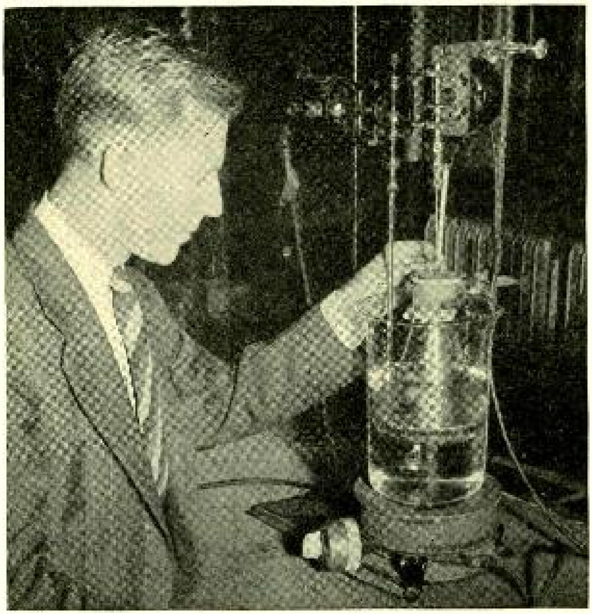


Greensalt Preservative for Telephone Poles

By C. M. HILL
Chemical Laboratories

WATER solutions of various salts have long been used as wood preservatives but most of them do not afford sufficiently lasting protection by themselves for the butt sections of telephone poles, because poles are often subjected to severe leaching conditions. To be effective in prolonging the life of wood in contact with the ground, water-soluble materials must undergo a change after injection which will render them insoluble while retaining their preservative value. A preservative with these properties, now known as greensalt, came to our attention about ten years ago. The composition most used contains potassium dichromate, copper sulphate and arsenic acid in solution. Variants include sodium dichromate as a substitute for the potassium salt, and also mixtures of chromic acid, copper carbonate and arsenic acid.

These preservatives, particularly the first one, have been given extensive laboratory tests to determine their preservative value in wood and their permanence. Groups of small blocks of southern pine sapwood were impregnated with solutions of graded concentration and subsequently subjected to the attack of wood-destroying fungi under controlled laboratory conditions. Blocks similarly impregnated were subjected to exhaustive leaching and the leach waters analyzed for copper, chromium and arsenic. The leached blocks were then exposed to fungus attack. These tests showed that greensalt became almost completely insoluble within a short time after injection and both leached and unleached blocks stood up well when exposed to fungus attack.

Outdoor exposure tests on southern pine saplings one inch in diameter and posts four to five inches in diameter treated with greensalt were begun in 1934 at the Gulfport, Mississippi, test plot, where conditions are very favorable to rapid destruction of wood in contact with the ground. The seven-year record of specimens treated with one-half pound and one pound of greensalt preservative per cubic foot of wood and exposed at Gulfport is excellent in comparison with simultaneous similar tests of preservatives of established standing including creosote. Compilation of the results of laboratory rotting tests requires months, while years are necessary to evaluate outdoor exposure tests. Meanwhile some investigations were carried on to determine how the constituents of greensalt solution are rendered insoluble and thereby fixed in wood.

Stability of greensalt solution in the absence of wood was demonstrated by evaporating some to dryness in glass. Water redissolved the dry residue. When dextrose, a reducing sugar, was added to greensalt solution, however, a precipitate formed after standing several days at room temperature and increased in quantity with time.

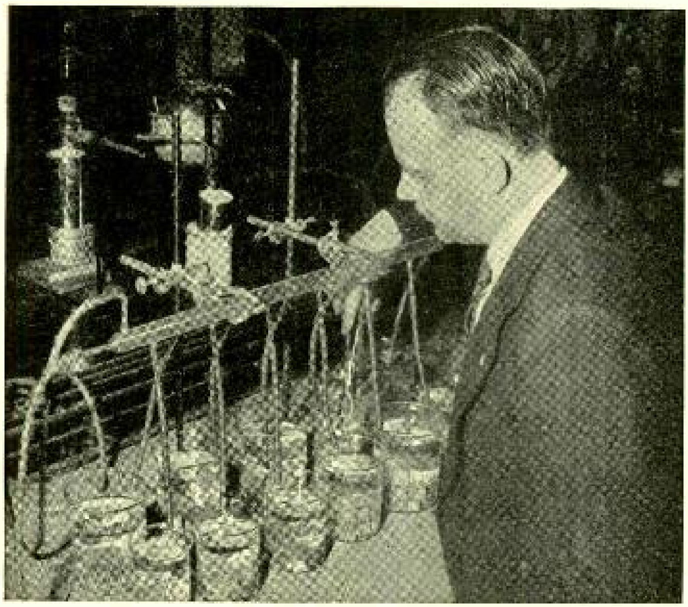


Fig. 2—To test the fixation of greensalt preservative in southern pine, small blocks of this wood were impregnated with this preservative and leached exhaustively by flowing water over them. Chemical analysis of the leach water showed that greensalt becomes almost completely insoluble a short time after injection. The author of the article is shown here

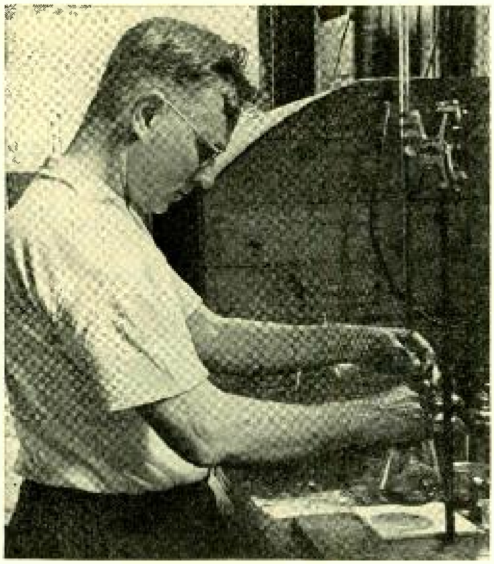


Fig. 1—Analytical control of greensalt preservative at the treating plant at Spartanburg, South Carolina. J. F. Jensen is making the test

Analyses of this precipitate indicated the formation of insoluble arsenates, chromates and hydroxides of copper and chromium. The only water-soluble compound remaining after complete conversion is potassium sulphate, which is not toxic. No soluble salts are produced by the reactions of greensalt composed of chromic acid, copper carbonate and arsenic acid.

The addition of a water extract of the soluble constituents of wood to greensalt solution causes precipitation like that induced by dextrose. This reduction proceeds quite rapidly in wood and laboratory experiments have shown that the rate of reaction is dependent on the temperature. In these experiments fixation was determined from analyses of greensalt solution before and after contact with sawdust. The results, expressed as pounds of preservative fixed per cubic foot of wood, are shown graphically with respect to temperature in Figure 3 and in relation to time in Figure 4.

When the treatment of pole-size timber was investigated the stability of greensalt solution under conditions of commercial practice was studied and satisfactory schedules of treating procedure and analytical control were developed. It was demonstrated that fixation of the preservative in poles takes place to an appreciable extent during the treating process. This is of significance in the commercial treatment of southern pine poles for the following reasons. Southern pine normally has a very deep sapwood and preservatives must be applied under pressure to assure adequate penetration. It is undesirable, however, for telephone poles to retain all of the solution which must be injected to satisfy penetration requirements and it is customary to recover some of the preservative at the conclusion of treatment by applying vacuum to the poles.

If any fixation has taken place during the treating process the treating solution on hand at the completion of a charge will have slightly lower concentration than at the start of treatment because the "kickback" solution drawn off by the vacuum has been selectively stripped to some degree of its constituents. It follows that the retention of salts in the treated charge will be greater than that indicated from net retention of the solution alone. The concentration and volume of the solution must be known both before and after treatment to calculate the preservative retained. It was therefore necessary to develop a routine for determining changes in the concentration of the solution during treatment.

Distribution of preservative throughout the cross-section of a treated pole was determined from analyses on borings and

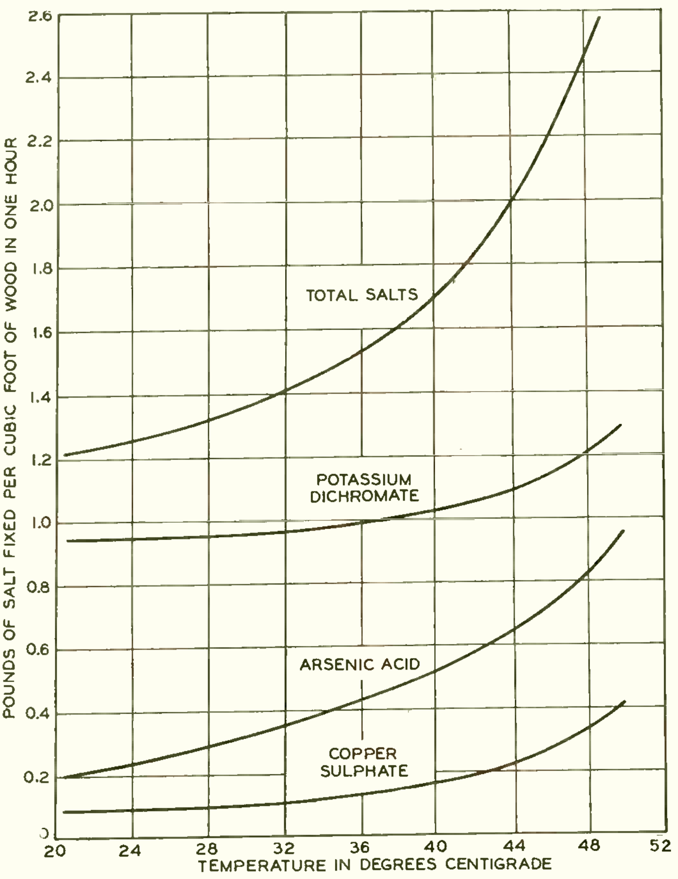


Fig. 3—Fixation of greensalt in southern pine sawdust expressed as pounds of preservative fixed in one hour per cubic foot of wood, at different temperatures

found to be at least as even and regular as that attained with creosote. Penetration of preservative is usually apparent by means of borings but staining solutions have been developed to aid in those cases where the sapwood is discolored by mould.

It has been established that greensalt becomes firmly fixed in wood within a short time after injection and that wood which retains an overall concentration of one pound of preservative per cubic foot is highly resistant to decay and insect attack.

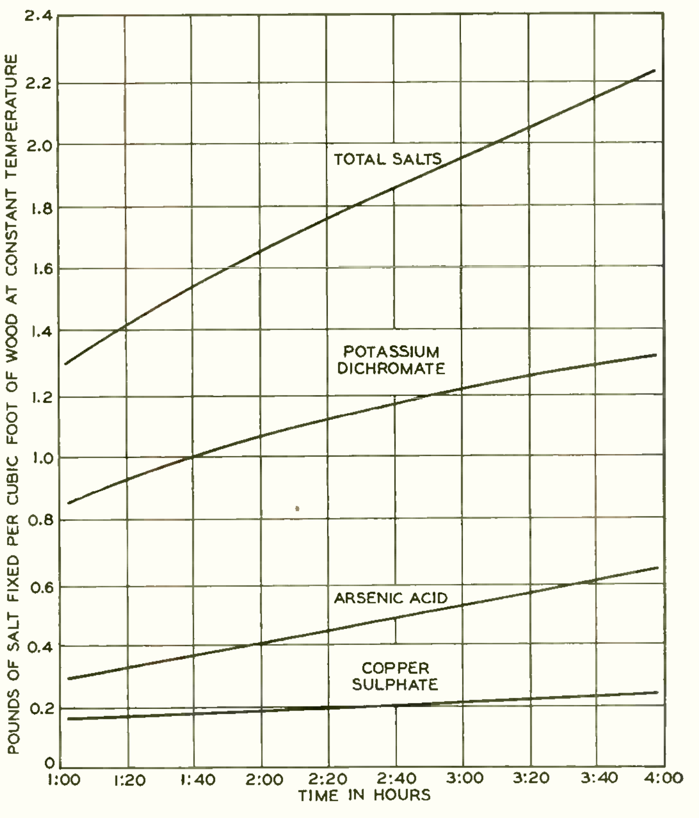


Fig. 4—Amount of greensalt preservative fixed versus time at constant temperature in southern yellow pine sawdust

A Spread-Scale Recorder

By O. D. ENGSTROM
Transmission Development

As THE communication art has progressed, the transmission tolerances of telephone circuits have become more severe, requiring a corresponding improvement in measuring technique and equipment. When a telephone circuit had only a few amplifiers or other circuit units, each could be permitted a larger share of the total permissible distortion, and errors in measurement of 0.25 db meant very little. With the present transmission systems requiring many more circuit units than the earlier systems, this situation has changed. More accurate and faster operating testing equipment has been required, and a recording transmission-measuring set was developed that will cover the voice frequency spectrum in a few minutes.* As originally used, the chart of this recorder could be read to about 0.2 db, but for many present-day measurements this is not adequate, and a new "spread-scale" recorder has been developed that can be read to 0.02 db.

For a transmission measurement, the various pieces of apparatus are arranged as shown in Figure 1. An adjustable-frequency oscillator is provided with a small synchronous motor that changes the output frequency continuously over the range from 200 to 3500 cycles for each test. An equalizer and adjustable attenuator in the output of the oscillator maintain the output power constant at the desired level for the test. At the output of the circuit being measured is the 1-U amplifier-rectifier that converts the received alternating current into direct current for operating the recorder. The 500-cycle selective detector is employed to mark the chart at a point corresponding to a test frequency of 500 cycles, and this mark is used in placing the frequency ordinates on the chart by the meth-

*Record, *April*, 1938, *page* 289.

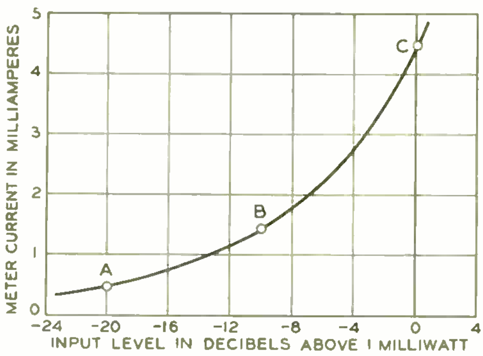


Fig. 2—Input-output characteristic of amplifier-detector as used for the 20 db chart

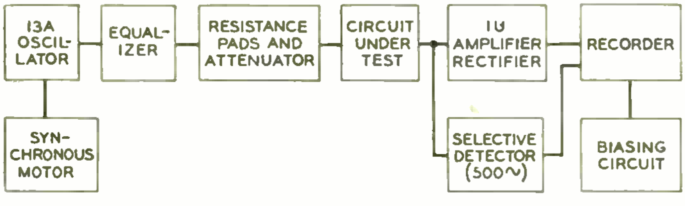


Fig. 1—Block schematic of testing circuit using the spread-scale recorder

od described in the article already referred to. The biasing circuit was added as one of the changes required to produce the spread-scale characteristic, and will be described later.

The characteristics of the 1-U amplifier-rectifier as used before the modifications were made for spread-scale recording are shown in Figure 2. The characteristics of the recorder are such that at 1.42 milliamperes the pointer is at mid scale, and at 4.5 ma. it is at full scale. This latter current corresponds to one milliwatt input to the rectifier, and 1.42 ma.

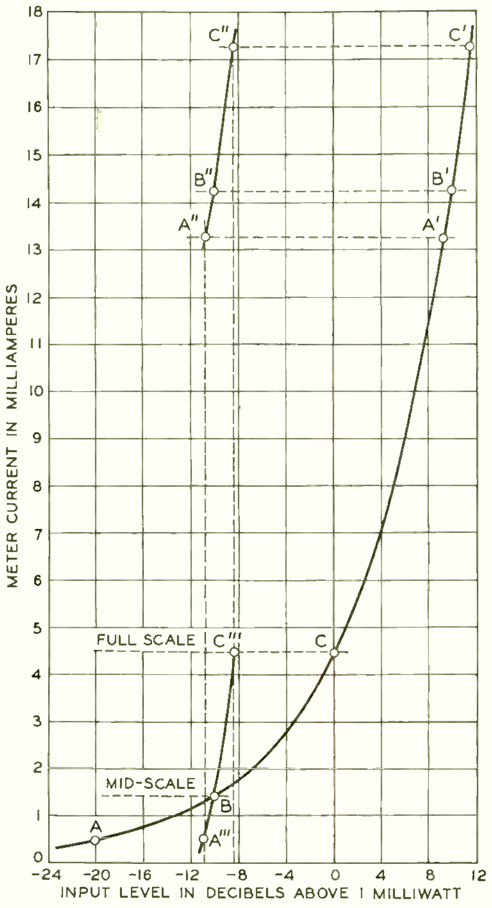


Fig. 3—Input-output characteristic of amplifier-detector arranged for increased load-carrying capacity

corresponds to about ten db below one milliwatt. Twenty db below one milliwatt input gives a meter current of 0.45 ma., and this is about the lowest point of the scale that is normally used. The recorder thus covers a range of 20 db over which the meter current changes some 4 milliamperes from 0.45 to 4.5, and the smallest difference in level that can be read is about 0.2 db. To provide for reading changes as small as 0.02 db, the scale must obviously be spread to provide about ten times the distance for each db change in level. This requires, of course, that the total range be reduced to about one-tenth of the present range, that is, it will be some 2 db instead of 20 db.

What is needed to bring this about is a modification of the rectifier to secure a steeper characteristic so that a change in input level of about 2.5 db will produce the full four-milliampere change in meter current. As a first step, the load-carrying capacity of the amplifier was increased, giving the characteristic shown by the solid curve of Figure 3. The section from A to C is the same as Figure 2, but above point C, the characteristic of the original rectifier flattened out, and thus at no point did it have a steep enough slope to give the spread-scale characteristic desired. With the increased load capacity, however, the curve steepens for higher inputs, and from points A′ to C′ there is a four-milliampere change in output current for an input change of about 2.5 db.

The midpoint of the recorder scale is at 1.42 ma., which as may be seen from the curve corresponds to an input level of −10 db. The full scale of the meter is at 4.5 ma., or 3.08 ma. higher, while the lowest used part is at 0.45 ma., which is 0.97 ma. below 1.42. With the increased load capacity of the rectifier, an input of 10 db above 1 milliwatt gives a current of 14.2 ma., and currents of 0.97 ma. below this and 3.08 ma. above it give the points A′ and C′ of Figure 3, corresponding to input levels of approximately +9 and +11.5 db, respectively. By giving the rectifier an additional gain of 20 db, however, the characteristic curve would be shifted to the left by 20 db, and the section A′C′ would lie above inputs between −11 and −8.5 db as shown by curve A″C″ of Figure 3.

With these changes, the meter current would change about 4 ma. as the input level changed some 2.5 db centering around an input level of −10 db. This gives a spread-scale characteristic, since the full 4 ma. change in meter current is brought about by a 2.5 db change in input instead of a 20 db change as with the original arrangement. There is still one difficulty to be overcome, however, because the present recorder requires only 4.5 ma. for maximum deflection, while at point C the output of the rectifier is over 17 ma.

This difficulty was overcome by the circuit shown in Figure 4, which is marked "biasing circuit" in Figure 1. A battery and adjustable resistance is connected across the recorder in such a manner as to tend to pass a current of 12.78 ma. through the recorder in a direction opposite to that of the current from the rectifier. The actual current through the recorder, therefore, will be the difference between the current from the rectifier and this fixed biasing current. With a rectifier current of 14.2 ma., the net current in the meter would be 1.42 ma., which gives mid-scale deflection. Similarly a rectifier current of 17.28 ma. would result in a net recorder current of 4.5 ma., and a rectifier current of 13.23 in recorder current of 0.45 ma. So far as recorder current is concerned, therefore, this biasing circuit has the effect of lowering the curve A″ B″ C″ to the position A‴ B C‴ and B′ now is the same as B of Figure 2. With the modified rectifier and the biasing circuit,

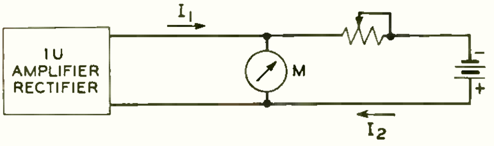


Fig. 4—Biasing circuit for spread-scale recorder

curve A‴ B C‴ expresses the relationship between input power and meter current, and thus corresponds to curve ABC of Figure 2. The difference is that the full scale of the meter is covered by 2.5 db change in input, although it is centralized as before at a level of −10 db.

The meter scale obtained with this modification is not linear in db, but this is readily taken care of by readjusting the scale marking springs. The charts used with this recorder have no printed scales on them. The recorder is equipped with small spring fingers that mark the db scale by pressure on the chart as described in the article already referred to, and these fingers may be easily readjusted to indicate correctly the new "spread" scale.

To secure the added precision needed for a chart that is to be read to 0.02 db, certain other changes had to be made in the testing equipment. These included principally an increased voltage stability of the power supplies and an increased stability of the output of the oscillator and of the gain of the detector as the frequency varied over the test range. Steps taken to improve the circuit in these respects include the provision of a regulated plate-battery power supply for both the oscillator and the detector, storage battery for filament supply, the selection of quiet tubes, and special regulation for the oscillator output characteristics.

The circuit is calibrated by applying an input of 10 db below 1 milliwatt to the amplifier rectifier, and then adjusting the resistance in the circuit of the biasing battery until a mid-scale deflection is obtained. When making a measurement of the transmission characteristic of a piece of equipment, it is then necessary to adjust the oscillator output so that the output of the equipment under test is 10 db below 1 milliwatt at roughly the frequency of the mean attenuation. The dial of the oscillator is then set below the edge of the desired band, and the oscillator and recorder are both started. A typical record made on a compandor with this modified recorder is shown in Figure 5.

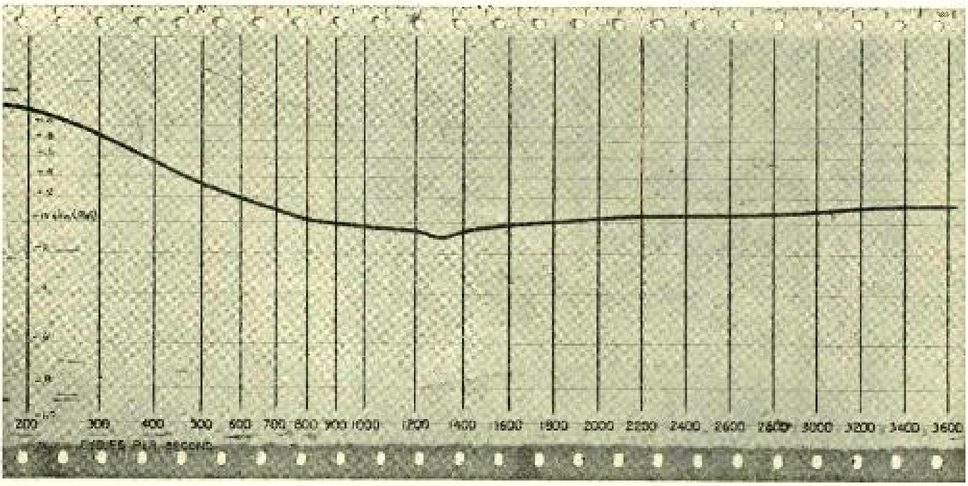
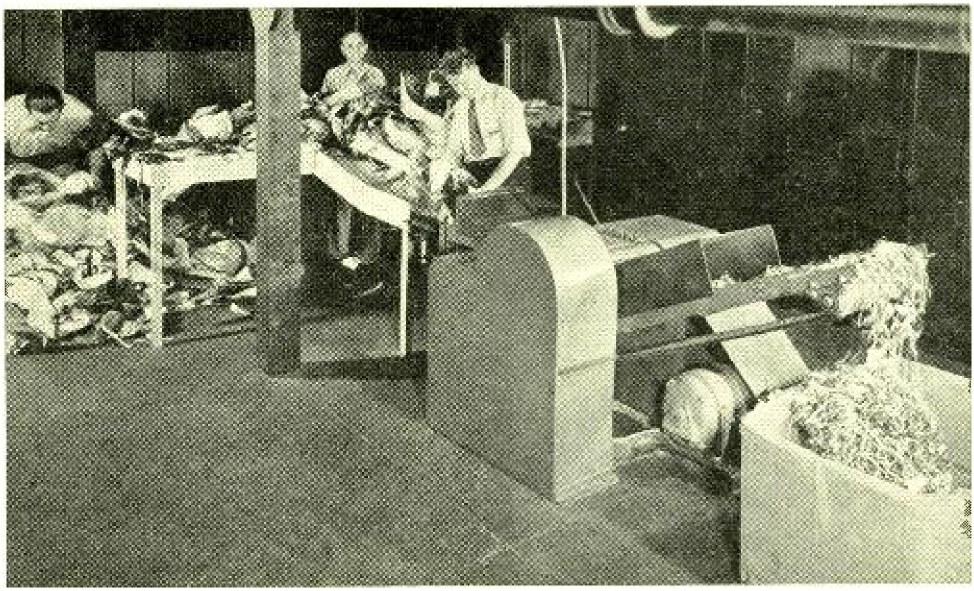


Fig. 5—Chart taken with spread-scale recorder to show transmission characteristics of a compandor



Salvaging for Victory

By C. T. BOYLES
Traffic Department

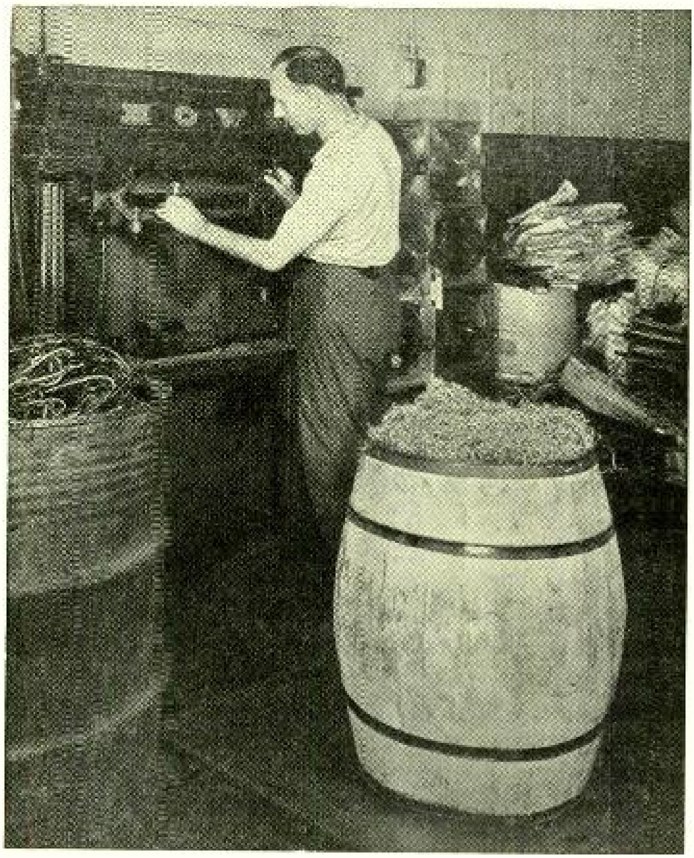
TO GLEAN the remaining value from the large amount of discarded equipment and other waste material that has served its use in our varied undertakings, the Laboratories has always carried on salvage work. This work, under the direct supervision of R. C. Fisher, is more difficult with us than with an ordinary manufacturing plant of equivalent size because the function of Bell Laboratories is to create a continual flow of new and different things rather than a group of stabilized articles each with its regular and unvarying quota of salvageable stock. Much more than the collection and sale of waste is required, since the greater bulk of the material, and by far the most valuable, is apparatus that for most effective disposal must be dismantled, inspected, and then passed upon with intelligence before being classified.

With the advent of war the work of salvaging has taken on a different aspect, and to some extent has acquired new motives. Under normal conditions the ruling criterion is whether the salvaged material can be sold for more than the cost of collecting it and preparing it for sale. As a result, the work varies somewhat with the price of scrap. A typical example is waste paper. A good many years ago all paper was saved and baled, and brought a high enough price to show a profit on the operation. During the last fifteen years, however, the price that could be obtained for such paper did not justify its packing, and consequently the paper has been burned.

Net profit from salvaging is no longer the sole criterion, however, since, in view of a possible paper shortage, conservation of this material becomes a duty regardless of other factors. A shredder and baler have, therefore, been obtained and are now in use. When our plans are completed in the near future, all paper salvaged from waste paper baskets from discarded drawings and similar sources will be reduced to a tangled mass of very narrow strips. Some of this material will be used in our Shipping Department for packing. The remainder and other paper will be baled for sale.

All material coming to the salvage group is first inspected for condition and possible further use. In some of this work the Central Instrument Bureau acts as a consultant. If the apparatus, such as meters, resistors, or relays, is capable of further laboratory use, it is properly transferred to suitable store rooms or departments that may have use for it. If for some reason or other it cannot be disposed of in this manner, and is not of Western Electric manufacture, it is set aside for sale to dealers. All coded apparatus, that is all apparatus of Western Electric manufacture, that cannot be further used here is set aside for return to the Western Electric for repair or other salvage operations. All special apparatus, such as development models or special experimental equipment, is completely dismantled to destroy all evidence of its function, and the component parts are either reserved for further use or set aside for sale.

Scrap metal, such as steel, iron, brass, aluminum, and bronze in all forms is sorted and separately stored. Pieces sufficiently large for further use, whether bar, rod, plate, or piping, are held for stock, as are pipe and conduit fittings. The rest is sold and since most of our critical metal scrap is sold to Nassau Smelting, most of it is available for further use in Western Electric products. Scrap cable and wire is treated in a similar manner. Rubber and plastics are also carefully separated and disposed of to further



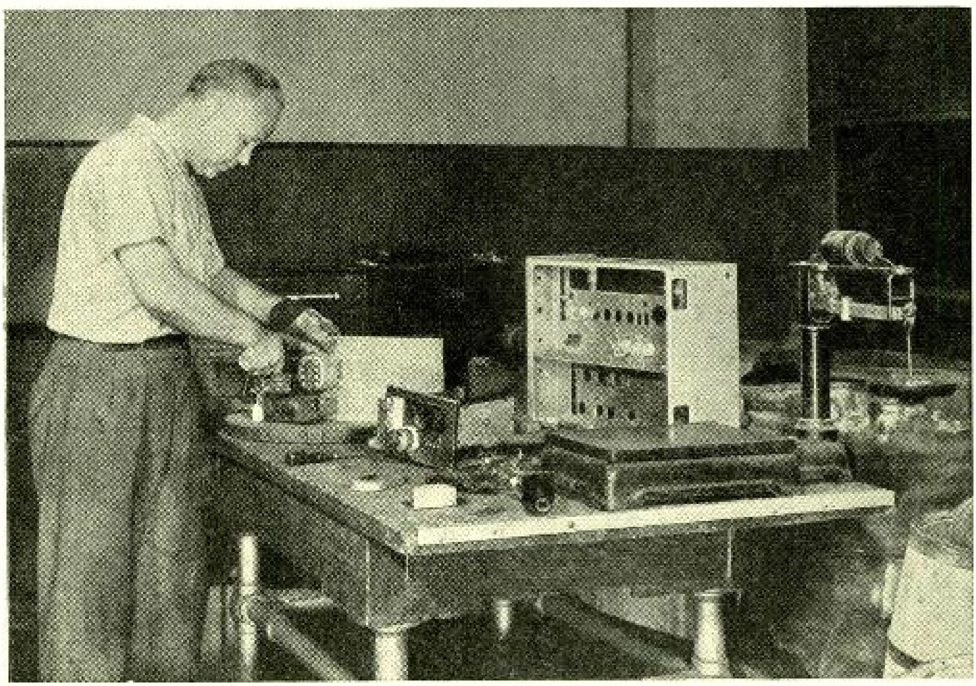
Patrick Currie weighs a barrel of brass turnings which will be shipped to the Nassau Smelting and Refining Company the war effort. Lathe turnings and sweepings from the Shop are also segregated according to type of metal and sold.

Under the new criterion for salvage, many things are being conserved that were discarded as valueless before. Waste grease from the restaurant comes under this heading.

During 1941, over half a million pounds of material were received by the Salvage Department, while nearly as much material has passed through its hands during only the first eight months of 1942. Forwarding apparatus and materials to the Salvage Department has often saved time by making it possible for war projects to proceed when delays in securing new materials would have caused serious interruptions. Thus by some increase in effort, all waste material is either conserved to assist our war effort, or is added to the Government's urgently needed scrap pile.

A careful record is kept of all materials held for salvage, and every two weeks a report is forwarded to the Industrial Salvage Section of the War Production Board.

As this issue of the RECORD goes to press, a room-to-room salvage campaign is under way to collect all unneeded material, apparatus, and machines in lockers, store rooms, laboratories, and offices. Recognizing the importance of material conservation to our war effort, the personnel of the laboratories are coöperating to the fullest extent. Although the final results are not yet available, the early indications are very encouraging.



Fred Hellwinkel disassembles some experimental apparatus prior to sorting the salvaged material for proper disposal

NEWS AND PICTURES

Preparing a protective metal surface for an accelerated corrosion test made over water in a constant-temperature oven

This group of research directors included representatives of Aluminum Company, American Brass, Armstrong Cork, Bakelite, Colgate-Palmolive-Peet, Corning Glass, Dorr Company, duPont, Eastman Kodak, General Aniline & Film, General Electric, Gulf Research, International Nickel, Johnson & Johnson, Mellon Institute, New Jersey Zinc, Parke-Davis, Standard Brands, Standard Oil, U. S. Rubber, U. S. Steel, and Westinghouse; their host, Dr. Buckley, and several of his associates

News of the Month

Research Directors Visit Murray Hill

About 40 directors of industrial research and their associates were guests of Dr. Buckley at the Murray Hill Laboratories on September 25. Assembling at West Street, the group was transferred to the auditorium at Murray Hill by bus. There they heard a general statement on the Laboratories by Dr. Buckley and a description of the new building and its services by M. B. Long. After an inspection of the acoustical laboratory, and luncheon in the restaurant, small groups were formed under the leadership of J. Leutritz, Jr., H. D. Bender, G. Q. Lumsden, G. A. Smith, F. L. Hunt and C. D. Hanscom. Starting in different directions they were met at thirteen stations by members of the Laboratories who explained the particular features of interest. Stations and speakers were:

Metallurgical Laboratory	E. E. Schumacher
Rubber Laboratory	A. R. Kemp
Sample Laboratory Room (Wall down, and fixtures and pipes exposed)	J. G. Motley
Typical Office Wing	C. C. Towne
Timber Laboratory	R. H. Colley
Typical Basement	T. J. Crowe
Typical Attic	J. E. Ballantyne
Library	Leah E. Smith
Stock and Supplies Room	G. B. Hamm
Laboratory Development Shop	H. C. Atkinson
Sound-Proof Installations	J. R. Erickson
Drafting Room	H. Anderson
Control and Reception Room	A. F. Leyden

Members of the party were dinner guests of Dr. Jewett and Dr. Buckley at the Short Hills Club.

Laboratories Girls Enter WAVES

Grace Wagner of the Quality Assurance Department was the first young woman of the Laboratories to be sworn in the Women Appointed for Voluntary Emergency Service—the WAVES. This was on September 25 and then, on October 9, Marcelle Lesire was sworn in. Both have been granted leaves of absence to enter military service and reported at the University of Wisconsin on October 9 for training in that section of the WAVES concerned with communications.

Miss Wagner's work with the Quality Assurance Department has dealt in part with the receipt of all originating papers concerned in Bell System complaints and determination of the apparatus and equipment classification of the physical material involved. This has afforded her a background familiarity with many of the components of telephone communication which may well prove of value in her military service.

Miss Lesire was a member of the General Service Department. She was first with General Transcription and then transferred to the special service group located on the sixth floor at West Street.

The Telephone Business

Evidence that long distance communications are distinctly a war industry is furnished by the mounting load on Long Lines facilities since Pearl Harbor. Figures for the first eight months of this year reflect marked increases over the corresponding 1941 period in toll, TWX and private line services.

Of special significance in the eight months' comparison is the growth in Government usage of private telephone lines. At the end of August, 1941, the U. S. was using 23 such circuits totaling 5,300 miles. On the last day of August, 1942, the number of circuits was over 300, and the mileage had swelled to over 150,000.

During the same period Government teletype and Morse circuits have quadrupled and their mileage grown from 112,000 to nearly 290,000 miles, well over 150 per cent. Eight months' totals on Long Lines telephone messages show a growth of over 30 per cent, while TWX is up about 40.

In the Nation's Service

UNITED STATES ARMY

Major Emil Alisch
Lieut. A. Eugene Anderson
Nils H. Anderson
Louis R. Bell
Lieut. Arnold R. Bertels

George Bickard
Ludwig J. Bierl
Capt. Foster B. Blake
Capt. John H. Bogle, M.D.
Charles T. Bolger

Clement Bosch
Major M. Maxwell Bower
Capt. Charles R. Brearty
Lieut. Sherman T. Brewer
Charles D. Briggs

George Bukur, Jr.
Edward J. Bybel
Thomas J. Calvani
Horace J. Camp
Gerard E. Campbell

Raymond P. Chapman
Lieut. David F. Ciccolella
Edward R. Clark
Lieut. Col. Andrew W. Clement
Capt. Francis A. Coles

Michael Collins
Robert R. Cordell
Capt. Orrin F. Crankshaw, M.D.
Joseph F. Daly
Lieut. Col. Richard A. Devereux

Lieut. Thomas J. Doherty
Robert J. Drout
Robert A. Dryden
Major William H. Edwards
Lieut. Col. Albert M. Elliott

Lieut. Col. Hiram B. Ely
Lieut. Col. Albert J. Engelberg
Robert J. Erny
William L. Farmer, Jr.
Lieut. William J. Flavin

Paul J. Flickinger
Lieut. Col. Raymond O. Ford
Lieut. Joseph E. Fox
Lieut. Bertram M. Froehly
David N. Fulton

George W. Galbavy
Major William J. Galbraith
Owen N. Giertsen
Thomas J. Gilchrest
Hugh J. Glynn

Ernest G. Graf
Capt. Ernest Graunas
Major Charles H. Greenall
Lieut. Harold B. Guerci
John F. Gulbin

Lieut. Walter S. Gunnarson
Major Robert W. Harper
Lieut. Col. John M. Hayward
Morgan F. Hickey
Capt. Henry E. Hill

Lieut. Foster A. Hinshaw
Francis M. Hodge
Lieut. Lester H. Hofmann
Lieut. Harry W. Holmlin
Ralph D. Horne

John P. Houlihan
Frank J. Howe
Alexander Howitt
Edward J. Hughes, Jr.
Edward P. Hullah

Frederick J. Hurt
Burton L. Jamison
Joseph A. Joyce
Oliver C. Kanouse
Capt. Robert L. Kaylor

Capt. Howard J. Keefer
Capt. William Kes
Capt. Harold T. King
Lieut. William M. Knott
Major Albert G. Kobylarz

Lieut. Robert J. Koechlin
Frank C. Kozak
Charles J. Kuhn
George J. Langzettel
Henri T. Lefebure

Lieut. William H. Lichtenberger
Richard D. Long
Capt. Stanley H. Lovering
Major William R. Lyon
Lieut. Walter W. Maas

Major Joseph A. Mahoney
Lieut. Paul Mallery
Herman E. Manke
John Marrero, Jr.
Lieut. Roderick K. McAlpine

Major Thomas A. McCann, III
Charles J. McDonald
Peter F. McGann
Robert F. McLaughlin
Armin J. McNaughton

Major James W. McRae
William J. Meehan
Charles E. Merkel
Lieut. James H. Miller
Lieut. Louis T. Miller

Lieut. John K. Mills
Capt. Floyd A. Minks
Lieut. Col. Harvey N. Misenheimer
Robert T. Monahan
Lieut. Frederick B. Monell, Jr.

Robert C. Nance
Ernest F. Neubert
John Nichol
Peter E. O'Donnell
Karl J. Ogaard

Lieut. Orving C. Olsen
John M. O'Neill
Capt. Dexter T. Osgood
John T. O'Shea
Frank J. Osolinik

Capt. Irving C. Osten-Sacken
John E. Paplin
Thomas A. Pariseau
Lieut. Frank A. Parsons
John H. Pennstrom, Jr.

Lieut. Edwin H. Perkins
William G. Pimpl
William T. Quinn
Lieut. Leroy G. Rainhart
Lieut. Einar Reinberg

Lieut. George M. Richards
Capt. John C. Roe
Robert T. Rooney
Major Ward K. St. Clair
Alex J. Sandor

Lieut. Jacob W. Schaefer
George A. Schiehser
William J. Schneider
Charles R. Schramm
Lieut. Charles L. Semmelman

Michael Sheehan
Major Hubert A. Sheppard
Lieut. Frederick J. Skinner
Thomas J. Slattery
Gerard V. Smith

Major Walter F. Smith, Jr.
Major Arthur D. Soper
Major Malcolm A. Specht
Lieut. Lambert W. Stammerjohn
John H. Stelljes

In the Nation's Service

UNITED STATES ARMY

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Alfred T. Stiller
Major William W. Sturdy
Major Morton Sultzer
Lieut. Samuel C. Tallman

Wilson Taylor
Capt. Donald E. Thomas
Major Kermit O. Thorp

Francis E. Tucker
John J. Turley
Lieut. William G. Turnbull, Jr.
August Uhl
Ambrose J. Vallely

James J. Viggers
Charles M. Voss
Anthony A. Waraske

Lieut. Kenneth L. Warthman
Kenneth E. Waters
Major Allen L. Whitman
William Wiegmann
Lieut. Robert C. Winans

Thomas G. Woods
Edward J. Yastremski
Lieut. James E. Zendt

UNITED STATES NAVY

Robert Angle
Walter B. Bachmann
Robert W. Blaschke
Nicholas Brady
Perry R. Brockett

Edward J. Burns
Edwin L. Chinnock
Harry B. Compton
William J. Conner, Jr.
Lieut. Comm. Rodman D. deKay

Jeremiah J. Doody
Lieut. Laurence G. FitzSimmons, Jr.
Nicholas J. Flynn

Ensign Halsey A. Frederick, Jr.
Lieut. Harry C. Hart
George E. Helmke
Lieut. Charles A. Herbert
Martin P. Hughes

Jesse M. Jackson
Ensign Raymond A. Kempf
Richard C. Lamont
Ensign Joseph A. Lehans
Albert J. Leimer

Marcelle M. Lesire
Robert C. Lockwood
Lieut. Thomas H. Neely
Emmett F. Noe

Jack I. Picard
Lieut. Charles M. Redding
Ensign Charles C. Rock
Lieut. John R. Sackman
Frederick W. Schwartz

Richard A. Shine
Carl E. Stone
Gordon B. Taylor
Lieut. Clarence Unnewehr
Donald L. Viemeister

Grace M. Wagner
William P. Weiler
Lieut. Comm. Nels C. Youngstrom

UNITED STATES MARINES

John C. Applegate
Lieut. Stephen Duma

Arne J. Elvejord
Richard C. Fiala
Frank J. Gunther

John F. McCarthy
John C. Ptacek

NATIONAL DEFENSE RESEARCH COMMITTEE

Walter H. Brattain
Michael J. Burger
William B. Callaway
Eginhard Dietze
Paul V. Dimock

Frank H. Graham
Erhard Hartmann
William Herriott
Joseph W. Hoek

Joseph P. Maxfield
Horace T. O'Neil
Mary E. Quinn
Max S. Richardson

William Shockley
William B. Snow
George R. Stibitz
Albert L. Thuras

Walter L. Tierney
Richard J. Tillman
John E. Tweeddale
Robert G. Watling
Genevieve D. Weldon

NAVY DEPARTMENT

BUREAU OF ORDNANCE

Walter B. Ellwood
Joseph F. Keithley

BUREAU OF SHIPS

John W. Smith

U. S. MARITIME COMMISSION

Edward J. Chance
Frank J. Fleischer
Austin R. Suneson

WAR DEPARTMENT

Charles A. Parker

SIGNAL CORPS TRAINING SCHOOL

Gustav A. Backman
Harold Georgens
Warren E. Thacker

WAR PRODUCTION BOARD

Hamilton Baillard

Louis A. Dorff,
Special Consultant with
Army Air Force in
Civilian Capacity

Herman A. Larlee,
Civilian Capacity with
the Signal Corps

Charles R. Leutz, Jr.,
Civilian Pilot
Training

Frank W. Lindberg,
New York State
Merchant Marine
Academy

company. We have many comforts in our day room—radio, reading, writing, etc. . . . The civilians of Augusta have been most kind to us all."

* * *

A. Chaiclin of the Transmission Development Department, who is in charge of the group of Western Electric Installation Department men working in the Graybar-Varick building, has received letters from two of these men now in service—Raymond Farley and Thomas Calahan.

Mr. Farley writes from "Somewhere in Australia" that "From the other side of the world I can send you very little news. All I can tell you about my job is that I am a switchboard operator. A lot of the equipment we used to work on in the Labs I see and use over here. . . ."

Mr. Calahan writes: "Well I guess you've heard about how we took over these Solomon Islands. I am on Guadalcanal Island. We have had a swell time but I couldn't get hold of any Jap ears for you fellows. . . . I sure miss the Labs. Tell Mr. Shiley that as soon as this lousy war is over I'll be back.

"Once I thought I'd like to stay in the Marines. The only thing wrong is that we exist rather than live. . . . Tell Slim and the other fellows that they should be here. We have fresh and salt water swimming and we drink Jap beer all night. They make darn good beer too. . . . Bombs are dropping less than a mile to my left. Boy, this war is fun (like . . . .)."

"I MOLD ALL MY SALVAGE FAT INTO BULLETS, BEFORE I TURN IT IN...I FIGURE THIS WAY, IT'LL SAVE TIME."

* * * * *

M. M. Bower, who is in the General Development Section of the Office of the Chief Signal Officer at Washington, was advanced to the rank of Major on September 15.

* * * * *

Four members of the Laboratories who have been on military leaves of absence have returned. They are Dick S. Barlow, Robert L. Dietzold, Glover D. Johnson and Daniel H. Wenny, Jr.

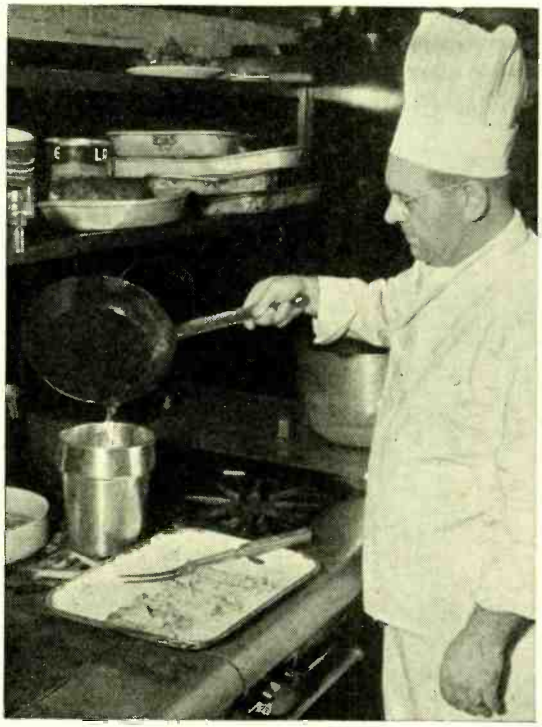
* * * * *

On October 15 there were 258 members of the Laboratories "In the Nation's Service," as tabulated on pages vi and vii, either on military leaves of absence or on personal leaves. In the Army there are 174, including 38 Lieutenants, 17 Captains, 21 Majors and 8 Lieutenant Colonels; in the Navy, 40, including 4 Ensigns, 6 Lieutenants and 2 Lieutenant Commanders; Marines, 7, including 1 Lieutenant; in the National Defense Research Committee, 22; and in Government Departments or in special training, 15.

Commissions in the list are based on the latest information we have and there are probably some inaccuracies which we will correct as soon as new information is received. Copies of the Record are sent to everyone on leave and to their families where it is so desired.

Save Grease!

The accompanying photographs show what the Laboratories are doing to save grease. Are you doing your part at home?



Are you doing this in your home? At the left, Andrew Scaglione of the Restaurant saves bacon grease. This is then used for other frying, such as liver, and then poured into the salvage can as Polo Grafal is doing at the right. For the eight months beginning February the Restaurant at West Street has salvaged 4,845 pounds of grease and fats

Get yourself a tin can, scrub it out, put it on the back of the stove where it's handy and tell the family "This is for grease salvage."

Grease salvage is your job—saving as much as you can of the two billion pounds that ordinarily go to waste. When the Philippines, Malaya and the Dutch East Indies were taken, about half of our imports of fats and oils went. We need these for food, soaps, paints and varnishes and as ingredients for explosives, gun powders and medicines.

Since February the West Street restaurant has turned over to our Salvage Department 1,400 lbs. of clear grease, 1,822 lbs. of mixed grease and 1,623 lbs. of fat. For the three months beginning with July the Murray Hill restaurant has turned over 581 lbs. of clear grease and 1,833 lbs. of mixed grease and fats. Clear grease brings seven cents per pound and mixed grease and fats four cents.

Here we see Andrew Bartinelli (in front) of the Restaurant and Patrick Currie of the Salvage Department emptying a container

Soldiers performing at the mirrophone during one of the Pacific Company's shows in Washington

Army Camp Shows

Displays and demonstration equipment developed by the Laboratories have played an important part in the "Army Camp Show" put on by The Pacific Telephone and Telegraph Company last spring and summer in various camps in Washington. Display equipment included models of early telephones, cable display, ship-to-shore exhibit, the voice mirror and an oscilloscope. Demonstration equipment included the mirrophone, artificial larynx, "Wobbly" bar, permalloy rod, electrical stethoscope and the throat microphone. Twenty-six shows were given at Vancouver (Wash.), Fort Lewis and McChord Field with an average attendance of about 310.

Another series of shows was staged in the North California-Nevada area. This was a "variety" show and included a cast of twelve telephone employees. One skit centered around the mirrophone. Following a brief explanation of its development it was then demonstrated with the audience taking the principal part. This show was staged thirty-eight times before an average audience of about 475 service men at Salinas, King City, Camp Roberts, San José, Camp San Luis Obispo, Fort Ord and Camp McQuaich.

News Notes

O. E. Buckley has been appointed a member of a committee of engineers and scientists named by Donald M. Nelson, chairman of WPB, to determine the manner in which the Projects Office of Technical Development of the WPB shall be established. The decision to set up such an office was made following a report recommending the formation of a "strong scientific and technical organization" to make sure that the nation's technical ability and resources are "utilized to the full" in the war production program. The committee is expected to define the scope, functions and methods of operations which the Projects Office should have.

The 1942-1943 roster of officers and committee members of the American Institute of Electrical Engineers includes the following members of the Laboratories: *Constitution and By-Laws*, R. L. Jones; *Charles LeGeyt Fortescue Fellowship*, O. E. Buckley; *Lamme Medal*, M. J. Kelly; *Membership*, D. C. Meyer; *Publication*, John Mills; *Research*, M. J. Kelly; *Standards*, R. L. Jones; *Basic Sciences*, M. J. Kelly and J. D. Tebo; *Communication*, H. A. Affel, John Davidson, Jr., S. B. Ingram and

Members of the Laboratories to Whom Patents Were Issued During the Month of September

B. J. Bjornson
O. Cesareo
W. A. Depp
E. Dickten (2)
W. H. Edwards
H. W. Goff
F. Gray (2)
J. F. Hearn
A. Herckmans
W. H. T. Holden
R. K. Honaman
H. Hovland (2)
L. W. Hussey
J. B. Johnson
A. R. Kemp
D. H. King
B. J. Kinsburg
W. C. Kleinfelder
F. R. Lamberty
R. F. Massonneau
A. E. Melhose
D. T. Osgood
K. H. Perkins
C. E. Pollard, Jr.
G. C. Reier
H. O. Siegmund
C. G. Spencer
B. E. Stevens (3)
C. C. Towne
A. Tradup
R. L. Vance
G. W. Weaver

R. G. McCurdy; *Education*, G. B. Thomas; *Instruments and Measurements*, E. I. Green; *Power Transmission and Distribution*, H. M. Trueblood; and *Protective Devices*, P. A. Jeanne and A. H. Schirmer.

During the third quarter of 1942, the following members of the Laboratories have been enrolled as members of the Edward J. Hall Chapter, Telephone Pioneers of America:

Hermann Alfke
H. S. Black
D. E. Branson
R. L. Case
Wendel Cernik
A. J. Christopher
A. G. Dalton
G. H. Downes
E. F. Elbert
O. C. Eliason
F. F. Farnsworth
Patrick Healy
T. C. Henneberger
W. H. T. Holden
E. J. Kane
C. E. Lane
W. P. Mason
Prescott May
Hazel Mayhew
C. G. McCormick
D. L. Moody
A. B. Reynolds
K. F. Rodgers
E. M. Staples
W. E. Stephens
Ida Wiberg
L. A. Yost
A. W. Ziegler

In order to afford additional protection to Laboratories property only the following entrances to the 463 West Street building may be used for entrance by members holding suitable cards:

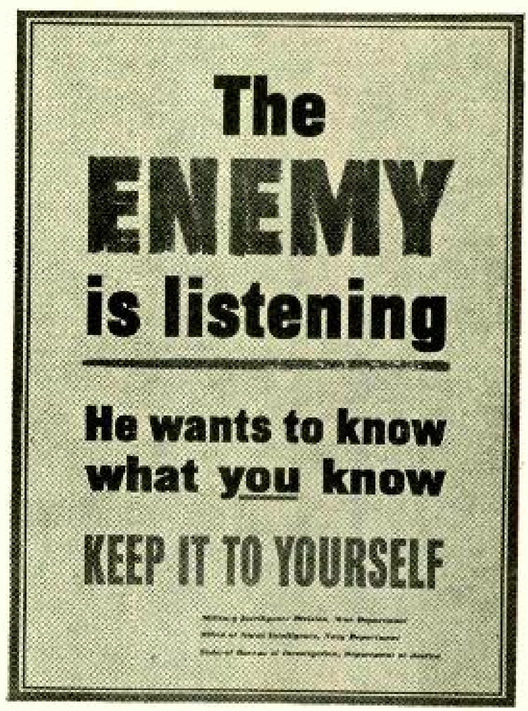
	Section
463 West Street	D
67 Bethune Street	D and C
57 Bethune Street	D
55 Bethune Street	H
155 Bank Street	K
165 Bank Street	I

However, for the convenience of employees, the entrances at 451 and 459 West Street and 734 and 744 Washington may also be used as exits during the regular day hours.

In discussing the organization of a committee of scientists to act as advisers to the Minister of Production, *Nature* (London, Sept. 12, 1942) says: "*Nature* has never recognized any distinction between men of science and engineers; the latter are a class of the former. The tendency in some quarters to make an unnecessary distinction is confusing and sometimes leads to friction." In the Laboratories they are both included under "Members of the Technical Staff."

E. E. Schumacher and G. S. Phipps visited the Point Breeze plant to discuss metallurgical problems.

C. J. Frosch, at the Tennessee Eastman Corporation at Kingsport, discussed plastics.



Chosen by Lot

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

* * * * *

To many members of the Laboratories Earl Hollis must seem to live the life of Riley, for while the rest of us are patriotically trying to avoid buying anything, he

Earl Hollis

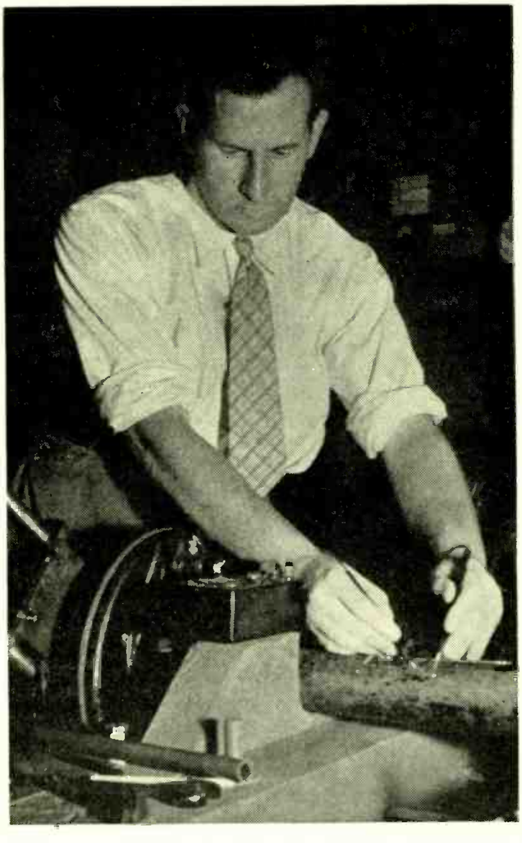
just buys and buys and buys. But even with priorities to help him, he has no easy time of it, for many of the things the Laboratories needs are very scarce; if he didn't know just where to look, he would never find them.

Earl graduated from Stevens in 1923 and was a production man for National Carbon for several years. He joined our Purchasing Department in 1929, and has since specialized in machinery and in metals. He has to know a lot about suppliers: what they make, how promptly they can deliver, how their prices compare. He is always on the lookout for new materials, so as to keep the engineers informed, and of course he must keep abreast of market trends, and of the constantly changing priority and allocation rulings of government.

Born in Queens, Earl still lives there. He and Mrs. Hollis have three children, the oldest a girl of fourteen. In their home are many pieces of Chinese art which he has collected during several years. He enjoys ball games and boxing matches, and when he had time he used to play golf. Before he entered the Laboratories, he used to buy machinery for export to Japan. Now when he places a high priority order, he takes grim satisfaction in the thought that he is helping to land a few projectiles on the Japs.

* * * * *

Kenneth Smith has a lot of hobbies—archery, photography, telescopes, painting—



Kenneth Smith

but none that intrigue him as much as making high-frequency currents go where they should and do as they are told. And that is just what he has been doing in Wire Transmission Research for the last dozen years. Most of that time he worked on coaxial cable systems, especially the testing equipment required to keep them working, but now his technique is being applied to win the war.

Born in Galesburg of college-trained parents, Ken attended Chaffee Junior College and Pomona College, both in California. After graduating from Pomona in 1928, he was an assistant instructor in physics at Dartmouth for two years, and received a master's degree there in 1930. Then he entered the Laboratories; and has been concerned with oscillators, analyzers, and phase-shift measurement circuits. Three patent applications have been filed in his name.

With their two young sons, the Smiths live in White Plains.

RUTH FLEISCHMANN

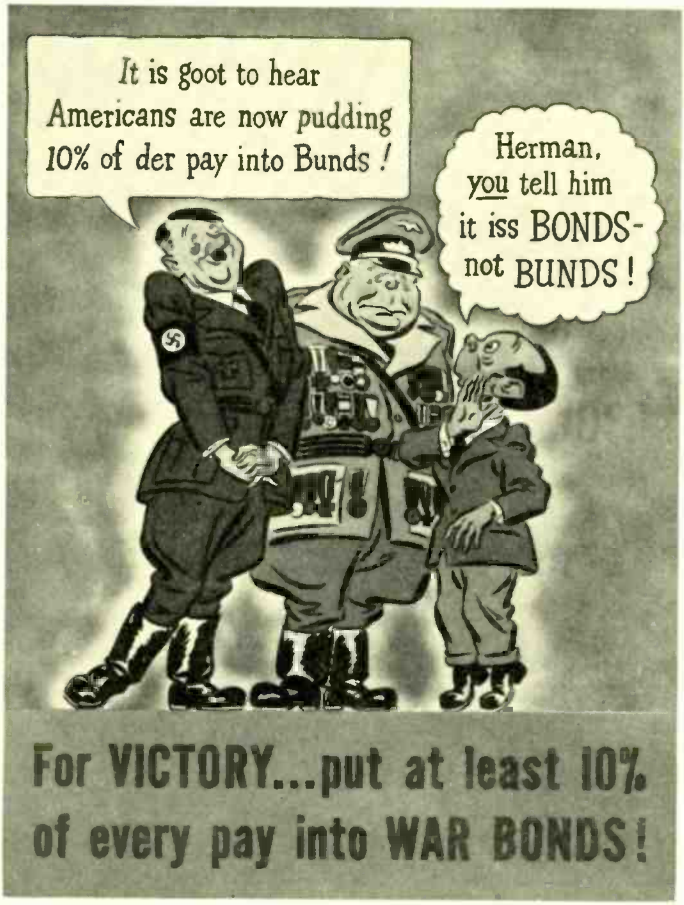
W. J. O'NEILL

* * * * *

RUTH FLEISCHMANN likes to make people happy—whether by her skill in making hors d'oeuvres and what goes with them; or by her alertness as a hostess, or by the happiness that her associates in the 5-A Files enjoy so much. She grew up in Cliffside Park, and after graduation from high school in 1936 she entered the Laboratories, in the Mailing Department. For five years she helped keep the records in Systems Drafting in the Davis building, and then took up her present job, distribution of Systems Development specifications. Married last year, she and her husband live in Ridgefield Park and have a mutual interest in photography. She bowls in the Laboratories Club, and swims, skates and dances. No career-girl, she likes housekeeping and she expects some day to make that a full-time activity.

* * * * *

LIKE many patent attorneys, W. J. O'NEILL began with an engineering degree—B.S. in E.E. That was from Worcester Poly in 1917; after a year's graduate study he entered Westinghouse Electric at East Pittsburgh and worked as an engineer on industrial control. Two years later he transferred to Westinghouse foreign sales work, which brought him to New York. With his evenings free—he was, and still is, a bachelor—he took courses in business administration at N. Y. U. and continued with law at Fordham. Admitted to the bar in 1927,



he transferred to the Westinghouse patent department, located in East Pittsburgh. Manhattan had gotten into his blood, however, and in 1929 he returned and associated with a New York patent law office. This led to entering and later taking charge of the patent department of the newly formed Kolster Radio Corporation; when that company was absorbed by I. T. and T., Mr. O'Neill continued with the same patent activities for some time and then went back to the law office practice of patent law for two years, specializing in interferences and court practice. He joined our Patent Department in 1934, and has specialized in oscillating circuits and piezo-electric crystals.

Mr. O'Neill still finds in New York City much of interest to encourage him to indulge in the pastime of walking and sightseeing. Indoors, he enjoys reading; for entertainment he likes to go to sporting events, operas and concerts. Once upon a time he used to take vacation cruises, but now his money is going into War Savings Bonds.

* * *

F. J. Given and A. J. Christopher are on an informal advisory committee of the WPB dealing with the problem of obtaining condensers for war equipment.

During the week of September 7, Mr. Given attended a conference in Arlington, Va., with WPB, Army and Navy officials on matters pertaining to the use of condensers in war equipment. He also visited the Tobe Deutschmann plant in Canton, Mass., in connection with engineering questions on condensers being produced for war equipment for Western Electric Company.

A. M. Skellett spoke on *The Use of Secondary Electron Emission to Obtain Trigger or Relay Action* at a meeting of the Basic Science Group of the New York A.I.E.E. Section. A meeting of Executive Committee of the Group held just before the talk was attended by R. E. Crane, R. W. DeMonte and R. L. Shepherd.

Record articles abstracted in recent issues of *Nature* (London) include *Application of Junction Line Filters* by F. A. Hinshaw; *The Junction Line Filter* by J. O. Israel; *Suppressing High-Frequency Disturbances from Telephone Apparatus* by M. E. Krom; *Factors Controlling Man-Made Radio Interference* by R. A. Shetzline; and *A Pilot-Channel Regulator for the K1 Carrier System* by J. H. Bollman.

O. C. Eliason went to Kearney where he will remain for a period of several weeks to assist in some of the problems arising in connection with the development of crystal units.

A. E. Dietz, accompanied by O. C. Johnson and E. M. Butler of the Western Electric Company at Kearney, visited the De Jur Amsco Instrument Company in

Shelton, Conn., to discuss the manufacture of special volume indicators.

B. R. McDonald visited the No. 10 manual office at Southampton and the No. 1 manual office at Hempstead to supervise a trial installation of signaling equipment.

A. S. King was in Trenton investigating step-by-step problems.

R. B. Gibney has been elected Secretary of the Metropolitan Section of the Electrochemical Society.

H. W. Hermance, at central offices in Buffalo and Pittsburgh, studied contact performance.

C. S. Fuller has been nominated chairman-elect of the Division of Paint, Varnish and Plastic Chemistry of the American Chemical Society.

Papers presented at the American Chemical Society, held in Buffalo from September 5 to 10, were *Motion Picture Study of Balata and Hevea Latices with Some Observations on Buna S and Neoprene Latices* by F. F. Lucas and *Low Temperature Testing of Rubber-Influence of Variable Stress on Brittle Point* by A. R. Kemp and G. G. Winspear. Others attending were W. O. Baker, B. S. Biggs, B. L. Clarke, C. S. Fuller, H. W. Hermance, J. H. Ingmanson and V. T. Wallder.

B. S. Biggs visited the Resinous Products and Chemical Company, Philadelphia, to discuss plastics.

F. T. Forster observed battery tests at Youngstown.

M. V. Hunter discussed motor problems at Chicago and Lynn.

"The Telephone Hour"

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

NOVEMBER 9, 1942

El Capitan — *Sousa*
Orchestra
Norwegian Rustic March from "Lyric Suite" — *Grieg*
Prelude No. 1 and No. 7 — *Chopin*
Empress of the Pagoda from "Mother Goose Suite" — *Ravel*
Impression — *Templeton*
Alec Templeton
Perpetuum Mobile — *Paganini*
Orchestra
Finale from Second Concerto — *Rachmaninoff*
Alec Templeton and Orchestra

NOVEMBER 16, 1942

Till the Clouds Roll By from "Oh Boy" — *Kern*
Orchestra
I'll See You Again from "Bittersweet" — *Coward*
Lily Pons
Casey Jones — *Traditional*
Orchestra
The Blue Danube — *Strauss*
Lily Pons
Stenka Razin — *Glazounow*
Orchestra
Queen of the Night from "Magic Flute" — *Mozart*
Lily Pons

NOVEMBER 23, 1942

Hymn of Thanksgiving — *Kremser*
Lawrence Tibbett and Chorus
Tambourin Chinois — *Kreisler*
Orchestra
Pilgrim's Song — *Tschaikowsky*
The Wreck of the "Julie Plante" — *O'Hara*
Lawrence Tibbett
Gold and Silver Waltz — *Lehár*
Orchestra
Te Deum from "Tosca" — *Puccini*
Lawrence Tibbett and Chorus

NOVEMBER 30, 1942

American in Paris — *Gershwin*
Oscar Levant and Orchestra
Waltz in C Sharp Minor — *Chopin*
Etude in C Sharp Minor — *Chopin*
Oscar Levant
Song of American Freedom — *Sowerby*
Chorus and Orchestra

DECEMBER 7, 1942

Turkish March — *Beethoven*
Orchestra
Concerto in D—Slow Movement — *Brahms*
Jascha Heifetz
Intermezzo No. 2 from "Jewels of the Madonna" — *Wolf-Ferrari*
Orchestra
La Plus Que Lente — *Debussy*
Polonaise in D Major — *Wieniawski*
Jascha Heifetz

Women Members of the Laboratories

She Brings the Tropics to West Street

The warm water-saturated air of a tropical interior is destructive to metallic parts, hence it has been customary to give exposed surfaces a heavy coating of nickel. But nickel is now very scarce and chemists in Bell Telephone Laboratories have been studying other methods of protecting metal surfaces.

Under the direction of C. H. Sample the accelerated corrosion tests have been carried on by Miss Lillian Heid, who winds the specimen on a glass arbor, as shown on the News Notes frontispiece of this issue. She then removes it, weighs and replaces it, and puts the arbor and sample over water in a constant-temperature oven.

Miss Heid graduated from Julia Richman High School in 1939. She had hoped to study medicine, but circumstances prevented and she entered the Laboratories as a messenger. The first girl to take our out-of-hours course in electro-chemistry, she soon got a transfer to the Chemical Laboratories. Miss Heid is the second generation of her family in the Laboratories; her father is a power service operator at Graybar-Varick.

Mary Van Bergen discusses a train reservation with an engineer about to go on a trip

Transportation and Hotel Reservations

During the first nine months of 1942 Mary Van Bergen of the Central Service Department and her two assistants, Mary Reiners and Marion Greenberger, have been obtaining for members of the Laboratories an average of over $6,950 worth of train reservations per month. June with $10,400, July with $11,500 and September with $10,100 were the big months. This compares with a monthly average of $3,890 in 1941 and $2,350 in 1940.

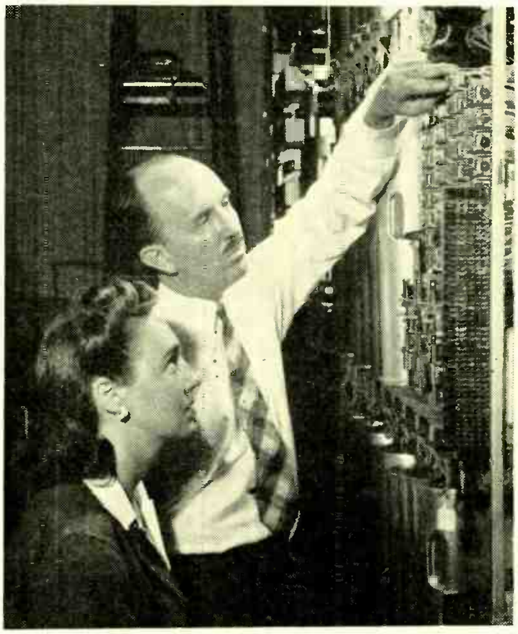
Last year travel by plane averaged approximately $2,140 per month. As everyone knows, war conditions have greatly curtailed plane transportation and since last April travel by this means has been on a cash basis with priorities a considerable factor.

Hotel reservations are relayed to Veronica Monahan of the Telegraph Department who makes them by wire.

In discussing the question of reservations with Miss Van Bergen, her one suggestion to all members of the Laboratories was the wish that a little more time be given in which to make reservations. The girls realize that under present conditions many trips are made on short notice but on the others we all could probably give them more time.

Laboratories Girl Pictured in *Life*

As basis for a story on college graduates in industry, *Life* magazine sent a reporter to Smith College last spring, photographed a half dozen seniors, interviewed them as to their aims. Edwina Golding of Quality Assurance was one of them; after they were settled in their new jobs, she was interviewed again by one of *Life's* editorial associates. An "interesting" picture was required, so she



Above—W. G. Freeman explains to Edwina Golding how a step-by-step switch operates

Right—When this picture was taken in the Electronics Laboratory, Mary Coffey's job was to take meter readings on vacuum tubes while they were being pumped. "Toots" graduated last year from Newtown High School and worked in a department store for a while but likes war work better. Ten per cent of her pay goes into War Bonds

Left—Isabell Maddocks, a draftswoman in Equipment Development, entered the Laboratories in 1938, a graduate of Manual Training High School. After two years as a messenger, she went into the drafting room for on-the-job training. Beginning with small changes on existing drawings, in a year and a half she has worked up to retouching on photographs. Miss Maddocks is also a ten percenter in the purchase of War Bonds

The Laboratories needs more draftswomen. Any of those interested in this opportunity should see Miss Mary Brainard in Women's Employment.

Conversation Piece at Murray Hill
Mary Gargiulo (left) and Mildred Bourne on the terrace in front of the Acoustics Laboratory discuss War Savings Bonds to which both are regularly subscribing

was posed with apparatus concerned in her quality studies. Picture favored by *Life*, and used in its September 28 issue, showed her with a telephone dial. Of interest to readers of the Record and reproduced on page xvii is one which shows W. G. Freeman explaining to her the operation of a step-by-step switch.

Doll and Toy Committee Ask Your Support

Last year the Doll and Toy Committee contributed over 3,200 dolls and toys to fifty-three institutions and welfare agencies in the metropolitan area. This year they hope to do even better and, in addition, to fill at least 100 Red Cross bags to be sent to men in the Overseas Forces. Let's all do our part in helping the committee meet their goal.

The committee is headed by Margaret McEntee, and Mary Reddington has charge of the bags for soldiers. Representatives are conveniently available to receive contributions, whether a doll or toy or the equivalent purchase price. A sum of $100.00 has been earmarked for the soldiers' bags.

A separate committee has been set up at the Murray Hill Laboratory with Marie Wright as chairman. Their dolls and toys will reach the lucky recipients through welfare agencies in the surrounding territory.

Departmental Representatives for the Doll and Toy Committee

	Department
Charlotte Bortzfield	110 and 210
Nellie Schofield	Research
Marguerite Johnston, Grace Clifford, Eleanor Lloyd	2100 to 2400, inclusive
Louise Van Bergen	2500
Helene Fischer	2600
Marie Ressler	3100, 3300, 3500 and 3600
Margaret Remmelman, Catherine Cronin, Julia Haege	Drafting Room of 3200
Nora Holohan	3200, except Drafting Room
Alberta Strimaitis	3400
Mary Ellen Bagley	6000
Mary Reddington	6500
Louise Van Bergen	7000
Louise Gregorio	Graybar-Varick
Ada Van Riper	Davis

Murray Hill

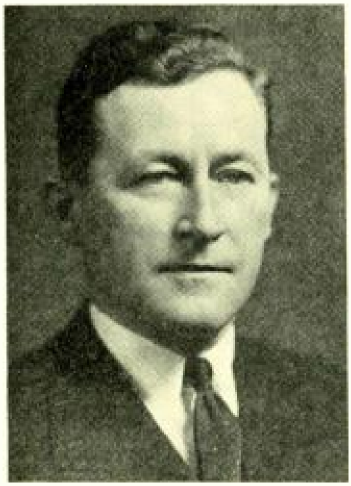
Marie Wright	*Chairman*
Dorothy Storm	*Secretary*

THIS YEAR THE CHRISTMAS COMMITTEE IN ADDITION TO DISTRIBUTING DOLLS AND TOYS ARE FILLING 100 CHRISTMAS KITS FOR SERVICE MEN OVERSEAS

Top—Members of the Doll and Toy Committee filling kits for service men overseas. Bags contained cigarettes, mechanical pencils, sewing and first aid kits, razor blades and shaving soap, stationery, metal mirrors, tooth brushes and tooth paste, hand soap and pocket-size books. Left to right: Jeannette Granger, Charlotte Bortzfield, Mildred Malone, Thelma Danielsen, Magda Kretschmann, Mary Reddington, Grace Clifford, Jean Gavin, Clare Lent and Hilda Muller

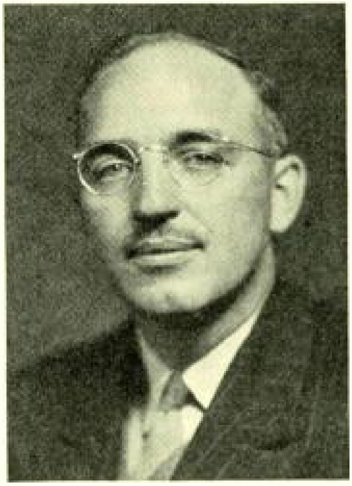
Below at left—Part of the completed kits. Left to right: Grace Clifford, Jean Gavin, Jeannette Granger and Mildred Malone

Below at right—Last year 3,200 dolls and toys were distributed in the Metropolitan area. In the midst of world-wide strife let's not forget the youngsters



Howard L. Coyne

Fred A. Anderson



J. George Knapp

years worked in various machine and tool concerns, four years of which were with the Simplex Motion Picture Projector Company. He joined the Engineering Department of the Western Electric Company in 1917; from then until 1935 he was an instrument maker in the Development Shop engaged in making dies and tools, picture transmission and sound picture apparatus, and rapid record oscillographs. Mr. Anderson transferred to the dial laboratory of the Switching Apparatus Development Department in 1935. Since then he has been promoted to the grade of laboratory technician and is concerned with designing and constructing models, gauges, and special testing apparatus required in the dial laboratory.

The Andersons live in Richmond Hill. Their son is a Lieutenant, junior grade, in the U. S. Naval Reserve. Mr. Anderson is a deep-sea fisherman and is also interested in bowling. He is a member of the Edward J. Hall Chapter of the Telephone Pioneers of America.

* * *

J. G. Knapp joined the research service group in 1917 where he soon advanced to the position of stockkeeper for the duration of World War I. Then, for the next six years, he worked in the Physical Research Laboratory on fundamental carbon studies and on the initial development of electric phonograph recording. During this time he took the Technical Assistants' Course, graduating with the second group in 1923. In 1925, with the formation of the Electro-Optical Research Department, Mr. Knapp worked on practical optical problems along with the study of contact metals for telephone apparatus. He was also associated with the development of telephoto and television apparatus. During the 1927 demonstration of one-way television he was in Washington where he handled the controls and order-wire services and in the 1929 two-way demonstration was in charge of the West Street terminal. In connection with his contact studies he developed, with E. F. Kingsbury, a technique for growing of silver hairs on silver sulfide surfaces. In 1938 his efforts were directed to the investigation of cathode ray screen materials for which he took part in the development of the supersonic cell fluorometer. Following this he studied the resonance effect occurring in the frequency response of gas-filled photoelectric cells, the results of which were applied to television. Since the summer of 1941 he has been developing apparatus for the Signal Corps and for the Navy.

Mr. and Mrs. Knapp live in Basking Ridge with their two children—a son who will shortly be in the armed forces and a younger daughter. Mr. Knapp is interested in all phases of farming and raises his own vegetables and fruits. He is a Telephone Pioneer.

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William Held, Jr., joined the drafting group of the Western Electric Engineering Department in 1917. Until 1931 he worked on central-office and subscriber station apparatus. Since then he has been concerned with drafting phases of the work done by the Commercial Products Development Department, particularly speech input equipment and radio transmission equipment and, more recently, FM apparatus. For the past year he has been concerned with apparatus for the Signal Corps and Navy. From 1931 to 1938 he was located in the Graybar-Varick building and since then at Whippany with the exception of the year 1940 when he was at Kearney.

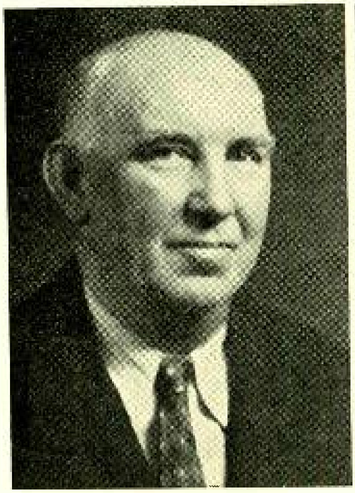
William Held, Jr.

Mr. Held and his wife live in Union City and usually spend their summer in Northern Jersey. He has bowled for years in the Bell Laboratories' Club and last year bowled with the Jersey group at South Orange. He also belongs to that ardent group of horseshoe pitchers at the Whippany laboratory.

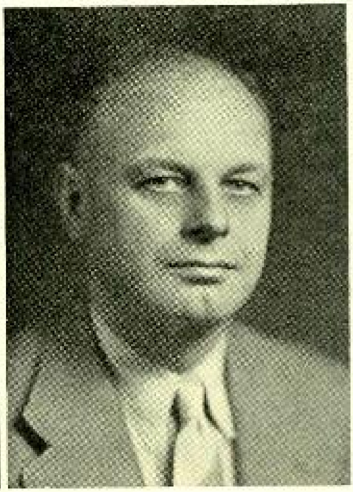
* * * * *

Mention of any heavy electric conduit work brings to mind Patrick Healy of the Building Shop. During the World War I period he worked on the new alternating current power boards installed in the Power Plant and on the conduit system to the various power rooms throughout the West Street building. Following the war he worked on the changeover from d-c to a-c supply which continued until our own generating equipment plant closed in 1924. Since then he has been involved in all major changes in power distribution throughout the building. Before 1917 Mr. Healy had worked for an outside electrical contractor for seven years.

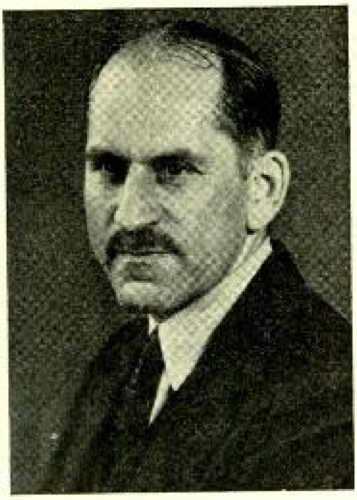
Mr. and Mrs. Healy live in Manhattan. His present rec-



Patrick Healy



Harold C. Cramer



Helmuth Eckardt

reation is horseshoe pitching. Years ago, when the Bell Laboratories Club was a member of a city tug-of-war league, Mr. Healy was a member of the team which held the championship for four years straight. He is a member of the Telephone Pioneers of America.

* * * * *

H. C. Cramer came to West Street in 1917 in the General Service Department but soon joined the method of operation group of the Systems Development Department. At this time the panel system was in its initial stages of commercial application and he wrote the method of operation sheets for the sender and some of the other circuits for the Kansas City installation. Following this he prepared the first X-specifications, now known as Bell System Practices on relays. He subsequently prepared similar specifications on panel equipment, relays and step-by-step apparatus keys and selectors and then transferred to the circuit laboratory where he tested circuits for the step-by-step and PBX systems.

Mr. Cramer transferred to the d-c telegraph development group in 1930 and then three years later to what is now the Transmission Development Department. Here he has prepared manufacturing and testing specifications, for the use of the Western Electric Company, and Bell System Practices, for use of the Operating Companies. More recently he has been preparing instruction books on equipment for the Signal Corps and the Navy.

Mr. and Mrs. Cramer live in Jersey City. He is fond of golf and swimming and usually spends his vacation in Nantucket or at Buck Hill Falls. He is a Telephone Pioneer.

* * * * *

Helmuth Eckardt started as a messenger with the Engineering Department in 1917 and shortly thereafter transferred to the Transmission Branch where he worked on routine testing of telephone receivers. He attended Cooper Union during this time and received his B.S. degree in 1922. From 1922 to 1929 he was successively engaged in transmitter and audiphone development and the development of wax-disc recording. In connection with the latter he spent several months at the Camden plant of the Victor Company making high-fidelity records with our Laboratories apparatus.

In 1929 Mr. Eckardt transferred to the Commercial Products Development Department where he was in the sound-picture laboratory responsible for disc recording. Several years later he transferred to the group working on the acoustic treatment of telephone booths and on methods for reducing noise in typewriters and billing machines. This group also acted as consultants to other departments on questions of acoustic treatments. Since 1940, in the Station Apparatus Development Department, he has been concerned with telephone instrument development. More recently he has been developing special transmission instruments for war purposes.

Bee keeping and gardening, on his eight-acre place in Towaco, are chief among Mr. Eckardt's hobbies though he is also much interested in pictorial photography, being a past president of the Telephone Camera Club of Manhattan. The Eckardts have four children. Their oldest, a son, now works for the Wright Aeronautical Company in Paterson. The daughter graduated from high school last June and the other two boys are in high school. Mr. Eckardt is a Telephone Pioneer.

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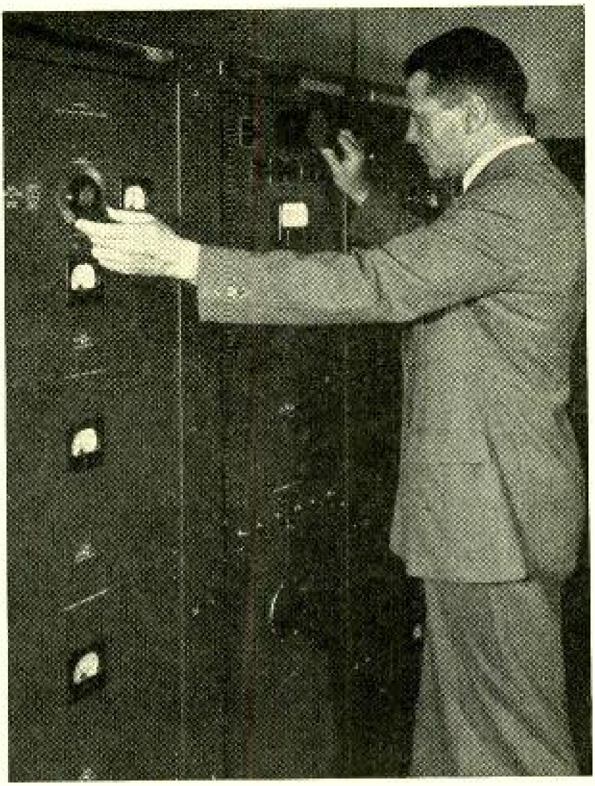
Correction

An erroneous figure appeared in the leading article in the September issue of the Record for the number of N.D.R.C. projects assigned to the Laboratories. The correct figure for the total (as of October 1) is 58. On several of these, work has been completed. At the present time the Laboratories is working on about 300 major projects for the Army or the Navy related to contracts with the Western Electric Company. About three-quarters of the current expense of the Laboratories is on government work, the rest on problems of communications of the United States.

New Reference Frequency Equipment

By V. J. WEBER
Transmission Apparatus Engineering



IT IS only within the last thirty years or so, stimulated by the development and application of carrier methods to radio and wire communications, that high precision measurement of frequency has received extensive study. Frequencies in radio and carrier telephone are now held constant to very high precision; and for the manufacture of radio and telephone apparatus it has been necessary to develop frequency standards of even greater precision. For the Hawthorne plant of the Western Electric Company the Laboratories have recently developed new reference frequency equipment which is interesting as an embodiment of the most modern technique.

This equipment is known as the W10815 reference frequency assembly. It occupies four five-foot cabinets. In the photograph at the head of this article the equipment is undergoing final test at the Laboratories. It provides frequencies, accurate to two parts in ten million, of 100, 10, 1.0, and 0.1 kilocycles, which may be distributed as desired around the Hawthorne plant. It also includes apparatus to detect any errors in these frequencies, and in such cases to give an alarm if the error exceeds a certain very low value.

A front view of the equipment is shown in Figure 2. Two independent reference frequency supplies are provided; these are bays 1 and 3 from the left of Figure 2. This provision of two separate sources is advantageous in making spare equipment available should trouble develop in one source. It also enables a continuous check to be maintained of the difference between the frequency of the two sources, and thus gives prompt indication of any incipient trouble.

A basic frequency of 100 kc is generated by an oscillator circuit in the upper panel, and immediately below this is a 100-kc amplifier. Below this are three panels, producing submultiple frequencies of 10 kc, of 1 kc, and of 100 cycles. The second bay from the left is for frequency checking. Besides providing for comparing the two frequencies with each other, it also permits either to be checked against a standard five-megacycle frequency sent out over Station WWV by the National Bureau of Standards in Washington. The bay at the extreme right provides independent power supplies for each of the three units. Power is taken at 117 volts and 60 cycles from the commercial supply; and from it four units produce regulated direct current for plate supply, and a fifth unit supplies regulated a-c heater voltage. There is one direct-current power supply for each of the three bays, while the fourth serves as a spare, and may be connected in place of any of the other three by running cords between them.

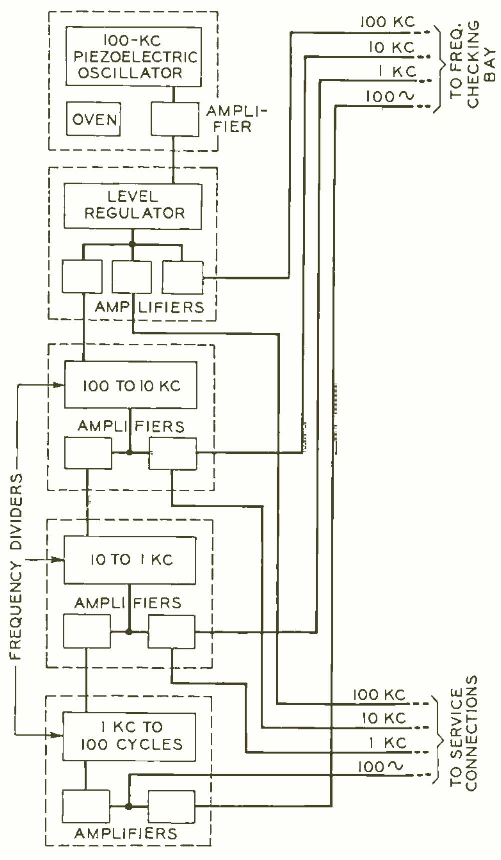


Fig. 1—Block schematic of arrangement of apparatus on the reference-frequency bays

The arrangement of apparatus on the reference-frequency bay is shown in Figure 1. The 100-kc primary-frequency oscillator is controlled by a quartz crystal mounted in a temperature-controlled oven. Immediately below this is the 100-kc amplifier panel, where three amplifiers supply separate outputs. One feeds the 10-kc submultiple generator, the second gives a similar output for distribution as desired throughout the plant, while the third runs to the adjacent bay to be used for a continuous check against the frequency of the other standard.

Each of the submultiple generators in the three lower panels supplies the tenth submultiple of the frequency supplied to it, as will be described more fully in a future article. Thus the first, fed from 100 kc, supplies 10 kc; the second, supplied from the 10 kc, furnishes 1 kc; while the third, fed by 1 kc, supplies 0.1 kc, or 100 cycles. Each has two output amplifiers: one to supply the next lower submultiple generator, and one to supply the service frequency. The latter amplifier also has a connection running to the frequency-checking bay. The 100-cycle generator requires no feed to a lower submultiple generator, but two connections are taken to the checking bay, because the 100-cycle frequency is used for the alarm circuit as well as for visual checking. Since the 100-cycle frequency depends on all the higher ones, a trouble anywhere in the reference-frequency bay will show up in this frequency band.

The upper panel of the frequency-checking bay includes a cathode-ray oscilloscope, which may be used to indicate the relationship between the outputs of any of the four frequencies of the two standard-frequency bays. Comparisons may also be made be-

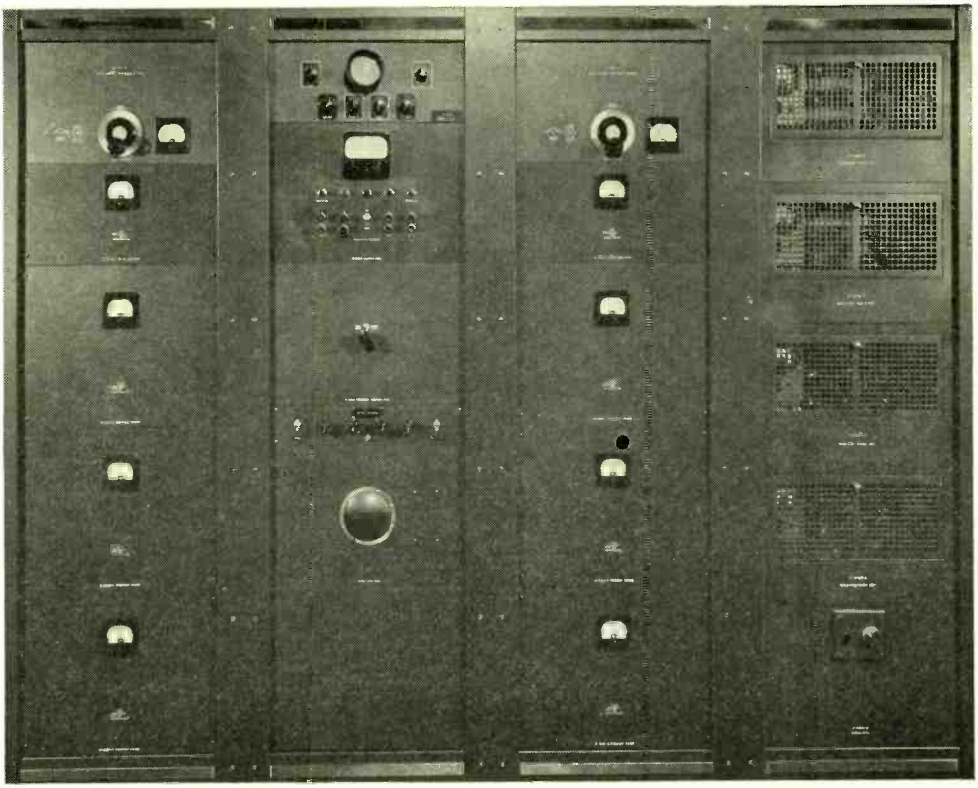


Fig. 2—Front view of the W10815 Reference Frequency Assembly

tween the 100-kc fundamental and the derived frequencies. The meter on the panel beneath the oscilloscope is used to give a direct measurement of the difference in frequency between either of the primary frequencies and the standard frequency received from Station WWV, or between the two primary frequencies themselves. Most of this measuring equipment, including a radio receiver for picking up the signal from WWV, is mounted on the two panels below the meter panel.

On the panel next to the bottom is the alarm circuit, which includes a loudspeaker and an electric gong. This panel operates on the 100-cycle output, as already mentioned, and the gong rings whenever the two frequencies deviate by a predetermined amount in either frequency or level. To run down the source of a trouble, the outputs of each of the three higher frequencies from the two frequency standards may then be compared on the cathode-ray oscilloscope. The arrangement and operation of this entire frequency-checking panel will also be described in greater detail in a future article.

Equipment is readily accessible through full-length doors on the back of each bay. To simplify repair or replacement, each panel is connected to the bay wiring through flexible cords and plugs. Rear views of the power and one of the reference-frequency bays are shown in Figure 3. Any of the power units may be replaced by the spare simply by running cords between them. The bay wiring itself is in rigid conduit, but arranged so that it may readily be removed in sections. This semi-flexible wiring arrangement, besides simplifying replacement, tends to reduce both the original cost and the subsequent maintenance, when required, which is particularly important for apparatus used in a manufacturing plant.

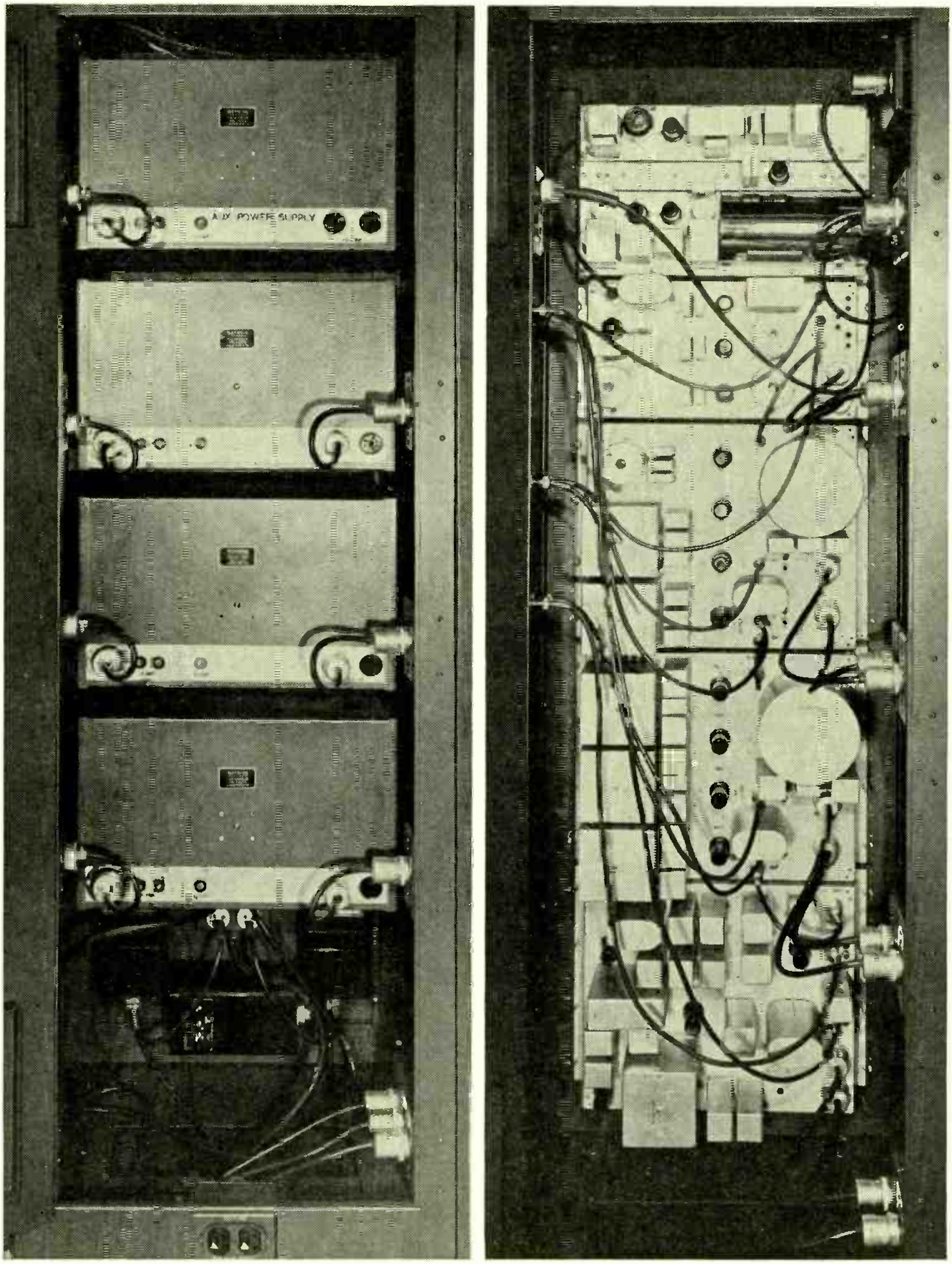


Fig. 3—Rear view of power supply bay with door open at left and rear view of one of the reference-frequency generating bays showing flexible cord connections at right

Central DSA Switchboard

By E. W. FLINT
Switching Development Department

[Where many different operations are to be performed at a place remote from the control point, one must choose between using a large number of wires or installing coding and decoding apparatus that will permit the different operations to be selected by a variety of codes sent over a single pair of conductors. The article below describes an ingenious method that permits a two-wire circuit to transmit signals in both directions and to control a number of operations by the use of only a few additional relays at each end of the circuit.—EDITOR.]

WITH the introduction of dial service, switchboards could not be entirely eliminated. "A" boards and operators are still needed for handling calls beyond the subscriber dialing area, for giving assistance to subscribers under some conditions, for requesting and supervising coin deposits for some calls originated by coin lines, and for serving miscellaneous intercepted calls. "B" boards and operators are required in some areas for completing calls from manual and toll offices. As the dial system has been extended into the less concentrated residential areas, the load on both "A" and "B" boards decreases, and it often becomes uneconomical to maintain these switchboards in each dial office. Centralized "A" and "B" switchboards—the latter already described*—have therefore been made available to secure greater economy of operation, and have been in service for some years. The various modifications that must be made in transforming to centralized operation of the "DSA" board can be adequately illustrated by considering only the possible operations subsequent to a subscriber's dialing zero and reaching an

*RECORD, *October*, 1941, *page* 53.

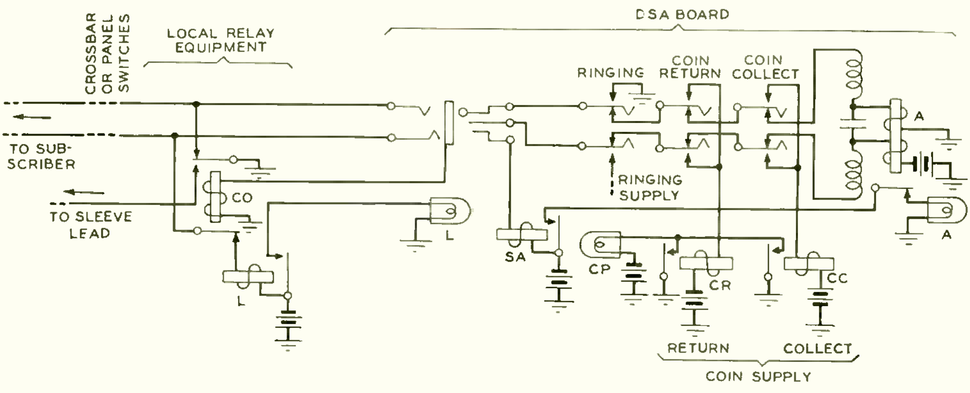


Fig. 1—Simplified schematic of major circuit elements for the answering end of a cord pair for a dial system "A" board when it is in the same building as the dial office

operator at a central "DSA" board that is employed with the panel and crossbar system.

Where the "DSA" board is in the same building as the dial office, the major elements of the answering end of the cord circuit employed are shown in simplified form in Figure 1. When a subscriber's line is connected to the "DSA" board, the L relay operates and lights a "line" lamp in front of an operator, who answers by inserting the plug of a cord circuit in the jack, thus operating the CO relay. This releases the L relay, thus putting out the line lamp, and grounds the sleeve lead to "hold" the calling line. Relay SA, in series with CO, also operates, and connects battery to the supervisory lamp A. This lamp does not light, however, because relay A, operating over the circuit through the subscriber's switchhook, holds the circuit of the supervisory lamp open. The operator is now able to talk to the subscriber, and to give the assistance needed. Should the subscriber wish to recall the operator, he moves his switchhook slowly up and down, which operates and releases the A relay, thus flashing the operator's supervisory lamp.

Besides these relays employed to signal the operator, provisions are made to enable an operator to collect or return coins when she is connected to a coin-box line, and to ring the subscriber. For these purposes she is provided the three keys shown. The coin currents pass through relays, and if a coin is in the box at the time, the current will be large enough to operate the relay and light a lamp in front of the operator.

When the "DSA" board is not in the same building as the subscriber's office, this simple arrangement is not practicable. In the first place, the increase in the circuit resistance due to the presence of an interoffice trunk would seriously interfere with the satisfactory operation of the relays and lamps involved. In addition there might be a very appreciable difference in the ground potential between the two offices. With circuits using a ground return, such as that of the SA and CO relays, for example, the difference in ground potential between the two grounding points adds to or subtracts from the battery voltage, and might thus introduce a serious variable. Besides these difficulties, there is the matter of the number of conductors required. In Figure 1, it will be noticed there are four conductors between the local relay equipment and the "DSA" switchboard. An interoffice trunk, on the other hand, has only one pair of conductors, and if two pairs had to be used for each connection to the "DSA" board, the additional expense would become serious.

In providing central "DSA" service, two basic requirements are readily apparent. Ringing and coin potentials should all be applied at the subscriber's central office so as to avoid the resistance of a long trunk, and the operator's cord circuit should remain unchanged so as to maintain standard operating procedures, especially since a central "DSA" board will serve both local and remote central offices. Relays at the two ends of the trunk must thus be provided to permit the keys at the "DSA" board to control the application of ringing and coin potentials at the remote subscriber's office and to permit signals to be transmitted over the interoffice trunk from the subscriber's office to operate the A, CC, and CR relays. Besides providing for these signals, the circuit must enable the operator to "hold" the connection to the calling line until she withdraws her plug. In providing these signals, moreover, battery at one end of the trunk and ground at the other must be avoided because of the possibility of difference in ground potential.

With the arrangement provided, the trunk is coupled to the subscriber's office circuit at one end, and to the "DSA" office equipment at the other, through repeating coils and condensers as indicated in Figure 2. Voice currents pass through the repeat coils, but the various signal currents are blocked and are applied to or taken from the circuit at the four positions marked I, II, III and IV, which represent the two sides of the repeat coils at the ends of the trunk. The cord circuit is the same as in Figure 1. To perform the various operations, the operator manipulates her keys as she would for local "DSA" calls, but the signal voltages are not applied to the subscriber's line directly from the "DSA" position but by relays at position I, which are in turn controlled by signals sent over the trunk from the "DSA" office. The switch at the extreme left, for example, represents a relay—called RB in the actual trunk circuit — that transfers the subscriber's line from the talking path to a ringing supply. Switch CB similarly represents a relay that transfers the line from the talking path to a circuit over which either coin return or coin collect current is sent—one when relay CR is operated, and the other when relay CC is operated. The switch TR represents a relay that transfers a connection from the line to either an L or an LI relay; the former controls the operator's line lamp and the latter her supervisory lamp. This TR relay is normally in the down position so as to permit the L relay to detect the connection of a subscriber's line to the trunk and to signal the operator. After the operator has plugged in, however, TR will be operated to the up position, where it remains as long as the plug is in the jack. In this position relay L of LI has control of the operator's supervisory lamp and also "holds" the calling line.

The passage of signals over the trunk circuit may be followed with the help of Figures 3 and 4, which represent the section of the circuit between the dotted lines a-b of Figure

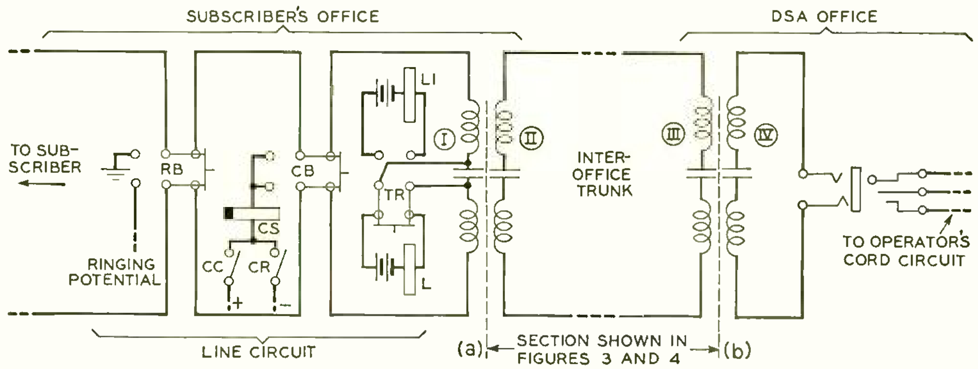


Fig. 2—When the "DSA" board is remote from the dial office, the connecting trunk is equipped with repeat coils at each end, and relays at positions I, II, III and IV are required to transfer d-c signals across the gaps formed by the repeat coils—gaps readily spanned by voice currents

2 at various stages of the operating procedure. Each diagram shows the same circuit, but the relays are shown either operated or non-operated depending on the function being performed, and in each case the active section of the circuit is shown in heavy lines. The half dozen signals required are secured by using currents of three different strengths and two polarities in conjunction with branch circuits switched in or out by transfer relays for various operating steps.

Figure 3A represents the condition when no line is connected at the left and no cord circuit at the right. The circuit is closed at both ends, but no current flows over it because no battery is connected.

When a call comes in, relay L at the left of Figure 2 is operated, and in turn operates RT of Figure 3A, resulting in the connections shown in Figure 3B. MG is a marginal relay, and does not operate on the current that now flows over the trunk, but relay L at position III does, and over a path not shown lights the line lamp at the "DSA" board. When the operator plugs in, relay SL operates in series with SA of her cord circuit, just as CO operates in series with it in Figure 1. The operation of SL transfers the trunk connection from relay L to relay LI and battery as shown in Figure 3C. Relay LI operates and, through contacts not shown, it connects a shunt across the condenser in the operator's side of the repeat coil, and thus closes a circuit for the operation of relay A of the cord circuit. The battery in series with LI, assisting that associated with MG at posi-

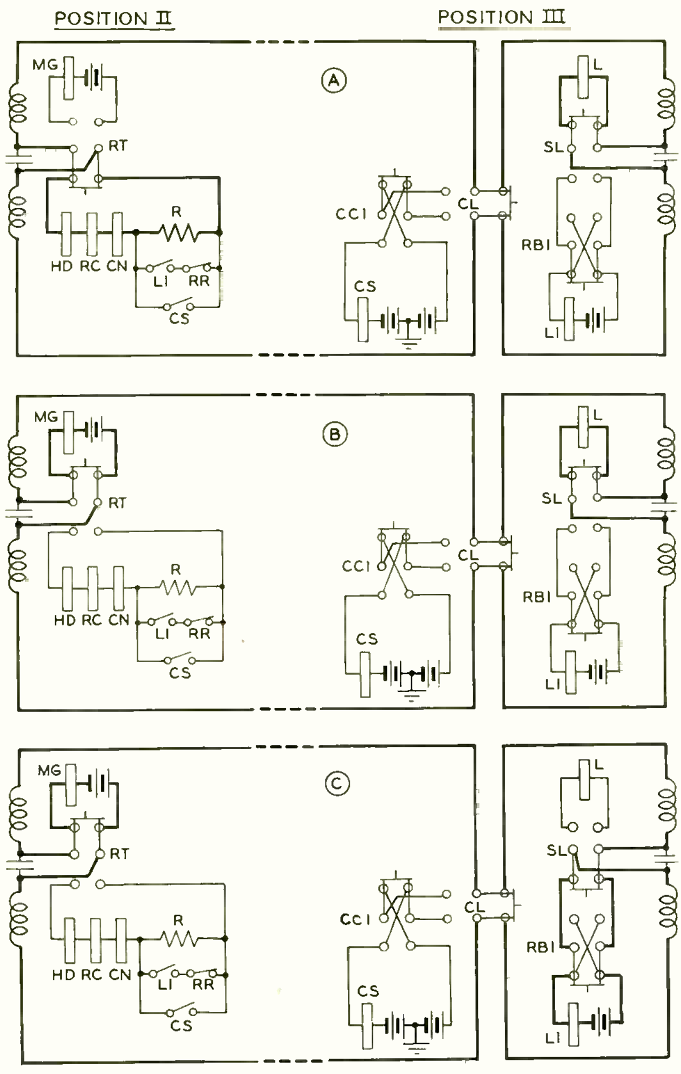


Fig. 3—Diagrammatic representation of trunk circuit: A, with no call, and no cord plugged in; B, a calling subscriber connected to the trunk; and C, after the operator plugs in

tion II, results in sufficient current to operate relay MG, and a contact on MG operates relay TR indicated in Figure 2, thus transferring the subscriber's line connection from relay L to relay LI. The operation of TR also results in application of ground to the sleeve lead and thus "holds" the connection. When L releases as a result of the operation of TR, it opens the contact that held relay RT operated, and when RT releases as a result, the circuit becomes as shown in Figure 4A.

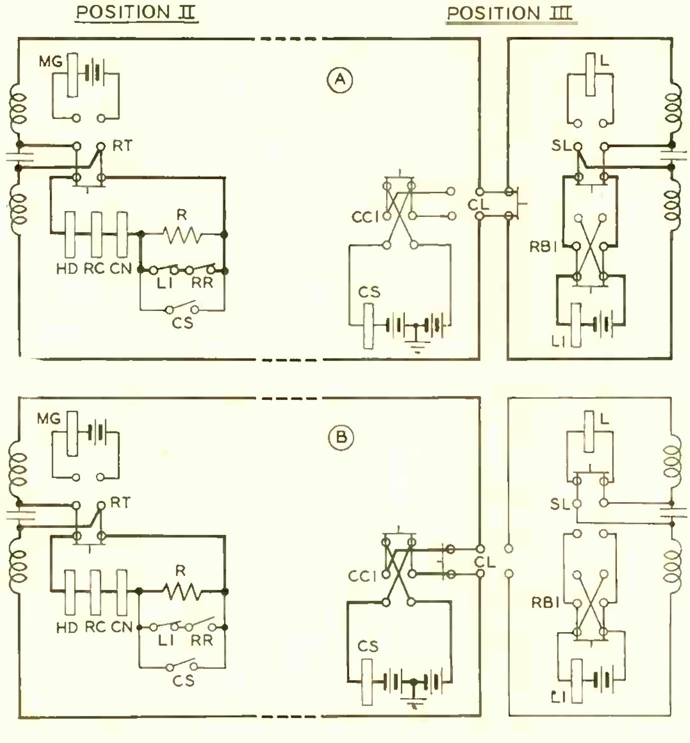


Fig. 4—Diagrammatic representation of trunk circuit: A, normal conditions after operator has answered; B, switched for coin return in action

With the circuit in this condition, battery is supplied from the "DSA" office, position III, through relay LI, and the resulting current flows over the trunk and through relays HD, RC, and CN at position II. These three relays have different characteristics: HD is a sensitive relay, and operates on the current now flowing over the trunk and remains operated under all subsequent conditions until the circuit is opened by the withdrawal of the operator's plug. Its chief function is to keep relay TR of Figure 2 operated to the LI position, and to "hold" the subscriber's line. Relay RC is polarized, and will not operate when the tip lead is positive as it now is. Relay CN is a marginal relay, and will not operate until considerably more current flows through it. Resistance R, which is in series with HD, RC, and CN, is short-circuited by a contact on relay LI of Figure 2. Should the subscriber wish to attract the operator's attention, he would move his switchhook slowly up and down, and each time his circuit is opened, relay LI will release. In doing so, it opens the short circuit across resistance R, and the current in the trunk is reduced sufficiently as a result to release relay LI at position III. In releasing, LI opens the shunt across the condenser in the repeat coil, thus releasing relay A in the operator's cord circuit, and lighting the supervisory lamp. This lamp thus follows the up-and-down motion of the subscriber's telephone-set switchhook.

Operation of the ringing key operates a relay that in turn operates RBI at position III. This reverses the current sent over the trunk, and as a in the spring of 1920. His first year was spent as an electrician in the building shop, and at the end of this period he was made chief electrician of the old steam power plant. Two years later he became general foreman in charge of Building Service, which position he held till 1928. At present he is Traffic Supervisor, in charge of the Shipping, Receiving and Salvage Departments.

V. J. WEBER came to the Laboratories in 1929 and at first was associated with the Chemical Research Department as a Technical Assistant. He later became a member of the Technical Staff, and in 1939 transferred to the Apparatus Development Department. Here with the Transmission Apparatus Engineering group he has since been engaged in the development of apparatus for crosstalk measuring, of regulated power-supply equipment, of frequency-measuring equipment, and of a variety of other projects handled by this group.

C. T. Boyles

V. J. Weber