BELL LABORATORIES RECORD

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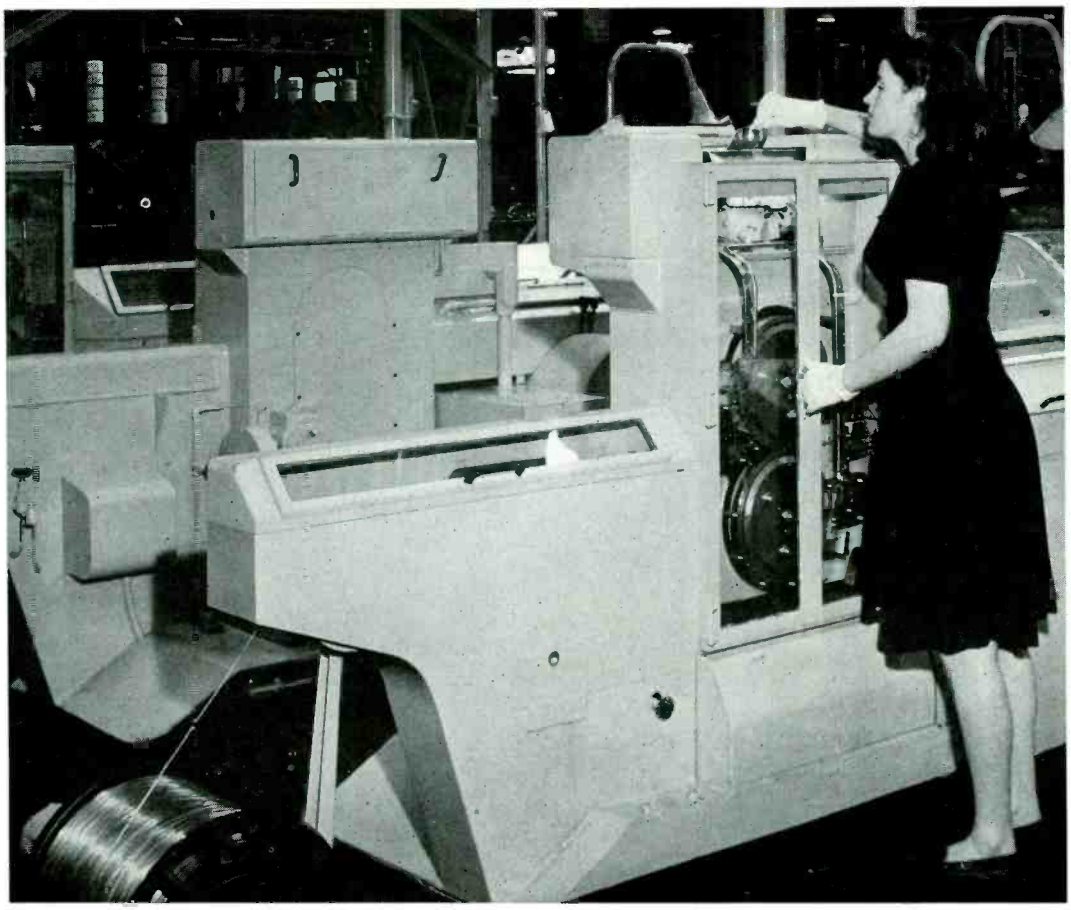
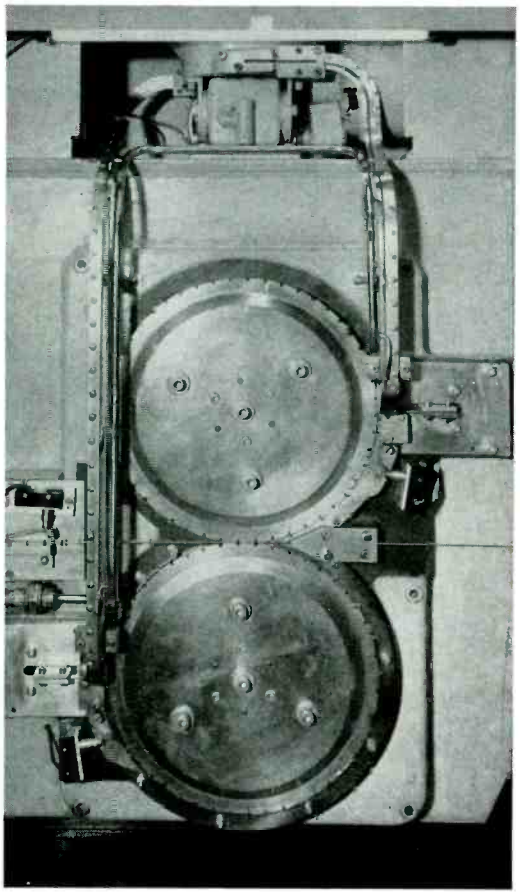


Polyethylene-Disc Insulators for Coaxials

By C. KREISHER
Outside Plant Development

IN EVERY mile of a six-unit coaxial cable there are about five hundred and seven thousand small insulating discs to keep the wire within it from contact with the cylindrical outer conductor. When manufacture of commercial coaxial cable was started in 1935, hard rubber was the best available material for these discs. A hard rubber with excellent mechanical qualities, reasonably low power factor and a dielectric constant that made it satisfactory up to moderately high frequencies was developed by the Laboratories for this purpose. It was recognized, however, that higher frequencies would be used eventually, with correspondingly greater shunt losses and a search for a better dielectric was made while the New York-Philadelphia* and Stevens Point-Minneapolis† coaxial cables were being

*RECORD, *June*, 1937, *p.* 325; †*January*, 1941, *p.* 138.



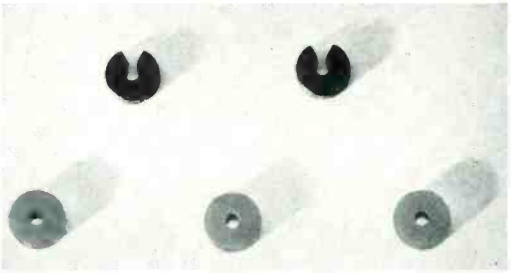


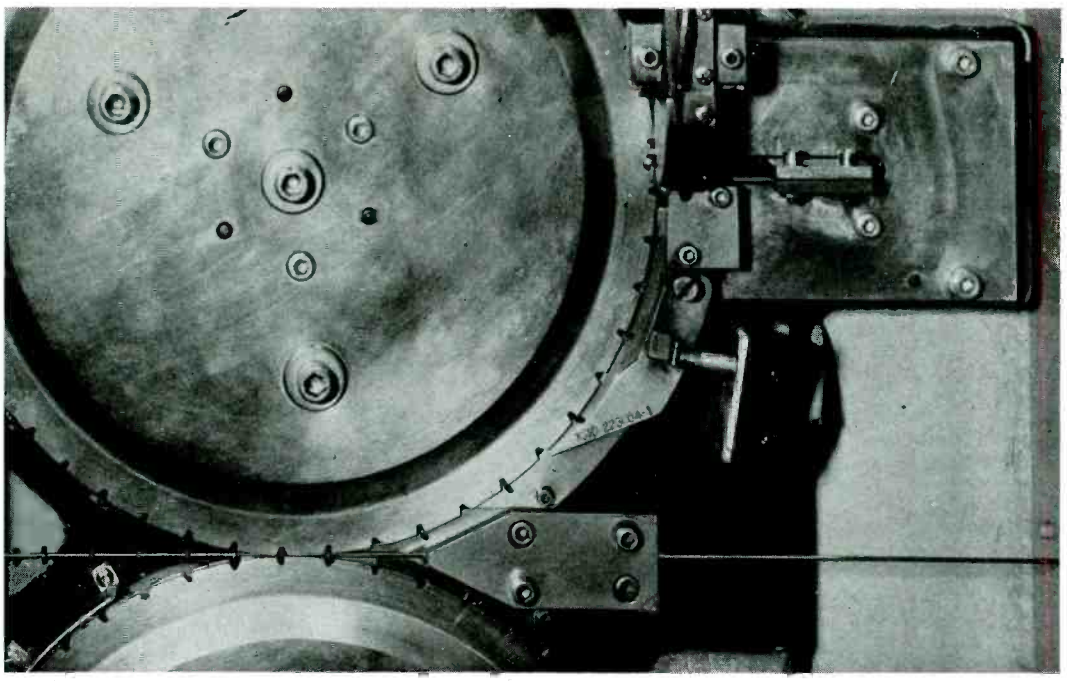
Fig. 1 (above)—Polyethylene insulators are punched as whole discs; those of hard rubber have a radial slot

Fig. 2 (left)—The polyethylene discs are then fed into slots in the periphery of two wheels between which the coaxial conductor passes

Fig. 3 (below)—The discs are slotted radially by knives just before they are forced onto the wire by the two wheels

manufactured with hard rubber insulation.

Prior to the manufacture of the Baltimore-Washington cable, polyethylene became available on an experimental basis and showed promising characteristics, including extremely low power factor. After investigation it was decided to make a commercial trial of this dielectric on a ten-mile section of the Baltimore-Washington cable.



Measurements on experimental coaxials with polyethylene-disc insulation showed excellent electrical characteristics. Its low power factor reduced the shunt losses to about one-twelfth of those with rubber discs and its dielectric constant is 2.3 compared with 3.1 for hard rubber. Polyethylene is very much softer than hard rubber, however, and it was feared that the center wire might force its way through the discs under tension at a bend in the cable, thus approaching or even making contact with the outer conductor. Lengths of coaxial with various weights on the center conductor were hung over drums to evaluate this tendency and the results were sufficiently favorable to warrant a field trial.

The Baltimore-Washington experimental installation with polyethylene-disc insulation was entirely successful but subsequent cables, prior to that between Terre Haute and St. Louis, have been insulated with

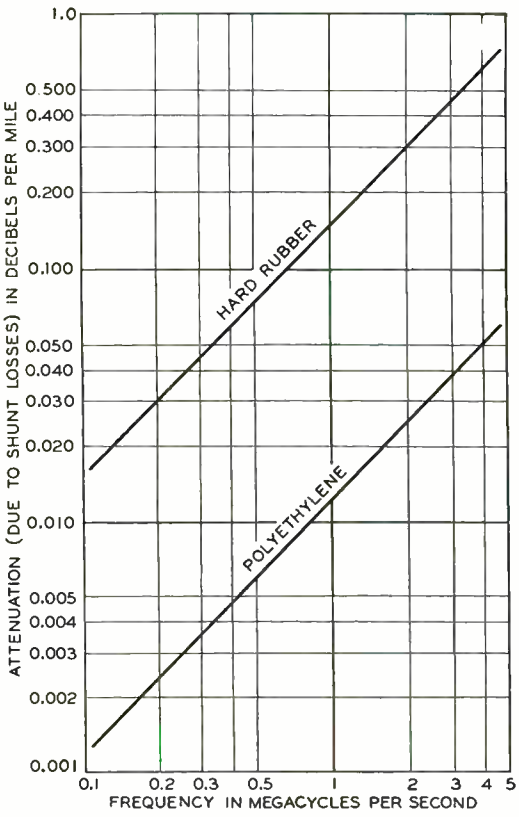


Fig. 4—Attenuation caused by shunt losses in polyethylene insulators is about one-twelfth of that in those made of hard rubber

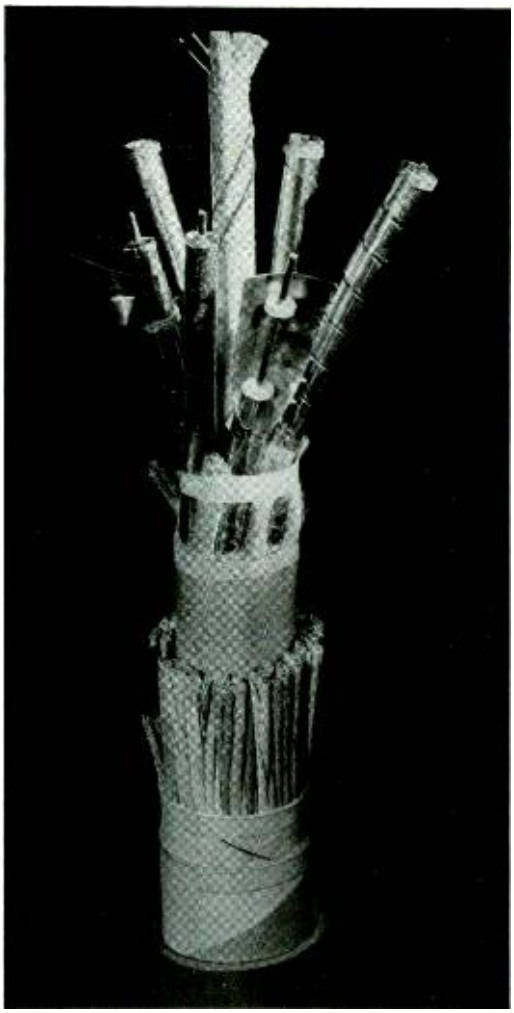


Fig. 5—Coaxial cable which uses polyethylene-disc insulators

hard rubber, principally because polyethylene was not available in the necessary quantities. In the meantime, supplies of polyethylene became available in this country under the impetus of war needs for high-grade insulation. When the Terre Haute-St. Louis cable was projected it was thus possible to specify polyethylene insulation, with assurance from the Baltimore-Washington installation that the material would be satisfactory. To allow time for the procurement of manufacturing equipment, a portion of the new cable was insulated with the remaining stock of hard rubber. It is particularly fortunate that all factors combine to make the use of polyethylene pos-

sible and desirable, since hard rubber would not be obtainable for this purpose at present.

Coaxials with polyethylene discs are very similar in construction to those insulated with hard rubber, but the method of applying the discs is different. A slot is punched in the hard rubber discs along a radius and these discs are snapped into place on the wire. This method did not hold the softer polyethylene discs firmly enough on the wire. To overcome this disadvantage, Western Electric Company engineers developed a means of punching discs from polyethylene sheet stock, with a center hole, shown in Figure 1, and pressing them against a knife which cuts a radial slit in each disc just before it is forced onto the wire, as shown in Figure 2. The difference between the two discs is illustrated in Figure 1.

Since polyethylene has a relatively low softening point it is necessary to keep the temperature of the cable down to a safe point while it is being sheathed with lead. This is accomplished by placing an air or water-cooled jacket around the cable core in the lead press and by passing the lead-covered cable through a bath of cold water as it leaves the press.

The cold flow tests indicated that it would be advantageous to use polyethylene discs which are slightly thicker than those of hard rubber and accordingly they are made 0.070 inch instead of 0.063 inch thick. This nearly nullifies the effect on capacitance of the lower dielectric constant. Polyethylene maintains high insulation resistance and dielectric strength.

Improvement in high-frequency attenuation obtained by using polyethylene discs is shown graphically in Figure 4. The percentage improvement in shunt attenuation is the same for the different frequencies. It is particularly fortunate that this improvement can be made at this time when a very large coaxial cable program is being undertaken by the Bell System.

THE AUTHOR: C. KREISHER joined the Western Electric Company at Hawthorne in 1921 soon after graduation, with the degree of B.S. in Electrical Engineering, from the State College of Washington. He was assigned to what has since become the Outside Plant Development Department of the Laboratories and has been associated with this work ever since. In 1932 he transferred to Point Breeze where he has been engaged principally in the design of cable for carrier and coaxial systems.

POST-WAR TELEPHONE CONSTRUCTION

The Bell System is mapping a two-billion-dollar post-war construction program to provide additional jobs on a large scale in the manufacture, installation and operation of telephone equipment, according to a statement by Vice-President Mark R. Sullivan of the American Telephone and Telegraph Company.

The record construction program is aimed at meeting the backed-up demand for telephones, adding new service and extending and improving services. It calls for an estimated expenditure of a billion dollars almost immediately and another billion dollars within a very few years. At the peak year it is likely that expenditures for construction will be as great as $650,000,000, which is 50 per cent higher than the highest year immediately preceding the war. Just when this peak will be reached depends upon how fast manpower, materials and manufacturing facilities become available.

Radar and the Bell System

The following excerpts are from a memorandum of information distributed by A T & T, marking the relaxation of security restrictions on radar for the first time since mid-1943.

IN IMPORTANCE of contribution to victory, radar ranks high in the top bracket of new instruments in this war. Development of radar to its present high level of effectiveness and production of radars in the large quantities required by the United Nations' land, sea and air forces has been an outstanding contribution of the United States to the Allied cause.

What Is Radar?

Radar can be defined broadly as a powerful electronic "eye" which uses high-frequency radio echoes to determine the presence and location of unseen objects in space. Specifically, a radar system does the following: (1) it generates high-frequency high-power electrical waves; (2) it projects these waves from an antenna, usually in a narrow beam; (3) it picks up the waves which reflect back from objects in its range; and (4) converts these into a pattern on a fluorescent screen.

Associated with these equipments are electrical circuits which accurately time the echoes from the unseen objects and thus measure the distance and give the exact position. Other circuits enable the reflector-like antenna to follow the enemy object automatically as it moves.

Types of Radars

Radar types are broadly classified in two categories: first, the "search" type which sweeps wide and distant areas to detect the approximate position of a target; and, second, the "fire control" type which uses a narrow beam to determine precisely the position of the target so that shells can be properly aimed or bombs released at the right instant.

The search operation can be compared to scanning the entire scene with the naked eye, while fire control radar is comparable to focusing a telescope to "draw a bead" on the target.

Both functions are combined in some radars which employ a lower frequency (longer wave) in searching for and detecting enemy objects, then switch to a higher frequency (shorter wave) to give exact information on the location of the object being sought.

During the headlong development of radar systems since Pearl Harbor, design changes have followed each other in rapid succession. Radar was a new weapon being adapted to global war by land, sea and air. Technological evolution, coupled with experience gained in combat use, constantly pointed the way to new uses and better designs. Altogether, Bell Telephone Laboratories developed and produced designs for about 100 types of radar.

Radars in Action

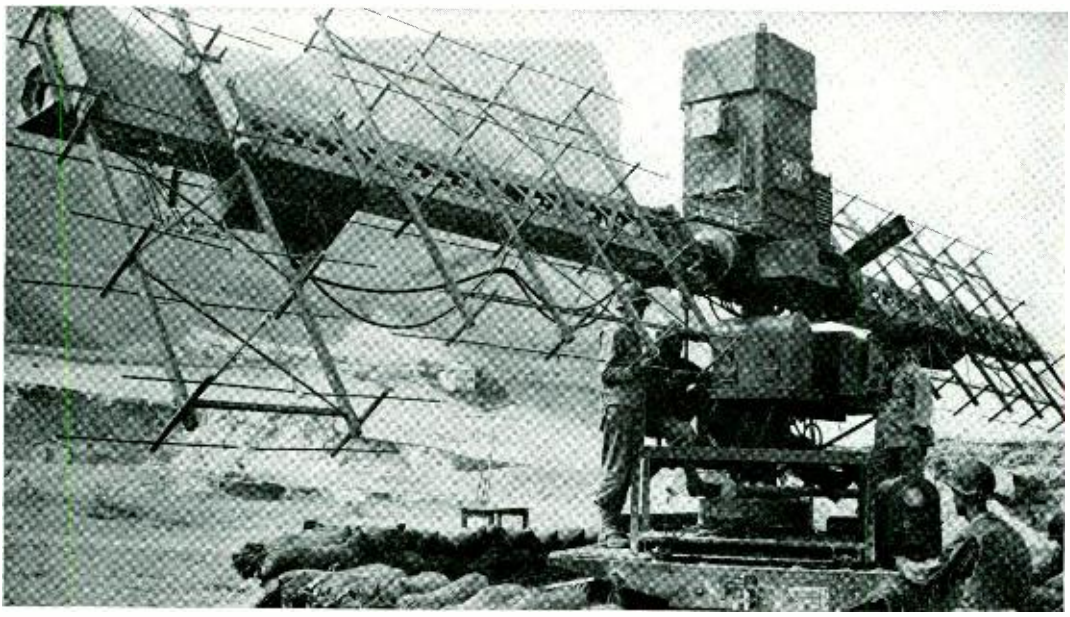
Radar is credited with an important rôle in enabling the Allies to stand off the aggressor nations during the early years of the war, and then turning the tide against them as we did. An early radar, of the long-range search type, enabled RAF airmen to save Britain from the Nazi air blitz. Without radar, the Allied armies could not have landed so successfully on the European continent, destroyed the Nazi armed might and coped so effectively with the deadly buzz-bombs. And in the vast spaces of the Pacific Ocean, shipboard and airborne radars have aided our sea and air arms in shattering Japanese ships and planes from Guadalcanal to Okinawa, and in blasting military targets on Nippon's home islands in fair weather and foul.

The effectiveness of radar can be illustrated by citing some of the battle accomplishments of a few of the radars developed by Bell Telephone Laboratories and manufactured by Western Electric.

On the Anzio Beachhead in Italy, our troops were taking a pounding from enemy night bombers. The older types of anti-aircraft radars had been effectively jammed by the Germans and thus were useless. Then a new fire control radar was brought in, and the morning after its first night of action, the ground was strewn with Nazi planes.

Again in the Battle of Savo Island, the *South Dakota* teamed with the U.S.S. *Washington* in sinking three Japanese cruisers and one or two battleships with the aid of another fire control radar made by the Bell System which supplied firing information to their main batteries. The action began at midnight and the big guns were pointed by this radar.

Japanese reaction to the amazing accuracy of U. S. Navy guns in pitch darkness and at great range is shown by this authenticated story. It was a night battle near



U. S. Signal Corps Photo

Against the rugged background of Southern Italy, a radar manufactured by Western Electric silently probed the sky for errant units of the Luftwaffe. Known to the War Department as an "early warning" radar, this equipment helped us to blunt the violence of the enemy's air attack at the very peak of its power early in the war

Soon the night attacks stopped. The Germans were losing too many planes to make it pay. In the Pacific, too, this radar saw plenty of action. It furnished anti-aircraft protection on Saipan, Leyte, Okinawa and on other islands, particularly during the early days of each invasion.

In the Battle of Santa Cruz Island, the fabulous Battleship X (*South Dakota*) was credited with bringing down 32 enemy planes in one engagement. It was the Navy's first anti-aircraft fire control radar designed and built for the Navy by the Bell System that pointed the guns in this blazing action.

Guadalcanal and our warships had sunk a number of enemy ships before they could open fire. A Japanese officer, fished out of the water, asked immediately to see what he called "your six-inch machine-gun with the electric eye pointer." He was referring to the guns carried by our cruisers, which had fired so fast that he thought they were huge machine-guns.

On the fourth night after our forces landed on Leyte, a five-boat U. S. submarine pack intercepted a 27-ship Japanese convoy some 40 miles off Manila Bay. It was at night, and fog added to the short visibility. With

the exclusive use of the surface search and torpedo control radar for submarines made by the Bell System, the U. S. subs sank 25 of these troop, cargo and tanker ships within four hours. The 26th was left in flames. A destroyer, escorting the convoy, escaped, for the American subs had no torpedoes left.

Reports of Western Electric field engineers in the China-Burma-India theater tell of notable success in the sea sweeps achieved by planes equipped with Bell System radars. One of these engineers, reporting at the time when most of the U. S. bombers were based some distance from the coast, said that the planes of his particular bomber group had sunk more than 100,000 tons of enemy shipping in slightly over a month. On several occasions, one bomber got two ships in one night.

Credit Shared by Many

Like a tree, radar has grown from many roots. Long before the war, A. H. Taylor, Leo C. Young and their associates in the Naval Research Laboratory and Colonel (now Major General) Colton were experimenting with an early form of the radar principle. In Great Britain Sir Robert Watson Watt and his associates were experimenting along similar lines. Thus, radar has been developed through years of research and experiment, chiefly in the United States and Great Britain. Credit must be shared by many of the foremost scientists of the two nations, both civil and military.

Radar is a type of communications equipment. At all stages of its development the techniques of the communication art have been drawn upon by the scientists and engineers who have developed radar. It is natural, therefore, that Bell Laboratories should have been giving attention to this problem before the outbreak of the war in Europe in 1939. Since that time the Laboratories have worked closely with the National Defense Research Committee and its Radiation Laboratory, with Army and Navy specialists and with scientists of Great Britain. Reciprocal disclosures have been made by American and British scientists. In fact, the wartime radar program has furnished an outstanding example of coöperation, both internationally and between private and government enterprise in this country.

Scope of the Bell System's Contribution

This country has made the largest contribution in research, development and production of radars for use in every phase of modern warfare. To such wartime leadership the Bell System's extensive research and manufacturing organizations, Bell Telephone Laboratories and the Western Electric Company, made outstanding contributions. Together they have formed the number one industrial team in radar technology and manufacture. Bell Telephone Laboratories has had a much larger group of scientists and engineers than any other industrial organization working throughout the war in advancing radar science and in designing new radars for the Army and Navy. Not only have more radar designs come from these Laboratories than from any other industrial laboratory, but also a much larger volume of completely new and essential components has been developed here. The Western Electric Company, with the aid of hundreds of sub-contractors to which it supplied specifications and every detail of manufacturing procedure, has supplied more radars—all of them of Bell Laboratories design—than any other manufacturer. In short, the research and manufacturing branches of the Bell System have together developed and supplied the Government radars and their components in volume greater than any other supplier.

Bell Laboratories and Western have furnished radars for the Army, Navy and Marine Corps in all fields of application. They have had substantially full responsibility for development and production of radars for Navy ship gunfire control for submarines, and for Air Force planes, both bombers and fighters.

All large guns of the U. S. Navy are pointed by radars designed by Bell Laboratories and made by Western Electric. The Navy calls one of these "the best radar equipment yet installed on shipboard."

Radars designed by Bell Laboratories and made by Western are standard for the B-29's in the Pacific for navigation, target location and high altitude bombing. The Bell System team has also developed and produced the low altitude radar bombsights for attacks against enemy shipping that have had largest use by the Army and Navy.

Bell Laboratories pioneered in research on electrical computing portions of the radar bombsight and has been responsible for the development of most of those that have had large combat use. With the Government-established Radiation Laboratories of the National Defense Research Committee, the Laboratories have shared almost the entire research and development programs of the bombing radars.

Much of the bombing problem is made automatic by a new type of computer developed by Bell Laboratories. Most of the necessary information can be "set in" the equipment before the target is reached. Except for one simple operation, the machine does the "thinking and acting" under fire over the target. The computer steers the plane and automatically drops the bombs at the release point. Still more accurate radar bombsight systems are in process of development.

Western Electric's production record throws further light on the Bell System's contributions to the radar program: Up to June 30, 1945, Western Electric had supplied the Government with 52,930 radar systems of 64 different types, valued at more than $800,000,000. The company's yearly output reached a record high of 22,000 radars in 1944. These units, together with components, spare parts and test equipment, were furnished at a value of $340,000,000—an amount equal to almost a million dollars for each day in the year. This record has been greatly exceeded during the first six months of 1945 when Western Electric turned out 19,800 radars.

Something of the urgency and speed of radar development and research can be seen in the fact that Bell Laboratories in 1944 was at work on 81 different types of radar systems, and that Western Electric produced 44 different types, of which 20 were new in production in that year. These figures mean a great deal more when the nature of the undertaking is considered. Like any highly complex electronic device, radar is an intricate structure of wires, vacuum tubes, condensers, switches, wave guides and hundreds of other components.

Each type of radar is designed and built for a specific purpose. One radar unit may have 374 vacuum tubes, another only 80. (By comparison, a moderate-sized, console model radio for home use may have eight tubes.) A land-based radar may tip the scales at 70,000 pounds, while smaller, compact units built for fighter planes weigh only about as much as the pilot. A radar unit may cost $87,000 or $6,000. It may require 40,000 labor-hours to complete, or only about one-tenth as long, depending upon its size and the purpose it is to serve.

School for War Training

The School for War Training, conducted by Bell Telephone Laboratories in New York City, has instructed some 4,000 officers and men of the Army and Navy. In the aggregate they studied more than 100 courses in military electronics, chiefly radar. After graduation, most of the trainees became responsible for the training of additional men, either as instructors or as officers in command of maintenance units. Many went directly from the Laboratories' school to critical locations. The Navy now requires that every major combat vessel shall carry at least one graduate of the Bell Laboratories' course on radar fire control (gun pointing) equipment.

Radar Test Sets

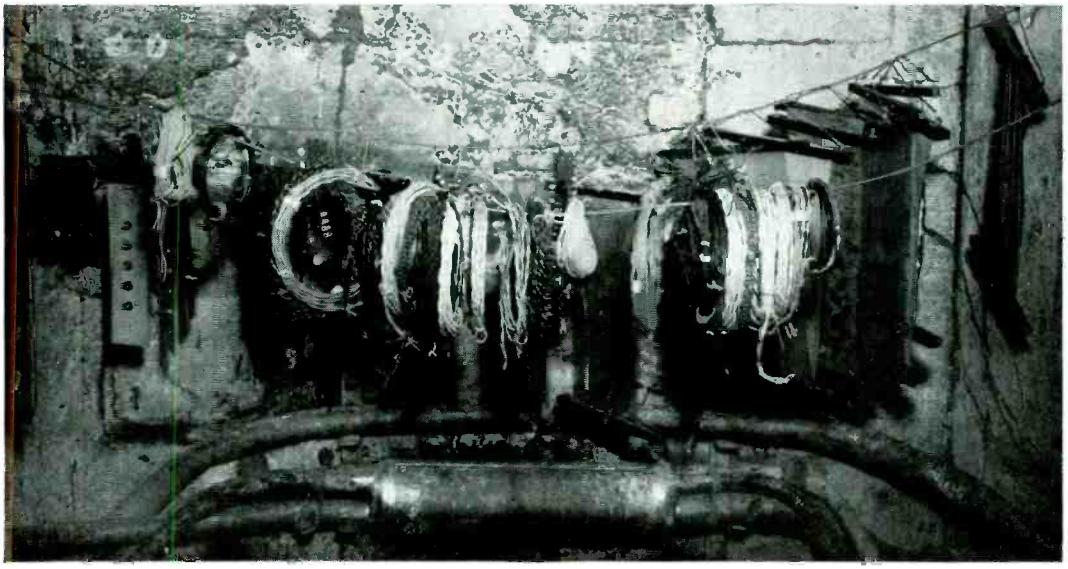
Precision test equipment is vitally important to the proper functioning of radar units. If no objects are perceived on the radar screen, it may mean one of two things: (1) that no objects are within the field of "vision," or (2) that the radar is not working. Only a test can tell. Even if one or more objects appear on the screen, only a test can determine whether a better adjustment would make it possible to detect more distant objects. Facilities for testing the equipment regularly are obviously important in keeping it working at best efficiency.

Long before Pearl Harbor, Bell Laboratories undertook to provide test equipment for a few early radars. Commitments grew until the Laboratories assumed a major rôle in the entire development program and Western Electric a major share of the manufacturing load. The Laboratories developed more than 100 different test sets for various purposes. In 1944, Western Electric made more than 40,000 units of 68 types.

JUNGLE LABORATORY

WAY down in the jungles of Panama is a little-known outpost of Bell Telephone Laboratories which has been making a vital contribution to the war effort. Protected only by an open hut, samples of apparatus and materials, shown below, demonstrate their powers to stand up under the ravages of humidity, fungus and corrosion to which they are exposed in tropical warfare.

Back in the States comparable samples are receiving correlated tests under artificial conditions of high humidity and temperature designed to simulate tropical conditions. However, an indoor test for outdoor conditions, while highly informative, is rarely a perfect replica of a test under field conditions because there is always the risk of an unknown factor which does not appear in the



laboratory test. For instance, a material which readily develops fungus growth when sealed in a bottle at high humidity may show no evidence of such growth in the tropics where the humidity is tempered by air currents. Other significant factors are the height of the samples above the floor of the jungle as well as the amount of sunlight they receive.

So when experience with equipment in the tropics created an urgent demand for exact information, the Laboratories literally set out to calibrate the jungle. In coöperation with the Signal Corps, K. G. Compton and J. M. Wilson arranged for a test to be set up in the nearest convenient spot of typical tropics—the Isthmus of Panama—and C. F. Fordham went down there with the samples.

The samples broadly represented insulating and other organic materials as well as apparatus parts used in electronic equipment in the tropics: molded insulation, sleeving, laminated plastics, unfinished and varnished fabrics, films and sheets of synthetics, laminated wood fabricated with different adhesives and various gasketing materials. There were insulated wire samples in the form of radio hookup and other telephone wires having different outer braids and primary insulation as well as small retardation coils using fine wire. A duplicate set of samples was treated by spraying with a varnish containing a fungicide.

After eleven months' exposure each set of samples was wrapped in a moisture-proof film, packed in a hermetically sealed can and flown to New York for examination while still moist from their jungle sojourn. The resulting information has been a great help in correlating the effects of actual tropical conditions with the results of accelerated laboratory tests.

Mr. Compton has this to say: "While in the Panama, I joined with Army officials in a systematic search for fungus growth in communications and electronic equipment. It took three weeks to discover a bona-fide case, although, in the meantime, one of our party developed a fungus infection in an insect bite on his leg. Even in the tropics fungus appears on equipment less frequently than many suppose. Moisture remains the No. 1 enemy of equipment in the tropics. Fungus which is universal in its latent state comes to life only under favorable conditions of moisture, heat and food supply. Such encouraging conditions are likely to occur in an air-tight packing box in the hold of a ship. However, given the proper environment, fungus will sprout and prosper just as well in your summer cottage as in the tropics."

A Recording Camera for Testing Electrical Gun Directors

By J. H. WADDELL
Switching Apparatus Development

IN THE Bell System, the chief use for recording cameras has been to make periodic records of the readings of message registers. Besides permitting a large number of registers to be recorded in a very short time, this method provides a permanent and necessarily correct record of the readings for billing purposes which is available for checking at any time. A camera developed for this purpose some years ago has already been described in the RECORD.* With the development of the electrical gun director,† it became necessary, both for testing during development and manufacture, and as a part of routine operation, to record the readings of a number of moving dials simultaneously and at very short intervals. Existing recording cameras were not suitable for a number of reasons, and so a new arrangement had to be devised to do the job.

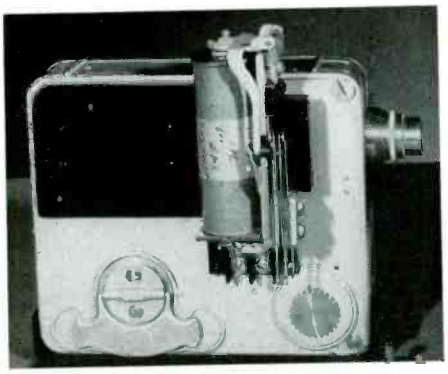


Fig. 1—Side view of camera showing relay cover removed

A study was made of cameras available in the market to see which could be adapted to our uses with the least time and effort. A 16-mm camera was wanted that would take still pictures with one motion of the exposure lever and motion pictures with another, and the construc

*RECORD, April, 1937, p. 257
†RECORD, Dec., 1943, p. 157

tion should be such that an extension arm could readily be installed to permit the lever to be operated by a relay. Only one suitable camera was found. Fortunately, it required only a small force to operate the lever in either direction, and it was of the magazine loading type that permitted either a short length of film to be removed for immediate developing or the entire magazine to be removed for processing at one time.

This camera, with the addition of a 223-type step-by-step relay to operate it, and a few other minor modifications, served as the basic recording unit. It is shown in the photograph at the head of this article with the film magazine being inserted, and in Figure 1 from the operating side with the relay cover off. To secure adequate operating force from the relay, new windings had to be designed to give a pull of 300 grams, and a number of such coils were provided so that any d-c operating voltage from 6 to 300 could be used. The camera is spring driven and governor controlled; the winding key for the spring is evident at the lower left of Figure 1. The magazine holds 50 ft. of 16-mm film, and either 25 ft. of motion pictures or 1,000 single pictures may be taken with one

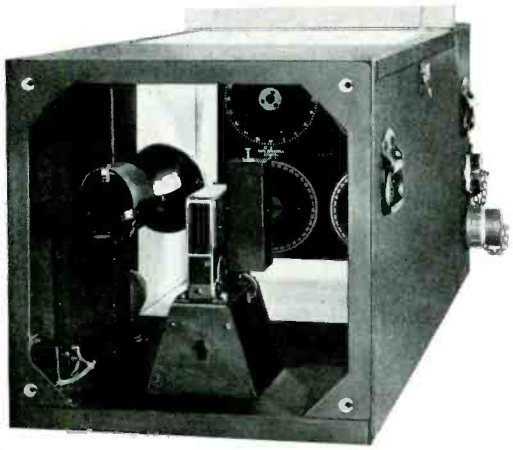


Fig. 2—The basic camera mounted in a light-tight box with the dials and an Edgerton flashing lamp

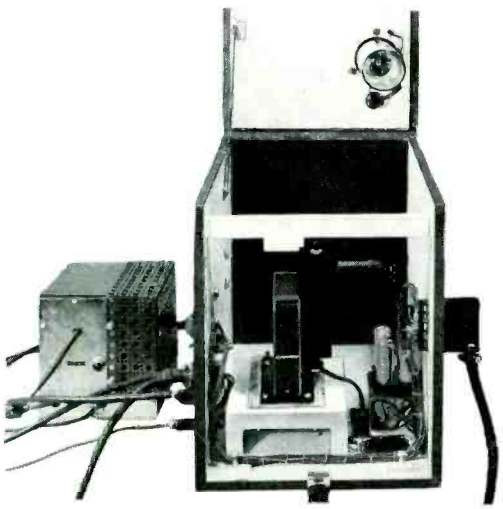


Fig. 3—Unit for photographing test dial used in conjunction with Figure 4

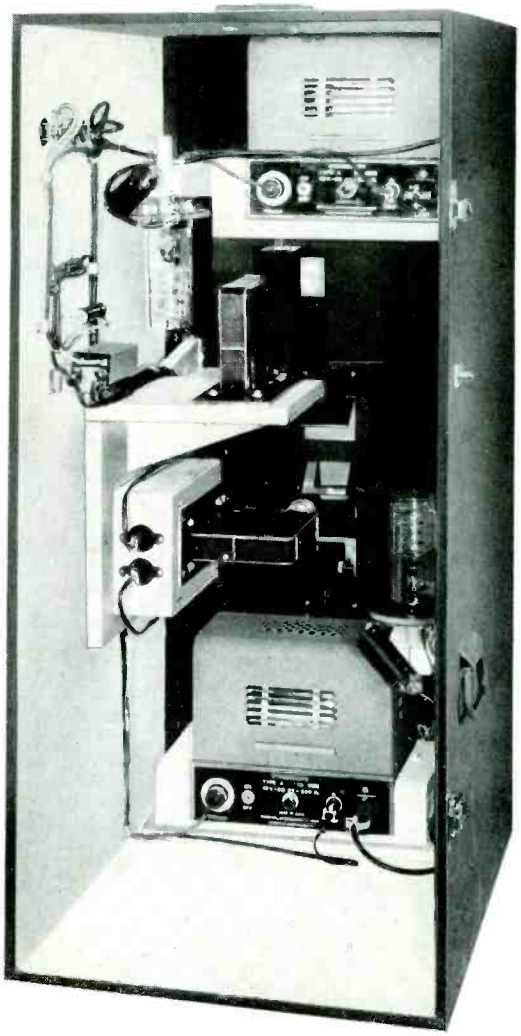


Fig. 4—An assembly of two cameras and flashing lamps used for photographing three dials

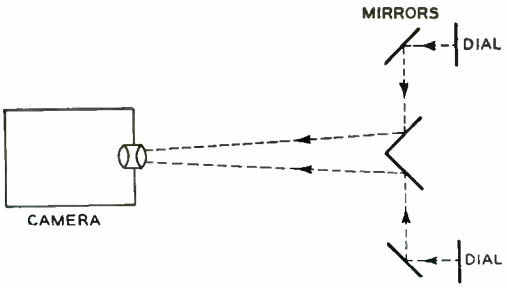


Fig. 5—Mirrors for lower camera

winding of the motor. By winding the camera during the run, however, the entire 50 ft. of film may be taken either as motion pictures or as 2,000 single pictures.

The lens supplied with the camera is of 1-in. focal length, but a lens of 17-mm focal length is employed in some applications to secure a wider angle of vision and greater depth of focus. The shutter was also modified to reduce the exposure time to 0.005 second. Since the shutter was of the barrel type, the exposure time could readily be shortened from the original 0.025 to 0.005 second by narrowing the slot.

In the first model of the camera for use with the director, incandescent lamps and reflectors were used to provide the illumination. There was found to be a delay of about an eightieth of a second between the operating impulse and the taking of the picture, while it was desirable to have this interval only one or two milli-seconds if possible. This was achieved by removing the shutter entirely and substituting an Edgerton flashing lamp for the incandescent bulbs. At the same time a light-tight box was used to house the camera and the dials as shown in Figure 2. With this arrangement, the control pulse flashes the lamp to take the picture and then the film is moved to be ready for the next exposure.

This basic unit has been used in a number of different assemblies for photographing dials associated with the director and for other applications. To correlate the computer and the test equipment, two temporary set-ups were employed using flashing lamps. One, shown in Figure 4, was clamped to the side of the computer to photograph the dials, while the other, shown in Figure 3,

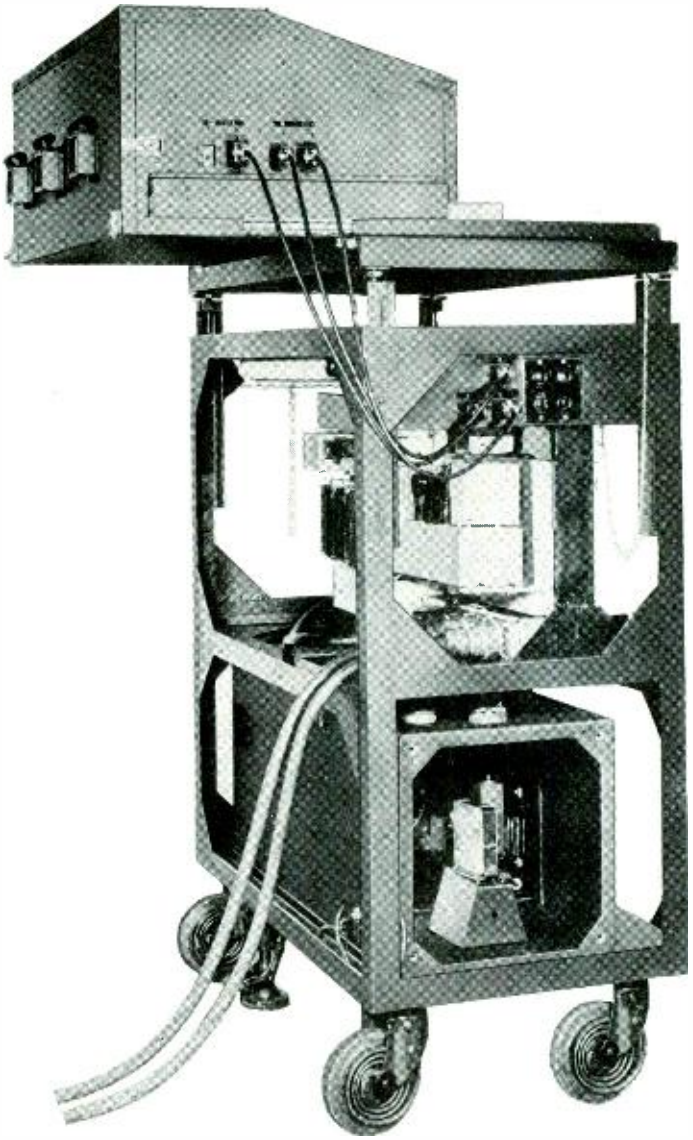


Fig. 6—A later two-unit arrangement for recording computer dials and data recorder

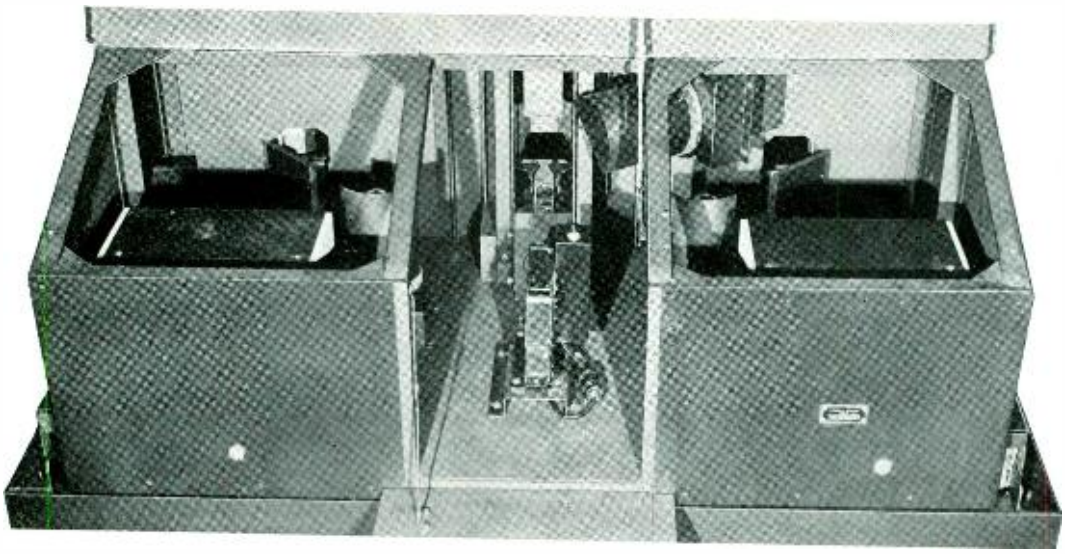


Fig. 7—Upper unit of Figure 6 with cover removed

was used to photograph the dial on the test equipment simultaneously. The former unit used two cameras to photograph three dials; one camera photographed one dial and at the same time the other photographed two.

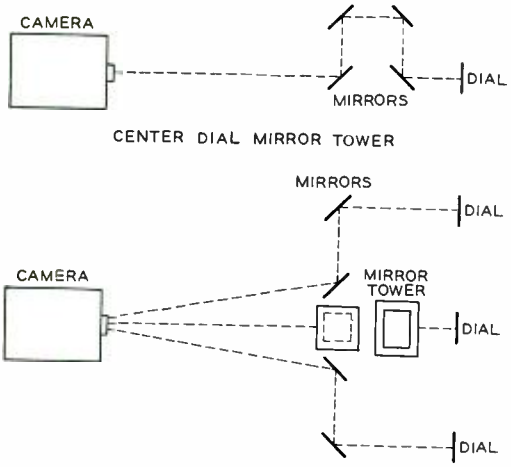


Fig. 8—Mirror system used with Figure 7

These latter two dials were spaced some distance apart, and to bring them side by side on the 16-mm film, a system of mirrors was employed as shown in Figure 5. Arrangements of this type were furnished for use in the Laboratories, at Hawthorne, and in England.

For a later computer development, the arrangement shown in Figure 6 was used for photographing computer dials and data recorder, simultaneously. The data recorder unit is mounted in a lower part of the framework with the test equipment in the upper compartment, while the dial photographing unit is on top and arranged to be slid out and clamped to the computer. This upper unit with cover lifted is shown in Figure 7. The two outer dials are separated from the middle one by 13½ inches, and to bring them within the angular vision of the camera, the mirror system shown in Figure 8 was employed. Two mirrors each were used

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THE AUTHOR: JOHN H. WADDELL joined Bell Telephone Laboratories in 1929 after having been with the duPont Film Manufacturing Corporation. He had studied chemistry at Pennsylvania State College, and during the period of our active work in sound pictures, he worked on the physics and chemistry of film developing systems in the sound picture laboratory. Since that time he has been engaged in photographic and optical engineering work, chiefly in designing cameras of both the recording and slow-motion-picture type, and in developing photographic techniques for special applications in the Bell System and Armed Forces.

Kjeldsen-Hawthorne

to bring the outer dials into the field of the lens as shown in the lower sketch. Then to provide the same distance from dial to lens for the central dial, the system of mirrors shown in the upper sketch was used. Other applications of the camera have been made for photographing seven dials of computing equipment simultaneously.

Another application transformed the basic unit into a two-eyed camera to photograph a moving target at a distance and a meter indication. This arrangement is shown in Figure 9. The moving target is photographed with a 21-cm lens to obtain larger magnification, while the meter is photographed through a 35-mm lens and a right angle prism. Figure 10 shows the arrangement

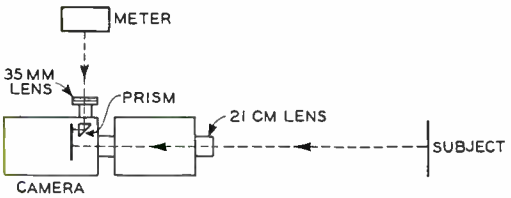


Fig. 10—Diagrammatic arrangement of Fig. 9

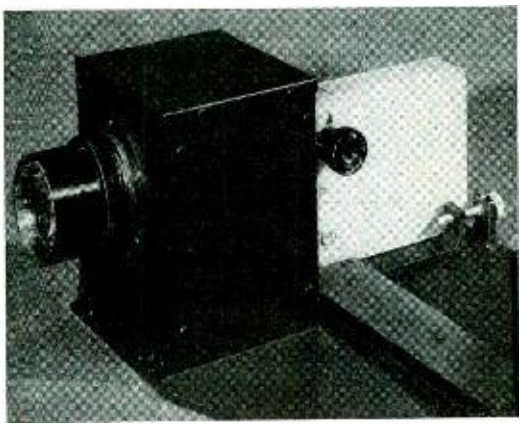
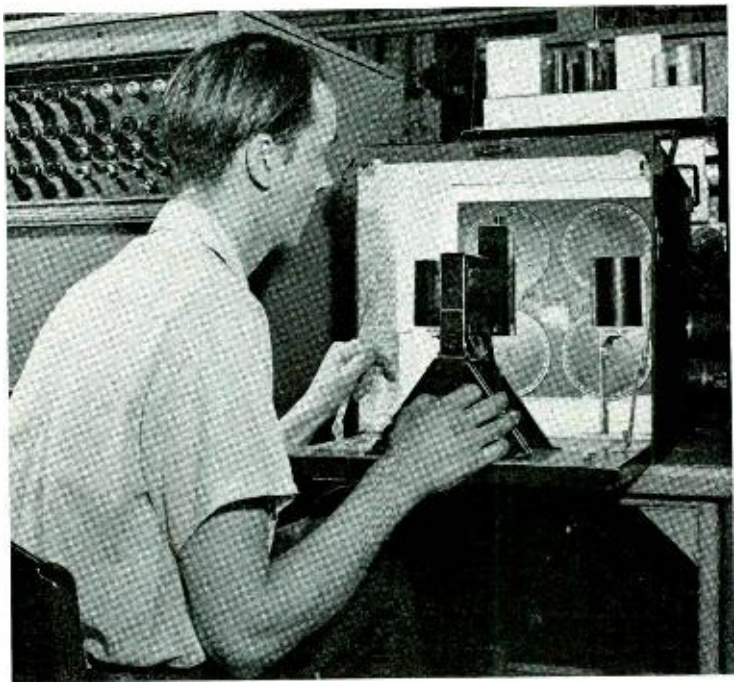


Fig. 9—A two-eyed camera arrangement of the basic unit

graphically. The prism is mounted so that the image of the meter appears in one corner of the 16-mm film while the target occupies the greater part of the frame.

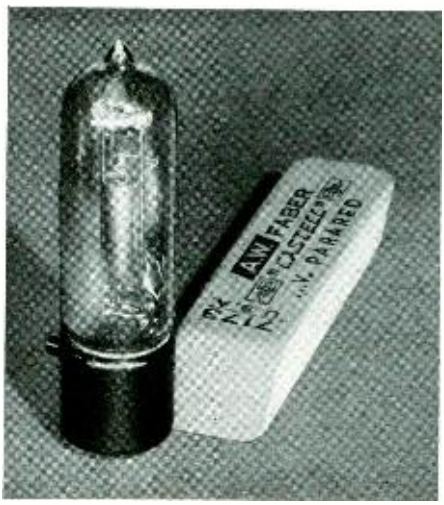
Other uses of the new recording camera have been for photographing cathode-ray oscilloscope traces, for studying the elasticity of synthetic rubber, and for checking tracking operations.



One of the recording cameras in use at the Hawthorne plant of the Western Electric Company for testing the M-9 Gun Data Computer

Historic Firsts: The Peanut Tube

IN READING of developments and inventions made many years ago, it is often hard to understand why there was any great difficulty either in foreseeing the needs or producing the apparatus. Advances made in those early years have been part of the art for so long a time that they are accepted as naturally as are the letters of the alphabet. A case in point is the peanut tube. It would now be classed as of simple construction with no novel features, and its size, although small, is by no means outstanding. In 1918, however, over a quarter of a century of intensive development work on vacuum tubes that is now part of our normal practice was unknown and unforeseeable, and techniques now long available had not then been thought of.



During World War I, radio communication, which contributes essentially to the success of our present operations, was new, and its enormous possibilities were almost entirely unexplored. On ships and airplanes, radio was proving indispensable, and the Signal Corps badly wanted portable sets for use at advance positions to give communication with bases and the major bodies of troops. For such a purpose, the radio sets had to be compact and light, the operating battery had to be small, and above all, the tubes had to be strong enough to withstand the rough usage they would be subjected to. A small, strong tube that would operate on a single dry cell was desired, but the smallest existing tube required a six-volt battery for its operation, and although it was small by ordinary standards, it was large compared with what was wanted for front-line service.

Probably one of the most difficult problems to be solved in producing a small tube was presented by the filament. In such a tube, the filament is necessarily short, and since the current drain on the battery must be small, a very fine wire was needed to secure sufficient resistance. Since the surface area of the filament varies as the diameter, the emission from a plain metal filament of the required length would be insufficient to meet the requirements. An oxide coating was required to give the needed emission, but the existing coating techniques proved inadequate for the hair-like filament that had to be used. By patience and ingenuity, however, all difficulties were eventually overcome, and by the summer of 1918, H. W. Weinhart had produced a tube a little over 2 inches high and some five-eighths of an inch in diameter, that, operating on a single dry cell, drew only 0.2 of an ampere. Someone picked it up and exclaimed: "It looks like a peanut." From the aptness of this simile, it has been called a peanut tube ever since, although it was coded the N-Type tube during the development, and became the 215-A for manufacturing purposes. A patent was applied for in July, 1919, and Weinhart was granted Patent 1,550,768 in 1925.

Armistice Day came too soon for the new tube to get into battle service, but it has been in peacetime service ever since. It was used in large quantities for many years in radio receivers manufactured by Northern Electric, and it has been used by Western Electric in audiphones, audiometers, and in a number of amplifiers where small size and low current drain are important.

Signal Corps Photo

Travelling Telephone Consultant

By E. PEDERSEN

WHEN our transatlantic plane came to a stop on La Guardia Field, a Sergeant went down the "Stairs" in one jump and began turning cartwheels on the concrete. "I'm home! I'm home!" he shouted. Well, that's the way I felt, too, after travelling around war-torn Europe for ten months. The Sergeant had just finished three years.

This story might well begin with the early part of the war, when, as a member of the equipment development group, I took part in the design of the Spiral-4 carrier equipment for the Signal Corps. Later on I watched the performance of this tactical equipment when it was put through its paces during Army maneuvers in the South. The so-called "Packaged" equipment was another line of communications equipment we designed for fixed plant use of the Army.

Having spent considerable time with these various types of Army equipment, it was not too great a surprise to me when in May, 1944, I was asked if I would serve as a Technical Observer for overseas service with the Signal Corps. What are the duties of a T.O.? Well, nobody seemed to have too clear a picture of them at the time, but believing I know now, I shall attempt to pass them along to you.

After the usual routine of form-filling, inoculations, and an extensive Army training course consisting of a one and a half-hour lecture on how to behave as an officer, Lee Glezen of Transmission Engineering and I were in uniform and aboard a transport plane. We arrived safely in London after a rather uneventful flight across the Atlantic. This lack of excitement, however, was more than compensated for when, about half an hour after our arrival, the first buzz-bomb put in its appearance. This was a clear indication to us that our new assignment was somewhat out of the ordinary.

The Signal Corps received us with open arms and didn't waste any time in putting us to work. The jobs assigned to us were of a varied nature and touched on practically every phase of wire communication. We travelled around in England and Wales meeting Signal Corps personnel with whom we discussed problems from supply to transmission. Visiting depot after depot, we checked on what equipment had arrived from the States and what all-important items might still be in the depots at home. This checking was not confined to paper work; we actually wrestled with the boxes whether they weighed 10 pounds or 1,000. It was training for what was to come later.

One rather interesting assignment found us teaching school. The subject was "Carrier Telephone and Telegraph" and I don't know who got the worst of it, the students or the instructors. The boys certainly kept us on our toes throughout the three-week course. My days as a professor were numbered, however, as I received orders to report in London with full field equipment and be ready to push across to the continent. The list of items that go to make up an officer's field equipment is rather imposing, but the major items are the bedding roll, pup tent, gas mask, gas-proof clothing, steel helmet, and not to forget the most important item—the mess kit. To an Army officer, I suppose the revolver is his most important item, but being a T.O. you are not allowed to carry arms—your non-combatant sleeve insignia is supposed to be your protection. I certainly hoped the Germans had good eyesight. With all this gear collected and neatly packed, I left London and was soon aboard a U. S. Coast Guard cutter taking the most thorough and prolonged wetting of my life as it shipped green channel water the full length of its deck.

Well, I was in France and the breakthrough at St. Lo was just beginning. My first problem was to locate the Signal Repair Company to which I was to be attached. This was no easy matter when one considered the tremendous number of troops and material of all kinds which in those days were concentrated in the area between Cherbourg and St. Lo. Two days of travelling up and down roads filled with military traffic finally brought me to my outfit. Arriving at midnight, the Sergeant on duty said, "You'd better find a place to pitch your tent, sir, there's no need to wake the Captain." So there I was with all my gear and a bit of open field and real darkness, and in Norway, where I did my Boy Scouting, we didn't use pup tents. However, I got it up after a fashion and my bedding roll laid out under it; and the next thing I knew it was morning and one soldier was saying to another, "Lookit, a guy with gray hair!"

After this introduction, I tackled the job of instructing the boys in the operation and maintenance of the Spiral-4 carrier equipment. This work kept me on the go continually while the Armies were moving ahead through Normandy and I with them. Some of this work had nothing to do with wire communications problems but consisted of what I like to refer to as "housekeeping" problems. In a short time I found myself becoming an expert in such things as foxhole digging and doing my laundry with the aid of my steel helmet. Working day and night with this group of soldiers, I had an excellent opportunity to get really acquainted with the American GI. His ingenuity, which is almost unbelievable, together with his sense of humor, adds up to produce the finest soldier the world has ever seen.

Every day, as well as many of the nights, had its share of excitement, as for instance my first visit to Paris. On the rapid encirclement of Paris from the south, I wanted to get from Army HQ up toward the front. The safe route was a long arc, so I decided to cut across the outskirts of the city. But the trick didn't work for the FFI halted me at a barricade and suggested another route. Even that was none too safe; my driver and I frequently heard the whine of bullets and the rattle of falling pieces of masonry. The next day Paris was liberated.

Up to this time my work had been with the Armies in the field but now another important problem confronted us. The liberated areas behind the Armies had to be provided with a fixed plant network. The importance of this network was obvious when one considers that the Army supplies had to come through this area and also that the Air Corps must depend on this network to relay messages back to their main bases in the United Kingdom. Back in London they decided that the most expeditious manner in which this network could be provided would be to rehabilitate the French toll cable between Cherbourg and Paris. This decision was based on Mr. Glezen's assurance that he would take care of the repeater stations and on a promise by Lt. Col. O. W. Kammerer, a former Long Lines man, that he would get the cables in condition. I have since often wondered if the two of them realized what a tremendous task lay ahead of them.

In my travels I had seen the handiwork left by the Germans. Repeater stations were in a number of cases blown sky high and the

cable damage appeared to be almost beyond repair. The Air Corps saw to it that Mr. Glezen got to France in a hurry and with his HQ established in the city of Rennes he proceeded to tackle his part of the job. Packaged voice-frequency repeaters and associated equipment were installed, sometimes in existing buildings, at other times right out in the open. In the latter cases, the Army engineers would later move in and build a house around the already working telephone equipment.

E. Pedersen

Not all of the French repeater stations were wrecked. Thanks to the quick action of the FFI moving close on the heels of the retreating Germans, fuses were cut or fires put out; in that case the existing equipment was used, as was the case in Paris. While all this work was going on twenty-four hours a day, the cable splicing crews were performing near miracles with the damaged cables. Circuits were being established between various points but they were having trouble getting through to Paris. This was to be my part of the job and I was rushed in to Paris a few days after its liberation. A Signal Corps Colonel setting me down in front of the long-distance building said: "Take it over; it's all yours, only get us some circuits through to Cherbourg in a hurry." Thinking back on the days and nights that followed, it all seems like an awful nightmare. French equipment, French personnel and the language difficulty was enough to drive a man crazy. It was two o'clock the next morning before I got a circuit through to Rennes, 200 miles away, and then what joy! Lee Glezen was on the other end of it. At last, someone who spoke my language.

For three weeks that test room was a madhouse with the Army calling for more and more circuits as various units arrived in Paris and set up shop. I slept on the floor and ate "C" rations from a keyshelf—and not too plentifully at that. The French telephone men began to "unlearn" the habit of stalling on which they had put a fine polish during the German régime and, with the help of more and more Signal Corps personnel, we began to offer a passable grade of telephone service. Mr. Glezen had by now arrived in Paris and the two of us began to render a consulting service to all and sundry on every possible sort of wire communication problem.*

With Paris as my HQ, I began a series of tours to the various Armies and Army Groups for the purpose of assisting with problems in connection with tactical wire equipment. Arriving at a headquarters, be it Army, Corps or Division, usually in late afternoon, my jeep driver would heave my bedding roll into whatever inn or cowbarn or wrecked house was designated by the local

*The following is an excerpt from a letter written by Mr. Pedersen during this period:

"From early morning to late at night all kinds of questions are fired at us by Generals, Corporals and what have you. Do we answer all of them? Yes, sir, we do (and I hope a fair percentage is correct). Would you like to have us engineer, say, 400 miles of open-wire line with carrier and all the trimmings from scratch? Give us fifteen minutes and we will hand you the layout all wrapped up and ready for service. Of course, we will survey the line for you. If you don't have the personnel to operate your equipment, we will train them in two weeks. If you don't have the equipment, don't worry, we will tell the French how to build the damned stuff for you. Some equipment may be German, some French, also British and of course American. That's easy, just go ahead and modify—it works when we get through with it. How does it work? Well, we will discuss that later. When it comes to the finer points of transmission, you will find that there are two schools of thought over here. One group works on the theory that you stretch a rope between two points, hang a 'phone on each end, and that constitutes a circuit. The other school (Lee Glezen and yours truly) is of the opinion that one ought to be able to talk between these two points."

billeting officer and we would line up with our mess kits for chow. That line was usually outdoors, and by the time one found a place to sit down, the food was cold but it tasted mighty fine. These evening meals, eaten in the dark, were rather interesting since you couldn't see what was in the mess kit but had to rely on taste. Yes, that was pork chops and spinach, but what about that strange flavor; oh sure—that was vanilla pudding, spread on top of the whole business, but it still tasted mighty good. Supper finished, then talking all evening long with Signal Officers who found themselves up against all sorts of problems—line construction, transmission, repair. Tired as I might be, these men were even more tired, but tremendously in earnest, for lives depended on their every decision. Then off again the next morning, and the next, and the next, until finally I got back to Paris and a chilly room, but at any rate a room which I could call my own. That is, half of it, the other half belonged to my room-mate, Lee L. Glezen.

These trips were not always up forward; some of them took me back to the rear areas where I had come through in the earlier days. Up on the now famous Omaha and Utah beaches, I spent weeks going through the many large open-air Signal Corps depots looking for badly needed equipment. Wading around in knee-deep mud with rain pouring down constantly day after day, I came to appreciate the need for waterproof packing and sturdy shipping crates for all Army equipment.

On some of the trips, I visited the former Western Electric factory, now owned by I.T.&T., in Antwerp, and helped them get started on the manufacture of equipment we needed. The problems confronting us were not only in connection with our own equipment but also those caused by the necessity of using the equipment of our Allies as well as that of our enemies, and making them all work together. A considerable number of captured German telephone repeaters were put to excellent use in our network. However, since the Germans always managed to remove the tubes from the equipment they left behind, a certain amount of American ingenuity had to be resorted to in order to make the equipment work; hence the episode of the "General Bradley" tube,* the pentode made for the battle front in three days.

On my last tour of the front, immediately prior to my return to the States, I was particularly interested in inspecting the condition of the Spiral-4 carrier equipment since a large percentage of this equipment had been in continuous use since the early days in Normandy. Watching the equipment as it began to roll across the Rhine, for its trek through Germany, I was thinking of the men and women of the Western Electric factories and wishing that they all could have seen the way their products were standing up to rough handling and to rain and mud everywhere in Europe.

My overseas stay had been planned originally for a period of four months, but the work was so pressing that I kept staying on and on. Finally, however, replacements became available, my packing was done in nothing flat and I boarded a plane for New York where I arrived on March 30. The experience had been arduous—my waistline was streamlined, but the opportunity of working side by side with our Army is one that I am glad not to have missed.

*RECORD, *March*, 1945, *p.* 78.

The Dream of a GI Comes True

HOME from the European theater of war, JOHN MARKO fulfilled the dream of hundreds of Bell Laboratories men when he was greeted by this bevy of draftswomen who work, as he did, in the Systems Development Department. A member of the 95th Infantry Division, he was awarded three battle stars and a Meritorious Unit Citation. The girls shown with John are, left to right, DOROTHEA ALBANESE, FLORENCE MANCUSO, LILLIAN HOFFMAN, ANNETTE GOLDEN, NORMA MOLECKI, TEDDY PRIMIANO, CLARA PESCHL and JEAN VAN DUSEN.

Robert J. Cameron

With but three months of combat service and less than a year's military service, Robert J. Cameron has returned to the States with the Silver Star, Bronze Star, Purple Heart, Combat Infantryman Badge, three Presidential Citations and seven battle stars on his campaign ribbons. Robert fought with the First Army through France, Belgium, Germany, and into Czechoslovakia, where the fighting continued until June 15. He was awarded the Silver Star for having brought back to the lines a comrade wounded when they were caught by enemy fire; he was awarded the Purple Heart for wounds received later when he was hit by a German "burp" or sub-machine gun—fortunately his pack stopped all but one bullet. Robert is convalescing at Camp Upton Hospital and was on furlough when his brother, John, a B-26 pilot, flew back from Europe to Bradley Field, Connecticut.

Leonard Photo

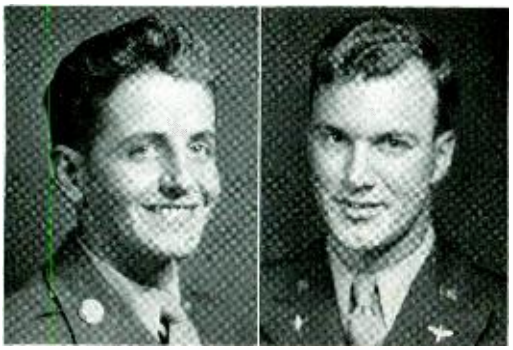
R. J. CAMERON

Frank Kozak

"I have been overseas now for several months. Part of the time I spent in New Guinea, but I am now in the Philippines. I landed here on D plus 12 and have been in combat 94 days. The Japs caught plenty of hell and I am back at my rest camp. It is good to get a good night's sleep. We have been doing our best to end this war as soon as possible. It would be nice to get back and see the old gang at the Labs again."

Carl Bachmann

"I have been transferred to the Counter Intelligence Corps which keeps me busy running down clues of the Nazi big shots who have disappeared. At one time I was after Himmler himself, but had only found



W. N. Leufer Lt. R. C. Benkert

his family when he was picked up. However, I'm still out after Himmler's loot. I am now in St. Johann, Austria, in what is known as the Austrian Alps, and I'm tired from climbing them trying to find SS troops who still like to fight. The war is not over here yet and those boys are killing GI's every day. Last week two of our men were shot and two beheaded by the SS men in these hills."

Lieut. Richard C. Benkert

Lieut. Richard C. Benkert of the Army Air Forces has recently returned from overseas duty. A bombardier, he flew 35 missions and dropped 93 tons of bombs on Germany. During flights over enemy territory his plane was hit several times, and on these occasions his flak suit saved him from serious injury. The photograph on the following page is his service jacket with a bomb designating the number and names of his missions in the European theater of war.

Lieut. Benkert has been released from the Army and is again a draftsman in the Equipment Development Department. His wife, the former Marjorie Flynn, is a BTL girl.

L. M. Nielsen W. V. Flushing

William V. Flushing

William V. Flushing has returned to civilian life and work as a Technical Assistant at the Laboratories after twenty-eight months of military service. His basic training was with the Air Corps and from there he went into the ASTP for ten months until that program was discontinued. After infantry training he was sent overseas and served as a 50-mm gunner during the Battle of the Bulge. His Army decorations include two battle stars on his European ribbon and the Combat Infantryman Badge.

John P. Houlihan

John P. Houlihan has returned to the Plant Department as a supervisor after having completed thirty-nine months of service with the Army, twenty-seven of them over-

J. H. Geiger J. P. Houlihan

seas. A member of an anti-aircraft outfit, he fought in North Africa and earned battle stars for the battles of Algeria and Tunis, and later for the battle of Sicily. Mr. Houlihan was then stationed in Sardinia until he was sent home on a twenty-one-day rotation furlough after which his next assignment was at Fort Jackson, S. C., for infantry training. When, after seven months in the States, he was sent to France, he went back to his own outfit in Alsace-Lorraine and with it fought through Germany and into Austria, earning his fourth battle star. Mr. Houlihan was released from the Army on the point system during the week following V-E day.

John H. Geiger

John H. Geiger, who was a prisoner of war in Germany for about three months

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prior to his release in April, returned to the United States in May and has been hospitalized in Staten Island where he has been attempting to regain the 60 pounds that he lost while a prisoner. Some of the camps occupied were near strategic military targets which were bombed consistently by Allied fliers whose aim was not always perfect. Private Geiger, while home on leave, visited the Murray Hill Laboratories. He expects to go to a North Carolina camp for reassignment and training some time in September.

Lieut. Benkert's service jacket bears the names of the thirty-five bombing missions he made in the ETO

Lt. Robert H. van Deusen

Lieut. Robert H. van Deusen was the damage control officer of one of four destroyer escorts which sank a German U-boat in the mid-Atlantic. Zigzagging in a long and desperate effort to elude its pursuers, the enemy sub was finally hunted down and blown to pieces in deep water. Debris, oil and personal belongings of the crew—such as a song book and the bowl of a pipe—told the crews of the DE's that their search was at an end. Lieut. van Deusen is a former Laboratories man.

Leonard M. Nielsen

Leonard M. Nielsen has come back again from Greenland where most of his military service was spent and has been sent to Lake Placid for reassignment. Sergeant Nielsen visited the Apparatus Drafting Department while on furlough and told his friends there that he had been prepared to spend at least another year in Greenland.

Robert A. Hauslen

"Just a note from the Pacific. No, I won't gripe about the lack of liberty, Navy breakfasts or any of the usual things. What worries me is the thirteen planes we have painted on our bridge—thirteen is definitely unlucky! I firmly believe that the *Cowell* is the luckiest ship in the fleet, bar none. Of course our gunners are tops or I wouldn't be

Roll of Honor

Killed in Action

Lieutenant Ernest G. Graf
Captain Orrin F. Crankshaw
Ensign David F. Greenhagen
Private Harry A. Malone, Jr.
Private Sarkis Karibian
Private Eugene H. Sheehan
Private Edward A. Fern
Lieutenant Thomas M. Pepe
Lieutenant Stanley W. Erickson
Ensign Joseph Kelly
Lieutenant Everett T. Urbanski

Missing in Action

Lieutenant Robert F. Healy
Private Joseph T. Murphy
Lieutenant John K. Gardner

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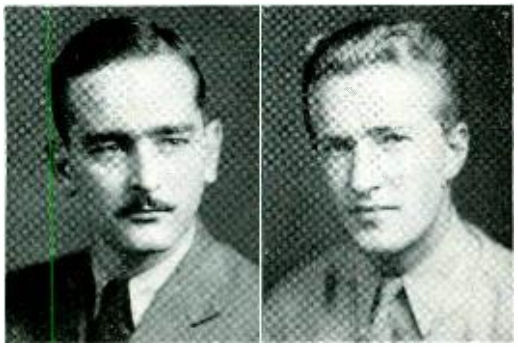


E. L. Chinnock A. R. Strnad

around to write this—luck only goes so far, you know. We have lots of Western Electric gear on board—thank God! Some of those Jap planes might still be flying if it weren't for the accuracy of Western Electric gear."

Albert R. Strnad

Through his earlier training and his experience in Research Drafting, an interesting opportunity has come to Albert R. Strnad, of the Army Air Forces. En route to Lowry Field for training in B-29 gunnery, he met another Air Force trainee who had been studying for his Ph.D. in psychology. During their schooling, they saw the need for a new training device. When they got to their next post—Buckingham Field, Florida—they succeeded in interesting one of the officers in letting them do some work on it. Eventually, a successful demonstration was made and the Air Force placed an order with a manufacturer to have several of the devices built. Pvt. Strnad was detailed to the factory to help get work started; while on a procurement mission to New York late in June he came in to see his friends at West Street.

Chief E. L. Chinnock

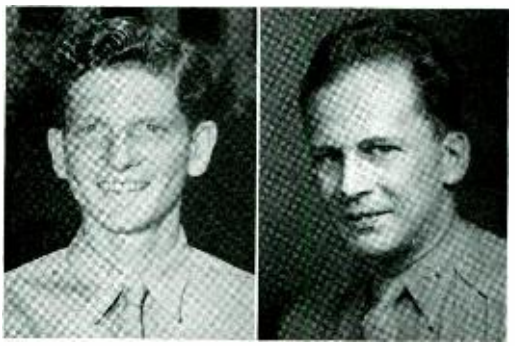
Chief Radioman Edwin L. Chinnock, on military leave from Holmdel, visited West Street. He left the Laboratories in December, 1940, spent two years in the Caribbean and two years at Cape Cod on the site of Station WCC which was taken over by the Navy. He is now on his way to the Far East for his next assignment.

Bruce Bleecker

Bruce Bleecker visited the Murray Hill Laboratories after returning from 15 months' overseas duty with the 8th Air Force in England. While in the service his group won the Distinguished Unit Citation, and he is the proud wearer of six battle stars. Bruce served as an instructor on special electronic apparatus during the last few months before returning home. He was at home during July and then went to a camp in the Middle West for reassignment. He is looking forward to entering college to complete his education when he is discharged from the Army.

Son of C. O. Parks Missing in Action

Robert R. Parks, USNR, the only son of Charles O. Parks of the Transmission Development Department, is missing in action after his ship, the *Morrison*, was attacked and finally sunk off Okinawa, the Navy Department has announced. A graduate of Norwalk High School in Connecticut,



Bruce Bleecker Lt. R. D. Horne

he was a member of the class of '46 at the School of Engineering, Northeastern University, when he was inducted into the Navy at his own request in August, 1943. "Bobby" had survived two previous sinkings, first on the *Robert Smith* and then on the *Pritchett*, both of which were lost. His granduncle was the late Rear Admiral Charles W. Parks, USN.

Lieut. Frank R. Hanlon

Lieut. Frank R. Hanlon has returned from Europe for a leave before being reassigned to some other theater of operation. His service ribbon bore two campaign stars and his Air Medal two clusters. For its part in the shuttle bombing of Germany, his outfit was awarded the Presidential Citation. Lieut. Hanlon, a navigator, has been in service for three years and began flying in action a year ago August. All of his high

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altitude bombing missions were made in the same B-17 plane in which he flew home to Bradley Field, Connecticut.

Lieut. Col. A. G. Kobylarz

"As the result of a pretty bad automobile accident," writes Lieut. Col. A. G. Kobylarz, "I have been laid up in the station hospital and expect to be here for the next six weeks. Otherwise, things are still the same here at Wright Field, Ohio."

Louis C. Brown

"Now that the European war is over, we are taking personnel away from combat zones instead of to them. I was interested in that article about wire laying with a C47, as that is the ship I fly. It is the work horse of the Air Corps and we are all proud of that name and of what it did toward victory."

Lt. Robert C. Nance

"I believe the last time I wrote was in November from Leyte. Since then I've moved around a little more, touching New Guinea, Luzon, an undisclosed spot and now, Okinawa. The popular saying, 'the world is a small place,' didn't hold its own in my particular case until recently when I met Lt. Col. Bailey."

Leaves of Absence

As of July 31, there had been 998 leaves of absence granted to members of the Laboratories. Of these, 79 have been completed. The 919 active leaves were divided as follows:

Army 510 **Navy 305** **Marines 28**

Women's Services 76

There were also 19 members on merchant marine leaves and 17 members on personal leaves for war work.

Recent Leaves

United States Army

Mario P. Rosato

United States Navy

George M. Dewire
Robert Enderlin
S. Catherine Ridner
Robert M. Selling

Signal Corps Photo

Brig. Gen. R. G. Mosses of the 12th Army Group awards Bronze Star Medal to Col. Raymond O. Ford at Wiesbaden, Germany

Lieut. Ralph D. Horne

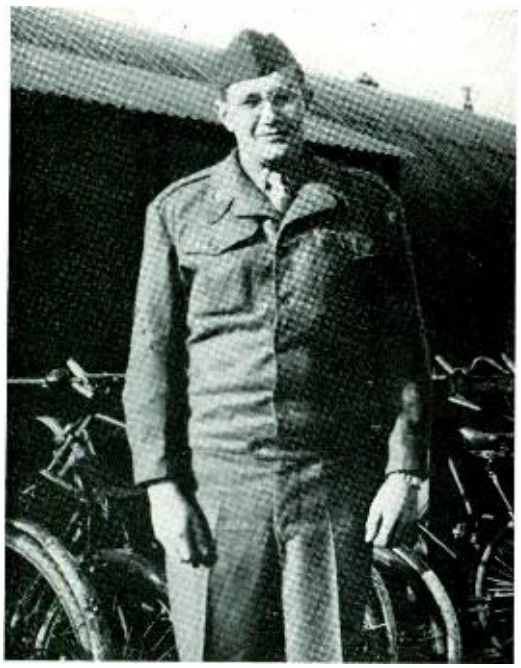
Lieut. Ralph D. Horne, who was a prisoner of war in Germany for nine months, was a frequent visitor to the Laboratories during his recent military leave. He has since been sent to Atlantic City for further assignment and hopes to be given more flying assignment in this country.

William F. Johnson

"Have been spending my time here in Manila since I came overseas, also knocking about the island mixing business with pleasure. There is lots of work in the telephone line as well as all types of rebuilding as the town sort of got taken apart."

Vincent Decker

"At this moment we are lying off an island out here, one which you no doubt have been hearing a lot about these days. After leaving Zamboanga, we headed for Polloc Harbor on Mindanao. We arrived there just after the invasion and things were pretty quiet except for some fighting on the beach and in the hills. The next place we arrived at was Piso Point (Davao) on Mindanao and here early in the morning bombarded the Jap boat docks and oil and gasoline tanks. No doubt many Japs joined their honorable ancestors that morning. After we finished with them, the B-24's made sweeps on them with machine guns and those rocket guns and it was really a good show. Our next



Herbert Baker returned to the States on a B-17 *after twenty-four months' duty overseas where he had been an armorer on* B-17's. *During his visit home he called at the Laboratories to renew acquaintances*

stop was Legaspi on Luzon. There is an active volcano located there and it was belching smoke and fire. On we sailed again, this time into Manila Bay. The harbor there is pretty well in ruin, many ships have been sunk, some still remain above the water in forms of masts and superstructures. In all there are said to be six hundred ships sunk there. As soon as the O. K. is given to tell where we have been since then, I will have something a lot more exciting to tell my friends at the Laboratories about."

William J. Douglas

"It was good to hear that war ended in Europe, but it didn't make much difference to us out here at that time as we were very busy then. Since then we have had a little more time to think as things are under control and we figure that before long the Japons, as we call them, will feel the full weight of our might. If they only knew what was in store for them, I think they would surrender now before their islands are blown completely off the map."

The following members of the Laboratories on military leaves of absence have received promotions:

A/C Maxwell C. Andrews; Wesley Bender, S 1/c; Lt. Col. Arnold E. Bowen; S/Sgt. Rolf Dalane; Harry W. Dohlmar, EM 2/c; Elizabeth E. Doyle, S 1/c; Lieut. Owen N. Giertsen; Joseph T. Grissom, AEM 1/c; S/Sgt. Gerard Hall; Carl H. Hamann, ACRT; Pfc. Charles R. Hempel; F/O Harold Jaffe; S/Sgt. William F. Johnson; Pfc. Kenneth A. Josephson; Joseph Kocan, ART 2/c; Lt. (jg) John P. Manning; Pfc. John P. Mahoney; Lieut. Robert F. McLaughlin; 1st Sgt. Armin McNaughton; Pfc. Harry C. Meier; John R. Nelson, SX 1/c; Sgt. Leonard M. Nielsen; Robert D. Nostrand, MOMM 2/c; Lieut. William G. Pimpl; Nelson A. Popp, ARM 3/c; Lt. (sg) S. Milton Ray; George E. Schoener, S 2/c; Pfc. Frederick Soltow; Sgt. Charles R. Storin; Lt. (jg) A. R. Suneson; Sgt. A. J. Vallely; Sgt. W. L. Vedera; and Sgt. G. Warren Wheeler.

Francis M. Hodge, now a Signal Message Center Chief, is due to go to the Pacific some time the latter part of this year.

Elizabeth Doyle is at Willow Grove, Pa., awaiting transfer to Naval Air Transportation Service.

Donald E. Blesse is attached to a Combat Aircraft Service Unit as an elec-

Frank B. Malm recently visited his father, Frank S. Malm, at Murray Hill. He is an air cadet in the U. S. Army Air Forces and is stationed at Tyndall Field, Florida

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trician, and EDWARD J. BURNS is on duty as a radioman in the same department.

HAROLD JAFFE has completed pilot and bombardier courses and is taking a ten-week course in radar at Langley Field, Virginia.

JOSEPH J. DOYLE has moved from Fort Meade to Fort Ord where he is awaiting shipment overseas.

LEON PASQUA reports the pre-radio course at Hugh Manley High School in Chicago good and the food exceptionally good.

LIEUT. ROBERT S. WILLIAMS writes from his station in Puerto Rico that he is doing long lines construction.

HOWARD S. HOPKINS, now near Pilsen in Czechoslovakia, expects to head for the States with his division some time in the late fall.

Robert Klem in Saipan—"leaning on a Jap totem pole"

HERBERT C. DEVALVE, formerly stationed in Calcutta, arrived in Rhodes General Hospital after a flying trip from Florida and comes to New York each week-end.

THEODORE T. O'SHAUGHNESSY has served in the Atlantic for eleven months aboard a seaplane tender which has just returned to the States with Naval aviation personnel from England.

RICHARD E. STREBEL expects reassignment to fleet duty now that he has graduated from the Advanced Radio Material School at Navy Pier, Chicago.

ROBERT J. SEYMOUR writes from Marienbad, Czechoslovakia, that it has been a long and sometimes hard road with the First Army since the Normandy beachhead.

THOMAS J. O'CONNOR indicates that he is anticipating a pleasant, interesting time at the Naval Training Center, Gulfport, Mississippi, "avoiding mosquitoes and absorbing tons of material on radio and radar gear."

COMDR. NELS C. YOUNGSTROM reports that he is on one of the most westerly islands, working with the Signal Corps, many officers of which are Bell System men from all over the States.

EUNICE E. STOREY is on temporary duty in Boston studying radar sets at M. I. T.

LT. WILLIAM G. PIMPL was with the "Fighting 69th" since February 6 and is now awaiting a new assignment.

THOMAS J. O'NEILL says "Hello, Gang. Just a line to say I am at last back with the outfit fully recuperated from my injuries. After four months I am in Lenggrin in Bavaria, thirty-five miles distant from Munich."

J. R. NELSON called at Murray Hill recently on his return from the Caribbean area. He has been assigned to the Naval Mine Warfare Test Station located at Solomons, Maryland.

CHARLES J. EFINGER, instrument maker at Murray Hill now on military leave, visited there recently. He is a Machinist's Mate 1/c, USN, and is now stationed at the Naval Station at Solomons, Maryland.

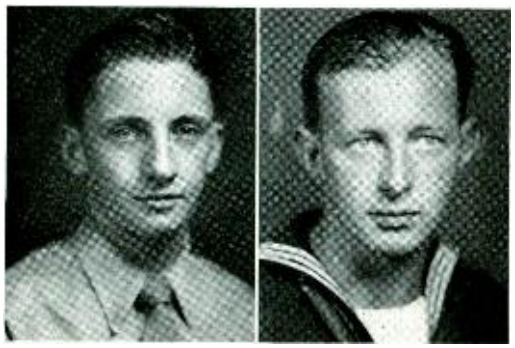
"I RECEIVED the Bronze Star for communications work with the 9th Army," MARTIN E. POULSEN writes. "A lot of the credit goes to MR. PEDERSEN who was over here from the Labs and who really got us the equipment and pointers on 'how'."

JOHN P. MAHONEY has been awarded "the Combat Infantryman Badge in recognition of his exemplary performance of duty in ground combat against the enemy." He served with the Army's famed 42nd Rainbow Division.

"I WAS AT Berchtesgaden and saw Hitler's stronghold. I went all through his house—there is very little intact, through the Stormtroopers house, Field Marshal Keitel's headquarters and the Eagle's Nest." From JOHN J. LORDAN'S recent letter.

DOMENICK J. MACCIA goes to sleep counting boats not sheep out in the Pacific. He is a dockmaster—a job which consists of logging boats in and out of the island as they come to be repaired; he also has a few charts and boats to keep him happy, according to a recent letter to F. D. LEAMER.

LOIS JONES, who is in a Hospital Corps



J. J. Doyle Joseph Kocan

School in Maryland, particularly enjoys news of Whippany folks which she sees in the Record.

"Manila, the most modern city of the Philippines at one time, is now one mass of rubble. The demolition of the city by the Japs before their retreat is beyond anyone's imagination," writes George E. Linehan.

"I am now a 'Gunner Senior Photographer' on a B-29 photo ship and it is both interesting and at times exciting." From Robert Beattie.

Joseph R. May has been transferred from anti-aircraft at Camp Hulen, Texas, to the infantry at Camp Livingston, Louisiana. He was with the Building Service Department at Murray Hill prior to his induction and visited there recently while on leave.

Helen A. Elberson also visited Murray Hill recently where she used to serve on the restaurant staff until she joined the Wacs. Now she drives a truck at Fort Wright for the Army.

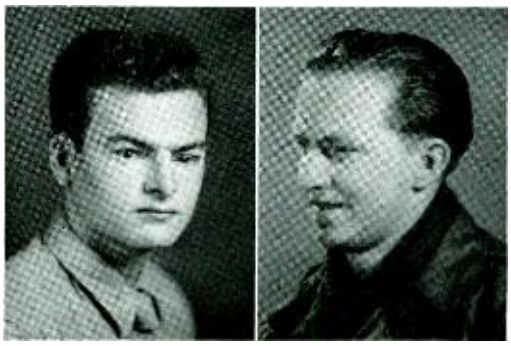
Edward J. Schaum arrived home on June 24, after four months in Europe with the 97th Infantry Division. He participated in the battles of the Ruhr and of Czechoslovakia, and now expects to be sent to the Pacific theater of operations.

W. A. Sumner writes: "My team and I are working on installation of a secret Western Electric equipment."

Captain J. E. Zendt was at Fort Monmouth prior to his leaving for California and the Pacific to take up new duties.

Herbert Fischer visited his friends in the Photocopy Department following completion of his boot training at Sampson and has recently written them a letter from Hawaii.

Frank A. Koditek is now studying electrical engineering in the V-12 program at Illinois Institute of Technology after having been overseas one year in the European theater of operations on an LST.



Edwin Remirez A. T. Stiller

Edwin Remirez, a former member of the Laboratories, returned from Camp Devens to visit the Restaurant group with whom he formerly worked.

Lawrence M. Cassano is seeing plenty of action out in the Pacific where his job is to repair marine engines called Sea Mules.

"I can tell now that I've been in the Military Intelligence ever since I left Florida," Victor Silzer writes. "All the European cities I've seen except Paris are virtually destroyed, but in the country Nature quickly covers the battle scars of war and the damage is less noticeable."

Daniel T. Hayes was another visitor to the Laboratories who was en route to California for reassignment.

Martin C. Nielson is stationed at Guam, where he gets a chance to see Admiral Nimitz and his staff regularly.

F. A. Koditek Herbert Fischer

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RUDY LUTTKUS

ARTHUR LEONHARDT

ALFRED T. STILLER of Murray Hill in a recent letter to the RECORD recounted his experiences in battle and reiterated the hope of so many men still overseas, to come home.

NICHOLAS BRADY has returned to his Atlantic Fleet Destroyer after attending damage control school in Philadelphia. His destroyer, according to a Navy release, sank two German warships and two merchant ships. Mr. Brady has served 32 months on the destroyer, and is a veteran of the invasions of Normandy and Southern France.

CARL W. FLEISCHER is working in the frame room of the squadron information center on Mindanao where the entire wire maintenance section is composed of Bell System men from the Eastern states.

ANOTHER VISITOR to West Street was JOSEPH KOCAN, who had completed his naval training at Corpus Christi and was en route to the West Coast for his next assignment.

JOSEPH J. DOYLE has completed his Army training and is now on his way overseas it is presumed. He visited West Street while on furlough.

ROBERT F. RENNICK, also a visitor at the Laboratories, was home on a convalescent furlough from New Guinea, where he had earned two battle stars.

ACCORDING to a Navy release, CARL H. HAMANN advanced to aviation chief radio technician USNR while serving on an aircraft carrier of the Atlantic fleet.

"I'M STILL WORKING on Lab equipment and still being proud of the work you are doing back at home," from GUSTAV BACHMAN who is on Oahu in the Hawaiian Islands.

ARTHUR LEONHARDT, seaman second class, was recently at Murray Hill, where he is on leave from Building Service Department.

IN A letter to IDA WIBERG, CHARLES S. GRAHAM writes that he is hoping that he'll soon be one of the fellows sailing into New York harbor.

JOHN J. MOSKO is in Rhodes Hospital in Utica, N. Y., recuperating from wounds received in Europe.

AMONG THE RECENT visitors to the Laboratories at West Street were RAYMOND A. SCHRODER of Camp Shanks; CAPT. ORVING O. OLSEN on leave from the 862nd A.A.A. Specifications Depot at Dayton where he is Chief of Stock Control; and ROBERT F. RENNICK on furlough from Ashford General Hospital.

ROBERT D. NOSTRAND, recently returned from fourteen months' duty on a subchaser in the ETO, called to see G. L. SEIGMAN and other friends during his thirty-day furlough. On D-day his boat escorted LST's to the Normandy beachheads.

HARRY W. DOHLMAR is now doing Central Office maintenance work in the Philippines to which he has been transferred after having previously been at Midway and on the Hawaiian Islands.

RUDY P. LUTTKUS visited his old gang when he had completed his training at the Great Lakes.

"I'VE BEEN in the PBM trainers which the Bell Labs designed," writes ENS. W. F. LYNCH. "When they were building that, I never thought that some day I would be training in it. You would swear you were in a real plane even to the point of landing it. I told the instructors I worked for Bell Labs."

"PANAMA is a far cry from any district in the States," according to RUDOLPH WILLS. "Except for two or three large cities, all houses are of wood and built off the ground."

R. A. WILLS

ENS. W. F. LYNCH

C. P. WELLS

W. J. CRUMPTON

W. J. THAYER

A. R. SWOBODA

Retirements

During the past few months, nine members of the Laboratories have retired, three at their own request with Class A pensions and six under the Retirement Age Rule with Class A pensions. Retiring at their own request were: C. P. WELLS with thirty-four years of service; W. J. THAYER, twenty-four years; and R. N. CARR, twenty-three years. Those retiring under the Retirement Age Rule were WILLIAM CARROLL with forty-four years of service; R. J. FISHER, thirty-seven years; A. A. SCHWINN, thirty-six years; A. R. SWOBODA, thirty-five years; FRED WRAGG, thirty-four years; and W. J. CRUMPTON, twenty-five years.

CHALMERS P. WELLS

Mr. Wells joined the Colorado Telephone Company in 1901 and then was successively with the old New York and New Jersey Telephone Company and The Bell Telephone Company of Pennsylvania. He left the Bell System in 1910 but returned in 1917 to what is now the Equipment Development Department of the Laboratories. In 1930 he became associated with trial installations of cable-carrier systems and unattended repeater stations at the Morristown laboratory. A few years ago he returned to the trial installation group at West Street.

WALTER J. THAYER

Before joining the Laboratories in 1920, Mr. Thayer had been engaged for several years in railway signal engineering work. After becoming a member of the Technical Staff of the Laboratories, he spent about a year with the specification group, and then joined the Apparatus Development Department. Here he engaged for a short time in the development of station apparatus, and was then assigned to the group developing audiometers, audiphones, and laboratory and testing apparatus. With this group he took part in the original development of both the buzzer and phonograph types of audiometers and the pocket and purse-type audiphones. In 1928 he returned to what is now the Section Apparatus Development Department and in the years just prior to the war had been concerned with the design of coin collecting devices and associated apparatus. During the war years Mr. Thayer was engaged in the design of high-level loudspeaker systems for the Armed Forces.

ROY N. CARR

Mr. Carr came to West Street in 1922 as a clock repairer when time clocks were in general use throughout the building. When time clocks were abandoned, he continued his maintenance of all the other clocks. In addition, he did mechanical work in the Development Shops Department.

WILLIAM CARROLL

When Mr. Carroll became a member of the Western Electric Company in 1900, the original sections of the present building had been occupied but a short time. For three years he helped out in the shop and then he was assigned to the cable department, removing cables from the drying ovens. In 1907 he was made a night watchman and a short time later was transferred to the operation of elevators. For many years as an elevator operator, expert in handling the former hydraulic elevators, and more re-

cently as a Uniformed Watchman, "Bill" was a familiar figure. During the war he became a supervisor in charge of paper salvage, which position he held at the time of his retirement.

Ralph J. Fisher

Mr. Fisher started his telephone work in the independent field in 1903 when he joined the Home Telephone Company in Los Angeles. Here he worked on switchboard wiring for both private-branch exchanges and central-office equipment. Two years later he went with The Pacific Telephone and Telegraph Company at San Francisco where he did similar work until 1909. He then left the telephone field and until 1916 was with the Perkins Electric Company, Torrington, Connecticut, on general contracting work. Following this he came to the Laboratories where for several years he was in the Plant Department on general electrical work. In 1924 Mr. Fisher transferred to the design and wiring group of the Research Staff Department where he worked on picture transmission and television apparatus and on special equipment for lectures and demonstrations. More recently he had been concerned with apparatus being developed for the Armed Forces.

Andrew A. Schwinn

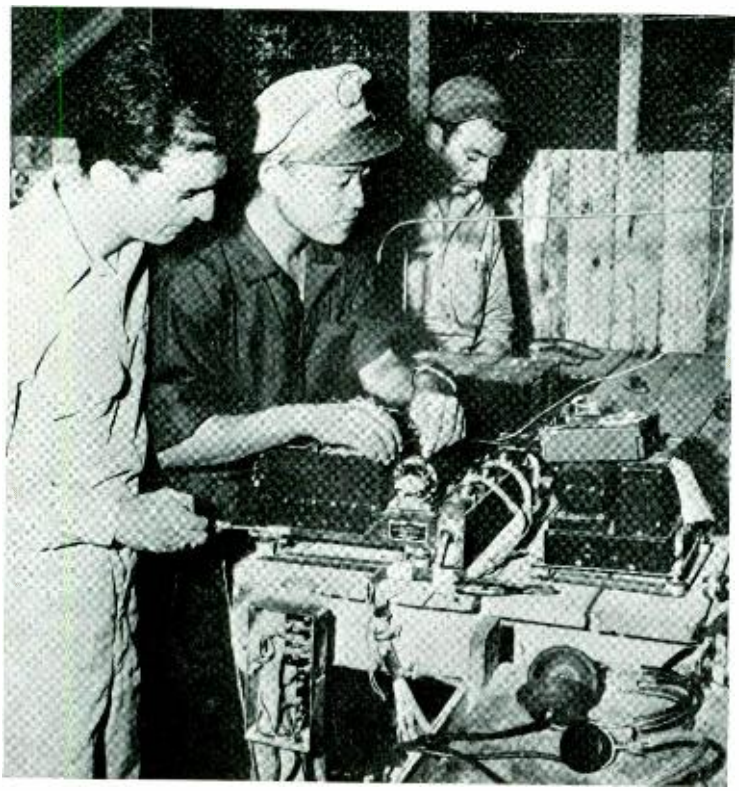
Construction of models of early semi-mechanical switching systems was Mr. Schwinn's first work at West Street. Three years later he transferred to the Model Shop, where in addition to the general work of the shop he specialized in the construction of models for the panel system, then in the early stage of development. When the first installation of the system was contemplated, Mr. Schwinn transferred to Hawthorne where for a half year he assisted in the production of the equipment. He then went to Newark to take part in the installation of the equipment in the Mulberry, Waverly and Branch Brook exchanges. Soon after his return to the Model Shop, wartime developments enlarged the scope of his activities to include vacuum-tube construction. In the early thirties he was transferred to the Research Department where he worked on the construction of apparatus for investigations on carbon microphone contacts. More recently he had been engaged in war work.

Fred Wragg

Adolph R. Swoboda

After receiving the B.S. degree from the University of Nebraska in 1903, Mr. Swoboda immediately joined the student course of the Western Electric Company at Clinton Street. He then came to West Street as a switchboard inspector, soon taking up the design of power plants for central offices. Returning to his Alma Mater, he obtained the E.E. degree in 1907 and, after four years with the Kellogg Switchboard and Supply Company, returned to what is now the Laboratories. An early connection with the Physical Laboratory

A. A. Schwinn | R. N. Carr | R. J. Fisher | Wm. Carroll



AAF Photo from Acme

A Lieutenant in a Chinese-American unit in China is being trained to maintain Signal Corps radio equipment. Here he checks a receiver made by the Western Electric Company. Two associated transmitters are in the background

was followed by work with groups developing public address systems, telegraph and transmission maintenance apparatus. During this period he also had a part in the development of coin collectors and other station apparatus, and of resistances with low-power factors. He then was concerned with the design of coils and more recently with testing apparatus. Since last January he had been at Murray Hill with the group in Electronic Apparatus Development working on the development of varistors and thermistors.

FRED WRAGG

Mr. Wragg came to the Western Electric Company in 1910 as an instrument maker and first worked on printing telegraph and machine switching equipment. Later, during the installation of the original semi-automatic step-by-step PBX at the Hotel Commodore, he helped to make final adjustments to the apparatus. In 1920 he was placed in charge of the various tool rooms in the Plant and Shop Departments in New York.

Mr. Wragg transferred to Murray Hill in 1943, and until his retirement supervised the Development Shop Tool Room and the Finish Shop operations.

WILLIAM J. CRUMPTON

Mr. Crumpton's first work at the Laboratories was with the Transmission Systems Engineering Department. In 1924 he transferred to the Patent Department, where he was concerned successively with patent phases of high-frequency signaling; transmission, submarine signaling, telegraphy and vacuum-tube structures; and, from 1927 to 1940, with picture transmission, television and optics. Since 1940 Mr. Crumpton had been concerned with investigations of outside inventions that might be pertinent to the telephone industry.

News Notes

AT THE RESEARCH LABORATORIES of the Bakelite Corporation, Bloomfield, N. J., K. G. COMPTON, C. C. HIPKINS and J. C. OSTEN discussed newly developed phenolic resins used in the formulation of various organic coatings.

"The Telephone Hour"

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

September 3	*Jascha Heifetz*
September 10	*Lily Pons*
September 17	*Oscar Levant*
September 24	*Nelson Eddy*
October 1	*Bidu Sayão*

B. L. CLARK attended an N.D.R.C. committee meeting in Boston on August 2.

R. J. PHAIR tested abrasion resistant finishes for leading edges at the National Advisory Committee on Aeronautics Laboratory in Cleveland.

R. M. BURNS and K. G. COMPTON attended a Navy conference at Philadelphia.

A. MENDIZZA studied special finishes on aluminum at the Stolle Corp. in Ohio.

K. G. COMPTON and J. LEUTRITZ visited Johns Hopkins for the N.D.R.C. in connection with the study of the effect of humidity and fungus on plastics. They also studied the effects of humidity and fungus on wire for the N.D.R.C. at Rensselaer Polytechnic Institute, Troy, N. Y.

J. LEUTRITZ has successfully completed requirements for his Ph.D. degree at Columbia.

D. E. TRUCKSESS went to the Power Equipment Company in Detroit to discuss rectifier problems.

J. L. Dow Retires

J. L. Dow, Director of Switching Development, retired at his own request on August 31. Effective August 1, F. J. SCUDDER became Director of Switching Development and A. J. BUSCH replaced him as Switching Development Engineer.

J. R. Townsend Elected President of A.S.T.M.

At the annual meeting of the American Society for Testing Materials in New York in June, J. R. TOWNSEND was elected President for the ensuing year. K. G. COUTLEE was made Chairman of Sub-Committee 5 on Ceramics and Committee D-9 on Insulating Materials and R. C. PLATOW, Chairman of Committee D-14 on Adhesives.

Bell Laboratories Club Chess News

F. B. FERRANDIZ was elected Chess Club chairman for 1945-1946 season. Activities will include reëntry into the Commercial Chess League Tournament, the Lightning Tournament, Women's Championship Tournaments and outside matches. Men and women chess players who are interested in joining the Club are asked to notify the chairman, Mr. Ferrandiz, 4D, Extension 1025, so that their names may be added to the roster now being prepared.

* * * * *

During the month of June the United States Patent Office issued patents on applications previously filed by the following members of the Laboratories:

L. G. Abraham
W. R. Bennett (2)
W. L. Bond
L. J. Bowne
E. Dickten
T. L. Dimond
B. Dysart
L. Espenschied
R. E. Graham
C. L. Krumreich
W. Y. Lang
H. A. Lewis
D. MacKenzie
R. F. Massonneau
H. W. Meehan
R. Mueller
R. S. Ohl
J. A. Potter
R. C. Shaw
D. M. Terry
A. B. Thomas
D. E. Trucksess

August Service Anniversaries of Members of the Laboratories

10 years

W. G. Domidion
P. J. Harrington
C. F. Loomis
Edward Watkinson

15 years

R. W. Apetz
C. L. Black
A. K. Bohren
E. C. Borman
O. E. DeLange
G. B. Engelhardt
G. H. Eschenauer
W. R. Fahringer
Bonafede Forte
R. W. Friis
Hugh Gill
S. C. Hight
E. L. Kuntze
F. D. Leamer
L. A. Meacham
J. L. Merrill
S. O. Rice
Sidney Rosen
J. C. Sullivan
G. K. Teal
H. M. Thomson
Elizabeth Williams
E. F. Wulf

20 years

O. M. Akey
M. W. Baldwin
H. L. Brown
H. W. Bryant
John Butler
C. J. Calbick
John Donoghue
Morris Fritts
A. J. Grossman
H. W. Hermance
B. A. Kingsbury
W. A. Klute
C. J. Meden
Edward Murphy
J. G. Nordahl
J. F. Polhemus
F. A. Polkinghorn
C. W. Ramsden
Fred Ufer
K. G. Van Wynen
Marie Wright

25 years

R. S. Alford
Walter Clarner
Mary Corkery
C. M. Darienzo
H. J. Fisher
C. E. Flaig
M. E. Fultz
Gilbert Haege
R. C. Hersh
C. F. Larkin
A. V. Loog
Elizabeth McKewen
Alfred Melhose
A. M. Nicholson
W. E. Reid
Donald Robertson
A. G. Shepherd
A. R. Thompson
Arthur Volz
M. A. Warren
J. B. Worth
L. F. Wright

30 years

B. P. Hamilton
G. H. Heydt
R. J. Podeyn
S. P. Shackleton

35 years

H. W. Baker
W. G. Breivogel
J. T. Butterfield
O. A. Friend
C. B. Robertson

45 years

A. W. Horne

Women of the Laboratories

Elizabeth Armstrong's approach to her work in the crystallography field differs from that of her co-workers in that their viewpoint is that of the physicist while hers is that of a geologist and mineralogist. Miss Armstrong came to the Laboratories to help with the optical and X-ray orientation of crystals in the spring of 1943. She is now at Murray Hill doing research on the fundamental properties of natural and synthetic crystals, and she brought to her work an unusual background in her field. A graduate of Barnard, she instructed at Bryn Mawr while preparing for her Master and her Ph.D. degrees in geology and from there went back to Barnard as a lecturer for three years. Miss Armstrong then became an assistant in mineralogy at Columbia to Dr. Paul F. Kerr, with whom she published a paper *Recorded Experiments in the Production of Quartz* as a restricted supplement of the *Bulletin of the Geological Society of America*. While studying quartz as it occurs naturally, under a National Research Council Fellowship, she accepted the opening in the Physical Research Department at the Laboratories. A patent of hers has been applied for at the United States Patent Office and she is having published a paper *Studies of Misoriented Material on the Lapped Surfaces of Quartz Plates*, which was delivered by her as one of a series in the Symposium on Quartz Crystals at the American Society for the Advancement of Science meeting in Cleveland last fall.

Except for the time she spent at Bryn Mawr, Miss Armstrong has always lived in New York City, her birthplace, and even now commutes daily from London Terrace to Murray Hill. Some few years ago she taught sailing up at Cape Cod but now her interest after hours is hiking with the Appalachian Mountain Club to which many members of the Laboratories belong. She is also a skiing enthusiast.

Elizabeth Armstrong

* * * * *

Eileen Kemmler has been awarded a full tuition evening scholarship at the Washington Square College of New York University. She is the third Bell Telephone Laboratories girl to have won the award in competitive examinations with selected employees of metropolitan firms. A resident of Valley Stream and a graduate of its Central High School, Eileen came to the Laboratories in 1941 as a mail girl and was transferred first to clerk in the Commercial Relations Department and then to the Systems Development Department where she did both clerical and technical work. While in that department Eileen took the part-time Technical Assistant training course which she feels is an asset to her in her present position in the Apparatus Staff

group where she is responsible for keeping track of tool-made samples of apparatus developed by engineers of the Apparatus Development Department. She checks the samples, issues reports on their status, has them approved and photographed and maintains permanent card records.

With a college course about to take up five of her week nights, Eileen's free time will be at a premium. However, she enjoys all kinds of sports and likes to read. During the past summer she spent most Sundays at the beach storing up sunshine against the strenuous winter program which she is planning. Last year she found time to teach a beginners' class at Sunday School.

ANN MENIG

* * *

CHIEF OPERATOR of one of the largest private-branch exchange boards in the world is a distinction which ANN MENIG has enjoyed for many years. As supervisor of the main board at West Street as well as of the boards in the Laboratories premises at Chambers Street, Whippany, Deal and Hudson Street, it is her duty to keep flowing smoothly the 40,000 calls which members of the Laboratories at those locations make and receive on a daily average. Recently Miss Menig attended a conference of the chief operators of the Western Electric Company held at 195 Broadway and discussed operating problems, particularly those involving the use of Bell System tie lines between New York, Chicago and Baltimore.

A resident of the Stuyvesant section of Manhattan, Miss Menig has a cottage on Staten Island where she spends weekends, following her main hobby, which is gardening. At present she is experimenting with espalier dwarf trees which she first became interested in during a trip to Europe. She is also a stamp collector and a lover of music, having held season tickets for the opera for a few years. Her vacations recently were spent at various places in the nearby countryside, but her ambition is to travel and vacation on the Alaskan Highway now that the war is over.

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AMONG THE Laboratories women who have left to do war work in special services are ALICE SIEGMUND, ESME KIRKWOOD and MAGDA KRETSCHMANN. The daughter of H. O. SIEGMUND, Miss Siegmund has recently arrived at an Army camp at Kamchapara, about thirty miles from Calcutta, India, to do work with the Red Cross, while Miss Kirkwood, the daughter of McLean Kirkwood of A T & T, is a Red Cross Staff Assistant in Recreation at Pisa, Italy. Miss Kretschmann, on the other hand, left recently for Germany to perform special intelligence work which Army spokesmen have declined to describe. Both she and Miss Kirkwood were formerly members of the Personnel Department, while Miss Siegmund was employed as a Technical Assistant in the Chemical Department.

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DEVICES such as FLORENCE R. MAYER helps to start on their way through the Development Shops helped to bring home her paratrooper fiancé from the European battlefield. It is Florence's job to clear all orders

EILEEN KEMMLER

FLORENCE R. MAYER

for the Development Shops through her desk, assigning numbers and checking requisitions for proper approval and delegation of authority. Her phone is kept constantly busy by engineers calling her to reserve X numbers for ideas or projects they have.

This is Florence's third job at the Laboratories since she came here after graduation from Grover Cleveland High School in 1941. Her first as messenger was a stepping stone to work in the files and that in turn led to her present position. A recent bride, she is interested now in establishing her own home when her husband has completed his hospital convalescing period.

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MARTHA SCHROEDER, as clerical assistant in the Mimeograph Department at Fourteenth Street, is responsible for the filing of some 5,000 stencils which that group handles, and for making up reports daily and weekly on the mimeographing, hectographing and collating done by the group. Upon graduating from Julia Richmond High School in 1941, she came to the Laboratories and became an Office Appliance Operator in the Mimeograph Department and after two years as an operator she was assigned to the clerical work of that department. Consequently she is familiar with and can operate all types of mimeograph and hectograph machines used at the Laboratories.

MARTHA SCHROEDER

No, you're not seeing double. These are the Zitzmann twins, Frances and Shirley, of the Mailing Department. They are identical twins but you can distinguish them by their wrist watches. Frances, a "lefty," wears hers on her right arm, while Shirley is right-handed and wears her wrist watch on her left arm

Most of Martha's free time is spent with her fiancé, ANGELO GARBARINO of Chambers Street. Together they enjoy hockey, boxing, and basketball games at Madison Square Garden, boat rides on the Hudson and picnics. They also enjoy going to the theater and planning their future home.

SIS TOEPFER

BEFORE COMING to the Laboratories, SIS TOEPFER was a model. Most of her work was with stylists who created new hair-dos on her blond tresses, had their work modeled, then photographed to appear in magazines like *Beauty Culture* and *American Hairdresser*, in whose pages her pictures have appeared. Because she preferred a business career to modeling, Miss Toepfer came to the Commercial Relations Department at West Street as a typist. She was assigned there for one year before being transferred to the same department at Whippany, where she is now the point of contact for obtaining schedules on purchase orders from the Purchasing Department and, in order to facilitate this work, she occasionally makes trips to New York to their Fourteenth Street offices.

A graduate of Morristown High School, Miss Toepfer is vice-president of the Morristown Junior Women's Club and president of the Beta Omicron sorority there, two offices which take up most of her free time. She corresponds frequently with her two brothers in service and with a number of others, one of whom is the Marine Corps pilot, a Laboratories man, who recently had a lei of orchids flown to her from Hawaii.

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COMING UP from the ranks of general messenger, and then a department messenger, BERVA HARDY is now a member of the files group of the Systems Development Department. There she maintains a topical and numerical index of all that department's BTL drawings and specifications and of Western Electric drawings which are sent on routine distribution. Berva's outside interests are contingent upon the time required for her studies at night school. However, when she has time she is interested in reading, particularly current literature, and in crocheting. Her brothers are both in service so that writing to them frequently and going to USO dances takes up whatever free time she may have.

News Notes

K. K. DARROW in the June 29 issue of *Science* gave a page and a half review of the book *Science in Progress* (Fourth Series, Yale University Press).

PROBLEMS relating to the use of synthetic hard rubber were discussed by W. S. BISHOP at Hawthorne recently.

W. MCMAHON has been appointed a member of the American Society for Testing Materials Committee D-7 on Wood.

A. R. KEMP and H. PETERS went to Boston to discuss synthetic rubber with the

Berva Hardy delivers a "super-rush" order, the handling of which is another part of her work in the Systems files

Union Bay State and the Dewey and Almy Chemical Companies.

With W. G. Straitiff, Mr. Kemp also visited the duPont Laboratories at Wilmington, Delaware, to discuss and to study problems arising from the use of neoprene for cable jackets.

The July issue of the *Proceedings of the I.R.E.* carries an article by L. C. Peterson and F. B. Llewellyn on the *Performance and Measurements of Mixers in Terms of the Linear-Network Theory*.

W. L. Betts has been elected Secretary of the Metropolitan Section of the American Society of Mechanical Engineers.

B. E. Stevens visited at Hawthorne on power transformer problems. Before returning to New York he also went to the Jefferson Electric Company, at Bellwood, Illinois, and the Line Material Company, at Zanesville, Ohio.

Electrolytic capacitors were discussed by M. Whitehead at the Sprague Electric Company, North Adams, Mass., and at the P. R. Mallory Company at Indianapolis, Indiana.

C. R. Steiner also visited the Sprague

Engagements

*Herbert S. Arnold—*Miriam Pearce
Jerry Esposito, U. S. Army—*Sophie Corace
Leo P. Gates, U. S. Army—*Anne Ashton
*Lieut. Ralph D. Horne, U. S. Army—*Dorothy Sellers
Capt. Lauren A. Raymond, U. S. Army—
*Lieut. Mary Burke, U. S. Army

Weddings

*Herbert Baker, U. S. Army—Rita Marmonstein
Dr. David W. Barton—*Lilias Swift
*Lieut. Richard C. Benkert, U. S. Army—
*Marjorie Flynn
*F. Gordon Merrill—*Lola Schmidt
*Orwar S. Mesch—Carrie Louise Perry
*Leonard M. Nielsen, U. S. Army—Alma Weber
*Victor Silzer, U. S. Army—Dorothy Coberg
*Aubrey A. Smith—Marion MacLeod
*Charles H. Wallschleger—*Carol Townley
*Lieut. Everett C. Walsman, USNR—
Frances Schnuriger

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

Prize winners of the recent art exhibit in the Murray Hill Lounge were Florence Purdon, D. H. King, J. Andrus and G. P. Spindler. Other successful contestants, not in the photograph, were Nelly Radder, J. J. Sabin, F. C. Tolley and R. M. Sherman

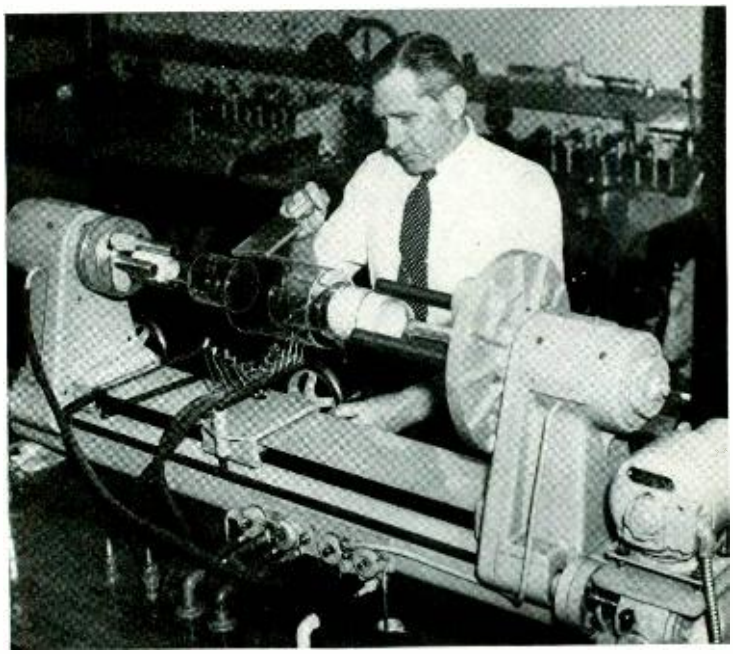
Electric Company at North Adams, Mass., to discuss the insulating finish for electrolytic capacitor containers.

G. A. GAWEL was at the Standard Transformer Company, Chicago, in connection with problems of the moisture-proofing of power transformers.

J. H. BOWER discussed batteries at the Cleveland, Ohio, plant of the National Carbon Company.

C. A. WEBBER visited the Simplex Wire and Cable Company and the Boston Insulated Wire and Cable Company in Boston on cable matters.

I. E. FAIR discussed crystal units on a visit to Hawthorne.



Complicated glass apparatus is formed at Murray Hill on a glass-working lathe. V. L. Lundahl is the operator

J. R. PIERCE is the author of an article *A Figure of Merit for Electron-Concentrating Systems*, published in the July issue of the *Proceedings of the I.R.E.* In the same issue there is a discussion of Mr. Pierce's paper, *Reflex Oscillators*, by E. U. Condon, A. E. Harrison, W. W. Hansen and J. R. Woodyard, with concluding remarks by the author himself.

R. C. PLATOW, C. J. FROSCH and C. S. FULLER inspected plastics developments at the U. S. Plywood Corp., at New Rochelle.

W. O. BAKER has been appointed chairman of the Physical and Inorganic Group of the North New Jersey Section of the American Chemical Society.

WALTER H. BRATTAIN, Whitman College class of '24, was elected to the college chapter of Phi Beta Kappa.

J. A. WATTERS and C. E. MILLER, together with engineers from the Long Lines Department and from Kearny, visited the four K-carrier auxiliary stations between New York and Philadelphia in connection with the crosstalk balancing equipment.

WITH REPRESENTATIVES of the Bell Telephone Company of Canada, G. Q. LUMSDEN witnessed creosote-pentachlorphenol-petroleum treatments at Savannah, Georgia.

MR. LUMSDEN accompanied R. H. COLLEY to New Haven to examine salt-treated poles in a coöperative study with The Southern New England Telephone Company.

AN INSPECTION trip to several of the K-carrier stations in the Albany area was made by H. H. SPENCER, J. M. DUGUID and A. J. WIER of the Laboratories, and by A. B. Covey and W. A. Clark of the O and E.

H. KEPPICUS visited the principal offices on the new Atlanta-Jacksonville coaxial cable route.

R. H. COLLEY went to Washington to discuss proposed war emergency standard specifications for *Poles—Miscellaneous Conifers* with OPA and other agencies.

V. T. CALLAHAN visited the General Motors, Detroit, Michigan; the Duplex Truck Company, Lansing, Michigan; and the Kohler Company, Sheboygan, Wisconsin, to study diesel engines and automatically controlled gasoline engines.

Please put your RECORD in the "Correspondence-Out" box when you are through with it so that it can be sent to a Serviceman's family.

Obituaries

DEATH overtook CHARLES E. PIERCE at Kansas City airport as he was en route to his home in North Hollywood after 22 months in the Laboratories. He had been temporarily transferred to us from the Southern California Telephone Company to assist in our war program. Mr. Pierce graduated from the University of Southern California (B.S.) in 1917, and from Columbia University (M.A.) in 1919. After a short time with Western Electric he transferred to the Pacific Company and later to its subsidiary, the Southern California Telephone Company where he became a supervising construction foreman. In the Laboratories he was a test engineer in power equipment group of the Equipment Development Department working synchro devices used in radar, computers and gunfire control.

Some months ago Mr. Pierce was taken ill, and as soon as his physician thought it prudent, he started for his home.

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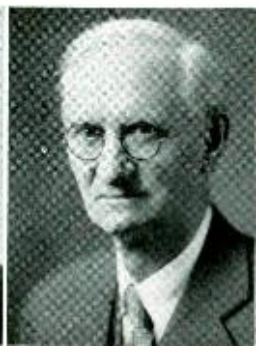
FRANCES POST, a member of the Patent Department, died on August 1. Miss Post was retired on a disability pension last November and prior to that she had been out for a year due to sickness. After graduating from Paterson High School, she came to the Laboratories in 1923 and since that time had been in the Patent Department. Her first assignment was in the Classified Patent Files where she worked a short time before being transferred to the case cost control group where she remained until the time of her illness. In her home community she was active in civic affairs, particularly in the D.A.R., of which she was regent at the time of her death. Miss Post also participated in the work being done to increase the educational facilities of underprivileged Kentucky mountain children.

E. G. HENRIQUEZ-GIL
1919-1945



J. L. HOGG
1871-1945

C. E. PIERCE
1892-1945

FRANCES POST
1905-1945

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E. G. HENRIQUEZ-GIL, a Technical Assistant in the Commercial Products Development Department at Whippany who had been on a disability leave since last February, died on June 22. Soon after graduating from the Morristown High School he joined the radio group at Whippany and since then, 1941, had been engaged in the electrical and some mechanical design work on experimental and final models of special electronic apparatus for the Armed Forces. He also worked on laboratory test equipment useful in testing this apparatus.

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J. L. HOGG, formerly Transmission Staff Engineer of the wire transmission research group, who retired in 1936 after sixteen years of service, died on July 3. Holding A.B. and Ph.D. degrees from Harvard, he was head of the Physics Department of McMasters University from 1906 to 1911 and of the same department at the University of Saskatchewan from 1911 to 1920. At the Laboratories he was first concerned with an investigation of telegraph transmission and then with the early development of volume control systems to enable speech of varying volumes to be transmitted over lines at nearly constant volume. Previous to his retirement he had made a survey of all known investigations on the behavior of relay contacts, so that further research in this field could be carried out along new lines.