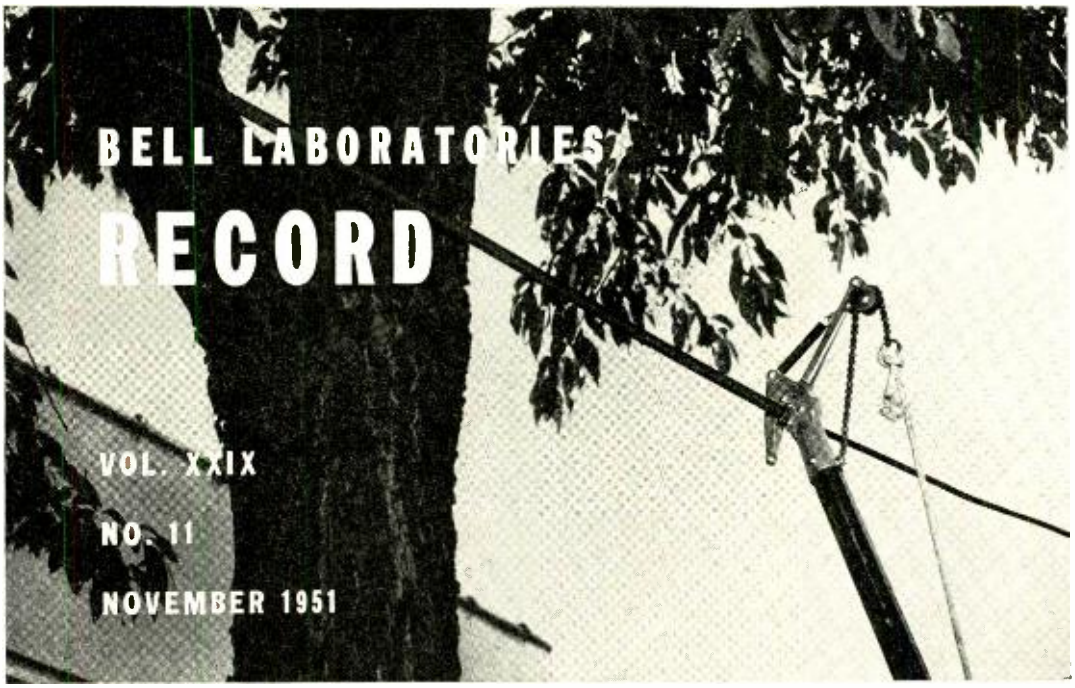

Plastic guards for aerial wire

W. S. BISHOP
Outside Plant Development

In stringing drop wire—the insulated line between a distribution cable or open wire and the subscriber's premises—it is not always possible to avoid trees. Continual movement of branches at contact points causes wear of the wire jacket and insulation and eventually, through exposure of conductors, failure of service. Although the present neoprene jacketed drop wire is considerably more resistant to abrasion than the earlier wires covered with weatherproofed cotton braid, it is still desirable to protect the wire from contact with tree trunks and branches. For this purpose, a new type of plastic guard has been developed by Outside Plant Development.

The earlier form of guard consisted of two sections of half-round wooden molding two feet long and 3/8-inch inside diameter. The two sections were wired together to enclose the wire at the point of tree contact. These guards could be readily installed and were sufficiently weather-durable, but because of their stiffness and short length, they abraded the wire at the guard ends. They also retained moisture which accelerated deterioration of the cotton, then the standard protective covering for drop wire. In addition, because of their weight, it was undesirable to employ them except at points where serious abrasion occurred.

These weaknesses were overcome by employing tubes of cellulose acetate butyrate (Tenite II) pigmented with 1 per cent carbon black. This inexpensive guard is readily installed, allows moisture to drain and affords adequate protection. It is light in weight, flexible, and inconspicuous. Following successful field trials in several Associated Company areas two types have been made available.

The S type, in the form of an extruded tube, approximately ½-inch in diameter and 36 inches long is applicable to new con-

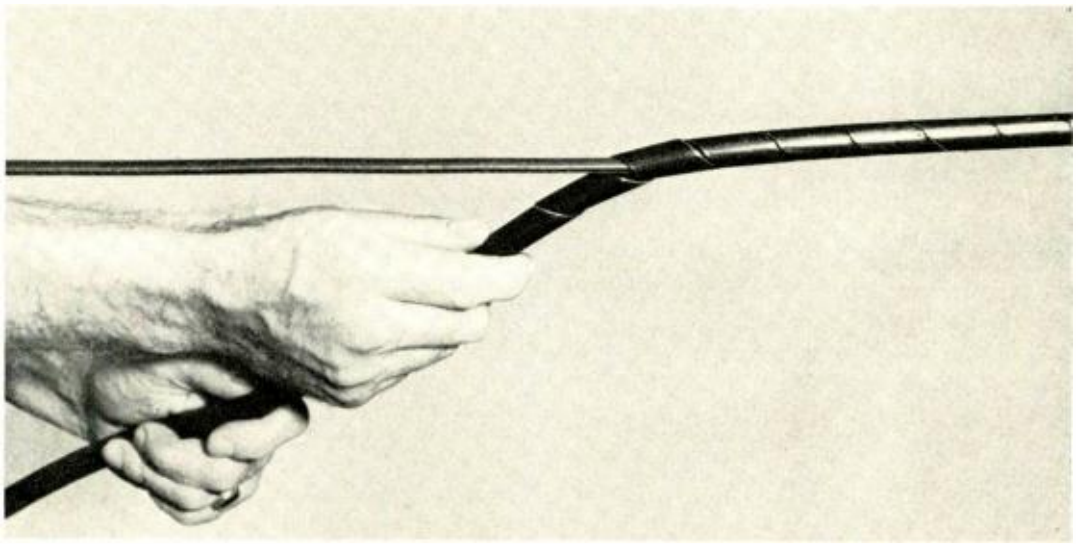

Fig. 1—Installing P type guard on drop wire.

struction where the installer, working on the ground, threads the wire through the necessary number of guards and subsequently pulls the wire up to position to make the terminations. For wire already in place, the P type takes the form of a similar tube slit by a helical cut having a pitch of approximately 1¼ inches. It is installed by spiralling on as depicted in Figure 1. This is usually accomplished by the installer working from a pole or ladder.

With both types of guard it is necessary to locate them on the wire and then to prevent subsequent shift in position. To locate the guards a special tool, the B clip crimper, attached to a tree pruner handle, is used by the installer on the ground to push the guards along the wire to the proper position. A guard is held in place by crimping "S" shaped corrugated sheet metal clips on the wire adjacent to each end. These clips are held in the crimper and closed on the wire by a lever which the installer actuates by pulling a rope as illustrated at the head of this article.

While these guards are simple in form, several precautions must be taken in the control of their quality to assure performance in service. For example, the presence of stresses sometimes called "elastic memory," may be introduced by improper extruding conditions and may cause excessive shrinkage or deformation of the guard after installation. In the earliest guards formed from helically wrapped tape, relaxation of the extrusion stresses actually unwrapped the helix at the ends of the guards permitting them to override the S clip, telescope one into another or even unwrap completely from the wire. To provide against the acceptance of guards which may deform to an undesirable degree in service, specifications require that the tubing from which the guards are fabricated shall not shrink excessively after exposure to elevated temperatures. As a further control on this feature and to prevent the accidental inclusion of compounds which may lead to cracking or shattering in cold weather, the tubing is required to meet a cold bend test at 0 degrees F.

An important consideration is that the plastic be compounded to withstand the destructive effects of weather. This need was recognized early in the development stages of the guard and a thermoplastic compound inhibited against degradation from sunlight was specified as soon as it became available commercially. This compound contains salol which acts by preferentially absorbing the actinic rays with resultant slow decomposition of the inhibitor. It is used extensively in the trade as it does not affect the appearance of the clear thermo-

plastic but its effectiveness is limited in time due to its decomposition.

In order to provide a longer physical life for the guards, the Laboratories proposed that carbon black, a well-known protective agent for plastics in general, be incorporated in the thermoplastic compound. This material absorbs and dissipates the ultraviolet frequencies at the surface of the plastic and is effective until practically all the plastic has been weathered away. It is interesting to note that earlier attempts to make plastics weather-stable by incorporating black dyes improved their appearance but were not adequately effective in prolonging their outdoor life. Accelerated laboratory tests indicate that the incorporation of carbon black in the thermoplastic material results in guards having a probable weathering life of at least fifteen years.

Laboratory and field experience with the P and S guards led logically to the development of another type of guard to provide insulation protection for copper or steel line wire strung through trees. This, the L type, is also of black Tenite II, extruded as a tube approximately 3/16-inch in diameter. Because of its small size it is furnished in 100-foot coils. This guard is used in preference to tree wire* where an occasional span needs protection and may be placed on line wire either at the time of installation or, subsequently, in which case it is necessary to cut the wire before threading on the guards. These guards are purchased under specification requirements similar to those applying to P and S guards.

The P, S and L type wire guards, now standard in the Bell System, provide inexpensive and easily installed protection. Meanwhile, the search continues for a plastic with even better performance characteristics, particularly from the standpoints of sunlight and abrasion resistance.

* RECORD, *November* 1949, *page* 381.

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Vocal gestures

GORDON E. PETERSON
Transmission Research

Speech is a complex combination of sounds of many frequencies and intensities all varying continuously in time. One method of portraying these characteristics of speech, the sound spectograph, was developed some years ago in these Laboratories. Speech patterns produced by such devices, called visible speech,* are now being studied as an aid to teaching the congenitally deaf to talk.

It has long been recognized, however, that not all of the details present in a sound spectogram are essential to the interpretation of speech sounds. If the essential elements of speech could be determined, not only could speech be portrayed more easily in graphical form, but it might be possible to devise electrical circuits that would translate speech directly into the mechanical operations called for by the speech. It is conceivable, for example, that circuits could be devised that would enable a subscriber to speak a number into his telephone transmitter and have electrical circuits automatically establish the connection called for, although at the present time no such arrangements are planned.

One of the promising results of the continuing studies of speech characteristics is the analysis of vocal gestures. This term was applied by Sir Richard Paget to the mouth movements in speech: movements of the tongue, lips, and jaw. The equivalents of these movements are to be found in the sequences of frequencies present in speech. While manual gestures often emphasize certain of our meanings, or even express feelings we cannot express by speech alone, vocal gestures seem to carry

* RECORD, January, 1946, *page* 7.

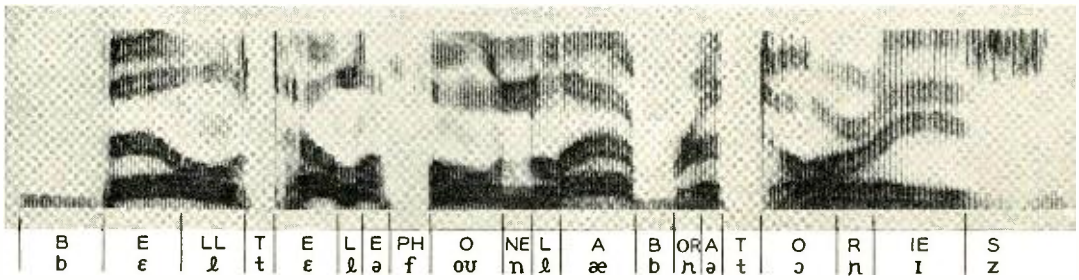


Fig. 1—A spectogram of "Bell Telephone Laboratories."

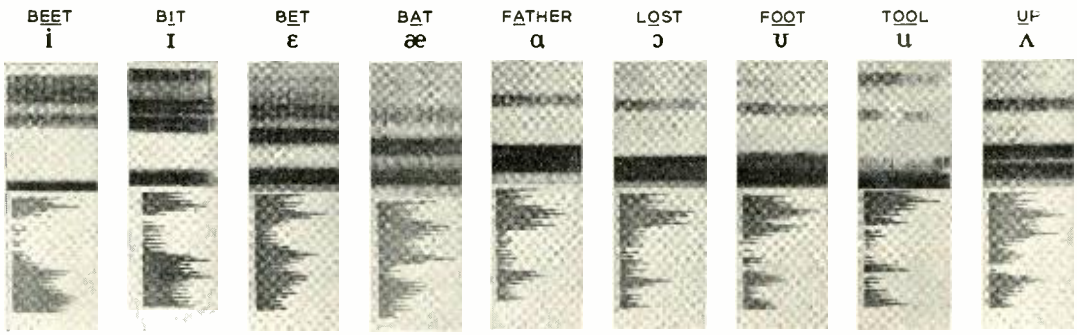


Fig. 2—The upper portions of the patterns show spectrograms of a number of sustained vowels. A section of each vowel is shown immediately below each spectrogram.

most of the essential significance of the speech sounds.

In spectrograms, various types of speech sound formations have characteristic patterns as shown by Figure 1, which is the spectrogram for "Bell Telephone Laboratories." Plosives, such as the p, b, t, and d sounds, are shown by gaps; fricatives, such as f, v, and s sounds, by random vertical striations; and voiced vowels and semivowels by the heavy black bands or "bars" that move throughout the records. These bars result from the cavity resonances of the vocal mechanism.

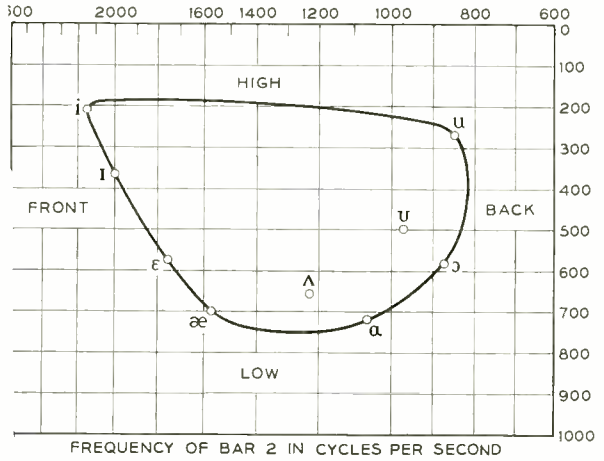


Fig. 3—A plot of the frequency of bar 1 against that of bar 2 for the vowels of Figure 2.

It will be noticed that the bars move about in frequency as time progresses and seldom remain fixed for an appreciable length of time. In an attempt to better understand the information present in the vowel bars, a series of sustained vowels was formed, as shown in Figure 2. The symbols shown above these and in the subsequent illustrations are from the International Phonetic Alphabet. Key words are given above the symbols.

The upper pattern for each of the vowels of Figure 2 is the broadband analysis with the sound spectograph, using a frequency scale linear from 0 to 3400 cps. In the lower pattern for each vowel, an amplitude section, or spectral analysis, of the vowel is shown. In these patterns amplitude is portrayed horizontally and the frequency scale is inverted, starting with zero at the center and extending downward to 3400 cps. Frequency equalization is employed to strengthen the higher frequencies, which are normally weak in speech. The lines in the lower patterns represent the individual harmonics of the voice. It is the regions of reinforcement of these harmonics which are represented by the vowel bars. The bar nearest zero frequency has been called "bar 1," the next "bar 2," the third "bar 3," and so on.

When the frequency of bar 1 is plotted against the frequency of bar 2 for these sustained vowels, as shown in Figure 3, a vowel loop is formed. It is of considerable interest that when the origin is placed at the upper right, as in Figure 3, the arrangement of the vowels is essentially the same as in the tongue-position diagrams which phoneticians have employed for many years to describe the relationships among the vowels. In the figure the terms "high, front,

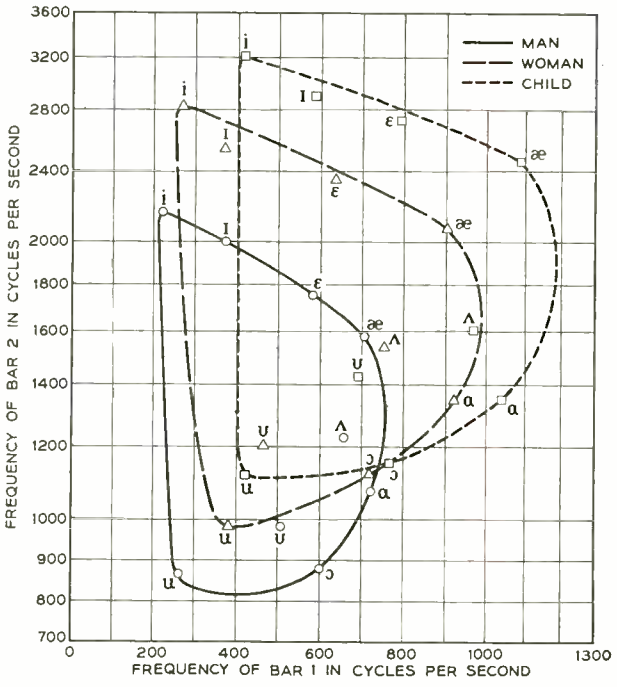


Fig. 4—Plots similar to Figure 3 for the vowels as spoken by a man, woman, and a child.

low, back" refer to positions of the hump of the tongue within the mouth. The frequency scale employed in Figure 3 and in subsequent graphs is that described by Koenig.* It represents frequency relationships approximately as they are sensed by the ear.

Experimentation has shown that for any single speaker such a vowel loop rather well represents the constraints of his vocal cavity system, and while points may be formed anywhere within the loop, points may not lie far outside. It is somewhat disturbing, however, to find that the voices of all speakers do not fall within the same vowel loop. There is a large factor of vocal cavity size involved, as shown in the loops for a man, a woman, and a child of Figure 4. These are plotted with the origin at the lower left. As would be expected, the bar positions of any particular vowel lie higher in frequency for speakers with smaller vocal cavities.

It is immediately evident, however, that the vowel relationships for the speakers of Figure 4 are similar. This suggests that there may be certain form features of these vowel patterns which are the same, although the absolute frequency values are not.

In actual speech there is a continuous movement or change in the spectral form. This change results from the continuously shifting formations of the vocal cavities during speech. Such changes may be shown, for example, by plotting the frequency of bar 2 against that of bar 1 as certain sounds are spoken. This is shown in Figure 5 for the words "one", "five", and nine." The arrow indicates the end of the graph and the direction of time flow of the plot. It is this type of graph that depicts the vocal gestures.

These vowel traces also carry information about the consonants. The consonants are formed by characteristic mouth positions, involving a certain degree of variation depending upon the particular consonant class involved. The consonant mouth positions have characteristic resonance values which ►

* RECORD, *August*, 1949, *page* 299.

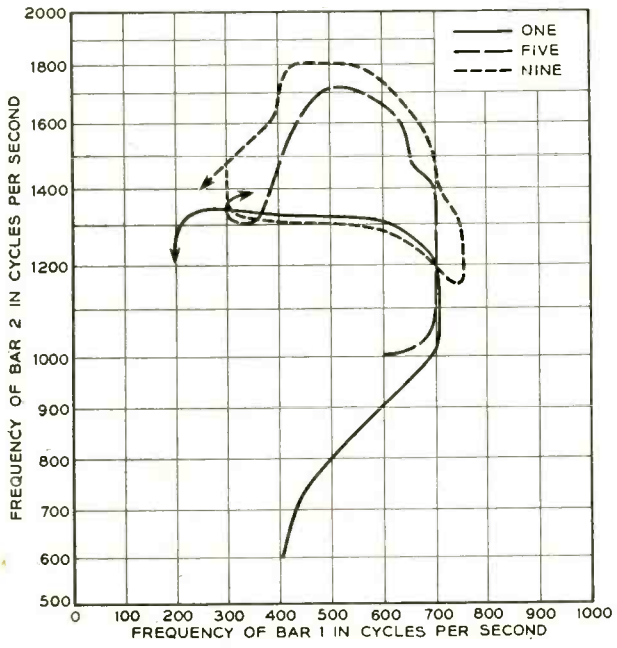


Fig. 5—Plots of the frequency of bar 1 against that of bar 2 for the words "one," "five," and "nine." This type of graph depicts the vocal gestures.

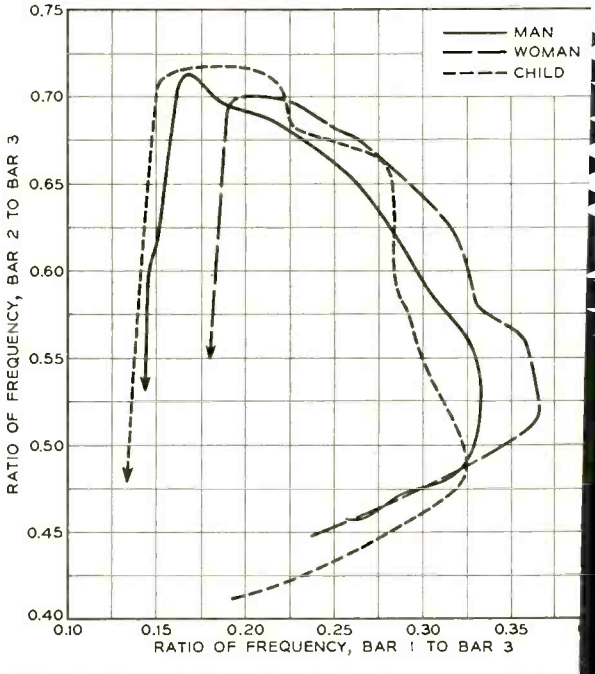


Fig. 6—Plots of the ratio of the frequency of bar 2 to that of bar 3 against the ratio of the frequency of bar 1 to that of bar 3 for the word "five."

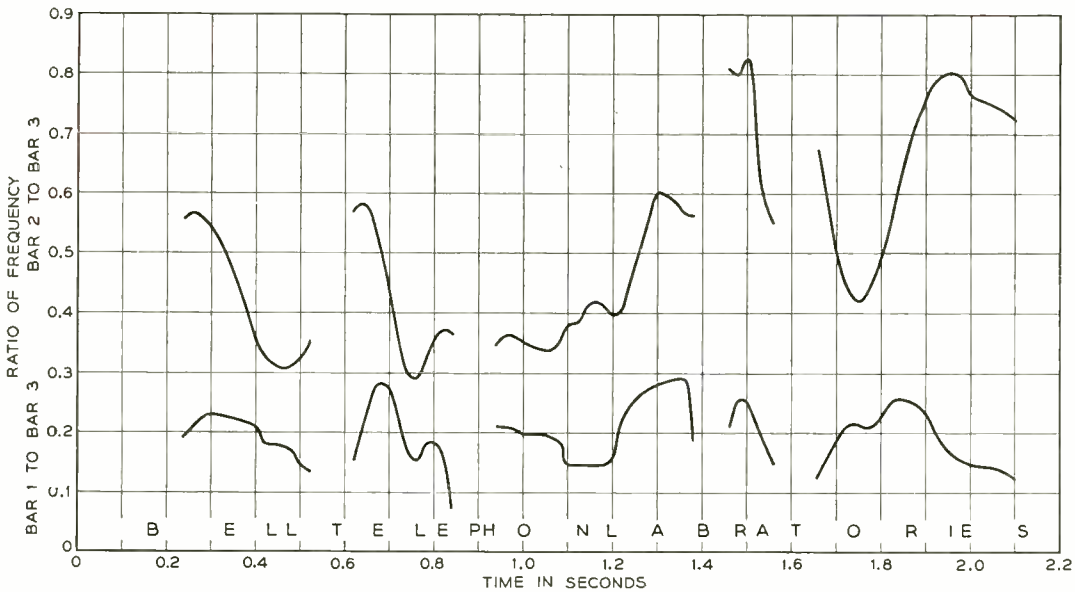


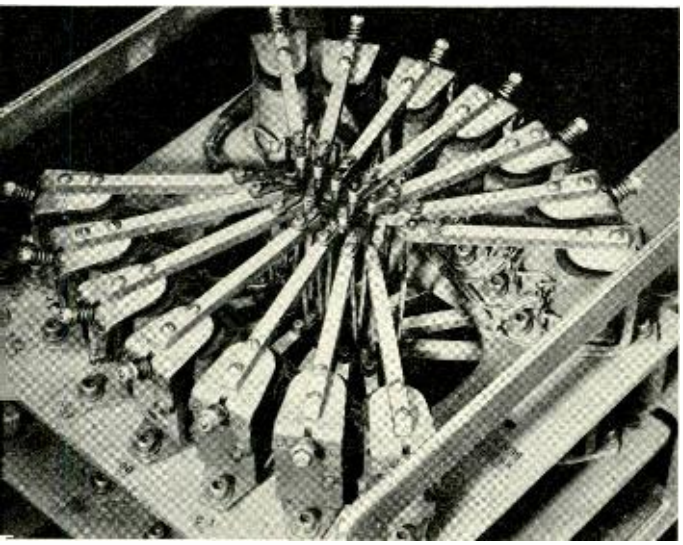
Fig. 7—Plots against time of the ratio of the frequency of bar 1 to that of bar 3, below, and of the ratio of the frequency of bar 2 to that of bar 3, above, for "Bell Telephone Laboratories." In these curves the broad plateaus and the maximums and minimums represent the speech sound in the mouth. Transition or influence movements from one speech sound to the next are those regions in which the curves are changing rapidly.

appear whenever energy is present to show their locations in frequency. The consonant influences appear in the location and direction in frequency of the initial and terminal portion of the traces.

It has been found that if the ratios of the frequencies of the various bars are plotted instead of the absolute frequencies of the bars during the formation of a speech sound, the resulting plots are much more nearly aligned for different speakers. This is shown in Figure 6. In this figure the digit "five" is shown for a man, a woman, and a child. By employing ratios, B_1/B_3 and B_2/B_3, absolute frequency values are removed and only the relationships or vowel forms remain. While the absolute frequency values which appeared in these three speakings were markedly different, it is seen that the shapes and positions of the frequency ratio traces are very similar. A similarity is also found in the ratio traces of the other digits.

(Continued on page 510)

THE AUTHOR: G. E. PETERSON received an A.B. degree from DePauw University in 1935, and M.A. and Ph.D. degrees from Louisiana State University in 1937 and 1939, respectively. For the next five years he served as speech pathologist and taught, first at Ball State Teachers College and then at Northwestern University. In 1944, working under an OSRD contract at the Psycho-Acoustic Laboratory at Harvard University, Dr. Peterson made a study of specifications for hearing aids. He joined the staff of the Laboratories in 1946, where his work has been in the basic analyses of speech and the study of the physical characteristics of the various speech sounds.



The AMA tape perforator

P. B. DRAKE
Switching Apparatus Development

One of the basic devices of the Automatic Message Accounting system* is the tape perforator. Its function is to perforate holes in paper tape in a coded pattern, and it is used both in central offices and in accounting centers. In central offices, it records the pertinent information for each call, while in accounting centers, it provides new tapes as the data are processed for use in preparing the customers' bills. The machine consists essentially of 28 perforating magnets, a drum, and a paper advance mechanism. The magnets, each with an armature arm carrying a perforating pin, are mounted on a two-level steel frame as shown in Figure 1. The drum and paper advance mechanism, together with a number of auxiliary units are mounted on the underside of the machine. The steel frame, consisting of two duplicate halves, is designed to protect the parts mounted on it from damage when the machine is resting on any side, and at the same time to provide handles by which the perforator may be moved about.

In early studies of the AMA project, it was decided to use a tape three inches wide, and to record six coded digits in each line of perforations across the tape. Since one of the digits requires space for three perforations, and each of the remaining digits requires space for five, a total of 28 perforating positions is required. Allowing for suitable margins along each edge of the tape, this gives only a tenth of an inch between the centers of adjacent perforations. Since the perforating pins themselves are nearly a tenth of an inch in diameter, and the armature bars that operate them are appreciably wider than that, it was obvious that all 28 pins could not be lined up in a single row across the tape. The arrangement adopted is indicated in Figure 2.

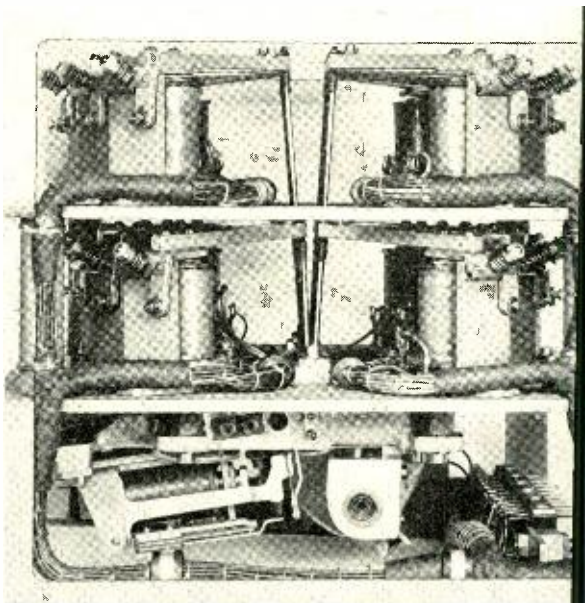


Fig. 1—Side view of the perforator used in accounting centers.

* RECORD, *September*, 1951, *page* 401.

The perforating magnets are divided into four groups of seven each and mounted on two levels; on each level seven magnets are mounted in an arc near the front edge of the frame, and seven in a similar arc near the rear edge of the frame. The fourteen pins operated by magnets along the rear of the frame are lined up over alternate perforating positions in one row, and those operated by magnets along the front end of the frame are lined up over alternate perforating positions in the adjacent row. This is indicated in Figure 3, where the positions are numbered from 1 to 28 across the tape, and the rows are numbered in the order in which they pass through the perforator. The first "line" of codes perforated use the even numbered holes in Row 1 and the odd numbered holes in Row 2. The second "line" perforated use the even numbered holes in Row 2 and the odd numbered holes in Row 3, and so on for successive "lines" of information. Although in descriptions of the AMA system reference is always made to

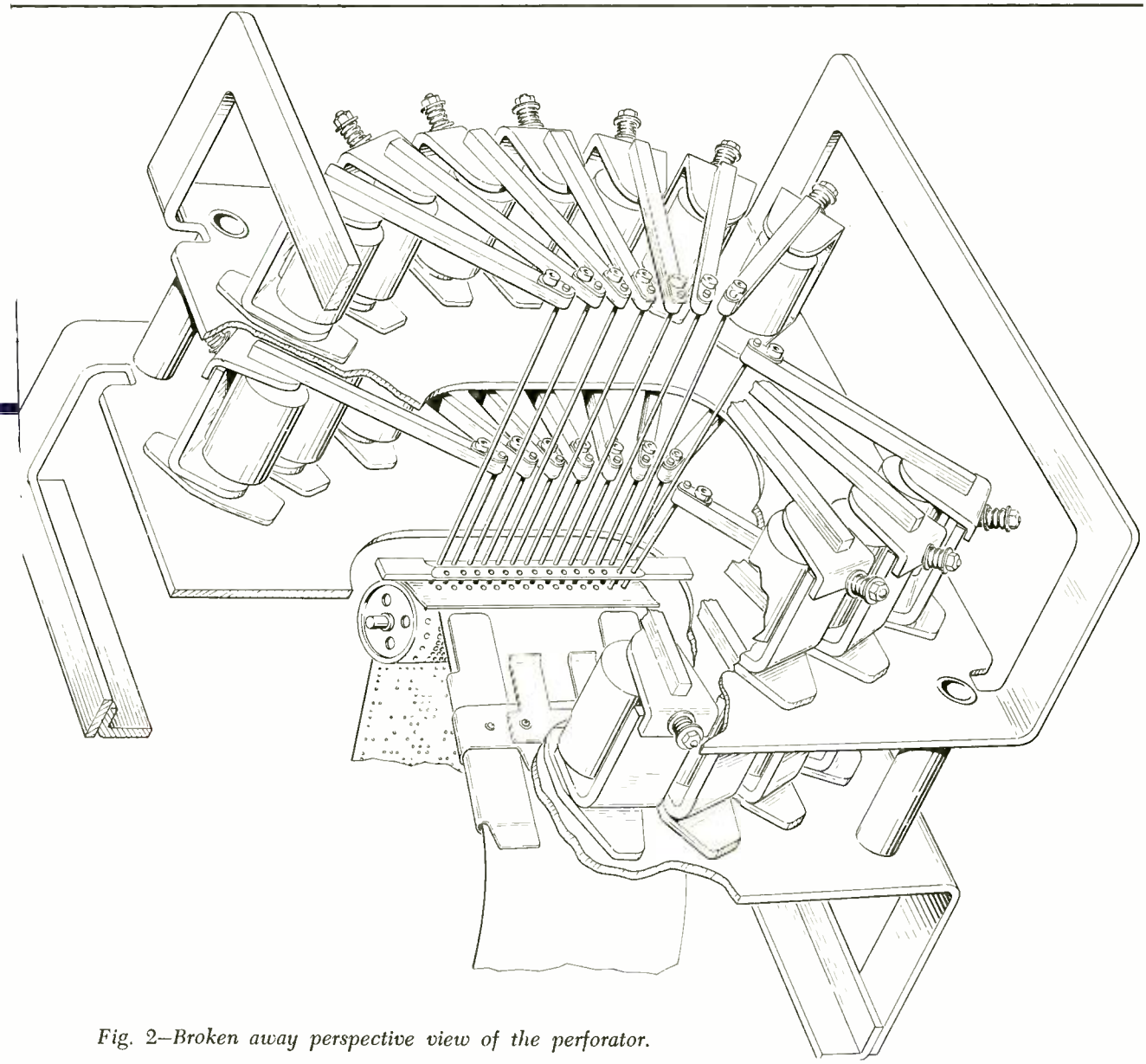


Fig. 2—Broken away perspective view of the perforator.

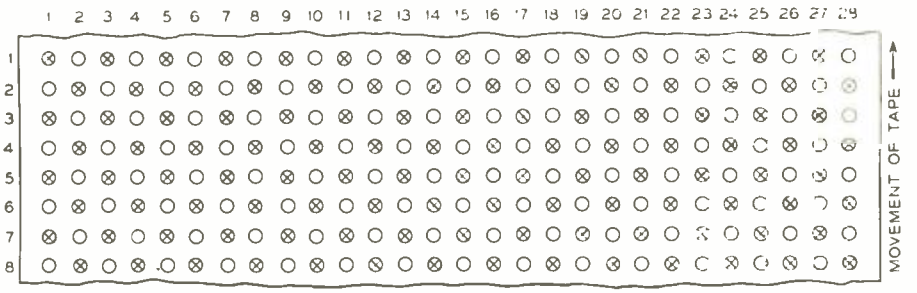


Fig. 3 — Pattern of the holes that are punched in tape by the perforator.

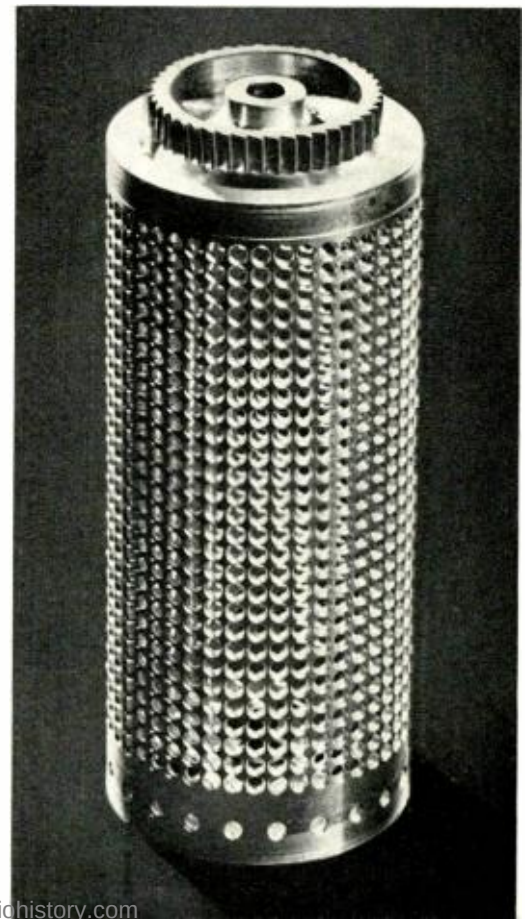
the information carried by a "line" of holes, the holes comprising such a "line" are physically the alternate holes in adjacent rows.

One of the most difficult undertakings in the design of the perforator was the drum on which the paper rests while being perforated. This drum is approximately 1½ inches in diameter and 3⅝ inches long and has 1232 holes (44 rows of 28 each). The holes are countersunk so as to conform to the conical ends of the perforating pins. Extreme precision is necessary in drilling these holes to permit the perforating pins to seat properly in them without binding in the guide. Also, the perforated tape is later passed through a reader at the accounting center, and the conically shaped perforations must fit accurately in the holes of the drum of a reader while the tape is being read. Since the machine was designed, moreover, to perforate 20 lines a second, and thus for each perforating operation the drum must be started, rotated a little over 8 degrees, then stopped, and still leave sufficient time for the perforating operation, all within 0.05 of a second, it had to be made very light to limit the force of inertia. It was therefore made from aluminum tubing with a wall about 1/16 of an inch thick. One of these drums removed from the machine is shown in Figure 4.

In operation, the tape is fed into the chute just under the bottom level of the frame, evident in Figure 2. This chute directs the paper under a curved metal guide plate, also evident in Figure 2, that holds the paper against the drum and guides it out of the machine. This guide is drilled with two rows of clearance holes to permit the perforating pins to pass through. Just above this guide is a second guide, similarly drilled, but with slightly smaller holes that guide the perforating pins into the proper holes in the drum. When the pins are up, their points are just below this upper guide, and when a magnet operates, the conically shaped point of the pin passes through the hole in the lower guide, perforates the tape, and forms a paper cone in the tape that seats in the countersunk hole in the drum. As the pin is retracted, the paper cone remains in the drum, and it is by means of these cones that the tape is drawn as the drum is rotated.

The paper-advance mechanism consists of a magnet and an armature carrying a

Fig. 4—An AMA drum.



pawl which engages the teeth of a ratchet attached to the drum, evident in Figure 4. When the magnet is electrically energized the pawl is withdrawn from a ratchet tooth and positioned to engage the next tooth. A retaining pawl prevents the drum from rotating when the driving pawl is withdrawn. When the magnet is de-energized,

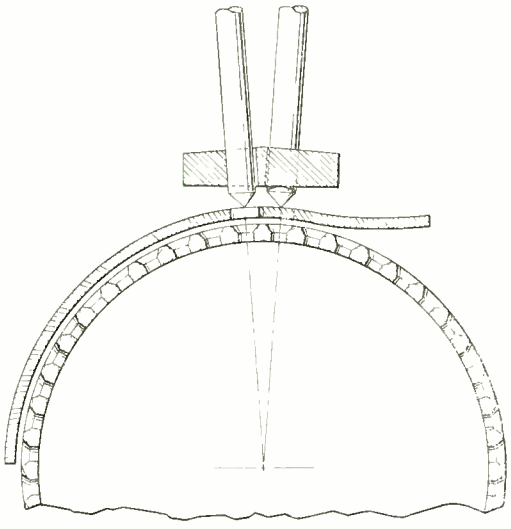


Fig. 5—Diagram showing relative positions of perforating pins and drum.

the spring-driven armature causes the pawl to engage the ratchet tooth and rotate the drum to advance the paper tape one row of holes. Each time the perforating magnets perforate holes in the tape, the paper-advance mechanism operates and advances the tape one step.

Each perforating pin moves along the line passing from the center of a hole in the drum to the axis of the drum, and thus the pins for the two rows of holes slant inward as the sides of a V that would intersect on the axis of the drum. This is evident in Figures 1 and 2 and in more detail in Figure 5. Since the pins must move essentially in a straight line, while the ends of the armature bars travel in an arc, a flexible coupling is required between them. This is accomplished by the construction shown in Figure 6. It consists of a steel ball held firmly between a cup-pointed set-screw and the top of the perforating pin by a helical spring. One end of the spring is held by the screw threads of the set-screw, while the other end is set into a groove in the pin. This coupling readily permits the slight rocking needed when the magnet operates. These springs are evident in Figure 1, which also shows the springs at the rear of the magnets that return the armatures to their normal positions, and thus withdraw the perforating pins when the operating current is interrupted.

To provide a continuous tape for the perforators, the end of one tape is spliced to the beginning of another. In this splicing operation the two tapes are overlapped for a short distance, and since the perforating pins cannot consistently penetrate the double thickness of tape, each perforator is equipped with a splice indicator, which detects an approaching slice and causes a special pattern to be perforated on the tape for a short distance each side of the splice.

At the time the splice is made, a rectangular hole, called a splice window, is cut in the tape across the splice as shown in Figure 8. The splice indicator itself consists of a flat finger (just below the middle of the drum in Figure 9) that rests on the tape a short distance back from the drum. When the splice window comes along, this

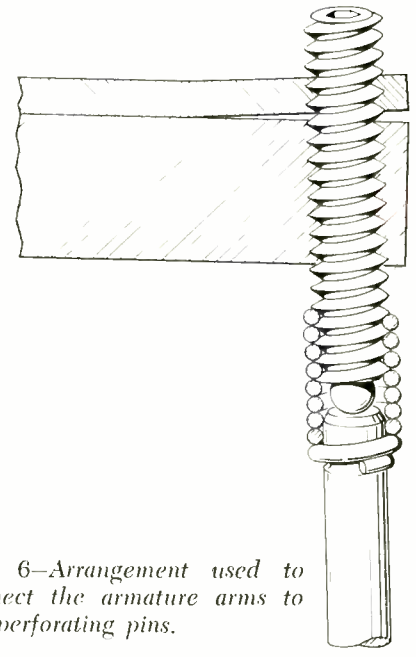
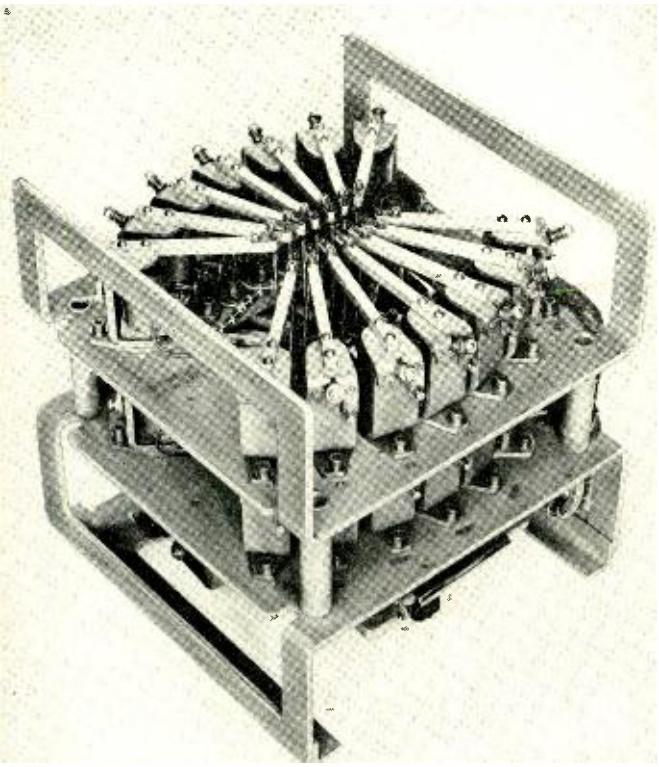


Fig. 6—Arrangement used to connect the armature arms to the perforating pins.



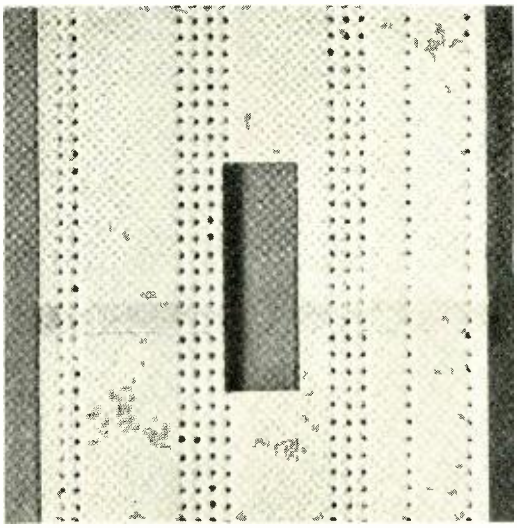


Fig. 8—A section of the tape showing a splice window and a splice pattern.

Fig. 7—View of the AMA perforator showing the two duplicate halves of the frame assembled to provide a two level structure for supporting the perforating magnets.

spring driven finger moves up a short distance through the splice window and in doing so permits a micro-switch to operate, causing an associated circuit to direct the perforator to produce a splice pattern—also shown in Figure 8. For the brief period while this splice pattern is being perforated, the machine is unavailable for perforating message information, and thus there is avoided the possible mutilation of information pertaining to a call because of the perforating fingers' being unable to penetrate the double thickness of paper at the splice. At the accounting centers, the circuits recognize the splice pattern, and no information is recorded until the splice pattern has passed through the reader.

Besides these various features of the perforator that are common to the machines used in both central offices and accounting centers, there are a few auxiliary features used only in the central office machines or only in the accounting center machines. In central offices the tapes are cut only once a day, and to allow space for cutting, the recorder — at about 3 a.m. — automatically perforates several feet of splice pattern on the tape together with tape identification codes on each end of the splice pattern. Tape may then be cut anywhere within this splice pattern at the convenience of the operating staff.

At accounting centers, on the other hand, the tapes are cut more frequently and at irregular intervals. To simplify this cutting, an electrically operated paper cutting mechanism is attached to the machines used in the accounting centers. It consists of a longitudinal section of a cylinder just back of the perforating drum, shown in Figure 10, that when rotated by a solenoid, shears the paper from one side to the other against a stationary knife edge. The cutter is push-button controlled, and thus permits the tapes to be quickly cut by the attendants whenever the required amount of information has been recorded.

At the accounting center, the perforated tape is allowed to fall into a bin. It was found during the development stage that at times, particularly during the winter months, the paper in passing through the

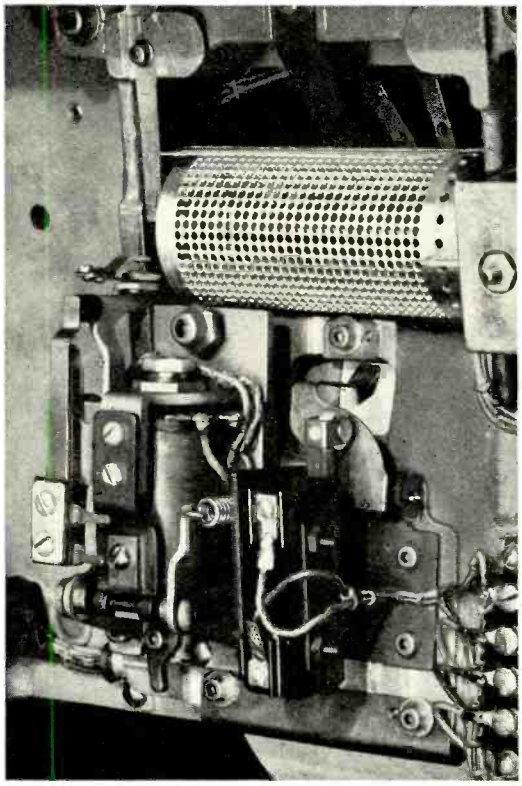


Fig. 9—View of the underside of a central office perforator showing the splice detecting finger just below the middle of the drum.

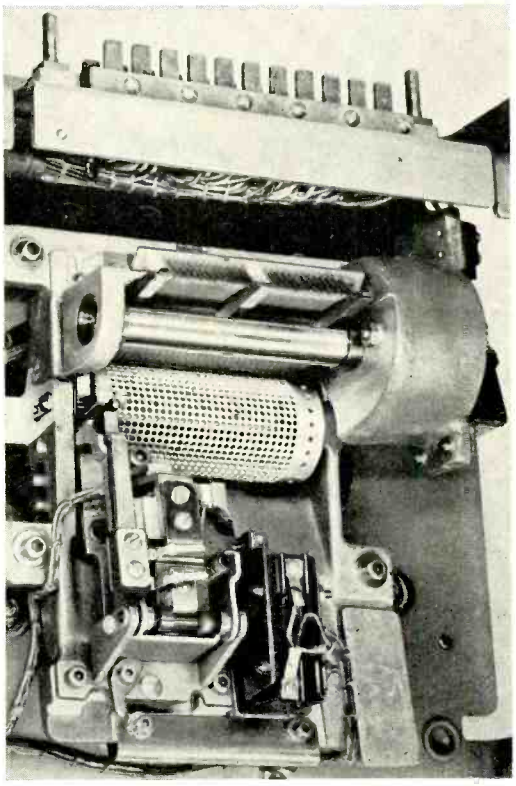


Fig. 10—Underside of an accounting center perforator showing the cutting mechanism and the static eliminator just above the drawer.

perforator collected sufficient static electricity to cause the tape to cling to the storage bin. This drastically reduced the amount of tape that could be deposited in a bin. To alleviate this, a static eliminator consisting of a series of needle points was designed and mounted on the paper cutter frame to dissipate the static electricity as the tape leaves the perforator. This static eliminator is also evident in Figure 10. There is no need for it in the central office machine where the perforated tape is wound on a motor-driven drum.

Although the machines in central offices

THE AUTHOR: After graduation in 1925 with a B.S. degree in M.E. from Virginia Polytechnic Institute, P. B. DRAKE worked for the American Can Company. In 1927 he joined Associated Dental Products, and the following year came to the Laboratories. He was concerned with writing specifications on dial systems and special product apparatus until 1937, when he transferred to the group that was studying costs of step-by-step apparatus. Following the outbreak of World War II, Mr. Drake was sent to Ford Motor Company in Dearborn, Michigan, and then to Chicago, to help in the design and production of gun directors. Two years later, he returned to the Laboratories to help in the design of radar equipment. He is currently designing apparatus for AMA and making cost studies on relays.

do not have either the paper cutter or the static eliminator, they, in turn, are equipped with a drum-advance check that is not used in accounting centers. It consists of a small relay having a finger on its armature to "peck" at the drum. Special holes around the periphery of the drum on one end, shown in Figures 4 and 9, are arranged so that at every other step of the drum one of the holes is brought into alignment with the finger of the relay. Each time that the perforating magnets are electrically energized, the relay is also energized so that its finger will strike the periphery of the drum or engage one of the drum holes. When it engages a hole, the relay armature is permitted to complete its operating stroke and to close its contacts. When it strikes the drum, however, the motion of the armature is restricted and the relay contacts do not close. Continuation of this sequence indicates to the associated circuit that the drum advances after each operation of the perforating magnets. A failure of the sequence at once gives an alarm so that the operation of the perforator can be checked.

The electrical components of the perforator are connected by a local cable to a plug mounted on the underside of the perforator, partially evident in Figures 9 and 10. This plug contains 44 terminals arranged on two levels and is so designed and mounted that it may be plugged into the properly positioned jack to which the associated circuits are connected.

In designing the perforator, a number of parts manufactured for existing telephone apparatus were used, and modified where necessary to keep down the development and manufacturing expense. The perforating magnets, for instance, contain the same coil assembly and pole pieces used on 263-type relays. The paper advance mechanism utilizes the magnet, armature, pawl, and framework of the 206-type selector. Perforators used in accounting centers are known as KS-13882, List 1, while those for use in central offices are known as KS-13882, List 2 perforators.

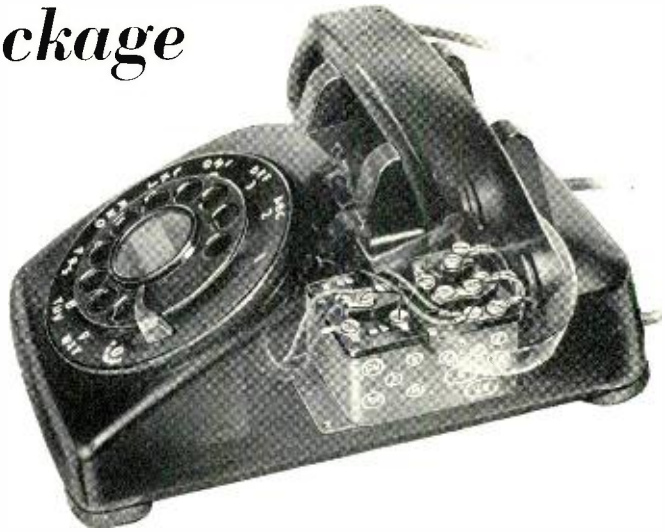
These perforating machines are at present being manufactured by the Teletype Corporation in Chicago.

(Continued from page 503)

Although time is a fundamental dimension in speech production, it does not appear as one of the coordinates in such plots as that of Figure 6, but rather follows the irregular pattern of the curve itself. It is possible, however, to re-plot the frequency ratios with time as the horizontal axis. To represent data equivalent to Figure 6 on such a plot, there would be two curves: one representing the ration of frequency B1 to B3, and one the ratio of frequency B2 to B3, both plotted against time. In Figure 7 such a plot is made for the words "Bell Telephone Laboratories." Figure 7 is thus comparable with Figure 1. Although Figure 7 is far simpler than Figure 1, it is believed that it contains most of the essential information of the speech sounds it portrays. In general, the broad plateaus and the maximums and minimums of these curves represent the speech sound, or target positions in the mouth. Regions in which the curves are changing rapidly with time represent the transition or influence movements from one speech sound to the next.

The recent experimental work which has been done strongly indicates that the vowel bars carry a large portion of the essential information in speech. These bar patterns are not only fundamental to the identification of the vowels, and semi-vowels, but contribute to the identification of the consonants. The traces or acoustical gestures appear to afford a basic means of displaying this type of information.

A transmission package for the 500 telephone set



W. R. NEISSER
Transmission Apparatus Development

One design objective of the 500-type telephone set was that it be easy to assemble and wire in the factory. The 425A network designed for this set made an important contribution to this objective. In a single, sealed package it combines the induction coil, the talking and ringing capacitors, the dial radio interference filter and the sidetone balancing impedance*. Its terminal plate supplies the principal connecting block for the set.

* RECORD, *July*, 1934, *page* 347.

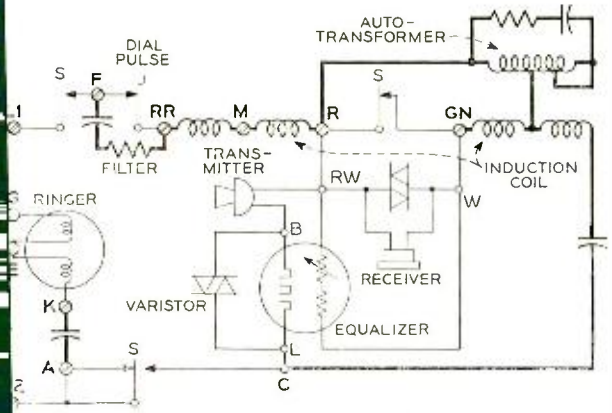


Fig. 1—Circuit of 500-type telephone set. Heavy lines denote circuit elements and terminals provided by 425A network.

The circuit elements of the 425A network and the terminals which it provides to facilitate connections between other parts of the telephone set are shown in heavy lines in Figure 1. To maintain present sidetone levels with the more efficient instruments of the new handset a balancing impedance was required having the characteristics shown by the solid lines in Figure 2. The fixed resistance of earlier sets would meet these requirements only at one frequency. The desired resistance-reactance combination is of the form shown to the left of Figure 3. Involving among other elements a 2-mf capacitor, it would be large and expensive if built with conventional parts. G. A. Persons solved the problem by means of the equivalent autotransformer network shown at the right of Figure 3. Its characteristics are shown by the dotted curves of Figure 2.

The inductance element L is furnished by the self-inductance of the (R-1) winding of the autotransformer. The resistance R_A is made up of the effect of losses in the autotransformer core, paralleled by the d-c resistance of the short-circuited portion of the winding stepped up by transformer action. By stepping down the impedance of a series capacitor-resistor combination (extreme right of Figure 3) a small 0.2-mf capacitor was made to do the work of the

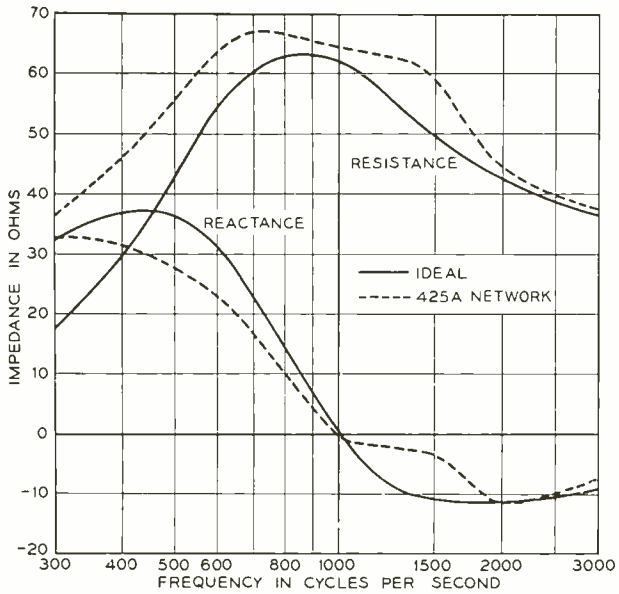


Fig. 2—Characteristics of anti-sidetone balancing impedance. The solid lines show the impedance required to maintain present sidetone levels for the more efficient instruments of the new bandset.

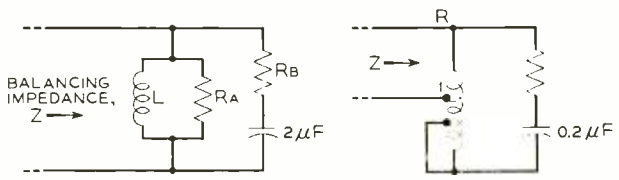


Fig. 3—Autotransformer network at the right and its equivalent impedance at the left.

needed 2.0-mf unit. A further space saving was realized by utilizing the newly developed metallized paper capacitors† which are less than half as big as conventional foil-paper capacitors.

Packaging seven circuit components in one container (Figure 4) provides ease of mounting and wiring into the telephone set, minimum space requirements, excellent protection of the elements from damage, and low cost. The internal wiring is done under close factory supervision and control, and several external interconnections with their added cost and danger of error are eliminated. The package is automatically tested on the production line before being incorporated in the telephone set assembly. Careful design for long component life is essential since any element failure would necessitate replacement of the entire package.

To insure long, trouble-free life the induction coil and autotransformer windings are interleaved with cellulose acetate sheet and ample end margins are provided to avoid short-circuited turns or layers. The magnet wire is insulated with "solder-through" enamel to eliminate the danger of damage in enamel scraping operations and to avoid poorly soldered connections due to failure to clean the wire properly. It also provides cheaper soldered connections. The four capacitor units, being of

† RECORD, *February*, 1951, *page* 56.

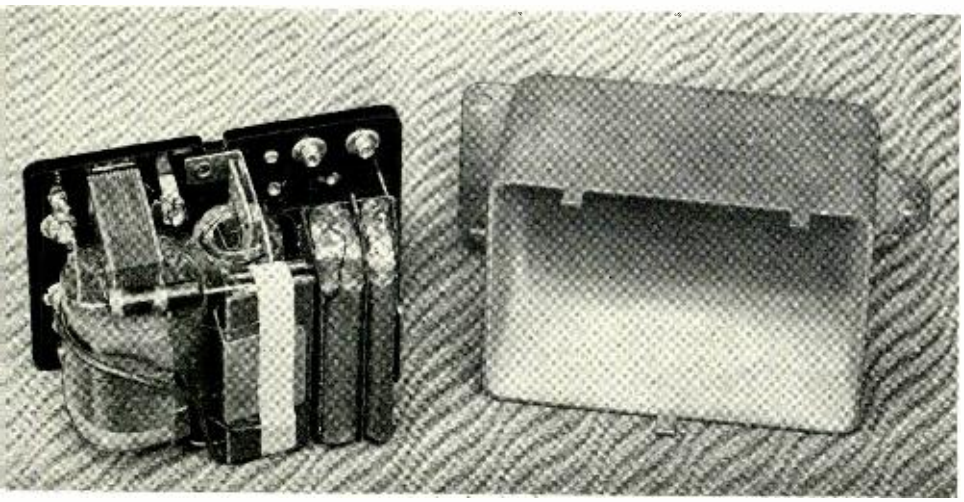


Fig. 4—Elements of the seven circuit components of the 425A network.

the metallized paper type, are "self-healing" in case of dielectric failure due to high voltage surges. The container is a sturdy steel can, and as a final safeguard the entire assembly is dried, and the can filled with moisture-excluding compound. In addition to providing mechanical protection, the can also serves as a magnetic shield to prevent crosstalk when the talking circuit is connected to one line and the ringer to another, as is necessary in some wiring plans.

The molded plastic terminal plate (Figure 5) is equipped with both solder type terminals for permanent connections and screw type to facilitate field changes where, for example, a change in the class of service is required. There are molded projections to hold the set wires in place during soldering. Accidental contact between cord tips or between the tips and adjacent terminals is prevented by means of terminals on different levels and molded stop-studs. Other molded studs prevent cord tips from backing out from under the terminal screws when screws are tightened. The 425A network enables the 500 set to meet its circuit performance objectives as well as those having to do with space limitations, durability and manufacturing economy.

Fig. 5—Cover of 425A network was designed to make connections simple and accurate.

THE AUTHOR: W. R. NEISSER received an A.B. degree in 1925 from Bucknell University and a B.S. degree in E.E. two years later from the University of Pennsylvania. He worked for the New Jersey Bell Telephone Company for a few months on the extension of local telephone plant facilities, and in 1928 accepted a position with the Laboratories, where he has since been engaged in design work on small coils and transformers, principally those used in subscriber and operator sets.

Cellulose acetate filled coils

CHARLES SCHNEIDER
Switching Apparatus Development

It is difficult to appreciate that a part of such basic simplicity as the coil of an electromagnet has been the subject of almost uninterrupted study over a long period of years. The engineering effort expended stems from the fact that the vast quantity of coils used in the telephone system demands the highest degree of performance reliability and places continual emphasis on lower manufacturing costs.

Perhaps the greatest single advance in the design and manufacture of coils was the development of the cellulose acetate filled coil. This construction, which introduces a sheet of thin cellulose acetate between layers of the winding, evolved from the automatic multiple winding machine developed for paper filled coils. The cellulose acetate filled coil has been adopted so extensively that annual production has been in excess of 27 million coils (1948) for central office switching apparatus alone.

Prior to the introduction of the filled construction, coils were wound on individual spools. Multiple winding and the ease with which the filled coil lends itself to conveyor assembly methods, have produced considerable cost savings.

The multiple winding machine (Figure 1) used most frequently in the manufacture of cellulose acetate filled coils employs mandrels of varying length up to 15-3/4 inches, on which may be wound "sticks" of coils consisting of as many as twelve individual coils per mandrel. Wire is wound simultaneously from supply spools through wire guides spaced along the length of the mandrel. The coils are wound so as to leave 3/16 inch separation between coils to provide insulation at the ends of the coils and

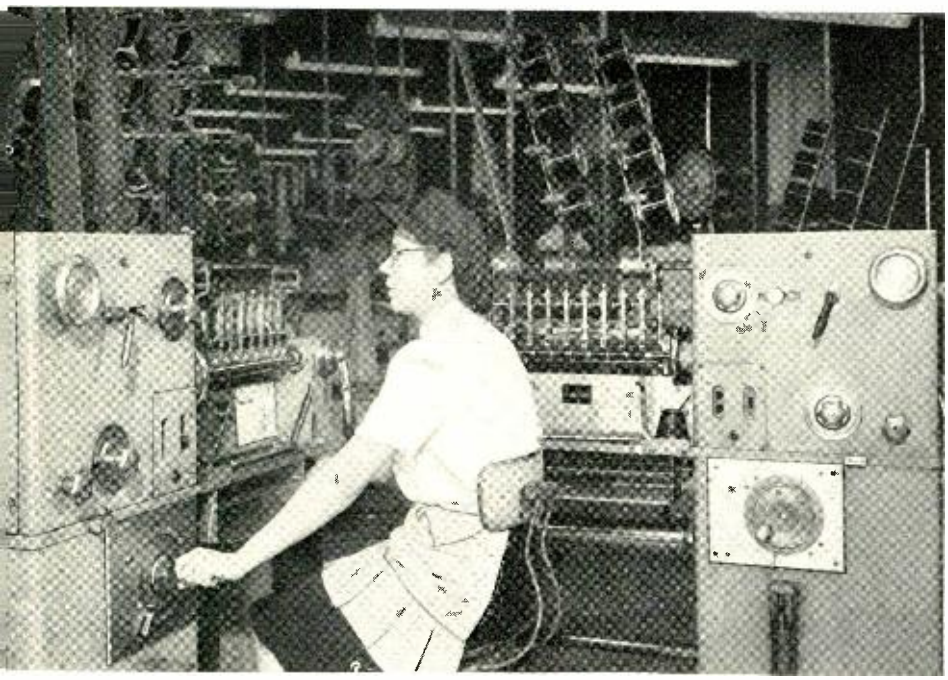


Fig. 1—Winding cellulose acetate filled coils at Hawthorne.

space to permit cutting the stick into individual coils without damaging the windings.

Before starting the automatic winding operation, the wires of each spool are fastened in place on the mandrel by means of a key extending its full length. A slip paper, to facilitate removal of the mandrel after the winding operation, is wound over the mandrel; on top of this paper are applied three layers of 0.002-inch sheet cellulose acetate that constitute the core insulation of the completed coil. Adjustments are made for pitch of winding and turns per layer before the automatic winding operation begins.

During the winding operation, as the mandrel rotates, the winding mechanism moves longitudinally with respect to the mandrel of the machine and reverses direction at the completion of each layer of the winding. As a layer is completed and before the next one is wound, a sheet of 0.0007 inch cellulose acetate is automatically cut to the required length and injected into the winding to cover the completed layer. In this manner the layers of wire are interleaved with cellulose acetate.

When the required number of layers have been wound, an insulator consisting of five layers of 0.0007-inch cellulose acetate is applied over the stick; this insulator constitutes the coil cover, after the completed coil assembly has been dipped in acetone and allowed to dry. Formerly a covering of vincellatate muslin, (cellulose acetate faced vincellatate impregnated muslin), was wound over the individual coils in a final assembly operation, but substantial cost savings have been realized by applying the cover to the coil stick. This insulation has been applied with no sacrifice of coil quality.

After the cover has been applied, the stick is removed from the machine, the mandrel is withdrawn, and the stick is cut into individual coils by means of a rotary multiple saw, in one operation. In the next operation, the slip paper is withdrawn from the individual coils and a few turns of the inner and outer ends of the winding are pulled out to provide leads. It is standard practice to wind the coils to even layers so that the leads terminate at the same end. Figure 2 illustrates a stick of coils upon removal from the winding machine; Figure 3 shows the construction of a coil.

The coil now is sized by coalescing the projecting insulation under heat and pressure into a hard dense "end margin." In this operation the inner circumference of the terminal end is flared to direct the inner lead outward, thereby minimizing the chance of short circuits to the core of a coil assembly. In the next operation the coil and non-terminal or front spoolhead are pushed onto a spool assembly consisting of a core and a cellulose acetate faced phenol fiber terminal spoolhead. During this assembly the leads are threaded through eyelet terminals in the spoolhead using a special fixture equipped with needles. For the larger sizes of wire, the leads are stiff enough to eliminate the use of the needles. The terminal end of the assembly is then dipped in acetone to bond the coil to the rear or terminal spoolhead. Scraping the wires to remove the enamel insulation, followed by soldering the leads to the spoolhead terminals, completes the assembly. Figure 4 shows the completed assembly, partially cut away to show the construction.

Fig. 2—A "stick" of coils as it comes from the winding machine.

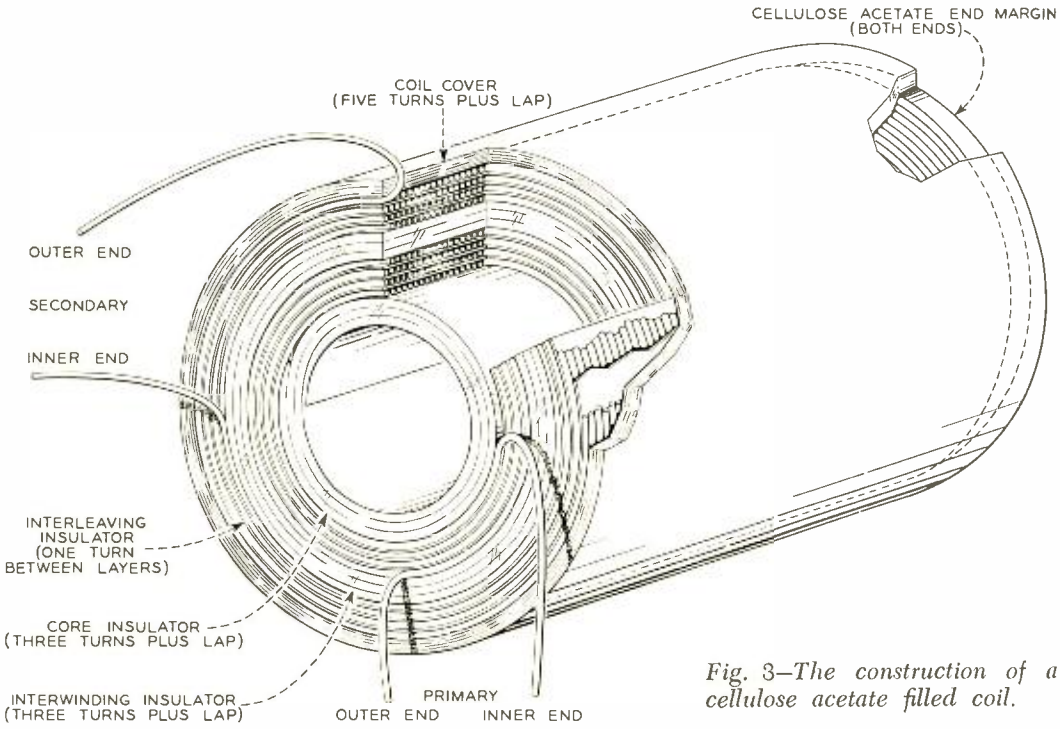


Fig. 3—The construction of a cellulose acetate filled coil.

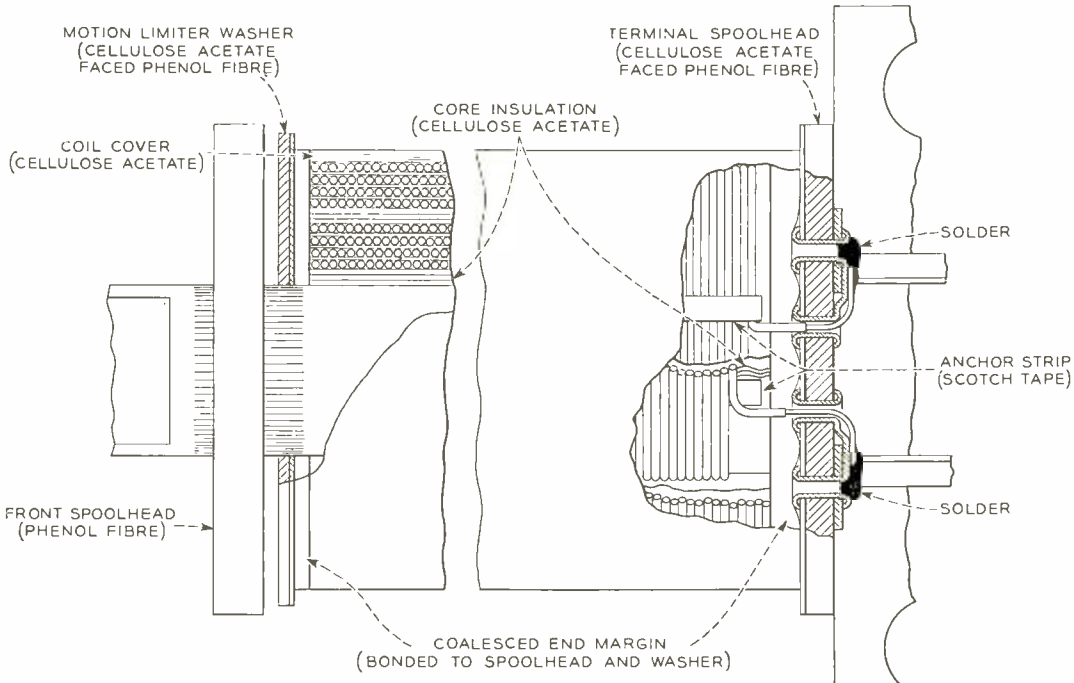


Fig. 4—Complete coil and core assembly, partially cut away to show the construction.

Lead Breakage

While spool wound coils having wire of No. 30 gauge or smaller are provided with stranded lead wires, so as to avoid lead breakage, the winding wire of filled coils is brought directly to the terminals.

Development of the cellulose acetate filled coil coincided with the development of switching apparatus having much higher speed of operation than that of earlier equipment. As a result of this higher speed, coils are subjected to much greater impacts and vibration than heretofore—conditions that require special efforts to prevent lead breakage.

Principal cause of lead wire breakage is fatigue. Slight discontinuities in clamping the lead wires between the coil and terminal spoolhead will permit a small length of lead to vibrate and, after a period of time, fail as a result of fatigue. It is essential, therefore, that the coil be uniformly and securely bonded to the terminal spoolhead over practically the entire abutting area. A satisfactory bond is obtained by controlling both the dipping process and the pressure between the coil and spoolhead to permit penetration of the acetone. Lead breakage also is caused by softness of the cellulose acetate end margin at the terminal end, which results in a longitudinal bellows action with operation. To minimize this effect, the projecting insulation is coalesced into a hard dense end margin. The bellows action is aggravated by a loose fit of the coil on the core, particularly in those magnets where the armature strikes the core of a magnet in which the pole face is on the side at the front end. This armature impact upon actuation produces lateral displacement of the coil on the core at the front or non-terminal end. The coil tends to pivot about the terminal spoolhead, and if the end margin is soft, expansion and contraction occur with the result that the leads imbedded in the end margin are worked to the fatigue point. In order to overcome this difficulty, coils of relays such as the U and UB types have been equipped with a motion limiter washer which is essentially a 0.015 inch cellulose acetate faced phenol fiber disc forced onto a knurl at the front or non-terminal end and bonded to the coil by dipping in acetone. The washer, although a tight fit on the knurl, can move longitudinally with the coil. Since there is always some slight shrinkage of the cellulose acetate in the longitudinal direction of the coil, the washer must move with it, but lateral motion is prevented and the bellows effect is minimized.

Control of the acetone dipping process is essential not only to prevent lead breakage but to insure against short circuits and voltage breakdown that might be caused by excessive dissolution of the cellulose acetate end margin. A high-frequency breakdown test applied across the winding is used to insure that the coil is free from shorted turns or layers, and that it is capable of withstanding the peak voltages experienced in switching circuits.

Heating

Although the cellulose acetate filled coil employs thinner enameled wire than the conventional spool wound coil, it is capable of withstanding higher winding temperatures when operated continuously under circuit trouble conditions. The safe temperature for these conditions is 360 degrees F for the filled coil as compared to 325 degrees F for the spool wound construction. In both cases a restriction is imposed that the duration of the trouble shall not exceed 48 hours. The normal operating temperature limit of the winding is 225 degrees F; this limitation derives from the inability of other parts of the structure, such as the hard rubber studs used to actuate contact springs, to withstand higher temperatures without seriously affecting adjustment. A secondary governing factor in the choice of the operating temperature limit is that of preventing bodily injury. An exposed magnet in closed proximity to an operator, or likely to be touched in the manipulation of other equipment should be held to a lower temperature than a magnet that is mounted in a relatively inaccessible position. A temperature in the neighborhood of 150 to 160 degree F has been found to be safe. This temperature refers to the external parts of the apparatus, the temperature of the coil itself being much higher. For the majority of telephone relays a temperature of 150 degrees F on exposed magnet parts

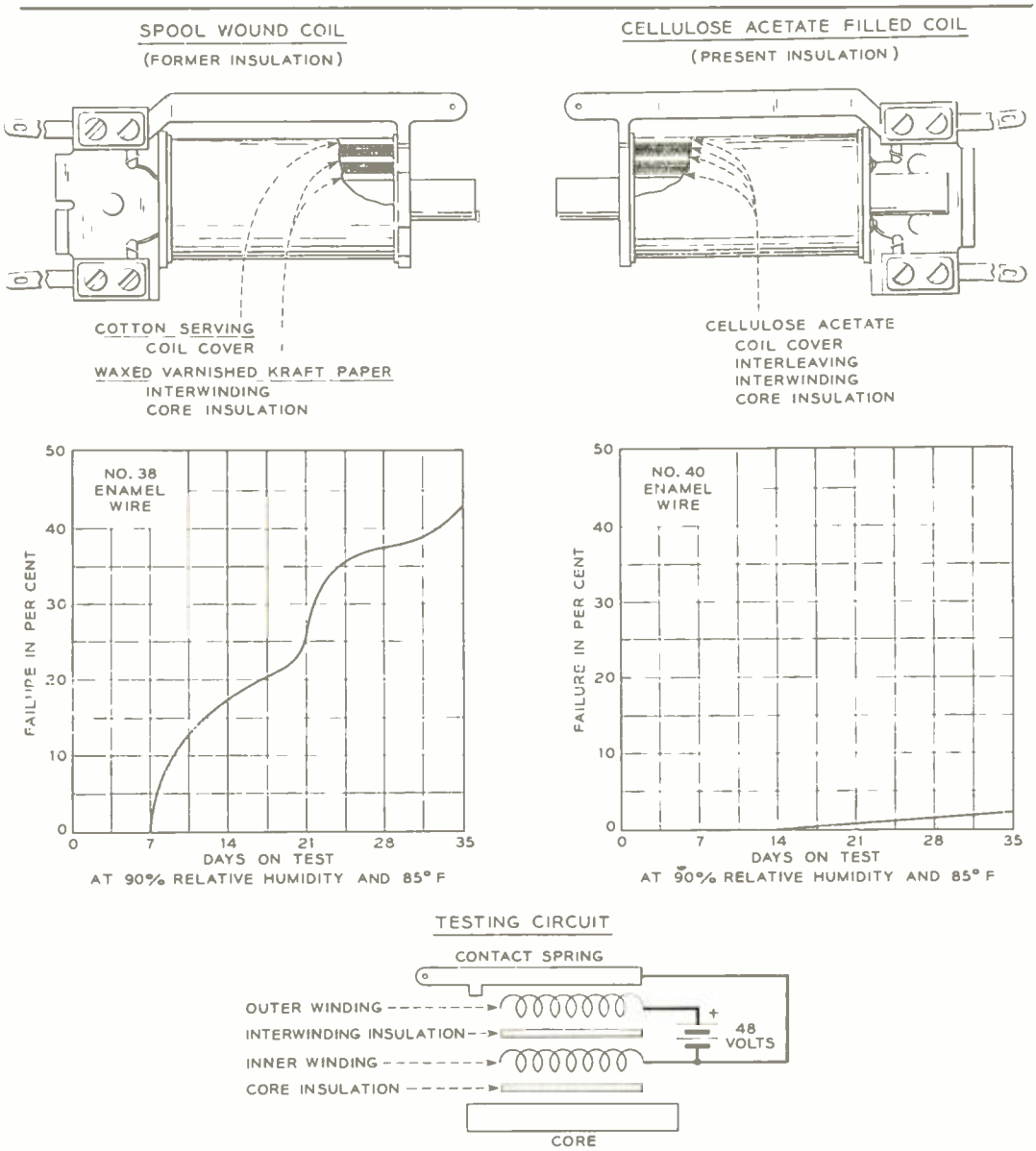


Fig. 5—The cellulose acetate filled coil is greatly superior to the older construction under severe atmospheric conditions.

has been found to correspond closely to an average winding temperature of 225 degrees F.

Corrosion

For many years, studies were made with a view to eliminating occasional corrosion of fine wire windings which occurred under unfavorable atmospheric and circuit conditions. Although improvements were effected, an entirely satisfactory coil was not developed until cellulose acetate insulation was introduced. Waxed varnished papers, which were among the better materials available, were used quite extensively in spool wound electromagnet coils, but were objectionable because the wax sometimes vaporized and condensed on the pole faces, resulting in sticking armatures.

Electrolytic corrosion occurs in windings when a d-c difference of potential exists

between windings or between the winding and another part of the magnet structure. Corrosion, which might not occur under normal humidity conditions, progresses very rapidly under high humidity. Cellulose acetate is superior to other types of insulation because it is free from corrosion promoting impurities, although it in itself is not impervious to moisture.

The usual corrosion test for telephone applications is made with double or triple wound coils since these represent the most serious corrosion condition. The coils are subjected to 90 per cent relative humidity at 85 degree F with negative potential applied to the inner winding and positive potential applied to the outer winding of double wound coils or the secondary winding of triple wound coils. No current flows in the windings. Depending upon the type of apparatus in which the coil is used, other parts of the structure may be positive or negative to simulate actual service circuit conditions. During a 35 to 40 day test period, continuity checks are made, periodically, using a Wheatstone Bridge having a battery supply of 1½ volts in series with 10,000 ohms. This method of test does not permit application of sufficient voltage, or flow of sufficient current to establish continuity through an infinitesimal length where the wire may be corroded through nor does it cause a reduced section of wire to burn out. Stated differently, this method of test does not destroy metallic continuity nor does it restore continuity through a corroded section. Thus, more consistent results are obtained than if higher voltages or currents were to be used.

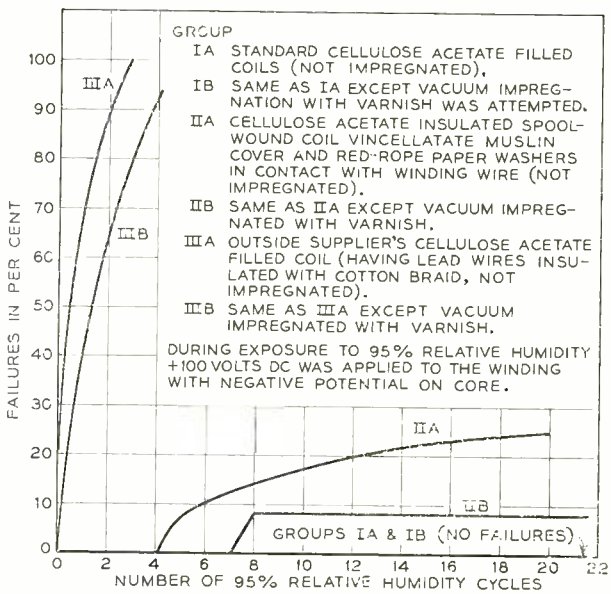


Fig. 6—Under severe atmospheric conditions, the cellulose acetate filled coil performs better than impregnated coils of other constructions

This corrosion test was adopted as a means of obtaining data on proposed constructions, using as a basis of comparison, the performance, in this test, of the earlier standard spool wound construction. The latter had given satisfactory service in the field, only occasional failures occurring under the most severe circuit and atmospheric conditions. The marked superiority of the cellulose acetate filled coil in comparison with the older coil, as shown in Figure 5, indicates that for telephone

THE AUTHOR: CHARLES SCHNEIDER received a B.S. degree in E.E. from Cooper Union in 1932. He joined the Laboratories in 1923. Until 1926 he worked in the Commercial Department and later spent several years in a laboratory group testing electronic apparatus. As a Member of the Technical Staff he was associated with the Apparatus Analysis Department from 1930 to 1946 and was engaged in analyses and testing of general apparatus. In recent years he has been performing similar work in the more specialized field of relays and electromagnetic apparatus.

applications, the risk of corrosion failures has virtually been eliminated.

From time to time the question arises as to how the cellulose acetate filled coil compares with impregnated windings employing other types of insulation for use in Armed Service equipment where atmospheric conditions are more severe than those ordinarily encountered in the telephone plant. Frequently, specifications for these applications require impregnation of the windings. Tests have shown that impregnation will extend the life of a coil employing inferior materials, but that corrosion will take place in a much shorter period than where cellulose acetate insulation is employed without impregnation. The filled coil does not lend itself readily to impregnation as the impregnant cannot adequately penetrate the coil assembly. As the cellulose acetate filled coil is much more resistant to corrosion than impregnated coils employing other types of insulation, development of an impregnating process has not been considered necessary. Furthermore, impregnation of electromagnets is not desirable because of the risk of contaminating the pole faces.

Figure 5 illustrates the results of comparative tests on cellulose acetate filled coils and impregnated windings, using the following cycling procedure:

Step A—8 hours at 85-90 degrees F at 95 per cent relative humidity.

Step B—2½ hours raising temperature to 150 degrees F maintaining 95 per cent relative humidity.

Step C—3 hours at 150 degrees F at 95 per cent relative humidity.

Step D—2½ hours lowering temperature to 85-90 degrees F maintaining 95 per cent relative humidity.

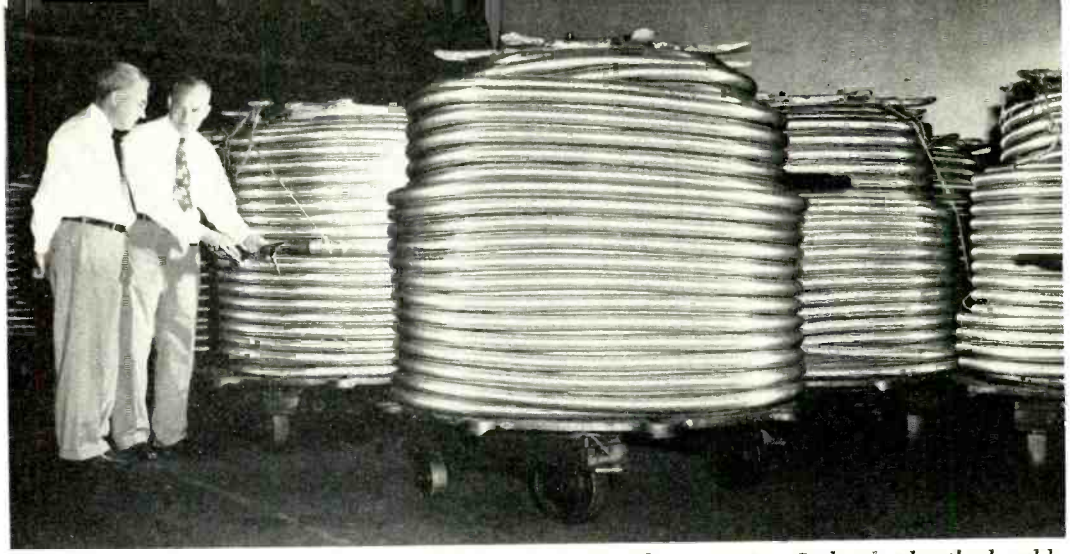
Step E—2½ hours raising temperature to 150 degrees F maintaining 95 per cent relative humidity.

Step F—3 hours at 150 degrees F at 95 per cent relative humidity.

Step G—2½ hours lowering temperature to 85-90 degrees F maintaining 95 per cent relative humidity.

This represents one cycle of the test. Such a test produces severe condensation and as a consequence, corrosion, when impurities are present, is accelerated to the degree that a construction capable of withstanding a 90 per cent relative humidity test for many days, may fail within a few cycles. Figure 6 illustrates the effect of introducing into a cellulose acetate insulated coil any material containing corrosive impurities. Materials such as red rope paper and vincellatate muslin are not ordinarily considered to be undesirably corrosive and have been used successfully in the telephone plant for many years. Nevertheless, in the humidity cycling test, these materials cause corrosion at an objectionable rate. Curves IIA and IIB of Figure 6 show that the corrosive effects of these materials can be retarded but not overcome by resorting to impregnation. The corrosiveness of ordinary commercial grades of braided cotton is illustrated by curves IIIA and IIIB. Other tests have shown that impregnation of coils containing corrosion promoting materials will not effectively inhibit corrosion.

Because of the large cost saving and improved performance, the cellulose acetate filled coil is employed in all new designs of telephone switching apparatus. This construction also has been adopted in older apparatus whenever modifications in design to accommodate the filled coil are feasible.



J. H. Glover, Jr. (Western Electric) (right) and C. Kreisher examine Stalpeth sheathed cable prior to the polyethylene jacketing.

Laboratories' People Away From Home
KEARNY

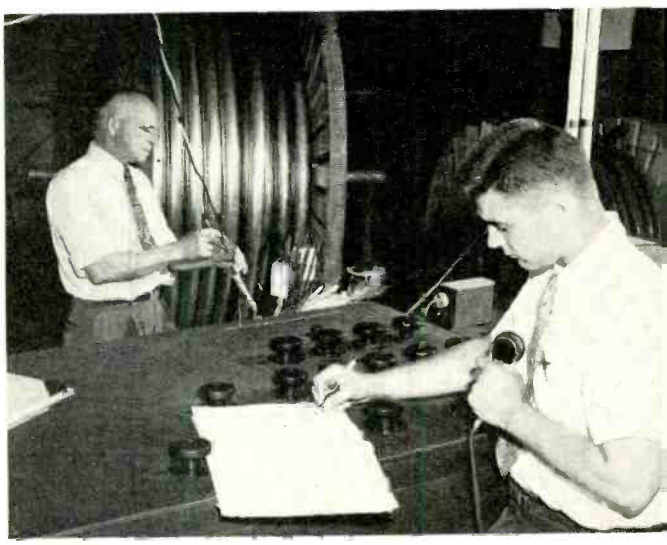
Kearny, as well as Point Breeze *, has Laboratories' cable engineers working with their Western Electric associates.

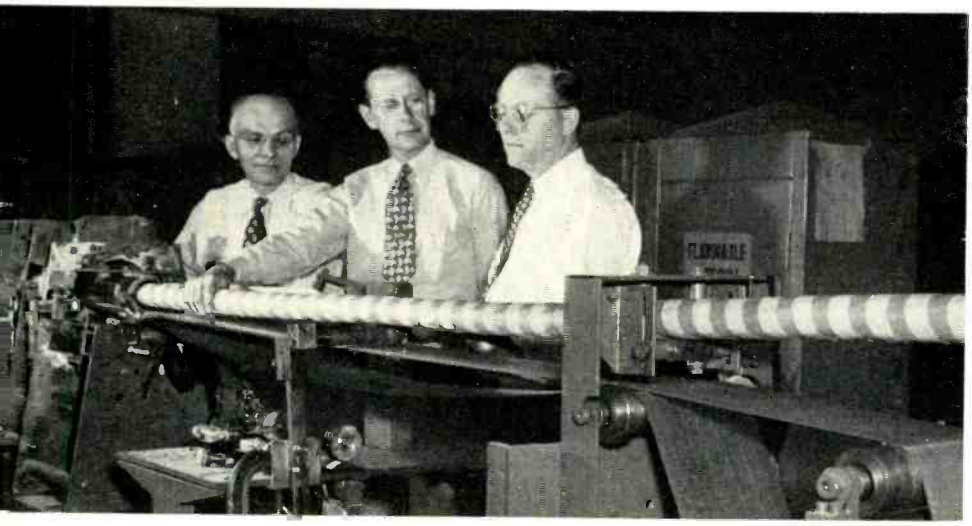
Exchange area cable is manufactured at Kearny and Hawthorne, while Point Breeze is concerned principally with toll and coaxial cable. The Kearny group performs the same type of work for exchange area cable as the Point Breeze group does for toll and coaxial cable. The same close relationship exists between the Laboratories and Western Electric engineers at Kearny as at Point Breeze. The Kearny and Point Breeze contingents are also in frequent contact with each other and with the cable headquarters group and others at Murray Hill and West Street.

* RECORD, *September*, 1951, *page* 419.

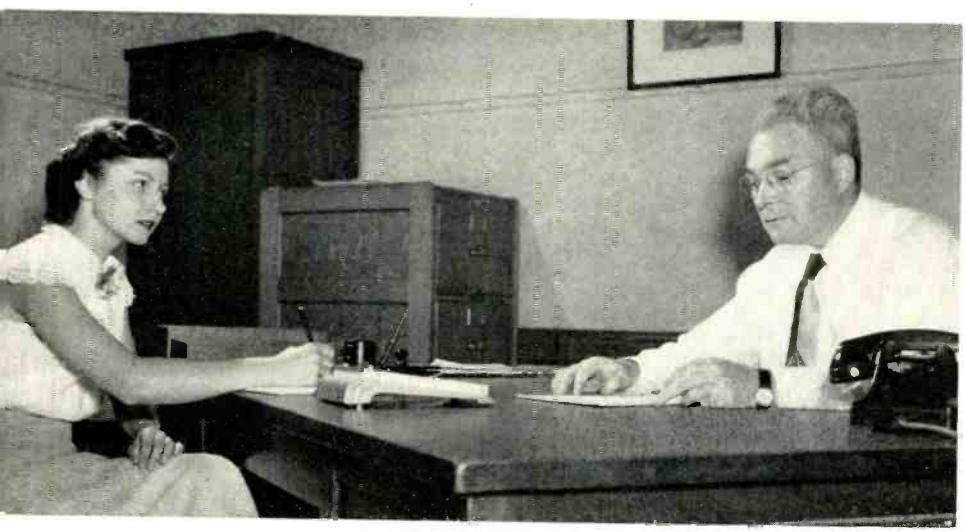
R. M. Norman (left) and W. T. Hicks (center), both of Western Electric, discuss with C. T. Wyman the lay-up of a unit type cable at the cabling machine.

E. V. Kosso has just completed a measurement of mutual capacitance of a video pair. L. C. Swicker is placing test leads on another video pair.

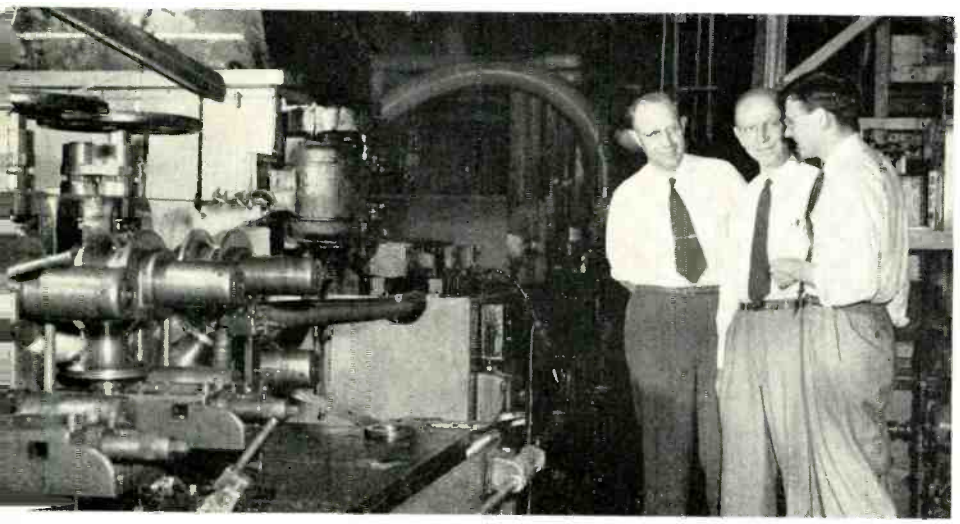




H. C. Slechta (Western Electric) (left), F. W. Horn (center), and C. A. Hallam (Western Electric) inspect the forming operation of aluminum and steel on the Stalpeth cable line.

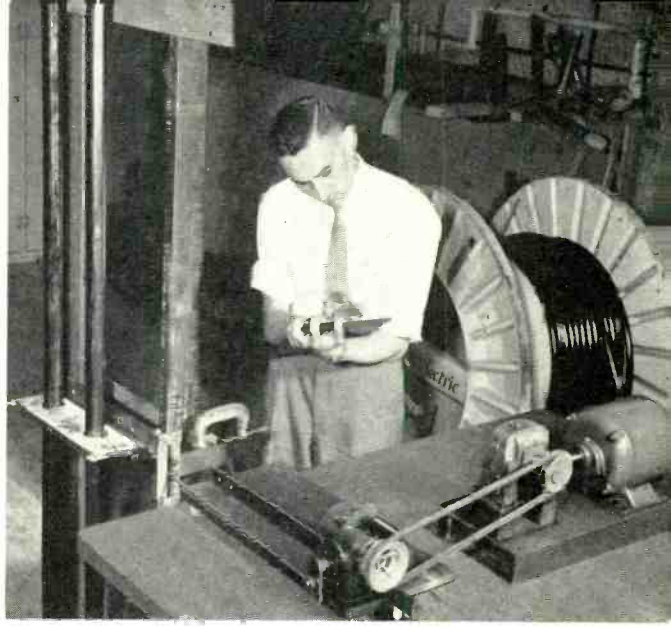


Ethel Kroschinski is taking dictation from C. Kreisher.

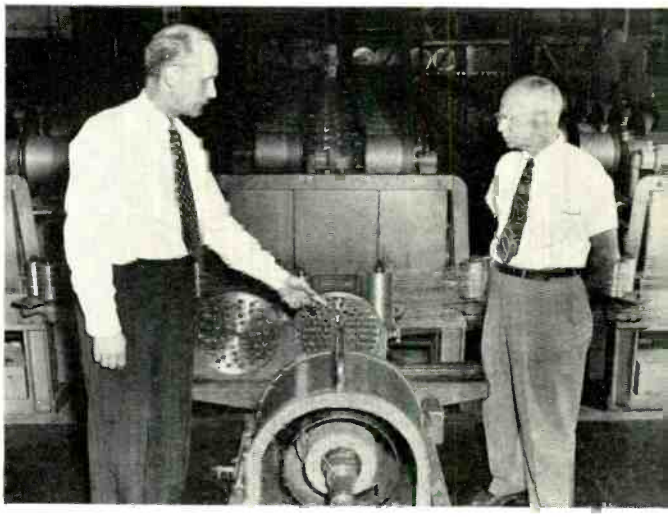


J. H. Kutzelman (Western Electric) (right) discusses the polyethylene jacketing of Stalpeth cable, while C. T. Wyman (left) and E. W. Reynolds (Western Electric) listen.

Right—R. W. Larisch is recording the number of cycles of flexure of two sections of Stalpeth cable. Fatigue tests of the composite aluminum, steel, and polyethylene sheath are made in this laboratory machine.

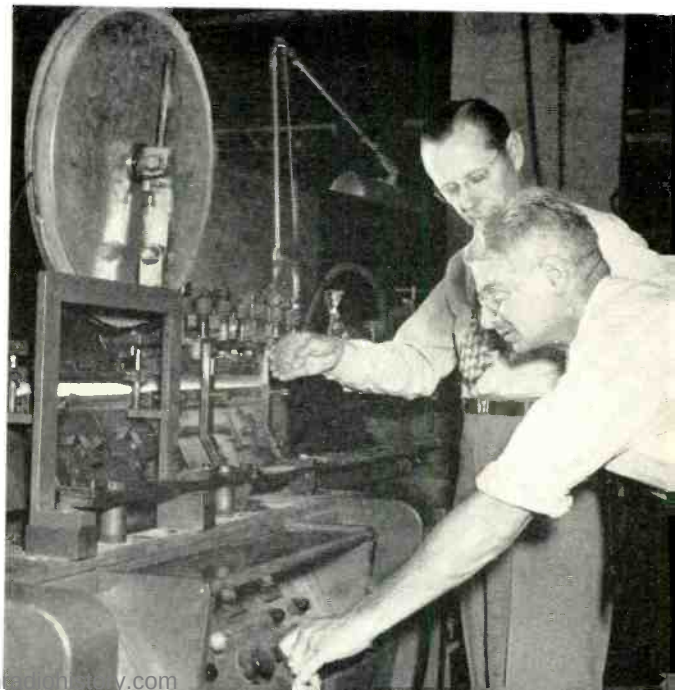


Below—F. W. Horn applying a cracking agent to a stressed sample of polyethylene jacket from Alpeth sheath prior to placing the test fixture in the oven to determine the time required to crack. This is the method of determining the crack resistance of different types of polyethylene.



Center, right—J. E. Dutton (Western Electric) (left) and L. C. Swicker talk about the lay-up of the twisted pairs on the high speed flyer-strander.

Right—H. N. Padowicz (Western Electric) (right) and F. W. Horn study the soldering operation on Stalpeth cable. Heat is produced by high frequency (375 kc) induction and solder is fed into the machine from the roll at the top left.



November, 1951

Transistor Symposium at Murray Hill

In cooperation with the military services, Bell Telephone Laboratories recently held a five-day symposium on Transistor electronics at the Murray Hill Laboratories in New Jersey, where the Transistor was invented a little more than three years ago. Nearly 300 guests attended the sessions which ran from September 17 to September 21, inclusive.

In compiling the invitation list, the military services were asked by the Laboratories to nominate representatives of their own groups and of contractors whose work was of a nature that would benefit from more detailed information on recent progress in the Transistor field. More than 100 representatives from the Army, Navy, Air Force and government agencies attended the sessions. About a score of universities were also represented.

Nearly 100 representatives of a wide range of industrial companies also participated. Large and small, these companies covered the major part of the American electronic industry. The material presented was necessarily "restricted" and consequently all participants in the sessions were either United States citizens or specifically cleared by the military services.

In opening the symposium, Dr. Kelly, stated that improved point contact Transistors are becoming available in small quantities through the Western Electric Company and that the new junction type Transistors are expected to be available for limited experimental purposes by the end of the year.

He said the Laboratories proposed the symposium so that present knowledge of the Transistor and its circuit applications could be made available to circuit and systems engineers wishing to explore their possible use, particularly in military projects. Accelerated application of Transistor devices in the interests of national security is expected to result.

Material was presented at the symposium by nearly a score of Bell Laboratories scientists and engineers working on Transistor electronics. Topics covered were basic Transistor physics and theory, the characteristics of experimental Transistors and Transistor circuitry.

Speakers and the subjects of their papers were: *Present Status,* J. A. Morton; *Theory of Semi-Conductors,* G. L. Pearson; *Transistor Theory,* M. Sparks; *Characteristics and Properties of Point Contact Transistors Applicable in CW Transmission Circuits* and *Basic Amplifier Properties of Transistors,* R. M. Ryder; *Photosensitive Properties of Transistors,* J. N. Shive; *Basic Point-Contact Amplifier Behavior,* R. M. Ryder; *Power Amplifiers and Duality,* G. Raisbeck; *Amplifiers with Junction Transistors,* R. L. Wallace, Jr.; *Résumé of Transistor Characteristics in Their Application to Amplifiers,* R. M. Ryder; *Some System Applications of Transistor Amplifiers,* R. S. Caruthers; *Gen-*

eral Oscillator Considerations, Gordon Raisbeck; *Experimental and Practical Applications of Transistor Oscillators,* R. S. Caruthers.

General Modulator Considerations, Gordon Raisbeck; *Modulators in Carrier Telephone Systems,* R. S. Caruthers; *Application of Transistors in a High-Speed Computer,* J. H. Felker; *Transistor Characteristics and Properties Applicable to Pulse and Control Circuits,* A. E. Anderson; *Some Circuit Design Considerations,* J. R. Davey; *Introduction to Transistor Building Blocks and Assemblies,* A. E. Anderson; *Typical Building Blocks,* J. R. Davey; *Binary Counter,* R. L. Trent; *Optical Encoder,* R. E. Yaeger; *Shift Register and Serial Adder,* J. R. Harris; *Data on Experimental Transistor Types,* J. A. Morton; and *Concluding Remarks,* H. A. Affel.

M. J. Kelly (left) speaking to the visitors at the beginning of the Symposium. H. A. Affel, chairman of the technical program committee, stands behind him.

Arrangements for the Symposium were under the direction of a committee consisting of H. A. Affel, Chairman, A. Tradup, H. B. Ely, and T. N. Pope. Mr. Affel was in charge of the technical program and sessions; Mr. Tradup took care of the invitations in cooperation with the Military; and Mr. Ely and Mr. Pope were concerned with the general arrangements—luncheons, transportation, registration, etc. About 250 visitors were brought from New York to Murray Hill and returned each day in buses; these buses were also used to transport them to and from lunch each noon, at which they were guests of the Laboratories. F. E. Dorlon supervised the serving of the luncheons, which were furnished by a caterer.

The size and length of this Symposium obviously required the assistance of many Laboratories people, too numerous to mention here. Appreciation expressed by the visitors, however, for the opportunity to learn about the Transistor in its present stages of development, indicates that the efforts made in this undertaking were well worth while.

Members of the Laboratories Honored by the I.R.E.

At a meeting of the Board of Directors of the I.R.E. September 12, several Bell Laboratories engineers and scientists were named Fellows of the Institute. This award, the highest membership grade, is bestowed annually upon those who have made outstanding contributions to radio engineering or allied fields.

The Laboratories recipients of the Fellow award, which takes effect January 1, 1952, are: H. W. Bode, A. B. Crawford, W. E. Kock, W. W. Mumford, H. Nyquist, and P. H. Smith.

Deal-Holmdel Colloquium

"The Physics of Rainfall" was the subject of the lecture given at the first meeting of the 1951-52 Deal-Holmdel Colloquium at Holmdel, September 28. The speaker was Dr. E. G. Bowen, Director of the Radio Physics Laboratory in Sydney, Australia.

In his lecture, Dr. Bowen explained the theory of rain-drop formation under varying conditions of temperature and altitude. Raindrop size and density were illustrated by the method of radar presentation, scanning from ground and aircraft positions, which produces an excellent cross-section of the particular cloud or cloud formation under observation.

The speaker also discussed the usual methods of creating artificial rain by cloud seeding with dry-ice pellets or with silver iodide crystals. He expressed a preference for the dry-ice method for the experiments conducted in the vicinity of Sydney. An interesting side light was the correlation between wheat production and the amount of rain fall; it appears that the yield was increased only when sufficient rain fell during the germination period, while excess rain fall after that period had no effect.

R. M. Burns Awarded Perkin Medal

The Perkin Medal, outstanding honor in the field of industrial chemistry has been awarded to Robert M. Burns, Chemical Director of the Laboratories. Presentation will be made in January 1952.

Dr. Burns entered the Laboratories in 1922, was appointed Assistant Chemical Director in 1931 and Director in 1945. His accomplishments include important applications of chemistry to problems of the communications industry, notably in: the control and prevention of corrosion; the development of primary batteries, storage cells (calcium-lead) and electrolytic capacitors (employing aluminum and tungsten); the solution of metallurgical problems of the industry, particularly those of the metalloids and semi-conductors used in the highly valuable Transistors employed in electronic circuits; the development of ceramic and high polymer (synthetic resin) insulating and structural materials; the artificial growth of utilization of large piezo-electric crystals for the control of electronic circuits; and the development of methods of instrumental and micro-analysis required in these fields.

Among earlier recipients of the Perkin Medal is Dr. R. R. Williams, who preceded Dr. Burns as Chemical Director.

ECA Metallurgists Visit Murray Hill

On September 20, a group of thirty-two outstanding research metallurgists from various parts of the world visited the Murray Hill metallurgical laboratory. They had come to the United States under the ECA plan, and were visiting a number of prominent laboratories through the cooperation of the American Society for Metals.

Following introductory remarks by R. K. Honaman, E. E. Schumacher described the laboratory and the work being done there. The group then moved to the large conference room, where talks on the various aspects of metallurgical developments were given by Mr. Schumacher, W. C. Ellis, D. H. Wenny, J. H. Scaff, G. M. Bouton and I. V. Williams.

Lonely Outpost: On a spur of Mount Rose, in Nevada, stands this microwave radio-relay station, one of 125 between Boston and Los Angeles.

Automatic Switching Equipment Installed in Atlanta

Operator toll dialing equipment was placed in operation October 7 in Atlanta. The installation, provided jointly by the Long Lines Department and the Southern Bell Telephone Company, brings to fourteen the number of cities in the country with machine switching equipment for handling long distance calls.

Besides permitting direct long distance dialing to more than 1,000 communities by telephone operators in Atlanta, the equipment automatically switches calls that are routed to and through Atlanta from distant cities.

Lecturers' Conference

Seventy-five members of the Bell System Lecturers' Conference spent two days at the Laboratories listening to talks and viewing new developments which will help them to explain the functions of research in the telephone system. The two-day session was organized by A. R. Thompson, in cooperation with M. E. Strieby who was recently appointed Director of Technical Demonstrations at the A T & T. The conference featured talks by M. J. Kelly on the nature and purposes of the Laboratories; by Vice President B. T. Miller and J. M. Shaw of the A T & T and by R. K. Honaman on the objectives of lecture-demonstration activities. In C. D. Hanscom's absence, the Laboratories' latest lecture aids were demonstrated by M. Brotherton. H. J. Kostkos presented a simplified audiometer. In the Arnold Auditorium, the conferees heard about recent technical advances in talks by C. H. Elmendorf, J. B. Maggio, J. A. Coy, A. G. Jensen, C. E. Shannon and E. E. Schumacher.

Japanese Legislators Visit Bell System Installations

Five members of the Diet of Japan, which corresponds to the United States Congress, recently visited Bell System units in the New York area as part of a nationwide tour of communications companies. Arranged by the U. S. Federal Communications Commission at the request of the Far East Command, the tour was designed to give the Japanese legislators an opportunity to study American communication techniques at first hand. The Diet is now considering legislation which looks toward more independent management of the Japanese communications system under the Ministry of Telecommunications.

During their four-day tour of Bell Companies, which took place in September, the Diet members visited the headquarters building of the A T & T Company, the New York Telephone Company and the Long Lines Department. They also toured the Kearny plant of Western Electric and the Laboratories at Murray Hill.

The visiting group was made up of members of both upper and lower houses of the Diet, including the chairmen of the committees responsible for communications legislation in the two houses. The group was accompanied by an interpreter, a Japanese student now on a fellowship at Johns Hopkins University.

Cleo F. Craig, president of A T & T, welcomes the visiting members of the Japanese Diet at the headquarters building of the American Company. Shown with the visitors are M. J. Kelly, president of the Laboratories (in back of Mr. Craig), H. S. Dumas, executive vice president of A T & T (fourth from right), and Stanley Bracken, president of Western Electric (extreme right).

H. B. Ely describes an experiment being conducted in the free-space room at Murray Hill to Japanese legislators. Left to right, Mr. Ely, Mr. Shintani, Mr. Hasegawa, Mr. Yamada, Mr. Sikiuchi, J. Campbell, Mr. Terao and Mr. Egawa.

Pioneer General Assembly

The twenty-sixth meeting of the General Assembly of the Telephone Pioneers of America was held at Louisville, Kentucky, during the week of September 26. H. J. Delchamps and Hattie Bodenstein, President and Secretary respectively, represented the Frank B. Jewett Chapter. All sixty-two Chapters of the Pioneers were represented at the meeting. Including guests, there were 688 persons registered.

While the entire meeting was packed with interesting work, coupled with equally interesting social events in the evenings, the events

Hal S. Dumas, president of the Pioneers, welcomes Cleo F. Craig, president of the A T & T, to the 1951 General Assembly at Louisville, Kentucky. Both men display the string ties which lent an air of the "old South" to the meeting.

which came in for special mention by our representatives were the address made by S. W. Cooper of Albany on *Meeting the Challenge of Telephone Pioneering*, and a social gathering of the delegates and guests of Section 10, at which Mr. and Mrs. W. A. Hughes were host and hostess and at which C. F. Craig, president of A T & T, spoke.

President C. F. Craig, in his address to the Telephone Pioneers, said in part,

"It is wonderful to be here with you. It is wonderful to be with so many friends. One of the great satisfactions of a lifetime in telephone work is the fellowship we share as Telephone Pioneers.

"We are a healthy, flourishing, active outfit. We have a lot of fun in the process. What more could anyone ask? Certainly I could ask nothing better than to be with you and among you this evening. I am deeply grateful for the privilege.

"How can I show you my appreciation? I can be brief—and I will be. But I do want to leave a definite thought with you about the business in which we are all engaged. It is this—I think the state of the business is good.

"Despite all the headaches and the hurdles, we have made a magnificent record. Just think of it! In the Bell System alone, fifteen million more telephones are in service than there were when the war ended. We are rendering a far better and more valuable service. We have improved our efficiency, our equipment and our methods of operation. The over-all increase in rates, large as it has to be in total amount, has been relatively much less than the rise in prices generally. In relation to average family income, the service we render is a bigger bargain—a lesser part of the family budget than ever before.

"Here we are then in the 75th Anniversary Year—with the largest and finest telephone plant in history; with the biggest dollar and cents value we have ever offered; with new developments already in operation—and more on the way—that carry us farther and farther into a new era in telephone communication."

Pennsylvania Dutch Week-End

Frost on the pumpkins and tinges of Autumn on farmlands of Amish folk and Mennonites gave the women of the Frank B. Jewett Chapter of the Telephone Pioneers a colorful week-end in the Pennsylvania Dutch countryside. Their trip by bus on October 19 included dinner at the Stockholm Restaurant in Somerville, en route to the Brunswick Hotel in Lancaster, their headquarters. Saturday brought a brisk trip at dawn to the farmers' market followed by a leisurely breakfast. The day-time tours covered the Amish farming country, landmarks including Ephrata settlement and the famous Mennonite Churches, and a visit to the pretzel industry. In the evening the pioneers enjoyed informal entertainment which included stories and recitations in Pennsylvania Dutch dialect.

Following church services on Sunday, they visited such places as the Ironmasters Houses, the Witness Tree, *Wheatland*, President Buchanan's home, and the famous old mines of the area. The group had dinner at Doylestown en route to New York that evening.

Handicraft Bazaar on November 15

Women Pioneers at West Street are busy preparing to open their first handicraft bazaar in the lounge area at West Street on Thursday evening, November 15, and Friday noon, November 16. For weeks past they have been hemming linen dish towels by the dozens, tatting edges for handkerchiefs, crocheting potholders, weaving hand towels, and making jewelry for their enterprise. One evening they had an old-fashioned stuffing bee, at which they poked cotton into parts of colorful clowns to be offered for children's Christmas presents. They will also have a few toys and hand dressed dolls for sale for youngsters. Other holiday items they plan to offer are perfumes, hard candies, chocolates, nuts, ribbons, and gay, handmade aprons of practical prints for daily use or gay floral chintz as cocktail aprons.

Proceeds of the bazaar will be used for the welfare fund of the women's activities committee. The fund provides holiday gifts for veterans hospitalized since 1919, greeting cards for the large Life Member group, and flowers for women Pioneers during illness.

A. Santillo registers guests as R. T. Jenkins waits.

Pioneer Activities in New Jersey

The New Jersey Council of the F. B. Jewett Chapter of the Telephone Pioneers started the Fall season with three closely-spaced and well-attended activities coordinated by Council Chairman A. R. Brooks. On September 26 the Hobby Committee arranged a noon-time program of a motion picture and forum on wise financial investments presented by a well-known brokerage firm. After the picture, *Fair Exchange*, R. C. Carrigan introduced the investment representative, Bruce Nord.

R. C. Keyser, grounds maintenance supervisor at Murray Hill, discussed *Preparation and Maintenance for a Good Lawn* at noon on September 27.

The last Friday evening in September brought a capacity audience to the Arnold Auditorium when the Entertainment Committee presented *An Evening of Music*. About 320 Pioneers and guests heard Winston E. Kock, organist; Larned A. Meacham, violinist; Uno A. Matson, pianist; The Murray Hill Glee Club, conducted by Albert A. Rienstra; and The Barber Shoppers, G. B. Thomas, director.

The Murray Hill Glee Club sing "Loch Lomond" to the Pioneer audience at Murray Hill.

Changes in Organization

E. J. Johnson, Special Equipment Engineer, has been transferred from the Facilities Development Department, to the Telegraph Development Department, reporting to E. F. Watson, Director of Telegraph Development. Mr. Johnson's responsibilities will be unchanged, and the trial installations and current development groups presently reporting to him will continue under his supervision.

H. O. Siegmund, Switching Apparatus Engineer, has been transferred from the Switching Apparatus Development Department to the Facilities Development Department, as Project Development Engineer in charge of a new organization, reporting to A. D. Knowlton, Director of Facilities Development. The groups which previously reported to Mr. Siegmund will remain in the Switching Apparatus Development Department, and their activities are being directed by A. C. Keller, in addition to his responsibilities as Director of Switching Apparatus Development.

S. B. Ingram has been appointed Assistant to J. R. Wilson, Director of Electronic Apparatus Development, and will act for Mr. Wilson in the latter's absence. In addition to his duties as assistant to Mr. Wilson, Mr. Ingram will continue to be in charge of Department 2920.

W. A. Depp has been appointed Electronic Apparatus Development Engineer in charge of

CALLED TO ACTIVE DUTY

Roy A. Huebner's training at Northeastern Technical School prepared him for his work as junior draftsman when he joined Apparatus Drafting at Murray Hill last year. A reservist, he was called to active naval duty during the month of September.

Raymond Ford of the Murray Hill restaurant staff has joined the Army. Mr. Ford is one of three brothers who have done the same type of work in the restaurant. James remains on the job, while Charles, also on a Laboratories' military leave, fights in Korea. The latter's wife, Alice Ford, is a member of the General Service Group at Murray Hill.

Dominic Di Stephano, who had been a Naval reservist, attended Community College at Temple University before joining the Laboratories. He was a Technical Assistant in Electronic Apparatus at Murray Hill.

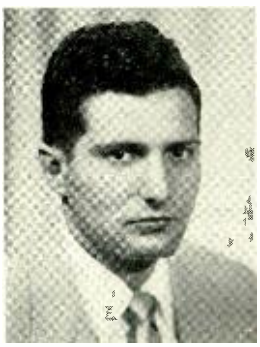
Fred E. Castle has enlisted in the Air Force. Since joining the Laboratories in 1950 he had worked as a messenger until his recent transfer to accounting work in the Club Store.

R. A. HUEBNER

RAYMOND FORD

Robert A. Maher had an active career in the Navy before he joined the Physical Research group at Murray Hill in 1946. Since then he had been engaged in the project of alpha particle bombardment of diamonds. A reservist, he was recalled to duty as a chief petty officer.

Robert J. McCusker has enlisted in the Navy. After his graduation from Regional High School, he joined the Electronic Apparatus Department at Murray Hill as an assembler.



DOMINIC DI STEPHANO

F. E. CASTLE

R. A. MAHER

R. J. MCCUSKER

Engineers from Illinois Bell and their families enjoy a picnic at Seeley's Pond.

Department 2960, replacing Mr. Ingram in that capacity.

M. E. Hines and the group reporting to him in Department 2960 have been transferred to Department 2940 reporting to J. P. Molnar, Electronic Apparatus Development Engineer.

D. J. Hendrick, Supervisor of Construction Engineering—New York, who formerly reported to G. H. Bogart, was appointed Plant Engineer—Whippany, reporting to S. H. Willard.

"I. B." Picnic

Former Illinois Bell Telephone employees now at A T & T, Murray Hill, West Street, Whippany and Allentown held a picnic reunion at Seeley's Pond Picnic Area on September 8. Favored with a bright, cool September day, thirty-one employees and families, a total of eighty, turned out for the affair. Bachelors in the group furnished all the refreshments, and both children and grown-ups were amply supplied with soda-pop and ice cream.

The men loosened creaking muscles and engaged in volley ball, horse shoes, and soft ball. An old rivalry was renewed in the impromptu soft ball game between former State and Chicago area teams. In the absence of an unbiased scorekeeper, State area was reported to have won by a score approximating 9—7.

The wives served a varied and delicious picnic fare, after which the groups relaxed and exchanged gossip about their various activities, with the usual abundance of "telephone talk."

New York Section A.I.E.E.

The New York Section of the A.I.E.E., largest Section of the Institute, has a total membership of about 7,250, including 1,855 student members. Laboratories' engineers who are officers of the Section for the year 1951-1952 are: Basic Science Division, R. H. Van Horn, Secretary, and E. B. Payne, Chairman, of its Symposium Committee; Communication Division, M. A. Townsend, Chairman, Meetings and Papers Committee; and Advisory Committee, consisting of the five most recent Past Chairmen of the New York Section, J. D. Tebo, Chairman.

Western Electric and Western Union Sign Patent Agreement

Technical leadership of the United States in the field of communications was strengthened recently when the Western Union Telegraph Company and the Western Electric Company signed a non-exclusive cross-licensing patent agreement, making the inventions of each of these companies available to the other for the public benefit.

Under the agreement, signed by Western Electric for itself and for the American Telephone and Telegraph Company and their subsidiaries, Western Union receives a non-exclusive license in the wire telegraph field under all Bell System patents. Western Electric and A T & T receive a non-exclusive license in the communications field under Western Union

Illinois Bell engineers play volleyball.

HAVE YOU CONTRIBUTED?

Santa filled the requests of these little ones who visited the Laboratories a year ago from the Winfield Nursery around the corner from West Street. He'll have toys and dolls for hundreds of needy children like them if we all contribute to the Doll and Toy Committee.

patents. The agreement, effective September 15, 1951, will continue indefinitely unless terminated by one year's advance notice given after December 31, 1957.

Under the agreement the two companies license each other to use inventions made before as well as during the life of the agreement. Rights acquired under the agreement to use patented inventions continue for the lives of the patents.

Switching Circuits

*Design of Switching Circuits** is the title of the most recent book in the Laboratories Series. Authors of the 556-page volume are W. Keister, A. E. Ritchie and S. H. Washburn.

The book presents the basic techniques of switching circuit design—techniques that are applicable to digital computers and other complex control systems as well as telephone switching systems. The objective of the book is to present the fundamental principles underlying the design of switching circuits, rather than to describe the operation of specific circuit—except as examples. The approach is based upon the logical inter-relation of closed or open circuit paths instead of from the standpoint of electric circuit theory.

Although no formal division is made, the text can be considered as falling into three parts: basic relay circuit design fundamentals; the design of single-function circuits; and the planning and design of multi-functional circuits. The book thus follows an orderly plan from the fundamental control concepts, through basic switching circuit design, the applications of these building blocks of single function circuits, reaching finally multi-functional circuit design. Principles and techniques are illustrated primarily by relay switching circuits, but electronic circuit fundamentals are included, in which electron tubes, rectifiers, and Transistors are discussed and examples given.

Writing of the text was started soon after the end of World War II as a series of lecture notes for use in training new engineers in the Switching System Development Department. This later formed the basis of a one-semester course for graduate students at M.I.T. The present volume is a final edition of the text used in the M.I.T. course, revised to take advantage of the academic experience gained there.

* *The Design of Switching Circuits* by William Keister, Alistair E. Ritchie and Seth H. Washburn. Price, $6.00. D. Van Nostrand Company, Inc., New York.

Alice Charlton, chairman of the Whippany Doll and Toy Committee, accepts a check from Albert Diegler, commander of Legion Post No. 329 which is comprised of veterans at that location. This year members of the Laboratories at Whippany will give Christmas gifts to children polio and heart victims as well as to children in boarding homes in New Jersey. In error in last month's RECORD *were the names of the secretary and treasurer of the Whippany Committee. They are Ann Harris and Mary Ann Kufta respectively.*

Seventeenth Bell System Salon of Photography

All members and pensioners of the Bell System are eligible to participate in the seventeenth Bell System Salon of Photography. No entry fee will be required from members in good standing of the Telephone Camera Club of Manhattan or from pensioners of the Bell System. A fee of one dollar will be required from all others. Checks should be made payable to: The Telephone Camera Club of Manhattan, and mailed to: J. W. Wiack, Western Electric Company, 99 Church Street, New York 7, N. Y.

Each print must be the work of the exhibitor, which may have been taken at any time; however, it must not have been previously accepted in any earlier Bell System Salon. Process color or toned prints are permissible, but hand colored work is not.

Prints must be mounted on light colored mounts 16 by 20 inches. Mounting so that the 20-inch side hangs vertically is preferred. Title of print, contributor's name and address, club affiliation if any, must be printed on the back of the mount. For the convenience of the viewing public, title and signature on the front are suggested. At least one print will be hung from each club submitting eight prints. An entry blank completely filled out must be submitted by each exhibitor by the time indicated in the next paragraph.

Four prints may be offered by each entrant and they must be received in New York by November 30, 1951. Mail prints to: R. Siska, Room 831, 140 West Street, New York 7, N. Y.

Prints will be judged at 140 West Street, Room A, 30th Floor, on the evening of December 6, 1951. The Salon will be held in New York at 195 Broadway during the week of January 7 to 11, 1952.

H. B. SMITH
35 Years

H. H. HALL
45 Years

E. F. KETCHAM
45 Years

J. J. COLLINS
35 Years

P. C. SEEGER
35 Years

SERVICE ANNIVERSARIES

Members of the Laboratories who will receive Service Emblems on the November dates noted

45 Years

H. H. Hall.....15th
E. F. Ketcham....24th

35 Years

J. J. Collins.....27th
R. C. Kamphausen 19th
P. C. Seeger.....21st
H. B. Smith.....27th

30 Years

P. R. Andrews....14th
A. F. Grenell.....26th
C. R. Meissner....2nd
T. D. Robb.....28th
G. C. Smith.....21st
J. W. Van de Water.9th
J. Whytock 15th
W. H. S. Youry...21st

25 Years

E. W. Anderson....1st
W. S. Bishop.....1st
F. Cowan 10th
J. M. Dunham.....8th
J. J. Halligan.....8th
F. Keeling 8th
B. McKim 20th
W. McMahon 26th
G. P. Spindler....15th
E. E. Wright.....11th

20 Years

R. J. Philipps.....15th

15 Years

Ruth Ammons 9th
N. H. Anderson..23rd
M. J. Doody.....22nd
A. F. Hofmann...16th
D. F. Hoth.....10th
Mozarta Libby 8th
H. E. Vaiden.....2nd
J. M. Woitovich...16th

10 Years

A. S. Allocco.....19th
R. W. Blackmore..24th
C. D. Briggs.....10th
R. C. Casterline....3rd
Catherine Cooney.24th
Marjorie Forrest..10th
R. H. Granger....10th
E. J. Hughes.....10th
C. J. McDonald..18th
L. A. McNeill....19th
F. H. Miller.....18th
O. J. Mohni.....13th
L. J. Murphy.....19th
D. I. Oakley.....10th
J. I. Picard.....10th
J. J. Rosato.....26th
L. J. Szilagyi.....10th
J. R. Walsh.....18th
H. T. Webber.....3rd
E. Wojciechowski.11th

Joan Hoffman is typical of the many junior draftsmen who join the Laboratories to do interesting work on engineering and military projects.

A YEAR AND A HALF AT THE LABORATORIES

When Joan Hoffman came to the Laboratories in early 1950 as a messenger she decided on her own initiative to study mechanical drawing at Columbia University evenings. Her courses there convinced Joan that she had an aptitude for drafting and she decided upon it as a career. While she continued her studies evenings, she was promoted from the messenger group to junior clerk in the Mailing Department, and in July of this year to the drafting department.

She attended a seven-week full-time intensive training course in Bell Systems drafting practices given by Laboratories instructors before she was ready to join other young women at their drafting boards in the schematic group. This Fall, Joan returned to Columbia to continue her studies there in evening classes.

Her coming to the Laboratories was a natural. Her uncle, Ralph Rice, and her cousins, Lillian Hoffman and Frank Menk, work here. Joan is a graduate of Union Hill High School in Union City, New Jersey, where she lives with her parents and two brothers, Richard, fifteen and Kenneth, seven. She participates in church and guild activities at the Transfiguration Church and still finds time, even with home work, to go dancing.

Left—Joan's first assignment at the Laboratories was that of messenger whose duties include the escorting of visitors in the Laboratories. She is shown with Elizabeth Wilson. Center—Promotion from messenger to junior clerk brought Joan interesting work in the mail car, which travels vertically railroad style, from the first to ninth floors at West Street to assist in the delivery of company mail. Catherine Aillo and Joan sort the mail into sections for the various floors. Right—Joan took two years of academic and two of secretarial studies at Union Hill High. A course in mechanical drawing at Columbia convinced her that she'd like to follow family tradition as a Bell Laboratories draftsman.

Hazel Mayhew discusses Joan's mechanical drawing marks at Columbia and the possibilities of her promotion to junior draftsman.

A supervisor, Paul Boschan, helps Joan with a schematic problem.

Left—Lillian Hoffman, Joan's cousin, established herself as one of the first women in the drafting field at the Laboratories. Right—Joan achieves one of her ambitions as she joins the schematics drafting group in their newly renovated area on the fifth floor.

Right — A group of young people in the Lounge. Mary Barton, Roy Metzler, Frank Menk, Joan, Howard Weilbacher, and Harold Burger.

Left — Waiting for her friends in the Lounge gives her a few minutes to enjoy the women's pages of operating company magazines.

Right—Lunch in the West Street restaurant. Left to right, Mary Sullivan, Grace Sherry, Dorothy Sherry, Lucy Francabandera, Charlotte Tillinghast, Margaret Conrad, Helen Ball, Joan and Sally Lem.

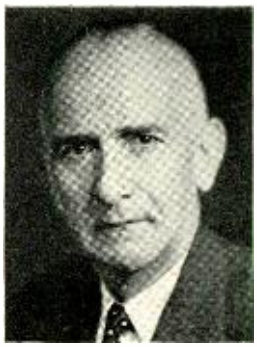
E. D. Jones of the Benefit Department answers Joan's nquiries about the added benefits which will be ers as soon as she has completed two years of Bell System service.

A stroll at noon to Abingdon Square park in the warm autumn sunshine where Joan and Dorothy Sherry make friends with two youngsters who play there each day.

RETIREMENTS

Recent retirements from the Laboratories include R. W. Harper with 44 years of service; J. G. Brearley, 41 years; S. B. Kent, 40 years; R. H. Kreider, 39 years; A. S. Fritz, 36 years; M. A. Froberg, 35 years; J. W. Umscheid, 34 years; and Michael Conlon, 25 years.

J. G. BREARLEY



R. W. HARPER

ROBERT W. HARPER

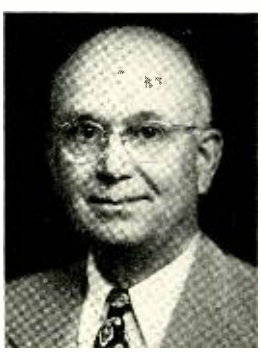
In 1907, Bob Harper stepped off the boat in New York fresh from a Scottish farm. His older brother was in the Cincinnati Company so Bob was soon at work there, painting iron work on a central office job. His Highland accent was pretty broad in those days—some of it still clings to him—and the boys had a lot of fun while they were teaching him the local dialect, and how to clear trouble, install telephones and become a telephone man in general.

Transferring to Western Electric in 1910, Mr. Harper soon became an installation foreman and had charge of acceptance tests on new central offices. In 1917 he entered the engineering department of Michigan Bell, but soon obtained leave to join the Signal Corps in World War I. Returning from France, he entered the Laboratories; after a few months on relays and contacts, he became a designer of circuits to interconnect manual with dial offices. Then he supervised the circuit design of all PBX's, community dial offices and station facilities and later participated in the usage in the Bell System of community dial equipment obtained from outside suppliers.

In World War II Mr. Harper was commissioned a Major in the Office of the Chief Signal Officer. He later commanded a training center, and then a Signal Corps battalion which installed communications and aids to air navigation for the Air Corps on many Pacific islands. He was discharged with the rank of Colonel.

Some time ago Bob and Mrs. Harper acquired four acres near Lynchburg, Virginia. They are to move down there to build a home where Bob plans to spend the autumn of his life growing vegetables, fruits and flowers. That is, he is going back to the soil, where he got his start.

R. H. KREIDER



S. B. KENT

JOSEPH G. BREARLEY

From 1910 to 1918, Joe Brearley was in the outside plant engineering group of New York Telephone; then he served in the Navy for two years. Returning to the Telephone Company he had to do with the introduction of the dial system in New York City. In 1929 he transferred to the Laboratories to work on cable development and was active in the lead-calcium cable sheath project.

For a good many years, Mr. Brearley has been interested in the economic problems involved in cable systems, and has been one of the Laboratories' specialists on such questions as the costs to be met by a new cable system in order to prove it in over existing types, and has carried out numerous field studies in the territories of Operating Companies in connection with a variety of cable problems.

Mr. and Mrs. Brearley will soon make their home near Daytona Beach, Florida; under consideration is a job at the Air Force Missile Test Center at Cocoa, Florida. Joe has five regrets at leaving New Jersey; his three children and two grandchildren.

STANLEY B. KENT

Joining Western Electric's student course at Hawthorne in 1911, Mr. Kent soon went into loading coil development; one project during the next five years was the air-gap type used on the Transcontinental Line. In 1916 he entered the Patent Department where he specialized in carrier and radio transmission, and for a while in submarine cables. From 1927 on he has specialized in telephotography, television

and electro-optics. His most recent work has been on the microwave radio relay system, the latest type of transcontinental communication system, now in use for telephony and television. He is an A.B. from Oberlin (1908) and an M.E. in E.E. (1911) from Cornell.

The Kents have lived for many years in Port Washington, and except for a visit to Florida this winter, there they will remain. An M.D. son and a granddaughter in the Bronx may have something to do with that decision.

Roy H. Kreider

Final step in the development of a new telephone system is the field trial, during which the last difficulties are ironed out and the results of field experience are made available to the development engineers. Roy Kreider has had charge of all major field trials for the last quarter century; he and his group have made

A. S. Fritz

M. A. Froberg

J. W. Umscheid

Michael Conlon

arrangements with the Operating Companies for such trials, have followed the equipment through manufacture and installation and have delivered them to the development engineers for final tests and service operation.

Mr. Kreider joined Western Electric's student course in 1912 on graduation from Penn State (B.S. in E.E.). He came to West Street in 1919 to work on the early development of the panel system and in 1925 took over the trial installation group which he headed until his retirement. Many successful engineers owe their early training here to that group.

Well rooted in Summit, where he has long been active in church and Boy Scout work, Mr. Kreider plans to remain there. Both of his sons live with their parents; Philip is in Protection Development at Murray Hill and Daniel, a Long Lines engineer, is currently in military service. His trees and his garden in summer and his stamp and coin collections in winter will give Roy plenty of happy activity.

Adolph S. Fritz

Mr. Fritz is a milling machine operator in the Development Shop during working hours, but otherwise he is a country squire on Staten Island where he has lived for half a century. In retirement, he will exchange his suburb for the real country near Stone Ridge, N. Y., where on an acre and a half he will continue to garden and raise mimosa trees.

From 1906 to 1913 Mr. Fritz was a machinist in Western Electric's Manufacturing Department. When it moved to Hawthorne he worked elsewhere until 1922 when he joined the Laboratories. For many years he has milled to shape the many metallic specimens which are required for fatigue studies in Metallurgical Research. Because these specimens must be accurate in dimension and must be prepared without strain changes in the metal structure, the job requires skill and care.

Mr. Fritz is a bachelor and plans to spend some efforts improving his already excellent cooking and preserving.

Magnus A. Froberg

Mr. Froberg joined Western Electric's power engineering group in 1916 and three years later was one of the party which moved to New York from Hawthorne. At West Street he designed the power plant for "Pennsylvania" —the city's first dial board and the first to require bus-bars instead of cables for power in the battery room.

Design of specific plants was soon handed over to Western Electric, but down the years Mr. Froberg continued to develop new methods of power supply as central offices grew and new telephones became available. The Type-M generator, whose output requires no filter, was superseded by the "commercial" dc machine, with a low-pass electromagnetic filter for talking circuits; the mercury arc, although it re-

mained in use, was outstripped by gas-tube and metallic rectifiers. For the last ten years Mr. Froberg's work has been on unregulated copper oxide and selenium rectifiers and on noise studies.

When Mr. Froberg moved to New York in 1919, his household goods included some tropical fish and that hobby has grown until his home in Chatham has more than twenty tanks. When he and Mrs. Froberg go to Florida, their interest will be in bigger fish, firmly hooked on a stout line. Their two sons are married; one family is in Chicago and the other, which includes a grandson, is in South Carolina.

JOHN W. UMSCHEID

Mr. Umscheid entered the Laboratories in 1917 as a draftsman after training in that craft at Central High School in Newark. He advanced through the various grades of apparatus drafting, becoming a supervisor in 1927 and a Member of the Technical Staff in 1929. Some time later he was placed in charge of all Apparatus Development drafting. Last year, when the Laboratories' Systems and Apparatus drafting was reorganized on an area basis, Mr. Umscheid was given charge of Apparatus drafting in the New York Area. During all his supervisory years Mr. Umscheid contributed substantially to the mechanical design of the various apparatus drawn under his supervision.

Residents of Maplewood, the Umscheids expect to remain there. One of their sons is in insurance, one is an architectural draftsman, and his daughter is in High School.

MICHAEL CONLON

There is a lot of housekeeping to be done in the Laboratories—cleaning our buildings, bringing up coal for the firemen, washing chemical glasses, charging storage batteries, delivering material, moving furniture. Mike Conlon has done all these jobs in his twenty-five years at West Street, and now he is planning to return to his native Eire to be a farmer again. Born near Athlone, he has a brother and sister there, who are arranging for him, his wife and his two younger children to live near them. His daughter, a clerk in Long Lines, will remain for the present, as will one of her brothers.

Engagements

Carol N. Grubb*—Robert Papsco
Eleanor Schaefer*—Wesley Castle
Jean Whitney*—Ross C. Little, Jr.
Betty Mocksfield*—William L. Shaffer*
Jean Kennedy*—Thomas W. Sweeney

Weddings

Beatrice Menne—Gene V. Hitter*
Ruth M. Philipp*—Col. Charles S. Herrman
Caryl Schrumpf*—George F. Geisenhainer
Elizabeth Scott*—Sgt. Frank Howarth
Anne Witherspoon*—Kenneth H. Grim
Jean Pick*—Anthony Yellen

Births

George William, Jr., October 5, to Mr. and Mrs. George W. Eckner. Mr. Eckner is in Quality Assurance.

Leslie Ellen, August 19, to Mr. and Mrs. Jack Keyser. Mr. Keyser is a member of the Quality Assurance.

Nancy Anne, September 4 to Mr. and Mrs. T. Knispel. Mr. Knispel is a member of the Coil Shop at Murray Hill.

William James, July 25 to Mr. and Mrs. J. Schmid. Mr. Schmid is a member of the Coil Shop at Murray Hill.

Richard John, October 4, to Lt. and Mrs. Edward J. Zillian, Lt. Zillian is on military leave. Mrs. Zillian was formerly in Medical.

Thomas Robert, on October 15, to Mr. and Mrs. William L. Willdigg. Mr. Willdigg is a member of the Switching Systems Development.

New Jersey Golf Tournament

Top row, left to right—J. G. Mathews, J. J. McMahon, B. H. Simons and R. N. Kurtze, 11th green; C. E. Luffman, D. A. Quarles, A. H. Bobeck and G. E. Brandenski (guest), 8th green.

Second row—E. K. Eberhardt, J. A. Word, J. M. Marko and L. P. Brown, 15th tee; L. S. Cooper, D. L. Viemeister and A. Kobylarz, 13th fairway; J. R. Riker's son-in-law W. E. Melick, H. N. Sanfilippo and Mr. Riker, 13th green.

Third row—G. M. Phillips, H. B. Brehm, C. B. Swenson and G. H. Baker, 9th fairway; J. P. Griffen, W. H. Brattain, N. B. Hannay and L. Weinberger, 12th green; W. L. Patterson, J. Prendergast, A. Jankowski and F. J. Shiel, 14th tee.

Fourth row—T. C. Barlow, J. F. Lawrie and J. E. Ballantyne, 10th green; J. G. Walsh, C. G. Pangburn, Commander J. G. Franklin, U.S.N. resident visitor at Whippany, and J. A. Folio; B. W. Kendall (retired), I. Welber, T. R. Hoffman and W. J. Pietenpol, 15th tee.

Fifth row—W. F. Malone, E. J. Aridas, D. K. Batchelor, E. G. Morton and A. F. Mott.

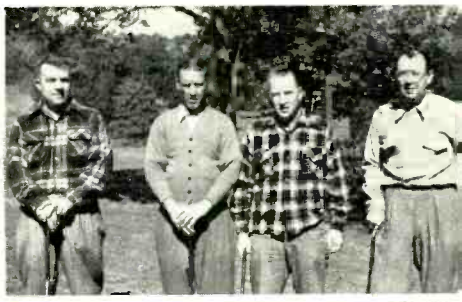




NEW JERSEY GOLF TOURNAMENT

Over seventy-five members of the Laboratories played in the Fall tournament of Bell Laboratories Club at the Essex County Golf Club on September 29. Low net prize winners in Class "A" were J. E. Lawrie, first; H. M. Yates, G. Markey and D. Viemeister, tied for second; and D. K. Batchelor, fifth. Kickers' prizes went to R. D. Fracassi and A. H. Jankowski. In Class "B" low net winners were H. T. Reeve, first; L. P. Brown, second; W. Kalin, third; and J. R. Riker and A. Kobylarz, tied for fourth. Kickers' prizes in the Class were won by C. B. Swenson, W. E. Melick and R. L. Shepherd.









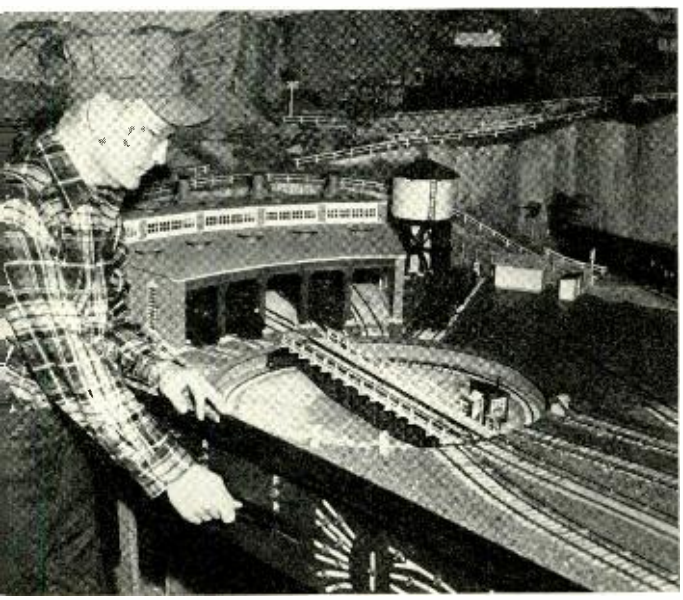


News Notes

SIR JOHN COCKCROFT, Director of the Atomic Energy Research Establishment at Harwell, England, visited the Murray Hill Laboratories with M. J. KELLY on Saturday, September 8.

DR. KELLY attended a special meeting of the Executive Committee of the A.A.A.S. at Arden House, Harriman, New York, on September 13. On September 25 he greeted the directors of the Chesapeake and Potomac Telephone Company when they visited Murray Hill. On the following day he accompanied Sir Alexander Little, Director General of the British Post Office, and Mr. Edward W. Root on a visit through Murray Hill. Dr. Kelly, S. B. COUSINS, A. B. CLARK, D. A. QUARLES, R. BOWN and W. C. TINUS attended the National Security Industrial Association dinner at the Waldorf-Astoria on September 26.

R. B. SHANCK was the invited guest of the Erie Railroad and a member of the official party of communications and railroad executives who gathered at Harriman, New York, on September 21 to commemorate the 100th anniversary of the first telegraphed train order. The Honorable Wayne Coy, Chairman of the Federal Communications Commission, was the principal speaker at the dedication service, held in conjunction with the Erie, the Western Union Telegraph Company and the Morse Telegraph Club of America.



Railroading keeps W. J. Hill of Murray Hill happy in his free time.

"The Telephone Hour"

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

November 5	Marian Anderson, *contralto*
November 12	Nelson Eddy, *baritone*
November 19	Jascha Heifetz, *violinist*
November 26	Oscar Levant, *pianist*
December 3	Pia Tassinari, *soprano,* and Ferruccio Tagliavini, *tenor*
December 10	To be announced
December 17	Jussi Bjoerling, *tenor*
December 24	Blanche Thebom, *mezzo soprano*
December 31	Robert Casadesus, *pianist*

N. KNAPP and A. A. HEBERLEIN visited the Western Electric plant at Allentown to discuss improved test procedures designed to insure that the full useful life is obtained from 396A and 403B electron tubes used in television circuits in the Bell System.

S. DOBA, H. A. LEWIS and R. H. BADGLEY, with J. S. GRIM of Long Lines, visited Washington recently to observe the transmission of color televise over coaxial and microwave circuits. RCA has been testing the transmission of color television signals originating in New York, and is using Bell System facilities for this purpose. Mr. Doba, as a member of Panel 14 of the National Television Systems Committee, has participated in discussions as to the form and characteristics of synchronizing pulses for use with the proposed NTSC color television systems.

B. DYSART and C. E. CLUTTS were at Pittsburgh testing a modified coaxial switch being developed for switching the video outputs of two microwave links across Lake Ontario, part of the new television interconnection between the United States and Canada. This involved a modification of an L1 system line switch and switch control circuit.

K. K. DARROW visited Copenhagen during the summer where he participated in the Conference on Quantum Physics, arranged by Professor Niels Bohr. As vice-president and member of the executive committee, Dr. Darrow also attended the General Assembly of the International Union of Pure and Applied Physics in Copenhagen. Following his return to this country he attended the International Conference on Nuclear Physics organized by S. K. Allison and held in Chicago.

IN QUEST of less costly and more compact methods of assembling and packaging components,

R. M. C. GREENIDGE and W. J. CLARKE addressed engineers of the Western Electric's E of M and Production Organization at Kearny on plastics and printed wire techniques. The plastic encasement of filters was the subject of a visit by N. J. EICH to the Western Electric Company plant at Haverhill, Massachusetts.

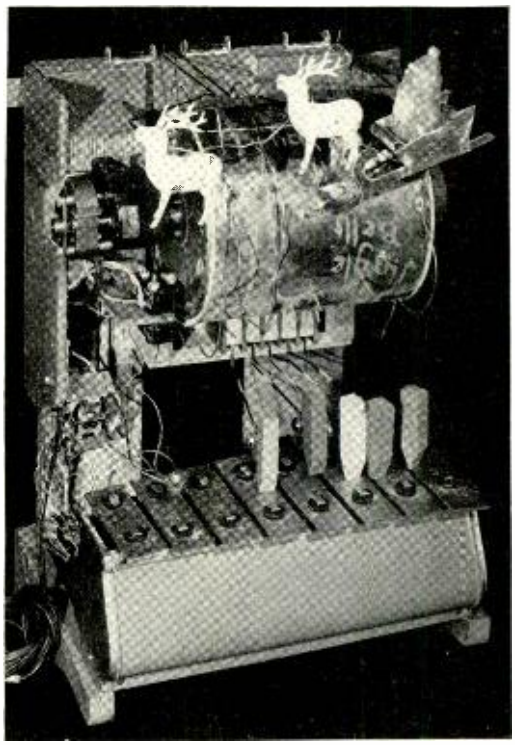
A. E. RITCHIE recently spent a week at Chicago making a general study of traffic operations. He was accompanied by R. M. SINKS, now a member of the Technical Staff, who recently transferred to the Laboratories from the Illinois Bell Company.

A. E. JOEL, B. F. LEWIS, F. T. ANDREWS, JR., and R. R. ANDERSON visited the Bureau of Standards in Washington to study their use of cathode-ray tubes for storing information. Later in the month, Mr. Lewis also visited the RCA Laboratories in Princeton to investigate the storage tubes used there, and then went on to the Bureau of Standards to inspect their methods of magnetic storage.

A NEW combined information desk, known as the 23 type, has recently been developed by the Laboratories, and will be described in a later issue of the RECORD. It has been installed on a trial basis in Harrisburg, Pa., and Canton, Ohio. H. H. ABBOTT, H. E. NOWECK, P. L. WRIGHT, W. W. BROWN, W. B. CALLAWAY, and W. G. BARRETT went to Harrisburg for the cutover on September 15. This desk incorporates a number of new features, and apparatus was installed at Harrisburg to study the performance of the desk under various conditions, Mr. Barrett and Mr. Callaway remained in Harrisburg several days, and Mr. Noweck went to Canton where similar but less extensive traffic studies are being carried on.

H. W. AUGUSTADT, L. B. COOKE, A. M. ELLIOTT, R. F. MASSONNEAU, and R. A. MILLER, together with representatives of the A T & T and the Western Electric Company, recently spent a few days in Cleveland studying the operation of the variable announcing apparatus of the Brush Development Company.

FOT THE PAST year fifty "war-babies" in a Staten Island orphange have been blessed by Laboratories' godmothers who remember them on birthdays, Christmas, holidays and during vacation time. Born during World War II, the children usually come from broken homes and have parents living. Consequently since they cannot be offered for adoption, they must spend their childhood in institutions.



W. Keister was not satisfied with the ordinary doorbell especially at Christmas time, so he built the musical door chimes shown in the photograph. When a caller presses the button, the motor driven drum actuates the hammers of a xylophone that plays "Jingle Bells." Santa travels up and down in time with the music.

These youngsters learn faith and trust in grownups through their contacts with their godmothers. The girls in return gain in stature through the confidence and love they receive from the children whom they are helping to develop into more secure and happy persons.

ELSIE DITTMAR is chairman of the Freehold Day Camp Committee, a community enterprise sponsored by the Mayor of Freehold, the Council, Y.M.C.A., and public school system. The Freehold Day Camp ran for five weeks during the summer, and was attended by 130 campers. Through donations of church, civic and township groups, scholarships were made available for worthy campers who were unable to pay the nominal tuition fee.

DR. JOHN R. BOWMAN of the Mellon Institute visited the Murray Hill Laboratory on October 4 where he discussed electrochemical, mechanical and electronic analogue computers at a conference in the Arnold Auditorium. Dr. Bowman is head of the Mellon Institute De-

A. L. Johnsrud, is shown in action with his 8 x 10 camera. His Christmas picture of Whippany will appear on the December RECORD *cover.*

partment of research in physical chemistry. His fields of activity, in addition to physical chemistry, have been entomology, separation processes in chemical engineering, electronic calculating machines, and lubrication.

RUGGED OPERATING conditions often make the hermetic sealing of apparatus a "must" in equipment for the Armed Services. In turn, effective sealing as well as apparatus performance are dependent on the type and quality of the terminals used. The problems of sealed terminal manufacture were the subject of a visit by A. W. TREPTOW and A. W. ZIEGLER to Winston-Salem.

J. R. TOWNSEND, K. G. COMPTON and A. MENDIZZA visited San Francisco to inspect the Point Reyes test site and to install initial specimens for corrosion tests. With the opening of Point Reyes it will now be possible to evaluate corrosion resistance to the elements countrywide since test sites are already in operation at New York; Steubenville, Ohio; and Perrine, Florida. Mr. Townsend, Mr. Compton, R. C. PLATOW and J. F. SHEA visited the Douglas Aircraft Corporation, in Santa Monica, California, to discuss materials and processing problems. Mr. Townsend has been appointed chairman of the general committee on arrangements for the fiftieth anniversary meeting of the American Society for Testing Materials to be held in New York in June, 1952.

A CONVENIENT WAY to determine whether an apparatus component has the proper impedance is to compare its impedance with that of a standard through the bridge circuit of a hybrid transformer. E. F. SARTORI who developed an improved hybrid transformer for testing L3 coaxial components visited Haverhill to discuss its manufacture.

A SMALL RURAL TOLL CABLE with polyethylene insulated conductors and Alpeth sheath was recently installed by the Michigan Bell Telephone Company between Trout Lake and St. Ignace, a distance of 27 miles. Polyethylene insulated cable is being developed with the expectation of improving service reliability and reducing maintenance costs as a result of the high dielectric strength and water-proof quality of polyethylene insulation. As in the case of the first installation of this type of cable at Cooperstown, New York, a newly developed prefabricated splice cover was used in which the seals to the cable sheath were made by means of compression gaskets instead of the rubber tape wrappings now employed. W. C. KLEINFELDER and D. C. SMITH of the Laboratories and H. W. Butler and A. Paone of the A T & T witnessed this trial.

"FOR Patriotic Civilian Service to the Department of the Army," was the citation when J. R. TOWNSEND was presented a Certificate of Appreciation for his services on the Technical Industrial Intelligence Committee, Joint Chiefs of Staff, during World War II. The presentation was recently made at Governors Island, N. Y., by Lieutenant General Willis B. Crittenberger, Commanding General of the First Army.

V. T. WALLDER and J. B. DE COSTE attended a Symposium on *The Degradation of Polymers* held by the National Bureau of Standards in Washington where factors relating to the deterioration of organic materials, such as polyethylene, polyvinyl chloride and cellulose acetate, were discussed. N. B. HANNAY also attended a Symposium on *Mass Spectroscopy in Physics Research* and J. CRABTREE and W. L. HAWKINS, a semi-centennial Symposium on *Polymer Degradation Mechanisms,* at the Bureau.

H. A. BIRDSALL is a member of the American Chemical Society Committee sponsoring the

lecture series on chemistry and technology of textiles currently being offered at the Celanese Company's auditorium in Summit.

H. PETERS visited the Cambridge, Massachusetts, plant of the Simplex Wire and Cable Company in connection with a submarine cable splice problem. F. HARDY visited the Western Electric Company at Burlington, Winston-Salem and Greensboro, North Carolina, to discuss the lubrication of military equipment which has been returned for modernization.

MEETINGS of the American Chemical Society and the International Union of Pure Chemistry were attended by many chemists, including R. M. BURNS, G. T. KOHMAN, W. O. BAKER, B. S. BIGGS, H. PETERS, C. M. HILL, D. EDELSON, L. A. WOOTEN, C. D. THURMOND, C. L. LUKE, F. H. WINSLOW, J. F. AMBROSE, and others.

THE LABORATORIES were represented in interference proceedings at the Patent Office in Washington by H. S. Wertz before the Primary Examiner.

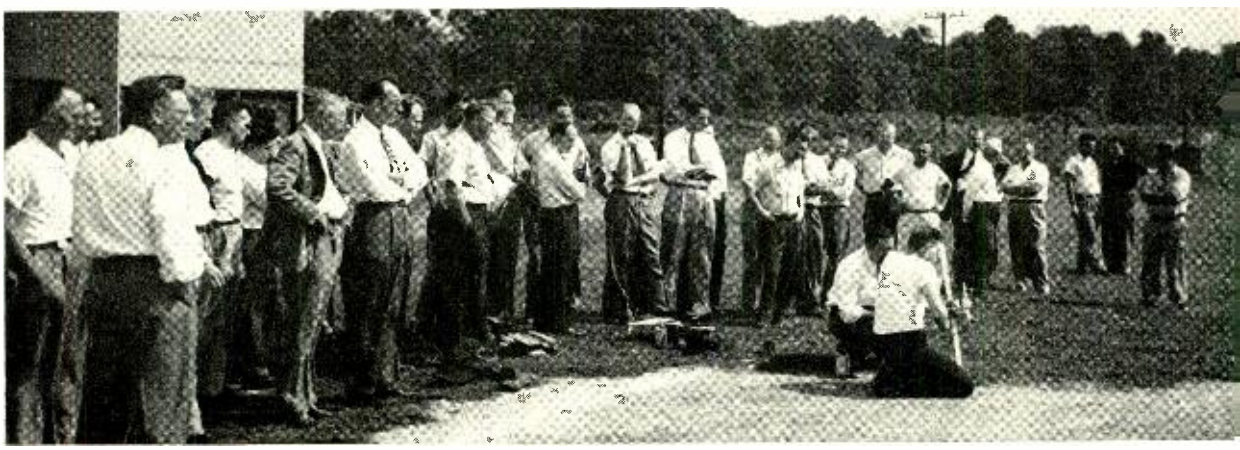
DR. A. VON ENGEL, lecturer in physics at the University of Oxford, visited Murray Hill in September and at a conference in the Arnold Auditorium spoke on *Electrodeless High Frequency Discharges.* Dr. von Engel is a recognized authority on the conduction of electricity in gases and worked in this field at the Siemens-Schuckert Works before coming to Oxford.

PROFESSOR WOLFGANG GENTNER, who visited Murray Hill on September 28, is professor and director of the Physikalisches Institut at the University of Freiburg. In addition, he is director of the Kaiser-Wilhelm Institut für Physik at Hechingen. His fields of activity have been biophysics, radioactivity and nuclear physics. At a conference in the Arnold Auditorium Professor Gentner talked on *Determination of the Age of Minerals by Radioactive Methods.*

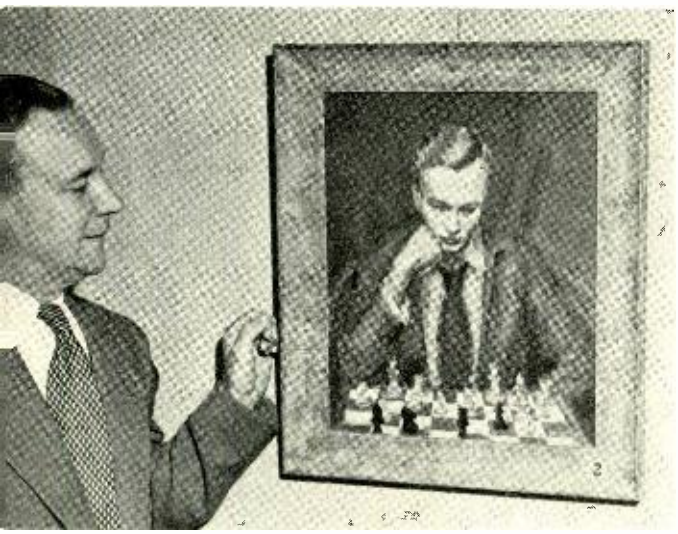
G. Q. LUMSDEN, with engineers of the Bell Telephone Company of Canada and the New England Telephone and Telegraph Company, examined greensalt treated red pine poles that have been in service in Billerica, Massachu-

Model Airplanes at Whippany

A group of Whippany model airplane enthusiasts gave a demonstration of their hobby at the ball field recently. They have formed a club and intend to give a noontime lecture soon on the construction and flying of wire-controlled and radio-controlled models. Among the members are E. Babcock, a national figure in the model airplane sport, E. D. Knab, who organized the Club, R. C. Remington, authority on radio-controlled planes, and L. E. Barkoff, who demonstrated wire-controlled planes.



setts, since 1941. All poles examined were found to be in excellent condition after the first ten years of their service. The Bell Telephone Company of Canada has just completed greensalt treatment of some 20,000 red and jack pine poles produced this year and plans to treat a similar number of poles in 1952. Greensalt is a clean, waterborne wood preservative invented by Sonti Kamesam and developed for practical use by the Laboratories. The chemical brush control project of the New England Telephone and Telegraph Company under the antenna towers at Green Harbor, Massachusetts, was also examined.



"Chess Player" is one of the oil paintings by H. E. Ericson of Allentown which was exhibited recently at Allentown Art Museum. Mr. Ericson's subject is Louis Von Ohlsen, a co-worker. The painting required five sittings of one hour each and the work was interrupted by the arrival of Mr. Von Ohlsen's twins.

Engineer Exhibits Art Work at Allentown

H. E. Ericson, a member of the technical staff at Allentown, recently exhibited his oil paintings at the Allentown Art Museum where twelve examples of his art were hanging for a month. All but two were of people. Mr. Ericson's aim is to express the mood of his subject in as direct and frank a way as possible. Of the two landscapes hung in the museum last month, one was a Swedish landscape and the other a black and white, entitled, *Fire Fighters.* The latter was the result of sketches made on the docks near West Street during a fire in 1947. It was also chosen the best composition for Fire Prevention Week by the Art Students League.

Mr. Ericson was born in Sweden and graduated from Katrineholm Technical College. After coming to this country he ventured into commercial art for a short time before entering the Laboratories in 1928 as a draftsman. In 1935 he was promoted to MTS, working at West Street until he was transferred to Allentown in 1948 where he is a member of the Electronics Apparatus Development Department in the specifications group.

News Notes

IN A RECENT COPY of the *Bronx Cheer,* a weekly paper published by and for patients and personnel of Veterans Administration Hospital at Kingsbridge in the Bronx, is a note about a member of the Laboratories at West Street who is a patient there. He is JOSEPH NAPODA, a stretcher case, who is in a cast from his neck to his heels. On Labor Day a mammoth carnival was sponsored by the Hospital and the volunteer organizations. One of the main events was the "Parade on Wheels." Among the winners was Mr. Napoda, who with a buddy dressed themselves and their stretchers as "Pirates." They took first prize for the "Funniest" pair in the parade. Members of the Laboratories Stamp Club, who visit the patients at Kingsbridge every Thursday evening to help with their stamp activities, also visit Mr. Napoda. He is also visited by members of the Building Shops of which he is a member.

R. H. COLLEY and J. LEUTRITZ, JR., attended meetings in Cincinnati of a Special Committee on Fundamental Research on Oil Preservatives and of the general Preservatives Committee, respectively, of the American Wood-Preservers' Association. Mr. Leutritz has been made chairman of a subcommittee on laboratory and field test techniques for evaluating wood preservatives. Mr. Colley also visited the Batelle Memorial Institute at Columbus in connection with the research program of the Special Committee.

L. R. SNOKE cooperated with representatives of the Joslyn Manufacturing and Supply Company, Franklin Park, Illinois, and the Western Electric Company in initiating at that plant the treatment of poles with penta-petroleum solution. Studies were made to determine the conformance of commercial production to the requirements of a new results type specification for the penta treatment of poles.