this time he also learned to operate induction furnaces. During the depression he turned his previous hobby, still photography, to good stead by getting a job as a photo-lithographer. Returning to the Laboratories in 1934, he worked for a while in the Plant Department. Three years later he was again operating electric furnaces in the Metallurgical Lab-



ERNEST BABCOCK

oratory, where he is now engaged in work for the Armed Forces.

Philip lives in Elizabeth and is married to the former Martha Markthaler who also works at Murray Hill. He enjoys bowling and archery. However, his fondness for motor boats is his liveliest sports interest; although he manages to get dumped overboard nearly every summer, he has thus far cheated Davy Jones by holding on to the craft until rescued.

### NEWS NOTES

AXEL G. JENSEN has been made a fellow of the Institute of Radio Engineers for his constructive participation in the development of the short-wave transatlantic telephone, the development of broadband telephony, and the art of television.

M. M. JONES was in Baltimore for about two weeks working on the Baltimore-Washington coaxial system trial.

K. K. DARROW has been reelected secretary of the American Physical Society.

AT THE I.R.E. winter conference, held jointly with a similar conference of the A.I.E.E., papers were presented by R. S. JULIAN, *Transmission—Line Charts*; LLOYD ESPENSCHIED, *Electric Communications—The Past and Present Illuminate the Future*;

March 1943

and G. C. SOUTHWORTH, *Beyond the Ultra-Shorts*. An abstract of Dr. Southworth's paper will be found on page 194.

R. W. DEMONTE, on January 4, visited the Magnetic Winding Company in Easton with engineers of the Western Electric Company in connection with power transformers. Mr. DeMonte also visited the Jefferson Electric Company, Bellwood, Ill., on power transformer problems.

A. J. CHRISTOPHER was in Chicago during the week of January 30 to discuss matters pertaining to the manufacture of condensers.

G. H. LOVELL, at the Hawthorne plant of the Western Electric Company, discussed the manufacture of filters for carrier systems.

H. H. STAEBNER and W. V. THOMPSON conferred with engineers at Point Breeze on cord development problems. R. T. STAPLES was also at Point Breeze on cable matters.

H. H. GLENN, at Point Breeze and Washington, discussed the development of wire for special applications.

C. A. WEBBER was at Hawthorne and at the Radiation Laboratory of M.I.T. in connection with cables.

C. H. WHEELER was at the J. G. Brill Company in Philadelphia on matters relating to trailer equipment.



P. H. SCHMITT





H. A. PIDGEON, 1883-1943



D. C. MEYER, 1890-1943

of a group responsible for the development of all types of vacuum tubes used for communication purposes, particularly those used in modern long-distance telephone equipment. Since the beginning of the present war he had been concerned with the development of vacuum tubes and other electronic devices for the Army and Navy. Dr. Pidgeon had contributed several technical papers in his field of endeavor.

Dr. Pidgeon is survived by his wife, Lillian Esther Terrell, three daughters, Virginia Ann, Barbara Jane and Pauline Terrell, and a sister, Mrs. Anna Van Fossen of Pennsville, Ohio.

D. D. MILLER and C. W. McWILLIAMS visited the Leeds and Northrup Company, Philadelphia, in connection with the design of special recording apparatus.

R. NORDENSWAN visited the Haydon Manufacturing Company, Forestville, Conn., to discuss timer motors.

W. G. LASKEY went to Hawthorne on matters relating to manufacture of meters.

O. S. MARKUSON of the Outside Plant group at Point Breeze was in New York for conferences on coaxial cable developments.

C. D. HOCKER attended the meeting of the Executive Committee of the American Society for Testing Materials held in Philadelphia on January 19.

#### OBITUARIES

HOWARD A. PIDGEON, Vacuum Tube Development Engineer of the Electronics Research Department, died on February 7. Dr. Pidgeon received the B.S. degree from Ohio University in 1911 and the M.S. degree in 1912. He then went to Cornell University where he engaged in work in engineering and physics, acted as instructor in physics and received his Ph.D. degree in 1918. He joined the Laboratories, then the Engineering Department of the Western Electric Company, in October, 1918, and for a number of years was engaged in fundamental studies of electron emission.

Since then, in the Electronics Research Department, Dr. Pidgeon had been in charge

Pauline Terrell, and a sister, Mrs. Anna Van Fossen of Pennsville, Ohio.

DELBERT C. MEYER, Toll Equipment Engineer of the Equipment Development Department, died suddenly on February 2. He attended Western Reserve University for three years and Case School of Applied Science for two years, taking a combined course whereby he received a B.A. degree from Western Reserve and a B.S. degree from Case in 1912. He joined the student course of the Western Electric Company at Hawthorne and, after the usual shop training and installation experience at Cleveland and Cincinnati, entered the equipment section of the Engineering Department on central-office engineering. Mr. Meyer transferred to the Equipment Development Department in New York in 1920 and his first work here was correlating the provision of terminal equipment for the first telephone cable between Key West and Havana. Since then he had been engaged in the development of toll equipment with the exception of one year when he was in charge of the trial installation section of the Equipment Development Department. As head of the toll equipment group, Mr. Meyer had been responsible for the equipment problems of switchboards, test boards, telephone repeaters, toll signaling equipment, open-wire carrier telephone, cable and coaxial systems, and all equipment work for telegraph systems. Since the beginning of the



present war his department had been responsible for the translation of scientists' ideas for radically new types of communication systems into practical designs which could be made up in quantity and used reliably by military personnel in the field.

Mr. Meyer lived in East Orange. He is survived by his wife, one son who is a Lieutenant in the Marine Air Corps and two daughters.

\* \* \* \* \*

G. M. BOUTON and J. A. CARR, accompanied by D. Fisher, C. F. Baldwin and E. R. Albrecht of the Long Lines and E. J. Bonnesen of the O. & E. Department, were in Connecticut to inspect the aerial cable between Occum and Danielson, particularly in connection with cable-sheath problems.

F. HARDY, at Point Breeze, discussed lubrication problems.

J. R. TOWNSEND has been appointed to the Die-Casting Inspection Committee of the War Production Board.

J. W. CORWIN visited special projects under way at Washington, Arlington and Philadelphia.

D. ROSS, at Hawthorne, discussed shop practices, and W. W. BROWN, operators' chairs of non-critical material.

V. T. CALLAHAN attended the SAE Convention at Detroit. He also visited the Continental Motors Corporation, Muskegon, and the Le Roi Company, Milwaukee, in connection with gasoline engine problems.

J. H. SHEPARD, in Illinois, discussed motors at the John Oster Company and Barber-Colman Company.

C. L. DEELWATER was at the F. A. Smith Manufacturing Co., Rochester, to inspect motor and blower units.

H. T. LANGABEER conferred on power plant problems with engineers of the Western Electric Company at Hawthorne.

F. T. FORSTER discussed battery equipments at Washington.

E. F. HELBING visited the Leland Electric Company, Dayton, on inverter problems.

R. H. HUMER and C. W. VAN DUYN visited the Westinghouse Electric and Manufacturing Company, Lima, Ohio; the General Electric Company, Fort Wayne, Indiana; A. G. Redmond Company, Owosso, Mich.; and the Western Electric Company, Chicago, on discussions of dynamotors.

J. H. INGMANSON has been elected chairman of the New York Rubber Group, American Chemical Society.

# VITAMINS FOR VICTORY

**Here's how Vitamins will help you to  
KEEP WELL and ON THE JOB this Winter**

	ESSENTIAL TO:	IMPORTANT FOOD SOURCES
<b>a</b>	EYESIGHT AND APPETITE	Prunes, butter, milk, cream cheese, peas, lettuce, carrots, spinach, eggs, beef liver, oysters.
<b>b</b> (COMPLEX)	NERVES AND DIGESTION	Peas, tomatoes, spinach, egg yolks, whole grains, nuts, liver, oysters, grapes.
<b>c</b>	TEETH, BONES, BLOODVESSELS	Horseradish, peppers, spinach, lemon, orange, pineapple, apples, liver, grapefruit, bananas, peas, tomatoes.
<b>d</b>	BONES, TEETH, GLANDS	Fish liver oils, butter, milk, eggs, sardines, clams, liver.
<b>e</b>	ADULT VITALITY	Linseed, wheat and whole grains, spinach, watercress, peas, milk, eggs, muscle meats, fish, lettuce, peanuts, molasses, corn.
<b>(Riboflavin)</b>	Skin, Hair, Digestion and Lifetime Vitality of Body Cells	Spinach, cabbage, bananas, liver, kidneys, prune flesh, turnip, carrot and beet tops, dried peas, veal, beef, malted milk, eggs.

**VITAMINS GIVE YOU INCREASED VITALITY**

**to help win VICTORY**

Courtesy of the New Jersey Bell

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## Women Members of the Laboratories

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For many years ANNA K. MARSHALL, in assisting F. F. LUCAS, has played a part in making the Microscopic Analysis Laboratory one of the best known of its kind in the world. A pioneer among women in the laboratory field, Miss Marshall has done cancer research as well as the photomicrographic work for which she is known. She is the author of articles in the RECORD and of a monograph. Essentially her work at the Laboratories consists in studying in minute detail, under the microscope, any materials used in the telephone plant, particularly metals. Pictures many hundred times larger than life are taken with still or motion picture cameras using visible and invisible light; defects in materials are studied; changes are seen due to various treatments of samples submitted and improvements are suggested in order to give more serviceable and economical materials to the Bell System.

The quiet distinction Miss Marshall has achieved has come from her activities as an energetic clubwoman as well as from her work in the Laboratories. She has served two terms as President of Syracuse Alumnae and her contacts with people who are active



MISS A. K. MARSHALL

in other fields has given her a refreshing viewpoint in her studies. Lecturing to distinguished visitors who come to visit the Microscopic Analysis Laboratory has given



*A timesaver in the Apparatus Drafting Department is the special typewriter with a 32-inch carriage that Miss Ida Wiberg uses. The machine has all Gothic type which, being similar to hand lettering, can be used on drawings to eliminate a draftsman's lettering long notes and requirements. When drawings in this Department are completed they are passed on to Ida who can type many more drawings in a day than a man could letter. She also has a smaller Gothic type machine for typing pertinent information onto instruction sheets for relays*





*P.B.X. operators at West Street have posted a map of the world on which they have mounted small flags bearing the initials of men in the Armed Forces. Grace Connor and Evelyn Armstrong point out their own particular flags. Miss Connor joined the WAVES and reported to Hunter College on February 19*

shall admits, and the fresh air, pretty countryside and friends gathered around the hearth make a welcome change from New York City life.

\* \* \*

Laboratory work comes naturally to THYRA BACKER because her father is Professor of Chemistry at Stevens Institute of Technology and she has helped him summers with his research problems. Since last September, Thyra has been employed at Murray Hill as a Technical Assistant in the Ceramics Laboratory, where she makes up specimens of ceramics for test and occasionally does small-scale production. Recently she has worked on the development of vitreous enamel-wire-wound resistors.

her a reputation as a speaker and she is occasionally asked to address scientific groups and women's clubs in various parts of the country. On Sundays she serves as hostess to Servicemen at parties given by the College and University Women's Center. Her favorite pastimes are photography and painting, and sometimes a combination of both, sculpture, weaving and the theatre. Miss Marshall feels that hobbies are more necessary for people who no longer have a family to enjoy. Earlier in her career she wrote stories for children's magazines and for a year created the woman's page of a West Coast newspaper.

The photograph shows her operating a diamond saw which cuts hard ceramic plates accurately to the required dimensions. After graduating from Summit High School Thyra spent a year at the Maryland College for Women and then went to the Paine Hall

Every career girl wants to make a niche for herself in a man's world and yet remain feminine. Miss Marshall approached the problem as one of intelligent combination of interests within and without the Laboratories. She spends most of her vacations—two trips abroad were exceptions—back near Ticonderoga where she went to high school. In a little white cottage with green shutters and a native stone fireplace she keeps "open house" for her friends and family. There, as in her city apartment and in her spotless laboratory—a showplace for its polished furniture and gleaming fixtures—she plays at housekeeping. Entertaining and cooking for guests are a novelty, Miss Mar-



THYRA BACKER

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School the following year to prepare as a medical assistant. She was a doctor's assistant when she joined the Laboratories. Thyra plays the flute and sings in a church choir. She is fond of swimming and has tried bowling but doesn't claim to be an athlete. Operettas are her favorite theatrical interest.



*Florence A. Lutgen, formerly a supervisor in the Restaurant, has been assigned to study Aerography at Lakehurst, N. J.*

"I am thrilled by the responsibility of my job," says ALICE FARLEY, blonde, tube tester in Electronics Research. It is up to Alice to see that every tube that passes her inspection is "fit to fight."

Formerly a member of "The Profession," Alice made her stage debut as a dancer at the age of three. She has played in musical shows and pictures; this is her first production job. Evenings, she is a hostess at the Stage Door Canteen. She won't admit that any of the hearts that are supposed to be left there are actually in her keeping.

### GIRLS! GIVE YOUR OLD LIPSTICKS FOR SCRAP METAL

All of you have used or partly used lipsticks, as well as old compacts and other top-drawer doodads, that are needed for



ALICE FARLEY

scrap. Why not sacrifice all except your favorite lipstick—you may need that for refills—to make bullets? Kim Mee Ng, from Transcription, in donating all her old lipsticks, feels that the newer composition ones are more attractive than the old-fashioned metal ones. Then, too, the lipstick you deposit, Kim says, may make the bullet that will save your brother or your husband!

You'll find red-white-and-blue bullet-

### Three Pairs a Year!

To make them do you must:

**Insist that new shoes fit comfortably.**  
Improperly fitting shoes, besides being injurious to health, will not wear well.

**Keep each pair of shoes on shoe trees at least a day between wearings.**

**Clean and polish them regularly.** Apply a little castor oil or saddle soap to the uppers to make them soft and water resistant.

**Have shoes repaired as soon as they need it.**

**Watch your step—put your foot down and take it up without sliding or twisting.**







EDGAR F. HELBING



AMOS H. SHANGLE

### TWENTY-FIVE-YEAR SERVICE ANNIVERSARIES

About this time twenty-five years ago, the Laboratories, in the midst of World War I, was adding rapidly to its personnel. Many of those men and women are now eligible for biographies in the RECORD. Only a limited number can be published each month, so that currently 26 are still unpublished.

\* \* \* \* \*

EDGAR F. HELBING joined the Inspection Branch of the Western Electric Company at the time it was located on Irving Place. At first he covered all types of telephone apparatus and then specialized in power equipment. Evenings he studied at Cooper Union from which he received a degree of B.S. in E.E. in 1923 and the E.E. degree in 1926. From 1923 to 1925 Mr. Helbing was Resident Inspector at Fort Wayne and took care of power apparatus inspection for the Indiana and Ohio territory. About the time he returned, the Inspection Branch was split and he came to West Street with the group now known as the Quality Assurance Department. For most of the time since then Mr. Helbing has been concerned with investigating and cor-

recting various conditions which adversely affect telephone service caused by substandard central-office apparatus and power equipment. For most of the past year he has been in the Equipment Development Department engineering equipment for the Armed Forces.

The Helbings live on a thirty-four-acre farm in Woodbury Falls, N. Y., with their two daughters, ages 11 and 12. Gardening and working around the farm are his main recreations. In this connection he can make a tractor do about everything

but talk. He is a Telephone Pioneer.

\* \* \* \* \*

BEFORE AMOS H. SHANGLE joined the Bell System he spent eight years with the Shedd Electric Company and a similar length of time with the Watson Stillman Company, both in New Jersey. Coming to West Street, Mr. Shangle spent seven years in the drafting group of the Apparatus Development Department and then transferred to the group investigating and designing apparatus to be manufactured in outside concerns. Part of this work included printing telegraph for which he designed several special attachments, checked machines and followed their general engineering. Since 1929, in what is



JAMES D. BEATTY



THOMAS J. MAZZI





**GEORGE E. COUNIHAN**  
*of the Equipment Development Department completed thirty years of service in the Bell System on February 17*



**MARTIN JOHNSON**  
*of the Plant Department completed thirty years of service in the Bell System on February 27*

crossbar in 1L, toll and toll crossbar in 2L and step-by-step, manual and miscellaneous in 3L. Mr. Beatty's responsibilities for installing equipment in these various circuit laboratories, adjusting and maintaining it have been no small job.

Living in West Englewood, Mr. and Mrs. Beatty have one daughter who graduated from New Jersey State Teachers' College in 1940 and is now a teacher in the elementary school at Paramus, N. J. Mr. Beatty enjoys watching all kinds of sports but his main recreation is taking care of an unusually large rock garden at the side of his home.

\* \* \*

now the mechanical apparatus group of the Switching Apparatus Development Department, he has been engaged in designing tools and apparatus for general telephone maintenance work. More recently he has continued this type of work as applied to apparatus for the Army and Navy.

Although residents of Roselle, N. J., the Shangles have spent considerable time at their cottage on Lake Arrowhead. They have a daughter who is married. Hunting, fishing, table tennis and outdoor sports are Mr. Shangle's main recreations. He is a Telephone Pioneer.

\* \* \*

PRACTICALLY all of JAMES D. BEATTY's twenty-five years of service have been spent in adjusting and assembling laboratory equipment for what is now the Switching Development Department. Beginning with the machine switching group, the first laboratory was just a small room—702. Now the laboratories consist of four large areas: panel in 1K,

SOON AFTER THOMAS J. MAZZI joined the service group of Western Electric Engineering Department, he transferred to the toll circuit laboratory on wiring, testing and circuit work and on the calculation of current drains for toll switchboards and testroom circuits. While with this group he also spent some time at New London on war

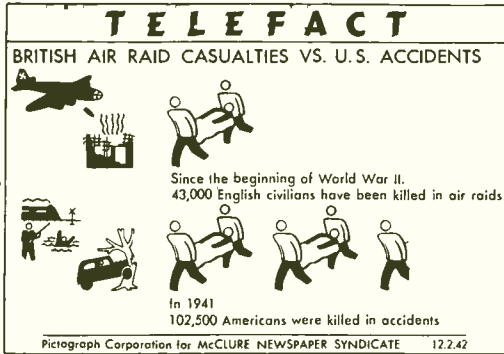


**RICHARD C. DAVIS**  
*of the Switching Development Department completed thirty years of service in the Bell System on February 21*



**BURTON W. KENDALL**  
*Circuit Research Director completed thirty years of service in the Bell System on February 6*

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work. Later he continued his evening studies in electrical engineering at Brooklyn Polytechnic and took a course in industrial engineering at Columbia.

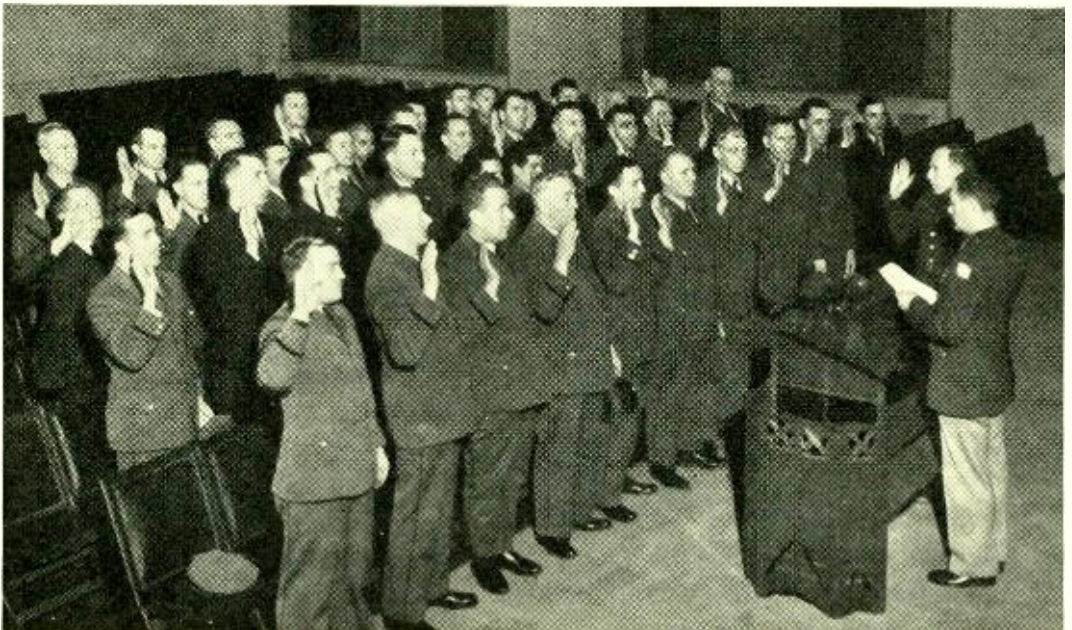
Mr. Mazzi later joined the toll development group where he was associated with the design and testing of the first 22-type repeaters, with the testing of repeaters sent to Sweden and also of the four-wire repeaters and associated signaling circuits for the British Post Office. He was loaned for two years to the method of operation group of the Systems Development Department to prepare method-of-operation sheets on all

toll circuits and then returned to his former group where he continued the preparation of circuit drawings for specific projects. Since 1927 Mr. Mazzi has specialized and acted as the main contact point in the specifications and testing group for the standardization and checking of circuit drawings in the Toll and Telegraph Departments for conformity with standard circuit design practice and drawing requirements. At present most of his time is spent in work of a similar nature on drawings for war projects.

Surf and boat fishing are his chief hobbies though he is also very much interested in bowling and swimming. Mr. and Mrs. Mazzi live in City Island, N. Y., where their daughter is in elementary school. Mr. Mazzi is a Telephone Pioneer.

\* \* \* \* \*

PHYLLIS BARTON, after three years in the old Physical Laboratory on the development of vacuum tubes, entered the laboratory of the carrier research group where she was responsible for the technical files and for the keeping of records of all types of equipment use. In 1934 she transferred to the Research Service Department, was placed in charge



“THEY’RE IN THE ARMY NOW”

*Uniformed watchmen who guard the Laboratories’ New York locations are sworn into the Auxiliary Military Police of the United States Army. Administering the oath are Lieutenant G. Hunsaker and Lieutenant R. L. Easton, both of the Metropolitan Military District*





PHYLLIS BARTON



MRS. CORNELIA MILLER



DOROTHY ANGELL

of the research instrument service in 1937 and in the 1941 consolidation of all instrument services, became a member of the Central Instrument Bureau. The functions of the C.I.B. are to expedite the work of various technical staffs by making readily available, on short-term loan, standard types of testing and measurement instruments and to maintain files to assist in locating specialized instruments required for short periods. Miss Barton's knowledge of the facilities available throughout the Laboratories and of the special requirements continually encountered has been of invaluable assistance in the operation of the C.I.B.

Miss Barton, who lives in Forest Hills, is very active in church work, particularly with pre-school children. For many years she was chairman of the Laboratories Hiking Club and a member of the Glee Club. She is particularly fond of mountainous sections of New York State and of the Green Mountains in Vermont and her vacations are usually hiking trips in these regions.

\* \* \* \* \*

AFTER A YEAR in a private business school, Mrs. CORNELIA MILLER, known more familiarly to her many friends in the Laboratories as Neill Clare, joined the Patent Department of the Western Electric Company. She was a stenographer for two years and then chief stenographer for a similar period. Since then she has been

secretary to E. V. GRIGGS, Assistant General Patent Attorney.

Mrs. Miller lives in the Park Terrace section of Upper Manhattan with her husband and mother. She is fond of singing, which she studied for seven years, and of playing the piano—for a number of years she was pianist of the Laboratories Symphonic Orchestra and of the Dance Orchestra. Both she and her husband enjoy golf and vacations usually find them in some place where there is a good golf course.

\* \* \* \* \*

DOROTHY ANGELL joined the American Telephone and Telegraph Company as a computer and shortly after the D & R was organized in 1919 she was transferred to Dr. JOHN R. CARSON's group where she was engaged in secretarial, drafting, mathematical and general engineering work. She came to the Laboratories with this group at the time of the 1934 consolidation. For the past few years Miss Angell has been in W. A. SHEWHART's statistical group of the Mathematical Research Department, concerned with the work in applied mathematical statistics.

Miss Angell lives in Plainfield. She enjoys music and all sorts of outdoor activities and many vacations find her back at her former home in the Berkshires. A First-Aider of the Laboratories, she took the advanced training course in New Jersey and is at present cap-







WERNER HARTMANN



WILLIAM B. CARDELL



ROSARIO GERARDI

tain of a Decontamination Squad of her local Civilian Defense Council.

\* \* \* \* \*

WERNER HARTMANN came to West Street in 1916 as a messenger and six months later entered the Chemical Laboratories to do general analytical work. He left in October, 1918, to enter the Army and returned to his analytical work in 1920. He studied at Brooklyn Polytechnic and then at C.C.N.Y. from which he received his A.B. degree in 1927. In 1922 he transferred to the rubber laboratory; and then, from 1925 to 1932, he was concerned with the preparation of high-purity platinum for use in vacuum tube filaments. For the next nine years he was with the metallurgical group investigating insulating materials for magnetic powders. Since then he has been engaged in spectrochemical analysis.

He is quite active in fraternal affairs, and is also a member of the Telephone Pioneers of America and of the Appalachian Mountain Club. Mr. and Mrs. Hartmann live in the Village.

**You must work unceasingly, regardless of sleep, regardless of food. A pint of sweat will save a gallon of blood.**

*—General Patton, to the African Invasion Force*

WILLIAM B. CARDELL came to the Engineering Department of the Western Electric Company as a tool and instrument maker. His first work was on submarine detection apparatus during World War I. He then was engaged in the usual run of work going through the Development Shop, including early handset designs and the forming of relay springs and experimental spot welding. He also spent considerable time on making parts, assembling and checking the final apparatus for the New York-Azores cable. In 1935 Mr. Cardell transferred to the research service group where he was engaged in making jigs and fixtures for experimental vacuum tubes, devices for testing telephone transmitters and other equipment for the Research Department. Since 1937 he has been in the Transmission Development Department on the mechanical development of apparatus for coaxial systems. He has been particularly concerned with the preparation of early development models of coaxial amplifiers and regulators for the three-megacycle system.

The Cardells live in Orange, N. J. They have a son who is a draftsman for the C-O-Two Fire Equipment Company of Newark, and a daughter, a Spanish stenographer for Hoffman La Roche of Nutley. Gardening and photography are his main recreations and vacations are usually spent in the Adirondacks, the mountains of Northern New England, or in Virginia. Born in Guantánamo, Cuba, he and his wife spent

an eight-week vacation there in 1920. He is a Telephone Pioneer.

\* \* \* \* \*

ROSARIO GERARDI joined the Engineering Department of the Western Electric Company in 1913 as a porter. He left the Company in 1918 and then returned later. For many years he took care of cleaning the circuit development laboratories of the Systems Development Department. More recently, in the local service group, he takes hydrometer readings of portable storage batteries and replaces them when necessary. He washes beakers, graduates and other glassware used in the Chemical Laboratories, using special cleaning solutions in some cases.

Mr. and Mrs. Gerardi live in the Ridgewood section of Brooklyn and have two daughters, one of whom is married. Mr. Gerardi is a member of the Edward J. Hall Chapter of the Telephone Pioneers of America.



Here are Ensign and Mrs. Joseph Lehans whose marriage was recorded in this section of the RECORD for January

### WE SEE BY THE PAPERS, that

DENVER'S new 5,000-pound master air raid siren, capable of sounding a note which would break the ear drums of a person standing nearby, is on its way here, Denver defense officials said yesterday.

The big siren, designed by Chrysler Corp. engineers, in collaboration with the Bell Laboratories, is capable of producing the loudest sustained sound ever achieved by mechanical means, its makers claim.—*Rocky Mt. News, Denver, Colo., January 10, 1943.*

COLUMBUS is now represented in the Bell System's arsenal of invention and development by GLEN LEACH and JOHN JAEGER, from the company's engineering department, and W. L. WALTER, a recent graduate in mechanical engineering who had been acquiring telephone experience as an Ohio Bell telephone installer.

All of the Ohio telephone men were selected because of special qualifications for the technical work which the Bell Laboratories are doing for the Army and Navy. The transfer is for the duration of the war.

Importance of electrical communications in war and the im-

March 1943

portance of the Bell Laboratories in the arts of communication were manifest in the first World War and are even more manifest today.—*Dispatch, Columbus, Ohio, January 15, 1943.*

ROBERT F. McLAUGHLIN has been promoted to the grade of Technician Grade Three in the Headquarters Company of his Corps. Prior to his enlistment, McLaughlin was employed as a draftsman by Bell Telephone Laboratories. This is his third promotion.—*Paterson Call, January 16, 1943.*

MR. AND MRS. JOHN B. MALASPINA have announced the engagement of their daughter Theresa Margaret to JOSEPH CHARLES BLANK, JR., who at present is employed as a draftsman for the Bell Telephone Laboratories, New York City.—*Jersey Observer, Hoboken, N. J., January 18, 1943.*

SOUTH OF THE BORDER (U. S.-Canada) is a better place to live, so far, than north of it. A married Canadian with two dependents, and earning \$5,000, will pay \$1,662 in taxes, of which \$600 is refundable later; in the United States, a man in the same class would pay \$788, of which \$96 is refundable. Canada has been collecting 50 per cent of its budget (largely for war) from taxes, including the refundable part, which

