BELL LABORATORIES RECORD

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To All the Members of Bell Telephone Laboratories and to all the members on leave in the Armed Services, or elsewhere sharing in the war effort, I express my sincere wishes for the New Year.

A year ago I reported that the previous year of 1942 had been one of great achievement; that we had finished the transformation from peacetime activities to war work; and that our effectiveness had been attested by the Armed Forces which were relying upon equipment of our development and design.

During 1943 many new military tools which we devised or perfected came into practical use in the theaters of war. Although military secrecy forbids details as to these devices, I can tell you that they have been commended by many high military authorities for their successful performance. During the year we also received commendation by the award of another star on our Army-Navy "E" Flag.

As the year has gone on, our emphasis has shifted from devising new tools to the perfection and early production of those already under way which offer promise of great military value. This shift is bringing an increased load on our organization.

Our output is still climbing and has not yet reached its peak. The year 1944, therefore, offers us still greater opportunities for service; and it will bring heavier demands and obligations. From what we have been told of the results obtained with the equipment we have developed, we know for a certainty that our efforts are contributing significantly in the progress toward victory. Let each of us resolve that his own part shall be the utmost he can give.

Oliver E. Buckley

Substitute Materials in Telephone Booths

By E. W. NILES
Station Apparatus Development

A CASUAL glance at a telephone booth with its wooden panels would not lead one to think it a hopeful source for saving steel and other strategic materials. But each peacetime booth used about 93 pounds of steel and by redesign 85 have been eliminated. With the exhaustion of available stocks of steel these changes will save over 300 tons of this metal per year on the approximately 8,000 telephone booths required by war effort and civilian needs. Other urgent materials conserved are 95 tons of rubber compound and 35 of brass and bronze, including that saved in maintenance.

Fig. 1—Substitute materials save approximately 85 pounds of steel, 25 of rubber compound, and 10 of brass and bronze in the construction of the wartime telephone booth

Fifteen different parts of the booths have been redesigned. The major saving in steel was made by substituting plywood or masonite in the base, thereby conserving 43.5 pounds per booth. The plywood base, B, Figure 2, is constructed of ½-inch five-ply fir, glued and screwed to birch or maple sleepers, S. These sleepers fit rabbets, R, in the bottoms of the sides and back, E, of the booth and provide inclined surfaces for supporting the base plates, P, which extend up the sides. Filler strips, G, attached to the sides and back continue these supporting surfaces to the required height. Because the base sleepers slope inward, the bottom of the small section of the folding door is tapered slightly to clear it when the door is open. This does not affect the appearance of the door noticeably because the tapered surface is concealed when it is folded back against the side of the booth. Three ⅛-inch x 2-inch hardwood blocks, H, are glued and bradded to the under surface, one in the center of the base and one at each of the rear corners. Along the front edge is fastened to the under surface a hardwood strip, K, 2 inches wide. These keep the plywood base from resting directly on the floor. All the exposed surfaces are coated with a protective finish. The base forms a self-contained unit to which the sides, back and door frame are attached with screws. This type of construction preserves the knock-down feature which is used in some installations.

The new construction is also adaptable to installations at customer's premises, where tile or similar permanent

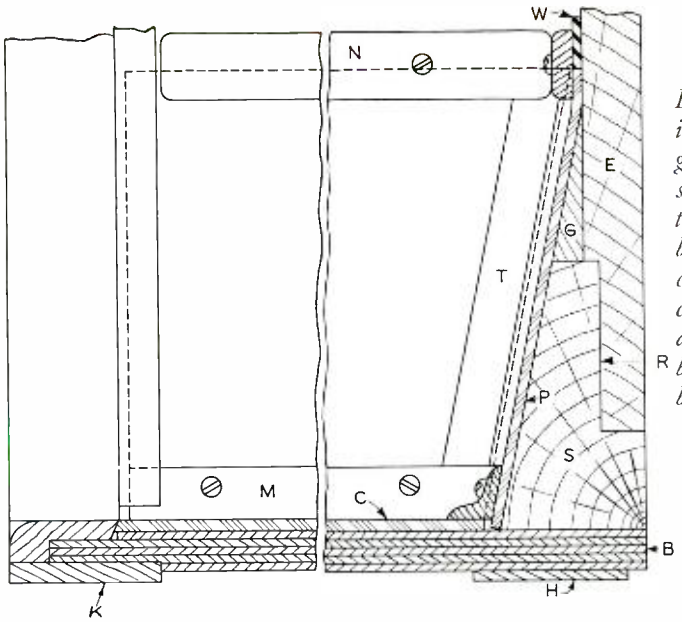


Fig. 2—Base, B, *is now plywood instead of steel. Five-ply fir is glued and screwed to wooden sleepers,* S, *which fit rabbets,* R, *in the bottoms of the sides and the back,* E. *Linoleum base plates,* P, *extend up from the linoleum floor covering,* C. *Filler strips,* G, *extend above the sleepers. Hardwood blocks,* H, *and strip,* K, *raise the base from the floor. The lining,* W, *is compressed wood*

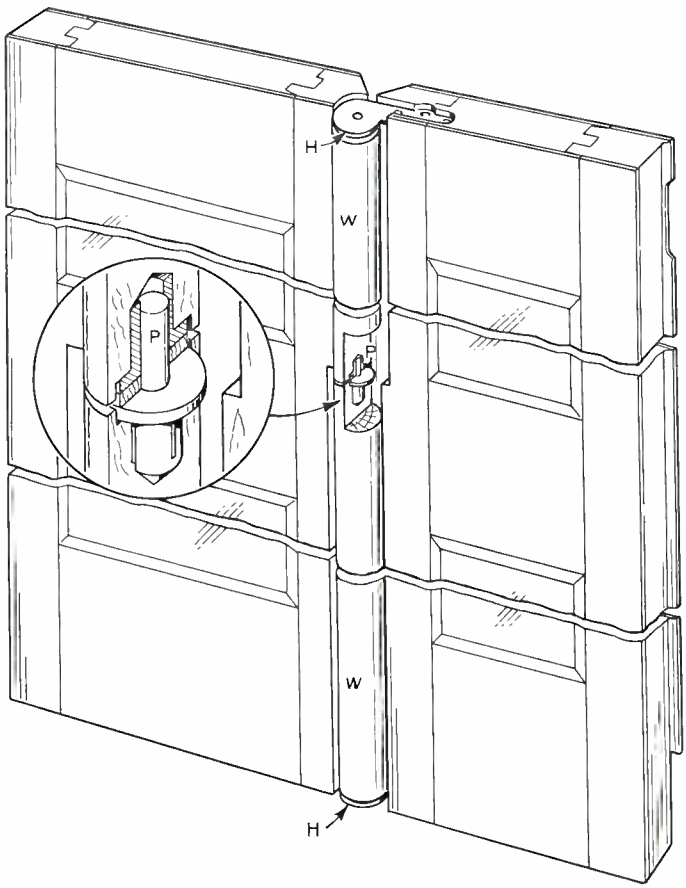


Fig. 3—A wooden door hinge has been substituted for the bronze piano hinge previously used. It is made of two cylindrical wooden members, one of which is attached to each section of the door. The two parts of the hinge cover the entire height of the door and are joined at the center by metal pivots. There are metal hinge bearings at the top and bottom of the wooden cylinders, shown at H

Fig. 4—A compressed wood-board lining has been substituted for sheet steel in this booth. The door has a wooden handle and the shelf and seat bracket are also of wood. The card now has a wooden frame

flooring make a floorless booth desirable. At these locations the plywood part of the base is removed and the sleepers are anchored to the floor.

For the floor covering, C, and interior base plates, P, linoleum was substituted for rubber, which saves seventeen pounds of rubber compound per booth. This saving amounts to approximately fifteen tons of pure gum rubber per year.

In steel a large saving was obtained by lining the booth with compressed wood pulp board, W, instead of sheet steel. This substitute material, whose improved appearance has caused favorable comment, has a hard brown mottled surface. It is not easily scratched or cut and its dark color prevents pencil marks from being easily seen. A wax finish is applied to the material at the factory to facilitate cleaning. This substitution saves 23 pounds of steel per booth.

Black finished wood moulding is now used instead of steel for the base moulding, M, the binder strips, N, and corner angles, T, along the top and at the corners of the linoleum floor.

The steel track in which the door glide-block slides will be omitted and instead a channel will be provided in the hardwood that supports the track. The steel door handle has been replaced by a one-piece wooden one which is fastened by glue and screws. Two-part wooden door hinges are now used instead of a bronze piano hinge to connect the sections of the folding door. The new hinge has two cylindrical wooden pieces, W, Figure 3, one of which is fastened to the upper part of the larger section of the door and the other to the lower part of the smaller section. The two sections are joined at the center by metal pivots, P, in the ends of the wooden cylinders and at the top and bottom by metal hinge bearings, H.

Wood has been substituted for steel for the shelf and also for the seat bracket. Both are made of birch and finished with brown enamel paint like that on the seat. A backboard of birch plywood, reinforced with a hardwood backbone which connects the triangular top and bottom members, is now used instead of a steel board for mounting the coin collect telephone set. Tee nuts are located in the backboard panel and angular mounting holes are provided so that the new board can be fastened in the booth and the coin collector mounted

with machine screws in the same manner as the steel backboard. The new board has a flat black finish.

Kick plates have been omitted from doors and the exterior of the booth. The bronze "Telephone" sign has been dispensed with and wood has been substituted for the steel that was formerly used for the card frame.

For outdoor booths a wooden roof has been provided as a substitute for the galvanized iron peak-roof previously used. The new roof has a cypress frame and ribs in which ¼-inch panels of masonite wood are inserted. In appearance it resembles the metal roof.

These substitutions have been made without sacrificing serviceability and they maintain existing over-all dimensions and interchangeability of parts as far as practicable. Further studies are in progress to provide for the use of other materials as required by the changing supply situation.

THE AUTHOR: E. W. NILES was graduated from the Massachusetts Institute of Technology with the degree of S.B. in 1904. For two years he was an assistant in Physics at that Institute; then he joined the Engineering Department of the American Telephone and Telegraph Company. In 1934 he transferred to the Apparatus Development Department of the Laboratories. Most of Mr. Niles' work since that time has been concerned with station apparatus, including coin collectors and studies to reduce their susceptibility to fraudulent practices. In this connection he represented the Bell System on an American Standards Association Committee and on one representing the operating areas of the New York Telephone Company. Earlier, Mr. Niles represented the A T & T on a National Bureau of Standards Committee on dry batteries. He has recently been working on substitute materials suitable for telephone booths.

U. S. Army Photo

Modernized "Information" for Large PBX's

By H. H. ABBOTT
Local Central Office Facilities

BECAUSE of the large size of the new private branch exchanges for the War Department and the National War Agencies in Washington, a number of unusual features were incorporated, some of which have already been described in the RECORD.* Another one is the application of automatic call distribution to the information desks, which has not been done at private branch exchanges before. This feature is also included in the information desk at the PBX for the Navy. The advantage of automatic distribution is that it permits calls coming in over a large number of trunks to be distributed evenly among all the operators without requiring extensive key or jack equipment at the operators' positions. It thus secures efficiency in operation by treating all the operators as a single group with a minimum of key and lamp equipment. With large installations such as these, and with the difficulty in securing suitable operators under wartime conditions, efficiency in the use of all equipment and personnel becomes particularly important.

With automatic call distribution, the calls are grouped according to their order of arrival, and are connected to the desk positions as the operators become idle. No cords and jacks are provided; instead, the calls are completed to the operators through switches similar to step-by-step line finders. An operator makes her position available for a call by connecting her telephone to the position and operating a key. She receives a signal through her head set just as a call is being connected to her position, and after she has responded and supplied the required information, she generally restores the key to disconnect her position, although, on certain types of calls, her position is automatically disconnected from the line when the calling party disconnects.

Besides supplying information, the operators at these desks also give "intercepting" service. If a number that was not in use was dialed, for example, the

**February, 1943, p. 130.*

call would be extended to the information desk where the operator would either tell the calling party to dial again, if he had dialed the wrong number, or recall the PBX attendant and ask her to transfer the calling party to the desired number. In replying to such a call, the operator asks, "What number did you call, please?" while in replying to an information call she responds by saying "Information." To permit the operator to make the proper response, therefore, signals are provided to distinguish the two types of calls. This is accomplished by using two types of tones to indicate to the operator when a call is being connected to her circuit. For information calls, a high-pitched tone is received, and for intercepting calls, a low-pitched tone is employed.

Still another indication is needed because calls may require different treatment depending on whether they come from outside the PBX, reaching the operator by way of the PBX switchboard, or whether they come from a local PBX extension. For the same type of call, regardless of the source, the same response is given by the operator, but on calls from outside the PBX, after she has supplied the desired information, she signals the switchboard operator so that the call may be properly completed. For calls within the PBX, however, the operator tells the calling party to hang up and then dial the number he wants, since she has no facilities for transferring the connection. Lamps are used to distinguish these two classes of calls and one of them lights on each call. One of these lamps is white and is designated SWBD, while the other is red and is designated EXT.

The rate at which calls come into the information desk varies widely. At times they will arrive much faster than they can be handled, while at other times there will not be a sufficient number of calls to supply all the operators with a normal load. Arrangements are incorporated in the automatic distributing circuits, therefore, both for holding excess calls under busy conditions and for distributing them in approximately the order in which they arrive to the various operators as they become idle; and under light load conditions for dividing the calls among the operators in rotation so that each will receive her proportionate share of the load. This assignment of calls is under the control of two groups of relays called "gate" circuits.* The circuit that controls the call distribution while one or more calls are waiting is called the trunk gate and the other is called the position gate.

During periods when all the operators are busy, the trunk gate separates all waiting calls into two groups: one group inside the gate and one outside. As the operators become idle, the group of

*RECORD, *September*, 1939, *p.* 21.

THE AUTHOR: HENRY H. ABBOTT entered Long Lines in 1920. The following year he returned to Ohio State University and in 1923 graduated with the degree B.E.E. Returning to the A T & T he entered the Department of Development and Research where he engaged in the development of manual and dial central-office and private-branch exchange systems. In 1930 he received the E.E. degree from Ohio State. He came to the Laboratories during the 1934 consolidation and since then has been in the local facilities group of the Systems Development Department where he has been largely concerned with the development of PBX's of the dial type. Now he is engaged on war projects. He is a consulting member of the Committee on Research and Development of the Telegraph and Telephone Section of the Association of American Railroads.

calls inside the gate is passed to them, and when all the calls in this group are handled, the gate opens just long enough to let all the calls waiting outside come in. No calls are held outside the gate, therefore, longer than it takes to handle the groups of calls inside the gate, and with typical traffic loads the average delay seldom exceeds a period of five seconds.

When one or more operators are idle the position gate comes into action. It acts in much the same way as does the trunk gate except it holds the operators within or without the gate, much as the trunk gate holds calls. The gate remains closed till all operators within the gate have received a call. It then operates momentarily and allows all operators outside to come in, and then remains closed until all these have had calls.

This control of the distribution of calls by gates does not insure that calls are handled in exactly the order in which they arrive, but instead that all those that arrive within a short interval are handled before any arriving later. The number of calls in each group depends on the rate at which calls are arriving relative to the rate at which the available operators handle calls. Under busy conditions, the waiting period is short enough to be unobjectionable, and the relay gate arrangement is considerably less expensive than one that would complete calls in their exact sequence of arrival. Experience in Washington has indicated that the gate system is very satisfactory.

The information desk for the Army PBX has 36 operators' positions and 197 trunks over which calls are received. The other PBX's have smaller information desks—of from 8 to 24 positions—but the ratio between positions and trunks is about the same. During busy periods the operators handle calls at a rate of over 50 per hour per operator with an average holding time of about 45 seconds. At the War Department PBX, under these conditions, one call is received about every two seconds.

Measuring the resistance characteristics of thermistors in a constant temperature bath. The rapid change in resistance with temperature of these semi-conductors is used to regulate carrier telephone circuits. G. W. Davis is making the measurements

Historic Firsts: Airplane Radio Telephony

ALTHOUGH the airplane was scarcely out of the experimental stage at the beginning of World War I, its great possibilities for military and naval use were obvious. To bring out the full advantages of these possibilities, however, radio communication to and from the plane seemed essential. During the early years of that war, radio telegraph equipment was extensively tried. Radio telephone communication would have been more desirable, but no suitable equipment or circuits were available. The few trials of the radio telephone made prior to this time employed low-efficiency apparatus operating at low efficiencies and requiring a large amount of space, while for airplane use it was essential that weight and space be kept to a minimum.

Foreseeing the need for such apparatus, Bell Telephone Laboratories—then the Engineering Department of the Western Electric Company—had already carried on considerable experimental work, and had fairly well surveyed the possibilities. When Major General Squier, Chief Signal Officer of the Army, called a conference late in May, 1917, to consider the feasibility of radio communication for planes in flight, it was thus in a position to outline what seemed possible. As a result of conclusions reached at this conference, the Signal Corps placed an order on the Western Electric Company to develop radio telephone apparatus for airplane service. Within less than six weeks experimental apparatus was ready, and a series of tests was carried out at Langley Field, Va., from June 30 to July 5, 1917. On July 2 speech was successfully transmitted from plane to ground, and on July 5 good transmission was obtained from ground to plane. Further tests, using modified apparatus, were made between August 14 and 24, and on August 18 successful two-way transmission was attained between plane and ground, and two days later between plane and plane.

Many factors contributed to the promptness with which the Laboratories overcame the many obstacles to radio airplane telephony. Probably the basic contribution was the Heising constant-current modulator. Of the previous modulation systems, one required amplifier stages beyond the modulator, which gave low efficiency and added greatly to weight and bulk, while another, using grid modulation of an oscillator, gave only 5 or 10 per cent modulation, and was difficult to adjust for its best performance. With the Heising circuit only two tubes were required altogether, and modulation was greater than 50 per cent. It was these great improvements in operating characteristics that made airplane radio telephony practicable.

Disintegration of Face Brick by Dissolved Salts

By J. M. HARDESTY
Outside Plant Development

SURFACE erosion of brick masonry accompanied by changes of color and spalling, with disfiguring effects, may result from the deposition at or near the exposed face of the brick of salts which have been dissolved by moisture from a greater depth and brought toward the surface by capillary action. This occurred in a relatively new telephone building in the metropolitan area of New York and was found by the Laboratories to be caused by calcium sulfate in the brick.

The building is a three-story structure constructed in 1931 of side cut, fireclay face brick with flash finish. The color ranged from a light to a dark salmon pink. Shortly after completion the walls of the building started to effloresce. By 1934 many of the lighter bricks were affected by surface spalling and had changed to a buff or yellowish gray. A year later some of the darker colored bricks also were affected. This spalling progressed until the original faces of a large number of the bricks entirely disappeared and more than half of them showed some surface erosion which seriously impaired the general appearance of the building.

To study the cause of this surface disintegration, twelve bricks, representative of the color range and degree to which weathering had progressed, were removed from the building for test. These bricks were all stretchers in the wall, so that each had one exposed and one unexposed face. The mortar adhering to the unexposed face, sides and ends was removed without marring or scratching the original finish of the brick. These samples were numbered 1 to 12. Later a brick, left over from the group obtained to replace the twelve taken from the building, was added and numbered 13.

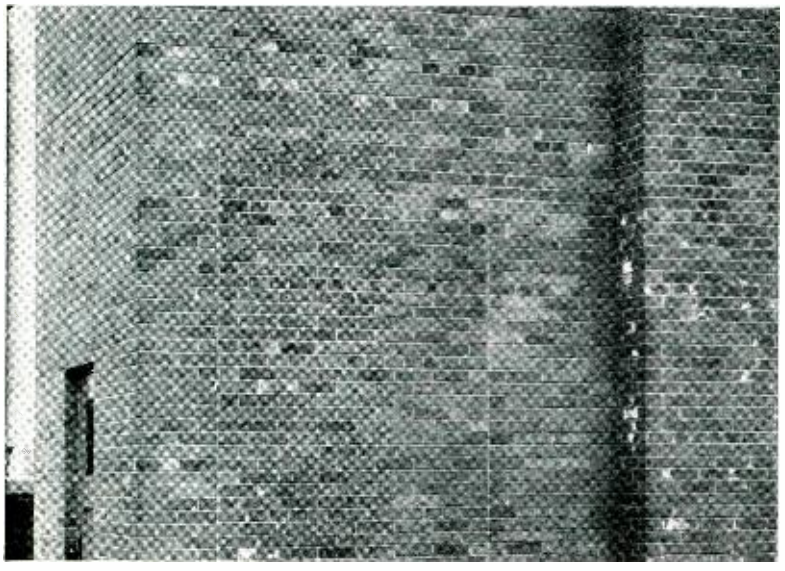


Fig. 1—Brick wall showing surface disintegration caused by the efflorescence of soluble salts in the brick

Physical characteristics of these samples were about normal for a good grade face brick. Their modulus of rupture varied from 565 to 1,340 and their crushing strength from 4,200 to 7,350 pounds per square inch. The ratio of cold to boiling water ab-

sorption was well within the range required to withstand normal weathering.

To determine if the source of the spalling was the freezing of moisture within the bricks, the larger and less disfigured halves of the samples obtained from the rupture test were subjected to seventy-four cycles of freezing and thawing. At the end of this period no change was observed in the surface of the bricks as determined by photographs taken before and after the test. This showed that the weathering was not due to frost.

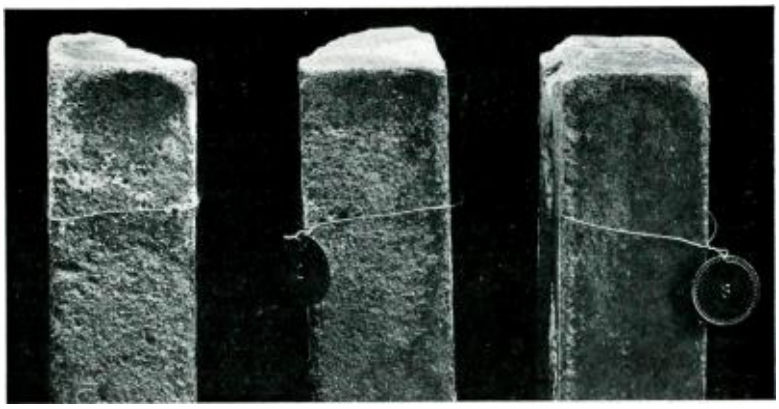


Fig. 2—Bricks taken from the wall shown in Figure 1. The spalling resulted from calcium sulfate crystals which were deposited under the surface layer of the brick

That there were soluble salts in the brick was shown by standing them on end in a shallow dish of water. After several days of exposure to this "wick test" salts were deposited on their surfaces. The amount of this deposit was rated by visual inspection.

For chemical and microscopic examination, a typically weathered brick was cut out of the building and thin chips were also chiseled from the exposed face of about a dozen others which showed weathering. The whole brick was placed in a shallow dish of distilled water with its face up and above the surface. After four days a white crystalline powder had deposited on the exposed face. Chemical analysis showed that it consisted wholly of calcium sulfate. Qualitative analysis of a water extract of the same brick indicated the presence of a considerable amount of calcium sulfate. No other water soluble substance was present in any appreciable quantity.

At the conclusion of the first wick tests the salt deposits on samples 1 to 12 and on sample 13 were also analyzed. That on sample 13 was calcium sulfate; samples 1 to 12 showed a mixture of calcium and sodium sulfates.

Microscopic examination of the brick chips revealed segregated lumps of calcium sulfate which were sometimes as much as one millimeter in diameter. All of them consisted of groups of small crystals, some of which flew from the lump when it was touched by a probe, suggesting a strained condition. This indicates that the calcium sulfate was not sintered during the firing process in the manufacture of the brick.

Further examination of the chip speci-

THE AUTHOR: After graduation by the University of Texas in 1923 and the University of Illinois in 1925 with B.S. and M.S. degrees in civil engineering, J. M. HARDESTY joined the Outside Plant Development Department of the Laboratories in 1927. Since that time he has been chiefly engaged in studies relating to the design, construction and maintenance of underground telephone systems. For the past year he has spent his entire time on essential war work.

mens revealed that some of the calcium sulfate lumps had started to redissolve. Several cases of actual spalling were also observed. In each of these a small flake from the surface was in the process of being separated from the rest of the brick. A small crystal of calcium sulfate was found on their underside when these flakes were lifted and examined.

The wick test is a rough indication of the soluble salt content of a brick and provides a convenient means of determining whether it is likely to effloresce in a masonry wall. The data for samples 1 to 12 showed definite correlation between soluble salt content and degree of disintegration of the bricks in service. Where the wick test shows no more than moderate efflorescence, the disintegration was slight.

Results of the wick tests and the chemical analyses indicate that the bricks contained calcium sulfate in a soluble form. The main source of the salt, as indicated by microscopic examination of the body of the bricks and by chemical analysis of the unused sample 13, appears to be the bricks themselves and not the mortar or the back-up materials that were used.

Microscopic examination of the specimens suggests the following explanation of the mechanism of spalling. During rainy seasons the bricks absorb moisture which dissolves some of the calcium sulfate. In dry periods this solution moves toward the exposed face of the brick wall. There it becomes concentrated by evaporation of the water and in time a thin layer of minute crystals forms just beneath the surface of the brick. The mechanical force exerted by these crystals, as they form and accumulate, causes thin flakes of brick to spall from the surface, thereby destroying the face texture and leaving it rough.

Research

Research explores the hidden depths of nature, carrying on its search with imagination and ingenuity. Through precise experiment and careful analysis it discovers new facts about materials and natural forces. It discloses the unexpected and finds new relationships which it formulates mathematically as guides to further progress.

In its processes research is imaginative but at the same time very matter of fact; it is highly theoretical but also very practical. Starting from the knowns of science it makes a planned attack on neighboring unknowns, seeking answers to definite questions. But as it carries on it is ever observant; and often the by-products of its search prove of the greater value.

Development of the Electrical Director

FROM its conception in June, 1940, until the Western Electric Company began production for the Army in the fall of 1942, the Electrical Director drew upon the services of some 400 engineers, scientists, and technicians of the Laboratories. Including 3,300 different parts, it required the preparation of 5,000 detail drawings, 1,100 specifications, and a maintenance manual of five large volumes, as well as an instruction manual, spare parts list, and the design of many special maintenance tools and circuits. In addition, it was necessary to prepare textbook material and conduct classes for training a large group of Army personnel in its principles, operation, and maintenance so that they in turn could train the many groups that would later be responsible for the apparatus in the field.

Although, by any criterion, the Director, with its complicated electrical circuits, was a major development, the work required in completing its development for the Army was much greater for several reasons than would have been required for a development of comparable magnitude in the telephone field. In the first place, the principles and apparatus required were new, and detailed information had to be prepared for almost every element. Developments for the telephone plant, on the other hand, utilize established principles and standard equipment to a large extent—the novelty lying chiefly in the circuits in which they are arranged. In addition, apparatus for the telephone plant is turned over for operation and maintenance to men who have had long experience in the use of similar equipment, while there was no one with experience in operating and servicing the novel equipment of the Director. Its development under war conditions, with shortages in many materials restricting the work at every step, and with the neces-

sity for speed continually contesting with the need for precision and dependability in every element, still further increased the difficulties of the task.

For those not intimately associated with the development of complicated electrical apparatus, it is difficult to understand the very lengthy period normally intervening between conception and commercial production. The many parts of the completed apparatus all work together so smoothly and seem so obviously the correct and inevitable choice that the almost infinite other possibilities of individual parts and arrangements that might conceivably have accomplished the same overall objectives are completely overlooked. With any new and intricate invention the first step is to study the principles involved to make sure they are sound and are capable, when given fitting material form, of producing the objective sought. Then an experimental model must be made to verify and demonstrate the underlying principles. In building this experimental model, little thought is given to anything but embodying the principles in workable form. Such considerations as operating reliability, facility in manufacture, wear of parts, maintenance, atmospheric conditions, the presence of sand and dust under which it must operate, and many other factors are left for later attention.

Following approval of the experimental model, therefore, commercial development must undertake the conversion to a form that will be practicable to manufacture in the desired quantity and will still successfully meet all conditions likely to be encountered in the field. In man-hours required this is a much bigger undertaking than the building of the experimental model. At almost every step it requires testing of individual parts and of assemblies, and the design must be analyzed to make sure that, besides meeting the basic requirements, it will be easy to maintain.

As already described in the RECORD,* the principle of the Director was conceived by D. B. Parkinson in June, 1940, when the Armies of Oppression were overrunning the Low Countries without the opposing forces seeming able to offer any effective resistance. The great potential value of such a Director was promptly recognized, and a small group in the Research Department at once started the theoretical studies necessary to prove the soundness of the principles involved and the practicability of its embodiment in physical form. By the fall of that year a prospectus of the device was submitted to the Army. In November the project was approved and the NDRC authorized the Laboratories to develop an experimental model.

V. M. Cousins of the Physical Research Department testing a computer with an electrical "course" generator

*November, 1943, p. 157.

The development of this experimental model was at once undertaken by a group of 12 or 15 men under the immediate direction of C. A. Lovell and with help from the Mathematical Research group under the supervision of H. W. Bode. By working day and night, regardless of regular hours, this small group made such effective use of their time that by the following November an experimental model was submitted to the Army for test. An exhaustive study of the apparatus was at once begun by the Army, and in March, 1942, a final report approving the Director was made.

Newark Evening News

The tracker of the Director as set up for demonstration at Murray Hill. One soldier orients the telescopes in elevation while the other orients them in azimuth by turning the entire tracker ahead

This experimental model that had been given approval by the Army was entirely adequate for its purpose, but between it and the actual apparatus that might be used on all battle fronts from the arctic Aleutians to tropical Bougainville, that must be transported over rough seas and carried in jolting trucks over swamp, ice, or desert sand, and that must withstand the rough usage and shocks of battle conditions, there must intervene an incredible amount of development interspersed with continual testing both of separate elements and of assembled units. Under ordinary conditions, the overall development of a system of this magnitude might well consume many years. Besides the development and the testing in the Laboratories, manufacturing methods must be studied and perhaps new equipment secured to enable the device to be economically manufactured to the precision required. That this phase of the development of the Director was accomplished in less than a year was a tribute not only to the ingenuity and determination of the hundreds of Laboratories personnel involved, but to the whole-hearted cooperation of engineers of the Army, the Western Electric Company, and other manufacturing concerns brought in to help in the final manufacture.

Months before the final authorization to proceed with manufacture was obtained from the Army, commercial development, under direction of J. J.

Kuhn, had already commenced. Groups under the immediate supervision of O. H. Danielson and W. W. Werring assumed entire charge of the development for manufacture—translating the basic principles worked out by the physical and mathematical research groups into designs that could be readily manufactured with speed and precision. Close touch was maintained at all times with the Western Electric Company and the Design Division of the Ordnance Department as well as with the Research Groups that designed the experimental model. It is of utmost importance in such a development that the various parts and component assemblies be capable of manufacture by the usual shop personnel and with a minimum of skilled workmanship, except perhaps in the design and production of special tools. The problems encountered are thus entirely different from those encountered in the construction of an experimental model, which employs skilled mechanics working directly under the supervision of the engineers themselves. Because of the wide range and type of apparatus, the development drew heavily on all the major departments of the Laboratories. Over 30 development groups were called upon for assistance to a greater or less extent. Although cost was not as restricting as for commercial apparatus, material shortages and time limitations more than made up for the partial easing of this restriction.

It was very early apparent that if the development were to be completed in the minimum possible time, the Laboratories personnel, already overloaded with important war projects, would require outside help—particularly in preparing the large number of detail drawings that would be needed. It was equally apparent that the manufacture of the Director would have to be divided among several plants. The Ford Company, the International Harvester Company, the Liquid Carbonic Corporation, the Motiograph Corporation, and the Teletype Corporation were therefore called upon for assistance. A large group at the Ford plant undertook the drafting for the tracker, and the design was completed and manufacture undertaken by the International Harvester and Liquid Carbonic companies. Design work for the altitude converter was done partly by Ford but chiefly by the Teletype Corporation, while the Motiograph Corporation took over its manufacture. R. V. Terry supervised the work in these various plants through the design and the early manufacturing period.

One of the difficult problems associated with the manufacture of the Director was the devising of tests that would insure every Director leaving the factory would perform with the greatest practicable accuracy in the field. With a complex device like the Director, overall performance depends on contributions from a very large number of elements, each of which may depart slightly in one way or another from ideal performance. Overall tests are therefore required in addition to the test of individual elements and such tests were devised by V. M. Cousins. For these tests, limits must be established that take into consideration not only the overall accuracy desired but the manufacturing variations normally to be expected, since part of the value of such tests lies in their ability to detect variations in manufacturing procedure and to correct them before their effect on overall performance becomes serious. This latter investigation was undertaken by H. F. Dodge, and the novel and effective limits he laid down have proven highly satisfactory, and have elicited warm praise from the Ordnance Department of the Army.

Since the proper aiming of antiaircraft guns depends on involved relationships between speed and position of the plane, the velocity of the projectile, the distance between the trackers

and the guns, and the ever-present factors of gravity, air density, and wind velocity, the Mathematical Research group played an important part in the Director development from the very first. S. Darlington and H. G. Och worked closely with the Director group under C. A. Lovell for the development of the experimental model, and made substantial contributions to its success. They and other members of the Mathematical Research group extended their contributions throughout the stage of commercial development. Altogether the mathematical work for the project has required the services of from fifteen to twenty engineers and some twenty computers.

Because of the novel and intricate nature of the Director, it was obvious that provisions for its successful operation and maintenance in the field would require special attention. Francis A. Hubbard was given responsibility for preparing instruction material, for coordinating maintenance practices, and for conducting field tests of the units after they were delivered to the Army. For preparation of the maintenance instructions, a group experienced in similar work for the Bell System was formed under the immediate direction of Philip Husta. Three classes of maintenance were to be provided for: preventive maintenance, which includes such tests as would avoid future trouble; periodical maintenance, to overhaul and recondition equipment at specified intervals to insure the most efficient operation; and trouble location and correction. To permit suitable maintenance procedures to be carried out, a large variety of tools and testing equipment had to be developed, and for this work other groups from both the Apparatus Development Department and the Systems Development Department were called upon. Five large volumes of a maintenance manual, one operating manual, and a preliminary instruction manual prepared for use in the school for war training were prepared.

Before this work could be started, the group engaged in it had to become thoroughly versed, not only in the general theory and operation of the Director, but in the function and limitations of every individual part com-

Newark Evening News

prising it. This was true to a somewhat more limited extent of many of the other groups working on the development. Informal classes were organized to expedite this educational work. It was obvious also that classes would have to be conducted by the Army to train the thousands of men that would operate and maintain the apparatus in the field. To lay the foundations for this work, the Laboratories school for war training, under the general direction of R. K. Honaman, undertook to prepare texts, and to conduct a course in Director operation and maintenance for a large group of Army personnel.

In appraising the magnitude of completing the development of the Director in such a remarkably short time, it is necessary to remember that it is only one of the very large number of developments now in progress. Certain men and groups devoted their entire time to the Director all through its development, but most groups worked on it to complete specified tasks, and more or less concurrently were carrying on other projects. The Director, important a development as it was, ranks not as an isolated achievement but only as one of the many important projects carried on by the Laboratories for the Armed Forces.

Television Over Telephone Cable

FOR the benefit of wounded service men in hospitals of the Metropolitan area, the National Broadcasting Company planned a television broadcast of the Rodeo at Madison Square Garden on the night of October 25. The New York Telephone Company was asked to provide a wire circuit between the Garden and Radio City as it had previously done for the Six-Day Bicycle Race.* It was agreed that a circuit would be set up and an attempt made to equalize it if enough elements could be found among six amplifiers used with pre-war circuits that were still available in Philadelphia. This equipment was brought back to New York on our truck on October 20.

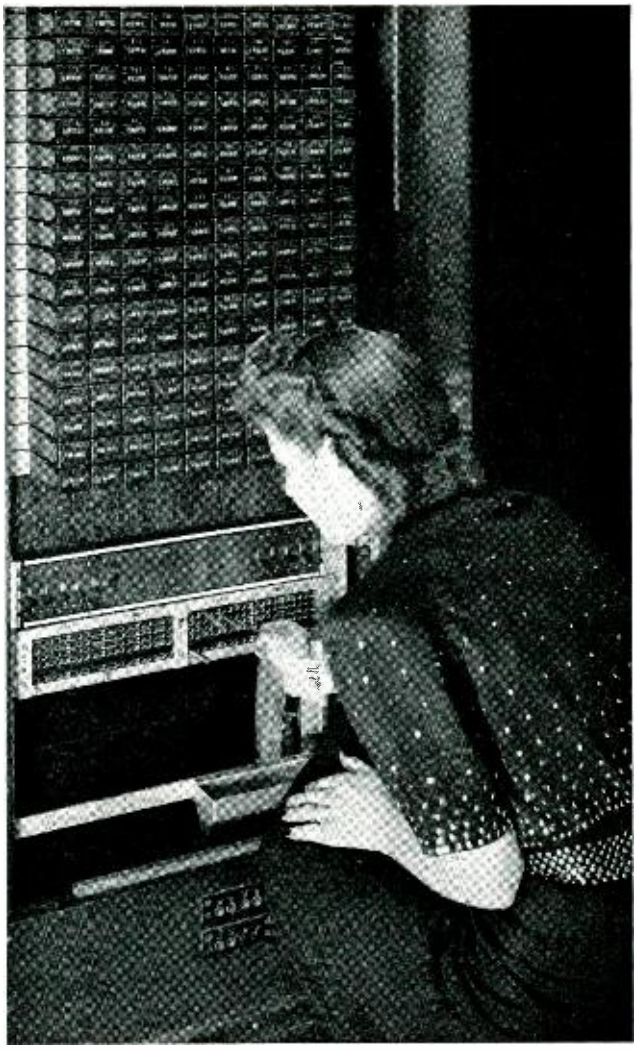
On October 21 A. F. Mott began overhauling the amplifiers and collecting all the equalizing equipment that had not been salvaged for war work, and found enough parts for a transmitter, repeater, and a receiving amplifier. He and G. B. Engelhardt then assembled this equipment and with R. M. Pease distributed it to Madison Square Garden, Circle central office, and the NBC control room in Radio City on October 23. B. Dysart and L. W. Morrison assisted in setting up the circuit. The Telephone Company released the lines previously used on this circuit, and at 5 o'clock Monday afternoon, October 25, the circuit was turned over to the National Broadcasting Company. At 9:10 P.M. pictures of the Rodeo were broadcast and a program presented over the wire line up to 10:15 P.M.

The circuit was used again for transmitting the War Fund Rally and the Ice Carnival, and is available for future broadcasts as occasion may demand. This use of telephone circuits for television will probably increase in the future. The difficulties involved and the methods of overcoming them have already been described in the RECORD.† It seems very likely that telephone cables of the Bell System may be as closely associated with post-war television broadcasts as they are with sound broadcasts at the present time.

*RECORD, *June*, 1939, *p.* 313. †*October*, 1939, *p.* 34.

Registering "Busy Line" Frequency in the Crossbar System

By R. E. HERSEY
Switching Development



IF OFFICES, stores, and other extensive users of the telephone are to have adequate service, they must have a sufficient number of lines to the central office to insure that incoming calls will not find the lines busy except at times of unusual load. Probably the most effective way of determining whether or not additional lines are needed is to record the number of times the lines are all found busy over some convenient period. This is determined at the central office which serves the subscriber, and apparatus for automatically counting the calls that fail to reach the subscriber because all lines are busy has long been in use in dial areas.

In step-by-step and panel systems the only part of the switching equipment that knows whether or not a line is busy is the last switch in the chain: the connector in the step-by-step system and the final selector in the panel system. These are the switches that "busy test" the line and send a busy signal back to the calling subscriber. These final switches do not have a record of the called number, but are guided to it either by a sender in the calling office or by the dial of the calling subscriber. It has been necessary, therefore, to associate the circuit used for counting the all-lines-busy conditions with the actual line terminals, and to arrange the final switch to pass a signal to the counting circuit when an all-lines-busy condition is encountered. The registering equipment must be capable of being connected to any of the line terminals for which a count is to be made, and, whenever a study is to be made on a different line, the connection must be changed accordingly.

In the crossbar system the lines are tested by the terminating markers, and these markers also have a record of the number of the line called. By associating the counting circuit with the marker, therefore, of which there are only a comparatively few for each office, a much simpler system has been developed.

FIGURE 1—COMBINATION OF OPERATED REGISTER RELAYS TO GIVE THE VARIOUS DIGITS

Digits	*Relays Operated in Either H, T or U Set*	*Relays Operated in Th Set*
0	0	0
1	1	1
2	2	2
3	1+2	1+2
4	4	4
5	5	4+1
6	5+1	4+2
7	5+2	4+2+1
8	5+2+1	8
9	5+4	8+1

After the marker has encountered an all-lines-busy condition, it returns a signal to the incoming trunk circuit to record the fact, and this circuit returns the busy signal to the calling subscriber. The terminating markers are arranged so that during this short interval while they are signaling the incoming trunk circuit of the busy condition, they also connect to the line-overflow register circuit, and indicate to it the called number. This transfer of information takes place while the marker is continuing its normal function, and thus does not increase the marker holding time.

A record of the called line is stored on four sets of four relays* in the terminating marker—one set for each digit of the number. The four relays of a set are operated or not operated in different combinations for each of the ten possible digits. Similar sets of register relays are also provided in the common equipment of the line overflow register circuit, and when a marker finds all the lines busy for a particular number recorded on its register relays, it operates the same combination of register relays in this common equipment. The various combinations are shown in Figure 1. Depending upon the particular combination of operated or not operated relays, ground will be placed on one or another of ten leads, and the lead grounded indicates the value of the digit recorded. The arrangement of one set of these register relays in the common equipment is shown in Figure 2. There is a similar set of ten leads from the other three sets of register relays. As a result of the operation of the register relays in the common equipment, the number called will be indicated by a ground appearing on four leads, one in each set of ten from the register relays.

Each marker will operate a combination of register relays in the common equipment every time an all-lines-busy

*RECORD, *July*, 1939, *p.* 356.

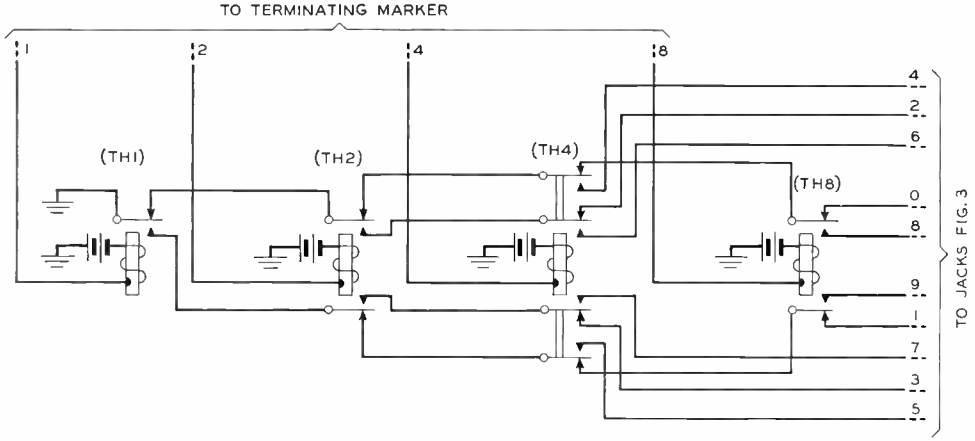


Fig. 2—The register relays in the common equipment—four sets as above—translate signals over four leads from the marker to a ground on one of ten leads

condition is encountered, but only occasionally will this combination correspond to the line number for which the count is being made. The circuit must thus be arranged to operate the register only when the number recorded on the register relays of the common equipment corresponds to that on which a count is being made.

This is accomplished by carrying the four sets of ten leads from the common equipment to four sets of ten jacks—each set arranged as shown in Figure 3. The "ring" terminals of all jacks in each set of ten are connected together and carried to a matching circuit used to operate the register, and plugs with their "ring" and "sleeve" terminals connected together are inserted in jacks of the four sets to correspond to the number for which the count is being made. Thus, for a count of line 6725, plugs would be inserted in the No. 6 jack of the thousands group, in the No. 7 jack of the hundreds group, and so on. This connects these four leads to the matching circuit. Since in such traffic studies it may be desirable to observe several numbers at the same time, several matching circuits, each associated with four sets of ten jacks in the jack field, are also provided.

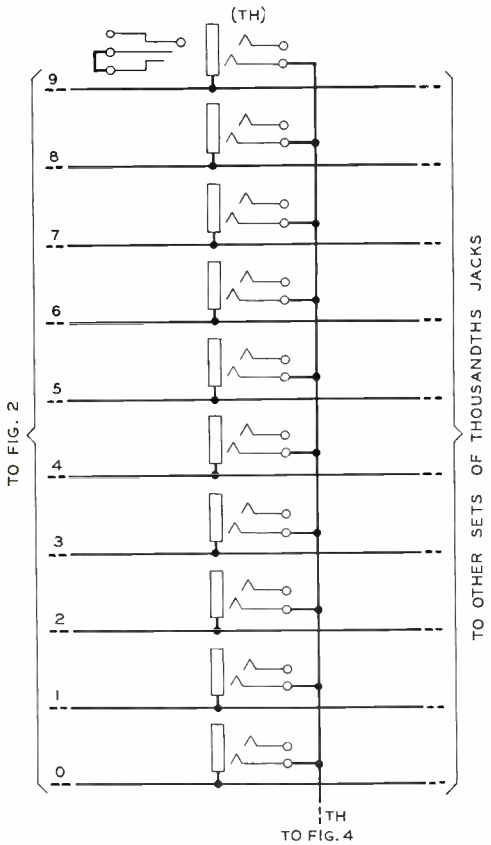


Fig. 3—For each digit of each register circuit a set of ten jacks is arranged as shown

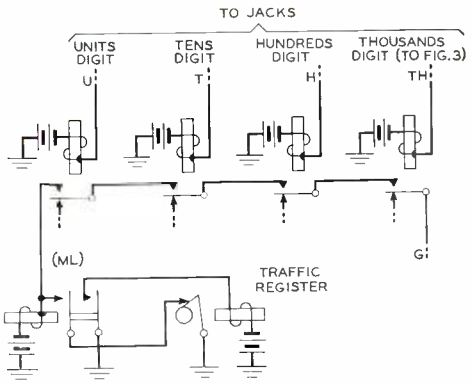


Fig. 4—Typical arrangement of matching relays in the common equipment

Each matching circuit consists of a set of four matching relays plus a relay to operate the register, as shown in Figure 4. Only when ground appears on all four of the leads, indicating that the number recorded on the register relays is the one being studied, is there a closed path to operate the ML relay, which in turn operates the register. For any number found busy but not being observed, one or more of the relays of each matching circuit will not be operated, and thus the circuit to each ML relay will be open, and no register will operate. The registers are somewhat sluggish in operation, and the ML relays are arranged to lock operated through a contact on the register, to insure that the register is fully operated.

Markers are provided in groups of from 3 to 10, and each such group of markers may handle the calls for from

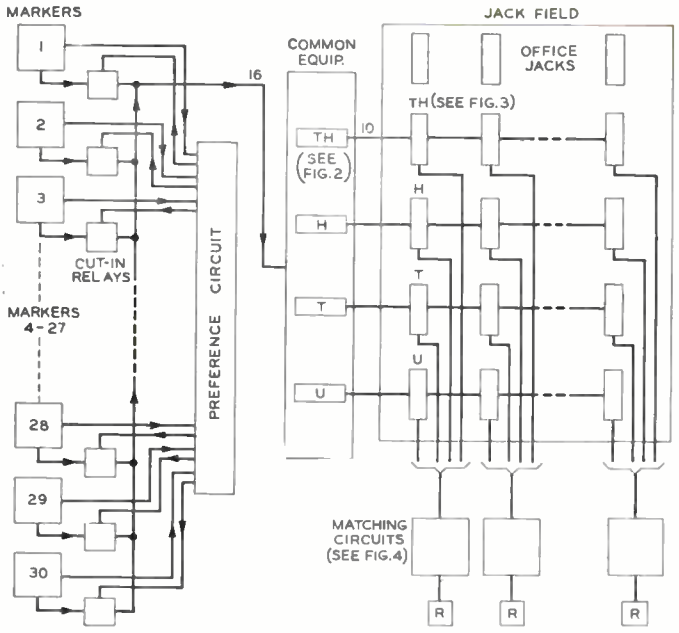


Fig. 5—Block schematic for the all-lines-busy register circuit used in the crossbar system

one to four central offices. Moreover there may be several groups of markers in the same building. The line overflow register circuit was thus designed to record for as many as 30 markers. Since only one all-busy condition can be recorded at a time, the circuit by which the markers gain access to the register circuit is arranged to permit only one connection at a time. Should two markers encounter an all-busy condition simultaneously, only one would be connected through at that time and there may be insufficient time before the other marker releases to permit it to make a record of its busy number. Since the connection to the register circuit is maintained only for a very short time—a fraction of a second—and since an all-lines-busy condition is a comparatively rare occurrence, the number of lost records because of this limitation is insignificant except under conditions of extreme overload.

Each marker gains access to the common equipment of the register circuit through a cut-in relay which connects the four leads from each of the four sets of register relays in the marker to the corresponding relays of the common equipment shown in Figure 2. The operation of these cut-in relays, however, is controlled through a lock-out circuit* and a set of preference relays. This combination prevents more than one cut-in relay from being operated at the same time, and determines which marker should be connected through when more than one encounter an all-busy condition at the same time. Each marker has its preference relay, and is given a preference classification, and when two or more markers attempt to gain access to the register circuit at the same time, only the one with the highest preference is accepted.

This arrangement is indicated in Figure 5, which shows the entire system in block schematic form.

Since the various registers may be used for recording all-lines-busy conditions for lines in several office units, and since the same line numbers may appear in all of them, it is necessary to plug up for the office name as well as for the line number. Besides the numerical jacks in the jack field, therefore, a set of jacks is provided for each register to select the office desired. For each register circuit there is one of these jacks for each possible office, and a plug is inserted in the proper office jack as well as in each numerical jack. These office jacks extend the ground lead G of Figure 4 through to the markers, in a manner similar to that of the number jacks. Ground will appear on this lead only when the number involved is in that particular office.

*Record, *September*, 1939, *p.* 21.

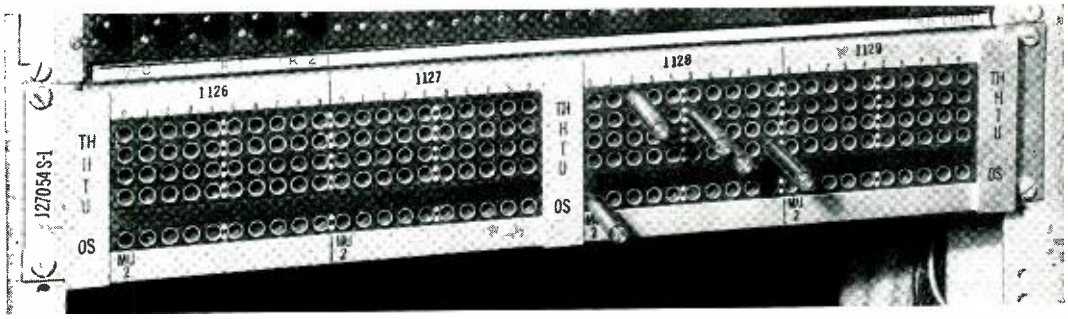
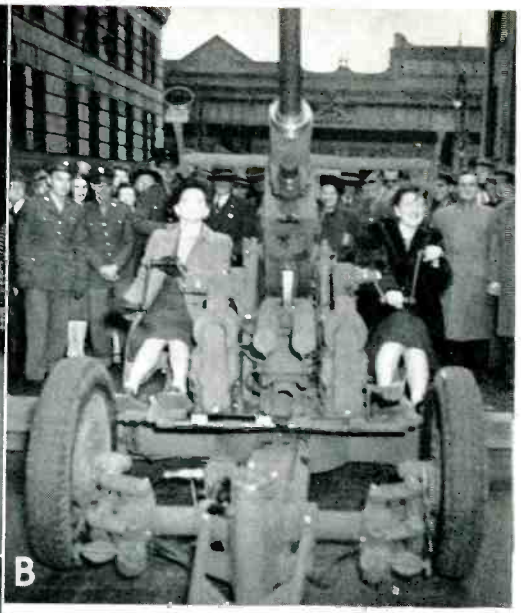


Fig. 6—Jack field for busy-line register circuit in the Murray Hill-2 office

With such equipment it is a simple matter to secure a count on any line. It is necessary only to insert five plugs in the jack field of one of the registers, and to read the register at the beginning and end of any desired period. A change in the line being studied is readily made at any time. In the Murray Hill-2 office in New York City the jack fields for the busy-line register circuit are installed in the lower part of the traffic register rack as shown in the photograph at the head of this article. The jack field is shown in greater detail in Figure 6.

THE AUTHOR: R. E. HERSEY's studies at Beloit College were interrupted by fourteen months of service with the Signal Corps in France during World War I. After the armistice he studied at the Sorbonne University in Paris until July, 1919, when he returned to this country and received a B.S. degree from Beloit College. Following a year with the Delco-Light Company and two years at Harvard Engineering School he joined our Systems laboratories in 1922. Two years later he transferred to the local systems circuit group where he engaged in the development of the call distributing "B" board and key pulsing type toll and DS"A" boards. Mr. Hersey was associated with the fundamental studies for the crossbar system and designed the first issue of the originating marker. In October, 1941, he took over supervision of circuit design of senders, decoders and markers for all systems. In this capacity he has been instrumental in the design of the No. 4 toll crossbar system placed in operation in Philadelphia last August. Mr. Hersey has also been concerned with the design of the automatic ticketing equipment for the step-by-step system now being installed in the Los Angeles area.



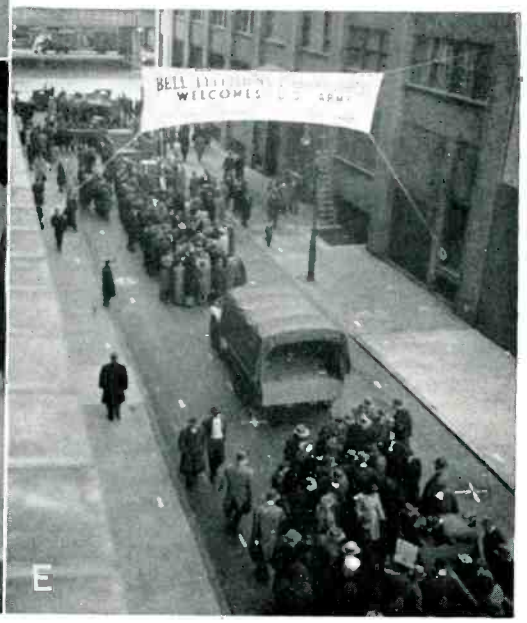
A—*Herminia Dominguez will get her man, if it takes a 50-cal. machine gun!*

B—*Iris Boteler and Rose Howe (Electronics) do some star-gazing*

C—*No hostile plane appeared for Mildred Beckner and Katherine Berny (Accounting) as they looked through the telescopes of the Electrical Director*

D—*Helen Mason (Networks) takes a lesson in loading from Corporal George Austin of Aberdeen*

E—*About 4,500 people passed through the show during the afternoon*



The Army Salutes Bell Laboratories

By Allan Carney, A. T. & T.

A biting wind whipped across the Hudson River and coat collars were turned up high. The side street alongside Bell Telephone Laboratories was roped off and guarded at each end. A helmeted MP was there with his tommy-gun, and you could tell something special was going on. And it was!

The occasion was a special showing of war weapons and munitions for the Laboratories people. A detachment from the U. S. Army's Ordnance Department brought the wide assortment of equipment to the headquarters building on West Street for the exhibit, which also included one of the new M9 Electrical Gun Directors from the Murray Hill Laboratories.

It was an official Army salute to the men and women of the Laboratories for the effective instruments of war they have perfected for the Armed Forces.

For four hours the Laboratories folks took turns at "talking shop" with the officers and enlisted men. They learned how many rounds the 40-mm anti-aircraft gun will fire a minute, how and why the Japanese have come to respect our mortars in South Pacific fighting and what the business end of a two-thousand-pound bomb looks like at close range.

They saw Japanese guns, too, some brought back from Guadalcanal. In the overcoated crowds that huddled around these weapons were several Chinese people from the Laboratories, keenly interested in the war equipment of their implacable enemy, the Japanese.

The 40-mm anti-aircraft gun, hooked up with its power plant and electromechanical director, caught the crowd's fancy. A Laboratories engineer, watching the director function, commented, "She works good." It was his first chance to see this director, turned out by another concern. He already knew all about the Laboratories' own M9 Director, which operates the 90-mm gun.

Both men and women stood in line to await their turn at the height finder, its sights fixed on the top of a distant skyscraper instead of an enemy plane.

"All I can see are people here on the street," said one girl as she peered into the long cylinder. So the people were removed from in front of the height finder's "eyes," and then she found the "target."

"The Laboratories people are sort of home folks to us," said Major J. G. Remick. "We of the Army are glad to have an opportunity like this to show how we appreciate the development work they are doing."

George Fowler and the officer guests: Lieut. W. E. Vance, Mr. Fowler, Lieut. Colonel Harvey Rivkins, Major G. J. Remick, Lieut. T. W. Barnes, Lieut. S. J. Warner

Cold or not, it was four hours of good fun and fellowship. Girls climbed in the Army jeep to pose for pictures, veterans of World War I swapped yarns with soldiers of '43, and everyone felt pretty good about having a part in providing such fine equipment.

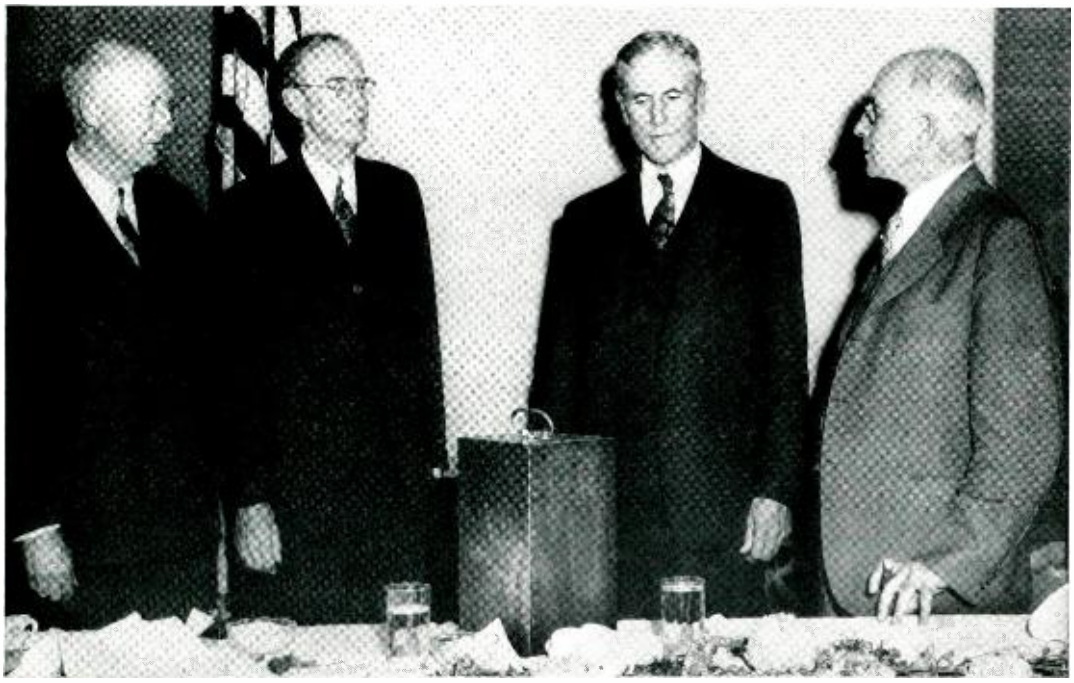
* * * * *

Arrangements for the show were made by Colonel L. A. Codd for the Army and R. K. Honaman for the Laboratories. Major J. G. Remick of the New York Ordnance District carried out these arrangements locally; cooperating with Ordnance were the Army's Eastern Defense and Second Service Commands. The optical height finder was provided by Mergenthaler Linotype Company. W. C. Somers of our Plant Department saw to the assignment of guards, placing of a banner, etc. Reception of visitors, including lunch and refreshments for enlisted men, were looked after by W. C. F. Farnell. Plans were carefully worked out by L. S. O'Roark and G. F. Fowler for the orderly movement of personnel from their jobs to the show and back. L. E. Gaige, commander of the Auxiliary Corps of Legionnaires, was in charge of volunteers from that group who were on duty in the street. Details of police and firemen were provided by Captain P. J. Kirley and Captain J. J. McGuire, respectively. Vice-President Blackwell was host at a luncheon to the officer personnel.

Leo Montamat Retires

With over forty-eight years of service in the Bell System to his credit, LEO MONTAMAT retired from the Laboratories on November 30. In 1895, before the Western Electric Company had built on the 463 West Street plot, Mr. Montamat joined the Company as an office boy in the building at Greenwich and Thames Streets, New York. By 1902 he had become expert in his field of accounting and was sent to Europe as auditor and accountant. Returning in 1905, he was soon transferred to Hawthorne where he had experience in several departments and in 1910 became the Assistant Chief Clerk.

At Hawthorne Mr. Montamat had been Chief of Clerical Methods for a number of years when in 1923 a staff organization of the Manufacturing Department was set up



At a testimonial dinner for Leo Montamat, speakers were O. E. Buckley, O. B. Blackwell (toastmaster), Mr. Montamat, F. B. Jewett, all pictured above; W. Fondiller, W. M. Beers and W. F. Hosford of Western Electric. Appropriately, the menu was in the form of a G.E.I.

Members of a British scientific mission and the related U. S. committee visited the Whippany Radio Laboratory on December 1, following a day of conferences at West Street. They were entertained at lunch by F. B. Jewett, O. E. Buckley, M. J. Kelly, O. M. Glunt and Ralph Bown (upper row, above). Shown in the lower row are Lt. Com. H. L. Vanderford, Brig. Gen. H. M. McClelland, Capt. F. R. Furth, Rear Adm. J. R. Redman, Dr. D. M. Robinson, Rear Adm. J. A. Furer, Dr. Karl T. Compton, Sir Robert Watson-Watt, Dr. C. E. Horton, Prof. J. B. Cockcroft, Prof. A. G. Shenstone, Dr. W. B. Lewis, Air Comm. C. P. Brown, Brig. Gen. H. M. Paterson, Group Capt. D. H. Johnson, Lt. Col. A. J. M. Fisher, Capt. Solberg and J. H. Teeter

at Broadway to coördinate the activities of Hawthorne and of the recently opened Kearny plant. In that year he was transferred to New York and soon became Superintendent of Business Methods, later becoming Assistant Comptroller of Manufacture. From this position he came to the Laboratories as Assistant Vice-President in 1935. Since that time Mr. Montamat has been in charge of the General Staff Departments, including accounting, financial, commercial relations, plant and general service.

Retirement will not bring inactivity to Mr. Montamat, for he has become a member of the Navy's Price Adjustment Board, which is concerned with the re-negotiation of contracts for naval projects.

William Fondiller Takes Over

With the retirement of MR. MONTAMAT, the transfer of his duties to WILLIAM FONDILLER became complete. Mr. Fondiller, as assistant vice-president, now has charge of the General Staff Departments: accounting, financial, commercial relations, plant, and general service.

On graduation from the College of the City of New York where he received the B.S. degree, Mr. Fondiller studied at Columbia and he received an E.E. in 1909 and subsequently the M.A. degree. In 1909 he joined the Engineering Department of the Western Electric Company which in 1925 was incorporated in the Laboratories.

His early work was concerned with the development of loading coils and it was under his direction that the compressed powdered core, now universally used in loading coils, was developed. Later he was appointed head of the Physical Laboratory which had a broad responsibility for electrical testing and materials engineering. Mr. Fondiller, at various times, was in charge of the design of panel and crossbar switching apparatus, station apparatus and transmission apparatus, including electrical filters,

*Inspecting developments at Whippany are Sir Robert Watson-Watt, leader in British *** development; Dr. Karl T. Compton, president of M.I.T.; and Dr. F. B. Jewett*

transformers, varistors, testing apparatus, etc. He also had charge of apparatus drafting and specifications engineering.

The modern combined telephone set was visualized by Mr. Fondiller who initiated the commercial development of this apparatus. His technical contributions are evidenced by various technical papers which he has presented and by eighteen patents which have been granted for his inventions.

A Letter from John H. Bell

HERE IS AN excerpt from a letter from JOHN H. BELL who retired in July, 1941. Mr. Bell now lives near Stanton, New Jersey:

"As you can imagine, the walk out to the mail box and the subsequent half hour of poring over the news is an important event every day. But I have noticed that once a month when the BELL LABORATORIES RECORD arrives its perusal gets a priority rating over the daily paper!! As you can suppose, the most interesting items are news of my ex-colleagues, but I go through the RECORD from cover to cover.

"The box of tools you fellows gave me as a parting gift has proved most valuable. In the summertime, of course, my time is spent in gardening; but in the winter, when outdoor work is not possible, I generally have one or more articles to make. One year I made a picket fence around my wife's garden, another year I made a big cold-frame which enables us to get a jump on the weather by a month or more by raising vegetable seedlings.

"This summer and fall I built a root cellar to hold the anticipated bumper crops of apples, peaches, carrots, potatoes, onions, etc., which we shall harvest next year. You see I am still an optimist!! The walls are of stone and the roof is well insulated. It will be interesting to see what the temperature readings are when cold weather really arrives."

16 Hits Out of 48 Shots

THROUGH THE COURTESY of the Anti-Aircraft Artillery Command, a number of editors who had been unable to attend the Gun Director demonstration at Murray Hill were shown one of these instruments installed and operating at a nearby AA. battery. During the visit it was learned that in recent firing practice the battery scored 16 hits out of 48 shots at a sleeve target towed by an airplane. In the party were F. A. Lewis, *Electrical Engineering;* John Kay, *Life;* Gilbert Sonbergh, *Electronic Industries;* and P. C. JONES, BELL LABORATORIES RECORD. Host to the group was Captain A. N. Huston.

BLOOD DONORS

Francis Bertola
John Cebak
J. P. Coggins
Frances Dour
R. K. Hansen
J. F. Hurley
Charles Kuhl
Edna Lynch
Marjorie McLinden
Elizabeth Minerowitz
Veronica Moore
W. H. Nelson
Madeline Roche
Margaret Sweeney
K. B. Walker
Viola White
Bertha Wolpert

THE 1943 AWARD for Chemical Engineering Achievement has been made by the magazine *Chemical Engineering* to the American Synthetic Rubber Industry for its great contribution to the war effort. The Laboratories was one of the individual companies to be recognized and a suitably engrossed scroll now hangs in the Chemical Laboratories at Murray Hill. Present at a dinner on December 8 at which the Award was conferred were: R. R. WILLIAMS, R. M. BURNS, C. S. FULLER, B. S. BIGGS, A. R. KEMP, F. S. MALM, W. O. BAKER, C. D. HOCKER and W. S. GORTON.

JAMES W. HUBBELL, President of the New York Telephone Company, was elected president of the Telephone Pioneers of America for 1944 in the recent voting by members of the Pioneers' General Assembly. Mr. Hubbell succeeds A. H. Mellinger, President of Illinois Bell Telephone Co.

AS PRESIDENT of the National Academy of Sciences, DR. FRANK B. JEWETT presided at the autumn meeting held November 22 in Washington, D. C. On December 1 he addressed the Institute on Post-War Reconstruction of New York University on *The Promise of Technology After the War.*

LLOYD ESPENSCHIED was made Chairman of the New York Section of the Institute of Radio Engineers at the meeting of the Institute held December 1 as a joint meeting with the Radio Club of America.

THE MEMBERS of Bell Laboratories had contributed a total of $28,402.42 to the National War Fund as of December 21, 1943. Up to that date 5,419 members had donated contributions to the Fund.

"THE TELEPHONE HOUR"

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

JANUARY 10, 1944

March from "Prince Igor" — *Borodin*
Orchestra

Slow Movement— — *Goldmark*
Concerto in A Minor
Jascha Heifetz and Orchestra

Viennese — *Godowsky*
Guitarre — *Moszkowski*
Impromptu — *Schubert-Heifetz*
Introduction and Tarantelle — *Sarasate*
Jascha Heifetz and Orchestra

JANUARY 17, 1944

Czardas from "Coppélia" — *Delibes*
Orchestra

Agnus Dei — *Bizet*
Marian Anderson

If There Is Someone Lovelier Than You — *Schwartz*
Orchestra

Believe Me If All Those Endearing Young Charms — *Traditional*

Oh! What a Beautiful City — *Spiritual-arr. Boatner*

Dere's No Hidin' Place Down Dere — *Spiritual-arr. Brown*
Marian Anderson

La Cenerentola Overture — *Rossini*
Orchestra

My Heart at Thy Sweet Voice from "Samson and Delilah" — *Saint-Saëns*
Marian Anderson

JANUARY 24, 1944

Chopsticks — *Traditional*
Orchestra

Water Boy — *Traditional-arr. Robinson*
Nelson Eddy

Riviera Girl Waltzes — *Kalman*
Orchestra

Thy Beaming Eyes — *MacDowell*

Let's Make Tomorrow Today from "Knickerbocker Holiday" — *Heymann*
Nelson Eddy

Prelude to "La Traviata" — *Verdi*
Orchestra

Do Not Weep, My Child from "The Demon" — *Rubinstein*
Nelson Eddy

JANUARY 31, 1944

Babes in the Woods from "Very Good Eddie" — *Kern*
Orchestra

Clair de Lune from "Fêtes Gálantes" — *Debussy*
Lily Pons

Spanish Serenade — *Chaminade*
Orchestra

Only a Rose from "The Vagabond King" — *Friml*
Lily Pons

First Movement—Symphony No. 4 in A Major — *Mendelssohn*
Orchestra

Ah Fors è Lui from "La Traviata" — *Verdi*
Lily Pons

Bell Telephone Laboratories Chapter

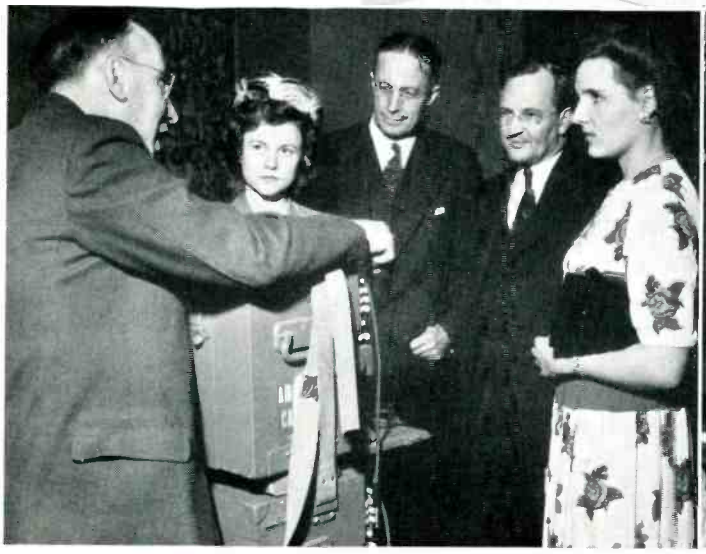
Above, left—Dr. Buckley explains to Mrs. Buckley (right) and Mr. and Mrs. G. B. Thomas how a Spiral-4 connector is locked

Above, right—Standing between the latest and the earliest models of Western Electric tank radio sets, J. G. Nordahl listens to Dr. Jewett while C. M. Hebbert and Mrs. Hebbert look on

Center — M. E. Maloney demonstrates a portable air-warning center to Kristen Mortensen and her father, "J.P." Other demonstrators at this exhibit were Albert Tradup, M. B. McDavitt, and J. M. Horne

Below, left—A. C. Gilmore describes a portable PBX to Marjorie Sheppard, Virginia Gray and their fathers

Below, right—W. P. Mason describes his crystals to Mr. and Mrs. R. L. Young



Telephone Pioneers of America

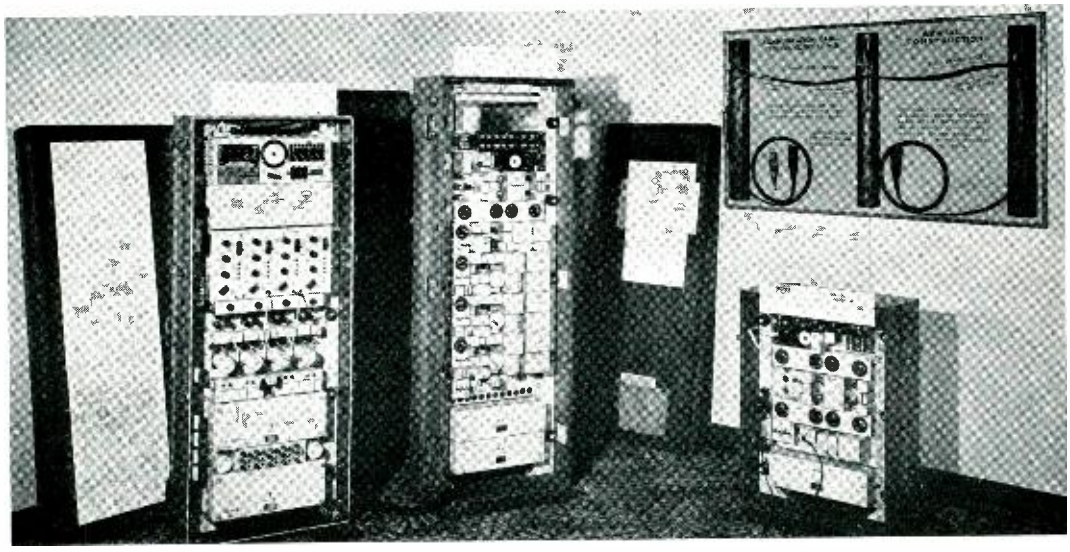
NEARLY six hundred members and guests of Bell Telephone Laboratories Chapter No. 54, Telephone Pioneers of America, assembled in the Hotel Commodore on December 15 for the Chapter's first meeting and dinner. Entering the West Ballroom, they saw exhibits of war devices developed by their associates: transmitters and receivers for many special uses; Spiral-4 cable and its terminal apparatus; quartz-crystal manufacturing tools; a tank-radio telephone set in operation; and a portable air information center ready for use. These were explained by engineers who had participated in the work. In addition, there was captured German equipment, and a moving diorama, loaned by Western Electric, showed how the electrical gun director works.

Toastmaster for the dinner was Roy Heffner, secretary of the Chapter. He introduced its president, Dr. Jewett, who recalled early days and compared the organization of scientific work for World War I with that of today. Then Dr. Buckley, vice-president of the Chapter, after contrasting the Laboratories work in the two wars, emphasized the increase in research and development projects. That, he said, had been due largely to the greater maturity of the organization and its members, and the greater fund of experience on which both could draw. Pioneers who had been members of the old Western Electric Engineering Department can now see in the modern equipment of war many items which grew out of their own work on radio telephony, submarine detection, and other military projects of World War I. Members of the new Pioneer Chapter can be proud that the Laboratories, measured on any scale, is now one of the largest war industries in New York City.

Following the speeches, a war film was shown, and the meeting adjourned.

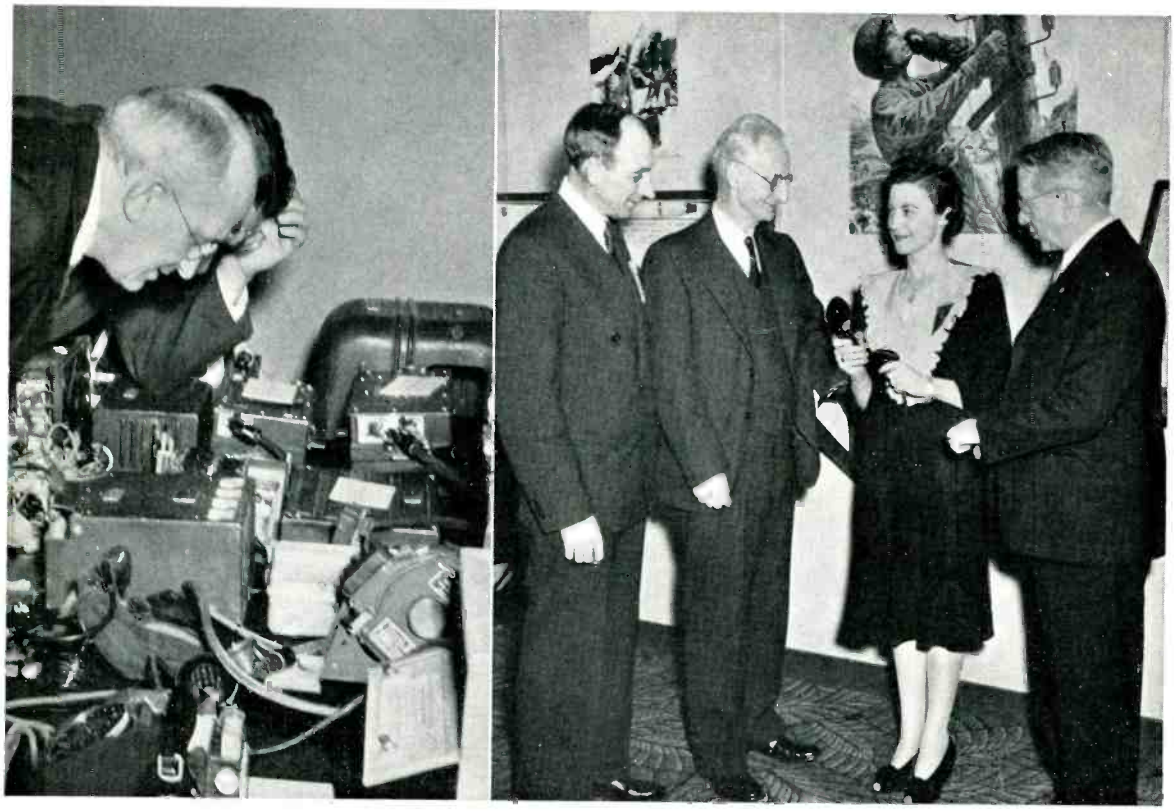
Behind the scenes of this initial effort to show members of the Laboratories what their associates have been doing lay a considerable amount of work done by the people named in the captions. The job was coordinated by Henry J. Kostkos with Manfred Brotherton as his right-hand man. E. J. Reilly had the job of transportation and packing; the portable panels were furnished by the Diorama Corporation. Mabel Roche was receptionist and hostesses were Mary Van Bergen and Irene Ryan.

Not pictured was a demonstration of how the lip and throat microphones work, staged by W. F. Clemency and C. F. Mitchell, and a demonstration of the Mirrophone, which was arranged by F. L. Crutchfield.



Spiral-4 cable and its terminal equipment were demonstrated by O. B. Jacobs, C. A. Dahlbom, A. C. Dickieson and H. Keppicus. A. L. Fox made the wall panel

Bell Telephone Laboratories Chapter

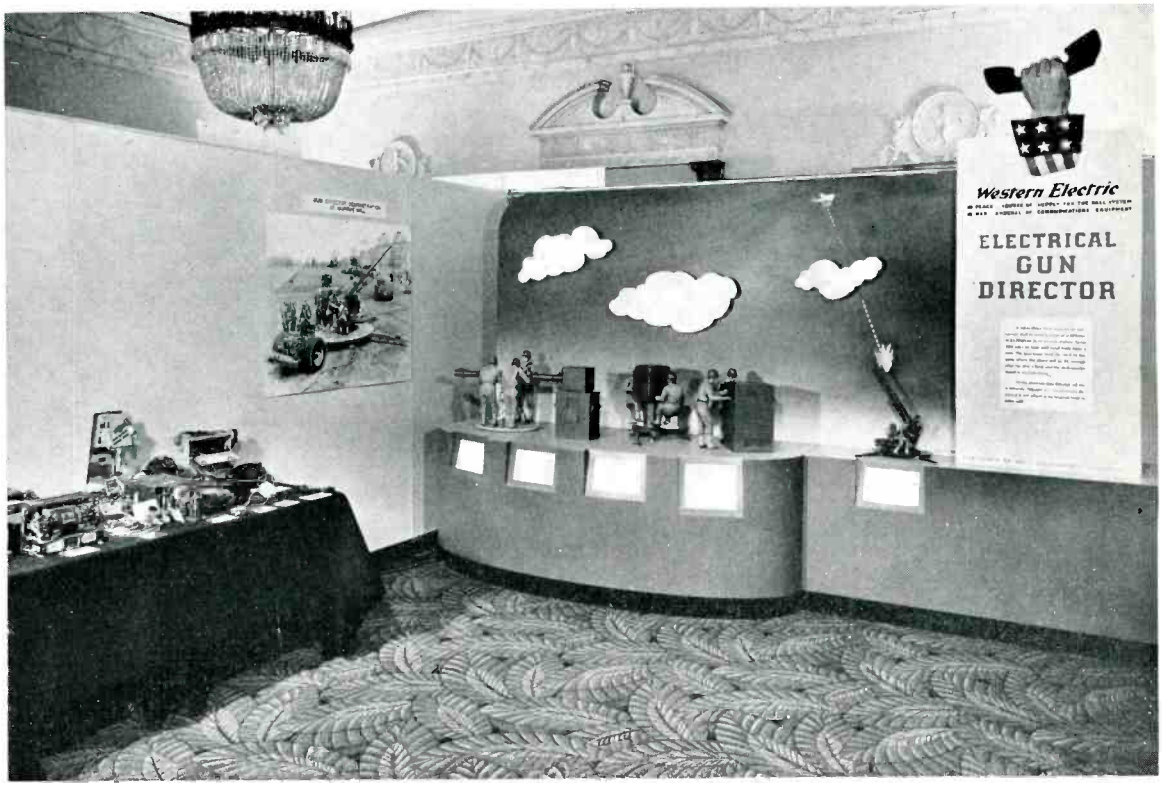


At the left L. P. Ferris studies captured enemy communications gear while at the right H. I. Beardsley, J. W. Gooderham and J. D. Hubbell hear from Jennie Amodeo how a field telephone works

Left—This full-size picture of the interior of a bomber (extreme left) shows Western Electric airborne radio telephone sets; the instruments, exhibited on a table, were explained by J. W. Pollio. Right—Quartz crystals and their manufacture into plates were shown by W. P. Mason, W. A. Marrison, Miss Elizabeth Armstrong and W. L. Bond

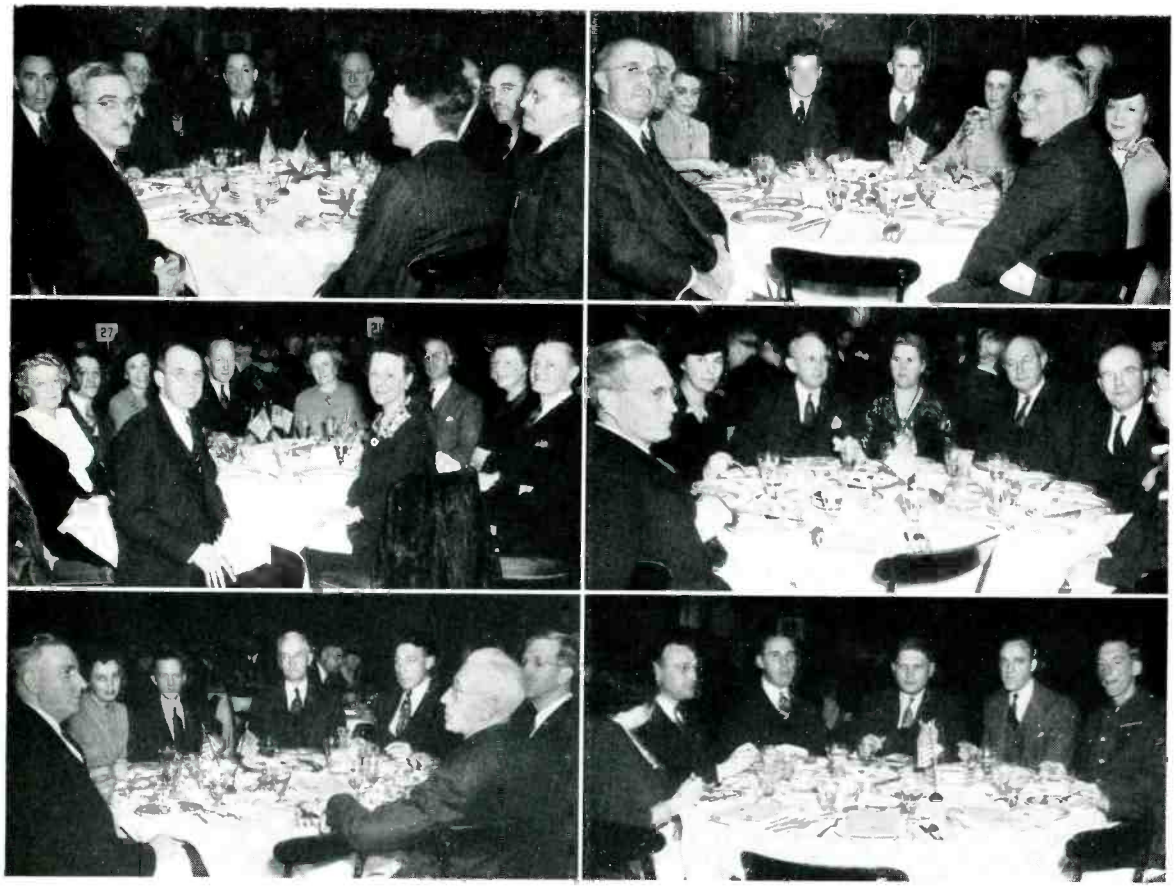
Telephone Pioneers of America

Transmitters and receivers for combat were assembled in this exhibit by J. R. Erickson and G. A. Wahl. They were demonstrated by H. I. Beardsley, K. E. Hammer, W. L. Tuffnell and G. G. Lavery



Communications equipment captured from the enemy is shown at the left and the premiere of a working diorama lent by Western Electric Company at the right

At the Dinner of the Telephone Pioneers



News Notes

C. J. Frosch went to Hawthorne for conferences on plastic domes for radio detecting equipment.

A. R. Kemp and F. S. Malm conferred with members of the Northern Electric Company, Montreal, on projects involving the conversion from natural to synthetic rubber insulating materials.

On a visit to the Hawthorne plant of the Western Electric Company G. H. Williams studied various adhesion problems.

G. Deeg, Jr., discussed plastic forming and casting at the duPont Company, Arlington, New Jersey, and at the Andover Kent Aviation Company, New Brunswick, New Jersey.

At the Socony-Vacuum Refinery at Billingsport, N. J., R. Mueller was concerned with transformer oil questions.

R. F. Mallina and B. E. Stevens visited Indian Head, Maryland, on work for the National Defense Research Council.

F. J. Hallenbeck went to the Bureau of Standards in Washington during November to discuss standardization problems.

R. M. C. Greenidge took up crystal filter matters at Washington.

While in Boston in November, A. R. D'Heedene visited the General Electric Company and the Radiation Laboratory.

A. J. Grossman made special networks studies in Chicago.

H. H. Staebner was in Baltimore on cords and cables.

C. A. Webber went to Washington and to Point Breeze on insulated wire and cable matters. He also went to Chicago where he discussed problems of cables and cords.

H. O. Siegmund presented an illustrated

talk on *High-Speed Motion Picture Photography* before the Rotary Club at Doylestown, Pennsylvania.

WITH ENGINEERS of the Bell Telephone Company of Canada at La Chute, Quebec, G. Q. LUMSDEN reviewed the development of red pine crossarms and their preservative treatment with creosote and pentachlorphenol solutions. At Lancaster, Ontario, Mr. Lumsden participated in an investigation of ground-line treatment methods that were being carried on under adverse weather conditions.

AFTER ATTENDING an executive committee meeting of the American Wood-Preservers' Association in Chicago, R. H. COLLEY visited suppliers in Minneapolis and Milwaukee to discuss the standardization of designs and methods of treatment of western red cedar poles.

AT THE BUREAU of Standards in Washington, J. H. GRAY conferred on tests being made by the Bureau on concrete manhole frames and covers. He also visited the Eatontown Signal Laboratory at Fort Monmouth in connection with trials of recovery equipment for buried cable.

W. H. S. YOURY discussed DR tape at the Eatontown Signal Laboratory.

J. M. WEST has been given a leave of absence from the Laboratories to take up special duties in the office of Secretary of War, Washington.

E. B. CAVE and F. J. SAMERDYKE appeared in interference proceedings before the Primary Examiner at the Patent Office in Richmond.

FROM OCTOBER 21 to 27, R. B. SHANCK was at Camp Coles on National Defense Research Council matters.

ON FRIDAY and Saturday, January 28 and 29, 1944, the Institute of Radio Engineers will hold its winter technical meeting at the Hotel Commodore, New York City. This meeting will be of great interest to all engineers working with electronics and radio.

December Service Anniversaries of Members of the Laboratories

10 *Years*

Arthur Albanese
W. E. Dabb
H. W. Hinz
F. A. Janiszewski, Jr.
L. J. Kelly
C. H. Trenkle
G. T. Ford
A. W. Gally
J. J. Harley
J. V. Kavanagh
Josef Kosmol
Charles Maggs
J. P. Mahoney
August Mendizza
George Morfopoulos
Todos Odarenko
A. C. Peterson, Jr.
A. E. Petzold
Barbara Vatter
C. P. Voltz
F. J. Zebrowski

15 *Years*

S. M. Arnold
J. F. Barry
G. V. Dale
John Deininger
W. H. Dunham

20 *Years*

L. I. Broughton
E. L. Dias
J. B. Dixon
C. A. Johnson, Jr.
E. M. Mowton
Mary Routhier
Violet Stalhand
H. R. Yoeckel
H. E. Crosby
J. D. Kilgallen
H. T. Langabeer
T. J. O'Neil

25 *Years*

William Atkinson
R. O. Covell

30 *Years*

E. G. Hilyard
P. B. Murphy
J. B. Retallack

35 *Years*

Frank Waldman

Major W. R. Lyon

Albert Leimer

Ernest Neubert

W. J. Conner

In the Nation's Service

Ernest Neubert

"Today I'm in London at the 'Eagle Club' and I've finished as good a dinner as can be had in England today. It cost 1/6 (thirty cents) and was a full course with roast chicken at the top. With rationing so strict everywhere else over here it seems a wonder that the Red Cross can treat us so well. Before I continue, I'd like to tell you that regardless of anything unfavorable you might hear about the Red Cross, it is a wonderful organization. In London alone it runs about fifteen huge hotels, taken over for the Yanks only, and at them we can get a bed with beautiful clean sheets (something we forgot existed) for as little as 1/6 per night. All meals at any A. R. C. cost 1/6 and are delicious. In addition, at the clubs we have numerous recreational facilities of every sort. We can shave and shower and get all kinds of other little things done for us. The most important feature is the friendly spirit of the women, both English and American, who run the clubs. Most are volunteers and they are wonderful to us. They go out of their way to make the boys comfortable and I don't hesitate to say that they are as lovely a bunch of people as I've ever met. What I'm trying to tell you is that from my experience, which is broadening every day, the A. R. C. is great. Believe in it, support it, and give it all the credit it is due.

"We had a little excitement the other day; the flight I was in was attacked by some Jerry fighters. We all came out O. K. and I don't think I can say as much for a few of the fighters. Outside of that everything is going on as usual. Flak is our principal worry, but it's not too bad. At present I have the Air Medal with an Oak Leaf Cluster and I have completed a number of flights toward the next cluster."

Major W. R. Lyon

Major Lyon returned to the Laboratories for his first visit in three years. He is now with the container and packaging branch of the production engineering section at Wright Field, Ohio. His job is to coördinate conferences which are held periodically in each of the six procurement districts.

William J. Conner

William J. Conner has returned from the Sicilian and African campaigns where he was a beach-jumper on PT's and ARB's (Air Rescue Boats). He had trained at Camp Bradford with the fourteen men of his crew. Unusual luck followed them, and, while eighty per cent casualties were expected, not a man was lost. Through both campaigns Bill used secret Laboratories-developed equipment which he often had to repair without spares and with makeshift wires and equipment taken from shot-down German Stukas.

Though he could not give very many details, Bill could say that he spent three enjoyable weeks on the Isle of Capri, his longest stay in any one place. By day he enjoyed swimming in the natural lake of the Blue Grotto, a stalactite cavern where

one's body was blue under water; by night the crew hunted "E" boats, heavily armed Jerry speed boats, or made raids on the Bay of Naples. Once they ran into a German convoy. To sail against it would have meant death, so they sailed into the bay with the convoy and later made their escape. Bill is again at Camp Bradford awaiting a new assignment as a beach jumper.

Albert Leimer

ALBERT LEIMER of the General Service Department has been assigned as an instructor at Pensacola, Florida. He was injured in Africa and has the Purple Heart and the French Good Will Medal. He is the only known enlisted man from the Laboratories to hold a pilot's license, and one of the few Labs men to have done overseas duty before Pearl Harbor. Of his five major engagements, two were in the American theater of war, two in the African and one in the Sicilian theater. Both American engagements were with submarines; his African engagements were a bombing raid on Casablanca on New Year's Eve and an air-sea rescue at Bizerte; the Sicilian engagement was an air-sea rescue and the coverage of men on ships along the Italian coast during commando raids on Palermo.

Sigmund Fronczak

"Just a few lines to inform you of my new address. I finally managed to get a ship. I like my duty very much. We get around; I hope we get to New York before much longer. I sure do miss the United States and everything that goes with them. I'll drop in to see the boys—what's left of them—when I get back. According to the RECORD, the draft is taking its toll."

Captain L. W. Stammerjohn

"Greetings from 'somewhere in England':

"I still think of the old gang back at the Labs quite often. I suppose they are all busy turning out equipment or should I say apparatus. (It looks as if I'm forgetting the terminology.) Every once in a while I run across a familiar face or name in the RECORD —makes me a little homesick. Give my best regards to the gang."

Walter B. Bachmann

"I'm still on Island X way out here, west of the Nation, in the North Pacific, but I'm looking forward to a leave in the near future. Since I've been here the Island has grown up like a city out of swampland; just like the New York World's Fair, only I assure you the buildings aren't so attractive

Captain Einar Reinberg talks over old times with his former associates, E. Alenius (left), Christopher Hartley and Louis Cooper

From Lemoore, California, where he is flying BT-15's, Stanley W. Erickson sends his regards to the men and women in Section 4B

and there are no women. How I long for those pretty faces that stroll through the Labs hallways!

"I am attached to the recreation and morale department and I get a good feeling inside making others happy and helping them to enjoy their stay here. I am part-time librarian, but mainly I work in the theater which, when converted, is a gymnasium. Several times a week I run films in the hospital."

Lieut. Charles J. McDonald

"I have been tremendously busy since transferring from Australia to a place in the Southwest Pacific. It's not permissible to talk about the weather, but I can say I'd go for large chunks of ice and snow. When I get back I'll have great stories to tell. How is everyone at the Labs? I'd sure like to hear from my friends there."

Robert C. Lamont

"At this merry point in life my conscience has the better of me and I feel that a letter to the RECORD is in order. Every issue contains news of fellow servicemen with whom I used to work and of others who remain at the Labs. It has been a helpful means of keeping in touch with them as time will permit no other way.

"I will complete my training here at Corpus Christi some time in January. From here orders will take us to some Naval Air Base where we will be assigned to a squadron. From there—well that is anybody's guess. I have encountered many Western Electric products and numerous Bell System employees. So you can see I am continually reminded of the Labs."

Lieut. Col. Malcolm A. Specht

"I am now Battalion Commanding Officer here at Camp Maxey, Texas. My family has been able to follow me and they now live in Paris, Texas. As I have only recently taken over this duty, there will be much more to report in a month or so."

Thomas J. Calvani

"England is a very nice place and the people are good to us 'Yankees.' The girls are much like ours but, of course, not so

Military Leaves of Absence

There were 691 members of the Laboratories on military leaves of absence as of November 30, 1943.

Army 443 Waves 25 Wacs 9

Marine Corps Women's Reserve 4

Navy, Marines and Coast Guard 210

RECENT LEAVES

United States Army

Laura J. Chamberlain	Victor B. Obermiller
Charles A. Haas, Jr.	Edward W. O'Hara
George E. Linehan	Richard Rafferty
John R. Merchant	George A. Seibel
Robert H. Meuser	Theodore J. West

United States Navy

Lawrence F. Albrecht	Margaret S. MacIlvaine
Lawrence M. Cassano	William J. Nicholl, Jr.
John S. Clow	Lt. (j.g.) S. Milton Ray
Doris H. Colsh	Howard J. Reed
James P. Larimer	Elena R. Tighe
Gordon J. MacDonald	John J. Yostpille

United States Marines

Marcae D. Bitowf Frost G. Higbie

Dorothy M. Scully

pretty. I have been to London and I think it compares with N.Y.C. in many ways."

Andrew Schwind

"Civilians have no way of realizing what a soldier's life is like, nor do they realize how much they can do to make it brighter. It is nothing big or costly. Just write to him, keep writing to him. When he receives your letter it's the only time in his day when he realizes he still has a personality. Write to any boy you know. Send him interesting clippings from papers or magazines. Give him the news of back home."

Major Frank A. Parsons

"I am still at Aberdeen where I am assigned to the Bomb Disposal School. Last July I was appointed Director of Technical Research and Intelligence; last month I received a promotion to Major. I was particularly interested in the article on *Philadelphia Adopts Automatic Toll Switching* in the November RECORD, as that was the last thing I was working on before entering on active duty."

Eugene F. Krautter

"Hi-ya Folks: I received the RECORD way down here in the Caribbean and I'm always happy to get it. It is really good to read about the fellows I knew back at West Street who are now working for Uncle Sam. Many of the technical articles are pertinent —and I enjoy all of them even with my limited technical background."

Vincent J. Wycheck

"I am stationed for the present at Port Hueneme. This camp has some advantages of being near Hollywood. We live in Quonset huts, twelve people in a hut; though we're Navy men we sleep on Army cots. They are teaching us to live as we will at our base and believe me it's not all the comforts of home. But one gets used to it.

"Had the pleasure of going to Hollywood to the Canteen, where I met a few stars—they treat the boys in service wonderfully."

Robert Rennick

"BOB LYNCH and I are attending a course given by the Southwestern Bell on a new form of teletypewriter system. They really keep us busy, with school eight hours a day and two hours of study. The training we had in the course which the Personnel Department gave certainly helps us for we use the B-1 (Green Book) as one of the texts."

Robert M. Hulle, a former member of the Laboratories on furlough from Camp McCoy, Wisconsin, called to see the girls in the Apparatus Development Files. Shown with him are, left to right: Frances Steen, Blanche Adams, Shirley Lawton and Marjorie Hayes

Lt. R. I. Nolan

Robert Burns

W. P. Harnack

Ralph Nelsen

R. F. Flinn

J. T. Grissom

Harold Jaffe: "I've been classified as a pilot at the San Antonio classification center and I'm just rarin' to go. The Record brings me back some swell memories of the Labs."

Lieut. Col. Albert J. Engelberg is now stationed with the Air Service Command at the base in San Bernardino, California.

Gerard F. Hall has been transferred to the A.S.T.P. at the University of Illinois.

"I am in the Signal Corps attached to the Air Corps at Myrtle Beach, S. C., where I work on the * * * equipment on B-25's, B-26's and P-39's." Harold Georgens.

Hugh J. Glynn has moved up with his outfit to a Southwest Pacific Island. He was formerly stationed in Australia. "I see by the September Record that O'Shea has the situation under control over at the other side of the world."

Lieut. Robert I. Nolan is stationed at Fort Bliss, Texas.

Joseph W. Hoek of the Ordnance Department has a San Francisco overseas address.

F. R. Misiewicz is studying to become a Radio Technician at Texas Agricultural and Mechanical Naval Training School at College Station, Texas.

Robert Burns of the Army Air Corps, completing his training at Radio School, has been assigned to Morris Field, N. C.

Lieut. F. W. Whiteside is at Victorville Army Air Field in California.

Ralph Nelsen was a technical assistant with the wiring group 1 K section before he joined the Army. His present assignment is a course of study in New York City.

August Uhl, who has recently been on maneuvers in Virginia, hopes to be home on furlough this month.

Robert F. Flinn returned to the Laboratories on his first furlough since his induction. He is studying engineering at De Paul University, Chicago.

William P. Harnack is a student under the A.S.T.P. at Virginia Military Institute.

Joseph T. Grissom does electrical work on B-24 Liberators at Norfolk. After boot training he studied at Detroit and was stationed at Elizabeth City, North Carolina.

William Springer, after completing his boot training, visited friends at West Street. He is now in training at the Armed Guard School in Virginia.

Edward J. Yastremski, formerly of the Restaurant, is now an Army cook, first class.

"The very major part that the men of the Labs have played in the pioneer developments in electronics is obvious at a place like Harvard. It makes me proud to be associated with such a group." From Lieut. Donald R. Schoen, who is studying radio and electronics theory there.

L. Charles Brown has been sent to Fort Monmouth to take a pre-*** course.

"HERE I AM a thousand miles from home and they send me back to the Bell System. I'm going to school in the Illinois Bell Telephone Building in Chicago. Those girls back home have loads of competition," says EDWARD L. FISCHER of the Signal Corps.

JOSEPH WOLEK completed his boot training at Newport, Rhode Island, and was assigned to a Section Base on Staten Island.

"I AM stationed at the Norfolk Naval Hospital as a hospital corpsman where I am learning first aid, medicines and minor surgery," says WILLIAM A. BEATTY.

ALBERT MERLINO, who formerly worked in the Restaurant, returned to West Street for a visit while on leave. He is a cook aboard a battlewagon.

"I'M FINISHING up my basic training at Greensboro, North Carolina, and hope to be shipped to college soon. The pace here is so intense that we have little time to ourselves, but I'll answer all letters as quickly as possible. Many thanks to all for their kindnesses before I left." EUGENE FLANNERY.

HAROLD PHARES of the Army Air Forces writes: "Just received the November RECORD, and in the article on *Communication and Invasion* you picture the transmitter and receiver I use constantly in Radio School at Scott Field. My regards to Research Drafting and to the gang at Deal Laboratory."

FLORENCE LUTGEN visited the Labs during her December leave. She has been promoted to second class aerographer's mate.

JOHN F. MARTIN, aviation cadet, is at Peru, Indiana. "Now that I've finally started real naval flying I haven't so much time to myself as I had previously. My ground school marks have been good. I have passed both my A and B check flights and am now in the C, or acrobatic, stage."

DURING NOVEMBER FRANK R. HANLON visited the Mail Department where he formerly worked. At the present time his assignment is Dorr Field, Arcadia, Florida.

ENSIGN MARTIN P. HUGHES now has a San Francisco Fleet Post Office address.

DONALD L. VIEMEISTER is aboard a battleship but it is not known in which theater of war he is engaged.

J. M. BARSTOW and C. R. GRAY have left this country and are now traveling in a combat area as civilians.

FRANK A. CHIONCHIO writes, "I am studying at Columbia University. If I am successful I will receive a degree in electrical engineering and a commission as Ensign."

ROBERT H. MEUSER has been transferred from Fort Dix to Fort McClellan, Alabama.

"THIS SCHOOL has a fine reputation for training pilots," says ALFRED O. SCHMITZ, who was assigned to Darr Aero Tech at Albany, Georgia, in November.

"I HAVE BEEN stationed here at

WM. SPRINGER

E. J. YASTREMSKI

AUGUST UHL

J. W. WOLEK

W. A. BEATTY

ALBERT MERLINO

Swarthmore College since my enlistment in the Navy last July. In January I hope to receive my B.S. in Electrical Engineering. Then I'll be sent to Midshipmen's School and from there my assignment will be to M.I.T. for further study in electronics." HARRY A. BENNETT.

"I AM STILL with the Military Police at Greenville, Pennsylvania, seeing that the soldiers get their passes, guarding the camp gates, doing town duty and watching prisoners." From ALFRED T. STILLER.

WILLIAM B. RYDER, a Western Electric man formerly attached to the Laboratories, in recent months has been working in the field on the Electrical Director.

JAMES W. ERICSSON has a New York A.P.O. number and is serving with a signal repair company.

HALVAR S. ENGER, JR., formerly of the Laboratories, has been overseas since May.

DONALD VIEMEISTER J. M. BARSTOW

He landed in Casablanca with a troop-carrier squadron, has been at Oran and Tunis, and is now presumably in Sicily.

JOHN R. NELSON was a technical assistant in Department 1120 at Murray Hill. He now has an R T 2/c rating and is at a Naval Air Station in care of the New York Fleet Post Office.

LIEUT. ORVAL ALLISON is now at a New York A.P.O. address where he is serving with a signal service company.

IRENE BIER returned to West Street during her fifteen-day leave from the Pensacola Naval Air Station where she is a storekeeper third class.

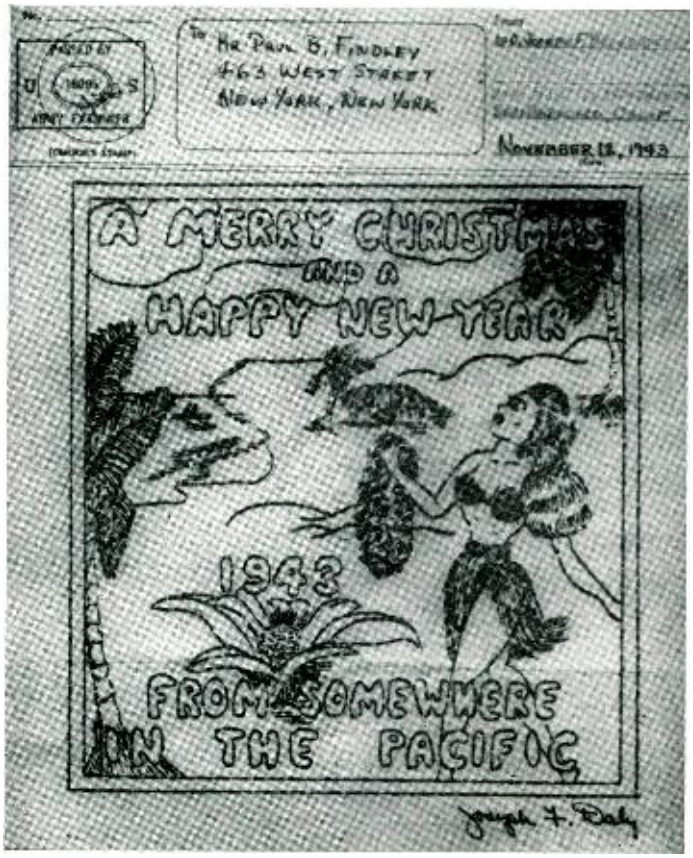
WALTER F. SMITH has been promoted to the rank of Lieutenant Colonel.

RICHARD C. WILLIAMS has been assigned to study at Virginia Polytechnic Institute.

"PLEASE remember me to the gang in Photostat. I am attending pre-flight school at San Antonio, Texas." ROBERT F. HEALY.

LIEUT. ROBERT C. NANCE has been on the move "with A.P.O. numbers changing with the moon," as he puts it. Attu was his first stop, the other missions have not been released for publication yet.

HAROLD C. BELL, aviation cadet, has been assigned to the Naval Air Station located in Bunker Hill, Indiana.



Appreciation for the RECORD *was shown by J. F. Daly in this Christmas greeting to the Editor by V-mail*

Ensign Frank Zylla studied at the War Training School during November. He is on the move again.

William H. Tappen has been assigned to the Aberdeen Proving Ground, Maryland.

John E. Sienko of the Seabees has been transferred from Davisville, R. I., to the Advanced Base Assembly and Training Unit, out at Long Beach, New York.

W. A. Reenstra and B. P. Ransom have completed a course at the Radio Matériel School and are now at a New York Fleet Post Office address.

H. S. Enger

C. R. Gray

Thomas Johnson has been assigned to a five months' course at Radio School in Hollidaysburg, Pennsylvania.

David Webster has been transferred from St. Petersburg, Florida, to a Fighter Bomber Squadron at Abilene, Texas.

Herbert E. Earl is at San Antonio taking classification tests.

R. L. Pritchard is studying at Massachusetts Institute of Technology under the Navy V-12 program.

W. B. Snow is stationed at Fort Trumbell, Connecticut.

"Camp Crowder is wonderful, but it's too far from New York and my wife," Martin E. Poulsen says. "This is a new unit preparing to train under combat conditions. I expect to be through soon and I'll get my first, and undoubtedly my last, furlough in the U.S.A. then."

Harold H. Hoffman of the Army Air Corps is in training at Miami.

W. J. Perry

Lt. T. G. Woods

F. G. Higbie of Whippany is stationed at the Parris Island Marine Depot.

First Lieut. George M. Richards is engaged in teaching new navigators combat tricks in a B-24 at the Mountain Home Air Base, Idaho. "I don't mind the work; in fact, I like it, but I want to get back into pilot training. My application has been sent through recently. Regards to all my friends at the Laboratories."

"I have been transferred to the A.S.T.P. training unit at Clemson College, South Carolina, where I am studying for an engineering degree," writes Patrick S. Bennett. "I have noticed quite a number of BTL men in this program."

Victor Silzer is attending "Forbidden Radio" School at Boca Raton Field.

"I am in Arizona with a group of Italian prisoners," William G. Pimpl writes. "I have traveled a long way since last I wrote. I spent 20 months guarding the West Coast and now I'm with this escort guard unit."

Edward H. Bueb's transfer took him to Warner Robins, Georgia, where he is in a * * * casual company.

Capt. F. B. Monell is attending school at Fort Monmouth.

Others from whom cards or letters have been received include:

H. C. Meier, J. L. Smith, J. D. Cohn, W. R. Schleicher, J. D. Cuyler, W. J. H. Thoele, J. W. Cunningham, W. V. Flushing, G. E. Fuchs, D. W. Graham, W. J. Bittman, J. A. Joyce, C. E. Klein, N. A. Popp, J. A. Ceonzo, K. C. Oestreicher, L. P. O'Donoghue, L. C. Munch.

Men of the Laboratories

Chosen by Lot

Born in Montana, James Roberts grew up and went to school in Prosser, Washington. After graduation from the State College at Pullman in 1936—where he specialized in

James Roberts

electrical communication—he worked for Puget Sound Power and Light for five years, then entered the Pacific Company as a technical man in the Oregon toll plant. There he was concerned with testing and lining up new carrier systems and clearing their trickier troubles. In 1942 he transferred to the Chief Engineer's staff to work on inductive coördination, and came to the Laboratories in June of last year. Here his work has been on transformers and reactance coils for high-voltage d-c supply to many of our special military devices.

Mr. and Mrs. Roberts live in Orange, where they have made a number of friends among the Laboratories crowd. For recreation they have been doing a bit of sightseeing; but when "the duration" is over, Mr. Roberts rather thinks he will be glad to trade the canyons of Manhattan for the snowy peaks of Oregon.

* * * * *

A hobby had a good deal to do with bringing Ed Seim from C & P Traffic to Apparatus Development to work on Navy projects. Since graduation from M.I.T. in 1927 he had been interested in radio design, equipping a home laboratory with a cathode ray oscilloscope, oscillators and other instruments. That seemed to make real the paper work which is the lot of the traffic man, who studies peg counts, makes out force-adjustment sheets or—if he is an engineer—estimates the cost of handling traffic over trunk groups of various sizes. Bill had quite a wide experience in Baltimore, and also on the Eastern Shore. He finds his new work fascinating because he is always building something new instead of getting his information entirely from tables and curves.

A confirmed Baltimorean, Bill rejoins his wife there every Saturday night; during the

Edward R. Seim

week he lives with two other Laboratories men in the Village. When he has any leisure he listens to his FM radio set and when he has any money left from buying War Bonds he buys another phonograph record.

* * * * *

NINETEEN-THIRTY was a big year for BILL LARNER—he graduated from Northwestern (B.S. in E.E.), he married, and he entered the Bell System in the Engineering Department of Illinois Bell. Two years later he transferred to Plant to the job of adapting "Bell System Practices"—an operating man's bible—to local needs. A big rate case absorbed him for a while; then he returned

WILLIAM T. LARNER

to Engineering to handle two big crossbar central-office jobs. Last April he came to the Laboratories to help develop test sets and other equipment for some of our confidential military projects.

The Larners and their eight-year-old son live in White Plains, a location which Bill thinks would be wonderful if he had the gas and the time to explore the beautiful country around it.

* * * * *

A WARTIME transfer to the Laboratories did not move EDWARD BORDEN across the continent, but it has changed his life nonethe-less, for his war work in the Laboratories leaves him far less leisure than when he was

EDWARD W. BORDEN

a transmission engineer for New Jersey Bell. For that job—engineering of special services such as radio and private lines—he trained at Penn State, graduating in 1930. Since last May he has been making transmission studies for the radio links that are so vital in our far-flung Pacific theater of operations. His little girl, now four-and-a-half, wonders why Daddy doesn't work so much at his woodworking; but, after a long day at West Street, Daddy is glad he has another hobby—playing phonograph records from his extensive collection of classics.

* * * * *

F. J. GIVEN was in Washington on November 3 at an Industry Advisory Committee in connection with mica. Later in November he was also in Washington, where, with A. J. CHRISTOPHER, he discussed paper condensers with the Bureau of Ships. Mr. Given attended an industry meeting on standardization of components which was held in Baltimore by the War Committee on Radio.

E. L. SCHWARTZ, A. G. GANZ and A. D. HASLEY attended a colloquium on November 3 and 4 at the M. I. T. Radiation Laboratory, where MR. GANZ gave a paper on specialized transformers for war projects.

A. D. YARBROUGH in Chicago conferred on manufacturing problems of retard coils.

Obituary

JULIA E. SCHERR of the General Accounting Department died on November 21. Miss Scherr had been a member of the Payroll Group since she entered the Western Electric Engineering Department in 1904. In 1920 she was promoted to Supervisor of Payroll Clerks, a position which she held during the formation of Bell Telephone Laboratories in 1924 and on until 1937. In that year she became Supervisor of Payroll Deductions. Two years later she was made Supervisor of the Payroll Controls Group with responsibility for all payroll payments and deductions made from salaries. This position Miss Scherr held until 1942, when because of her background and wide experience in payroll work she was assigned to audits and inspections of all operations to insure accuracy and conformance to prescribed routines. She was engaged in this work at the 14th Street and 8th Avenue location of the Laboratories at the time of her death.

JULIA E. SCHERR

Do You Fumble Furloughs?

To those who are so fortunate as to have your boys within visiting distance, a word on how to handle a furlough is given by the Writers' War Board of New York City. You may be hysterical or desperate as the precious hours whiz by, and unless you think it all out ahead of time you may let a pout or flippancy slip out to spoil your boy's visit irretrievably.

Daydreaming about it for so long, you have his furlough planned and subdivided for him within an inch of his life—things we'd like to do, things we should do, things we must do, and so on. Forget it! Think about him first! You won't manage to cover half the ground you've charted, anyway. Do not cling to your guest of honor, or poke and bump him, just for the reassurance that he's really there. When your come-and-go hero is on hand: *Don't block out his time for him; let him relax; and share him.*

Sometimes the one thing he wants to do more than anything else is sleep—away from buglers and drills and pup tents. His Commanding Officer has granted him this period to be "at ease," so don't run him ragged to show him off. He may want to lounge on all the soft chairs in the house and spend quiet, intimate hours among those who put—and keep—him at ease. Don't act as if you're being slighted if he mentions that he'd like to say hello to a few old pals on this visit, too. If you're his mother, don't feel that he owes it to you not to leave your side while home. And if you're his wife, don't give him a spiel about forsaking all others when he speaks of taking a few hours to visit his sister. He'll probably do as you wish, but feel badly about it when he gets back.

Without being generous or appreciating the demands of his other allegiances, his mother, brother, grandma, cousin, uncle, girl friend, sister-in-law all put in possessive bids for time and attention. How can he please them all? How will he avoid "hurting" some of them? Sometimes it's enough to make a boy dread a leave—instead of looking forward to it.

When the furlough ends, there's an art to seeing him off well. The main guide to conduct is the boy and the picture you want him to carry away with him. It's tough to feel he's leaving a cry-baby, a softie, a so-sorry-for-me-gal. Show him you can take it if he can—take this mess and all that goes with it. Let him see that you consider his furlough as a piece of good fortune that you both could share. Be sure his last glimpse of you is clear and heartening, so that he can frame it in his mind with the caption, "A Good Sport."

News Notes

J. A. WATTERS and P. F. JONES, of the Transmission Group, visited Albany and Syracuse to investigate K2 carrier test-pilot-supply equipment.

W. W. BROWN went to Chicago and to Milwaukee in connection with operators' chairs made of non-critical material.

K. G. COMPTON attended the conference on corrosion and packaging held at the General Electric Company, Schenectady, New York, on November 3.

C. H. SAMPLE made a visit to Wilmington to view corrosion specimens of the International Nickel Company and the Dow Chemical Company.

DURING THE month of November, K. K. DARROW spoke on *Entropy and Disorder at the Absolute Zero* before the New York State Section of the American Physical Society at Ithaca; he also attended the meeting of the American Physical Society at Evanston, Illinois. Dr. Darrow led the discussion at the Symposium *Organization, Direction, and Support of Research* at the meeting of the American Philosophical Society and he spoke on *Entropy* before the Basic Science Group of the A.I.E.E. at Newark.

A. B. CLARK, D. A. QUARLES, H. A. AFFEL and B. J. KINSBURG, with H. H. Nance of Long Lines, visited the Princeton repeater station on November 15 to inspect the test and repair equipment which has recently been placed in operation for repairing type L1 carrier system amplifiers.

P. G. UPPSTROM, with C. E. Schooley of Long Lines, visited the Princeton repeater station on November 24 to assist in tests in connection with the establishment of the coaxial amplifier repair center at that station.

ON NOVEMBER 28 at Princeton, B. DYSART observed tests made by Long Lines on a model of a new coaxial amplifier switching unit.

C. J. CHRISTENSEN and A. N. HOLDEN were at Hawthorne to discuss crystal development problems.

JOHN MILLS talked to the Philadelphia Chapter of the Robert Morris Associates at the Union League in Philadelphia, December 16, on the subject *Electronics for Bankers*.

LILLIAN MALINKOWSKI spent the two weeks of her vacation harvesting fruit at Balmville, N.Y. Miss Malinkowski is a draftswoman in the Equipment Development Department at the Graybar-Varick building.

LOIS BRUEGGEMAN, PHYLLIS NIMMO, JEAN GEDDIS and ROSEMARY WETTKOP of the Murray Hill Laboratories have successfully completed an evening course in home nursing which was sponsored by the Summit Red Cross Chapter.

TELEPHONE SERVICE was inaugurated between the United States and the Island of Curaçao in the Dutch West Indies on December 20 over a short-wave radio telephone channel linking stations of the A T and T Company with stations of the Netherlands Colonial Government. Curaçao, an important oil refinery center, is one of a group of six islands in the Caribbean and is about one thousand miles from Dutch Guiana.

TAKE CARE OF YOURSELF

Within the past few days a highly contagious grippe-like infection has become epidemic in this area. It is characterized by sudden onset of feverishness and chills, a feeling of weakness and exhaustion and pain in the back, legs and arms. Not infrequently it is accompanied by sore throat or abdominal discomfort.

If those symptoms occur while you are at work, report immediately to the Medical Department. If they occur while you are at home, remain there and call your physician.

Because of the danger of transmission to others it is unwise and unfair for you to continue at work should you become ill as described. "Fighting it off" not only delays your recovery, but exposes others also. It may increase absence from work not only for yourself, but for those with whom you come in contact.

Guard Against Infection

1. **By avoiding those who are already ill. Stay out of crowds as much as possible. Wash your hands frequently with soap and water.**
2. **By eating a variety of nourishing foods and drinking plenty of water.**
3. **By walking some part of the distance to and from work each day.**
4. **By making a real effort to get enough sleep and rest.**
5. **By promoting elimination. Use a mild cathartic if necessary.**
6. **By keeping warm and dry. Wear clothes that will protect you adequately when you go outdoors. Avoid drafts, sudden chilling when overheated, wet clothes and wet feet.**

If you become ill remember that the treatment which you give yourself during the first few days is most important.

Call your physician and while waiting for him go to bed, drink plenty of milk, fruit juice and water. A teaspoonful of salt or soda in a glassful of warm water may be used as a gargle for an inflamed throat.

Isolation of this type of illness is the only known means of preventing the spread of it to others.

C. E. MARTIN, M.D., *Medical Director*
BELL TELEPHONE LABORATORIES, INC.

December, 1943

Fighters All — These Laboratories

MARY DUNHAM received her B.A. from Barnard in 1934 and is now a Technical Assistant in the Equipment Development Department. Miss Dunham prepares instruction books and technical manuscripts for the Armed Forces to explain to them how Laboratories-developed equipment is put together and how it works. She is given the rough manuscript plus photographs and drawings, and it is up to her to prepare the text, to lay out the manual according to Army and Navy practice, and to expedite the project to meet the schedule set by them. This requires proficiency in English and a knowledge of proofreading, blueprint reading, drafting, photography and mathematics.

IN THE APPARATUS Development Department FRANCES LOUGHLIN helps the new devices on their way to the Armed Forces by drawing parts, such as coils, transformers and condensers, for the engineers who designed them. Frances was graduated from Richmond Hill High School and in 1941 entered the Laboratories as a messenger. She was promoted to clerk and, after an evening course in drafting at Manhattan College, became an apprentice draftswoman. Frances has just completed a one-year course in Bell System drawing practices, given for five hours a week during working hours. Bowling and collecting classics are her main interests after a day at the drafting board.

ERNA KNIES is one of the many girls in the Blueprint Department who receive hundreds of drawings a day from men and women in the drafting departments, from the engineers and from the files. She makes blueprints and also helps to trim and to mark them, work she has been doing for two and a half years since her graduation from Wadleigh High School in Manhattan. Erna is fully aware of the importance of her job and of the essential part she is playing in winning the war. With a brother in the Army and her fiancé with the Navy in the Mediterranean, she has first-hand accounts of how much Labs-developed equipment means to our forces and to the Allies.

Girls Keep Military Designs Moving

HERE IS ETHEL COSTA, formerly a professional dancer. She is shown building a transformer for a military device, a task that requires a knowledge of mathematics, blueprint reading and shop practice, all of which she learned in class during business hours in the Coil Department. While her dancing feet seldom twinkle behind the footlights, her hands have become skillful in the essential work she is doing. Shortly before coming to the Laboratories she appeared in the RKO theater near her home in the Bronx. Her working hours leave her little time for dancing. However, she manages to do enough routine to keep herself in trim, and occasionally she puts on a USO show.

JOSEPHINE MONTE is responsible for writing, placing and following through on orders submitted by engineers and draftsmen for blueprints of Army and Navy equipment that is now being developed. "Jo" has six years of service to her credit here at the Laboratories. A native of Queens, she always has been a resident of that section of New York, except for the year when she did genealogical work out in Salt Lake City. Her job brought her into contact with the Mormons, among whom she has made many friends. She is an active member of the Theater Guild in her church and of its entertainment committee. Horseback riding is her other after-hours activity.

ELSIE SMITH, shown ready to type dictation she has just taken from an engineer, is another of the many girls whose work at the Laboratories indirectly makes possible the completion of guns and military devices, such as the ones displayed on Bethune Street last month. Her promotion to stenographer is recent and Elsie is justly proud of it. In 1941 she was graduated from Girls High School in Brooklyn where she now lives and, prior to becoming a member of the Transcription Group last April, she had done similar work in a non-essential industry. A remaining trace of accent gives the clue to her birthplace and childhood home, Lynchburg, Virginia.

EDITH MARTINI

EDITH MARTINI, a recent bride, has been a member of the Laboratories since 1935 when she joined the Stenographic Department as a stenotypist. Last year she became secretary to a radio engineer whose work is of a confidential nature.

Her home is on Long Island, where she is living for the duration with her mother and a sister. Edith, a graduate of St. Agnes Academy at College Point, attended Jamaica Teachers Training College and Hunter College before entering business.

Singing is her greatest delight—she has belonged to many choral groups and sings alto in a church choir; she likes classical music and collects recordings of Andre Kostelanetz. Knitting is another of her accomplishments. In the past she has made things for herself and her home, but now she concentrates on knitting for her husband, who is in the Medical Corps. Because of overtime and her busy home life, Edith does not have time to read the Book-of-the-Month selections which she buys. However, she does keep abreast of the periodicals to which she subscribes, especially *The New Yorker*, which is her favorite because "Its wit is keen, and its topics timely." When the war is over she hopes to have the time to do all the reading she wants and to enjoy the sports in which she no longer has time to participate.

* * * * *

EUGENIA V. WYCKOFF, a Member of the Technical Staff, is engaged in performing the computational analysis for an important military project at the Laboratories. Her work requires considerable attention to fine detail. Knowing this, it is not surprising that her interest in finite quantities is a carry-over from one of her hobbies, collecting miniature curios.

From her trips to the national parks, New Orleans, the Gaspé Peninsula, to Europe and to Alaska, she has returned home with Lilliputian reproductions of natives, animals, totem poles and what-nots. Her miniatures from India and South America are the gifts of friends who traveled there. Recently she won first prize at an American Doll Show for a three-inch baby doll for which she had knit, on ordinary sewing needles, an outfit of booties, leggings, sweater and bonnet, using silk thread in place of yarn.

Miss Wyckoff was born in Kansas City, Missouri; grew up in Mountain Lakes, N. J.; and received her B.S. degree in

EUGENIA V. WYCKOFF

mathematics from New Jersey College for Women. In 1924 she joined the Development and Research Department of the A T & T where she was engaged in inductive-coördination studies and current-drain studies. As an engineering assistant in the PBX group, one of her jobs was to index several thousand drawings and "that" she says "was a telephone education in itself."

Since coming to the Laboratories in 1934 she has been a member of the group working on Probability Research and the Theory of Switching. For a number of years she was closely associated with E. C. MOLINA and contributed materially to the mathematical analysis of the crossbar system. Miss Wyckoff was responsible for applying to the crossbar the principles of the formula which he developed and for checking the accuracy of the mathematical analysis with empirical studies known as "throwdowns"—processes by means of which answers to probability questions are obtained experimentally. She was given charge of the group of girls who made extension studies of the problems encountered in the crossbar. Later she applied this method to the study of complex graded multiples for trunking. From the time she began to work on "throwdowns" until she transferred to war work, her friends referred to her as the "wrestling champion."

Besides her hobby of miniatures, Miss Wyckoff is a camera enthusiast and a member of an advanced course in photography. She also makes marionettes and gives shows, and she sings first soprano with the Branscombe Chorus—a tradition in her family. However, her proudest hobby is her canning. Her Village apartment is well stocked with over a hundred jars of preserves which she put up on week-ends in the country last summer. When the war is over, Miss Wyckoff hopes to travel again, and her first trip will be along the new military highway to Alaska.

White Collar Girls

"Here's a hint that may surprise you. Almost more important than clothes," says Hildegarde Fillmore, beauty lecturer and editor, in the November issue of *The Blue Bell*, "are three points which are sure to have a quick effect on your employer: Your white collar voice, your white collar smile, your white collar person. You can't go out and buy any of these attributes, you just have to acquire them.

"About your voice. It's a good bet that you ought to pitch it lower, for most girls have voices that are rather high pitched. As a beginning, listen to yourself and your friends. Can you understand every word clearly? Do you yourself speak shrilly when you are a little excited?

"Your way of smiling is the second magic key to success. It's truly amazing to me to

National Needlecraft Bureau

see how far a pleasant smile can take a girl in business—not a silly grin or a tiresome giggle, but an expression that says: 'I like my job, I enjoy working for you.' Your 'white collar smile' is worth cultivating for it makes you the kind of a person your boss likes to have around.

"Last, but definitely not least, is your 'white collar person,' which can be described as the simple matter of being meticulously neat about your clothes and your own personal daintiness. I've known competent women to stay in poor jobs because they had some sloppy personal habit . . . a messy way of fixing their hair or a slip that always showed, for example.

"If possible, keep a personal kit in your desk—a tiny sewing card for dress repairs; a small size deodorant; an extra powder puff; skin freshener; and cleansing tissues."

LABORATORIES GIRLS ENJOY BOWLING ON FRIDAY NIGHTS

A—Edith Aanansen, Captain of the Ringers in "B" League, getting her ball out of the locker

B—Ruth Fleischmann with her bowling ball ready, and Ethel Ott, standing. Anne Muller seated

C—Harriet Toomey, off to a good start

D—Annette Richter, Chairman of the Girls' Bowling League, sends her ball down the alley

E—Freida Schultz, Betty Angelo, Marie Greene, Muriel Miller keeping score, Nannette Meade, Captain of the Keys in "A" League, Frances Dour, Captain of the Relays in "A" League, and Annette Richter

Training Completed for Technical Assistants

On December 11, 1943, seventeen young women completed the first six-week full-time training course for technical assistants given by the Personnel Department under the supervision of R. C. FREMON.

The course covered instruction and practice in soldering and the use of hand tools, assembly and wiring of circuits, electricity, electrical measurements, engineering computation, blueprint reading, and the identification of materials and apparatus. Instruction was given by W. T. SERMEUS, R. H. GERTZ, J. A. SEIFERT, A. G. MARTENSON and E. H. O'BRIEN in the classrooms and laboratory on the 14th Floor of the Lawyers Trust Building at Fourteenth Street and Eighth Avenue.

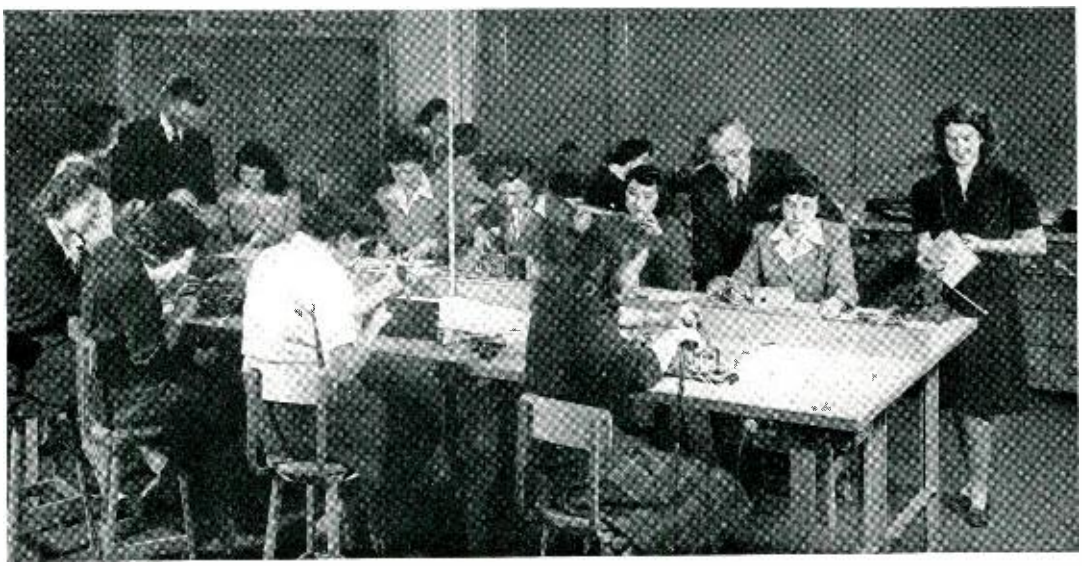
Thirteen of the group were new recruits who, after their introductory training, will go to work in various laboratories, most of them in the Systems Development Department; while the four others, who had already been working as technical assistants, have returned to their jobs with new skills.

Save Jars and Tops for 1944 Canning

The Department of Agriculture urges home canners to save all glass jars and tops suitable for re-use. Every re-usable jar and top will be needed to round out new supplies next summer. Every good jar and top used again saves scarce materials and manpower for other jobs in the war. Special attention is called to re-usable commercial jars and tops because these are not so familiar in home canning. Commercial jars are those in which housewives buy such products as coffee, pickles, peanut butter and jam.

Many are now standardized as to size and type of opening, so that a jar and its metal screw cap may be used for home canning by buying only a metal sealing disk with flowed-on rubber compound.

Thrifty homemakers are accustomed to save canning jars when home-canned foods are opened, and this year it is especially important to save all good equipment. Before storing, glass jars and glass disks should be scalded, and any jars in which food spoiled should be boiled in strong washing soda. Metal screw bands and screw caps



MEMBERS OF THE FIRST FULL-TIME SIX-WEEK COURSE FOR T. A.'S WITH SOME OF THE INSTRUCTORS

First row, left to right: Jean Kackenmester, Vivian Alling, Gloria Aronson, Virginia Kaas. Second row: Elizabeth Joa, Mr. Martenson, Norma Lerner, Marie D. Jennings, Jane Hady, Blanche Mesiboff, Mr. O'Brien, Jean Zales, Angela Scannell. Third row: Grace Golla, Margaret Kilroy, Ellen Meyer, Margaret Devlin (hidden)

More Girls Are Needed Urgently for Our Shop Training Program

Girls will receive full pay during the six-week training period

Minimum Qualifications

18 years of age

3 years of High School

They will learn to construct parts for vital military devices now being developed at the Laboratories

Please Tell Your Friends of This Need

Women's Employment Office
is located at
747 Washington Street

Open days: Monday through Saturday
10:00 A.M. to 4:00 P.M.

Open evenings: Monday and Tuesday
6:00 P.M. to 8:00 P.M.

should be stored clean. Wartime rubber jar rings are not re-usable, but are worth keeping for such jobs as sealing home-dried foods packaged in glass.

May Craig, Bea Messana and Charlotte Bortzfield worked on the Doll and Toy Committee which distributed gifts to fifty-three institutions and welfare agencies

1943 Doll and Toy Committee Report

The Doll and Toy Committee, under the chairmanship of MARY-ELLEN BAGLEY, extends its thanks to the members of the Laboratories for their generous support during the 1943 season. In response to the committee's appeal for toys and money to brighten the Christmas of needy children, the Laboratories New York locations contributed $1,367.00, an increase of $136.00 over 1942. Three thousand five hundred dolls and toys were distributed to fifty-three institutions and welfare agencies, an increase of 500 items over the previous year.

Pictures on this and on the following page give a glimpse of a few members of the committee with a part of the display which was erected in the Auditorium.

We See by the Papers, *that*

COL. C. H. GREENALL, formerly of Bell Telephone Laboratories, has become director of the laboratory at Frankford Arsenal, Philadelphia.—*Metal and Alloys, New York, N. Y., October,* 1943. (*Col. Greenall is on military leave of absence.*)

Super-accurate instruments, particularly one secret American device, promises the Nazi bombers the hottest reception they have ever had over Britain. Britain has devoted the efforts of 200 scientists to the task, and Bell Laboratory men from the United States and technicians from Canada have collaborated in the perfection of defenses which make them a far cry from those available during the blitz of 1940. — *Sun, Chicago, Ill., October* 25, 1943.

Another property sold is located on Monmouth Parkway, Shorelands, Monmouth Beach, on the South Shrewsbury River, containing 100 feet of bulkheaded river frontage. The seven-room colonial house was built approximately three years ago. MORRIS SHERWOOD, who is

associated with the Bell Laboratories at New York, is the new owner and will occupy it as his permanent residence.—*Press, Asbury Park, N. J., October* 25, 1943.

The appointment of RONALD MARTIN FOSTER, international authority in the field of applied mathematics, as head of the department of mathematics at Polytechnic Institute of Brooklyn, was announced by Dr. Harry S. Rogers, president of the Institute. Mr. Foster, who became a member of the staff of the American Telephone and Telegraph Company in 1917, recently resigned from the Bell Telephone Laboratories, which he joined in 1934, to undertake his work at the Polytechnic Institute. . . .

. . . Mr. Foster is known internationally for the Foster Reactance Theorem, one of the basic theorems for telegraph and radio network design. Another work which has made him world famous is the Campbell-Foster tables, used in advanced calculus in connection with the multiple problems of *** and fire control.—*New York Times, October* 31, 1943.

A cable-wrapping machine developed by Bell Telephone Laboratories* is proving itself a mighty handy device in these days of critical material shortages. . . . The cable-wrapping machine was designed originally for use when aerial cable needs to be taken down and put in the ground. This procedure permits linemen to bury a section of overhead cable without interruption of service.

One of the first places the machine proved its worth was in the bottom lands of the Wabash River near Clinton where Division 6 construction forces of the Long Lines Department used it in August to bury about two miles of the aerial Danville-Terre Haute A-cable which had been flooded out on several occasions.—*Daily Tribune, Peru, Indiana, November* 10, 1943.

*RECORD, *August*, 1943, *p.* 446.

Nellie Schofield, Constance Roke and Petrina Ribis, members of the 1943 *Doll and Toy Committee, with some of the toys displayed in the Auditorium*

RICHARD W. LINDSAY has been elected Operating Vice-President of The Mountain States Telephone and Telegraph Company. . . . He was appointed outside plant engineer in 1927. With the help of American Telephone and Telegraph and Bell Laboratories engineers he developed production and preservative treatment of lodgepole pine poles native to the Rocky Mountains. In 1933 he was appointed assistant chief engineer and was made chief engineer in 1934.—*Rocky Mt. News, Denver, Colorado, November* 17, 1943.

A talk and slides of Westchester quarries were presented by DR. ELIZABETH ARMSTRONG of Barnard College at a meeting of the literature department of the Women's Club of Eastchester. Dr. Armstrong is connected at present with the Bell Laboratories in Summit, N. J.—*Argus, Mount Vernon, N. Y., November* 23, 1943.

$[complexity]^n$—an editorial by John Mills

THE N-TH POWER of complexity is probably that of the orbits in which electrons swing around their nuclei. To divert an electron from its normal orbit requires a definite amount of work—a quantum, in the language of the physicist. When it returns, whether in one jump or by successive steps, there is radiation also in quanta. In each step the electron adopts one of the many orbits specifically possible to it—it won't accept any other. To this phenomenon there is more complexity than the most mathematically minded physicist or statistician of spectroscopic lines has yet been able to set down numerically.

Another orderly intricacy of nature is that of crystals—which look different, of course, when viewed x-raywise from different angles, but are static, fixed and simple as compared to radiating electrons.

The greatest man-made complexity is probably that of a machine-switching telephone system. Like an atom it has few different kinds of parts; but of each it may contain tens of thousands. And it probably has even more acceptable courses of action than does an electron which slips back into place among its planetary fellows around the nucleus of a heavy atom.

In a rapid but guided evolution these systems have adapted themselves to an increasing variety of situations. They respond to the dialed instructions of more and more people and these they execute over wider areas and at more distant points. They embody brains—several each in the larger systems—which can count, interpret and record and then initiate whole sequences of actions, after selecting the suitable means and verifying the possibilities. Even more, these brains have powers of self-analysis such that in the rare cases of their mental breakdown they can relinquish their jobs to fellow organisms and retire themselves from active service. As their cerebral processes fail, their sympathetic (autonomic) nervous systems act to free them from entangling connections with subscribers' lines and to signal a human attendant. When this doctor comes he finds they have recorded for him a diagnosis of the trouble.

Could one ask more intelligence in an electrical device? or expect a further evolution of its abilities? You and I might be tempted to answer "No." But that will never be the answer as long as there are telephone circuit designers.