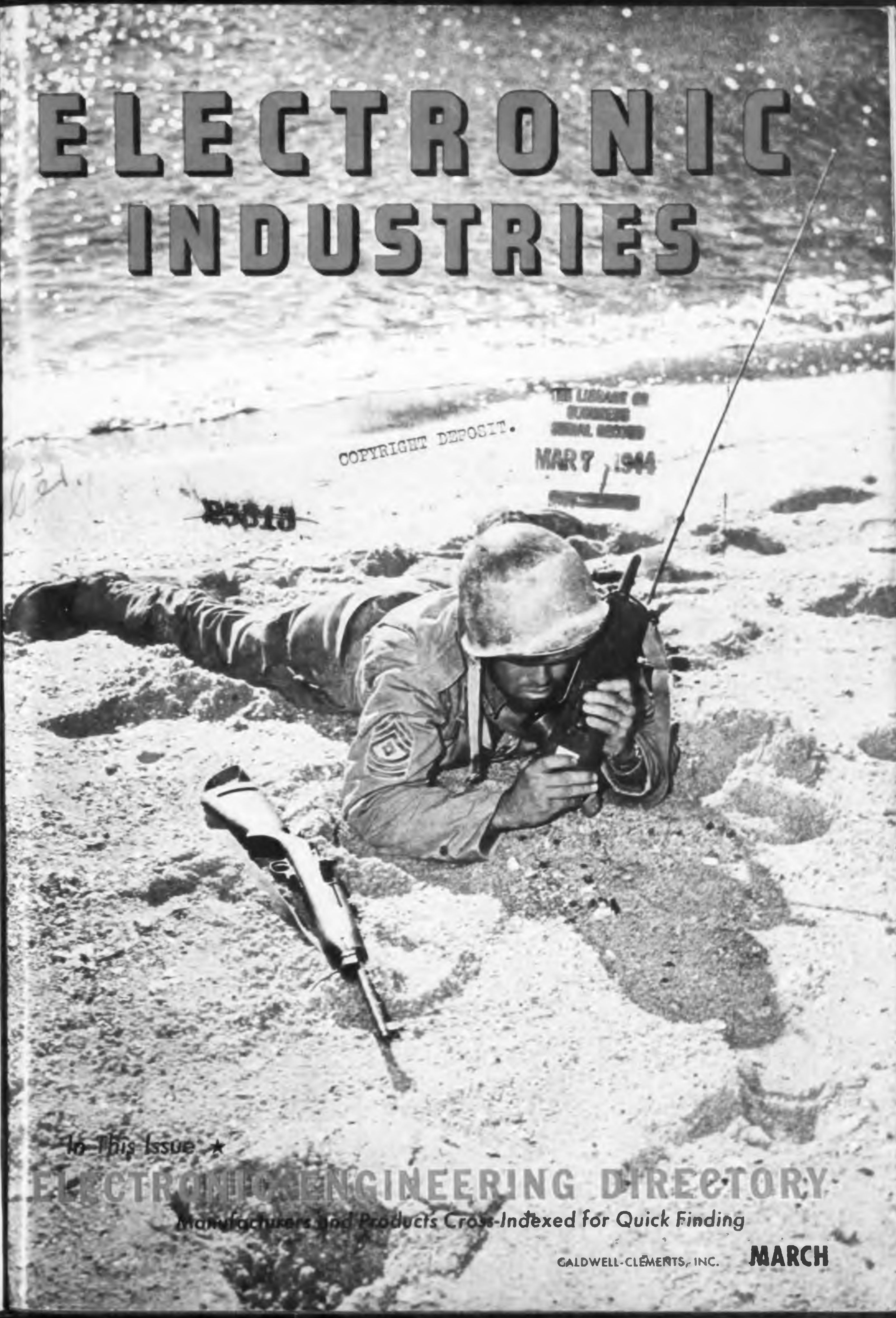
ELECTRONIC
INDUSTRIES
In This Issue ★
ELECTRONIC ENGINEERING DIRECTORY
Manufacturers and Products Cross-Indexed for Quick Finding
CALDWELL-CLEMENTS, INC.
MARCH
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MAR 7 1944

ELECTRONIC INDUSTRIES

Including INDUSTRIAL ELECTRONICS

★ IN THIS ISSUE — MARCH, 1944 ★

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CALDWELL-CLEMENTS, INC.—TEL. PLAZA [illegible] [illegible] LEXINGTON AVENUE NEW YORK 17, N. Y.

One of a series showing AMPEREX tubes in the ma

and

why AMPEREX

WATER AND AIR COOLED

TRANSMITTING AND RECTIFYING TUBES

Checked and double checked. That's the ***all-the-way*** history of *Amperex* tubes through every stage of construction. No chances are taken. Even after tubes have been aged, seasoned and subjected to severe tests, each day's production must hurdle final examination in our x-ray rooms. Here, an exhaustive analysis is made to determine the presence of invisible defects. When we pronounce the tubes "bottled to perfection" — *they are!* More than 100 different types of *Amperex* tubes are available for broadcast, industrial and electro-medical applications. Each one with "Amperextras" which assure operating efficiency and longer life.

AMPEREX ELECTRONIC PRODUCTS

79 WASHINGTON STREET • BROOKLYN 1, N. Y.

"BLOOD PLASMA MEANS LIVES SAVED . . . KEEP IT FLOWING TO THE FRONT"

Proved true by time

Time alone can prove how good capacitors are. The enviable reputation of Tobe Capacitors for *long life* rests on an almost complete absence of "returns". Such things don't "just happen". Back of Tobe Capacitors are constant research, specialized manufacturing experience and rigid inspections. Ratings are always on the conservative side.

Whatever your condenser problems, we invite you to put them up to our engineers. You will receive prompt service and close co-operation.

LONG LIFE ASSURED

TOBE DEUTSCHMANN CORP.
TOBE
CANTON · MASSACHUSETTS

TRS 605,
5 mfd. 600 volts
SIZE—
Overall height 5"
CONTAINER—
1 3/16" x 2 1/2" x 4"
Dimensions of other TRS models on request.

SPECIFICATIONS FOR TRS CAPACITORS

CAPACITY—.1 to 50.0 mfd.

WORKING VOLTAGE—
600 volts DC to 6,000 volts DC.

SHUNT RESISTANCE—
15,000 megohms per mfd.

RESISTANCE Terminal to Case—
10,000 megohms minimum.

POWER FACTOR—.002 to .005

VOLTAGE TEST Terminal to Case—
2,500 VDC for 600 volt condensers.

Capacitor unit tested at 2½ times rated voltage.

Universal (wrap around) L or foot type and screw Spade-lug mounting brackets can be supplied.

A small part in Victory today . . . **A BIG PART IN INDUSTRY TOMORROW**

ELECTRONOTES

ARMY LIKES FM

The Army uses more than half a dozen different FM models of communication equipment, mostly for vehicular direction. FM is used in half-tracks, scout cars and tanks. The Armored Command uses two types of FM sets—vehicular and portable. Every tank has an FM receiver and every fourth tank has both receiver and transmitter. For Command vehicles there is still another type of FM set that is portable and that can be used outside the vehicle. It operates on dry cells. Two other sets, similar to these, are used in jeeps, reconnaissance cars and heavy trucks. They operate from the vehicle battery.

975 PER DIVISION

The number of radio sets in a modern Armored Division totals 975. Seven different basic types of transmitters and receivers are used for voice and code communication. More than 75 per cent of them are push-button controlled.

SCR 299 FOR DX

The SCR 299 communications equipment has been the main means of contact between the American forces in North Africa, at one time having covered as much as 2300 miles quite satisfactorily. One of these sets was used for communication between Oran, Gibraltar, Algiers, Casablanca, Accra and England.

CHARTING THE BROADCASTING EMPIRE

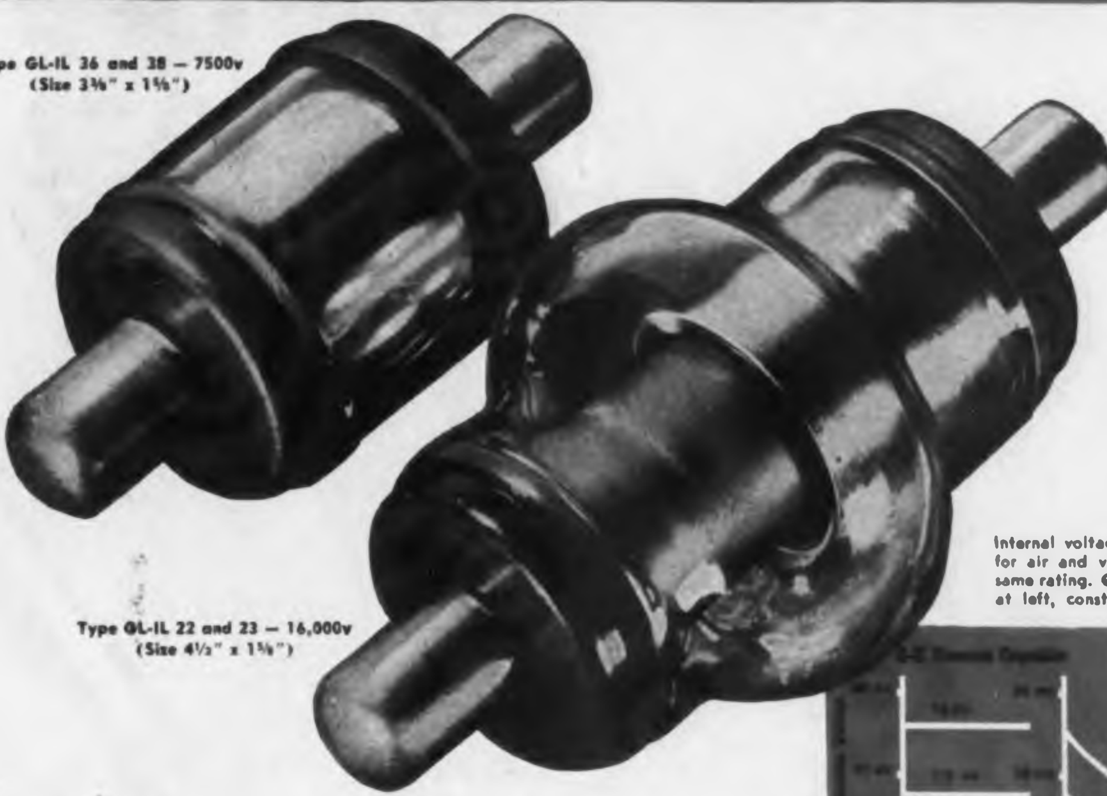
Even among engineers familiar with modern technics involved in network broadcasting, few realize the tremendous complexity of circuits and the vast amount of highly specialized equipment involved in carrying programs from a single source to hundreds of transmitters throughout the length and breadth of the United States.

Yet that great complexity can be sufficiently simplified and put into chart form so that the system, or plan, on which all chain broadcasting depends, becomes readily understandable.

It is such a chart, reproduced in four colors, that is to appear as a Supplement with the April issue of "Electronic Industries." This chart of the current practices and facilities of the parent of all electronic fields of activity—the broadcast industry—shows graphically how program transmission is effected over a typical broadcasting system network, with a program originating in a Hollywood studio and being broadcast by a New York station which is one link in a nationwide hook-up.

The four-color chart, together with an accompanying technical article, presents a mass of engineering information that will be of great value to the large number of broadcast engineers whose duties involve any phase of broadcasting. To manufacturers it will help in giving a better picture of the extent and use to which their products are being put.

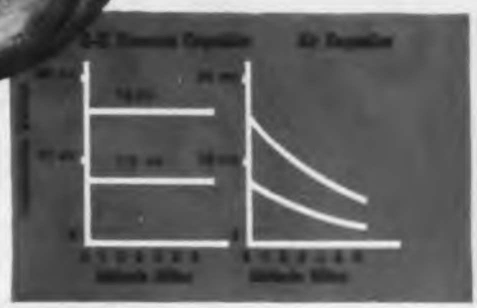
G-E VACUUM CAPACITORS ARE ONLY ONE-TENTH THE SIZE OF SIMILARLY RATED AIR CAPACITORS



Type GL-IL 36 and 38 — 7500v (Size 3⅜" x 1⅝")

Type GL-IL 22 and 23 — 16,000v (Size 4½" x 1⅝")

Internal voltage breakdown curves for air and vacuum capacitors of same rating. G-E vacuum capacitor at left, constant at all altitudes.



SMALL HIGH-CAPACITANCE UNITS

another G·E electronic FIRST!

Maintaining a long and constantly growing record of electronic "firsts," General Electric has pioneered and developed a new, unique line of vacuum capacitors having high capacitance heretofore considered impractical.

G-E vacuum capacitors are made respectively for peak voltages of 7500 and 16,000 in capacitances of 12, 25, 50 and 100 mmfd.

The remarkably small size of these G-E capacitors permits the compactness of design which is so important in circuits (especially high-frequency) common in military, aircraft, and amateur radio equipment.

Other advantages: Since there is no heating in the vacuum dielectric, and the total capacitance is lumped into a volume of about 1 cu. in., G-E vacuum capacitors are virtually loss-free. Internal voltage breakdown is constant, and is independent of altitude, temperature, humidity. Dust and other foreign matter have no effect on them. Stemless, electronically welded construction gives great rigidity. Savings in critical materials are reflected in lower costs.

A G-E "first" in industry, too! G-E vacuum capacitors are ideal in electronic heating apparatus where high voltages and heavy currents are present. No mica to deteriorate under heavy stresses; no dielectric losses due to dirt, moisture, and other factors! No large, cumbersome capacitor device is necessary — since these capacitors may be used in parallel with each carrying its share of the heavy current.

Write Today for Bulletin ET-2—"G-E Vacuum Capacitors." It includes nomographs to help you select the right capacitor for the job. Address *Electronics Department, General Electric, Schenectady, N. Y.*

• Tune in "The World Today" every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E "All Girl Orchestra" at 10 P. M. E.W.T. over NBC.

G. E. HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

161-C3

COMPLETE G-E EQUIPMENT

for wide-range, high-fidelity FM broadcasting

1. *FM Broadcast Transmitter.* G-E two-section 1000-watt transmitter, consisting of basic 250-watt exciter and 1000-watt radio frequency amplifier. Others from 250-watt to 50-kw ratings.

2. *FM Broadcast Antenna.* Circular type — an exclusive G-E development. Easy to tune and adjust — increased power gain.

3. *FM S-T Relay Transmitter* (25 watts) for relaying, *without* wires, local studio programs to remotely located broadcast transmitter station.

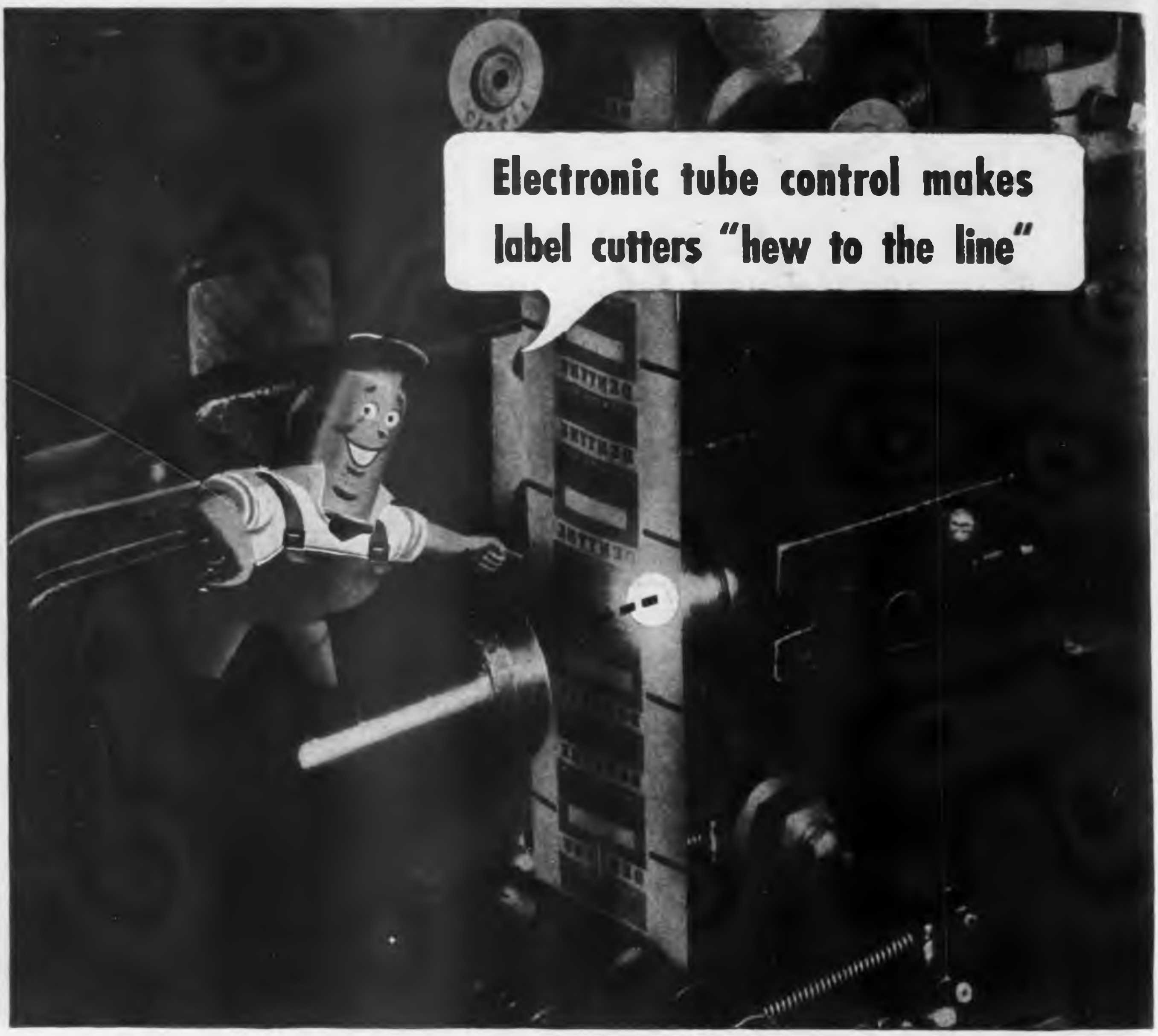
4. *FM Station Monitor* for checking center frequency, percentage modulation, and fidelity.

5. *FM S-T (studio-to-transmitter) Directional Relay Antenna* that provides a 100-fold power gain when used at both the studio and station transmitters.

6. *FM Receiver.* Full fidelity FM with noise levels as low as the circuits themselves and less than 2% distortion.

7. *Transmitter Tubes.* Developed from a long list of G-E basic electronic-tube "firsts," G-E transmitter tubes carry the definite assurance of maximum economy, efficiency and service life.

No. 11 IN A SERIES EXPLAINING THE USES OF ELECTRONIC TUBES IN INDUSTRY



The G-E phototube and G-E thyratron are the electronic tubes used in synchronizing the operation of this packaging machine.

Here the G-E phototube is being used in a photo-electric relay control—to eliminate cumulative errors in label-cutting register caused by slippage, shrinkage or stretching of paper. It makes possible the use of a continuous web of paper (instead of individual precut sheets) with complete accuracy.

As the web rolls through the processing machine, the phototube scans the margin for the register marks, and—in co-operation with the thyratron tube—gives the command to "CUT" at precisely the right instant. (Subsequent operations of the machine wrap and package the individual sticks of gum.)

The G-E phototube is exceptionally versatile. It can operate with transmitted or reflected light; on transparent, opaque, dull, glossy, shiny, or colored material. . . . Its applications in counting, sorting, and inspection jobs are unlimited.

The phototube is only one of a complete line of G-E electronic tubes now working for industry on innumerable jobs and many kinds of machinery. It is the purpose of G-E electronic tube engineers to aid any manufacturer of electronic devices in the application of tubes. Through its nation-wide distributing system, General Electric is also prepared to supply users of electronic devices with replacement tubes.

"HOW ELECTRONIC TUBES WORK"

This booklet will be mailed to you *without charge*. Its 24 pages are interestingly illustrated and written in easily understood language. Shows typical electronic tubes and their applications. Address *Electronics Department, General Electric, Schenectady, N. Y.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P.M. E.W.T. over NBC.*

G.E. HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

161-C

IMMEDIATE DELIVERY

On These 4MFD. -600 V.D.C.W.
OIL TYPE
CAPACITRONS

Meets U. S. Signal Corps and Navy Specifications

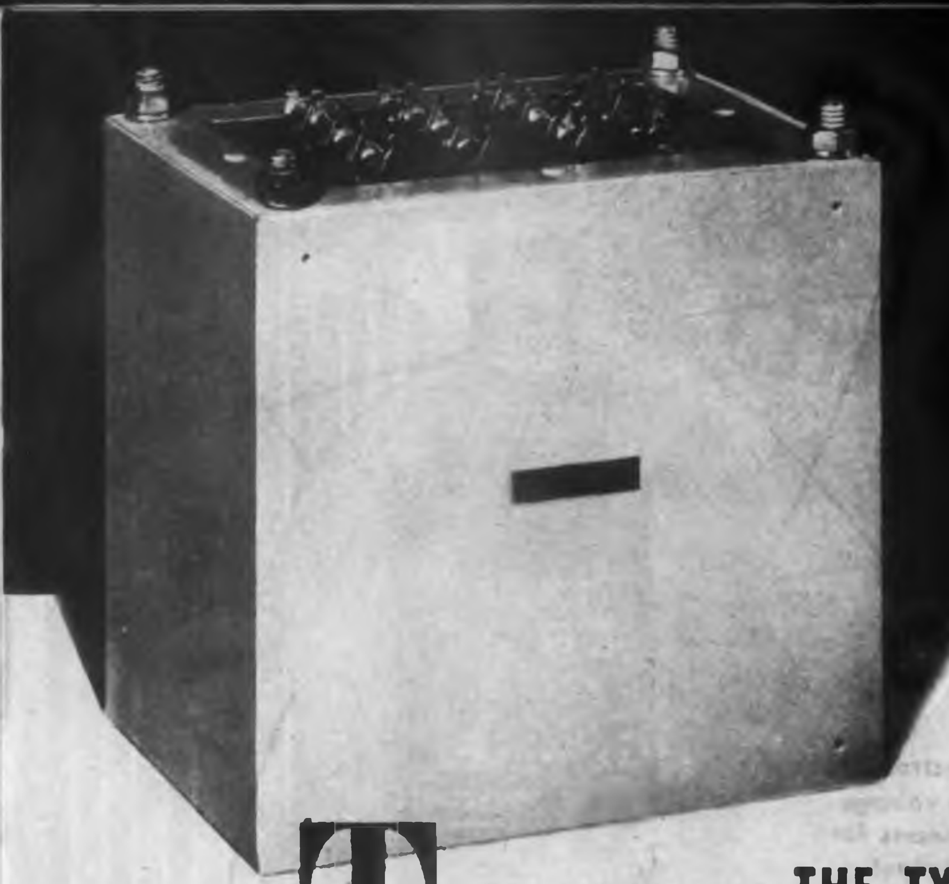
The Type EC Capacitron is a unit you can adopt to take the place of those hard to get specials and regulars. Mounts very simply—through a single hole to clear the ¾" x 16 threaded bakelite neck. It is locked on the chassis by means of a solid nut and lockwasher, which are supplied. The bakelite neck is "lock-spun" into the extruded metal container and is 100% hermetically sealed. The container is insulated. However, a ground lug can be supplied on notice for grounding either of the two insulated terminals.

Catalog No. 6EC400 (4MFD.—600 V.D.C.W.) is also Navy Standard CAAI-481080-10. In addition, we can also supply Type EC Capacitrons on special notice in other capacities and voltage ratings listed below.

CATALOG NUMBER	CAPACITY IN MFD'S.	WORKING VOLTAGE D.C.	HEIGHT INCHES	DIAMETER INCHES
6EC200	2	600	2¾	1½
6EC300	3	600	4½	1½
6EC400	4	600	4½	1½
10EC100	1	1000	2¾	1½
10EC200	2	1000	4½	1½
15EC50	.5	1500	2¾	1½
15EC100	1	1500	4½	1½

TYPE EC

CAPACITRONS INC.
318 West Schiller St. Chicago 10, Illinois



Illustrated at left, Type 300-A Output Transformer. Width 4[illegible]", length 6", height $5\frac{1}{2}$". Utilizes Hypersil core in conjunction with Harvel 612-C Impregnation process. Mounting facilities $\frac{1}{4}$-20 x $\frac{1}{2}$" studs on $3\frac{1}{2}$ x $5\frac{1}{4}$" centers. Weight 16 lbs.

THE TYPE 300-A TRANSFORMER

The Type 300-A Output Transformer was engineered primarily as a part of the Langevin Type 101-A Amplifier. Designed to work out of four 6L6's parallel push-pull or equivalent with nominal secondary impedance values of 2/18/32/150/600 ohms. When used in a circuit employing feedback secondary terminations from 1 to 1000 ohms are available. Will safely handle 50 watts. Designed for wide frequency response, high efficiency (in excess of 90% at all nominal output impedances) and good wave form even at low frequencies at high output levels.

Besides manufacturing public address equipment and electronic devices, The Langevin Company, Inc., also manufactures transformers and reactors to exact requirements. Capacity up to 5 KVA. Hermetically sealed components to strict Army-Navy specifications.

The Langevin Company

INCORPORATED

SOUND REINFORCEMENT AND REPRODUCTION ENGINEERING

NEW YORK	SAN FRANCISCO	LOS ANGELES
37 W. 65 St., 23	1050 Howard St., 3	1000 N. Seward St., 31

Control Cabinet Assembly. Consists of transmitter remote control unit, loud speaker and two fixed frequency airport receivers.

Transmitter for Airport Traffic Control. Output rating 50 watts, Frequency range 116 to 126.25 megacycles.

Over the whining bullets and the bursting shells . . . and in the dark silence of the night . . . he wants to hear the beat of your heart.

High up in his jungle roost, or down in the mud on his belly . . . waiting, watching, listening . . . he wants to know whether you're doing the things that will make his job easier, and the war shorter.

And if he were right here beside you, he might want to ask a few personal questions . . . like these:

> Did you put some of this week's pay in war bonds?
>
> Are you saving the scrap and fats and paper and other things we need to fight this war?
>
> Have you given blood to the Red Cross to save the boys who are fighting to save you?
>
> And . . . did you do your job today as if the outcome of the war depended on you alone?

These are the ways to show you're backing him up. These are the ways to let him hear the beat of your heart.

★ ★ ★

Here, at Kenyon, we're mighty proud to be playing a small part in winning a big war. That is why every Kenyon transformer used by the U.S. Signal Corps and other military branches reflects the same high craftsmanship and precision that went into our peacetime production. To bring victory closer, Kenyon workers are determined to do their share by turning out good transformers as fast as they know how.

THE MARK OF EXCELLENCE

KENYON TRANSFORMER CO., Inc. 840 BARRY STREET NEW YORK, U. S. A.

IT'S B&W AIR-WOUND CONSTRUCTION FOR TEMCO!

Where radio equipment must be constructed to the most advanced standards of service and durability . . .

For use where the going is the toughest . . .

That's where B&W Air Inductors really come into their own . . . a fact demonstrated once again by their selection for the famous Temco Transmitter.

In this case, B&W engineers designed a 1 KW rotary-link style Air Inductor for band switching operation that matched specifications to the letter—and B&W production saw to it that deliveries on all six Air Inductors for the job kept pace with production needs.

B&W Air Inductors are rugged, more durable, more adaptable, easier to mount. Dozens of standard types meet modern radio as well as electronic heating needs—and, as in this instance, B&W specialized facilities are geared to fast production of special coils of almost any type.

B&W

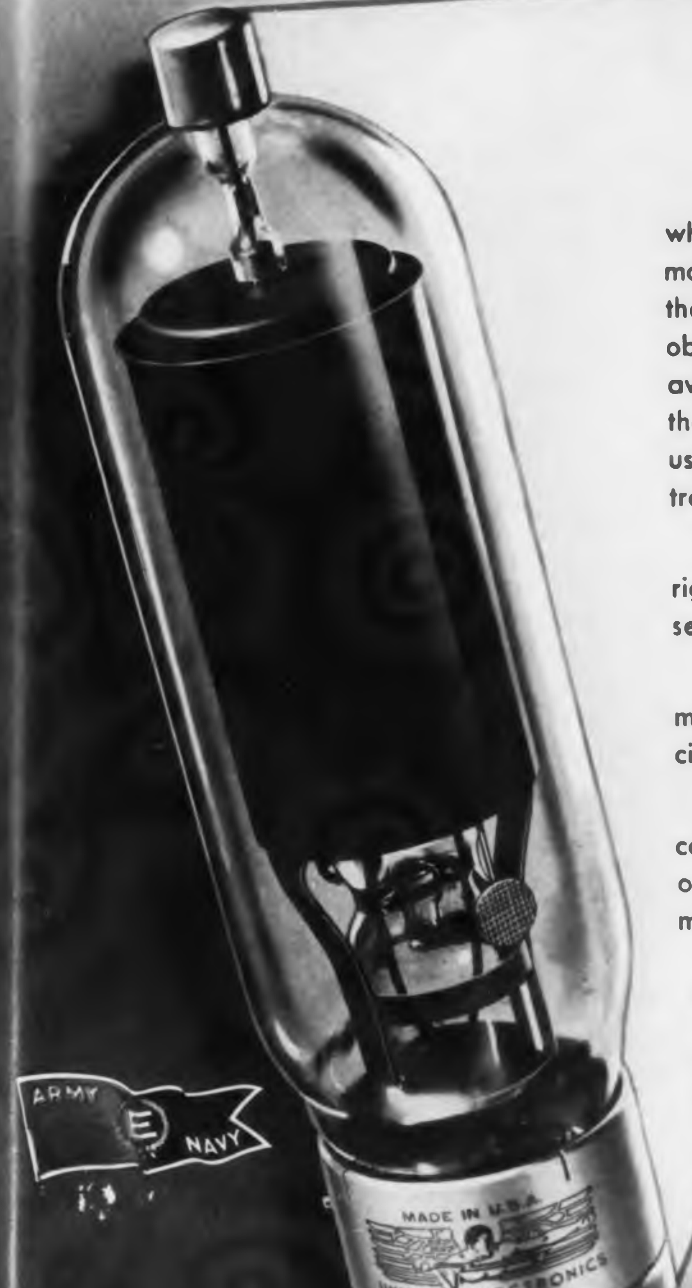
AIR INDUCTORS

Air-wound and Ceramic and Phenolic Form Types

BARKER & WILLIAMSON, 235 Fairfield Ave., UPPER DARBY, PA

Exclusive Export Representatives: Lindeteves, Inc., 10 Rockefeller Plaza, New York, N. Y., U. S. A.

Because Dependable Performance Counts Most — TEMCO Transmitters Use UNITED TUBES



BY virtue of the exacting conditions under which Temco transmitters must operate . . . in mobile police service and on active duty with the Armed Forces . . . Temco engineers were obliged to seek tubes of far greater than the average standards of performance . . . tubes that can "take it" for sustained periods of usage . . . tubes that can *travel* as well as transmit.

We are glad to be able to meet these rigid specifications, and to provide tubes which serve Temco with complete satisfaction.

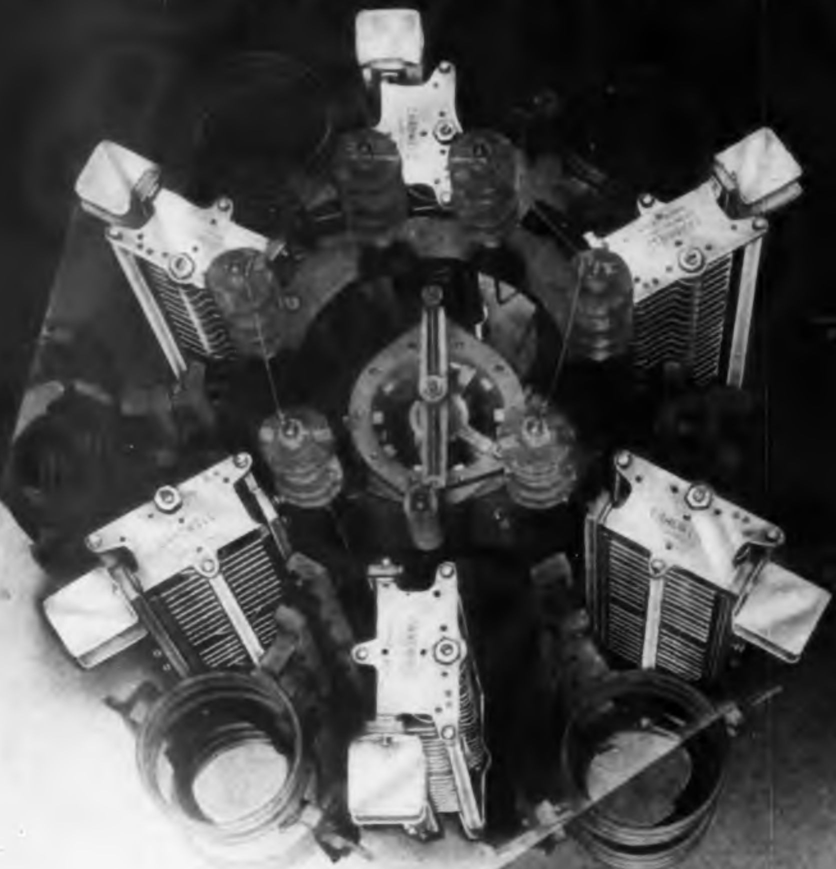
After all, tubes are the *heart* of a transmitter—and no transmitter can be more efficient or more sturdy than its tubes.

When performance counts — you can count on United Tubes to provide a maximum of electronic efficiency—plus a high degree of mechanical ruggedness.

UNITED
ELECTRONICS COMPANY
NEWARK, 2 New Jersey
Transmitting Tubes EXCLUSIVELY Since 1934

CONDENSERS *by* CARDWELL

Proud Choice for this NEW TEMCO *Achievement*



These are the ever-reliable Standard Cardwell Variable Air Capacitors.

Compact . . . ultra-sturdy . . . time-tested through the years in every conceivable type of service.

Invariably chosen by modern designers for the most exacting and rugged usage.

In the "business end" of high calibre radio communication or electronic equipment—always look for . . .

THE STANDARD OF COMPARISON

CARDWELL CONDENSERS

THE ALLEN D. CARDWELL MANUFACTURING CORPORATION
81 PROSPECT STREET BROOKLYN 1, N. Y.


Instinct and Engineering
Our feathered friend delivers the order "in person"—the soldier flashes it by radio. In war, communication, by any means, is a powerful weapon.
In the case of the bird, action is born of instinct. In the case of the field radio, very special electrical equipment generates the sending power.
Leland equipment is daily generating power for electronic services in every combat area. Leland equipment, in brighter days, will likewise serve the fast developing field of electronics.
Motors and generators in all types and sizes from 1/6 H.P. to 3 H.P. single phase, 5 H.P. polyphase. Engineering service on special designs.
THE LELAND ELECTRIC CO.
DAYTON, OHIO
Leland
ELECTRIC MOTORS

THE five most used words in industry today are unquestionably "When Can We Have Delivery?" If you need chassis, chassis mounting assemblies, panels, transformer housings or cabinets, the chances are 100-to-1 you need them *in a hurry!*

That's where Corry-Jamestown excels. We work in steel, stainless steel or aluminum! We specialize in precision! We price our work within reason!

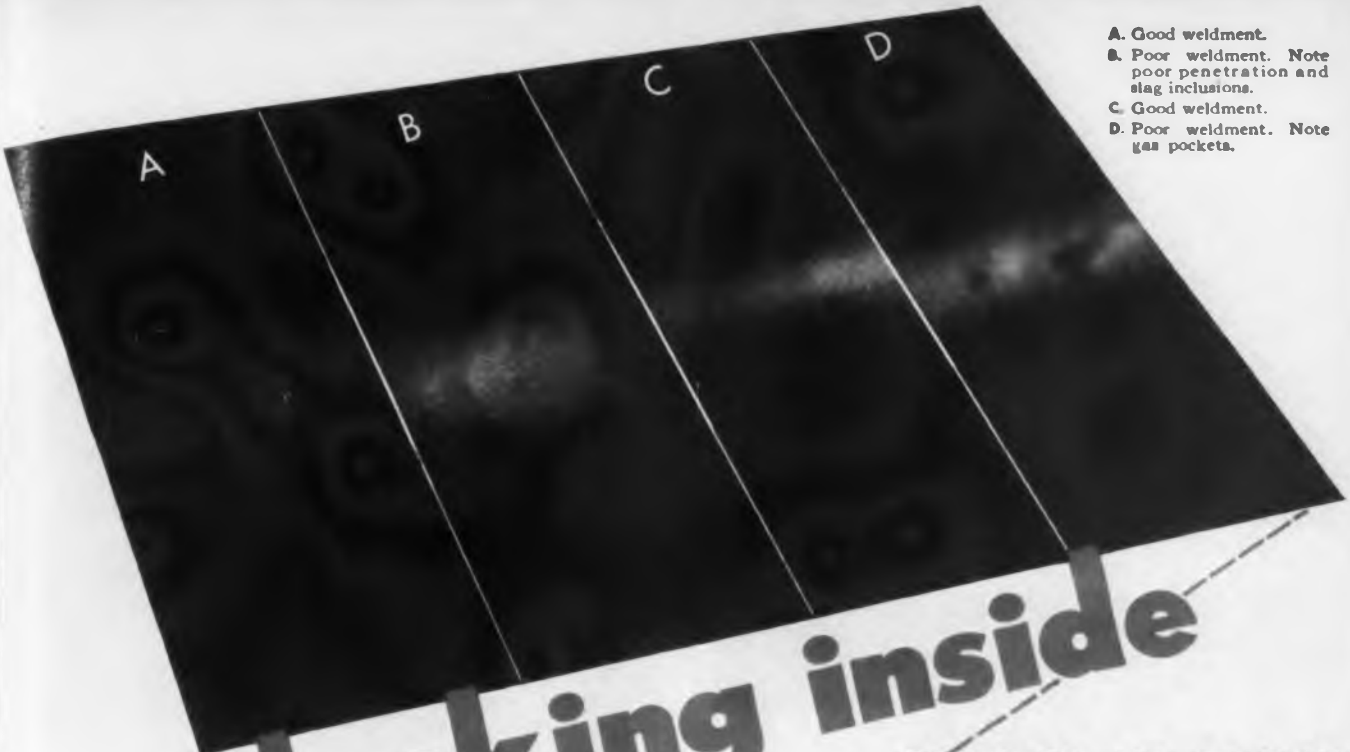
WE DELIVER ON TIME! That's putting your neck way out these days but speed is a Corry-Jamestown tradition.

If this sounds interesting and you want to start the ball rolling fast — send us your specifications.

CORRY - JAMESTOWN

MANUFACTURING CORPORATION, CORRY, PENNA.

SPEED VICTORY ★ BUY WAR BONDS



A. Good weldment.
B. Poor weldment. Note poor penetration and slag inclusions.
C. Good weldment.
D. Poor weldment. Note gas pockets.

looking inside WITH X-RAY

HELPS TRAINEES "CATCH ON" QUICKER!

They can SEE the difference between a good weld and a bad one

X-ray rules out guesswork in training, qualifying or classifying welders—or other workers—according to actual ability. It puts these all-important functions on a factual basis. For radiographs clarify . . . provide absolute proof . . . are readily understood because they *show* internal conditions that words fail to describe adequately.

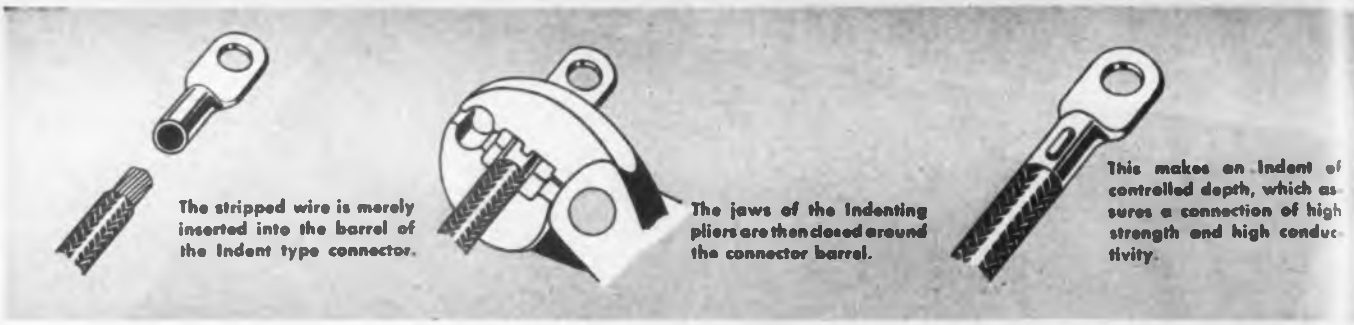
They let the worker *look inside* the weldment, casting or assembly . . . show him whether it's good or bad . . . show him what to do and what to avoid. He "catches on" quicker, adheres to good, sound methods, and becomes a faster, more efficient producer from the start.

In addition to shortening training time and putting worker-classification on a factual basis, Westinghouse Industrial X-ray is doing countless other jobs faster, better and more economically. These fall into such major classifications as speeding production, saving machine and man-hours, conserving critical materials and improving quality.

For more information, write for Booklet B-3159. It suggests how and where you can benefit by using industrial x-ray. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-02025

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE
Industrial
X-RAY



The stripped wire is merely inserted into the barrel of the Indent type connector.

The jaws of the Indenting pliers are then closed around the connector barrel.

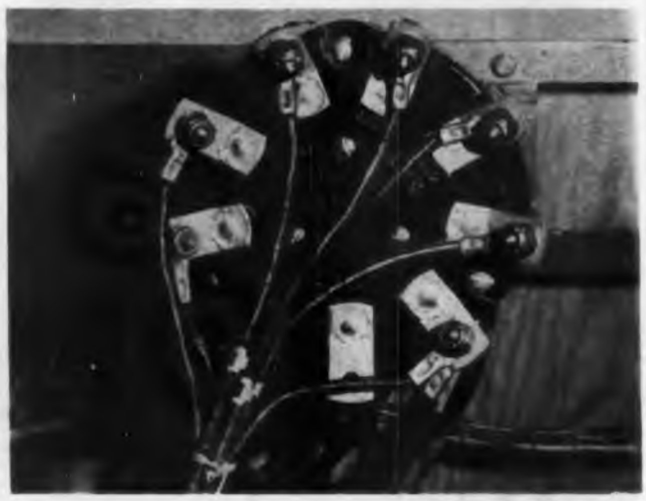
This makes an Indent of controlled depth, which assures a connection of high strength and high conductivity.

MECHANICAL INDENTING IS THE SPEEDY MODERN METHOD FOR MAKING ELECTRICAL CONNECTIONS

Hundreds of leads for electronic circuits are quickly Indent connected without a reject. Burndy Indent connectors are made in one-piece from pure copper; thus there can be no loosening of the connector, and there are no extra surfaces to cause increased contact resistance.

This automatic Burndy HYPRESS indents connectors as fast as the operator can press the trigger. Used extensively by aircraft and electrical manufacturers producing harnesses or leads in large quantities.

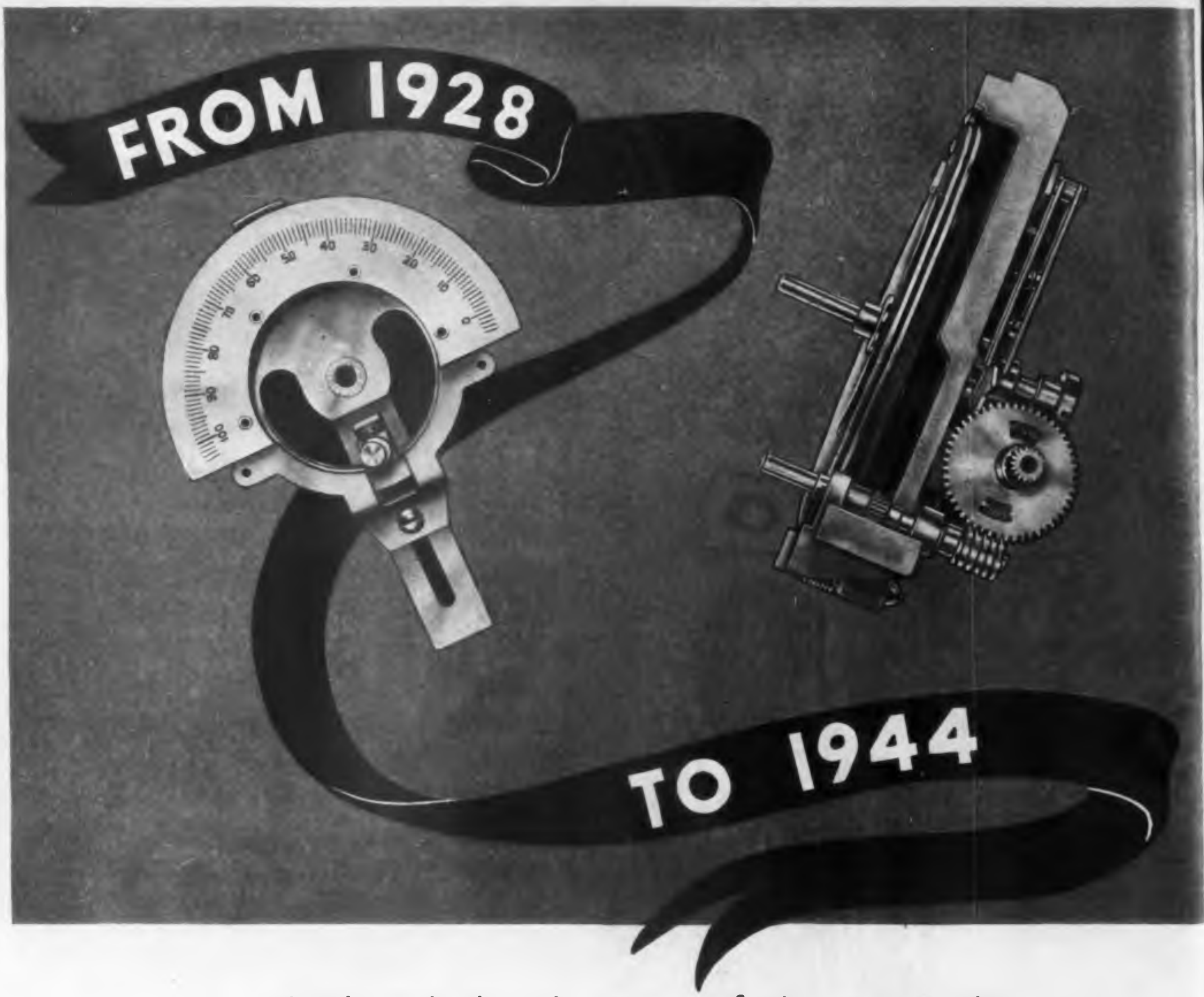
Inexperienced operators can make perfect Indent connections right from the start, and from three to ten times faster than by the older soldering methods. Absence of acid, which frequently causes finger burns, also makes job cleaner and faster.



Indent connections are used on rotary switches of all sizes; Burndy Indent connectors being available for all wire sizes from #29 up through the larger cable sizes.

HEADQUARTERS FOR CONNECTORS


Goin' Places!--
THANKS TO RADIO
This is one sneak raid that backfired—that ended where the only "good" Japs are found—because *radio* gave a warning . . . *radio* guided our interceptors . . . *radio* played its usual major part in the engagement. That's radio today. Tomorrow, this wartime "know how" will be applied to the creation and production of new FADA Radios with undreamed-of standards of beauty, faithfulness, performance and durability.
PLACE YOUR FAITH IN THE
FADA Radio
OF THE FUTURE
Famous Since Broadcasting Began!
FADA RADIO AND ELECTRIC COMPANY, INC., LONG ISLAND CITY, N. Y.



Looking backward at one of the many radio control devices designed and produced by Croname. Constant progress has been made from the string, friction, band drive type to the fine gear driven unit.

Today making exacting precision mechanical controls for radio and communication units.

METAL CABINETS - DIALS - PANELS

CRONAME
Electronic Controls

CROWE NAME PLATE AND MANUFACTURING CO.

3701 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

ASSURANCE

Camloc high speed fasteners operate with a quarter turn of the screwdriver. They secure doors and access panels in metal, plastic or plywood.

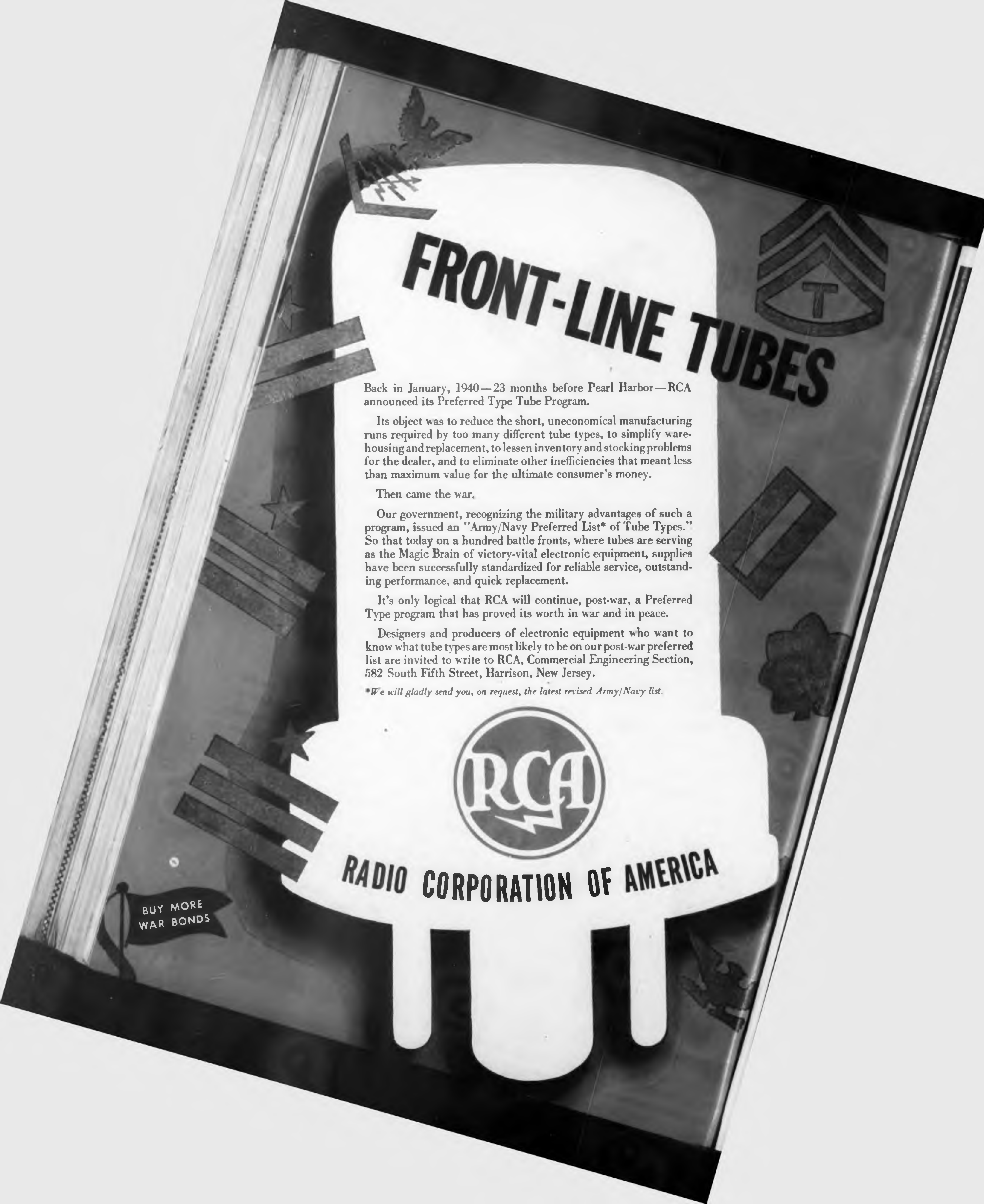
Stud Assembly is easily inserted or removed as a unit. Selection of correct size at final assembly allows for cumulated tolerances. Cross pin is permanent.

A complete line permits selection of Cam Collar exactly suited to the application. Floating type allows up to 1/8" alignment in any direction.

CAMLOC'S stud head clearly visible 1/8" above the panel indicates that the fastener is unlocked. A flush stud head gives assurance that Camloc has secured firmly, the members to which it is attached. Many such unique features make Camloc High Speed Fasteners an important part of today's fighting aircraft. Camloc eagerly awaits the day when this modern method of securing doors and access panels will be available to peacetime products of metal, plastic and plywood. Write for catalog.

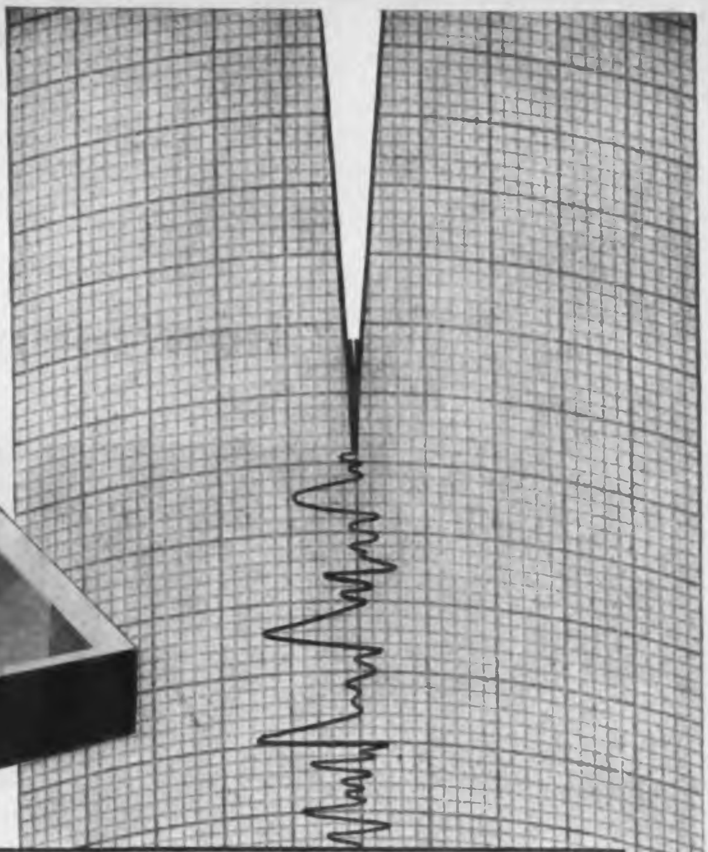
CAMLOC high-speed FASTENERS

CAMLOC FASTENER CORPORATION, 420 LEXINGTON AVE., NEW YORK 17, N.Y. • 5410 WILSHIRE BLVD., LOS ANGELES

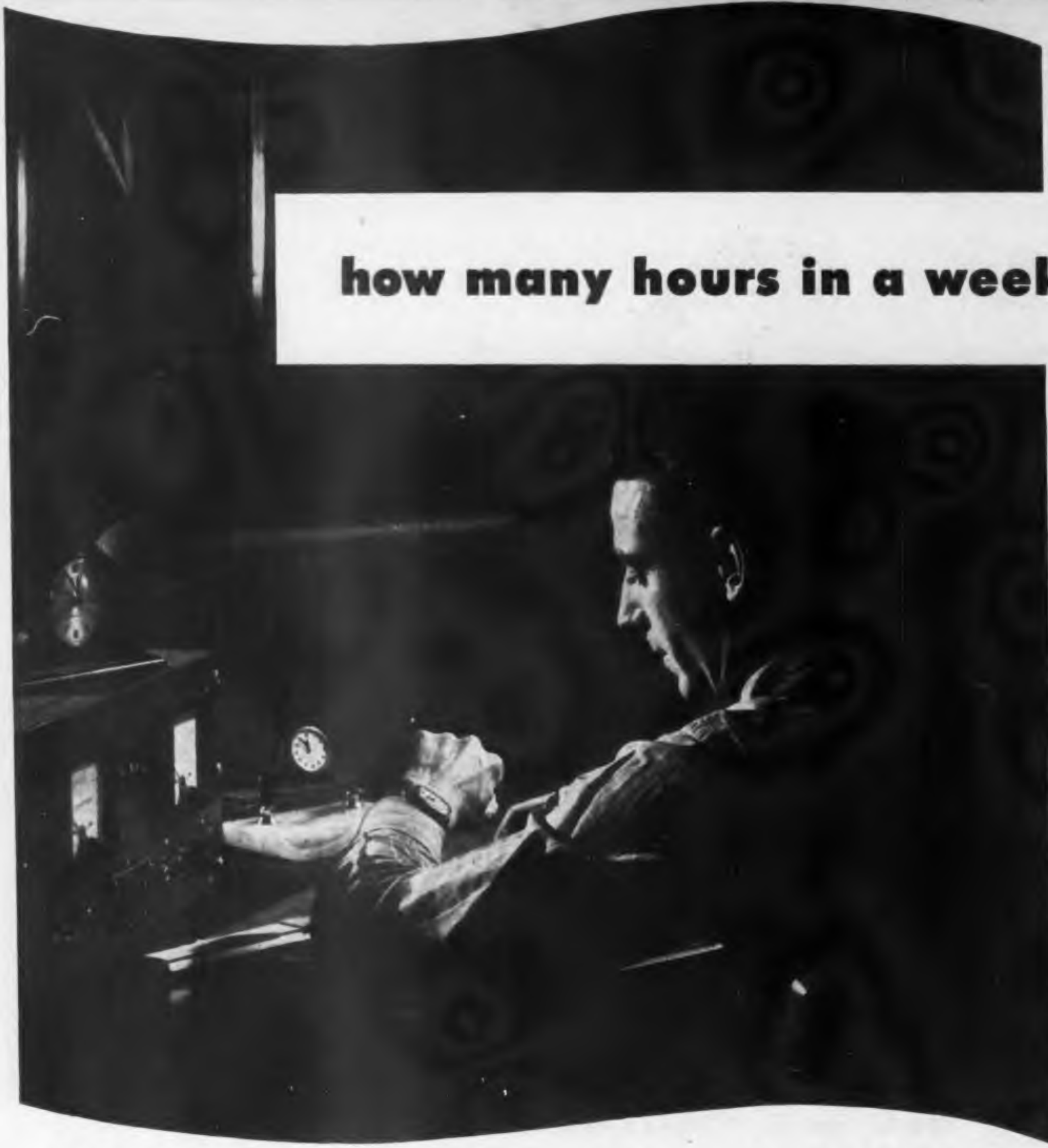

FRONT-LINE TUBES
Back in January, 1940—23 months before Pearl Harbor—RCA announced its Preferred Type Tube Program.
Its object was to reduce the short, uneconomical manufacturing runs required by too many different tube types, to simplify warehousing and replacement, to lessen inventory and stocking problems for the dealer, and to eliminate other inefficiencies that meant less than maximum value for the ultimate consumer's money.
Then came the war.
Our government, recognizing the military advantages of such a program, issued an "Army/Navy Preferred List* of Tube Types." So that today on a hundred battle fronts, where tubes are serving as the Magic Brain of victory-vital electronic equipment, supplies have been successfully standardized for reliable service, outstanding performance, and quick replacement.
It's only logical that RCA will continue, post-war, a Preferred Type program that has proved its worth in war and in peace.
Designers and producers of electronic equipment who want to know what tube types are most likely to be on our post-war preferred list are invited to write to RCA, Commercial Engineering Section, 582 South Fifth Street, Harrison, New Jersey.
*We will gladly send you, on request, the latest revised Army/Navy list.
RCA
RADIO CORPORATION OF AMERICA
BUY MORE WAR BONDS

JENSEN RADIO MANUFACTURING COMPANY, 6601 S. LARAMIE AVE., CHICAGO 38, U. S. A.

Power Twins
of
ALLIED'S RELAY LINE
RUGGED . . .
in their design and construction to withstand shock, vibration and extreme temperatures; built for heavy and continuous duty under most severe operating conditions.
DEPENDABLE
for aircraft, marine and industrial applications such as circuit breaking, switching, motor starting, motor controlling and for overload protection.
SPECIFY . . .
Allied's power-twins for all relay applications where positive action, long life and the utmost in dependability are desired.
BN 18 . . .
. . . the multiple circuit Power Relay; six pole — double throw, handles loads of 10 amperes per contact at voltages to 32 DC and 115 AC non-inductive on low power consumption of only 3.5 watts. Its coil is cellulose acetate sealed against humidity and salt-spray (an exclusive and patented feature of Allied Relays). Dimensions are 2 9/16" high, 3" wide and 2 1/8" deep. Weight is 9 1/2 ounces.
AN and ANS . . .
. . . the heavy duty Power Relays. Standard contact arrangement is single pole—single throw—normally open—double break. AN handles loads to 50 amperes—ANS to 75 amperes—at voltages to 32 DC and 115 AC non-inductive on low power consumption of only 3.5 watts. Their coils are cellulose acetate sealed against humidity and salt-spray (an exclusive and patented feature of Allied Relays). Dimensions are 2½" high, 2¼" wide and 2" deep. Weights are 9 ounces each.
ALLIED CONTROL COMPANY
INCORPORATED
2 EAST END AVENUE • (AT 79th STREET) • NEW YORK 21, N. Y.
FACTORIES: NEW YORK CITY • PLANTSVILLE, CONN. • CHICAGO, ILL.



how many hours in a week?



Electronic engineers have been working hard against time ever since Pearl Harbor. As far as they are concerned it's always "five minutes to twelve" — for they must not only keep up with, but must *anticipate* the vast requirements of modern warfare. And they are coming through — with the most of the best electronic equipment for the Allies — on time!

Raytheon-designed equipment and Raytheon-made tubes are serving on all battlefronts — with that "Plus-Extra" performance quality that has always been associated with the name Raytheon.

RAYTHEON

ARMY-NAVY "E" WITH STAR
Awarded All Four Divisions of Raytheon for Continued Excellence in Production

DEVOTED TO RESEARCH AND THE MANUFACTURE OF TUBES AND EQUIPMENT FOR THE NEW ERA OF ELECTRONICS

(Photo Courtesy Yerkes Observatory)

Clear Picture to the Strong Eye

HIGH DIELECTRIC STRENGTH

LOW MOISTURE ABSORPTION
CORROSION RESISTANCE

COMPRESSIVE STRENGTH

TENSILE STRENGTH

FLEXURAL STRENGTH

IMPACT STRENGTH

STABLE OVER A
WIDE TEMPERATURE RANGE

Many More Properties—Combined

THE Andromeda Nebula was just a blur in the sky until an inquiring mind and a telescope brought it into focus. Electricity was an awesome phenomenon until someone discovered how to use it. So it goes with all the unexposed realities in nature and science.

The future of plastics, in spite of already-known practical applications for them, is still a "blur in the sky." Engineers are getting a closer, sharper picture of what can and cannot be accomplished with them. The war has accelerated interest and action. But most of the work is ahead. The stimulus often, and logically, comes from the prospective user who knows his own requirements . . . from you, for example. If you'll write and tell us these requirements, we'll be glad to let you know, or find out, whether our type plastics will help.

SYNTHANE CORPORATION, OAKS, PENNSYLVANIA

Plan your present and future products with Synthane Technical Plastics

SHEETS • RODS • TUBES • FABRICATED PARTS — SYNTHANE — MOLDED-LAMINATED • MOLDED-MACERATED

SYNTHANE "Sandwich" Materials

One of the advantages of Synthane is the ease with which it can be bonded to other materials to produce a substance with the combined advantages of the partnership. Bonding takes place under heat and high pressure, during the polymerization of the Synthane; it is not a mere joining of two surfaces with an adhesive. The resulting combination, therefore, shows little or no tendency to delaminate.

Synthane combinations are familiarly known as Synthane "sandwich" materials, an appropriate name, for many different kinds of combinations are possible.

Probably the most widely used combination brings Synthane and rubber together.

Synthane-Rubber

Synthane-rubber combinations are advantageous where the strength of Synthane is desirable to back up rubber.

An interesting application concerns a washer used in electrolytic and oil type condensers. The washer is placed on the end of tin can electrolytic condensers with the Synthane face exposed to the chemicals to prevent deterioration. The can is crimped into the rubber to make a tight seal.

A similar washer is used on "bath-tub" condensers. Tough Synthane provides a firm seat for a nut which compresses the rubber to form a tight joint.

Combinations of rubber and Synthane have been furnished with rubber on one side, Synthane on the other; rubber on both sides with Synthane between; Synthane on both sides and rubber between; and alternate laminations of rubber and Synthane built up to any desired thickness.

There are many more possible uses for Synthane-rubber sandwich materials, which we cannot describe because of military censorship. There are also many important uses for a combination of Synthane and Neoprene.

Synthane-Synthane

Occasionally two grades of Synthane are combined. For instance, in certain radio tube sockets, layers of fabric

and paper base Synthane are combined. The paper base has usually better electrical properties while the fabric base furnishes added strength where the stress is greatest.

Bobbin heads in the textile industry are often made of paper and fabric bases combined. The fabric base endures rough handling, whereas the paper base on the inside of the head provides a smooth wearing surface.

Synthane-Asbestos

Synthane is wound about asbestos (or fibre) tubes and cured in the manufacture of tubing for large fuse cases. Synthane adds strength and rigidity to the fire resistance of the asbestos or fibre.

Synthane-Other Materials

Synthane can be united with a variety of materials to produce a variety of practical combinations. We have made or experimented with other combinations. If you have any combination in mind which we have not explored, we will be glad to investigate its possibilities for you.

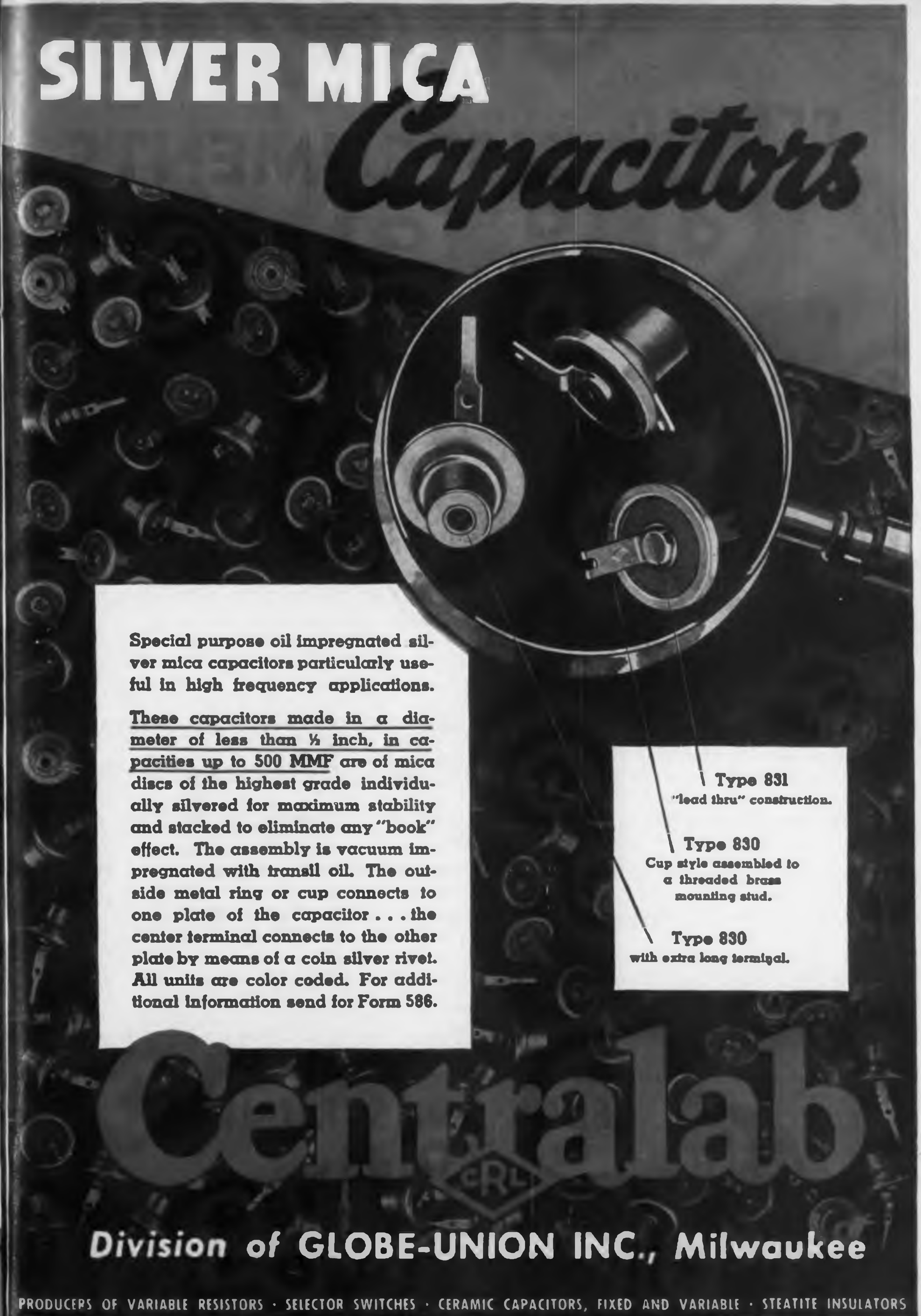
PLAN YOUR PRESENT AND FUTURE PRODUCTS WITH SYNTHANE TECHNICAL PLASTICS

SYNTHANE

SHEETS-RODS-TUBES-FABRICATED PARTS-MOLDED-LAMINATED-MOLDED MACERAT

SYNTHANE CORPORATION, OAKS, PENNA.

REPRESENTATIVES IN ALL PRINCIPAL CITIES


SILVER MICA
Capacitors
Special purpose oil impregnated silver mica capacitors particularly useful in high frequency applications.
These capacitors made in a diameter of less than ½ inch, in capacities up to 500 MMF are of mica discs of the highest grade individually silvered for maximum stability and stacked to eliminate any "book" effect. The assembly is vacuum impregnated with transil oil. The outside metal ring or cup connects to one plate of the capacitor . . . the center terminal connects to the other plate by means of a coin silver rivet. All units are color coded. For additional information send for Form 586.
Type 831
"lead thru" construction.
Type 830
Cup style assembled to a threaded brass mounting stud.
Type 830
with extra long terminal.
Centralab
CRL
Division of GLOBE-UNION INC., Milwaukee
PRODUCERS OF VARIABLE RESISTORS · SELECTOR SWITCHES · CERAMIC CAPACITORS, FIXED AND VARIABLE · STEATITE INSULATORS

FERRIS INSTRUMENTS

MODEL 18 MICROVOLTERS

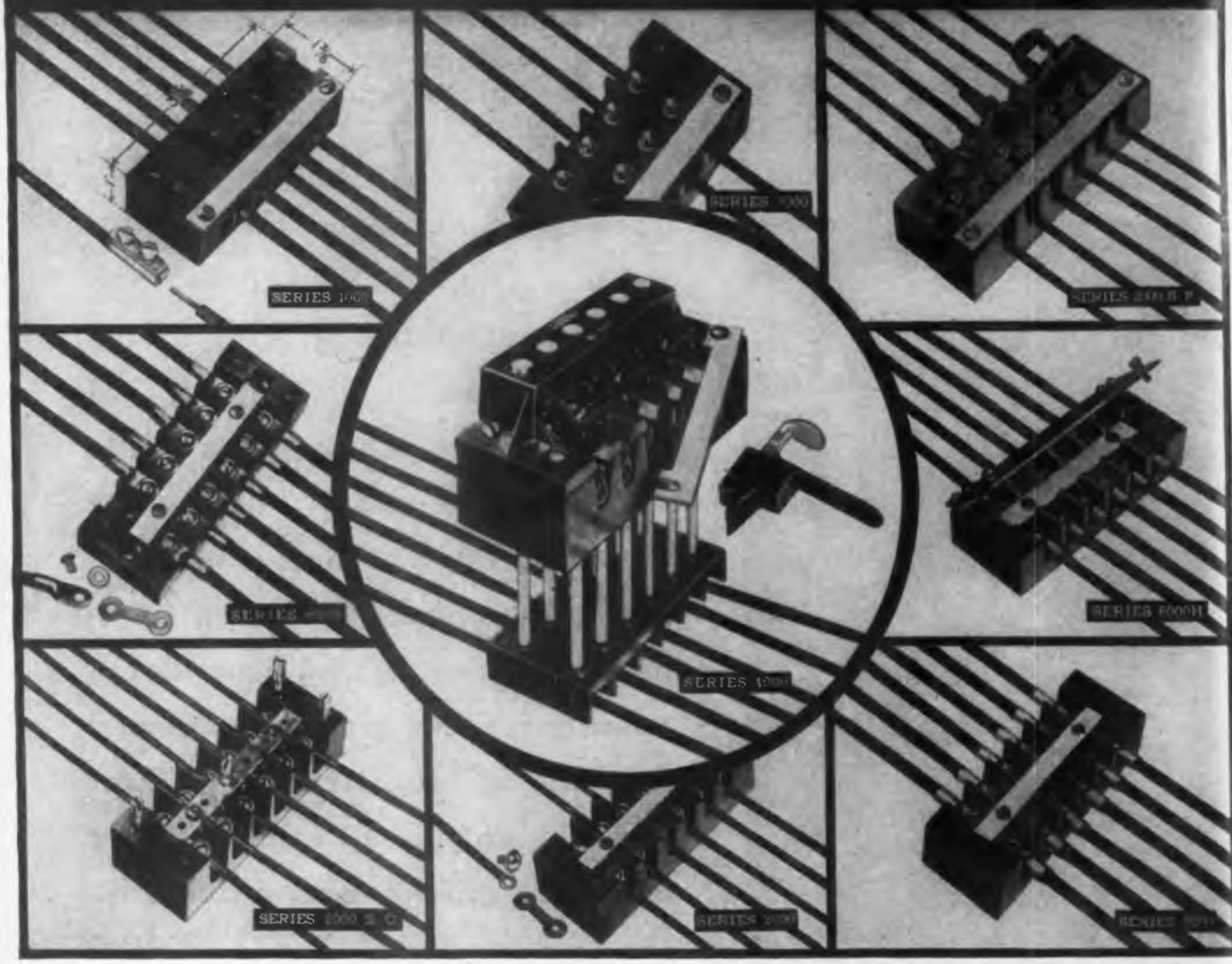
The name "MICROVOLTER" stamps the Model 18 Signal Generator as a Ferris product and is your guarantee of quality. The 18 series, ranging from the 18B to the 18FS, covers a wide variety of applications in the high frequency field. Many special features may be included on request and your correspondence is invited. Look for the name "MICROVOLTER".

FERRIS

FERRIS INSTRUMENT COMPANY

110 CORNELIA STREET, BOONTON, N. J.

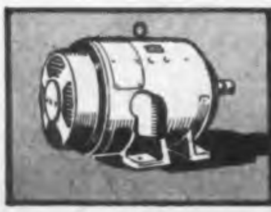
Choose from 10
BURKE TERMINAL BLOCKS

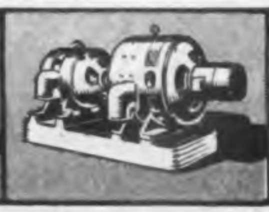


Wherever two or more wires come together there is an application for Burke Controlead Terminal Blocks. They are standardized in 10 types to meet all kinds of applications. Additional moulding capacity on a 24-hour basis permits faster deliveries to meet urgent war demands. Consult with Burke engineers for correct selection of these high quality blocks for your needs.

Write for Booklet TB-2 *Today*

BURKE ELECTRIC COMPANY • 1209 WEST 12TH STREET ERIE, PENNSYLVANIA





D.C. Equipment to 1500 H.P. and 1000 K.W.
A.C. Equipment to 1500 H.P. and 1000 K.W.
M-G Sets to 1000 K.W.
Molded Bakelite Terminal Blocks

wherever a tube is used...

For example—

Resistance Welding

Thyratron tubes, working with other thyratron or ignitron tubes and usually a relay, control the current for spot, projection, seam and other types of resistance welding for lower maintenance and better welds.

THERE'S A JOB FOR

Relays BY GUARDIAN

Your post-war product must stand the competition of *price* as well as quality. And manufacturers who use electron tubes to boost production, cut material costs, and increase product performance, have the edge on competitors. Electronic control of resistance welding is one cost-saver to consider.

In this, as in most other tube applications, the use of a relay increases efficiency. The Series 175 DC and Series 170 AC Relays by Guardian, when used in the output of the tube circuit, control external loads in accordance with the tube operating cycle. These relays have binding post terminals in place of solder lugs. Bakelite bases, molded to reduce surface leakage, give a higher breakdown factor. Contact capacity: 12½ amps., at 110 volts, 60 cycles, non-inductive. Information on contact combinations, coil voltages, and further data is yours for the asking.

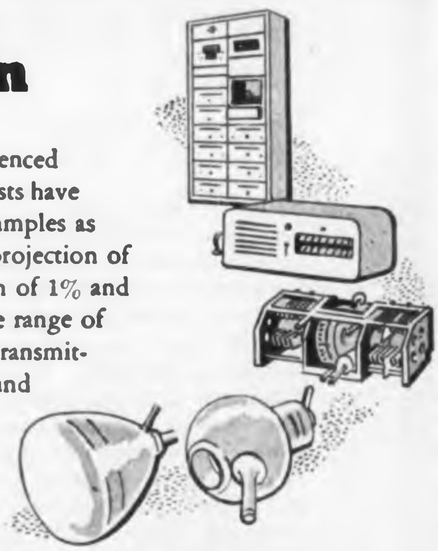
Consult Guardian wherever a tube is used. *However,* Relays by Guardian are *NOT* limited to tube applications but may be used wherever automatic control is desired for making, breaking, or changing the characteristics of electrical circuits.

GUARDIAN ELECTRIC

1622-C W. WALNUT STREET CHICAGO 12, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING AMERICAN WAR INDUSTRY

Doorway to Electronic Vision



Control of the forces of electronics begins with vision . . . especially by experienced engineering minds accustomed to achievement. RAULAND engineers and scientists have earned recognition in the field of electronic achievement with such notable examples as (1) *High Powered Cathode Ray Tubes* for large screen (15 *foot* x 20 *foot*) television projection of fine line definition. (2) *Frequency Standards* having a control accuracy of 1/100th of 1% and maintaining this almost unbelievable control throughout the entire temperature range of minus 30°C to plus 50°C. (3) *Communications,* as exemplified by precision-built transmitting type tuning condensers, two-way radio and intercommunicating and sound control units for industry. All of the fruits of RAULAND *Electroneering** are at work for our war effort today as they will serve industry in the new days to come.

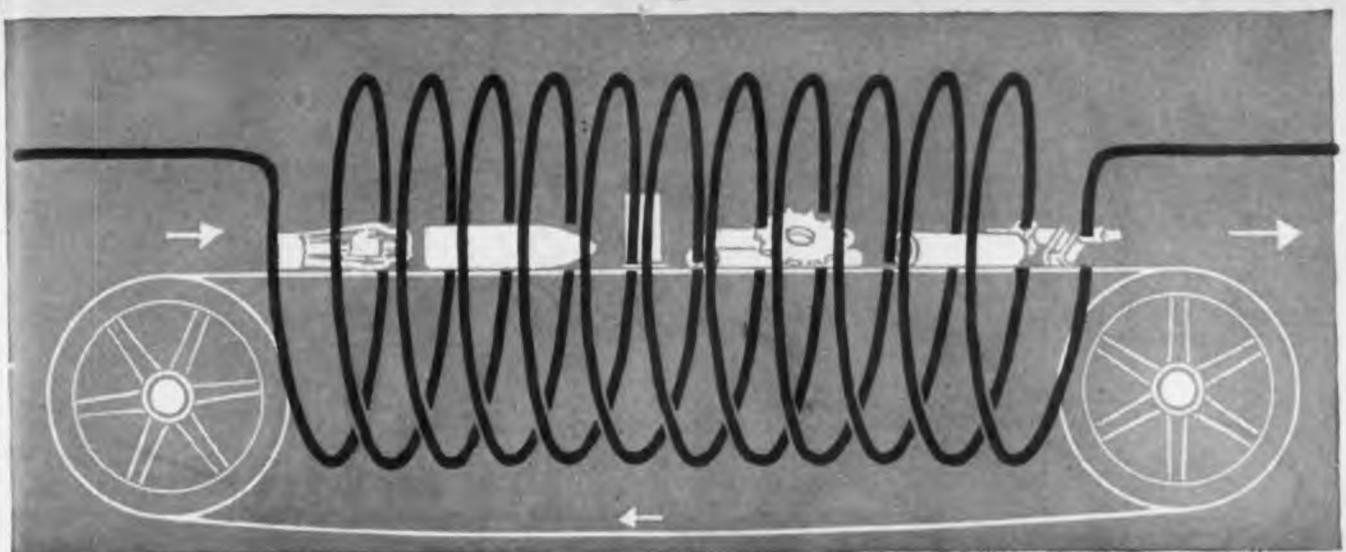
** The Rauland word for all of the carefully thought out steps in electronics from vision to completion.*

RADIO . . . SOUND . . . **Rauland** . . . COMMUNICATIONS

Electroneering is our business

THE RAULAND CORPORATION . . . CHICAGO, ILLINOIS

Buy War Bonds and Stamps! Rauland employees are still investing 10% of their salaries in War Bonds



HIGH FREQUENCY HEATING

is on the move!

In hundreds of new applications it's improving product quality at higher-than-ever speeds and lower heating costs. Here's what Ajax-Northrup users say about high frequency for

FORGING, UPSETTING: Faster, automatic. Lower unit heating cost. Less scale, hence greater dimensional accuracy and longer die life. Compact, dependable equipment takes little space.

> *Example:* A hot 75mm. billet every 28 seconds with a 5-heater set-up for forging. Accurately timed green lights set the pace for the operator. In one 8-hour shift, one upsetter turned out 960 perfect shells!

BRAZING: Perfect joints — almost no rejects. Less warping, scale, or residue. Easy to handle. No fumes or excessive heat.

> *Example:* 24 perfect brazed fuse seat liners per minute with battery of four Ajax-Northrup brazing units. Loading is easy and no clean-up is needed.

HARDENING: Fast, precise control needed for jobs ranging from self-quench to through hardening. Can achieve any heat pattern.

> *Example:* The noses of nearly 6,000 armor-piercing shells are hardened in one day with a single 6-kw. Ajax Northrup unit.

BUILT-IN induction heating is on the horizon for higher-production machines of tomorrow. Already Ajax-Northrup equipment is one of industry's best, most dependable tools. Bring your plans to us and let us engineer your high frequency heating.

POST-WAR SUGGESTIONS

Equipment bought for one war purpose can easily be converted to your peace-time heating. In most cases all you'll have to do is change a coil on the heaters, or connect up new brazing or hardening coils.

For example, you may be able to do a large part of your future forging, melting, and heat-treating (or any of hundreds of other jobs that are now being done by high-frequency) with equipment you install for shell forging.

66

AJAX-NORTHRUP

HIGH-FREQUENCY HEATING MELTING

AJAX ELECTROTHERMIC CORPORATION · Ajax Park TRENTON 5, N. J.

ASSOCIATE COMPANIES . . . THE AJAX METAL COMPANY, Non-Ferrous Ingot Metals.
AJAX ELECTRIC FURNACE CORPORATION, Ajax-Wyatt Induction Furnaces.
AJAX ELECTRIC COMPANY, INC., Ajax-Hultgren Salt Bath Furnaces.
AJAX ENGINEERING CORPORATION, Aluminum Melting Furnaces.


AAC Quartz CRYSTALS
help keep the communications
BRANIFF AIRWAYS
GREAT LINES TO THE GULF
CANADIAN PACIFIC
AIR LINES
CHICAGO AND SOUTHERN AIR LINES
C&S
DIXIELINER SERVICE
COLONIAL AIRLINES
CONTINENTAL AIR LINES
DELTA AIR LINES
INLAND AIR LINES
MID-CONTINENT AIRLINES
NATIONAL AIRLINES
NORTHEAST AIRLINES
NORTHWEST AIRLINES
PAA
Panagra
TCA
TWA
OVER ALL THE WAY
WESTERN AIR LINES
ARMY
NAVY
Today..and Tomorrow
Illustrated at right is a typical crystal manufactured by Aircraft Accessories Corporation and used in both ground and plane radio installations by America's commercial airlines. Many other types of AAC crystal units are being supplied various branches of the armed service and other government agencies.
Today, practically all AAC facilities are devoted to war production. Tomorrow, advanced AAC electronic developments will be available for the post-war world.
AAC
Products
AIRCRAFT
Manufacturers of PRECISION
Burbank, Calif.
Kansas

We expect you to expect more of your SPRINGS

The tough spring jobs go to beryllium copper in this war, for of all spring materials, this metal offers the best combination of all critical spring requirements—maximum electrical conductivity with high tensile strength, minimum drift, resistance to corrosion, high endurance strength, and efficient operation at temperatures too high for ordinary materials.

Instrument Specialities Company has developed the one exact technique, "Micro-processing," to put these desired spring qualities at your command—today for war, tomorrow for peace.

"Seeing" is in the Using

"Fancy" Springs *(at the top)* are Micro-processed to precision tolerances not obtainable by any other process or material.

For "Average" Springs *(below)* Micro-processing delivers closer tolerances and better physical properties than obtainable by ordinary processing methods.

A spring need not be "fancy" for you to benefit by Micro-processing. While in a number of instances we have Micro-processed large quantities of exceptional springs to perform functions never before expected of any springs; in hundreds of other cases we have added materially to the life of such every day products as brushes, motors, instruments, etc., by improving the quality of "average" springs.

I-S gets the most out of springs by putting the required maximum into them. We stand ready to prove our statements on your own springs. A time-saving data sheet is available on request, or send drawings and specifications for Micro-processed samples. Why not expect more of your springs?

INSTRUMENT SPECIALTIES CO., INC.

DEPT. E-2 LITTLE FALLS., NEW JERSEY

No. 1044
Actual Size

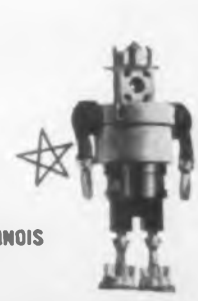
★

CINCH *Mounting Strap*

FOR MINIATURE TUBE SOCKET

★ *Mounting strap fastened to chassis by central single rivet (see above) and two removable screws.*

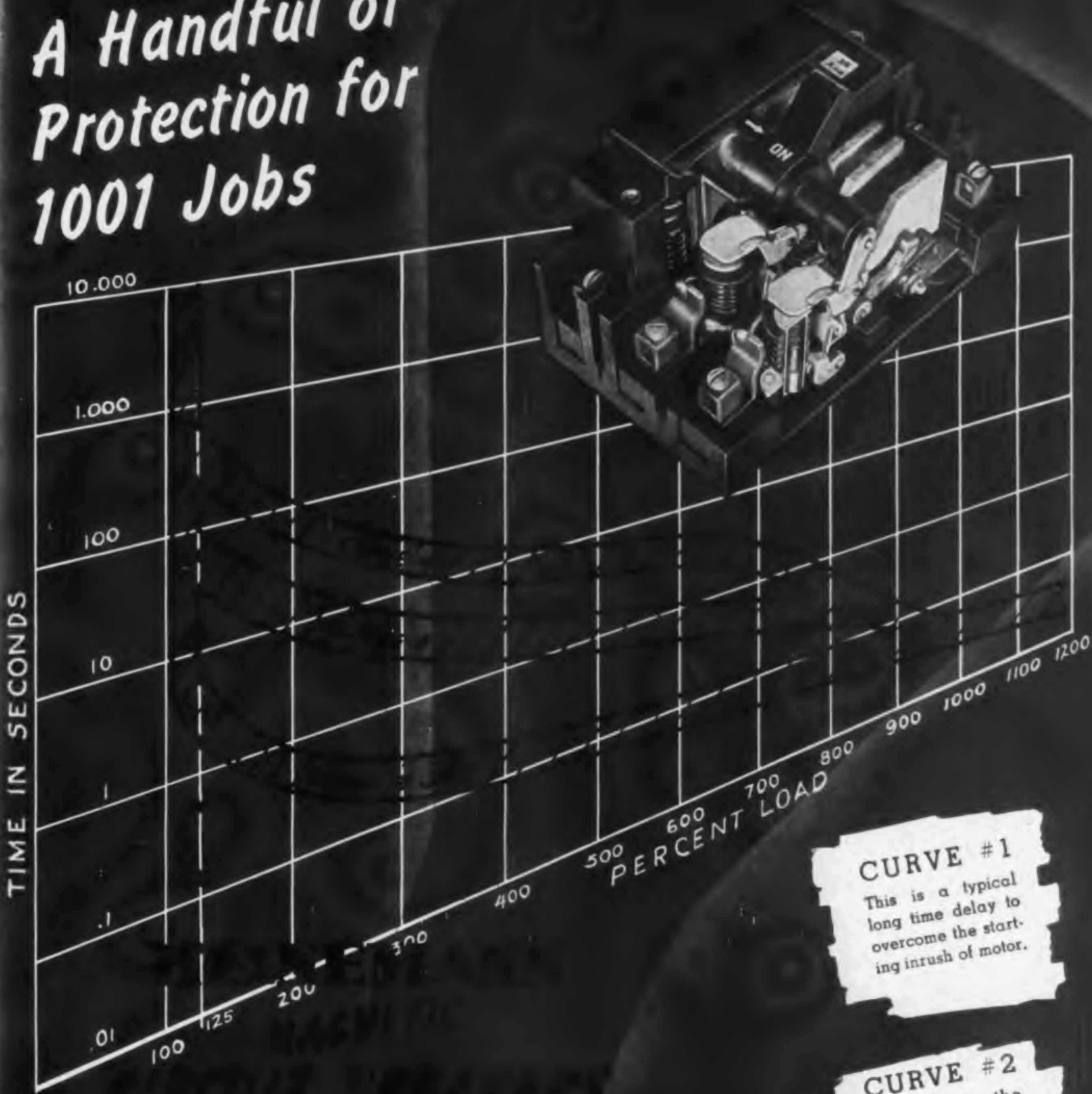
• To design and manufacture satisfactory miniature tube sockets is one of Cinch's primary functions. This is our contribution in an all-out war effort. However, the job is not finished until the socket is satisfactorily mounted in the radio chassis, hence "*Cinch mounting straps.*" Examine the illustration, the simplicity of assembly is obvious. Note lug (No.1044) makes it possible to "hitch" ground wires for electrical connections, also strap can be supplied without lugs (No. 1028) both threaded 4-40. *(Samples available on request.)*



CINCH MANUFACTURING CORPORATION • 2335 WEST VAN BUREN STREET, CHICAGO, ILLINOIS

SUBSIDIARY: UNITED-CARR FASTENER CORPORATION, CAMBRIDGE, MASS.

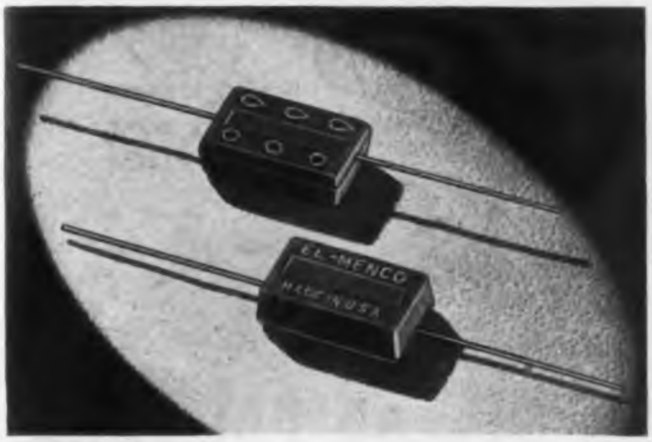
A Handful of Protection for 1001 Jobs



CURVE #1
This is a typical long time delay to overcome the starting inrush of motor.

CURVE #2
This may be the ideal protection for small transformers since the breaker takes care of the relatively fast and high inrush of current when first connected to the line.

CURVE #3
This may be the ideal protection for a filament and plate circuit.

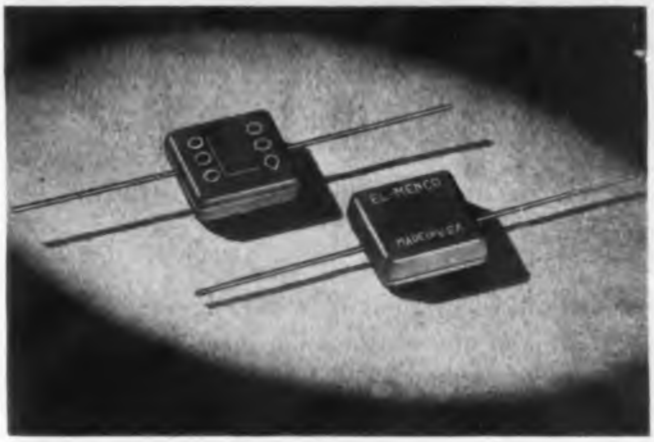


TODAY—

in a war torn world—El-Menco Capacitors are chosen by the Army and the Navy for their high quality—their ruggedness — their "fool-proof" superiority.

TOMORROW—

when Victory comes, they'll still be in there—improving, in their *small way*—the radio receiver of the future.



Our new Capacitor Catalogue for Manufacturers of Electronic Equipment is now ready for distribution. Send for it today, on your firm letterhead.

The ELECTRO MOTIVE MFG. CO.

WILLIMANTIC · · CONN.

ARMY E NAVY

Main line telegraph combination set as supplied to the Signal Corps in 1898

In 1898
FOOTE, PIERSON INSTRUMENTS WERE SERVING THE NATION

HERE WAS A VICTORY that brought cheer and encouragement to the home-front in the days of the Spanish-American War. Even then news travelled fast—by means of telegraph equipment which Foote, Pierson & Company built at that time for the Army Signal Corps.

Before the turn of the century, Foote, Pierson & Company also was experienced in the manufacture of telephone switchboards, fire alarm boxes and recorders, X-ray equipment and delicate scientific laboratory apparatus—all of which required a high degree of technical skill.

To this background of 48 years of extensive experience and fine craftsmanship have been added the type of personnel and facilities which have made possible the wartime mass production of close tolerance electronic and mechanical apparatus—without impairing our high standards of performance.

As tomorrow's progress is rooted in achievements long past, the history of Foote, Pierson & Company is assurance that our participation will facilitate the development and manufacture of *your* future electronic products.

FOOTE · PIERSON & CO · INC

MANUFACTURERS OF PRECISION INSTRUMENTS SINCE 1896

75 Hudson Street FP *Newark 4, N. J.*

Longer life and superior performance are distinguished characteristics of NORELCO Cathode Ray Tubes. These qualities are achieved by advanced production techniques—assured by perfect *scores* in 90 exacting tests of raw materials, parts, sub-assemblies, assemblies and performance.

One of the 90, the torsion test, which follows the immersion test, is illustrated above.

It is this precision, this relentless pursuit of perfection which has made North American Philips one of the leading producers of Cathode Ray Tubes. NORELCO power, transmitting and special-purpose tubes, quartz oscillator plates and communications equipment are doing wartime duty on land, on sea and in the air. And for those who carry this equipment on to Victory, every *okeh* on our inspection line is vital.

Tomorrow, these skills, the heritage of long years of world-wide experience in electrical applications, will be available for the development of peacetime industries.

For our war industries we now make Searchray (X-ray) apparatus for industrial and research applications; X-ray Diffraction Apparatus; Electronic Temperature Indicators; Direct Reading Frequency Meters; Electronic Measuring Instruments; High Frequency Heating Equipment; Tungsten and Molybdenum in powder, rod, wire and sheet form; Tungsten Alloys; Fine Wire of practically all drawable metals and alloys: bare, plated and enameled; Diamond Dies.

And for Victory we say: Buy More War Bonds.

Norelco

ELECTRONIC PRODUCTS by

NORTH AMERICAN PHILIPS COMPANY, INC.

Executive Offices: 100 East 42nd Street, New York 17, New York
Factories in Dobbs Ferry, New York; Mount Vernon, New York (Metalix Division); Lewiston, Maine (Elmet Division)

TO EXACTING LABORATORY STANDARDS . .

Quick and efficient comprehension of the production of laboratory equipment comes naturally to us of ECA. We're rich in the fundamental experiences arising from specialization in the development, design and manufacture of "tailored-to-order" radio and electronic equipment. Our facilities, geared to exacting laboratory standards, permit our engineers and technicians to approach a problem confident that the ultimate result will prove ultimately satisfactory.

An example of the work we do is the ECA Laboratory Oscillograph. This is a 7-inch, direct current, general purpose device built to provide features not ordinarily available in any commercial unit. This Oscillograph has seen continuous service in the ECA laboratory for more than a year, and it has been employed for such varied purposes as photographing transcient phenomena, measuring time delay circuits, checking the fidelity of mechanical recorders and oscillographs, and so on.

INVASION! *This is no time for complacency. It's still necessary to buy War Bonds . . . still necessary to save scrap metal . . . still necessary to be a regular patron of the Red Cross Blood Bank . . . to hasten Victory and save lives.*

eca

ELECTRONIC CORP. OF AMERICA

45 WEST 18th STREET • NEW YORK 11, N. Y. • WATKINS 9-1870

Taylor vulcanized fibre is TOUGH

Complete sets of track insulation for the various weights and types of rail are fabricated by Taylor to A.A.R. specifications. Taylor Fibre has high density. It will not flow under pressure. It has contributed to the success of the automatic block signal system. Taylor railroad track insulation includes everything necessary for complete rail joint insulation—end posts, bottom plates, washer plates, head plates, fish plates, bushings. Whatever your insulation problem may be, Take it to Taylor. Our engineers will be glad to study your blueprints and make recommendations, without obligation.

Tough as the hide of a "hippo," Taylor Vulcanized Fibre is amazing many a skeptical engineer with its ability to stand up under severe punishment.

Between thousands of rail joints, for example, are track-shaped sections of Taylor Vulcanized Fibre insulation. Under the pounding of giant locomotives and heavily-loaded cars that ceaselessly beat and flex the rails, Taylor insulation stands up better than any other material the railroads have ever tried.

Yes, Taylor Vulcanized Fibre is *TOUGH*. And its *quality* is remarkably dependable, too; for it's produced by the Verifibre Process—Taylor's name for quality-control. In the industry's most modern plant, every raw material is produced, checked, and verified under Taylor control and supervision.

If you have a problem that might be solved either by Vulcanized Fibre or Phenol Fibre, it will pay you to Take it to Taylor. Orders are now subject to WPB allocation.

TAYLOR FIBRE COMPANY

NORRISTOWN, PENNSYLVANIA • OFFICES IN PRINCIPAL CITIES
PACIFIC COAST HEADQUARTERS: 544 S. SAN PEDRO ST., LOS ANGELES
LAMINATED PLASTICS: VULCANIZED FIBRE • PHENOL FIBRE
SHEETS, RODS, TUBES, AND FABRICATED PARTS

THE MODEL 610-B

MEG-O-METER

A NEW BATTERY OPERATED
INSULATION TESTER!!

INSTANTLY INDICATES THE EXACT LEAKAGE OF ALL INSULATION FROM ZERO UP TO —

200 MEGOHMS

AT A TEST POTENTIAL OF

500 VOLTS D.C.

SUPPLIED BY A BUILT-IN BATTERY AND VIBRATOR POWER SUPPLY

The Model 610-B is ideal for either bench or field work. Operates on 2 self-contained batteries. NO EXTERNAL SOURCE OF CURRENT IS REQUIRED.

FEATURES:

★ **NO HAND CRANKING**—The 500 Volt Test Potential is made instantly available by throwing the front panel toggle switch.

★ **RESISTANCE RANGES**—In addition to the 0 to 200 Megohm Range which is used for Insulation Testing 2 additional lower resistance ranges are provided. The 2 lower resistance ranges are 0 to 20,000 Ohms and 0 to 2 Megohms

★ **METER MOVEMENT**—A 4½" 0 to 200 Microampere sensitive meter guarantees extremely accurate readings on all ranges.

★ **DIRECT READING**—All calibrations printed in large, easy-to-read type enabling exact determination of leakages from 0 to 200 Megohms. In addition, the Megohm scale is also subdivided into BAD (0 to 1 Megohm) DOUBTFUL (1 to 3 Megohms) GOOD (3 to 200 Megohms) sections. The BAD Section which indicates the danger point is printed in red.

Model 610-B comes housed in a beautiful, hand-rubbed Oak cabinet complete with cover, self-contained batteries, test leads and instructions. Size 9½" x 8½" x 6". Shipping weight, 16 pounds. **Price** **$62.50**

IMPORTANT: We also make the Model 610-E Meg-O-Meter which operates on 110 Volt 60 Cycle A.C. current. The Model 610-E is especially recommended for production testing where product must meet specified insulation requirements. Model 610-E provides exactly same services as the Model 610-B except that it operates on 110 Volt A.C. current instead of batteries. Price of Model 610-E complete is **$52.50**

THE NEW MODEL 590

VOLTAGE TESTER

Reads Like A Thermometer ! !

Automatically Indicates —

- Whether the voltage is 110, 220, 440 or 660 Volts.
- If the current is A.C. or D.C.
- If the appliance, motor, etc., connected in the line is "open".
- Which leg is "grounded".
- If the frequency is 25 or 60 cycles.
- If the fuse is "blown".
- When one side of an appliance or motor connected to the line under test is "grounded".
- Excessive leakage between a motor and a line.
- When a three phase motor is running erratically due to a "blown" fuse.

No meter, No switching, No tip jacks. To use: simply connect the needle pointed test prods across any line and this truly versatile instrument will instantly indicate the Voltage, frequency, type of Current, etc. Rugged, dependable and efficient, this amazing electric tester measures only 1¾" x 5" x 1⅝" and weighs only 5 ounces. Unlike most electrical testing instruments which necessarily require a great amount of care, the Model 590 is designed for "bang around" maintenance work, and yet due to the unique design it compares favorably in sensitivity with expensive metered instruments in that it draws less than 1 Milliampere of current.

MODEL 590 comes housed in a beautiful hand-rubbed, wooden cabinet. Panel is of etched steel. Shipping weight 2 pounds. Complete with instructions. ....Only **$5.85**

THE MODEL 560

INDUSTRIAL ANALYZER

MEASURES:

A. C. and D. C. VOLTAGES UP TO...1500 **VOLTS**
RESISTANCE UP TO...2500 **OHMS**
A.C. CURRENT UP TO . . . 30 **AMPERES.**

FEATURES:

★ COMPLETELY PORTABLE—NO EXTERNAL SOURCE OF CURRENT REQUIRED.
★ SAME VOLTAGE SCALE USED FOR BOTH A.C. AND D.C.
★ ALL CALIBRATIONS PRINTED DIRECTLY ON METER. NO COMPUTATION OR CHARTS.

SPECIFICATIONS:

5 A.C. AND D.C. VOLTAGE RANGES: 0 to 60/150/300/600/1500 Volts.
2 RESISTANCE RANGES: 0 to 250 Ohms. 0 to 2500 Ohms.
A.C. CURRENT: UP TO 30 AMPERES.

MODEL 560 INDUSTRIAL ANALYZER comes housed in a beautiful, hand-rubbed wooden cabinet complete with cover, self-contained battery, test leads and instructions. Size 8½" x 7" x 4¼". Shipping weight 7 pounds. ....Only **$28.50**

SUPERIOR INSTRUMENTS CO.

227-B FULTON ST. **NEW YORK 7, N. Y.**

FIRST IN THE "FIRSTS"

It takes a leader to initiate "firsts". Adding to an outstanding record as producers of the finest recording blanks, Audio has introduced many famous "firsts", which have filled distinct, useful needs in the recording industry: ***First*** **— with glass base recording discs of absolutely correct strength-to-weight ratio, to replace and equal in satisfaction war-restricted aluminum blanks.*** ***First*** **— with engineered thread action to facilitate effective control, no matter what the system of thread handling.** ***First*** **— with non-chipping fibre insert; also three drive-pin holes which eliminates weakening the glass structure by extra drilling.** ***First*** **— with an exclusive coating formula also process assuring a truly flawless surface, and free from all imperfections.** The same engineering skill and care which have made Audiodiscs the standard, will, in the future, produce further Audio "firsts", as a matter of course.

Audio Devices, 444 Madison Ave., New York 22, N.Y.

audiodiscs

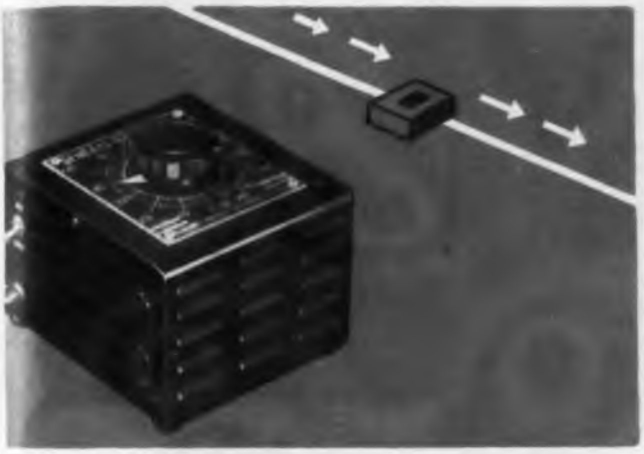
they speak for themselves

*As critical restrictions are lifted, there will be more aluminum discs available for professional recording.

Electronic Industries, March, 1944

ACHIEVE THE "IMPOSSIBLE"

Smooth Power Control
AT THE TURN OF A KNOB

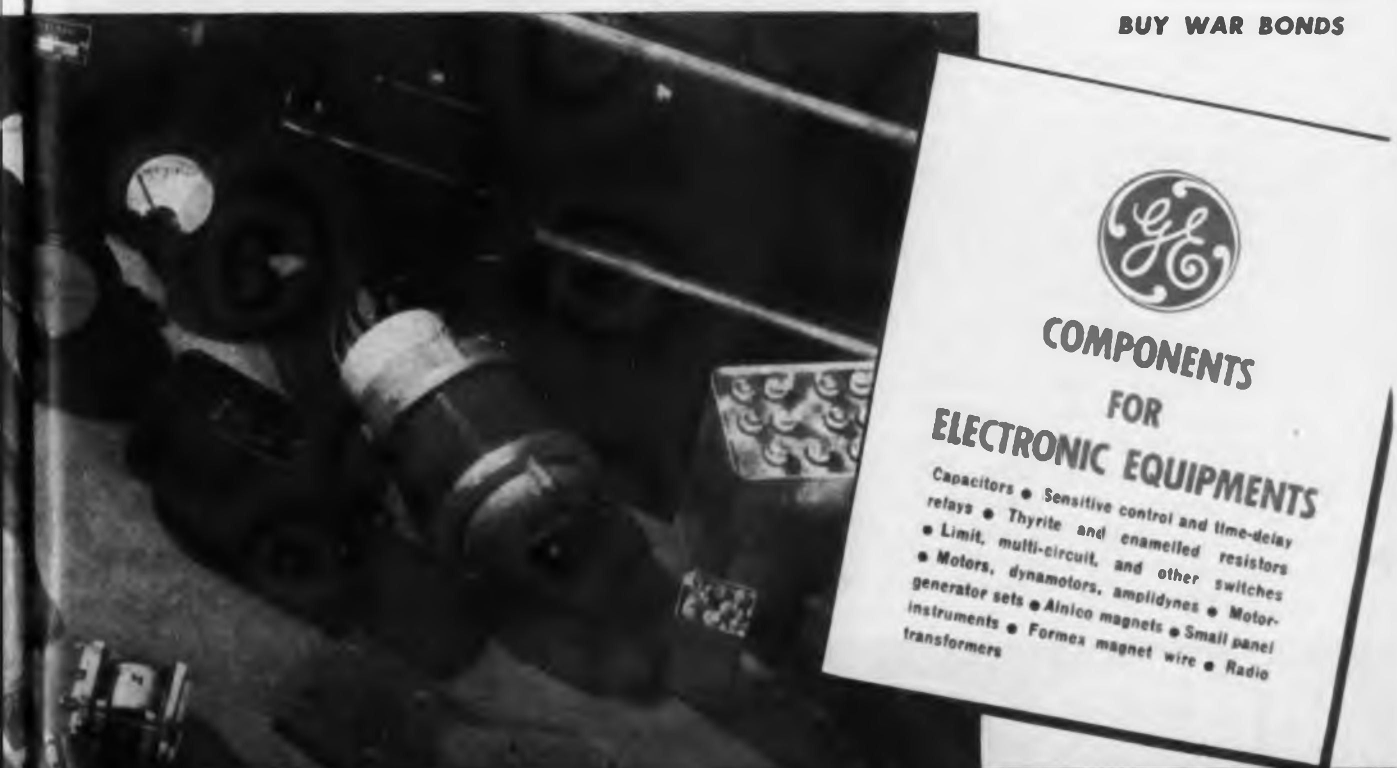


VARIABLE-VOLTAGE AUTOTRANSFORMER used for smooth control of uninterrupted voltage and small amounts of power. Mechanically strong, compact, and light in weight, designed for panel or bench mounting. Operates on low input power and low exciting current, with high efficiency and excellent regulation throughout entire range from zero to full load. Made in three capacities. Bulletin GEA-3635A.

Constant Output Voltage...
FROM VARYING INPUT

AUTOMATIC VOLTAGE STABILIZER used in conjunction with equipment requiring closely regulated input voltage. Provides practically instantaneous correction of voltage changes caused by either a changing input voltage or variation in magnitude of the load. Has no moving parts, requires no adjustments. Bulletin GEA-3634A.

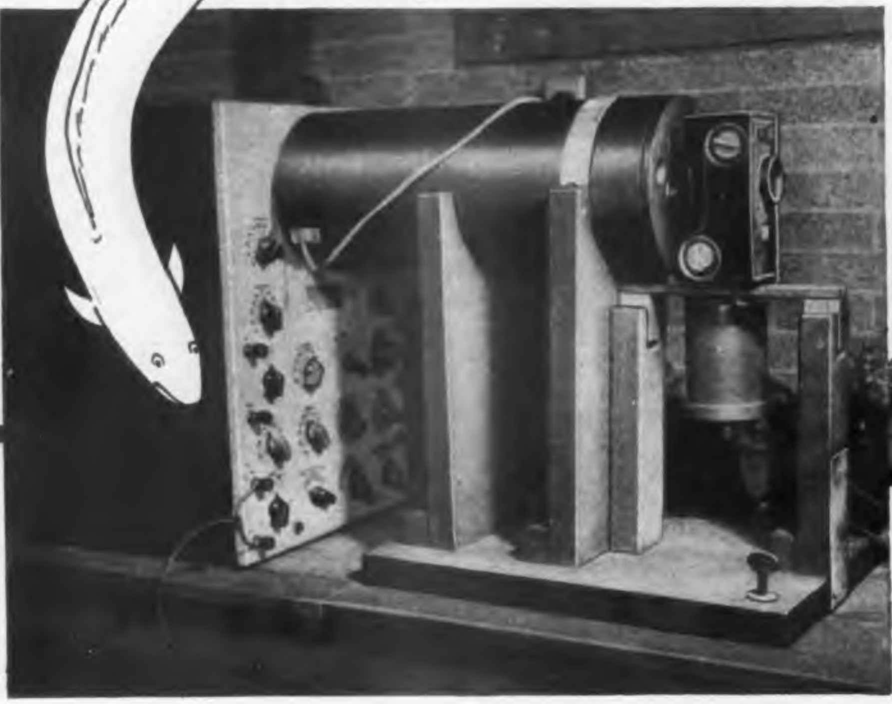
BUY WAR BONDS



GENERAL ELECTRIC

The DuMONT OSCILLOGRAPH solves the riddle...

Why the electric eel?



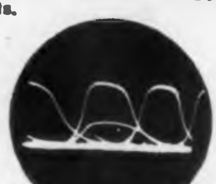
Man is stunned – sometimes killed. Fish are paralyzed at 20 feet. The electric eel even develops eye cataracts from its own shocks. But just how masses of nerve cells in that seven-foot body can generate such powerful electric discharges, has long posed a riddle for scientists. There have been many guesses as to voltage, amperage, duration, frequency. But nothing specific.

It has remained for Dr. C. W. Coates of the New York Aquarium staff, assisted by several scientists and physicists, to apply cathode-ray technique to this riddle. The electric eel now stands stripped of its operational secrets. Duly recorded are voltages as high as 600 – above 500 common; discharges in trains of three or more; both major and minor discharges; average time interval between discharges as short as .002 second. These and other established details are now found in several published papers.

Dr. Coates places the eel in a wooden trough (note rubber gloves!). Sliding electrode strips establish contact along body. A DuMont Type 175-A oscillograph, especially suitable for transient studies, together with solenoid-operated single-frame movie camera, records recurrent discharges.

Just another case history of DuMont cathode-ray equipment engaged in solving scientific, engineering or industrial riddles. Write for literature.

Voltage-time oscillogram of anterior segment of electric eel. Electrodes at anterior end of large organ and 10 cm. behind. Length of horizontal base corresponds to 5 milli-seconds. Peak is about 100 volts.



Voltage-time oscillogram of posterior segment. Electrodes 40 cm. and 70 cm. from anterior end of large organ. Scale same as above. Discharge of lower voltage is of the intermediate type.

DUMONT *Precision Electronics & Television*

ALLEN B. DU MONT LABORATORIES, INC., PASSAIC, NEW JERSEY • CABLE ADDRESS: WESPEXLIN, NEW YORK

What Price Pilots?

Uncle Sam takes a new recruit of top-notch physical and mental ability, and makes a combat pilot of him in two years, at a cost of $30,000.

Trained and equipped* to perfection, he will be a sure-fire success as a fighting man. But what about the day his combat job is finished — can we be as certain that he will come back to a nation of opportunity and prosperity?

Regular, substantial investment in war bonds is a double-edged sword that helps fight the war and assures a prosperous postwar economy. It is your duty and ours to encourage those who work with and for us to invest regularly and substantially . . . for everybody's future.

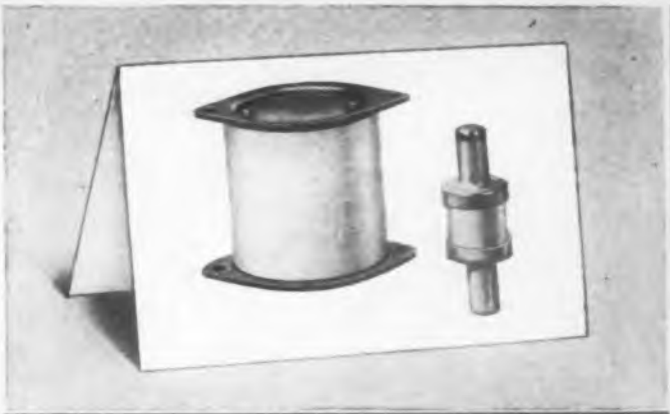
ARMY E NAVY

* Among our contributions to his equipment are communications equipment and aircraft ignition components. Connecticut Telephone and Electric Division employees are over 99% pledged to regular payroll deductions on an average of 15% of their incomes.

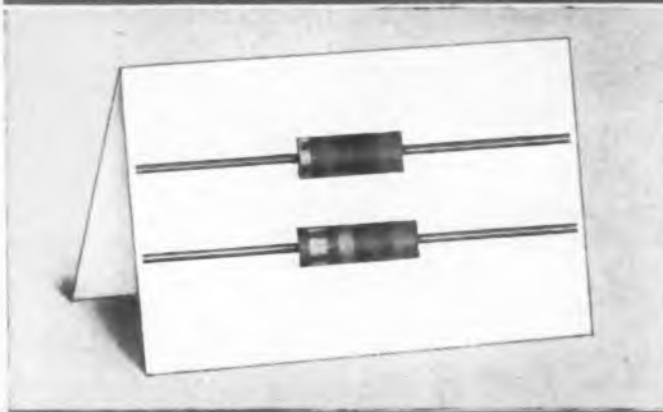
CONNECTICUT TELEPHONE & ELECTRIC DIVISION

GREAT AMERICAN INDUSTRIES

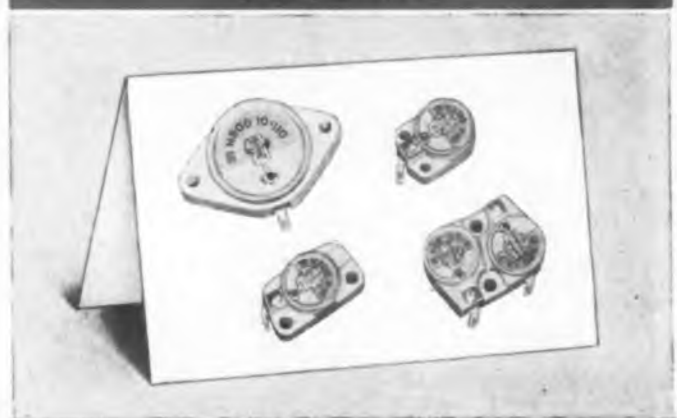
MERIDEN **CONNECTICUT**



HIGH VOLTAGE TRANSMITTING CERAMICON — DOUBLE CUP CERAMICON



ERIE RESISTORS



CERAMICON TRIMMERS

ERIE SUPPRESSORS

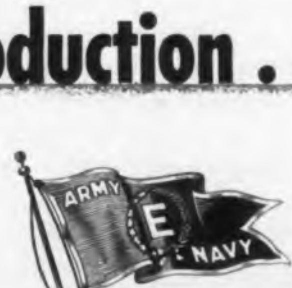
ELECTRONIC

by Erie

Development . .

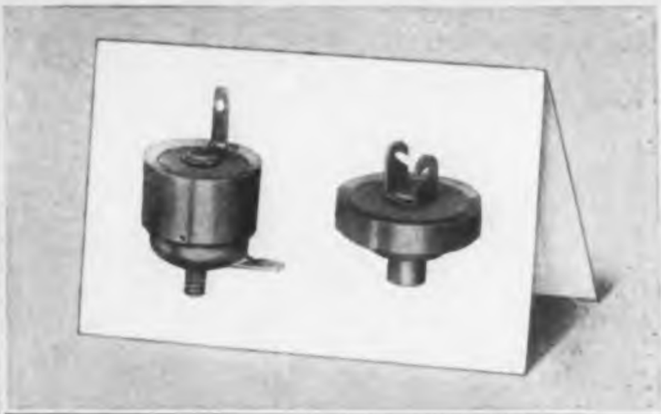
Engineering . . .

Production . . .

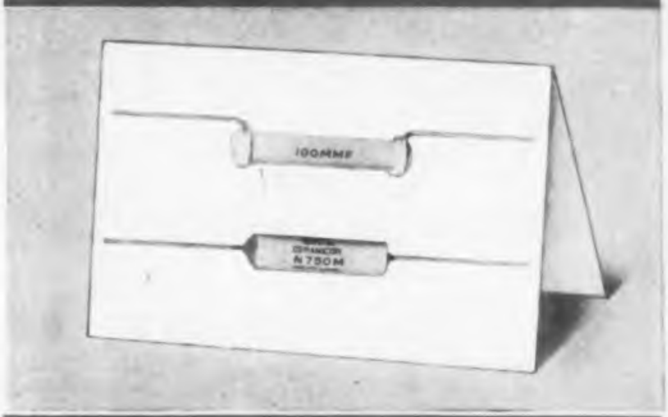


ERIE RESISTOR CORPORATION

COMPONENTS
Resistor


DISC CERAMICONS

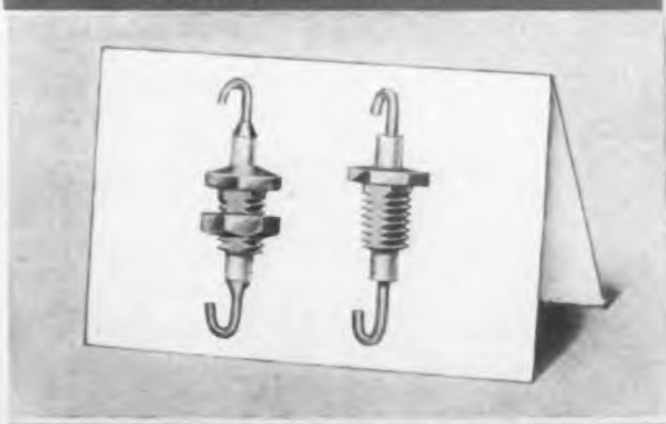
Erie Resistor has made many contributions to the progress of the Electronic Industry through the development of accurate, dependable components. In 1933, Erie Resistor introduced the first insulated ½ and 1 watt carbon resistors. Three years later, Erie Ceramicons, a new type of silvered ceramic condenser, with definite reproducable temperature characteristics, were made available for American radios. The continued development of this basic principal of construction has kept pace with industry's requirements, with Ceramicon Trimmers and high-voltage transmitting Ceramicons. For V.H.F. and U.H.F. applications, where low series inductance is essential, Erie Resistor developed Button Silver Mica Condensers and Disc Ceramicons.


CERAMICONS

Behind these developments are the Erie Resistor Engineers who have also designed most of the automatic machinery and other production equipment necessary for the economical manufacture of Erie components. These men have the theoretical knowledge and practical experience necessary for the design of new types of components for F.M. and Television. Electric equipment manufacturers are invited to consult with the Erie Resistor engineering department on their condenser and resistor design problems.


ERIE BUTTON SILVER MICAS

The facilities for producing Erie Resistors, Suppressors, and Condensers have been more than doubled to take care of wartime needs. The Army-Navy "E" Flag, which flies over the four Erie Resistor plants in Erie, is a tribute to Erie Resistor employees' all-out effort for war production.


FEED-THRU CERAMICONS

Let's All Back The Attack
BUY WAR BONDS

· · · ERIE, PENNSYLVANIA · · ·

with AMERTRAN WS and WSB FILAMENT TRANSFORMERS

The ingenious terminal arrangement of AmerTran "WS" and "WSB" transformers eliminates exposed secondary leads to the transmitter rectifier filament. The tube socket is integral with the transformer body and (in the "WSB") the center tap is brought out through the ceramic base.

Rugged, moisture-proofed and insulated well above standard requirements (the test voltage is two and a half times their rated d.c. operating voltage), many of these transformers are being used in ratings formerly restricted to oil-immersed apparatus.

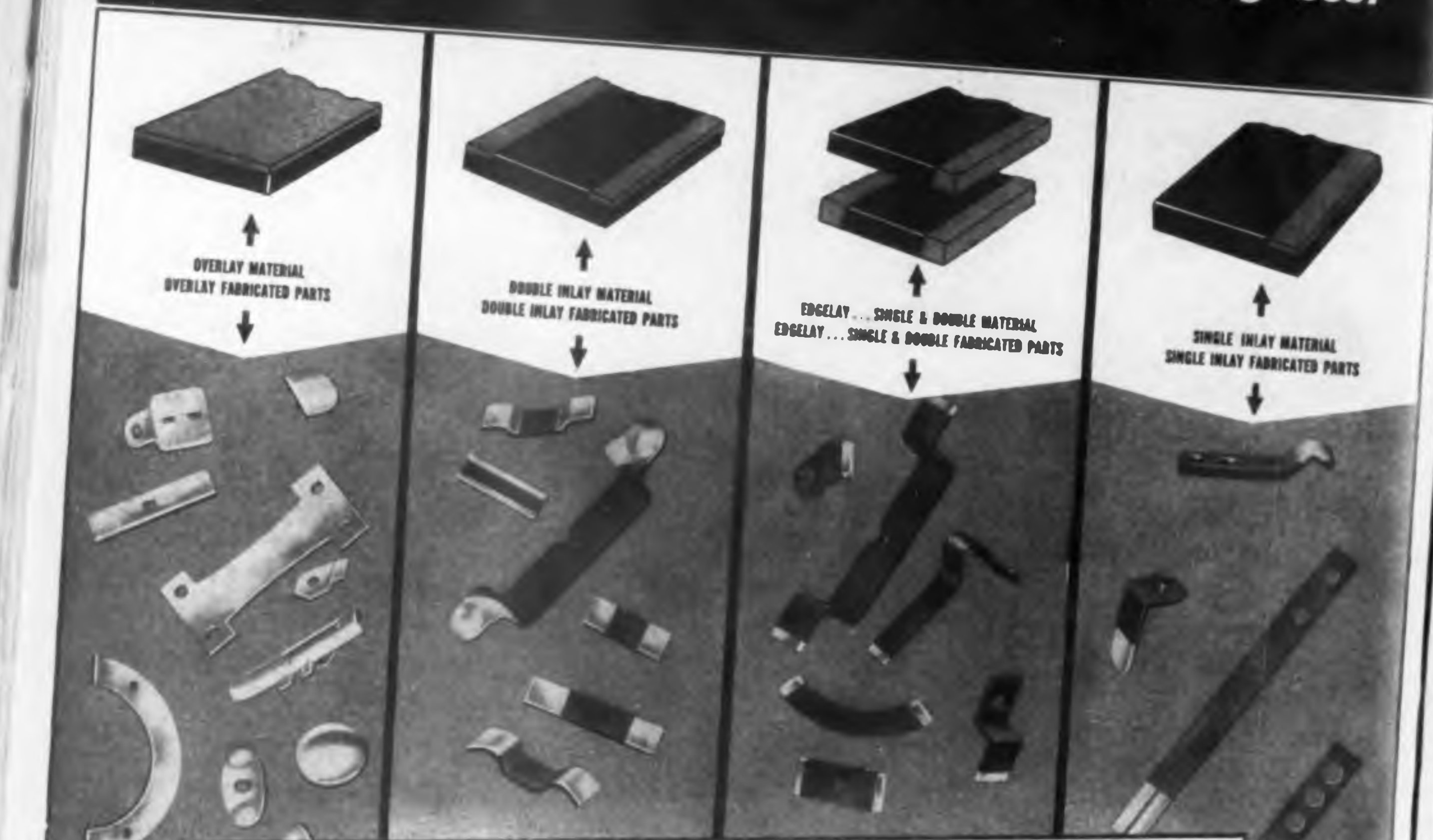
Among their features are completely enclosed windings, compound filled, full electrostatic shields and primary taps arranged to permit close control of secondary voltage. Complete information covering "WS" and "WSB" Filament Transformers will be furnished upon request. Ask for catalog 14-5.

AMERICAN TRANSFORMER COMPANY
178 EMMET STREET **NEWARK 5, N. J.**

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

AMERTRAN

4 Ways to Use
GENERAL PLATE LAMINATED SILVER
For Improving Contact Performance and Reducing Cost



The enormous advantage of General Plate Laminated Contacts is that they give you solid silver performance at a fraction of the silver cost. Why . . . because General Plate permanently bonds a thin layer of silver on a suitable inexpensive base metal, thus providing a silver contact face of high electrical conductivity at the *point of actual contact*. This eliminates costly solid silver contact assemblies, yet assures dependable electrical performance.

In addition to economy, the laminating process makes the silver contact surface harder, thereby assuring long contact life. The base metal adds strength and workability, and at the same time makes spot welding or soldering more practical. The fabricated assemblies, illustrated, show typical contacts made from General Plate Laminated Contact Metals.

If you have a contact problem, investigate General Plate Laminated Metals. They are available in sheet and stripe ready to be made into contacts . . . or as complete fabricated assemblies ready for installation. Write for complete information and catalog.

GENERAL PLATE DIVISION

of Metals & Controls Corporation

ATTLEBORO, MASSACHUSETTS

Metals and Controls Corporation Divisions manufacture the following products: Laminated & Solid Precious Metals Electrical Contacts Solid and Rolled Plated Precious Metals in all forms — Truflex Thermostat Metals.

hidden within ½" copper walls..yet x-ray seeing is ~~believing~~ knowing

Here is a typical application of non-destructive X-Ray inspection to the kind of tough problem which *it alone* can solve satisfactorily. An extremely complex grid-filament structure hidden deep within heavy copper tube walls . . . yet X-Ray demonstrates, with precision, certainty and speed, any error in alignment and sealing of elements, broken connections or any of dozens of other faults which could otherwise escape detection until too late. Moreover, in doing all this, industrial radiography provides a permanent, visible check record at a cost well in line with routine production inspection.

industrial PICKER x-ray **sets the pace in x-ray**

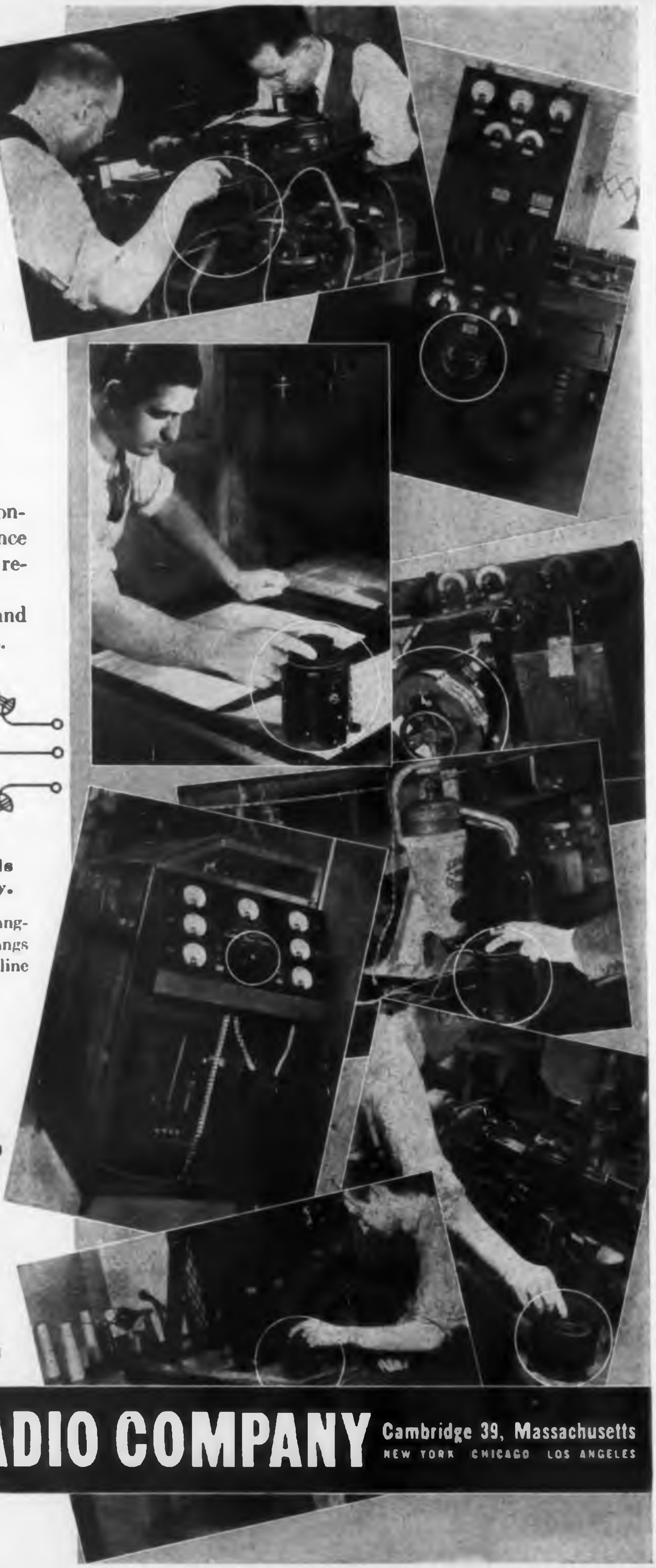
The radiographic inspection operation described here is one of many being conducted routinely in electronic tube plants, and employing Picker 150 KV X-Ray Units, either stationary or mobile. Picker builds industrial X-Ray equipment in many models and capacities for every phase of industrial x-ray . . . radiography, fluoroscopy, and diffraction.

Branches in principal cities throughout the country. A Picker engineer near at hand will always be glad to discuss with you the application of x-ray to your own inspection problems.

PICKER X-RAY corporation
300 FOURTH AVENUE • NEW YORK 10, N. Y.
WAITE MANUFACTURING DIVISION, CLEVELAND, OHIO

USE VARIACS*

for Efficient Voltage Control



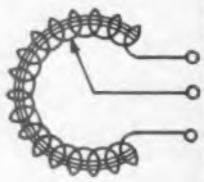
Hundreds of thousands of Variacs are used to control motor speed, heat, light and power, and to compensate for under-voltage or over-voltage lines.

Variacs have **● LOW LOSSES**
● GOOD REGULATION
● SMALL SIZE
● LINEAR VOLTAGE ADJUSTMENT

These features, plus General Radio quality construction are the reasons for the wide acceptance of the Variac wherever variable a-c voltage is required.

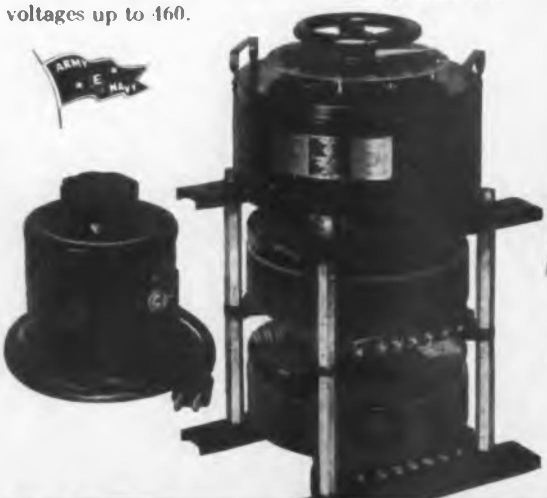
Variacs are more efficient, more economical, and more convenient to use than resistive controls.

The Variac is an autotransformer with a toroidally shaped winding. As the control dial is rotated, a carbon brush traverses the winding, turn by turn. The brush position at any setting determines the output voltage, which is read directly from the dial.



Bulletin No. 860 describes current models of the Variac. Write for your copy today.

Variacs are available for 60-cycle service in 9 models ranging from 170 va to 7 kva. They can be assembled in gangs for 3-phase operation in power ratings up to 25 kva for line voltages up to 460.



GENERAL RADIO COMPANY Cambridge 39, Massachusetts
NEW YORK CHICAGO LOS ANGELES

*The name *Variac* is a registered trade mark of the General Radio Company. The Variac is manufactured and sold under U. S. Patent No. 2,009,013.

For Operating
110-Volt A.C.
Equipment
from
110-Volt D.C.
Power Source

THE E·L MODEL 262

TYPICAL APPLICATIONS OF MODEL 262

***The operation of*— Radio Receivers • Radio Transmitters • Public Address Systems • Radio-Phonographs • Inter-Office Communication Systems • Sewing Machines • Electric Fans • Office Equipment • Electric Trains**

■ This unit was designed for, and has met, the severe demands of wartime service for the operation of 110-volt A.C. radios, on land and sea, with complete success. It is engineered to eliminate R.F. noise over a frequency band from 550 kilocycles to 20 megacycles, and will operate satisfactorily under wide extremes of temperature and humidity. Further information on this and other *E·L* Vibrator Power Supplies will be gladly supplied on request.

Electronic
LABORATORIES, INC.
INDIANAPOLIS

E·L MODEL 262 SPECIFICATIONS AND PERFORMANCE DATA

LOAD POWER FACTOR: 85% to 100%
INPUT: 110 volts D.C.
OUTPUT: 110 volts A.C.
OUTPUT POWER: 250 volt-amperes
FREQUENCY: 60 cycles
EFFICIENCY: 85% at rated load
REGULATION: 15% approximately
TEMPERATURE RISE: 50 degrees F.
HUMIDITY: Will operate under any degree of humidity up to 95%
VIBRATION: Unit is built to withstand severe shock and sudden jar
SIZE: Length, 10¾"; width, 9 7/32"; height, 8 5/32"; weight, 28½ pounds

OTHER E·L 110-VOLT MODELS

Model	Watt Rating	Load Power Factor
267	2–5 Watts	High
261	5–75 Watts	High
204	50–150 Watts	High
262	250 Watts	High
260	250 Watts	Low
263	400 Watts	Low
264	500 Watts	High
268	750 Watts	Low
269	1500 Watts	Low

TEAM MATES

THAT MAKE ELECTRONS "GO TO TOWN"

HERE are two partners that have taken the "impossible" out of hundreds of wartime control problems. One is the electronic tube in its infinite variety of types and applications. The other is Automatic Electric control apparatus—the relays, stepping switches and other devices which serve as "muscles" for the miracles of electronic science. Together, they are helping to speed new electronic ideas through the laboratory and put them to practical use on the production line and on the fighting fronts.

Automatic Electric field engineers are working daily with the makers of electronic devices of every kind, offering time-saving suggestions for the selection of the right control apparatus for each job, and extending the benefit of the technique which comes from fifty years of experience in electrical control applications.

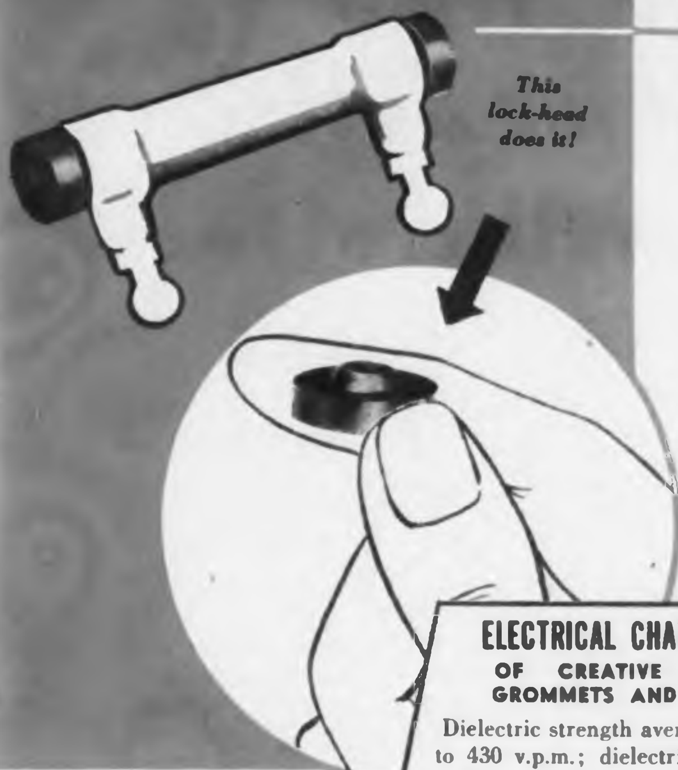
Let us pool our knowledge with yours. First step is to get a copy of the Automatic Electric catalog on control devices. Then, if you would like competent help in selecting the right combination for your needs, call in our field engineer. His recommendations will save you time and money.

Relays
AND OTHER CONTROL DEVICES
by AUTOMATIC ELECTRIC

AUTOMATIC ELECTRIC SALES CORPORATION
1033 West Van Buren Street
Chicago 7, Illinois
In Canada: Automatic Electric (Canada) Limited, Toronto

MUSCLES FOR THE MIRACLES OF ELECTRONICS

CREATIVE SPEEDS PRODUCTION



NEW! DESIGNED BY CREATIVE!

"CROWN-FIT" PHENOLIC RESISTOR BUSHINGS

ASSURE TIGHT, *PERFECTLY CENTERED* MOUNTING!

Again Creative helps you speed assembly. Creative's "Crown-fit" phenolic bushings are engineered to seat perfectly in center holes of 10 and 20 watt resistors. They lock in instantly, and stay put. For use with No. 6 or No. 8 bolts.

ELECTRICAL CHARACTERISTICS
OF CREATIVE PHENOLIC GROMMETS AND BUSHINGS

Dielectric strength averages about 260 to 430 v.p.m.; dielectric constant 5.5 to 7.4; power factor at 10 cycles .02 to .05. Water absorption is unusually low at only .5% in 24 hour test.

Creative's Gear-Collar

PHENOLIC GROMMETS
SPEED ASSEMBLY

NOW AVAILABLE IN 2 NEW SIZES! You can now get Creative gear-collar grommets to fit clearance holes for 3/8″ and 13/32″ wire. Special sizes up to 1 1/32″ wire clearance made on order—in quantities of 10,000 or more; no molds required. Any quantity available from stock in 6 standard sizes for practically every type of panel or electrical mounting.

Have you checked Creative's
CUSTOM PLASTIC FABRICATION —*without molds?*

SEND FOR SAMPLES and detailed literature

CREATIVE PLASTICS CORP.
968 KENT AVE., BROOKLYN 5, N. Y.

BLILEY CRYSTALS
RIDE WITH THE SCR-299
Built by hallicrafters

ONE of the outstanding achievements in wartime radio transmitter design is the SCR-299. Serving equally well as a mobile or stationary radio station, this now famous equipment is doing a real job on our battle fronts.

This war is run by radio. The vital importance of maintaining reliable communications necessitates the selection of quartz crystal units that are accurate and dependable. Bliley Crystals are engineered for service . . . they are used in all branches of military communications and are, of course, supplied for the SCR-299.

BACK THE ATTACK WITH WAR BONDS

BLILEY ELECTRIC CO., ERIE, PA.

SELENIUM INSTRUMENT AND RELAY RECTIFIERS

Instrument Rectifier DS

Instrument Rectifier DL

Instrument Rectifier H-SM

Instrument Rectifier N-2

Instrument Rectifier HS

Instrument Rectifier HL

Instrument Rectifier BS

Instrument Rectifier HS-20

SELENIUM RECTIFIERS

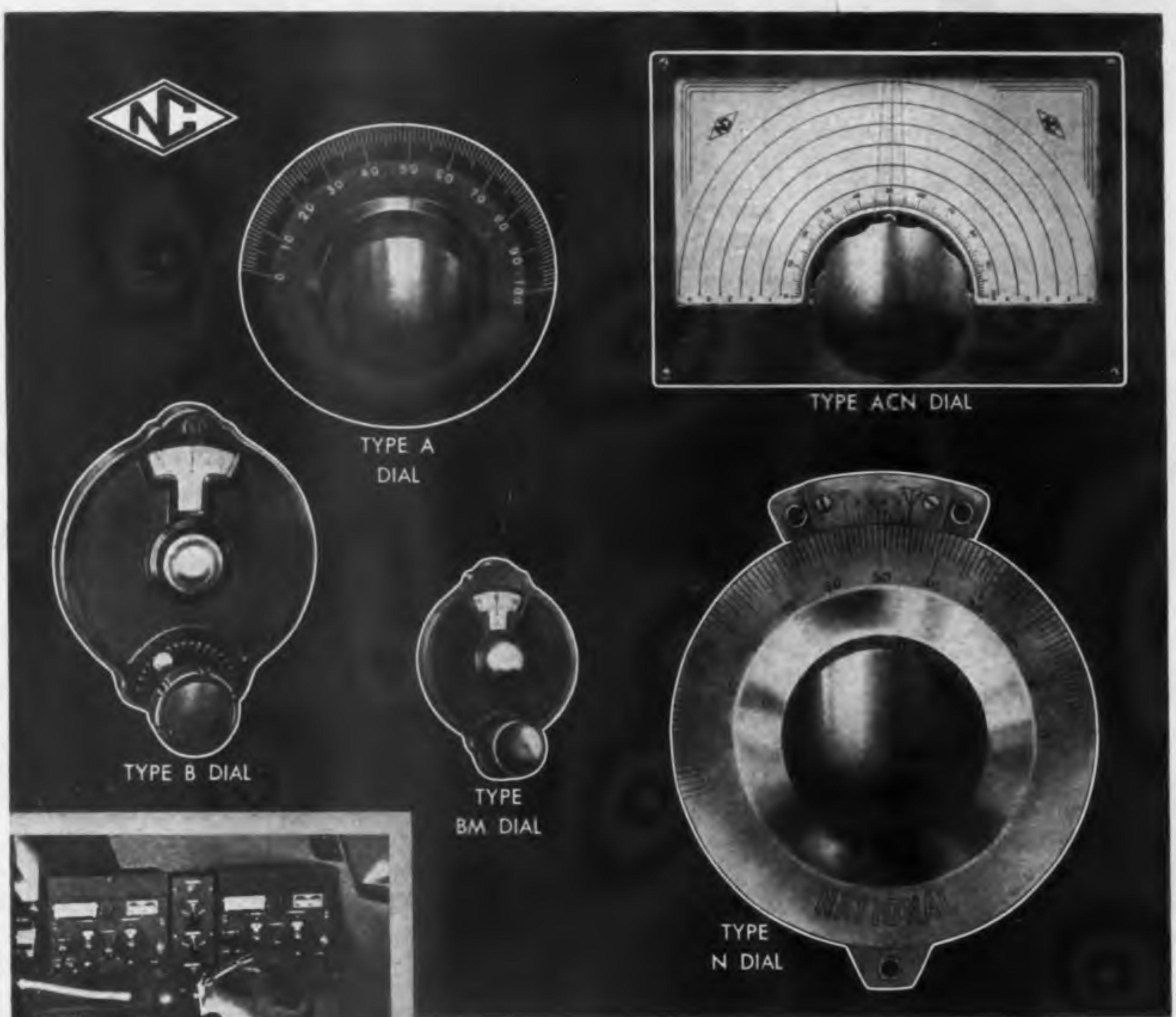
are rapidly becoming standard throughout American industry, with today's engineers counting on the Selenium Corporation for the most complete line of rectifiers. Selenium Rectifiers have permanent characteristics with a temperature range from −50°C to + 75°C; unlimited life, maximum efficiency per unit wt., and are weather resistant. Special types are available.

WRITE ON YOUR LETTERHEAD FOR LITERATURE

SELENIUM CORPORATION of AMERICA

Emby Selenium Instrument Rectifiers • Emby Selenium Self-Generating Photo Cells
Selco Selenium Power Rectifiers

1800-1804 West Pico Boulevard, Los Angeles 6, California • *Eastern Sales Division* 215-05 27th Ave., Bayside, L. I., Telephone: Bayside 9-8958 • *Canadian Sales Division:* J. R. Longstaffe, Ltd., 349 Carlaw, Toronto, Canada



The photograph immediately above shows an installation inside a Pan-American Clipper. National Dials have been a favorite with Pan-American Airways for many years.

TYPE N DIAL—Four-inch diameter with engine divided scale and flush vernier. 5 to 1 ratio.

TYPE ACN DIAL—Designed for direct calibration. Dial bezel size 5" x 7¼".

TYPE B DIAL—Compact, variable-ratio drive inclosed in bakelite case. Illuminator available.

TYPE BM DIAL—Similar to Type B, but smaller in size and having a fixed ratio.

TYPE A DIAL—The Original Velvet Vernier Dial, an unchallenged favorite for twenty years.

ACCURACY
—and VELVET DRIVE

In War as in Peace, National Dials provide the smooth effortless control that makes the operator master of his equipment. Enormous increases in our productive capacity are meeting war-time demands, and National Dials are available with reasonably prompt delivery to users having the necessary priority.

NATIONAL COMPANY, INC.

MALDEN, MASS.

McElroy... and nobody else

Whenever you see the McElroy name on a piece of equipment... that's McElroy and nobody else. We never imitate... never copy. We create... design... build... and deliver. One of our most notable achievements is the *new* XTR-442 BM Automatic Transmitter— an essential where transmission must be regulated to a given number of words per minute. The new XTR-442 BM comprises two units.

Keying Unit which consists of the McElroy keying head coupled to a newly designed drive. The speed of the keying head is instantly adjustable at any rate from 10 to 200 words per minute. At any given setting, the rate cannot vary because of the constant speed motor

Electronic Unit which responds to the keying head to produce either tone for keying a radiotelegraph transmitter, or to key a transmitter with a heavy-duty pivotless relay. The tone can be impressed on a radiofrequency carrier current, sent to a remote transmitting station, filtered and used to operate a transmitter without requiring relay action. The heavy-duty relay in this unit may also be used to break the actuating current to a relay in a radiotelegraph transmitter.

BLOOD IS AMMUNITION . . . GIVE A PINT TO THE RED CROSS TODAY

F YOU HAVE A PROBLEM IN
RADIO TELEGRAPHY OR AN
CATION INCORPORATING PRESENT OR
ELECTRONIC DESIGN, WE WOULD LIKE TO WORK WITH Y

McElroy MANUFACTURING CORP.
82 BROOKLINE AVE. BOSTON, MASS.

WORLD'S LARGEST MANUFACTURER OF AUTOMATIC RADIO TELEGRAPH APPARATUS

Accurately MAINTAINED CAPACITANCE

over temperature range between

−40° C. to +70° C.

Type K compensating capacitors are supplied only in low-loss (yellow) XM bakelite cases. Sealed for immersion.

Available in limited range of capacitances and voltage ratings as listed in latest catalog.

Obtainable in any temperature co-efficient from −.005% to +.005% per degree C. over temperature range from −40° C. to +70° C.

Standard tolerance is plus/minus 5%. Closer tolerances obtainable at extra cost. Minimum tolerance available is plus/minus 2% or 2 mmf., whichever is greater.

Can be used to correct normally positive temperature co-efficient of inductances for maintenance of constant L-C products (resonant frequency) of tuned circuits independent of temperature.

● Zero temperature co-efficient capacitors can be used wherever a capac*itance independent of temperature* is required. Furthermore, since Aerovox Type K compensating capacitors are also available in any temperature co-efficient from −.005% to +.005% per degree C., various circuits can be developed or refined to utilize the negative, zero or positive temperature co-efficients of such compensating capacitance. Examples:

One suggested application is as a shunt for the measurement of r.f. currents with a vacuum-tube voltmeter as the indicating instrument.

Compensating capacitors may be used in radio range beacons where it is essential to maintain uniform currents both in magnitude and phase relationship simultaneously in several circuits, regardless of wide temperature changes.

By the use of compensating capacitors it is feasible to obtain oscillator frequency stability comparable with that obtained from quartz crystals, and with marked economies in weight, space, cost.

Therefore, when you face the problem of maintaining constant operational characteristics despite temperature variations, just specify Aerovox Type K compensating capacitors.

● ***WRITE FOR LITERATURE...***

Aerovox Type K compensating capacitor curves, technical details and listings, are included in the new Aerovox Capacitor Manual. Write on your business stationery, for your copy.

AEROVOX *Capacitors*

INDIVIDUALLY TESTED

AEROVOX CORPORATION, NEW BEDFORD, MASS., U. S. A. • SALES OFFICES IN ALL PRINCIPAL CITIES
Export: 100 VARICK ST., N. Y. C. • Cable 'ARLAB' • In Canada: AEROVOX CANADA LTD., HAMILTON, ONT.

On war and production fronts 'round the world Radiotone IMPROVES MORALE

Official U. S. Marine Corps Photo

Radiotone installation at Consolidated Steel Company's Wilmington Shipyards

RADIO • RECORDING PUBLIC ADDRESS

Radiotone is giving outstanding performance in hundreds of industrial plants, arsenals, shipyards and on far-flung battle fronts. Because it is versatile, compact and rugged, it serves workers and fighters equally well.

Radiotone is a complete broadcasting system. It assures the finest radio reception . . . records voice, orchestra or radio programs ready for instant reproduction . . . permanently records management messages and directors' meetings . . . and can be equipped with any number of loud speakers or used in conjunction with your present P. A. system.

Radiotone is a convenient, portable instrument which requires no studio facilities. Anyone can operate it. Anyone engaged in essential war work can buy Radiotone TODAY.

DEALERS CAN PARTICIPATE NOW!

Write for catalog No. R-200 and complete details covering Radiotone models, microphones, speakers, needles and discs.

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Division of
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KEEP SENDING THOSE LETTERS!

"Bill Halligan says that all the contest entries he's received so far have been *swell*—he wants *more* letters tellin' about actual experiences with *all* types of Radio Communications equipment built by Hallicrafters including the SCR-299!"

RULES FOR THE CONTEST

Hallicrafters will give $100.00 for the best letter received during each of the five months of November, December, January, February and March. (Deadline: Midnite, the last day of each month.)

For every serious letter received Hallicrafters will send $1.00 so even if you do not win a big prize your time will not be in vain.

Your letter will become the property of Hallicrafters and they will have the right to reproduce it in a Hallicrafters advertisement. Write as many letters as you wish. V-Mail letters will do.

MILITARY REGULATIONS PROHIBIT THE PUBLICATION OF WINNERS' NAMES AND PHOTOS AT PRESENT... MONTHLY WINNERS WILL BE NOTIFIED IMMEDIATELY UPON JUDGING.

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THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

SIMPLICITY OF APPLICATION

. . . and High Degree of Vibration Isolation are Basic Features of ➡ ➡ ➡

LORD
BONDED RUBBER
Shear Type
MOUNTINGS

MILLIONS of Lord Mountings are in use today, providing protection against the harmful effects of shock and vibration on all types of industrial, military, and naval equipment, from light, delicate instruments to heavy, massive machinery.

Providing such protection in modern equipment designs may well be termed "Protective Engineering". To engineers confronted with a problem of vibration control, Lord offers a wide variety of bonded rubber, shear type mountings from the standpoint of function, size, shape, load ratings, and methods of application.

The accompanying photographs show Lord Plate Form Holder Type Mountings being used to float electric generators within the transmitter housing of a marine radio unit manufactured by Federal Telephone and Radio Corporation, at Newark, New Jersey. Simplicity of application is well illustrated. The generators weigh 110 pounds each, and the mountings serve to isolate component equipment from any disturbing forces emanating from this source.

Through proper mounting selection, isolation efficiencies ranging from 75% to 85% reduction of disturbing forces may be expected, although reductions up to 97% are not unusual in equipment operating at very high frequencies. The remarkable efficiency of Lord Mountings is due to the accuracy, precision, and uniform quality of manufacture.

Lord Mountings are made in two main types, Plate Form and Tube Form, with variations to suit special conditions. Load ratings of standard sizes range from a few ounces to 1500 pounds. They absorb shock, control vibration, and minimize all noise transmitted through solid conduction.

For complete information covering all Lord Mountings, as well as engineering discussion on vibration control, write for Bulletins 103 and 104, or call in a Lord Vibration Engineer for consultation on your vibration problems. There is no obligation.

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ERIE, PENNSYLVANIA

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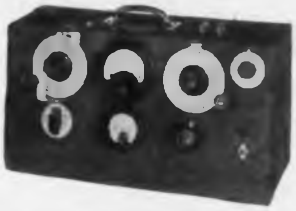
You can depend upon these DIRECT READING

INSTRUMENTS

in development, research, design and production of radio and allied equipment

Q-METER

TYPE 160-A



Frequency Range: 50kc. to 75mc. may be extended with external oscillator down to 1 kc.

Range of Q Measurements, Coils: 50 to 625.

Accuracy: In general ± 5%

Range of Q Tuning Condenser: 30-450 mmf. (Vernier Condenser: ± 3 mmf.)

Q-METER

TYPE 170-A

Frequency Range: 30mc. to 200 mc.

Range of Q Measurements, Coils: 100-1200

Accuracy: In general ± 10%

Range of Q Tuning Condenser: 10-60 mmf.

QX CHECKER

TYPE 110-A

The factory counterpart of the Q-Meter. Compares fundamental characteristics of inductance or capacitance and Q under production line conditions with a high degree of accuracy, yet quickly and simply. Insures uniform parts held within close tolerances. Frequency range 100 kc. to 25 mc.

FREQUENCY MODULATED SIGNAL GENERATOR

TYPE 150 SERIES

Type 150 A—Frequency 41-50 mc. and 1-10 mc.

Type 151 A—Frequency 30-40 mc. and 1-9 mc.

Type 152 A—Frequency 20-28 mc. and 0.5-5 mc.

Type 154 A—Frequency 27-39 mc. and 1-7 mc.

Developed specifically for use in design of F.M. equipment. Frequency and Amplitude Modulation available separately or simultaneously.

BEAT FREQUENCY GENERATOR

TYPE 140-A

A single compact Instrument which provides wide frequency and voltage coverage of generated signals.

Frequency Range: 20 cycles to 5 mc. in two frequency ranges.

Output Voltage Range: 1 millivolt to 32 volts.

Accuracy: ± 3%.

Output Power: One watt into external load.

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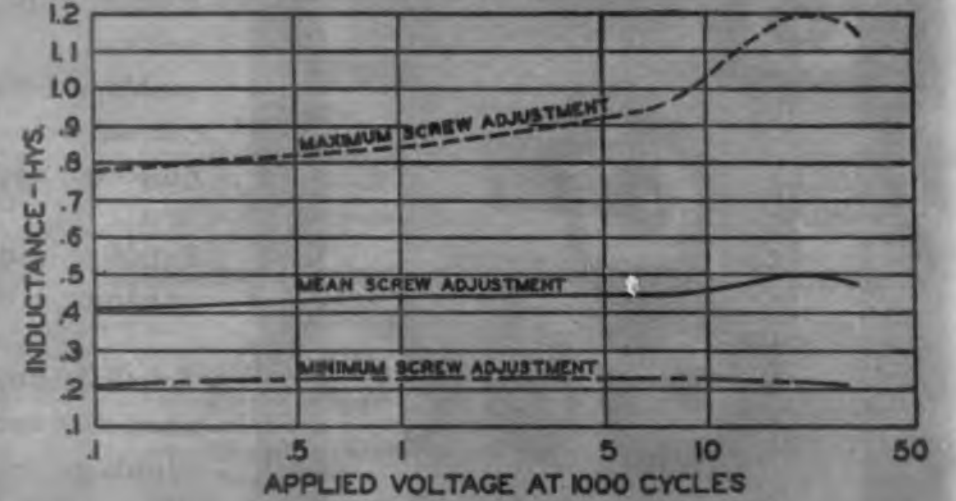

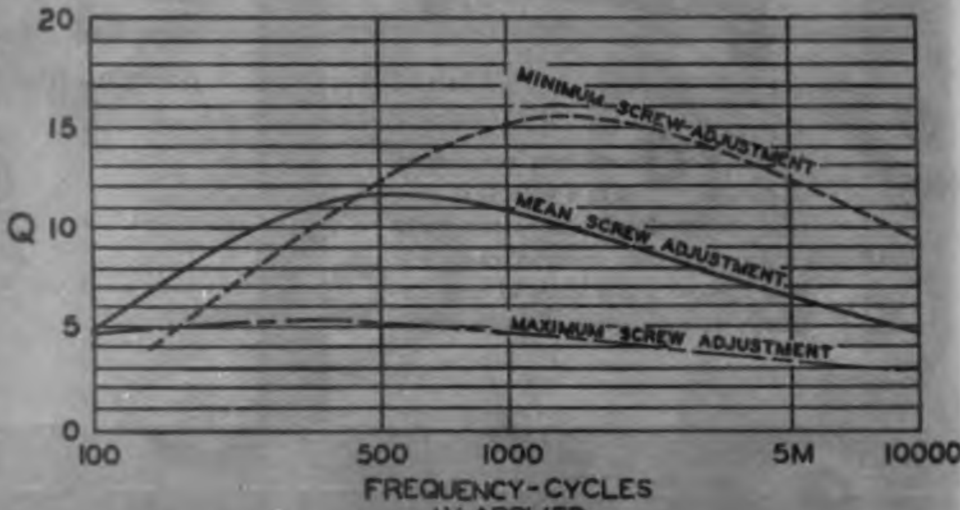

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EXPORT DIVISION: 13 EAST 40th STREET, NEW YORK 16, N. Y., CABLES: "ARLAB"

ELECTRONIC INDUSTRIES

including INDUSTRIAL ELECTRONICS

O. H. CALDWELL, EDITOR ★ M. CLEMENTS, PUBLISHER ★ 480 LEXINGTON AVE., NEW YORK (17), N. Y.

They'll Need "51% More in '44"

Like everything else in radio and in modern war, slogans are soon outdated. And so WPB already finds inadequate its ringing phrase of a few months ago—"For every 3 in '43, they'll need 4 in '44!"

For instead of a 33-1/3 per cent increase over last year, the 1944 demand for radio and radar equipment is now revealed to be up 51 per cent, based even on the marvelous 1943 performance. It means that facilities and manpower which did such a remarkable production job last year, must now speed up 51 per cent by taking advantage of every short cut, every economy, and every simplification due to standardization.

A tremendous war task has been handed to the radio-electronic industries in this decisive year of 1944. But no one doubts that radio plants will deliver, as demanded—"51 per cent more, in '44!"

Fluorescents for Automobiles

With the growing use of alternating-current generators on military equipment, particularly in the aircraft field, it is natural that the advantages of such systems should impress engineers in the civilian automotive vehicle fields, passenger, truck and bus. Passenger-car manufacturers already are considering the use of alternating current on postwar cars, and this opens up an entirely new field of lighting possibilities built around the use of fluorescent lamps.

If and when alternating current systems are provided on ordinary passenger cars such as we all drive, no doubt some manufacturers will consider fluorescent lamps for interior lighting, and perhaps for instrument-panel lighting. Fluorescent head lights have also been proposed, but it is doubtful whether they can meet the requirements for headlighting where the chief need is for a small, concentrated light source that can be controlled to give sufficient intensity and distribution of light on the road several hundred feet in advance of the car. Diffused lighting over the entire front of the car might be of some value from a safety point of view and to provide decorative effects. But it does not appear likely that car manufacturers will be willing to incur the cost of such lighting.

50,000 Radio-electronic Recruits

How many new men qualified to understand and maintain radio and electronic equipment, will come out of military service, post war?

The various schools in the military radio training program have "trained" in the technical principles of radio some 100,000 to 150,000 men, we understand. But we doubt that more than half of these will show enough interest in or taste for the subject of radio-electronics, to keep it up in civilian life.

Hence our estimate is that the War will add to the normal radio population at least 50,000 men—perhaps 75,000—who will be available for general radio and electronic work of repairs, maintenance, etc. (The above figures, of course, do not include "operators" trained in code, but not technically informed.)

Ultra High Frequency Radiation

The distinctive characteristics of 500 mc and higher frequency radiations, present a simultaneous problem and solution. The radiations travel in practically straight paths and are easily reflected by most surfaces. As commercial services use these frequencies the problems of reflections will arise, particularly with television in metropolitan areas.

With these "vest pocket" wavelengths, however, it becomes practical to use electrically-elaborate antenna arrays with a sensitive pick-up angle of a few degrees. With such directional selectivity it is a relatively simple matter to choose the desired angle of reception and transmission.

Several such small arrays may be found on the postwar apartment houses as the solution to reception from several stations and the rejection of unwanted reflections.

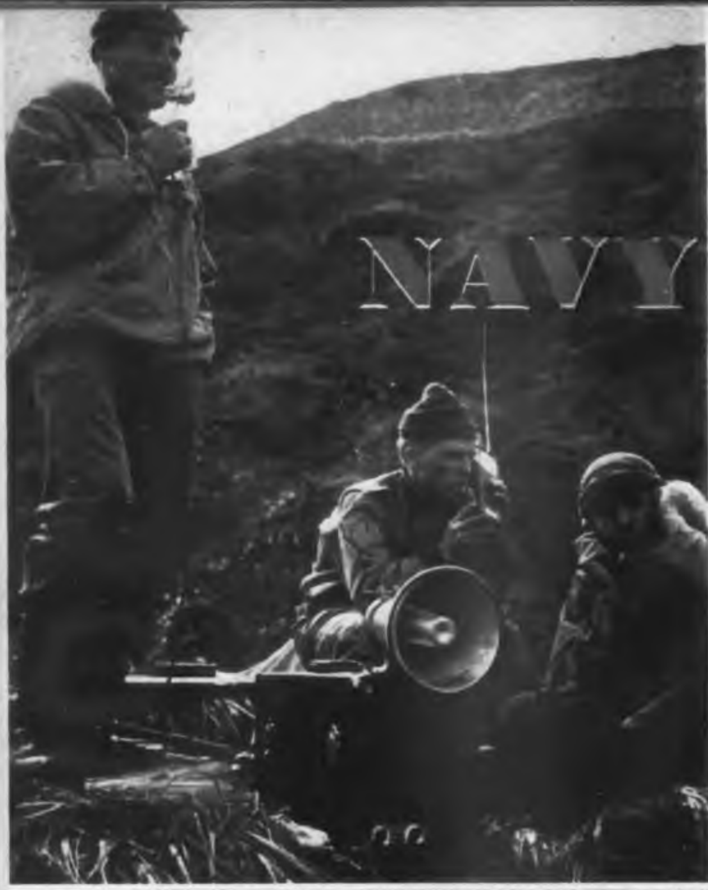
In this issue—

ELECTRONIC ENGINEERING DIRECTORY SECTION

Complete listings of manufacturers of all products and items entering into radio and electronic equipment

New Feature—Alphabetical "finding list" of names of all concerns producing electronic equipment

Paper Shortage—Owing to the unexpected size of this issue and the limitations placed by WPB on paper tonnage used by publishers, it has been necessary to employ a special lighter weight of paper in the Electronic Engineering Directory Section



NAVY RADIO AT WAR

Communications equipment that is helping to knock the enemy down

Advancing inland after the occupation of Kiska with the vanguard of the American-Canadian invading force, these members of an observation unit use the ubiquitous Handy-Talkie. Note high efficiency reflex loudspeaker with built-in driver unit

Nerve Center on Tarawa

This is the main communications post, aptly termed the "Nerve Center" of a Marine Corps regiment, set up soon after the Marines landed and took over

Beach operations, such as this on Kiska, are directed by means of self-powered reflex loudspeakers like the the one that appears in the foreground

Nerve Center of a Battleship

This view of the Communications Office on a modern battleship, one of the first pictures of the kind to be released, shows a small part of the equipment for maintaining contact with other ships and bases, and intership phones

Aboard a Navy bomber, the radio operator has great responsibilities, and not much room in which to move around

The Gunnery Officer, one of the busiest men aboard ship, watches results of anti-aircraft fire, directs gunners. Note new Navy helmet

WPB MOVES TO EASE

by ROLAND C. DAVIES
Electronic Industries Washington Bureau

Stage now set for formulation of definite plans for changeover, though military needs are still very great

● The electronic-radio-radar manufacturing industry will be among the last of the American war production activities to be reconverted to normal peacetime operations—that is well known. But the stage has been set for the formulation of definite plans for the changeover.

Because the industry is supplying the Army through its Signal Corps with the sinews of ground and air communications which is such a vital and integral element of this Global War, the managements and workers of the industry know their job is by no means finished in war production—in fact, they have been called upon this year for production of between 35 and 50 per cent above 1943.

The problem of the Navy Department as far as electronic-radio-radar production is concerned is expected to be easier to handle after the European phase of the war is well accomplished. Most of the equipment needed for the Pacific operations is already on order and the only need for actual increases of the present production orders anywhere along the line will be for increases in the demands of the Army and Navy due to extensions of the conflict beyond present estimates.

Exempt Future Orders From Renegotiation

Price analysis in the Army's Procurement Services and the Army Service Forces headquarters on the basis of costs has become increasingly effective, Brigadier-General Albert J. Browning, ASF Director of Purchases, has reported, so that renegotiation of war production contracts to recapture excessive profits probably will be a decreasing factor from now on. Lieutenant-General Somervell, Commanding General of the ASF, has instructed the Technical Services of the Army, including the Signal Corps that by June first all contracts for repeat and continuation orders are to be placed at prices to be kept exempt from renegotiation.—"Electronic Industries" Washington Bureau

There must not be any faltering or letup by the industry in war production, even though the desire is to get lined up for the postwar future. The atrocities of the Japanese against the American soldiers and sailors in the Philippines—as well as "our dead on the beaches of Tarawa"—should blot out such thoughts and any companies which engage in active postwar arrangements of establishing sales contracts and negotiations to the detriment of their war production schedules deserve censure.

The format of the reconversion planning can be established and already has been launched. As the result of the decision of War Production Board Chairman, Donald M. Nelson that the industry advisory committees should play a definite and important role in reconversion planning just as they did in the mobilization period, the WPB Radio and Radar Division has reorganized its major Industry Advisory Committee with the addition of three new members, all topmost industry executives, so that the planning of the changeover to postwar operations can be consummated in the most efficient and effective way possible. Chairman Nelson has decreed that the reconversion planning is to be based on the deliberation of these advisory committees, which are now free to go ahead with this work without fear of anti-trust law violations.

New advisory members

The three new members of the Radio and Radar Industry Advisory Committee are E. A. Nicholas, president of the Farnsworth Television and Radio Corp., R. C. Cosgrove, vice-president and general manager in charge of manufacturing for the Crosley Corp. and Fred C. Williams, top manufacturing executive of Philco. The other members of the Committee—and this body has up to the present time confined itself to consideration of military production — are vice-president W. F. Hosford of Western Electric; Vice-President W. R. G. Baker in charge of the Electronics Department of General Electric; W. P. Hilliard, director of sales and engineering of Bendix Radio; E. E. Lewis, RCA Victor Division of RCA; A. S. Wells, president of Wells-

NEW MEMBERS OF RADIO AND RADAR INDUSTRY COMMITTEE

E. A. NICHOLAS President, Farnsworth Television and Radio Corp.

R. C. COSGROVE Vice-President, the Crosley Corporation

F. C. WILLIAMS Assistant to the President, Philco Corp.

INDUSTRY RECONVERSION

Gardner & Co.; P. L. Schoenen, vice-president and general manager of the Hamilton Radio Corp.; Monte Cohen, sales and general manager of the F. W. Sickles Co.; and Max F. Balcon, vice-president in charge of the Radio Division of Sylvania Electric Products, Inc.

A subcommittee has been formed in the Division's Industry Advisory Committee to concentrate mainly upon reconversion problems and planning. WPB Radio and Radar Division Director Ray C. Ellis, who throughout the entire period of war production mobilization and in the past 21 months has held the WPB helm in guiding the war role of the electronic-radio industry with such notable success and constructive direction, is now going to aid the industry in the reconversion planning when the stage is fully set for such activities. *(See Washington News column.)*

The Army and Navy leadership which has been close to the electronic-radio industry—Major General Harry C. Ingles, Chief Signal Officer, Major General William H. Harrison, Chief of the Signal Corps' Procurement and Distribution Service, and Captain Jennings B. Dow, Chief of the Radio Division of the Navy's Bureau of Ships, and Capt. D. F. J. Shea, his senior assistant, are aware of, and are sympathetic to, the industry's desire to be able to establish a sound foundation in the postwar era. But the responsibility of the Armed Services is to see that adequate and efficient radio and radar apparatus and equipment reaches the fighting forces in the far-flung combat zones throughout the world because lack of this material means the loss of American lives and of lives in the forces of our Allies. In a recent address calling for greater effort on the home front, General George C. Marshall, Chief of Staff of the Army, epitomized this by referring to his own "terrible responsibility for the lives of many men."

Demobilization planning

When the proper time comes after the requirements for the impending European invasion are fulfilled, the Signal Corps leadership is expected to engage in discussions with the electronic-radio manufacturing industry to aid in the reconversion planning. In line with the War Department's policy of aiding industry in its reconversion problems, this will involve the formulation of long range plans and policies for complete or partial demobilization of industries producing Signal Corps equipment and supplies; the recommendation of plans and policies for the storage, classification, use and disposal of the apparatus and equipment in process of production or already produced when contracts are terminated; the conducting and supervising of studies of critical and strategic materials in the hands of the Signal Corps to facilitate the furnishing of such materials to the manufacturing industries to permit conversion to civilian production as war requirements lessen; the conducting of studies of signal equipment to determine what equipment types can be manufactured to enable the smooth conversion of these industries from a wartime to a peacetime basis; and the exercising of staff supervision of demobilization planning by the Signal Corps Procurement and Distribution Field Agencies.

The War Department has just announced the new policy review system for the Army Service Forces to insure that adjustments in the Army Procurement Program are made with full consideration of the effects on the civilian economy as well as the fundamental factor of military necessity.

As the shifting requirements of war force increased production of some items and cuts on others. these changes will be programmed to cause as little disruption as possible. The new review system is designed to ensure prompt and equitable consideration of the many factors entering into the termination program.

(Continued on page 372)

Current organization of the Procurement and Distribution Service of the Signal Corps under Major General W. H. Harrison, showing addition of Activations and Allowances and Materiel Demobilization Planning Branches to facilitate industry reconversion in step with any slackening in demand for military equipment

MULTIWINDING MOTORS FOR ELECTRONIC USES

by EDWARD M. GLASER
Senior Electrical Engineer, Kollsman Instrument Div., Square D Co.

Practical applications of the principles of position indicating synchronous motors to industrial problems

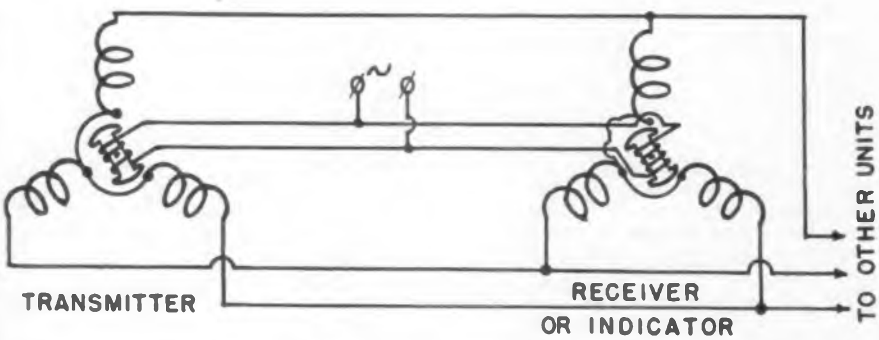


Fig. 1—In their commoner uses, rotors of all units in a group are excited from the same single phase source of ac

● Self-synchronizing, position-indicating motors are a sort of cross between a motor and a variable coupling transformer. While they will run as motors under certain operating conditions, they are designed for accurately duplicating motion at some point distant from its source. A wide variety of types and sizes has now been developed. When two such motors are interconnected and energized by a proper source of ac, their rotors will remain in exactly the same angular position with respect to their stators, no matter how much distance is between them, up to possibly 1 mile. When the rotor of either unit is moved by an outside force, the rotor of the other will follow automatically. Any number of units may be grouped together, one serving as a transmitter, the others as receivers.

When more than three units are used, it is desirable to employ a transmitter having a lower impedance than the receivers to insure proper torque and accuracy. While these "motors" are not particularly new some of their principles of operation have not received the attention they merit, so an outline of these principles may be of interest. In its commoner uses, the rotors of all units in a group are excited from the same single phase ac source as in Fig. 1. The stators act as transformer secondary windings, connections being made to corresponding windings of transmitters and receivers. In this service a 3-phase type of winding is used, but no polyphase voltages are involved; only different ratios of single phase voltages.

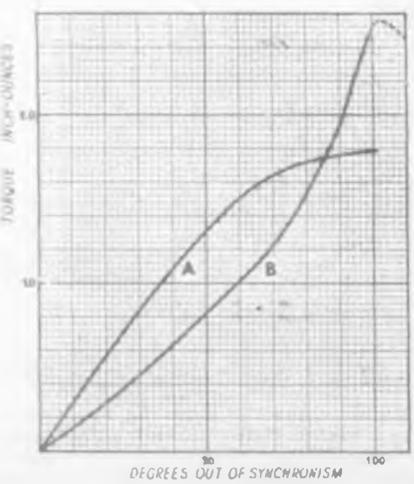
With the system at rest (with all indicator units in synchronism with the transmitter) the voltages induced in the stator windings of the transmitter are identical in phase and magnitude to the voltages induced in the windings of the indicators. Consequently no current flows between the transmitter and the indicators. The electrical conditions are similar to an unloaded transformer.

If the rotor of the transmitter is turned slightly, the voltages induced in the respective secondary windings are no longer the same as the voltages induced in the windings of the indicators. Consequently, currents flow between transmitter and indicator stators and develop a torque which moves the indicator rotors to a new position corresponding to that of the transmitter. During a short time interval, while the rotors are out-of-step, the units have the characteristics of loaded transformers.

When the transmitter shaft is rotated, the indicators react on it, tending to prevent rotation. Each unit in the system affects every other unit, but the indicators, since they are usually smaller than the transmitter, will have less effect on the system than the transmitter. This matter must always be kept in mind in setting up any telemetering system.

Motors developed for this purpose (Teletorque* units) have ground and balanced rotors, generous slip rings (as shown in photograph) and dual brushes. Each brush has a different natural frequency to guard against poor con-

Fig. 2—The torque delivered by two types of Teletorque instruments increases with the angle of displacement. Curve A represents the 32-V 60 cycle (403-02) and curve B the 110-V 400 cycle instrument



*Kollsman

tact in the event of vibrational resonance. The indicators are especially designed for low inertia without sacrificing ruggedness, and in order that this characteristic be maintained throughout life they are treated to resist corrosion.

In the Teletorque system the torque varies linearly with the angle of displacement up to 40 or 50 deg. for 60 cycle units, and then increases at a lesser rate reaching a maximum value at about 100 deg. as in Fig. 2A. On higher frequency systems the efficiency even increases somewhat at higher displacement angles, as in Fig. 2B. Should indicator and transmitter be forced to remain out of synchronism by large angles, all types of units will over-heat somewhat, due to the excess current produced.

CHARACTERISTICS	TYPE NO.							
	403-01	403-02	741-02	775-01	779-01	779-02	403-03	776-03
Frequency - Cycles per sec.	400	60	60	400	400	60	60	60
Voltage - volts	110	32	32	47.5	47.5	32	115	115
Current - ma	158	195	90	100	100	104	87	42
Input - volt-amperes	17.4	6.17	2.88	4.75	4.75	3.33	10.01	4.83
Power, Input - watts	3.2	1.9	1.0	1.0	1.0	1.2	3.25	2.1
Power Factor -	.18	.31	.35	.21	.21	.36	.32	.43
Peak Torque - inch-ounces	2.00	1.80	.64	1.05	1.05	.47	2.9	.75
Accuracy - degrees of circle	±.75	±.75	±.75	±.75	±.75	±.75	±.75	±.75
Temperature Rise - Degrees C.	24.0	22.0	15.0	9.0	9.0	19.4	12	10

* Time required for indicating unit to come to rest at synchronous position after displacement of 180 deg.

List of the many basic types of Teletorque transmitters (above) and of Circutrol units (below) showing their electrical characteristics

CHARACTERISTICS		TYPE NO.									
		787-01	787-02	830-01	830-02	846-01	846-02	846-03	846-04	840-01	840-02
		ROTATABLE TRANSFORMER		DIFFERENTIAL CIRCUTROL						PHASE SHIFTER	
Frequency - Cycles per Sec.		60	400	60	400	60	400	60	60	60	400
Rotor Winding - No. of Phases		1	1	3	3	1	1	1	3	1	1
Stator Winding - No. of Phases		2	2	3	3	2	2	2	3	3	3
Winding (S) Energized During Test		Rotor	Rotor	Both	Both	Both	Both	Both	Both	Stator	Stator
ROTOR INPUT	Voltage - Volts	32	100	18	21	32	110	115	24	-	-
	Current - ma	115	185	-	-	220	130	60	270	-	-
	Power - Watts	1.51	4.1	-	-	2.0	2.5	2.0	5.0	-	-
STATOR INPUT	Voltage - Volts	-	-	18	21	32	110	115	24	230	110
	Current - ma	-	-	-	-	200	120	57	300	63	430
	Power - Watts	-	-	-	-	5.0	5.0	5.0	5.5	8.6	6.2
Temperature Rise - Degrees C.		15	45	Negl.	Negl.	42	40	43	60	52	52
Secondary Voltage In Maximum Position - Volts		53	228	-	-	-	-	-	-	125*	125*
Type of Electrical Connections		Lugs	Lugs	Lugs	Lugs	Lugs	Lugs	Lugs	Lugs	Lugs	Lugs
Length, Over-all Inches		2.920	2.920	2.920	2.920	3.545	3.545	3.545	3.545	3.545	3.545
Diameter, Max. Outside - Inches		2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
Weight, Complete Unit - Ounces		10	10	11	11	17	17	17	17.5	15	15
Weight, Shaft Assembly - Ounces		1.55	1.55	2.2	2.2	4.8	4.8	4.8	5.2	3.0	3.0

* Constant for all rotor positions.

NOTE: Differential Circutrol Units have non-salient pole rotors, therefore the electrical constants of the stator windings do not change with different rotor positions when the rotor is not loaded.

New uses

In view of the widespread uses of these devices it is natural that many new effects and uses are being developed in many other fields than that of a remote indicator. One electronic application has the synchronous rotation of a variable condenser at a remote point for frequency modulation or tuning. In this case, the transmitter is rotated by a low-starting-torque motor to prevent the transmitter and receiver Teletorques from getting out of step. If a high-starting torque motor were to be employed to drive the transmitter, too great an acceleration might result, in which case the receiver unit will fall out of step with the transmitter and will come to rest, similar to a stalled synchronous motor.

To reverse the direction of rotation of any unit, it is only necessary to interchange two stator leads. Should the rotor of any unit in the system become open-circuited, the system will continue to operate, though with less torque and abnormal heating of the remaining units in the system. However, the rotor of the open unit having no polarity of its own, acts as a symmetrical iron vane without choice of direction. Hence it may track correctly or 180 deg. out.

A variation in the principle used in Circutrols, when used as a single unit have many applications in the electronic field. For such applications, they may have high impedance phase-windings, wound for either 2 or 3-phase operation. Where 3-phase supply is available, the stator may be used as a primary and the rotor as the secondary of a phase-selecting transformer or phase-shifter. Since the windings have two poles, 1 deg. of rotation = 1 deg. phase shift, and if the pointer is set at the in-phase position, a dial marked in circular degrees can be used to select phase angle. The 2-phase system operates similarly.

Units of this principle but with special constants can be used as rotatable transformers, where the output voltage depends on the position of the rotor. The curves Fig. 4 show a polar diagram of the voltage output of a 400-cycle version of this item. A photograph of the rotor such as might be used in a rotatable transformer or a phase shifter is shown.

These units may be used as synchroscopes to indicate the relative

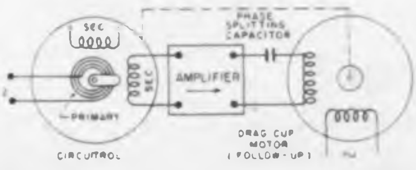


Fig. 3 — Combination Circutrol-electronic application useful as remote indicator

phase angle of two sources of the same frequency applied to the two sets of windings. Phase-angle indicators or synchroscopes operate more smoothly when at least one of the supplies is polyphase. Where both sources are 3-phase, differential units with 3-phase rotors and 3-phase stators are normally used.

Differential Circutrol units have three general types of applications. A unit wound with a 3-phase rotor and a 3-phase stator may be used as a dual receiver unit in conjunction with two Teletorque transmitters, in which case it will indicate the sum or difference of movement of the transmitters. The 3-phase stator winding acts as a repeater winding for the first transmitter while the 3-phase rotor winding acts as a repeater for the second transmitter. The same type of 3-phase unit may be used as a synchroscope to indicate synchronism and phase relation between two 3-phase sources.

(Continued on page 382)

FINDING THE ANSWER

Gathering facts pertinent to possible development of new items and presenting them in practical report form

● There is a staggering volume of scientific electronic achievement pent up awaiting the next decade for its release. Any company interested or engaged in electronic manufacture has access to fragments of these new ideas. Some see larger sections than others. Common to all, however, is the knowledge that our industry is on the threshold of an entirely new phase of its history. To a manufacturer each new product presents at once a promise and a threat. If he can manufacture and sell it more successfully than his competitor, it is a promise. Otherwise it is better that it be avoided completely.

To determine whether the new product can be successfully merchandised is a matter for investigation by thoroughly competent personnel—men who have had experience in that type of study. A great deal of this kind of work currently is being done. After a positive "guesstimate" based on sufficient information has been made, it becomes necessary to evaluate the "internal factors" that influence the profitableness of the particular product as related to the maker's entire line.

The first of this series of articles discussed the factors themselves. The second pointed out some methods of gathering the required data. This third and concluding article deals with a suggested method of reporting the information collected.

SIX STEPS TO WELL ORGANIZED FACT-FINDING

Assuming that our investigation of the "internal factors" of a certain new product has been completed and we have neatly arranged in some sort of index form the multiplicity of facts and opinions that resulted from asking a number of specific questions, what comes next? The natural answer would seem to be that some process of evaluation and decision be contrived.

It may sound pedantic to approach such a romantic subject as a new electronic product in such a cold-blooded way. It is significant, however, that the companies of vast resources are the least romantic—internally, if not from a publicity viewpoint—in their approach to this subject. The rapidity with which a favorable balance sheet can acquire "deferred assets" is something to behold. And there are few of our industry's companies that have not had a chance to marvel—in a repentant mood—at the process.

No formula can be categorically stated. No perfect equation can be derived. We can, though, lay all our cards on the table, by suit and in sequence. This is what a report should do. If it is well done it should be difficult for anyone to make a serious mistake without having had his eyes wide open. There can be no insurance against that kind.

Arranging conclusions

The extent of the report should be consistent with the breadth of the subject. This is not a license to write a volume. There is only one reason for writing a report a volume in size. That is to present a field to a group that is not only completely unfamiliar with the field but also is mentally incapable of the vision necessary to react to the suggestion implied in terse summary sentences. The art of arranging conclusions in brief, integrated report form is well worth the practice required to achieve its perfection.

The starting point of any report should be an introduction telling why and how it was prepared. This should be neither a lengthy apology

TO POSTWAR PRODUCTS

nor a short trite statement. It should, in as few words as possible, for the future as well as the present, bring anyone, no matter how unfamiliar with the situation, to the opening sentences of the report and drop the reader there in a completely at home condition.

Where does product fit?

The first portion of the report proper should show the field, division and section into which the new product falls. This section should contain enough orientating material so that anyone, no matter how unacquainted he may be with the subject, can perceive the exact relation of the particular product to the whole field.

The next section might list, in a well arranged manner, the various "internal factors" chosen for investigation. This grouping need not be too detailed. The objective is to demonstrate the scope of the report and in that way limit its uses and application to the material it contains. This sounds somewhat superfluous but it is not. So often has bad judgment resulted from the tendency common to many "high pressure" managers to fasten on a little point for decision purposes, that it becomes necessary to present the big points in an unmistakable fashion before even trying to convey any impressions whatsoever.

Mapping the project

These sections of the report comprise what might be called the map or geography of the subject matter. In many cases emphasis by photographic or drawing illustration proves valuable. The psychologist is familiar with the varied time of absorption in different individuals and with the great differences between reaction times in one or another person. It may take one man hours to understand a page of figures but to him a graph would have told it all in three minutes. Another person's reaction might be exactly opposite.

Variations in people's ability to grasp a chain of thought when presented in pictorial, written or oral form are of immense importance to the reporting method. Unless the material is specifically for a person or group whose characteristics are known, it is wiser to use some composite form. Well chosen color treatment can be of great value but here again caution must be exercised with a report for a special purpose. For instance, in one recent report prepared especially for three executives, the charts were aptly presented in four colors. No little comment ensued when the color-blindness of two of the executives became known to the engineer who had prepared the study.

Factual data

With the background of the report in shape we can go ahead and get down to the meat of the subject. Our index of factual data and recorded opinion is in condition for presentation. In this section, great care should be exercised not to indulge in too much steering or evaluation. At this point allow the facts or opinions to speak for themselves—but clearly. For this reason a division into negative and positive points is recommended.

A good arrangement is to start with the most negative factor—in other words the best argument for not going into the particular product. Factor, fact and opinion should be grouped in an isolated paragraph as a negative point. Immediately following should come the second most negative and so on in descending order until the points are almost of a balanced nature. No straddle position should be taken. If the questions have been properly chosen, each factor becomes definite. Every factor must be either negative or positive and should be reported as such.

After presenting the negative side of the situation, the positive factors should be detailed. Again the arrangement can descend, from the most powerful argument for going ahead, to the weakest. Care should be exercised to keep each separate point isolated. A fact—or fifty—and an opinion—or several—can become a single point. The principle is that only by strict conformity to a framework can our report become anything better than patchwork.

In arranging our negative and positive points, it is proper that additional stress should be laid on the exercise of a high degree of care lest evaluation, conclusion, recommendation or reporter's opinion creep into this section. By clearly defining the boundary lines of each part of the report, it can make sense, by unskillful handling, it can make nonsense—or even worse, serious error.

After listing the negative and positive points, it is well to devote a portion of the report to an evaluation of the factors. The person preparing the report will not necessarily be the best qualified to decide the relative importance of various points. He is, however, at the time of reporting, in the best position of anyone so far as being able to visualize the interrelation of the various points developed.

Evaluating factors

This part of the report is for his justification of the relative importance attached to the several positive and negative factors set forth in the previous section of the analysis. An evaluation is not an opinion of possibilities but rather a careful weighing of the relative value of all of the pros and cons. If something is obvious, there is no point in wasting space talking about it, but there are many facets to any selection of new product "internal factors" that will be relatively obscure in their relation to the whole.

The object of the whole endeavor is to find that particular product which by its merchandising possibilities and its "internal factor" situation, is most suited to become a profitable addition to our manufacturer's business. This thought should control every factor chosen, every question asked and every sentence of the report. A product may be novel, intriguing, interesting, useful or any number of other things, but unless it ultimately will make money for its manufacturer, there is no sense wasting time on its consideration. The report, especially the section

(*Continued on page* 330)

Planning for the Future

This is the third of a series of articles dealing with a logical plan for investigating postwar product possibilities. The first article dealt with Internal Factors that must be considered; the second covered Organization of Data.—Editor.

PE TUBE GAS DETECTION

Ultra-violet photometer arranged to "see" dangerous concentrations of harmful gases in industrial operations

● Many industrial plants are subject to the hazard of dangerous concentrations of certain gases in the working areas. Most gases, even though "colorless" in visible light, absorb one or more bands of light in the ultra-violet range. By designing a light-source to emit, and a photoelectric system to "see" ultra-violet of a critical wavelength for a particular gas, the presence of even a small trace of the gas between the source and the phototube will result in a measurable change in phototube current.

To analyze for dangerous concentrations of carbon disulphide gas attendant upon certain chemical operations, the Du Pont Rayon technical division and the electrochemicals dept. designed the ultraviolet photometer illustrated.

The device consists of a mercury arc ultra-violet generator whose carefully stabilized output is formed into two parallel beams by quartz condensing lenses and prisms. The

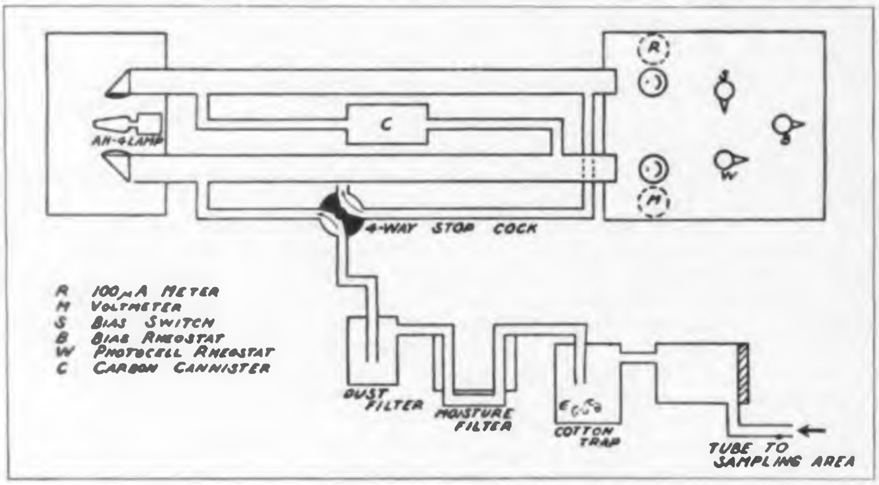
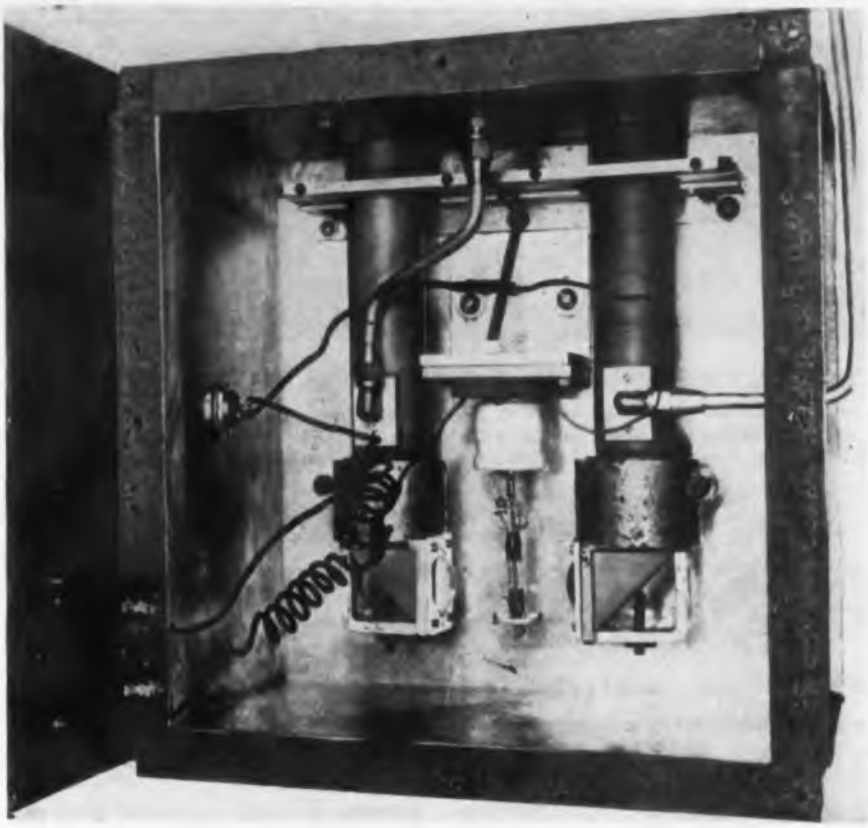


Diagram of gas analyzer. Air to be checked passes through one tube, then through carbon filter C. If gas is present, it is absorbed. Pure air then passes to second tube to upset balanced phototubes' response

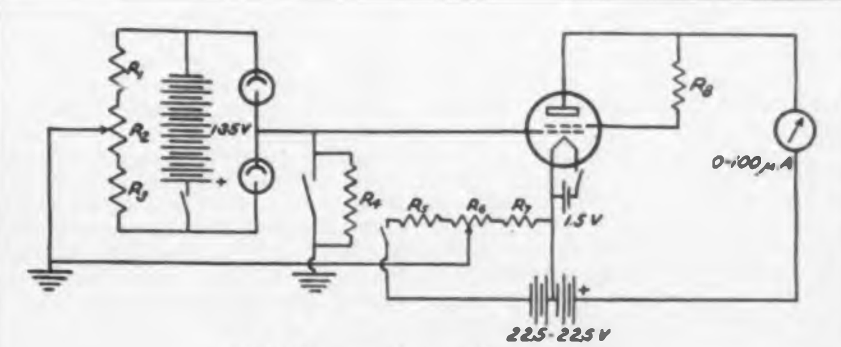
Intake hose of gas analyzer sampling atmosphere at nose level of chemical operator, to check behavior of large suction duct supposed to remove fumes from vessel



Left: Interior of light-source chamber, showing ultra-violet lamp with outer glass envelope removed; condensing lenses, and prisms. Right: Close-up of the analyzer. Chamber at top holds ultra-violet generator and quartz condensing lenses and prisms. Two large gas tubes connect to analyzing chamber, at bottom containing balanced phototubes and amplifier

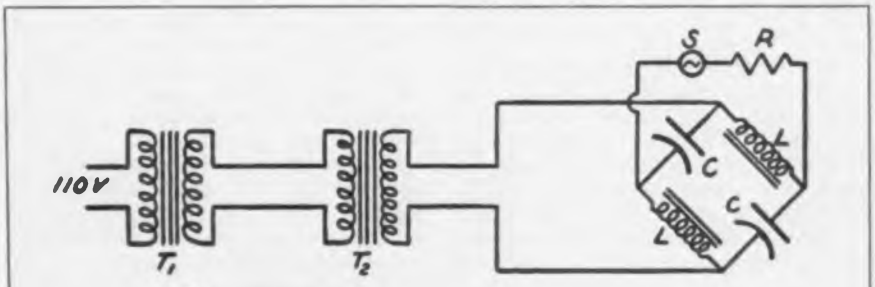
beams enter two sealed absorption tubes several inches in diameter and 31 inches long. The beams leave the far ends of the tubes through special glass filters designed to pass a narrow band of wavelengths in the region of 3,132 Angstrom units. This light then reaches the cathodes of two matched sodium phototubes. The tubes are connected in a series-balanced circuit so arranged that equal illumination provides a fixed grid bias to the type 32 amplifier tube. Any unbalance in the amounts of light reaching the phototubes causes a proportional change in the grid bias, the effect of which is read on the microammeter.

A "grab sample" or a continuous sample of the air to be analyzed enters one of the tubes, after passing through dust, dirt, and moisture filters, and leaves through a carbon filter chamber which removes any carbon disulphide present. The purified sample then continues on into the second light absorption tube. In this way, the second phototube "sees" air known to contain no carbon disulphide gas contamination. If the air passing before the first phototube contains as little as one part in a million of the gas, its cathode emission falls off, with the result that the grid bias and plate current of the amplifier tube change appreciably.



R_1, R_3, R_5.	1.0 megohm	R_7.	15 megohms
R_2.	0.5 megohm	R_8.	50 megohms
R_4.	2000 megohms		
R_6.	250 megohms		

Above: Circuit diagram of gas analyzer, using two matched sodium phototubes and one type 32 amplifier. Below: Constant current power supply for lamp



C.	3.5 mfd.
L.	2 henries, 0.5 ampere
R.	1000 ohms, 100 watts
S.	G-E H-4 mercury lamp, envelope removed
T_1.	110-volt, 125-watt Sola voltage regulator
T_2.	G-E H-4 lamp transformer

FM BROADCASTERS TECHNICAL "INFORMATION PLEASE" PANEL IN SESSION

These are the eight experts who answered any and all questions on FM for Convention delegates. L to R: Philip Louckes, Counsel to FMBI; E. K. Jett, FCC Commissioner; George Adair, FCC; C. M. Jansky, Jr., Consultant to FMBI; Walter Damm, President of FMBI; Major Edwin H. Armstrong; John Shepard 3d; Commander Paul De Mars, USNR

ENGINEERS DISCUSS FM

Technical matters engage greatest attention of record attendance of over 700 at FMBI convention

• With a record attendance of over 700, FM Broadcasters, Inc., wound up its two-day fifth annual convention at the Commodore in New York on Jan. 27, by re-electing all its present officers for another term; recommending a return to the status of its former dues arrangement, temporarily suspended; and in general giving the whole FM situation a pretty thorough going-over.

"As I see the FMBI of the future," said President Walter Damm in his opening remarks, "I see its actions limited to FM problems and not to what we generally call over-all industry problems—unless, of course, it becomes evident that such general broadcasting problems are not being handled as the membership thinks they ought to be handled. Under such circumstances, FMBI ought to be able to do a good job for its members at a cost of $20,000 to $25,000 per year and for this amount could render a service worth the dues.

"Since the announcement of this fifth annual convention, 32 new membership applications have been received and today FMBI has 63 active members and 41 affiliate members. Of these affiliate members 13 are non-broadcasters—that is, manufacturers, consulting engineers and firms having an interest in FM; and 28 are individuals or firms that have not filed applications for construction permits but who intend to do so. These will automatically become active members when notice is received that applications have been filed."

A Washington business office is to be opened at 711 Columbia Bldg., in charge of Myles Louckes.

As was to be expected, Major Edwin H. Armstrong took a prominent part in the discussions; in addition to addressing the gathering and presenting a chart which represents the recommendations of FMBI as regards the need for expansion of the existing FM spectrum allocation, he acted as the principal member of a round table panel which undertook to answer a considerable number of technical questions, some of which had been prepared and submitted in advance, and some of which were asked from the floor. This panel (questions and answers are reported elsewhere in this issue) included C. M. Jansky, Jr., E. K. Jett, formerly chief engineer of FCC and now a Commissioner, George Adair of FCC, Philip Louckes, John Shepard 3rd, Walter Damm and Commander Paul A. De Mars, USNR.

Other features of the gathering included an address by FCC Chairman James Lawrence Fly; an analysis of current FM problems by C. M. Jansky, Jr.; a summing up of the relationship of RTPB to FM broadcasting by Dr. W. R. G. Baker, chairman of Radio Technical Planning Board. Next membership meeting of FMBI is scheduled for April 14, in New York.

HOW FM GREW FROM A STATIC ELIMINATOR

By Major Edwin H. Armstrong

FM started 30 years ago in an effort to produce a static eliminator on a radio telegraph system, before broadcasting was ever in existence, and now it works out that it is about to produce a rebirth, not only in the technical aspects but in the economic, social and political aspects of broadcasting.

More by accident and good luck than anything else, it so happened that I ran into the use of frequency modulation in a particular way, and the solution, like all solutions, is simple after you know the answer to the problem. It is simply to use a type of radio wave for transmission that is different from the waves produced by nature, and then build a receiver which will respond only to that particular wave and which will not respond to the normal type of wave or to those waves which are so closely akin to the ordinary signal wave, the waves created by static.

It took 15 years on the wrong foot before I got on the right one, and that was, as I say, mainly as a result of a chance observation. But now we understand what it is that FM does and how it avoids the natural disturbances.

The next event of importance occurred in June of 1936, when the FCC called a hearing to allocate the frequencies from 30 million cycles up.

At that meeting, two men only spoke in favor of frequency modulation. It isn't necessary for me to tell you who one of them was, but I want to tell you who the other one was, because I take off my hat to him and to his sound engineering sense, Paul A. DeMars, then chief engineer and technical adviser of the Yankee Network, now Commander DeMars, USNR.

Arrayed against the two of us was tne word "television," which was a word to conjure with in those days. The net result was a frequency allocation which you can see from the chart that is reproduced herewith.

A hearing was held by the Commission to investigate the demands of the FM service for channel space. The assignments were tentative ones, with the provision that if one service advanced faster than another, then there would be a re-

(Continued on page 342)

CONDITIONS THAT GOVERN FM DEVELOPMENT

By C. M. Jansky, Jr.
Consulting Engineer

The destiny of FM will be largely determined by the following:

(1) The engineering potentialities of the system.

(2) The adequacy of the channel assignments provided by the regularly constituted government licensing authority.

(3) The guiding or restrictive effect as the case may be of the operating rules and standards imposed by that licensing authority.

(4) The value of the public service rendered by the broadcasters themselves.

Now, serious mistakes can be made by merely looking at FM through a pair of AM spectacles.

We now have the use of 40 channels lying between 42,000 and 50,000 kilocycles. There is available no tangible evidence to prove that this is not the best place in the spectrum for FM and there is plenty to prove that it is. However, it is highly probable that a wider band than that at present available will be necessary to accommodate all legitimate applicants. This is evidenced by the fact that already in some parts of the United States there are more applications than can be granted in the existing band. FM Broadcasters, Inc., is already on record with a request that more FM channels adjacent to the existing band be provided.

The Board of Directors of FMBI has approved the following recommendations of its Special Engineering Committee:

I. It is recommended that the principle of allocation based upon assigning Service Areas to station applications be retained but the rigid coupling of service areas to trade areas be abandoned.

II. It is recommended that new classification of channels if necessary be made on a regional, rather than a nationwide, basis.

III. It is recommended that the use of the dual terminology "High Frequency Broadcast Stations" (as used by the FCC), and "FM Broadcast Stations" (as more commonly used by industry and public alike) be discontinued in favor of the use of only one such designation, "FM Broadcast Stations."

IV. It is recommended that in the granting of licenses to FM broadcast stations that the Commission take into account such factors as:

(1) The natural coverage area which the station would have based upon the proposed location, power, antenna gain, and the laws of propagation for the territory to be served.

(2) The ability of the station to deliver adequate service to the community or communities the station is primarily intended to serve.

(3) That in licensing a station the Commission shall define the area throughout which that station shall be protected against interference from other stations on the same channel, even though the facilities to be originally installed do not provide for coverage of the ultimate area.

V. It is recommended that the Commission allow a period of Commercial, Program and Engineering development to provide for normal growth before requiring installation of facilities to cover the ultimate area proposed, taking into consideration that growth in listener audience in different sections will be at different rates.

The engineering potentialities of FM broadcasting are practically unlimited. In contrast to the limited opportunities for expansion in the AM band, we can have a large number of FM stations with well defined

(Continued on page 344)

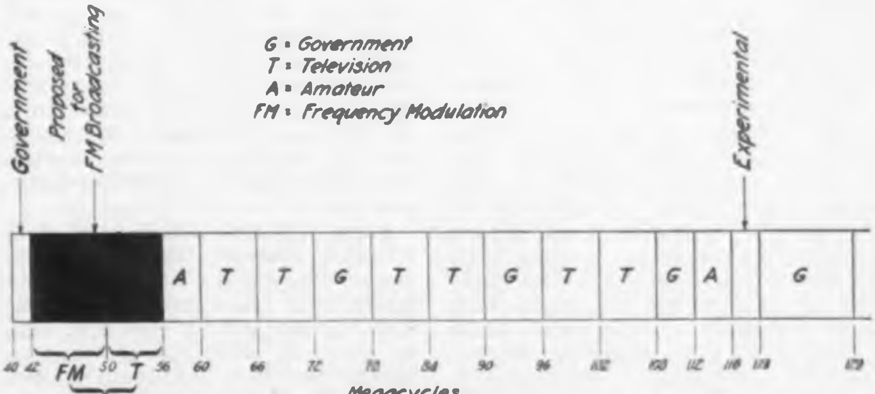
WHERE RTPB FITS INTO THE FM PICTURE

By Dr. W. R. G. Baker
General Electric

After outlining the general purpose of the Radio Technical Planning Board, of which he is chairman, and stating the specific duties of each of the thirteen panels, Dr. Baker plunged immediately into the work the board will have to do with regard to FM. He said, in part:

The scope of the VHF Broadcasting Panel—(Panel 5) is "The review and further development of standards with reference to broadcasting in the frequency band of 30 to 300 mc." This Panel has, among other problems, the task of answering such questions as:

1. What systems other than frequency modulation should be investigated?
2. With respect to frequency modulation, what changes should be made in the system standards in the light of the operating experience over the past few years? *(Turn the page)*



Not all allocations are shown on this chart, prepared by Major Armstrong, though it does show the increased space necessary for future development of FM according to the opinion and wishes of FMBI

3. To what extent will the technical advance due to the war affect the present system standards and frequency allocation? And what changes can be recommended at this time as a result of such technical advancement?
4. What is the desired frequency allocation based on a national FM broadcasting service, and how can it be obtained having due regard for other services?

The problem facing the VHF Panel is to determine a means for laying the foundation of our postwar business in FM and at the same time, not to close the door on improvements or growth, or in any way limit the service rendered the consumer. Hence, it seems to me

(Continued on page 344)

EXPERTS ANSWER FM TECHNICAL QUESTIONS

These questions, submitted in advance in writing, were answered before the Convention by the Panel of experts whose portraits appear in the group reproduced on page 110.

"Can I put an FM antenna on my AM tower, and can a modern AM transmitter tower be revamped so that it can be used to transmit AM and FM simultaneously?"

MR. JANSKY: It is physically possible to put an FM transmitter on top of an AM tower. We have done it any number of times on non-directional systems and directional.

"Wattage for wattage, does an FM transmitter use more power than an AM transmitter?"

MR. JANSKY: In terms of power rating, the FM transmitter uses less. The reason is that in the ultimate stages the power has to be four times the carrier power in the peaks of amplitude modulation. That is not true in FM.

"Is a limiter tube absolutely necessary in an FM receiver and what is the purpose of this tube?"

MAJOR ARMSTRONG: Some device which will wipe out response to amplitude changes is essential. The basis of the invention is to have a receiver which responds only to wide frequency changes in the transmitted wave and not to amplitude modulations or to small frequency changes.

The limiter is the simplest way of wiping out the effect of amplitude changes. Obviously, there you could have a quick acting, automatic volume control, or you could use counter feed-back in some way to wipe out the effects, or a synchronous oscillating tube, or something of that sort. I am inclined to think that the ordinary limiter, or perhaps a double limiter, will be found to be as simple and cheap as any method which can be employed to wipe out the defects of the amplitude discrepancies.

"Has the Commission formulated a policy of licensing studio to transmitter links on a general basis or will such links only be licensed where it is impossible to obtain telephone lines?"

MR. ADAIR: The Commission, to the best of my knowledge, has formulated no policy other than as set out in the present rules. These provide for the operation of ST stations only with FM stations, and with international broadcast stations. It thus makes no restrictions with respect to whether or not telephone lines are available.

"What is the cost of operating an AM station as compared with an FM station—power for power?"

MAJOR ARMSTRONG: We have some figures for a period of 8000 hours' operation at 40 kilowatts power output, and the figures include the power bills and the cost of tube replacements. It works out to about $2.50 an hour.

The power rate that we pay is very much higher than is customary around New York City. The rate is about two cents a kilowatt hour. I understand that most of the broadcasters are paying around a cent or under per kilowatt hour. Of that cost, the breakdown is about 30 cents for tube replacements. The rest is the power plant.

"Is there any data available on directional FM antenna, or does the Commission require a circular pattern? For instance, I am located in a corner of my trade area, and in order to comply with a circular pattern I would have to have my transmitter almost 40 miles from the city."

MR. ADAIR: The Commission has no requirement as far as a circular pattern is concerned. There is data available on directional antenna for the 40 and 50 megacycle band as well as other bands. However, in my opinion, I believe it is advisable wherever possible to stay away from directional antennas. It is feasible, technically, to employ them, and the Commission has no requirement against them. Their use is generally dictated by the circumstances, but it adds a little complication in some cases to the installations.

"Would intense field in a city be an advantage, or would cross modulation on other services present a problem?"

MAJOR ARMSTRONG: I think that depends on the definition of

(Continued on page 346)

WHAT FM MANUFACTURERS PLAN FOR THE FUTURE

By Charles M. Srebroff
Radio Engineering Laboratories

As ardent believers in FM, we feel that the postwar period will show a tremendous increase in the number of FM broadcast stations. We feel that many of these new broadcasters will not come from the ranks of the present AM group, but will constitute the local banker, grocer, newspaper or what-have-you.

Along this line, Rel has set up a program whereby the new broadcaster entering the field can secure a complete "packaged" FM broadcast station, low in cost and easy to erect so that his community, which now lacks adequate, enjoyable and static-free radio entertainment will be properly taken care of. This FM radio package will comprise a 1 kw transmitter,

(Continued on page 360)

By Lee McCanne
Stromberg-Carlson

In the postwar period, Stromberg-Carlson recognizes two fields for FM home sets:—

1—The high quality field in which we have been predominant. We intend to maintain our leadership in tone quality in our better postwar sets.

2—We also recognize a field for simpler FM sets with standard loud speakers and audio circuits.

We have no present plans for producing FM receivers for automobiles, though we believe that FM portable sets will be a postwar market item, and that FM — AM sets for automobile, marine and aircraft use will find a ready demand.

(Continued on page 360)

Postwar Studies Engage IRE

Over 1700 attend Winter Technical Meeting and discuss domestic and international aspects of radio engineering

• When finis was written to the 1944 IRE Winter Technical Meeting in the Commodore Hotel, New York, on January 28, after two and a fraction days devoted almost entirely to engineering discussion (one evening was given over to a joint meeting with the American Institute of Electrical Engineers) these things had been accomplished:

A new record for attendance (over 1700) was set up, approached only by the 1939 gathering of 1600; an enthusiastic 800 had been at the annual dinner; the Institute's Medal of Honor had been awarded to Haraden Pratt (IT&T) "for his engineering contributions to the development of radio and his constructive leadership in Institute affairs"; the Morris Liebman Memorial prize for 1943 had been presented to W. L. Barrow (MIT) "for his theoretical and experimental investigations of ultra-high frequency propagation in wave guides"; and Fellowship Awards had been presented to S. L. Bailey, C. R. Burrows, M. G. Crosby, Harry Diamond, C. B. Feldman, Keith Henney, D. O. North, K. A. Norton, S. W. Seeley, D. B. Sinclair and Leo Young; the members had listened to the presentation of an even score of technical papers, as well as two symposiums, one on the Engineering Work of the FFC and the other a report by the individual chairmen of the 13 Panels that go to make up the Radio Technical Planning Board.

RTPB PANEL CHAIRMEN REPORT ON PROGRESS

In leading off the symposium on RTPB affairs, chairman Dr. W. R. G. Baker pointed out that already his organization contains representatives from some 126 different companies with a present personnel of over 450 people, and is still growing. Except for Panel 7, all Panels now are fully organized and either have held initial meetings or will immediately. These reports by Panel Chairman were more in the nature of work to be done than of things that have been accomplished for as yet there has hardly been time for the crystallization of recommendations.

Dr. Alfred T. Goldsmith outlined the scope of Panel 1, which has to do with Spectrum Utilization, by painting a picture of the ideal plan of allocations in which it might be possible to start from scratch and allocate a sufficient number of frequencies to every necessary service and thus finish the job all at once, which of course, is hardly possible. He again stressed the prime problem of immediacy vs. long-time planning as set forth in the last issue of "Electronic Industries." As a guide to the deliberations of his Panel, an extensive questionnaire has been prepared and sent to all of the other Panels.

For Panel 2 (Frequency Allocation) Chairman C. B. Jolliffe pointed out that the work of his group necessarily hinges upon what the other Panels do; that the problems involved require that Panel 2 take into consideration the deliberations of all other Panels and attempt to arrive at a judicial decision as to what ought to be done.

Reporting for Panel 3 (High Frequency Generation) Chairman Roger Wise emphasized the need for "cleared" members in order that deliberations might be carried on with similarly "cleared" members on other Panels.

H. S. Frazier, Chairman of Panel 4 (Standard Broadcasting) reported that (quoting a bulletin of FCC) "there are 10 million inhabitants living outside the daytime primary service area of any broadcast station; and 21 million living outside the nightime service range of all stations; perhaps the greatest service this Panel could hope to perform would be the development of standards and methods which would eventually bring reliable radio reception to most of these people".

C. M. Jansky, Jr., Chairman of Panel 5 (Very High Frequency Broadcasting) reported the formation of special committees on polarization and on the determination of a standard if frequency for high frequency receivers, and brought up the question of wartime development of means of modulation, other than standard AM and FM, which should be considered. A special com-

These Addresses, representing a part of the extensive IRE program, were briefed in the February issue of Electronic Industries

Reports of FCC Engineers, page 308, this issue

- **Limitations Imposed by Quantum Theory on Resonator Control of Electrons, by L. P. Smith, Cornell University**
- **AC Network Analyzer Studies of Electromagnetic-Cavity Resonators, by J. R. Whinnery, C. Concordia, W. Ridgeway, and Gabriel Kron**
- **A New Approach to the Solution of High-Frequency Field Problems, by J. R. Whinnery and Simon Ramo**
- **Equivalent Circuit of the Field Equations of Maxwell, by Gabriel Kron—Presented by J. F. McAllister, Jr., General Electric Co.**
- **Design Technic vs. Service Requirements, by I. W. Stanton, Radio Corp. of America**
- **Some Experiments Relating to the Statistical Theory of Noise, by C. M. Burrill, Radio Corp. of America**
- **Modification of Noise by Certain Non-Linear Devices, by D. O. North, Radio Corp. of America**
- **Joint Army and Navy Tube Standardization Program, by Lieutenant C. W. Martel, United States Army, and J. W. Greer, United States Navy**
- **Intermittent Behavior in Oscillators, by W. A. Edson, Bell Telephone Laboratories**
- **Standardization of Service Equipment, by Commander A. B. Chamberlin, United States Navy, Bureau of Ships, Radio Division**
- **Transmission-Line Analogies of Plane Electromagnetic Waves, by A. B. Bronwell, Northwestern University**
- **Amplidyne System of Control, by E. F. W. Alexanderson, K. K. Bowman, and M. A. Edwards, General Electric Co.**
- **Equivalent Circuits for Discontinuities in Transmission Lines, by J. R. Whinnery and H. W. Jamieson, General Electric Co.**
- **The Piston Attenuator, by H. A. Wheeler, Hazeltine Electronics Corp.**

mittee also is working on relay problems.

D. Smith, Chairman of Panel 6 (Television) gave as the consensus of his Panel that all present frequencies are urgently needed for Television, plus many more.

Chairman John V. L. Hogan of Panel 7 (Facsimile) is still in process of completing the organization of the group which at present has a total of 23 members representing 18 interests. He urged that careful consideration be given to facsimile, which he styled "the new radio printing press."

Panel 8 (Radio Communication) has been organized by Chairman Haraden Pratt into four committees which will deal with (1) point-to-point, ship-to-shore, picture transmission, etc.; (2) mobile services; (3) international broadcasting; (4) technical problems common to all. At the moment the Panel is busiest with answers to the questions propounded by Panel 1.

Panel 9 (Relay Systems) had not had a meeting and Chairman E. W. Engstrom's report had to do primarily with the work that has been laid down for this group.

Chairman W. P. Hilliard of Panel 10 (Radio Range, Direction and Recognition) pointed out that as the title of the Panel indicates, much of its deliberations must concern secret technical matters. A meeting was scheduled for middle of February.

For Panel 11 (Aeronautical Radio) Chairman D. W. Rentzel emphasized the need for consideration of two plans, one for the immediate future and another which might be the ultimate plan, for a period at least 10 years in the future.

Chairman C. V. Aggers of Panel 12 (Industrial, Scientific and Medical Equipment) has organized his group into four committees with duties involving the study of (1) industrial heating equipment; (2) medical and surgical equipment; (3) scientific equipment; and (4) control equipment. These groups, he stated, are primarily concerned with the elimination of all forms of interference.

Panel 13 (Portable, Mobile and Emergency Service Communications) which has Prof. D. E. Noble as its Chairman, has been split into eight committees which collectively are working on problems having to do with (1) reduction of interference between services; (2) standards of good engineering practice; (3) extending the use of equipment beyond present uses. The ultimate plan, he believes is one that must of necessity embrace a period of from 5 to 10 years.

Signal Corps Analyzes Enemy Radio

By Major General R. B. Colton

Chief of Engineering and Technical Service
U. S. Signal Corps.

Generally speaking, German equipment is the best enemy equipment and the Japanese equipment probably the poorest. However, German and Japanese equipments all have points of interest to you as engineers, and we can and do learn from our enemies.

The first enemy equipment to be analyzed by our engineers was the German airborne radio Communications set, FUG 10. The German abbreviation FUG means a collection of radio apparatus, or in general what we know as a radio set.

The FUG 10 is used in German bomber and reconnaissance aircraft, including the Junkers 88 and the Heinkel 111. The complete set consists of a long wave transmitter and receiver, a short wave transmitter and receiver, direction finding equipment, intercommunication amplifiers, blind approach equipment, and associated dynamotors and control boxes. The FUG 10 is capable of operation up to 1,000 miles on cw with favorable conditions.

Conventional supers

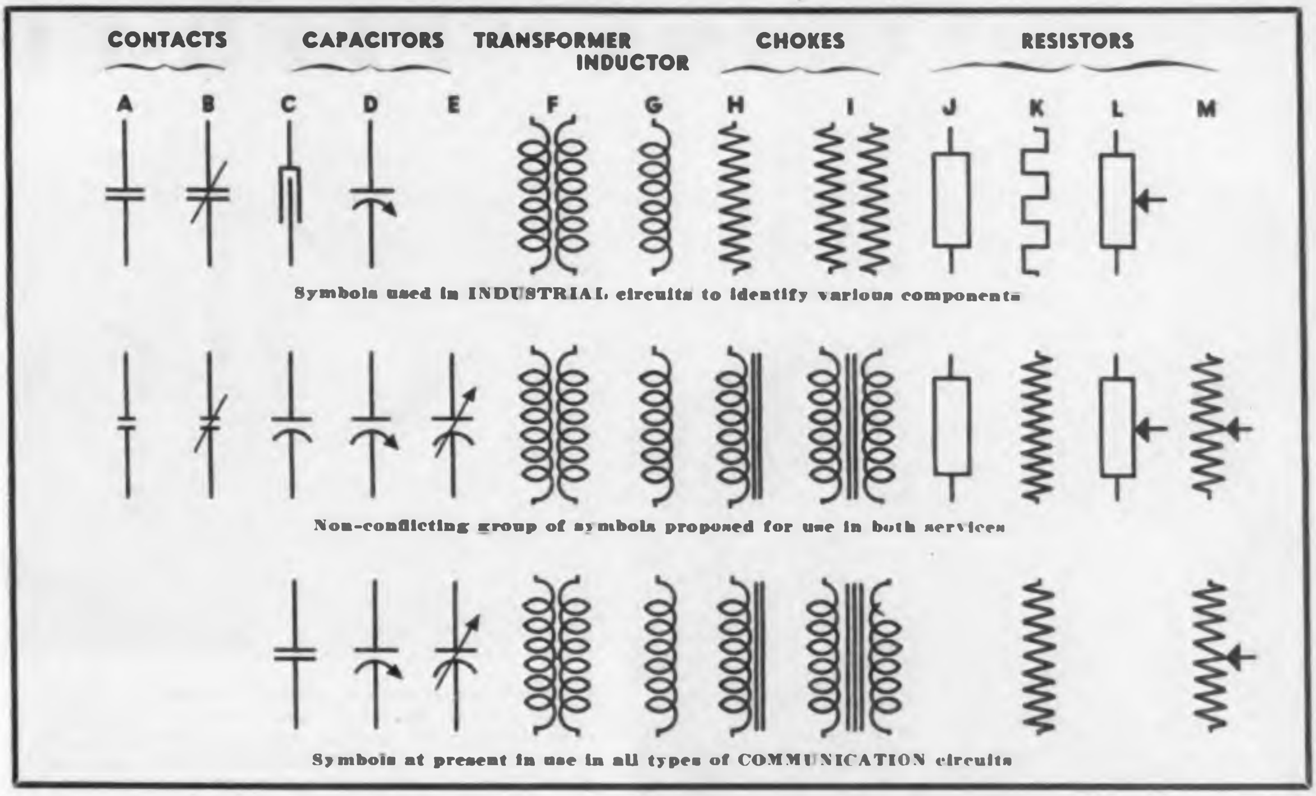
The two receivers, EK and EL, are similar except for their frequencies, which are 300 to 600 kilocycles for the long wave receiver and 3 to 6 megacycles for the short wave receiver. The letter E stands for "Empfanger", which means "receiver", the K for "Kurz" or "short", and the "L" for "Lange" or long wave. In a similar manner transmitters are designated by the letter "S" for "sender". The circuits are both conventional superheterodynes. The standard Telefunken type RV-12P 2000 tube is used. R means tube, V means amplifier, 12 is the filament voltage, P signifies pentode, and 2000 is the transconductance. Both have four spot frequencies that can be set by a cam click mechanism on the main tuning condenser. The receivers are used mainly for cw or mcw reception. The intermediate frequency of the long wave receiver is 140 kc, and of the short wave receiver, 1400 kc.

The high-frequency oscillators are stabilized by means of temperature compensating condensers. The radio frequency and intermediate frequency coils are all of the iron core variety. No automatic volume control is incorporated. A test socket is available on the front panel for checking operating voltages. The dynamotor voltages supplied are 12 volts for the heaters and 200 volts at 40 milliamperes for the plates.

MOPA transmitters

The two transmitters, SK and SL, are also similar, except for their frequency ranges, which are 300 to 600 kilocycles for the long wave transmitter and 3 to 6 megacycles for the short wave transmitter. Both units incorporate a master oscillator and two amplifiers in parallel. Type RL-12P 35 tubes are used in all stages. The ratings of these tubes are included in their nomenclature. R means tube, L means power, 12 means filament voltage, P means pentode and 35 denotes plate and screen dissipation (30 watts on the plate and 5 watts on the screen). The tuning of the two circuits is accomplished by iron-core variometers ganged together and controlled by a single knob. As in the receivers, four preset spot frequencies are also available and test sockets are provided on the front panel to measure existing potentials. The dynamotor supplies plate voltage of 600 volts at 150 milliamperes. The emission is cw only. However, in recently captured units radio-telephone has been added by grid-

(Continued on page 316)



The conflict between industrial contacts, top row, A and B, and the fixed capacitors of radio usage, C, bottom row, is handled by a distinct variation to both arrangements. The middle row, recommended, is used as follows: A and B, normally open and normally closed contacts. The more elaborate grouping of contacts on relays, etc., retain same symbols now used in communication circuits. Item C middle row represents a fixed capacitor (a minor variation from present procedure). D and E are alternate forms of variable capacitors. Items F to I represent inductances, transformers and chokes, and J to M, alternate forms of fixed and adjustable resistors. The "block" representation, J and L, carries a space for its value

Propose Standard Symbols

Changes suggested that will eliminate duplication and confusion in power and communication circuits

• During last month, substantial progress has been made toward the elimination of the duplication in the system of symbols in power and communication circuits. As we have mentioned before, for many years an identical appearance has been given to certain symbolic representation of entirely different components by these two groups. The existence of this double standard of electrical symbols has been a persistent obstacle toward the universal understanding of circuit operation.

A tentative set of revised symbols covering the controversial items has been set up by representatives of numerous groups, comprising industrial organization, military standardization agencies, engineering societies and technical publishers. They were called together by the American Standards Association at the suggestion of many of the groups interested. It is too early to report what the final appearance of those symbols may be that are fortunate enough to jump the hurdles in a coordinating conference (because long usage and the thousands of circuits involved, have made any change difficult to apply.)

Double standards

Working drawings, service manuals and training aids in the industrial fields have all used simple symbols for the equipment items most frequently found. These have been the contacts of circuit breakers, protective devices, switches, etc., together with transformers, solenoid coils and, less frequently, capacitors and resistors. Those symbols have been the simplest possible arrangements for a draftsman to draw.

With the ever-increasing use of electronic tubes, capacitors and resistors make up the bulk of the components an electronic or radio circuit diagram, and the contacts of switches, etc., are rarely put in. For that matter, power transformers and the associated rectifier and filter elements are frequently omitted as well. It happened that the power engineer's symbol for a contact was the same as the communication group's symbol for a capacitor. It has happened that these symbols sometimes got into the same diagram! The confusion that existed with these double standards put many in the class of not bothering to look at diagrams using the "other" group of symbols. The plan of systematizing these items

(*Continued on page* 340)

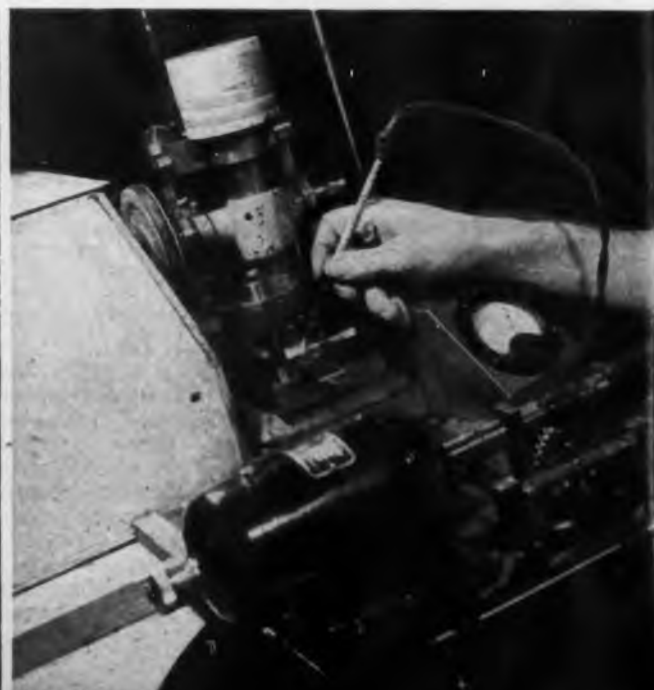
PRODUCTION SPEED-UP

1. Above: Short cuts to worker training are graphic charts used in Westinghouse electronics laboratories and experimental factory for tube production. The picturizations represent a technic borrowed from correspondence schools. Some jobs are done at sight by the use of the charts, all are standardized

2. Left: Nineteen engineering assistants culled from Sylvania's Emporium, Pa., production lines six months ago, have proved their mettle in contributing perhaps 30 per cent improvement in the engineering department's output by performing tests

3. Lower left: In the metal tube painting operation at RCA's Harrison, N. J., plant, a photoelectric control was rigged up to turn on the spray gun only during the interval when the tube is directly in front of the gun, and to withhold the paint when occasional tubes are missing from their sockets on the conveyor

4. Below: Jewels from a punch press. In Westinghouse setup, glass rod is fed automatically into hydrogen flame to stamp out precision glass bearings for instrument use. Thermocouple measures flame temperature



5. Above: Studies in chemical engineering developed several noteworthy wartime substitutes at RCA Victor Division, Camden, N. J. New "L-R" soldering flux overcame soldering problems, particularly with steel, which demanded fluxing agent more vigorous than rosin but less corrosive than zinc chloride or other acids requiring water-washing. L-R flux is mixture of rosin and levulinic acid (corn starch derivative)

6. Right above: For tropical-arctic service, "cumar impregnant" coil wax will not crack at —50 deg. C. nor flow at 85 deg. C. This resin-like material has a dielectric constant of 2.8 and a power factor of 1 per cent at room temperature. It consists of 66.9 per cent cumar resin, 26.2 citicica oil, and 6.9 per cent of a highly purified mineral oil, blended under careful laboratory control

7. Far right: New material provides higher "Q" and higher permeability cores than natural magnetite. Extremely fine powdered black oxide of iron (a paint industry pigment) free from the nonmagnetic gangue always found in magnetite, is compressed into cores as shown

8. Below: Pencil-type solder dispenser devised at General Electric's Schenectady works prevents contamination of solder from handling and dirt. Gadget consists of piece of resin tubing with a force-fit metal nozzle. Solder is pre-wound on a drill rod, inserted, then pulled out nozzle as needed

Process CONTROL METHODS

by RALPH R. BATCHER
Consulting Editor

Part II—Electronic methods for the measurement of small displacements by the use of resistance strain gages

● In the utilization of small changes in the position of an object, or the displacement of some section of it, for the investigation of the actuating causes, it was shown in Part I that numerous physical effects could be brought into service. The utilization of changes in frequency effected by the displacement was described.

An even more popular system of measuring displacements, uses simple resistance elements for converting small movements into their electrical equivalent. The method has about every advantage over other methods: lightweight, simple to construct and apply, inexpensive, easy to calibrate, and obtainable in essentially interchangeable groups.

The basic strain element consists of a resistance wire of small diameter that is compressed and stretched by the movement under investigation. If a wire is stretched it becomes longer and slimmer, both of which increase its resistance. The actual value of $\triangle$ R can be roughly estimated by the use of Poisson's ratio, which is a statement of the relation between the transverse contraction of a bar or rod of uniform cross-section, and the elongation per unit length when subjected to a tensile stress.

Fig. 1—Typical size of strain gages (not the smallest in use however) which are cemented flat against object being tested

However, this resistance/strain relation has been determined for many sets of conditions and materials and the results compare only approximately with the Poisson theory—the resistance change being generally greater than simple physical variations will account for. Possibly this is because the premises upon which Poisson's ratio were formulated should not be extrapolated to cover such small diameter wires as are used in strain gages, the original theory having been developed for fairly massive rods.

Uses resistance charges

While rather large resistance changes are caused by compression and tension with some materials, the selection of the actual material has narrowed down to a few with good stability (constancy of $\triangle$ R with repeated strains), low temperature coefficients of resistance (so that resistance changes with temperature do not mask those due to strain)and a high elastic limit (so that permanent shifts do not occur under the stresses likely to occur during normal operation).

These criteria have been met by commercial strain gages which have been marketed* and used by industry in many fields, to the extent of considerably past the million mark, sometimes as many as several thousand on one job: such as measuring every important stress in a new aircraft design.

It is probable that while there is much to be learned as to the ideal material, that would give a greater resistance variation, the greatest improvement will come from new measuring technics, because the resistance variations that are to be measured are not large. The gage units are carefully constructed under specified conditions of resistance, length, material and are each calibrated as to their sensivity factor, which is the relation between incremental resistance and elongation—that is $\triangle R/\triangle L$. Both values are measured as a percentage of original value. They are experimentally checked to within 0.5 per cent.

Considering a typical gage, having dimensions as assumed in Fig. 2, with a resistance of 118.5 ohms and a sensivity factor of 1.97. There is a maximum wattage dissipation that can be handled by a gage of a certain area, which in this case is about one tenth of a watt. This figure can be exceeded for short intervals, or when contact with metal assures a good heat conduction. Assuming a current of 0.030 ampere through this gage—it is found that a resistance variation of $\triangle R = \frac{R \times \triangle L \times F}{L} = .37$ ohms per mil (0.001 in.) of extension or compression, or 2.7 mils movement per ohm. With a current level of .030 amp. this is equivalent to a voltage change of .011 volt per mil, which calls for either a sensitive bridge for static measurements, or an oscillograph for dynamic tests under operating conditions. While this voltage may seem quite small this is really quite considerable of an output when compared to some of the commonplace microphones in use.

In order to cover the wide range of applications already found of value several lengths and resistance values have been standardized, one

Fig. 2—Terminal heads connected to an accurately laid out grid of selected alloy wire, about 0.001 in. diameter

*The perfection this device has attained has been due to many workers: P. W. Bridgeman, Simmons, A. C. Ruge, A. V. deForest, R. W. Carlson, and others. The important rights have been secured by the Baldwin-Southwork Division of Baldwin Locomotive works, which company has provided some of the material for this resume.

FOR INDUSTRIAL USES

of which should suitably cover the deflection range desired, and still permit test circuits to be standardized. The resistance variation to be expected from these units under operating conditions can be determined from the chart Fig. 3. Here the length L, resistance R and sensitivity factor F are all characteristics supplied with the gages when purchased, and lines connecting those points (first R and F, and then another line from L to the point where the first line crosses the center scale will, if extended, give the mils deflection for a change of one ohm). Since the strain gages give a linear output, lesser values of $\triangle R$ will indicate correspondingly less movements. Linear variations as low as 2.5 microns have been noted with this system.

There is no lower limit of the frequency response, as the gage will take note of steady response. This makes it easy to procure a dynamic calibration for a gage by static measurements. The actual limit is that of the recording equipment. For static loads a direct current and a standard bridge (one with adequate sensitivity for small resistance changes) will suffice. For slowly-varying loads, a recorder or oscillograph can be used. One expedient is to supply an alternating current to the bridge, whereupon measurements are recorded of the envelope of the applied frequency, as modulated by the gage movements. This sort of record does not take note however of the direction of that movement, as an unbalance in either an extension or a contraction will produce the same indication, unless the balance is purposely upset at the start.

Gages are accurate

The wire gages themselves, especially those developed for dynamic measurements, are accurate up to the limit of frequencies encountered in mechanical tests, which means 100 kc or higher. Impact movements of a few microseconds are clearly recorded. This indicates that a gage may be used directly in the input circuit of an oscillograph. The usual laboratory oscillograph of the 5 inch diameter size has an internal amplifier with a gain of say 2000, and gives a 3 inch deflection with about 0.03 volts applied (rms). With a current of 0.030 ampere through the gage, a 0.001 in. elongation will cause a change of 0.011 volts and a deflection of about 1 in. A circuit, as in

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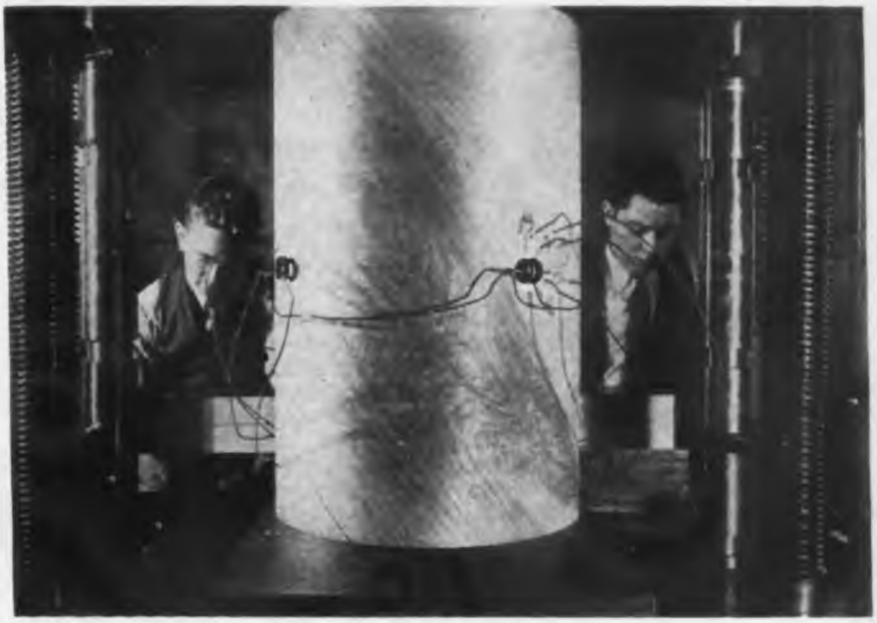

A compression test on a veneer cylinder using several resistance strain gages so distributed that the strains in various directions caused by great pressures exerted on the cylinder are registered. Much experimenting is being done on veneers suitable for use in aircraft at the Forest Products Laboratories, Madison, Wis.

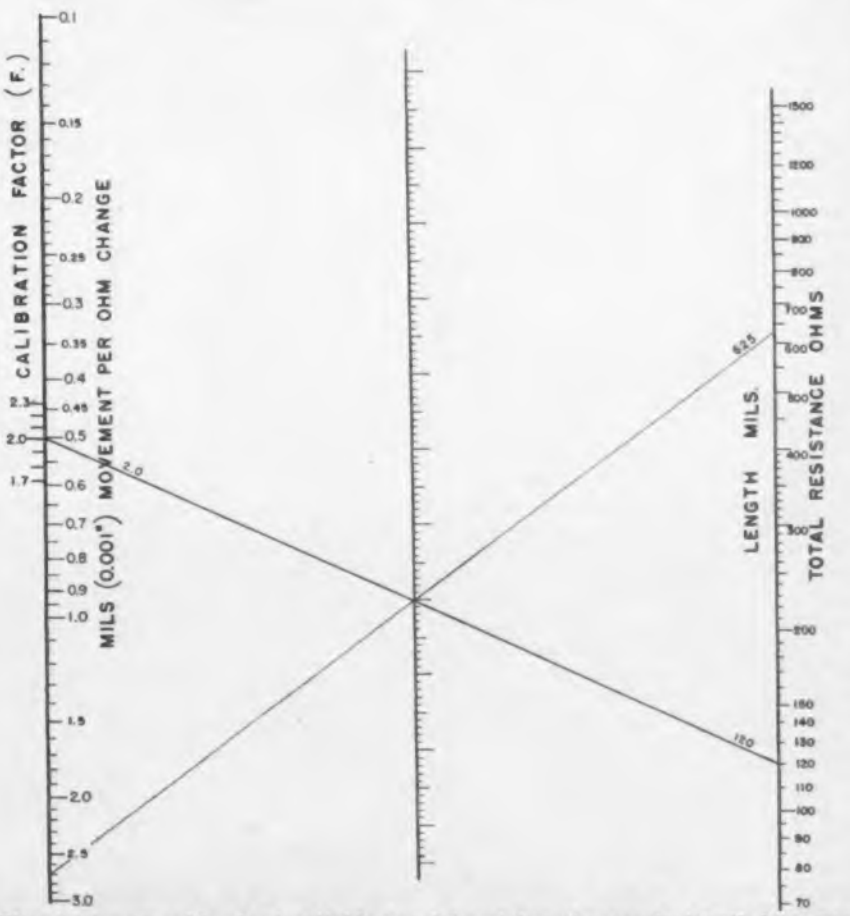

Fig. 3—Nomographic chart suitable for determining changes in length in gages of known characteristics corresponding to registered changes in resistance

POLAROGRAPHIC Analysis

by A. C. WALKER
Bell Telephone Laboratories

Electrochemical methods of determining extremely small quantities of iron and antimony in battery acid

● An important source of lead storage battery deterioration is the continual internal drain which results from self-discharge and sulfation caused by the presence of small amounts of metals other than lead. Two of these substances, iron and antimony, cannot be completely excluded in commercial battery manufacture. They may be present either as ions in solution or as adsorbed and deposited material on the active surfaces of the plates. The amounts of these impurities in solution are so small that it is difficult to follow their concentration changes during battery operation without taking unduly large samples for analysis.

In 1925, Heyrovsky and his coworkers in Prague devised an electrochemical method of detecting extremely small quantities of substances in solution. This "polarographic" method is of value in chemical analysis and has been used in the laboratories to measure quantitatively the iron, antimony and lead present in storage battery electrolyte.

A schematic of the polarograph, Fig. 1, shows the solution tested, B, in a flask between a pool of mercury A and a dropping mercury electrode C. The battery K applies voltage to the solution through the slidewire potentiometer E which is motor-driven at M to increase this voltage continuously. A galvanometer G measures the current through the solution and its deflections are recorded photographically on a chart J which rotates in synchronism with the drum of the potentiometer. A rheostat N controls the voltage applied to the potentiometer and a shunt H adjusts the sensivity of the galvanometer for solutions of widely different concentrations.

Very little current flows until the applied potential reaches a value characteristic of one of the substances in the solution. Then it increases suddenly and produces a step in the current-potential curve. These steps identify the elements present. The polarographic method of analysis is so sensitive that a substance can be detected in a million times its weight of water and the characteristic curves can be drawn in a few minutes.

The electrolytic cell, Fig. 2, holds from one to two milliliters of solution. Hydrogen is bubbled through it to remove oxygen which would affect the potential measurements. The hydrogen inlet is just at the surface of the mercury pool, thus acting as a seal when the flow of gas is stopped and the test run is made. Prior to taking measurements, about five minutes suffices to remove the oxygen and adjust the potentiometer.

The high current density on the small mercury drops makes all of the ions of the reacting substance in the layer of solution at the surface of the drop tend to deposit at once thus leaving this layer substantially empty with respect to these ions. Current flow is limited to a constant average value, which is the rate at which ions of the substance depositing can diffuse from the main body of the solution into the surface layer surrounding the drop.

If there are positive ions of more than one substance in the solution, that with the lowest electrode potential relative to mercury plates out first and produces the first step on the chart, Fig. 3. Others follow in the order of their electrode potentials and each makes a separate step provided these potentials differ by 0.2 volts or more. The width of these steps depends on the concentration of the solution, the rate at which the reacting substance diffuses into

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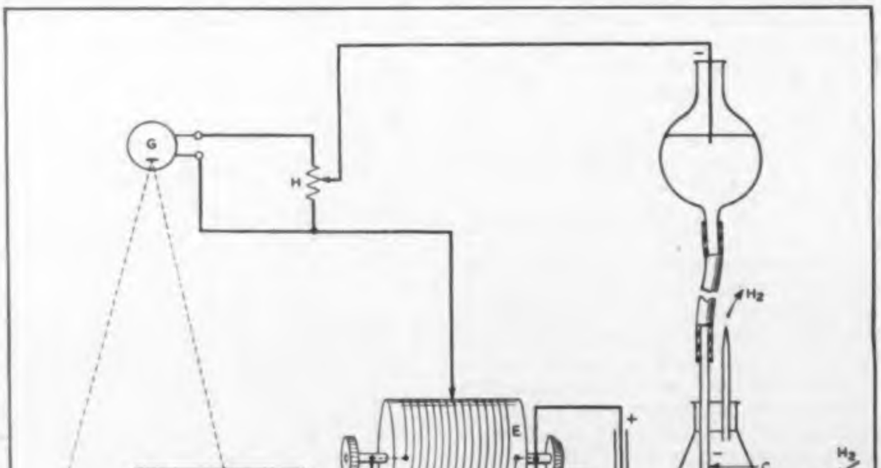


Fig. 1—Schematic of polarographic method of electrochemical analysis in which minute substances in solution are measured by a difference in potential as they are deposited on a dropping mercury electrode

Four blind women sorting mica sheets by "feel." Each has her own method, but general idea is to judge thickness by tensile bending strength. Girls are accurate to one ten-thousandth inch! The seeing person in foreground maintains a spot check on their work with a gage. Allman has employed up to twenty blind girls at once

BLIND AID MICA OUTPUT

● The story of Philadelphia Mica Corp. is the story of blind, 25 year old "Bob" Allman, president, whose chief interest in life has been the rehabilitation of blind people, in Peace and War. In September, 1943, he organized the company for the double-barreled purpose of helping to relieve the bottleneck in mica and giving blind people a social purpose and place in the war effort. Since then he has had as many as twenty blind girls on the payroll at once.

Allman, whose personal story appeared in the "Saturday Evening Post" for June 22, 1940, has been totally blind since the age of 4, when he fell backwards from the top of a box car kids dared him to climb. In a school for the blind he invented thoroughly practical versions of baseball and football for blind participants. A graduate of the University of Pennsylvania, he is the only blind person ever to have won a college athletic letter. A graduate also of law school, Allman is a member of the bar in Philadelphia.

Over and above the purely social benefits, Allman points out and can prove that blind mica gagers do a better job than sighted people. Accuracy of their work is as good or better than that of the hand-gage and eye method, and their speed is twice that of sighted workers. "Moreover," says Allman, "mica gagging taps a large source of 4-F labor and releases sighted persons for other essential work." Allman's chief ambition is to see his enterprise grow and extend itself firmly in the postwar world. He looks to television to demand large quantities of mica capacitors. There is no worthier postwar purpose, he feels, than to help those boys who gave their eyes that democracy might live.

Left: Closeup of blind worker's hands. This girl holds a bundle of mica in her right hand, feels a sheet at a time in her left before tossing it into the correct tray. She has been blind a year; thinks "Bob" Allman is a saint! Center: Next step in mica process requires sight-punching out the individual mica squares for low-loss condensers. Right: Final inspection. Mica squares are examined by reflected and transmitted light for inclusions of air or other unwanted material

TUBES ON THE JOB

X-Ray for Ballistics Research

Radiographs taken in a millionth of a second in this 300,000 volt Westinghouse X-Ray equipment, make possible studies of the action of bullets in motion within gun barrels and when they hit targets of armor plate or other materials.

The Army has two of these units at Frankford Arsenal in Philadelphia, and two at the Ballistics Research Laboratories of the Army Ordnance Proving Grounds in Aberdeen, Md. Two mobile units are placed side by side, so that two pictures of a single bullet can be taken at different stages.

Each unit is mounted on wheels, weighs 1500 lbs., measures 8 ft. long, 7 ft. high and 3 ft. wide. Projecting from the front of the carriage is the ultra high speed tube 24 in. long. The first experimental tube which made possible ultra high speed X-Rays was developed in the Westinghouse Lamp Laboratories at Bloomfield, N. J., by Dr. Charles M. Slack and his associates.

High Frequency Bug Eliminator

Three kilowatts of ten megacycle energy can kill all the bugs in 400 one-pound packages of grain, cereals, or flour, in an hour. So said Edwin D. Tillson, Chicago Utilities Research Commission engineer, at a demonstration before several hundred grain elevator men.

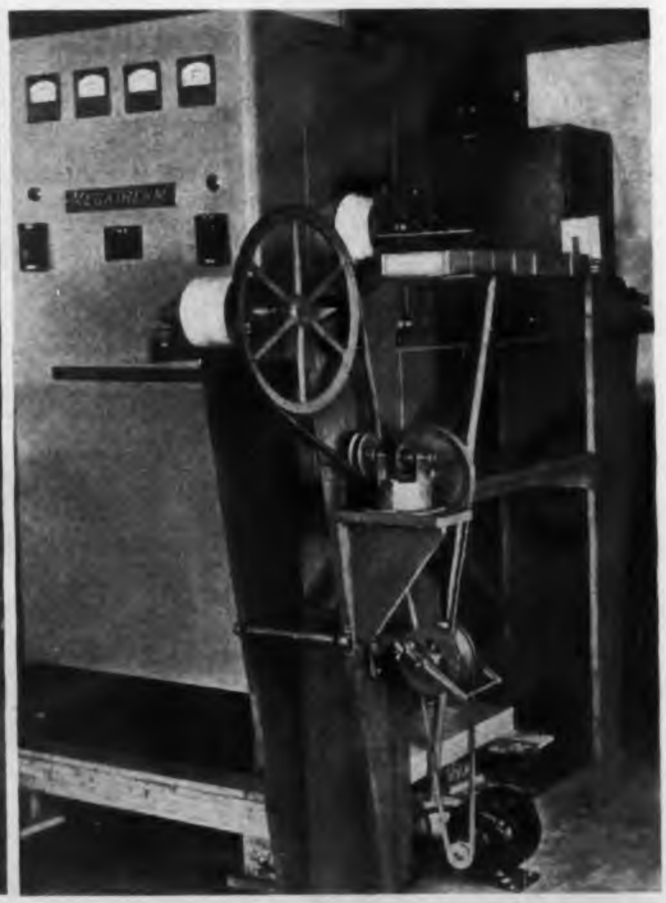
The equipment used is a "Megatherm" 3-kw output, two to ten mc oscillator made by the Industrial Electronics Division of Federal Telephone and Radio Corp., with a motorized conveyor belt to carry the packaged grain between the output plates of the dielectric heating unit. Each package receives the energy for 20 to 30 seconds.

Cost figures should be of interest. Assuming each package to weigh one pound and the contents to have a specific heat of 0.4, the temperature must be raised about 60 degrees F. in order to kill all insects or larvae. Sixty times 0.4 gives the heat required, or 24 Btu's. Three kilowatts amount to 10,236 Btu's, or sufficient to treat about 400 one-pound packages. Assuming a power cost of one cent per kwh and an overall efficiency of 50 per cent (very conservative), the operating cost per hour would be six cents. The energy cost per package comes to 0.015 cents.

In addition to the precaution of using a cotton conveyor belt, labeling should not be done immediately before the sterilizing operation. Wet glue can be a problem! The same high frequency equipment, might be used to sterilize bags.

X-Ray equipment below makes possible studies of the action of bullets in motion within gun barrels

High-frequency dielectric heating equipment in use to sterilize packaged pancake flour



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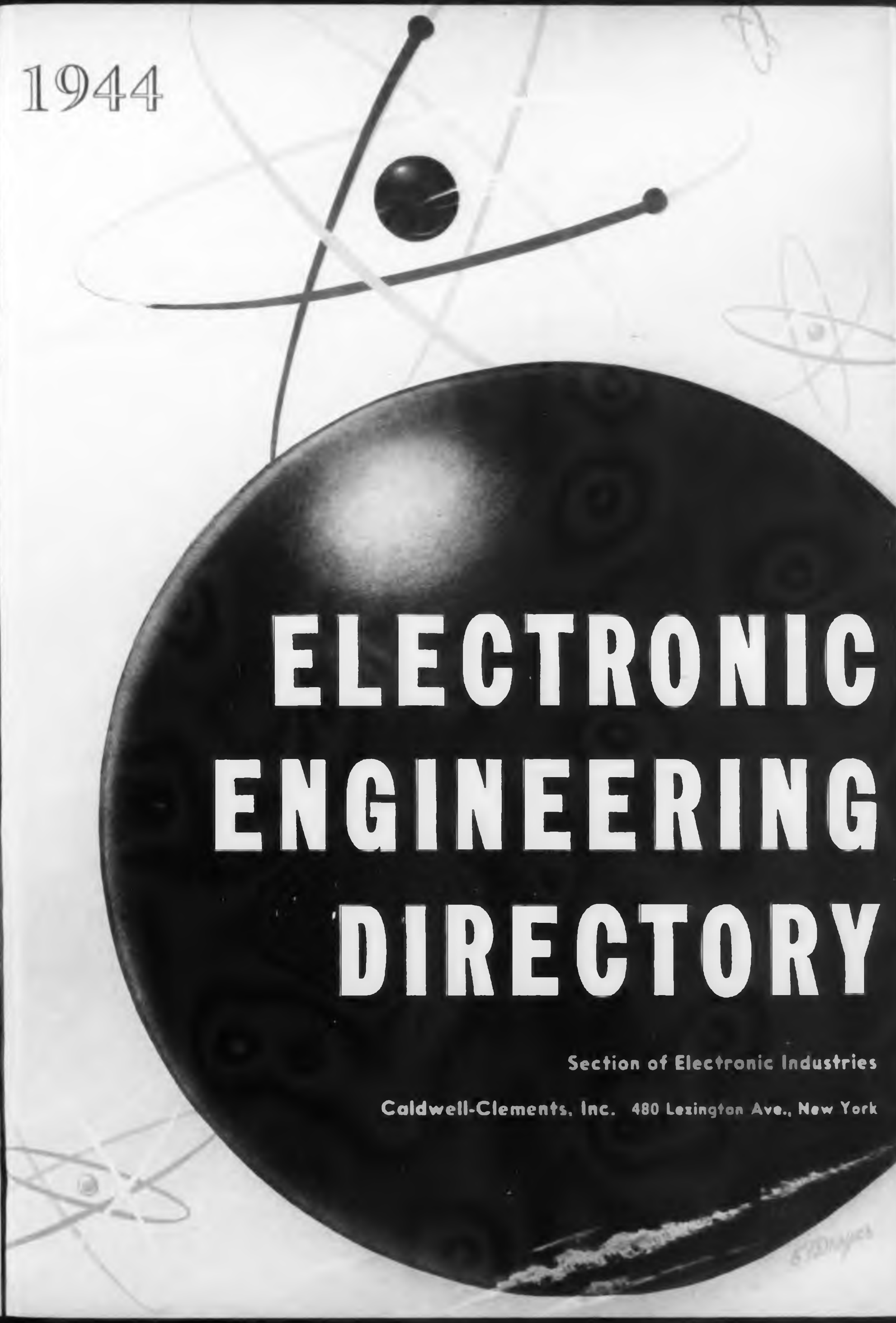


ELECTRONIC ENGINEERING DIRECTORY

Section of Electronic Industries

Caldwell-Clements, Inc. 480 Lexington Ave., New York

1944 ELECTRONIC ENGINEERING DIRECTORY SECTION

INDEX TO PRODUCTS, EQUIPMENT, INSTRUMENTS AND MATERIALS

ELECTRONIC ENGINEERING DIRECTORY SECTION

Complete listings of all products and items entering into radio, radar, and electronic equipment

Antennas & Accessories

Airplane antenna	AA
All-wave (home)	AW
Antenna reeling equipment	AR
Auto	A
Dummy antenna	DA
Feeder spreaders	FS
Ground clamps	G
Grounding springs	GS
HF assemblies	HF
Insulators	I
Kits	K
Lightning arresters	L
Loop antennas	LA
Master systems	MS
Outlets	O
Rotary beam	RB
Television & FM	TL
Towers & Supports (home)	T

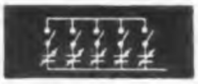
ABC Radio Laboratories, 3334 N. New Jersey St., Indianapolis, Indiana—AW
Acme Welding Co., Louisville, Ohio—AW, F, LA,T
Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, L. I., N. Y.—AA, I, LA, AR
Aircraft Accessories Corp., Fairfax & Funston Rd., Kansas City 15, Kan.—AA,LA
Airplane & Marine Instruments, Inc., Box 92, Clearfield, Pa.—TL, LA
The Akron Porcelain Co., Corey Ave., Akron 14, Ohio —I
Alpha Wire Corp., 50 Howard St., New York 13, N. Y. G, I, K, L, MS, TL
American Lava Corp., Cherokee Blvd., & Manufacturers Rd., Chattanooga 5, Tenn.—FS, I
American Radio Hardware Co., Inc., 478 Broadway, New York, N. Y.—G, O
Amplex Engineering, Inc., 1620 Grand Ave., New Castle, Ind.—RB, T
Amy, Aceves & King, Inc., 11 W. 42nd St., New York 18, N. Y.—MS, O
Andrew Co., 363 E. 75th St., Chicago, Ill.—AA, AW, A, HF, K, LA, MS, RB, TL
Astatic Corp., 830 Market St., Youngstown 1, Ohio—AA
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.—G
Auburn Mfg. Co., 100 Stack St., Middletown, Conn.—I
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—FS, HF, I, LA, RB
Rex Bassett, Inc., Bassett Bldg., 500 SE Second St., Ft. Lauderdale, Fla.—AA, A, L
Belden Mfg. Co., 4647 W. Van Buren St., Chicago, Ill.—AW, TL, K, L
Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.—AA
Bendix Radio, Division of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—AA, I, LA, T
Birnbach Radio Co., Inc., 145 Hudson St., New York, N. Y. "Birco"—AW, G, I, K, L, MS, O, TL
Blaw-Knox Company, Blawnox, Pa.—TL, T
L. S. Brach Mfg. Co., 55 Dickerson St., Newark, N. J.—AW, A, G, I, K, L, MS
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—FS, I
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York 54, N. Y.—G
Burton-Rogers Co., 857 Boylston St., Boston 16, Mass.—A, TL
Cardy-Lundmark Co., 1801 W. Bryon St., Chicago 13, Ill.—LA
Centralab, Division of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.—I
Clampipe—Mueller Electric Co.
Collins Radio Co., 2920 First Ave., Cedar Rapids, Iowa—T, I
Colonial Radio Corp., 254 Rano St., Buffalo 7, N. Y. —A
Communications Co., Inc., 300 Greco Ave., 6250 Coral Gables, Fla.—AA, LA, T
Communications Equipment Corp., 134 W. Colo. Blvd., Pasadena, Calif.—T
Consolidated Wire & Assoc. Corps., 1635 S. Clinton, Chicago, Ill.—A, AW, G, K, L, MS
Cook Ceramic Mfg. Co., 500 Prospect St., Trenton, N. J.—I
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.—L
Corning Glass Works, Corning, N. Y. "Pyrex"—I
Cornish Wire Co., Inc., 15 Park Row, New York, 7, N. Y., "Corwico", "Noise-Master"—AW, K, L, TL
Corwico—Cornish Wire Co., Inc.
Coto-Coil Co., Inc., 71 Willard Ave., Providence, R. I.—I
Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—I
Doolittle Radio, Inc., 7421-So. Loomis Blvd., Chicago 36, Ill.—AA, A, HF
DX Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.—RB
Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza So., Long Island City, N. Y.—AW, G, I, K, L
Electro-Marine Co., 274 Madison Ave., New York 16, N. Y.—HF, O
Electronic Mechanics Inc., 70 Clifton Blvd., Clifton, N. J.—I
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—TL
Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—HF
Essex Electronics, 1060 Broad St., Newark 2, N. J.—LA
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—HF, RB, T
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—T
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J.—DA
Fisher Research Laboratory, 1961 University Av., P.O. Box 356, Palo Alto, Calif.—AW, A, LA
M. M. Fleron & Sons, Inc., 113 N. Broad St., Trenton, N. J., "Fleron"—AW, G, I, K, L, O, TL, T
Froiland Mfg. Co., 430 St. James Ave., Springfield, Mass.—HF
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—AW, A, G, I, K, L, MS, TL
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—GS
General Ceramics and Steatite Corp., Crows Mill Raod, Keasbey, N. J.—FS, I
General Communications Co., 681 Beacon St., Boston 15, Mass—AA, HF, LA
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—I, TL, I
General Radio Co., 30 State St., Cambridge, Mass. —DA
General Winding Co., 420 W. 45th St., New York, N. Y., "Gen-Win"—AW, K, MS
Gen-Win—General Winding Co.
Harco Steel Construction Co., Inc., 1180 E. Broad St., Elizabeth 4, N. J.—T, TL
D. H. Harrel, 1527 E. 74th Place, Chicago, Ill.—T
Heath Co., Benton Harbor, Mich.—LA
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—AA, RB
ICA—Insuline Corp. of America
Ideco—International Stacey Corp.
Illinois Seating Corp., 2138 N. Racine Ave., Chicago, Ill.—T
Imperial Porcelain Works, Inc., New York Ave. & Mulberry St., Trenton, N. J.—I
Insuline Corp. of America, 3602—35th Ave., Long Island City, N. Y., "ICA"—A, LA, TL
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—AW, K
International-Stacey Corp., 910 Michigan Ave., Columbus, Ohio, "Ideco"—T
Isolantite Inc., 343 Cortlandt St., Belleville 9, N. J. —FS, HF, I
Ray Jefferson, Inc., 40 E. Merrick Rd., Freeport, L. I., N. Y.—HF
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn 19, N. Y., "JFD"—A, K
E. F. Johnson Co., Waseca, Minn.—I
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.—A
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—TL
Lapp Insulator Co., Inc., Le Roy, N. Y.—I, O, DA
Lear Avia, Inc., Piqua, Ohio—AA, AR, T
Lehigh Structural Steel Co., 17 Battery Place, New York, N. Y.—T
Lenoxite Div., Lenox, Inc., 65 Prince St., Trenton, N. J.—I
Lewisburg Chair & Furniture Co., Lewisburg, Pa.—T
Fred M. Link, 125 W. 17th St., New York, N. Y.—TL, T
John E. Lingo & Son, Inc., 28th St. & Buren Ave., Camden, N. J.—T
Littelfuse, Inc., 4757 Ravenswood Ave., Chicago 40, Ill.—L
Locke Insulator Corporation, P. O. Box 57, Baltimore 3, Md.—T, K
Maxwell Smith Co., 1027 N. Highland Ave., Hollywood, Calif.—T
Measurements Corp., 116 Monroe St., Boonton, N. J. —HF
Meissner Mfg. Co., Belmont & Seventh Sts., Mt. Carmel, Ill.—I
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—FS, I
Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—I
Mueller Electric Co., 1583 E. 31st St., Cleveland, 14, Ohio, "Universal", "Clampipe"—G
The Muter Co., 1255 S. Michigan Ave., Chicago, Ill.—LA

ALPHABETICAL "FINDING LIST"— See Page 166

An exclusive feature of this Engineering Directory is the alphabetical list of names of all concerns producing electronic equipment which appears following the product listings. If you know the name of a company and want to learn its principal products, address, etc., use Alphabetical "Finding List" at end of this Product Directory Section

Mycalex Corporation of America, 60 Clifton Blvd., Clifton, N. J.—I
National Co., Inc., 61 Sherman St., Malden 43, Mass. GS, HF
National Mineral Co., 2638 No. Pulaski Rd., Chicago 31, Ill.—LA
National Porcelain Co., 400 Southard St., Trenton, N. J.—I
Noise-Master—Cornish Wire Co., Inc.
Ohmite Mfg. Co., 4835 Flournoy St., Chicago 44, Ill.—DA
Penn-Union Electric Corp., 315 State St., Erie, Pa.—G
Philco Corp., C and Tioga Sts., Philadelphia 34, Pa.—AA, A, LA, TL
Philson Mfg. Co., Inc. 156 Chambers St., New York, 7, N. Y.—AA, A, TL
The Porcelain Insulator Corp., Main St., Lima, N. Y.—I
Porcelain Products, Inc., 124 W. Front St., Findlay, Ohio—I
Premax Products Div., Chisholm-Ryder Co., Inc., College and Highland Aves., Niagara Falls, N. Y.—AA, AW, A, G, HF, I, RB, TL, T
Pyrex—Corning Glass Works
Quam Nichols Co., 33rd Place & Cottage Grove Ave., Chicago 16, Ill.—AA
Radex Corp., 1332 Elston Ave., Chicago, Ill.—LA
The Radiart Corp., 3571 W. 62nd St., Cleveland, 2, Ohio—3
Radio Frequency Labs., Inc., Boonton, N. J.—LA
Radio Navigational Instrument Corp., 305 E. 63rd St., New York 21, N. Y.—LA
Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.—HF
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio—T
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—MS
Bernard Rice's Sons, 325 Fifth Ave., New York, N. Y.—HF
Richardson Allen Corp., 15 West 20th St., New York 11, N. Y.—DA
The T. R. Routh Co., 1045 Bryant St., San Francisco, Calif.—I
Sandee Mfg. Co., 3945 N. Western Ave., Chicago 18, Ill.—I
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.—AA
Schuttig & Co., 9th & Kearny Sts. N. E., Washington 17, D. C.—HF
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.—K, LA
Snyder Mfg. Co., 813 Noble St., Philadelphia, Pa.—A, G, T
Southern Products, Independence, Mo.—AA, A, G
Standard Winding Co., 44-62 Johnes St., Newburg, N. Y.—LA
States Co., 19 New Park Ave., Hartford 6, Conn.—DA
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—AW
Summerill Tubing Co., Bridgeport, Pa.—AA, A
Suoer Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.—LA
Superior Porcelain Co., Parkersburg, W. Va.—I
Taco—Technical Appliance Corp.
Technical Appliance Corp., 516 W. 34th St., New York 1, N. Y., "Taco"—AW, G, I, K, L, MS, O, TL
Therm-Electrical Meters Co., Inc., Pearsall Place, Ithaca, N. Y.—HF
R. Thomas & Sons, Lisbon, Ohio—I
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.—RB
Trebor Radio Co., Pasadena 18, Calif.—LA
Ucinite Co., Div. of United-Carr Fastener Corp., Newtonville, Mass.—AA
Uniform Tubes, Shure Lane & Lauriston St., Philadelphia 28, Pa.—AA, AW, A, HF
Union Electrical Porcelain Works, Inc., Trenton, N. J.—I
Universal Clay Products Co., 1740 E. 12th St., Cleveland, Ohio—I
United States Rubber Co., 1232 Sixth Ave., New York 20, N. Y.—AA
Utilities Service Co., 1 Pine St., Allentown, Pa.—G, K, LA, T
Vertrod Mfg. Co., 132 Nassau St., New York, N. Y.—AW, K, TL
Victor Insulators, Inc., Maple Ave., Victor, N. Y.—I
Ward Products Corp., 1523 E. 45th St., Cleveland, Ohio, "Ward"—AW, A, G, L, LA, TL
Western Electric Co., 195 Broadway, New York, N. Y.—T
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.—I, O
Whisk Laboratories, 145 W. 45th St., New York, N. Y.—MS
Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.—G, GS
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—AA
Wincharger Corp., Sioux City, Iowa—T
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.—AA, AW, A, HF, LA, MS, RB, TL

Automatic Tuning Units & Parts



Face plates ....see DIALS
Geared tuning units ....GC
Inductance trimmer units ....IT
Mechanical automatic selectors ....MS
Push button motor operated units (complete) ....PM
Push button trimmer units (complete) ....PT
Remote controls ....R
Switches ....S
Trimmer condenser units ....CU
Tuning motors ....M

Aladdin Radio Industries, Inc., 225 W. Jackson Blvd., Chicago, Ill.—IT
Alden Products Co., 119 N. Main St., Brockton, Mass.—GC
Alliance Manufacturing Co., Lake Park Blvd., Alliance, Ohio—M
Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y.—R, S
American Automatic Electric Sales Co., 1019 W. Van Buren, Chicago, Ill.—R
American Steel Package Co., Squire Ave., Defiance, Ohio, "Defiance"—MS
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—M
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.—IT, PT, CU
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—GC, IT
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—IT, PM, R, S, M
Centralab, Div. of Globe Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis., "Centralab"—S, CU
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—MS, PM
Consolidated Wire & Assoc. Corps., 1635 S. Clinton, Chicago, Ill.—MS
Control Corp., 600 Stinson Blvd., Minneapolis, Minn.—R
Coto-Coil Co., 71 Willard Ave., Providence, R. I.—MS, R, S
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill., "Crowe"—MS
Doolittle Radio, Inc., 7421 So. Loomis Blvd., Chicago 36, Ill.—R
Defiance—American Steel Package Co.
DX Crystal Corp., 1841 W. Carroll Ave. Chicago, Ill.—IT, CU
Electro Motive Mfg. Co., Park & John Sts., Willimantic, Conn.—CU
Essex Electronics, 1060 Broad St., Newark 2, N. J. IT
H. C. Evans & Co., 1528 W. Adams St., Chicago, Ill.—S
The Forest Electronic Co., 820 E. 65th St., New York, N. Y.—R
Froiland Mfg. Co., 430 St. James Ave., Springfield, Mass.—GC, R
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill., "Motorola"—R
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—S
General Control Co., 243 Broadway, Cambridge 39, Mass.—S
General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J.—MS, PM, R, M
General Winding Co., 420 W. 45th St., New York, N. Y., "Gen-Win"—IT, PM, PT, CU, M
Gen-Win—General Winding Co.
Guardian Electric Mfg. Co., 1622 W. Walnut St., Chicago, Ill.—R
E. I. Guthman & Co., Inc., 15 S. Throop St., Chicago, Ill., "Guthman"—IT, PT, CU
The Hammarlund Mfg. Co., 460 W. 34th St., New York 1, N. Y.—CU
Hart Manufacturing Co., 110 Bartholomew Ave., Hartford, Conn.—R
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—GC, IT, MS, PM, PT, R
Lear Avia, Inc., Piqua, Ohio—M
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind., "Yaxley", "Mallory"—S
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—CU
Motorola—Galvin Mfg. Corp.
The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill.—PT, S
National Mineral Co., 2638 No. Pulaski Rd., Chicago 31, Ill.—R
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill., "Oak"—GC, MS, PM, S
Oxford-Tartak Radio Corp., 3911 South Michigan Ave., Chicago, Ill.—R
Philco Corp.,* Tioga & C Sts., Philadelphia, Pa.—GC, IT, PM, PT, R, S, CU, M
Press Wireless, Inc., 1475 Broadway, New York 18, N. Y.—R
Radio Receptor Co., Inc., 251 W. 19th St., New York, N. Y.—R
W. C. Robinette Co., 802 Fair Oaks Ave., So. Pasadena, Calif., "Motron"—R
F. W. Sickles Co., 165 Front St., Chicopee, Mass.—IT, PM, PT, CU
F. A. Smith Mfg. Co., Inc., P. O. Box 509, Rochester, N. Y.—M
Southern Products, Independence, Mo.—GC, MS
Sprague Products Co., North Adams, Massachusetts—CU, PT
Sprague Specialties Co., North Adams, Mass.—PT, CU
Stackpole Carbon Co., St. Marys, Pa., "Stackpole"—S
F. W. Stewart Mfg. Corp., 4311 Ravenswood Ave., Chicago, Ill.—MS, PM, R, S
Stow Mfg. Co., Inc., Binghamton, N. Y.—R
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.—IT
Teleradio Engineering Corp., 99 Wall St., New York 5, N. Y., "Teleradio"—IT, PT, CU
Ucinite Co., Div. of United-Carr Fastener Corp., Newtonville, Mass—S
Utah Radio Products Co., 850 Orleans St., Chicago Ill., "Utah"—M
Wheelco Instrument Co., 847 W. Harrison St., Chicago 7, Ill.—R
Wilcox Elctric Co, Inc., 1400 Chestnut, Kansas City 1, Mo.—GC, R
Wilson Mfg. Co., Inc., 600 N. Andrews Ave., Ft. Lauderdale, Fla.—MS
Winters & Crampton Corp., 150 Wilson Ave., Grandville Mich.—MS, PM
Yaxley—P. R. Mallory & Co., Inc.

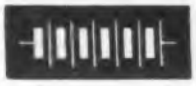
Battery Chargers

Electronic tube rectified VC
Gas engine driven ....G
Hand cranked ....HC
Metallic rectified ....MC
Motor generator ....MG
Vibrator rectified V
Wind driven ....W

Acme Electric & Mfg. Co., 54 Water St., Cuba, N. Y.—MC
Allen Elec. & Equip. Co., 2101 N. Pitcher St., Kalamazoo, 13F, Mich.—VC
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—VC
American Battery Co., 17 S. Jefferson St., Chicago, Ill.—MC, VC
American Communications Corp., 306 Broadway, New York 7, N. Y.—G, MC, VC, V
American Television & Radio Co., 300 E. 4th St., St. Paul 1, Minn., "ATR"—MC
American Transformer Co., 178 Emmet St., Newark 5, N. J.—MC, VC
Arnessen Electric Co., 116 Broad St., New York 4, N. Y.—MG
ATR—American Television & Radio Co
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—VC
The Automatic Electrical Devices Co., 324 E. Third St., Cincinnati, Ohio—MC
Battery Boosters—The Benwood Linze Co.
The Benwood Linze Co., 1811-19 Locust St., St. Louis 3, Mo., "B-L," "Battery Boosters"—MC
B-L—The Benwood Linze Co.
Briggs & Stratton Corp., 2711 N. 13th St., Milwaukee, Wis.—G
The Brown-Brockmeyer Co., 1000 S. Smithville Rd., Dayton, Ohio—MG
J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—VC
Burke Electric Co., 12th & Cranberry Sts., Erie, Pa.—HC
Carpenter Mfg. Co., 179 Sidney St., Cambridge, Mass.—MC
Carter Motor Company, 1608 Milwaukee Ave., Chicago 47, Ill.—HC, MG

Climax Engineering Co, Clinton, Iowa—G, MC
Communications Equip. Corp., 134 W. Colorado St., Pasadena 1, Calif.—VC
Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—MC
Diehl Mfg. Co., Finderne Plant, Somerville, N. J.—MG
Eicor Inc., West 1501 Congress St., Chicago 7, Ill., "Utilite"—G, MG
The Electric Products Co., 1725 Clarkstone Rd., Cleveland 21, Ohio—MG
Electric Specialty Co., 211 South St., Stamford, Conn.—G, MG
Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.—"Rexselen" MC
Electrical Products Co., 6535 Russell St., Detroit, Mich.—G, W
Electricoil Transformer Co., 421 Canal St., New York 13, N. Y.—MC, VC
Electro Products Laboratories, 549 W. Randolph St., Chicago 6, Ill.—MC, VC, V
Electron Equipment Corp., 917 Meridian St., So. Pasadena, Calif. "Eleco"—MC, VC
Electronic Laboratories, Inc., 122 West New York St., Indianapolis, Ind.—MC, VC, V
Electronic Products Co., 19 N. First St., Geneva, Ill.—MC, VC
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.—VC
Electronic Transformer Co., 207 W. 25th St., New York 1, N. Y.—VC, V
Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.—MC
Federal Telephone & Radio Corp., Selenium Rectifier Div., 1000 Passaic Ave., E. Newark, N. J.—MC
Franklin Transformer Mfg. Co., 65 22nd Ave. N. E., Minneapolis 13, Minn.—MC, VC
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—MC, VC
General Electric Company, 1 River Road, Schenectady, N. Y.—MC, MG, VC
Thos. B. Gibbs Co., Delavan, Wis.—VC
Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.—MC, VC
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—MC, VC
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—MC, VC
Homelite Corp., Riverdale Ave., Port Chester, N. Y. G, MG
Horni Signal Mfg. Corp., 310 Hudson St., New York 13, N. Y.—MC
Hy Ef Electrical Products Mfg. Co., 1515 W. Pico Blvd., Los Angeles, Calif., "Hy Ef"—MC, VC
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.—MG
Kato Engineering Co., 530 N. Front St., Mankato, Minn., "Kato"—G
Laurehk Radio Mfg. Co., 3931 Monroe Ave., Wayne, Mich.—VC
Lawrance Aeronautical Corp., Stiles St., Linden, N. J.—G
Lear Avia, Inc., Piqua, Ohio—W
Leland Electric Co., 1501 Webster St., Dayton 1, Ohio—MG
Leslie L. Linick & Co., 1640 E. 54th St., Chicago 15, Ill.—MC
Linick, Green & Reed, Inc., 29 East Madison St., Chicago, Ill.—MC
Fred M. Link, 125 W. 17th St., New York, N. Y.—MC
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind., "Mallory"—MC, V
McColpin-Christie Corp., Ltd., 4922 S. Figueroa St., Los Angeles 37, Calif.—MC, VC
Merwin-Wilson Co., New Milford, Conn.—MC, VC
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—VC
The North Electric Mfg. Co., 501 S. Market St., Galion, Ohio—MC
D. W. Onan & Sons, 1890 Royalston Ave., Minneapolis 5, Minn.—G
Penn Boiler & Burner Mfg. Corp., Fruitville Rd., Lancaster, Pa.—G, MG
Pincor—Pioneer Gen-E-Motor Corp.
Pioneer Gen-E-Motor Corp., 5841 W. Dickens Ave., Chicago 39, Ill., "Pincor"—G
Power Equipment Co., 627 W. Alexandrine, Detroit 1, Mich.—MC, VC
Radionic Transformer Co., 411 S. Green St., Chicago 7, Ill.—VC
Raytheon Mfg. Co., Electrical Equip. Division, 190 Willow St., Waltham, Mass., "Recticharger"—MC, VC, V
The Ready Power Company, 3826 Grand Ave., Detroit, Mich.—G
Recticharger—Raytheon Mfg. Co.
Richardson Allen Corp., 15 West 20th St., New York 11, N. Y.—VC
Schauer Machine Co., 2060 Reading Rd., Cincinnati 2, Ohio—MC
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.—MG
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—V
Stancor—Standard Transformer Corp.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill., "Stancor"—MC
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—VC
Taylor Tubes, Inc., 2318 Wabansia Ave., Chicago, Ill.—VC
Technical Apparatus Co., Inc., 1171 Tremont St., Boston, Mass.—MC
United Transformer Co., 150 Varick St., New York 13, N. Y.—MC, VC
Universal Motor Co., 186 Harrison St., Oshkosh, Wis.—G
Utilite—Eicor, Inc.
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J., "Rectagon"—MC, MG, VC
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.—MC, MG
Willard Storage Battery Co., 246 E. 131st St., Cleveland, Ohio, "Willard"—MC, VC
Wind Power Mfg. Co., Newton, Iowa—G, MG, W
Wincharger Corp., Sioux City, Iowa—G, W
Wind-Impeller Electric Works, Ellsworth, Iowa—W

Batteries, Dry & Wet

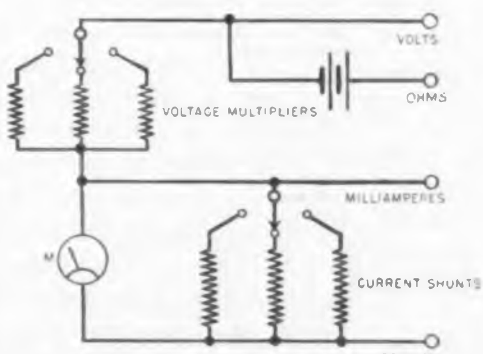


Bias cells	BC
Dry cells	DC
Hearing aid	HB
Radio dry batteries	R
Standard cells	C
Storage	S
Storage-non-spill	SN

Acme Battery Co., 61 Pearl St., Brooklyn, N. Y., "Advance"—DC
Advance—Acme Battery Co.
Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, L. I., N. Y.—S
Air Cell—National Carbon Co., Inc.
American Battery Co., 17 So. Jefferson St., Chicago, Ill.—S, SN
Bond Electric Corp., Div. of Western Cartridge Co., 275 Winchester Ave., New Haven 4, Conn.—DC, R
Bowers Battery & Spark Plug Co., Reading, Pa.—S, SN
Bright Star Battery Co., 202 Crooks Ave., Clifton, N. J., "Bright Star", "Uneed-it", "Eclipse"—BC, DC, R
Bryant Mfg. Co., 401 North Pauline St., Chicago, Ill.—S
Burgess Battery Co., Freeport, Ill., "Power-House", "Multi-Ply," "Uni-Cel"—DC, HB, R
Carpenter Mfg. Co., 179 Sidney St., Cambridge, Mass.—SN
Centralab Div., Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee, Wis.—S
Eclipse—Bright Star Battery Co.
Edison Storage Battery Div., Thomas A. Edison, Inc., West Orange, N. J.—S
Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia, Pa., "Exide"—S
Eppley Laboratory, Inc., 12 Sheffield Ave., Newport, R. I.—R
Eveready—National Carbon Co.
Exide—Electric Storage Battery Co.
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—DC, S, SN, R
General Dry Batteries, Inc., 13000 Athens Ave., Cleveland, Ohio—HB, DC, R
General Lead Batteries Co., 125 Chapel St., Newark, N. J.—S
Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.—S, SN
Ideal Commutator Dresser Co., 5079 Park Ave., Sycamore, Ill.—SN
Jumbo Mfg. Co., Spencer, Iowa—S
Koehler Mfg. Co., Inc., 395 Lincoln St., Marlboro, Mass.—HB, SN
Laurehk Radio Mfg. Co., 3918 Monroe Ave., Wayne, Mich.—HB
Layer-Bilt—National Carbon Co., Inc.
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—BC
Marathon Battery Company, Wausau, Wis.—BC, DC, HB, R
Mini-Max—National Carbon Co., Inc.
Monark Battery Co., Inc., 1240 N. Homan Ave., Chicago, Ill., "Monark"—S
Multi-Ply—Burgess Battery Co.
National Battery Co., 1728 Roblyn Ave., St. Paul, Minn.—S
National Carbon Co., Inc., 30 E. 42nd St., New York, N. Y., "Air Cell", "Eveready", "Layer-Bilt", Mini-Max"—HB, DC, DC, R
National Union Radio Corp., 15 Washington St., Newark 2, N. J.—R, DC
Philco Corp., Tioga & C Sts., Philadelphia 34, Pa.—DC, R, S
Power-House—Burgess Battery Co.
Prest-O-Lite Battery Co., Inc., P. O. Box 1655, Indianapolis 6, Ind.—S, SN
Ray-O-Vac Co., 2317 Winnebago St., Madison 4, Wis.—DC, HB, R
Reading Batteries, Inc., Reading Pa.—S, SN
Solar Corp., 1000 W. Bruce St., Milwaukee 4, Wis.—S, SN
Sonotone Corp., Elmsford, N. Y.—HB

Useful Applications in Electronic Developments .... **No. 1**

VOLT-OHM-MILLIAMMETER



TYPICAL USES: Measuring values of direct voltage and current; measuring dc resistance.

WHAT IT IS AND HOW IT IS USED: In circuit testing and trouble shooting, the commonest piece of test apparatus is the volt-ohm milliammeter combination with self-contained resistors, switches and battery, to enable the measurement of any component under direct current conditions. These instruments generally have an internal impedance of 1000 ohms per volt (with a 1 ma movement), although increased sensitivities up to 50,000 ohms per volt are available) using a 20 microampere movement).

Southern Battery Co., Appomattox, Va.—DC
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—DC, S
Uneed-It—Bright Star Battery Co.
Uni-sel—Burgess Battery Co.
United States Electric Mfg. Corp., 222 W. 14th St., New York, N. Y., "Usalite"—DC, R
Universal Battery Co., 3410 S. LaSalle St., Chicago, Ill.—S, SN
U S L Battery Corp., Niagara Falls, N. Y.—S
Usalite—United States Electric Mfg. Co.
Willard Storage Battery Co., 246 E. 131st St., Cleveland, Ohio, "Willard"—BC, DC, S, SN, R
Wind Power Mfg. Co., Newton, Iowa—S
Wincharger Corp., Sioux City, Iowa—S
Winchester Repeating Arms Co., Div. of Western Cartridge Co., 275 Winchester Ave., New Haven 4, Conn.—DC, R

Cabinets, Racks & Panels

Bins & racks ....B
Carrying bags ....CB
Chassis C
Leather handles—straps L
Metal cabinets ....M
Panels ....P
Plastic ....see PLASTIC MOLDERS
Racks ....R
Trays & tote baskets ....T
Wood cabinets ....W

Ace Mfg. Corp., 1239 E. Erie Ave., Philadelphia 24, Pa.—C
Acro Tool & Die Works, 4892 North Clark St., Chicago 40, Ill.—W
Acromark Co., 9-13 Morrell St., Elizabeth 4, N. J. P
Adler Mfg. Co., 2903 W. Chestnut St., Louisville 11, Ky.—W
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City 15, Kan.—C, M, P, R
Airplane & Marine Instruments, Inc., Box 92, Clearfield, Pa.—M, W
Aldine Paper Co., Inc., 373 Fourth Ave., New York 10, N. Y.—P
Allen Elec. & Equip. Co., 2103 N. Pitcher St., Kalamazoo, Mich.—M
All-Steel Equip. Co., 723 Griffith Ave., Aurora, Ill.—M
Altec Lansing Corp., 1680 No. Vine St., Hollywood 28, Calif.—C, M, P, R
American Communications Corp., 306 Broadway, New York 7, N. Y.—C, W (See Plastic Molders)
Anaconda Wire and Cable Co., 25 Broadway, New York, N. Y.—C
Arkay Laboratories, Inc., 1570 So. First St., Milwaukee 4, Wis.—C, M, P
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.—W
Atlas Sound Corp., 1448 39th St., Brooklyn 18, N. Y.—W
Bell Sound Systems, Inc., 203 N. 4th St., Columbus, Ohio—M, W
Bendix Radio, Division of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—C, M, P, R
Birch—Boetsch Bros.
A. Bitter Construction Co., 721 E. 133rd St., New York, N. Y.—R, W
Boetsch Bros., 221 E. 144th St., New York 51, N. Y. "Birch"—W
Brunswick Radio Div., Mersman Bros. Corp., 244 Madison Ave., New York, N. Y.—W
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—C, M, P, R
Castlewood Mfg. Co., Inc., 12th & Burnett Sts., Louisville 10, Ky.—W
Caswell-Runyan Co., Huntington, Ind.—W
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.—W
Churchill Cabinet Co., 2119 W. Churchill St., Chicago, Ill.—W
Cole Steel Equipment Co., 349 Broadway, New York 13, N. Y.—M
Columbia Associates, 141 W. 24th St., New York, N. Y.—C
Columbia Metal Box Co., 260 E. 143rd St., New York, N. Y.—M
Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago 47, Ill.—C, M
Communications Co. Inc., 300 Greco Ave., Coral Gables, 34, Fla.—C, M
Communications Equip. Corp., 134 W. Colorado St., Pasadena 1, Calif.—C, M, P, R
Corry-Jamestown Mfg. Corp., No. First Ave., Corry, Pa.—C, M, P, R
Crowe Name Plate & Mfg Co., 3701 Ravenswood Ave., Chicago 13, Ill.—C, M, P
Dahlstrom Metallic Door Co., Buffalo & E. 2nd, Jamestown, N. Y.—C, M, P, R
DeJur-Amsco Corp., Bridges St., Shelton, Conn.—EP
Doolittle Radio, Inc., 7421 So. Loomis Blvd., Chicago 36, Ill.—C, M
Electron Equipment Corp., 917 Meridian St., So. Pasadena, Calif.—"Elco," M, P
Electronic Supply Co., 6-8 Winter St., Worcester 4, Mass.—C, M, P
Erie Art Metal Co., 1602 E. 18th St., Erie, Pa. C, P, M
Erie Can Co., 816 Erie St., Chicago, Ill.—M
H. C. Evans & Co., 1528 W. Adams St., Chicago, Ill.—W
Falstrom Co., Falstrom Court, Passaic, N. J.—C, M, P
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—C, M, P, R, W
Flock Process Corp., 17 W. 31st St., New York, N. Y. —Flock covered cabinets
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.—W
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—P
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—P, R
General Time Instruments Corp., Seth Thomas Clocks Division, Thomaston, Conn.—W
Greenhut Insulation Co., 31 W. 21st St., New York, N. Y.—P
Grenby Mfg. Co., Plainville, Conn.—C, M, R
Gordon L. Hall Co., Old Lyme, Conn.—"Binrack", M, R
W. C. Heller & Co., 1944 Caldwell St., Montpelier, Ohio—W
Hamilton Mfg. Co., Two Rivers, Wis.—W
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—C, M, P
Hofstatter's Sons, Inc., 42-53 24th St., Long Island City 1, N. Y.—W
ICA—Insuline Corp. of America
Illinois Cabinet Co., 2525 Eleventh St., Rockford, Ill.—W
Illinois Wood Products Corp., 2512 S. Damen Ave., Chicago 8, Ill.—W
Ingraham Co., Bristol, Conn.—W
Insuline Corp. of America, 3602—35th Ave., Long Island City, N. Y., "ICA"—C, M, P, R
Kane Mfg. Corp., No. Fraley St., Kane, Pa.—M
Karp Metal Products Co., Inc., 129—30th St., Brooklyn 32, N. Y.—C, M, P, R
Klise Mfg. Co., 50 Cottage Grove St., S. W., Grand Rapids 2, Mich.—W
Walter S. Kraus Co., 43-10 Forty-Eighth Ave., Woodside, N. Y.—W
Kurz Kasch, Inc., So. Broadway, Dayton 1, Ohio—See Plastic Molders
Le Febure Corp., Cedar Rapids, Iowa—M, W
Leland Electric Co., 1501 Webster St., Dayton 1, Ohio—P, R
Lewisburg Chair & Furniture Co., Lewisburg, Pa.—W
Lewyt Metal Products Co., Inc., 60 Broadway, Brooklyn, N. Y.—M
Lindsay & Lindsay, 222 W. Adams St., Chicago 6, Ill.—M
Littelfuse, Inc., 4732 Ravenswood Ave., Chicago, Ill.
H. K. Lorentzen, Inc., 391 West Broadway, New York 16, N. Y.—C, M, P, R
Mayer Mfg. Corp., 50 Division Place, Brooklyn 22, N. Y.—M
John Meck Industries, Liberty at Pennsylvania, Plymouth, Ind.—M
Metallic Arts Co., 243 Broadway, Cambridge, Mass. —C, M, P
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—C, M, P, R
National Mineral Co., 2638 No. Pulaski Rd., Chicago 31, Ill.—C, M, P, R
New England Etching & Plating Co., 25 Spring St., Holyoke, Mass.—P
O K Machine Co., 2131 Fairfield Ave. Fort Wayne 6, Ind.—C, P, R
Otto K. Olesen Illuminating Co., Ltd., 1560 No. Vine St., Hollywood 28, Calif.—M
Orange Screen Co., 615 Valley St., Maplewood, N. J. —C, M
Paramount Radio Mfg. Co., 967—32nd St., Oakland 8, Calif.—W
Par-Metal Products Corp., 32-62—49th St., Long Island City 3, N. Y., "Par-Met"—C, M, P, R
Penn Union Electric Corp., 315 State St., Erie, Pa —M
Premier Metal Etching Co., 2103—44th Ave., Long Island City 1, N. Y.—P
Press Wireless, Inc., 1475 Broadway, New York 18, N. Y.—C, M, P, R
Quality Hardware & Machine Corp., 5823—51 No. Ravenswood Ave., Chicago 26, Ill.—C
Radiad Service, 720 West Schubert Ave. Chicago 14, Ill.—C, M, P
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—M
The Recordit Co., 555 Bedford Ave., University City, Mo.—R, W
A. E. Rittenhouse Co., Honeye Falls, N. Y.—M
Sanders Bros. Mfg. Co., 409 W. Main St., Ottawa, Ill.—W
Schloss Bros. Corp., 801 E. 135th St., New York, N. Y.—W
Schuttig & Company, 9th & Kearny Sts., N. E., Washington 17, D. C.— C, M, P
Screenmakers, Inc., 64 Fulton St., New York 7, N. Y.—C, M, P, W
Security Steel Equipment Corp., Avenel St., Avenel, N. J.—C, M, P
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.—C, M, P, R
N. G. Slater Corp., 3 West 29th St., New York 1, N. Y.—P
Southern Products, Independence, Mo.—M, R
Sparkes Mfg. Co., Ltd., 318 Jefferson St., Newark 5, N. J.—C, M
Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.—P
Steger Furniture Mfg. Co., Steger, Ill.—T, W
Sun Shoe Mfg. Co., 617 N. Aberdeen St., Chicago 22, Ill.—CB, L
Templetone Radio Co., Greenmanville Ave., Mystic, Conn.—W
Tonk Mfg. Co, 1812 N. Magnolia, Chicago, Ill.—W
Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.—C, M, P
Treber Radio Co., Pasadena 18, Calif.—P, W
Union Aircraft Products Corp., 245 E. 23rd St., New York 10, N. Y.—C, M, P, R, W
United Radio Mfg. Co., 191 Greenwich St., New York 7, N. Y.—C, P
Wabash Cabinet Co., Wabash, Ind.—W
Wm. T. Wallace Mfg. Co., Peru, Ind.—W
Waterman Products Co., Inc., 1900 No. 6th St., Philadelphia 22, Pa.—C, M, P
Weltronic Corp., East Outer Drive, Detroit, Mich.—M
Western Electric Co., 195 Broadway, New York, N. Y. —M, C, P
White Research Associates, 899 Boylston St., Boston 15, Mass.—M, P, R
Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.—P
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—C, M, P, R
Worcester Pressed Steel Co., Worcester, Mass.—P, M, C

Capacitors, Fixed

Air, fixed ....A
Ceramic insulated C
Compressed gas ....G
Electrolytic dry ....ED
Electrolytic wet ....EW
Fluorescent lamp units ....FS
Industrial I
Mica receiving ....M
Paper (receiving) ....P
Plug-in condensers ....PF
Polystyrene insulated ....PO
Silvered mica ....S
Standard ....ST
Temperature compens. ....TC
Transmitting ....T
Vacuum cond. V

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.—ED, EW, FS, I, M, P, PF, PO, S, ST, TC, T
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City 15, Kans.—T
The Akron Porcelain Co., Cory Ave., Akron, Ohio—C
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—P
American Condenser Co., 2508 So. Michigan Ave., Chicago 16, Ill.—ED, P
Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill.—FS
Atlas Condenser Products Co., 3120 Third Ave., New York, N. Y.—ED, FS, P
Atoms—Sprague Products Co.
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—P
The Automatic Electrical Devices Co., 324 E. Third St., Cincinnati, Ohio—EW
Automatic Winding Co., 900 Passaic Ave., East Newark, N. J.—C, M, T
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—PF, T
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—ST, TC

Capacitrons, Inc., 318 W. Schiller, Chicago 10, Ill.—I, P, PF, T

The Allen D. Cardwell Mfg. Corp., 81 Prospect St., Brooklyn 1, N. Y.—A

Centralab, Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.—C, S, TC

Ceramicon—Erie Resistor Corp.

Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—I, M, S

Condenser Products Co., 1369-1375 No. Branch St., Chicago, Ill.—ED, FS, I, P, PO, T

Consolidated Wire & Assoc. Corps., 1635 S. Clinton, Chicago, Ill.—ED, P, T

Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio—C

Cornell-Dubilier Elec. Corp., 1000 Hamilton Blvd., S. Plainfield, N. J.—C, ED, EW, FS, FB, I, M, P, PF, PO, PC, S, T, TC

Corning Glass Works, Corning, N. Y.—C

Cosmic Radio Corp., 699 E. 135th St., New York 54, N. Y., "Cosmic," "Megrite", "Polymet"—ED, FS, P

Henry L. Crowley & Co., Inc., 1 Central Ave., West Orange, N. J.—C

Tobe Deutschmann Corp., Canton, Mass.—ED, FB, I, P, PF, T

Domino—Solar Mfg. Corp.

Dumont Electric Co., 34 Hubert St., New York 13, N. Y.—ED, EW, FS, I, M, P, PF, PO, S, ST

Ecco High Frequency Elec. Corp., 7020 Hudson Blvd., N. Bergen, N. J., "Ecco," "H-F"—T

Eimac—Eitel-McCullough, Inc.

Eitel-McCullough, Inc., San Bruno, Calif. "Eimac"—V

Electrical Reactance Corp., Franklinville, N. Y.—C

Electro Motive Mfg. Co., Inc., S. Park & John Sts., Willimantic, Conn., "Elmenco"—M, S

Elmenco—Electro Motive Mfg. Co., Inc.

Erie Resistor Corp., 640 W. 12th St., Erie, Pa., "Ceramicon"—C, S, TC

Ex-Stat—Tilton Electric Co.

J. E. Fast & Co., 3129 No. Crawford Ave., Chicago 41, Ill.—FS, I, P, UO, ST, T

Fostoria Pressed Steel Corp., Fostoria, Ohio—FS

Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y.—PO

General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—ED, EW, FS, I, M, P, ST, T, V

General Electric Co., 1 River Rd., Schenectady, N. Y., —FB, I, P, PC, T

General Radio Co., 30 State St., Cambridge, Mass., "G-R"—ST

G-H—Girard-Hopkins

Girard-Hopkins, 1000 40th Ave., Oakland, Calif.—ED, FB, I, P, PC, T

Glenn-Roberts Co., 2107 Adams St., Indianapolis, Ind.

Gudeman Co., 361 W. Superior St., Chicago, Ill.—ED, I

Edwin I. Guthman & Co., Inc., 15 S. Throop St., Chicago, Ill.—P

G-R—General Radio Co.

The Hammarlund Mfg. Co., 460 W. 34th St., New York 1, N. Y.—T

H. R. S. Products, 5707 W. Lake St., Chicago, Ill.—ES, FB, I, P, PE, PO, PC, T

ICA—Insuline Corp. of America

Illinois Condenser Co., 1160 Howe St., Chicago, Ill., "Illinois"—ED, FS, FB, I, M, P, PC, T

Industrial Condenser Corp., 1725 W. North Ave., Chicago 22, Ill., "Industrial"—ED, FS, I, P, PF, PO, ST, T

Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., "ICA"—M

E. F. Johnson Co., Waseca, Minn., "Johnson"—T, G

Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.—ED, EW

Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—ST

J. R. Kilburn Glass Co., Inc., Chartley, Mass.—C

Kodacap—Micamold Radio Corp.

Little Giant—Solar Mfg. Corp.

Locke Insulator Corp., P. O. Box 57, Baltimore 3, Md.—C

The Louthan Mfg. Co., 2000 Harvey Ave., E. Liverpool, Ohio—C

The Macallen Co., 16 Macallen St., Boston, Mass.—M

The Magnavox Co., 2131 Bueter Rd., Ft. Wayne 4, Ind.—ED

P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind., "Mallory"—ED, I, P, T

Megrite—Cosmic Radio Corp.

Micamold Radio Corp., 1087 Flushing Ave., Brooklyn 6, N. Y., "Kodacap"—ED, FS, FB, I, M, P, PF, S, T

James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—S, ST, T

Minicap—Solar Mfg. Corp.

Music Master Mfg. Co., 542 So. Dearborn St., Chicago 5, Ill.—ED, I, P

The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill.—C, TC

National Union Radio Corp., 15 Washington St., Newark 2, N. J.—ED, EW, M, P

New England Confectionary Co., 254 Mass. Ave., Cambridge, Mass.—I

Noma Electric Corp., 55 W. 13th St., New York 11, N. Y.—M

Polymet Condenser Co., 699 E. 135th St., New York, N. Y.—I

The Potter Co., 1950 Sheridan Rd., N., Chicago 1, Ill.—ED, FS, I, P, ST, TC, T

Printloid, Inc., 93 Mercer St., New York 12, N. Y.—PO

RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—M, S, T, TC

Reynolds Spring Co., Molded Plastics Division, Cambridge, Mass.—PO

Albert Rothenstein, 135 Liberty St., New York 6, N. Y.—M

Sandee Mfg. Co., 3945 No. Western Ave., Chicago 18, Ill.—PO

Sangamo Electric Co., 11th & Converse Sts., Springfield, Ill., "Sangamo"—M

Sealdtite—Solar Mfg. Corp.

F. W. Sickles Co., 165 Front St., Chicopee, Mass., "Silver Cap"—M, S

Solar Mfg. Corp., 586 Ave. A, Bayonne, N. J., "Solar," "Domino," "Sealdtite," "Tom Thumb," "Transoil," "Transmica," "Minicap," "Little Giant"—ED, FS, I, M, P, PF, PO, S, TC, T

Sprague Products Co., N. Adams, Mass., "Sprague 600 Line," "Atoms"—ED, EW, I, M, P, PC, S, T, TC

Sprague Specialties Co., N. Adams, Mass.—ED, EW, I, M, P, T, TC, FS, FB, PF, PO, PC, S

Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—P

Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.—C

Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—FS

Teleradio Engineering Corp., 99 Wall St., New York 5, N. Y.—S

Telex Products Co., Telex Park, Minneapolis, Minn.—M

Tilton Electric Corp., 138 W. 17th St., New York, N. Y., "Ex-Stat"—ED, EW, P

Tom Thumb—Solar Mfg. Co.

Transmica—Solar Mfg. Co.

Transoil—Solar Mfg. Co.

Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—I, V

White Research Associates, 899 Boylston St., Boston 15, Mass.—C, ST

Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—T

Winslow Co., 31 Fulton St., Newark 2, N. J.—S

Capacitors, Variable

Air trimmer	A
Ceramic trimmer	CT
Compressed gas filled	CG
Mica trimmer	M
Neutralizing	N
Precision	P
Receiver tuning	RT
Transmitting tuning	TT

Alden Prods. Co., 119 N. Main St., Brockton, Mass.—M, RT

American Steel Package Co., Squire Ave., Defiance, Ohio. "Defiance"—A, RT

Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.—A, M

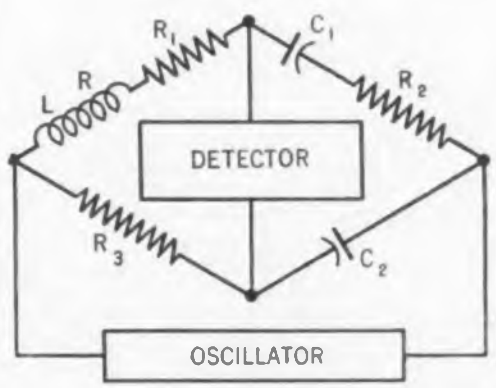
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—A, P, TT

Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—P, RT, TT

Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio, "Bud"—RT, TT

Allen D. Cardwell Mfg. Corp., 81 Prospect St., Brooklyn 1, N. Y.—A, RT, TT

Useful Applications in Electronic Developments..........No. 2



BRIDGE MEASUREMENT

TYPICAL USES: Measurement of any and all electrical values, or physical phenomena which can be converted into a varying electrical value.

WHAT IT IS AND HOW IT IS USED: The measurement of inductance, capacitance, and resistance values by comparison with known values is the function of a bridge circuit. Absolute balance of the components of this circuit is indicated by a zero signal in the detector. This circuit shows the Owen's bridge circuit arrangement. For greatest accuracy a pure waveform must be available, so that a vacuum tube oscillator is used, and for greatest sensitivity an audio amplifier is necessary.

Centralab, Div. of Globe-Union, Inc., 900 E. Keef Ave., Milwaukee 1, Wis.—CT
Ceramicon—Erie Resistor Corp.
Cosmic Radio Corp., 699 E. 135th St., New York 54, N. Y.—A, RT
Cover Dual Systems, Inc., Div. of Electro Voice Corp., 5215-25 Ravenswood Ave., Chicago 40, Ill.—TT
Defiance—American Steel Package Co.
De Wald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.—A, TT
DX Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.—M
Electro Motive Mfg. Co., S. Park & John Sts., Willimantic, Conn., "Elmenco"—A, M
Elmenco—Electro Motive Mfg. Co.,
Erie Resistor Corp., 640 W. 12th St., Erie, Pa. "Ceramicon"—CT
Federal Mfg. & Engineering Corp., 199-217 Steuben St., Brooklyn 5, N. Y.—P
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—A, CT, M, TT
General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J., "G. I."—P, RT, TT
General Radio Co., 30 State St., Cambridge, Mass. "G-R"—P
General Winding Co., 420 W. 45th St., New York, N. Y. "Gen-Win"—A, M
Gen-Win—General Winding Co.
G. I.—General Instrument Corp.
G-R—General Radio Co.
Grenby Mfg. Co., Plainville, Conn.—A
E. I. Guthman, Inc., 400 S. Peoria St., Chicago, Ill.—A, M
Halstead Traffic Communications Corp., 155 E. 44th St., New York 17, N. Y.—P, RT
Hammarlund Mfg. Co., Inc., 460 W. 34th St., New York 1, N. Y.—A, CT, N, P, RT, TT
Hoffman Radio Corp., 3430 So. Hill St., Los Angeles 7, Calif.—A, RT
Hy Ef Electrical Products Mfg. Co., 1515 W. Pico Blvd., Los Angeles, Calif. "Hy-Ef"—RT
ICA—Insuline Corp. of America
Insuline Corp. of America, 3602—35th Ave., Long Island City, N. Y.—"ICA"—M, RT, TT
E. F. Johnson Co., Waseca, Minn. "Johnson"—TT, CG
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.—A, TT
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—P
J. R. Kilburn Glass Co., Inc., Chartley, Mass.—CT
Lapp Insulator Co., Inc., Le Roy, N. Y.—N, TT
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill., "Meissner"—A, CT, M
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—M, P, RT, TT
National Co., Inc., Malden, Mass., "National"—A, N, P, RT, TT
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill.—A, RT, TT
Peerless Laboratories, Inc., 115 East 23rd St., New York 10, N. Y.—TT
Press Wireless, Inc., 1475 Broadway, New York 18, N. Y.—TT
Radio Condenser Co., Davis & Copewood Sts., Camden, N. J., "R.C.C."—RT
Rauland Corp., 4245 No. Knox Ave., Chicago 41, Ill.—P
R.C.C.—Radio Condenser Co.
F. W. Sickles Co., 165 Front St., Chicopee, Mass.—A, M
Solar Mfg. Corp., 586 Avenue A, Bayonne, N. J., "Solar"—M
Sprague Specialties Co., North Adams, Mass.—M
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.—CT
Teleradio Engineering Corp., 99 Wall St., New York 5, N. Y.—A, CT, M, P, TT
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.—PT
White Research Associates, 899 Boylston St., Boston 15, Mass.—P
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—TT
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.—P, RT, TT

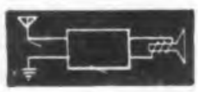
Chemicals for Radio

J. T. Baker Chemical Co., N. Broad St., Phillipsburg, N. J.—Cathode Components
Dow Chemical Co., Midland, Mich.
Eastman Kodak Co., Rochester 4, N. Y.
Fansteel Metallurgical Corp., 2200 Sheridan St., North Chicago, Ill.
Foote Mineral Co., 1609 Summer St., Philadelphia, Pa.
George W. Gates Co., Inc., Franklin Square, L. I., N. Y., "Quartz Etch"
King Laboratories, Inc., 205 Oneida St., Syracuse, N. Y.
Merck & Co., Inc., Rahway, N. J.—"Special chemicals for electronic tubes, etc."
Patterson Screen, Division E. I. Du Pont de Nemours & Co., 625 Main St., Towanda, Pa.—"Phosphors"
Schaar & Co., 754 W. Lexington St., Chicago, Ill.—"Chemicals"
F. W. Zons, 239 Centre St., New York, N. Y.

Communication and Military Equipment

Editor's Note

Nearly all of the companies listed below are normally producers of peacetime radio and television receivers who have certified their present activity and are listed under the general heading of "military equipment" without detailing the types of equipment produced.



Aarons Radio Corp., 125 E. 46th St., New York 17, N. Y.
Admiral Corp., 3800 W. Cortland St., Chicago, Ill.
Air-King Products Co., Inc., 1523-29—63rd St., Brooklyn 19, N. Y.
Andrea Radio Corp., 43-20 24 St., Long Island City, N. Y.
Ansley Radio Corp., 21-10—49th Ave., Long Island City 1, N. Y.
Arvin-Noblitt-Sparks Industries, Inc.
Automatic Radio Mfg. Co., 122 Brookline Ave., Boston, Mass.
The Bell & Howell Co., 1802 Larchmont Ave., Chicago, Ill.
Bell Radio & Television, 125 E. 46th St., New York 17, N. Y. "Bell"
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Bendix Aviation Corp., Pacific Div. 11600 Sherman Way, N. Hollywood, Calif.
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Road, Baltimore 4, Md.
Berger Electronics, 109-01—72nd Road, Forest Hills, L. I., N. Y.
Browning Laboratories, Inc., 751 Main St., Winchester, Mass.
Clarion-Warwick Mfg. Corp.
Colonial Radio Corp., 254 Rano St., Buffalo, N. Y.
The Crosley Corp., 1320 Arlington St., Cincinnati, Ohio.
Crowley Radio Lamp and Mfg. Co., 200 Gratiot Ave., Detroit, Mich.
Delco Radio, Div. General Motors Corp., Kokomo, Ind.
DeWald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y. "DeWald"—"USL"
Allen B. Dumont Lab. Inc., 2 Main Ave., Passaic, N. J.
Dynaphone-Ansley Radio Corp.
Dynavox Corp., 55 E. 11th St., New York, N. Y.
Echophone Radio Co., 201 E. 26th St., Chicago, Ill.
Eckstein Radio & Television Co., LeRoy, Minn.
Electrical Research Labs. Inc., 2020 Ridge Ave., Evanston, Ill. "Erla," "Sentinel"
Electromatic Distributors Inc., 88 University Place, New York, N. Y.
Electronic Corp. of America, 45 W. 18th St., New York, N. Y.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Erla-Electrical Research Lab. Inc.
Espey Mfg. Co., 305 E. 63rd St., New York, N. Y. "Motorola"
Fada Radio & Elec. Mfg. Co., 30-20 Thomson Ave., Long Island City, N. Y.
Farnsworth Television & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill. "Motorola"
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
G-E—General Electric Co.
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.
General Motors Corp., Detroit, Mich.
General Television & Radio Corp., 1240 N. Homan Ave., Chicago, Ill.
Gilfillan Brothers, 1815 Venice Blvd., Los Angeles, Calif.
Hallicrafters Co., 2607 S. Indiana Ave., Chicago, Ill. "Skyrider"
Hamilton Radio Corp., 510 Sixth Ave., New York, N. Y.
Hammarlund Mfg. Co., 460 W. 34th St., New York, N. Y. "Super-Pro"
Hazeltine Electronics Corp., 1775 Broadway, New York, N. Y.
Herbach & Rademan Co., 522 Market St., Philadelphia, Pa.
Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.
Hoffman Radio Corp., 833 Venice Bldg., Los Angeles, Calif.
Howard Radio Co., 1735 Belmont Ave., Chicago, Ill.
Hudson American Co., 23 W. 43rd St., New York, N. Y.
International Detrola Corp., 1501 Beard St., Detroit, Mich.
International Tel. & Tel. Co., 67 Broad St., New York, N. Y.
Ray Jefferson Inc., 40 E. Merrick Rd., Freeport, L. I., N. Y.
Jefferson-Travis Radio Mfg. Corp., 245 E. 23rd St., New York 10, N. Y.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Kingston Radio Co., Inc., Kokomo, Ind.
Lear Avia, Inc., Piqua, Ohio
Fred M. Link, 125 W. 17th St., New York, N. Y.
The Magnavox Co., Ltd., Fort Wayne, Ind.
Majestic Radio & Television Corp., 2600 W. 55th St., Chicago, Ill.
Meissner Mfg Co., Mt. Carmel, Ill.
Midwest Radio Corp., 909 Broadway, Cincinnati, Ohio.
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Motorola—Galvin Mfg. Corp.
National Co., Inc., 61 Sherman St., Malden, Mass.
Noblitt-Sparks Industries, Columbus, Ind. "Arvin"
North American Philips Co., Inc., 145 Palisade St., Dobbs Ferry, N. Y.
Packard Bell Co., 1115-1119 S. Hope St., Los Angeles, Calif.
Packard Mfg. Corp., Kentucky & Morris Ave., Indianapolis, Ind.
Philco Corp., Ontario & C Sts., Philadelphia, Pa.
Philharmonic Radio Corp., 216 William St., New York, N. Y.
Pilot Radio Corp., 37-06—36th St., Long Island City, N. Y.
Press Wireless, Inc., 1475 Broadway, New York 18, N. Y.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radiola—RCA-Victor, Div. Radio Corp. of America.
Radio Recepter Co., Inc., 251 W. 19th St., New York 11, N. Y.
The Rauland Corp., 4245 Knox Ave., Chicago 41, Ill.
RCA-Victor, Div. Radio Corp. of America, Front & Cooper Sts., Camden, N. J.
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.
Regal Electronics Corp., 20 West 20th St., New York, N. Y.
Remler Co., Ltd, 19th at Bryant, San Francisco, Calif.
E. H. Scott Radio Labs., Inc., 4450 Ravenswood Ave., Chicago, Ill.
J. P. Seeburg Corp., 1500 N. Dayton St., Chicago, Ill.
Sentinel-Electrical Research Lab, Inc.
Sentinel Radio Corp., 2020 Ridge Ave., Evanston, Ill.
Setchell-Carlson, Inc., 2233 University Ave., St. Paul, Minn.
Sheridan Electro Corp., 2850 S. Michigan Ave., Chicago, Ill.
Simplex Radio Corp., Sandusky, Ohio
Skyrider—The Hallicrafters Co.
Sonora Radio & Television Corp., 325 Hoyne Ave., Chicago, Ill.
Sparks-Withington Co., 2400 E. Ganson Ave., Jackson Mich. "Sparton"
Sparton—Sparks-Withington Co.
Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn 1, N. Y.

Stewart-Warner Corp., 228 N. LaSalle St., Chicago, Ill.

Stromberg-Carlson Co., 100 Carlson Road, Rochester, N. Y.

Super-Pro-Hammarlund Mfg. Co.

Technical Radio Co., 275—9th St., San Francisco 3. Calif.

Templetone Radio Co., Mystic, Conn.

Trav-Ler Karenola Radio & Tel. Corp., 1028 W. Van Buren St., Chicago, Ill.

Troudabor—Warwick Mfg. Corp.

USL-DeWald Radio Mfg. Co.

Utah Radio Products Co., 320 W. Ohio St., Chicago, Ill.

Victory Radio Corp., 155 W. 72nd St., New York, N. Y.

Viewtone Co., 203 E. 18th St., New York, N. Y.

Warwick Mfg. Corp., 4640 W. Harrison St., Chicago, Ill. "Troubador," "Warwick"

Watterson Radio Co., P. O. Box 54, Dallas, Texas

Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago, Ill.

Western Electric Co., 195 Broadway, New York, N. Y.

Westinghouse Electric & Mfg. Co., 2519 Wilkens Ave., Baltimore, Md.

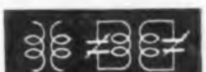
Wilcox-Electric Co., 14th & Chestnut, Kansas City 1, Mo.

The Wilcox-Gay Corp., Charlotte, Mich.

The Rudolph Wurlitzer Co., Falls Blvd., No. Tonawanda, N. Y.

Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

Coils, RF & IF



Coil forms .... F
I. F. coils .... IF
R. F. chokes (receiving) .... CH
R. F. chokes (transmitting) .... RT
R. F. coils (receiving) .... RF
R. F. coils (transmitting) .... T

Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.—RT, T

Airplane & Marine Instruments, Inc., Box 92, Clearfield, Pa.—CH, RT, T

Aladdin Radio Industries, Inc., 223 W. Jackson Blvd., Chicago, Ill., "Aladdin"—IF, CH, P, RF, T

Albion Coil Co., Albion, Ill.—IF, CH, RT, RF, T

Alden Products Co., 117 North Main St., Brockton, Mass., "Na-Ald"—F

American Communications Corp., 306 Broadway, New York 7, N. Y.—RT, T

American Lava Corp., Cherokee Blvd. & Manufacturers Rd., Chattanooga, 5, Tenn.—F

American Phenolic Corp., 1830 So. 54th St., Cicero Ill., "Amphenol"—F

Amphenol—American Phenolic Corp.

Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.—F, IF, CH, RF, T

Audio Development Co., 2833 13th Ave., So., Minneapolis, Minn.—CH, RT

Andrew Co., 363 E. 75th St., Chicago 19, Ill.—RT, T

Aray Mfg. & Supply Co., Inc., 3105 Pine St., St. Louis 3, Mo.—F, T

Arnessen Electric Co., 116 Broad St., New York 4, N. Y.—IF

Auburn Mfg. Co., 100 Stack St., Middletown, Conn.—F

Automatic Winding Co., 900 Passaic Ave., East Newark, N. J.—W. IF, CH, RF, T

N. S. Baer Co., 9-11 Montgomery St., Hillside, N. J.—F

Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—F, IF, CH, RT, RF, T

Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—F, IF, CH, RT, RF, T

Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—IF, CH, RF

Bridgeport Mfg. Co., Bridgeport, Ill.—IF, CH, RT, RF, T

Browning Laboratories, Inc., 750 Main St., Winchester, Mass.—IF, T

Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—F, RF, T

Wm. W. L. Burnett Radio Lab., 4815 Idaho St., San Diego 4, Calif.—CH, RT, RF, T

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.—IF

Carron Mfg. Co., 415 So. Aberdeen St., Chicago 7, Ill., "Carron"—IF, CH, RT, RF, T

Centralab. Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee, Wis.—F

Climax Engineering Co., Clinton, Iowa—CH, RT

Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—F, T

Communications Co., Inc., 300 Greco Ave., Coral Gables 34, Fla.—IF, CH, RT, RF, T

Communications Equipment Corp., 134 W. Colo. St., Pasadena 1, Calif.—IF, CH, RT, RF, T

Consolidated Molded Products Co., 309 Cherry St., Scranton, Pa.—F

Corning Glass Works, Corning, N. Y.—F

Coto-Coil Co., 71 Willard Ave., Providence, R. I.—F, IF, T

Henry L. Crowley & Co., Inc., 1 Central Ave., West Orange, N. J.—F

S. H. Couch Co., Inc., North Quincy 71, Mass.—CH, RF

Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—F

Dean W. Davis & Co., Inc., 549 Fulton St., Chicago, Ill.—F, S

Dinion Coil Co., P. O. Drawer D, Caledonia, N. Y.—T

R. L. Drake Co., 11 Longworth St., Dayton 2, Ohio—IF, CH, RT, RF, T

DX Crystals Co., 1841 W. Carroll Ave., Chicago, Ill.

Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia, Pa.—IF, T

Eckstein Radio & Television Co., Inc., 1400 Harmon Place, Minneapolis, Minn.—CH, RT, RF

Electricoil Transformer Co., 421 Canal St., New York 13, N. Y.—F, IF, CH, RT, RF, T

Electronic Products Mfg. Corp., 7300 Huron River Dr., Dexter, Mich.—CH

Electronic Winding Co., 6227 Broadway, Chicago 10, Ill.—RF, T

Erco Radio Laboratories, Inc., 231 Main St., Hempstead, N. Y.—RT, T

Essex Electronics, 1060 Broad St., Newark 2, N. J.—IF, CH, RT, RF, T

John E. Fast & Co., 3129 No. Crawford Ave., Chicago 41, Ill.—CH

Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.—IF, CH, RF

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.—F, CH, RT

General Communications Co., 681 Beacon St., Boston 15, Mass.—CH, RT, RF, T

General Ceramics & Steatite Corp., Crows Mill Rd., Keasbey, N. J.—F

General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—F

The General Industries Co., Taylor & Olive Sts., Elyria, Ohio—F

General Radio Co., 30 State St., Cambridge, Mass. "G-R"—CH

General Winding Co., 420 W. 45th St., New York, N. Y., "Gen-Win"—F, IF, CH, RF, T

Gen-Win—General Winding Co.

G-R—General Radio Co

Edwin I. Guthman & Co., Inc., 15 S. Throop St., Chicago, Ill.—IF, CH, RF

Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—RT, T

Hammarlund Mfg. Co., Inc., 460 West 34th St., New York 1, N. Y.—F, IF, CH, RT

Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—IF, CH, RT, RF, T

Horni Signal Mfg. Corp., 310 Hudson St. New York, N. Y.—F

ICA—Insuline Corp. of America

Industrial Electronics Corp., 80 Bank St., Newark 2, N. J.—CH, RT

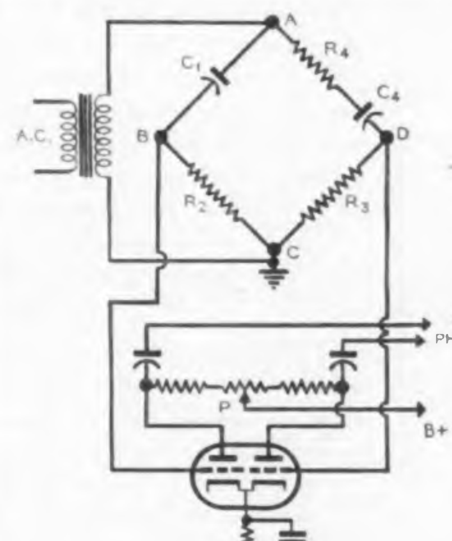
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y. "ICA"—F, CH, RT, RF, T

Insulating Tube Co., Inc., 26 Cottage St., P. O. Box 1, Poughkeepsie, N. Y.—F

International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—IF, RF

Isolantite, Inc., 343 Cortlandt St., Belleville, N. J.—F

Useful Applications in Electronic Developments .... No. 3



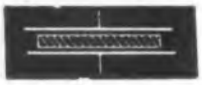
AUDIO FREQUENCY BRIDGE

TYPICAL USES: Measuring values and electrical losses in circuits containing inductance and capacitance.

WHAT IT IS AND HOW IT IS USED: Higher quality electronic equipment means the accurate determination of the losses in material used in the separate components, and of the losses in those components. A unity ratio arm bridge is a common method of measuring the values of inductances and capacitances and their internal losses. In this circuit, the losses in C_1 are compared with a standard, C_4, by adding resistance to the latter (using R_4) until the minimum tone is obtained. When C_4 is adjusted to give a null balance point in the phones, C_1 is then equal to C_4 and the losses in C_1 are equivalent to the reading of C_4.

E. F. Johnson Co., Waseca, Minn., "Johnson"—F, RT, T
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.—IF, RF
Lectrohm, Inc., 5135 W. 25th Place, Cicero, Ill.—CH, RT
Lenoxite Div., Lenox, Inc., 65 Prince St., Trenton, N. J.—F
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill., "Meissner"—F, IF, CH, RF, RT
James Millen Mfg. Co., Inc., 150 Exchange St. Malden, Mass.—F, IF, CH, RT, RF, T
J. W. Miller Co., 5917 S. Main St., Los Angeles, Calif., "Miller"—IF, CH, RT, RF
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 3, Ill.—IF, CH, RT, RF, T
The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill.—F, IF, CH, RT, RF, T
Na-ald—Alden Products Co.
National Tile Co., 26 & Lynn Sts., Anderson, Ind.—F
N-C—National Company
National Company, Inc., Malden, Mass., "National," "N-C"—F, IF, CH, RF, T
N. E. Radiocrafters, 1156 Commonwealth Ave., Boston (Allston 34), Mass.—F
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago 44, Ill.—CH, RT
Pacific Clay Products, SteaPACtite Div., 306 W. Ave., 26 Los Angeles 31, Calif.—F
Pacific Electronics, Sprague at Jefferson Sts., Spokane 5, Wash. "Peco"—T
Paramount Paper Tube Co., 801 Glasgow Ave., Ft. Wayne, Ind.—F
Peerless Mfg. Corp., 1400 W. Ormsby, Louisville, Ky.—S
Philco Corp., C and Tioga Sts., Philadelphia, Pa.—IF, CH, RT, RF
Potter & Brumfield Mfg. Co., Princeton, Ind.—F, IF
Plax Corp., Box 1019, Hartford 1, Conn.—F
Precision Paper Tube Co., 2033 W. Charleston St., Chicago, Ill.—F
Press Wireless, Inc., 1475 Broadway, New York 18, N. Y.—RT, T
Printloid, Inc., 93 Mercer St., New York 12, N. Y.—F
Radio Craftsmen, 1341-3 So. Michigan Ave., Chicago 5, Ill.—F, IF, CH, RT, RF, T
Radio Frequency Labs., Inc., Boonton, N. J.—IF, CH, RT, RF
Sandee Mfg. Co., 3945 N. Western Ave., Chicago 18, Ill.—F
Schuttig & Co., 9th & Kerny Sts., N. E. Washington 17, D. C.—T
F. W. Sickles Co., 165 Front St., Chicopee, Mass.—IF, CH, RT, RF, T
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.—F, IF, CH, RT, RF
Sound Equipment Corp., 6245 Lexington Ave., Hollywood 38, Calif.—IF, RF
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y.—F
Standard Winding Co., 44-62 Johnes St., Newburg, N. Y.—F, IF, CH, RT, RF, T
Stanwyck Winding Co., 102-104 S. Lander St., Newburg, N. Y.—IF, CH, RT, RF, F
Super Electric Products Corp., 1057 Summit Ave., Jersey City N. J.—IF, CH, RT, RF
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.—F, IF, CH, RT, RF, T
Teleradio Engineering Corp., 99 Wall St., New York 5, N. Y.—F, IF, CH, RT, RF, T
The R. Thomas & Sons Co., Lisbon, Ohio—F
Ucinite Co., Div. of United-Carr Fastener Corp., Newtonville, Mass.—F
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—F, T
Whisk Laboratories, 145 W. 45th St., New York 19, N. Y.—CH, RT, RF, T
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—IF, CH, RT, RF, T
Wright Resistors, 7 W. 30th St., New York 1, N. Y.—CH, RT, RF, T
Zierick Mfg. Corp., 385 Gerard Ave., New York, N. Y.—F

Crystals & Accessories



Crystal cartridges C
Frequency standard ....F
Holders ....H
I. F. Filter ....S
Rochelle salt ....R
Temp. control ovens ....T
Tourmaline ....TO
Raw quartz ....Q

Aircraft Accessories Corp., Fairfax & Funston Rd., Kansas City 15, Kan.—F
Akron Porcelain Co., Cory Ave., Akron 14, Ohio—H
Alden Products Co., 119 N. Main St., Brockton, Mass.—H
American Instrument Co., Silver Springs, Md.—T
American Jewels Corp., 94 County St., Attleboro, Mass.—F, H, S
American Lava Corp., Cherokee Blvd., & Manufacturers Rd., Chattanooga 5, Tenn.—H
American Radio Hardware Co., Inc., 478 Broadway, New York, N. Y.—H
Alfred W. Barber Laboratories, 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.—F
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—F
Rex Bassett, Inc., 500 S. E. Second St., Fort Lauderdale, Fla.—F
Leroy W. Beier, 600 S. Michigan Ave., Chicago 5, Ill.—H
Bendix Radio Division, Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—C, F, H, T
Bliley Electric Co., Union Station Bldg., Erie, Pa.—F, H, S, T
Charles J. Bodnor, Inc., 58 Marbledale Rd., Tuckahoe, N. Y.—C
Browning Laboratories, Inc., 751 Main St., Winchester, Mass.—F
Brush Development Co., 3311 Perkins Ave., Cleveland 14, Ohio—C, R
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—H
Wm. W. L. Burnett Radio Laboratory, 4814 Idaho St., San Diego 4, Calif—C, F, H, S, T
Carlisle Crystal Corp., Carlisle, Pa.—F
The Ciough-Brengle Co., 5501 Broadway, Chicago, Ill.—F
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—F
Collins Radio Co., 2920 First Ave., Cedar Rapids, Iowa—F
Commercial Crystal Co., 112 No. Water St., Lancaster, Pa.—F, S
Commercial Equipment Co., 1416 McGee St., Kansas City, Mo.—H
Commercial Radio Equipment Co., 321 E. Gregory Blvd., Kansas City, Mo.—F, H, S
Communications Equipment Corp., 134 W. Colo. St., Pasadena 1, Calif.—C
C. G. Conn, Ltd., Elkhart, Ind.—F
Consolidated Molded Products Corp., 309 Cherry St., Scranton, Pa.—H
Cryco, Inc., 1516 Mission St., S. Pasadena, Calif.—H
Crystal Laboratories, Inc., 801 W. Maple St., Wichita, Kansas—H
Crystal Products Co., 1519 McGee St., Kansas City 8, Mo.—F, S
Crystal Research Laboratories, Inc., 29 Allyn St., Hartford 3, Conn.—C, F
C. W. Manufacturing Co., 3800 Brooklyn Ave., Los Angeles, Calif.—H
Dallons Laboratories, 5066 Santa Monica Blvd., Los Angeles 27, Calif.—C, F, S, T
The Diamond Drill Carbon Co., 53 Park Row, New York, N. Y.—F
Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago, Ill.—F
Dur-O-Lite Pencil Co., 1001 No. 25th Ave., Melrose Park, Ill.—H
DX Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.—C, F, H, S
Eclipse Moulded Products Co., 5151 No. 32nd St., Milwaukee 9, Wis.—H
Eidson's, 1309 N. Second St., Temple, Texas—F, H
Electric Appliances Corp., 120 W. North St., Indianapolis, Ind.—H
Electro Products Laboratories, 549 W. Randalph St., Chicago, Ill.—F
Electronic Industries, Cedar Rapids, Iowa.—H
Electronic Industries, Sandwich, Ill.—H
Electronic Products Mfg. Corp., 7300 Huron River Drive, Dexter, Mich.—H
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—C, F, S, T
Elkay Radio Products, 319 E. Walnut St., Oglesby, Ill.—H
Erco Radio Labs., Inc., Hempstead, L. I., N. Y.—F
Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—F
Federal Engineering Co., 37 Murray St., New York, N. Y.—H
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J.—F
Franklin Transformer Mfg. Co., 65 22nd Ave., N. E., Minneapolis 13, Minn.—F
Frequency Measuring Co., 601 W. Pennway, Kansas City, Mo.—H
Garner Electronics, 1100 W. Washington Blvd., Chicago, Ill.—F
Gemex Co., Union, N. J.—H
General Ceramics & Steatite Corp., Crows Mill Rd., Keasbey, N. J.—H
General Crystal Corp., 1776 Foster Ave., Schenectady, N. Y.—F
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—C, F, H
General Electric Company, 1 River Road, Schenectady, N. Y.—F, S, H
General Piezo Co., 2614 State Ave., Kansas City, Kan.—H
General Quartz Laboratories, Cosmopolitan Bldg., Irvington-on-Hudson, N. Y.—H
General Radio Co., 30 State St., Cambridge, Mass., "G-R"—F
Gentleman Products Division, Henney Motor Co., 1708 Cuming St., Omaha, Nebr.—F
Thos. B. Gibbs Co., Delavan, Wis.—F
Good-All Electric Co., 320 N. Spruce St., Ogalola, Nebr.—H
The Hammarlund Co., Inc., 460 W. 34th St., New York 1, N. Y.—S
Hatcher & Fisk Mfrs., 125 Kansas St., Topeka, Kans.—C
Hathaway Instrument Co., 1315 S. Clarkson, Denver, Colo.—F
Harvey-Wells Communications, Inc., North St., Southbridge, Mass.—H
Henry Mfg. Co., 2218 Westwood Blvd., Los Angeles 25, Calif.—C, F, H, S
Herbach & Rademan Co., 522 Market St., Philadelphia, Pa.—F
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.—F
The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio—F
Hipower Crystal Co., 2037 Charleston St., Chicago 47, Ill., "Hipower"—F
P. R. Hoffman Co., 321 Cherry St., Carlisle, Pa.—H, Q
Hollister Crystal Co., 1617 Pearl St., Boulder, Colo.—C, F, S
Howard Mfg. Co., Council Bluffs, Iowa—H
Hudson American Corp., 23 W. 43rd St., New York, N. Y.—C, H
G. C. Hunt & Sons, Carlisle, Pa.—H
ICA—Insuline Corp. of America
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., "ICA"—H
Ray Jefferson, Inc., 40 E. Merrick Rd., Freeport, L. I., N. Y.—F
Jefferson-Travis Radio Mfg. Corp., 380 Second Ave., New York, N. Y.—H, F
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.—C
Katz & Ogush, Inc., 33 W. 60th St., New York, N. Y.—H
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—F, T
Keystone Piezo Co., 943 Liberty Ave., Pittsburgh, Pa.—H
Landis & Gyr, Inc., 104 Fifth Ave., New York, N. Y.—T
Lavoie Laboratories, Morganville, N. J.—F
Lear Avia, Inc., Piqua, Ohio—F
Leeds Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.—F
Leuck Crystal Laboratories, 245 So. 11th St., Lincoln 6, Nebr.—F
John Meck Industries, Liberty St., Plymouth, Ind.—F
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill.—T, F
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—F, H
August E. Miller, 9226 Hudson Blvd., North Bergen, N. J.—F
Molded Insulation Co., 335 East Price St., Philadelphia, Pa.—H
Monitor Piezo Products Co., 815 Fremont, South Pasadena, Calif.—F, H, S, T
Monowatt Electric, 66 Bissell St., Providence, R. I.—H
National Co., Inc., 61 Sherman St., Malden 43, Mass.—H, S
National Tile Co., 26th & Lynn Sts., Anderson, Ind.—H
North American Philips Co., Inc., 145 Palisade St., Dobbs Ferry, N. Y.—F, H
Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—F
Pacific Radio Crystal Co., 1035 Post, San Francisco, Calif.—F
Pan-Electronics Laboratories, Inc., 498-500 Spring St., N.W., Atlanta, Ga.—F
Petersen Radio Co., 2800 West Broadway, Council Bluffs, Iowa, "P. R. Crystals"—C, F, H, S, T
Philco Corp., Tioga & C Streets, Philadelphia 34, Pa.—C, F
Phonette Co. of America, 7122 Melrose Ave., Los Angeles, Calif.—H
Pierson-DeLane, Inc., 2345 W. Washington Blvd., Los Angeles, Calif.—F
Piezo Electric Products Co., 104 Fifth Ave., Brooklyn Park 25, Md.—F
P. R. Crystals—Petersen Radio Co.
Precision Piezo Service, 427 Mayflower St., Baton Rouge, La.—C, F, H, T
Premier Crystal Labs., Inc., 63 Park Row, New York 7, N. Y.—H, F
Quartz Laboratories, Kansas City, Mo.—F
R 9 Crystal Company, Inc., 907-909 Penn Ave., Pittsburgh 22, Pa.—C, F, S

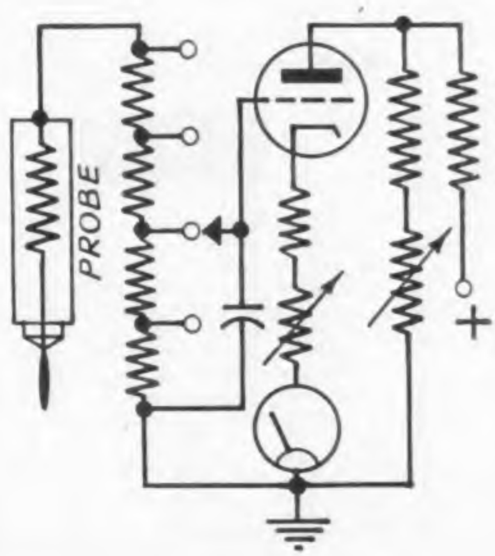
Radell Corp., 6323-27 Guilford Ave., Indianapolis, Ind.—F, H
Radio Specialty Mfg. Co., 403 N. W. 9th Ave., Portland, Ore.—F, H, S, T
The Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.—F
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—C, S
Reeves Sound Laboratories, 62 W. 47th St., New York, N. Y.—C
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—H
R.E.C. Mfg. Corp., 1250 Highland St., Holliston, Mass.—H
Riverbank Laboratories, Geneva, Ill.—F
Ross Manufacturing Co., 2241 S. Indiana Ave., Chicago, Ill.—H
Scientific Radio Products, 738-42 West Broadway, Council Bluffs, Iowa—F, H, S
Scientific Radio Service, 4301 Sheridan St., University Park, Md.—F, H, S
Shure Bros., 225 W. Huron St., Chicago 10, Ill.—C
F. W. Sickles Co., 165 Front St., Chicopee, Mass.—S
Sipp-Eastwood Corp., 39 Keen St., Paterson, N. J.—H
Maxwell Smith Co., 1027 N. Highland Ave., Hollywood, Calif.—F
Sound Apparatus Co., 150 W. 46th St., New York, N. Y.—F
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.—T
Standard Piezo Co., 20 No. Hanover St., Carlisle Pa.—C, F, H, S, T
Telicon Corp., 305 E. 63rd St., New York, N. Y.—H
Tibbetts Laboratories, 12 Norfolk St., Cambridge, Mass.—R
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York, N. Y.—F
Tung-Sol Lamp Works, Inc., 95 Eighth Ave., Newark 4, N. J.—H
The Turner Company, 909-17th St., N. E., Cedar Rapids, Iowa—C
George Ulanet Co., 88 E. Kinney St., Newark 5, N. J.—T
Unibra Trading Co., 30 Rockefeller Plaza, New York 20, N. Y.—Q
Union Piezo Co., 701 McCarter Highway, Newark, N. J.—H
Universal Quartz Co., 347 W. 36th St., New York, N. Y.—Q
Universal Television System, 112 W. 18th St., Kansas City, Mo.—H
Valpey Crystal Corp., 1244 Highland St., Holliston, Mass.—F, H, S, T
Valverde Laboratories, 252 Lafayette St., New York 12 N. Y.—T
Vreeland Lapidary Mfg. Co., 2020 S. W. Jefferson St., Portland, Ore.—Q
V Precision Instrument Mfg. Co., Inc., 57-02 Hoffman Dr., Elmhurst, N. Y.—F
Wm. T. Wallace Mfg. Co., Chili & Madison Ave., Peru, Ind.—C
Webster Electric Co., 1900 Clark St., Racine, Wis.—C
James W. Weldon Laboratory, 2315 Harrison, Kansas City 8, Mo.—T
Wenkstern Halsey Co., 305 First St., S. W., Cedar Rapids, Iowa—Q
Western Electric Co., Kearny, N. J.—F, H, S, T
Western Electric Co., 195 Broadway, New York, N. Y.—F
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—T
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—C, H
Wynne Precision Co., 114 North Hill St., Griffin 1, Ga.—C, F
Carl Zeiss, Inc., 485 Fifth Ave., New York, N. Y.—H, TO

Dials, Name Plates and Knobs

Call letter tabs. CL
Complete dials .... D
Crystals C
Decalcomanias .... DE
Dial cables & belts .... DC
Dial lamps L
Dial light assem. .... PL
Dial locks .... DL
Dial pointers .... P
Drive rubbers .... DR
Escutcheons .... E
Faces or scales .... F
Jewel pilot lights .... JL
Knobs—molded .... KM
Knob springs .... KS
Knobs—wooden .... KW
Name plates .... N
Panel signal lights .... S
Shaft lock .... SL
Telephones dials .... T
Worm drives .... WD

Ace Mfg. Corp., 1239 E. Erie Ave., Philadelphia 24, Pa.—WD
The Acromark Co., 9 Morrell St., Elizabeth 4, N. J.—D, F, N
Airplane & Marine Instruments, Inc., Box 93, Clearfield, Pa.—D
Alden Products Co., 119 N. Main St., Brockton, Mass.—DC, PL, KM, JL
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—JL
American Emblem Co., Inc., Onondago St., Utica, N. Y.—D, E, N
American Insulator Corp., New Freedom, Pa.—KM
American Radio Hardware Co., Inc., 478 Broadway, New York, N. Y., "Arhco"—PL, P, JL
Arens Controls, Inc., 2253 S. Halsted St., Chicago 8, Ill.—KM
Arhco—American Radio Hardware Co.
Auburn Button Works, Auburn, N. Y.—KM
O. Austin Co., 42 Greene St., New York 13, N. Y.—DE, F, N
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—JL, T
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—D, DL, P, N
Bastian Bros. Co., 1600 Clinton Ave., N., Rochester, N. Y.—DE, E, F, N
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—D, C, DL, P, KM, WD
Browning Labs., Inc., 751 Main St., Winchester, Mass.—D, E
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio, "Bud"—D, JL, N
Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.—C
Cardy-Lundmark Co., 1801 W. Byron St., Chicago 13, Ill.—D, F
Cleveland Plastics, Inc., 1611 E. 21st St., Cleveland, Ohio—KM
Colonial Brass Co., Middleboro, Mass.—N
Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago 47, Ill.—PL
Consolidated Molded Products Corp., 309 Cherry St., Scranton, Pa.—KM
Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—N
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago 13, Ill., "Crowe"—D, E, KM, N
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.—KM
Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—KM
The Daven Co., 191 Central Ave., Newark 4, N. J.—E, KM
Harry Davies Molding Co., 1428 N. Wells St., Chicago, Ill.—KM
Dial Light Co. of America, 90 West St., New York 6, N. Y.—PL, JL, S
The Dickey-Grabler Co., 10302 Madison Ave., Cleveland, Ohio—N
Drake Mfg. Co., 1713 W. Hubbard St., Chicago 22, Ill., "Drake"—PL, JL
Hugh H. Eby, Inc., 18 W. Chelton Ave., Philadelphia, Pa.—KM
Eclipse Moulded Products Co., 5151 N. 32nd St., Milwaukee 9, Wis.—P, E, F, KM, N
Electrical Insulation Co., Inc., 12 Vestry St., New York 13, N. Y.—E, N
Enameloid-Cloisonne—Gemloid Corp.
Erie Resistor Corp., 644 West 12th St., Erie, Pa.—E, KM
Etched Products Corp., 39-01 Queens Blvd., Long Island City, N. Y.—D, E, F, N
H. C. Evans & Co., 1528 W. Adams St., Chicago, Ill.—L
Federal Screw Products Co., 224 W. Huron St., Chicago 10, Ill.—PL
G. Felsenthal & Sons, 4108 W. Grand Ave., Chicago 51, Ill.—D, C, F, N
Flexo Wire Co., 638 W. Genesee St., Syracuse, N. Y.—DC
Flock Process Co., 17 W. 31st St., New York, N. Y.—DE, E, F, N

Useful Applications in Electronic Developments .... No. 4



VACUUM TUBE VOLTMETER

TYPICAL USES: Measuring emf of high impedance sources; measuring high-frequency ac.

WHAT IT IS AND HOW IT IS USED: This is an instrument that uses the characteristics of a vacuum tube amplifier in the measurement of direct and alternating voltage. In contrast to the usual voltmeter, a VTVM can have an internal impedance of hundreds of megohms on all scale ranges. Furthermore, it is effective at high-frequencies, extending to many megacycles. Numerous arrangements other than that shown have been used. It can be used to read peak voltages of any waveform.

Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill. —KM
G-C—General Cement Mfg. Co.
Gemlite—Gemloid Corp.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y., "Enameloid-Cloisonne," "Gemlite"— D, DC, P, E, F, KM
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., "G-C"—DC, DR, KM, KS, KW, PL
General Crystal Corp., 1776 Foster Ave., Schenectady, N. Y.—C
General Electric Co.,1285 Boston Ave., Bridgeport, Conn.—DC, P, KM
General Industries Co., Taylor & Clive Sts., Elyria, Ohio—KM
General Radio Co., 30 State St., Cambridge, Mass.—D, DL, KM
Gits Molding Corp., 4600 W. Huron St., Chicago, Ill.—P, E, KM
Gothard Mfg. Co., Springfield, Ill.—PL, JL
L. F. Grammes & Sons, Inc., 399 Union St., Allentown, Pa.—D, P, E, F, N
Greenhut Insulation Co., 31 W. 21st St., New York, N. Y.—E, F, N
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—KM
Hopp Press, Inc., 460 W. 34th St., New York 1, N. Y.—D, P, E, F, N
Horni Signal Mfg. Corp., 310 Hudson St., New York 13, N. Y.—WD
ICA—Insuline Corp. of America
Imperial Molded Products Corp., 2925 W. Harrison St., Chicago 12, Ill.—KM
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., "ICA"—D, C, KM, N
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn 19, N. Y.—DC
E. F. Johnson Co., Waseca, Minn.—P
Kellogg Switchboard & Supply Co., 6650 S. Cicero St., Chicago, Ill.—JL, L, PL
J. R. Kilburn Glass Co., Inc., S. Worcester St., Chartley, Mass.—JL
H. R. Kirkland Co., 8-10 King St., Morristown, N. J. —L
Klise Mfg. Co., 50 Cottage Grove St., S.W., Grand Rapids 2, Mich.—KW
Kopps Glass, Inc., 1 E. 42nd St., New York 17, N. Y.—PL, JL
Kurz Kasch, Inc., So. Broadway, Dayton 1, Ohio—KM
Linick, Green & Reed, Inc., 29 East Madison St., Chicago, Ill.—C
Long Island Engraving Co., 19 W. 21st St., New York 10, N. Y.—E, N
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind., "Yaxley"—F, JL, KM
The Meyercord Co., 5323 W. Lake St., Chicago 44, Ill.—DE
Mica Insulator Co., 200 Varick St., New York 14, N. Y.—F, M
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—D, PL
Molded Insulation Co., 335 East Price St., Philadelphia, Pa.—KM
National Company, Inc., Malden, Mass.—KM, PL, DL
National Lock Co., 1902 Seventh St., Rockford, Ill. E, KM, KW, N
National Union Radio Corp., 15 Washington St., Newark 2, N. J.—L
N. E. Radiocrafters, 1156 Commonwealth Av., Boston, Allston 34, Mass.—D, P, F, KM, N
New England Etching & Plating Co., 25 Spring St., Holyoke, Mass.—D, DE, E, F, N
Norton Laboratories, Inc., 560 Mill St., Lockport, N. Y.—KM
Parisian Novelty Co., 3510 S. Western Ave., Chicago, Ill.—CL
Patent Button Co. of Tennessee, Inc., 2221 Century St., Knoxville S. Tenn.—KM
Peerless Roll Leaf Co., 4511-4523 New York Ave., Union City, N. J.—F, N
Philco Corp., Tioga and C Sts., Philadelphia 34, Pa. —KM, CL
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—D, E, N
Premier Crystal Laboratories, Inc., 63 Park Row, New York 7, N. Y.—L
Premier Metal Etching Co., 21-03 44th Ave., Long Island City 1, N. Y.—F, N
Printloid, Inc., 93 Mercer St., New York 12, N. Y. —P, F, N
Radio City Products Co., 127 W. 26th St., New York, N. Y.—KM
Radio Craftsmen, 1341-3 S. Michigan Ave., Chicago 5, Ill.—DL
Radio Essentials, Inc., 69 Wooster St., New York, N. Y.—KM, PL
Radio Specialty Mfg. Co., 403 N. W. 9th Ave., Portland, Ore.—C
Raymond Mfg. Co., Division of Associated Spring Corp., Corry, Pa.—KS
R.E.C. Mfg. Corp., 1250 Highland St., Holliston, Mass.—C
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—KM, N
Reynolds Spring Co., Molded Plastics Division, Cambridge, Mass.—KM
Rhodes Mfg. Co., 1753, N. Honore St., Chicago, Ill. —KM, KW
Richardson Co., Melrose Park, Melrose Park, Ill.—KM, D
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif., "Walsco"—DC, DR, KS
Screenmakers, Inc., 64 Fulton St., New York 7, N. Y.—D, E, N
Signal Indicator Corp., 140 Cedar St., New York 6, N. Y.—S, JL
N. G. Slater Corp., 3 W. 29th St., New York 1, N. Y.—D, C, E, F, N
Southern Products, Independence, Mo.—KS, WD
F. W. Stewart Mfg. Corp., 4311 Ravenswood Ave., Chicago, Ill.—D, C, P, E, KM, PL
Jos. Stokes Rubber Co., Taylor St., Trenton, N. J.—KM
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—JL
Superior Tube Co., Norristown, Pa.—P
Syracuse Ornamental Co., 581 S. Clinton St., Syracuse 2, N. Y., "Syrocowood," "Woodite," "Syroco" —E, KW, N
Syroco—Syracuse Ornamental Co.
Syrocowood—Syracuse Ornamental Co.
Tingstol Corp., 1461 W. Grand St., Chicago, Ill.—PL
Tungston Contact Mfg. Co., 7311 Cottage Ave., N. Bergen, N. J.—KM
Tung-Sol Lamp Works, Inc., 95 Eighth Ave., Newark 4, N. J.—L
The Ucinite Co., Div. of United-Carr Fastener Corp., 459 Watertown St., Newtonville, Mass.—PL, DL
George Ulanet Co., 88 E. Kinney St., Newark 5, N. J.—C
United Radio Mfg. Co., 191 Greenwich St., New York 7, N. Y.—N
Variaten Cinema Engr. Co., 1508 W. Verdugo Ave., Burbank, Calif.—F
Walsco—Walter L. Schott Co
Western Lithograph Co., 600 E. 2nd St., Los Angeles 54, Calif.—CL
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—L, N
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—E, KM, L
Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.—DC, KS
Woodite—Syracuse Ornamental Co.
Worcester Pressed Steel Co., Worcester, Mass.—E
Yaxley—P. R. Mallory & Co., Inc.

Drafting Room Equipment

Drafting instruments	DI
Drafting tables	DT
Drawing papers	D
Electric erasers	EE
Lighting equipment	L
Pencils and accessories	P
Print making machines	BM
Sensitized papers	SP
Stools	ST
Tracing cloth	TC

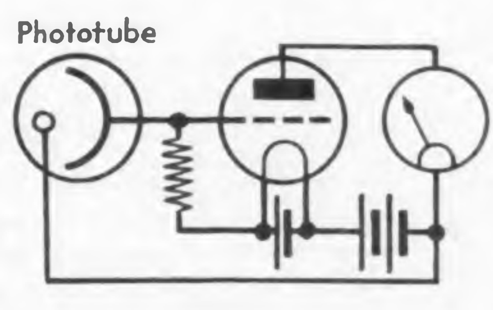
Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill., "Flexo"—L
American Photocopy Equipment Co., 2849 N. Clark St., Chicago 14, Ill.—BM
Charles Bruning Co., Inc., 100 Read St., New York 13, N. Y.—DI, DT, D, EE, L, P, BM, SP, TC
Cardinell Corp., Montclair, N. J.—D, TC
Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago 47, Ill.—L
Joseph Dixon Crucible Co., 167 Wayne St., Jersey City 3, N. J.—P
Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza S., Long Island City, N. Y.—L
Eagle Pencil Co., 703 E. 13th St., New York 9, N. Y., "Verithin"—P
Eclipse Moulded Products Co., 5151 N. 32nd St., Milwaukee 9, Wis.—DI
Eraser Co., Inc., 231 W. Water St., Syracuse 2, N. Y.—P
Etched Products Corp., 39-01 Queens Blvd. Long Island City, N. Y.—DI
A. W. Faber, Co., Inc., 41 Dickerson St., Newark 4, N. J.—EE, P
Faries Mfg. Co., 1036 E. Grand Ave., Decatur, 70, Ill.—L
Flexo—Art Specialty Co.
Fostoria Pressed Steel Corp., Fostoria, Ohio—L
George W. Gates & Co., Inc., Hempstead Turnpike & Lucille Ave., Franklin Square, N. Y.—L
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., "GC"—DI
General Pencil Co., 67-73 Fleet St., Jersey City 6, N. J.—P
Hamilton Mfg. Co., Two Rivers, Wis.—DT, ST
Hampden Mfg. Co., Inc., 301 E. 4th St., Plainfield, N. J.—P
Holliston Mills, Inc., Norwood, Mass., "Micro-weave"—DI
Keuffel & Esser Co., 3rd & Adams St., Hoboken, N. J.—DI, TC, D
Kliegl Bros. Universal Electric Stage Lighting Co., 321 W. 50th St., New York, N. Y.—L
Michigan Fluorescent Light Co., 71 S. Parke, Pontiac 14, Mich.—L
Micro-weave—Holliston Mills, Inc.
Ozalid Products Division of General Aniline & Film Corp., Johnson City, N. Y.—BM
Peck and Harvey, 4327 W. Addison St., Chicago 41, Ill.—BM
Photogenic Machine Co., 21 Olive St., Youngstown 1, Ohio—L
The Frederick Post Co., 3562 North Avondale, Chicago, Ill.—DT, D, EE, DI
Premier Metal Etching Co., 21-03 44th Ave., Long Island City, N. Y.—DI
Reliance Devices Co., Inc., 510 Sixth Ave., New York 11, N. Y.—L
N. G. Slater Corp., 3 W. 29th St., New York 1, N. Y—DI.
Southern Products, Independence, Mo.—DI
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—L
F. W. Wakefield Brass Co., Vermilion, Ohio—L
F. Weber Co., 1220 Buttonwood St., Philadelphia 23, Pa.—DL, DT, D
Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.—L
R. D. Werner Co., Inc., 380 Second Ave., New York 10, N. Y.—DI
David White Co., 315 W. Court St., Milwaukee, Wis.—DI, DT, D, EE, L, P, BM, TC
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—L
Wickes Brothers, 515 N. Washington Ave., Saginaw, Mich.—BM

Electronic Control Equipment

Anti-sabotage & blackout	AS
Boiler level alarms	B
Combustion	IC
Conductivity controls	CC
Counting devices	C
Dimension control	DC
Door control	D
Flow control	F
Grading & sorting controls	G
Heat treating controls	HC
Humidity controls	H
Level control	L
Lighting controls	LC
Machine safety control	MS
Motor & generator control	MC
Package wrapping control	P
Pressure control	VC
Printing controls	PC
Smoke density controls	S
Solenoid valves	SV
Temperature controls	TC
Time controls	TI
Traffic	TR
Weight control	WC
Welding control	WE

Aarons Radio Corp., 125 E. 46th St., New York, N. Y.—AS, CC, DC, MS, WE
Alco Valve Co., 865 Kingsland Ave., St. Louis 5, Mo.—SV
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee, 4, Wis.—MC, WE
Allied Control Co, Inc., 2 E. End Ave., New York 21, N. Y.—SV
American District Telegraph Co., 157 Sixth Ave., New York, N. Y.—AS, S
American Gas Accumulator Co., 1031 Newark Ave., Elizabeth, N. J.—TI
American Instrument Co., Silver Spring, Md.—TC
American Time Products, Inc., 580 Fifth Ave., New York 19, N. Y.—MC, TI
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—AS, CC, D, LC, MC, TI, TR, WE
Amplifier Co. of America, 398 Broadway, New York 13, N. Y.—CC, H, S, TI
Andrews & Perillo, 39-30 Crescent St., Long Island City 1, N. Y.—S, DC
ATC Co., Inc., 34 E. Logan St., Philadelphia 44, Pa.—TI
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—G
Automatic Alarms, Inc., Youngstown, Ohio—AS
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—SV
Automatic Electric Mfg. Co., Mankato, Minn.—LC, TI
The Automatic Electrical Devices Co., 324 E. 3rd St., Cincinnati, Ohio—AS
Automatic Products Co., 2450 N. 32nd St., Milwaukee, Wis.—SV
Automatic Switch Co., 41 E. 11th St., New York 3, N. Y.—SV
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia 44, Pa.—TI
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—AS, C, TI
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—C, S, TI
Berger Electronics, 109-01 72nd Rd., Forest Hills, L. I., N. Y.—DC, TC
Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia, Pa.—IC, S
Brown Instrument Co., 4536 Wayne Ave., Philadelphia, Pa.—B, TC, TI
Browning Laboratories, Inc., 751 Main St., Winchester, Mass.—AS
Bruno—New York, Inc., Engineering Products Div., 351-4th Ave., New York 10, N. Y.—AS, C, MS, TI
Burling Instrument Co., 253 Springfield Ave., Newark 3, N. J.—HC, TC
Burlington Instrument Co., Burlington, Iowa—MC
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.—SV
Carson Micrometer Corp., P. O. Box 57, Little Falls, N. J.—DC
The Clark Controller Co., 1146 E. 152nd St., Cleveland, Ohio—TI, WE
Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.—B, IC
Communications Co., Inc., 300 Greco Ave., Coral Gables 34, Fla.—LC
Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—AS
R. W. Cramer Co., Inc., Centerbrook 1, Conn.—TI
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee 1, Wis.—C, HC, LC, MC, PC, SV, TI, WE
Cyclotron Specialities Co., Moraga, Calif.—C
Distillation Products, Inc., 755 Ridge Road W., Rochester 13, N. Y.—CC, C, TC
Doolittle Radio, Inc., 7421 So. Loomis Blvd., Chicago 36, Ill.—C
R. L. Drake Co., 11 Longworth St., Dayton 2, Ohio—C, DC, G, H, P, TC, WC
Allen B. DuMont Laboratories, Inc., 2 Main Ave., Passaic, N. J.—G, HC
Eagle Signal Corp., 202 20th St., Moline, Ill.—C, TI, TR
Eicor, Inc., 1501 W. Congress St., Chicago, Ill.—MC
The Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, Ohio—WE
Electric Eye Equipment Co., 6 W. Fairchild St., Danville, Ill.—G
The Electric Products Co., 1725 Clarkstone Rd., Cleveland 21, Ohio, MC
Electric Sorting Machine Co., 802 Michigan Trust Bldg., Grand Rapids 2, Mich.—G
Electric Sound Engineering Co., 109 N. Dearborn St., Chicago 2, Ill.—TI
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.—HC, TC
Electrol, Inc., 85 Grand St., Kingston, N. Y.—D, TI
Electron Corp., 219 Sunrise Highway, Freeport, N. Y.—TI
Electron Equipment Corp., 917 Meridan St., So. Pasadena, Calif.—C, G, HC, LC, MS, MC, PC, TI
Electronic Control Corp., 1573 E. Forest Ave., Detroit 7, Mich.—AS, C, DC, D, MS, S, TC, TI
Electronic Corp. of America, 45 W. 18th St., New York, N. Y.—AS
Electronic Laboratory, 306 S. Edinburgh Ave., Los Angeles, Calif.—AS, P, HC, TC
Electronic Products Co., 19 N. First St., Geneva, Ill—AS, IC, C, G, H, S, WE
Electronic Radio Alarm, Inc., 1920 Lincoln-Liberty Bldg., Broad and Chestnut Sts., Philadelphia 7, Pa.—MS, AS
Electronic Sound Engineering Co., 109 N. Dearborn St., Chicago, Ill.—TI
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—TC
Electronic Supply Co., 6-8 Winter St., Worcester 4, Mass.—AS, C, TI, WE
Ess Instrument Co., George Washington Bridge Plaza, Fort Lee, N. J.—B, IC, CC, H, MS, P, PC, S, WC
Exact Weight Scale Co., 944 W. Fifth Ave., Columbus 8, Ohio—WC
Federal Instrument Co., 3931-47th Ave., Long Island City 4, N. Y.—B, CC, DC, MS
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—AS, C, HC, LC, MC
Fenwal, Inc., Pleasant St., Ashland, Mass.—TC
Forrest Electronics Co., 320 E. 65th St., New York, N. Y.—C, TI
George E. Fredericks, Bethayres, Pa.—VC
General Control Co., 243 Broadway, Cambridge 39, Mass.—DC, MS, TI
General Electric Co., 1 River Road, Schenectady, N. Y.—AS, B, C, DC, D, G, HC, LC, MS M, MC, P, PC, S, TC, TI, TR, WC, WE
General Electronic Industries, Div. of Auto Ordnance Corp., 342 W. Putnam Ave., Greenwich, Conn.—TC
Thos. B. Gibbs Co., Delavan, Wis.—C, DC, MC, TC, TI
The Girdler Corp. 224 E. Broadway, Louisville, Ky.—I
Gisholt Machine Co., 13 S. Baldwin St., Madison, Wis.—WC
Guaranteed Products, Wellington 1, Ohio, "Shox-Stock"—AS
Guenther Electronics Co., 1318 W. 2nd St., Appleton, Wis.—C, MS, P, PC
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—AS, B, IC, CC, C, DC, D, G, HC, H, LC, MS, MC, P, PC, S, SV, TC, TI, TR, WC, WE
Halstead Traffic Communications Corp., 155 E. 44th St., New York 17, N. Y.—TR
Hart Mfg. Co., Hamilton St., Hartford, Conn.—TC
Wm. Hansen Co., R. 3, Niles, Mich.—AS, D, HC, LC, S, TC.
Hathaway Instrument Co., 1315 S. Clarkson, Denver, Colo.—DC, WC
Haydon Mfg. Co., Inc., Forestville, Conn.—C, G, HC, LC, MC, TC, TI, WE
H-B Electric Co., Inc., 6101 N. 21st St., Philadelphia 38, Pa.—CC, HC, H, LC, MC, TC, TI, TR
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—C, G, LC, P, TI, WC, WE
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—B, C, D, HC, LC, SV, TC, TI, WE
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—SV, TC
Hewlett-Packard Company, 395 Page Mill Rd., Palo Alto, Calif.—WE
Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.—AS
Hollywood Electronics, Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif.—AS, HC
Horni Signal Mfg. Corp., 310 Hudson St., New York 13, N. Y.—D, LC, TR
Illinois Testing Laboratories, Inc., 420 No. La Salle St., Chicago 10, Ill.—TC
Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.—CC
Industrial Timer Corp., 117 Edison Pl., Newark 5, N. J.—C, TI
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—AS, C, D
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—AS, B, C, DC, D, HC, LC, MS, MC, P, PC, S, TC, TI, TR, WC, WE
Jeffrey Mfg. Co., 920-99 No. Fourth St., Columbus 16, Ohio—WC
W. Haddon Judson Co., Ardmore, Pa.—TI
Kurman Electric Co., Inc., 30-30 Northern Blvd., Long Island City, N. Y.—C, DC, LC, MC, TC, TI, WC, WE
L. A. B. Corp., P. O. Box 162, Summit, N. J.—B,
Lear Avia, Inc., Piqua, Ohio—MS, MC, TC, TI, TR
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.—IC, CC, HC, H, S, TC
Lektra Laboratories, Inc., 30 E. Tenth St., New York 3, N. Y.—TI
Leland Electric Co., 1501 Webster St., Dayton, Ohio—MC
Leupold & Stevens Instruments, 4445 N. E. Glisan, Portland 13, Ore.—F
Littelfuse Inc., 4732 Ravenswood Ave., Chicago, Ill.—AS, LC
Logansport Machine, Inc., Box 166, Logansport, Ind.—SV
J. Milton Luers, 12 Pine St., Mount Clemens, Mich.—TI
Lumenite Electric Co., 407 S. Dearborn St., Chicago 5, Ill.—B, CC, C, D, G, HC, LC, MS, TI, WC, L
The Magnetic Gauge Co., 60 E. Bartges St., Akron, Ohio—DC, G, WC
O. B. McClintock Co., 139 Lyndale Ave. N., Minneapolis 3, Minn.—AS
McDonnell & Miller, Room 1316, Wrigley Bldg., Chicago, Ill.—B
McNeill Engineering Co., 4057 W. Van Buren St., Chicago, Ill.—S
The Mercoid Corp., 4201 Belmont Ave., Chicago 41, Ill.—TC
Merwin-Wilson Co., New Milford, Conn.—HC, TC
Minneapolis-Honeywell Regulator Co., 2712 Fourth Ave., Minneapolis, Minn.—HC, MC, TC
M-M Electric Co., 6122 N. 21st St., Philadelphia, 38, Pa.—CC, MC, TC
National Electric Mfg. Co., 103 E. Ferry St., Berrien Springs, Mich.—TC, TI, TR
National Union Radio Corp., 15 Washington St., Newark, N. J.—AS
P. K. Nelson Mfrs., 401 Oklahoma Bldg., Tulsa 3, Okla., L
Offner Electronics, Inc., 5320 No. Kedzie Ave., Chicago, Ill.—MC
Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.—TI
Photobell Corp., 116 Nassau St., New York 7, N. Y.—AS, B, IC, C, DC, G, H, LC, MS, PC, S, TC, TI, TR, WC
Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.—AS, CC, C, G, LC, MS, PC, S, TI, TR, L
Photovolt Corp. 95 Madison Ave., New York 16, N. Y.—S
Potter & Brumfield Mfg. Co., Inc., 700 N. Gibson St., Princeton, Ind.—C
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.—TC

Useful Applications in Electronic Developments..........No. 5



LIGHT INTENSITY MEASUREMENTS

TYPICAL USES: Accurately measuring light emitted by radium buttons, etc.; graphing colors in terms of reflectivity vs. wavelength.

WHAT IT IS AND HOW IT IS USED: About the only reliable way of measuring light intensity, and its spectral characteristics is by the use of a photoelectric device. The electronic type, called a phototube is generally used in conjunction with vacuum tube amplifiers. Phototubes have sensitivities of the order of 20 microamps per lumen per square inch of cathode surface, for the evacuated type, and about 90 microamps for the gas type.

Price Brothers Co., East Church and Second St., Frederick, Md.—TI
Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y.—"Pyro", HC, TC
Radio Electronic Co., 1816 Villanova Dr., Oakland, Calif.—AS, B, C, DC, D, G, HC, LC, MS, MC, P, PC, S, TC, TI, TR, WC, WE
Radiotechnic Lab., 1328 Sherman Ave., Evanston, Ill.—HC
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—DC, MS, WC
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.—AS, B, IC, CC, C, D, G, HC, H, LC, MS, MC, P, PC, S, TC, TR, WC, TI
Richards Electro-Fence Co., Payette, Idaho—AS
Richardson-Allen Corp., 15 W. 20th St., New York, 11, N. Y.—B, IC, C, DC, D, G, H, LC, MS, MC, P, PC, S, SV, TC, TI, TR, WC WE
Robertshaw Thermostat Co., Youngwood, Pa.—TC
W. C. Robinette Co., 802 Fair Oaks Ave., S. Pasadena, Calif.—DC, MC
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago, Ill.—AS, C, G, TI
R. & T. Electronics Co., 2626 14th St., N. W., Washington, D. C.—HC, TC
Sangamo Électric Co., 11th & Converse Sts., Springfield, Ill.—TI
Schulmerich Electronics, Inc., Temple Ave., Sellersville, Pa.—AS
Seely Instrument Co., Inc., 2249 14th St., S. W., Akron, Ohio—MS, TI
Selenium Corp. of America, 1800 W. Pico Blvd., Los Angeles, Calif.—PC
Shox-Stock—Guaranteed Products Corp.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.—MC
F. A. Smith Mfg. Co., Inc., P. O. Box 509, Rochester, N. Y.—TC
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—G
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.—TC
Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.—TI
The Stanley Works, Magic Door Division, 143 Lake St., New Britain, Conn.—D
The States Company, 19 New Park Ave., Hartford 6, Conn.—TI
C. H. Stoelting Co., 424 No. Homan Ave., Chicago 24, Ill.—TI
Superior Electric Company, Laurel St., Bristol, Conn.—HC, LC
Supreme Electric Products Corp., 194 Vassar St., Rochester 7, N. Y.—SV
Synchro-Start Products, Inc., 221 E. Cullerton, Chicago, Ill.—AS, B, IC, C, DC, D, G, HC, LC, MS, MC, P, PC, S, TC, TI, TR, WC, WE
C. J. Tagliabue Mfg. Co., 550 Park Ave., Brooklyn, 5, N. Y.—IC, HC, H, S, TC, TI
Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.—CC, H, TC, WC
Technical Apparatus Co., Inc., 1171 Tremont St., Boston, Mass.—HC, LC, S
Televiso Products, Inc., 6533 Olmstead Ave., Chicago, Ill.—DC,
Tenney Engineering, Inc., 8 Elm St., Montclair, N. J.—H, TC
Thomas-Gibbs Welding Co., Lynn, Mass.—WE
Thordarson Electric Mfg. Co., "Flashtron", 500 W. Huron St., Chicago 10, Ill.—IC, C, HC, MC, TC
Tomlee Tool & Eng. Co., 253 3rd Ave. So., Minneapolis 15, Minn.—B, IC, G, HC, H, P, S, TC
Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.—TC, TI
Tung-Sol Lamp Works, Inc., 95 8th Ave., Newark 4, N. J.—B, LC, TC, TI
George Ulanet Co., 88 East Kinney St., Newark 5, N. J.—TC, TI
Uniform Tubes, Shurs Lane & Lauriston St., Philadelphia 28, Pa.—HC, TC
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.—AS, D, LC, PC, TI
Viking Instruments, Inc., 432 Fairfield Ave., Stamford, Conn.—MS, TC
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.—LC, MC
Waterman Products Co., Inc., 1900 N. 6th St., Philadelphia 22, Pa.—C
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—C, G, HC, MC, P, PC, TC, TI, TR, WE
Weksler Thermometer Corp., 52 W. Houston St., New York 12, N. Y.—TC
James W. Weldon Laboratory, 2315 Harrison, Kansas City 8, Mo.—IC, HC, TC
Weltronic Co., 20735 Grand River Ave., Detroit 19, Mich.—WE, MC, TI
Westinghouse Elec. & Mfg. Co., Lamp Div., "Furnatron," "Moto-trol," "Photo-trol," "Weldo-trol," Bloomfield, N. J.—B, C, DC, D, G, HC, LC, MS, MC, P, PC, SV, TC, TI, TR, WC, WE
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.—LC
Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.—B, TC, MS
White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6, Mo.—SV, TC
White Research Associates, 899 Boylston St., Boston 15, Mass.—C, DC, G, H, LC, MS, P, PC, TC, WC, WE
Wilson Mfg. Co., Inc., 600 N. Andrews Ave., Ft. Lauderdale, Fla.—H, TI
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.—AS, C, DC, TR
Werner Electronic Devices, 848 Noble St., Chicago 22, Ill.—AS, IC, C, DC, D, G, H, LC, MS, MC, P, PC, S, SV, TI, TR, WC, WE
Zenith Electric Co., 15 W. Walton St., Chicago, Ill. TI, AS

Electronic Medical & Industrial Equipment & Accessories

Anoxia photometers	AP
Audiometers	A
Cortical stimulator	C
Diathermy	D
Dielectric heating	HD
Electro-cardiograph	EC
Electro-encephalograph	EE
Electro-sedative gen	EG
Electro-shock machines	S
Electron microscopes	E
Fluoroscope screens	F
Geophysical instruments	GI
Germicidal lamps	GL
Induction heating	I
Infra red drying equipment	ID
Internal combustion analyzers	IC
Lie detectors	L
Metal flaw detection	MF
Metal locator	ML
Meterological trans. & rec.	M
Stethographs and stethophones	ST
Wind velocity meter	WM
X-Ray diffraction equipment	XD
X-Ray inspection machines	X
X-Ray intensity meters	XM
X-Ray screen & filters	XS

Ajax Electrothermic Corp., Ajax Park, Trenton 5, N. J.—I
R. B. Annis Co., 1101 N. Delaware St., Indianapolis 2, Ind.—ML
Amplifier Co. of America, 398 Broadway, New York 13, N. Y.—EC, EE, GI, L
Andrews & Perillo, 39-30 Crescent St., Long Island City 1, N. Y.—ML
Associated Research, Inc., 231 So. Green St., Chicago 7, Ill.—L
Audio Development Co., 2833—13th Ave., S., Minneapolis 7, Minn.—A
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—EG
Austin Electronic Mfg. Co., Warren Pa.—D
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—D, HD, GI, I, ML
Birtcher Corp., 5087 Huntington Dr., Los Angeles 36, Calif.—D, I
Branston Electric Mfg. Co., 61-65 Gill Pl., Buffalo 13, N. Y.—D
J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—HD, I
The Burdick Corp., Milton, Wis.—D, EC, X
Burton Mfg. Co., 3855 No. Lincoln Ave., Chicago 13, Ill.—GI, GL
Cambridge Instrument Co., Inc., 3732 Grand Central Terminal, New York, N. Y.—ST
Campbell-X-Ray Corp., 138 Brookline Ave., Boston, Mass.—X
Coleman Electric Co., 318 Madison St., Maywood, Ill.—AP
Communications Equipment Corp., 134 W. Colorado St., Pasadena 1, Calif.—D, GI
Communication Measurements Lab., 131 Liberty St., New York, N. Y.—ML
Consolidated Engineering Corp., 1255 E. Green St., Pasadena 5, Calif.—GI
Continental Electric Co., 715 Hamilton St., Geneva, Ill.—GL
Continental X-Ray Corp., 1933 So. Halsted St., Chicago 8, Ill.—X
Cover Dual Systems, Inc., Div. of Electra Voice Corp., 5215-25 Ravenswood Ave., Chicago 40, Ill.—M
Cyclonics Mfg. Co., Inc., 3906 Hudson Blvd., Union City, N. J.—I
R. L. Drake Co., 11 Longworth St., Dayton 2, Ohio—HD, I
Allen B. DuMont Laboratories, Inc., 2 Main Ave., Passaic, N. J.—ML, MF
E. I. du Pont de Nemours & Co., Patterson Screen Div., 625 Main St., Towanda, Pa.—F, XS
Ecco High Frequency Electric Corp., 7020 Hudson Blvd., North Bergen, N. J.—HD, I
Electro-Medical Laboratory, Inc., 1529 Highland Ave., Holliston, Mass.—EC, EE
Electron Equipment Corp., 917 Meridian St., So. Pasadena, Calif., "Eleco"—GI, I, ML
Electronic Control Corp., 1573 E. Forest Ave., Detroit 7, Mich.—XM
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—D, HD, GI, I
Electronic Supply Co., 6-8 Winter St., Worcester 4, Mass.—D, EC, EE, GI, I, ST
Engineering Laboratories, Inc., 624 E. Fourth St., Tulsa, Okla.—EC, ML
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—GI, I, ML
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.—GI
Fisher Corp., Glendale, Calif.—D, GL
Fisher Research Laboratory, 1961 University Ave., P. O. Box 356, Palo Alto, Calif.—GI, ML
Fostoria Pressed Steel Corp., Fostoria, Ohio—ID
Franklin X-Ray Co., 2100 Arch St., Philadelphia 3, Pa.—X
Garfield Medical Apparatus Co., 147 W. 22nd St., New York 11, N. Y.—D, X
George W. Gates & Co., Inc., Hempstead Turnpike & Lucille Ave., Franklin Square, N. Y.—GL
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—E, I, ML
General Electric X-Ray Corp.—2012 Jackson Blvd., Chicago 12, Ill.—D, EC, X, XM, XS
Geophysical Instrument Co., 1315 Half St., S.E., Washington 3, D. C.—GI, ML, XM
Girdler Corp., 224 E. Broadway, Louisville 1, Ky.—HD
W. & L. E. Gurley, 514 Fulton St., Troy, N. Y.—WM
Haines Mfg Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—D, HD, I
Haydon Mfg. Co., Inc., Forestville, Conn.—EE, X
Heiland Research Corp., 130 E. Fifth Ave., Denver 9, Colo.—GI
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—L, ML
Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.—D
Hollywood Electronics, Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif.—I
Horni Signal Mfg. Corp., 310 Hudson St., New York, N. Y.—ML
Hy-El Electrical Products Mfg. Co., 1515 W. Pico Blvd., Los Angeles, Calif.—IC
Illinois Testing Laboratories, Inc., 420 No. LaSalle St., Chicago 10, Ill.—ML
Induction Heating Corp., 389 Lafayette St., New York 3, N. Y.—HD, I
Industrial Electronics Corp., 80 Bank St., Newark 2, N. J.—GL
Industrial Transformer Corp., 2540 Belmont Ave., New York 58, N. Y.—HD
Industrial X-Ray Labs., Inc., 1615 Second St., Seattle, Wash.—X
Infra-Red Engineers & Designers, 1633 E. 40th St., Cleveland 3, Ohio—ID
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—A, D, I
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—ML, X
W. Haddon Judson Co., Ardmore, Pa.—I, MF
Jarell Ash Co., 165 Newbury St., Boston, Mass.—X
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—GI
Kurman Electric Co., 35-18 37th St., Long Island City 1, N. Y.—HD
Laurehk Radio Mfg. Co., 3931 Monroe Ave., Wayne, Mich.—A, ST
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.—EC, GI, ML
Lektra Labs., Inc., 30 E. 10th St., New York 3, N. Y.—EE

Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York, N. Y.—I
Leupold & Stevens Instruments, 4445 N. E. Glisan, Portland 13, Ore.—M
Liebel-Flarsheim Co., 303 W. 3rd St., Cincinnati 2, Ohio—D
Lumenite Electric Co., 407 S. Dearborn St., Chicago 5, Ill.—ML
Maico Co., Inc., Minneapolis 8, Minn.—A, L, ST
Magnaflux Corp., 5914 Northwest Highway, Chicago, Ill.—X
Magnetic Analysis Corp., 42-44 12th St., Long Island City 1, N. Y.—MF
Marshall Radio Eng. Labs., 5008 Lankershim Blvd., N. Hollywood, Calif.—L, ML, ST
McKesson Appliance Co., 2228 Ashland Ave., Toledo, Ohio—EC
Michigan Fluorescent Light Co., 71 S. Parke, Pontiac 14, Mich.—GL, ID
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—D, HD, I, ST
Music Master Mfg. Co., 542 So. Dearborn St., Chicago 5, Ill.—A, D, EE
Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.—I
New England Etching & Plating Co., 25 Spring St., Holyoke, Mass.—F
Newman X-Ray Corp., 518 Hankes Ave., Aurora, Ill.—X
North American Electric Lamp Co., 1014 Tyler St., St. Louis 6, Mo., "Nalco"—ID
Northwest Syndicate, Inc., 711 St. Helens Ave., Tacoma 1, Wash.—HD
Offner Electronics, Inc., 5320 No. Kedzie Ave., Chicago, Ill.—EC, EE, S
The Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio—I
Otarion, Inc., 448 No. Wells St., Chicago 10, Ill.—A
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.—L
Peerless Laboratories, 115 E. 23rd St., New York 10, N. Y.—D, HD, X
Philips Metalix Corp., 100 E. 42nd St., New York, N. Y.—D, F, X
Photobell Corp., 114 Nassau St., New York, N. Y.—ML
Picker X-Ray Corp., 300 Fourth Ave., New York 10, N. Y.—X
Powers Electronic & Communication Co., Inc., New St., Glen Cove, L. I., N. Y.—HD, X, XM,XS
Radio Electronic Co., 1816 Villanova Dr., Oakland, Calif.—D, EC, ML
Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.—HD
Rahm Instruments, Inc., 12 W. Broadway, New York 7, N. Y.—EC, EE, ST
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—E, I, ML
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.—D
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.—ML
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—HD, I
Richardson Allen Corp., 15 W. 20th St., New York 11, N. Y.—I
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago, Ill.—D
Safety Electric Co., 110 So. Dearborn St., Chicago 3, Ill.—D, GL
Sanborn Co., 39 Osborn St., Cambridge 39, Mass.—EC, ST
Safety Electric Co., 110 So. Dearborn St., Chicago 3, Ill.—D, GL, ID
Schuttig & Co., 9th & Kearny Sts., N. E., Washington 17, D. C.—WM
"S" Corrugated Quenched Gap Co., 119 Monroe St., Garfield, N. J.—I
Sonotone Corp., P. O. Box 200, Elmsford, N. Y.—A
Sperti, Inc., Beech & Kenilworth Aves., Norwood, Cincinnati 12, Ohio—GL
Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn 1, N. Y.—IC
St. John X-Ray Service, Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—X, XS, XD
Standard Technical Devices, Inc., 3008 Avenue M, Brooklyn, 10, N. Y.—D, I
C. H. Stoelting Co., 424 N. Homan Ave., Chicago 24, Ill.—A, EC, L
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—GL
Synchro-Start Products, Inc., 221 E. Cullerton, Chicago, Ill.—ML
Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.—A, HD, GI, I
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.—ML
Terma Electric Co., 20 W. 22nd St., New York 10, N. Y.—D, I
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago 10, Ill., "Flashtron"—GI
Ultra-Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles 27, Calif., "Sterilaire", "Mineralight"—GL, ML
James W. Weldon Laboratory, 2315 Harrison St., Kansas City 8, Mo.—I
Western Electric Co., 195 Broadway, New York, N. Y.—A
Westinghouse Elec. & Mfg. Co., Lamp Division, Bloomfield, N. J.—HD, EC, F, GL, I, X, XS
Whisk Laboratories, 145 W. 45th St., New York 19, N. Y.—D, X
White Research Associates, 899 Boylston St., Boston 15, Mass.—D, HD, EC, EE, I
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—A, I
Wymn Mfg. Div., Hudson Supply Co., 401 N. 27th St., Richmond, Va.—I

Flexible Shaft Controls

Control units (complete) .... CU
Control heads .... CH
Fittings .... F
Flexible shafts .... FS

Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, N. Y.—CU, CH, F, FS
American Chain & Cable Co., Bridgeport 2, Conn.—CU, F
Arens Controls, Inc., 2253 S. Halsted St., Chicago 8, Ill.—CU
Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.—FS
Breeze Corporations, 26 S. 6th St., Newark, N. J.—FS
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—FS
Chicago Metal Hose Corp., 1315 S. 3rd Ave., Maywood, Ill.—F
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—CU
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago 13, Ill.—"Crowe"—CU
Dual Remote Control Co., 31776 W. Warren St., Wayne, Mich., "Ducon"—CU, CH, F, FS
Ducon—Dual Remote Control Co.
Froiland Mfg. Co., 430 St. James Ave., Springfield, Mass.—F
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill., "Motorola"—CU, CH, F, FS
Insuline Corp. of America, 3602 35 Ave., Long Island City, N. Y., "ICA"—FS
Invincible Tool Co., 611 Empire Bldg., Pittsburgh 22, Pa.—FS
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn, N. Y., "JFD"—T, F, FS
Lear Avia, Inc., Piqua, Ohio—CU ,FS
Leslie L. Linick & Co., 1640 E. 54th St., Chicago 15, Ill.—FS
Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—FS
Motorola—Galvin Mfg. Corp.
National Co., Inc., 61 Sherman St., Malden 48, Mass.—FS
Philco Corp., Tioga & C Sts., Philadelphia, Pa.—CU, CH, F, FS
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill., "Reco"—FS
Reynolds Spring Co., Molded Plastics Division, Cambridge, Mass.—CH
Southern Products, Independence, Mo.—CU, CH, F, FS
Standard Technical Devices, Inc., 3008 Avenue M, Brooklyn 10, N. Y.—F
F. W. Stewart Mfg. Co., 4311 Ravenswood Ave., Chicago, Ill., "Stewart"—CU, CH, F, FS
Stow Manufacturing Co., Inc., Binghamton, N. Y.—CU, CH, F, FS
Troy Radio & Television Co., 1144 S. Olive St., Los Angeles, Calif.—CU, CH
Walker-Turner Co., Inc., Berckman St., Plainfield, N. J.—CU, CH, F, FS
S. S. White Dental Mfg. Co., Industrial Div., 10 E. 40th St., New York 16, N. Y.—F, FS
Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.—FS

Hand Tools

Alignment tools .... AT
Chassis holders .... CH
Demagnetizers .... DM
Drills, electric .... D
Electric etchers .... EE
Electroplater .... E
Flux, fluid .... SF
Flux, paste .... SP
Hand micrometers .... HM
Hacksaw blades .... HB
Hammers, plastic .... H
Hand drills .... HD
Hole cutters .... HC
Inspection lenses L
Inspection mirrors .... M
Knob puller .... KP
Pliers .... P
Punches .... PU
Punching machines .... PM
Ratchet wrenches .... RW
Scales & tapes .... TS
Screwdrivers .... SD
Side cutters .... SC
Socket wrenches .... SW
Solder .... S
Soldering irons (elec.) .... SI
Soldering iron stands .... SS
Soldering iron tips .... SE
Solder pots .... ST
Staple driver .... SH
Twist drills .... T
Tube pullers .... TP
Wire strippers .... WS
Vises V

Askermann, Steffan Co., 4532 W. Palmer St., Chicago, Ill.—ST
Acromark Co., 9-13 Morrell St., Elizabeth 4, N. J.—EE, PU, PM, SI
Acro Tool & Die Works, 4892 N. Clark St., Chicago 40, Ill.—CH
Alpha Metal & Rolling Mills, Inc., 365 Hudson Ave., Brooklyn 1, N. Y.—S
American Electrical Heater Co., 6110 Cass Ave., Detroit 2, Mich., "American Beauty"—SI, SS, SE
American Phenolic Corp., 1833 S. 54th Ave., Cicero, Ill., "Amphenol"—HC, PU
American Radio Hardware Co., 476 Broadway, New York, N. Y., "Arhco"—SD, SE, SI, SW, TP
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25, Pa.—SF, SP
Amphenol—American Phenolic Corp.
R. B. Annis Co., 1101 N. Delaware St., Indianapolis 2, Ind.—DM, EE
Arhco—American Radio Hardware Co.
The Automatic Electrical Devices Co., 324 E. Third St., Cincinnati, Ohio—SF
Automatic Mfg. Co., Inc., Harrison, N. J.—PM
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.—S
Billings & Spencer Co., 1 Laurel, Hartford 6, Conn. "Billings"—P, SD, SW
Bostitch, East Greenwich, R. I.—SH
Burgess Battery Co., Handicraft Div., 180 N. Wabash Ave., Chicago 1, Ill.—EE
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.—S, SE
Chicago Tool & Engineering Co., 8383 So. Chicago Ave., Chicago 17, Ill.—HC, V
Christiansen Co., Inc., 71 Willard Ave., Providence 6, R. I.—SD
Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.—HC
Cole Radio Works, 86 Westville Ave., Caldwell, N. J.—SI
Continental Machines, Inc., 1301 Washington Ave., So. Minneapolis 4, Minn.—DM
Continental Screw Co., 457 Mt. Pleasant St., New Bedford, Mass.—SD
Detroit Power Screw Driver Co., 2801 W. Fort St., Detroit, Mich.—SD
Division Lead Co., 836 W. Kinzie St., Chicago 22, Ill. S, SF, SP
Drake Electric Works, Inc., 3656 Lincoln Ave., Chicago, Ill.—SI, SS
The Eagle-Picher Lead Co., American Bldg., Cincinnati 1, Ohio.—S
Eisler Engineering Co., 740-770 So. 13th St., Newark, N. J.—ST
Electric Soldering Iron Co., Inc., Deep River, Conn., "Esico"—SI, SS, SE, ST
Esico—Electric Soldering Iron Co., Inc.
Federal Screw Products Co., 224 W. Huron St., Chicago, Ill.—S, SE, SP, SW
The Forsberg Mfg. Co., Bridgeport, Conn.—HB, HD, SD
Froiland Mfg. Co., 430 St. James Ave., Springfield, Mass.—AT
Gardiner Metal Co., 4820 So. Campbell Ave., Chicago 32, Ill.—S
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., "G-C"—WS

General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—SI
Goldsmith Bros., Smelting & Refining Co., 58 E. Washington St., Chicago, Ill.—S
Greenlee Tool Co., 2136 12th St., Rockford, Ill.—HC, PU, SD
Handy & Harman, 82 Fulton St., New York 7, N. Y.—SP, S
Hexacon Elec. Co., 161 W. Clay Ave., Roselle Park, N. J.—SI, SS, SE
Holo-Krome Screw Corp., Hartford 10, Conn.—SD
O. Hommel Co., 209 4th Ave., Pittsburgh, Pa.—SF, SP
Ideal Cummutator Dresser Co., Park Ave., Sycamore, Ill.—EE, SI, WS
Industrial Screw & Supply Co., 717 W. Lake St., Chicago 6, Ill.—S, SF, SP
Instansolder—Cole Radio Works
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y.—AT, CH, PU, SE, SI, SS, HC, SD, SW
K-D Mfg. Co., 526 N. Plum St., Lancaster, Pa., "K-D"—P, RW
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago, Ill.—SI
Kelnor Mfg. Co., Central Tower, San Francisco 3, Calif.—SI
Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.—S, SS
Kollath Manufacturing Co., 212-224 N. Loomis St., Chicago 7, Ill.—SI, SS, SE, ST
Kraeuter & Co., Inc., 563 18th Ave., Newark, N. J.—P, PU
Kwikheat—Vanatta Mfg. Co.
Larrimore Sales Co., P. O. Box 1234, St. Louis 1, Mo.—M
Lectrohm, Inc., 5125 W. 25th St., Cicero 50, Ill. "Lectrohm"—ST
Leland Electric Co., 1501 Webster St., Dayton 1, Ohio—SS
Leslie L. Linick & Co., 1640 E. 54th St., Chicago 15, Ill.—SF, SP, SD, S
Linick, Green & Reed, Inc., 29 E. Madison St., Chicago, Ill.—AT, D, E, HB, S, SD, SF
Lufkin Rule Co., 1730 Hess Ave., Saginaw, Mich.—HM, TS
Meissner Mfg. Co., 7th & Bellmont, Mt. Carmel, Ill., "Meissner"—HC, ST
Morse Twist Drill & Machine Co., 163 Pleasant St., New Bedford, Mass.—T
Mueller Electric Co., 1583 E. 31st St., Cleveland, Ohio, "Snapper"—AT
New Britain Machine Co., 70 South St., New Britain, Conn.—RW, SD, SW
New York Solder Co., Inc., 15 Crosby St., New York, N. Y.—S
The Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio—SF
Park Metalware Co., Inc., Orchard Park, N. Y.—AT, P, SD, SW
Parker-Kalon Corp., 200 Varick St., New York, N. Y.—PU
Philco Corp., Tioga & C Sts., Philadelphia, Pa.—AT, SD, SW, TP
Photobell Corp., 114 Nassau St., New York, N. Y.—SS
H. P. Preis Engraving Machine Co., 155 Summit St., Newark 4, N. J.—EE
Production Devices, Inc., N. Williams St., Whitehall, N. Y.—V
Pyramid Products Co., 2224 S. State St., Chicago, Ill.—WS
Rapid Electroplating Process, Inc., 1414 S. Wabash N. Y.—AT, SD, SE, SI, SW
Rapid Electroplating Process, Inc., 1414 S. Wabash Ave., Chicago, Ill.—E
The Ruby Chemical Co., 68-70 McDowell St., Columbus, Ohio, "Rubyfluid"—S, SF, SP
Rubyfluid—The Ruby Chemical Co.
R and R Plastics, Inc., 85 Union St., Springfield, Mass.—H
Geo. Scherr Co., Inc., 128 Lafayette St., New York, N. Y.—HM, L
The Wm. Schollhorn Co., 414 Chapel St., New Haven, Conn.—P, PU
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.—SD, SH
Snapper—Mueller Electric Co.
Southern Products, Independence, Mo.—CH, EE, HC, PU, WS
Speedcraft—Wire Stripper Co.
The L. S. Starrett Co., Athol, Mass.—HB, PU, SD
Sta-Warm Electric Co., Ravenna, Ohio—ST
Stevens Walden, Inc., 475 Shrewsbury St., Worcester 4, Mass.—AT, HC, P, PU, RW, SW, SD
Stow Manufacturing Co., Inc., Binghamton, N. Y.—D
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—HD, P, SD, SW, S, SI, SF, SE, SP, SS, ST, WS
Superior Flux Co., 913 Public Sq. Bldg., Cleveland 13, Ohio—SP
Tilton Electric Corp., 138 W. 17th St., New York, N. Y.—S
Harold E. Trent Co., Leverington Ave. & Wilde St., Philadelphia 27, Pa.—ST, SI
Tubing Seal-Cap, Inc., 215 W. 7th St., Los Angeles 14, Calif.—RW
Tuck Mfg. Co., 74 Ames St., Brockton, Mass.—SD
Ullman Products Co., 857-61 4th Ave., Brooklyn 32, N. Y.—DM, L, M
The United States Electrical Tool Co., 1050 Findlay St., Cincinnati 14, Ohio—D, SD
Utica Drop Forge & Tool Corp., 2415 Whiteboro St., Utica 4, N. Y.—P, RW, SC
Vaco Prods. Co., 317 E. Ontario St., Chicago, Ill.—SD, SW
Vanatta Mfg. Co., 516 Monterey Ave., Ontario, Calif.—SE, SI
Vasco Electrical Mfg. Co., 4116 Avalon Blvd., Los Angeles, Calif.—SE, SI, ST
Wales-Strippit Corp., 345 Payne Ave., No. Tonawanda, N. Y.—HC
Weller Bros., 516 Northampton St., Easton, Pa.—SI
We'lmade Electric Mfg. Co., Torrington, Conn.—SI
Western Electric Co., 195 Broadway, New York, N. Y.—S
Westinghouse Elec. & Mfg. Co., Lamp Division, Bloomfield, N. J.—ST
Wire Stripper Co., 1725 Eastham Ave., East Cleveland, Ohio, "Speedcraft"—WS

Hardware—Connectors and Miscellaneous Parts

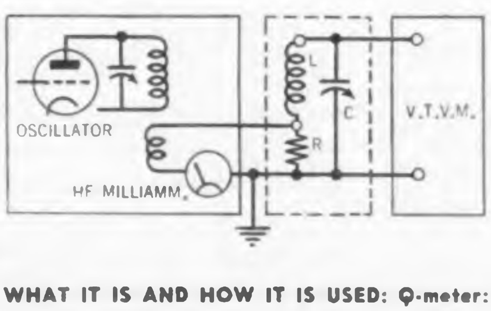
Binding posts .... BP
Cable clamps CC
Cable connectors C
Clips, spring .... SC
Coaxial cable fittings .... CF
Coil shields .... CS
Contact points .... CM
Couplings .... CP
Fuses (meter) .... F
Fuse holders .... FH
Gaskets .... GA
Grid clips .... GC
Grommets .... G
Hinges, cabinet hdwe. .... H
Jacks .... J
Lock nuts .... LN
Mounting brackets .... MB
Nuts .... NL
Plugs .... P
Retaining rings .... RR
Rivets .... R
Safety terminals .... STE
Screws .... S
Self-tapping screws .... SS
Shielding, rubber .... SR
Shockproof mounts .... SM
Soldering lugs .... SL
Solderless lugs L
Solderless links LI
Solderless pins .... PS
Springs .... SP
Strain reliefs .... ST
Terminals .... TE
Terminal strips .... T
Tube shields .... TS
Tube clamps .... TC
Tube sockets .... SKT
Washers, brass .... WB
Washers, felt .... WF
Washers, fibre .... FW
Washers, lock .... WL
Washers, plastic .... WP
Washers, rubber .... WR

Acme Folding Box Co., 141-155 E. 25th St., New York 10, N. Y.—GA
Accurate Spring Mfg. Co., 3811 W. Lake St., Chicago 24, Ill.—SP
Airadio, Inc., 2 Selleck St., Stamford, Conn.—C
Aircraft & Diesel Equipment Corp., 4401 N. Ravenswood Ave., Chicago 40, Ill.
Aircraft-Marine Products, Inc., 1523 No. 4th St., Harrisburg, Pa.—C, GC, TE
Aircraft Screw Products Co., Inc., 47-23 35th St., Long Island City 1, N. Y.—S
Alden Products Co., 119 N. Main St., Brockton, Mass.—BP, C, CP, FH, GC, J, P, SKT
Aldine Paper Co., Inc., 373 4th Ave., New York 10, N. Y.—FW
All-Steel Equip. Co., 723 Griffith Ave., Aurora, Ill. CC, C, CP
All Weather Springs, 140 Cedar St., New York 6, N. Y.—SP
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—BP, TE
American Communications Corp., 306 Broadway, New York 7, N. Y.—TE, T, SM
American Emblem Co., Inc., Box 116-E, Utica, N. Y.—G
American Instrument Co., Silver Spring, Md.—J, P
American Microphone Co., 1915 S. Western Ave., Los Angeles, Calif.—C, CP
American Nut & Bolt Fastener Co., 2029 Doerr St., Pittsburgh, Pa.—NL, FW, WF, WL
American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill., "Amphenol"—CC, C, CF, CP, P, T, TS
American Radio Hardware Co., Inc., 476 Broadway, New York, N. Y., "Arhco"—BP, C, FH, G, GC, J, MB, P, S, SKT, SL, SC, SP, SS, T, TS, FW, WL
American Screw Co., 21 Stevens St., Providence, R. I.—S, SS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio—SP
Amphenol—American Phenolic Corp.
Andrews Co., 363 E. 75th St., Chicago 19, Ill.—CF
Arens Controls, Inc., 2253 S. Halsted St., Chicago 8, Ill.—CC, G
Arhco—American Radio Hardware Co.
Armstrong Cork Co., Lancaster, Pa.—WF, FW, WR
Arnessen Electric Co., 116 Broad St., New York 4, N. Y.—FH
Arrow-Hart & Hegeman Electric Co., Laurel & Peck Sts., Hartford, Conn.—J
The Astatic Corp., 830 Market St., Youngstown 1, Ohio—CF
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.—CC, C, SC, CP, FH, SL, TE, T
Auburn Mfg. Co., 100 Stack St., Middletown, Conn.—G, FW, WF, WP, WR
Audio Development Co., 2833 13th Ave., So., Minneapolis 7, Minn.—J, P
Aurora Precision Devices, 318 Anderson Blvd., Geneva, Ill.—TE
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—J, P, T
N. S. Baer Co., 9-11 Montgomery St., Hillside, N. J.—FW, WP
Baker & Co., Inc., 113 Astor St., Newark, N. J.—CM
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—CP, J, P, TC
Wallace Barnes Co., P. O. Box 1521, Bristol, Conn. SP
Birnbach Radio Co., Inc., 145 Hudson St., New York, N. Y.—BP, CP, FS, P, S, SKT, SL, T, WF, WL
The Birtcher Corp., 5087 Huntington Dr., Los Angeles 36, Calif.—TC
C. S. Brainin Co., 233 Spring St., New York 13, N. Y.—CM
Breeze Corporations, Newark, N. J.—SR
The Bristol Co., Waterbury, Conn.—S
Bud Radio, Inc., 2118 E. 55 St., Cleveland 3, Ohio—CP, J, MB, NL, P, SL, TE, T, TS
J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—TE
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York 54, N. Y.—CC, C, L, PS, LF
Bussmann Mfg. Co., University at Jefferson, St. Louis, Mo., "Buss"—F, FH
Callite Tungsten Corp., 558 39th St., Union City, N. J.—CM
Camloc Fastener Corp., 420 Lexington Ave., New York 17, N. Y.—NL
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.—CC, C, CF, P, TE, T
Allen D. Cardwell Mfg. Corp., 81 Prospect St., Brooklyn 1, N. Y.—CP, TE
Chandler Products Corp., 1491 Chardon Rd., Cleveland, Ohio—S
John Chatillon & Sons, 85-93 Cliff St., New York 7, N. Y.—SP
Chase Brass & Copper Co., Inc., 236 Grand St., Waterbury 91, Conn.—BP, C, SC, FH, G, NL, R, S, WB, WL
Chicago Rivet & Machine Co., 9600 Jackson Blvd., Bellwood, Ill.—R
Chicago Telephone Supply Co., Elkhart, Ind.—J
Chicago Tool & Engineering Co., 8383 So. Chicago Ave., Chicago 17, Ill.—CC, C, CP, SL
Christiansen Co., Inc., 71 Willard Ave., Providence 5, R. I.—NL, WB
Cinch Mfg. Corp., 2335 W. Van Buren St., Chicago, Ill., "Cinch"—BP, C, G, GC, P, SKT, SL, T, TS
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio—CM
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—CC, CM, STE
Columbia Nut & Bolt Co., 915 Main St., Bridgeport 3, Conn.—NL, LN

Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago 47, Ill.—TS, WB
Connecticut Telephone & Electric Div. Great American Industries. Inc., Meriden, Conn.—J. P, TE
Connector Corp., 401 N. Broad St., Philadelphia 8, Pa.—C, CF, P
Consolidated Molded Products Corp., 309 Cherry St., Scranton, Pa.—BP, T
Continental-Diamond Fibre Co., Newark, Del.—CP
Corbin Screw Corp., High, Myrtle & Grove Sts., New Britain, Conn.—NL, S, SS
Continental Screw Co., 457 Mt. Pleasant St., New Bedford, Mass.—S, SS
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.—T
Communication Products Co., 744 Broad St., Newark, N. J.—CF
Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—G, T, WP
The Daven Co., 158 Summit St., Newark, N. J.—BP
Division Lead Co., 836 W. Kinzie St., Chicago 22, Ill.—WB
Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza, So., Long Island City, N. Y.—SKT
Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia 44, Pa.—BP, CC, J, P, SL, T, SKT
Eclipse Moulded Products Co., 5151 No. 32nd St., Milwaukee 9, Wis.—WP
Elastic Stop Nut Corp., 2330 Vauxhall Rd., Union, N. J.—NL
Elco Tool & Screw Corp., 1800 Broadway, Rockford, Ill.—R, S, SS
Electrical Facilities, Inc., 4224 Holden St., Oakland, Calif.—T
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.—SKT
Electronic Products Mfg. Corp., 7300 Huron River Dr., Dexter, Mich.—J, P
Electronic Supply Co., 6-8 Winter St., Worcester 4, Mass.—C, MB, TE
Englewood Electrical Supply Co., 5801 S. Halsted St., Chicago 21, Ill.—C
Ericsson Screw Machine Products Co., Inc., 25 Lafayette St., Brooklyn 1, N. Y.—S
Erie Can Co., 816 W. Erie St., Chicago, Ill., "Erie" CS, TS
H. C. Evans & Co., 1528 W. Adams St., Chicago, Ill. —F, FH, NL, R, S, SS, SL, SP, SC, WL
Everlock—Thompson-Bremer & Co.
Ex-Stat—Tilton Electric Corp.
Fansteel Metallurgical Corp., 2200 Sheridan Road, No. Chicago, Ill.—CM
Faries Mfg. Co., 1036 E. Grand Ave., Decatur 70, Ill.—S, TE
Federal Screw Products Co., 224 W Huron St., Chicago 10, Ill.—G, GC, MB, NL, R, S, SL, SS, T, FW, WL, WR, TE
A. W. Franklin Mfg. Corp., 175 Varick St., New York 14, N. Y.—BP, J, P, STE, SL, TE, T, SKT, RR
Franklin Fibre Lamitex, Corp., Wilmington, Del.—FW
Froiland Mfg. Co., 430 St. James Ave., Springfield, Mass.—BP, C, CF, CP, P, S
G-C—General Cement Mfg. Co.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y.—CF, G, WP
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—"G-C"—G, J, NL, R, S, SS, SKT, SL, SP, WF, FW, WL, CC, C, TE, WB, WP, WR
General Electric Co. 1285 Boston Ave., Bridgeport Conn., "GE"—CC, C, CF, J, SKT
General Plate Co., Div. of Metals & Controls Corp., 40 Forest St., Attleboro, Mass.—CM
General Radio Co., 30 State St., Cambridge, Mass.—BP, C, CF, J, P
General Winding Co., 254 W. 31st St., New York, N. Y., "Gen-Win"—BP
Gen-Win—General Winding Co.
Geometric Stamping Co., 1111 E. 200th St., Cleveland 17, Ohio—CC, SC, CS, FH, MB, TE, TS
Gibson Electric Co., 8350 Frankstown Ave., Pittsburgh 21, Pa., "Gibsiloy"—CM
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn 17, N. Y., "Goat-Form-Fitting"—TS
B. F. Goodrich Co., 500 So. Main St., Akron, Ohio, "Rivnuts"—R
L. F. Grammes & Sons, Inc., Jordan & Union Sts., Allentown, Pa.—C
Greenhut Insulation Co., 31 W. 21st St., New York, N. Y.—T, FW, WP
Gripmaster—George Walker Co.
The Harwood Co., 540 N. LaBrea St., Los Angeles Calif.—C
John Hassall, Inc., Clay & Oakland Sts., Brooklyn, N. Y.—R, S
The Holo-Krome Screw Corp., Hartford 10, Conn.—S
Harvey Hubbell, Inc., Bridgeport 2, Conn.—C
Heyman Mfg. Co., Kenilworth, N. J.—FW, ST
Hunter Pressed Steel Co., Lansdale, Pa.,—SC, SP
ICA—Insuline Corp. of America
Ideal Commutator Dresser Co., Park Ave., Sycamore, Ill.—C, SL
Industrial Screw & Supply Co., 717 W. Lake St., Chicago 6, Ill.—BP, CC, SC, G, NL, R, S, SS, SL, TE, WB, WP, FW, WL, WP
Industrial Synthetics Corp., 60 Woolsey St., Irvington 11, N. J., "Synflex"—G
Instrument Specialties Co., Inc., 244 Bergen Blvd., Little Falls, N. J.—SP
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.—FW, G
Insuline Corp. of America, 3602 35th Ave., Long Island City, N.Y. "ICA"—BP, C, CC, SC, CS, CP, FH, GG, G, J, MB, NL, L, P, R, STE, S, SS, SL, SP, TE, T, TS, SKT, FW, WL, WP, WR
J.F.D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn 19, N. Y.—TS, P
E. F. Johnson Co., Waseca, Minn., "Johnson"—BP, CP, FS, GC, J, P, SKT
Howard B. Jones, 2460 W. George St., Chicago 18, Ill.—F, H, J, T, P, TE
Kane Mfg. Corp., North Fraley St., Kane, Pa.—CC, MB, TC
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.—J, P, SL, TE, T
Kirscher Metal Products Co., 631 Kent Ave., Brooklyn 11, N. Y.—CC, C, SC, FH, GC, MB, SP, TE, TS
Kliegl Bros. University Electric Stage Lighting Co., 321 W 50th St., New York, N. Y.—C, T
Kollath Manufacturing Co., 212-224 N. Loomis St., Chicago 7, Ill.—BP, CC, C, SC, FH, MB, P, SL
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y. SC, SP
Lenz Electric Mfg. Co., 1751 N. Western Ave., Chicago, Ill.—SKT
Linick, Green & Reed, Inc., 29 E. Madison St., Chicago, Ill.—FS
Littelfuse, Inc., 4757 Ravenswood Ave., Chicago 40, Ill.—F, FH, TE
Locke Insulator Corp., P. O. Box 57, Baltimore 3, Md.—CC, C, CF
Lord Mfg. Co., 1635 W. 12th St., Erie, Pa.—SM
H. K. Lorentzen, Inc., 391 W. Broadway, New York 16, N. Y.—SM
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind., "Yaxley"—CM, J, P
F. N. Manross & Sons, Div. of Associated Spring Corp. Bristol, Conn.—SP, WB
Manufacturers Screw Products, 216-222 W. Hubbard St., Chicago, Ill.—BP, G, NL, R, S, SL, SS, T, FW, WF, WL
Master Products Co., 6400 Park Ave., S. E., Cleveland 5, Ohio—WB
Melrath Supply & Gasket Co., Inc., Tioga & Memphis Sts., Piladelphia 34, Pa.—GA, FW
Mica Insulator Co., 200 Varick St., New York 14, N. Y.—T, WP
Micarta Fabricators, Inc., 4619 Ravenswood Ave., Chicago, Ill.—GC, SKT, T, WF
Mid-West Screw Products Co., Main & St. George St., St. Louis, Mo.,—S
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—BP, CC, C, SC, CS, GC, MB, P, STE, TE, T, TS, TC, SKT
J. W. Miller Co., 5917 S. Main St., Los Angeles, Calif., "Miller"—CS, G, MB, T
Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—BP C, J, P, SKT, T
Monowatt Electric Corp., 66 Bissell St., Providence, R. I.—C
Frank W. Morse Co., 301 Congress St., Boston 10, Mass.—BP, CC, C, SC, TE
Muehlhausen Spring Corp., Logansport, Ind.—SP
Mueller Electric Co., 1583 E. 31st St., Cleveland 14, Ohio, "Universal"—SC
Multi Electrical Mfg. Co., 1840 W. 14th St., Chicago, Ill.—FH, SL
Wm. J. Murdock Co., 158 Carter St., Chelsea 50, Mass.—J, P
The Muter Co., 1255 S. Michigan Ave., Chicago, Ill., "Muter"—SL, T
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.—TC, SKT
National Company, Inc., Malden, Mass.—BP, SKT
National Gasket & Mfg. Co., 122 E. 25th St., New York, N. Y.—GA
National Lock Co., 1902 Sevent St., Rockford, Ill.—NL, S, SS, H
National Lock Washer Co., 40 Hermon St., Newark, N. J.—WL, WR
The National Screw & Mfg. Co., 2440 E. 75th St., Cleveland 4, Ohio—NL, R, S, SS
National Vulcanized Fibre Co., Wilmington, Del.—T, WF
New Britain Spring Co., 696 W. Main St., New Britain, Conn.—SP
New England Screw Co., Keene, N. H.—SS
The North Electric Mfg. Co., P. O. Box 267, Galion, Ohio—T
Northam Warren Corp., War Works Div., Stamford, Conn.—P, SKT
Northwest Plastics, Inc., 2233 University Ave., St. Paul 4, Minn.—WP
O K Machine Co., 2131 Fairfield Ave., Fort Wayne 6, Ind.—BP, CC, C, CS, GC, G, J, MB, TE, T, TS
Pacific Railway Equipment Co., 960 E. 61st St., Los Angeles 1, Calif., "Preco"—R
The Palnut Co., 62 Cordier St., Irvington, N. J.—NL, LN
Parker-Kalon Corp., 200 Varick St., New York, N. Y.—SS
Patton-MacGuyer Co., 17 Virginia Ave., Providence, R. I.—TE
Paul & Beekman, Div. of Philadelphia Lawnmower & Mfg. Co., 18th & Courtland Sts., Philadelphia, Pa.—TS
Peck Spring Co., Plainville, Conn.—SP
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.—CP, G, WB, WF, FW, WL, WP
Penn-Union Electric Corp., 315 State St., Erie, Pa., —C, CP, FH, GC, NL, SC, SL, T, WL
Perm-O-Flux Corp., 4916 W. Grand Ave., Chicago, Ill.—MR
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago 50, Ill. —NL, S
Phonette Co. of America, 7122 Melrose Ave., Los Angeles, Calif.—FW, WP
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—WP
Porcelain Products, Inc., Parkersburg, W. Va.—CC
Potter & Brumfield Mfg. Co., Inc., 700 No. Gibson St., Princeton, Ind.—C
Precision Specialties, 210-220 W. Western Ave., Los Angeles 4, Calif.—P, T
Printloid, Inc., 93 Mercer St., New York 12, N. Y. —G, FW, WP
Progressive Mfg. Co., P. O. Box 538, Torrington, Conn.—NL, R, S
The Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.—P, C

Useful Applications in Electronic Developments . . . . No. 6

Q-METER



TYPICAL USES: Measuring inductance or capacitance; finding resonant frequency and distributed capacitance of coils; measuring circuit losses.

WHAT IT IS AND HOW IT IS USED: Q-meter: (an abbreviation for Quality-meter) provides by direct indication of the relation between the reactance of an inductance or capacitance and its effective resistance at any frequency in the normal range. The usual instrument covers only values of those components that can be tuned to resonance at radio frequencies. A Q-meter will also indicate the values of inductance or capacitance by resonance methods.

Radex Corp., 1322 Elston Ave., Chicago, Ill.—BP, CS, GC, J, SC

Radio Essentials, Inc., 69 Wooster St., New York, N. Y.—BP, CS, CP, FW, GC, G, J, MB, NL, P, S, SKT, SL, SP, SS, SC, T, WL

Radio Specialties Co., 1956 So. Figueroa St., Los Angeles 7, Calif.—T

The Rajah Co., Bloomfield, N. J.—TE

Raymond Mfg. Co., Div. of Associated Spring Corp., Drawer 401, Corry, Pa.—SC, SP

Reed & Prince Mfg. Co., 1 Duncan Ave., Worcester 1, Mass.—S, SS, NL, R

Reliable Spring & Wire Forms Co., 3167 Fulton Rd., Cleveland 9, Ohio—SC, SP, TC, WB, WL

Remler Co., Ltd., 19th at Bryant, San Francisco, Calif., "Remler"—T, SKT

Bernard Rice's Sons, Inc., 325 Fifth Ave., New York, N. Y.—TS

Richardson Co., Melrose Park, Melrose Park, Ill.—WP

Rupp's Assembling & Mfg. Works, 2341 N. Seminary Ave., Chicago 14, Ill.—P, TE

Rusgreen Mfg. Co., 14262 Birwood Ave., Detroit 4, Mich.—C, SL, TE, T

St. Louis Screw & Bolt Co., 6900 N. Broadway, St. Louis, Mo.—NL, S, WL

Sandee Mfg. Co., 3945 No. Western Ave., Chicago 18, Ill.—TS, WP

Walter L. Schott Co., 9306 P, Santa Monica Blvd., Beverly Hills, Calif.—CC, J, S, SP, WF, FW, WR

Selectar Mfg. Co., 21-10 49th Ave., Long Island City 1, N. Y.—C, CF

Shakeproof Inc., 2501 N. Keeler Ave., Chicago 39, Ill.—S, SS, TE, WB, WL

Sheldon Service Corp., 24-15 43rd Ave., Long Island City, N. Y.—CP

H. B. Sherman Mfg. Co., 22 Barney St., Battle Creek, Mich.—SL, TE, L, LI, SC

Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.—BP, CS, J

Nathan R. Smith Mfg. Co., 105 Pasadena Ave., So. Pasadena, Calif.—SL

Southern Products, Independence Mo.—CC, CP, MB, SP

Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y.—G, FW, WP

Staco—Standard Electrical Products Co.

Standard Electric Time Co., 89 Logan St., Springfield 2, Mass—BP, J, P

Standard Electrical Products Co., 300 E. 4th St., St. Paul, Minn., "Staco"—T

Standard Locknut & Lockwasher, Inc., 33-35 W. St. Clair St., Indianapolis 4, Ind.—NL, WL

Standard Pressed Steel Co., Jenkintown, Pa.—S, SS

Standard Technical Devices, Inc., 3008 Avenue M, Brooklyn 10, N. Y.—G, J, P

The States Co., 19 New Park Ave., Hartford 6, Conn.—BP, FH, T

Stewart Stamping Co., 621 E. 216th St., New York 67, N. Y.—CC, FH, GC, MB, SL, SP, TE, T, WB

Edwin B. Stimpson Co., Inc., 70 Franklin Ave., Brooklyn 5, N. Y.—R, TE, WB

Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—BP, CC, C, J, P, TE, T

Sundt Engineering Co., 4763 Ravenswood Ave., Chicago, Ill.—TE

Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—SKT

Synthane Corp., Highland Ave., Oaks, Pa.—SKT, T

Taylor Fibre Co., Norristown, Pa.—WP

Thomas & Betts Co., Inc., 30-36 Butler St., Elizabeth 1, N. J.—C, TE, T

Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill., "Everlock"—WL

Tilton Electric Corp., 138 W. 17 St., New York, N. Y., "Ex-Stat"—S, SL, T, WF, WL

Tinnerman Products, Inc., 2038 Fulton Rd., Cleveland., Ohio

Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.—MB

Trav-Ler Karenola Radio & Television Corp., 1028-36 W. Van Buren St., Chicago 7, Ill.—BP, J, P, T, SP

Tubular Rivet & Stud Co., Wollaston, Mass.—CM, R

The Ucinite Co., Div. United Carr Fastener Corp., Newtonville, Mass.—BP, CC, C, CF, CP, MB, TE, T, TC, WP

Union Aircraft Products Corp., 245 E. 23rd St., New York 10, N. Y.—C, CS, CP, MB, SL, TE, TH

United Radio Mfg. Co., 191 Greenwich St., New York 7, N. Y.—WP

United Screw & Bolt Corp., 2513 W. Cullerton St., Chicago 8, Ill.—NL, S, SS, WB

United States Rubber Co., 1230 6th Ave., New York 10, N. Y.—G, SR, WR

Universal—Mueller Electric Co.

Universal Microphone Co., Ltd., 424 Warren Lane, Inglewood, Calif.—J, P

Utah Radio Products Co., 850 Orleans St., Chicago, Ill.—GC, J, P, TS

George Walker Co., 118 Amsterdam Ave., Passaic, N. J., "Gripmaster"—CC

Western Automatic Machine Screw Co., Lake Ave. at Foster, Elyria, Ohio—NL, S

Western Electric Co., 195 Broadway, New York, N. Y.—J, P, SKT, T

Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—CC, C, CM, F, FH, TC, SKT

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—CP

The S. S. White Dental Mfg. Co., Industrial Division, 10 E. 40th St., New York, N. Y.—FS

Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit 16, Mich.—SC, TE, WB, FW, WL, WR, L

Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.—CC, SC, GC, NL, R, S, SP

Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—CC

Wilmington Fibre Specialty Co., P. O. Drawer 1028, Wilmington 99, Del.—FW, G, WP

H. A. Wilson Co., 105 Chestnut St., Newark 5, N. J.—CM

C. D. Wood Electric Co., Inc., 826 Broadway, New York, N. Y.—BP, J

Worcester Pressed Steel Co., Worcester, Mass.—CS, G

Wynn Mfg. Div., Hudson Supply Co., 401 N. 27th St., Richmond, Va.—J

Yaxley—P. R. Mallory & Co., Inc.

Yost Superior Co., Springfield, Ohio—SP

Zierick Mfg. Corp., 385 Gerard Ave., Bronx 51, N. Y.—SL

Insulation & Insulators

(See also PAINTS, CEMENTS & WAX)

Alundum grain	AG
Bonded mica	BM
Can liners	CL
Ceramic parts	C
Capacitor paper	CP
Coil insulating tape	ST
Glass tubing	G
Glass bonded mica	GM
Fibre	F
Insulating beads	IB
Fibre-glass	FG
Friction tape	FT
Mica	M
Paper	P
Paper tubing	PT
Plastics	PL
Rubber insulation	RI
Stand-off insulators	SO
Tubing (varnished)	T
Varnished cambric	VC
Metallized bushings	MB

Acme Folding Box Co., Inc., 141-155 E. 25th St., New York 10, N. Y.—CP, F, P, CL

Acme Wire Co., 1255 Dixwell Ave., New Haven 14, Conn.—VC

The Akron Porcelain Co., Cory Ave., Akron 14, Ohio—C, SO

Alden Products Co., 117 N. Main St., Brockton, Mass.—PL, SO

Aldine Paper Co., Inc., 373 4th Ave., New York 10, N. Y.—P

Alpha Wire Corp., 50 Howard St., New York 13, N. Y.—T

Alsimag—American Lava Corp.

American Insulator Corporation, New Freedom, Pa.—PL

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga 5, Tenn., "Alsimag"—C, IB, SO

American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill., "Amphenol"—C, IB, PL

Amphenol—American Phenolic Corp.

Arens Controls, Inc., 2253 S. Halsted St., Chicago 8, Ill.—RI, T

Armstrong Cork Co., Lancaster, Pa.—RI

Armite—Spaulding Fibre Co., Inc.

Auburn Button Works, Auburn, N. Y.—PL

Auburn Mfg. Co., 100 Stack St., Middletown, Conn.—F, M, P, RI, VC

N. S. Baer Co., 9 Montgomery St., Hillside, N. J.—F, PL

Bakelite Corporation, 30 E. 42nd St., New York 17, N. Y.—PL

Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—C, PL, SO

B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.—PL, T, VC

Bentley, Harris Mfg. Co., Conshohocken, Pa., "B-H"—T

B-H—Bentley, Harris Mfg. Co.

Birnbach Radio Co., Inc., 145 Hudson St., New York, N. Y.—C, SO, T, VC

The Birtcher Corp., 5087 Huntington Dr., N., Los Angeles, Calif.—PL

Boonton Molding Co., Boonton, N. J.—PL

L. S. Brach Mfg. Corp., 55 Dickerson St., Newark, N. J.—C, F, PL, SO

Wm. Brand & Co., 276 Fourth Ave., New York 10, N. Y., "Turbo"—BM, FG, FT, G, M, PL, T, VC

Brandywine Fibre Products Co., 14th & Walnut Sts., Wilmington, Dela.—F

Brown Co., 500 Fifth Ave., New York 18, N. Y.—P, F

Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio, "Bud"—C, SO

Burndy Engineering Co., Inc., 107 Eastern Blvd., New York 54, N. Y.—PL

Carbide & Carbon Chemicals Corp., Plastics Div., 30 E. 42nd St., New York 17, N. Y.—P

Cardy-Lundmark Co., 1801 West Byron St., Chicago 13, Ill.—F, P

Carter Products Corp., 6921 Carnegie Ave., Cleveland 3, Ohio—PL

Catalin Corp., 1 Park Ave., New York, N. Y., "Loalin"—PL

Celanese Celluloid Corp., 180 Madison Ave., New York, 16, N. Y., "Lumarith Protectoid"—PL

Centralab, Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.—C, SO

Central Paper Co., 2400 Lakeshore Dr., Muskegon, Mich.—CP, P, PT

Colonial Insulator Co., Akron 11, Ohio—C

Colonial Kolonite Co., 2212 Armitage Ave., Chicago 47, Ill.—BM, F, FG, PL, T

Consolidated Molded Products Corp., 309 Cherry St., Scranton, Pa.—C, PL

Continental-Diamond Fibre Co., Newark, Dela., "Diamond," "Dilecto"—BM, F, PL

Cook Ceramic Mfg. Co., 503 Prospect St., Trenton, N. J.—C

Corning Glass Works, Corning, N. Y., "Pyrex"—C, G, SO

Cottrell Paper Co., Inc., 19 Purchase St., Fall River, Mass.—P

Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—PL

Crolite—Henry L. Crowley & Co.

Henry L. Crowley & Co., Inc., 1 Central Ave., West Orange, N. J., "Crolite"—C

Harry Davies Molding Co., 1428 N. Wells St., Chicago, Ill.—PL

Diamond—Continental-Diamond Fibre Co.

Dilecto—Continental-Diamond Fibre Co.

Dow Chemical Co., Plastics Div., Midland, Mich.—PL

E. I. DuPont de Nemours & Co., Inc., Plastics Dept., 626 Schuyler Ave., Arlington, N. J.—PL

Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y., "Durez"—PL

Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia, Pa.—PL

Eclipse Moulded Products Co., 5151 N. 32nd St., Milwaukee 9, Wis.—PL

Electrical Insulation Co., Inc., 12 Vesey St., New York 13, N. Y.—PL, T

Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.—BM, GM

Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.—G

Endurette Corp. of America, Cliffwood, N. J.—VC

Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn.—PL, PT

Federal Screw Products Co., 224 W. Huron St., Chicago, Ill.—T

Ford Radio & Mica Corp., 538 63rd St., Brooklyn, N. Y.—M

Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, Ohio, "Formica"—PL

Franklin-Fibre-Lamitex Corp., Wilmington, Dela.—B, F, PL

Fyberoid—Wilmington Fibre Specialty Co.
A. W. Franklin Mfg. Corp., 175 Varick St., New York N. Y.—C, PL
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y.—FT, PL
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—F, FG, FT, ST, VC, G, PL, RI
General Ceramics & Steatite Corp., Keasby, N. J.—C, IB, SO
General Electric Co., 1 River Rd., Schenectady, N. Y. BM, C, F, FT, M, PL, VC, GM
General Electric Co., Plastics Dept., 1 Plastics Ave., Pittsfield, Mass.—PL
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—BM, C, CP, IB, M, PL
The General Industries Co., Taylor & Olive Sts., Elyria, Ohio—PL
General Paper Tube Co., 430 E. Chelton Ave., Philadelphia, Pa.—PT
B. F. Goodrich Co., 500 So. Main St., Akron, Ohio, "Koroseal", "Geon"—PL
Greenhut Insulation Co., 31 W. 21st St., New York, N. Y.—F, PL
Haines Mfg. Co., 248-274 McKibbon St., Brooklyn 6, N. Y.—PL
Halowax Products Division, Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.—PL
Hawley Products Co., 201 No. First Ave., St. Charles, Ill.—F
Hodgman Rubber Co., Framingham, Mass.—RI
ICA—Insuline Corp. of America
Huse Liberty Mica Co., 171 Camden St., Boston 18, Mass.—M
Imperial Molded Products Corp., 2925 W. Harrison St., Chicago 12, Ill.—PL
Imperial Porcelain Works, Inc., Trenton Ave. & Mulberry St., Trenton, N. J.—C
Industrial Molded Products Co., 2035 Charleston, Chicago, Ill.—PL
Industrial Screw & Supply Co., 717 W. Lake St., Chicago 6, Ill.—FT, ST, SO, T
Industrial Synthetics Corp., 60 Woolsey St., Irvington 11, N. J., "Synflex"—RI, PL
Insulating Tube Co., Inc., 26 Cottage St., P. O. Box 1, Poughkeepsie, N. Y.—PT, PL
Insulation Manufacturers Corp., 565 W. Washington Chicago, Ill.—BM, F, FG, FT, G, M, P, PT, RI, ST, T, VC
Insulation Products Co., 504 N. Richland St., Pittsburgh, Pa.—PL
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., "ICA"—C, F, FG, IB, PL, SO, T
Insul-X Co., 857 Meeker Ave., Brooklyn, N. Y.—PL, RI
Insurok—The Richardson Co.
Irv-O-Volt—Irvington Varnish & Insulator Co.
International Product Corp., 2554 Greenmount Ave., Baltimore 18, Md.—BM, C, GM
Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington, N. J., "Irv-O-Volt"—PL, T, VC
Isolantite, Inc., 343 Cortlandt St., Belleville 9, N. J. C, IB
E. F. Johnson Co., Waseca, Minn.—C
Johnson Rubber Co., Middlefield, Ohio—RI
Katz & Ogush, Inc., 33 W. 60th St., New York, N. Y.—IB
Keystone Specialty Co., 1373½ Cove Ave., Lakewood, Cleveland, Ohio—PL
J. R. Kilburn Glass Co., Inc., Chartley, Mass. —C, G, IB
Knox Porcelain Corp., Knoxville, Tenn.—C, SO
Kuhn & Jacob Molding & Tool Co., 1200 Southard St., Trenton 8, N. J.—PL
Kurz-Kasch, Inc., So. Broadway, Dayton 1, Ohio PL
Lamicoid—Mica Insulator Co.
Lapp Insulator Co., Inc., Le Roy, N. Y.—C, SO
Lavite—D. M. Steward Mfg. Co.
Lenoxite Div., Lenox, Inc., 66 Prince St., Trenton, N. J.—C, SO
Loalin—Catalin Corp.
Locke Insulator Corp., P. O. Box 57, Baltimore 3, Md.—C, SO
The Louthan Mfg. Co., 200 Harvey Ave., East Liverpool, Ohio—C
Lumarith Protectoid—Celanese Celluloid Corp.
The Macallen Co., 16 Macallen St., Boston, Mass.—M
Maico Co., Inc., Minneapolis 8, Minn.— PL
Makalot Corp., 262 Washington St., Boston, Mass.—PL
John A. Manning Paper Co., Inc., Troy, N. Y.—F, P
The Metsch Refractories Co., East Liverpool, Ohio—C
Mica Insulator Co., 200 Varick St., New York 14, N. Y., "Micanite", "Empire", Munsell", "Lamicord,"—BM, F, FG, FT, M, P, PT, PL, T, VC
Mica Products Mfg. Co., 88 Wooster St., New York, N. Y.—BM, F, FG, M, T, VC
Micarta Fabricators, Inc., 4619 Ravenswood Ave., Chicago, Ill.—F, PL, T
Mico—Mica Insulator Co.
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—C.
Mitchell-Rand Insulating Co., 53 Murray St., New York, 7, N. Y.—BM, CP, F, FG, FT, IB, M, P, T, VC, PL
Molded Insulation Co., 335 East Price St., Philadelphia, Pa.—PL
Monsanto Chemical Co., Plastics Division, Springfield, Mass.—PL
Multi Electrical Mfg. Co., 1840 W. 14th St., Chicago, Ill.—C
Eugene Munsell & Co., 200 Varick St., New York, N. Y.—M
Mycalex Corporation of America, 60 Clifton Blvd., Clifton, N. J.—C, SO, GM
Mykroy, Inc., 1917 No. Springfield Ave., Chicago 47, Ill.—SO, BM
N-C—National Company, Inc.
National Co., Inc., Malden, Mass., "N-C"—C
National Porcelain Co., 400 Southard St., Trenton, N. J.—BC, IB, SO
National Tile Co., 26th & Lynn Sts., Anderson, Ind.—C, SO
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.—FG, P, PL, T, VC
National Vulcanized Fibre Co., Wilmington, Dela., "Phenolite"—F, P, PL
Nepperhan Sales Co., Inc., 175 Fifth Ave., New York 10, N. Y., "Nepera"—CP, FG, T, VC
New England Mica Co., Waltham, Mass.—M
New England Radiocrafters, 1156 Commonwealth Ave., Brookline, Mass.—PL
Northern Industrial Chemical Co., Elkins St., S. Boston, Mass.——PL
Norton Co., 1 New Bond St., Worcester 6, Mass.—AO
Norton Laboratories, Inc., 560 Mill St., Lockport, N. Y.—PL
Ohmoid—Wilmington Fibre Specialty Co.
Owens-Corning Fiberglas Corp., Toledo, Ohio—FG
Pacific Clay Products, SteaPACtite Div., 300 West Ave. 26, Los Angeles 31, Calif.—C, IB, SO
Paramount Paper Tube Co., 805 Glasgow Ave., Fort Wayne, Ind.—T
Parisian Novelty Co., 3510 S. Western Ave., Chicago, Ill.—PL
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.—F, M, P, PT, T
Phenolite—National Vulcanized Fibre Co.
Philadelphia Mica Corp., 3515 North 10th St., Philadelphia 40, Pa.—BM, M
Pierce Laboratory, Inc., Summit, N. J.—PL
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—PL
Plax Corp., Box 1019, Hartford 1, Conn.—IB, PL, SO
Poinsettia, Inc., 11 Cedar Ave., Pitman, N. J.—PL
Porcelain Enamel & Mfg. Co., Plastics Div., 5601 Eastern Ave., Baltimore, Md.—M, PL
The Porcelain Insulator Corp., Main St., Lima, N. Y. —C, SO
Porcelain Products, Inc., 124 W. Front St., Findlay, Ohio—C, SO
Precision Paper Tube Co., 2033 W. Charleston St., Chicago, Ill.—P, PL, PT, T
Premax Products, Div. Chisholm-Ryder Co., Inc., College and Highland Aves., Niagara Falls, N. Y. —SO
Printloid, Inc., 93 Mercer St., New York, N. Y.—F, PL
Pyrex—Corning Glass Works
Racon Elec. Co., Inc., 52 E. 19th St., New York, N. Y.—PL
Radio Essentials, Inc., 63 Wooster St., New York, N. Y.—SO, T, C
Recto Molded Products, Inc., Appleton & B. & O. R. R., Cincinnati, Ohio—PL
Reynolds Spring Co., Molded Plastics Division, Cambridge, Mass.—PL
The Richardson Co., Melrose Park, Ill.—PL
Rogan Bros., 2001 S. Michigan Ave., Chicago, Ill.—PL
The T. R. Routh Co., 1045 Bryant St., San Francisco, Calif.—SO
Rupp's Assembling & Mfg. Works, 2341 N. Seminary Ave., Chicago, Ill.—C
Sandee Mfg. Co., 3945 N. Western Ave., Chicago 18, Ill.—PL, T
Saxonburg Potteries, Saxonburg, Pa.—C
Schweitzer Paper Co., 142 Miller St., Newark, N. J. —CP
Smith Paper Co., Inc., 22 Eagle Ave., Lee, Mass.—CP, P
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y.—F, PL, T, VC
Spauldite—Spaulding Fibre Co., Inc.
Spaulde—Spaulding Fibre Co., Inc.
Sperti, Inc., Beech & Kenilworth Aves., Norwood, Cincinnati 12, Ohio—G, IB, SO
Square D Co., 6060 Rivard St., Detroit, Mich.—P
Standard Insulation Co., 74-76 Paterson Ave., E. Rutherford, N. J.—CP, P, VC
Star Porcelain Co., 41 Muirhead Ave., Trenton, N. J.
Steapactite—Pacific Clay Products
D. M. Steward Mfg. Co., Chattanooga, Tenn., "Lavite" —C, IB, SO
Jos. Stokes Rubber Co., Taylor St., Trenton, N. J. —PL
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—FT
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.—C, IB, SO
Suprenant Electrical Insulation Co., 84 Purchase St., Boston, Mass.—T
Synthane Corp., Highland Ave., Oaks, Pa., "Synthane" —PL
Tar Heel Mica Co., Plumtree, N. C.—BM, M
Taylor Fibre Co., Norristown, Pa.—F, PL
R. Thomas & Sons Co., Lisbon, Ohio—C, SO
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.—PL
Tri-State Molding Co., Henderson, Ky.—PL
Tungsten Contact Mfg. Co., 7511 Cottage Ave., North Bergen, N. J.—PL
Turbo—Wm. Brand & Co.
Ucinite Co., Div. of United-Carr Fastener Corp., Newtonville, Mass.—PL
Union Electrical Porcelain Works, Inc., Vam St., Trenton 5, N. J., "Millham"—C
Universal Clay Products Co., 1740 E. 12th St., Cleveland, Ohio—C
U. S. Rubber Co., 1230 Sixth Ave., New York 20, N. Y.—FT, RI
W. Urban & Co., 518 Broadway, Camden, N. J.—F, SO
Van-O-Lite Co., see Nepperhan Sales Co.
Varflex Corp., Rome, N. Y.—FG, T, I, PL
Victor Insulators, Inc., Victor, N. Y.—C, SO
Washington Porcelain Co., Washington, N. J.—C, SO
R. D. Werner Co., Inc., 380 Second Ave., New York, 10, N. Y.—PL
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. —C, F, FG, FT, M, P, PL, PT, SO, T, VC
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—BM, C, CP, F, FG, FT, IB, P, PT, PL, SO, T, VC
West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y.—F
Whitney Blake Co., New Haven, Conn.—PL
Wilmington Fibre Specialty Co., Wilmington, Dela.—F, P
Wm. E. Wright & Sons Co., West Warren, Mass.—ST

Laboratory Equipment

(See also MEASURING INSTRUMENTS)

Capacitor specialties C
Decade boxes, capacity ....DC
Decade boxes, resistance ....RD
Electric wave filters ....E
Electronic balances ....EB
Electronic switches ....ES
Equalizing filters ....EF
Gas analyzers ....GA
Inductance specialties L
Lenses ....LE
Multivibrators ....MV
Optical equipment ....OE
Oscillographs, direct-writing ....OD
Oscillographs, cathode ray ....O
Radio spectrum analyzers ....RA
Refrigerated test cabinets ....RC
Resistance specialties ....R
Salt-spray cabinets ....SC
Spectrographic equipment ....S
Square wave gen..................................SW
Standard signal A.F. gen.......................SA
Standard signal R.F. gen.......................SR
Stroboscopes ....ST
Ultrasonic oscillators...........................SO
Surface analyzers ....SM
Tuning fork oscillators ....TO

Aero Communications Inc., 231 Main St., Hempstead, L. I., N. Y.—SR
Aerovox Corp., 742 Belleville Ave., New Bedford, Mass.—C
Aircraft Accessories Corp., Fairfax & Funston Rd., Kansas City, Kan.—O, SA, SR, SW
Allen Electric and Equipment Co., 2101-29 N. Pitcher St., Kalamazoo, 13F, Mich.—GA
Allied Control Co. Inc., 2 East End Ave., New York 21, N. Y.—ES
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—RD

American Coils Co., 29 Lexington St., Newark, N. J. —RC
American Instrument Co., Silver Spring, Md.—RC, SC
American Jewels Corp., 94 County St., Attleboro, Mass.—R
American Time Products, Inc., 580 Fifth Ave., New York 19, N. Y.—SA, ST, TO
American Transformer Co., 180 Emmet St., Newark 5, N. J.—E, L
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—SW, ST
Amplifier Co., of America, 398 Broadway, New York 3, N. Y.—E, DC, RD, EB, ES, EF, SW, SA
Andrew Co., 363 E. 75th St., Chicago 19, Ill.—E, L
R. B. Annis Co., 1101 N. Delaware St., Indianapolis 2, Ind.—O
Applied Research Laboratories, 4336 San Fernando Rd., Glendale, Calif.—S
Approved Technical Apparatus Co., 733 Blake Ave., Brooklyn, N. Y.—C, SR
Associated Research, Inc., 231 So. Green St., Chicago 7, Ill., "Vibrotest"—RD
Audio Development Co., 2833 13th Ave., S., Minneapolis 7, Minn—E
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—SW, SA
Ballantine Laboratories, Inc., Boonton, N. J.—SR
Alfred W. Barber Laboratories, 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.—RA, SA, SW
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—L
Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.—LE, OE, S
Bell & Howell Co., 1801 Larchmont Ave., Chicago 19, Ill.—LE, OE
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—C, E, ES, EF, GA, L, O, RA, SW, SA, SR
Best Mfg. Co. 1200 Grove St., Irvington 11, N. J.—E, EF, L, SA, ST
James G. Biddle Co., 1211-13 Arch St., Philadelphia, Pa.—R
Bliley Electric Co., Union Station Bldg., Erie, Pa. —E
Bludworth Marine Div. of National Simplex Bludworth, Inc., 100 Gold St., New York, N. Y.—SO
Boonton Radio Corp., Boonton, N. J., "Q Meter," "QX Checker"—SR
Browning Laboratories, Inc., 750 Main St., Winchester, Mass.—SW, SR
Brush Development Co., 3311 Perkins Ave., Cleveland 14, Ohio—OD, SM
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio —C
J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—RD
Carrier Corp., South Geddes St., Syracuse, N. Y.—RC
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill. —L, SA, SR
Centralab, Div of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.—C
Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill.—GA, RC, S
The Clough-Brengle Co., 5501 Broadway, Chicago, Ill. —E, O, SA, SR
Coleman Electric Co., 318 Madison St., Maywood, Ill —S
Colonial Radio Corp., 254 Rano St., Buffalo 7, N. Y. —SW
Communications Co., Inc., 300 Greco Ave., Coral Gables 34, Fla.—SR
Communications Equipment Corp., 134 W. Colorado St., Pasadena 1, Calif.—SA, SR
C. G. Conn, Ltd., Elkhart, Ind.—ST
Consolidated Engineering Corp., 1255 E. Green St., Pasadena, Calif.—GA, OD, S
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., S. Plainfield, N. J.—C, DC
The R. W. Cramer Co., Inc., Centerbrook, Conn.—ES
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee 1, Wis—ES, R
Cyclotron Specialties Co., Moraga, Calif.—ES
The Daven Co., 191 Central Ave., Newark 4, N. J. —RD, R
De Jur-Amsco Corp., 6 Bridge St., Shelton, Conn.—R
Determohn—Ohmite Mfg. Co
Tobe Deutschmann, Corp., Canton, Mass.—C
Distillation Products, Inc., 755 Ridge Road W., Rochester 13, N. Y.—OE
John Dougherty, 74 N Willow St., Montclair, N. J.—RC
Allen B. DuMont Labs, Inc., 2 Main Ave., Passaic, N. J.—ES, O, SW
Electro-Medical Laboratory, Inc., 1529 Highland Ave., Holliston, Mass.—OD
Electronic Control Corp., 626 Harper, Detroit, Mich. —ES
Electronic Products Co., 19 N. First St., Geneva, Ill —ES, RD
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—ES, O, S, SW, SA, SR
Electronic Supply Co., 6-8 Winter St., Worcester 4, Mass.—OE, ES
Electro Products Laboratories, 549 W. Randolph St., Chicago 6, Ill.—E, SA
Engineering Laboratories, Inc., 624 E. Fourth St., Tulsa, Okla.—SW
Erco Radio Labs, Inc., 231 Main St., Hempstead, L. I., N. Y.—SR
Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—L, O, SW, SA, SR
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—SA, SR
Federal A. C. Switch Corp., 1200 Niagara St., Buffalo, N. Y.—ES
Federal Mfg. & Engineering Corp., 199-217 Steuben St., Brooklyn 5, N. Y.—SR
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.—E, EF, L
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J.—SR
Fish-Schurman Corp., 230 E. 45th St., New York 17, N. Y.—LE, OE, S
Flashtron—Thordarson Electric Mfg. Co.
Frostrode Products, 19003 John R., Detroit, Mich. —RC
Freed Transformer Co., 72 Spring St., New York, N. Y.—E, EF, L
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—OE, SR
Garod Radio Corp., 70 Washington St., Brooklyn 1, N. Y.—SR
General Communication Co., 681 Beacon St., Boston 15, Mass.—RD, EB, SR
General Electric Co., 1 River Rd., Schenectady, N. Y. —C, DC, E, ES, L, O, R, RD, SA, SM, SR, SW
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—ES, O, SW, SA, SR, ST
General Radio Co., 30 State St., Cambridge, Mass., "Strobolux," "Strobotac"—C, DC, E, L, O, R, RD, SA, ST, SW, SR, TO
Geophysical Instrument Co., 1315 Half St., S. E., Washington 3, D. C.—LE, OE
Thos. B. Gibbs Co., Delavan, Wis.—TO
Grenby Mfg. Co., Plainville, Conn.—SW, SA, SR
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—ES, L, SA, SR
Hamilton Mfg. Co., Two Rivers, Wis.—OD
The Hammarlund Mfg., Inc., 460 W. 34th St., New York 1, N. Y.—C
Hardwick, Hindle, Inc., 40 Herman St., Newark, N. J. —R
Harshaw Scientific, 1945 E. 79th St., Cleveland 6, Ohio—GA, OE, S
Hathaway Instrument Co., 1315 S. Clarkson, Denver, Colo.—O, OD
Haydon Mfg. Co., Inc., Forestville, Conn.—ST
H-B Electric Co., 6101 N. 21st St., Philadelphia 38, Pa.—ES
Heiland Research Corp., 130 E. Fifth Ave., Denver 9, Colo.—GA, OD
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—E, ES, EF, O, RD, SA, SW
Hercules Electric & Mfg. Co., 2416 Atlantic Ave., Brooklyn 33, N. Y.—E, L
Herron Optical Co., 705 W. Jefferson Blvd., Los Angeles 7, Calif.—L, OE
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.—OE, O, SR, ST
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.—SR, SA, SW
The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio—O, SR
Hollywood Electronics Co., Div. of Megard Corp., 1601 So. Burlington Ave, Los Angeles 6, Calif.—O, SA, SR, EF
Hollywood Transformer Co., 645 N. Martel Ave., Hollywood 36, Calif.—E, EF
Hudson American Corp., 23 W. 43rd St., New York, N. Y.—RA, SA, SR
Industrial Condenser Corp., 1725 W. North Ave., Chicago 22, Ill.—C, DC
Industrial Filter & Pump Mfg. Co., 3017 W. Carroll Ave., Chicago, Ill.—SC
Industrial Instruments, 156 Culver Ave., Jersey City, N. J.—RD
Instrument Optics Co., 1872 Genesee St., Buffalo 11, N. Y.—LE, OE
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—C, E, EF, ES, L, O, SR, R, RA, SM, SW
Jackson Electrical Instrument Co., 131 Wayne Ave., Dayton 1, Ohio.—O, SA
Jarrell Ash Co., 165 Newbury St., Boston 16, Mass. —OE, LE, S
Ray Jefferson, Inc., 40 E. Merrick Rd., Freeport, L. I., N. Y.—RC
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkway, Brooklyn 19, N. Y.—ST
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—C, DC, RD, EF, L, O, R, SW, SA, SR, MV
Kenyon Transformer Co., Inc., 840 Barry St., New York 59, N. Y.—E
J. R. Kilburn Glass Co., Inc., Chartley, Mass.—C
Kold-Hold Mfg. Co., 424 N. Grand Ave., Lansing 4, Mich.—RC
Kopp Glass, Inc., 1 E. 42nd St., New York 17, N. Y.—LE
Landis & Gyr, Inc., 104 Fifth Ave., New York, N. Y. —R
Lapp Insulator Co., Inc., Le Roy, N. Y.—C
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.—L
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.—DC, RD, GA, S
Littelfuse, Inc., 4732 Ravenswood Ave., Chicago, Ill —ES
Lumenite Electric Co., 407 S. Dearborn St., Chicago 5, Ill.—ES
Marion Electric Instrument Co., Stark Street Gate, Manchester, N. H.—R
Marshall Radio Engineering Labs., 5008 Lankershim Blvd., North Hollywood, Calif.—O
Measurement Corp., 116 Monroe St., Boonton, N. J. —SR, SW
John Meck Industries, Liberty at Pennsylvania, Plymouth, Ind.—C
Merwin-Wilson Co., New Milford, Conn.—E, L
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—O, SW
Mineralight—Ultra-Violet Products, Inc
Mobile Refrigeration, Div. of Bowser, Inc., 38-32 54th St., Woodside, L. I., N. Y.—RC
Wm. Mogey & Sons, Inc., Plainfield, N. J.—OE
Monarch Mfg. Co, 3341 Belmont Ave., Chicago, Ill "Monarch"—SR
Motor Mike—Sprague Products Co.
Motor Products Corp., 2301 Davis St., N. Chicago, Ill.—RC
Muter Co., 1255 So. Michigan Ave., Chicago 5, Ill.—RD
National Co., Inc., 61 Sherman St., Malden 48, Mass.—E
National Technical Laboratories, 820 Mission St., So. Pasadena, Cal., "Beckman"—GA, OE, S
New York Transformer Co., 26 Waverly Place, New York, N. Y.—L
Nillson Elec. Lab., Inc., 103 Lafayette St., New York, N. Y.—R, ST
Northern Engineering Labs., 50 Church St., New York, N. Y.—RC
Offner Electronics, Inc., 5320 No. Kedzie Ave., Chicago, Ill.—OD, SA
The Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio—R
Ohmite Mfg Co., 4835 Flournoy St., Chicago 44, Ill. "Determohn"—RD, R
Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—C, E
Pancramic Radio Corp., 245 W. 55th St., New York 19, N. Y.—RA, SW
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.—OE, R
The Perkin-Elmer Corp., P. O. Box 331, Glenbrook, Conn.—LE, OE
Photobell Corp., 116 Nassau St., New York 7, N. Y. —DC, ES, EB, LE, OE, ST
Physicists Research Co., 343 S. Main St., Ann Arbor, Mich.—SM
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—OD
Potter Co., 1950 Sheridan Rd., N. Chicago 1, Ill., "Potter"—C, GA
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.—SR
Precision Scientific Co., 1750 N. Springfield Ave., Chicago 47, Ill.—GA, SC
Q Meter—Boonton Radio Corp.
QX Checker—Boonton Radio Corp.
Radio City Products Co., Inc., 127 W. 26th St., New York 1, N. Y.—O
Radio Specialty Mfg. Co., 403 N.W. 9th St., Portland, Ore.—SR
Rahm Instruments, Inc., 12 West Broadway, New York 7, N. Y.—OD
Raytheon Mfg. Co., 190 Willow St., Waltham, Mass —SW
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.—IT
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—O, SA, SR, SW
Reiner Electronics Co., 152 W. 25th St., New York 1, N. Y.—O, SW
Revco, Inc., Deerfield, Mich.—RC
Richardson Allen Corp., 15 West 20th St., New York 11, N. Y.—EB, ES
Riverbank Laboratories, Batavia Rd., Geneva, Ill.—TO
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago, Ill.—C, E, ES, L, O, SA, SW
Saxl Instrument Co., Inc., 38 James St., E. Providence, R. I.—SM
Sav-Way Industries, 4875 E. Eight Mile Rd., Detroit 13, Mich.—SM
Schaar & Co., 754 W. Lexington St., Chicago, Ill —RC
Schuttig & Co., 9th & Kearny Sts., Washington, D. C. —C, L, R
Scientific Radio Products Co., 738-40-42 W. Broadway, Council Bluffs, Iowa—SA
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa. —RD, R
F. W. Sickles Co., Chicopee, Mass.—L
F. A. Smith Mfg. Co., Inc., P. O. Box 509, Rochester, N. Y.—ES

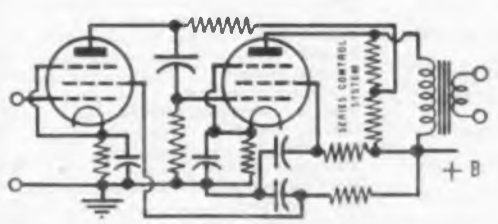
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—E
Solar Mfg. Corp., 586 Avenue A, Bayonne, N. J.—C
Sound Apparatus Co., 150 W. 46th St., New York, N. Y.—ES
Sound Equipment Corp., 6245 Lexington Ave., Hollywood 38, Calif.—SR
Sprague Products Co., N. Adams, Mass., "Motor Mike"—C
Sprague Specialties Co., N. Adams, Mass.—C
Strobolux—General Radio Co.
Strobotac—General Radio Co
Sundt Engineering Co., 4763 Ravenswood Ave., Chicago, Ill.—O
Supreme Instruments Corp., Howard St., Greenwood, Miss., "Supreme"—O, RD
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill—L
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—O
Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.—R
Technical Apparatus Co., Inc., 1171 Tremont St., Boston, Mass.—DC, RD, SR
Templetone Radio Co., Greeumanville Ave., Mystic, Conn.—O, SW, SR
Tenney Engineering, Inc., 8 Elm St., Montclair, N. J.—RC, SC
Thordarson Electric Mfg. Co., 500 West Huron St., Chicago 10, Ill., "Flashtron"—E, ES
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 44, Pa.—RD, R
Tibbetts Laboratories, 12 Norfolk St., Cambridge, Mass.—O
Transformer Engineering Co., Stamford, Conn.—E, EF
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.—SA, SR
Triplett Electrical Instrument Co., Harmon Rd., Bluffton, Ohio—SR
Triumph Mfg. Co., 913-21 W. Van Buren St., Chicago, Ill.—O, SR
United Cinephone Corp., Torrington, Conn.—SL
Ultra-Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles 27, Calif., "Mineralight"—SM
United Transformer Co., 150 Varick St., New York 13, N. Y.—E, EF, SA, L
Valpey Crystal Corp., 1244 Highland St., Holliston, Mass.—SO
Variaten Cinema Engr. Co., 1508 W. Verdugo Ave., Burbank, Calif.—RD
Vibrotest—Associated Research, Inc.
Waterman Products Co., Inc., 1900 No. 6th St., Philadelphia 22, Pa.—O, SW, SA, SR
Earl Webber Co., 4352 W. Roosevelt, Chicago, Ill.—SR
Wm. M. Welch Mfg. Co., 1515 N. Sedgewick St., Chicago, Ill.—RD
Western Electric Co., 195 Broadway, New York, N. Y.—E, EF, FM,
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—E, GA, OD, O, RC, SW, ST
Weston Electrical Instrument Corp., 597 Frelinghuysen Ave., Newark, N. J.—SR
The S. S. White Dental Mfg. Co., Industrial Division, 10 E. 40th St., New York, N. Y.—R
White Research Associates, 899 Boylston St., Boston 15, Mass.—C, DC, RD, E, OE, O, SA, SR
Winslow Co., 31 Fulton St., Newark 2, N. J.—RD, R, TO
Wynne Precision Co., 114 No. Hill St., Griffin 1, Ga.—LE

Machinery & Production Equipment

Air cleaners	AC
Bench lathes	L
Blower units	B
Buffers and grinders	G
Coil winding machines	CW
Crystal grinders	G
Crystal lapping discs	LD
Crystal saw baldes	C
Dies	D
Drill press	P
Electric furnaces	E
Impregnating equipment	IM
Jigs and fixtures	J
Marking and numbering machines	MN
Metal forming equipment	MF
Molding presses	MP
Powdered metal press	PM
Pressure welding electrodes	PW
Quartz cutting machines	QC
Riveter, automatic	R
Spot welders	S
Vacuum pumps	VP
Vacuum tube machinery	VM
Vibration control equipment	VC
Wire insulating machine	WI
X-Ray, pattern markers	X

Ace Mfg. Co., 1239 E. Erie Ave., Philadelphia 24, Pa.—D, J
Acme Tool & Die Co., 426 Ingle St., Evansville 8, Ind.—D, J
The Acromark Co., 9-13 Morrell St., Elizabeth 4, N. J.—MN
Aero Tool and Die Works, 4892 No. Clark St., Chicago 40, Ill.—J
Aeroil Burner Co., Inc., 5701 Park Ave., West New York, N. J.—IM
Air-Maze Corp., 5200 Harvard St., Cleveland 5, Ohio—AC
Algoma Products, 3080 E. Outer Dr., Detroit, Mich.—D, J
All-Steel Equip. Co., 723 Griffith Ave., Aurora, Ill.—MF
American Electric Fusion Corp., 2600 W. Diversey Ave., Chicago 47, Ill.—PW, S
American Instrument Co., 8020 Georgia Ave., Silver Spring, Md.—C
American Insulating Machinery Co., Fairhill & Huntingdon Sts., Philadelphia 33, Pa.—J
Andrews & Perillo, 39-30 Crescent St., Long Island City 1, N. Y.—D, J, MF
R.B. Annis Co., 1101 N. Delaware St., Indianapolis 2, Ind.—MN, VC
Associated Research, Inc., 231 So. Green St., Chicago 7, Ill.—VC
Auto Engraver Co., 1776 Broadway, New York 19, N. Y.—MN, MF
The Automatic Electrical Devices Co., 324 E. 3rd St., Cincinnati, Ohio—VC
Baird Machine Co., 1700 Stratford Ave., Stratford 9, Conn.—MF
Bear Mfg. Co., Rock Island, Ill.—VC
The Brown-Brockmeyer Co., 1004 Smithville, Dayton, Ohio—G
Burgess Battery Co., Handicraft Div., 180 N. Wabash Ave., Chicago 1, Ill.—MN
Oscar Caplan & Sons, Diamond Tool Repl. Div., 207 W. Saratoga St., Baltimore, Md.—QC
Central Scientific Co., 1700 Irving Park Road, Chicago 13, Ill.—VP
P. E. Chapman Electrical Works, 1820 Chouteau Ave., St. Louis 3, Mo.—CW
Chicago Rivet & Machine Co., 9600 Jackson Blvd., Bellwood, Ill.—R
Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.—QC
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio—PW
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles Calif.—CW, P
Consolidated Diamond Saw Blade Co., 320 Yonkers Ave., Yonkers 2, N. Y.—C
Continental Machines, Inc., 1301 Washington Ave., S. Minneapolis, Minn.—MF
Cook Research Laboratories, Ltd., 950 Crane St., Menlo Park, Calif.—D, J
Crescent Industries, Inc., 4140 Belmont Ave., Chicago 41, Ill.—D
Daly Machine & Tool Works, 923 Frelinghuysen Ave., Newark, N. J.—J
Danneman Die-Set Co., 203 Lafayette St., New York 12, N. Y.—D
Despatch Oven Co., 722 Central Ave., Minneapolis, Minn.—E
The Dickey-Grabler Co., 10302 Madison Ave., Cleveland, Ohio—D
Diehl Mfg. Co., Finderene Plant, Sommerville, N. J.—G
Distillation Products, Inc., 755 Ridge Rd., W., Rochester 13, N. Y.—IM, V, VM
The Dumore Co., 1225—14th St., Racine, Wis.—G
Eastern Air Devices, Inc., 585 Dean St., Brooklyn 17, N. Y.—B
Ecco High Frequency Electric Corp., 7020 Hudson Blvd., N. Bergen, N. J.—VM
T. J. Edwards Co., 121 Beech St., Boston, Mass.—D, MN
Eisler Engineering Co., 778 S. 13th St., Newark 3, N. J.—CW, MN, PW, VP, VM
Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia 32, Pa.—CW
Electronic Products Co., 111 East Third St., Mt. Vernon, N. Y.—VP
Felker Mfg. Co., Torrance, Calif.—C
Charles A. Fuchs Bros., 13-15 Mollineaux Pl., Roosevelt, Nassau, N. Y.—D, J, MF
General Crystal Corp., 1776 Foster Ave., Schenectady, N. Y.—QC
General Electric Co., 1 River Rd., Schenectady, N. Y. FR, VM, VP, VC
Gisholt Machine Co., 1125 E. Washington Ave., Madison 3, Wisc.—VC
Wm. Hanson Co., R. 3, Niles, Mich.—VC
Hardware Specialties Mfg. Co., P. O. Box 844, Bridgeport, Conn.—J
Haydu Bros., Box 1226, Plainfield, N. J.—VP, VM, D
P. R. Hoffman Co., 321 Cherry St., Carlisle, Pa.—C
Hoffman Co., 41-43 N. Penn St., York, Pa.—IM
Hydraulic Press Mfg. Co., Mount Gilead, Ohio—MF
Ideal Commutator Dresser Co., Park Ave., Sycamore, Ill.—MN
Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.—IT, MO
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—VC
International Machine Works, 2027—46th St., North Bergen, N. J.—VP, VM
Invincible Tool Co., 611 Empire Bldg., Pittsburgh 22, Pa.—P
Kahle Engineering Co., 1307-9—7th St., N. Bergen, N. J.—CW, MN, MF, PW, VP, VM, S, J
Kinney Mfg. Co., 3529-41 Washington St., Boston 30, Mass.—VP
H. W. Knight & Sons, Inc., 96 State St., Seneca Falls, N. Y.—X
Kollath Manufacturing Co., 212-224 N. Loomis St., Chicago 7, Ill.—D, J, MF
Kollsman Instrument Div., Square D Co., 80-08—45th Ave., Elmhurst, L. I., N. Y.—SM
Korfund Co., Inc., 48-15—32nd Pl., Long Island City, N. Y.—VC
Kux Machine Co., 3924-44 W. Harrison St., Chicago 24, Ill.—MF, MP, PM
L. A. B. Corp., P. O. Box 162, Summit, N. J.—VC
Leiman Bros., Inc., 156 Christie St., Newark 5, N. J.—VP, G
Lepel High Frequency Labs Inc., 39 W. 60th St., New York, N. Y.—CW
Leslie L. Linick & Co., 1640 E. 54th St., Chicago 15, Ill.—L, MF
Linick, Green & Reed, Inc., 29 E. Madison St. Chicago, Ill.—P
Littlefuse Inc., 4732 Ravenswood Ave., Chicago, Ill.—VC
Logansport Machine, Inc. Box 166, Logansport, Ind.—MF
Lord Mfg. Co., 1635 W. 12th St., Erie, Pa.—VC
L. R. Mfg. Co., 65 New Litchfield St., Torrington, Conn.—B
The Maico Co., Inc., 2632 Nicollet Ave., Minneapolis, Minn.—D, J
Markem Machine Co., Keene, N. H.—MN
Jas. H. Matthews & Co., 3729 Belmont Ave., Chicago 18, Ill.—D, J, MN
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill.—CW
Merwin-Wilson Co., New Milford, Conn.—CW
Morse Boulger Destructor Co., 209 E. 42nd St., New York 17, N. Y.

Useful Applications in Electronic Developments..........No. 7



INVERSE FEEDBACK AMPLIFIER

TYPICAL USES: High quality sound systems electronic control devices requiring high degree stability.

Many industrial developments in former years suffered from inefficient designs because of a lack of information on certain factors that were too small to measure. Of late, many styles of amplifiers have been developed that will handle the amplification of small effects in a straightforward manner to permit accurate appraisal of their importance. The inverse feedback principle is the most effective way of improving the quality of an amplifier so that it will handle a wider range of input amplitude and frequencies.

Mico Instrument Co., 80 Trowbridge St., Cambridge 38, Mass.—CW, VM
Morse Twist Drill & Machine Co., 163 Pleasant St., New Bedford, Mass.—D
Morey Machinery Co., Inc., 4-57 26th Ave., Astoria 2, Long Island, N. Y.—L
National Gasket & Mfg. Co., 122 E. 25th St., New York, N. Y.—LD
National Research Corp., 100 Brookline Ave., Boston, Mass.—VP, VM
New Jersey Machine Corp., Willow Ave., at 16th St., Hoboken, N. J.—VM
New Method Steel Stamps, Inc., 147 Jos. Campau St., Detroit, Mich.—MN
Norton Co., 1 New Bond St., Worcester 6, Mass.—G
Numberall Stamp & Tool Co., 379 Huguenot Ave., Staten Island, N. Y.—MN
O K Machine Co., 2131 Fairfield Ave., Fort Wayne 6, Ind.—D, J, MF, CW
O'Neil-Irwin Mfg. Co., 316—8th Ave., S., Minneapolis 15, Minn.—MF
Oregon Electronic Mfg. Co., 206 S. W. Washington St., Portland 4, Ore.—MN
Pacific Railway Equipment Co., 960 E. 61st St., Los Angeles 1, Calif.—MP
Peerless Roll Leaf Co., Inc., 4511-4523 New York Ave., Union City, N. J.—MN
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.—D, MF
Photobell Corp., 114 Nassau St., New York, N. Y.—VC
Pratt & Whitney Div. of Niles-Bement-Pond Co., West Hartford, Conn.—L
H. P. Preis Engraving Machine Co., 155 Summit St., Newark 4, N. J.—MN, MF
Production Engineering Corp., 666 Van Houten Ave., Passaic, N. J.—IM
Production Instrument Co., 710 W. Jackson Blvd., Chicago, Ill.—CW
Professional Tool & Engineering Co., 153-159 W. Ohio St., Chicago 10, Ill.—J
Quaker City Gear Works, Inc., 1910-32 N. Front St., Philadelphia, Pa.
Quality Hardware & Machine Corp., 5823-51 No. Ravenswood Ave., Chicago 26, Ill.—D, J
Radex Corp., 1322 Elston Ave., Chicago, Ill.—CW, IM
Radiad Service, 720 W. Schubert Ave., Chicago 14, Ill.—D, J
Radio Electronic Co., 1816 Villanova Dr., Oakland, Calif.—VC
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—VM
Reed Prentice Corp., 677 Cambridge St., Worcester 4, Mass.—MP
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.—G
R. & T. Electronics Co., 2626 14th St., N. W., Washington, D. C.—VM
Sav-Way Industries, 4875 E. Eight Mile Rd., Detroit 13, Mich.—G
Schauer Machine Co., 2060 Reading Rd., Cincinnati 2, Ohio—G
Shure Brothers, 225 W. Huron St., Chicago, Ill.—VC
Anton Smit & Co., Inc., 333 W. 52nd St., New York 19, N. Y.—C
F. A. Smith Mfg. Co., Inc., 900 Davis St., Rochester 2, N. Y.—B
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—D
Southern Products, Independence, Mo.—CW, D, P, J, MF, PW
Sparkes Mfg. Co., Ltd., 318 Jefferson St., Newark 5, N. J.—D, VC
Speer Carbon Co., St. Marys, Pa.—FW
Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio—L, G
Standard Machinery Co., Providence, R. I.—MF
Sta-Warm Electric Co., Ravenna, Ohio—IM
F. J. Stokes Machine Co., 6038 Tabor Rd., Philadelphia 20, Pa.—IM, VP, PM, MP
Stricker-Brunhuber Co., 19 W. 24th St., New York, N. Y.—MP
B. F. Sturtevant Co., Damon St., Hyde Park, Boston 36, Mass.—B
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—VM
Synchro-Start Products, Inc., 221 E. Cullerton, Chicago, Ill.—VC
Televiso Products, Inc., 6533 Olmstead Ave., Chicago, Ill.—VC
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.—CW
Therm-Electric Meters Co., Inc., Pearsall Place, Ithaca, N. Y.—D, J
Thermo Electric Mfg. Co., 480 W. Locust St., Dubuque, Iowa—E
Thomas & Skinner Steel Products Co., 1120 E. 23rd St., Indianapolis 5, Ind.—D
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 44, Pa.—J, MN
Torit Mfg. Co., Walnut & Exchange Sts., St. Paul 2, Minn.—AC
Harold E. Trent Co., Leverington Ave., & Wilde St., Philadelphia 27, Pa.—IM, VM
U. S. Rubber Co., 1232 Sixth Ave., New York 20, N. Y.—G, VC
U. S. Electrical Tool Co., 1050 Findlay St., Cincinnati 14, Ohio—G
Universal Winding Co., 1655 Elmwood Ave., Cranston, R. I.—CW
Vonnegut Moulder Corp., 1851 Madison Ave., Indianapolis 2, Ind.—G
Wales-Strippit Corp., 845 Payne Ave., No. Tonawanda, N. Y.—D
Walker-Turner Co., Inc., Berckman St., Plainfield, N. J.—L, G, P
W. M. Welch Scientific Co., 1515 Sedgwick St., Chicago 10, Ill.—VP
James W. Weldon Lab., 2315 Harrison, Kansas City 8, Mo.—E
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—AC, VP, VC
Westinghouse Electric & Mfg. Co., 1216 W. 58 St., Cleveland, Ohio—AC
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—AC
Whisk Laboratories, 145 W. 45th St., New York 19, N. Y.—CW
White Research Associates, 899 Boylston St., Boston 15, Mass.—J
Wynne Precision Co., 114 N. Hill St., Griffin 1, Ga.—C, J

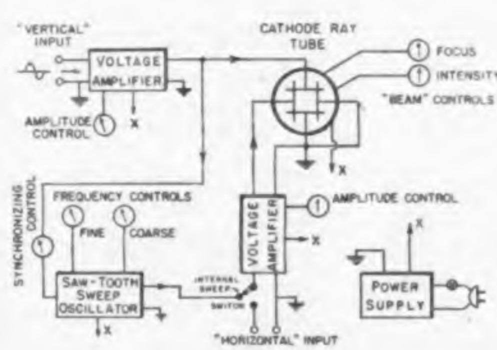
Measuring Instruments & Equipment

Ammeters, indicating .... A
Ammeters & milliammeters, recording .... AR
Attenuation meters .... AM
Battery testers .... BT
Bridges .... B
Color analyzers C
Dielectric const. recorder .... DC
Distortion meters .... D
Electric dimension gauge .... EG
Electric micrometer .... EM
Electronic hygrometers .... EH
Electronic viscosimeters VC
Electrostatic VM .... E
Field strength meters .... F
Frequency measuring devices .... FM
Frequency response recorders .... FR
Galvanometers .... G
High volt testers breakdown .... H
Impulse counter IC
Instrument parts .... MP
Insulation testers .... IT
Ionization gauges .... IG
Light intensity L
Megohm meters .... MO
Multi-meters .... M
Neon test lights .... N
Ohmmeters .... O
P.E. densitometers .... PE
PH meters .... PH
Pressure measurements .... PM
Phase angle meters .... P
Q-meter .... QE
Radio set analyzers .... R
Reflection meters .... RM
Sound level meters & recorders .... S
Spring testing equip. .... ST
Tachometer .... TA
Thermo-couples .... TH
Thermometers & pyrometers .... T
Time measurement .... TM
Trans. measuring set .... TR
Tube testers .... TT
Tuning forks .... TF
Vacuum gauges .... VG
Vac. tube voltmeters .... VT
Vibration measuring equip. .... VM
Volume indicators VI
Voltmeters V
Watt-hour meters .... WH
Watt meters .... W
Wave analyzers .... WA
Wave meters .... WM

Ace Mfg. Corp. 1239 E. Erie Ave., Philadelphia 24, Pa.—MP, TA
Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.—F, FM, VT, WM
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.—B
Aircraft Accessories Corp., Fairfax & Funsten Rd., Kansas City, Kans.—FM, WM
Airplane & Marine Instruments, Inc., Box 92, Clearfield, Pa.—WM
All American Tool & Mfg. Co., 1014 Fullerton Ave., Chicago, Ill.—VM
Allen Elec. & Equip. Co., 2103 Pitcher St., Kalamazoo 13F, Mich.—V, O
American Communications Corp., 306 Broadway, New York 7, N. Y.—VI
American Instrument Co., Silver Spring, Md.—PH
American Thermo-Electric Co., 67 E. 8th St., New York 3, N. Y.—TH
American Time Products, Inc., 580 Fifth Ave., New York 19, N. Y.—FM, TF
Amplifier Co. of America, 398 Broadway, New York 13, N. Y.—EH, PH, VI
Andrew Co., 363 E. 75th St., Chicago 19, Ill.—P
R. B. Annis Co., 1101 No. Delaware St., Indianapolis 2, Ind.—VM
Applied Research Laboratories, 4336 San Fernando Rd., Glendale 4, Calif.—PE
Askania Regulator Co., 1605 S. Michigan Ave., Chicago, Ill.—PM
Associated Research, Inc., 231 So. Green St., Chicago 7, Ill.—A, B, IT, MO, O, TA, VM, V, H
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—AR, S, W
Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio—T
Ballantine Laboratories, Inc., Boonton, N. J.—AR, FR, S, W
Alfred W. Barber Laboratories, 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.—VT
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—F, FM, WM
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—D, F, FM, P, VT, WA, WM
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—FM
Biddle Co., James G., 1211 Arch St., Philadelphia, Pa.—FM, IT, MO, VM
Richard H. Bird, 23 Moody St., Waltham, Mass.—MP
Bliley Electric Co., Union Station Bldg., Erie, Pa.—PM
Boonton Radio Corp., Boonton, N. J.—IT, QE
W. W. Boes Co., 3001 Salem Ave., Dayton 1, Ohio—A, O, S, TH, V
Boulin Instrument Co., 65 Madison Ave., New York, N. Y.—TA
The Bristol Co., Waterbury, Conn.—AR, T, TH
Brown Instrument Co., 4536 Wayne Ave., Philadelphia, Pa.—T, TH, PM
Browning Laboratories, Inc., 751 Main St., Winchester, Mass.—FM
Brush Development Co., 3311 Perkins Ave., Cleveland, 14, Ohio—G, PM, VM
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—WM
Burton-Rogers Co., 857 Boylston St., Boston 16, Mass.—A, V
Bulova Watch Co., 630 Fifth Ave., New York, N. Y.—M
Burlington Instrument Co., 316 Valley St., Burlington, Iowa—A, FM, O, TH, V
Wm. W. L. Burnett Radio Laboratory, 4814 Idaho St., San Diego 4, Calif.—FM
Cambridge Instrument Co., Inc., 3732 Grand Central Terminal, New York, N. Y.—G, TH, GA, PH
Carson Micrometer Corp., P. O. Box 57, Little Falls, N. J.—FM
Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill.—PH
The Clough-Brengle Co., 5501 Broadway, Chicago, Ill.—A, FM, IT, M, V, MO, AM, B
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—G, T
Colloid Equipment Co., Inc., 50 Church St., New York 7, N. Y.—EH
Coleman Electric Co., 318 Madison St., Maywood, Ill.—PH
Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, Ohio, "Tong Test"—A
Commercial Research Laboratories, Inc., 20 Bartlett Ave., Detroit 3, Mich.—PM, VM
Communications Co., Inc., 300 Greco Ave., Coral Gables 34, Fla.—F
Communication Measurement Laboratory, 120 Greenwich St., New York, N. Y.—B, FM, VM
Continental Electric Co., 715 Hamilton St., Geneva, Ill.—VG
C. G. Conn., Ltd., Elkhart, Ind.—FM
Consolidated Engineering Corp., 1255 E. Green St., Pasadena 5, Calif.—G, VM
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., S. Plainfield, N. J.—B
Corning Glass Works, Corning, N. Y.—C
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.—TA
Cyclotron Specialties Co., Moraga, Calif.—VG, IC
The Daven Co., 191 Central Ave., Newark 4, N. J.—FM, VI, TR, S
De Jur-Amsco Corp., 6 Bridge St., Shelton, Conn.—A, O, V
Tobe Deutschmann Corp., Canton, Mass.—B
Distillation Products, Inc., 755 Ridge Rd., W., Rochester 13, N. Y.—MP, PM, TH, VG
Doolittle Radio, Inc., 7421 So. Loomis Blvd., Chicago 36, Ill.—FM

R. L. Drake Co., 11 Longworth St., Dayton 2, Ohio —EH, IT
Allen B. DuMont Laboratories, Inc., 2 Main Ave., Passaic, N. J.—VM
Ecco High Frequency Electric Corp., 7020 Hudson Blvd., No. Bergen, N. J.—VG
Electronic Development Co., 2055 Harney St., Omaha 2, Nebr.—A, V
Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.—M
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.—VG
Electronic Products Co., 19 No. First St., Geneva, Ill.—EH
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—B, F, FM, MO, O, M, PH, P, VG, VT, WM
Electro-Products Laboratories, 549 West Randolph St., Chicago 6, Ill.—H
Charles Engelhard, Inc., 233 N. J. RR Ave., Newark 5, N. J.—AR, TH, T
Engineering Laboratories, Inc., 624 E. 4th St., Tulsa, Okla.—PM, VM
Ess Instrument Company, George Washington Bridge Plaza, Fort Lee, N. J.—C
Esterline—The T. R. Routh Co.
The Esterline-Angus Co., Inc., P. O. Box 596, Indianapolis, Ind.—AR, F, O, S
Eppley Laboratory, Inc., 12 Sheffield Ave., Newport, R. I.—TH
Erco Radio Laboratories, Inc., 231 Main St., Hempstead, N. Y.—F, FM, VT, WM
Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—B, FM, O, VT, V
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—F, FM, O, VT, VI
Federal Instrument Co., 3931—47th Ave., Long Island City 4, N. Y.—B, MP
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.—A, E, IT, VM
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J.—VT, F, FM, RN, QE
Field Electrical Instrument Co., 2432 Grand Concourse, New York 57, N. Y.—TH
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.—C, PH
Fish-Schurman Corp., 230 E. 48th St., New York 17, N. Y.—D, MP, L, VG
Forest Electronics Co., 320 E. 65th St., New York, N. Y.—R
George E. Fredericks, Bethayres, Pa.—VG
Charles A. Fuchs Bros., 13-15 Mollineaux Pl., Roosevelt, Nassau, N. Y.—MP
Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago, Ill.—C
Gamma Instrument Co., Inc., 95 Madison Ave., New York 16, N. Y.—PH
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—FM, WM
Henry A. Gardner Laboratory, Inc., 1500 Rhode Island Ave., N. W., Washington 5, D. C.—C, RM
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—H
General Communication Co., 681 Beacon St., Boston 15, Mass.—B, FM, F, TT
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—F, FM, FR, MO, M, S, TH, VT, VI, V
General Electric Co., 1 River Rd., Schenectady, N. Y.—A, AR, E, FM, IT, G, M, S, W, WH, T, V, VT, MO, L, P, F, TH, WM, B, CA, VM, WA
General Radio Co., 30 State St., Cambridge, Mass.—AM, B, D, FM, IT, MO, S, TA, VT, VM, V, WA, WM
General Time Instruments Corp., Seth Thomas Clock Division, Thomaston, Conn.—CH
Geophysical Instrument Co., 1315 Half St., S. E., Washington 3, D. C.—TC
Gisholt Machine Co., 13 S. Baldwin St., Madison, Wis.—VM
G-M Laboratories, Inc., 4336 N. Knox Ave., Chicago 41, Ill.—A, G, V
G. M. Mfg. Co., 50 West 3rd St., New York 12, N. Y.—T
Grenby Mfg. Co., Plainville, Conn.—B, D, FM, O, VT, WA, Q
Gruen Watch Co., Time Hill, Cincinnati, Ohio—M
W. & L. E. Gurley, 514 Fulton Street, Troy, N. Y.—FM
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—C, F, MO, M, O, VT
Hart Moisture Gauges, Inc., 126 Liberty St., New York 16, N. Y.—EH
Hasler Tel Co., 34 Vesey St., New York 7, N. Y.—TA
Hathaway Instrument Co., 1315 South Clarkson, Denver, Colo.—FM, G, MI, VM
Haydon Mfg. Co., Forestville, Conn.—FR
Heiland Research Corp., 130 East 5th Ave., Denver 9, Colo.—G, VM
Herbach & Rademan Co., Mfg. Div. 517 Ludlow St., Philadelphia 6, Pa.—B, FM, IT, PH, VG, VT, RM, TC, IG
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.—VT, D, FM
The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio—A, FM, O, VT, W, V
Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.—FM
Hoffman Radio Corp., 3430 South Hill St., Los Angeles 7, Calif.—FM
Hollywood Electronics Co., Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif.—D
Hudson American Corp., 234 W. 43rd St., New York, N. Y.—F, FM
Hy El Electrical Products Mfg. Co., 1518 W. Pico Blvd., Los Angeles Calif., "Hy-El"—IT, PM
Ideal Commutator Dresser Co., Park Ave., Sycamore, Ill.—IT, TA
Illinois Testing Laboratories, Inc., 420 No. LaSalle St., Chicago 10, Ill.—TH, T
Industrial Instruments, 156 Culver Ave., Jersey City, N. J.—IT
Industrial Transformer Corp., 2540 Belmont Ave., New York 58, N. Y.—IT
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—FM
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—D, F, FM, IT, L, P, S, VT, PM
Jackson Electrical Instrument Co., 131 Wayne Ave., Dayton 1, Ohio—M, VT
J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.—A, FM, G, O, TA, T, VM, V
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—B, D, F, FM, IT, MO, M, O, P, VG, VT, VI, WA, WM
Keystone Carbon Co., Inc., 1935 State St., St. Marys, Pa.—MP
Klett Mfg. Co., 179 E. 87th St., New York, N. Y.—C
Knickerbocker Development Corp., 471 Cortlandt St., Belleville 9, N. J.—A, M, O, TA, VT, VI, V
L. A. B. Corp., Summit, N. J.—VM
Lampkin Labs., Bradenton, Fla.—FM
Landis & Gyr, Inc., 104 Fifth Ave., New York, N. Y.—WH
Lavoie Laboratories, Matawan-Freehold Rd., Morganville, N. J.—FM
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.—VT
Lear Avia, Inc., Piqua, Ohio—PM
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.—B, FM, FR, G, IT, L, O, PH, P, TH, T
Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.—A, T
Link Engineering Co., 13845 Elmira Ave., Detroit 27, Mich.—ST
Fred M. Link, 12 W. 17th St., New York, N. Y.—FM, IT
Littelfuse, Inc., 4757 Ravenswood Ave., Chicago 40, Ill.—TH, N
Marion Electric Instrument Co., Stark Street Gate, Manchester, N. H.—A, AR, F, G, O, PH, S, V
Marshall Radio Engineering Labs., 5008 Lankershim Blvd., No. Hollywood, Calif.—F, FM
O. B. McClintock Co., 139 Lyndale Ave., N., Minneapolis 3, Minn.—A, G, MP, M, O, S, V
Measurements Corp., 116 Monroe St., Boonton, N. J.—F, FM, MO, O, VT, WM
Meissner Mfg. Co., 7th & Belmont, Mt. Carmel, Ill.—FM, VT
Merwin-Wilson Co., New Milford, Conn.—TH
Meters, Inc., 915 Riveria Dr., Indianapolis 5, Ind.—A
Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.—TA, EM, TM
Mico Instrument Co., 80 Trowbridge St., Cambridge 38, Mass.—WA, WM
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—FM, PH, WM
B. F. Miller Co., P. O. Box 5GB, Trenton, N. J.—IT
Miniature Precision Bearings, Keene, N. H.—MP
Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—VM
Monarch Mfg. Co., 3341 Belmont Ave., Chicago, Ill., "Monarch"—MV
Motron—W. C. Robinette Co.
Muter Co., 1255 So. Michigan Ave., Chicago 5, Ill.—B
National Research Corp., 100 Brookline Ave., Boston, Mass.—T, VG, IG
National Instrument Co., 44 School St., Boston, Mass.—HC
National Technical Laboratories, 820 Mission St., So. Pasadena, Calif.—C, PH
Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.—IT
Niagara Electrical Instrument Co., 1 W. Genesee St., Buffalo 2, N. Y.—A, V, W
Nilsson Elec. Lab. Inc., 103 Lafayette St., New York 13, N. Y.—G, MP, MO, O
Northern Laboratories, Ltd., 50 Church St., New York 7, N. Y.—EH, PM, T
Nothelfer Winding Labs., 111 Albermarle Ave., Trenton, N. J.—IT
Norton Electrical Instrument Co., 75 Hilliard St., Manchester, Conn.—A, V
Offner Electronics, Inc., 5320 No. Kedzie Ave., Chicago, Ill.—VM
Oregon Electronic Mfg. Co., 206 S. W. Washington St., Portland 4, Oreg.—B, FM, MP, IT, MO
Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—F, M, WM
Panoramic Radio Corp., 245 W. 55th St., New York 19, N. Y.—B, FM, WA
Partlow Corp., 2 Campton Rd., New Hartford, N. Y.—T
Pfaltz & Bauer, Inc., 350 Fifth Ave., New York, N. Y.—G, CO
Philco Corp., Tioga & C Sts., Philadelphia, Pa.—M, W, VT
Photobell Corp., 116 Nassau St., New York 7, N. Y.—B, C, EH, FM, IT, L, MO, PE
Photovolt Corp., 95 Madison Ave., New York 16, N. Y.—L, C
The Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.—T
Powers Electronic & Communication Co., Inc., New St., Glen Cove, L. I., N. Y.—FR, S
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.—A, MO, M, O, VT, VI, V, TT, R
Precision Products Co., 26 Bedford St., Waltham 54, Mass.—MP
Precision Scientific Co., 1750 N. Springfield Ave., Chicago 47, Ill.—T
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.—T, VG

Useful Applications in Electronic Developments ....No. 8



CATHODE RAY OSCILLOGRAPH

TYPICAL USES: Analyze oscillator, amplifier, and special purpose circuits; study many phenomena too rapid or too complex for other methods.

WHAT IT IS AND HOW IT IS USED: A cathode ray oscillograph is probably the most versatile piece of equipment in a test laboratory, and is of importance in other fields of engineering activity as well. It can be used to indicate voltage, current, phase differences, waveform, frequency, timing studies, and many other factors dealing with the characteristics and quality factors of miscellaneous devices, where until recently, the usual laboratory was content with general purpose oscillographs, now many specialized designs are doing a good job better in unusual applications.

Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y., "Pyro"—T

Radex Corp., 1322 Elston Ave., Chicago, Ill.—B

Radio City Products Co., 127 W. 26th St., New York 1, N. Y.—B, G, MO, M, O, VT, V, TT, R

Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.—F, IT, MO, M, O, VT, VI

Radio Electronic Co., 1817 Villanova Drive, Oakland, Calif.—C, PM

Radio Specialty Mfg. Co., 403 N. W. 9th St., Portland, Ore.—FM

Radiotechnic Lab., 1328 Sherman Ave., Evanston, Ill.—TT

The Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.—FM

Rawson Electrical Instrument Co., 110 Potter St., Cambridge 42, Mass.—A, E, MO, M, TH, V, W

Ray Jefferson, Inc., 40 E. Merrick Rd., Freeport, L. I., N. Y.—FM

Raytheon Mfg. Co., 190 Willow St., Waltham, Mass.—VM

Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.—B, F, M, S, VT, VM

Reiner Electronics Co., 152 W. 25th St., New York 1, N. Y.—VT

Roller-Smith Co., Bethlehem, Pa.—B

Saxl Instrument Co., Inc., 38 James St. E. Providence, R. I.—VM

Arklay S. Richards Co., Inc., 72 Winchester St., Newton Highlands 61, Mass.—TH

Richardson Allen Corp., 15 West 20th St., New York 11, N. Y.—B, EH, F, PH

RCA Victor Div., Radio Corp of America, Front & Cooper Sts., Camden, N. J.—D, F, O, P, VT, VI

Frank Rieber, Inc., 11916 W. Pico Blvd., Los Angeles, Calif.—FM

Riverbank Laboratories, Geneva, Ill.—TF

W. C. Robinette Co., 802 Fairoaks, South Pasadena, Calif., "Motron"—P

The T. R. Routh Co., 1045 Bryant St., San Francisco, Calif., "Esterline," "Vibrotest"—AR, IT, V, MO, W

Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago, Ill.—E, FM, MO, B, VM

Rubicon Co., 3753 Ridge Ave., Philadelphia, Pa.—G, IT, B, CA, CO

Sangamo Electric Co., 11th & Converse Sts., Springfield, Ill.—A, TA, WH

Solar Mfg. Co., 586 Avenue A, Bayonne, N. J.—B

Schaar & Co., 754 W. Lexington St., Chicago, Ill.—T, TH, CO

Schuttig & Co., 9th & Kearny Sts., N. E., Washington 17, D. C.—FM, WM

Scientific Radio Products Co., 738-40-42 West Broadway, Council Bluffs, Iowa—FM

Sensitive Research Instrument Corp., 4545 Bronx Blvd., New York, N. Y.—G, TH, V, WH

Shallcross Mfg. Co., Jackson & Pusey Ave., Collingdale, Pa.—IT, MO, M

Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.—TT, R

Shure Bros., 225 West Huron St., Chicago 10, Ill.—S, VM

Simpson Electric Co., 5216 West Kinzie St., Chicago, Ill.—A, G, M, V

F. A. Smith Mfg. Co., Inc., P. O. Box 509, Rochester, N. Y.—PM

Sound Apparatus Co., 150 W. 46th St., New York 19, N. Y.—FR, S, VT

Sound Equipment Corp., 6245 Lexington Ave., Hollywood, Calif.—R

Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.—TA

Standard Piezo Co., 20 No. Hanover St., Carlisle, Pa.—FM

Fred Stein Laboratories, 4th & Kansas St., Atchison, Kan.—EH

Sterling Mfg. Co., 9205 Detroit Ave., Cleveland 2, Ohio—A, V, BT

Herman H. Sticht Co., Inc., 27 Park Place, New York 7, N. Y.—A, AR, B, E, FM, IT, MO, O, TA, V, WH, W

C. H. Stoelting Co., 424 No. Homan Ave., Chicago 24, Ill—MP, TF

F. J. Stokes Machine Co., 6038 Tabor Rd., Philadelphia 20, Pa.—VG

Sun Mfg. Co., 6323 Avondale Ave., Chicago 31, Ill.—A, G, MO, O, S, TA, TH, VG, V

Sundt Engineering Co., 4763 Ravenswood Ave, Chicago, Ill—TH

Supreme Instruments Corp., 414 Howard St., Greenwood, Miss.—A, M, MO, V, VT

Swiss Jewel Co., Lafayette Bldg., Philadelphia, Pa.—MP

Synchro-Start Products, Inc., 221 E. Cullerton, Chicago, Ill.—PM

C. J. Tagliabue Mfg. Co., 550 Park Ave., Brooklyn 5, N. Y.—G, PH, PM, TH, T, VG

Takk Corp., 26 West Market St., Newark, Ohio—H

Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.—B, EH, IT, MO, PM, DC, VC

Technical Apparatus Co., 1171 Tremont St., Boston, Mass.—IT

Televiso Products, Inc., 6533 Olmstead Ave., Chicago, Ill.—TH, VT

Tenney Engineering, Inc., 8 Elm St., Montclair, N. J.—PM

Templetone Radio Co., Greenmanville Ave., Mystic, Conn.—VT

Thomas & Skinner Steel Products Co., 1120 E. 23rd St., Indianapolis 5, Ind.—MP

Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 44, Pa.—A, B, G, MP, O, PH, TH, T, V

Tong-Test—Columbia Electric Mfg. Co.

Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.—MP

Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.—FM, TT

Triplett Electric Instrument Co., Harmon Rd., Bluffton, Ohio—A, D, F, FM, G, MP, IT, MO, M, O, PH, P, S, TH, VI, V, WH, W, WM

Triumph Mfg. Co., 913-21 W. Van Buren St., Chicago, Ill.—A, M, V

Uniform Tubes, Shurs Lane & Lauriston St., Philadelphia 28, Pa.—TH

U. S. Television Mfg. Corp., 106 Seventh Ave., New York, N. Y.—IT

United Cinephone Corp., Torrington, Conn.—B

Variaten Cinema Engr. Co., 1508 W. Verdugo Ave., Burbank, Calif.—AM, S, VI

Vibrotest—The T. R. Routh Co

Wallace Barnes Co., Bristol, Conn.—MP

Waterman Products Co., Inc., 1900 N. 6th St., Philadlphia 22, Pa.—B, D, FM, IT, MO, VT, W

Earl Webber Co., 4352 W. Roosevelt, Chicago, Ill.—FM, MV

Weksler Thermometer Corp., 52 W. Houston St., New York 12, N. Y.—PM, T, VG

W. M. Welch Scientific Co., 1515 Sedgwick St., Chicago 10, Ill.—A, G, O, VG, V

Western Electric Co., 195 Broadway, New York, N. Y.—FR, FS, S, TH, W, B, VM, WA

Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.—A, AR, AM, E, FR, FM, G, MP, PT, M, O, P, S, TA, TH, VM, VI, V, WH, W

West Shore Laboratories, Box 117, Marblehead, Mass.—VG

Weston Electrical Instrument Corp., 614 Frelinghuysen Ave. Newark 5, N. J.—A, FM, G, IT, L, MO, M, O, P, S, TA, VT, VI, V, W

Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.—A, TH, T, V, W

White Research Associates, 899 Boylston St., Boston 15, Mass.—C, EH, FM, FR, MP, L, MO, M, O, PE, PM, VT, WA

Winslow Co., 31 Fulton St., Newark 2, N. J.—B, G, IT, MO, O, PM, TA, TH, T, VG

Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.—B, C

Metal for Radio

Aluminum	A
Aluminum tubing	AT
Barium	BA
Bearings	BG
Beryllium	BR
Brass	B
Brass tubing	BT
Carbon & graphite	CA
Copper tubing	CT
Core materials, laminated	CM
Core materials, powdered	CP
Die castings	DC
Flexible metal hose	H
Foils, tin, lead, etc.	FO
Iron (SVEA metal)	I
Lead, tin alloys	LT
Magnesium alloys	MA
Metal bellows	MB
Metal coated steel	CS
Metal finishing service	MF
Molybdenum	M
Monel tubings	ML
Nickel	N
Nickel tubing	NT
Permanent magnets	PM
Platinum	P
Porous bearing metals	PB
Screw machine products	SP
Silver brazing alloys	SB
Silver & compounds	AG
Spring contact metals	SM
Stampings	S
Stainless steel	ST
Steel tubing	FT
Strontium	ST
Tantalum	TA
Thermostatic metals	TM
Tungsten	T
Wire screen cloth	WC
Zirconium	Z

Ace Mfg. Corp., 1239 E. Erie Ave., Philadlphia 24, Pa.—SP, S

Acheson Colloids Corp., Port Huron, Mich.—G

Ackin Stamping Co., 1923 Nebraska Ave., Toledo 7, Ohio—S

Aladdin Radio Industries, 235 W. Jackson, Chicago, Ill.—CP

Alden Products Co., 117 N. Main St., Brockton, Mass., "Na-Ald"—S

Algoma Products, 3080 E. Outer Drive, Detroit, Mich.—S

Alpha Metal & Rolling Mills, Inc., 363 Hudson Ave., Brooklyn 1, N. Y.—LT

Alrose Chemical Co., Providence, R. I.—MF

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.—A

Aluminum Finishing Corp., 1119 E. 22nd St., Indianapolis, Ind.—A, MF

American Brass Co., Waterbury, Conn.—S

American Electro Metal Corp., 320 Yonkers Ave., Yonkers, N. Y., "Elmet"—M, T

American Platinum Works, N. J. R. R. Ave., at Olive St., Newark 5, N. J.—SB, AG, P

American Rolling Mill Co., 703 Curtis St., Middletown, Ohio—CM

Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.—BT, CT

Andrews & Perillo, 39-30 Crescent St., Long Island City 1, N. Y.—S

Apollo Metal Works, 6666 S. Oak Park Ave., Chicago, Ill.—CS

Arkay Laboratories, Inc., 1570 S. First St., Milwaukee 4, Wis.—S

Armco—The American Rolling Mill Co.

The Arnold Engineering Co., 147 E. Ontario St., Chicago, Ill.—PM

Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill.—DC, S

Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.—S

Audubon Wire Cloth Corp., Richmond St. & Castor Ave., Philadelphia 34, Pa.—WC

Aurora Precision Devices, 318 Anderson Blvd., Geneva, Ill.—SP

The Automatic Electrical Devices Co., 324 E. Third St., Cincinnati, Ohio—PM

Baker Co., Inc., 113 Astor St., Newark, N. J.—SB, AG, SM, S

Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.—A, BG, B, FO, LT, N, SB

Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—S

Bridgeport Brass Co., Grand St., Bridgeport, Conn.—S

Bunting Brass & Bronze Co., 715 Spencer St., Toledo 9, Ohio—BG

Bussey Pen Products Co., 5151 W. 65th St., Chicago 38, Ill.—S, WC

W. H. Chace Co., 1630 Beard St., Detroit 9, Mich.—MA

Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.—B, BT, CT, DC, NT, S, WC

Chicago Metal Hose Corp., 1315 S. Third Ave., Maywood, Ill.—CT, H, MB

Cinaudagraph Corp., Stamford, Conn.—PM

Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio—T

Cleveland Wire Cloth & Mfg. Co., 3573-83 E. 78th St., Cleveland 5, Ohio—WC

Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—CM, S

Continental Machines, Inc., 1301 Washington Ave., S., Minneapolis, Minn.—S

Corbin Screw Corp., High, Myrtle & Grove Sts., New Britain, Conn.—SP

Crescent Industries, Inc., 4140 Belmont Ave., Chicago 41, Ill.—S

Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill., "Crowe"—S

Henry L. Crowley & Co., Inc., 1 Central Ave., West Orange, N. J.—CP

Crucible Steel Co., 405 Lexington Ave., New York, N. Y.—PM

Dayton Rogers Mfg. Co., 2835 12 Ave. S., Minneapolis, Minn.—S

Dahlstrom Metallic Door Co., Buffalo & E. 2nd, Jamestown, N. Y.—S

DeJur-Amsco Corp., Bridge St., Shelton, Conn.—A, AR, D, FR, G, CM, M, S, V, VT, WM

Diebel Die & Mfg Co., 3658 N. Lincoln Ave., Chicago 13, Ill.—S

Joseph Dixon Crucible Co., 167 Wayne St., Jersey City 3, N. J., "Dixonac"—CA

The Dickey-Grabler Co., 10302 Madison Ave., Cleveland, Ohio—S

Division Lead Co., 836 West Kinzie St., Chicago 22, Ill.—BG, DC, FO, LT, SB, AG, S

Dow Chemical Co., Midland, Mich.—MA

Driver-Harris Company, Harrison, N. J.—N

The Eagle-Picher Lead Co., American Bldg., Cincinnati 1, Ohio.—LT

Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia 44, Pa.—S

Electro Products Laboratories, 549 W. Randolph St., Chicago 6, Ill.—CP

Electronic Supply Co., 6-8 Winter St., Worcester 4, Mass.—S

Elmet—American Electro Metal Corp.

Fafnir Bearing Co., Booth St., New Britain, Conn.—BG

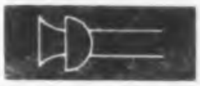
Fairmont Aluminum Co., Fairmont, W. Va.—A

Falstrom Co., Falstrom Court, Passaic, N. J.—S

Fansteel Metallurgical Corp., 2200 Sheridan Rd., No. Chicago, Ill.—M, SM, T, TA

Faries Mfg. Co., 1036 E. Grand Ave., Decatur 70, Ill—SP, S
Ferrocart Corp. of America, Hastings-on-Hudson, N. Y.—CP
Flock Process Co., 17 West 31st St., New York, N. Y.—WG
Foote Mineral Co., 1609 Summer St., Philadelphia 3, Pa.—CP, Z
Froiland Mfg. Co., 430 St. James Ave., Springfield, Mass.—SP
Charles A. Fuchs Bros., 13-15 Mollineaux Pl., Roosevelt, Nassau, N. Y.—SP, S
Gardiner Metal Co., 4820 S. Campbell Ave., Chicago 32, Ill.—LT
General Aniline & Film Corp., 435 Hudson St., New York 14, N. Y.—CP
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—B, BT, CA, C, P, FO, SP
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—PM, S
General Electric Co., 1 River Rd., Schenectady, N. Y.—PM
General Plate, Div. of Metals & Controls Corp., Attleboro, Mass.—ML, NT, SB, AG
Geometric Stamping Co., 1111 E. 200th St., Cleveland 17, Ohio—S
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn 17, N. Y.—S
Goldsmith Bros. Smelting & Refining Co., 58 E. Washington St., Chicago, Ill—AG
L. F. Grammes & Sons, Inc., Jordan & Union St., Allentown, Pa.—S
Handy & Harman, 82 Fulton St., New York 7, N. Y., "Easyflow"—SB, AG, MF
John Hassall, Inc., Clay & Oakland St., Brooklyn, N. Y.—SP
Haydon Mfg. Co., Inc., Forestville, Conn.—M
Haydu Bros., P. O. Box 1226, Plainfield, N. J.—S
Heyman Mfg. Co., Kenilworth, N. J.—S
O. Hommel Co., 209—4th Ave., Pittsburgh, Pa.—FO, SB, AG
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8, Mich.—N
ICA—Insuline Corp. of America
Indiana Steel Prods. Co., Valparaiso, Ind.—PM
Industrial Sound Products Co., 3597 Mission St., San Francisco, Calif.—S
The International Nickel Co., Inc., 67 Wall St., New York, N. Y.—N, NT
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., "ICA"—A, B, SP
C. O. Jelliff Mfg. Corp., Pequot Rd., Southport, Conn.—WC
Johnson Tin Foil & Metal Co., 6100 So. Broadway, St. Louis 11, Mo.—FO
Keystone Carbon Co., Inc., 1935 State St., St. Marys, Pa.—BG, CA, PB
King Laboratories, Inc., 205 Oneida St., Syracuse 4, N. Y.—BA, S, ST
Kollath Manufacturing Co., 212-224 N. Loomis St., Chicago 7, Ill.—SP, S
Lansing Stamping Co., P. O. Box 449, Lansing, Mich.—S
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.—N, S
Leslie L. Linick & Co., 1640 E. 54th St., Chicago 15, Ill.—M, SB, AG, TA
Linick, Green & Reed, Inc., 29 E. Madison St., Chicago, Ill.—LT, M, N, TA
Machlett Laboratories, Inc., 1063 Hope St., Springdale, Conn.—BR
Magna Mfg. Co., Inc., 444 Madison Ave., New York 22, N. Y.—MA, CP
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—CP, M, SM, T
Master Products Co., 6400 Park Ave., S. E., Cleveland 5, Ohio—S
G. S. Mepham Corp., 2001 Lynch Ave., E. St. Louis, Ill.—CP
Merwin-Wilson Co., New Milford, Conn.—L, S
Metal Textile Corp., 4 Central Ave., West Orange, N. J.—WC
Metroloy Co., Inc., 55 E. Alpine St., Newark, N. J.—T
Mid-West Screw Products Co., Main & St. George Sts., St. Louis, Mo.—SP
Miniature Precision Bearings, Keene, N. H.—BG
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich—B, CT, SP
Na-Ald—Alden Products Co.
National Die Casting Co., 600 N. Albany Ave., Chicago 12, Ill.—DC
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland 4, Ohio—SP
New Britain Machine Co., 70 South St., New Britain, Conn.—SP
New England Etching & Plating Co., 25 Spring St., Holyoke, Mass.—S
New Products Corp., Benton Harbor, Mich.—DC, S
North American Philips Co., Inc., 145 Palisade St., Dobbs Ferry, N. Y.—M, T
O K Machine Co., 2131 Fairfield Ave., Fort Wayne 6, Ind.—S
Orange Screen Co., 615 Valley St., Maplewood, N. J.—S
Peck Spring Co., 12 Grove Ave., Plainville, Conn.—S
Paul & Beekman, Div. of Phila. Lawnmower & Mfg. Co., 18th & Cleveland Sts., Philadelphia, Pa.—S
Peerless Mfg. Corp., 1400 W. Ormsby, Louisville, Ky. CM, S
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia, Pa.—S
Plastic Metals, Inc., 131 Bridge St., Johnstown, Pa.—CP
Plume & Atwood Mfg. Co., Waterbury, Conn.—S, SP
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.—AT, CT, NT
Premax Products Div., Chisholm-Ryder Co., Inc., College & Highland Aves., Niagara Falls, N. Y.—S
Pyroferric Co., 175 Varick St., New York 14, N. Y.—CP
Quality Hardware & Machine Corp., 5823-51 N. Ravenswood Ave., Chicago 26, Ill.—S
Racon Electric Co., Inc., 52 East 19th St., New York, N. Y.—S
Radiad Service, 720 Schubert Ave., Chicago, Ill.—S
Rapid Electroplating Process, Inc., 1414 S. Wabash Ave., Chicago 5, Ill.—MF
Raymond Mfg. Co., Div. of Associated Spring Corp., Drawer 401, Corry, Pa.—S
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio—CM, CS, FT
Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.—A, B, BT, CT, NT
Bernard Rice's Sons, 325 5th Ave., New York, N. Y.—S
Riverside Metal Co., Keystone Bldg., Riverside, N. J.—N, SM
John A. Roebling's Sons Co., 640 S. Broad St., Trenton 2, N. J.—WC
Rusgreen Mfg. Co., 14262 Birwood Ave., Detroit 4, Mich.—S
Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore 13, Md.—ST
Screenmakers, Inc., 64 Fulton St., New York 7, N. Y.—MF
Simonds Saw & Steel Co., Lockport, N. Y.—PM
Sirian Wire & Contact Co., 260 Sherman Ave., Newark 5, N. J.—M, T
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—PM, SP, T
Southern Products, Independence, Mo.—BG, DC, SP, SM, S
Speer Carbon Co., St. Marys, Pa.—CA
Stackpole Carbon Co., P. O. Box 327, St. Marys, Pa.—CP
Stewart Stamping Co., 621 E. 216th St., New York 67, N. Y.—S
Edwin B. Stimpson Co., Inc., 70 Franklin Ave., Brooklyn 5, N. Y.—S
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.—TS
Summerill Tubing Co., Bridgeport, Pa.—ML, N, NT, FT
Superior Flake Graphite Co., 33 So. Clark St., Chicago 3, Ill.—CA
Superior Tube Co., Norristown, Pa.—AT, MT
Swedish Iron & Steel Corp., 17 Battery Place, New York, N. Y.—I, PM
Sylvania Electric Prod. Inc., 500-5th Ave., New York 18, N. Y.—T
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—PM
Thermador Elec. Mfg. Co., 5119 S. Riverside Dr., Los Angeles 22, Calif.—CM
Thomas & Skinner Steel Prods. Co., 1120 E. 23rd St., Indianapolis 5, Ind.—S, PM, CM
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.—S
Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.—S
Trent Tube Mfg. Co., East Troy, Wis.—ML, NT, FT
Ucinite Co., Div. of United Carr Fastener Corp., Newtonville, Mass.—S
Uniform Tubes, Shurs Lane & Lauriston St., Philadelphia 28, Pa.—AT, BT, CT, ML, NT, FT
Union Aircraft Products Corp., 245 E. 23rd St., New York 10, N. Y.—SB, S
United Plastics Corp., 60 Broad St., New York 4, N. Y.—PM
United Radio Mfg. Co., 191 Greenwich St., New York 7, N. Y.—A
The United States Graphite Co., Saginaw, Mich.—BG, CA
Veeder-Root, Inc., Hartford, Conn.—DC
R. D. Werner Co., Inc., 380 Second Ave., New York 10, N. Y.—A, AT, BT
Western Automatic Machine Screw Co., Lake Ave. at Foster, Elyria, Ohio—SP
Western Cartridge Co., Brass Mills Div., East Alton, Ill.—B
Western Electric Co., 195 Broadway, New York, N. Y.—CM, CP, SM
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—CM, F, LT
Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.—CM, M, PM, TA, T
Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit 16, Mich—S
Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.—WC
Willor Mfg. Corp., 288 Eastern Blvd., New York 54, N. Y.—S
H. A. Wilson Co., 105 Chestnut St., Newark 5, N. J.—AG, T, TM
Winslow Co., 31 Fulton St., Newark 2, N. J.—AG
Worcester Pressed Steel Co., Worcester, Mass.—S
Youngstown Pressed Steel Co., Warren, Ohio—S

Microphones



(Cable, see WIRE)

Carbon	CAR
Condenser	CON
Connectors	CTR
Contact	CT
Crystal	CRY
Dynamic	DYN
Springs	SPR
Stands	STD
Stethaphones	S
Telephone handsets	T
Velocity	VEL

Alden Products Co., 119 N. Main St., Brockton, Mass., "Na-Ald"—CTR
American Amplifier & Tel. Co., 1222 Glendon Ave., Los Angeles, Calif.—DYN, VEL
American Automatic Electric Sales Co., 1019 W. Van Buren, Chicago, Ill.—CAR
American Microphone Co., Inc., 1917 S. Western Ave., Los Angeles, Calif., "American"—CAR, CON, CTR, CRY, DYN, HB, SPR, STD, VEL
American Phenolic Corp., 1830 E. 54th Ave., Chicago 50, Ill.—CTR
Amperite Co., 561 Broadway, New York 12, N. Y.—CT, DYN, STD, VEL
Amphenol—American Phenolic Corp.
Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill.—CTR, STD
The Astatic Corp., 830 Market St., Youngstown 1, Ohio—CRY, DYN, STD
Atlas Sound Corp., 1443 39th St., Brooklyn 18, N. Y.—CTR, STD
Audiograph—John Meck Industries
Aurex Corp., 1115 N. Franklin St., Chicago, Ill.—CON
Austin Electronic Mfg. Co., Warren, Pa.—DYN
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—CAR, DYN
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—CON
Wallace Barnes Corp., Bristol, Conn.—SPR
Belltone—Bell Sound Systems, Inc.
Bell Sound Systems, Inc., 203 N. 4th St., Columbus, Ohio, "Belfone"—CRY, DYN, STD, VEL
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—CT, DYN
Brush Development Co., 3311 Perkins Ave., Cleveland, 14, Ohio—CRY
Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio—STD
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles, Calif.—CTR
Collins Co., 644 Landfair Ave., Westwood Village, Los Angeles, Calif.—CRY, DYN
Conn. Telephone & Elec. Div., Great American Industries, Inc., Meriden, Conn.—T
Eastern Mike-Stand Co., 56 Christopher St., Brooklyn 12, N. Y.—STD
Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia 44, Pa.—DYN
Electrical Industries Mfg. Co., 1938 Morford Pl., Red Bank, N. J.—CAR
Electrical Sound Engineering Co., 109 N. Dearborn St., Chicago, Ill.—DYN
Electro-Voice Mfg. Co., Inc., 1239 South Bend Ave., South Bend 24, Ind.—CAR, CTR, DYN, SPR, STD, VEL
Erwood Co., 223 W. Erie St., Chicago, Ill.—DYN, STD
Executone, Inc., 415 Lexington Ave., New York 17, N. Y.—DYN
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.—P, S
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—CAR, SPR
General Electric Co., 1 River Rd., Schenectady, N. Y., "G—E" (Broadcast Microphones)
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—PM, S
Gibson, Inc., 225 Parsons St., Kalamazoo, Mich.—CAR, CRY, STD, VEL
Hayman Mfg. Co., Kenilworth, N. J.—S
Industrial Sound Products Co., 3597 Mission St., San Francisco 10, Calif.—DYN, STD
Joseph Dixon Crucible Co., 167 Wayne St., Jersey City 3, N. J., "Dixonac"—CA
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.—CAR
Kellogg Switchboard & Supply Co., 6650 S. Cicero St., Chicago 38, Ill.—CAR, CT, STD
Lektra Laboratories, Inc., 30 E. 10th St., New York 3, N. Y.—DYN
Lifetime Sound Equipment Co., 1101 Adams St., Toledo, Ohio.—CAR, CON, DYN, VIL
Magnavox Co., 2131 Bueter Rd., Ft. Wayne 4, Ind.—CAR, DYN
F. N. Manross & Sons, Div. of Assoc. Spring Corp., Bristol, Conn.—SPR

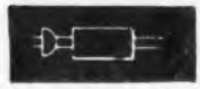
John Meck Industries, Liberty St., Plymouth, Ind., "Audiograph"—CRY, CTR, DYN, STD, VEL
Miles Reproducer Co., 812 Broadway, New York 3, N. Y.—CON, CT, DYN
Molded Insulation Co., 335 East Price St., Philadelphia, Pa.—CTR
E. A. Myers & Sons, Radioear Bldg., Mt. Lebanon, Pa.—CAR
Na-Ald—Alden Products Co.
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles, Calif.—CRY, DYN, STD
Otto K. Olesen Ill. Co., Ltd., 1560 N. Vine St., Hollywood 28, Calif.—STD
Operadio Mfg. Co., St. Charles, Ill.—DYN
Oxford Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—DYN
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.—DYN
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.
Powers Electronic & Communication Co., Inc., New St., Glen Cove, L. I., N. Y.—DYN
Premax Products Div., Chisholm-Ryder Co., Inc., College and Highland Aves., Niagara Falls, N. Y.—S
Quam-Nichols Co., 33rd Pl. & Cottage Grove Ave., Chicago 16, Ill.—DYN
Racon Elec. Co., Inc., 52 E. 19th St., New York 3, N. Y.—DYN, STD
Radiotone, Inc., 7356 Melrose Ave., Hollywood, Calif.—CRY, DYN, STD
The Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.—CRY, DYN, STD, VEL
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA"—CON, CRY, DYN, STD, VEL
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—DYN
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.—CTR
Se'ectar Mfg. Corp., 21-10 49th Ave., Long Island City, N. Y.—CTR
Shure Bros., 225 W. Huron St., Chicago 10, Ill.—CAR, CTR, CT, CRY, DYN, SPR, STD
Mark Simpson Mfg. Co., Inc., 188 W. 4th St., New York, N. Y.—CT, STD
Speak-O-Phone Recording & Equipment Co., 23 W 60th St., New York, N. Y.—CAR, CRY, SPR, STD
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—CAR, DYN, STD
Telex Products Co., Telex Park, Minneapolis, Minn.—DYN
Tibbetts Labs., 12 Norfolk St., Cambridge, Mass.—CRY
Thomas & Betts Co., Inc., 30-36 Butler St., Elizabeth 1, N. J.—CTR
The Turner Co., 909 17th St., N. E., Cedar Rapids, Iowa—DYN, CRY
Unidyne—Shure Bros.
Uniplex—Shure Bros.
Universal Microphone Co., 424 Warren Lane, Inglewood, Calif—CAR, CON, CTR, CT, CRY, DYN, SPR, STD, VEL
V Precision Instrument Mfg. Co., Inc., 57-02 Hoffman Dr., Elmhurst, N. Y.—CRY
Waters Conley Co., 501 First Ave., N. W., Rochester, Minn.—CAR
Western Electric Co., 195 Broadway, New York, N. Y.—CAR, CON, CRY, DYN, VEL, CTR, STD
H. A. Wilson Co., 105 Chestnut St., Newark 5, N. J.—AR, T, TM

Motors & Generators

Alternators ....A
Converters ....CON
DC generators ....DC
Dynamotors ....DYN
Flexible couplings ....F
Gas engines ....ENG
Hand cranked gen. ....HC
HF generator....................HF
Miniature control motors ....MM
Motor starters ....MS
Motors ....M
Power plants ....AC
Selsyns, etc. ....S
Turntable motors ....T

Acklin Stamping Co., 1923 Nebraska Ave., Toledo 7, Ohio—DYN
Air-Way Electric Appliance Corp., 2101 Auburn Ave., Toledo 1, Ohio—DYN, M, DC
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 4, Wis.—MS
Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio—DC, DYN, M, T
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.—A, CON, DC, M
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—A, CON, DC, M, S, T
Arnessen Electric Co., 116 Broad St., New York 4, N. Y.—A, DC, M, S
The Automatic Electrical Devices Co., 326 E. Third St., Cincinnati, Ohio—CON
Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.—DC, DYN, M
Bendix Radio Div., Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—A, CON, DYN, M, S
Black & Decker Electric Co., Kent, Ohio—M
Bodine Electric Co., 2254 W. Ohio St., Chicago 12, Ill.—M
The Brown-Brockmeyer Co., 1004 Smithville, Dayton, Ohio—M
Buda Co., Harvey, Ill.—ENG, AC
Burke Electric Co., 12th & Cranberry Sts., Erie, Pa.—A, CON, DC, DYN, M, HC
Carson Machine & Supply Co., Box 4547, Oklahoma City 9, Okla.—AC
Carter Motor Co., 1608 Milwaukee Ave., Chicago 47, Ill.—CON, DC, DYN, M
Caterpillar Tractor Co., Peoria, Ill.—AC
Century Electric Co., 1808 Pine St., St. Louis, Mo.—M
Climax Engineering Co., Clinton, Iowa—A, DC, ENG
Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, Ohio—A, DC
Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.—A
Continental Electric Co., Inc., 325 Ferry St., Newark 5, N. J.—A, CON, DC, DYN, M, AC
Continental Machine, Inc., 1301 Washington Ave., S. Minneapolis 4, Min.—A
Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—S
Diehl Mfg. Co., Finderne Plant, Somerville, N. J.—A, CON, DC, DYN, M, S, T
Dunmore Co., 1225 Fourteenth St., Racine, Wisc.—M
Eastern Air Devices, Inc., 585 Dean St., Brooklyn 17, N. Y.—DC, M
Elcor, Inc., 1501 W. Congress St., Chicago 7, Ill.—A, CON, DC, DYN, M, AC
Electric Indicator Co., 112 Parker Ave., Stamford, Conn.—CON, DC, M, S
Electric Motor Corp., 1215 State St., Racine, Wisc.—M
Electric Products Co., 1725 Clarkstone Rd., Cleveland 21, Ohio—A, DC, M
Electric Specialty Co., 211 South St., Stamford, Conn., "Esco"—A, CON, DC, DYN, M, AC, S, T
Emerson Electric Mfg. Co., 1824 Washington Ave., St. Louis 3, Mo.—M
Esco—Electric Specialty Co.
Fairbanks, Morse & Co., 606 S. Michigan Ave., Chicago, Ill.—M
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—A, DYN, T
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.—T
General Electric Co., 1 River Rd., Schenectady, N. Y.—AC, CON, DC, DYN
The General Industries Co., Taylor & Olive Sts., Elyria, Ohio.—M
General Motors Corp., Sunlight Electrical Div., 523 Dana Ave., Warren, Ohio—M
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—T
Haydon Mfg. Co., Inc., Forestville, Conn.—M, T, MM
Holtzer-Cabot Electric Co., 400 Stuart St. and 125 Amory St., Boston 17, Mass.—A, CON, DC, DYN, M
Homelite Corp., Riverdale Ave., Port Chester, N. Y.—A, DC, ENG, AC
Howell Electric Motors Co., Howell, Mich.—M
Imperial Electric Co., 84 Ira Ave., Akron, Ohio—A, DC, M
Janette Mfg. Co., 556 W. Monroe St., Chicago 6, Ill.—A, CON, DC, DYN, T
Kato Engineering Co., 530 N. Front St., Mankato, Minn.—A, CON, DC, AC, HF
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago, Ill.—CON
Kiekhaefer Corp., 210 Western Ave., Cedarburg, Wis.—ENG
Kollsman Instrument Div. of Square D. Co., 80-08 45th Ave., Elmhurst, N. Y.—A, M, S, MM
Lawrence Aeronautical Corp., Stiles St., Linden, N. J.—ENG, M, AC
Lauson Co., New Holstein, Wis.—ENG
Lear Avia, Inc., Piqua, Ohio—DYN, M, S
Leland Electric Co., 1501 Webster St., Dayton 1, Ohio—A, CON, DC, M
Lord Mfg. Co., 1635 W. 12th St., Erie, Pa.—F
Master Electric Co., 126 Davis Ave., Dayton, Ohio—M
Master Vibrator Co., 200 Davis Ave., Dayton, Ohio—AC
Midco Mfg. & Dist. Co., Inc., 13th St. & Kentucky Ave., Sheboygan, Wis.—AC
National Mineral Co., 2638 No. Pulaski Rd., Chicago 31, Ill.—A, DC, DYN, M
New Products Corp., North Shore Drive, Benton Harbor, Mich.—DC, S
The K. B. Noble Co., 450 Capitol Ave., Hartford, Conn.—AC
North American Philips Co., Inc., 145 Palisade St., Dobbs Ferry, N. Y.—FW
John Oster Mfg. Co. of Ill., Genoa, Ill.—M
D. W. Onan & Sons, 1890 Royalston Ave., Minneapolis 5, Minn.—AC
Penn Boiler & Burner Mfg. Corp., Fruitville Road, Lancaster, Pa.—AC
Pioneer Gen-E-Motor Corp., 5841 W. Dickens Ave., Chicago 39, Ill.—A, CON, DC, DYN, AC
Presto Recording Corp., 242 W. 55th St., New York, N. Y., "Presto"—T
RCA Victor Division, Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA Photophone"—CON
The Ready Power Co., 3826 Grand River, Detroit, Mich.—AC
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.—M
Robbins & Myers, 1934 Clark Blvd., Springfield, Ohio—M
W. C. Robinette Co., 802 Fair Oaks Ave., So. Pasadena, Calif., "Metron"—M, S, T
Ruby Electric Co., 729 Seventh Ave., New York 19, N. Y.—CON, DC
Russell Electric Co., 340 W. Huron St., Chicago 10, Ill.—A, CON, DC, DYN, M, T
Scranton Record Co., 300 Brook St., Scranton, Pa.—T
Signal Electric Mfg. Co., 1939 Troam St., Menominee, Mich.—M
F. A. Smith Mfg. Co., Inc., 900 Davis St., Rochester 2, N. Y., "Pilot"—M
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York, N. Y.—T
Speedway Mfg. Co., 1898 S. 52nd Ave., Cicero, Ill.—M
Trav-Ler Karenola Radio & Television Corp., 1028-36 W. Van Buren St., Chicago 7, Ill.—DYN
Universal Motor Co., 186 Harrison St., Oshkosh, Wisc.—ENG, AC
U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Calif.—M
Wagner Electric Corp., 6410 Plymouth Ave., St. Louis, Mo.—M
Walker-Turner Co., Inc., Berckman St., Plainfield, N. J.—M
Warren Telechron Co., Lock Box F, Ashland, Mass.—M
Webster Products Corp., 3825 Armitage Ave., Chicago 47, Ill.—DYN, T
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—T
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—A, CON, DC, DYN, ENG, M, AC, ST
Wincharger Corp., Sioux City, Iowa—AC, CON, DYN, ENG
Wind Power Mfg. Co., Newton, Iowa—A, DC, AC

Noise Elimination Equipment



Interference analyzers ....IA
Interference locators I
Power filters ....P
Radio set filters ....S

Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, L. I., N. Y.—P, S
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.—IA, P, S
American Communications Corp., 306 Broadway, New York 7, N. Y.—I, P, S
American Transformer Co., 180 Emmet St., Newark, N. J.—P
Apex Industries, Inc., 1035 W. Lake St., Chicago, Ill.—P, S
Automatic Electric Mfg. Co., Mankato, Minn.—P
Avis Products Co., 749 N. Highland, Los Angeles, Calif.—P, S
Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.—P
Bendix Radio Div., Bendix Aviation Corp., 920 E. Fort Ave., Baltimore, Md.—I
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—S
The Birtcher Corp., 5087 Huntington Dr. N., Los Angeles, Calif.—P
L. S. Brach Mfg. Corp., 55 Dickerson St., Newark, N. J.—S
Communications Equipment Corp., 134 W. Colorado St., Pasadena 1, Calif.—P, S
Condenser Products Co., 1369-75 No. Branch St., Chicago, Ill.—P, S
Consolidated Wire & Assoc. Corps., 1635 S. Clinton, Chicago, Ill.—S
Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio—"Continental," "Filternoys"—P, S
Cornell-Dubilier Elec. Corp., 1000 Hamilton Blvd., S. Plainfield, N. J., "Quietone"—P, S
Henry L. Crowley & Co., Inc., 1 Central Ave., West Orange, N. J.—P
Tobe Deutschmann Corp., Canton, Mass.—I, IA, P

R. L. Drake Co., 11 Longworth St., Dayton 2, Ohio —P
Dumont Electric Co., 34 Hubert St., New York 13, N. Y.—P, S
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.—P, S
Electronic Transformer Co., 515 W. 29th St., New York 1, N. Y.—P, S
Elim-O-Stat—Solar Mfg. Corp.
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—I
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J., "Ferris"—I
Filternoys—Continental Carbon, Inc.
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—P
General Electric Co., Pittsfield, Mass.—P
Hoffman Radio Corp., 3430 South Hill St., Los Angeles 7, Calif.—IA, S
Industrial Condenser Corp., 1725 W. North Ave., Chicago 22, Ill.—P, S
ICA—Insuline Corp. of America
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y.—P, S
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—I, IA, P, S
International Transformer Co., 17 W. 20th St., New York, N. Y.—P
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn, N. Y.—S
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.—I
Lear Avia, Inc., Piqua, Ohio—P
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—P, S
Measurements Corp., 116 Monroe St., Boonton, N. J. —IA
Meissner Mfg. Co., 7th & Belmont, Mt. Carmel, Ill.—S
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—P
J. W. Miller Co., 5917 S. Main St., Los Angeles, Calif., "Miller"—P, S
Muter Co., 1255 So. Michigan Ave., Chicago 5, Ill. —S
New York Transformer Co., 26 Waverly Place, New York 3, N. Y.—P, S
Ohmite Mfg. Co., 4835 Flournoy St., Chicago 44, Ill.—P
Penn Boiler & Burner Mfg. Corp., Fruitville Rd., Lancaster, Pa.—P
Pioneer Gen-E-Motors, 5841 Dickens Ave., Chicago, Ill.—P
Potter Co., 1950 Sheridan Rd., North Chicago 1, Ill.—P, S
Quietone—Cornell-Dubilier Elec. Corp.
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.—P
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—I, IA
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—P, S
Solar Mfg. Corp., 586 Avenue A, Bayonne, N. J.—S
Sprague Products Co., North Adams, Mass.—I, IA, P, S
Sprague Specialties Co., N. Adams, Mass.—I, IA, P, S
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.—P
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.—S
Technical Appliance Corp., 516 W. 34th St., New York 1, N. Y.—S
Whisk Laboratories, 145 W. 45th St., New York 19, N. Y.—P

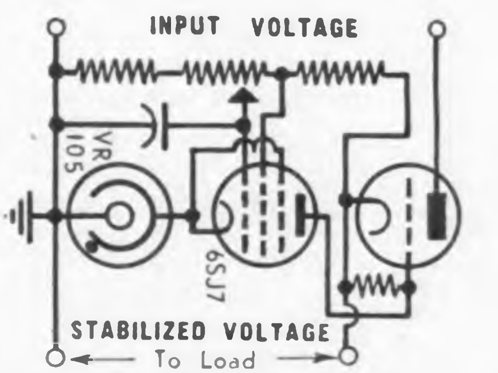
Ajax Electrothermic Corp., Ajax Park, Trenton 5, N. J.—C, I
Alden Products Co., 119 N. Main St., Brockton, Mass. —C, I
Allied Asphalt & Mineral Corp., 217 Broadway, New York 7, N. Y.—I
American Phenolic Corp., 1830 S. 54th Ave., Chicago, 50, Ill., "Amphenol"—CD
Amphenol—American Phenolic Corp.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.—I
Armstrong Cork Co., Lancaster, Pa.—C
Bakelite Corp., 30 E. 42nd St., New York 17, N. Y. C, R
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—CD
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.—I
Belle Alkali Co., Belle, W. Va.—S
Biwax Corp., 3445 Howard St., Skokie, Ill.—I, W, R
Black Bear Co., Inc., 620 Fifth Ave., New York 20, N. Y.—SL
Cantol Wax Co., 211 N. Washington St., Bloomington, Ind.—I, W
Carbide & Carbon Chemicals Corp., Plastics Div., 30 E. 42nd St., New York 17, N. Y.—C, R
Celanese Celluloid Corp., 180 Madison Ave., New York, N. Y.—C
Communications Products Co., 744 Broad St., Newark, N. J.—L
Crolite—Henry L. Crowley & Co.
Henry L. Crowley & Co., 1 Central Ave., West Orange, N. J., "Crolite"—C
James B. Day & Co., 1872 Clybourn Ave., Chicago, Ill.—C, CD, E, I, L, P, R, S, V, W
Distillation Products, Inc., 755 Ridge Rd., W., Rochester 13, N. Y.—VG, SL
John C. Dolph Co., 168 Emmett St., Newark 5, N. J.—E, I, L, V, W, S, P
Dow Chemical Co., Midland, Mich.—I, R, S
Durez Plastics & Chemicals, Inc., 1926 Walck Road, North Tonawanda, N. Y.—R, V, A
Durite Plastic, Inc., 5000 Summerdale Ave., Philadelphia, 24, Pa.—I, R, V
The Eagle-Picher Lead Co., American Bldg., Cincinnati 1, Ohio—I, P
Egyptian Lacquer Mfg. Co., 1270 Sixth Ave., New York, N. Y.—E, L, P, S, V
GC—General Cement Mfg. Co.
General Aniline & Film Corp., 435 Hudson St., New York 14, N. Y.—CD, I
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., "GC"—C, CD, E, I, L, P, R, S, V, W, WF
General Electric Co., 1 River Rd., Schenectady, N. Y. —C, I
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—C
The P. D. George Co., 5200 N. 2nd St., St. Louis 7, Mo.—C, CD, E, I, L, P, R, S, V, W
Girard-Hopkins, 1000 40th Ave., Oakland, Calif.— P, S
B. F. Goodrich Co., 500 S. Main St., Akron, Ohio —I, R

Halowax Products Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.—I, M, W
Harvel—Irvington Varnish & Insulator Co.
Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn 6, N. Y.—E, L, P, V, WF
O. Hommel Co., 209—4th Ave., Pittsburgh, Pa.— C, E, L, P
A. C. Horn Co., 43-36 10th St., Long Island City 1, N. Y.—E, I, L, P, R, S, V, W, WF
Industrial Synthetics Corp., 60 Woolsey St., Irvington, N. J.—I
Insl-X-Co., 857 Meeker Ave., Brooklyn, N. Y.—I, P
Insulation Mfrs. Corp., 565 W. Washington Blvd., Chicago 6, Ill.—C, V, CD, I, R
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y.—E
Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington 11, N. J., "Irvington," "Harvel"—I, R, V
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn 19, N. Y., "JFD"—C, S
Kinney Mfg. Co., 3595 Washington St., Jamaica Plain, Boston 30, Mass.—SL
Libbey-Owens-Ford Glass Co., Plaskon Div., 2112 Sylvan Ave., Toledo 6, Ohio—A
Leslie L. Linick & Co., 1640 E. 54th St., Chicago 51, Ill.—C, W
The Lowe Bros Co., 424 E. 3rd St., Dayton 2, Ohio —E, L, P, V, WF
Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.—C, CD, E, I, L, P, R, S, V, W
Marblette Corp., 37-21 30th St., Long Island City, N. Y.—C, L, R, V
Meissner Mfg. Co., 7th & Belmont, Mt. Carmel, Ill. "Meissner"—CD
Mica Insulator Co., 200 Varick St., New York, N. Y., "Mico"—C, I
Mico—Mica Insulator Co.
Midland Paint & Varnish Co., 9115 Reno Ave., Cleveland, Ohio—E, I, P, V
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—CD
Mitchell Rand Insulation Co., 53 Murray St., New York 7, N. Y.—I, V, W, L
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.—R
Murphy Varnish Co., 224 McWhorter St., Newark, N. J.—E, L, P, V, C, WF
New England Radiocrafters, 1156 Commonwealth Ave., Boston, Mass.—CD, L
New Wrinkle, Inc., 314 W. First St., Dayton 2, Ohio —E, L, P, R, V, WF
Oakite Products, Inc., 22 Thames St., New York 6, N. Y.—S
Paisley Products, Inc., 1770 Canalport Ave., Chicago 16, Ill.—C, R, W
Phillips Process Co., Inc., 192 Mill St., Rochester 4, N. Y.—M
Pioneer Asphalt Co., 435 N. Michigan Ave., Chicago, Ill.—P
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—C, S
Poinsettia, Inc., 111 Cedar Ave., Pitman, N. J.—W

Paint, Cement & Wax Products

Adhesives	A
Cement	C
Coil dopes	CD
Enamels	E
Insulating compounds	I
Lacquers	L
Marking inks	M
Paint	P
Resins	R
Solvents	S
Special lubricants	SL
Vacuum greases	VG
Varnish	V
Waterproofing comp.	WC
Wax	W
Wrinkle finish	WF

Useful Applications in Electronic Developments ....No. 9



VOLTAGE STABILIZER

TYPICAL USES: In power supplies for any radio, electronic or other precision electrical equipment requiring an unvarying source of voltage.

WHAT IT IS AND HOW IT IS USED: Tests of the operational characteristics of many circuits require direct voltages that do not vary, by reason of changes in the voltage of the source, or changes in the load. Precise regulation of the voltage is accomplished by using electronic tubes in what might be called a de-amplifier, wherein all variations are ironed out. The circuit shown is one simple method of accomplishing this. The 6SJ7 pentode takes note of the variations from any cause and controls the impedance of the triode in series with the load to equalize those variations.

OMISSIONS

Listings have been omitted in all cases when, after three requests, a company has failed to return our directory questionnaire or otherwise verify its activity.

Pratt & Lambert, Inc., 75 Tonawanda St., Buffalo 7, N. Y.—E, L, P, V, C, S, WF
The Resinous Products & Chemical Co., West Washington S., Philadelphia, Pa.—R, S
Roxalin Flexible Finishes, Inc., 800 Magnolia Ave., Elizabeth, N. J.—C, CD, E, I, L, P, R, S, V, W
Sauereisen Cements Co., Sharpsburg Station, Pittsburgh 15, Pa.—C, I
Schaar & Co., 754 W. Lexington St., Chicago, Ill.—C
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif., "Walsco"—C, CD, E, L, P, S, V, I, WF
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn, N. Y.—P
The Sherwin-Williams Co., 101 Prospect Ave., Cleveland, Ohio—E, I, L, P, R, S, V
Solar Corp., 1000 W. Bruce St., Milwaukee 4, Wisc.—P, R, S, V, W
Standard Insulation Co., 74-76 Paterson Ave., East Rutherford, N. J.—I, V
Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago, Ill.—W
Standard Varnish Works, 2600 Richmond Terrace, Staten Island 3, N. Y.—C, CD, E, I, L, P, R, S, V, W, WF
Stromberg-Carlson Tel. Mfg. Co., 100 Carlson Rd., Rochester, N. Y.—I
United States Rubber Co., 1232 Sixth Ave., New York 20, N. Y.—C, I, L
Walsco—Walter L. Schott Co.
R. D. Werner Co., Inc., 380 Second Ave., New York, N. Y.—I
Western Electric Co., 195 Broadway, New York, N. Y.—I
Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.—C, CD, E, I, L, P, R, S, V
Wipe-On Corporation, 105 Hudson St., New York 13, N. Y.—V
Zophar Mills, Inc., 128 26th St., Brooklyn 32, N. Y.—C, I, W, R

Photo Electric Equipment

(See also TUBES)

Complete units	EE
Light supplies	L
Photo cells	PC
Photometers	PM
Relays	R

Advance Electric Co., 1262 W. Second St., Los Angeles, Calif.—R
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 4, Wis.—R
Allied Control Co., Inc., 2 E. End Ave., New York 21, N. Y.—R
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—R
American Instrument Co., Silver Spring, Md.—EE
American Phenolic Corp., 1830 So. 54th Ave., Chicago 50, Ill.—EE
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—PC
Andrews & Perillo, 39-30 Crescent St., Long Island City 1, N. Y.—EE
R. B. Annis Co., 1101 No. Delaware St., Indianapolis 2, Ind.—EE
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—EE
Auth Electrical Specialty Co., 422 E. 53rd St., New York 22, N. Y.—R
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—R
Automatic Electric Mfg. Co., Mankato, Minn.—R
Bank's Mfg. Co., 1105 Lawrence Ave., Chicago, Ill.—R
Benwood Linze Co., 1811-19 Locust St., St. Louis 3, Mo.—PC
E. M. Berndt Corp., Auricon Div., 5515 Sunset Blvd., Hollywood 28, Calif.—EE
Bradley Laboratories, Inc., 82 Meadow St., New Haven 10, Conn., "Luxtron"—PC
Burke & James, Inc., 223 W. Madison St., Chicago, Ill.—L
Burton Mfg. Co., 3855 No. Lincoln Ave., Chicago 13, Ill.—L
Cetron—Continental Electric Co.
Coleman Electric Co., 318 Madison St., Maywood, Ill.—PM
Continental Electric Co., 715 Hamilton St., Geneva, Ill., "Cetron"—PC
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee 1, Wisc.—R
De Jur-Amsco Corp., 6 Bridge St., Shelton, Conn.—PM
Struthers Dunn, Inc., 1321 Arch St., Philadelphia, Pa.—R
Eastern Amplifier Corp., 794 E. 140th St., Bronx, N. Y.—EE
Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia, 44, Pa.—PC, R
Electric Sorting Machine Co., 802 Michigan Trust Bldg., Grand Rapids 2, Mich.—EE
Electro-Eye—Wm. Hansen Co.
Electro-Medical Laboratory, Inc., Holliston, Mass.—PM
Electronic Control Corp., 1573 E. Forest Ave., Detroit 7, Mich.—EE, R, L
Electronic Products Co., Geneva, Ill.—EE, R
Ess Instrument Co., George Washington Bridge Plaza, Fort Lee, N. J.—EE, R
Fischer & Porter Co., P. O. Box 127, Hatboro, Pa.—EE
Fish-Shurman Corp., 230 E. 45th St., New York 17, N. Y.—P
Henry A. Gardner Laboratory, Inc., 1500 Rhode Island Ave., N. W. Washington 5, D. C.—PM
George W. Gates & Co., Inc., Hempstead Turnpike & Lucilla Ave., Franklin Square, N. Y.—L
General Electric Co., 1 River Rd., Schenectady, N. Y. EE, L, PC, R
General Scientific Corp., 4029 S. Kedzie Ave., Chicago, Ill.—"Lumotron"—PC
G-M Laboratories, Inc., 4336 N. Knox Ave., Chicago 11, Ill.—PC, R
Guardian Electric Mfg. Co., 1622 Walnut St., Chicago, Ill.—R
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—R
Wm. Hansen Co., R. 3, Niles, Mich., "Electro-Eye," "Radiocall," "Ordercall"—EE
H-B Electric Company, Inc., 6101 North 21st St., Philadlphia 38, Pa.—R
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—EE, R
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio—PC, PM
Hollywood Electronics, Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif—EE
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—E
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—EE
Kliegl Bros. Universal Electric Stage Lighting Co., 321 W. 50th St., New York, N. Y.—L
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.—PM
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.—R
Leupold & Stevens Instruments, 4445 No. E. Glisan, Portland 13, Ore.—EE
Lumotron—General Scientific Corp.
Luxtron—Bradley Labs., Inc.
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill.—R
Michigan Fluorescent Light Co., 71-75 S. Parke, Pontiac 14, Mich.—L
Miles Reproducer Co., Inc., 812 Broadway, New York 3, N. Y.—PC
Muter Co., 1255 So. Michigan Ave., Chicago 5, Ill.—R
McElroy Mfg. Corp., 82 Brookline Ave., Boston, Mass.—EE
National Mineral Co., 2638 No. Pulaski Rd., Chicago 31, Ill.—EE
National Technical Laboratories, 820 Mission St., So. Pasadena, Calif.—PM
National Union Radio Corp., 15 Washington St., Newark 2, N. J.—PC
Nelco—North American Electric Lamp Co.
Nilsson Electrical Laboratory, Inc., 103 Lafayette St., New York 13, N. Y.—EE
North American Electric Lamp Co., 1014 Tyler St., St. Louis 6, Mo., "Nelco"—L
The North Electric Mfg. Co., P. O. Box 267, Galion, Ohio—R
Ordercall—Wm. Hansen Co.
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.—R
Peerless Mfg. Corp., 1400 W. Ormsby, Louisville, Ky.—R
Pfaltz & Bauer, Inc., 350 Fifth Ave., New York, N. Y.—EE, PC
Photobell Corp., 116 Nassau St., New York 7, N. Y.—EE, L, PC, PM, R
Photoswitch, Inc., Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.—EE
Photovolt Corp., 95 Madison Ave., New York 16, N. Y.—PC, PM
Photronic—Weston Electrical Instrument Corp.
Potter & Brumfield Mfg. Co., Inc., 700 N. Gibson St., Princeton, Ind.—R
Potter Elec. Signal & Mfg. Co., Century Bldg., St. Louis, Mo.—EE
Precision Scientific Co., 1750 N. Springfield Ave., Chicago 47, Ill.—L
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.—R
Radiant Lamp Corp., 300 Jelliff Ave., Newark 8, N. J.—L
Radiocall—Wm. Hansen Co.
Radio Electronic Co., 1816 Villanova Dr., Oakland, Calif.—EE
RCA-Victor Division, Radio Corp. of America, Camden, N. J.—PC
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.—EE
The Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.—PC
RBM Mfg. Co., Logansport, Ind.—R
Richardson Allen Corp., 15 West 20th St., New York 11, N. Y.—EE, R
Safety Electric Co., 110 So. Dearborn St., Chicago 3, Ill.—L
Saxl Instrument Co., Inc., 38 James St., E. Providence, R. I.—EE
Selenium Corp. of America, 1800 W. Pico Blvd., Los Angeles, Calif.—PC
Sigma Instruments, Inc., 76 Freeport St., Boston 22, Mass.—R
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., S. Pasadena, Calif.—R
Sperti, Inc., Beech & Kenilworth Aves., Norwood, Cincinnati 12, Ohio—PC
S. O. S. Cinema Supply Corp., 449 W. 42nd St., New York 18, N. Y.—EE
Talking Devices Co., 4447 W. Irving Park Rd., Chicago, Ill.—L
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.—EE, R
Vacutron, Inc., 2819 12th St., Arlington, Va.—PC
Weltronic Corp., 3080 E. Outer Dr., Detroit, Mich.—EE
Western Electric Co., 195 Broadway, New York, N. Y.—PC
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—EE, L, PC, R
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—PC, R, L, EE
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J., "Photronic"—PC, R
White Research Associates, 899 Boylston St., Boston 15, Mass.—EE
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—EE

Plastic Materials

Acrylics	A
Aniline formaldehyde resin	AF
Cast resin	CR
Cellulose acetate	C
Cellulose acetate butyrate	CB
Cellulose nitrate	CN
Ethyl cellulose	EC
Laminates	L
Melamines	M
Phenols	PH
Polystyrene	P
Urea	U
Vinyl resins	V

Acadia Synthetic Products Div., Western Felt Works, 4035 Ogden Ave., Chicago, Ill.—P
Alvar—Shawinigan Prod. Corp.
American Cyanamid Co., Plastics Div., 30 Rockefeller Plaza, New York 20, N. Y.—L, U, M
American Molding Powder & Chemical Corp., 109 S. 5th St., Brooklyn, N. Y.—C, EC
American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill.—EC, P
American Products Mfg. Co., 8131 Oleander St., New Orleans, La.—C
Arpin Mfg. Co., 422 Alden St., Orange, N. J.—A, C, CN, EC, P, V
Auburn Button Works, Inc., Auburn, N. Y.—CN
Baker Oil Tools, Inc., P. O. Box 127, Vernon Station, Los Angeles, Calif.—CR
N. S. Baer Co., 9-11 Montgomery St., Hillside, N. J.—L, PH
Bakelite Corp., 30 E. 42nd St., New York 17, N. Y.—C, PH, P, U
Beetle—American Cyanamid Co.
Bryant Electric Co., 1421 State St., Bridgeport, Conn., "Templus"—PH
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York 54, N. Y.—V
Butacite—E. I. DuPont de Nemours & Co., Inc.
Butvar—Shawinigan Prod. Corp.

Carbide & Carbon Chemicals Corp., Plastics Div., 30 E. 42nd St., New York 17, N. Y., "Vinylite"—V
Catalin Corp., 1 Park Ave., New York 16, N. Y., "Loalin"—CR, PH, P
Celanese Celluloid Corp., 180 Madison Ave., New York 16, N. Y., "Celluloid," "Lumarith"—C, EC, CN
Celeron—Continental Diamond Fibre Co.
Cellanite—Continental Diamond Fibre Co.
Celluloid—Celanese-Celluloid Corp.
Celluplastic Corp., 50 Avenue L, Newark, N. J.—C
Central Process Corp., Forest Park, Ill.—CR, PH
Chemaco Corp., Subsidiary of Mfgrs. Chem. Corp., Berkeley Heights, N. J.—C, EC, P, V
Ciba Products Corp., 77-79 River St., Hoboken, N. J.—AF
Coffite—Formica Insulation Co.
Coltrock—Colts Patent Fire Arms Mfg. Co.
Colts Patent Fire Arms Mfg. Co., 17 Van Dyke Ave., Hartford, Conn., "Coltrock"—PH
Continental Diamond Fibre Co., Newark, Del., "Celeron," "Cellanite," "Dilectene," "Dilecto," "Vulcoid"—L
Colonial Kolonite Co., 2214 Armitage Ave., Chicago 47, Ill.—A, CR, C, L, PH, P
Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—A, CR, C, L, PH
Crystalite—Rohm & Haas Co.
Detroit Paper Products Co., 5800 Domine St., Detroit, Mich., "Duraloy"—L
Dilectene—Continental Diamond Fibre Co.
Dilecto—Continental Diamond Fibre Co.
Dow Chemical Co., Midland, Mich., "Ethocel," "Styron"—EC, PH, P
E. I. DuPont de Nemours & Co., Inc., Plastics Dept., 626 Schuyler Ave., Arlington, N. J., "Butacite," "Lucite," "Plastacele," "Pyralin"—A, C, CN, V
Duraloy—Detroit Paper Products Co.
Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y., "Durez"—PH
Durite Plastics, Inc., 5000 Summerdale Ave., Philadelphia 24, Pa.—PH, L
Eastman Kodak Co., 343 State St., Rochester, N. Y.—C, CN
Electrical Insulation Co., Inc., 12 Vestry St., New York 13, N. Y.—L
Essex Corp., Charlottesville, Va.—CN
Ethocel—Dow Chemical Co.
Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn.—C, EC, P, V
Fibestos—Monsanto Chemical Co.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, Ohio, "Coffite," "Formica"—L
Formvar—Shawinigan Prod. Corp.
Franklin Fibre-Lamitex Corp., Wilmington, Del., "Lamitex"—L
General Aniline & Film Corp., 435 Hudson St., New York 14, N. Y.—V
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y.—A, C, EC, P, V
Gemstone—A. Knoedler Co.
General Electric Co., Plastics Dept., 1 Plastics Ave., Pittsfield, Mass., "Textolite"—PH, L
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—CR, C, P
Gering Products, Inc., N. 7th & Monroe Ave., Kenilworth, N. J.—C, CN, EC
B. F. Goodrich Co., 500 S. Main St., Akron, Ohio, "Koroseal"—V
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—PH, P, U
Haveg Corp., E. Newark, Del., "Haveg"—PH
Hercules Powder Co., 916 Market St., Wilmington, Del., "Herculoid"—CN, EC
Herculoid—Hercules Powder Co.
Heresite & Chemical Co., Manitowoc, Wis., "Heresite"—CR, PH
Hopp Press, Inc., 460 W. 34th St., New York 1, N. Y.—C, EC, L, V
Indur—Reilly Tar & Chemical Corp.
Industrial Synthetics Corp., 60 Woolsey St., Irvington, N. J.—C, CA, EC
The Insel Co., Schuyler Ave., Fort Quincy, Arlington, N. J.—EC
Insulating Tube Co., Inc., 26 Cottage St., P. O. Box 1, Poughkeepsie, N. Y.—L
Insulation Mfrs. Corp., 565 W. Washington Blvd., Chicago 6, Ill.—L
Insurok—The Richardson Co.
Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington, N. J.—C
A. Knoedler Co., Lancaster, Pa., "Gemstone"—CR
Koroseal—B. F. Goodrich Co.
Lamicoid—Mica Insulator Co.
Lamitex—Franklin Fibre-Lamitex Corp.
Libbey-Owens-Ford Glass Co., Plaskon Div., 2112 Sylvan Ave., Toledo 6, Ohio—U, M
Loalin—Catalin Corp.
Lucite—DuPont de Nemours & Co., Ltd.
Lumarith—Celanese Celluloid Corp.
Lustron—Monsanto Chemical Co.
Makalot Corp., 262 Washington St., Boston, Mass., "Makalot"—C, CA, PH, U
Manufacturers Chemical Corp., Berkeley Heights, N. J.—C, CA, EC
Marblette Corp., 37-21—30th St., Long Island City, N. Y., "Marblette"—CR
McInerny Plastics Co., 655 Godfrey Ave., S. W., Grand Rapids, Mich.—L
Mica Insulator Co., 200 Varick St., New York 14, N. Y., "Lamicoid"—L
Micarta—Westinghouse Elec. & Mfg. Co.
Michigan Molded Plastics, Inc., Dexter, Mich., "Michrock"—PH
Michrock—Michigan Molded Plastics, Inc.
Monsanto Chemical Co., Plastic Div., Springfield 2, Mass., "Fibestos," "Lustron," "Opalon," "Resinox"—CR, C, CN, PH, P, V, M
National Plastic Products Co., 2527 Russell St., Detroit, Mich.—C, CR, L
National Vulcanized Fibre Co., Wilmington, Del., "Phenolite"—L
N. E. Radiocrafters, 1156 Commonwealth Ave., Boston, Allston 34, Mass.—P
Norton Laboratories, Inc., 560 Mill St., Lockport, N. Y.—A, C, EC, PH, P, U, V
Neillite—Watertown Mfg. Co.
Nixonite—Nixon Nitration Works
Nixon Nitration Works, Nixon, N. J., "Nixonite"—C, CN, EC
Ohmoid—Wilmington Fibre Specialty Co.
Opalon—Monsanto Chemical Co.
Panelyte Division, St. Regis Paper Co., 230 Park Ave., New York, N. Y., "Panelyte"—L
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.—L
Peters Chemical Mfg. Co., 3623 Lake St., Melrose Park, Ill.—A
Phenolite—National Vulcanized Fibre Co.
Plaskon Co., 2121 Sylvan Ave., Toledo, Ohio, "Plaskon"—U
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—C, L, V
Plastacele—E. I. DuPont de Nemours & Co., Inc.
Plasticraft Associates, 155 E. Ohio St., Chicago, Ill.—L
Plax Corp., Box 1019, Hartford 1, Conn.—A, C, EC, P
Plexiglas—Rohm & Haas Co.
Pyralin—E. I. DuPont de Nemours & Co., Inc.
R and R Plastics, Inc., 85 Union St., Springfield, Mass.—CM
Reilly Tar & Chemical Corp., Merchants Bank Bldg., Indianapolis, Ind., "Indur"—PH
Resinous Products & Chemical Co., 222 W. Washington Sq., Philadelphia, Pa., "Uformite"—U
Resinox—Monsanto Chemical Co.
Resistoflex Corp., 89 Plansoen St., Belleville, N. J.—V
The Richardson Co., Melrose Park, Ill., "Insurok"—L
Rohm & Haas Co., 222 W. Washington St., Philadelphia, Pa., "Plexiglas"—A, U
Sandee Mfg. Co., 3945 N. Western Ave., Chicago 18, Ill.—A, C, CN, EC, P, V
Shawinigan Prod. Corp., 350 Fifth Ave., New York, N. Y., "Alvar," "Butvar," "Formvar"—V
Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y., "Spauldite"—L
Spauldite—Spaulding Fibre Co.
Styron—Dow Chemical Co.
Standard Varnish Works, 2600 Richmond Terrace, Staten Island 3, N. Y.—A, CR, C, CN, EC, L, PH, P, U, V
Synthane Corp., Oaks, Pa., "Synthane"—L
Synvar Corp., 109 Lombard St., Wilmington, Del.—PH, U
Taylor Fibre Co., Norristown, Pa.—L
Tempus—Bryant Electric Co.
Tenite—Tennessee Eastman Corp.
Tennessee Eastman Corp., Kingsport, Tenn., "Tenite"—C
Textolite—General Electric Co., Plastics Div.
United Radio Mfg. Co., 191 Greenwich St., New York 7, N. Y.—PH
Uformite—Resinous Products & Chemicals Co.
Vinylite—Carbide & Carbon Chemicals Corp.
Vulcoid—Continental Diamond Fibre Co.
Watertown Mfg. Co., Watertown, Conn., "Neillite"—PH
R. D. Werner Co., Inc., 380—2nd Ave., New York, N. Y.—V
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—L, PH
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., "Micarta"—PH
Wilmington Fibre Specialty Co., Wilmington 99, Del., "Ohmoid"—L, PH

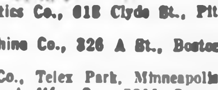
Plastic Molders and Fabricators

Cabinet molders C
Extruded shapes .... E
Fabricators .... F
Parts molders .... P

Alden Prods. Co., 117 N. Main St., Brockton, Mass.—F, P
American Communications Corp., 306 Broadway, New York 7, N. Y.—C, F, P
American Insulator Corp., New Freedom, Pa.—C, P
American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, N. Y.—E, P
Amphenol—American Phenolic Corp.
Anchor Plastics Co., 71 Grand St., New York 13, N. Y.—E
Aray Mfg. & Supply Co., Inc., 3105 Pine St., St. Louis 3, Mo.—F, P
Arpin Mfg. Co., 422 Alden St., Orange, N. J.—F, P
Atlantic Plastics, 2730 Grand Ave, Cleveland, 4, Ohio—P
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.—E, P
Auburn Button Works, Inc., Auburn, N. Y.—E, P
N. S. Baer Co., 9-11 Montgomery St., Hillside, N. J.—F
Barber-Colman Co., Molded Prods. Div., Rockford, Ill.—P
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.—F
Bastian Bros. Co., 1600 Clinton Ave., N., Rochester N. Y.—F
Bend-A-Lite Plastics Co., 123 S. Honore St., Chicago, Ill.—F
Boonton Molding Co., Boonton, N. J.—P
Bridgeport Molded Prods., Inc., 303 Myrtle Ave., Bridgeport, Conn.—P
Arnold Brilhart, Ltd., 437 Middleneck Rd., Great Neck, L. I., N. Y.—F, P
Bryant Electric Co., Plastics Div., 1105 Railroad Ave., Bridgeport, Conn.—P
Burton Mfg. Co., 3855 No. Lincoln Ave., Chicago 13, Ill.—P
Cardy-Lundmark Co., 1801 West Byron St., Chicago, 13, Ill.—F
Carter Products Corp., 6921 Carnegie Ave., Cleveland, 3, Ohio—E
Catalin Corp., 1 Park Ave., New York, N. Y., "Catalin"—C, F
Chicago Molded Prods. Corp., 1020 N. Kolmar Ave., Chicago 51, Ill.—C, P
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, Ohio—P
Cleveland Plastics, Inc., 1611 E. 21st St., Cleveland, Ohio—E, P
Colonial Kolonite Co., 2214 Armitage Ave., Chicago, 47, Ill.—F
Continental Diamond Fibre Co., Newark, Dela.—F, P
Colt's Patent Fire Arms Mfg. Co., Plastics Div., Hartford, Conn.—E, P
Consolidated Molded Prods. Corp., 409 Cherry St., Scranton, Pa.—P
Creative Plastics Corp., 968 Kent Ave., Brooklyn 5, N. Y.—P, F
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.—P
Harry Davies Molding Co., 1428 N. Wells St., Chicago, Ill.—C, P
Dayton Insulating Molding Co., 418 E. First St., Dayton, Ohio—C, E, F, P
Diemolding Corp., Rasbach St., Canastota, N. Y.—C, P
Eagle Plastics Corp., 23-10 Bridge Plaza South, Long Island City, N. Y.—P
Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia, 44, Pa.—P
Eclipse Moulded Products Co., 5151 N. 32nd St., Milwaukee 9, Wis.—C, E, P, F
Electrical Insulation Co., Inc., 12 Vestry St., New York 13, N. Y.—F
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.—F, P
Emeloid Co., 291 Laurel Ave., Arlington, N. J.—F, P
Erie Resistor Corp., 644 W. 12 St., Erie, Pa.—E, P
Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn., "Interlox"—F
G. Felsenthal & Sons, 4108 W. Grand Ave., Chicago 51, Ill.—F, P
A. W. Franklin Mfg. Corp., 175 Varick St., New York 14, N. Y.—F
Franklin Fibre-Lamitex Corp., Wilmington, Del.—P
Garfield Mfg. Co., Garfield, N. J.—P
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y., "Gemute"—E, F, P
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—E

Gemute—Gemloid Corp.
General Electric Co., Plastics Dept., 1 Plastics Ave., Pittsfield, Mass.—C, E, P
The General Industries Co., Taylor & Olive Sts., Elyria, Ohio—C, P
Gits Molding Corp., 4600 Huron St., Chicago, Ill—P
Greenhut Insulation Co., 31 W 21st St., New York, N. Y.—F
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—C, P
Henry Mfg. Co., 2213 Westwood Blvd., Los Angeles 25, Calif.—P
Hugh H. Eby, Inc., 18 W. Chelton Ave., Philadelphia 44, Pa.—P
Hopp Press, Inc., 460 W. 34th St., New York 1, N. Y.—E, F, P
House of Plastics, 1720 Euclid Ave., Cleveland 15, Ohio—F
Imperial Molded Prods. Corp., 2925 W. Harrison St., Chicago 12, Ill.—P
Industrial Synthetics Corp., 60 Woolsey St., Irvington 11, N. J., "Synflex"—E
Insulating Fabricators of New England, Inc., 22 Elkins St., S. Boston, Mass.—F
Insulation Fabricators, Inc., 12 E. 12th St., New York, N. Y.—F
Insulation Mfg. Co., 11 New York Ave., Brooklyn, N. Y.—P
Insulation Prods. Co., 504 N. Richland St., Pittsburgh, Pa.—P
Insurok—The Richardson Co.
Interlox—Extruded Plastics, Inc.
Keasby & Mattison Co., Butler Ave., Ambler, Pa.—P
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave. Chicago, Ill.—P
Klise Mfg. Co., 50 Cottage Grove St., S. W., Grand Rapids 2, Mich.—E, F
Kuhn & Jacob Molding & Tool Co., 1200 Southard St. Trenton, N. J.—P
Kurz-Kasch, Inc., S. Broadway. Dayton 1, Ohio—C, P
Lacey-Webber Co., Kalamazoo, Mich.—C, F, P
Mack Molding Co., Wayne, N. J.—E, C, P
Maico Co., Inc., Minneapolis 8, Minn.—F, P
Meissner Mfg. Co., 7th & Belmont, Mt. Carmel, Ill—P
Metaplast Co., 205 W. 19th St., New York 11, N. Y.—F
Mica Insulator Co., 200 Varick St., New York 14, N. Y.—"Lamicoid,"F
Michigan Molded Plastics, Inc., G St., Dexter, Mich—P
Elmer E. Mills Corp., 812 W. Van Buren St., Chicago, Ill—E, P
Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—P
National Lock Co., 1902 Seventh St., Rockford, Ill. C, P
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N.J.—E
Niagara Insul Bake Specialty Co., Inc., 483 Delaware Ave., Albany, N. Y.—P
Northern Industrial Chem. Co., 10 Elkins St., S Boston, Mass.—C, P
Northwest Plastic, Inc., 2233 University Ave., St. Paul 4, Minn.—C, E, F, P
Norton Labs., Inc., 560 Mill St., Lockport, N. Y.—C, P
Oris Mfg. Co., Thomaston, Conn.—P
Patent Button Co. of Tenn., Inc., 2221 Century St., Knoxville 8, Tenn.—C, P
Penn Fibre & Specialty Co., 2030 E. Westermoreland St., Philadelphia 34, Pa.—F
Parisian Novelty Co., 3510 S. Western Ave., Chicago, Ill—F
Plastic Fabricators Co., 440 Sansome St., San Francisco 11, Calif.—F
Plastic Mfrs., Inc., Fairfield Ave., Stamford, Conn.—F, P
Plastic Molding Corp., Sandy Hook, Conn.—P
Plastikmould—R. D. Werner Co., Inc.
Plastiktrim—R. D Werner Co., Inc.
Plax Corp., Box 1019, Hartford 1, Conn.—E, F
Poinsettia, Inc., 96 Cedar Ave., Pitman, N. J.—P
Precision Fabricators, Inc., Champeney Terrace, Rochester, N. Y.—F
Precision Specialties, 210-220 N. Western Ave., Los Angeles 4, Calif.—E,F
Printloid, Inc., 93 Mercer St., New York 12, N. Y.—F
Racon Electric Co., Inc., 52 E. 19th St., New York 3, N. Y.—F, P
Radio Specialties Co., 1956 So. Figueroa St., Los Angeles 7, Calif.—F
R. E. C. Mfg. Corp., 1250 Highland St., Holliston, Mass.—P
Recto Molded Prods., Inc., Appleton & B. & O. R. R., Cincinnati 9, Ohio—P
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif., "Remler"—C, P, E, F
Reynolds Spring Co., Molded Plastics Div., Cambridge, Ohio—C, E, P
The Richardson Co., Melrose Park, Ill., "Insurok"——C, E, P, F
Rogan Brothers, 2001 S. Michigan Ave., Chicago, Ill—P
Royal Moulding Co., 69 Gordon Ave., Providence 5, R. I.—P
Sandee Mfg. Co., 3945 N. Western Ave., Chicago 18, Ill.—E
Shaw Insulator Co., 150 Colt St., Irvington. N. J.—P
Sinko Tool & Mfg. Co., 351 N. Crawford Ave., Chicago, Ill.—P
N. G. Slater Corp., 3 West 29th St., New York 1, N. Y.—F, P
Southern Products, Independence, Mo.—F
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y.—E, F
Specialty Insulation Mfg. Co., Church St., Hoosick Falls, N. Y.—F
Standard Molding Corp., Dayton, Ohio—C, P
Standard Technical Devices, Inc., 3008 Ave. M, Brooklyn 10, N. Y.—F
Jos. Stokes Rubber Co., Taylor St., Trenton, N. J.—C, P
Synthetic Plastics Co., 88 St. Francis St., Newark, N. J.—P
Syracuse Ornamental Co., 581 S. Clinton St., Syracuse 2, N. Y.—C, P
Tech-Art Plastics Co., 41-01 36th Ave., Long Island City, N. Y.—C, E, P
Technical Plastics Co., 618 Clyde St., Pittsburgh 13, Pa.—F
Terkelsen Machine Co., 326 A St., Boston 10, Mass.—P
Telex Prods. Co., Telex Park, Minneapolis, Minn.—P
Tungsten Contact Mfg. Co., 7311 Cottage Ave., N. Bergen, N. J.—P
Union Insulating Co., Box 351 Parkersburg, W. Va.—P
United Plastics Corp., 60 Broad St., New York 4, N. Y.—C, P
Universal Plastics Corp., 235 Jersey Ave., New Brunswick, N. J.—C, P
Varflex Corp., Rome, N. Y.—E
Victory Mfg. Co., 1724 W. Arcade Pl., Chicago 12, Ill.—P
Waterbury Button Co., 835 S. Main St., Waterbury, Conn.—P
Watertown Mfg. Co., 8 Porter St., Watertown, Conn.—P
Wernco—R. D. Werner Co., Inc.
R. D. Werner Co., Inc., 380—2nd Ave., New York 10, N. Y., "Wernco," "Plastiktrim," "Plastikmould"—E
Western Electric Co., 195 Broadway, New York, N. Y.—P
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—F, P
Wheeling Stamping Co., Wheeling, W. Va.—P
The S. S. White Dental Mfg. Co., Industrial Div. 10 E. 40th St., New York 16, N. Y.—P
Wilmington Fibre Specialty Co., Wilmington 99, Dela.—F, P
Windman Bros., 3325 Union Pacific Ave., Los Angeles 23, Calif.—C, P

Power Rectifier Systems & Vibrators



Battery eliminators .... BE
Electronic tube rectified .... VT
Hand cranked units .... HC
Inverters .... INV
Mercury arc .... MA
Metallic rectifiers .... M
Rectifier power units .... PU
Vibrator freq. changers .... VF
Vibrator power packs .... VP
Vibrators V
Voltage regulators .... VR

Acme Electric & Mfg. Co., 54 Water St., Cuba, N. Y.—PU
Aircraft Accessories Corp., Fairfax & Funston Rd., Kansas City, Kans.—PU
Airplane & Marine Instruments, Inc., Box 92, Clearfield, Pa.—PU, VT
Air-Way Electric Appliance Corp., 2101 Auburn Ave., Toledo 1, Ohio—INV
Allen Elec. & Equip. Co., 2103 North Pitcher St., Kalamazoo, Mich.—BE, M, PU
Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio—INV, VR
Allis-Chalmers Mfg. Co., Milwaukee, Wisc.—MA, VT, PU
Altec Lansing Corp., 6902 McKinley Ave., Los Angeles, Calif.—PU
American Automatic Electric Sales Co., 1019 W. Van Buren, Chicago, Ill.—BE
American Battery Co., 17 S. Jefferson St., Chicago, Ill.—M, VT
American Communications Corp., 306 Broadway, New York 7, N. Y.—M, VT, V, VP, VR
American Television & Radio Co., 300 E. Fourth St., St. Paul 1, Minn.—INV, M, V, VP
American Transformer Co., 178 Emmet St., Newark 5, N. J.—M, MA, VT, VP, VR
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—INV, MA, VT, V, VP, VR
Amplifier Co. of America, 398 Broadway, New York 13, N. Y.—INV, VR
Applied Research Laboratories, 4336 San Fernando Rd., Glendale 4, Calif.—VR
Aurex Corp., 1115-7 N. Franklin St., Chicago, Ill—VP
Auto Radio Filterpac—The Benwood Linze Co.
Automatic Electrical Devices Co., 324 E. 3rd St., Cincinnati, Ohio—M, PU, INV, V, VP
Bendix Radio, Div. of Bendix Aviation Corp., E. Joppa Rd., Baltimore 4, Md.—INV, V, VP, VR
The Benwood Linze Co., 1811-19 Locust St., St. Louis 3, Mo., "B-L," "Auto Radio Filterpac,"—M
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—V, VP
Bradley Laboratories, Inc., 82 Meadow St., New Haven 10, Conn.—M
J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—M, VT
B-L—The Benwood Linze Co.
Carter Motor Co., 1609 Milwaukee Ave., Chicago, Ill—HC
Communications Equipment Corp., 134 W. Colo. St., Pasadena 1, Calif.—VT, VP
Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.—VT, VR
Conn. Telephone & Elec. Div., Great American Industries, Inc., Meriden, Conn.—PU
Continental Electric Co., Geneva, Ill., "Cetron"—VT
Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—M, VR
The Crosley Corp., Cincinnati 25, Ohio,—VP
Eleco—Electron Equipment Corp.
Electric Sorting Machine Co., 802 Michigan Trust Bldg., Grand Rapids 2, Mich.—VR
Electric Specialty Co., 211 South St., Stamford, Conn.—INV
Electrical Facilities, Inc., 4224 Holden St.,, Oakland 8, Calif., "Rexselen"—M
Electrical Research Lab. Inc., 124 W. New York St., Evanston, Ill.—V
Electricoil Transformer Co., 417-421 Canal St., New York, N. Y.—BE, PU
Electron Equipment Corp., 917 Meridian St., So. Pasadena, Calif. "Eleco"—INV, M, MA, VT, VR
Electronic Corp. of America, 45 W. 18th St., New York, N. Y.—PU
Electronic Laboratories, Inc., 122 W. New York St., Indianapolis, Ind., "Portapack," "Portapower"—INV, V, VP, VR
Electronic Products Co., Geneva, Ill.—VT, VR
Electronic Transformer Co., 515 W. 29th St., New York 1, N. Y.—INV, M, MA, VT, V, VP, VR
Electro Products Laboratories, 549 W. Randolph St., Chicago 6, Ill.—M, VT, VP, MA
Fansteel Metallurgical Corp., 2200 Sheridan Road, North Chicago, Ill..—M
Federal Telephone & Radio Corp., Selenium Rectifier Div., 1000 Passaic Ave., E. Newark, N. J.—M
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—VT
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.—VT, V, VP, VR
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J., "Ferris"—PU, INV, VP
Flashtron—Thordarson Electric Mfg. Co.
Franklin Transformer Mfg. Co., 65 22nd Ave. N. E., Minneapolis 13, Minn.—M
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill., "Motorola"—V
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—HC
General Communication Co., 681 Beacon St., Boston, Mass.—VP
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—M, VT, VR
General Electric Co., West Lynn, Mass.—M
General Electric Company, 1 River Rd., Schenectady, N. Y.—M, MA, PU, INV, VP
General Transformer Corp., 1250 W. Van Buren St., Chicago 7, Ill.—VP, VT, V
Thos. B. Gibbs Co., Delavan, Wis.—INV, MA, VT, VR
Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.—M, VT
W. Green Electric Co., Inc., 130 Cedar St., New York 6, N. Y.—M, VT
The Grenby Manufacturing Co., Plainville, Conn.—VT
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—VT, VR
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—M, VT
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—M, MA, VT, VP
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—M, VT, VP
Horni Signal Mfg. Corp., 310 Hudson St., New York 13, N. Y.—M
Hudson American Corp., 23 W. 43rd St., New York, N. Y.—VR
Hy-Ef Electrical Products Mfg. Co., Electrical Testing Equipment, 1515 W. Pico Blvd., Ex. 2231, Los Angeles, Calif.—M, VT
Industrial Transformer Corp., 2540 Belmont Ave., New York 58, N. Y.—VT, VR

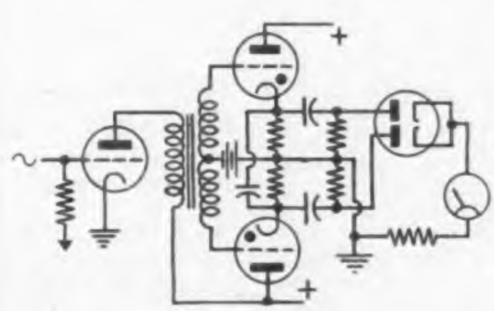
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—VP
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—BE, PU, INV, V, VP
James Vibrapower Co., Inc., 1551 Thomas St., Chicago, Ill.—V, VP
Jefferson-Travis Radio Mfg. Corp., 380 Second Ave., New York, N. Y.—VP
Kaar Engineering Co., 619 Emerson St., Palo Alto, Cal.—VP
Korfund Co., Inc., 48-15—32nd Place, Long Island City 11, N. Y.—VC
Lear Avia, Inc., Piqua, Ohio—PU, VP
Leland Electric Co., 1501 Webster St., Dayton, Ohio—INV
Linick, Green & Reed, Inc., 29 E. Madison St., Chicago, Ill.—M
Mallory Dry Disc—P. R. Mallory & Co., Inc.
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—M, V, VP
McColpin-Christie Corp. Ltd., 4922 S. Figueroa St., Los Angeles 37, Calif.—M, VT
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill.—V
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—VT
Motorola—Galvin Mfg. Corp
National Company, Inc., Malden, Mass.—PU, VP
Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.—VT
The North Electric Mfg. Co., 501 S. Market St., Galion, Ohio—M
Nothelfer Winding Labs., 111 Albermarle Ave., Trenton, N. J.—MA, PU
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill. "Oak"—V, INV
Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—VP
Operadio Mfg. Co., St. Charles, Ill.—VT
Philco Corp., Tioga & C Sts., Philadelphia, Pa.—V
Portapack—Electronic Laboratories
Portapower—Electronic Laboratories
Power Equipment Co., 627 W. Alexandrine, Detroit 1, Mich.—M, VT, VR
The Radiart Corp., 3571 W. 62nd St., Cleveland 2, Ohio "Vipower"—V, VP
Radio Receptor Co., Inc., 251 W. 19 St., New York 11, N. Y.—VT
Raytheon Mfg. Co., Waltham, Mass.—"Rectifilter"—M, MA, VT, VR
Radionic Transformer Co., 411 S. Green St., Chicago 7, Ill.—VT, VP
Radiotron—RCA Victor Div. Radio Corp. of America
Rauland Corporation, 4245 N. Knox Ave., Chicago, Ill.—PU, INV, VP
Raytheon Mfg. Co., 190 Willow St., Waltham, Mass.—M, MA, VT, VR
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA", "Radiotron" PU, VR, VP
The Ready Power Company, 3826 Grand River, Detroit, Mich.—PU
Rectifilter—Raytheon Mfg. Co.
Rexselen—Electrical Facilities, Inc.
Richardson Allen Corp., 15 W. 20th St., New York 11, N. Y.—M, MA, VT
Schaurer Machine Co., 2060 Reading Rd., Cincinnati 2, Ohio—M
Schuttig & Company, 9th & Kearney Sts., N. E., Washington 17, D. C.—M, VT
Selenium Corp. of America, 1800 W. Pico, Los Angeles, Calif.—M
Silman Mfg. Corp., 805 Pennsylvania Ave., Pittsburgh, Pa.—PU
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.—INV
S. O. S. Cinema Supply Corp., 449 W. 42nd St., New York 18, N. Y.—VT, VR
Stancor—Standard Transformer Corp.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill., "Stancor"—BE, M, V
Taylor Tubes, Inc., 2318 Wabansia Ave., Chicago, Ill.—G, MA, V
Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.—V
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.—VT
The Turner Co., 909 17th St. N. E., Cedar Rapids, Iowa—V
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago 10, Ill., "Flashtron"—VP, VR
Transformer Engineering Co., Stamford, Conn.—INV, VP
United Transformer Co., 150 Varick St., New York 13, N. Y.—INV, VR
Utah Radio Products Co., 850 Orleans St., Chicago, Ill.—V
Vipower—The Radiart Corp.
Waterman Prod. Co., Inc., 1900 N. 6th St., Philadelphia 22, Pa.—VR
Webster Products, 3825 W. Armitage Ave., Chicago 47, Ill.—VR
Western Electric Co., 195 Broadway, New York, N. Y.—M
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—M, MA
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—M, MA, VT, VR
Weston Electrical Instrument Corp., 597 Frelinghuysen Ave., Newark, N. J.—M
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.—V, VP, INV
White Research Associates, 899 Boylston St., Boston 15, Mass.—VT
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—VT, VP, VR
Wincharger Corp., Sioux City, Iowa—INV

Recording Equipment & Blanks

Code recorders .... CR
Cutting heads .... CH
Discs (blank) .... D
Equalizers .... E
Film recorders .... F
Graphic recorders .... RG
Magnetic recorders .... MT
Needles (cutting) .... CN
Record preforms and molding compounds .... RP
Recording machines .... RM
Recording machine assm. .... RA
Screws .... S
Turntables .... TT

Advance Recording Prods. Co., 36-12 34th St., Long Island City, N. Y.—D
Air-King Products Co., Inc., 1523-29 63rd St., Brooklyn 19, N. Y.—RA
Alden Prods. Co., 119 N. Main St., Brockton, Mass.—RM
Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio—M, RM, TT
Allied Recording Prods. Co., 21-09 43rd Ave., Long Island City, N. Y.—CH, D, M, CN, RM., S, TT
Amertype Recordgraph Corp., 333 W. 52nd St., New York 19, N. Y.—F, RM
Amplifier Co. of America, 398 Broadway, New York 13, N. Y.—E
R. B. Annis Co., 1101 N. Delaware St., Indianapolis 2, Indiana—RG
The Astatic Corp., 830 Market St., Youngstown 1, Ohio—CH
Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y., "Audiodises," "Audiopoints"—CN, D
Audiodiscs—Audio Devices, Inc.
Audiopoints—Audio Devices, Inc.
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—RG
Austin Electronic Mfg. Co., Warren, Pa.—CH, E, RM, RA
The Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio—CR, RP, TT
Bell & Howell Co., 1801 Larchmont Ave., Chicago 13, Ill.—F
Berger Electronics, 109-01 72nd Rd., Forest Hills, N. Y.—E, S
E. M. Berndt Corp., Auricon Div., 5515 Sunset Blvd., Hollywood 28, Calif.—F, RM
Best Mfg. Co. Inc., 1200 Grove St., Irvington 11, N. J.—E
Birch—Boetsch Bros.
Black Diamond—M. A. Gerett Corp.
The Bristol Co., Waterbury, Conn.—R
H. O. Boehme, Inc., 915 Broadway, New York 10, N. Y.—CR
Boetsch Bros., 221 E. 144th St., New York 51, N. Y., "Birch"—RM
Brush Development Co., 3318 Perkins Ave., Cleveland, 14, Ohio, "Soundmirror"—CH, E, MT
Cardy-Lundmark Co., 1801 W. Byron St., Chicago 13, Ill.—D
Carbide & Carbon Chemicals Corp., Plastics Div., 30 E. 42nd St., New York, N. Y.—RP
The Christiansen Co., Inc., 71 Willard Ave., Providence 5, R. I.—CN
C. G. Conn, Ltd., Elkhart, Ind.—CH, D, MT, RM
The Corbin Screw Corp., High, Myrtle & Grove Sts., New Britain, Conn.—S
The Daven Co., 191 Central Ave., Newark 4, N. J.—E
Dearborn Glass Co., 2414 W. 21st St., Chicago, Ill.—R
Dictaphone Corp., 420 Lexington Ave., New York, N. Y.—RM
Duodisc—Duotone Co.
Duotone Co., 799 Broadway, New York, N. Y., "Duodisc"—CH, D, CN, RA
The Eldeen Co., 504 N. Water St., Milwaukee 2, Wisc.—CN
Electronic Research Corp., 2659 W. 19th St., Chicago, Ill.—E
Electrovox Co., 169 Maplewood Ave., Maplewood, N. J.—"Walco"—CN
Emeloid Mfg. Co., 289 Laurel Ave., Arlington, N. J.—D
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—RA
Fairchild Aviation Corp., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y.—CH, E, RM
Federal Recorder Co., Inc., 630 S. Wabash Ave., Chicago 5, Ill.—D, RM
Filmgraph—Miles Reproducer Co., Inc.
Floch Process Co., 17 W. 31st St., New York, N. Y.—TT
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—CN, S
General Electric Co., 1 River Rd., Schenectady, N. Y.—MT
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—MT
The General Industries Co., Taylor & Olive Sts., Elyria, Ohio—M, RA, RM, TT
General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J.—RM
General Phonograph Corp., Putnam, Conn.—CN
M. A. Gerett Corp., 2947 N. 30th St., Milwaukee, Wis., "Black Diamond"—CN
The Gould-Moody Co., 395 Broadway, New York 13, N. Y., "Black Seal"—D, CN
Gray Mfg. Co., 230 Park Ave., New York, N. Y.—RM
Halstead Traffic Communications Corp., 155 E. 44th St., New York 17, N. Y.—MT
Harris Mfg. Co., 2422 W. 7th St., Los Angeles, Calif.—CN, D
Hayden Mfg. Co, Inc., Forestville, Conn.—RM, TT

Useful Applications in Electronic Developments .... No. 10



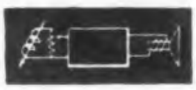
VISUAL FREQUENCY INDICATOR

TYPICAL USES: Measuring frequency of signal generators, etc.; measurement and study of machine vibration; tachometer.

WHAT IT IS AND HOW IT IS USED: Engineers working with electronic devices are usually concerned with frequency measurements in the audio range. This instrument gives an indication on the scale of a direct reading instrument of the actual frequency applied, irrespective of the strength of that signal. The process consists of converting the signal to a series of fixed amplitude pulses, and then adding up their effect in a meter circuit.

Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.—MT
Hollywood Electronics Co., Div. of Megard Corp., 1601 S. Burlington Ave., Los Angeles 6, Calif.—E
Home Recording Co., 699 E. 135th St., Bronx 54, N. Y.—D
Industrial Screw & Supply Co., 717 W. Lake St., Chicago 6, Ill.—S
Jefferson-Travis Radio Mfg. Corp., 245 E. 23rd St., New York 10, N. Y.—RM
Jensen Industries, 737 N. Michigan Ave., Chicago, Ill.—CN
The Langevin Co., Inc., 37 W. 65th St., New York, N. Y.—E, RM, RA, TT
Lear Avia, Inc., Piqua, Ohio—M
Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.—S
McElroy Mfg. Corp., 82 Brookline Ave., Boston, Mass.—CR
Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.—RG
Miles Reproducer Co., Inc., 812 Broadway, New York 3, N. Y.—CH, E, F, CN, RM, RA
Mirror Record Corp., 58 W. 25th St., New York, N. Y.—CR, CH, D, CN, RM
Montgomery Bros., 61 Fremont St., San Francisco, Calif.—RM
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 5, Ill.—CN, RM
The National Mineral Co., 2638 N. Pulaski Rd., Chicago 31, Ill.—F
The National Screw & Mfg. Co., 2440 E. 75th St., Cleveland 4, Ohio—S
New Products Corp., North Shore Drive, Benton Harbor, Mich.—RM
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif., "Port-Elec."—M, RM, RA, TT
The Paraloy Co., 600 S. Michigan Ave., Chicago, Ill.—CN
Permo Point—Permo, Inc.
Permo, Inc., 6415 Ravenswood Ave., Chicago 26, Ill., "Permo Point"—CN
Pfanstiehl Chemical Co., 104 Lakeview Ave., Waukegan, Ill.—CN
Philco Corp., Tioga & C Sts., Philadelphia, Pa.—CN, RM, TT
Phonograph Needle Mfg. Co., Inc., 42 Dudley St., Providence, R. I.—CN
Poinsettia, Inc., 86 Cedar Ave., Pitman, N. J.—RP
Port-Elec—Pacific Sound Equipment Co.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.—CH, D, E, CN, RM, RA, S, TT
Radiad Service, 720 W. Schubert Ave., Chicago 14, Ill.—F, TT
Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.—MT
Radiotone, Inc., 7356 Melrose Ave., Hollywood, Calif.—CH, D, E, CN, RM, RA, TT
Radiotone Div., The Robinson Houchin Optical Co., 79 Thurman Ave., Columbus 6, Ohio—RM
Rahm Instruments, Inc., 12 W. Broadway, New York 7, N. Y.—RG
The Rauland Corp., 4245 N. Knox Ave., Chicago, Ill—RM
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA"—CH, F, CN, RM, TT
The Recordisc Corp., 395 Broadway, New York 13, N. Y.—D, CN
The Recordit Co., 555 Bedford Ave., University City, Mo.—CN
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y—RM
Recoton Corp., 21-10 49th Ave., Long Island City, N. Y.—CN
Rek-O-Kut Corp., 176 Lafayette St., New York, N. Y.—M, RM, RA, TT
Frank Rieber, Inc., 11916 W. Pico Blvd., Los Angeles, Calif.—D, RM
Riggs & Jeffreys, Inc., 73 Winthrop Ave., Newark N. J.—CN, D, RM
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif., "Walsco"—RP
Scranton Record Co., 300 Brook St., Scranton, Pa.—CH, CN, D, E, M, MT, R, RA, RM, S, TT
Scully Machine Co., 62 Walter St., Bridgeport, Conn.—RM
Selectar Mfg. Corp., 21-10 49th Ave., Long Island City, N. Y.—RM
Shure Bros., 225 W. Huron St., Chicago 10, Ill.—CH
Mark Simpson Mfg. Co., Inc., 188 W. 4th St., New York, N. Y.—RM
S. O. S. Cinema Supply Corp., 449 W. 42nd St., New York 18, N. Y.—F
Sound Apparatus Co., 150 W. 46th St., New York 19, N. Y.—RG
Sound Devices Co., Inc., 160 E. 116th St., New York 29, N. Y.—D
Soundmirror—Brush Development Co.
The Sound Scriber Corp., 82 Audubon St., New Haven 11, Conn.—RM
Sparkes Mfg. Co., Ltd., 318 Jefferson St., Newark 5, N. J.—RM, RA, TT
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York 23, N. Y.—CH, D, CN, RM, RA, S, TT
Herman H. Sticht Co., Inc., 27 Park Place, New York 7, N. Y.—RG
Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago, Ill.—RA, RM, TT
Teleplex Co., 107 Hudson St., Jersey City 2, N. J.—CR
Thordarson Elec. Mfg. Co., 500 W. Huron St., Chicago, Ill.—E
Tibbetts Laboratories, 12 Norfolk St., Cambridge, Mass.—CH
Troy Radio & Television Co., 1144 S. Olive St., Los Angeles, Calif.—CN, D, M, RS
United Transformer Co., 150 Varick St., New York 13, N. Y.—E
Walco—Electrovox Co.
Walsco—Walter L. Schott Co.
Waters Conley Co., Rochester, Minn.—CR
Webster Electric Co., 1900 Clark St., Racine, Wis.—CH
Webster Products, 3825 W. Armitage Ave., Chicago 47, Ill.—RA, RM
Western Sound & Electric Labs., Inc., 3512 W. St. Paul Ave., Milwaukee 8, Wis.—RM
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—M
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—E
Wilcox-Gay Corp., Charlotte, Mich., "Wilcox-Gay"—D, RM
Zephyr Prods. Co., 160 E. 116th St., New York 29, N. Y.—D

Records, Transcriptions & Playing Equipment



Automatic record changers	ARC
Coin record players	CM
Electric phonographs	EL
Felt-flock, turntable	F
Frequency records	FR
Needles	N
Pick-ups (crystal)	PC
Pick-ups (dynamic)	D
Pick-ups (magnetic)	PM
Records	R
Record compounds	RC
Record pressers	RM
Sound effect records	S
Transcription record players	TR
Turntables	TT

H. W. Acton Co., Inc., 370 7th Ave., New York, N. Y.—"Actone"—N
Actone—H. W. Acton Co., Inc.
Admiral Corp., 3800 W. Cortland St., Chicago 47, Ill.
Air-King Products Co., Inc., 1523-29 63rd St., Brooklyn 19, N. Y.—ARC, EL
Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio—ARC, F, TT
Andrea Radio Corp., 43-20—34th St., Long Island City, N. Y.—EL
Ansley Radio Corp., 21-10—49th Ave., Long Island City 1, N. Y.—EL
The Astatic Corp., 830 Market St., Youngstown 1, Ohio—PC
Auburn Mfg. Co., 102 Stack St., Middletown, Conn.—F
Audak Co., 500 Fifth Ave., New York, N. Y., "Audax"—PM
Audax—Audak Co.
Audio Devices, Inc., 1600 Broadway, New York, N. Y., "Audiopoint"—N
Audiopoint—Audio Devices, Inc.
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—FR, TR
The Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio—ARC,EL
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—PC, D, PM
Berger Electronics, 109-01 72nd Rd., Forest Hills, L. I., N. Y.—N, F
Birch—Boetsch Bros., New York, N. Y.
Bluebird—RCA Victor Div., Radio Corp. of America
Boetsch Bros., 221 E. 144th St., New York, N. Y., "Birch"—EL, F, TR
David Bogen Co., Inc., 663 Broadway, New York 12, N. Y.—ARC, EL, TR
Brunswick Div., Mersman Bros. Corp., 244 Madison Ave., New York, N. Y.—EL
Brush Development Co., 3311 Perkins Ave., Cleveland 14, Ohio—PC
Calvert Motors Associates, Ltd., 1028 Linden Ave., Baltimore, Md.—EL
The Christiansen Co., Inc., 71 Willard Ave., Providence 5, R. I.—N
Classic Point—The Eldeen Co.
Columbia Associates, 141 W. 24th St., New York, N. Y.—EL
Columbia Recording Corp., 1473 Barnum Ave., Bridgeport, Conn., "Columbia," "Masterworks," "Okeh"—EL, N, R, RA, RM
Decca Records, Inc., 50 W. 57th St., New York, N. Y., "Decca"—EL, M, N, PC, R, RA, RP
Duotone Co., 799 Broadway, New York, N. Y.—N, R
"Durashield"—Plastic Fabricators Co.
The Eldeen Co., 504 N. Water St., Milwaukee 2, Wis. "Classic Point," "Maestro Point," "Merit Point," "Victory Point"—N
Electrical Research Laboratories, Inc., 2020 Ridge Ave., Evanston, Ill.—EL, RP
Emerson Radio & Phonograph Corp., 111 8th Ave., New York 11, N. Y.—EL, N
Espey Mfg. Co., Inc., 305 E. 63d St., New York 21, N. Y.—EL
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—EL, TR
Fairchild Aviation Corp., 88-06 Van Wyck Blvd., Jamaica, L. I.,N. Y.—D, TR
Farnsworth Telev. & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.—ARC, EL, RP
Fidelitone—Permo, Inc.
Flock Process Co., 17 W. 31st St., New York, N. Y.—F
Freed Radio Corp., 200 Hudson Street, New York, N. Y.—"Freed-Eisemann,"—EL
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill.—"Motorola"—ARC, N, PC, RA, EL
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—F, TR, TT
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.—ARC, EL, N, PC, PM, TR, TT
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—F, N, RC
General Electric Co., 1 River Rd., Schenectady, N. Y—EL
The General Industries Co., Taylor & Olive Sts., Elyria, Ohio—ARC, TR, TT
General Instrument Corp., 829 Newark Ave., Elizabeth, 3, N. J.—ARC, TT
General Phonograph Corp., Putnam, Conn.—N
M. A. Gerrett Corp., 724 W. Winnebago St., Milwaukee 5, Wis.—"Miracle Point"—N
Godfrey Mfg. Corp., 171 South 2nd St., Milwaukee 4, Wisc.—EL
Goldenpoint—Lowell Needle Co.
Goldentone—Lowell Needle Co.
Halstead Traffic Communications Corp., 155 E. 44th St., New York 17, N. Y.—TR
Harris Mfg. Co., 2422 W. 7th St., Los Angeles 5, Calif.—EL, TR
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—EL, TR
Heroservice, 45 W. 45th St., New York 19, N. Y.—S
Hilo—Shure Bros.
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—ARC, EL
Jensen Industries, Inc., 737 N. Michigan Ave., Chicago, Ill.—N
Lowell Needle Co., 1 Wildore St., Putnam, Conn., "Goldentone," "Goldenpoint"—N
Maestro Point—The Eldeen Co.
The Magnavox Co., Inc., 2131 Bueter Rd., Ft. Wayne, Ind.—EL
Masterworks—Columbia Recording Corp.
John Meck Industries, Liberty St., Plymouth, Ind.—EL
Merit Point—The Eldeen Co.
Miracle Point—M. A. Gerett Corp.
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 5, Ill.—EL, NR, TR
National Die Casting Co., 600 N. Albany Ave., Chicago 12, Ill.—ARC, CM
National Union Radio Corp., 15 Washington St., Newark 2, N. J.—ARC
Newcombe Audio Products Co., 2815 S. Hill St., Los Angeles 7, Calif.—CM, EL, TR
New Products Corp., North Shore Drive, Benton Harbor, Mich.—ARC, TR
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill.—ARC
Okeh—Columbia Recording Corp.
Operadio Mfg. Co., 13th & Indiana Sts., St. Charles, Ill., "Operadio."—EL
Otto K. Olesen Ill Co., Ltd., 1560 No. Vine St., Hollywood 28, Calif.—EL, TR
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif., "Port-Elec."—EL, N, PC, TR,
The Paraloy Co., 600 S. Michigan Ave., Chicago, Ill.—N
Permo Point—Permo Inc.
Permo Inc., 6415 Ravenswood Ave., Chicago 26, Ill. "Fideltone," "Permo Point"—N
Pfanstiehl Chemical Co., 104 Lake View Ave., Waukegan, Ill.—N
Philco Corp., Tioga & C Sts., Philadelphia, Pa.—ARC, EL

Phonograph Needle Mfg. Co., Inc., 42 Dudley St., Providence, R. I., "Supreme"—N
Phonola—Waters-Conley Co.
Plastic Fabricators Co., 440 Sansome St., San Francisco, Calif.—"Rurashield"—FR, TT
Poinsettia, Inc., 96 Cedar Ave., Pitman, N. J.—R, RC, RM
Port-Elec.—Pacific Sound Equipment Co.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.—N, PM, TR, TT
Radiad Service, 720 W. Schubert Ave., Chicago 14, Ill.—TR, TT
Radiotone, Inc., 7356 Melrose Ave., Hollywood, Calif.—TR
Radiotone Div., Robinson Houchin Optical Co., 79 Thurman Ave., Columbus 6, Ohio—TR
Radolek Co., 601 W. Randolph St., Chicago, Ill., "Radolek".—EL, RP, TR
Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.—TR
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA," "Victor," "Bluebird"—ARC, EL, N, PC, PM, R, TR, TT
The Recordit Co., 535 Bedford Ave., University City, Mo.—N, R
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y. ARC, EL, CM
Recoton Corp., 21-10 49th Ave., Long Island City, N. Y.—N
Regal Amplifier Mfg. Corp., 20 West 20th St., New York, N. Y.—ARC, EL R, TR
Riggs & Jeffries, Inc., 73 Winthrop St., Newark 4, N. J.—N, R
Walter L. Schott Co., 9308 Santa Monica Blvd., Beverly Hills, Calif., "Walsco"—RC
Scranton Record Co., 300 Brook St., Scranton, Pa. ARC, CM, D, EL, F, N, PC, PM, R, RA, RM, TR, TT
Shure Bros., 225 W. Huron St., Chicago 10, Ill., "Hilo," "Zephyr"—IC
Mark Simpson Mfg. Co., Inc., 188 W. 4th St., New York, N. Y.—EL, TR
Sonora Radio & Television Corp., 325 N. Hoyne Ave., Chicago, Ill.—"Sonora"—EL, R
Sonart Record Corp., 251 W. 42nd St., New York 18, N. Y.—R
The Sound Scriber Corp., 82 Audubon St., New Haven 11, Conn.—TR
Sparkes Mfg. Co., Ltd., 318 Jefferson St., Newark 5, N. J.—ARC, EL, TR, TT
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York 23, N. Y.—EL, N, PC, D, PM, R, TR, TT
Stark Sound Engineering Corp., 616 High, Ft. Waine 2, Indiana—R
Stromberg-Carlson Co., 100 Carlson Rd., Rochester, N. Y., "Stromberg-Carlson"—EL, ARC
Supreme—Phonograph Needle Mfg. Co., Inc.
Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago, Ill.—ARC, EL, TR, TT
Tibbetts Laboratories, 12 Norfolk St., Cambridge, Mass.—PC
Trav-Ler Karenola Radio & Television Corp., 1028 W. Van Buren St., Chicago 7, Ill.—ARC, EL
Troy Radio & Television Co., 1144 S. Olive St., Los Angeles, Calif.—ARC, EL, N, PC, PM, R
Victor—RCA Victor Div., Radio Corp. of America.
Victory Point—The Eldeen Co.
Walsco—Walter L. Schott Co.
Waters Conley Co., 501 First Ave. N. W., Rochester, Minn." "Phonola"—EL
Webster Electric Co., 1900 Clark St., Racine, Wis.—PC, PM
Webster Products, 3825 W. Armitage Ave., Chicago 47, Ill.—ARC, EL, F, TT
Western Elec. Co., 300 Central Ave., Kearney, N. J.—EL, PM, TR
Western Sound & Electric Labs., Inc., 3512 W. St. Paul Ave., Milwaukee 8, Wis.—TR
Wilcox-Gay Corp., Charlotte, Mich.—ARC, EL, N
The Rudolph Wurlitzer Co., Niagara Falls Blvd., North Tonawanda, N. Y.—ARC, CM
Zephyr—Shure Bros.

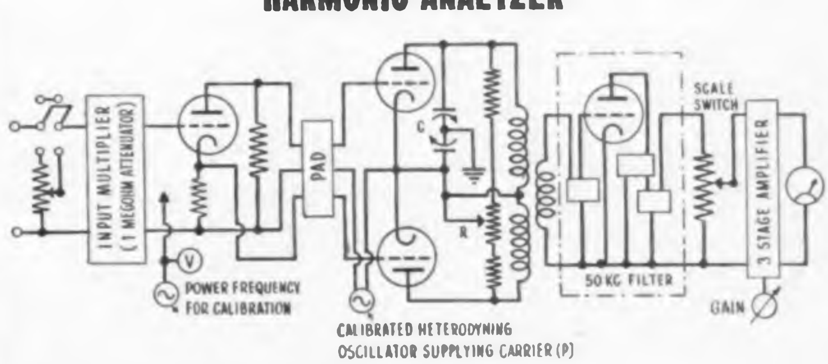
Resistors & Volume Controls

Attenuators (precision) ....A
Fixed composition ....FC
Fixed wirewound ....FW
High frequency resis. slug..................HR
Industrial fixed I
Neg. temp. coeff. resis..................N
Plug-in (tubes) ....PT
Power rheostats ....PR
Precision ....PRE
Slide-wire potentiometers ....S
Suppressors ....SU
Variable V
Volume controls VC

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.—"Insulated Carbon"—FW, V
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 4, Wis.—"Bradleyometer," "Bradleyunit"—A, FC, PR, V, VC
American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—FW, SU
Amperite Co., 561 Broadway, New York 12, N. Y.—V
Atlas Resistor Co., 425 Broome St., New York, N. Y., "Atlas"—FW, V
The Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—A
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—FW
Berger Electronics, 109-01 72nd Rd., Forest Hills, L. I., N. Y.—V, VC
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—A
James G. Biddle Co., 1211 Arch St., Philadelphia, Pa.—PR
The Birtcher Corp., 5087 Huntington Dr., N., Los Angeles, Calif.—FC
Bradleyometer—Allen-Bradley Co.
Bradleyunit—Allen-Bradley Co.
Brown Devil—Ohmite Mfg. Co.
Candohms—The Muter Co.
Carborundum Co., Box 337, Niagara Falls, N. Y.—FC, I, SU
Centralab, Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.—PR
Chicago Telephone Supply Co., Elkhart, Ind.—PRE, S, V, VC
Clarostat Mfg. Co., Inc., 285 N. 6th St., Brooklyn, N. Y., "Clarostat"—A, FC, FW, I, PT, PR, PRE, V, VC
Consolidated Wire & Assoc. Corps., 1635 S. Clinton, Chicago, Ill.—FC, FW, SU, W
Continental Carbon, Inc., 13900 Loraine Ave., Cleveland, Ohio, "Continental"—FC, FW, PRE, SU
Corning Glass Works, Corning, N. Y.—A
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.—FW, I
The Daven Co., 191 Central Ave., Newark 4, N. J.—A, FW, PRE
Dependable—Radio City Prods. Co., Inc.
De Jur-Amsco Corp., 6 Bridge St., Shelton, Conn.—PR, V, VC
Dividohm—Ohmite Mfg. Co.
Electrical Reactance Corp., Franklinville, N. Y.—FW
Electronic Prods. Co., 19 N. 1st St., Geneva, Ill.—A, FC, FW, I
Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—A, FC, FW
The Eppley Laboratory, Inc., 12 Sheffield Ave., Newport, R. I.—PRE
Erie Resistor Corp., 644 W. 12th St., Erie, Pa.—FC, SU
Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—A, FW
Ex-Stat—Tilton Electric Co.
Ferris Instrument Co., 110 Cornelia St., Boonton, N. J.—A, S
General Electric Co., 1 River Rd., Schenectady, N. Y.—I, PR, PT
General Radio Co., 30 State St., Cambridge, Mass., "G-R"—A FW, HR, PR, PRE, S, V, VC
G-H—Girard-Hopkins
Girard-Hopkins, 1000 40th Ave., Oakland, Calif., "G-H"—FC
G-R—General Radio Co.
Groves Corp., Cape Giraudeau, Mo.—FW
Hardwick & Hindle, Inc., 40 Herman St., Newark, N. J.—FW, I, PR, S, V
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.—A
Hollywood Electronics, Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif.—A
Hytron Corp., 23 New Derby St., Salem, Mass., "Hytron"—PT
ICA—Insuline Corp. of America
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.—I
Instrument Resistors Co., 25 Amity St., Little Falls, N. J.—FW
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., "ICA"—FW, PRE, SU, V.
International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa., "IRC"—A, FC, FW, HR, I, PR, PRE, S, SU, V, VC
IRC—International Resistance Co.
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn, N. Y., "JFD"—PT
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—A, PRE, S
Keystone Carbon Co., Inc., 1935 State St., St. Marys, Pa.—N
Koolohms—Sprague Products Co.
Landis & Gyr, Inc., 104 5th Ave., New York, N. Y.—FW, I
Lectrohm, Inc., 5125 W. 25th St., Cicero 50, Ill.—FW, V
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.—S

Useful Applications in Electronic Developments..........No. 11

HARMONIC ANALYZER



TYPICAL USES: Study behavior of oscillators and amplifiers for radio, sound, and industrial applications.

WHAT IT IS AND HOW IT IS USED: This instrument samples any applied audio tone, as to the frequency and amplitude of the fundamental and any other components present. The principle of operation is to heterodyne the signal with a variable oscillator so that a 50 kc beat note occurs at successive points in the audio band over which the sampling is carried out. A 50 kc band pass filter that has a flat-top characteristic a few cycles wide, permits the measurement of the amplitude of each harmonic encountered, where it can be compared with the intensity of the fundamental.

P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—FW, I, V, VC, PR

Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y.—FW, PT

Microhm—Precision Resistor Co.

Multivolt—Ohmite Mfg. Co.

The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill.—"Candohms," "Zipohms"—FW, PT, V

National Electric Controller Co., 5307 Ravenswood Ave., Chicago 40, Ill.—"National"—PR

National Technical Laboratories, 820 Mission St., S. Pasadena, Calif.—"Beckman"—PRE, S

National Union Radio Corp., 15 Washington St., Newark 2, N. J.—VC

Nillson Elec. Lab., Inc., 103 Lafayette St., New York 13, N. Y.—PRE

The Ohio Carbon Co., 12508 Berea Rd., Cleveland 11, Ohio—FC, FW, SU

Ohmite Mfg. Co., 4835 Flournoy St., Chicago 44, Ill., "Ohmite," "Brown Devil," "Corrib," "Multivolt," "Riteohm," "Dividohm," "Wirewatt"—A, FW, I, PR, PRE, S, V

Ohmspun—The States Co.

Oregon Electronic Mfg. Co., 206 S. W. Washington St., Portland 4, Oregon—S

Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.—FW

Philco Corp., Tioga & S Sts., Philadelphia, Pa.—FW, PT, SU, V, VC

Precision Resistor Co., 334 Badger Ave., Newark, N. J., "Microhm"—A, I, PR, PRE, RW, V

Radio City Products Co., Inc., 127 W. 26th St., New York, N. Y., "Dependable"—PRE

Raytheon Production Corp., 55 Chapel St., Newton, Mass.—PT

Rex Rheostat Co., 3 Foxhurst Rd., Baldwin, L. I., N. Y.—FW, I, PR, S, V

Riteohm—Ohmite Mfg. Co.

Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—A

Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago, Ill.—A

Sensitive Research Instrument Co., 4545 Bronx Blvd., New York, N. Y.—FW

Shallcross Mfg. Co., Jackson & Pusey Aves., Collingdale, Pa.—FW, PRE

Speer Carbon Co., St. Marys, Pa.—FC

Speer Resistor Corp., St. Marys, Pa.—FW, V

Sprague Products Co., N. Adams, Mass., "Koolohms"—FW, I, PRE

Sprague Specialties Co., N. Adams, Mass.—FW, I, PRE

Stackpole Carbon Co., PO Box 327, St. Marys, Pa.—FC, V, VC

The States Co., 19 New Park Ave., Hartford 6, Conn.—"Ohmspun"—FC, FW

Herman H. Sticht Co., Inc., 27 Park Pl., New York, N. Y.—FW, PR, PRE

Sylvania Electric Products, Inc., Emporium, Pa., "Sylvania"—PT

Tech Laboratories, 7 Lincoln St., Jersey City, 7, N. J., "Tech Lab"—A, FW, VC

Techtmann Indsutries, Inc., 828 N. Broadway, Milwaukee 2, Wisc.—FW, I

Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Phila 44, Pa.—S

Tilton Electric Corp., 138 W. 17th St., New York, N. Y., "Ex-Stat"—FW, SU, VC

Trutest—Lafayette Radio Corp.

H. W. Tuttle & Co., 261 W. Maumee St., Adrian, Mich.—FW, I

Utah Radio Products Co., 820 Orleans St., Chicago, Ill.—A, FW, I, PRE, V, VC

Variaten Cinema Engr. Co., 1508 W. Verdugo Ave., Burbank, Calif.—A, FW, PRE, VC

Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.—FW, I, PR, S, V

Watlow Electric Mfg. Co., 1320 N. 23rd St., St. Louis 6, Mo.—FC, FW

Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.—FC, FW, HR, PR, PRE

Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.—S

The S. S. White Dental Mfg. Co., Industrial Div., 10 E. 40th St., New York 16, N. Y.—FC

The Winslow Co., 31 Fulton St., Newark 2, N. J.—PRE

Wirl Co., 5221 Greene St., Phildelphia 44, Pa.—FW, I, SU, V, VC

Wirtco Phenocote—Wirt Co.

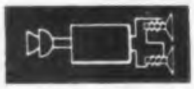
Wright Resistors, 7 W. 30th St., New York 1, N. Y.—FW, I, PRE, S, V, P

The Rudolph Wurlitzer Co., Falls Blvd., No. Tonawanda, N. Y.—A

Yaxley—P. R. Mallory & Co., Inc.

Zipohms—The Muter Co.

Sound Systems, Intercommunicators & Hearing Aids



Acoustic materials	AM
Bell, buzzers	B
Electronic musical equip	E
Hearing aids	H
Intercommunicators	I
Mobile amplifiers	M
Power amplifiers	PA
Pre amplifiers	PRE
Remote controllers	RC
Sound systems (complete)	SS
Car-top speaker rack	CR

ACA—Amplifier Co. of America

Aircraft Accessories Corp., Fairfax & Funsten Rd., Kansas City, Kans.—M, PA, PRE

Altec Lansing Corp., 1680 No. Vine St., Hollywood 28, Calif.—PA, PRE, SS

American Amplifier & Tel. Co., Inc., 1222 Glendon Ave., Los Angeles, Calif.—I

American Automatic Electric Sales Co., 1019 W. Van Buren St., Chicago, Ill.—I

American Communications Corp., 306 Broadway, New York 7, N. Y.—PA, PRE, SS, I, M

American Transformer Co., 178 Emmet St., Newark, N. J.—PA

Amperite Co., 561 Broadway, New York, N. Y., "Amperite"—PRE

Amplifier Co. of America, 398 Broadway, New York 13, N. Y., "ACA"—M, PA, PRE, RC, SS, H, I

Ampro Corp. 2851 N. Western Ave., Chicago 18, Ill.—PA

Ansley Radio Corp., 21-10 49th Ave., Long Island City 1, N. Y.—I, E

Art Specialty Co., 3245 W. Lake St. Chicago 24, Ill.—CR

Atlas—David Bogen Co., Inc.

Atlas Sound Corp., 1443 39th St., Brooklyn 18, N. Y.—AM, SS, CR

Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—PRE

Audiograph—John Meck Industries

Austin Electronic Mfg. Co., Warren, Pa.—PA, PRE, RC, SS, I

Autocrat-Phone—Autocrat Radio Co.

Autocrat Radio Co., 3855 N. Hamilton Ave., Chicago, Ill., "Autocrat-Phone"—I

Bank's Manufacturing Corp., 1105 Lawrence Ave., Chicago 40, Ill.—I, PA, SS

Rex Bassett, Inc., Bassett Bldg., 500 Second St., Ft. Lauderdale, Fla.—I, M, PA, PRE, SS

Belfone—Bell Sound Systems, Inc.

Bell Radio & Television, 125 E. 46th St., New York, N. Y.—SS

Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio, "Belfone"—M, PA, PRE, RC, SS, I, CR

Bendix Aviation Corp., Pacific Div., 11600 Sherman Wal, N. Hollywood, Calif.—I, PRE

David Bogen Co., Inc., 663 Broadway, New York 12, N. Y., "Atlas"—I, M, PA, PRE, RC, SS

Boom Electric & Amplifier Co., 1227 W. Washington Blvd., Chicago, Ill.—SS

Brush Development Co., 3311 Perkins Ave., Cleveland 14, Ohio.—H

Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.—I, PA, SS

Clarion—Electronic Corp. of America

Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago 47, Ill.—M, PA, PRE

Commercial Research Laboratories, Inc., 20 Bartlett Ave., Detroit 3, Mich.—PA

Communications Co., Inc., 300 Greco Ave., Coral Gables 34, Fla.—I, PRE

Communications Equipment Corporation, 134 W. Colorado St., Pasadena 1, Calif.—I, M, PA, PRE, RC, SS, CR

C. G. Conn, Ltd., Elkhart, Ind.—SS

Conn. Telephone & Elec. Div., Great American Industries, Inc., Meriden, Conn.—I

Consolidated Engineering Corp., 1255 E. Green St., Pasadena 5, Calif.—PA

Control Corp., 600 Stinson Blvd., Minneapolis, Minn.—I

Crystal-Vox Hearing Instruments Co., 442 Book Bldg., Detroit 26, Mich.—H

Dalmo Victor, Inc., 620 York St., San Francisco 10, Calif.—I

DeVry Corp., 1111 Armitage Ave., Chicago, Ill.—SS

De Wald Radio Mfg., Corp., 440 Lafayette St., New York, N. Y.—I

Dilks Acoustic Products Co., 540 West Ave., Norwalk, Conn.—M, PA, SS

Frank I. Dufrane Co., Inc., 1138 Howard St., San Francisco, Calif.—SS, I

Eastern Amplifier Corp., 794 E. 140th St., Bronx 3, N. Y.—M, PA, PRE, RC, SS

Eckstein Radio & Television Co., 1400 Harmon Pl., Minneapolis 3, Minn.—M, PA, PRE

Electrical Research Lab., 122 W. New York St., Evanston, Ill.—I

Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia 32, Pa.—B

Electro Products Labs., 549 W. Randolph St., Chicago, Ill.—RC

Electronic Corp. of America, 45 W. 18th St., New York, N. Y., "Clarion"—M, PA, PRE, RC, SS, I

Electronic Specialty Co., 3458 Glendale Blvd., Los Angeles 26, Calif.—I

Electronic Sound Engineering Co., 109 N. Dearborn St., Chicago 2, Ill.—I, M, PA, PRE, RC, SS

Empire Radio Mfg., 114 E. 47th St., New York, N. Y.—SS

Erwood Co., 223 W. Erie, Chicago, Ill.—M, PA, PRE, RC, SS, CR

Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—H, I

Executone, Inc., 415 Lexington Ave., New York 17, N. Y.—PA, SS, I, PRE, RC

Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—PRE

Fairchild Aviation Co., 88-06 Van Wyck Blvd., Jamaica, N. Y.—PA

Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.—PA, PRE, SS

Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—I, M, PA, PRE, RC, SS

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y., "Ferranti"—I, M, PA

The Forest Electronic Co., 320 E. 65th St., New York, N. Y.—PA, SS

Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—I, M, PA, PRE, SS

Gates American Corp., Quincy, Ill.—SS

General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—I, M, PA, PRE, RC, SS, CR

Gentleman Products Div., Henney Motor Co., 1708 Cuming St., Omaha, Nebr.—M, PA, PRE, RC, SS, I

Thos. B. Gibbs Co., Delavan, Wis.—PA

Gibson, Inc., 225 Parsons St., Kalamazoo 13F, Mich.—E

Godfrey Mfg. Corp., 171 So. 2nd St., Milwaukee 4, Wis.—PA, PRE, SS, I, M

Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—H, PA

Halstead Traffic Communications Corp., 155 E. 44th St., New York 17, N. Y.—I, RC

Herbach & Rademan Co., Mfg Div., 517 Ludlow St., Philadelphia 6, Pa.—M, PA, PRE, RC, SS

Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.—I, M, PA, PRE, RC, SS

A. G. Hintze Co., 1547 Westchester Blvd., Westchester, Ill.—AM, H, I

Hoffman Radio Corp., 3430 So. Hill St., Los Angeles 7, Calif.—I, SS

C. L. Hoffman Corp., 436 Blvd. of Allies, Pittsburgh, Pa.—H

Hollywood Electronics Co., Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif.—M, PA, PRE, SS, I, RC

Holtzer-Cabot Electric Co., 400 Stuart St., Boston 17, Mass.—PA, PRE, SS

Horni Signal Mfg. Corp., 310 Hudson St., New York, N. Y.—I

Hudson American Corp., 23 W. 43rd St., New York, N. Y.—PA, PRE, SS

Industrial Sound Products Co., 3597 Mission St., San Francisco 10, Calif.—I, PA

Industrial Transformer Corp., 2540 Belmont Ave., New York 58, N. Y.—PA

Intercall Systems, Inc., 610 Linden Ave., Dayton 1, Ohio—I

International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—H, I, M, RC, SS

International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—SS, I

Johns-Manville, 22 E. 40th St., New York, N. Y.—AM

Karadio Corp., 1400 Harmon Pl., Minneapolis, Minn.—M, PA, PRE

Lake Mfg. Co., 2323 Chestnut St., Oakland 7, Calif.—I, B

Langevin Co., Inc., 37 W. 65th St., New York, N. Y.—M, PA, PRE, RC, SS

Laurehk Radio Mfg. Co., 3931 Monroe Ave., Wayne, Mich., "Laurehk"—H, I, SS

Lektra Laboratories, Inc., 30 E. Tenth St., New York, N. Y.—I

Lifetime Sound Equipment Co., 1101-1103 Adams St., Toledo, Ohio—SS

Lincrophone Co., 1661 Howard Ave., Utica, N. Y.—M, PA, SS

Maico Co., Inc., Minneapolis 8, Minn.—H

John Meck Industries, Liberty St., Plymouth, Ind., "Audiograph"—M, PA, PRE, SS, I, CR

Meissner Mfg. Co., 7th and Belmont, Mt. Carmel, Ill.—PA, I

Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y. "Miles"—M, PA, PRE, RC, SS, I

James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—PA
Music Master Mfg. Co., 542 So. Dearborn St., Chicago 5, Ill.—I, M, PA, PRE, SS
E. A. Myers & Sons, Radioear Bldg., Mt. Lebanon, Pittsburgh 16, Pa., Radiocar"—H
National Co., Inc., 61 Sherman St., Malden 48, Mass. —PA
National Inter-Communicating Systems, 2434 Montrose Ave., Chicago 18, Ill., "Convers-O-Call"—PA, PRE, SS, I
National Mineral Co., 2638 No. Pulaski Rd., Chicago 31, Ill.—PA, RC
National Union Radio Corp., 15 Washington St., Newark 2, N. J.—M, PA, SS, I
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles 7, Calif.—M, PA, PRE, RC, SS, I
The North Electric Mfg. Co., P. O. Box 267, Galion, Ohio.—I
Operadio Mfg. Co., 13th & Indiana Sts., St. Charles, Ill., "Operadio"—M, PA, PRE, RC, SS, I
Otarion, Inc., 448 No. Wells St., Chicago 10, Ill.—H
Oxford Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—M, PA, PRE, SS
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif., "Port-Elec"—SS
Paraphone Hearing Aid, Inc., 2056 E. 4th, Cleveland 15, Ohio., "Paravox"—H
Philco Corp., Tioga & C Sts., Philadelphia 34, Pa.—I, PA
Philmore Mfg. Co., 113 University Place, New York, N. Y.—I
Phonette Co. of America, 7122 Melrose Ave., Los Angeles, Calif.—I
Port-Elec—Pacific Sound Equipment Co.
Port A Fone—Austin Electronic Mfg. Co.
Radex Corp., 1322 Elston Ave., Chicago, Ill.—I
Powers Electronic & Communication Co., Inc., New St., Glen Cove, L. I., N. Y.—M, PA, PRE, SS
Power Equipment Co., 627 W. Alexandrine, Detroit 5, Mich.—SS
Presto Recording Corp., 242 W. 55th St., New York, N. Y., "Presto"—M, PA, PRE
Racon Elec. Co., Inc., 52 E. 19th St., New York 3, N. Y.—AM
Radiad Service, 720 Schubert Ave., Chicago, Ill.—PA
Radio Electronic Co., 1816 Villanova Drive, Oakland, Calif.—SS, I
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.—PA, SS
Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.—SS
Radio Specialty Mfg. Co., 403 N.W. 9th St., Portland, Ore.—I, M, PA, PRE
Radiotechnic Lab., 1328 Sherman Ave., Evanston, Ill. —SS
Riggs & Jeffrics, Inc., 73 Winthrop St., Newark 4, N. J.
Rauland Corp., 4245 N. Knox Ave., Chicago 4, Ill. —I, M, PA, PRE, SS, RC
Raytheon Mfg. Co., 190 Willow St., Waltham, Mass. PA, PRE
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—I, M, PA, PRE, RC, SS
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.—I
Regal Amplifier Mfg. Corp., 20 W. 20th St., New York, N. Y.—M, PA, SS, I
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill. —M, PA, PRE, SS
Remler Co., Ltd., 2101 Bryant St., San Francisco 0, Calif., "Remler"—I, PA, PRE, SS
Frank Rieber, Inc., 11916 West Pico Blvd., Los Angeles, Calif.—PA, PRE, RC, SS
Rowe Radio Research Laboratory Co., 2428 N. Pulaski Rd., Chicago, Ill.—PRE
Ruby Electric Co., 729 Seventh Ave., New York 19, N. Y.—I, M, PA, SS
Schulmerich Electronics Inc., Temple Ave., Sellersville, Pa.—M, PA, PRE, RC, SS, H, I
Select-O-Phone Co., Div. of Screw Machine Products Co., Inc., 1012 Eddy St., Providence 5, R. I.—I
Setchell-Carlson, Inc., 2233 University Ave., St. Paul, Minn., "Setchell-Carlson"—PA, SS, M
Shure Bros., 225 W. Huron St., Chicago 10, Ill.—H
Silman Mfg. Corp., 305 Pennsylvania Ave., Pittsburgh, Pa.—PA, PRE, I
Mark Simpson Mfg. Co., Inc., 188 W. 4th St., New York, N. Y.—M, PA, PRE, RC, SS, I
Sonotone Corp., P. O. Box 200, Elmsford, N. Y.—H
S. O. S. Cinema Supply Corp., 449 W. 42nd St., New York 18, N. Y.—M, PA, PRE, SS
Sound Equipment Corp., 6245 Lexington Ave., Hollywood 38, Calif.—M, PA, PRE, SS
Stark Sound Engineering Corp., 616 High St., Ft. Wayne 2, Ind.—SS
C. H. Stoelting Co., 424 No. Homan Ave., Chicago 24, Ill.—AM
The Sound Scriber Corp., 82 Audubon St., New Haven, Conn.—PRE
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 8, N. Y., "Stromberg-Carlson"—PA, PRE, SS, RC
Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago 7, Ill.—PRE, RC, PA, I
Technical Apparatus Co., Inc., 1171 Tremont St., Boston, Mass.—PRE
Tel Autograph Corp., 16 W. 61st St., New York 23, N. Y.—I
Telemotor Corp., 260-5th Ave., New York, N. Y. —I
Telex Products Co., Telex Park, Minneapolis, Minn. —H
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago 10, Ill., "Flashtron"—M, PA, PRE, RC
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.—PA, PRE, RC, M, SS
Trav-Ler Karenola Radio & Television Corp., 1028-36 W. Van Buren St., Chicago 7, Ill.—I
Trebor Radio Co., Pasadena 18, Calif.—I
Troy Radio & Television Co., 1144 S. Olive St., Los Angeles, Calif.—I
Triumph Mfg. Co., 913 W. Van Buren St., Chicago, Ill.—PA, PRE, SS
Vac-O-Grip Co., 2025 Detroit Ave., Toledo 6, Ohio —CR
Viking Instruments, Inc., 432 Fairfield Ave., Stamford, Conn.—I, RC
Waterman Products Co., Inc., 1900 N. 6th St., Philadelphia 22, Pa.—PA
Webster Electric Co., 1900 Clark St., Racine, Wis., "Webster Electric"—M, PA, PRE, RC, SS, I
Wesbar Stamping Corp., West Bend, Wis.—CR
Western Electric Co., 195 Broadway, New York, N. Y. —PA, PRE, SS
Western Sound & Elec. Labs., Inc., 3512 W. St. Paul Ave., Milwaukee 8, Wis.—M, P, PRE, RC, SS, I
Wilcox Electric Co., 1400 Chestnut St., Kansas City 1, Mo.—PA, PRE, M
Whisk Laboratores, 145 W. 45th St., New York 19, N. Y.—M, PA, PRE
Rudolph Wurlitzer Co., Falls Blvd., No. Tonawanda, N. Y.—I, PA, PRE

Speakers & Headphones

Acoustic chambers	CH
Baffles	B
Cones	C
Crystal headphones	HC
Crystal speakers	CS
Dynamic headphones	HD
Electro-dynamic	D
Field coils	F
Field exciters	FE
Grille cloths	GC
Hearing aid headphones	HA
Magnetic speakers	M
Magnetic headphones	HM
PM drivers	PD
Permanent magnet dynamic	PM
Projector horns	PH
Shims, adjusting	S
Stands	ST

The Acme Wire Co., 1255 Dixwell Ave., New Haven 14, Conn.—F
Adler Mfg. Co., 2901 W. Chestnut St., Louisville, Ky. —B
Altec Lansing Corp., 1680 No. Vine St. Hollywood 29, Calif.—B, D, F, FE, PM, PH
American Amplifier & Tel. Co., Inc., 1222 Glendon Ave., Los Angeles, Calif.—HM
American Communications Corp., 306 Broadway, New York 7, N. Y.—B, FE, PH.
Apex Industries, Inc., 1035 W. Lake St., Chicago, Ill. —F
Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill. —B, PH, ST
Atlas Sound Corp., 1443—39th St., Brooklyn 18, N. Y.—CH, B, C, D, F, FE, GC, M, PD, PM, PH, ST.
Auburn Mfg. Co., 100 Stack St., Middletown, Conn. —S
Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.—CH
Autocrat Radio Co., 3855 N. Hamilton Ave., Chicago, Ill.—HM
Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.— C, D, F, FE, M, HM, PD, PM, S
Brush Development Co., 3311 Perkins Ave., Cleveland 14, Ohio—HC
C. F. Cannon Co., Springwater, N. Y.—HM
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill. —HM
Chicago Telephone Supply Co., 1142 W. Beardsley Ave., Elkhart, Ind. "Frost"—HM
Cinaudagraph Speakers, Inc., 3929 S. Michigan Blvd., Chicago, Ill.—B, C, CH, D, F, FE, GC, M, PM, PD, PH, S, ST
Cleveland Wire Cloth & Mfg. Co., 3173 E. 78th St., Cleveland 5, Ohio—GC
Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago 47, Ill.—B, C, ST
Connecticut Telephone & Electric Div. Great American Industries, Inc., 70 Britannia St., Meriden, Conn. —HM
Crescent Industries, Inc., 4140 Belmont Ave., Chicago 41, Ill—D, PM
Hugh H. Eby, Inc., 18 W. Chelton Ave., Philadelphia, Pa.—HM
Electronic Sound Engineering Co., 109 N. Dearborn St., Chicago, Ill.—CH, B, PD, PM
Electronic Transformer Co., 515 W. 29th St., New York, N. Y.—F, FE
Erwood Co., 223 W. Erie St., Chicago, Ill.—FE, PH, ST
Frost-Chicago Telephone Supply Co.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., "G-C"—GC, S
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—PD, PM
Hawley Products Co., 201 N. First Ave., St. Charles, Ill.—CH, B, C, PH
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—F
A. G. Hintze Co., 1547 Westchester Blvd., Westchester, Ill—GC.
Holtzer Cabot Electric Co., 125 Amory St., Boston 19, Mass.—HM
Hollywood Electronics Co., 800 Sunset Blvd., Los Angeles, Calif.—B, CH
ICA—Insuline Corp. of America
Illinois Wood Products Corp., 2512 S. Damen Ave., Chicago 8, Ill.—CH, B
Industrial Sound Products Co., 3597 Mission St., San Francisco 10, Calif.—CH, B
Industrial Wire Cloth Products Corp., Wayne, Mich. —GC
Insuline Corp. of America, 3602—35th Ave., Long Island City, N. Y. "ICA"—HM
Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.—CH, B, C, D, F, FE, PD, PM, PH, ST.
J.F.D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn, N. Y.—F, S
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago, Ill.—HM
Langevin Co., 37 W. 65th St., New York, N. Y.— CH, D, FE, PD, PM, PH, ST
Laurehk Radio Mfg. Co., 3918 Monroe Ave., Wayne, Mich.—HC
Leotone Radio Co., 63 Dey St., New York, N. Y.— ACC, B, C, D, F, GC
Lifetime Sound Equipment Co., 1101 Adams St., Toledo, Ohio—B, PD, PH
The Magnavox Co., 2131 Bueter Rd., Ft. Wayne 4, Ind.—D, PM
Magnetic Windings Co., 16th & Butler Sts., Easton, Pa.—F
Maico Co., Inc., Minneapolis 8, Minn—HA
John Meck Industries, Liberty at Pennsylvania, Plymouth, Ind.—B, PM, PH
Miles Reproducer Co., 812 Broadway, New York, N. Y. —F, FE, M, PH
Wm. J. Murdock, 158 Carter St., Chelsea 50, Mass. —HM
E. A. Myers & Sons, Radioear Bldg., Mt. Lebanon, Pittsburgh 16, Pa.—HM
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles 7, Calif.—B, ST
A. Olek & Son, Inc., 4757-59 Melrose St., Philadelphia 37, Pa.—GC
Otto K. Olesen, Ill. Co. Ltd., 1560 Vine St., Hollywood 28, Calif.—B
Operadio Mfg. Co., 13th & Indiana Sts., St. Charles, Ill.—D, PD, PM
Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill., "Oxford"—B, C, D, F, FE, HF, M, PD, PH, PM
Parisian Novelty Co., 3510 S. Western Ave., Chicago, Ill.—S
Peerless Mfg. Corp., 1400 W. Ormsby, Louisville, Ky.—F
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.— D, M, PM
Philco Corp., Tioga & C Sts., Philadelphia, Pa.— C, D, F, M, PM
Philmore Mfg. Co., 113 University Pl., New York, N. Y.—HM
Powers Electronic & Communication Co., Inc., New St., Glen Cove, L. I., N. Y.—D, PH
Presto Recording Corp., 242 W. 55th St., New York, N. Y.—D
Quam-Nichols Co., 33rd Pl. & Cottage Grove Ave., Chicago 16, Ill.—D, M, PM
Racon Elec. Co., Inc., 52 E. 19 St., New York 3, N. Y.—CH, B, D, F, FE, PD, PM, PH, ST

Radioear—E. A. Myers & Sons
Radio Speakers, Inc. 221 E. Cullerton St., Chicago, Ill.—D, PM, HD, HM
Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill. —R, PH
RCA Victor Div., Radio Corp. of America, Camden, N. J.—B, D, FE, PD, PM, PH, ST
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—B, PH
The Rola Co., Inc., 2530 Superior Ave., Cleveland 14, Ohio—F, FE, HM, PM
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.—GC
Mark Simpson Mfg Co. Inc., 188 W. 4th St., New York, N. Y.—B, CH, PD, PH
Shure Bros., 225 W. Huron St., Chicago 10, Ill.—HM
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—F
Thomas & Skinner Steel Prod. Co., 1120 E. 23rd St., Indianapolis 5, Ind.—PM
Sonotone Corp., Elmsford, N. Y.—HC, HM
S. O. S. Cinema Supply Corp., 449 W. 42nd St., New York 18, N. Y.—CH, B, FE
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York 23, N. Y.—HM
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—CH, D, PD, PM, PH
Telex Products Co., Telex Park, Minneapolis, Minn.—HC, HM
Thomas & Skinner Steel Products Co., 1120 E. 23rd St., Indianapolis 5, Ind.—PM
Tibbetts Labs., 12 Norfolk St., Cambridge, Mass.—HC
Trebor Radio Co., Pasadena 18, Calif.—F
Trimm, Inc., 1770 W. Berteau, Chicago, Ill.—HM
Troy Radio & Telev. Co., 1144 S. Olive St., Los Angeles, Calif.—D, PM
University Labs., 225 Varick St., New York 14, N. Y.—CH, B, D, PD, PM, PH
Utah Radio Prod. Co., 850 Orleans St., Chicago, Ill.—C, D, M, PM, B
Watterson Radio Mfg. Co., Dallas, Texas.—B
Weller Bros., 516 Northampton St., Easton, Pa.—F
Western Elec. Co., 195 Broadway, New York, N. Y.—HD, HM
Western Sound & Electric Labs Inc., 3512 W. St. Paul Ave., Milwaukee, Wisc.—D, PH, PM
The Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.—F, FE
Worcester Pressed Steel Co., Worcester, Mass.—S
Wright, Inc., 2233 University Ave., St. Paul, Minn., "Nokoil"—D, B

Switches & Relays

Circuit breakers	CB
Counters, electric	C
Float switch	F
Fluorescent lamp starters	FS
Key switch	SK
Mercury relays	M
Mercury switches	MS
Polarized relays	RP
Pressure switch	PS
Push button	PB
Relays	R
Rotary selector switches	SL
Safety interlocks	S
Solenoids	SO
Stepping relays	SR
Thermal switches	T
Time delay relays	TD
Timers	TE
Toggle switches	TO
Vacuum	V
Wave change (receiver)	W
Wave change (transmitter)	WT

Acme Wire Co., New Haven, Conn.—SO
The Acro Electric Co., 1305 Superior Ave., Cleveland 14, Ohio, "Acrosnap"—PB
The Adams & Westlake Co., Elkhart, Ind.—R
Advance Elec. Co., 1260 W. 2nd St., Los Angeles, Calif.—R
Alco Valve Co., 805 Kingsland Ave., St. Louis 5, Mo. —F
Bruno H. Ahlers, 8524 89th St., Woodhaven, L. I., N. Y.—CB, SL
Alden Products Co., 117 North Main St., Brockton, Mass., "Na-Aid"—SL
Allen-Bradley Co., 136 W Greenfield Ave., Milwaukee, Wis.—CB, P, PB, R, SK, TE, S
Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y.—SO, CB, R, SR
Allis-Chalmers Mfg. Co., Milwaukee 1, Wisc.—CB
American Automatic Electric Sales Co., 1019 W Van Buren St., Chicago, Ill.—C, M, CB, SO, R, RP, S, SK, SR, TE
American Communications Corp., 306 Broadway, New York 7, N. Y.—R
American Gas Accumulator Co. 1027 Newark Ave., Elizabeth 3, N. J.—R, T, TD
American Instrument Co., Silver Spring, Md.—M, MS, R
American Phenolic Corp., 1830 S. 54th St., Cicero, Ill. "Amphenol"—SL, W
Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—TE, V
Amperite Co., 561 Broadway, New York 12, N. Y. —R, TE, T
Amphenol—American Phenolic Corp.
Andrew Co., 363 E. 75th St., Chicago 19, Ill.—R
Apex Industries, Inc., 1035 W. Lake St., Chicago, Ill.—CB, R, RP, SR, TE
Arkay Laboratories, Inc., 1570 S. First St., Milwaukee 4, Wisc.—R
The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.—FS, R, T
Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill.—FS
ATC Co., Inc., 34 E. Logan St., Philadelphia 44, Pa.—TE
Audio Development Co., 2833 13th Ave., S. Minneapolis 7, Minn.—SK
Auth Electrical Specialty Co., 422-430 E. 53rd St., New York 22, N. Y.—RP, PB, R, SL, T, TE
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—C, SK, M, RP, PB, R, SL, S, SR, TO
Automatic Electric Mfg. Co., Mankato, Minn. "Automatic"—R, TE
Automatic Switch Co., 41 E. 11th St., New York 3, N. Y.—R
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia 44, Pa.—TE
Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland 9, Ohio—MS, TE
Banks Mfg. Co., 1105 Lawrence Ave., Chicago 40, Ill.—R
Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—SL, WT
Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.—V
Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—V
Berger Electronics, 109-01 72nd Rd., Forest Hills, L. I., N. Y.—S
Best Mfg. Co., 1200 Grove St., Irvington 11, N. J. —R, RP, M, SL
The Birtcher Corp., 5087 N. Huntington Dr., Los Angeles 36, Calif.—R
J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—R
Centralab, Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wisc.—PB, SL, TO, W, WT
Chicago Telephone Supply Co., 1142 W. Beardsley Ave., Elkhart, Ind.—PB, SK, W
C. P. Clare Co., 4719 Sunnyside Ave., Chicago 30, Ill.—R, SK, PB, SR
Clarostat Mfg. Co., 285 N. 6th St., Brooklyn, N. Y., "Clarostat"—CB
Communication Products Co., 744 Broad St., Newark, N. J.—SL
Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—R
Continental X-Ray Corp., 1933 So. Halstead St., Chicago 8, Ill.—SL
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.—R, TE, SO, S
Cover Dual Signal Systems, Inc., Div. of Electro Voice Corp., 5215-25 Ravenswood Ave., Chicago 40, Ill.—SR
The R. W. Cramer Co., Inc., Centerbrook 1, Conn. —TE, R
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wisc.—CB, PB, R, SL, TE, TO
The Daven Co., 191 Central Ave., Newark 4, N. J. —SL
Distillation Products, Inc., 755 Ridge Rd. W., Rochester 13, N. Y.—V
Struthers Dunn, Inc., 1321 Arch St., Philadelphia 7, Pa.—M, RP, R, SR, TE
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.—R
Eagle Signal Corp., 202 20th St., Moline, Ill.—C, TE
Eastern Air Devices, Inc., 585 Dean St., Brooklyn 17, N. Y.—R
Eimac—Eitel-McCullough, Inc.
Eitel-McCullough, Inc., San Bruno, Calif., "Eimac"—V
Eleco-Electron Equipment Corp.
Electrical Coil Winding Co., 2733 Saunders St., Camden, N. J.—SO
The Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, Ohio—PB
Electrical Facilities, Inc., 4224 Holden St., Oakland, Calif.—SL
Electron Equipment Corp., 917 Meridan St., So. Pasadena, Calif. "Eleco"—SR
Electronic Laboratories, Inc., 122 W. New York St., Indianapolis, Ind.—VR
Electronic Products Co., 19 N. 1st St., Geneva, Ill.—TE
Electronic Sound Engineering Co., 109 N. Dearborn St., Chicago 2, Ill.—RP, R, SR, TE
Electronic Transformer Co., 515 W. 29th St., New York, N. Y.—SO
Charles Engelhard, Inc., 233 N. J. R. R. Ave., Newark 5, N. J.—SL
Ess Instrument Co., George Washington Bridge Plaza, Ft. Lee, N. J.—R
H. C. Evans & Co., 1528 W. Adams St., Chicago 7, Ill.—R, SO
Federal A. C. Switch Corp., 1200 Niagara St., Buffalo 13, N. Y.—SK, TO
Federal Electric Co., 8700 So. State St., Chicago, Ill—CB, FS
Federal Mfg. & Engineering Corp., 199-217 Steuben St., Brooklyn 5, N. Y.—SK
Federal Telephone & Radio Corp., 200 Mt. Pleasant Ave., Newark, N. J.—SK
Fenwal, Inc., Main St., Ashland, Mass.—T
Ferranti Electric Co., 30 Rockefeller Plaza, New York, N. Y.—SO
General Appliance Co., P. O. Box 127, N. Kingsville, Ohio—PB
General Cement Mfg Co., 919 Taylor Ave., Rockford, Ill.—FS, PB, SL, S, TO
General Controls Co., Glendale, Calif.—R
General Control Co., 243 Broadway, Cambridge 39, Mass.—SK, SL, TE
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—SL, S, V
General Electric Co., 1 River Rd., Schenectady, N. Y. —C, CB, FS, M, PB, R, S, SL, SO, V
General Radio Co., 30 State St., Cambridge, Mass., "G-R", "Variac"—SL
Thomas B. Gibbs & Co., Delevan, Wisc., "Gibbs"—TE
G-M Laboratories, Inc., 4336 N. Knox Ave., Chicago 41, Ill.—R
G-R—General Radio Co.
Guardian Electric Mfg. Co., 1400 W. Washington Blvd., Chicago 7, Ill.—C, M, MS, RP, R, SL, S, SR, T
Guenther Electronics Co., 1318 W. 2nd St., Appleton, Wisc.—C, TE
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—CB, R
Hart Mfg. Co., Hamilton St., Hartford, Conn.—M, MS, PB, R, T
Hartman Electrical Mfg. Co., 175 N. Diamond St., Mansfield, Ohio—RP, PB, R, T
Haydon Mfg. Co., Inc., Forestville, Conn.—C, SK, R, TE, TD
H-B. Electric Co., Inc., 6101 N. 21st St., Philadelphia 38, Pa.—M, MS, R, T, TE, V
Heineman Circuit Breaker Co., Box 299, Trenton 2, N. J.—N, CB
Herbach & Rademan Co. Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—PS
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—TE
Robert Hetherington & Son, Inc., 1216 Elmwood Ave., Sharon Hills, Pa.—CB
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—R, T
Horni Signal Mfg. Corp., 310 Hudson St., New York 13, N. Y.—SO, R, RP
Industrial & Commercial Electronics, Belmont, Calif. —R
Industrial Electronics Corp., 80 Bank St., Newark 2, N. J.—FS, R
Industrial Timer Corp., 117 Edison Pl., Newark 5, N. J.—TE, C
Insuline Corp. of America, 3602—35th Ave., Long Island City, N. Y.—TO
International Electronics, Inc., 630 Fifth Ave., New York, N. Y.—C, V
I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.—CB
J-B-L Instruments, Inc., 420 E. Providence Rd., Aldan, Pa.—SL
J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.—SL
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy, Brooklyn 19, N. Y.—SL, TO
Jefferson Electric Co., Bellwood, Ill.—R, SO
E. F. Johnson Co., Waseca, Minn.—R
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago, Ill.—R, SK
H. R. Kirkland Co., Morristown, N. J.—PB
Kurman Electric Co., 35-18 37th St., Long Island City 1, N. Y.—R
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.—R
Lear Avia, Inc., Piqua, Ohio—CB, RP, PB, R, SL, S, SR, T, W, WT
Lektra Laboratories, Inc., 30 E. 10th St., New York, N. Y.—TE
Littelfuse, Inc., 4757 Ravenswood Ave., Chicago 40, Ill.—CB, MS

Lumenite Electric Co., 407 So. Dearborn St., Chicago 5, Ill.—TE, V
Magnavox Co., 2131 Bueter Rd., Ft. Wayne 4, Ind.—SO
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—PB, SL, TE, W, WT
Mark Time—M. H. Rhodes, Inc.
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill.—R
The Mercoid Corp., 4201 Belmont Ave., Chicago 41, Ill.—M, MS, R
Merit Coil & Transformer Corp., 311 N. Desplaines St., Chicago, Ill.—SO
Metallic Arts Co., 243 Broadway, Cambridge, Mass.—TO
Michigan Fluorescent Light Co., 71-75 S. Parke, Pontiac 14, Mich.—FS, T
Micro Switch Corp., 8 W. Spring St., Freeport, Ill., "Microswitch"—PB, SK, CB, SL
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—R
Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—PB, SK
Donald P. Mossman, Inc., 6133 Northwest Highway, Chicago 31, Ill.—SK, PB, R, SR, TO
Mu-Switch Corp., 38 Pequit St., Canton, Mass.—PB, T
The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill., "Muter"—PB, R
National Electric Mfg. Co., 103 E. Ferry St., Berrien Springs, Mich.—R, SL, SR, TE
New England Radiocrafters, 1156 Commonwealth Ave., Brookline, Mass.—W
New York Transformer Co., 26 Waverly Place, New York 3, N. Y.—SO
The North Electric Mfg. Co., 501 S. Market St., Galion, Ohio—SK, R, SL, SR
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill., "Oak"—PB, W, WT
Ohmite Mfg. Co., 4835 Flournoy St., Chicago 44, Ill.—SL, WT
Oregon Electronic Mfg. Co., 206 S. W. Washington St., Portland 4, Ore.—SL
Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.—R, TE, TD
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.—R, SL
Partlow Corp., 2 Campton Rd., New Hartford, N. Y.—TD
Peerless Laboratories, Inc., 115 E. 23rd St., New York 10, N. Y.—SL, S
Peerless Mfg. Corp., 1400 W. Ormsby, Louisville, Ky.—C, R, S, SR, SO
Phonette Co. of America, 7122 Melrose Ave., Los Angeles, Calif.—WT
Photobell Corp., 116 Nassau St., New York 7, N. Y.—TE
Pierce Laboratory, Inc., Summit, N. J.—CB, R
Potter & Brumfield Mfg. Co., Inc., 700 N. Gibson St., Princeton, Ind.—C, R, TE
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.—R
Price Brothers Co., East Church & Second St., Frederick, Md.—R
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.—WT
Radionics Control Co., 3758 W. Belmont Ave., Chicago, Ill.—R
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—SK, PB, R
Reliance Automatic Lighting Co., 1927 Mead St., Racine, Wisc.—TE
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.—M, MS, S, T, TE, R
M. H. Rhodes, Inc., Hartford, Conn., "Mark Time"—TE
Richardson Allen Corp., 15 West 20th St., New York 11, N. Y.—C, SL, T, TE, WT
John A. Roebling's Sons Co., Trenton, N. J.—SO
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago, Ill.—TE, SL
R. & T. Electronics Co., 2626 14th St., N. W., Washington, D. C.—FS
Shallcross Mfg. Co., Jackson & Pusey Aves., Collingdale, Pa., "Shallcross"—SL
Sigma Instruments, Inc., 76 Freeport St., Boston 22, Mass—CB, RP, R, TE
F. A. Smith Mfg. Co., Inc., 900 Davis St., Rochester 2, N. Y.—CB
Nathan R. Smith Mfg. Co., 105 Pasadena Ave., Pasadena, Calif.—PB, SO
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.—T, CB
Sperti, Inc., Beech & Kenilworth Aves., Norwood, Cincinnati 12, Ohio—M, MS, V
Stackpole Carbon Co., P. O. Box 327, St. Marys, Pa.—SL, TO
Staco—Standard Electrical Prods. Co.
Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.—C, TE
Standard Electrical Prods. Co., 300 E. 4th St., St. Paul, Minn., "Staco"—M, PB, R, RF, S, SR, TE, W, WT, CB
The States Co., 19 New York Ave., Hartford, Conn.—SL
C. H. Stoelting Co., 424 N. Homan Ave., Chicago 24, Ill.—C
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—SK, PB, R
Super Electric Products Corp., 1057 Summit Ave., Jersey City 7, N. J.—SL, W, WT
Supreme Electric Products Corp., 194 Vassar St., Rochester, N. Y.—SO
Sundt Engineering Co., 4763 Ravenswood Ave., Chicago, Ill.—CB
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—FS
Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J., "Tech-Lab"—SL, SR
Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.—MS, TE
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.—R
Triplett Electrical Instrument Corp., Harmon Rd., Bluffton, Ohio—SL
Trumbull Electric Mfg. Co., Woodford Ave., Plainville, Conn.—CB, PB, T
Tung-Sol Lamp Works, Inc., 95 Eighth Ave., Newark 4, N. J.—CB, R, T, TE
George Ulanet Co., 88 E. Kinney St., Newark 5, N. J.—T, TE
The Ucinite Co., Div., of United Carr Fastener Corp., Newtonville, Mass.—PB, W, WT
United Cinephone Corp., 65 Litchfield St., Torrington, Conn.—S, R, TE, V
Universal Microphone Co., 424 Warren Lane, Inglewood, Calif.—PB, TO
Utah Radio Prods. Co., 850 Orleans St., Chicago, Ill.—R
Valverde Laboratories, 252 Lafayette St., New York 12, N. Y.—T
Variac—General Radio Co.
Veeder Root, Inc., Hartford, Conn.—C
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.—R, T, TE, W, WT
Warren Telechron Co., Lock Box F, Ashland, Mass.—TE
Weller Bros., 516 Northampton St., Easton, Pa.—SO
Western Electric Co., 195 Broadway, New York, N. Y.—C, PB, R, RP, SK, SR, TE, V
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—C, CB, FS, S, SO, TE
Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.—CB, FS, M, MS, RP, PB, R, SL, S, T, TE, TO
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.—R
Wheelco Instruments Co., 847 W. Harrison St., Chicago, Ill.—PB
Wilson Mfg. Co., Inc., 600 N. Andrews Ave., Ft. Lauderdale, Fla.—TE
Wirt Co., 5221 Greene St., Philadelphia, Pa.—CB, P, W
Yaxley—P. R. Mallory & Co., Inc.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.—SL, TE

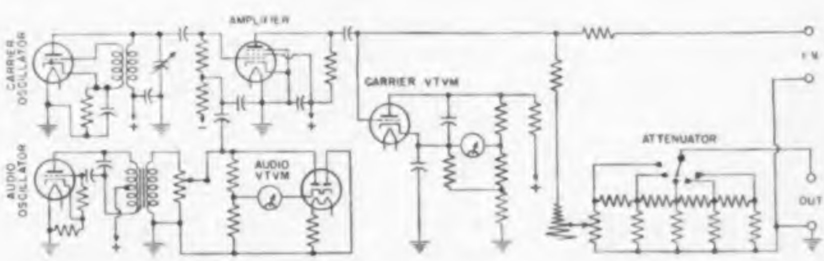
Transformers & Chokes

Audio (receiving) .... A
Auto transformers .... AU
Bridge .... B
Chokes C
Coils & windings .... CW
Current trans .... T
Fence Controllers .... FA
Fluorescent reactors .... R
Mike cable transformers .... MT
Plug-in transformers .... PT
Power, receiving-transmitting .... P
Rotatable transformers .... RT
Voltage regulating .... VR
Welding transformers .... WT

ACA—Amplifier Co. of America
Acme Electric & Mfg. Co., 57 Water St., Cuba, N. Y., "Acme"—A, AU, C, P, R, VR, CW, WT
Acme Wire Co., 1255 Dixwell Ave., New Haven, Conn.—CW
Adjust-a-Volt—Standard Elec'l. Prods. Co.
Allen Elec. & Equip. Co., 2101-29 N. Pitcher St., Kalamazoo 13F, Mich.—WT
Allis-Chalmers Mfg. Co., Milwaukee 1, Wisc.—AU, VR, WT
Altec Lansing Corp., 1680 No. Vine St., Hollywood 28, Calif.—A, C, CW, P
American Communications Corp., 306 Broadway, New York 7, N. Y.—C, CW
American Instrument Co., 8020 Georgia Ave., Silver Spring, Md.—AU
American Transformer Co., 178 Emmet St., Newark 5, N. J., "Amertran"—A, AU, C, CW, P, PT, T, VR, B, MT, WT
Amertran—American Transformer Co.
Amplifier Co. of America, 398 Broadway, New York 13, N. Y., "ACA"—AU, CW, VR, A, B, C, T, MT, P, WT
R. B. Annis Co., 1101 N. Delaware St., Indianapolis 3, Ind.—T
Apex Industries, Inc., 1035 W. Lake St., Chicago, Ill.—A, AU, C, CW, FA, MT, P, PT, R, T, VR
Aray Mfg. & Supply Co., Inc., 3105 Pine St., St Louis 3, Mo.—P

Useful Applications in Electronic Developments .... No. 12

SIGNAL GENERATOR



TYPICAL USES: Analyzing circuit performance of radio, sound, and other amplifiers at selected excitation frequencies.

WHAT IT IS AND HOW IT IS USED: An instrument of primary importance in the design and testing of radio receivers, produces a test signal having known frequency, modulation characteristics and intensity, that simulates, in an exact and reproducible manner, the signal that might be received from a distant station. The equipment consists of an rf oscillator covering the correct range of frequencies, modulated at will, with a tone oscillator at desired amplitude. The modulated output is set to a prescribed level with a VTVM and then attenuated down to the desired level for sensitivity, selectivity and overload tests. Sometimes instrument is known as a microvolter.

Associated Research, Inc., 231 So. Green St., Chicago 7, Ill.—T

Audio Development Co., 2833—13th Ave., S., Minneapolis 7, Minn.—A, AU, C, P, B

Bendix Radio, Div. of Bendix Aviation Corp., East Joppa Rd., Baltimore 4, Md.—A, C, CW, P

Best Mfg. Co., Inc., 1200 Grove St., Irvington 11, N. J.—A, C, CW, B, B, MT, PT

Burlington Instrument Co., Burlington, Iowa—VR

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.—A, C

Chicago Transformer Corp., 3501 W. Addison St., Chicago, Ill., "Chitran"—A, AU, C, CW, FA, MT, P, R

Chitran—Chicago Transformer Corp.

Cinaudagraph Speakers, Inc., 3929 S. Michigan Ave., Chicago, Ill.—A, C, CW

Cole Radio Works, 86 Westville Ave., Caldwell, N. J.—AU

Cook Electric Co., 2700 Southport Ave., Chicago, Ill.—CW

Condenser Products Co., 1369-1375 No. Branch St., Chicago, Ill.—R

Control Corp., 600 Stinson Blvd., Minneapolis 13, Minn.—C, P

Dean W. Davis & Co., Inc., 549 Fulton St., Chicago, Ill.—AU, C, CW

Dinion Coil Co., P. O. Box D, Caledonia, N. Y.—A, AU, C, CW, P, VR

Eisler Engineering Co., 740-770 So. 13th St., Newark, N. J.—WT

Elco—Electron Equipment Corp.

Electric Sorting Machine Co., 802 Michigan Trust Bldg., Grand Rapids, Mich.—VR

Electrical Coil Winding Co., 2733 Saunders St., Camden, N. J.—C, CW

Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.—T

Electricoil Transformer Co., 417-421 Canal St., New York 18, N. Y.—AU, C, CW, P, PT, T, WT

Electron Equipment Corp., 917 Meridian St., So. Pasadena, Calif., "Elco"—CW, P

Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.—A, AU, B, C, MT, P

Electronic Laboratories, Inc., 122 West New York St., Indianapolis, Ind.—VR

Electronic Products Co., 19 N. First St., Geneva, Ill.—FA, VR

Electronic Sound Engineering Co., 109 N. Dearborn St., Chicago 2, Ill—MT

Electronic Transformer Co., 515 W. 29th St., New York 1, N. Y.—A, AU, C, CW, P, T, B, MT, PT, VR, WT

Engineering Laboratories, Inc., 624 E. Fourth St., Tulsa, Okla.—A

Ex-Stat—Tilton Electric Corp.

Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.—CW

Federal Telephone & Radio Corp., 200 Mt. Pleasant Ave., Newark, N. J.—A, T, P

Ferranti Electric Inc., 30 Rockefeller Plaza, New York 20, N. Y.—AU, C, A, B, CW, T, R, MT, PT, P, VR, WT

France Mfg. Co., 10325 Berea St., Cleveland 2, Ohio—R, P

Franklin Transformer Mfg. Co., 65 22nd Ave., N. E., Minneapolis 13, Minn.—A, AU, C, CW, P, VR, WT

Freed Transformer Co., 72 Spring St., New York 21, N. Y.—A, AU, C, CW, P, T, VR, B

A. P. Foster Co., 719 Wyoming Ave., Lockwood 15, Ohio—A, AU, C, CW, R, P

Gardner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.—AU, C, CW, R, A, B, P, WT

General Control Co., 243 Broadway, Cambridge 39, Mass.—T

General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—A, MT

General Electric Co., 1 River Road, Schenectady, N. Y.—A, AU, C, CW, P, R, T, VR

General Radio Co., 30 State St., Cambridge, Mass., "G-R," "Variac"—AU, B

General Transformer Corp., 1250 W. Van Buren St., Chicago 7, Ill, "Streamliner"—A, AU, C, P, R, CW, T

G-R—General Radio Co.

The Halldorson Co., 4500 Ravenswood Ave., Chicago, Ill.—A, AU, C, CW, P, PT

Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge 38, Mass.—A, C

Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.—AU, C., CW, T, R, MT, PT, P, WT

Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—AU, C, CW, P

Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles 36, Calif.—A, B, C, CW, P

Hudson American Corp., 23 W. 43rd St., New York, N. Y.—A, AU, C, PT, P, WT

Industrial Electronics Corp., 80 Bank St., Newark 2, N. J.—R, PT

Industrial Transformer Corp., 2540 Belmont Ave., New York 58, N. Y.—A, AU, C, CW, MT, P, PT, R, T, VR, B, WT

Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y.—C, P

Jefferson Electric Co., Bellwood, Ill.—A, AU, C, R, P

Kollsman Instrument, Div. of Square D Co., 80-08 45th Ave., Elmhurst, N. Y.—RT

Kenyon Transformer Co., Inc., 840 Barry St., New York 59, N. Y.—A, AU, C, P, PT, WT

Langevin Co., 37 W. 65th St., New York, N. Y.—A, AU, B, C, P

Magnetic Windings Co., 16th & Butler Sts., Easton, Pa.—A, C, CW, P, R, AU

P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.—C

Meissner Mfg. Co., 7th & Belmont, Mt. Carmel, Ill.—AU, C, CW

Merit Coil & Transformer Corp., 311 N. Desplaines St., Chicago 6, Ill.—A, AU, C, CW, P

Merwin-Wilson Co., New Milford, Conn.—A, AU, C, MT, P, PT, R, T, VR

B. F. Miller Co., P. O. Box 56B, Trenton, N. J.—AU, C, CW, P, T, VR

Moloney Electric Co., 5390 Bircher Blvd., St. Louis 20, Mo.—P

Music Master Mfg. Co., 542 S. Dearborn St., Chicago 5, Ill.—A, C, CW

National Co., Inc., 61 Sherman St., Malden 48, Mass., "National"—A, C, P

Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.—AU, C, T, VR, WT

Newcomb Audio Products Co., 2815 So. Hill St., Los Angeles 7, Calif.—A

New York Transformer Co., 26 Waverly Pl., New York 3, N. Y.—A, AU, C, P, CW

Nothelfer Winding Labs., 111 Albermarle Ave., Trenton 3, N. J.—AU, T, C, CW, P, WT

Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—A, C, CW, MT, P

Peerless Electrical Products Co., 6920 McKinley Ave., Los Angeles 1, Calif.—P

Peerless Laboratories, 115 E. 23rd St., New York 10, N. Y.—VR

Philco Corp., Tioga & C Sts., Philadelphia, Pa.—A, C

Potter Co., 1950 Sheridan Rd., No. Chicago 1, Ill.—R

Radionic Transformer Co., 411 So. Green St., Chicago 7, Ill.—A, AU, B, C, CW, T, R, MT, PT, P, VR, WT

Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.—MT, PT

Raytheon Mfg. Co., 190 Willow St., Waltham, Mass.—A, AU, B, C, CW, T, P, VR, WT

RCA Victor Division, Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA"—A, C, P, VR

Red Arrow Electric Corp., 100 Colt St., Irvington 11, N. J.—AU, C, P, T

A. E. Rittenhouse Co., Honeoye Falls, N. Y.—AU, CW, PT

John A. Roebling's Sons Co., 640 So. Broad St., Trenton 2, N. J.—CW

The Rola Co., Inc., 2530 Superior Ave., Cleveland 14, Ohio—A, AU, C, CW, P

Shure Bros., 225 W. Huron St., Chicago 10, Ill.—MT

Nathan R. Smith Mfg. Co., 105 Pasadena Ave., So. Pasadena, Calif.—A, AU, C, CW, R, P

Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.—A, AU, R, VR, C, P

Sonotone Corp., P. O. Box 200, Elmsford, N. Y.—A

Stancor—Standard Transformer Corp.

Standard Electrical Products Co., 300 E. 4th St., St. Paul, Minn., "Adjust-a-Volt"—VR

Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill., "Stancor"—A, AU, C, CW, FA, P

Standard Winding Co., 44-62 Johnes St., Newburgh, N. Y.—CW

Streamliner—General Transformer Corp.

Super Electric Products Corp., 1057 Summit Ave., Jersey City 7, N. J.—A, AU, C, CW, P, B, VR, T, MT, PT

Superior Electric Co., Laurel St., Bristol, Conn.—VR

Teleradio Engineering Corp., 484 Broome St., New York, N. Y.—A, AU, C, CW, P

Telex Products Co., Telex Park, Minneapolis, Minn.—A, C

Thermador Elec. Mfg. Co., 5119 S. Riverside Dr., Los Angeles 22, Calif.—A, C, CW, MT, P, PT, R, VR, AU, B, T

Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago 10, Ill., "Thordarson"—A, U, B, C, CW, T, R, MT, PT, P

Tilton Electric Corp., 138 West 17th St., New York, N. Y., "Ex-Stat,"—A, C, P

Transformer Engineering Co., Stamford, Conn.—A, AU, C, FA, MT, P, PT, T, VR

United Transformer Co., 150 Varick St., New York 13, N. Y., "UTC"—A, AU, C, CW, MT, P, PT, R, T, VR, B, WT

UTC—United Transformer Co.

Utah Radio Products Co., 850 Orleans St., Chicago, Ill.—A, AU, C, P

Variac—General Radio Co.

Waldron Electric Co., 13221 Merl Ave., Cleveland, Ohio—FA

Ward Leonard Electric Co., Mt. Vernon, N. Y.—VR

Webster Electric Co., Racine, Wisc.—A, CW, P

Weller Bros., 516 Northampton St., Easton, Pa.—CW

Western Electric Co., 195 Broadway, New York, N. Y.—A, AU, C, MT, P, VR

Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—AU, T, R, P, VR, WT

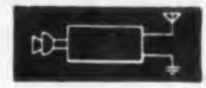
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.—P, T

Weston Electrical Instrument Corp., 597 Frelinghuysen Ave., Newark, N. J.—T

The Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.—A, AU, C, CW, FA, MT, P, PT, R, T, VR

Whisk Laboratories, 146 W. 45th St., New York 19, N. Y.—CW, P

Transmitters & Equipment



Auto code senders .... AC
Aviation (xmitters) .... AV
Broadcast (xmitters) .... BC
Control consoles CC
Facsimile .... FAC
Keys .... K
Marine (xmitters) .... M
Police (xmitters) .... P
Radioteletype .... RT
Speech amplifiers .... SA
Television transmitters .... T
Transmission monitor equip. .... TM

Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.—AV, BC, M, P, SA

Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, N. Y.—AV

Airadio, Inc., 4 Selleck St., Stamford, Conn.—AV, M, P

Air Communications, Inc., 2233 Grand Ave., Kansas City, Mo.—AV

Aircraft Accessories Corp., Fairfax & Funston Rd., Kansas City 15, Kans.—AV, P, SA

Aircraft Radio Corp., Boonton, N. J.—AV

Airplane & Marine Instruments, Inc., Box 92, Clearfield Pa.—AV, M, SA

American Communications Corp., 306 Broadway, New York 7, N. Y.—AL, BC, CC, K, M, P, SA, TM

Amplifier Co. of America, 19 W. 20th St., New York, N. Y.—SA

Arnessen Electric Co., 116 Broad St., New York 4, N. Y.—M

Austin Electronic Mfg. Co., Warren, Pa.—AV, SA

Automatic Electric Mfg. Co., Mankato, Minn. "Automatic"—AC

Barker and Williamson, 235 Fairfield Ave., Upper Darby, Pa.—AV, BC, CC, FAC, M, P, RT, SA, TM

Rex Bassett, Inc., Bassett Bldg., 500 S .E. Second St., Ft. Lauderdale, Fla.—AV, M, P

Belden Mfg. Co., 4647 W. Van Buren St., Chicago, Ill.—A

Bendix Radio, Div. Bendix Aviation Corp., E. Joppa Rd., Baltimore 4, Md.—AV, M, P

Bendix Aviation Corp., Pacific Division, 11600 Sherman Way, North Hollywood, Calif.—AV

Bliley Electric Co., 207 Union Sta. Bldg., Erie, Pa.—F, H, S

Bludworth Marine, Div. of National Simplex Bludworth, Inc., 100 Gold St., New York, N. Y.—M

Charles J. Bodnar Co., 58 Marbledale Rd., Tuckahoe 7, N. Y.—P

H. O. Boehme, Inc., 915 Broadway, New York 10, N. Y.—AC, TM

W. W. Boes Co., 3001 Salem Ave., Dayton 1, Ohio AV, TM

Browning Labs. Inc., 750 Main St., Winchester, Mass.—FM

Bud Radio, Inc., 2113 E. 55th St., Cleveland 3, Ohio—AC

J. H. Bunnell & Co., 215 Fulton St., New York 1, N. Y.—AV, BC, FAC, K, M, P

Wm. W. L. Burnett Radio Lab., 4814 Idaho St., San Diego 4, Calif.—M, P

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.—AV, M, P

Collins Radio Co., 2920 First Ave., Cedar Rapids, Iowa—AV, BC, CC, M, P, SA, T, TM

Communications Co., Inc., 300 Greco Ave., Coral Gables 34, Fla.—AV, M, P, SA

Communications Equipment Corp., 134 W. Colorado St., Pasadena, Calif.—AV, CC, M, P, RT, SA, TM, BC

Cover Dual Signal Systems, Inc., Div. of Electro Voice Corp., 6215-25 Ravenswood Ave., Chicago 40, Ill.—AV, P

Dahlstrom Metallic Door Co., Buffalo & E. Second Sts., Jamestown, N. Y.—CC

The Daven Co., 191 Central Ave., Newark 4, N. J.—CC

Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago 36, Ill.—AV, BC, CC, M, P, SA, TM

R. L. Drake Co., 11 Longworth St., Dayton 2, Ohio—AV, M, P, SA

Allen B. DuMont Laboratories, Inc., 2 Main Ave., Passaic, N. J.—TM, T

Eckstein Radio & Telev. Co., 1400 Harmon Pl., Minneapolis, Minn.—AV, P, TM

Eldson's, 1309 North Second Street, Temple, Texas—F

Electrical Industries Mfg. Co., Red Bank, N. J.—M

Electronic Research Corp., 2659 W. 19th St., Chicago 8, Ill.—M, P, TM

Electronic Sound Engineering Co., 109 W. Dearborn St., Chicago 2, Ill.—CC

Electronic Specialty Co., 3456 Glendale Blvd., Los Angeles 26, Calif.—AV

Erco Radio Labs., Inc., 231 Main St., Hempstead, L. I., N. Y.—AV, BC, M, P, SA
Espey Mfg. Co., Inc., 305 E. 63rd St., New York 21, N. Y.—M, P, SA
Fada Radio & Electric Mfg. Co., Inc., 30-20 Thomson Ave., Long Island City 1, N. Y.—AV, TM
Farnsworth Telev. & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.—AV, BC, CC, FC, TM
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.—AV, BC, CC, M, P, RT, SA, TM
Federal Telephone & Radio Corp., 200 Mt. Pleasant Ave., Newark, N. J. "Federal"—BC, AV, K, M, P, SA, TM
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.—AV, BC, FAC, M, P, RT, SA
Fisher Research Lab., 1961 University Ave., Palo Alto, Calif.—AV, M, P
Flashtron—Thordarson Electric Manufacturing Co.
Foote, Pierson & Co., 75 Hudson St., Newark, N. J.—M
Fostoria Research Laboratory, 1961 University Ave., Palto Alto, Calif.—AV, M, P
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago, Ill., "Motorola"—A, AV, BC, CC, M, P
Gardiner-Levering Company, Haddon Hts., New Jersey—AC
Garner Electronics Corp., 1100 W. Washington Blvd., Chicago, Ill.—M, P, SA, TM
Gates Radio & Supply Co., Quincy, Ill.—M, BC
Garod Radio Corp., 70 Washington St., Brooklyn 1, N. Y.—M
General Communication Co., 681 Beacon St., Boston 15, Mass.—AV, M
General Electric Company, 1285 Boston Avenue, Bridgeport, Conn.—SA
General Electric Co., 1 River Rd., Schenectady, N. Y.—AV, BC, CC, M, P, SA, TM
Thomas B. Gibbs & Co., Delavan, Wis., "Gibbs"—SA
The Hammarlund Mfg., Co., Inc., 460 West 34th Street, New York 1, New York—AV
Godfrey Mfg. Co., 171 South 2nd St., Milwaukee 4, Wisc.—SA
Grady Instrument Co., 11 Bailey Ave., Watertown 72, Mass.—M, P
Gray Radio Co., 730 Okeechobee Rd., West Palm Beach, Fla.—AV, M
Grenby Mfg. Co., Plainville, Conn.—AV, M
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—M, P, RT
Hallicrafters, Inc., 2611 S. Indiana Ave., Chicago 16, Ill.—AV, BC, M, P, SA
Halstead Traffic Communications Corp., 155 E. 44th St., New York 17, N. Y.—AV, CC, SA, TM
Hamilton Radio Corp., 510 6th Ave., New York, N. Y.—BC, M
Harvey Rdio Labs., Inc., 447 Concord Ave., Cambridge, 38, Mass.—AV, M, P
Harvey-Wells Communications, Inc., Southbridge, Mass.—AV, M, P
Haydon Mfg. Co., Inc., Forestville, Conn.—K
Heath Co., Benton Harbor, Mich.—AV
Henry Mfg. Co., 2213 Westwood Blvd., Los Angeles 25, Calif—M, SA, TM
Herbach & Rademan Co., Mfg. Div., 517 Ludlow St., Philadelphia 6, Pa.—AV, BC, CC, M, P, SA
Higgins Industries, Inc., Radio Div., 2221 Warwick Ave., Santa Monica, Calif.—AV, M, P
P. R. Hoffman Co., 321 Cherry St., Carlisle, Pa.—CR
Hollywood Electronics Co., Div. of Megard Corp., 1601 So. Burlington Ave., Los Angeles 6, Calif.—AV, M, SA, TM
Horni Signal Mfg. Corp., 310 Hudson Street, New York, N. Y.—K
Hudson American Corp., 23 W. 43rd St., New York, N. Y.—M, P, SA
The Instructograph Company, 4701 Sheridan Road, Chicago, Ill.—AC
Ideco—International Stacey Corp.
Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y.—AC
International Detrola Corp., 1501 Beard Ave., Detroit 9, Mich.—AV, P, SA
International-Stacey Corp., International Derrick & Equip. Div., 910 Michigan Ave., Columbus, Ohio, "Ideco"—GS
Ray Jefferson, Inc., 40 E. Merrick Rd., Freeport, L. I., N. Y.—M
Jefferson-Travis Radio Mfg. Corp., 245 E. 23rd St., New York 10, N. Y.—AV, M, P, TM
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.—M, P
Karadio Corp., 1400 Harmon Pl., Minneapolis, Minn.—AV, CC, P, SA
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—AV, BC, CC, M, P, SA, TM
Langevin Co., Inc., 37 W. 65th St., New York, N. Y. SA, TM
Lear Avia, Inc., Piqua, Ohio—AV, K
Fred M. Link, 125 W. 17th St., New York, N. Y.—P
Maritime Radio Corp., 24 Whitehall St., New York, N. Y.—M
McElroy Mfg. Corp., 82 Brookline Ave., Boston, Mass.—AC, AV, FAC, K
Meissner Mfg. Co., Belmont & 7th Sts., Mt. Carmel, Ill.—AV
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—AV, BC, CC, M, P, SA, TM

Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.—AV, K, SA
Motorola—Galvin Mfg. Corp.
National Co., Inc., 61 Sherman St., Malden 48, Mass.—SA
N-C—National Co.
Newcomb Audio Products Co., 2815 So. Hill St., Los Angeles 7, Calif.—SA
The North Electric Mfg. Co., P. O. Box 267, Galion, Ohio—AC
Oxford-Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.—AV, BC, M, P, SA
Panoramic Radio Corp., 242 W. 55th St., New York, N. Y.—TM
Philco Corp., Tioga & C Sts., Philadelphia 34, Pa.—AV, M
Pierson-DeLane, Inc., 2345 W. Washington Blvd., Los Angeles, Calif.—BC, P, TM
Powers Electronic & Communication Co., Inc., New St., Glen Cove, L. I., N. Y.—FAC, SA
Press Wireless, Inc., 1475 Broadway, New York 18, N. Y.—AV, BC, CC, FAC, M, P, RT, SA, TM
Presto Recording Corp., 242 W. 55th St., New York, N. Y.—SA
Pyrex—Corning Glass Works
Radio Craftsmen, 1341-3 So. Michigan Ave., Chicago 5, Ill.—SA
Radio Engineering Labs., Inc., 35-54 36th St., Long Island City, N. Y.—BC
Radio Essentials, Inc., 69 Wooster St., New York, N. Y.—K
Radio Frequency Labs., Inc., Boonton, N. J.—AV
Radiomarine Corp. of America, 75 Varick St., New York, N. Y.—M
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.—AV, M, P, TM
Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.—AV, BC, CC
Radio Specialty Mfg. Co., 403 N. W. 9th St., Portland, Ore.—M, P, SA, TM
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J.—AV, BC, CC, CR, FAC, P, SA, TM
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y—SA
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.—CC, SA, TM
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.—K
Richardson Allen Corp., 15 W. 20th St., New York 11, N. Y.—AV, BC, M, P
Ruby Electric Co., 729 Seventh Ave., New York 19, N. Y.—M, SA
Schulmerich Electronics, Inc., Temple Ave., Sellersville, Pa.—SA
Schuttig & Co., Ninth & Kearney Sts., N. E., Washington 17, D. C.—RT, SA
Sea Pal Radio Co., 228 N. LaSalle St., Chicago, Ill.—M
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.—FAC, RT
Maxwell Smith Co., 1027 N. Highland Ave., Hollywood, Calif.—AV, BC, CC, M, P, SA, TM
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York 23, N. Y.—SA
Stancor—Standard Transformer Corp.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill., "Stancor"—AV, P
Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y.—SA
Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.—BC

Technical Prods. International, 135 Liberty St., New York, N. Y., "Technipower"—SA
Technical Radio Co., 275 9th St., San Francisco 3, Calif.—M, P
Technipower—Technical Prods. International
Tel Autograph Corp., 16 W. 61st St., New York 23, N. Y.—FAC
Telegraph Apparatus Co., 325 W. Huron St., Chicago, Ill.—K
Temco—Transmitter Equipment Mfg. Co.
Teleplex Company, 107 Hudson St., Jersey City 2, N. J.—AC
Thordarson Elec. Mfg. Co., 500 W. Huron St., Chicago 10, Ill. "Flashtron"—SA
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y., "Temco"—AV, BC, CC, FAC, M, P, SA, TM
Trutest—Lafayette Radio Corp.
Variaten Cinema Engr. Co., 1508 W. Verdugo Ave., Burbank, Calif.—CC
The Vibroplex Company, 832 Broadway, New York, N. Y.—K
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.—AV, BC, SA
Waters Conley Company, Rochester, Minn.—AC
Western Electric Co., 195 Broadway, New York, N. Y—AV, BC, CC, CR, M, P, SA, TM
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.—P
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—AV, BC, CC
Wilcox Elec. Co., Inc., 1400 Chestnut St., Kansas City 1, Mo.—AV, BC, CC, FAC, M, P, RT, SA
Wilson Mfg. Co., Inc., 600 N. Andrews Ave., Ft. Lauderdale, Fla.—AC
Winslow Co., 31 Fulton St., Newark 2, N. J.—K
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.—SA

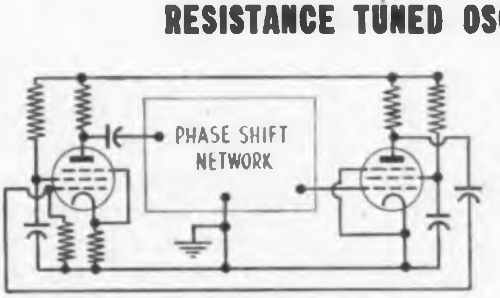
Tubes

Ballast (regulating) .... B
Cathode-ray .... CR
Electron multiplier .... EM
Geiger-Mueller tubes .... GM
Industrial and power rectifiers I
Miniature tubes .... MT
Phototubes .... PH
Receiving .... R
Special gaseous .... G
Special tubes .... ST
Television .... TT
Transmitting .... T
Velocity modulated .... VM
Voltage control VC
X-ray X

Amglo Corp., 4234 Lincoln Ave., Chicago 18, Ill.—B, CR, I, MT, PH, R, ST, TT, T, VC
Amperex Electronic Prods. Corp. 79 Washington St., Brooklyn 1, N. Y., "Amperex"—I, TT,T , X
Amperite Co., 561 Broadway, New York 12, N. Y., "Amperite"—B, VC

Useful Applications in Electronic Developments .... No. 13

RESISTANCE TUNED OSCILLATOR



TYPICAL USES: Making distortion measurements on amplifiers, broadcast transmitters, and other equipment; as a source of voltage for bridge measurements and to drive signal generators and other equipment requiring considerable power.

WHAT IT IS AND HOW IT IS USED: Resistance tuned oscillators utilize a circuit where the output of a resistance-capacitance coupled amplifier is fed back to the input circuit through a phase shifting network. The frequency of oscillations is that at which this R-C network provides a 180° phase shift between output and input. Resistance-tuned oscillators are suitable where low distortion, constant output, non-shifting zero setting and high output are required.

Arpin Mfg. Co., 422 Alden St., Orange, N. J.—ST, T
Art Radio Corp., 115 Liberty St., New York, N. Y.—B
Beckman—National Technical Laboratories
Cetron—Continental Electric Co.
Collins Radio Co., 2020 First Ave., Cedar Rapids, Iowa—R, T
Sigmund Cohn, 44 Gold St., New York, N. Y.—TP
Continental Elec. Co., 715 Hamilton St., Geneva, Ill., "Cetron"—I, PH, ST, VC
Cunningham—RCA Victor Div., Radio Corp. of America
Cyclotron Specialties Co., Moraga, Calif.—GM
Dallons Laboratories, 5066 Santa Monica Blvd., Los Angeles 27, Calif.—G
Distillation Prods., Inc., 755 Ridge Rd., W., Rochester 13, N. Y.—GM, ST
Allen B. DuMont Labs., Inc., 2 Main Ave., Passaic, N. J.—CR, TT
Eimac—Eitel-McCullough, Inc.
Eitel-McCullough, Inc., 798 San Mateo Ave., San Bruno, Calif., "Eimac"—I, T
Electronic Corp. of America, 45 W. 18th St., New York, N. Y.—T, VC
Electronic Enterprises, 67 Seventh Ave., Newark, N. J.—T
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.—GM, I, ST, T
Electrons, Inc., 127 Sussex Ave., Newark 4, N. J.—GM
Emerson Radio & Phono. Corp., 111 8th Ave., New York 11, N. Y.—B, I, MT, R, T
Farnsworth Telev. & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.—CR, EM, T, TT
Federal Telephone & Radio Corp., 200 Mt. Pleasant Ave., Newark, N. J.—B, CR, EM, I, R, ST, TT, T., VC
Gammatron—Heintz & Kaufman, Ltd.
George W. Gates & Co., Inc., Hempstead Turnpike & Lucille Ave., Franklin Square, N. Y.—G
General Electric Co., 1 River Rd., Schenectady, N. Y. B, CR, FM, I, R, TT, T, VC, MT, PH
General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago 12, Ill.—X
General Electronics, Inc., 101 Hazel St., Paterson, N. J.—I, T
Geophysical Instrument Co., 1315 Half St., S.E., Washington 3, D. C.—GM
G-M Laboratories Inc. 4336 No. Knox Ave. Chicago 41, Ill.—PH
Heintz & Kaufman, Ltd., S. San Francisco, Calif., "HK," "Gammatron"—I, T
HK—Heintz & Kaufman, Ltd.
Hytron Corp., 76 Lafayette St., Salem, Mass., "Hytron"—B, MT, R, ST, T, VC
Industrial & Commercial Electronics Co., Belmont, Calif.—I, ST, T
Jennings Radio Mfg. Co., McLaughlin Rd., San Jose, Calif.—T
J. F. D. Mfg. Co., 4111 Hamilton Pkway., Brooklyn 19, N. Y.—B
Ken-Rad Tube & Lamp Corp., Owensboro, Ky., "Ken-Rad"—R
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—CR, MT, ST, TT
King Laboratories, Inc., 205 Oneida St., Syracuse 4, New York—G
Lewis Electronics, 16 Lyndon St., Los Gatos, Calif.—T
Machlett Labs., Inc., 25 Grand St., Norwalk, Conn.—EM, GM, I, ST, T, X
Machlett Laboratories, Inc., 1063 Hope St., Springdale, Conn.—X
Muter Co., 1255 So. Michigan Ave., Chicago 5, Ill.—B
National Technical Laboratories, 820 Mission St., So. Passadena, Calif., "Beckman"—PH
National Union Radio Corp., 15 Washington St., Newark 2, N. J.—B, CR, EM, I, MT, PH, R, ST, TT, T
North American Philips Co., Inc., 145 Palisade St., Dobbs Ferry, N. Y.—CR, I, T, TT
Northern Mfg. Co., Inc., 36 Spring St., Newark, N. J.—CR.
Philips Metalix Corp., 100 E. 42nd St., New York, N. Y.—X
Photobell Corp., 116 Nassau St., New York 7, N. Y.—PH
Radio Electronic Co., 1816 Villanova Dr., Oakland, Calif.—CR, I, R, TT, T, X
Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.—CR, PH, ST, TT
R. & T. Electronics Co., 2626 14th St., N. W., Washington, D. C.—T
Raytheon Production Corp., 55 Chapel St., Newton, Mass.—R, T
RCA-Radiotron—RCA Victor Div., Radio Corp. of America
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA-Radiotron," "RCA-Victor," "Cunningham"—CR, EM, I, MT, PH, R, ST, TT, T, VC
Rogers Radio Tubes, Ltd., Toronto, Ontario, Canada—T
Slater Electric & Mfg. Co., 726 Atlantic Ave., Brooklyn, N. Y., "Slater"—B, I, R, T
Sonotone Corp., P. O. Box 200, Elmsford, N. Y.—MT, ST
Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn 1, N. Y.—VM
Sperti, Inc., Beech & Kenilworth Aves, Norwood, Cincinnati 12, Ohio—GM, I, PH, ST, TT, T, G
Standard Arcturus Corp., 30-34 Court St., Newark, 2, N. J.—MT, R, TT, T
Sundt Engineering Co., 4763 Ravenswood Ave., Chicago, Ill.—ST
Superior Electric Co., Laurel St., Bristol, Conn.—VC
Sylvania Elec. Prod., Inc., 500 Fifth Ave., New York 18, N. Y., "Sylvania"—B, CR, I, MT, R, ST, TT, T, VC, G
Taylor Tubes, Inc., 2341 Wabansia Ave., Chicago, Ill., "Taylor"—I, T
Translite, Inc., 639 Kent Ave., Brooklyn, N. Y.—T
Tung-Sol Lamp Works, Inc., Radio Tube Div., 95—8th Ave., Newark 4, N. J., "Tung-Sol"—MT, R, ST
United Electronics Co., 42 Spring St., Newark, N. J.—I, T
Western Electric Co., 195 Broadway, New York, N. Y.—CR, EM, MT, R, T, VC
Western Elec. Co., 300 Central Ave., Kearny, N. J.—R, CR, I, T, VC
West Shore Laboratories, Box 117, Marblehead, Mass.,—ST
Westinghouse Elec. & Mfg. Co., 2519 Wilkens Ave., Baltimore, Md.—T, VC, I, X
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.—I, T, VC, X
Westinghouse Lamp Div., Westinghouse Elec. & Mfg. Co., Bloomfield, N. J.—B, I, PH, R, ST, T, X, TT, VC
Wilcox Electric Co., 14th & Chestnut Sts., Kansas City, Mo.—T

Tube Parts

(See also METALS and WIRE)

Anodes, graphite ....AG
Anodes, metal ....AM
Bases ....B
Base pins ....BP
Cavities C
Fluorescent materials ....F
Fused quartz parts ....Q
Getters ....G
Glass bulbs ....GB
Grid & supports ....GS
Mica parts ....M
Rare gases ....RG
Stamped parts ....S
Tube repairing ....TR
Tube seal leads ....TS

Admak Mfg. Co., 44-46 Cordier St., Irvington, N. J. AM, S
Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.—RG
American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga 5, Tenn.—B
Amperex Electronic Prod. Corp., 81 Washington St., Brooklyn, N. Y.—AG
Arpin Mfg. Co., 422 Alden St., Orange, N. J.—AM, B, TR
Auburn Button Works, Inc., Auburn, N. Y.—B
The Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.—TS
Birtcher Corp., 5087 Huntington Dr., Los Angeles 36, Calif.—B
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio—TS
Sigmund Cohn, 44 Gold St., New York—TP
Corning Glass Works, Corning, N. Y.—GB
Dallons Laboratories, 5068 Santa Monica Blvd., Los Angeles 27, Calif.—Q
Wilbur B. Driver Co., 150 Riverside Ave., Newark, N. J.—TP
Division Lead Co., 836 W. Kinzie St., Chicago 22, Ill.—AM
E. I. DuPont de Nemours & Co., Patterson Screen Div., 625 Main St., Towanda, Pa.—F
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.—TR
Engineering Co., 27 Wright St., Newark, N. J.—B, TS
Freeland & Olschner Products, Inc., 611 Baronne St., New Orleans 13, La.—TR
General Electric Co., 1 River Rd., Schenectady, N. Y.—AM, B, S
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn 17, N. Y.—S
Haines Mfg. Co., 248-274 McKibbin St., Brooklyn 6, N. Y.—B
Hanoria Chemical & Mfg. Co., Newark, N. J.—Q
Haydu Brothers, P. O. Box 1226, Plainfield, N. J.—AM, BP, G, M, RG, GS
Huse Liberty Mica Co., 171 Camden St., Boston 18, Mass.—M
O. Hommel Co., 209 4th Ave., Pittsburgh, Pa.—F
Isolantite, Inc., 343 Cortlandt St., Belleville 9, N. J.—B
The C. O. Jelliff Mfg. Corp., Southport, Conn.—TP 29, Ill.—TR
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—TR
King Laboratories, Inc., 201 Oneida St., Syracuse, N. Y.—G
Lewis Electronics, 16 Lyndon St., Los Gatos, Calif.—TR
Metal Textile Corp., 4 Central Ave., W. Orange, N. J.
Metroloy Co., Inc., 57 E. Alpine St., Newark, N. J.—S
Mica Insulator Co., 200 Varick St., New York 14, N. Y., "Munsell"—M
Michigan Fluorescent Light Co., 71 S. Parke, Pontiac 14, Mich.
Norton Laboratories, Inc., 560 Mill St., Lockport, N. Y.—B
Pacific Clay Products, SteaPACTite Div., 306 West Ave. 26, Los Angeles 31, Calif.—B
Plastic Fabricators Co., 440 Sansome St., San Francisco, 11, Calif.—F
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA-Radiotron," "RCA-Victor," "Cunningham"—F, TR
Bernard Rice's Sons, 325 Fifth Ave., New York, N. Y.—AM, B, GS, S, C
Speer Carbon Co, St. Marys, Pa.—AG
Sperti, Inc., Beech & Kenilworth Aves, Norwood, Cincinnati 12, Ohio—TR
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.—B
Summerill Tubing Co., Bridgeport, Pa.—S
Superior Tube Co., Norristown, Pa.—AM, S
Swedish Iron & Steel Corp., 17 Battery Pl., New York, N. Y.—TS
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.—AG, AM, B, BP, F, G, M, TS
U. S. Tool Co., Inc., Ampere, E. Orange, N. J.—AG
West Shore Laboratories, Box 117, Marblehead, Mass.—TR
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—AM, F, G, TS

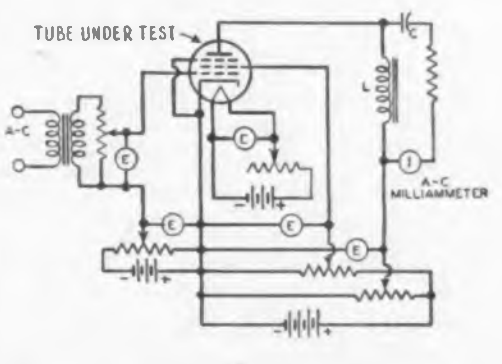
Wire & Cable

Antenna (receiving) ....A
Antenna (transmitting) ....AT
Antenna transmission cable (rec) AN
Antenna transmission cable (tr) ANT
Cable assemblies ....CA
Coaxial cable CC
Cords (attachment) ....CO
Filament wire ....FW
Flat woven cable ....FL
Guy ....G
High voltage ....HV
Hook-up ....HU
Insulated cable IC
Litzendraht L
Magnet ....M
Mike cable ....MC
Radio harness ....H
Resistance ....R
Resistance cords ....RC
Shielded ....S
Shielded ignition ....SI
Solid dielectric-UHF ....SD
Wave guides ....W
Wire shielding ....WS

Acme Wire Co., 1257 Dixwell Ave., New Haven 14, Conn., "Cottonite," "Enamelite," "Heatex," "Silkenite"—A, L, M
Acorn Insulated Wire Co., Inc., 225 King St., Brooklyn 31, N. Y.—HU, IC, S
Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, N. Y.—A, AT, H, SI
Aircraft-Marine Products, Inc., 288 N. Broad St., Elizabeth, N. J.—CA
Aircraft Products, 3502 E. Pontiac St., Fort Wayne, Ind.—CO, H
Airplane & Marine Instruments, Inc., Box 92, Clearfield, Pa.—CA
Alden Products Co., 119 N. Main St., Brockton, Mass.—CA, CO, FL, HU, H, IC, MC, S, SI, WS
Alpha Wire Corp., 50 Howard St., New York 13, N. Y.—AN, ANT, CA, CC, CO, FL, G, HU, IC, L, M, MC, H, RC, S, SI, WS
American Automatic Electric Co., 1019 W. Van Buren St., Chicago, Ill.—CA, CO
American Chain & Cable Co., Bridgeport 2, Conn.—G
American Communications Corp., 306 Broadway, New York 7, N. Y.—H
American Insulated Wire Co., 610 Manton Ave., Providence, R. I.—IC
American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill., "Amphenol"—CA, CC, WS
American Steel & Wire Co., 614 Superior St., N. W., Cleveland 13, Ohio—A, AT, AN, ANT, CC, G, HU, IC, M, MC, S, SI, WS
Amphenol—American Phenolic Co.
Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.—CC, IC, L, M
Andrew Co., 363 E. 75th St., Chicago 19, Ill.—AN, ANT, CA, CC
Aray Mfg. & Supply Co., Inc., 3105 Pine St., St. Louis 3, Mo.—CA

Arnessen Electric Co., 116 Broad St., New York 4, N. Y.—A, AT
Art Specialty Co., 3245 W. Lake St., Chicago 24, Ill. —BC
Automatic Electric Co., 1033 W. Van Buren St., Chicago 7, Ill.—CO
Rex Bassett, Inc., Bassett Bldg., 500 S. E. Second St., Ft. Lauderdale, Fla.—A, AT, AN, CC.
Belden Mfg. Co., P. O. Box 5070-A, Chicago 80, Ill. —A, AT, AN, ANT, CA, CC, CO, FL, HU, IC, L, M, MC, H, RC, S, SI, WS
Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.—CA, H
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J. —CO
Birnbach Radio Co., Inc., 145 Hudson St., New York, N. Y.—A, AN, ANT, AT, CC, CO, FL, G, HU, IC, L, M, MC, RC, S, SI
Boston Insulated Wire & Cable Co., 65 Bay St., Boston, Mass.—A, HU
Branston Electric Mfg. Co., 61-65 Gill Pl., Buffalo 13, N. Y.—CA, H
Bussey Pen Products Co., 5151 W. 65th St., Chicago 38, Ill.—G
Caswell-Runyan Co., Huntington, Ind.—CA ,H.
Central Cable Corp., 4 S. 15th St., Philadelphia, Pa. —A, AT, IC
Chase Brass & Copper Co., 263 Grand St., Waterbury 91, Conn.—IC, M
Chicago Metal Hose Corp., 1315 S. 3rd Ave. Maywood, Ill.—WS
Cleveland Wire Cloth & Mfg. Co., 3573-83 E. 78th St., Cleveland 5, Ohio—WC
C. G. Conn, Ltd., Elkhart, Ind.—ANT
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.—A, AN, ANT, AT, CO, HU, IC, M, MC, RC, S, SI, WS
Cordohm—Ohmite Mfg. Co.
Cornish Wire Co., Inc., 15 Park Row, New York 7, N.Y. "Corwico"—AN, ANT, CA, CO, G, HU, IC, MC
Corwico—Cornish Wire Co.
Cottonite—Acme Wire Co.
The Crescent Co., Front & Central Ave., Pawtucket, R. I.—CA, CO, HU, IC, H, S
Crescent Insulated Wire & Cable Co., Trenton, N. J.— A, AN, ANT, AT, CO, H, HU, IC, L, M, MC, S
Diamond Wire & Cable Co., 128 E. 16th St., Chicago Heights, Ill.—A, AN, CO, HU, IC, MC, RC, S, WS
Doolittle Radio, Inc., 7421 So. Loomis Blvd., Chicago 36, Ill.—AN, ANT, CC
Driver-Harris Co., Harrison, N. J.—R
Wilbur B. Driver Co., 150 Riverside Ave., Newark, N. J.—A, R
Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza S., Long Island City, N. Y.—CA, CO
Hugh H. Eby, Inc., 18 W. Chelten Ave., Philadelphia, Pa.—CA
The Electric Auto-Lite Co., Wire Div., Port Huron, Mich.—A, AT, AN, ANT, CA, CO, FL, HU, IC, M, MC, H, S, SI, WS
Electro-Voice Mfg. Co., Inc., 1239 S. Bend Ave., S. Bend, Ind.—MC
Enamelite—Acme Wire Co.
Essex Wire Corp., 1601 Wall St., Fort Wayne 6, Ind.—A, CA, CO, FL, HU, IC, L, M, MC, H, S, ST, WS
Federal Telephone & Radio Corp., 200 Mt. Pleasant Ave., Newark, N. J.—CC
M. M. Fleron & Son, Inc., 113 N. Broad St., Trenton, N. J., "Fleron"—CO, HU
Flexo Wire Co., 638 W. Genesee St., Syracuse 1, N. Y.—A, AT, FL, HU, WS
George W. Gates & Co., Inc., Hempstead Turnpike & Lucille Ave., Franklin Square, N. Y.—CO
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I. N. Y.—IC
General Cable Corp., 420 Lexington Ave., New York, N. Y.—A, AN, ANT, AT, CA, CO, FL, G, HU, IC, L, M, MC, S, SI, WS
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—A, CO, HU, R, RC
General Electric Co., 1 River Rd., Schenectady, N. Y. —CA, CC, CO, IC, L, M, FW
General Electric Co., 1285 Boston Ave., Bridgeport, Conn.—CA, CO, IC, M
General Insulated Wire Works, Inc., 69 Gordon Ave., Providence, R. I.—CA, CO, HU, IC, S, H
The James Goldmark Wire Co., 116 West St., New York, N. Y.—FL, HU, L, M, R, WS
Edwin I. Guthman & Co., Inc., 15 S. Throop St., Chicago, Ill.—L, M
Hatfield Wire & Cable Co., 605 Hillside Ave., Hillside, N. J.—IC
Heatex—Acme Wire Co.
Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J.—H
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8, Mich.—R
Hudson Wire Co., Winsted Div., 981 Main St., Winsted Conn.—M
INCA—Phelps Dodge Copper Prods. Corp.
Indiana Steel Wire Co., 700 S. Council St., Muncie, Ind.—G
Industrial Screw & Supply Co., 717 W. Lake St., Chicago 6, Ill.—WS
Industrial Synthetics Corp., 60 Woolsey St., Irvington N. J.—WS
Isolantite, Inc., 343 Cortlandt St., Belleville 9, N. J.—CC
The C. O. Jelliff Mfg. Corp., Pequot Rd., Southport, Conn.—R
J.F.D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn 19, N. Y.—R, RC
E. F. Johnson Co., Waseca, Minn., "Johnson"—ANT, AT, CC
Kellogg Switchboard & Supply Co., 6650 S. Cicero, Chicago 38, Ill.—CO
Kennecott Wire & Cable Co., Phillipsdale, R. I.—M
Walter A. Kent Co., 2602-4 W. 69th St., Chicago 29, Ill.—AT, ANT, CC
Knickerbocker Annunciator Co., 116 West St., New York 7, N. Y.—IC, L, M, WS
Lear Avia, Inc., Piqua, Ohio—CC
Lenz Electric Mfg. Co., 1751 N. Western Ave., Chicago, Ill.—A, HU, IC, M, S
Locke Insulator Corp., P. O., Box 57, Baltimore, Md.—CC, G
Lowell Insulated Wire Co., 171 Lincoln St., Lowell, Mass.—A, CA, CO, HU, IC, MC
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind., "Yaxley"—IC
Meissner Mfg. Co., 7th & Belmont Sts., Mt. Carmel, Ill.—L, M
James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.—CC
Muter Co., 1255 So. Michigan Ave., Chicago 5, Ill. —WS
North American Philips Co., Inc., 145 Palisade St., Dobbs Ferry, N. Y.—R, FW
Nonotuck Mfg. Co., Water St., Holyoke, Mass.—FL, WS
Northern Electric Co., 5224 N. Kedzie, Chicago, Ill. —RC
Northern Mfg. Co., Inc., 36 Spring St., Newark, N. J.—FW
Ohmite Mfg. Co., 4984 W. Flournoy St., Chicago, Ill., "Cordohm"—RC
The Okonite Co., Passaic, N. J.—A, AT, AN, ANT, CC, CO, IC, MC, S, SI, SD, HV
Packard Electric Div. General Motors Corp., Dana Ave., Warren, Ohio—CA, CO, HU, IC, H, S, SI, WS
Paperite—Acme Wire Co.
Patton-MacGuyer Co., 17 Virginia Ave., Providence, R. I.—M
Phelps-Dodge Copper Prods. Corp., 40 Wall St., New York, N. Y., "INCA"—CC, IC, M, S
Porcelain Products, Inc., Parkersburg, W. Va.—G
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.—S
Radex Corp., 1322 Elston Ave., Chicago, Ill.—A,CC
The Radiart Corp., 3571 W. 62nd St., Cleveland 2, Ohio—A, AT
Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.—CA
Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.—CA, CC, IC, H
Radionic Transformer Co., 411 So. Green St., Chicago 7, Ill.—H
RCA Victor Div., Radio Corp. of America, Front & Cooper Sts., Camden, N. J., "RCA"—AN, MC, S
Rea Magnet Wire Co., Inc., E. Pontiac St., Extended, Ft., Wayne 4, Ind.—L, M
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R. I.—HU, IC
Bernard Rice's Sons, 325 Fifth Ave., New York, N. Y.—W
E. A. Rittenhouse Co., Honeoye Falls, N. Y.—CA
Rockbestos Products Corp., P. O. Box 1102, New Haven 4, Conn.—CO, HU, IC, M, R, S, SI
John A. Roebling's Sons Co., 640 S. Broad St., Trenton 2, N. J.—FL, G, IC, M
Rome Cable Corp., 332 Ridge St., Rome, N. Y.— IC, M
Royal Electric Co., Inc., 95 Grand Ave., Pawtucket, R. I.—CA, CO, IC
Rupp's Assembling & Mfg. Works, 2341 N. Seminary Ave., Chicago 14, Ill.—CA, CO, IC
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.—A, CA, CO, H
Sandee Mfg. Co., 3945 No. Western Ave., Chicago 18, Ill.—CC, IC, WS, A, AT, CA, FW, HU
Sherman & Reilly, Inc., 1st & Broad, Chattanooga, Tenn.—G
Shure Bros., 225 W. Huron St., Chicago 10, Ill. —MC
Silkenite—Acme Wire Co.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge 39, Mass.—CA, CC, CO, IC, MC, S, SI
Standard Winding Co., 44-62 Johnes St., Newburgh, N. Y.—CA, H
Stromberg-Carlson Co., 100 Carlson Road, Rochester 3, N. Y.—CO, G, HU, IC, MC, S
Swedish Iron & Steel Corp., 17 Battery Pl., New York, N. Y.—R
Technical Appliance Corp., 516 W. 34th St., New York 1, N. Y.—A, AN
Trav-Ler Karenola Radio & Television Corp., 1028-36 W. Van Buren St., Chicago 7, Ill.—CA
The Ucinite Co., 459 Watertown St., Newtonville, Mass.—A, AT
Uniform Tubes, Shurs Lane & Lauriston St., Philadelphia 28, Pa.—A, AT, AN, ANT, CC, HU, S, WS
Utilities Service Co., Allentown, Pa.—G
United States Rubber Co., 1232 Sixth Ave., New York 20, N. Y.—A, CA, CC, CO, IC, MC, SI, WS
Universal Microphone Co., 424 Warren Lane, Inglewood, Calif.—MC
Wm. T. Wallace Mfg. Co., Peru, Ind.—CA
Western Electric Co., 195 Broadway, New York, N. Y. —AT, AN, ANT, CC, CO, FL, HU, IC, MC, S
Western Insulated Wire, Inc., 1001 E. 62nd St., Los Angeles 1, Calif.—A, AT, AN, ANT, CA, CO, HU, IC, MC, H, S, SI, WS
The Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.—L, M
Westinghouse Elec. & Mfg. Co., Lamp Div., Bloomfield, N. J.—FW
Whitaker Battery Supply Co., 1301 Burlington Ave., North Kansas City 16, Mo.—CA, FL, IC, H
Whitney Blake Co., New Haven, Conn.—S
C. D. Wood Electric Co., Inc., 826 Broadway, New York, N. Y.—CA, CC, CO, H
Wilcox Electric Co., Inc., 1400 Chestnut, Kansas City 1, Mo.—H
Yaxley—P. R. Mallory & Co., Inc.

Useful Applications in Electronic Developments .... No. 14



TUBE CHECKER

TYPICAL USES: For selecting tubes for use in test equipment where effectiveness depends on its operation on commercial tubes.

WHAT IT IS AND HOW IT IS USED: The maintainance of standard performance of electronic equipment means checking tubes at frequent intervals for operating characteristics. Many tube-checkers are available having facilities for testing certain of the characteristics, short circuits, emission, transconductance, and power output being the most useful checks.

ALPHABETICAL FINDING LIST of Electronic Manufacturers

Use this list if you know the name of a company and want to learn one of its products. Most of the following companies manufacture more than one product

A

Aarons Radio Corp., New York, N. Y. —Control Equipment

ABC Radio Labs., Indianapolis, Ind.—Antennas

Abbott Instrument, Inc., New York, N. Y. —Transmitters

Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.—Plastic Material

Accurate Spring Mfg. Co., Chicago, Ill. —Springs

Ace Mfg. Corp., Philadelphia, Pa.—Metal Stampings

Acheson Colloids Corp., Port Huron, Mich. —Graphite

Ackermann, Steffan Co., Chicago, Ill.—Tools

Acklin Stamping Co., Toledo, Ohio—Metal Stampings

Acme Battery Co., Brooklyn, N. Y.—Batteries

Acme Electric & Mfg. Co., Cuba, N. Y.—Transformers*

Acme Folding Box Co., Inc., New York, N. Y.—Paper Liners

Acme Tool & Die Co., Evansville, Ind. —Machinery

Acme Welding Co., Louisville, Ohio—Antennas

Acme Wire Co., New Haven, Conn.—Wire*

Acorn Insulated Wire Co., Inc., Brooklyn, N. Y.—Wire

Acro Electric Co., Cleveland, Ohio—Switches

The Acromark Corp., Elizabeth, N. J.—Machinery*

Acro Tool and Die Works, Chicago, Ill. —Hand Tools

H. W. Acton Co., Inc., New York, N. Y. —Needles

The Adams & Westlake Co., Elkhart, Ind. —Relays

Adler Mfg. Co., Louisville, Ky.—Cabinets

Admak Mfg. Co., Irvington, N. J.—Tube Parts

Admiral Corp., Chicago, Ill.—Communication Equipment

Advance Electric Co., Los Angeles, Calif. —Relays*

Advance Recording Products, Long Island City, N. Y.—Recorders

Aero Communications, Inc., Hempstead, L. I., N. Y.—Transmitters

Aeroil Burner Co., Inc., West New York, N. J.—Impregnating Equipment

Aeronautical Radio Mfg. Co., Roosevelt Field, Mineola, L. I., N. Y.—Antennas

Aerovox Corp., New Bedford, Mass.—Fixed Capacitors

Bruno H. Ahlers, Woodhaven, N. Y.—Relays

Airadio, Inc., Stamford, Conn.—Connectors

Air Communications, Inc., Kansas City, Mo.—Transmitters

Aircraft Accessories Corp., Kansas City, Kans.—Transmitters*

Aircraft & Diesel Equipment Corp., Chicago, Ill.—Hardware

Aircraft Marine Products, Inc., Harrisburg, Pa.—Laboratory Equipment

Aircraft Products Co., Fort Wayne, Ind.—Cord Assemblies

Aircraft Radio Corp., Boonton, N. J.—Transmitters*

Aircraft Screw Products Co., Inc., Long Island City, N. Y.—Hardware

Air King Products Co., Inc., Brooklyn, N. Y.—Communication Equipment

Air Maze Corp., Cleveland, Ohio—Air Cleaners

Airplane & Marine Instruments,, Inc., Clearfield, Pa.—Transmitters*

Air Reduction Sales Co., New York, N. Y.—Rare Gases

Air-Way Electric Appliance Corp., Toledo, Ohio—Motors

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.—Induction Heating

Akron Porcelain Co., Akron, Ohio—Insulation*

Aladdin Radio Industries Inc., Chicago, Ill.—Coils*

Albion Coil Co., Albion, Ill.—Coils

Alco Valve Co., St. Louis, Mo.—Control Equipment

Alden Products Co., Brockton, Mass.—Hardware*

Aldine Paper Co., Inc., New York, N. Y.—Insulation

Algoma Products, Detroit, Mich.—Machinery

All American Tool & Mfg. Co., Chicago, Ill.—Measuring Instruments

Allen Electric & Equipt. Co., Kalamazoo, Mich.—Laboratory Equipment*

Allen-Bradley Co., Milwaukee, Wisc.—Resistors

Alliance Mfg. Co., Alliance, Ohio—Motors*

Allied Asphalt & Mineral Corp., New York, N. Y.—Paint, Cement and Wax Products

Allied Control Co., Inc., New York, N. Y. —Relays*

Allied Recording Products Co., Long Island City, N. Y.—Recorders

Allis-Chalmers Mfg. Co., Milwaukee, Wisc. —Relays

All Steel Equipment Co., Aurora, Ill.—Machinery

All Weather Springs, New York, N. Y.—Springs

Aloha Metal & Rolling Mills, Inc., Brooklyn, N. Y.—Hand Tools

Alpha Wire Corp., New York, N. Y.—Wire

Alrose Chemical Co., Providence, R. I.—Metal Finishing

Altec Lansing Corp., Los Angeles, Calif. —Sound Systems*

Aluminum Co. of America, Pittsburgh, Pa.—Metal

Aluminum Finishing Corp., Indianapolis, Ind.—Metal Finishing

American Amplifier & Tele. Co., Inc., Los Angeles, Calif.—Microphones*

American Automatic Electric Sales Co., Chicago, Ill.—Relays*

American Battery Co., Chicago, Ill.—Chargers

The American Brass Co., Waterbury, Conn. —Metal

American Chain & Cable Co., Inc.—Bridgeport, Conn.—Wire

American Coils, Inc., Newark, N. J.—Laboratory Equipment

American Communications Corp., New York, N. Y.—Sound Systems*

American Condenser Co., Chicago, Ill. —Fixed Capacitors

American Cyanamid Co., New York, N. Y. —Plastics

American District Telegraph Co., New York, N. Y.—Control Equipment

American Electric Fusion Corp., Chicago, Ill.—Machinery

American Electrical Heater Co., Detroit, Mich.—Hand Tools

American Electro Metal Corp., Yonkers, N. Y.—Metal

American Emblem Co., Inc., Utica, N. Y. —Dials, Parts*

American Gas Accumulator Co., Elizabeth, N. J.—Switches*

American Instrument Co., Silver Spring, Md.—Relays*

American Insulated Wire Co., Providence, R. I.—Wire

American Insulating Machinery Co., Philadelphia, Pa.—Machinery.

American Insulator Corp., New Freedom, Pa.—Insulation*

American Jewels Corp., Attleboro, Mass. —Crystals

American Lava Corp., Chattanooga, Tenn. —Insulation*

American Microphone Co., Los Angeles, Calif.—Microphones*

American Molding Powder & Chemical Corp., Brooklyn, N. Y.—Plastics

American Nut & Bolt Fastener Co., Pittsburgh, Pa.—Hardware

American Phenolic Corp., Chicago, Ill.—Plastics*

American Photocopy Equip. Co., Chicago, Ill.—Drafting Equipment

American Platinum Works, Newark, N. J. —Metal

American Products Mfg. Co., New Orleans, La.—Plastics

American Radio Hardware Co., Inc., New York, N. Y.—Hardware*

American Rolling Mill Co., Middletown, Ohio—Metal

American Screw Co., Providence, R. I.—Hardware

American Solder & Flux Co., Philadelphia, Pa.—Flux

The American Steel Package Co., Defiance, Ohio—Variable Capacitors*

American Steel & Wire Co., Cleveland, Ohio—Wire*

American Television & Radio Co., St. Paul, Minn.—Chargers*

American Thermo-Elec. Co., New York, N. Y.—Measuring Instruments

American Time Products, Inc., New York, N. Y.—Control Equipment

American Transformer Co., Newark, N. J.—Transformers*

Amperex Electronic Products, Inc., Brooklyn, N. Y.—Tubes

Amperite Co., New York, N. Y.—Microphones*

Amertype Recordgraph Corp., New York, N. Y.—Recording Equipment

Amplo Corp., Chicago, Ill.—Amplifiers

Amplex Engineering Inc., New Castle, Ind.—Antennas*

Amplifier Co. of America, New York, N. Y.—Sound Systems*

Ampro Corp., Chicago, Ill.—Amplifiers

Amy, Aceves & King, Inc., New York, N. Y.—Antennas

Anaconda Wire & Cable Co., New York, N. Y.—Wire*

Anchor Plastics Co., New York, N. Y. —Plastic Fabricators

Andrea Radio Corp., Long Island City, N. Y.—Communication Equipment

Andrew & Co., Chicago, Ill.—Wire

Andrews & Perillo, Long Island City, N. Y.—Control Equipment*

Victor J. Andrew Co., Chicago, Ill.— Antenna Equip.

R. B. Annis Co., Indianapolis, Ind.—Transformers*

Ansley Radio Corp., Long Island City, N. Y.—Communication Equipment

Apollo Metal Works, Chicago, Ill.—Metal

Applied Research Labs., Glendale, Calif. —Laboratory Equipment

Approved Technical Apparatus Co., Brooklyn, N. Y.—Laboratory Equipment

Aray Mfg. & Supply Co., Inc., St. Louis, Mo.—Coils

Arens Controls, Inc., Chicago, Ill.—Insulation

Arkay Laboratories, Inc., Milwaukee, Wisc.—Switches

Armstrong Cork Co., Lancaster, Pa.—Insulation

Arnessen Electric Co., New York, N. Y. —Transmitters & Equipment

The Arnold Engineering Co., Chicago, Ill.— Permanent Magnets

Arpin Mfg. Co., Orange, N. J.—Plastic Molders

The Arrow-Hart & Hegeman Electric Co., Hartford, Conn.—Switches*

Art Specialty Co., Chicago, Ill.—Sound Systems*

Askania Regulator Co., Chicago, Ill.—Control Equipment

Associated Research, Inc., Chicago, Ill.—Laboratory Equipment*

The Astatic Corp., Youngstown, Ohio—Microphones*

ATC Co., Inc., Philadelphia, Pa.—Control Equipment

Atlantic Plastics, Cleveland, Ohio—Plastic Molders

Atlas Condenser Products Co., Bronx, N. Y.—Capacitors

Atlas Products Corp., New York, N. Y.—Plastic Molders

Atlas Resistor Co., New York, N. Y.—Resistors

Atlas Sound Corp., Brooklyn, N. Y.—Sound Systems*

Auburn Button Works, Inc., Auburn, N. Y. —Plastic Molders

Auburn Mfg. Co., Middletown, Conn.—Insulation*

Audak Co., New York, N. Y.—Pickups

Audio Development Co., Minneapolis, Minn. —Transformers*

Audio Devices, Inc., New York, N. Y.—Recorders*

The Audio-Tone Oscillator Co., Bridgeport, Conn.—Control Equipment*

Audubon Wire Cloth Corp., Philadelphia, Pa.—Metal Cloth

Aurex Corp., Chicago, Ill.—Microphones*

Aurora Precision Devices, Geneva, Ill.—Screw Products

The O. Austin Co., New York, N. Y.—Dials, Parts

Austin Electronic Mfg. Co., Warren, Pa. —Sound Systems*

Auth Electrical Specialty Co., Inc., New New York, N. Y.—Relays

Autocrat Radio Co., Chicago, Ill.—Sound Systems*

Auto Engraver Co., New York, N. Y.—Marking Machines

Automatic Alarms Co., Youngstown, Ohio —Control Equipment

Automatic Electric Co., Chicago, Ill.—Relays*

Automatic Elec. Mfg. Co., Mankato, Minn.—Relays*

The Automatic Electrical Devices Co., Cincinnati, Ohio—Chargers*

Automatic Mfg. Co., Inc., Harrison, N. J.—Tools

Automatic Products Co., Milwaukee, Wisc. —Solenoid Valves

Automatic Radio Mfg. Co., Boston, Mass. —Communication Equipment

Automatic Switch Co., New York, N. Y.—Switches

Automatic Temperature Control Co., Inc., Philadelphia, Pa.—Control Equipment*

Automatic Winding Co., E. Newark, N. J. —Coils*

Avia Products Co., Los Angeles, Calif.—Power Filters

B

Bacon Electric Timer Corp., Cleveland, Ohio—Switches
N. S. Baer Co., Hillside, N. J.—Hardware*
Bailey Meter Co., Cleveland, Ohio—Measuring Instruments
Baird Machine Co., Stratford, Conn.—Machinery
Bakelite Corp., New York, N. Y.—Plastics*
Baker & Co., Inc., Newark, N. J.—Hardware
J. T. Baker Chemical Co., Phillipsburg, N. J.—Chemicals
Baker Oil Tools, Inc., Los Angeles, Calif.—Plastics
Ballantine Labs., Inc., Boonton, N. J.—Measuring Instruments*
Bank's Manufacturing Co., Chicago, Ill.—Sound Systems*
Alfred W. Barber Labs., Flushing, N. Y.—Measuring Instruments*
Barber-Coleman Co., Molded Products Div., Rockford, Ill.—Plastic Molders
Barker & Williamson, Upper Darby, Pa.—Coils*
Rex Bassett, Inc., Fort Lauderdale, Fla.—Crystals*
Bastian Bros. Co., Rochester, N. Y.—Dials*
Bausch & Lomb Optical Co., Rochester, N. Y.—Laboratory Equipment
B & C Insulation Products, Inc., New York, N. Y.—Insulation*
The Bead Chain Mfg. Co., Bridgeport, Conn.—Tube Parts
Bear Mfg. Co., Rock Island, Ill—Machinery and Equipment
Belden Mfg. Co., Chicago, Ill.—Wire*
Belle Alkali Co., Belle, W. Va.—Solvents
The Bell & Howell Co., Chicago, Ill.—Communication Equipment
Bell Radio & Television, New York, N. Y.—Sound Systems*
Bell Sound Systems, Inc., Columbus, Ohio—Sound Systems*
Belmont Radio Corp., Chicago, Ill.—Communication Equipment
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.—Metal
Bend-A-Lite Plastics Co., Chicago, Ill.—Fabricators
Bendix Aviation, Ltd., No. Hollywood, Calif.—Intercommunicators
Bendix Radio Div., Bendix Aviation Corp., Baltimore, Md.—Communication Equipment*
Bentley, Harris Mfg. Co., Conshohocken, Pa.—Insulation
The Benwood Linze Co., St. Louis, Mo.—Chargers*
Berger Electronics, Forest Hills, L. I., N. Y.—Control Equipment*
E. M. Berndt Corp., Hollywood, Calif.—Photo-electric Equipment
Best Mfg. Co., Inc., Irvington, N. J.—Speakers*
James G. Biddle Co., Philadelphia, Pa.—Test Equipment*
Billings & Spencer Co., Hartford, Conn.—Hand Tools
Richard H. Bird, Waltham, Mass.—Instrument Parts
Birnbach Radio Co., Inc., New York, N. Y.—Wire*
The Birtcher Corp., Los Angeles, Calif.—Hardware*
A. Bitter Construction Co., New York, N. Y.—Cabinets*
Biwax Corp., Skokie, Ill.—Waxes
Black & Decker Electric Co., Kent, Ohio—Motors
Black Bear Co., Inc., New York, N. Y.—Special Lubricants
Blaw-Knox Division, Blaw-Knox Co., Blawnox, Pa.—Antennas*
Bliley Electric Co., Erie, Pa.—Crystals*
Bludworth Marine, Div. of National Simplex Bludworth, Inc., New York, N. Y.—Ultrasonic Oscillators
Bodine Electric Co., Chicago, Ill.—Motors
Charles J. Bodnar Co., Tuckahoe, N. Y.—Crystals
H. O. Boehme, Inc., New York, N. Y.—Radiotelegraph Equipment*
W. W. Boes Co., Dayton, Ohio—Transmitters and Equipment
Boetsch Bros., New York, N. Y.—Phonographs
David Bogen Co., Inc., New York.—Sound Systems*
Bond Electric Corp., New Haven, Conn.—Batteries
Boom Elec. & Amplifier Co., Chicago, Ill.—Sound Systems
Boonton Molding Co., Boonton, N. J.—Insulation*
Boonton Radio Co., Boonton, N. J.—Test Equipment
Bostitch, E. Greenwich, R. I.—Hand Tools
Boston Insulated Wire & Cable Co., Boston, Mass.—Wire
Boulin Instrument Co., New York, N. Y.—Measuring Instruments
Bowers Battery & Spark Plug Co., Reading, Pa.—Batteries
L. S. Brach Mfg. Co., Newark, N. J.—Antennas
Bradley Laboratories, Inc., New Haven, Conn.—Photo Electric Equipment*
C. S. Brainin Co., New York, N. Y.—Hardware
Wm. Brand & Co., New York, N. Y.—Insulation
Brandywine Fibre Products Co., Wilmington, Del.—Insulation
Branston Electric Mfg. Co., Buffalo, N. Y.—Electronic Equipment
Breeze Corporations, Newark, N. J.—Hardware
Bridgeport Brass Co., Bridgeport, Conn.—Metal
Bridgeport Mfg. Co., Bridgeport, Ill.—Coils
Bridgeport Molded Products, Inc., Bridgeport, Conn.—Plastic Molders
Briggs & Stratton Corp., Milwaukee, Wisc.—Chargers
Bright Star Battery Co., Clifton, N. J.—Batteries
Arnold Brilhart, Ltd., Great Neck, L. I., N. Y.—Plastic Fabricators
The Bristol Co., Waterbury, Conn.—Measuring Equipment*
Brooke Engineering Co., Inc., Philadelphia, Pa.—Control Equipment*
The Brown-Brockmeyer Co., Dayton, Ohio—Motors
Brown Co., New York, N. Y.—Insulation
Brown Instrument Co., Philadelphia, Pa.—Control Equipment
Browning Labs., Inc., Winchester, Mass.—Communication Equipment*
Charles Bruning Co., Inc., New York, N. Y.—Sensitized Paper
Bruno-New York, Inc., New York, N. Y.—Control Equipment*
Brunswick Radio Division, Mersman Bros. Corp., New York, N. Y.—Cabinets
Brush Development Co., Cleveland, Ohio—Microphones*
Bryant Electric Co., Bridgeport, Conn.—Plastics
Bryant Mfg. Co., Chicago, Ill—Batteries
Bud Radio, Inc., Cleveland, Ohio—Dials, Parts*
Buda Co., Harvey, Ill.—Motors
Bulova Watch Co., New York, N. Y.—Multi-Meters
J. H. Bunnell & Co., New York, N. Y.—Hardware*
Bunting Brass & Bronze Co., Toledo, Ohio—Metal
The Burdick Corp., Milton, Wisc.—Electronic Equipment
Burgess Battery Co., Freeport, Ill.—Batteries
Burgess Battery Co., Handicraft Div., Chicago, Ill.—Machinery*
Burke Electric Co., Erie, Pa.—Chargers
Burke & James, Inc., Chicago, Ill.—Photo Electric Equipment
Burling Instrument Co., Newark, N. J.—Control Equipment
Burlington Instrument Co., Burlington, Iowa—Control Equipment*
Burndy Engineering Co., New York, N. Y.—Connectors
Wm. W. L. Burnett Radio Lab., San Diego, Calif.—Coils*
Burton Mfg. Co., Chicago, Ill.—Electronic Equipment
Burton-Rogers Co., Boston, Mass.—Antennas
Bussey Pen Products Co., Chicago, Ill.—Metal
Bussmann Mfg. Co., St. Louis, Mo.—Fuses

OMISSIONS

Listings have been omitted in all cases where, after three requests, a company has failed to return our directory questionnaire or otherwise verify its activity.

C

Callite Tungsten Corp., Union City, N. J.—Hardware*
Calvert Motors Associates, Ltd., Baltimore, Md.
Cambridge Thermionic Corp., Cambridge, Mass.—Transformers
Campbell X-Ray Corp., Boston, Mass.—Laboratory Equipment*
Cambridge Instrument Co., Inc., New York, N. Y.—Laboratory Equipment*
Camloc Fastener Corp., New York, N. Y.—Hardware
C. F. Cannon Co., Springwater, N. Y.—Headphones
Cannon Electric Development Co., Los Angeles, Calif.—Connectors*
Cantol Wax Co., Bloomington, Ind.—Wax
Capacitrons, Inc., Chicago, Ill.—Fixed Capacitors
Oscar Caplan & Sons, Diamond Tool Replacement Div., Baltimore, Md.—Crystals
Carborundum Co., Niagara Falls, N. Y.—Resistors
Carbide & Carbon Chemicals Corp., Plastics Division, New York, N. Y.—Plastics*
Cardinell Corp., Montclair, N. J.—Drafting Room Equipment
The Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y.—Capacitors*
Cardy-Lundmark Co., Chicago, Ill.—Plastic Molders
Carpenter Mfg. Co., Cambridge, Mass.—Batteries
Carrier Corp., Syracuse, N. Y.—Laboratory Equipment
Carron Mfg. Co., Chicago, Ill.—Coils*
Carson Machine & Supply Co., Oklahoma City, Okla.—Motors
Carson Micrometer Corp., Little Falls, N. J.—Measuring Instruments
Carter Motor Co., Chicago, Ill.—Motors*
Carter Products Corp., Cleveland, Ohio—Plastic Molders
Castlewood Mfg. Co., Inc., Louisville, Ky.—Cabinets
Caswell-Runyan Co., Huntington, Ind.—Cabinets
Catalin Corp., New York, N. Y.—Plastics*
Caterpillar Tractor Co., Peoria, Ill.—Power Plants
Celanese Celluloid Corp., New York, N. Y.—Plastics*
Celluplastic Corp., Newark, N. J.—Plastics
Centralab Div., Globe Union, Milwaukee, Wisc.—Volume Controls*
Central Cable Corp., Philadelphia, Pa.—Wire
Central Paper Co., Muskegon, Mich.—Insulation
Central Process Corp., Forest Park, Ill.—Plastics
Central Scientific Co., Chicago, Ill.—Measuring Equipment*
Century Electric Co., St. Louis, Mo.—Motors
Ceramic Specialties Co., East Liverpool, Ohio—Insulation
W. M. Chace Co., Detroit, Mich.—Metals
Chandler Products Corp., Cleveland, Ohio—Hardware
P. E. Chapman Electrical Works, St. Louis, Mo.—Machinery
Chase Brass & Copper Co., Waterbury, Conn.—Brass*
John Chatillon & Sons, New York, N. Y.—Springs
Chemaco Corp., subsidiary of Manufacturers Chem. Corp., Berkeley Heights, N. J.—Plastic Materials
Chicago Metal Hose Corp., Maywood, Ill.—Wire*
Chicago Molded Products Corp., Chicago, Ill.—Molders
Chicago Rivet & Machine Co., Bellwood, Ill.—Machinery
Chicago Sound Systems Co., Chicago, Ill.—Sound Systems*
Chicago Telephone Supply Co., Elkhart, Ind.—Resistors
Chicago Tool and Engineering Co., Chicago, Ill.—Hand Tools
Chicago Transformer Corp., Chicago, Ill.—Transformers
Christiansen Co., Inc., Providence, R. I.—Hand Tools
Churchill Cabinet Co., Chicago, Ill.—Cabinets
Ciba Corp., New York, N. Y.—Plastics
Cinaudagraph Corp., Stamford, Conn.—Metal*
Cinaudagraph Speakers, Inc., Chicago, Ill.—Speakers
Cinch Manufacturing Co., Chicago, Ill.—Hardware
Cincinnati Molding Co., Cincinnati, Ohio—Molders
C. P. Clare & Co., Chicago, Ill.—Relays
Robert H. Clark Co., Beverly Hills, Calif.—Hand Tools
Clark Controller Co., Cleveland, Ohio—Control Equipment
Clarostat Mfg. Co., Inc., Brooklyn, N. Y.—Volume Controls*
Cleveland Plastics, Inc., Cleveland, Ohio—Molders
Cleveland Tungsten, Inc., Cleveland, Ohio—Tungsten*
Cleveland Wire Cloth & Mfg. Co., Cleveland, Ohio—Speaker Parts
Climax Engineering Co., Clinton, Iowa—Motors
The Clough-Brengle Co., Chicago, Ill.—Laboratory Equipment*
Sigmund Cohn, New York, N. Y.—Tube Parts
Cole Radio Works, Caldwell, N. J.—Transformers
Cole Steel Equipmnt Co., New York, N. Y.—Cabinets
Coleman Electric Co., Maywood, Ill.—Control Equipment*
Collins Co., Los Angeles, Calif.—Microphones*
Collins Radio Co., Cedar Rapids, Iowa—Transmitters
Colloid Equipment Co., Inc., New York, N. Y.—Measuring Instruments
Colonial Brass Co., Middleboro, Mass.—Measuring Instruments
Colonial Insulator Co., Akron, Ohio—Insulators
Colonial Kolonite Co., Chicago, Ill.—Insulation
Colonial Radio Corp., Buffalo, N. Y.—Communication Equipment
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.—Plastics
Columbia Associates, New York, N. Y.—Cabinets
Columbia Electric Mfg. Co., Cleveland, Ohio—Measuring Instruments
Columbia Metal Box Co., New York, N. Y.—Cabinets
Columbia Nut & Bolt Co., Bridgeport, Conn.—Hardware
Columbia Recording Corp., Bridgeport, Conn.—Records
Combustion Control Corp., Cambridge, Mass—Control Equipment
Commercial Crystal Co., Lancaster, Pa.—Crystals
Commercial Engineering Laboratories, Detroit, Mich.—Laboratory Equipment
Commercial Equipment Co., Kansas City, Mo.—Holders
Commercial Metal Products Co., Chicago, Ill.—Metal Cabinets
Commercial Radio Equipment Co., Kansas City, Mo.—Crystals
Commercial Research Laboratories, Inc., Detroit, Mich.—Measuring Instruments
Communications Co., Inc., Coral Gables, Fla.—Transmitters*
Communications Equipment Co., Pasadena, Calif.—Transmitters
Communication Measurements Lab., New York, N. Y.—Measuring Instruments*
Communication Products Co., Newark, N. J.—Communication Equipment
Condenser Products Co., Chicago, Ill.—Fixed Capacitors
C. G. Conn, Ltd., Elkhart, Ind.—Recording Equipment*
Conn. Telephone & Elec. Div., Great American Industries, Inc., Meriden, Conn.—Microphones*
Connector Corp., Philadelphia, Pa.—Hardware
Cosnolidated Diamond Saw Blade Co., Yonkers, N. Y.—Crystal Saws
Consolidated Engineering Corp., Pasadena, Calif.—Laboratory Equipment
Consolidated Molded Products Corp., Scranton, Pa.—Insulation*
Consolidated Wire & Assoc. Corps., Chicago, Ill.—Wire*
Continental Carbon, Inc., Cleveland, Ohio—Resistors*
Continental-Diamond Fibre Co., Newark, Del.—Plastics*
Continental Electric Co., Geneva, Ill.—Photo Electric Equipment*
Continental Electric Co., Inc., Newark, N. J.—Motors
Continental Machines, Inc., Minneapolis, Minn.—Machinery & Equipment*
Continental Screw Co., New Bedford, Mass.—Hardware*
Continental X Ray Corp., Chicago, Ill.—X-Ray Equipment
Control Corp., Minneapolis, Minn.—Control Equipment*

Cook Ceramic Mfg. Co., Trenton, N. J.—Insulation*
Cook Electric Co. of Chicago, Chicago, Ill.—Switches*
Cook Research Laboratories, Menlo Park, Calif.—Dies
Corbin Screw Corp., New Britain, Conn.—Hardware
Cornell-Dubilier Elec. Corp., South Plainfield, N. J.—Capacitors*
Corning Glass Works, Insulation Div., Corning, N. Y.—Insulation*
Cornish Wire Co., Inc., New York, N. Y.—Wire*
Corry-Jamestown Mfg. Corp., Corry, Pa.—Metal Cabinets
Cosmic Radio Corp., New York, N. Y.—Capacitors
Coto-Coil Co., Providence, R. I.—Coils*
Cottrell Paper Co., Inc., Fall River, Mass.—Insulation
S. H. Couch, Inc., North Quincy, Mass.—Coils
Cover Dual Signal Systems, Inc., Chicago, Ill.—Electronic Equipment
The R. W. Cramer Co., Inc., Centerbrook, Conn.—Control Equipment*
Creative Plastics Corp., Brooklyn, N. Y.—Plastic Molders
The Crescent Co., Pawtucket, R. I.—Wire
Crescent Industries, Inc., Chicago, Ill.—Speaker Parts*
The Crosley Corp., Cincinnati, Ohio—Communication Equipment
Crowe Name Plate & Mfg. Co., Chicago, Ill.—Dials, Parts*
Henry L. Crowley & Co., Inc., West Orange, N. J.—Coils*
Crowley Radio Lamp & Mfg. Co., Detroit, Mich.—Communication Equipment
Crucible Steel Co. of America, New York, N. Y.—Metal
Cryco, Inc. So. Pasadena, Calif.—Holders
Crystal Laboratories Inc., Wichita, Kans.—Holders
Crystal Mfg. Co., Chicago, Ill.—Crystals
Crystal Products Co., Kansas City, Mo.—Crystals
Crystal Research Labs., Inc., Hartford, Conn.—Crystals
Crystal-Vox Hearing Instruments Co., Detroit, Mich.—Sound Systems
Cutler-Hammer, Inc., Milwaukee, Wisc.—Switches
C. W. Mfg. Co., Los Angeles, Calif.—Holders
Cyclonics Mfg. Co., Inc., Union City, N. J.—Induction Heating
Cyclotron Specialties Co., Moraga, Calif.—Measuring Instruments

D

Dahlstrom Metallic Door Co., Metal Specialties Div., Jamestown, N. Y.—Metal Stampings*
Dallons Laboratories, Los Angeles, Calif.—Crystals
Dalmo Victor, Inc., San Francisco, Calif.—Communication Equipment
Daly Machine & Tool Works, Newark, N. J.—Machinery
Danneman Die-Set Co., New York, N. Y.—Machinery
The Daven Co., Newark, N. J.—Attenuators*
Harry Davies Molding Co., Chicago, Ill.—Insulation*
Dean W. Davis & Co., Inc., Chicago, Ill.—Transformers
James P. Day & Co., Chicago, Ill.—Lacquers
Dayton Acme Co., Cincinnati, Ohio—Test Equipment
Dayton Insulating Molding Co., Dayton, Ohio—Plastic Molders
Dayton Rogers Mfg. Co., Minneapolis Minn.—Stampings
Dearborn Glass Co., Chicago, Ill.—Recording Blanks
Decca Records, Inc., New York, N. Y.—Records
DeJur-Amsco Corp., Shelton, Conn.—Measuring Instruments*
Delco Radio Div., General Motors Corp., Kokomo, Ind.—Communication Equipment
DesPatch Oven Co., Minneapolis, Minn.—Machinery
Detroit Paper Products Co., Detroit, Mich.—Plastics
Detroit Power Screwdriver Co., Detroit, Mich.—Screwdrivers
Tobe Deutschmann Corp., Canton, Mass.—Capacitors*
De Vry Corp., Chicago, Ill.—Sound Systems
DeWald Radio Mfg. Corp., New York, N. Y.—Communication Equipment*
Dial Light Co. of America, Inc., New York, N. Y.—Dial Lamps
The Diamond Drill Carbon Co., New York, N. Y.—Crystals
Diamond Wire & Cable Co., Chicago Heights, Ill.—Wire
The Dickey Grabler Co., Cleveland, Ohio—Stampings
Dictaphone Corp., New York, N. Y.—Recorders
Diebel Die & Mfg. Co., Chicago, Ill.—Stampings
Diehl Mfg. Co., Elizabethport, N. J.—Motors*
Diemolding Corp., Canastota, N. Y.—Plastic Molders
Dilks Sales Co., Norwalk, Conn.—Sound Systems
Dinion Coil Co., Caledonia, N. Y.—Coils*
Distillation Products, Inc., Rochester, N. Y.—Measuring Instruments*
Division Lead Co., Chicago, Ill.—Solder
Joseph Dixon Crucible Co., Jersey City, N. J.—Drafting Equipment
John C. Dolph Co., Newark, N. J.—Lacquers*
Doolittle Radio, Inc., Chicago, Ill.—Transmitters
J. Dougherty, Montclair, N. J.—Laboratory Equipment
Dow Chemical Co., Midland, Mich.—Plastics*
R. L. Drake Co., Dayton, Ohio—Coils
Drake Electric Works, Inc., Chicago, Ill.—Tools
Frederick J. Drake & Co., Chicago, Ill.—Books
Drake Mfg. Co., Chicago, Ill.—Dials, Parts
Driver-Harris Co., Harrison, N. J.—Wire*
Wilbur B. Driver Co., Newark, N. J.—Wire*
Dual Remote Control Co., Wayne, Mich.—Control Heads
Frank I. DuFrane Co., Inc., San Francisco, Calif.—Sound Systems*
Allen B. DuMont Laboratories, Inc., Passaic, N. J.—Tubes*
Dumont Electric Co., New York, N. Y.—Capacitors*
The Dumore Co., Racine, Wisc.—Motors
Dunn, Struthers, Inc., Philadelphia, Pa.—Relays*
Duotone Company, Inc., New York, N. Y.—Needles*
E. I. DuPont de Nemours & Co., DuPont Plastics, Arlington, N. J.—Plastics*
E. I. du Pont de Nemours & Co., Patterson Screen Div., Towanda, Pa.—X-Ray Screens
Durakool, Inc., Elkhart, Ind.—Relays
Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.—Plastics*
Durite Plastics Div., Stokes & Smith Co., Philadelphia, Pa.—Plastics
Dur-O-Lite Pencil Co., Melrose Park, Ill.—Holders
DX Crystal Corp., Chicago, Ill.—Crystals*
Dynavox Corp., New York, N. Y.—Communication Equipment

E

Eagle Electric Mfg. Co., Inc., Long Island City, N. Y.—Drafting Equipment*
Eagle Pencil Co., New York, N. Y.—Drafting Equipment*
Eagle Picher Lead Co., Cincinnati, Ohio—Lead
Eagle Plastics Corp., Long Island City, N. Y.—Plastic Molders
Eagle Signal Corp., Moline, Ill.—Relays*
Eastern Air Devices, Inc., Brooklyn, N. Y.—Blower Units
Eastern Amplifier Corp., Bronx, N. Y.—Sound Systems*
Eastern Mike-Stand Co., Brooklyn, N. Y.—Microphones
Eastman Kodak Co., Rochester, N. Y.—Plastics
Hugh H. Eby, Inc., Philadelphia, Pa.—Dials, Parts*
Ecco High Frequency Elec. Corp., North Bergen, N. J.—Induction Heaters
Echophone Radio Co., Chicago, Ill.—Communication Equipment
Eckstein Radio & Telev. Co., Inc., Minneapolis, Minn.—Communication Equipment*
Eclipse Moulded Products Co., Milwaukee, Wisc.—Dials, Parts
Edison Storage Battery Div., Thomas A. Edison, West Orange, N. J.—Batteries
T. J. Edwards, Inc., Boston, Mass.—Dies
Egyptian Lacquer Mfg. Co., Inc., New York, N. Y.—Lacquers
Elcor, Inc., Chicago, Ill.—Motors*
Eidson's, Temple, Texas—Crystals*
Eisler Electric Corp., Union City, N. J.—Tube Parts
Eisler Engineering Co., Newark, N. J.—Machinery*
Eitel-McCullough, Inc., San Bruno, Calif.—Tubes
Elastic Stop Nut Corp., Union, N. J.—Hardware
Elco Tool & Screw Corp., Rockford, Ill.—Hardware
The Eldeen Co., Milwaukee, Wisc.—Needles*
Electric Appliances Corp., Indianapolis, Ind.—Holders
The Electric Auto-Lite Co., Port Huron, Mich.—Wire
Electric Controller & Mfg. Co., Cleveland, Ohio—Control Equipment*
Electric Eye Equip. Co., Danville, Ill.—Control Equipment
Electric Indicator Co., Stamford, Conn.—Motors
Electric Motor Corp., Racine, Wisc.—Motors
Electric Products Co., Cleveland, Ohio—Motors
Electric Service Supplies Co., Philadelphia, Pa.—Coil Winding Machinery
Electric Soldering Iron Co., Inc., Deep River, Conn.—Soldering Irons
Electric Sorting Machine Co., Grand Rapids, Mich.—Control Equipment*
Electric Specialty Co., Stamford, Conn.—Motors
Electric Storage Battery Co., Philadelphia, Pa.—Batteries
Electrical Insulation Co., Inc., New York, N. Y.—Insulation
Electrical Coil Winding Co., Camden, N. J.—Coils
Electrical Facilities, Inc., Oakland, Calif.—Transformers*
Electrical Products Co., Detroit, Mich.—Chargers
Electrical Reactance Corp., Franklinville, N. Y.—Fixed Capacitors
Electrical Research Labs., Inc., Evanston Ill.—Communication Equipment*
Electrical Testing Laboratories, New York, N. Y.—Testing Laboratories
Electricoil Transformer Co., New York, N. Y.—Transformers*
Electrocon Corp., Freeport, N. Y.—Electronic Controls
Electrol, Inc., Kingston, N. Y.—Control Equipment
Electromatic Distributors, Inc., New York, N. Y.—Communication Equipment
Electro-Marine Co., New York, N. Y.—Antennas
Electro-Medical Laboratory, Inc., Holliston, Mass.—Measuring Instruments*
The Electro Motive Mfg. Co., Inc., Willimantic, Conn.—Capacitors*
Electro Products Labs., Chicago, Ill.—Control Equipment*
Electron Equipment Corp., S. Pasadena, Calif.—Control Equipment*
Electronic Communications Co., Portland, Ore.—Transmitters
Electronic Control Corp., Detroit, Mich.—Control Equipment*
Electronic Corp. of America, New York, N. Y.—Sound Systems*
Electronic Development Co., Omaha, Nebr.—Measuring Instruments
Electronic Engineering Co., Chicago, Ill.—Transformers
Electronic Enterprises, Newark, N. J.—Tubes
Electronic Industries, Sandwich, Ill.—Holders
Electronic Industries, Cedar Rapids, Iowa—Holders
Electronic Laboratories, Inc., Indianapolis, Ind.—Vibrators*
Electronic Mechanics, Inc., Clifton, N. J.—Insulation
Electronic Products Co., Geneva, Ill.—Photo Electric Equipment*
Electronic Products Co., Mt. Vernon, N. Y.—Battery Chargers
Electronic Products Mfg. Corp., Dexter, Mich.—Crystals*
Electronic Radio Alarm, Inc., Philadelphia, Pa.—Control Equipment
Electronic Research Corp., Chicago, Ill.—Measuring Instruments
Electronic Specialty Co., Los Angeles, Calif.—Transmitters
Electronic Supply Co., Worcester, Mass.—Cabinets*
Electronic Sound Engineering Co., Chicago, Ill.
Electronic Transformer Co., New York, N. Y.—Transformers*
Electronic Winding Co., Chicago, Ill.—Coils
Electrons, Inc., Newark, N. J.—Tubes
Electro-Voice Mfg. Co., Inc., South Bend, Ind.—Microphones*
Electrovox Co., Maplewood, N. J.—Needles*
Elkay Radio Products, Oglesby, Ill.—Holders
Emeloid Mfg. Co., Arlington, N. J.—Recording Blanks
Emerson Electric Mfg. Co., St. Louis, Mo.—Motors
Emerson Radio & Phono. Corp., New York, N. Y.—Communication Equipment*
Endurette Corp. of America, Cliffwood, N. J.—Insulation
Charles Engelhard, Inc., Newark, N. J.—Switches & Relays
Engineering Co., Newark, N. J.—Tube Parts
Engineering Laboratories, Inc., Tulsa, Okla.—Transformers*
Englewood Electrical Supply Co., Chicago, Ill.—Cable Connectors
Eppley Laboratory, Inc., Newport, R. I.—Measuring Instruments
Eraser Co. Inc., Syracuse, N. Y.—Drafting Equipment
Erco Radio Labs., Inc., Hempstead, L. I., N. Y.—Laboratory Equipment*
Ericsson Screw Machine Products Co., Inc., Brooklyn, N. Y.—Screws
Erie Art Metal Co., Erie, Pa.—Cabinets*
Erie Can Co., Chicago, Ill.—Hardware*
Erie Resistor Corp., Erie, Pa.—Resistors*
Erwood Co., Chicago, Ill. — Sound Systems*
Espey Mfg. Co., Inc., New York, N. Y.—Communication Equipment
Ess Instrument Co., Fort Lee, N. J.—Control Equipment
Essex Corp., Charlottesville, Va.—Plastics
Essex Electronics, Newark, N. J.—Antennas
Essex Wire Corp., Detroit, Mich.—Wire
The Esterline-Angus Co., Inc., Indianapolis, Ind.—Measuring Instruments
Etched Products Corp., Long Island City, N. Y.—Dials, Parts*
H. C. Evans & Co., Chicago, Ill.—Coils*
The Exact Weight Scale Co., Columbus, Ohio—Control Equipment
Executone, Inc., New York, N. Y.—Intercommunications*
Extruded Plastics, Inc., Norwalk, Conn.—Plastic Molders

F

A. W. Faber Co., Newark, N. J.—Drafting Equipment
Fada Radio & Electric Mfg. Co., Inc., Long Island City, N. Y.—Communication Equipment*
Fafnir Bearing Co., New Britain, Conn.—Bearings
Fairbank Morse & Co., Chicago, Ill.—Machinery & Equipment
Fairchild Aviation Corp., Jamaica, L. I., N. Y.—Recorders*
Fairmont Aluminum Co., Fairmont, W. Va.—Aluminum
Falstrom Co., Passaic, N. J.—Cabinets
Fansteel Metallurgical Corp., North Chicago, Ill.—Metal*
Faries Mfg. Co., Decatur, Ill.—Lighting Equipment
Farnsworth Telev. & Radio Corp., Fort Wayne, Ind.—Communication Equipment*
John E. Fast & Co., Chicago, Ill.—Capacitors*
Federal A. C. Switch Corp., Buffalo, N. Y.—Switches*
Federal Electric Co., Chicago, Ill.—Switches & Relays
Federal Engineering Co., New York, N. Y.—Holders
Federal Instrument Co., Long Island City, N. Y.—Electronic Controls
Federal Mfg. & Engineering Corp., Brooklyn, N. Y.—Signal Generators
Federal Radio & Television Mfg. Co., Los Angeles, Calif.—Transmitters
Federal Recorder Co., Inc., Chicago, Ill.—Sound Systems
Federal Screw Products Co., Chicago, Ill.—Hardware*
Federal Telephone & Radio Corp., Newark, N. J.—Communication Equipment
Felker Mfg. Co., Torrance, Calif.—Crystal Saws
G. Felsenthal & Sons, Chicago, Ill.—Plastic Molders
Fenwal Incorporated, Ashland, Mass.—Thermo-Switches
Ferranti Electric, Inc., New York, N. Y.—Transformers*
Ferris Instrument Co., Boonton, N. J.—Laboratory Equipment*
Ferrocart Corp. of America, Hastings-on-Hudson, N. Y.—Metal

Field Electrical Instrument Co., New York, N. Y.—Measuring Instruments
Fischer Corp., Glendale, Calif.—Electronic Equipment
Fisher Research Laboratory, Palo Alto, Calif.—Transmitters•
Fisher Scientific Co., Pittsburgh, Pa.—Laboratory Equipment
Fish-Schurman Corp., New York, N. Y.—Laboratory Equipment
Fischer & Porter Co., Hatboro, Pa.—Control Equipment
M. M. Fleron & Sons, Inc., Trenton, N. J.—Antennas•
Flexo Wire Co., Syracuse, N. Y.—Wire•
Flock Process Co., New York, N. Y.—Dials, Parts•
Foote, Pierson & Co., Newark, N. J.—Transmitters
Ford Radio & Mica Corp., Brooklyn, N. Y.—Mica
The Forest Electronic Co., New York, N. Y.—Control Equipment
Formica Insulation Corp., Cincinnati, Ohio—Plastics•
Foote Mineral Co., Philadelphia, Pa.—Crystals
The Forsberg Mfg. Co., Bridgeport, Conn.—Tools
A. P. Foster Co., Lockland, Ohio—Transformers
Fostoria Pressed Steel Corp., Fostoria, Ohio—Lighting Equipment
France Mfg. Co., Cleveland, Ohio—Transformers
A. W. Franklin Mfg. Corp., New York, N. Y.—Sockets•
Franklin-Fibre-Lamitex Corp., Wilmington, Dela.—Plastics•
Franklin Transformer Mfg. Co., Minneapolis, Minn.—Transformers
Franklin X-Ray Co., Philadelphia, Pa.—X-Ray Equipment
George E. Fredericks Co., Bethayres, Pa.—Measuring Instruments
Freed Radio Corp., New York, N. Y.—Communication Equipment
Freed Transformer Co., New York, N. Y.—Transformers•
Freeland & Olschner Products Inc., New Orleans, La.—Tube Repairing
Frequency Measuring Co., Kansas City, Mo.—Holders
Freiland Mfg. Co., Springfield, Mass.—Metal
Frostrode Products, Detroit, Mich.—Test Cabinets
Charles A. Fuchs Bros., Roosevelt, L. I., N. Y.—Machinery

G

Gaertner Scientific Corp., Chicago, Ill.—Laboratory Equipment
Galvin Mfg. Corp., Chicago, Ill.—Communication Equipment•
Gamma Instrument Co., Inc., New York, N. Y.—Measuring Instruments
Gardiner-Levering Co., Haddon Heights, N. J.—Radiotelegraph equipment
Gardiner Metal Co., Chicago, Ill.—Tools
Gardner Electric Mfg. Co., Emeryville, Calif.—Transformers
Henry A. Gardner Laboratory, Inc., Washington, D. C.—Measuring Instruments
Garfield Mfg. Co., Garfield, N. J.—Plastic Molders
Garfield Medical Apparatus Co., New York, N. Y.—Electronic Medical Equipment
Garner Electronics Corp., Chicago, Ill.—Laboratory Equipment
Garod Radio Corp., Brooklyn, N. Y.—Communication Equipment
Garrard Sales Corp., New York, N. Y.—Record Players
Gates American Corp., Quincy, Ill.—Sound Systems
Gates Radio & Supply Co., Quincy, Ill.—Transmitters
George W. Gates & Co., Inc., Franklin Square, L. I., N. Y.—Photo Electric Equipment
Gemloid Corp., Elmhurst, L. I., N. Y.—Plastics•
Gemex Co., Union, N. J.—Crystal Accessories
General Aniline & Film Corp., Ozalid Products Div., Johnson City, N. Y.—Drafting Equipment
General Aniline Works, New York, N. Y.—Insulating Compounds
General Appliance Co., N. Kingsville, Ohio—Insulating Compounds
General Cable Corp., New York, N. Y.—Wire
General Cement Mfg. Co., Rockford, Ill.—Lacquers•
General Ceramics & Steatite Corp., Keasbey, N. J.—Insulation•
General Communication Co., Boston, Mass.—Transmitters•
General Control Co., Cambridge, Mass.—Control Equipment
General Controls Co., Glendale, Calif.—Relays
General Crystal Corp., Schenectady, N. Y.—Crystals•
General Dry Batteries, Inc., Cleveland, Ohio—Batteries
General Electric Co., Bridgeport, Conn.—Communication Equipment•
General Electric Co., Pittsfield, Mass.—Plastics•
General Electric Co., Schenectady, N. Y.—Transformers•
General Electronics Industries, Div. of Auto-Ordnance Corp., Greenwich, Conn.—Control Equipment
General Electric X-Ray Corp., Chicago, Ill.—Laboratory Equipment•
General Electronics, Inc., Paterson, N. J.—Tubes
The General Industries Co., Elyria, Ohio—Insulation•
General Instrument Corp., Elizabeth, N. J.—Capacitors•
General Insulated Wire Works, Inc., Providence, R. I.—Wire
General Lead Batteries Co., Paterson, N. J.—Batteries
General Motors Corp., Detroit, Mich.—Communication Equipment
General Paper Tube Co., Philadelphia, Pa.—Insulation
General Pencil Co., Jersey City, N. J.—Pencils
General Phonograph Corp., Putnam, Conn.—Needles
General Piezo Co., Kansas City, Kans.—Holders
General Plate Co., Div. Metals & Controls Corp., Attleboro, Mass.—Hardware
General Quartz Laboratories, Irvington-on-Hudson, N. Y.—Holders
General Radio Co., Cambridge, Mass.—Laboratory Equipment•
General Scientific Corp., Chicago, Ill.—Photo Electric Equipment
General Telev. & Radio Corp., Chicago, Ill.—Communication Equipment.
General Time Instruments Corp., Thomaston, Conn.—Measuring Instruments•
General Transformer Co., Chicago, Ill.—Transformers•
General Winding Co., New York, N. Y.—Coils•
Gentleman Prod. Div., Henney Motor Co., Omaha, Nebr.—Crystals•
Geometric Stamping Co., Cleveland, Ohio—Stampings
The P. D. George Co., St. Louis, Mo.—Varnishes
Geophysical Instrument Co., Washington, D. C.—Laboratory Equipment
M. A. Gerett Corp., Milwaukee, Wisc.—Recording Equip•
Gering Products, Inc., Kenilworth, N. J.—Plastics
Thomas B. Gibbs & Co., Delavan, Wis.—Control Equipment•
Gibson, Inc., Kalamazoo, Mich.—Sound Systems•
Gibson Electric Co., Pittsburgh, Pa.—Connectors
Gilfillan Brothers, Inc., Los Angeles, Calif.—Communication Equipment
Girard-Hopkins, Oakland, Calif.—Capacitors•
The Girdler Corp., Louisville, Ky.—Control Equipment
Gisholt Machine Co., Madison, Wis.—Control Equipment•
Gits Molding Corp., Chicago, Ill.—Dials, Parts•
Glenn-Roberts Co., Indianapolis, Ind.—Capacitors Fixed
G-M Laboratories, Inc., Chicago, Ill.—Measuring Equipment•
G. M. Mfg. Co., New York, N. Y.—Measuring Instruments
Goat Metal Stampings, Inc., Brooklyn, N. Y.—Metal•
Godfrey Mfg. Corp., Milwaukee, Wis.—Sound Systems•
The James Goldmark Wire Co., New York, N. Y.—Wire
Goldsmith Bros. Smelting & Refining Co., Chicago, Ill.—Metal
Good-All Electric Co., Ogalala, Nebr.—Holders
B. F. Goodrich Co., Akron, Ohio—Plastics
Gothard Mfg. Co., Springfield, Ill.—Dial Lights
The Gould-Moody Co., New York, N. Y.—Records•
Gould Storage Battery Corp., Depew, N. Y.—Batteries•
L. F. Grammes & Sons, Inc., Allentown, Pa.—Dials, Parts•
Grady Instrument Co., Watertown, Mass.—Transmitters
Gray Mfg. Co., New York, N. Y.—Recording Equipment
Gray Radio Co., West Palm Beach, Fla.—Transmitters
W. Green Electric Co., Inc., New York, N. Y.—Dry Disc Rectifier
Greenhut Insulation Co., New York, N. Y.—Plastic Fabricators
Greenlee Tool Co., Rockford, Ill.—Tools
Grenby Mfg. Co., Plainville, Conn.—Measuring Instruments
Groves Corp., Cape Girardeau, Mo.—Resistors
Gruen Watch Co., Time Hill, Cincinnati, Ohio—Meters
Guaranteed Products Corp., Wellington, Ohio—Control Equipment
Guardian Electric Mfg. Co., Chicago, Ill.—Relays•
Gudeman Co., Chicago, Ill.—Fixed Capacitors
W. & L. E. Gurley, Troy, N. Y.—Test Equipment•
Guenther Electronics Co., Appleton, Wisc.—Control Equipment
Edwin I. Guthman & Co., Inc., Chicago, Ill.—Coils

H

Haines Mfg. Co., Brooklyn, N. Y.—Induction Heating
Gordon L. Hall Co., Old Lyme, Conn.—Bins & Racks
The Halldorson Co., Chicago, Ill.—Transformers
The Hallicrafters Co., Chicago, Ill.—Communication Equipment
Halowax Products Div., Union Carbide & Carbon Corp., New York, N. Y.—Insulation•
Halstead Traffic Communications Corp., New York, N. Y.—Capacitors
Hamilton Mfg. Co., Two Rivers, Wisc.—Drafting Equipment
Hamilton Radio Corp., New York, N. Y.—Communication Equipment
The Hammarlund Mfg. Co., Inc., New York, N. Y.—Communication Equipment
Hampden Mfg. Co., Inc., Plainfield, N. J.—Drafting Equipment
Handy & Harman, New York, N. Y.—Silver
Hanovia Chemical & Mfg. Co., Newark, N. J.—Fused Quartz Parts
Wm. Hansen Co., Niles, Mich.—Control Equipment•
Harco Steel Construction Co., Inc., Elizabeth, N. J.—Antennas
Hardware Specialties Mfg. Co., Bridgeport Conn.—Machinery
Hardwick, Hindle, Inc., Newark, N. J.—Resistors•
D. H. Harrel, Chicago, Ill.—Antennas
Harris Mfg. Co., Los Angeles, Calif.—Recorders•
Harshaw Scientific, Cleveland, Ohio—Laboratory Equipment
Hart Mfg. Co., Hartford, Conn.—Switches•
Hart Moisture Gauges, Inc., New York, N. Y.—Measuring Instruments
Hartman Electrical Mfg. Co., Mansfield, Ohio—Switches
Harvey Radio Labs., Inc., Cambridge Mass.—Transmitters
Harvey-Wells Communications, Inc., Southbridge, Mass.—Holders
The Harwood Co., Los Angeles, Calif.—Connectors
Hasler-Tel Co., New York, N. Y.—Measuring Equipment
John Hassall, Inc., Brooklyn, N. Y.—Hardware•
Hatcher & Fisk Mfrs., Topeka, Kan.—Crystals
Hatfield Wire & Cable Co., Hillside, N. J.—Wire
Haveg Corp., E. Newark, Dela.—Plastics
Hawley Products Co., St. Charles, Ill.—Speaker Parts
Hayden Mfg. Co., Inc., Forrestville, Conn. Motors
Haydu Bros., Plainfield, N. J.—Tube Parts•
Hazeltine Electronics Corp., New York, N. Y.—Communication Equipment
H-B Electric Co., Philadelphia, Pa.—Control Equipment•
Heath Co., Benton Harbor, Mich.—Transmitters
Heiland Research Corp., Denver, Colo.—Laboratory Equipment•
Heinemann Circuit Breaker Co., Trenton, N. J.—Switches
Heintz & Kaufman, Ltd., South San Francisco, Calif.—Tubes
W. C. Heller & Co., Montpelier, Ohio—Cabinets
Henry Mfg. Co., Los Angeles, Calif.—Plastic Molders
Herbach & Rademan Co., Philadelphia, Pa.—Laboratory Equipment•
Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.—Battery Chargers
Hercules Powder Co., Wilmington, Dela.—Plastics
Heresite & Chemical Co., Manitowoc, Wisc.—Plastics
Hereservice, New York, N. Y.—Records
Herron Optical Co., Los Angeles, Calif.—Optical Equipment
Robt. Hetherington & Son, Inc., Sharon Hill, Pa.—Microphones•
Hewlett-Packard Co., Palo Alto, Calif.—Laboratory Equipment•
Hexacon Electric Co., Roselle Park, N. J.—Tools
Heyer Products Co., Inc., Belleville, N. J.—Battery Chargers
Heyman Mfg. Co., Kenilworth, N. J.—Stampings
The Hickok Electrical Instrument Co., Cleveland, Ohio—Laboratory Equipment•
Higgins Industries Inc., Santa Monica, Calif.—Crystals
Hilo Varnish Corp., Brooklyn, N. Y.—Varnish
A. J. Hintze Co., Westchester, Ill.—Speaker Parts
Hipower Crystal Co., Chicago, Ill.—Crystals
Hodgman Rubber Co., Framingham, Mass.—Insulation
P. R. Hoffman Co., Carlisle, Pa.—Crystals
Hoffman Co., York, Pa.—Tote Baskets
C. L. Hofmann Corp., Pittsburgh, Pa.—Sound Systems
Hoffman Radio Corp., Los Angeles, Calif—Communication Equipment
Hofstatter's Sons, Inc., Long Island City, N. Y.—Cabinets
Hollister Crystal Co., Boulder, Colo.—Crystals
Holliston Mills, Inc., Norwood, Mass.—Drafting Equipment
Hollywood Electronics Co., Los Angeles, Calif.—Sound Systems•
Hollywood Transformer Co., Los Angeles, Calif.—Transformers•
The Holo-Krome Screw Corp., Hartford, Conn.—Hardware
Holtzer-Cabot Electric Co., Boston, Mass.—Machinery & Equipment
Home Recording Co., New York, N. Y.—Recording Blanks
Homelite Corp., Port Chester, N. Y.—Battery Chargers
O. Hommel Co., Pittsburgh, Pa.—Metal
Hopp Press, Inc., New York, N. Y.—Palstic Fabricators
A. C. Horn Co., Long Island City, N. Y.—Paint & Wax
Horni Signal Mfg. Corp., New York, N. Y.—Control Equipment•
Hoskins Mfg. Co., Detroit, Mich.—Metal
House of Plastics, Cleveland, Ohio—Plastic Fabricators
Howard Mfg. Co., Council Bluffs, Iowa—Crystals
Howard Radio Co., Chicago, Ill.—Communication Equipment
Howell Electric Motors Co., Howell, Mich.—Motors
H. R. S. Products, Chicago, Ill.—Capacitors
Hoyt Electrical Instrument Works, Boston, Mass.—Test Equipment
Harvey Hubbell, Inc., Bridgeport, Conn.—Tuning Units
Hudson American Co., New York, N. Y.—Communication Equipment
Hudson Wire Co., Winsted Div., Winsted, Conn.—Wire
G. C. Hunt & Sons, Carlisle, Pa.—Crystals
Hunter Pressed Steel Co., Lansdale, Pa.—Hardware
Huse Liberty Mica Co., Boston, Mass.—Mica Insulation
Hy Ef Electrical Products Mfg. Co., Los Angeles, Calif.—Capacitors•
Hydraulic Press Mfg. Co., Mount Gilead, Ohio—Molding Presses
Hytron Corp., Salem, Mass.—Tubes•

I

Ideal Commutator Dresser Co., Sycamore, Ill.—Batteries

Illinois Cabinet Co., Rockford, Ill.—Cabinets

Illinois Condenser Co., Chicago, Ill.—Capacitors

Illinois Testing Laboratories, Inc., Chicago, Ill.—Control Equipment

Illinois Wood Products Corp., Chicago, Ill.—Cabinets*

Imperial Electric Co., Akron, Ohio—Motors

Imperial Molded Products Corp., Chicago, Ill.—Plastic Molders

Imperial Porcelain Works, Inc., Trenton, N. J.—Insulation*

Indiana Steel Products Co., Valparaiso, Ind.—Metal

Indiana Steel & Wire Co., Muncie, Ind—Wire

Induction Heating Corp., New York, N. Y.—Induction Heating

Industrial & Commercial Electronics Corp., Belmont, Calif.—Tubes

Industrial Condenser Corp., Chicago, Ill.—Capacitors*

Industrial Electronics Corp., Newark, N. J.—Transformers*

Industrial Filter & Pump Mfg. Co., Chicago, Ill—Laboratory Equipment

Industrial Instruments, Inc., Jersey City, N. J.—Laboratory Equipment*

Industrial Molded Prods. Co., Chicago, Ill.—Insulation*

Industrial Screw & Supply Co., Chicago, Ill.—Hardware*

Industrial Sound Products Co., San Francisco, Calif.—Metal

Industrial Synthetics Corp., Irvington, N. J.—Plastics

Industrial Timer Corp., Newark, N. J.—Control Equipment*

Industrial Transformer Corp., New York, N. Y.—Transformers*

Industrial X-Ray Laboratories, Inc., Seattle, Wash.—Laboratory Equipment*

Industrial Wire Cloth Products Corp., Wayne, Mich.—Speaker Parts

Infra-Red Engineers & Designers, Cleveland, Ohio—Infra-Red Drying Equip.

The Insel Co., Arlington, N. J.—Plastics

Insl-X-Co., Inc., Brooklyn, N. Y.—Insulation

Instructograph Company, Chicago, Ill.—Radio Telegraph Equipment

Instrument Optics Co., Buffalo, N. Y.—Optical Equipment

Instrument Resistors Co., Little Falls, N. J.—Resistors

Instrument Specialties Co., Inc., Little Falls, N. J.—Springs

Insulation Mfg. Co., Brooklyn, N. Y.—Plastic Molders

Insulation Manufacturers Corp., Chicago, Ill.—Insulation*

Insulation Products Co., Pittsburgh, Pa.—Insulation*

Insulating Tube Co., Inc., Poughkeepsie, N. Y.—Insulation

Insulating Fabricators of New England, Inc., S. Boston, Mass.—Plastic Fabricators

Insulating Fabricators, Inc., New York, N. Y.—Plastic Fabricators

Insuline Corp. of America, Long Island City, N. Y.—Capacitors*

Intercall Systems, Inc., Dayton, Ohio—Intercommunicators

International Detrola Corp., Detroit, Mich.—Communication Equipment

International Electronics, Inc., New York, N. Y.—Sound Systems*

International Machine Works, North Bergen, N. J.—Machinery

The International Nickel Co., Inc., New York, N. Y.—Metal

International Products Corp., Baltimore, Md.—Insulation

International Resistance Co., Philadelphia, Pa.—Resistors

Int. Tel. & Tel. Co., New York, N. Y.—Communication Equip.*

International Transformer Co., New York, N. Y.—Filters

Invincible Tool Co., Pittsburgh, Pa.—Flexible Shafts

Irvington Varnish & Insulator Co., Irvington, N. J.—Lacquers*

Isolantite, Inc., Belleville, N. J.—Insulation

I-T-E Circuit Breaker Co., Philadelphia, Pa.—Switches

J

The Jackson Electrical Instrument Co. Dayton, Ohio—Laboratory Equipment*

James Vibrapowr Co., Inc., Chicago, Ill.—Vibrators

Janette Mfg. Co., Chicago, Ill.—Dynamotors

Jarrell-Ash Co., Boston, Mass.—Laboratory Equipment

J-B-L Instrument Co., Alden, Pa.—Rotary Switches

J-B-T Instruments, Inc., New Haven, Conn.—Measuring Equipment.

Jefferson Electrical Co., Bellwood, Ill.—Transformers*

Ray Jefferson, Inc., Freeport, L. I., N. Y.—Communication Equipment

Jefferson-Travis Radio Mfg. Corp., New York, N. Y.—Communication Equipment*

Jeffrey Mfg. Co., Columbus, Ohio—Control Equipment

The C. O. Jelliff Mfg. Corp., Southport, Conn.—Tube Parts

Jennings Radio Mfg. Co., San Jose, Calif.—Tubes

Jensen Industries, Inc., Chicago, Ill.—Speakers*

Jensen Radio Mfg. Co., Chicago, Ill.—Speakers

J. F. D. Manufacturing Co., Brooklyn, N. Y.—Dials, Parts*

E. F. Johnson Co., Waseca, Minn.—Insulation*

The Johnson Rubber Co., Middlefield, Ohio—Insulation

The Johnston Tin Foil & Metal Co., St. Louis, Mo.—Metal

Howard B. Jones, Chicago, Ill.—Terminal Strips

W. Haddon Judson Co., Ardmore, Pa.—Electronic Control Equipment

Jumbo Mfg. Co., Spencer, Iowa—Storage Batteries

K

Kaar Engineering Co., Palo Alto, Calif.—Transmitters

Kahle Engineering Co., North Bergen, N. J.—Machinery & Equipment

Kane Mfg. Corp., Kane, Pa.—Cabinets

Karadio Corp., Minneapolis, Minn.—Sound Systems*

Karp Metal Products Co., Inc., Brooklyn, N. Y.—Cabinets

Kato Engineering Co., Mankato, Minn.—Rotary Machines*

Katz & Ogush, Inc., New York, N. Y.—Crystals*

K. D. Mfg. Co., Lancaster, Pa.—Tools

The Keasby & Mattison Co., Ambler, Pa.—Plastic Molders

Keikhaefer Corp., Cedarburg, Wisc.—Motors

Kellogg Switchboard & Supply Co., Chicago, Ill.—Relays*

Kennecott Wire & Cable Co., Phillipsdale, R. I.—Wire

Ken-Rad Tube & Lamp Corp., Owensboro, Ky.—Tubes

Walter A. Kent Co., Chicago, Ill.—Antennas

Kenyon Transformer Co., Inc., New York, N. Y.—Transformers*

Kester Solder Co., Chicago, Ill.—Solder

Keuffel & Esser Co., Hoboken, N. J.—Drafting Equipment

Keystone Carbon Co., Inc., St. Marys, Pa—Resistors

Keystone Piezo Co., Pittsburgh, Pa.—Holders

Keystone Specialty Co., Cleveland, Ohio—Insulation*

J. F. Kilburn Glass Co., Chartley, Mass—Insulation*

King Laboratories, Inc., Syracuse, N. Y.—Tube Parts*

Kingston Radio Co., Kokomo, Ind.—Communication Equipment

Kinney Mfg. Co., Boston, Mass.—Special Lubricants

H. R. Kirkland Co., Morristown, N. J.—Parts*

Klett Mfg. Co., New York, N. Y.—Laboratory Equipment

Kliegl Bros. Universal Electric Stage Lighting Co., New York, N. Y.—Photo Electric Equipment*

Klise Manufacturing Co., Grand Rapids, Mich.—Cabinets

Knickerbocker Annunciator Co., New York, N. Y.—Wire

Knickerbocker Development Corp., Belleville, N. J.—Measuring Instruments

H. W. Knight & Son, Inc., Seneca Falls, N. Y.—Pattern Markers

The James Knights Co., Sandwich, Ill.—Crystals

A. Knoedler Co., Lancaster, Pa.—Plastics

Knox Porcelain Corp., Knoxville, Tenn.—Insulation

Koehler Mfg. Co., Marlboro, Mass.—Batteries

Kold-Hold Mfg. Co., Lansing, Mich.—Laboratory Equipment

Kollsman Instrument Div., Square D Co., Elmhurst, L. I., N. Y.—Miniature Control Motors

Kollath Mfg. Co., Chicago, Ill.—Connectors

Kopp Glass, Inc., New York, N. Y.—Dials

Korfund Co., Inc., Long Island City, N. Y.—Machinery & Equipment

Kraeuter & Co., Inc., Newark, N. J.—Tools

Walter S. Kraus Co., Woodside, N. Y.—Cabinets

Krischer Metal Products Co., Brooklyn, N. Y.—Connectors

Kuhn & Jacob Molding & Tool Co., Trenton, N. J.—Plastic Molders

Kurman Electric Co., Inc., Long Island City, N. Y.—Control Equipment

Kurz-Kasch, Inc., Dayton, Ohio—Plastic Molders

Kux Machine Co., Chicago, Ill.—Molding Presses

L

L A B Corp., Summit, N. J.—Measuring Instruments

Lacey-Webber Co., Kalamazoo, Mich.—Plastic Fabricators

Lake Mfg. Co., Oakland, Calif.—Intercommunicators

Lampkin Laboratories, Bradenton, Fla.—Measuring Instruments

Landis & Gyr, Inc., New York, N. Y.—Laboratory Equipment*

Langevin Co., Inc., New York, N. Y.—Sound Systems

Lansing Stamping Co., Lansing, Mich.—Stampings

Lapp Insulator Co., Inc., LeRoy, N. Y.—Insulators*

Larrimore Sales Co., St. Louis, Mo.—Tools

Laurehk Radio Mfg. Co., Wayne, Mich.—Sound Systems*

The Lauson Co., New Holstein, Wis.—Rotary Machines

Lavoie Laboratories, Morganville, N. J.—Measuring Instruments

Lawrence Aeronautical Corp., Linden, N. J.—Motors

Lawton Products Co., New York, N. Y.—Measuring Instruments

Leach Relay Co., Inc., Los Angeles, Calif.—Relays*

Lear Avia, Inc., Piqua, Ohio—Motors

Lectrohm, Inc., Cicero, Ill.—Resistors*

Lee Spring Co., Inc., Brooklyn, N. Y.—Hardware*

Leeds & Northrup Co., Philadelphia, Pa.—Laboratory Equipment*

Le Febure Corp., Cedar Rapids, Iowa—Cabinets

Lehigh Structural Steel Co., New York, N. Y.—Antennas

Leiman Bros., Inc., Newark, N. J.—Machinery

Lektra Laboratories, Inc., New York, N. Y.—Electronic Medical Equipment

Leland Electric Co., Dayton, Ohio—Motors*

Lenoxite Division, Lenox, Inc., Trenton, N. J.—Insulation

Lenz Electric Mfg. Co., Chicago, Ill.—Wire*

Lenel High Frequency Labs., Inc., New York, N. Y.—Induction Heating*

Leuck Crystal Labs., Lincoln, Nebr.—Crystals

Leupold & Stevens Instruments, Portland, Ore.—Electronic Equipment

Lewisburg Chair &Furniture Co., Lewisburg, Pa.—Cabinets

Lewis Electronics, Los Gatos, Calif.—Tube Repairing

Lewis Engineering Co., Naugatuck, Conn.—Measuring Instruments

Lewyt Metal Products Co., Inc., Brooklyn, N. Y.—Cabinets

Libbey-Owens-Ford Glass Co., Plaskon Div., Toledo, Ohio—Glass

Liebel-Flarsheim Co., Cincinnati, Ohio—Electronic Equipment

Lifetime Sound Equipment Co., Toledo, Ohio—Microphones

The Lincrophone Co., Inc., Utica, N. Y—Sound Systems

Lindsay and Lindsay, Chicago, Ill.—Cabinets

John E. Lingo & Son, Inc., Camden, N. J—Antennas

Leslie L. Linick & Co., Chicago, Ill.—Machinery

Linick, Green & Reed, Inc., Chicago, Ill—Hardware*

Fred M. Link, New York, N. Y.—Test Equipment*

Link Engineering Co., Detroit, Mich.—Spring Testing Equipment

Littelfuse, Inc., Chicago, Ill.—Fuses Equipment*

Locke Insulator Corporation, Baltimore, Md.—Insulators*

Lord Mfg. Co., Erie, Pa.—Shock Mountings

Logansport Machine, Inc., Logansport, Ind—Machinery

Long Island Engraving Co., New York, N. Y.—Dials

H. K. Lorentzen, Inc., New York, N. Y. Racks and Panels

L-R Mfg. Co., Torrington, Conn.—Blower Units

Lufkin Rule Co., Saginaw, Mich.—Tools—Cabinets

The Louthan Mfg. Co., E. Liverpool, Ohio—Insulation*

Lowe Brothers Co., Dayton, Ohio—Lacquers

Lowell Insulated Wire Co., Lowell, Mass—Wire

Lowell Needle Co., Inc., Putnam, Conn—Needles

J. Milton Luers, Mt. Clemens, Mich—Electronic Control Equipment

Lumenite Electric Co., Chicago, Ill.—Control Equipment*

M

Maas & Waldstein Co., Newark, N. J.—Lacquers

The Macallen Co., Boston, Mass.—Mica*

Machlett Laboratories, Inc., Norwalk, Conn.—Tubes

Machlett Laboratories, Inc., Springdale, Conn.—X-Ray Equipment

Mack Molding Co., Wayne, N. J.—Plastic Molders

Magna Mfg. Co., Inc., Newark, N. J.—Sound Systems

Magnaflux Corporation, Chicago, Ill.—X-Ray Inspection Machines

The Magnavox Co., Fort Wayne, Ind—Capacitors*

Magnetic Analysis Corp., Long Island City, N. Y.—Flaw Detection

The Magnetic Gauge Co., Akron, Ohio—Control Equipment

Magnetic Windings Co., Easton, Pa.—Transformers and Chokes

The Maico Co., Inc., Minneapolis, Minn. Hearing Aids

Majestic Radio & Telev. Corp., Chicago, Ill.—Communication Equipment*

Makalot Corp., Boston, Mass.—Plastics*

P. R. Mallory & Co., Inc., Indianapolis, Ind.—Capacitors*

John A. Manning Paper Co., Troy, N. Y.—Insulation

F. N. Manross & Sons, Div. Assoc. Spring Corp., Bristol, Conn.—Springs

Manufacturers Chemical Corp., Berkeley Heights, N. J.—Plastics

Manufacturers Screw Products, Chicago, Ill.—Hardware*

Marathon Battery Co., Wausau, Wis.—Batteries

Marblette Corp., Long Island City, N. Y.—Plastics*

Marion Elec. Instr. Co., Manchester, N. H.—Measuring Instruments

Maritime Radio Corp., New York, N. Y.—Transmitters

Markem Machine Co., Keene, N. H.—Machinery & Equipment

Marshall Radio Engineering Labs., N. Hollywod, Calif.—Metal Locators

Master Products Co., Cleveland, Ohio.—Hardware

Master Electric Co., Dayton, Ohio—Machinery & Equipment

Master Vibrator Co., Dayton, Ohio—Power Plant

Jas. H. Matthews & Co., Chicago, Ill.—Machinery

Mayer Mfg. Corp., Brooklyn, N. Y.—Cabinets

Measurements Corp., Boonton, N. J.—Measuring Instruments

John Meck Industries, Plymouth, Ind.—Sound Systems*
Meissner Mfg. Co., Mt. Carmel, Ill.—Coils*
Melrath Supply & Gasket Co. Inc., Philadelphia, Pa.—Gaskets
George S. Mepham Corp., E. St. Louis, Ill.—Core Materials
Merit Coil & Transformer Corp., Chicago, Ill.—Transformers
Merck & Co., Inc., Rahway, N. J.—Chemicals
The Mercoid Corp., Chicago, Ill.—Relays*
Merwin-Wilson Co., New Milford, Conn.—Transformers*
Metal Textile Corp., West Orange, N. J.—Wire Screen Cloth
Metallic Arts Co. Inc., Cambridge, Mass. Cabinets
Metaplast Co., New York, N. Y.—Plastic Molders
Meters, Inc., Indianapolis, Ind.—Measuring Instruments
Metron Instrument Co., Denver, Colo.—Measuring Instruments
Metroley Co., Inc., Newark, N. J.—Metal*
Metsch Refractories Co., East Liverpool, Ohio—Insulation
The Meyercord Co., Chicago, Ill.—Decalcomanias
Mica Insulator Co., New York, N. Y.—Insulators*
Mica Products Mfg. Co., New York, N. Y.—Insulation
Micamold Radio Corp., Brooklyn, N. Y.—Capacitors
Micarta Fabricators, Inc., Chicago, Ill.—Insulation*
Michigan Fluorescent Light Co., Pontiac, Mich.—Lighting Equipment
Michigan Molded Plastics, Inc., Dexter, Mich.—Molders*
Mico Instrument Co., Cambridge, Mass.—Coil Winding Machines
Micro Switch Corp., Freeport, Ill.—Switches
Midcro Mfg. & Distributing Co., Inc., Sheboygan, Wis.—Power Plants
Midland Paint & Varnish Co., Cleveland, Ohio—Paints
Midwest Radio Corp., Cincinnati, Ohio—Communication Equipment
Mid-West Screw Products Co., St. Louis, Mo.—Hardware*
Miles Reproducer Co., New York, N. Y.—Recorders
James Millen Mfg. Co., Inc., Malden, Mass.—Connectors
August E. Miller, North Bergen, N. J.—Crystals
B. F. Miller Co., Trenton, N. J.—Transformers and Chokes
J. W. Miller Co., Los Angeles, Calif.—Coils*
Elmer E. Mills Corp., Chicago, Ill.—Plastic Molders
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.—Control Equipment
Miniature Precision Bearings, Keene, N. H.—Bearings
Mirror Record Corp., New York, N. Y.—Recorders
Mitchell-Rand Insulation Co., New York, N. Y.—Innsulation*
Mobile Refrigeration Div., Bowser Inc., Woodside, L. I., N. Y.—Refrigerated Cabinets
Wm. Mogey & Sons, Inc., Plainfield, N. J.—Laboratory Equip.
Molded Insulation Co., Philadelphia, Pa.—Insulation*
Moloney Electric Co., St. Louis, Mo.—Transformers
Monark Battery Co., Chicago, Ill.—Batteries
Monarch Mfg. Co., Chicago, Ill.—Laboratory Equipment*
Monitor Piezo Products Co., South Pasadena, Calif.—Crystals
Monsanto Chemical Co., Plastics Div., Springfield, Mass.—Plastics*
Montgomery Bros., San Francisco, Calif.—Recorders
Monowatt Electric Co., Providence, R. I.—Cable Connections
Morey Machinery Co., Inc., Astoria, L. I., N. Y.—Machinery
Morse Boulger Destructor Co., New York, N. Y.—Machinery
Morse Twist Drill & Machine Co., New Bedford, Mass.—Tools
Frank W. Morse Co., Boston, Mass.—Hardware
Donald P. Mossman, Inc., Chicago, Ill.—Relays
Motor Products Corp., North Chicago, Ill.—Laboratory Equipment
Muehlhausen Spring Corp., Logansport, Ind.—Hardware
Mueller Brass Co., Port Huron, Mich.—Metal
Mueller Electric Co., Cleveland, Ohio—Spring Clips
Multi Electrical Mfg. Co., Chicago, Ill.—Insulation*
Eugene Munsell & Co., New York, N. Y.—Insulation
Wm. J. Murdock Co., Chelsea, Mass.—Magnetic Headphones
Murphy Varnish Co., Newark, N. J.—Varnish
Music Master Mfg. Co., Chicago, Ill.—Recorders*
Mu-Switch Corp., Canton, Mass.—Switches
The Muter Co., Chicago, Ill.—Coils*
Mycalex Corp. of America, Clifton, N. J.—Insulation*
E. A. Myers & Son, Mt. Lebanon, Pittsburgh, Pa.—Hearing Aids
Mykroy, Inc., Chicago, Ill.—Insulation

Mc

O. B. McClintock Co., Minneapolis, Minn.—Electronic Controls
McColpin-Christie Corp. Ltd., Los Angeles, Calif.—Power Rectifiers
McDonnell & Miller, Chicago, Ill.—Control Equipment
McElroy Mfg. Corp., Boston, Mass.—Auto Code Senders
McInerney Plastics Co., Grand Rapids, Mich.—Plastics
McKesson Appliance Co., Toledo, Ohio—Electronic Equipment
T. W. McNeil Engineering Equipment Co., Chicago, Ill.—Control Equipment

N

National Battery Co., St. Paul, Minn.—Batteries
National Carbon Co., New York, N. Y.—Batteries
National Co., Inc., Malden, Mass.—Communication Equipment*
National Die Casting Co., Chicago, Ill.—Die Castings
National Electric Controller Co., Chicago, Ill.—Resistors
National Electric Mfg. Co., Berrien Springs, Mich.—Control Equipment
National Gasket & Washer Mfg. Co., New York, N. Y.—Gaskets
National Instrument Co., Boston, Mass.—Measuring Instruments
National Inter-Communicating Systems, Chicago, Ill.—Intercommunicators*
National Lock Co., Rockford, Ill.—Hardware
National Lock Washer Co., Newark, N. J. Retaining Rings
National Mineral Co., Chicago, Ill.—Motors & Generators
National Plastics Products Co., Detroit, Mich.—Plastics
National Porcelain Co., Trenton, N. J.—Insulation*
National Research Corp., Boston, Mass.—Measuring Instruments
National Scientific Products Co., Chicago, Ill.—Crystals
National Screw & Mfg. Co., Cleveland, Ohio—Hardware*
National Technical Laboratories, South Pasadena, Calif.—Resistors
National Tile Co., Anderson, Ind.—Insulators*
National Union Radio Corp., Newark, N. J.—Tubes*
National Varnished Products Corp., Woodbridge, N. J.—Insulation
National Vulcanized Fibre Co., Wilmington, Dela.—Insulation*
P. K. Nelson, Tulsa, Okla.—Control Equipment
Nepperhan Sales Co., Inc., New York, N. Y.—Insulation
Newark Transformer Co., Newark, N. J.—Transformers*
Newcomb Audio Products Co., Los Angeles, Calif.—Sound Systems*
New Britain Machine Co., New Britain, Conn.—Tools
New Britain Spring Co., New Britain, Conn.—Springs
New England Confectionary Co., Cambridge, Mass.—Capacitors
New England Etching & Plating Co., Holyoke, Mass.—Metal Finishing
New England Mica Co., Inc., Waltham, Mass.—Insulation
New England Radiocrafters, Boston, Mass.—Dials
New England Screw Co., Keene, N. H.—Hardware
New Jersey Machine Corp., Hoboken, N. J.—Vacuum Pumps
Newman X-Ray Corp., Aurora, Ill.—Electronic Equipment
New Method Steel Stamps, Inc., Detroit, Mich.—Marking Machines
New Products Corp., Benton Harbor, Mich.—Stampings
New Wrinkle, Inc., Dayton, Ohio—Lacquers
New York Solder Co., Inc., New York, N. Y.—Solder
New York Testing Laboratories, New York, N. Y.—Testing Laboratories
New York Transformer Co., New York, N. Y.—Transformers*
Niagara Electrical Instrument Co., Buffalo, N. Y.—Measuring Instruments
Niagara Insul Bake Specialty Co., Inc., Albany, N. Y.—Plastic Molders
Nilsson Electrical Laboratory Inc., New York, N. Y.—Measuring Instruments
Nixon Nitration Works, Nixon, N. J.—Plastics
The K. B. Noble Co., Hartford, Conn.—Rotary Machines
Noblitt-Sparks Industries, Columbus, Ind.—Communication Equipment
Noma Electric Corp., New York, N. Y.—Fixed Capacitors
Nonotuck Mfg. Co., Holyoke, Mass.—Wire
Norclay Radio Co., Independence, Mo.—Crystals
North American Electric Lamp Co., St. Louis, Mo.—Infra-red Lamps
North American Philips Co., Dobbs Ferry, N. Y.—Communications
North Electric Mfg. Co., Galion, Ill.—Battery Charges
Northam Warren Corp., Stamford, Conn.—Connectors
Northern Electric Co., Chicago, Ill.—Wire
Northern Engineering Laboratories, New York, N. Y.—Refrigerated Test Cabinets
Northern Industrial Chemical Co., South Boston, Mass.—Insulation*
Northern Laboratories, Ltd., New York, N. Y.—Measuring Instruments
Northern Mfg. Co., Inc., Newark, N. J.—Tubes
Northwest Plastics, Inc., St. Paul, Minn.—Plastic Molders
Northwest Syndicate, Inc., Tacoma, Wash.—High Frequency Heating
Norton Co., Worcester, Mass.—Insulation
Norton Electrical Instrument Co., Manchester, Conn.—Measuring Instruments
Norton Laboratories, Inc., Lockport, N. Y.—Insulation*
Nothelfer Winding Labs., Trenton, N. J.—Transformers
Numberall Stamp & Tool Co., Staten Island City—Connectors Numbering Machines

O

Oak Mfg. Co., Chicago, Ill.—Vibrators*
Oakite Products, Inc., New York, N. Y.—Solvents
Offner Electronics, Inc., Chicago, Ill.—Electronic Equipment
Ohio Crankshaft Co., Cleveland, Ohio—Induction Heaters
The Ohio Carbon Co., Cleveland, Ohio—Resistors*
The Ohio Crankshaft Co., Cleveland, Ohio—Electronic Equipment
Ohmite Mfg. Co., Chicago, Ill.—Resistors*
A. Olek & Son, Inc., Philadelphia, Pa.—Grill Cloth
O K Machine Co., Fort Wayne, Ind.—Machinery
The Okonite Co., Passaic, N. J.—Wire
Otto K. Olesen Ill., Co., Ltd., Hollywood, Calif.—Microphone Stands
D. W. Onan & Sons, Minneapolis, Minn. Power Plants
O'Neill-Irwin Mfg. Co., Minneapolis, Minn.—Machinery
Operadio Mfg. Co., St. Charles, Ill.—Speakers*
Orange Screen Co., Maplewood, N. J.—Stampings
Oregon Electronic Mfg. Co., Portland, Ore.—Measuring Instruments
Oris Mfg. Co., Thomaston, Conn.—Plastic Molders
John Oster Mfg. Co., of Illinois, Genoa, Ill.—Motors
Otarion, Inc., Chicago, Ill.—Hearing Aids
Oxford-Tartak Radio Corp., Chicago, Ill.—Speakers*
Owens-Corning Fiberglas Corp., Toledo, Ohio—Insulation
Ozalid Products Div. General Aniline & Film Corp., Johnson City, N. Y.—Print Making Machines

P

Pacific Clay Products, SteaPACtite Div. Los Angeles, Calif.—Insulation
Pacific Radio Crystal Co., San Francisco, Calif.—Crystals
Pacific Railway Equipment Co., Los Angeles, Calif.—Rivets
Pacific Sound Equipment Co., Hollywood, Calif.—Sound Systems*
Packard-Bell Co., Los Angeles, Calif.—Communication Equipment
Packard Electric Div., General Motors Corp, Warren, Ohio-Wire
Packard Mfg. Corp., Indianapolis, Ind.—Communication Equipment
The Palnut Co., Irvington, N. J.—Lock Nuts
Paisley Products, Inc., Chicago, Ill.—Cement & Wax
Pan-Electronics Labs. Inc., Atlanta, Ga.—Crystals
Panelyte Corp., New York, N. Y.—Plastics
Panoramic Radio Corp., New York, N. Y.—Laboratory Equipment
Paragon Electric Co., Chicago, Ill.—Relays
The Paraloy Co., Chicago, Ill.—Needles*
Paraphone Hearing Aid Inc., Cleveland, Ohio—Hearing Aids
Paramount Paper Tube Co., Fort Wayne, Ind—Varnished Tubing
Paramount Radio Co., Oakland, Calif.—Cabinets*
Parisian Novelty Co., Chicago, Ill.—Insulation*
Parker Engineering Products Co., New York, N. Y.—Photo Electric Equipment
Parker-Kalon Corp., New York, N. Y.—Screws*
Park Metalware Co., Inc., Orchard Park, N. Y.—Tools
Par-Metal Products Corp., Long Island City, N. Y.—Metal Cabinets
Partlow Corp., New Hartford, N. Y.—Measuring Instruments
Patent Button Co. of Tennessee, Inc., Knoxville, Tenn.—Plastic Molders
Patterson Screen Co., Towanda, Pa.—Electronic Equipment*
Patton-MacGuyer Co., Providence, R. I.—Hardware*
Paul & Beekman, Philadelphia, Pa.—Hardware
Peck Spring Co., Plainville, Conn.—Springs
Peck and Harvey, Chicago, Ill.—Print Making Machine
Peerless Electrical Products Co., Los Angeles Calif.—Transformers
Peerless Laboratories, Inc., New York, N. Y.—Diathermy Equipment*
Peerless Mfg. Corp., Louisville, Ky.—Coils*
Peerless Roll Leaf Co., Inc., Union City, N. J.—Stampings
Penn Boiler & Burner Mfg. Corp., Lancaster, Pa.—Motors
Penn Fibre & Specialty Co., Philadelphia, Pa.—Insulation*
Penn-Union Electric Corp., Erie, Pa.—Connectors
Perkin-Elmer Corp., Glenbrook, Conn.—Laboratory Equipment
Perm-O-Flux Corp., Chicago, Ill.—Speakers*
Permo, Inc., Chicago, Ill.—Instrument Parts
Peters Chemical Mfg. Co., Melrose Park, Ill.—Plastics
Petersen Radio Co., Council Bluffs, Iowa—Crystals
Pfaltz & Bauer, Inc., New York, N. Y.—Measuring Instruments
Pfanstiehl Chemical Co., Waukegan, Ill.—Needles
Phelps Dodge Copper Products Corp., Dobbs Ferry, N. Y.—Wire
Pheoll Mfg. Co., Chicago, Ill.—Hardware
Philco Corp., Philadelphia, Pa.—Communication Equipment*
Philadelphia Mica Corp., Philadelphia, Pa.—Mica Insulation
Philharmonic Radio Corp., New York, N. Y.—Communication Equipment

Philips Metalix Corp., New York, N. Y.—Laboratory Equipment*

Phillips Process Co. Inc., Rochester, N. Y.—Marking Inks

Philmore Mfg. Co., Inc., New York, N. Y.—Intercommunicators

Philson Mfg. Co., Inc., New York, N. Y.—Antennas

Phonette Co. of America, Los Angeles, Calif.—Crystals*

Phonograph Needle Mfg. Co., Inc., Providence, R. I.—Needles*

Photobell Corp., New York, N. Y.—Photo Electric Equipment*

Photogenic Machine Corp., Youngstown, Ohio—Lighting Equipment

Photoswitch Inc., Combustion Control Corp., Cambridge, Mass.—Electronic Controls

Photovolt Corp., New York, N. Y.—Photo Electric Equipment*

Physicists Research Co., Ann Arbor, Mich.—Laboratory Equipment

Picker X-Ray Corp., New York, N. Y.—X-Ray Inspection Machines

Pierce Laboratory, Inc., Summit, N. J.—Relays

Piezo Electric Products Co., Brooklyn Park, Md.—Crystals

Pilot Radio Corp., Long Island City, N. Y.—Communication Equipment

Pinkam & Smith Co., N. Boston, Mass.—Crystals

Pioneer Asphalt Co., Chicago, Ill.—Lacquers

Pioneer Gen-E-Motor Corp., Chicago, Ill.—Dynamotors

Pittsburgh Testing Laboratory, Pittsburgh, Pa.—Testing Laboratory

Plaskon Co., Toledo, Ohio—Plastics

Plastic Fabricators Co., San Francisco, Calif.—Plastic Fabricators

Plastic Manufacturers Inc., Stamford, Conn.—Plastic Fabricators

Plastic Metals, Inc., Johnstown, Pa.—Metal

Plastic Molding Corp., Sandy Hook, Conn.—Plastic Molders

Plasticraft Associates, Chicago, Ill.—Plastics

Plax Corp., Hartford, Conn.—Plastic Molders*

Plume & Atwood Mfg. Co., Waterbury,

Poinsettia, Inc., Pitman, N. J.—Records

Polymet Condenser Co., New York, N. Y.—Capacitors

Porcelain Enamel & Mfg. Co., Plastics Division, Baltimore, Md.—Insulation

Porcelain Products, Inc., Parkersburg, West Va.—Insulation

The Porcelain Insulator Corp., Lima, N. Y.—Insulators

Porcelain Products, Inc., Findlay, Ohio—Insulation*

The Frederick Post Co., Chicago, Ill.—Drawing Equipment

Potter Co., North Chicago, Ill.—Fixed Capacitors*

Potter & Brumfield Mfg. Co., Princeton, Ind.—Relays

Potter Elec. Signal & Mfg. Co., St. Louis, Mo.—Photo Electric Equipment

Power Equipment Co., Electronic Div., Detroit, Mich.—Sound Systems

Power Equipment Co., Detroit, Mich.—Power Rectifiers

Powers Electronic & Communication Co., Inc., Glen Cove, L. I., N. Y.—Power Amplifiers

The Powers Regulator Co., Chicago, Ill.—Measuring Instruments

Pratt & Lambert, Inc., Buffalo, N. Y.—Paint Products

Pratt & Whitney Div., Niles-Bement-Pond Co., W. Hartford, Conn.—Machinery & Equipment

Precise Development Co., Chicago, Ill.—Crystals

Precision Apparatus Corp., Elmhurst, L. I., N. Y.—Test Equipment

Precision Fabricators, Inc., Rochester, N. Y.—Plastic Molders

Precision Paper Tube Co., Chicago, Ill.—Insulation*

Precision Piezo Service, Baton Rouge, La.—Crystals

Precision Products Co., Waltham, Mass.—Instrument Parts

Precision Resistor Co., Newark, N. J.—Resistors

Precision Scientific Co., Chicago, Ill.—Laboratory Equipment

Precision Specialties, Los Angeles, Calif.—Plastic Molders

Precision Thermometer & Instrument Co., Philadelphia, Pa.—Thermometers

Precision Tube Co., Philadelphia, Pa.—Metal Tubing*

Premax Products Div., Chisholm-Ryder Co., Inc., Niagara Falls, N. Y.—Antennas

Premier Crystal Laboratories, Inc., New York, N. Y.—Crystals

Premier Metal Etching Co., Long Island City, N. Y.—Dials

Press Wireless, Inc., New York, N. Y.—Transmitters

Prest-O-Lite Battery Co., Indianapolis, Ind.—Storage Batteries

Presto Recording Corp., New York, N. Y.—Recorders

H. P. Preis Engraving Machine Co., Newark, N. J.—Marking & Numbering Machines

Price Brothers Co., Frederick, Md.—Relays

Printloid, Inc., New York, N. Y.—Plastic Fabricators

Production Devices, Inc., Whitehall, N. Y.—Vises

Production Engineering Corp., Clifton, N. J.—Machinery

Professional Tool & Engineering Co., Chicago, Ill.—Jigs

Progressive Mfg. Co., Torrington, Conn.—Hardware

Pyle-National Co., Chicago, Ill.—Connectors

Pyroferric Corp., New York, N. Y.—Core Materials

Pyramid Products Co., Chicago, Ill.—Tools

Pyrometer Instrument Co., New York, N. Y.—Pyrometers

Q

Quality Hardware & Machine Corp., Chicago, Ill.—Stampings

Quaker City Gear Works, Inc., Philadelphia, Pa.—Machinery.

Quartz Laboratories, Kansas City, Mo.—Crystals

Quam-Nichols Co., Chicago, Ill.—Speakers*

R

R 9 Crystal Co., Inc., Pittsburgh, Pa.—Crystals

Racon Electric Co., Inc., New York, N. Y.—Speakers

Radell Corp., Indianapolis, Ind.—Crystals

Radex Corp., Chicago, Ill.—Laboratory Equipment*

Radiant Lamp Corp., Newark, N. J.—Light Supplies

Radiad Service, Chicago, Ill.—Cabinets

The Radiart Corp., Cleveland, Ohio—Vibrators*

Radio City Products Co., New York, N. Y.—Measuring Instruments

Radio Condenser Co., Camden, N. J.—Capacitors

Radio Craftsmen, Chicago, Ill.—Coils

Radio Laboratories, Inc., Seattle, Wash.—Transmitters

Radio Design Co., Brooklyn, N. Y.—Measuring Instruments

Radio Electronic Co., Oakland, Calif.—Sound Systems*

Radio Engineering Labs., Inc., Long Island City, N. Y.—Transmitters

Radio Essentials, Inc., New York, N. Y.—Hardware*

Radio Frequency Labs., Inc., Boonton, N. J.—Test Equipment*

Radio Mfg. Engineers, Inc., Peoria, Ill.—Transmitters*

Radio Navigational Instrument Corp., New York, N. Y.—Antennas

Radio Receptor Co., Inc., New York, N. Y.—Transmitters

Radio Service Engineers, Ft. Wayne, Ind.—Test Equipment

Radio Speakers, Inc., Chicago, Ill.—Speakers*

Radio Specialties Co., Los Angeles, Calif.—Plastic Molders

Radio Specialty Mfg. Co., Portland, Ore.—Signal Generators

Radiotechnic Laboratory, Evanston, Ill.—Tube Testers

Radionics Control Co., Chicago, Ill.—Relays

Radionic Transformer Co., Chicago, Ill.—Transformers

Radiotone Div., Robinson Houchin Optical Co., Columbus, Ohio—Recorders

Radiotone, Inc., Hollywood, Calif.—Recorders

Rahm Instruments, Inc., New York, N. Y.—Electronic Equipment

The Rajah Co., Bloomfield, N. J.—Hardware

Rapid Electroplating Process, Inc., Chicago, Ill.—Metal Finishing

The Rauland Corp., Chicago, Ill.—Sound Systems*

Rawson Electrical Instrument Corp., Cambridge, Mass.—Measuring Instruments

Ray-O-Vac Co., Madison, Wisc.—Dry Batteries

Raymond Mfg. Co., Division of Associated Springs Corp., Corry, Pa.—Stampings

Raytheon Mfg. Co., Waltham, Mass.—Transformers

Raytheon Production Corp., Newton, Mass.—Tubes*

RBM Mfg. Co., Logansport, Ind.—Photo Electric Equipment

RCA Victor Div. of Radio Corp. of America, Camden, N. J.—Tubes*

Rea Magnet Wire Co., Inc., Fort Wayne, Ind.—Wire

R. E. C. Mfg. Corp., Holliston, Mass.—Crystals

Readrite Meter Works, Bluffton, Ohio—Test Equipment

Reading Batteries, Inc., Reading, Pa.—Storage Batteries

The Ready-Power Co., Detroit, Mich.—Chargers*

The RecorDisc Corp., New York, N. Y.—Recording Blanks

The Recordit Co., University City, Mo.—Recording Supplies*

Record-O-Vox, Inc., Brooklyn, N. Y.—Communications

Recto Molded Products, Inc., Cincinnati, Ohio—Parts Molders

Recoton Corp., Long Island City, N. Y.—Needles*

Red Arrow Electric Corp., Irvington, N. J.—Transformers

Reed Prentice Corp., Worcester, Mass.—Molding Presses

Reed & Prince Mfg. Co., Worcester, Mass.—Hardware

Reeves Sound Lab. Inc., New York, N. Y.—Crystals

Regal Electronics Corp., New York, N. Y.—Communications

Rehtron Corp., Chicago, Ill.—Electronic Controls

Reilly Tar & Chemical Corp., Indianapolis, Ind.—Plastics

Rek-O-Kut Corp., New York, N. Y.—Recording Assemblies

Reiner Electronics Co., New York, N. Y.—Laboratory Equipment

Reliable Spring & Wire Forms Co., Cleveland, Ohio—Hardware

Reliance Automatic Lighting Co., Racine, Wis.—Switches

Reliance Devices Co., Inc., New York, N. Y.—Drafting Room Equipment

Remler Co., Ltd., San Francisco, Calif.—Communication Equipment

Republic Steel Corp., Cleveland, Ohio—Laminations

Resinous Products & Chemicals Co., Philadelphia, Pa.—Plastics

Resistoflex Corp., Belleville, N. J.—Plastics

Revere Copper & Brass, Inc., New York, N. Y.—Metal

Rex Rheostat Co., Baldwin, L. I., N. Y.—Resistors

Revco, Inc., Deerfield, Mich.—Laboratory Equipment

Reynolds Electric Co., Chicago, Ill.—Machinery

Reynolds Spring Co., Plastic Div., Cambridge, Ohio—Insulation*

M. H. Rhodes, Inc., Hartford, Conn.—Switches

Bernard Rice's Sons, Inc., New York, N. Y.—Stampings

Rhode Island Insulated Wire Co., Cranston, R. I.—Wire

Rhodes Mfg. Co., Chicago, Ill.—Knobs

Arklay S. Richards Co., Inc., Newton Highlands, Mass.—Thermocouples

Richardson Co., Lockland, Ohio—Insulation

Richards' Electro-Fence Co., Payette, Idaho—Electronic Controls

Richardson-Allen Corp., New York, N. Y.—Electronic Controls

Frank Rieber, Inc., Los Angeles, Calif.—Sound Systems*

Riggs & Jeffrey, Inc., Newark, N. J.—Sound Systems

Rinauld Optical Co., Webster, Mass.—Crystals

A. E. Rittenhouse, Honeoye Falls, N. Y.—Transformers*

Riverbank Labs., Geneva, Ill.—Tuning Fork Oscillators

Riverside Metal Co., Riverside, N. J.—Metal

Robertshaw Thermostat Co., Youngwood, Pa.—Electronic Controls

W. C. Robinette Co., S. Pasadena, Calif.—Electronic Controls

Rockbestos Products Corp., New Haven, Conn.—Special Wire

John A. Roebling's Sons Co., Trenton, N. J.—Wire*

R. & R. Plastics, Springfield, Mass.—Fabricators

R & T Electronics Co., Washington, D. C.—Machinery

Rogan Brothers, Chicago, Ill.—Insulation*

Rogers Radio Tubes, Ltd., Toronto, Canada—Tubes

Rohm & Haas Co., Philadelphia, Pa.—Plastics

The Rola Co., Inc., Cleveland, Ohio—Speakers*

Roller-Smith Co., Bethlehem, Pa.—Laboratory Equipment

Rome Cable Corp., Rome, N. Y.—Wire

Ross Mfg. Co., Chicago, Ill.—Holders

Albert Rothenstein, New York, N. Y.—Fixed Capacitors

The T. R. Routh Co., San Francisco, Calif.—Measuring Instruments*

Rowe Radio Research Laboratory Co., Chicago, Ill.—Sound Systems*

Roxalin Flexible Finishes, Inc., Elizabeth, N. J.—Lacquers

Royal Electric Co., Inc., Pawtucket, R. I.—Wire

Royal Moulding Co., Inc., Providence, R. I.—Parts Molders

Rubicon Company, Philadelphia, Pa.—Laboratory Equipment*

The Ruby Chemical Co., Columbus, Ohio—Soldering Flux

Ruby Electric Co., New York, N. Y.—Sound Systems

Rupp's Assembling & Mfg. Works, Chicago, Ill.—Hardware*

Rusgreen Mfg. Co., Detroit, Mich.—Metal

Russell Electric Co., Chicago, Ill.—Motors & Generators

Rustless Iron & Steel Corp., Baltimore, Md.—Stainless Steel

S

Safety Electric Co., Chicago, Ill.—Infra-red Drying Equipment

St. John X-Ray Service, Inc., Long Island City, N. Y.—X-Ray Equipment

Sanborn Co., Cambridge, Mass.—Electronic Equipment

Sandee Mfg. Co., Chicago, Ill.—Insulation

Sauereisen Cements Co., Pittsburgh, Pa.—Cement Products

Sanders Bros. Mfg. Co., Ottawa, Ill.—Cabinets

Sangamo Electric Co., Springfield, Ill.—Measuring Instruments

E. H. Sargent Co., Oakland, Calif.—Intercommunicators

Sav-Way Industries, Detroit, Mich.—Machinery

Saxl Instrument Co., Inc., E. Providence, R. I.—Laboratory Equipment*

Saxonburg Potteries, Saxonburg, Pa.—Insulation

Schaar & Company, Chicago, Ill.—Chemicals

Schauer Machine Co., Cincinnati, Ohio—Power Rectifiers

George Scherr Co., Inc., New York, N. Y.—Inspection Mirrors

Schloss Brothers Corp., New York, N. Y.—Cabinets

The William Schollhorn Co., New Haven, Conn.—Tools

Walter L. Schott Co., Beverly Hills, Calif.—Paint Products

Schulmerich Electronics, Inc., Sellersville, Pa.—Electronic Controls

Schuttig & Co., Washington, D. C.—Measuring Instruments

Schweitzer Paper Co., Newark, N. J.—Capacitor Paper

Sciaky Brothers, Chicago, Ill.—Electronic Controls

"S" Corrugated Quenched Gap Co., Garfield, N. J.—Induction Heater

Scientific Radio Service, Hyattsville, Md.—Crystals

Scientific Radio Products Co., Council Bluffs, Iowa—Crystals

E. H. Scott Radio Laboratories, Inc., Chicago, Ill.—Communication Equipment

Scranton Record Co., Scranton, Pa.—Recording Blanks*

Screenmakers, Inc., New York, N. Y.—Dials

Scully Machine Co., Bridgeport, Conn.—Recorders

Security Steel Equipment Corp., Avenel, N. J.—Cabinets

J. P. Seeburg Corp., Chicago, Ill.—Communication Equipment

Seely Instrument Co., Akron, Ohio—Control Equipment

Selectar Mfg. Co., Long Island City, N. Y.—Cable Connectors

Select-O-Phone Co., Providence, R. I.—Inter-communicators

Selenium Corp. of America, Los Angeles, Calif.—Control Equipment*

Sensitive Research Instrument Corp., New York, N. Y.—Measuring Instruments*

Sentinel Radio Corp., Evanston, Ill.—Communication Equipment

Sentry Crystal Co., Portland, Ore.—Crystals

Setchell-Carlson, Inc., St. Paul, Minn.—Communication Equipment*

Shakeproof, Inc., Chicago, Ill.—Lockwashers

Shallcross Mfg. Co., Collingdale, Pa.—Measuring Instruments

Shawinigan Products Corp., New York, N. Y.—Plastics

Shaw Insulator Co., Irvington, N. J.—Plastic Molders

Sheldon Service Corp., Long Island City, N. Y.—Couplings

Sherman & Reilly, Inc., Chattanooga, Tenn.—Wire

Sheridan Electro Corp., Chicago, Ill.—Communication Equipment

H. B. Sherman Mfg. Co., Battle Creek, Mich.—Hardware

Sherron Metallic Corp., Brooklyn, N. Y.—Measuring Instruments

The Sherwin-Williams Co., Cleveland, Ohio—Paint*

Shideler Crystal Laboratory, Fort Dodge, Iowa—Crystals

Shure Brothers, Chicago, Ill.—Microphones*

F. W. Sickles Co., Chicopee, Mass.—Coils

Sigma Instruments, Inc., Boston, Mass.—Relays

Signal Electric Co., Menominee, Mich.—Machinery & Equipment

Signal Indicator Corp., New York, N. Y.—Signal Lights

Silman Mfg. Corp., Pittsburgh, Pa.—Sound Systems*

Simonds Saw & Steel Co., Lockport, N. Y.—Metal

Simmonds Aerocessories, Inc., Long Island City, N. Y.—Transmitters

Simplex Radio Corp., Sandusky, Ohio—Communication Equipment

Simplex Wire & Cable Co., Cambridge, Mass.—Wire

Mark Simpson Mfg. Co., Inc., New York, N. Y.—Sound Systems*

Simpson Electric Co., Chicago, Ill.—Measuring Equipment

Sinko Tool & Mfg. Co., Chicago, Ill.—Plastic Molders

Sipp-Eastwood Corp., Paterson, N. J.—Holders

Sirian Wire & Contact Co., Newark, N. J.—Metal for Radio

Slater Electric Mfg. Co., Inc., Brooklyn, N. Y.—Tubes

N. G. Slater Corp., New York, N. Y.—Cabinets

Anton Smit & Co., Inc., New York, N. Y.—Machinery

Small Motors, Inc., Chicago, Ill.—Vibrators*

F. A. Smith Mfg. Co., Rochester, N. Y.—Blowers

Melvin L. Smith Laboratories, Kane, Pa.—Crystals

Nathan R. Smith Mfg. Co., S. Pasadena, Calif.—Transformers*

Smith Paper Co., Inc., Lee, Mass.—Paper Insulation

Snyder Mfg. Co., Philadelphia, Pa.—Antennas

Sola Electric Co., Chicago, Ill.—Voltage Regulating Transformers

Solar Mfg. Corp., Bayonne, N. J.—Fixed Capacitors*

Solar Corp., Milwaukee, Wis.—Storage Batteries

Somerset Laboratories, Lyndhurst, N. J.—Crystals

Sonora Radio & Telev. Corp., Chicago, Ill.—Communication Equipment

Sonart Record Corp., New York, N. Y.—Records

Sonotone Corp., Elmsford, N. Y.—Hearing Aids

Sound Apparatus Co., New York, N. Y.—Graphic Recorders

S. O. S. Cinema Supply Corp., New York, N. Y.—Photoelectric Equipment

Sound Devices Co., Inc., New York, N. Y.—Recording Equipment

Sound Equipment Corp. of California, Hollywood, Calif.—Power Amplifiers

Sound Scriber Corp., New Haven, Conn.—Recorders*

Southern Battery Co., Appomattox, Va.—Batteries

Southern Products, Independence, Mo.—Antennas

Sparkes Mfg. Co., Ltd., Newark, N. J.—Cabinets

Sparks-Withington Co., Jackson, Mich.—Communication Equipment

Spaulding Fibre Co., Inc., Tonawanda, N. Y.—Insulation

Speak-O-Phone Recording & Equip. Co., New York, N. Y.—Recorders*

Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.—Plastic Molders

Speedway Mfg. Co., Cicero, Ill.—Motors

Speer Carbon Co., St. Mary's, Pa.—Carbon

Speer Resistor Co., St. Mary's, Pa.—Resistors

Spencer Thermostat Co., Attleboro, Mass.—Temperature Controls

Sperry Gyroscope Co., Inc., Brooklyn, N. Y.—Communication Equipment

Sperti, Inc., Norwood, Cincinnati, Ohio.—Electronic Medical Equipment

Sprague Products Co., N. Adams, Mass.—Capacitors

Sprague Specialties Co., N. Adams, Mass.—Resistors*

Square D Co., Detroit, Mich.—Insulation

Stackpole Carbon Co., St. Mary's, Pa.—Resistors*

Standard Arcturus Corp., Newark, N. J.—Tubes

Standard Coil Products Co., Chicago, Ill.—Crystals

The Standard Electric Time Co., Springfield, Mass.—Timers

Standard Electrical Products Co., St. Paul, Minn.—Hardware*

Standard Electrical Tool Co., Cincinnati, Ohio—Machinery

Standard Insulation Co., East Rutherford, N. J.—Insulation

Standard Locknut & Lockwasher, Inc., Indianapolis, Ind.—Locknuts

Standard Machinery Co., Providence, R. I.—Machinery

Standard Molding Corp., Dayton, Ohio—Plastic Molders

Standard Oil Co. (Indiana), Chicago, Ill.—Waxes

Standard Piezo Co., Carlisle, Pa.—Crystals

Standard Pressed Steel Co., Jenkintown, Pa.—Hardware

Standard Technical Devices, Inc., Brooklyn, N. Y.—Fabricators

Standard Transformer Corp., Chicago, Ill.—Transformers*

Standard Varnish Works, Staten Island, N. Y.—Paint Products

Standard Winding Corp., Newburgh, N. Y.—Coils

Stanley Works, Magic Door Div., New Britain, Conn.—Electronic Controls

Star Porcelain Co., Trenton, N. J.—Insulation

Stanwyck Winding Co., Newburgh, N. Y.—Coils

Stark Sound Engineering Corp., Fort Wayne, Ind.—Sound Systems

The L. S. Starrett Co., Athol, Mass.—Tools

The States Co., Hartford, Conn.—Electronic Controls

Sta-Warm Electric Co., Ravenna, Ohio—Solder Pots

Steger Furniture Mfg. Co., Steger, Ill.—Cabinets

Fred Stein Laboratories, Atchison, Kan.—Measuring Equipment

Sterling Mfg. Co., Cleveland, Ohio—Measuring Instruments

Stevens Walden, Inc., Worcester, Mass.—Tools

Stewart Stamping Co., New York, N. Y.—Hardware

D. M. Stewart Mfg. Co., Chattanooga, Tenn.—Insulation

F. W. Stewart Mfg. Corp., Chicago, Ill.—Flexible Shafts

Stewart-Warner Corp., Chicago, Ill.—Communication Equipment

Herman H. Sticht Co., Inc., New York, N. Y.—Measuring Instruments

Edwin B. Stimpson Co., Inc., Brooklyn, N. Y.—Hardware

C. H. Stoelting Co., Chicago, Ill.—Electronic Control

F. J. Stokes Machine Co., Philadelphia, Pa.—Molding Presses

Jos. Stokes Rubber Co., Trenton, N. J.—Insulation

Stow Mfg. Co., Binghamton, N. Y.—Flexible Shafts

Stromberg-Carlson Co., Rochester, N. Y.—Communication Equipment*

Struthers Dunn, see Dunn, Struthers

Stricker-Brunhuber Co., New York, N. Y.—Molding Presses

B. F. Sturtevant Co., Hyde Park, Boston, Mass.—Blowers

Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.—Insulation*

Summerill Tubing Co., Bridgeport, Pa.—Metal Tubing

Sun Mfg. Co., Chicago, Ill.—Measuring Instruments

Sun Shoe Mfg. Co., Chicago, Ill.—Leather Handles

Sundt Engineering Co., Chicago, Ill.—Laboratory Eqquipment*

Sunlight Electrical Div., General Motors Corp., Warren, Ohio—Motors

Super Electric Products Corp., Jersey City, N. J.—Switches

Superior Electric Co., Bristol, Conn.—Control Equipment

Superior Flake Graphite Co., Chicago, Ill.—Graphite

Superior Flux Co., Cleveland, Ohio—Flux

Superior Instruments Co., New York, N. Y.—Test Equipment

Superior Porcelain Co., Parkersburg, W. Va.—Antennas

Superior Tube Co., Norristown, Pa.—Tube Parts

Supreme Electric Products Corp., Rochester, N. Y.—Solenoid Valves

Supreme Instruments Corp., Greenwood, Miss.—Test Equipment*

Surprenant Electrical Insulation Co., Boston, Mass.—Varnished Tubing

S-W Inductor Co., Chicago, Ill.—Coils*

Swedish Iron & Steel Corp., New York, N. Y.—Metal*

Swiss Jewel Co., Philadelphia, Pa.—Instrument Parts

Sylvania Electric Products, Inc., New York, N. Y.—Tubes*

Synchro-Start Products, Inc., Chicago, Ill.—Control Equipment

Synthane Corp., Oaks, Pa.—Plastics*

Synthetic Plastics Co., Newark, N. J.—Plastic Molders

Syracuse Ornamental Co., Syracuse, N. Y.—Parts Molders

T

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y.—Electronic Controls

Takk Corp., Newark, Ohio—High Voltage Testers

Talk-A-Phone Mfg. Co., Chicago, Ill.—Intercommunicators

Tar Heel Mica Co., Plumtree, N. C.—Mica Insulation

Taylor Fibre Co., Norristown, Pa.—Plastics*

Taylor Tubes, Inc., Chicago, Ill.—Tubes*

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—Permanent Magnets

Tech-Art Plastics Co., Long Island City, N. Y.—Plastic Molders

Tech Laboratories, Jersey City, N. J.—Electronic Controls

Technical Apparatus Co., Boston, Mass.—Measuring Instruments

Technical Appliance Corp., New York, N. Y.—Antennas

Technical Plastics Co., Pittsburgh, Pa.—Plastic Molders

Technical Radio Co., San Francisco, Calif.—Transmitters

Techtmann Industries, Inc., Milwaukee, Wisc.—Resistors

Tel Autograph Corp., New York, N. Y.—Intercommunicators

Telegraph Apparatus Co., Chicago, Ill.—Transmitters

Telemotor Corp., New York, N. Y.—Intercommunicators

Teleplex Co., Jersey City, N.J.—Code Recorders

Teleplex Co., Jersey City, N. J.—Radio Telegraph Equipment

Teleradio Engineering Corp., New York, N. Y.—Variable Capacitors

Televiso Products Inc., Chicago, Ill.—Test Equipment*

Telex Products Co., Minneapolis, Minn.—Hearing Aids

Telicon Corp., New York, N. Y.—Holders

Templetone Radio Co., Mystic, Conn.—Communication Equipment

Tennessee Eastman Corp., Kingsport, Tenn.—Plastics

Tenney Engineering, Inc., Montclair, N. J.—Refrigerated Cabinets

Terkelsen Machine Co., Boston, Mass.—Plastic Molders

Terma Electric Co., New York, N. Y.—Diathermy

Thermador Electric Mfg. Co., Inc., Los Angeles, Calif.—Transformers*

Therm-Electric Meters Co., Inc., Ithaca, N. Y.—Machinery

Thermo-Electric Mfg. Co., Dubuque, Iowa—Electric Furnaces

Thomas & Betts Co., Inc., Elizabeth, N. J.—Hardware

The R. Thomas & Sons Co., Lisbon, Ohio—Insulation*

Thomas-Gibb Welding Co., Lynn, Mass.—Control Equipment

Thomas & Skinner Steel Products Co., Indianapolis, Ind.—Permanent Magnets

Thompson-Bremer & Co., Chicago, Ill.—Hardware

Thordarson Elec. Mfg. Co., Chicago, Ill.—Transformers*

Thwing-Albert Instrument Co., Philadelphia, Pa.—Measuring Instruments

Tibbetts Laboratories, Cambridge, Mass.—Crystals*

Tilton Electric Corp., New York, N. Y.—Resistors*

Tingstol Corp., Chicago, Ill.—Insulation*

Tinnerman Products, Inc., Cleveland, Ohio—Hardware

Tomlee Tool & Engineering Co., Minneapolis, Minn.—Electronic Control

Tonk Manufacturing Co., Chicago, Ill.—Cabinets

Tork Clock Co., Mount Vernon, N. Y.—Timers

Torit Mfg. Co., St. Paul, Minn.—Air Cleaners

Transformer Engineering Co., Stamford, Conn.—Laboratory Equipment*

Translite Inc., Brooklyn, N. Y.—Tubes

Transmitter Equipment Mfg. Co., Inc., New York, N. Y.—Transmitters

Trav-Ler Karanola Radio & Television Corp., Chicago, Ill.—Communication Equipment

Trebor Radio Co., Pasadena, Calif.—Intercommunications

Harold E. Trent Co., Philadelphia, Pa.—Machinery

Trent Tube Mfg. Co., East Troy, Wis.—Metal

Trimm, Inc., Chicago, Ill.—Headphones

The Triplett Electrical Instrument Co., Bluffton, Ohio—Measuring Instruments

Triumph Manufacturing Co., Chicago, Ill.—Test Equipment*

Tri-State Plastic Molding Co., Henderson, Ky.—Insulation.

Troy Radio & Television Co., Los Angeles, Calif.—Speakers*

Trumbull Electric Mfg. Co., Plainville, Conn.—Switches

Tubing Seal Cap, Inc., Los Angeles, Calif.—Tools

Tubular Rivet & Stud Co., Wollaston, Mass.—Rivets

Tuck Mfg. Co., Brockton, Mass.—Tools

Tung-Sol Lamp Works, Inc., Newark, N. J.—Tubes*

Turco Products, Inc., Los Angeles, Calif.—Chemicals

Tungsten Contact Mfg. Co., North Bergen, N. J.—Dials, Parts*

The Turner Co., Cedar Rapids, Iowa—Microphones*

H. W. Tuttle & Co., Adrian, Mich.—Resistors

U

The Ucinite Company, Div. of United Carr Fastener Corp., Newtonville, Mass.—Hardware

George Ulanet Co., Newark, N. J.—Switches

Ullman Products Co., Brooklyn, N. Y.—Hand Tools

Ultra-Violet Products, Inc., Los Angeles, Calif.—Ultra Violet Lamps

Unibra Trading Co., New York, N. Y.—Raw Quartz
Uniform Tubes, Philadelphia, Pa.—Metal Tubing
Union Aircraft Products Corp., New York, N. Y.—Hardware*
Union Electrical Porcelain Works, Inc., Trenton, N. J.—Insulators
Union Insulating Co., Parkersburg, W. Va.—Plastic Molders
Union Piezo Co., Newark, N. J.—Crystals
United Plastics Corp., New York, N. Y.—Plastic Molders
United Cinephone Corp., Torrington, Conn.—Laboratory Equipment*
United Electronics Co., Newark, N. J.—Tubes
United Radio Mfg. Co., New York, N. Y.—Cabinets
United Screw & Bolt Corp., Chicago, Ill.—Hardware
United States Electric Mfg. Corp., New York, N. Y.—Batteries
U. S. Electrical Motors, Inc., Los Angeles, Calif.—Machinery & Equipment
The U. S. Electrical Tool Co., Cincinnati, Ohio—Tools*
U. S. Graphite Co., Saginaw, Mich.—Graphite
U. S. Rubber Co., New York, N. Y.—Insulation*
United States Television Mfg. Corp., New York, N. Y.—Measuring Instruments
U. S. Testing Co., Inc., Hoboken, N. J.—Testing Laboratory
U. S. Tool Co., Inc., East Orange, N. J.—Tubes
United Transformer Co., New York, N. Y.—Transformers*
Universal Battery Co., Chicago, Ill.—Batteries
The Universal Clay Products Co., Sandusky, Ohio—Insulation
Universal Microphone Co., Inglewood, Calif.—Microphones*
Universal Motor Co., Oshkosh, Wis.—Motors
Universal Plastics Corp., New Brunswick, N. J.—Plastic Molders
Universal Television System, Kansas City, Mo.—Holders
Universal Winding Co., Cranston, R. I.—Machinery & Equipment
University Laboratories, New York, N. Y.—Speakers
USL Battery Corp., Niagara Falls, N. Y.—Batteries
Utah Radio Products Co., Chicago, Ill.—Communications
Utica Drop Forge & Tool Corp., Utica, N. Y.—Tools
Utilities Service Co., Allentown, Pa.—Antennas

V

Vac-O-Grip Co., Toledo, Ohio—Car Speaker Racks
Vaco Products Co., Chicago, Ill.—Tools
The Valpey Crystal Corp., Holliston, Mass.—Crystals
Valverde Laboratories, New York, N. Y.—Temperature Control Ovens
Vanatta Mfg. Co., Ontario, Calif.—Soldering Irons
Varflex Corp., Rome, N. Y.—Insulation*
Variaten Cinema Engineering Co., Burbank, Calif.—Transmitters
Veeder-Root, Inc., Hartford, Conn.—Die Castings
The Vibroplex Co., New York, N. Y.—Radiotelegraph Equipment*
Victor Insulators, Inc., Victor, N. Y.—Insulation
Victory Mfg. Co., Chicago, Ill.—Plastic Molders
Victory Radio Corp., New York, N. Y.—Communication Equipment
Viewtone Co., New York, N. Y.—Communication Equipment
Viking Instruments, Inc., Stamford, Conn.—Sound Systems
Vonnegut Moulder Corp., Indianapolis, Ind.—Machinery
Vreeland Lapidary Mfg. Co., Portland, Ore.—Crystals
V. Precision Instrument Mfg. Co., Inc., Elmhurst, L. I., N. Y.—Crystals

W

Wabash Cabinet Co., Wabash, Ind.—Cabinets
Wagner Electric Corp., St. Louis, Mo.—Motors
F. W. Wakefield Brass Co., Vermilion, Ohio—Lighting Equipment
George Walker Co., Passaic, N. J.—Hardware
Walker-Turner Co., Inc., Plainfield, N. J.—Machinery
Wallace Barnes Co., Bristol, Conn.—Instrument Parts
Wm. T. Wallace Mfg. Co., Peru, Ind.—Wire
Ward Leonard Electric Co., Mt. Vernon, N. Y.—Resistors*
Ward Products Corp., Cleveland, Ohio—Antennas
Warren Telechron Co., Ashland, Mass.—Timers
Warwick Mfg. Co., Chicago, Ill.—Communication Equipment
Washington Porcelain Co., Washington, N. J.—Insulation
Waterbury Button Co., Waterbury, Conn.—Plastic Molders
Waters-Conley Co., Rochester, Minn.—Record Players
Waterman Products Co., Inc., Philadelphia, Pa.—Cabinets
Watertown Mfg. Co., Watertown, Conn.—Plastics*
Watlow Electric Mfg. Co., St. Louis, Mo.—Resistors
Watterson Radio Mfg. Co., Dallas, Texas—Communication Equipment
Waugh Labs., New York, N. Y.—Laboratory Equipment
Earl Webber Co., Chicago, Ill.—Test Equipment*
F. Weber Co., Philadelphia, Pa.—Drafting Room Equipment
Webster Electric Co., Racine, Wis.—Sound Systems*
Webster Products, Chicago, Ill.—Record Changers
Weksler Thermometer Corp., New York, N. Y.—Measuring Instruments
W. M. Welch Scientific Co., Chicago, Ill.—Measuring Instrument
James W. Weldon Laboratory, Kansas City, Mo.—Electric Furnaces
Weller Bros., Easton, Pa.—Tools*
Wellmade Electric Mfg. Co., Torrington, Conn.—Tools
Wells-Gardner & Co., Chicago, Ill.—Communication Equipment
Weltronic Co., Detroit, Mich.—Electronic Controls
Wenkstern Hasley Co., Cedar Rapids, Iowa—Crystals
R. D. Werner Co., Inc., New York, N. Y.—Plastic Molders
Wesbar Stamping Corp., West Bend, Wis.—Car Speaker Racks
Western Automatic Machine Screw Co., Elyria, Ohio—Hardware
Western Cartridge Co., East Alton, Ill.—Metal for Radio
Western Electric Co., New York, N. Y.—Transmitters*
Western Felt Works—See Acadia Synthetic Products Div.
Western Insulated Wire, Inc., Los Angeles, Calif.—Wire
Western Lithograph Co., Los Angeles, Calif.—Code Letters
Western Sound & Electric Labs Inc., Milwaukee, Wis.—Sound Systems*
Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.—Tubes
Westinghouse Electric & Mfg. Co., Newark, N. J.—Tubes
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—Transformers*
Weston Electrical Instrument Corp., Newark, N. J.—Measuring Instruments
West Shore Laboratories, Marblehead, Mass.—Tube Repairing
West Virginia Pulp & Paper Co., New York, N. Y.—Insulation
Wheelco Instruments Co., Chicago, Ill.—Measuring Instruments
Wheeler Insulated Wire Co., Bridgeport, Conn.—Wire*
Wheeler Reflector Co., Boston, Mass.—Lighting Equipment
Wheeling Stamping Co., Wheeling, W. Va.—Plastic Molders
Whisk Laboratories, New York, N. Y.—Transformers
Whitaker Battery Supply Co., Philadelphia, Pa.—Wire and Cable
David White Co., Milwaukee, Wis.—Drafting Room Equipment
White Research Associates, Boston, Mass.—Cabinets
White-Rodgers Electric Co., St. Louis, Mo.—Electronic Controls
S. S. White Dental Mfg. Co., Industrial Div., New York, N. Y.—Flexible Shafts*
Whitehead Stamping Co., Detroit, Mich.—Stampings
Whitney Blake Co., New Haven, Conn.—Shielded Wire*
Wickes Brothers, Saginaw, Mich.—Drafting Equipment
Wickwire Spencer Steel Co., New York, N. Y.—Metal Products
Wilcox Electric Co., Inc., Kansas City, Mo.—Transmitters
Wilcox-Gay Corp., Charlotte, Mich.—Communication Equipment*
Willard Storage Battery Co., Cleveland, Ohio—Batteries*
Willor Mfg. Corp., New York, N. Y.—Stampings
Wilmington Fibre Specialty Co., Wilmington, Del.—Insulation*
H. A. Wilson Co., Newark, N. J.—Metal Products
Wilson Mfg. Co., Ft. Lauderdale, Fla.—Control Equipment
Wincharger Corp., Sioux City, Iowa—Rotary Machines*
Winchester Repeating Arms Co., New Haven, Conn.—Batteries
Wind-Impeller Electric Works, Ellsworth, Iowa—Chargers
Wind Power Mfg. Co., Newton, Iowa—Battery Chargers
Windman Bros., Los Angeles, Calif.—Plastic Molders
The Winslow Co., Inc., Newark, N. J.—Keys
Winslow Co., Newark, N. J.—Silver and Compounds
Winters & Crampton Corp., Grandville, Mich.—Transmitters
Wipe-on Corp., New York, N. Y.—Paint Products
Wire Stripper Co., East Cleveland, Ohio—Tools
Wirt Co., Philadelphia, Pa.—Resistors
Withers Gen. Co., Atlanta, Ga.—Crystals
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WASHINGTON

Latest Electronic News Developments Summarized
by *Electronic Industries'* Washington Bureau

RESUMPTION OF CIVILIAN PRODUCTION—Elsewhere in this issue of ELECTRONIC INDUSTRIES we discuss reconversion planning for the electronic-radio-radar industry, but in that connection it is most important to note a recent official War Department statement, signed by General Marshall, Chief of Staff, for circulation within the Army that "no extensive resumption of civilian production is possible at this time" and "even minor shifts must be most carefully undertaken because it is folly to gamble on the course of the invasion."

PLANNING IS DIFFICULT—Plans are being made in order to be able to shift to civilian production as quickly as possible when military conditions permit, the War Department statement emphasized. But "unexpected military developments make planning very difficult and all eventualities cannot be expected to be met . . . short term shocks are likely . . . generally, however, employment slacks, unlikely for a long time, should be absorbed by production shifts without serious delay" and "civilian purchasing power and our great production capacity will form a strong foundation for major conversion where it becomes possible."

NOTABLE RECORD—Despite the stormy upheavals that have occurred during the war years in the Office of Production Management and its successor, the War Production Board, Ray C. Ellis, Director of the WPB Radio and Radar Division, has continued in that post for the past 2½ years and has achieved a most notable record of constructive activity and cooperation with the electronic-radio-radar industry. A major reason for his success has been that Mr. Ellis has hewed to the line that military requirements—"the needs of the war and fighting forces"—come first and uppermost.

$300,000,000 MONTHLY—Mr. Ellis has worked most closely with the Army and Navy high authorities and has their complete confidence. He also has cooperated to the fullest extent with the industry leadership. Brought to the OPM in early 1941 by its then Director, now Lt. Gen. William S. Knudsen, Mr. Ellis has seen the military production grow from $15,000,000 a month to its present figure of more than $300,000,000. His work was so highly recognized that he was sent to England to study radar during early 1942. He also has maintained the closest liaison with the OSRD and is a member of the NDRC.

FIFTEEN YEARS EXPERIENCE—Rare are the Government appointments of persons with the qualifications and experience of Ewell Kirk Jett, who in mid-February became Federal Communications Commissioner after having served continuously 15 years in the Engineering Department of the old Federal Radio Commission and the FCC as Assistant Chief Engineer and Chief Engineer since 1938. Not only a Government radio and communications engineer of the highest reputation, Commissioner Jett has had the benefit of hearing the views of around a score of commissioners, including Dr. O. H. Caldwell when he served on the Federal Radio Commission.

INDEPENDENT IN VIEWS—Commissioner Jett will be independent in his views and, in keeping with the high standards of his engineering ethics, will weigh carefully all the facts in each decision and will not be swayed by political motives. The new commissioner will be tremendously useful to the FCC in the forthcoming postwar allocations of radio frequencies. He also is continuing to serve as Chairman of the important Coordinating Committee of the Board of War Communications and will be the FCC alternate on the State Department's International Communications Postwar Planning Committee.

RAILROADS BIG RADIO CUSTOMER—Impetus to radio communications as a major element in the dispatching and safety operations of the nation's railroads was given in recent testimony before the Senate Subcommittee on War Mobilization with the likelihood that Congress may soon receive a recommendation from that body for the stimulation of this means of communications. The big defect in railroad communications is viewed as a lack of communications coordination among these carriers.

FCC IS SYMPATHETIC—If the railways present a constructive general plan the FCC will be most sympathetic, the new Commissioner Jett told the Senate group. Another expert, the head of the Halstead Traffic Communication Corporation, predicted radio communication equipment is now available for use in freight yards and within three to six months should be ready for installation along the mainlines. Recent disastrous railroad wrecks could have been prevented with two-way radio between trains.

COMPONENTS CONTROL—More than a score of idle and excess critical components in the hands of prime contractors and in the stockpiles of the Army and Navy have been inventoried and lists exchanged with those three groups so that the prime contractors have been drawing off surplus stocks into military production. This work is being carried on by the WPB Components Recovery Section. The flow of the surplus components into the productive stream is felt to be overcoming the menace of component bottlenecks and also is absorbing surplus stocks.

FCC ANNUAL REPORT—More emphasis being placed on radio research today than at any other time, FCC stated in 1943 Annual Report. Military secrecy shrouds radar and other equally revolutionary and far-reaching projects, but after the war the whole field of radio "will be greatly affected by the discoveries now being carefully guarded in the laboratories."

STUDY FOREIGN NEEDS—Government agencies—UNRRA, WPB, FEA, etc.—are studying radio equipment needs in Europe when Axis forces are driven out. No conclusions as to requirements yet formulated.—**Roland C. Davies, Washington Editor, National Press Building.**


COMMUNICATIONS BRING THE WORLD TOGETHER
Pat. Pending
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PACES THE FUTURE WITH THE
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Engineering Facts about the New Speed King
a 90-ft. radio mast . . . can be erected........
in 60 minutes . . . . . by 5 inexperienced men
350 lbs. . . . . weight of mast
occupies 3 cu. ft. . . . sections are telescopic
740 lbs. total weight . . with erection equipment
10½ cu. ft. . . . . shipping space
125 miles p. h. . . . . wind velocity
no bolts required . . . easily erected in.......
extreme temperatures . by men wearing gloves
delivery now . . . . . heights of 25 ft. to 200 ft.
other types . . . . . . "Bantam King" "Elevator King" "Beacon King"
special designs . . . . to meet your requirements
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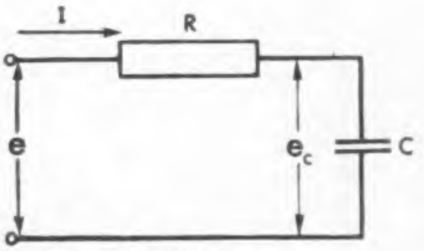
SURVEY of WIDE READING

Electronic news in the world's press. Review of engineering, scientific and industrial journals, here and abroad



Rectifier circuit diagram

Rectification with Imperfect Rectifiers

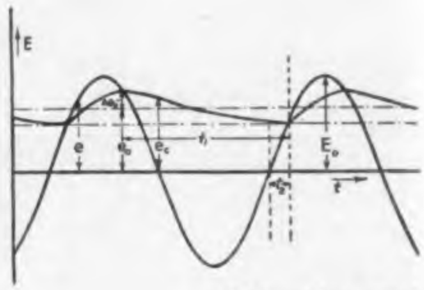
H. Sattler and W. Zwiesler (Hochfrequenztechnik und Elektroakustik, Berlin, March, 1943)

The voltage e_c across condenser C charged by sinusoidal voltage e through imperfect recitifier R is studied. Average condenser output voltage e_o and peak ripple voltage Δe_o are computed as functions of circuit constants and input voltage amplitude E_o. It is assumed that the rectifier has a constant resistance R_d in one direction, and a greater and also constant resistance R_s in the other direction. Provided this condition is approximately met in practice, the results will be correct for widely varying condenser voltages.

The circuit performance is described by the differential equation $de_c/dt + e_c/CR - \epsilon/CR = 0$. To find its solutions for the charging and discharging periods of the condenser, when the rectifier resistance is equal to R_d or R_s, respectively, use is made of the additional condition that the changes in condenser voltage during these two periods must be equal. The results of these computations are given in graphical form because explicit expressions are not available.

The two graphs shown were constructed for practical use by evaluating chosen points and subsequent interpolation. They represent curves of equal average condenser output voltage e_o and equal peak ripple voltage Δe_o, both in per cent of input voltage amplitude E_o, as functions of the products $2\pi\omega CR_d$ and $2\pi\omega CR_s$. Tables comparing experimental results with e_o and Δe_o values obtained from the charts show very good agreement between measured and graphically determined figures.

Time interval of condenser discharge, t_1, and time difference between zero input voltage and start of condenser discharge, t_2, can be read from another diagram as functions of the products $2\pi\omega CR_d$ and $2\pi\omega CR_s$. The time interval of condenser charge is then easily found from frequency and condenser discharge time.



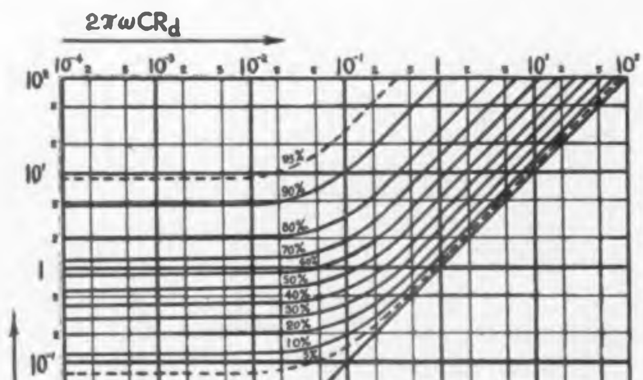
Voltage-time graph

Variable Gain-Constant DC Current Circuit

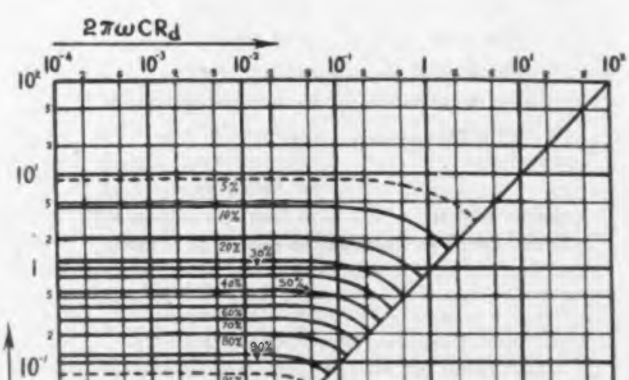
W. H. Stevens (Wireless Engineer, London, January, 1944)

The two-tube circuit is designed to operate as one tube with variable mutual conductance (slope of

(*Turn to page* 184)



Average condenser output voltage e_o in percent of input voltage amplitude E_o



Peak ripple voltage Δe_o in percent of input voltage amplitude E_o

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Write today for new price sheet which covers these changes and provides essential data on all Eimac tubes. Remember Eimac tubes are first choice of leading engineers throughout the world . . . first in the new developments in electronics.

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Produced by the most modern and efficient manufacturing methods, tested and perfected to meet the exacting demands of war, IRC Resistors will maintain their leadership as first choice of electronic engineers, manufacturers and service industries of tomorrow. . . . You are invited to consult our engineering-research staff now, in confidence, on any resistance problems connected with your peacetime products.

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1. *Most rigid specifications on enameled wire.*
2. *Largest size wire used for each resistance value and size.*
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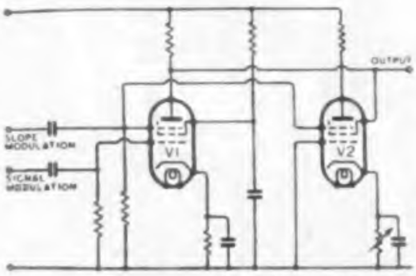
IRC makes more types of resistance units, in more shapes, for more applications than any other manufacturer in the world.

(*Continued from page* 176)
plate current-grid voltage characteristic) but constant dc current. In other words, the gain of the tube combination can be controlled without affecting the mean output current.

In television circuits, it is desirable to interrupt the video signal, i.e. reduce the slope to zero, and insert masking and synchronizing signals, i.e. have the same dc current component modulated with another type signal.

The slope of tube V_1, in the circuit shown, is varied, and V_2 is so



Controlling tube gain at constant dc current

connected that the sum of the dc currents to the plate of V_1 and to the screen grid of V_2 is maintained constant. It can be seen that if V_1 and V_2 are similar tubes and the same negative potential is applied to their suppressor grids, V_2 will pass current to its screen grid which will compensate for any current reduction to the plate of V_1 due to variation of their suppressor grid potential and the consequent division of cathode current into screen grid and plate current. By this arrangement, any modulation applied to the signal grid of V_1 will be amplified to a degree depending on the suppressor grid potential, while the mean current through both tubes is kept constant.

If the bias on V_2 is less than that on V_1, the slope modulating signal will appear on the plate of V_1. On increasing the bias resistor of V_2, this signal will be reduced, eventually disappearing altogether, and finally reappearing in the opposite phase as the cathode bias becomes greater than that of V_1. Other slight variations in the circuit are discussed.

Another application is the production of radial deflections on a circular time-base in cathode-ray oscillography. The radial deflection signal is applied to the suppressor grids varying the slope of the tubes which amplify the two 90 deg. out-of-phase sine voltages, and causing a corresponding change in the diameter of the circular pattern. However, there will be no shift in the center of the circle, because there has been no shift in the dc components. In this instance the slope of the plate current-grid voltage characteristic is varied but not reduced to zero as in the television application.

A further application of the circuit is its employment for abruptly quashing the gain of a radio frequency amplifier without introducing circuit ringing.

Rapid Timing Switch

F. O. Mason and K. Goldschmidt (Journal of Scientific Instruments, London, December, 1943)

The apparatus was designed to control a rapid and adjustable sequence of events, i. e. closing of relays. Any selected sequence of time differences of the order of 10^{-4} to 10^{-1} sec. between the tripping of four separate circuits can be selected; provisions for extending the time range may be included. A minute or two are required before a cycle can be repeated. The unit built has been used for switch-gear testing and was found to be accurate to within $\pm$ 1 per cent of the overall time interval.

The gas-filled initiating relay tube V_0 and the first mercury-filled operating relay tube V_1 are tripped either by a positive pulse applied to the input or by operation of an internal tripping switch. (Not shown.) No delay between initiating and first operating relay tube was needed in the particular application. The other operating relay tubes, V_2, V_3, V_4, are triggered with a time delay depending on the time constant of the CR network in the cathode circuit of the initiating relay tube V_0 and on the setting of their respective adjustable grid bias potentiometers. High resistances are used in the plate circuits to minimize interference and to reduce the drain on the dc power supply. It is necessary to switch off the plate supply momentarily before the circuit will reset for a succeeding cycle of operations.

For the particular use for which the unit was originally intended it was necessary to have some means for ensuring that immediately before operation full voltage is applied to the operating relay tubes and that all the discharge condensers in the plate circuits are fully charged. A tuning eye indicator V_5 is used for this purpose. Its control grid voltage is proportional to the sum of the plate voltages. Supply to tube V_2, V_3, V_4 is individually controlled by on-off switches which makes it possible to isolate discharge circuits not in use. Screening and ventilation was found to be most important.

On Permeatibility of Ferromagnetic Materials

K. M. Polivanov (Journal of Physics, Moscow, Vol. VII, No. 1)

The dependence of permeability on frequency may be an apparent effect caused by inhomogeneity of the samples or a property of the material inspected. This is shown theoretically, and tests to distinguish between actual and apparent changes in permeability with frequency are based on the theory.

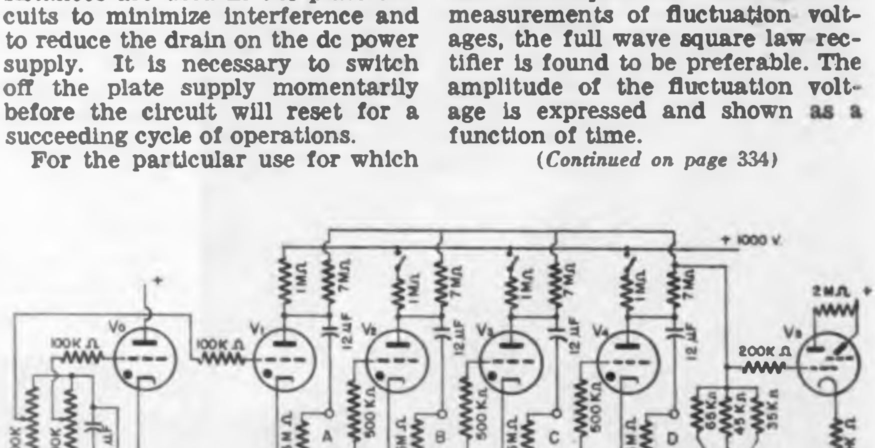
On Fluctuation Voltages

M. Surdin (Philosophical Magazine, London, October, 1943)

The distribution in time of spontaneous fluctuation voltages is studied from the thermodynamic point of view. A general formula is derived and applied to thermal voltage fluctuations in an amplifier of given bandwidth.

In a comparison of the expected responses of full wave linear and full wave square-law rectifiers for measurements of fluctuation voltages, the full wave square law rectifier is found to be preferable. The amplitude of the fluctuation voltage is expressed and shown as a function of time.

(*Continued on page* 334)



10^{-4} to 10^{-1} sec. time delay switch (K=kilo, M=meg.)

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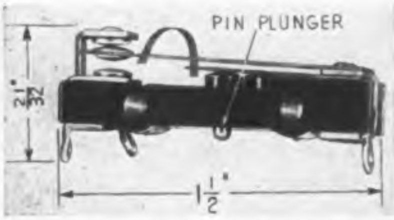
WHAT'S NEW

Devices, products and materials the manufacturers offer

Midget Switch

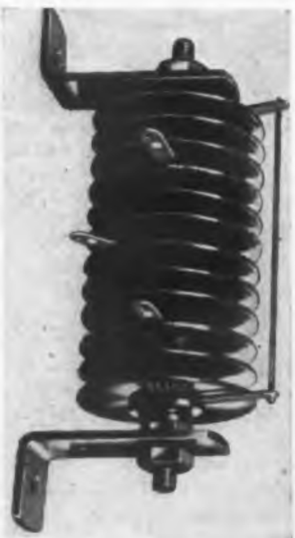
A new Acro-Snap midget switch built on the rolling spring principle is being made to the maximum dimension of 1½ in. It is 9/16 in. wide, 7/16 in. thick, and weighs less than 1 oz. All component parts are non-corrosive. The switch is designed for actuation from either the top or the bottom. It is adapted to electronic control devices, machine tools, aircraft, and electrical appliances. Fully



approved—having stood the Winterization tests under Army Air Force Directive 21A, including salt spray tests and both high and low temperature tests. Both the snap-action spring itself and the center blade are made of beryllium, while the base is of bakelite. When built into relays, smaller coils may be used as only 4 to 6 oz. operating pressure is required. Furnished in single pole, normally open, normally closed, and double throw with both pre-travel and over-travel provided. Manufactured by the Acro Electric Co., 1308 Superior Ave., Cleveland 14, O.

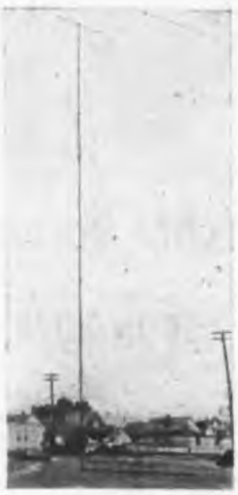
Power Rectifiers

A new line of power rectifiers is being manufactured by Selenium Corporation of America, 1800-04 West Pico Blvd., Los Angeles 6. Seven disk sizes ranging from ¾ in. to 4½ in. in diameter are available. All the units are moisture proof, have permanent characteristics. Assemblies with output up to 1000 amperes can be supplied. "Selco" rectifiers are available for bolt or stub mounting direct to equipment or with mounting brackets as per specs.



Telescopic Radio Mast

A telescopic 90-ft. radio mast, designed to withstand a wind pressure of 125 miles an hour and that can be erected from ground anchors to top-cross-arm in one hour, is manufactured by the Harco Steel Construction Co., 1180 E. Broad St., Elizabeth, N. J. The mast is also available in heights from 25 ft. to 200 ft. Fully self-contained and portable and already successfully used in many wartime installations in the communications field, this new unit may be used singly, or in multiple units. Basic in the design is use of light-weight steel tubing with a relatively high strength to weight ratio. Unique is a method of connecting the sections by an ingenious use of tapered bars and wedges which eliminates the conventional splice members and bolts ordinarily the weakest points of a structure. Use of trained riggers is not necessary for the erection of "Harco" Speed King Radio Masts, say company engineers. Experience has shown that five ordinary shop men with a winch can set up a complete 90-ft. mast in sixty



minutes. After erection, the boom (which is provided with the equipment) and the winch may be removed entirely, or, if such facility is required, may be left in place to permit lowering the mast. Smallest section of the 90-ft. completely telescopic mast is 3¼ in. in diameter and the sections increase to 4½ in. in the center. The unit, complete with cross arm of approximately 8 ft., takes less than 12 cu. ft. of shipping space when dismantled and weighs but 750 lbs., exclusive of shipping containers.

Telephone Type Relays

This telephone type line of relay incorporates modern design using newly developed materials and precision construction. Illustrated is Model TSU, for bottom mounting. While this relay was specifically designed for crystal switching, it is suitable for various high frequency, plate circuit and general utility applications. Contact arrangements can be supplied normally open, normally closed, single pole double throw, or in any two combinations. The contacts will carry two amperes at 24 volts dc and 115 volts ac, non-inductive

load. Coil resistances are available from a fraction of an ohm to 5,000 ohms. These relays will withstand vibrations up to 10 G and meet all standard salt spray and humidity specifications. Model TSL, for end mounting, is similar to TSU and both are available with ceramic or bakelite insulation. Their overall dimensions are 1¼ in. long, ¾ in. deep and 1⅛ in. high. (Height includes maximum number of contact arrangements.) Weights are 1¼ oz. Manufactured by Allied Control Co., 2 East End Ave., N. Y.

Magnetic Voltage Selector

A magnetic voltage selector manufactured by Zenith Electric Company, 152 West Walton St., Chicago 10, Ill., was developed for a new electro-plating process, for anodizing aluminum on ac. The unit is for transferring in steps from 2 to 40 volts. The arrangement is such that when transferring, the main contact opens before the secondary contact opens, and closes after the secondary contact is closed Arcing is thus eliminated. It embodies automatic main magnetic contacts and automatic main switch contacts for nine positions at 2½-volt intervals, from 2 to 40 volts.
(*Continued on page* 194)

TESTING TOMORROW'S RADIO TUBES

• Early in the war, Sylvania engineers stepped up experiment to perfect more rugged and more sensitive radio tubes for vital military communications.

Engineers added to a great array of precision checking instruments. They designed and built special new instruments to detect variations in radio tube characteristics never charted before.

This intensive research program has developed improved radio tubes. Many are now military secrets. But they promise to make postwar radio reception a revelation of clarity and fidelity.

After the war, as in the past, it will pay you to sell Sylvania.

Quality That Serves the War Shall Serve the Peace

RADIO DIVISION EMPORIUM, PENNSYLVANIA

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ELECTRIC PRODUCTS INC.

RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES, INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES

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MOST EFFICIENT PERFORMANCE.. AND BEST MEET PRODUCTION REQUIREMENTS..IN *Ceramic Insulation* PARTS

Lapp gas-filled condensers provide zero loss, high capacitance for small space requirement, non-failing puncture-proof design, constant capacitance under temperature variation.

Lapp standoff, bowl and entrance insulators are available in wide range as standard catalog items. Special-design units are easily produced by Lapp methods.

For its electrical and mechanical characteristics, a ceramic material—porcelain or steatite—deserves preference in many high-frequency applications.

But most efficient use of ceramics requires an understanding of the qualities of the material—and its limitations. Take the matter of tolerances, for example. Porcelain and steatite parts *can* be made to conform to any dimensional tolerances—by precision grinding. But it is better to avoid this expensive and time-consuming operation if possible. Usually all production problems are met if the *assembly* which incorporates the ceramic meets standard tolerances. The difference will probably be several dollars per piece in cost, and several man-hours of critical skilled labor.

Lapp is a foremost supplier of ceramic insulating parts for use in electronic circuits. Our engineers understand the demands of assembly-line production as well as performance-characteristic requirements. Lapp is prepared to take from your shoulders the whole load, for *design* and *production,* of insulating parts—incorporating ceramic and associated metal parts—that combine specified performance characteristics with manufacturing feasibility and economy. *Lapp Insulator Co., Inc., Le Roy, N. Y.*

Lapp

INSULATOR CO., INC.

LEROY, N. Y.

ARMY (E) NAVY

WHAT'S NEW

(Continued from page 186)

Microhmmeter

This new microhmmeter consists essentially of an ac bridge, completely self-contained and using no batteries. Stock model measures from 0.0001 ohm to one megohm in four ranges, with an accuracy of two per cent on 0 to 1.111 ohm range, one-half per cent on 1 to

1,111 ohms. Other ranges and better tolerance are available on order. A .5-0-.5 ma dc galvanometer is used as a null indicator. Sufficient dc output is available to drive a recorder or sensitive relay. The unit measures 18½ x 8½ x 6 in. and weighs 25 lbs. Designated as Type G-710, the microhmmeter is made by Tech Laboratories, 7 Lincoln St., Jersey City 7, N. J.

Portable Multi-Frequency Generator

The Type ATF-1336-2 portable multi-frequency generator is designed to produce eleven different frequencies between 10 and 190 C.P.S. All of the frequencies are derived electronically from a single temperature compensated, pressure controlled 600-cycle tuning fork and hence have the same accuracy as the tuning fork, which is about one part in 100,000

at ordinary indoor temperatures. Output voltage available is at least 30 volts for any frequency. Output impedance is 500,000 ohms maximum. The wave shape at all frequencies is sinusoidal and symmetrical within approximately 10 per cent. The unit is manufactured by American Time Products, Inc., 580 Fifth Ave., N.Y.C.

Variable Condensers

Prompt delivery on an extensive line of standard and special types of variable air condensers is now being offered by Kaar Engineering Co., Palo Alto, Calif. Kaar condensers are made with small cross-sections so that a number may be assembled in multi-channel radio equipment. Shafts can be furnished slotted for screwdriver adjustment. Tapered lock nuts and split bushings assure positive locking without disturbing the adjustment. Standard types range from 12 to 140 mmf. Special types are available with very wide air gaps, double rotors and stators, high maximum capacities, or special mounting brackets.

Aircraft Motor

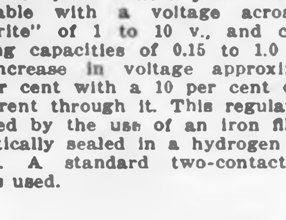
A new design of aircraft type direct current series motor is now being produced by the Alliance Mfg. Co., Alliance, Ohio. Primarily designed to operate blowers for cooling purposes in aircraft equipment, the unit operates on 28 volt dc at 0.75 ampere delivering a full 1/80 hp at 8000 rpm. The motor is of the latest approved aircraft design of light weight and high efficiency consistent with sturdy, totally enclosed, ball bearing construction. It measures overall, less the 1/4 in. diameter shaft extension, 3 in. in length by 1-7/8 in. diameter and weighs but 17 oz. Low temperature rise permits operations under high ambient temperatures. The basic design can be modified to meet other applications with either shunt or series winding for desired voltage, current drain and horsepower output up to 1/50.

Midget Regulator

The Amperite Co., of 561 Broadway, New York 12, N. Y., has manufactured a new automatic regulator designated as the T-6 Tube. This tube is especially useful where space is at a premium. It is obtainable with a voltage across the "amperite" of 1 to 10 v., and current carrying capacities of 0.15 to 1.0 a. It will increase in voltage approximately 250 per cent with a 10 per cent change in current through it. This regulation is obtained by the use of an iron filament hermetically sealed in a hydrogen atmosphere. A standard two-contact auto base is used.

Watertight Grommets

Dura-Grom grommets, made by Arens Controls, Inc., 2253 South Halstead St., Chicago, provide a fume- and watertight support for air, oil and hydraulic lines, electrical cables and flexible remote control casings, etc., through a firewall or



bulkhead. The device consists of an oil-resisting synthetic rubber disk with a radially extending slit and a cadmium plated steel retaining cup. They are made in several stock sizes from ⅛th to 1⅛th in. hole diameter, and can be supplied to hold multiple lines.

(Continued on page 290)

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THIS is the new ARHCO plant. Incorporating more than 60,000 square feet of space, it was planned and designed for today's urgent production schedules. Marking another milestone in our successful 21-year growth, it provides even better facilities for research, engineering, manufacturing and delivery.

Out of this new ARHCO plant come over two thousand individual components . . . each one doing a big job in radionic and industrial applications. Moreover, we are equipped to produce special parts from your blueprints. Quotations and advice furnished upon request.

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● Long before the war, their high quality and thorough dependability had earned for them national recognition and acceptance by many of the country's leading companies. From raw materials to the finished tube, we tolerate only the best of materials, rigidly controlled processes, close inspections and exacting final tests.

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ASSOCIATION NEWS

Cold-Cathode Standards

An all-day meeting of the Standards Committee of the Fluorescent Lighting Association was held January 25, in New York. The chairmen of the several standards committees covering cold-cathode fluorescent lighting products are Charles A. Pollak (General Luminscent Corp.) fluorescent tubing committee; John W. Mollica (Mobeco, Inc.) fluorescent lamp committee; John Sabatini (Colonial Neon Co., Inc.) fluorescent fixtures committee; Len C. Marshall (Sola Electric Co.) transformer committee; and Harry Weiss (Supro Lux Mfg. Co.) accessories committee. Victor H. Todd, President of the Association, presided.

In order to secure certain grades and sizes of glass tubing and bulbs better fitted to cold-cathode fluorescent requirements, a new Glass Standards Committee was appointed and includes John Sabatini, John Mollica, Charles A. Pollak and Robert Lambert (Corning Glass). The Association has set standards applying particularly to standard lamp lengths, terminals, lamp designations, "white" colors, transformers, etc.

SPME Meeting Changed to April 17-19

The Society of Motion Picture Engineers will hold its 55th semi-annual technical conference at the Hotel Pennsylvania, New York, April 17, 18 and 19, instead of April 25-27, as previously scheduled. Technical sessions, following a general business session opening the conference on Monday morning, are scheduled to be held throughout the three-day meeting, with special sessions in the evening.

Papers already submitted, according to W. H. Offenhauser, chairman of the papers committee, indicate the conference will cover new war developments in the motion picture engineering field.

Fouch Heads Electronic Membership Committee

James L. Fouch, president of the Universal Microphone Co., Inglewood, Calif., has been appointed chairman of the membership committee of the newly formed West Coast Electronics Manufacturers Association, composed of electronic and component parts manufacturers in the far west and Pacific Coast areas.

Conventions and Meetings Ahead

Institute of Radio Engineers (330 West 42nd Street, New York), March 1, New York.

Optical Society of America (A. C. Hardy, MIT), March 2-4, New York.

Society for Measurement and Control (New York Section Meeting), March 28, New York.

National Association of Broadcasters (535 Fifth Avenue, New York), April 10-13, Waldorf-Astoria, New York.

National Electrical Manufacturers' Association (W. J. Donald, 155 East 44th Street, New York), April 23-27, Chicago.

American Physical Society (Karl K. Darrow, Columbia University, New York), New York. April 27-29, Pittsburgh.

American Institute of Electrical Engineers (H. H. Henline, 29 West 39th Street, New York); North Eastern District Meeting, April, Boston; Summer Technical Meeting, June 26-30, St. Louis, Mo.; Pacific Coast Technical Meeting, Aug. 29-Sept. 1, Los Angeles.

Acoustical Society of America (Wallace Waterfall, 120 South LaSalle Street, Chicago), May 12-13, New York.

American Society of Mechanical Engineers (Ernest Hartford, 29 West 39th Street, New York), Semi-Annual Meeting, June 19-20, Pittsburgh.

Electrochemical Society (Colin G. Fink, Columbia University, New York), Spring Convention Meeting, April 12-15, Milwaukee.

Society of Motion Picture Engineers (Harry Smith, Jr., Hotel Pennsylvania, New York, N. Y.), April 17-19, Hotel Pennsylvania, New York.

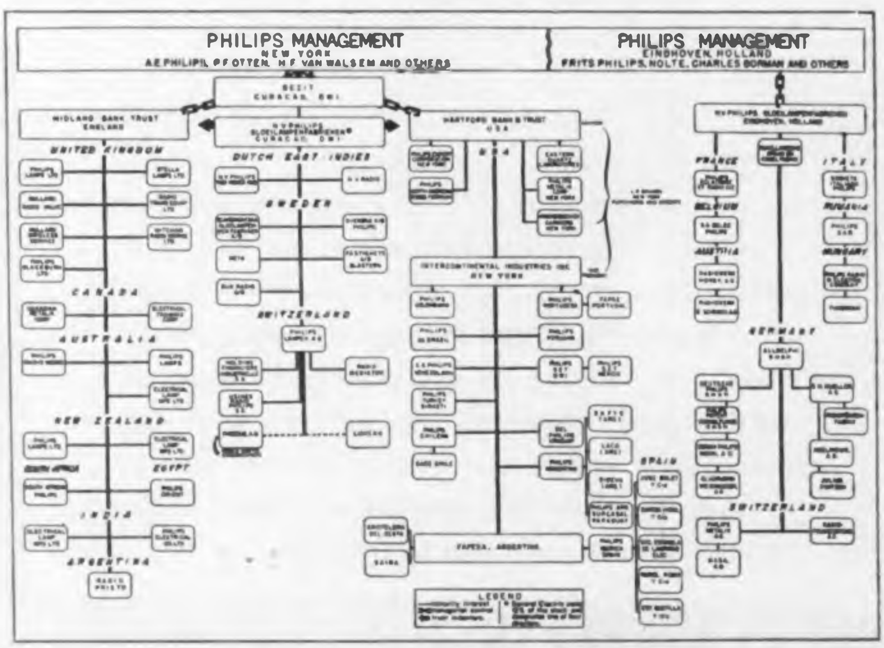
American Mathematical Society, April 28-29, New York, Chicago, Berkeley, Calif.

RMA Committee Members

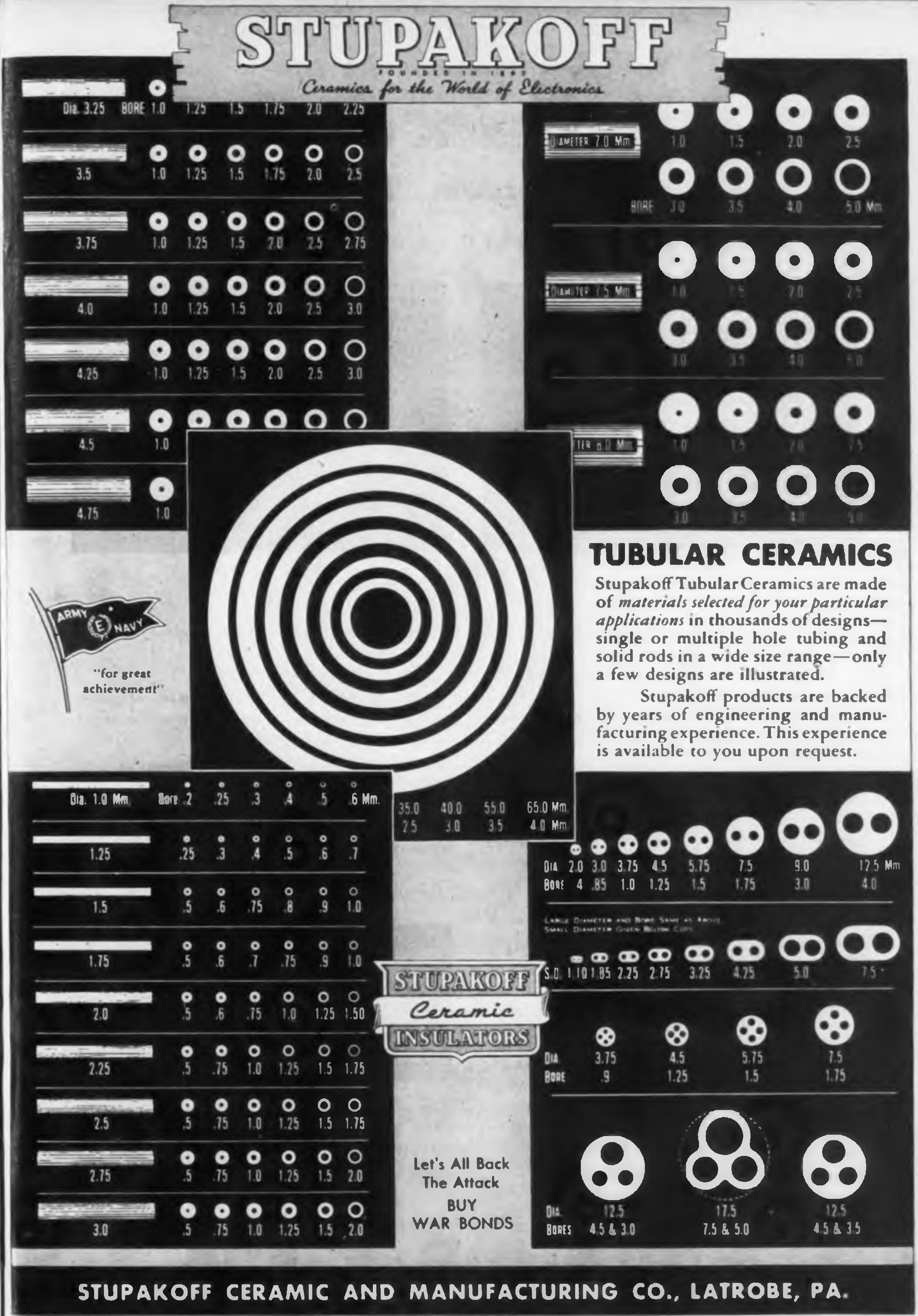
Following meetings held in conjunction with the RMA mid-winter conference at the Stevens in Chicago, Jan. 12 and 13, eight new

(Continued on page 214)

How the N. V. Philips Co. is Organized



Some idea of the size and importance of the N. V. Philips Co. is revealed in this organization chart which shows the company's vast international ramifications. The chart appeared as part of a report presented to a Senate sub-committee on war mobilization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Ceramics for the World of Electronics
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4.5 1.0
4.75 1.0
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DIA 2.0 3.0 3.75 4.5 5.75 7.5 9.0 12.5 Mm.
BORE .4 .85 1.0 1.25 1.5 1.75 3.0 4.0
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You can now secure the

CLARE TYPE "K" d. c. RELAY

sealed in a vacuum . . . dry air at sea level pressure . . . or inert gas

Wherever your design calls for a relay to operate at high altitudes or below sea level . . . in the midst of dust or moisture . . . where combustible gases make operation dangerous . . . this Clare Type "K" d.c. Sealed-In Relay brings its own ideal working conditions to the job.

Think what it means to seal in sea level air pressure with a relay that must operate precisely at 40,000 feet . . . to seal out moist air, seal in inert gas where arcing is a problem . . . to eliminate completely the effects of abrasive dust or corrosive fumes!

This new achievement in Clare "custom-building" adds a new sphere of usefulness to the Clare Type "K" d.c. Relay, already widely used because of its small, compact size, its precise construction and its ability to withstand vibration, shock and extremes of temperature.

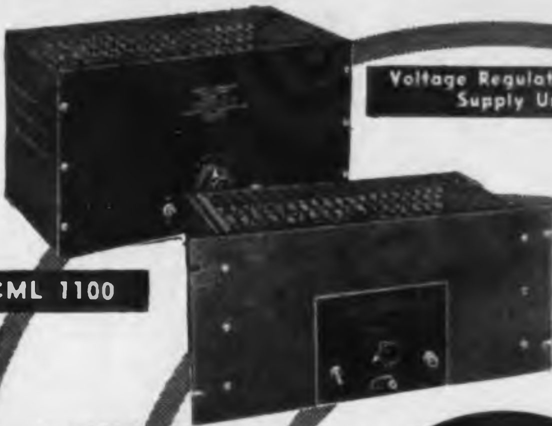
As illustrated, the Clare Type "K" d.c. is an extremely small relay . . . measures only 1½"x1¼" x 13/16"... weighs approximately 1⅔ ounces. Sealed in its steel housing, it is still a relay for those spots where inches and ounces count. The overall dimensions of the housing are: 2 7/16" long, 1½" in diameter. The weight of the enclosed relay is but 2½ ounces.

The Clare Type "K" d.c. Relay can be furnished in the contact forms shown, with any number of springs, up to and including 12 (6-in. housing shown above) . . . coil voltage range is from 1.5 volts to 60 volts d.c. . . . contacts of either 18 gauge silver, rated one ampere, 50 watts, or 18 gauge palladium, rated two amperes, 100 watts can be furnished.

Like all Clare Relays, the Clare Type "K" d.c. Relay can be "custom-built" to meet your specific design problems. Write us in regard to them and receive our suggestions. In the meantime, you should have our catalog and data book. C. P. Clare and Company, 4719 West Sunnyside Avenue, Chicago (30), Illinois. Sales engineers in all principal cities. Cable address: CLARELAY.

CLARE RELAYS

"Custom-Built" Multiple Contact Relays for Electrical, Electronic and Industrial Use



Voltage Regulated Power Supply Units

CML 1100

CML 1110

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Each CML development shown on this page is keyed to the most rigorous wartime specifications for accuracy. All are contributing importantly to precision and efficiency in scores of laboratory and industrial applications. From the Production Plug to the new Model 1420 Generator, CML offers equipment of accredited performance.

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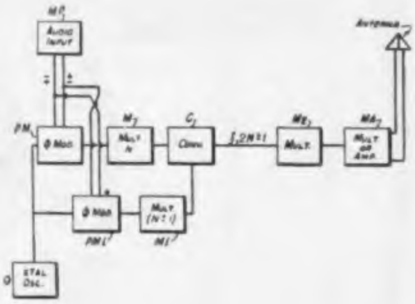
NEW PATENTS ISSUED

FM AND PHASE MODULATION

Phase Modulation

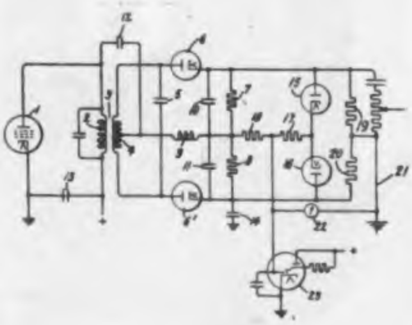
Crystal oscillator O supplies waves to both phase modulators PM and PM1 which obtain audio modulating potentials MP in opposite phases so that the phase of one carrier wave will be advanced when the phase of the other is retarded. The phase modulated output is fed to a converter C by way of two multipliers M and M1 wherein the phase modulated carriers are multiplied by factors differing



by the integer 1. The output of mixing tube C then contains the original carrier, i.e., the difference frequency of its inputs, having a phase deviation equal to the combined retarded and advanced phase deviations of modulators PM and PM1, i.e., equal to 2N ± 1 times the original phase deviations. This output component is multiplied, amplified and transmitted by the antenna. H. E. Goldstine, RCA, (F) June 10, 1942, (I) Dec. 7, 1943, No. 2,335,934.

FM Tuning Indicator

Resistance 17 is equal to resistance 18 and resistance 19 is equal to resistance 20. When the receiver is properly tuned the voltages across diodes 15 and 16 are equal, both conduct, and the voltage across instrument 22 will be half the voltage across



resistor 7 or 8, the two being equal. If the receiver is off tune, only one of diodes 15,16 conducts, and the voltage across resistor 18 is equal to half the voltage across either resistor 7 or 8, whichever voltage is higher. Half the voltage difference between the voltages across resistor 7 and 8 appears across resistor 20. The sum of the voltages on resistors 20, 8 and 18 is then half the voltage across resistors 7 or 8, whichever is the smaller; this is the voltage indicated by either instrument 22 or indicator tube 23. Maximum voltage corresponds to perfect tun-

ing, any deviation resulting in a decrease in voltage. R. B. Dome, General Electric Co., (F) Feb. 12, 1941, (I) Nov. 9, 1943, No. 2,333,990.

PICTURE TRANSMISSION

Color Television

Three pictures of different colors are simultaneously scanned in three tubes, the outputs are separately amplified. A low-pass filter follows each amplifier limiting the bandwidth of the three sets of signals. Because of the unequal delineatory capabilities of the primary colors, the filters in the channels of the red and blue images need not be as wide as that in the channel of the green image. The output of one of the filters is applied directly to the modulator, the outputs of the other channels are shifted in frequency so that the three frequency bands are adjacent one another and are then also applied to the modulator. At the receiver, the three frequency bands are separated by suitable filters, and those shifted in frequency at the transmitter are shifted back to their original frequency range. Three receiver tubes are fed by the three sets of signals to produce three colored images which are optically superimposed. A. N. Goldsmith, (F) Jan. 28, 1942, (I) Nov. 23, 1943, No. 2,335,180.

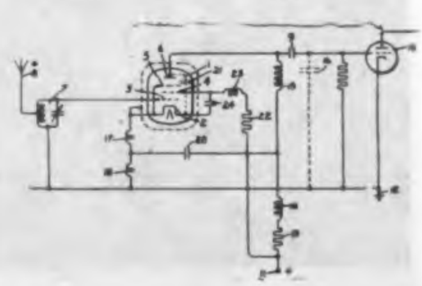
Facsimile Transmission

It is intended to reduce selective fading, harmonic distortion and similar effects. An audio frequency carrier, 1800 cycles, is amplitude-modulated with picture signals and applied to a frequency-doubling twin-triode tube. The output is rectified and filtered to obtain a dc voltage of varying amplitude which is used to control the grid potential of a reactance tube; the associated oscillator generates frequencies between 265.5 kc and 266.5 kc for white or black shades, respectively. These frequencies are mixed with a fixed frequency of 262.0 kc, resulting in an audio frequency band covering the range of from 3500 to 4500 cycles, the highest signal frequency being less than the first harmonic of the lowest signal frequency. The signals are used to amplitude-modulate a radio transmitter. A suitable receiver is also shown. A. E. Gerhard and E. G. Fraim, Press Wireless, Inc., (F) April 16, 1941, (I) Nov. 23, 1943, No. 2,334,818.

UHF AND HF APPARATUS

UHF Amplifier

It is intended to compensate for the unavoidable inductance 17,18 in the cathode lead which causes negative feedback and simulates a reduced input resistance. To maintain the cathode at ground potential for the operating frequency, bypass condenser 20 is inserted between plate tuning inductance 15 and a point on the



This meeting of Sight and Sound advanced Television's future!

IT WAS more than 15* years ago that Farnsworth research men synchronized sight with sound electronically and transmitted the two to experimental receiving sets.

By that important operation, they assured modern electronic television a wide public appeal. Its advance has been rapid — and nowhere more productive than at Farnsworth, where 18 years of television research have developed a number of key circuits, tubes and synchronizing devices—including the Farnsworth Dissector Tube and the Photo-Cell Multiplier Tube.

We lay much credit for Farnsworth progress to our research policy, which has always stressed the advantages of parallel work in both tubes and circuits.

Farnsworth research and manufacturing facilities — greatly broadened — are now producing only military communications equipment and highly specialized electronic devices, and our technical knowledge of applied electronics is enriched constantly.

When peace comes, our broadened background and resources will be better than ever able to help you in the fields of sight and sound reproduction.

** Another of a series of advertisements depicting milestones in television's history.*

LOOK FOR the Farnsworth Television advertisements in March 6, April 3 *Newsweek;* March 18, April 15 *Collier's.*

FARNSWORTH TELEVISION

• Farnsworth Television & Radio Corporation, Fort Wayne 1, Indiana. Farnsworth Radio and Television Transmitters and Receivers; Aircraft Radio Equipment; the Farnsworth Dissector Tube; the Capehart, the Capehart-Panamuse; the Farnsworth Phonograph-Radio.

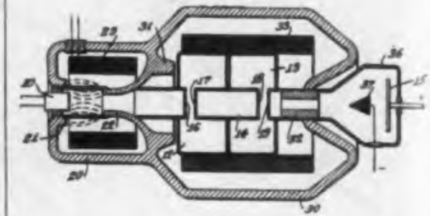
cathode lead dividing its inductance into two portions 17 and 18; inductance 17 is made to bear the same ratio to inductance 18 that grid-cathode capacitance of tube 10 bears to cathode-plate capacitance 21 of tube 1. Under this condition the voltages developed across inductances 17 and 18 will be equal and of opposite polarity so that cathode 2 will be maintained at ground potential. G. W. Fyler, General Electric Co., (F) June 22, 194-, (I) Nov. 23, 1943, No. 2,335,050.

RF Tube

The tube envelope consists of a shorter base section and a longer body section. Two triodes are arranged parallel to the axis of the envelope. The plates are mounted on the body section, their leads extend transversely of the envelope axis and are sealed to a side of the body section. Grids and cathodes are mounted on the base section, their leads extend longitudinally of the plate axes and the envelope axis. W. W. Eitel and J. A. McCullough, Eitel-McCullough, Inc., (F) May 19, 1942, (I) No. 30, 1943, No. 2,335,587.

Magnetic Electron Lens

It is intended to concentrate the electron beam for instance in velocity modulated tubes so that the modulating grids can be dispensed with; modulation occurs in small openings 16, 17 and extraction of energy from the beam in small openings 18, 19. The cross-section of the electron beam is controlled by a



high intensity magnetic field converging in the direction of electron travel. This field is produced by electromagnets 20 and 30 having pole pieces, 21, 22 and 31, 32; 23 and 33 are the windings of these electromagnets. C. V. Litton, International Standard Electric Corp., (F) Dec. 22, 1942, (I) Nov. 2, 1943, Re. 22,389.

MISCELLANEOUS

Photoelectric Control

A series of elements, for instance lamps, is to be controlled to operate one at a time for predetermined time intervals. Several photocells may be used; they are actuated by light reflected from a rotating surface at certain portions, at other portions the surface is non-reflecting. A detailed description of the apparatus is given and claimed. W. S. Tandler and D. S. Walker, Industrial Scientific Corp., (F) Aug. 2, 1940, (I) Dec. 7, 1943, No. 2,336,376.

Stereophonic Transmission

In stereophonic transmission it is essential that the reproduced sounds coming from two different directions be perfectly synchronized. It is therefore preferable to record them on one track. This is done by modulating a carrier of at least 7000 cycles in such a way that the oscillations representing one direction modulate solely the positive amplitude peaks and those coming from another direction solely the negative amplitude peaks of the carrier

(*Continued on page* 210)

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It happens every day . . . every hour! . . . From all parts of the Country . . . from the United Nations . . . come urgent calls for vital supplies to keep production humming . . . to hurry development projects . . . to aid men in training, and men in action. For it is a well-known fact that Allied is able to *deliver the goods . . . faster*—and *save precious man-hours all the way down the line!* . . .

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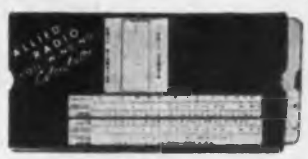

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ELECTRONIC TOOLS OF WAR . . . in quantity and on time! There are no delays because Remler has the facilities and experience to do the job from design to finished product —plus the know-how to cut production time which frequently permits quotations at lower prices. This organization of skilled specialists manufactures components and complete electronic equipment for our armed forces and components for *your* application. Inquiries invited.

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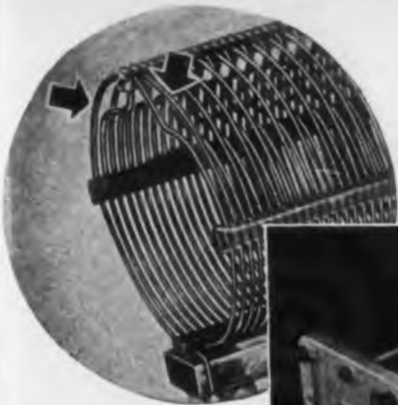
60	68	112	149		

PLP		PLQ		PLS	
56	65	56	65	56	64
59	67	59	67	59	65
60	74	60	74	60	74
61	76	61	76	61	76
62	77	62	77	62	77
63	104	63	104	63	104
64		64			

OTHER DESIGNS TO ORDER

When You Need

INDUCTORS...



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Indents are a special optional feature of B & W "Air Wound" construction on small, closely wound coils. Windings on either side of every turn of wire are indented, thus making tapping quick and easy, *anywhere on the inductor.*

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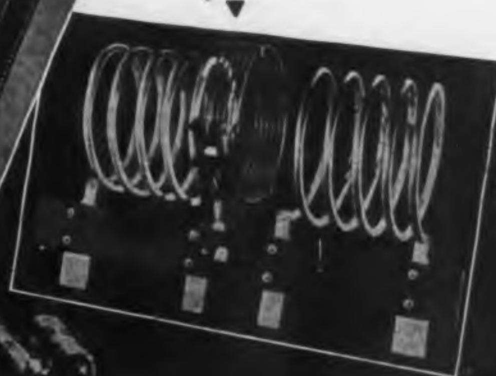
B & W offers a wealth of experience backed with highly specialized facilities for the production of special rotary coils. Above is a typical unit made to exacting war equipment specifications.

. . . you can get them at B & W—expertly engineered—designed and produced to the most exacting quality standards. In addition to the exclusive "Air Wound" types shown here, B & W offers "Air Wound" and ceramic- or phenolic-form types for practically any requirement.

◀ 20" long, and wound with #8 solid wire, this B & W Air Inductor carries a conservative continuous rating of 7.5 amps. Aside from special bracing, however, it is simply a "grown up" version of B & W Junior Coils of amateur radio fame.

Designed for 10 KW. service, this variable-link final amplifier plate coil is a good example of B & W on the job of matching modern inductor requirements. B & W units of this type are wound with copper tubing as large as 1" diameter.

▼



BARKER & WILLIAMSON 235 FAIRFIELD AVENUE UPPER DARBY, PA.

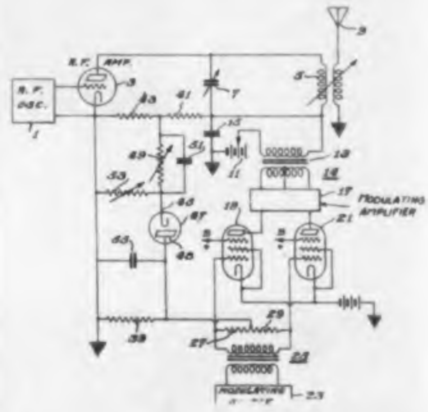
Prepared by The HARRY P BRIDGE COMPANY, PHILADELPHIA, PA.

(Continued from page 206)

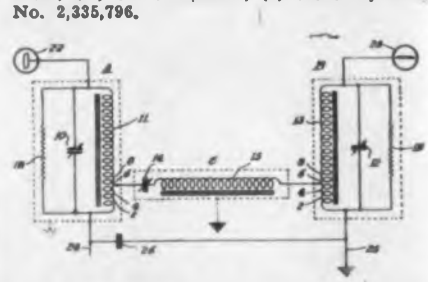
wave. To reproduce the two sound recordings, positive and negative halves of the carrier wave are separated, demodulated, filtered and applied to two distant loudspeakers. M. J. Cuinirus van der Meulen, Alien Property Custodian, (F) May 29, 1941, (I) Dec. 7, 1943, No. 2,336,276.

Modulation Limiter

It is desired to control the amplitude of the modulating voltage to automatically prevent the per cent modulation to exceed a predetermined value, independent of changes in the plate voltage of the modulating amplifier. For this purpose, a bias voltage is developed by rectifier 47 when the modulating voltage exceeds a predetermined portion of the dc plate voltage of modulating amplifier 3. The voltage on cathode 45 is determined by network 41,43,49,53, the ac voltage by network 41,43, condenser 51 being a bypass condenser for audio frequencies. With



this arrangement, it is possible to independently select the proportion of the dc and ac voltages which are impressed on rectifier 47 and to adjust the per cent modulation at which regulation commences. When the ac component present on cathode 45 exceeds the direct component, diode 47 draws current through resistor 39, and plate 48 develops a negative potential. This negative potential is applied as a bias to the grids of the remote cutoff amplifiers 19 and 21. H. J. Schrader, B. W. Robins, and J. M. Brumbaugh, RCA, (F) June 29, 1939, (I) Nov. 30, 1943, No. 2,335,796.



Variable Filter

Dimensions for the variable coupling shown are given so as to obtain a desired filter action; bandwidth and range may be adjusted. J. B. Minter, 2nd, H. W. Houck, (F) Aug. 30, 1940, (I) Dec. 14, 1943, No. 2,336,498.

Variable Condenser

It is known that the resistive component of impedances such as silicon carbide, boron carbide or copper oxide rectifiers varies with the direct current or low frequency alternating current therethrough. According to the invention the capacitive component of these impedances also is a function of the applied direct current and of a low frequency current;

(Continued on page 238)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ART AND SCIENCE...BOTH

Little wonder that tube making is often referred to as an *art*. For much of the work is by hand. To fashion these complex assemblies of filaments, grids, plates and wires; to position the parts within such close space limitations—parts, mind you, that often are so fragile, flimsy and elusive, *tweezers* are required to handle them—calls for a high degree of skill, a steady hand and an eye for accuracy. Art is right!

Yet, today, guiding every move of every N. U. production worker's hands is the "know how" of many scientists and engineers. Here are chemists, physicists, metallurgists, and men high in the sciences of electronics and mechanics—all teamed up in a scientific tube development and production program recognized as a model throughout this industry.

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RMA COMMITTEE

(*Continued from page 198*)

committees are now at work on various industry problems. These include groups concerned with present and future war contract cancellations, future industry reconversion, employment and personnel problems, sales financing, advertising and promotion, future distribution costs and other problems, industry statistics, the post-war patent situation and postwar export problems.

Following are the newly appointed committees (except an important group on problems of current and future contract terminations, including present as well as future problems of prime and subcontractors, which has not yet been completed):

INDUSTRY RECONVERSION

A. S. Wells (Chairman), Wells-Gardner & Co.;
E. A. Nicholas (Vice-chairman), Farnsworth Tel. & Radio Corp.;
Ben Abrams, Emerson Radio & Phonograph Corp.;
W. R. G. Baker, General Electric Co.;
M. F. Balcom, Sylvania Electric Products, Inc.;
Fred Williams, Philco Corp.;
W. J. Halligan, The Hallicrafters Co.;
C. B. Jolliffe, RCA Victor Division of RCA;
Ray H. Manson, Stromberg Carlson Co.;
Leslie F. Muter, The Muter Co.;
J. J. Nance, Zenith Radio Corp.;
Jas. H. Rasmussen, The Crosley Corp.;
Percy L. Schoenen, Hamilton Radio Corp.;
R. C. Sprague, Sprague Specialties Co.;
J. A. Stobbe, Colonial Radio Corp.

SALES FINANCING

J. P. Rogers (Chairman), Farnsworth Television & Radio Corp.;
Ben Abrams, Emerson Radio & Phonograph Corp.;
F. A. D. Andrea, Andrea Radio Corp.;
John Ballantyne, Philco Corp.;
Lee McCanne, Stromberg-Carlson Co.;
J. J. Nance, Zenith Radio Corp.;
W. H. Stellner, Galvin Mfg. Corp.;
L. W. Teegarden, RCA Victor Division of RCA;
E. A. Tracey, Majestic Radio & Television Corp.

INDUSTRY STATISTICS

Ross D. Siragusa (Chairman), Admiral Corp.;
E. A. Anderson, Radio Corporation of America;
M. F. Balcom, Sylvania Electric Products Inc.;
W. A. Coogan, Sylvania Electric Products Inc.;
C. W. Miller, Westinghouse Electric & Mfg. Co.;
Arnold O. Braun, P. R. Mallory & Co., Inc.;
Fred Williams, Philco Corp.

ADVERTISING

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E. I. Eger, Admiral Corp.;
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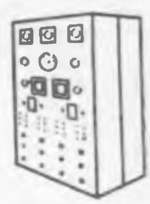

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D. C. Lee, Westinghouse Electric & Mfg. Co.;
W. P. Hilliard, Bendix Radio;
L. B. Morris, RCA Victor Division of RCA;
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Thomas A. Kennally, Philco Corp.;
Thomas F. Joyce, RCA Victor Division of RCA;
J. J. Nance, Zenith Radio Corp.;
James J. Rasmussen, The Crosley Corp.;
A. A. Brandt, General Elec. Co.

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J. D. Cook, RCA Victor Division of RCA;
Ad. Auriema, Ad. Auriema, Inc.;
Arthur J. Rocke, Rocke International Electric Corp.;
D. McIntosh, Philco International Corp.;
J. F. Weldon, Zenith Radio Corp.

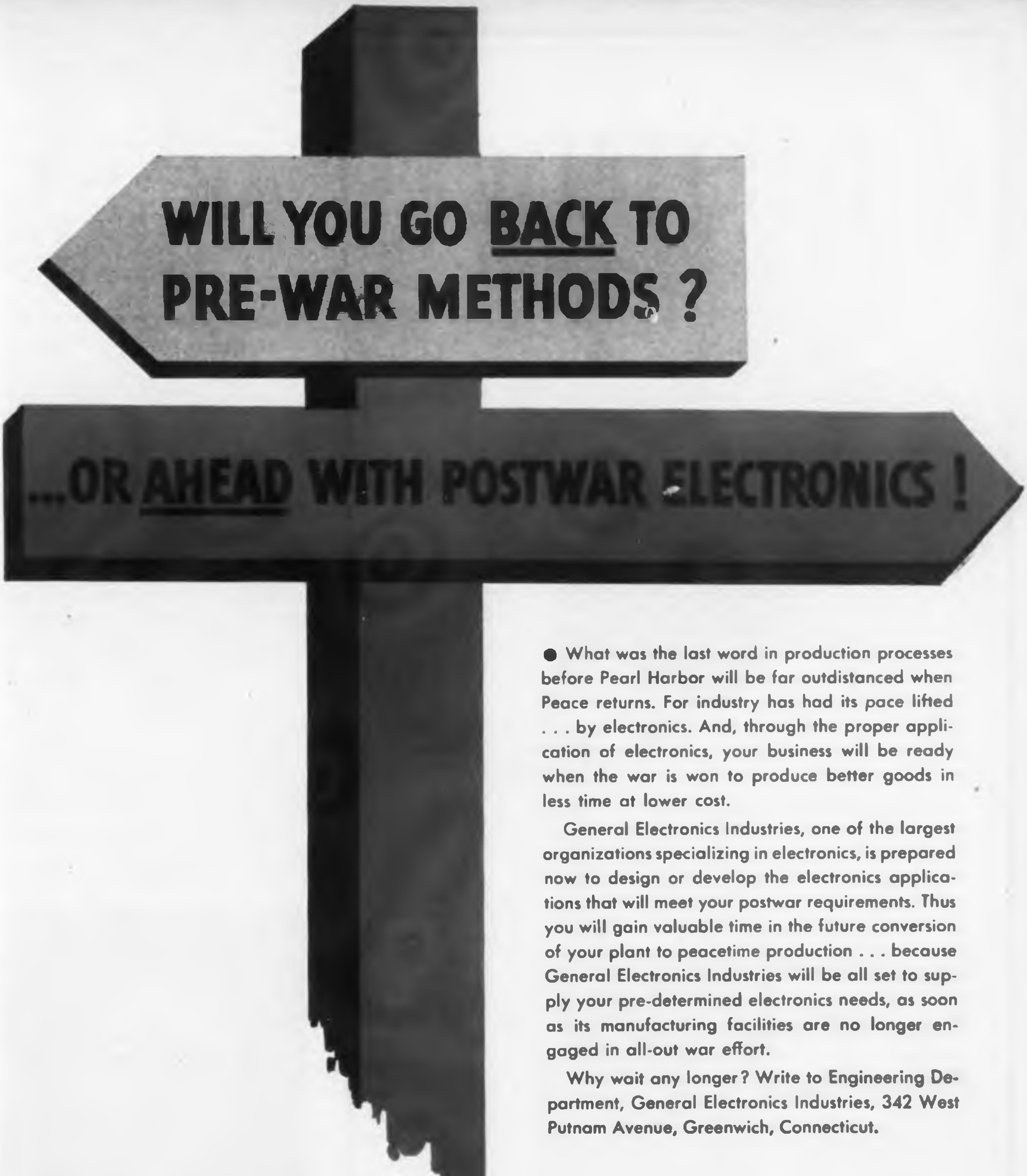
POSTWAR PLANNING

R. C. Cosgrove (Chairman), The Crosley Corp.;
Ben Abrams, Emerson Radio & Phonograph Corp.;
W. R. G. Baker, General Electric Co.;
M. F. Balcom, Sylvania Electric Products, Inc.;
John Ballantyne, Philco Corp.;
Walter Evans, Westinghouse Electric & Mfg. Co.;
A. H. Gardner, Colonial Radio Corp.;
C. B. Jolliffe, RCA Victor Division of RCA.;
L. L. Kelsey, Stewart-Warner Corp.;
George Lewis, Federal Telephone & Radio Corp.;
Leslie F. Muter, The Muter Co.;
J. J. Nance, Zenith Radio Corp.;
E. A. Nicholas, Farnsworth Television & Radio Corp.;
Ross D. Siragusa, Admiral Corp.;
Ray F. Sparrow, P. R. Mallory & Co., Inc.;
A. S. Wells, Wells-Gardner & Co.

RMA membership continues expanding, the following four new members being added at the meeting of the RMA Board of Directors: American Steel Export Co., New York; Machlett Laboratories, Inc., Norwalk, Conn.; Radex Corp., Chicago; Sheridan Electro Corp., Chicago.

RMA Appoints Douthat

The Radio Manufacturers Association has just appointed James W. Douthat as staff assistant to Bond Geddes, RMA executive vice-president. Mr. Douthat, who has been with the Associated Press for the past 18 years, has been designated as RMA Director of Publications. In the expansion of these services to association members, his duties will include the various RMA membership, press, patent, short wave program and other bulletins of the association and also industry promotions and press



● What was the last word in production processes before Pearl Harbor will be far outdistanced when Peace returns. For industry has had its pace lifted . . . by electronics. And, through the proper application of electronics, your business will be ready when the war is won to produce better goods in less time at lower cost.

General Electronics Industries, one of the largest organizations specializing in electronics, is prepared now to design or develop the electronics applications that will meet your postwar requirements. Thus you will gain valuable time in the future conversion of your plant to peacetime production . . . because General Electronics Industries will be all set to supply your pre-determined electronics needs, as soon as its manufacturing facilities are no longer engaged in all-out war effort.

Why wait any longer? Write to Engineering Department, General Electronics Industries, 342 West Putnam Avenue, Greenwich, Connecticut.

GENERAL *Electronics* INDUSTRIES

TRADE-MARK REG. U.S. PAT. OFF.

GREENWICH • STAMFORD • BRIDGEPORT • NEW MILFORD • NEW YORK relations. He will assist in RMA committee activities. The expansion of the RMA staff and membership services was authorized by the Association's Board of Directors.

Mr. Douthat, who is a graduate of Emory and Henry College of Virginia and later was an instructor in the Florida Military Academy has been in newspaper work continuously for the past 20 years. For the last 8 years he was in charge for the Associated Press of the U. S. Supreme Court coverage.

Philips Housewarming Reveals New Laboratory

The North American Philips Co., at present operating three plants in Mount Vernon and Dobbs Ferry, N. Y., and Lewiston, Me., housewarmed its new New York headquarters at 100 East 42nd St., Feb. 11 with an exhibition and demonstration of its many products in the electronic field. Concurrently it was announced that a new research laboratory has been opened in Irvington, N. Y., and that it will be headed up by Dr. Ora Stanley Duffenback, until now professor of physics at the University of Michigan. He is well known in the scientific world for his work in the field of electrical conduction through gases and for two years has been a director of research with the National Defense Research Council. Sketching the history of the Philips Company, Vice-President and General Manager Pieter van den Berg stated:

"The original Dutch company was founded in 1891 by Dr. A. F. Philips, who is now in this country,

Dr. O. S. Duffendack, newly appointed director of the new research laboratory of North American Philips Co., Inc., at Irvington, N. Y.

THE ANSWER TO A *Challenge*

AR-10-A

Dust cover removed, showing layout and treatment of dual crystal holders.

Check Points

- **3 BANDS**
  195-425, 2500-4500, 4500-8000 KC.
- **12 CRYSTAL CONTROL FREQ.**
- **2 BEACON BAND SPOT FREQ.**
- **REMOTE MANUAL TUNING**
- **WEIGHT**
  24 Pounds
- **SIZE**
  One Half ATR
- **DEPENDABLE**
  Simple to Service
- **APPROVED TYPE**
  Certificate #770

A challenge — to place in the hands of the United States Air Lines an instrument of destiny. A challenge — to radio engineers, designers, and fabricators. A challenge — to produce an instrument capable of operating on present frequencies and ready to function on the high frequencies to come . . . operate manually or on spot frequencies, and yet light in weight and small in size.

This has all been accomplished by HARVEY-WELLS in their new AR-10-A aircraft receiver!

We here at HARVEY-WELLS are always ready to put forth every ounce of our energy, experience, and enthusiasm, and cherish a desire that we may play some small part in helping you take your place in the future destiny of air supremacy. As you grow and continue to grow we should like to be with you. Wherever and whenever we can help — we'll be there.

LEFT — Front of model AR-10-A with dust cover in place, showing Model AA-12 Channel and control selectors, loop and antenna connections.

RIGHT — Close-up view of model AA-15 Electric control unit for remotely controlling all functions of the AR-10-A Receiver. A separate manual timing unit is also provided.

HARVEY-WELLS
Communications
INCORPORATED
PLANNING FOR TOMORROW—TODAY

SOUTHBRIDGE, MASS.

and his brother. In the years before the war, the factories at Eindhoven covered 78 acres and employed 20,000 people. The scientific laboratories employed a staff of over 1,000 and covered nearly 4 acres. In 1939 there were another 20,000 people in Philips factories in other parts of the world. Right now the factories in England employ between 10,000 and 20,000 workers on war production."

Johnson Joins Hammarlund

J. Kelly Johnson has been appointed executive engineer in charge of all engineering activities at Hammarlund Mfg. Co., Inc., 460 West 34th St., New York, N. Y. Mr. Johnson received his engineering degree at Columbia University in 1927, where he spent several years as instructor in electrical engineering. In 1929 he became assistant chief engineer of Silver-Marshall & Co., Chicago, Ill.; from 1930 to 1934 he was development engineer at Hazeltine Service Corp., New York, and from 1934 to 1937 chief engineer for Wells Gardner & Co., Chicago, returning in 1937 as engineer in charge of Hazeltine Service Corp., Chicago Laboratory. In 1943 he became chief of Production Section, Electronics Division, Office of Procurement and Material, Navy Dept., Washington, D. C., and served with that office until now.

J. Kelly Johnson who has been appointed executive engineer for Hammarlund Mfg. Co.

Veteran Operator's Cruise

Nineteenth anniversary dinner-cruise of the Veteran Wireless Operators Association brought together 500-odd members and guests of the organization at the Astor in New York, evening of February 12,

The Lost Battalion Had No Radios

1918... *Surrounded by Germans in the Argonne Forest, the 550 men of the Lost Battalion were reduced to 194 before rescue came. Communications were one-way by carrier pigeon.*

1944... *Today, in the thickest jungles, in the remotest outposts, in the air and on the sea, messages are exchanged in a split second—distance is annihilated—thanks to radio and electronic products.*

Sentinel

SENTINEL Equipment contributes to the effectiveness of modern radio communications and the prominent part radio is playing achieving victory for the United Nations. Management, engineering and production staffs of Sentinel Radio Corporation are proud of their equipment as it serves on global fronts. When victory comes, distributors and dealers of Sentinel radio and electronic equipment will profit by supplying a long denied demand.

Quality Radio Since 1920

SENTINEL RADIO CORPORATION
2020 RIDGE AVENUE, EVANSTON, ILL.

to reminisce with a long list of notables who trace present connections in the electronic industry back to brass-pounding days. The business agenda included presentation of Marconi Memorial Medals to five members: General "Hap" Arnold; "Bill" Halligan, president of Hallicrafters; "Ted" McElroy Mfg. Corp., who brought his own swing band with him; E. A. Nichols, president of Farnsworth Television and Radio Corp.; Ludwig Arnson, president of Radio Receptor.

Potentiometer Instruction

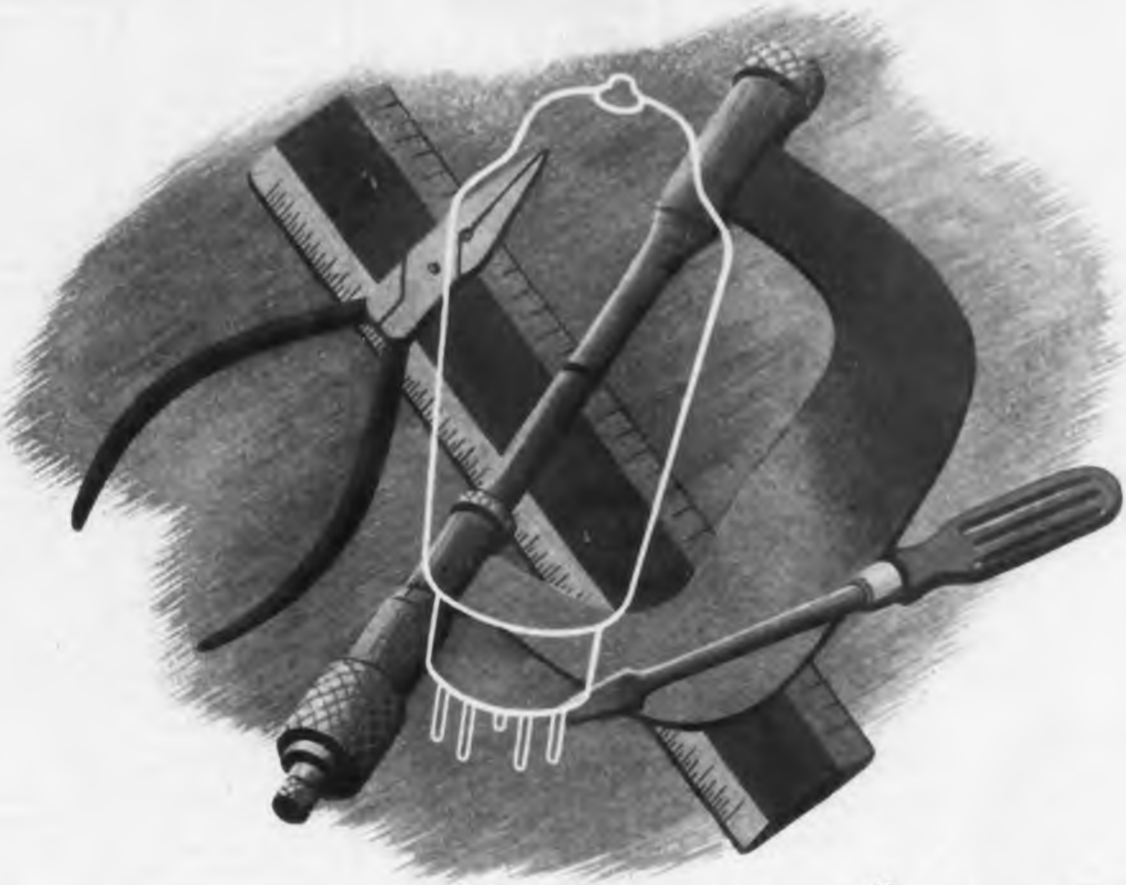
A new industrial instrument maintenance and repair course was started February 1 by the training school division, of the Brown Instrument Co., Philadelphia. Changes have been made in the general outline of the course, especially that having to do with instructions in the two types of potentiometers, mechanical and electronic. The two types will be treated as separate subjects to make it easier for students to absorb the basic principles of each, and to meet the requirements of those customers who send students to the school for the specific purpose of receiving continuous balance instrument instruction. The new classes will extend to April 26. Millivoltmeter type pyrometers will be studied from February 1 to 18; mechanical potentiometer type potentiometers from February 21 to March 8; continuous balance (electronic) potentiometers, March 9 to 16; electrically operated automatic control, March 17 to 23; flow meters, March 24 to April 3; thermometers, pressure gages and hygrometers, April 4 to 11; air-operated automatic control, April 12 to 20, and resistance thermometers and tachometers, from April 21 to April 26.

Dry Cells Increase

Total production of dry cells, including those for the armed forces, averaged about 35 per cent above the 1940 rate during the first nine months of 1943, according to WPB. Hearing aid cells increased nearly 40 per cent. The industry produced a quarterly average of batteries of all types amounting to 219,000-000 in 1940, as compared with a quarterly average of 294,358,000 cells in 1943.

Sylvania Industrial Moves

Expansion of Sylvania Electric Products' industrial apparatus plant at Emporium, Pa., has necessitated a transfer of the work to the company's plant Number Two at Williamsport, Pa., where additional space and personnel are available.



RTPB Plans Publicity

Radio Technical Planning Board has decided to make public some of the news of its deliberations. The decision came out of a meeting of the Board held February 10 in New York under the chairmanship of Dr. W. R. G. Baker. A committee consisting of Haraden Pratt and Dr. Alfred N. Goldsmith is to arrange for the preparation of news releases of a limited nature which are to be made public with a view to better acquainting the industry with the work RTPB is carrying on.

DuMont Heads TBA

Allen B. DuMont, president of Allen B. DuMont Laboratories, Inc., was elected president of the newly formed Television Broadcasters Association, Inc., at a meeting of the organization committee in New York on Jan. 29. Other officers elected were: Lewis Allen Weiss, Don Lee Network, vice-president; Jack Poppele, Station WOR, New York, assistant secretary-treasurer. Directors elected for three years include O. B. Hanson, NBC; E. A. Hayes, Hughes Tool Co., and Paul Raibourn, Paramount Pictures. Elected as directors for two years were Worthington Miner, CBS; Robert L. Gibson, General Electric Co., and Lewis Allen Weiss, Don Lee Network; and for one year, F. J. Bingley, Philco; Allen B. DuMont, and E. W. Mason of Earle C. Anthony, Inc.

The following committees were organized: Membership, to consist of the entire board of directors, with the actual carrying out of the work of the committee to be under the direction of Jack Poppele as assistant secretary. Publicity, with Robert L. Gibson as chairman. Gibson is assistant to the manager of General Electric broadcasting and publicity activities and in charge of the company's television station. Engineering committee, with F. J. Bingley of Philco as chairman. Program committee, whose province will be to study, develop and improve programs with W. C. Miner of CBS as chairman.

Postwar planning committee, to study the effect of television on potential employment and its use as a public service medium for entertainment and educational purposes, with Paul Raibourn of Paramount as chairman.

DuMont announced that the organization expects to form a television manufacturers' committee from among its associate members to resolve and integrate television manufacturing problems with broadcasting problems. On invitation of the Radio Technical Planning Board, the organization voted to join the RTPB as a sponsoring member.

D. W. May Leaves G-E; Forms Distributing Co.

Resigning his post as eastern regional manager of the Electronics Department of the General Electric Co., D. W. May has formed D. W. May, Inc., 1 East 42nd St., an organization for the warehousing and distribution of nationally known lines of radio, television and household appliances. First connection for the new firm is the exclusive franchise for the distribution of Farnsworth television and radio for the metropolitan market including New York and New Jersey.

Mr. May had been associated with General Electric for eight years. In 1935 he had charge of the introduction of the new G-E line of radios by the newly-formed Department. As manager of the G-E radio branch in New York, he launched the new radio line.

Having been interested in radio from its inception, Mr. May pioneered two radio stations. One of them, Station WDWM is now Station WCAP, Asbury Park, New Jersey. In the early days of radio he distributed many nationally famous lines, among them Crosley and Majestic. Following these, he was given the then little-known Philco line, and became the largest radio distributing firm in the world, with branches in New York, Newark and Boston.

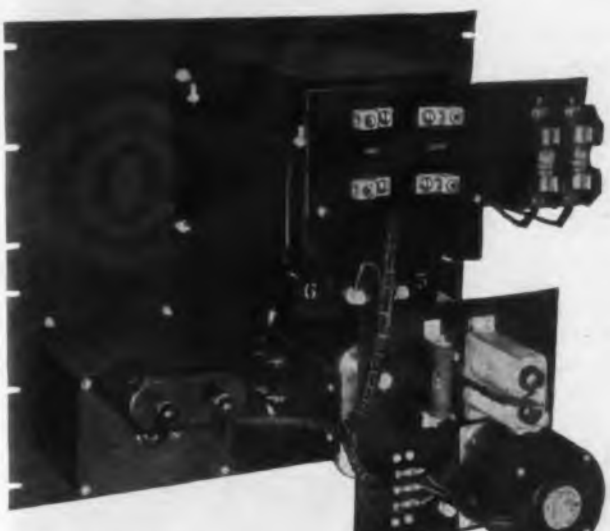
Electronic Products Expand

Expansion of the facilities of the Amperex Electronic Products through additional space is announced by S. E. Norris, sales manager, with the information that Plant No. 2 has been placed in operation. Located at 25 Washington St., near the parent plant at 79 Washington St., Brooklyn 1, N. Y., the new unit is the latest increase in the firm's productive capacity. It represents an expansion of approximately 2,000 per cent over normal production. Manufacturers of transmitting and rectifying tubes for electronic equipment, Amperex is the recipient of the Army-Navy "E" Award for excellence in war production.

Plastic Plating

The new process of metal plating on plastics, glass, etc., developed by Precision Paper Tube Co., has been taken over by Electro Plastic Processes, 2035 West Charleston St., Chicago 54, Ill. Installation of special equipment to facilitate production runs is going steadily forward. Operation on a limited basis has been in progress for several months.

The magic of ELECTRONICS...



NO word in industry has achieved more fame than "electronics". Perhaps its excessive use has over emphasized the wonders of an electronic world. However, there is the undeniable fact that the magical performance of electronic equipment is unexcelled.

An outstanding example is the SECO automatic voltage regulator. When its electronic "genie" . . . a special bridge and thyratron tube circuit . . . detects any fluctuation in A-C line voltage, a variable voltage transformer is authorized to correct for a constant output voltage.

This improved type regulator retains all the desirable characteristics inherent in the variable voltage autotransformers.

- HIGH EFFICENCY — 98% or better at full load.
- NO WAVE FORM DISTORTION.
- LOW EXCITING CURRENT.
- LOW COST PER KVA.

And it also has additional features offered by no other automatic voltage regulating equipment,

- NO INTERNAL MECHANICAL ADJUSTMENTS.
- OPERATION NOT AFFECTED BY LOAD OR POWER FACTOR.
- OUTPUT VOLTAGE AND SENSITIVITY ADJUSTABLE OVER WIDE RANGE
- CORRECTS A WIDE RANGE OF INPUT VOLTAGES. Standard models correct for input voltage variations of plus and minus 17.5% output voltage.

For all electrical and electronic applications, this modern voltage control is available for 115, 230, or 440 volt circuits in capacities up to 75 KVA.

Send for Bulletins

149 IE and 163 IE

SUPERIOR ELECTRIC COMPANY

281 LAUREL STREET, BRISTOL, CONNECTICUT

SUPERIOR *Electric Company*

IT&T Appoints Four

Board of Directors of the International Telephone and Telegraph Corp. has appointed four new vice-presidents and four second vice-presidents of the corporation. The new vice-presidents are: H. C. Roemer, vice-president and comptroller of Federal Telephone and Radio Corp., a manufacturing affiliate of I. T. & T.; W. H. Freng, assistant general attorney, who has also been appointed solicitor; Charles D. Hilles, secretary of the corporation; and Francis White, vice-president of the International Standard Electric Corp., another I. T. & T. affiliate. The second vice-presidents appointed are F. F. Davis, H. H. Buttner, G. A. Ogilvie, Leonard Jacob II.

Solar Rep. in Army

Henry Burwell of Atlanta, Ga., representative for Solar Mfg. Corp. and other companies in Southern states for many years, is now a Major in the Signal Corps connected with the Army Service Force. Ever since Major Burwell entered the armed services eighteen months ago, his business activities have been carried on by his wife, Mrs. Abby Burwell. She not only continues to maintain his office at 105 Forrest Ave. in Atlanta, but at the same time, is keeping in contact with the trade and otherwise carrying on for the duration.

Confident of Future

Preston R. Bassett, vice-president for engineering of Sperry Gyroscope Co., shown at the tenth anniversary dinner of the company's Fifteen Year Club at the Astor Hotel in New York

Frankel Heads Westinghouse Electronic Tube

Adolph Frankel has been appointed to head the Electronic Tube Sales Department of Westinghouse Electric & Mfg. Co. Coming to Westinghouse in 1917, Mr. Frankel was at first assigned to the advertising department in East Pittsburgh, later transferring to advertising headquarters in New York. In 1935, he was named merchandising manager of the Lamp Division, and in 1939 returned to the Bloomfield Works as manager of Special Products Sales.

In 1942 he became assistant manager of the Special Products Commercial Department and a year later was appointed staff assistant to the manager of the Lamp Division.

Hytemp to Thompson-Hayward

Thompson-Hayward Chemical Co., Kansas City, Mo., and branches in 15 other mid-western cities, has taken on exclusive representation of Griffin's Hytemp protective coating. The product, applied by brush, spray or dipping, resists temperatures to 3500 F., and is used, among other ways as a resist in selective hardening operations. Manufacturer is the Geo. R. Mowat Co., 24 W. 40th St., New York.

Cohan Leaves CBS

Edwin King Cohan has left Columbia Broadcasting System. After a period of 10 years as CBS director of engineering, he resigned middle of January and has not yet let it be known what he has in mind for the future. In his place, Wm. B. Lodge, who had been with the network since 1931, but for the past 18 months has been associate director of the Airborne Instruments Laboratories of Columbia University, will return to have charge of general design and development. Henry Grossman, network operations engineer, will have charge of engineering operations for CBS and in addition will remain chief engineer of WABC.

Henry Grossman (left) newly appointed in charge of engineering operations for CBS; and William B. Lodge, named acting director of CBS general engineering department

Formica Premiere

The Formica Insulation Co. staged a premiere showing of "The Formica Story," a five-reel informative motion picture in color, accompanied by narration, in New York City last month. The motion picture tells the factual story of the history of Formica, manufacturing and fabricating processes and diversified applications. It was made "on location" in the Formica plant in Cincinnati and in other parts of the United States where shots illustrating applications of the laminated products were filmed. The company plans to make the film available to technical and engineering societies, colleges and universities and manufacturers and fabricators.

Universal Ups Willyard

Les Willyard, for 13 years with the Universal Microphone Co., Inglewood. Calif., and lately its technical engineer in charge of research and test laboratories, has been appointed Chief Engineer of the company. The post had been vacant the past five years.

Deloraine IT&T Director

Edmond M. Deloraine, general director of the laboratories division of Federal Telephone and Radio Corp., manufacturing affiliate of IT&T, has been elected a member of the board of directors of IT&T. He has been closely identified with the corporation's research activities since 1925.

Edmond M. Deloraine, director of International Telephone & Telegraph Corp.

PRESTIGE?

THESE FIRMS USE **GOAT** ELECTRONIC TUBE PARTS

GOAT serves almost every electronic tube manufacturer with a tremendous variety of stock and special parts, made of any metal to any specified degree of accuracy. Because of experience gained since the days of radio infancy, GOAT has been able to meet the demands of this industry for greater quality, durability and quantity production. GOAT'S prestige, today, is based on this consistent ability to handle tough jobs requiring skill, precision and efficiency.

TYPICAL PARTS Shown here are just a few GOAT electronic tube parts and shields that have been stamped, drawn and formed on GOAT machines, dies and presses.

GOAT METAL STAMPINGS INC.

A DIVISION OF THE FRED GOAT CO., INC....EST. 1893

314 DEAN STREET • BROOKLYN, N. Y.

Plans International Electronic Exhibition

Dr. Henry Butler Allen, secretary of the Franklin Institute of Philadelphia, has announced the purpose of the Institute to organize and sponsor a postwar international electronic exhibition, with accompanying papers and discussions, in celebration of the 200th anniversary of Benjamin Franklin's Philadelphia electrical experiments.

These experiments were made during the years 1746 and 1752. In 1749 Franklin outlined the modern conception of the electronic constitution of electricity in these words: "The electrical matter consists of particles extremely subtile, since it can permeate common matter, even the densest metals, with such ease and freedom as not to receive any perceptible resistance."

40 KW Television System For Chicago's WGN Station

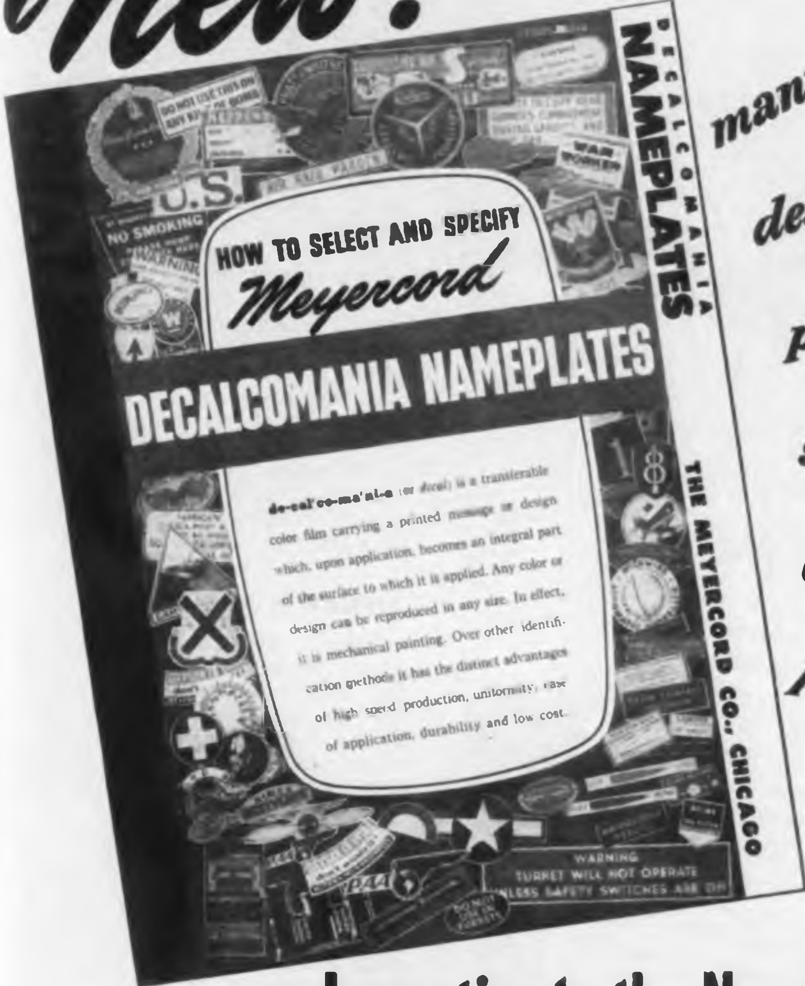
General Electric Co. has been commissioned to build a 40,000-watt television transmitter and elaborate studio equipment for WGN, Inc., Chicago, to be delivered after the war or as soon as priorities, as determined by the War Production Board, permit its construction.

The new WGN structure housing the first 40 kw television system to be built by G-E is to be seven or eight stories high and will be designed to take full advantage of the expected developments in many fields of radio after the war. Besides television, these include frequency modulation and facsimile as well as in standard AM facilities.

Directs Engineering

Roger M. Daugherty, who left Crosley in 1941 after 11 years in engineering work, is now director of engineering for International Detrola Corp., Detroit

New!



manufacturers... designers... product engineers... send for this Check-chart on product identification

Investigate the New Developments in

MEYERCORD DECALS

Meyercord research has developed Decalcomania nameplates resistant to acid, petroleum products, alkalis, alcohol, abrasion, moisture and temperature extremes. They provide highly legible product identification, operating instructions, wiring diagrams, etc., with substantial savings in metal, time, labor, weight and cost. Meyercord Decal nameplates are vibration-proof, eliminate sharp edges and require no screws or rivets for application. They are durable, washable and can be produced in any size, colors or design. Easy-to-use solvent or water methods of adhesion permit fast, lasting application to any known commercial surface. Investigate Meyercord Decals for war use...or postwar plans.

Send for a Free Decal Check-Chart

The check-chart tells how to select and apply the right Decal nameplate for 16 different surfaces. In file folder form to hold subsequent data sheets, it also lists 25 Meyercord Decal wartime uses on 34 different types of combat equipment. Address Department 62-3.

DECALS SAVE METAL

Back the Attack—Buy War Bonds

THE MEYERCORD CO.

World's Leading Decalcomania Manufacturer

5323 WEST LAKE STREET • CHICAGO 44, ILLINOIS

Sackheim Ups Output 22 Per Cent

B. J. Sackheim, president o[f] Manufacturers Screw Products Co., 216-222 W. Hubbard St., Chicago, Ill., manufacturers of Stronghold fastening devices, has won recognition for effecting a 22 per cent increase in vital war production at his plant during the last six months of 1943 by a concerted campaign against absenteeism among workers.

By holding "mock trials" of absentees, sponsoring drawings for attendance prizes, and developing special luncheons and other promotional methods, Sackheim has impressed his employes with the need for staying on the job to maintain production of war materials needed by the Armed Forces. By injecting his own personality into campaigns for production, he has also increased employe-employer cooperation and friendship.

ARHCO'S New Home

Newest addition to the growing production strength of the American Radio Hardware Co., Inc., at 152 MacQuesten Parkway, South Mount Vernon, N. Y., just opened, houses 350 employes and provides 60,000 square feet of working space.

X-Ray Administrator

Electrical engineer Henry J. Hoffman, long identified with the electronic tube industry, has been made Sales Manager of the Power Tube Division of Machlett Laboratories, world's largest producer of X-ray tubes, Norwalk, Conn. In addition he will be administrative assistant to vice-president Miles Pennypacker.

Henry J. Hoffman, newly appointed sales manager of Power Tube Division of Machlett Laboratories

Inductors – to specifications

From the small 100 watt tube socket types to the large 100KW types using copper tubing, Johnson inductors are designed to rigid specifications. They are more than coils. Into each of Johnson's inductors go more than 20 years of "know how"—familiarity with materials—skill in mechanical design—knowledge of circuits—and experience in electrical design for greatest efficiency in the particular application. Tapped inductors, fixed and variable coupling coils, variable inductors, and clips are all features Johnson can furnish. Copper tubing, wire, edgewise wound copper strip, or flat copper strip are available. Insulation materials used are steatite, Mycalex, Bakelite, and porcelain. Write for suggestions on YOUR inductor problem. Quotations furnished on the basis of either mechanical specifications or performance specifications.

Write for New
JOHNSON CATALOG
968O

JOHNSON
a famous name in Radio

E. F. JOHNSON COMPANY • WASECA • MINNESOTA

Electronic Manufacturing in Times Square

Hudson American Corp., 25 West 43rd St., New York, of which N. K. Hoskins is executive vice-president, now has five war plants operating in the Times Square area, making war materials for the United States Army Signal Corps. Production of war products in the heart of the city follows out the successful plans and philosophies of President Hazard E. Reeves, who is also co-founder and executive vice-president of Reeves Sound Laboratories, which have been successful in producing large quantities of crystal oscillators for bomber radios for the United States Army Signal Corps, in the Times Square area. The fact that women workers are available in Greater New York at the end of a five-cent fare, and the intense interest of such war workers (who come from all walks of life) in the manufacturing of war products, makes this policy of establishing war plants in the metropolitan district a sound one, according to these executives' experience.

R. Morris Pierce Elected Vice-President

R. Morris Pierce has been elected vice-president in charge of engineering of Stations WJR, Detroit; WGAR, Cleveland, and KMPC, Los Angeles. Pierce, WGAR chief engineer for thirteen years, served OWI and Psychological Warfare Branch, U.S. Army in North Africa and Sicily for seven months last year and is currently on leave again from his regular duties. He is returning to the European theater this week to resume his position as chief engineer of Psychological Warfare.

R. Morris Pierce, to Europe pro tem

. . . in Magnetic Structures

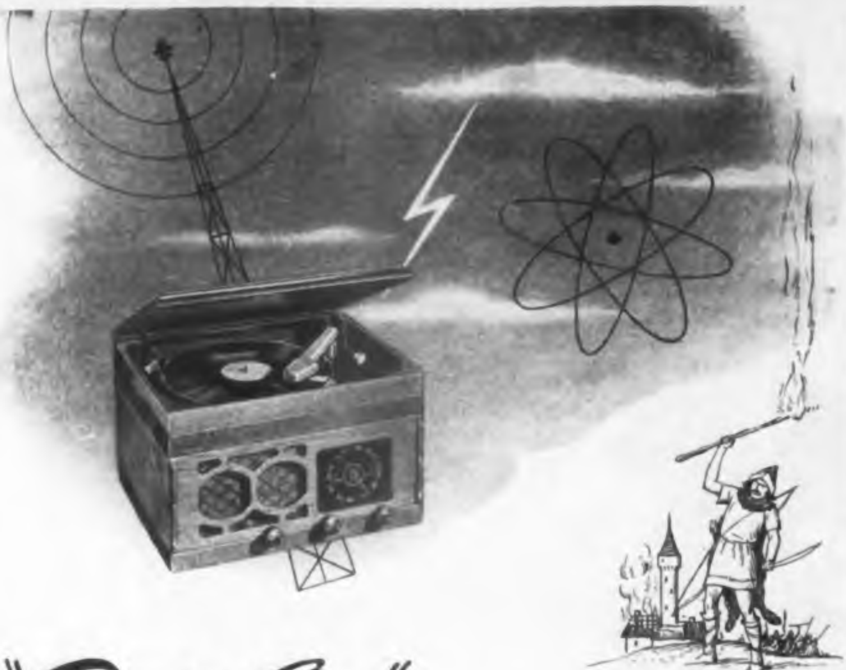
By the time we finish our present contract for headphones, Shure Engineers will have effected a 3½ ton saving in critical magnetic alloys. Redesign of the magnetic structure effected a saving of three-quarters—so that, today, the magnetic material generally required for one headphone is now enough for four headphones. This has been accomplished with full maintenance of the operating characteristics with the added advantage of decrease in weight. Shure Engineering continues to lead the way to better microphones and headphones for your postwar needs.

SHURE BROTHERS, 225 West Huron Street, Chicago

Designers and Manufacturers of Microphones and Acoustic Devices

ARMY E NAVY

SHURE
MICROPHONES



New Bendix Office

New York Office, with R. C Crabb and J. W. Moody jointly in charge, has been opened by the Pacific Division of Bendix Aviation Corp. (formerly Bendix Aviation, Ltd.), North Hollywood, Calif. The office is in room 1150, Lincoln Building, 60 East 42nd St., New York.

Rogers Adds Two

Rogers Radio Tubes, Ltd., Toronto, Canada, has added two well-known men to its organization. Dr. Walter H. Kohl has been elected a vice-president of the company, as well as chief engineer. Sidney T. Fisher has also been elected a vice-president.

Sidney T. Fisher now appointed Rogers vice-president and director

Dr. Walter H. Kohl who becomes vice-president and chief engineer of Rogers Tubes of Canada

GUTHMAN *Inductronics**

INDUCTORS AND ELECTRONICS

Typical in precision measuring of R. F. Inductors to rigid war production tolerances, the "Dynamic Inspection Analyzer" is representative of the ingenuity of Guthman "INDUCTRONIC" research. Employing a highly stabilized circuit of our own design this 24-frequency inspection device, used in the manufacture of an Ant. R. F. and Osc. assembly, can analyze the individual coils for band coverage, inductance, and Q. at their operating frequencies. Uniformity of electrical characteristics in the manufacture of Guthman super-improved coils makes...

*Guthman ... "Leader in Inductronics"**

EDWIN I. GUTHMAN & CO. INC.

15 SOUTH THROOP STREET · CHICAGO

PRECISION MANUFACTURERS AND ENGINEERS OF RADIO AND ELECTRICAL EQUIPMENT

Ease Civilian Tubes

The radio tube manufacturers and distributors in close liaison with Frank H. McIntosh, WPB Chief of the Foreign and Domestic Branch of the Radio and Radar Division, have worked out a program as the result of industry advisory committee meetings in mid-February for better distribution of civilian home receiving set tubes. The manufacturers are prorating their allotments of tubes to distributors on the basis of 1941 sales and population statistics. The manufacturers are also planning to interchange types of tubes between each other's plants in order to make production of the civilian tube allocations more efficacious. Both groups have agreed to aid the WPB in the proper policing of the distribution.

Dim-out and Black-out Pilot Lights

Gothard shutter-type pilot lights are manufactured as either dim-out lights or to completely black-out, despite the erroneous inpression caused by a recent competitive advertisement. These shutter-type lights made by the Gothard Pilot Light Co., Springfield, Ill., employ two disks, each of which has three holes. When the disks are so aligned as to place the three holes in one disk opposite the holes in the others, the pilot light produces a bright light. As the disks are turned 90 deg., the gradual misalignment of the holes reduces the brilliance of light until it finally reaches a total black-out.

If, as in some applications, it is desired to have a dim glow instead of a total black-out, a fourth hole is provided in the center of each disk, which will always permit a small amount of light to seep through. Gothard variable-intensity lights are also available with polarized lenses.

2000 Protected

When DeJur-Amsco Corp., Shelton, Conn., gifted its 2000 employes on electronic devices with life and hospital expense insurance, vice-president Jack Kuscher, his secretary Helen Andreini, secretary-treasurer Harry DeJur and president Ralph DeJur took part in presentation ceremonies

NEW BOOKS

Time Bases (Scanning Generators)

By O. S. Puckle, Research Engineer —A. C. Cossor, Ltd., London, published by John Wiley & Sons, Inc., New York, Chapman & Hall, Ltd., London. 204 Pages. Price $2.75.

The title "Time Bases" connotes a special part of a cathode ray oscillograph circuit. This book is an excellent review and description of such circuits, and in covering this subject, the author has compiled a remarkable text on all kinds of electronic circuits where tubes are used in ways other than simple amplifiers and oscillators. The book is written by a recognized authority on nonsinusoidal oscillators, and contains a wealth of information on unusual circuits. Most of the circuits described also have fields of utility outside that of an oscillographic accessory. Trigger circuits, timing circuits and relaxation oscillators having many industrial applications, are all described in detail.

Mathematics of Radio Communications

By T. J. Wang, Ph. D., Instructor in Electrical Engineering, The Ohio State University, published by D. Van Nostrand Company, Inc., New York City, 1943, 371 pages. $3.00.

"The book is designed for those students who are unable to devote the required time to a preliminary study of mathematics, but who, nevertheless, desire to pursue a serious study of communications." Arrangement and choice of subjects are well suited for this purpose. In a simultaneous course in communications, each electricity topic may be preceded by the requisite mathematics material. All exercises are taken from the electrical field.

The text starts with basic definitions and rules, and simple algebra, the fundamentals of evaluation of experimental data follow (graphs, error computations, simple slide rule operations). The next chapter covers basic circuit mathematics (algebra, exponents, quadratic equations, solution of simultaneous equations). Then trigonometric functions, vector methods, and logarithms are treated. Elementary calculus is introduced including approximation methods. Several tables frequently used in communications computations are given.

The text may also be recommended to a student for recapitulation of the subjects,—most of which do not extend beyond High School level,—as a basis for the study of

communications, because it gives explanations of the mathematical concepts used in this field, derivations of the important formulas and rules, and discussions of computation methods in comparatively short and concise treatment.

Fundamentals of Radio

By Jordan, Nelson, Osterbrock, Pumphrey, and Smeby. Edited by W. L. Everitt, professor of electrical engineering at Ohio State Univ., Fellow A. I. E. E. and I. R. E. Published by Prentice-Hall, New York City. 400 pages, $5.00.

A dignified text covering the basic material of radio operation, maintenance, design, and development. Three chapters (120 pgs.) are devoted to a review of elementary algebra, dc circuits, and ac circuits. After a section on electronic principles, the authors take up power supplies, sound, audio, V-T instruments, wave theory, radio principles, rf amplification, AM transmitters and receivers, propagation and antenna design.

Radio Market Data Handbook

Compiled by NAB Dept. of Research, under the direction of Paul F. Peter, Director. Published by National Association of Broadcasters, Inc., 1760 N St., N.W., Washington 6, D.C. 261 pages. $1.50 per copy.

This handbook will be useful as a basic source of information in engineering studies, by the broadcasting industry and in the preparation of applications for modification of facilities before the Federal Communications Commission, and to the radio industry as a whole.

Based on the U.S. Census of 1940, the information selected by the committee includes: population, families, radio families and total retail trade, with separate tabulations from the retail total for the food group, the general merchandise group, the apparel group, and drug stores.

Fundamentals of Telephony

By Arthur L. Albert, Professor of Communication Engineering, Oregon State College, published 1943 by McGraw Hill Book Co. Inc., New York City. First edition. 374 pages. Price $3.25.

This book is intended for communication engineering students and for telephone workers and is

devoted exclusively to telephone communication. The first four chapters present briefly the principles of electricity and acoustics upon which telephone practices are based. The book then considers the following subjects: telephone transmitters, receivers, telephone sets and circuits, telephone lines, manual telephone systems, dial telephone systems, loading, telephone measurements, noise and cross-talk, and repeaters and carriers. The book seems to cover these subjects accurately although briefly. As a text book it might have been desirable to discuss circuits more effectively, to enable the students to trace and understand the principles of the relays and other components, and their interrelations that make up so many modern telephone systems, so they are not lost when confronted with a circuit of this nature.

Maintenance and Servicing of Electrical Instruments

By James Spencer, Published 1941 by Instruments Publishing Company, Pittsburgh, Pennsylvania, U. S. A. 256 pages, with 274 illustrations. Bound in Fabricoid, size 5" x 8¼", Price $2.00.

This book may appeal to those who desire to know better how to select, use and get the best results from electrical instruments. It will also assist those who have the time (and patience) to repair their own instruments, although to provide this latter information was not the purpose of the author. This book gives a clear cut description of the operation of most of the presently-used industrial instruments and describes the sources of measurement errors, calibration procedure, besides the technic of maintenance and servicing. For many it will open the door to the mysterious gadgets in the sacred confines behind the "factory seal" of commonly used instruments.

Electron-Optics

By Paul Hatschek. Translated by Arthur Palme, Published by American Photographic Publishing Co., 353 Newbury Street, Boston. (1944) 161 Pages with 125 Illustrations. Price $3.00.

This is a review of the basic effects produced when electron rays are influenced by guiding fields. It is written in a nonmathematical style, in fact, in such a simplified form that the descriptions of cathode ray tubes, electron multipliers and electron microscopes, etc., would be of interest only to a popular audience of readers. The translator has added more information on some aspects of the study than appeared in the original text which was written in 1935-36.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* Especially indicated where Low Thermal Expansion, High Resistance to Heat Shock, Low Porosity and Low Loss Factor are requisites.
We have adequate facilities to process coil forms up to 5 inch diameter and pressed pieces to approximately 6 inches square.
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Division of GLOBE-UNION INC., Milwaukee
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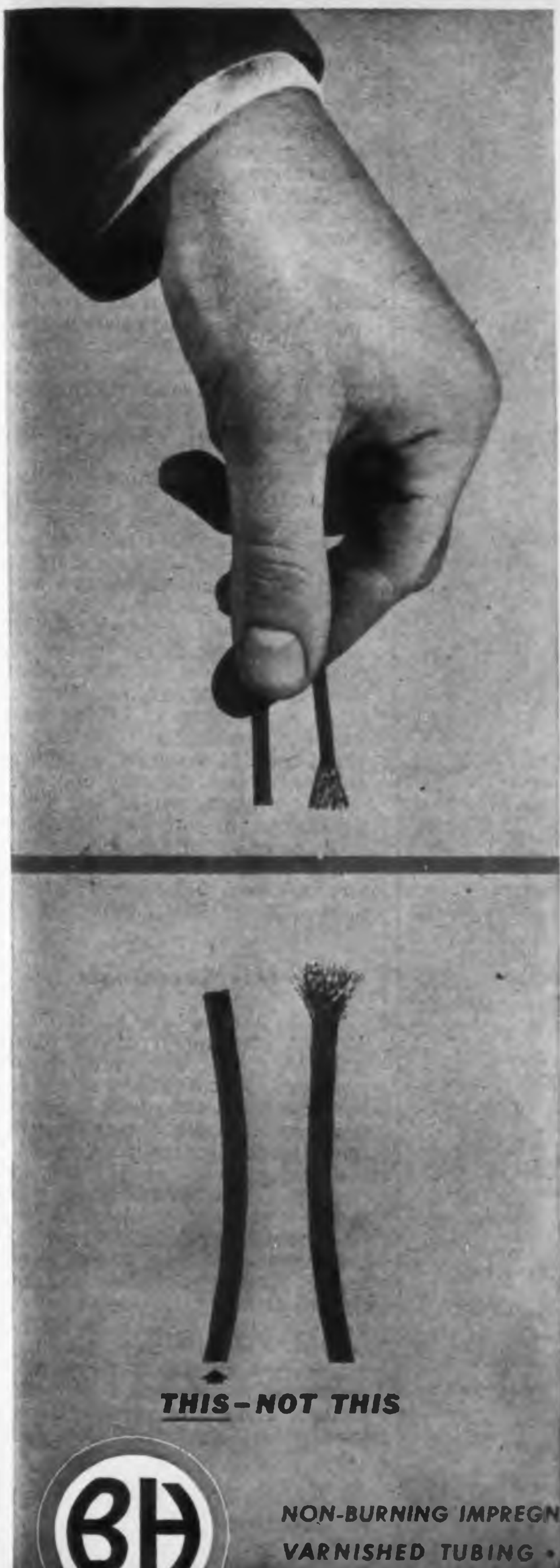
NEW BULLETINS

pH and Chlorine Control

A completely revised 83-page combination handbook and catalog (6th edition), of value to everyone interested in control of pH (acidity and alkalinity), chlorine, phosphates in boiler water, and in water analysis, has been published by W. A. Taylor & Co., 7300 York Road, Balto, (4) Md. Fifty pages are devoted to a simple, non-technical explanation of the meaning of pH control and the methods for making colorimetric determinations; precautions to be observed; discussion of the application of pH and chlorine control to 31 different fields, such as, water, sewage, boiler water, brewing, refrigerating brines, paper, laundry, sugar, textiles, etc.; a technical discussion of the meaning of pH control. The remaining 33 pages contain descriptions of Taylor slide comparators for general pH and chlorine control, determination of phosphates in boiler water and for analysis of water for nitrites, nitrates, silica, iron, ammonia, etc.

"Battle Talk"

It will be a long time before the public gets to know all the things Western Electric has done to help in winning the war; years, perhaps, before many of those things can be revealed. But in the meantime something more than a mere inkling of what has been going on has been revealed to the thousands of employes of Western Electric and their affiliated companies in a book, approximately the size of the Saturday Evening Post, that is as astonishing in the completeness of its revelations as it is beautiful in appearance. In 44 pages, a large percentage printed in full color,



SNUB TEST

Proves non-fray feature of new BH Fiberglas Sleeving

NEW, BH Extra Flexible Fiberglas Sleeving *will not fray*, even under severe conditions. You can prove this *right at your desk*. It's easy as snubbing out a cigarette. Here's how:

Write us for a sample of BH Extra Flexible Fiberglas Sleeving equal in size to the saturated sleeving you use now.

Hold short pieces of both BH Fiberglas Sleeving and the usual saturated sleeving between your thumb and index finger, and snub the ends of both sleevings against your desk, similar to the way you would snub out a cigarette. Do this five to ten times, pressing hard.

BH Flexible Fiberglas Sleeving will spread slightly under this pressure, may fuzz a little, but *will not fray*. The usual saturated sleeving will break down at the edges and separate.

Continued snubbing will not noticeably affect the BH Extra Flexible Fiberglas Sleeving, whereas the saturated sleeving will readily unravel and become progressively worse.

NON-FRAYING • FLEXIBLE • HEAT-RESISTANT
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NON-CRYSTALLIZING at LOW TEMPERATURES

The new BH Extra Flexible Fiberglas Sleeving is woven from the choicest continuous-filament Fiberglas yarns. It possesses high dielectric strength, is water-resistant and, like all BH Sleeving and Tubing—is non-inflammable.

All sizes from No. 20 to 5/8", inclusive, are available. Write for samples of this radically new and different sleeving today—in the sizes you desire. Seeing is believing! Bentley, Harris Manufacturing Co., Dept. I, Conshohocken, Pa.

BH PRODUCTS

NON-BURNING IMPREGNATED MAGNETO TUBING • NON-BURNING FLEXIBLE VARNISHED TUBING • SATURATED AND NON-SATURATED SLEEVING

BENTLEY, HARRIS MANUFACTURING CO.
Conshohocken, Penna.

editors Will Whitmore, Vance Hilliard and Joseph Dillon have pictured and diagrammed just about everything Western Electric is doing for the armed forces except the 37 per cent that is labelled restricted and secret. Of the remaining 63 per cent, 36 per cent is radio for aircraft, tank and field artillery, 9 per cent is telephone equipment, 7 per cent is gun directors, 6 per cent is wire and cable, 5 per cent is miscellaneous. This information, and much more of a similar nature has been cleverly shown in graph form. Aside from such statistics the book is chock-a-block full of photos, some taken under actual battle conditions, of the great variety of Western Electric military and naval equipment in use. Where it may be hard for nontechnical persons to understand how equipment is used, colored diagrams make military methods perfectly plain. In addition there are a score of photographs and wash drawings reproduced in color to help in giving Western Electric personnel a picture of the tremendously important work the company is carrying on. And that, in brief, is the purpose of the book. About it, President C. G. Stoll says: "This book is designed to help us all understand the way our daily jobs fit into the overall war front. Because many of the things we make carry to our fighting men the actual commands which bring victory to them on every front, we have called it 'Battle Talk'".

Solderless Terminals

Newest catalog to be produced by Aircraft Marine Products, Inc., Harrisburg, Pa., is more of an instruction manual than it is a mere listing of the hundreds of items the company makes. Specializing in solderless wiring terminals, clear illustrations show just how the various types are used and the very complete manner in which the special tools devised for the purpose perform the job they are designed to do. The 70 pages of the catalog are divided into seven sections, covering Diamond-Grip insulation support wire terminals, standard type wire terminals, flag type wire terminals, cable lugs, bonding jumpers and tabs, presses for terminal installation and reference data.

Plasticizers

The new 144 page catalog "Chemicals by Glyco" of the Glyco Products Co., Inc., 26 Court St., Brooklyn, N. Y., has just been published. Considerable additions have been made including a number of plasticizers for synthetic rubber, synthetic resins, etc., as well as fur-

The PHOTELOMETER insures the accuracy of its readings with built-in CONSTANT VOLTAGE

The "Photelometer" is a portable, photo-electric device, used to determine the concentration of substances in solution by the proportional transmission of incident light of *unvarying intensity*. For vital diagnoses and routine commercial decisions, it has supplanted the older systems of analysis by visual comparison, in many bio-chemical, industrial and hospital laboratories, due to its speed and accuracy.

The "Photelometer," so sensitive as to require voltage which does not vary more than ±1%, takes no chances with the uncertain voltages of commercial power lines. Its label specifies the voltage at which it should be operated and a built-in SOLA Constant Voltage Transformer maintains the voltage at this level by absorbing all sags and surges in the incoming power.

This is only one of the many electrically operated instruments and other types of equipment that now depend on built-in SOLA Constant Voltage Transformers for consistently accurate performance.

In designing any precision or electronic device, it is hazardous to assume that the voltage required for its successful operation will be available. Only where voltage control is incorporated as an integral part of the basic design can there be any guarantee of unvarying power. With this control, the performance of the device is automatically and instantaneously protected from voltage fluctuations.

SOLA Constant Voltage Transformers instantly and automatically absorb primary voltage variations up to 30% and deliver an unchanging, rated voltage. They require no supervision or manual adjustments and are self-protecting against short circuit. Custom-made units can be designed to exact specifications for built-in protection. Standard units are available in capacities from 10 VA to 15 KVA.

SOLA

Constant Voltage Transformers

To Manufacturers:

Built-in voltage control guarantees the voltage called for on your label. Consult our engineers on details of design specifications.

Ask for Bulletin 10CV-74

Transformers for: Constant Voltage • Cold Cathode Lighting • Mercury Lamps • Series Lighting • Fluorescent Lighting • X-Ray Equipment • Luminous Tube Signs Oil Burner Ignition • Radio • Power • Controls • Signal Systems • Door Bells and Chimes • etc. **SOLA ELECTRIC CO., 2525 Clybourn Ave., Chicago 14, Ill.**

ther information on the esters manufactured by the company. The usual features have been retained and the manual is complete with formulas, suggestions and tables of useful chemical and physical data.

Component Parts

Just off the press is the new 1944 36-page catalog, "Approved Precision Products" of P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind. The bulletin describes the complete line of Mallory radio, electrical, and electronic parts, giving complete mechanical and electrical dimensions and list prices.

Grinder Service

The complete line of Doall Surface grinding equipment, accessories and supplies manufactured by the Savage Tool Co., Savage, Minn., is pictured and described in their new 20-page booklet which shows the importance of unity when extreme accuracies and fine finishes are to be achieved in surface grinding operations. To accomplish these requirements of precision surface grinding, this company offers three hydraulically-operated grinders ranging in capacities from 7½ in. x 21 in. to 10 in. x 24 in. capacities. Specifications and application data are shown as applied to either tool room or production grinding.

Among accessories are grinding wheels, selectron and electromagnetic chucks and the wet or dry grinding attachments including a soluble oil for wet grinding.

Plancor No. 1666

"Reporting on Plancor No. 1666," Vice-President Harry A. Ehle, of International Resistance Co., calls it—a little vest-pocket sized booklet into which there has been packed the dramatic story of how a great manufacturing plant was made to spring almost full-fledged into existence, and almost over night but not without much toil and trouble and unbelievably hard work. It makes an interesting, and inspiring story.

High Frequency Induction

How one large manufacturer saved more than 144,000 lbs. of nickel in a year through adopting plain carbon steel and hardening it with the high frequency electrical induction process is one of many interesting cases cited in a revised 32-page booklet just issued by The Ohio Crankshaft Co., Cleveland, on the subject of induction heat treatment. Author of the publication is Dr. Harry B. Osborn, Jr., research and development engineer of the

Tocco Division of The Ohio Crankshaft Co. His booklet is one of the most comprehensive descriptions of the ramifications of this industrial tool.

Well illustrated, the booklet shows recent installations of the Tocco process as well as a series of views of various types of parts easily treated by induction. The publication is divided into chapters on heat treating applications so that the reader obtains an understanding of the principles of induction hardening, heat treating, brazing and soldering, normalizing and annealing and heating for forging and forming.

Other chapters deal with carbide solution and superhardness. Tables and charts reveal hardness tests, power effects, etc. A section touches upon the development of induction heating as a medium for hardening long cylindrical lengths, bars and tubes. A special fixture designed for this application is expected to open a new field for use by steel mills.

Battery Connectors

Cannon Electric's first complete bulletin on its line of battery connectors for aircraft, engines and general industrial uses has just been issued. Twenty-four pages and cover illustrate and describe a variety of battery connectors used with battery carts for engine starting, for the quick disconnect of large storage batteries, general service batteries, and rack battery installations. Application photos and condensed data sheets are also included. New is a quick disconnect battery plug and kit for use on batteries conforming to AN-W-B-141 specifications. Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.

Celectray Pyrometers

A new catalog of Tag equipment made by C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y., has been issued. In 38 well illustrated pages the company's complete line of electric thermometers, pyrometers, photoelectrically balanced recorders, indicators, controllers, recording controllers, potentiometers for thermocouples, slide-wire wheatstone bridges for resistance thermometers, etc., is described.

Insuline's Equipment

In a compact pictorial 48-page booklet, Insuline Corp. of America, 3602 35th Ave., Long Island City, N. Y., describes a very long line of stock products which regularly find use in electronic applications. These range all the way from various

types of phone plugs and jacks through coils, condensers, dials and miscellaneous hardware to a variety of cabinets, speaker housings, chassis and antenna equipments.

Speaker Equipment

Speakers, horns, multiple unit horns and single horn units of both permanent magnet and electrodynamic types in considerable variety are illustrated and described in a new 8-page catalog published by Racon Electric Co., Inc., 52 East 19th St., New York. Included are speaker equipment for every conceivable purpose indoors and outdoors.

Standard Vibrators

Electronic Laboratories, Inc., Indianapolis, Ind., has recently published a new booklet on standard vibrators for power supplies which includes a data table, schematics, and recommended vibrator specifications. Well illustrated throughout.

Wire Cloth

You may think you know a lot about wire cloth, but after reading "Industrial Wire Cloth" just published by the C. O. Jelliff Mfg. Co., Southport, Conn., you won't be so sure. This company produces an astonishing variety of such "cloth" in a considerable variety of weaves and of many different metals and materials — aluminum, brass and copper, phospher bronze, monel, nickel, nickel chromium, stainless steel, iron and galvanized, and a recent development, called iconel which is a combination of nickel and chromium. In its 96 pages, the book contains engineering data and commercial specifications on all the various types of wire cloth the company produces.

"Manpower, Music and Morale"

A plan for helping personnel relations in war production activities is outlined in a booklet recently published by the RCA Industrial and Sound Department, Camden, N. J.

Manpower, music and morale is discussed in a pictorial round-the-clock exposition and a new type of pre-installation service is described.

Transformer Converters

A new 36-page illustrated catalog describes various types and sizes of stock transformers manufactured by the Standard Transformer Co., 1500 No. Halstead St.,

Increases tube capabilities at 125-mc by more than 20 times!

The new coating of silver around the grid leads of Gammatron tubes answers one of the most baffling problems in high-frequency communication.

Until W. G. Wagener, chief engineer of Heintz and Kaufman Ltd. hit upon this simple solution, the life of all transmitting tubes at high frequencies was relatively short. Even tubes such as the HK-254 lasted only a brief 50 to 100 hours at 125 megacycles when very heavily loaded. The trouble was always the same . . . the glass around the grid lead would crack, and the tube would be ruined.

Heintz and Kaufman engineers found that the grid bead crack was caused by a change in composition of the glass adjacent to the tungsten. This change was due to a minute current flow resulting in electrolysis.

The silver coating now intercepts this current far enough away from the grid lead so that the glass immediately surrounding the lead retains its normal characteristics. Thus Heintz and Kaufman's patented coating enables such tubes as the HK-54, HK-254, and HK-454 to operate at high frequencies at higher powers for as long as 2000 hours—one Gammatron now outlasts 20 to 40 ordinary tubes without the silver dot!

HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO • CALIFORNIA, U. S. A.

Gammatron Tubes

Chicago, together with complete and detailed specifications. The catalog lists not only transformers for most electronic applications but many stock converters as well for the conversion of ac to dc. Charts are provided to identify quickly the correct units to be used in various applications.

"Highways of the Air"

Radio's important contribution to the safety of human life and property in air transport is the subject of a new booklet "Highways of the Air," recently published by the Radio Receptor Company, Inc., 251 W. 19th St., New York, makers of airline and airport radio navigational traffic control equipment. In simple non-technical language, the booklet outlines the function of navigational and traffic equipment and with the aid of numerous diagrams and illustrations, just what the "beam" is, how it is generated, and how it is sent to the pilot for his guidance in flying the skyways.

The airport traffic control system, as installed at LaGuardia Airport in New York, the new National Airport at Washington, D. C. and other modern air terminals are explained. Various components including radio ranges and the several different types of markers are described and their uses discussed, high-lighted by many photographs, maps, and charts.

Capacitor Types

Sprague Products Co., North Adams, Mass., has issued a folder offering immediate deliveries on various army-navy type bathtub condensers; oil-filled oil-impregnated can type capacitors; and various mica capacitors. The bathtub type metal rectangular units are available in a wide variety of single and dual capacities and in voltages from 50 to 1750 volts dc. Tolerance is minus 20 per cent, plus 30 per cent. The oil-filled, oil-impregnated can type units range in capacities from 1.0 to 17. mfd. and in a variety of ac-dc voltages. Mica condensers available for immediate delivery include many units in dc test voltages of 1000, 1500, and 5000.

"Die-less" Duplicating

A complete summary of the origin and development of the Di-Acro system of metal duplicating without dies, as well as descriptions of new machines, has been included in a revised 40-page catalog by the O'Neil-Irwin Mfg. Co., Minneapolis, Minn. Original photographs showing the machines in use for fabrication of various airplane parts are shown.

Test Equipment

Seven pieces of specialized test equipment are illustrated and described in a 10-page data book published by Technical Apparatus Co., Boston, 20, Mass. These include a high-voltage power pack providing 10,000 volts with an electronic timing circuit; production tube tester providing for static, dynamic and output measurement facilities; a unit delivering 200 millivolts of 400 cycle output with .25 per cent distortion; measuring equipment for determining the quality of welds; a multi-metered tube tester to check GM, gas and static characteristics of the family of super control rf pentodes. A number of other pieces of equipment, not cataloged, also are available.

250 kv X-Ray Units

A new booklet issued by Picker X-Ray Corp., 300 Fourth Ave., New York City, describes three 250 kv industrial radiographic units, dolly, jib crane, and mobile types. All units are pictured in typical applications and their various features discussed.

Radio Frequency Lacquer

A new and improved radio frequency lacquer with a low loss factor over a wide frequency range has been offered for various electronic applications by Communication Products Co., 744 Broad St., Newark, N. J. In a 24-page booklet, now ready for distribution, the uses of Q-Max A-27 are illustrated and described. The electrical and physical properties of Q-Max, as determined by careful laboratory tests, are recorded in a series of useful graphs and charts. Illustrated graphically, for a wide frequency range, are the dielectric constant, power factor and loss factor. Data are included for dielectric strength, density, drying time, adhesion and other characteristics.

Fluxine Chart

Anyone interested in welding, brazing or silver soldering will find considerable use for the new Krembs Fluxine Chart. The chart comes in bulletin form and gives a list of all the common metals and alloys recommending the most satisfactory flux to use when joining them by different processes. It is sponsored by an organization of welding and brazing consulting engineers. Published by Krembs & Co., 676 West Ohio St., Chicago 10, Ill.

Music Helps Morale

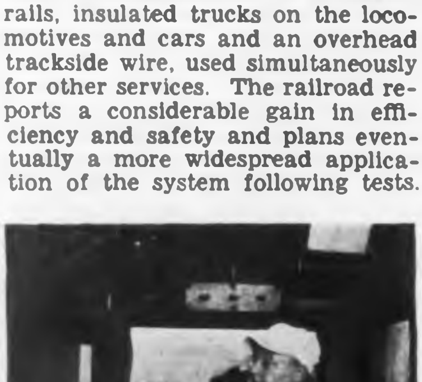
The important part that scientifically programmed music plays in war factories was demonstrated visually and aurally by RCA Victor Division of Radio Corp. of America, late in February at a luncheon in the Waldorf-Astoria, New York. The occasion was a press preview of a new film, "Manpower, Music and Morale." The gathering was addressed by Alex Nordholm of WPB and Mark Starr of the International Ladies Garment Workers Union.

Postwar Era

Dr. O. H. Caldwell, Editor of Electronic Industries, is to address the New York Electrical Society in the Engineering Auditorium, 29 West 39th St., New York, on the evening of March 8. Subject is "The Postwar Electronic Era."

Carrier Communication Adopted by Penn. R.R.

The Pennsylvania Railroad has installed a carrier current two-way communication system on a section of its main line and is thus the first railroad to adopt electronic means of communicating between the front and rear of trains, between trains, moving or stationary, and between trains and wayside blocks. The system, at present in experimental form, represents a joint development of the railroad and the Union Switch and Signal Co. and its installation follows several years of research. Equipment has been installed on ten locomotives and ten cabin cars, commonly called cabooses, and in a block station at Frenchtown, N. J., about 30 miles north of Trenton. The system involves a combination of insulated rails, insulated trucks on the locomotives and cars and an overhead trackside wire, used simultaneously for other services. The railroad reports a considerable gain in efficiency and safety and plans eventually a more widespread application of the system following tests.



Pennsylvania Railroad engineman using the new CC system just installed

Electrostatic Fan with No Moving Parts

Philadelphia's Franklin Institute has been presented with an electric fan with no moving parts by the inventor, Games Slayter, vice-president and director of research, Owens-Corning Fiberglas Corp.

The fan applies principles announced by Benjamin Franklin in Philadelphia 200 years ago. Franklin observed that an electrical discharge took place more readily from pointed conductors than from rounded surfaces. This discharge produced a wind which blew out a candle from a distance of several inches.

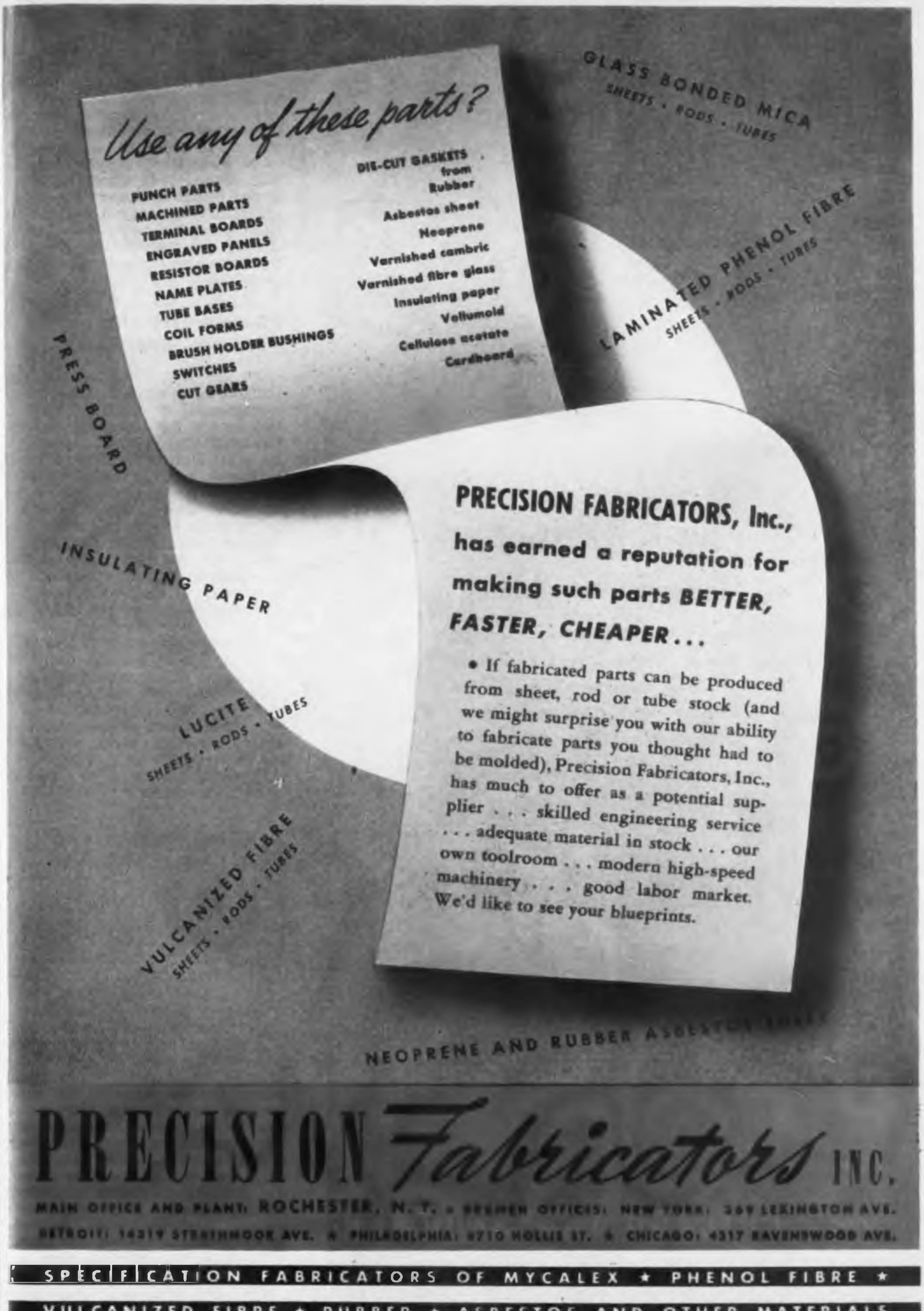
Mr. Slayter's modern application of the same experiment employs a rectangular metal box, open at each end. This box contains a row of four sharp-edged conductors, bristling with tiny filaments. The electricity discharging from these filaments sets the air in motion and blows it through four louvres which guide the direction of the air. Not yet as efficient as an office fan with electrically propelled blades, the fan at this stage has no commercial value, in Mr. Slayter's opinion.

Harrison Lauds Chicagoans

Wherever you are in the front lines or in fighting airplanes, "you find Chicago-made equipment," Major General William H. Harrison, Chief of the Signal Corps' Procurement and Distribution Service, told Radar-Radio Industries of Chicago, a group of about 35 electronic manufacturing companies in the vicinity of that city Feb. 11 at their annual meeting. The Chicago companies, General Harrison pointed out, make well over 20 per cent of the War Department's needs. He stressed that the war is not yet won and that the Army is desperately in need of equipment "today not tomorrow." He lauded the faithfulness and fine results of the electronic manufacturers and urged them "to stay in there pitching and doing our war job as those are doing theirs in the combat front lines."

Tinfoil vs. Radar

Because they could not get Christmas-tree decorations due to disrupted transportation conditions resulting from bombings, Berlin residents used for Yuletide ornaments tinfoil which had been dropped by American and RAF raiders to confuse radiolocation instruments, a Swedish newspaper correspondent in the German capital has reported. Again the use of tinfoil to disrupt the recordings of


Use any of these parts?
PUNCH PARTS
MACHINED PARTS
TERMINAL BOARDS
ENGRAVED PANELS
RESISTOR BOARDS
NAME PLATES
TUBE BASES
COIL FORMS
BRUSH HOLDER BUSHINGS
SWITCHES
CUT GEARS
DIE-CUT GASKETS from Rubber
Asbestos sheet
Neoprene
Varnished cambric
Varnished fibre glass
Insulating paper
Vellumoid
Cellulose acetate
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PRECISION FABRICATORS, Inc., has earned a reputation for making such parts BETTER, FASTER, CHEAPER...
• If fabricated parts can be produced from sheet, rod or tube stock (and we might surprise you with our ability to fabricate parts you thought had to be molded), Precision Fabricators, Inc., has much to offer as a potential supplier . . . skilled engineering service . . . adequate material in stock . . . our own toolroom . . . modern high-speed machinery . . . good labor market. We'd like to see your blueprints.
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MAIN OFFICE AND PLANT: ROCHESTER, N. Y. • BRANCH OFFICES: NEW YORK: 369 LEXINGTON AVE.
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SPECIFICATION FABRICATORS OF MYCALEX ★ PHENOL FIBRE ★
VULCANIZED FIBRE ★ RUBBER ★ ASBESTOS AND OTHER MATERIALS

radiolocation instruments has been revealed.

The simple use of tinfoil has proved of value for the purpose. It is believed that the foil is dropped by the so-called "pathfinder" airplanes which fly ahead of the raiding bombers and spot the targets. The use of tinfoil had not occurred, it is understood, until the latter half of last year when the tempo of the British and American bombing raids was stepped up. So far the Germans have not yet found a remedy to counteract the effects of the tinfoil on radiolocation recordings.

Photoelectrically Operated Stop-Watch

A tube and relay circuit constructed some years ago to operate a stop-watch is described by R. J. Wey in the January, 1944, issue of Electronic Engineering, London. At the start and finish of the cycle to be timed, a light beam impinging against a photoelectric cell is momentarily interrupted. The photocell controls the plate current of a vacuum tube which in turn actuates switches in the circuit of a magnet. The magnet armature sets off the stop watch at the beginning of the cycle and stops it as the end of the cycle.

Much more accurate timing than is possible with manual operation of the stop watch may be obtained, errors due to the human element being excluded. Further, the process to be timed is not interfered with because no energy is used for the interruption of a light beam; energy would be required for other types of controlling devices.

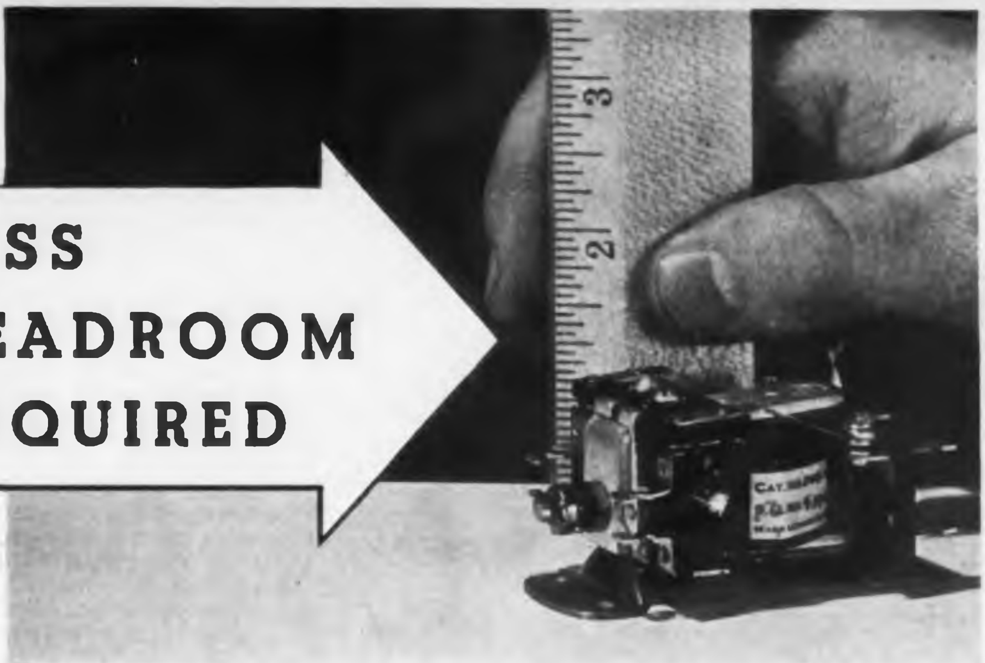
British-American Patent Pact Spurs Production

The little-known British-American Patent Interchange Agreement, two years old on January 1, 1944, has spurred the battle of production, which has achieved such glowing results.

Among the things being manufactured on both sides of the Atlantic, under the agreement, are: a kite, launched with a rocket-pistol, for use in carrying an aerial aloft to aid in sending out emergency distress signals; air compressors, range finders, illuminated gun sights, turrets, fuses, incendiary bombs, airborne lifeboats, lathes, bomb releases, catalysts—the agents which speed up chemical changes; torpedoes, condenser tubes, warship propellors, periscopes, bearings and lacquers. Many products are on the secret or confidential list and may not be publicized.

The directions and regulations under which such reverse lend-

LESS HEADROOM REQUIRED



for THIS RELAY . . .

The WARD LEONARD Midget Metal Relay measures only 1¼″ in height. Its sturdy design permits continuous service on standard AC and DC voltages up to 110-115V. This double pole, double throw relay has the silver-to-silver contacts, characteristic common to all Ward Leonard Relays.

WL Relay Bulletins

Bulletins are available describing light, intermediate and heavy duty relays in various contact combinations, high voltage relays, metal and molded base midgets, aircraft power relays, transfer relays, sensitive relays, thermal and motor driven time delay relays, latch-in relays, and various types of radio relays. Send for the data bulletins of interest to you.

ARMY E NAVY

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WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control WL devices since 1892.

WARD LEONARD ELECTRIC COMPANY, 61 SOUTH STREET, MOUNT VERNON, N. Y.

lease aid can be obtained from the United Kingdom and from several of the other Allies by War and Navy Department contractors are set forth in War Department Procurement Regulations, paragraphs 1109-1111 (available from Headquarters, Army Service Forces, War Department, Washington 25, D. C.) and Navy Procurement Directives, paragraphs 14001-14021, inclusive, available from the Office of the Under Secretary of the Navy, Navy Department, Washington 25, D. C.). Copies of the Patent Interchange Agreement and of other lend-lease and reciprocal aid agreements may be obtained upon application to the State Department, Washington 25, D. C.

While the Patent Interchange Agreement was formally signed between the Government of the United Kingdom and Northern Ireland and the Government of the United States on August 24, 1942, its effective date is January 1, 1942. Officially, the pact is known as the Patent Interchange Agreement, Executive Series 268.

ELECTRONIC TOMORROWS

Some Possibilities of the Electronic Home of the Future

Items selected from recent NBC-Blue Network series of 117 broadcasts on "Radio Magic" by O. H. Caldwell, editor of "Electronic Industries."

1. *Photo-cell control of inside and outside lights. Turned on automatically at dusk, extinguished at dawn.**
2. *Induction cooking. Large heating currents induced directly in utensils or food itself, making for fast and efficient cooking. Range top remains cold. Utensils get hot.* Bread cooked from inside, no crust.*
3. *"Photo-electric shingles" capture energy from sun (about 1800 kw on average house top). This energy, stored, would supply all lighting, cooking and heating needs.*
4. *Electrostatic vacuum cleaner. High-voltage plates attract dust and dirt; silent, "no maddening whine."*
5. *Ionization of air in home. Negative-"stimulating," to pep up an evening party. Positive ionization-"sedative," to make guests sleepy and go home!*
6. *Home radio printing press (facsimile). Delivers printed pages, headlines, cartoons, style sketches.*
7. *Phosphorescent wall-paper and carpet. Absorbs light daytime, glows all night dimly, to protect toes, shins and tempers.*
8. *Diathermy room heating. High-frequency magnetic waves fill room, inducing heating currents in the blood streams of occupants, keeping*

A MITE IN SIZE . . . BUT A
Giant in action!
Precision crystals are performing a mighty job under the most trying battle conditions. But only the crystals that are microscopically clean can operate indefinitely. That's what makes crystals giants.
Crystal Products Company methods of exacting cleanliness in manufacturing procedures are unsurpassed. All crystal oscillators are guaranteed free from flaws, ghosts, inclusions — and are free from optical and electric twinning.
Crystal PRODUCTS COMPANY
1519 McGEE STREET · KANSAS CITY 8, MISSOURI
Producers of Approved Precision Crystals for Radio Frequency Control

them comfortable, although windows may be open to winter air.

9. *Diathermy cocktails. Non-alcoholic pick-me-ups, guaranteed as efficacious as double old-fashioneds.*
10. *Radio phone connecting with owners' car and plane. A wavelength for every household group or individual.*
11. *Radio-set indicator showing kind of program (music, speech, etc.) on principal stations. Turns itself on automatically to announce important news.*
12. *Automobile driveway chimes.* Mailbox alarm.**
13. *Outdoor music podium, hidden among trees.**
14. *Self-opening garage door, worked by car headlights* or push-button radio on dashboard.*

*Items indicated have been in regular use at Dr. Caldwell's home in Cos Cob, Conn.

Application of Supersonics in Metallurgy

The following note has been published in the December 1943 issue of the Journal of Scientific Instruments, London: "According to a recent German article (an abstract of which has been supplied by RTP, Ministry of Aircraft Production), oxide film on aluminum sheets can be removed and proper anchoring of the 'tinning' achieved by the use of supersonics. The sheet is immersed in a bath of molten metal which is subjected to high-frequency vibrations by contacting it with a supersonic generator; frequencies of the order of 12,000 cyc./sec. are employed and the intensity may amount to as much as 10 W/cm. According to the paper, this subjects the contacting zinc particles to accelerations and decelerations of the order of 100g. This process appears to destroy the oxide film and so enable the zinc particles to become firmly anchored on to the sheet.

"Other applications of supersonics in metallurgy mentioned in the paper are the production of finer grain castings by exposing the melt to supersonic radiation during solidification and the production of self-lubricating bronze containing about 25 per cent of graphite."

Modern Magnetic Alloys For Instrument Use

The design trend of electrical indicating instruments has been greatly influenced by the use of permanent magnet alloys which have been developed during recent years, according to M. S. Wilson and J. M. Whittenton, engineers in the Electrical Instrument Section of General Electric's West Lynn

TODAY'S FAMILY ALBUM is no longer a pictorial record, but rather that treasured collection of the world's favorite music and musicians—"Bix" Beiderbecke—Toscanini—Tibbett and Sinatra—Beethoven's Fifth and Fats Waller.

So important have these albums become that the first postwar demand of these record devotees will be a perfected, simple to operate, precision-performance record changer. We envision a device that not merely plays in sequence, but acts as a magical, mechanical master-of-ceremonies, performing for uninterrupted hours, selecting at the owner's whim, executing request numbers, rendering encores, manipulating the records in any arrangement.

We at G. I. are anticipating this demand. In the postwar era a still greater portion of our activities will be devoted to the mass production of Automatic Record Changers with innovations and improvements of great significance.

The first in our industry to be so honored

ARMY E NAVY

General Instrument Corp.

829 NEWARK AVENUE, ELIZABETH 3, N. J.

PHONOGRAPH RECORD CHANGERS—HOME PHONOGRAPH RECORDERS—VARIABLE TUNING CONDENSERS—PUSH-BUTTON TUNING UNITS AND ACTUATORS

Works. They state that for given sensitivities, instruments have been made available which are sturdier and more reliable, and that instruments of higher sensitivity have been made possible by the use of the newer alloys. Also, relatively higher coercive force and high residual materials are now available that are readily machined and use a minimum of critical materials.

Higher sensitivity

For the past 15 to 20 years, cobalt steel permanent magnets have been used in instruments, providing a means of producing higher sensitivities. This material has been used in forged and cast forms and is most attractive from the standpoint of high coercive force of about 210 with total energy of 900,000. However, its inherent high cost limits its use primarily to the higher sensitivity instruments where the chrome and tungsten steels are unsatisfactory. Aluminum-nickel-cobalt iron (alnico) alloys are of particular interest to the electrical instrument designer due to their high values of coercive force and available energy.

Ideal magnet

The ideal magnet from the standpoint of the instrument designer would be one having high coercive force, residual induction and available energy, and which had good machining and fabricating qualities. An approach to this ideal has been made in the cobalt-molybdenum-iron alloys more commonly known as "comol." Comol, whose typical composition is 12 per cent molybdenum, balance iron, contains a minimum of the critical metals; it can be easily cast, and when properly heat treated, can be readily drilled, milled and machined. As a result, accurate machining dimensions permit the degree of precision which is required to fully utilize this material in instrument magnets.

Comol alloy

A coercive force of about 245 is obtained as compared with 210 for 36 per cent cobalt with a residual induction of 10,300, higher than either 36 per cent cobalt or alnico II, and a maximum energy value of 1,100,000 as compared with 930,000 for 36 per cent cobalt and 1,650,000 for alnico II.

A magnet of the comol type containing appreciably lower percentage of the critical elements has been utilized in instrument application as the permanent magnet in a new "thin" line of direct current and radio frequency G-E small panel permanent magnet-moving coil type instruments.

HOW TO PUT ONE AND ONE TOGETHER—AND GET ONE!

IT wasn't so long ago that soldering metal to glass was considered an impossibility. Yet today Corning Glass has developed a metallizing method whereby the base for the solder actually becomes an integral part of the glass itself, producing permanent hermetic seals. The metallized layer solders as easily as brass or copper and is not harmed by normal soldering temperatures. Parts can be soldered to it by an ordinary soldering iron, soft air-gas flame or induction heating. Truly, in this case, you can put one and one together—and get one!

Best of all, Corning type metallizing can now be applied to an extremely wide range of Corning's standard and extra-strong glasses. Where extreme resistance to thermal or mechanical shock is required it can be applied to tempered glass. Where electrical characteristics are of prime importance it can be applied to some of the special low-loss glasses such as Corning's "Pyrex" Multiform Glass No. 790.

If you have a difficult assembly problem on units which must be sealed against leakage of air, oil or water—Corning's metallizing method may very well prove an efficient, money-saving answer for you. But whatever your problem, we want you to know that Corning's unmatched "know how" in glass is always at your service. As a starter we'd like you to have a free detailed study called "There Will Be More Glass Parts In Postwar Electrical Products." Simply write the Electronic Sales Department I-3, Bulb and Tubing Division, Corning Glass Works, Corning, N. Y.

CORNING *means* Research in Glass

Electronic Glassware

T.M.REG. CORNING U.S. PAT. OFF.

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"PYREX" *and* "CORNING" *are registered trade-marks of Corning Glass Works*

MILESTONES TOWARD THE ELECTRONIC ERA

Some Early History of Condensers

by WILLIAM DUBILIER*

On October 11, 1745, Dean von Kleist of the cathedral of Camin, Germany, made an experiment, the importance of which he himself did not grasp, but which was so strange that he thought it worth while to write about it to Dr. Leberkuhn. Said von Kleist:

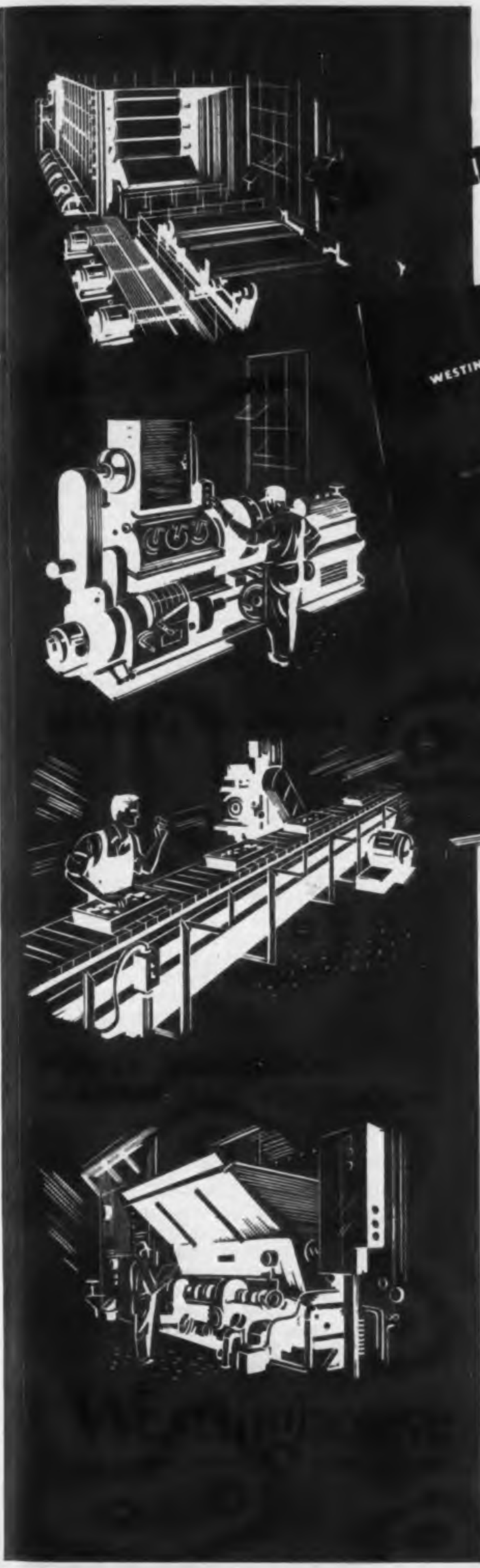
"When a nail or a piece of brass wire is put into a small apothecaries' vial and electrified, remarkable effects follow; but the vial must be very dry and warm. I commonly rub it over beforehand with a finger on which I put some powdered chalk. If a little mercury or a few drops of spirits of wine can be put into it the experiment succeeds the better. As soon as this vial and nail are removed from the electrifying glass, or the prime conductor to which it hath been exposed is taken away, it throws out a pencil of flame so long that with this burning machine in my hand I have taken about sixty steps in walking about my room; when it is electrified strongly I can take it into another room, and then fire spirits of wine with it. If while it is electrified I put my finger or a piece of gold which I hold in my hand to the nail, I receive a shock which stuns my arms and shoulders."

The "Leyden jar"

In January, 1746, Peter van Musschenbroeck made the same discovery independently. It was he who thoroughly studied the phenomena observed. Von Kleist had no explanation of scientific value to offer. Because van Musschenbroeck was a professor in the University of Leyden the apparatus came fittingly to be called a "Leyden jar."

The Leyden jar was a puzzle and a delight to polite society of the eighteenth century. Just as we talked about the X-ray and radium when they were discovered, so Paris and London in their time discussed the Leyden jar over the dinner table. But the old experimenters were unconscionable exaggerators. Gralath, one of them, maintained that the discharge gave some people the nose bleed. Even van Musschenbroeck, when he first

*William Dubilier, whose name has been long connected with condensers and capacitors, has also been a prolific radio and medical-apparatus inventor, holding some 300 patents in these fields. He was a pioneer in airplane communication and submarine detection. His Dubilier Condenser Company was first organized in London in 1910, and in 1916 he formed the Radio Patents Corp., which has licensed many well-known radio manufacturers. He is a Fellow of both the AIEE and IRE. His home is at New Rochelle, N. Y.



nswer is in this book

How to get Stepless d-c Motor Speeds from an a-c Current Supply

Mot-o-Trol, developed by Westinghouse, employs the precision of electronics to provide a new, wide, *stepless* range of speed control for d-c motors from an a-c current source. It starts motors, brings them up to preset speed smoothly and rapidly. It permits wide change of speed at any time, regulates speed under varying loads, applies dynamic braking for timed stopping—and reverses the motor. Many other functions are also possible. There are no separate linestarters—no field rheostats. To get all the facts about this new packaged motor drive, write today for your copy of booklet B-3301. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21306

MOT-O-TROL

Electronics at Work

wrote about his observations to Reaumur referred to "a new but terrible experiment," and said that his arm and body "were effected in a manner more terrible than I can express." The Abbe Nollet, in France, used to kill birds with the discharge to entertain the ladies of the court. Gralath tried to emulate him but succeeded in killing only beetles and worms. In his effort to obtain still stronger effects he hit on the plan of grouping several jars together and then succeeded in killing birds easily.

The most daring and imaginative of all these experimenters was certainly the Abbe Nollet. To amuse the French king he sent a discharge through one hundred and eighty soldiers and later through a line of Carthusian monks nine hundred feet long "by means of iron wires of proportionable length between every two, and consequently far exceeding the line of the one hundred and eighty guards. The effect was such that when the two extremities of this long line met in contact with the electrified vial, the whole company at the same instant gave a sudden spring, and all equally felt the shock." He electrified seeds, vegetables and animals, and noted the effect with painstaking accuracy and thus anticipated modern electroculture researches.

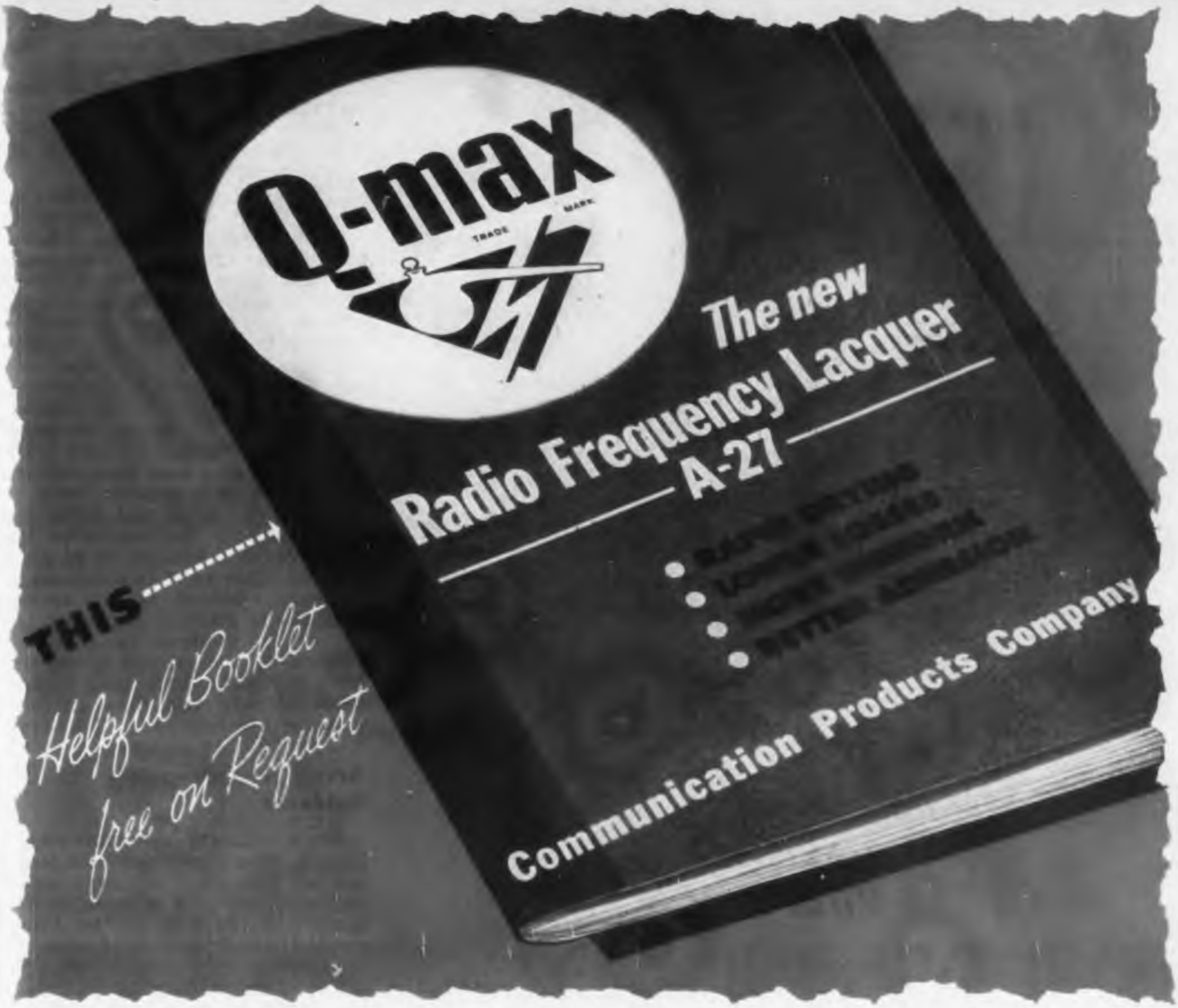
B. Franklin studies

Even scientists were so entertained by such experiments that no one seemed to realize that here was an apparatus which actually stored up electric charges—still the only one of its kind, if we consider the so-called storage battery as a chemical rectifier, as we should. But as the novelty of electrically shocking unsuspecting innocents and of killing birds and insects wore off, serious study began.

To Benjamin Franklin we owe the first scientific research that threw any light on the Leyden jar's strange properties. It was he who conceived the idea of connecting the outer coatings of a number of Leyden jars to produce his famous "cascade battery," in which the strength of the shock was enormously increased; and it was he who proved that the charges reside on the surface of the glass, not on the metallic coatings.

In 1746 Dr. Bevis gave the jar its conventional modern form of a glass bottle which is coated part way up inside and outside with tinfoil and which has a metal chain suspended from its cover so as to touch the inner tinfoil coating. The only change made from that day to this is the employment of electrically deposited copper instead of tinfoil.

What happens in the Leyden jar or condenser? According to the



Just off the press is this interesting 24-page booklet describing in detail the new and improved Q-Max A-27 Radio Frequency Lacquer.

Uses are illustrated and described . . . the excellent electrical and physical properties, as determined by careful laboratory tests, are recorded . . . the dielectric constant, power factor and low loss factor over a wide frequency range are shown in graph form . . . the results of laboratory tests on density, dielectric strength, acid member, drying time and other characteristics are reproduced.

Send for your copy of this informative booklet today.

Communication
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FACTORY: 346 BERGEN AVE., JERSEY CITY, N. J.

Coaxial Transmission Line and Fittings • Sterling Switches
Auto-Dryaire • Antenna and Radiating Systems • Q-Max A-27 Radio Frequency Lacquer

FACSIMILE—TODAY AND TOMORROW

Today Facsimile transmission is bringing back pictures of distant battle scenes within a few minutes; reconnaissance planes are sending to their headquarters sketch maps and notes made right over vital spots. Some day, perhaps, headline news can be typed and delivered in our living rooms; news pictures will be in our homes minutes after an event; police departments will flash fingerprints and photos throughout the world...no one knows what the future holds in store for Facsimile.

After the war, the Communication Products items listed below will again be entirely at the service of industry—for improving commercial broadcasting and helping to develop whatever new applications of radio and television peacetime will reveal.

older physicists, who believed in the "two-fluid" theory of electricity, a positive charge is given to the inner coating and an equal negative charge is induced simultaneously on the outer coating; the two charges unite when the two coatings are connected.

Franklin, who formulated the "one fluid" theory, referred all electrical phenomena to the accumulation of electricity in bodies in quantities more than their natural share, or to its being withdrawn from them so as to leave them minus their proper portion. On this theory the discharge of a Leyden jar consists in the passage of the excess through the conductor from one coating of the jar to the other.

Faraday, at a later date, realized that there is a peculiar state of strain in the glass and called the non-conductor that separated the metal coating, whether it be glass or some other suitable substance, a dielectric. Indeed, to such an extent is the glass of a Leyden jar electrically strained or squeezed, because of the tension along the lines of electric force, that, if it is made of very thin glass, it may actually give way under the stress

Army Broadcasting Systems

While military communications are the most important consideration on the most extensive radio system, or series of systems, in the world now operated by the Army Signal Corps, broadcasting of radio news and entertainment is not forgotten. In addition to day and night short wave broadcasts from the United States and the British Broadcasting Company in London, American troops all over the world can tune in on one or more of the scores of long and medium wave stations for special Army broadcasts. The Army owns and operates some of these stations and buys or is donated time on others.

In England the Army owns, and operates in cooperation with OWI, its own network of 55 stations which broadcast most of each day. Most of the stations are low-powered with broadcasting radius of only 10 to 15 miles, but they dot the British Isles and reach most American troop outposts there. In South Africa the Army has use of a large network of stations covering most of the outposts in that part of the world and reaching outposts in equatorial Africa. Australia permits our troops to broadcast their own programs from the 30 stations in the "land down under." In Iceland the only broadcasting station is the government-owned one at Reykjavik which leases 4 or 5 hours a day daily to the Army.

(Turn page)

NO INSULATING SLEEVING TO BUY—STOCK—or APPLY

A-MP

PRE-INSULATED

DIAMOND-GRIP SOLDERLESS TERMINALS

(Fully Protected by Patents Pending)

THE INSULATION IS BONDED TO THE TERMINAL

RED

INSULATION FOR

22-18

BLUE

INSULATION FOR

16-14

Perfect solderless connections — designed for mass production — with pre-insulation that saves time, labor, money!

Production cost of applying separate tubing to the terminal approximately the same as the cost of applying the terminal itself to the wire.

Only one operation — just crimp terminal on wire. Nothing else.

The insulation is bonded to the terminal and cannot be removed accidentally.

All of the features of the famous AMP Diamond Grip Insulation Support Terminal. The insulation takes the exact contour of the crimp.

Easy identification: Red insulation on terminals for wire sizes 22 to 18; Blue insulation on terminals for wire sizes 16 to 14. Press dies marked with matching color.

All the facts! Write today for **Bulletin 29 which includes test data.**

AMP precision power - operated dies make one complete crimping cycle in 28/100 of a second—every crimp is perfect.

"PRECISION ENGINEERING APPLIED TO THE END OF A WIRE"

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AIRCRAFT-MARINE PRODUCTS INC.
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SOLDERLESS WIRING DEVICES

A & M ACCESSORIES, LTD., TORONTO, ONTARIO, CANADA

Fourteen small-radius stations are now being operated by the Army in Alaska and the Aleutians, but there have been reception difficulties due to polar magnetic disturbances which are being remedied by the shipment of more receiving sets. In the Southwest Pacific for a time the only American radio programs came from the Pacific coast with rather poor short wave reception so that for a long time American troops had to tune in on Radio Tokyo. To correct this situation small portable transmitters that can be set up and dismantled quickly and cover a radius of from 150 to 500 miles have been shipped to the Southwest Pacific by the Army and are being used. In addition, the Army has recently begun shipping to that area small portable broadcasting stations that are so compact that they can be packed in a trunk and carried by two men.

The small outposts in the Caribbean are served by Army-owned stations at Panama and Trinidad and by a commercial station at Puerto Rico on which the Army buys time several times a day.

The Navy operates no broadcasting stations of its own since so much of its force is afloat and depends upon picking up programs from Army or commercial stations. While radios are standard equipment for any naval unit, their use is often greatly restricted in potential battle zones. To be acceptable aboard ship receiving sets must not have regenerative qualities which would disclose the ship's location.

Electrostatic Dust Removal

Dust and dirt in the air levy a continuous toll in industry. One of the most valuable weapons to be developed in the war against this deadly saboteur has proven to be the Precipitron, otherwise known as an electrostatic dust precipitator. Its applications continue to expand as time goes on.

Particularly successful has been the adaptation which catches oil mist at high-speed grinders. The fast-spinning tool heats and thrashes the cooling oil into a cloud that fills the atmosphere. In some plants it has created a fire hazard. It condenses on walls and pipes, causes premature electrical insulation failures and makes working environment unpleasant. Removal of the oil mist at its source not only eliminates these objections but also recovers the lubricant for re-use. Due to this saving, some plants are now able to use a better, more expensive cutting oil to obtain greater production. Precitrons for oil mist removal, have now

Thinnest rectangular magnet wire

RIBBON FORMEX

NOW AVAILABLE IN SIZES ALMOST AS THIN AS THE HUMAN HAIR

The new and novel shapes of G-E Formex* magnet wire now being made for the war program are vitally interesting to makers of fine electronic and other electric components.

Heretofore, .015 inch was considered the low limit for thickness of rectangular magnet wire. Now, G-E Formex magnet wire is available in ribbon-rectangular shapes as thin as *four one-thousandths of an inch.*

Smooth, strong, flexible, and able to withstand high-speed winding without damage to insulation, the new ribbon-rectangular Formex offers great possibilities. On jobs where previously round wire had to be used, it will ***substantially increase*** winding space factor. It may also be used in place of larger-size, rectangular magnet wire to ***increase magnetic effect*** or ***reduce size*** of coil.

In coil winding, varnish treatment, assembly, and actual operation, this new, ribbon-rectangular magnet wire, like all other Formex shapes, offers many advantages. Note the variety of the rectangular shapes, shown at right.

For further information on the use and selection of Formex magnet wire, ask the nearest G-E office for Bulletin GEA-3911. *General Electric Company, Schenectady, N. Y.*

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

GENERAL ELECTRIC

503-16-3200

HERE ARE SOME OF THE SIZES OF RIBBON FORMEX

THICKNESS IN MILS	WIDTH IN MILS	NOMINAL CIRCULAR-MIL AREA	NOMINAL RESISTANCE, OHMS PER 1000 FT AT 25 DEG C
4.0	100	506	20.85
5.0	100	632	16.70
5.0	85	537	19.65
5.0	125	791	13.33
5.6	112	793	13.30
6.0	125	946	11.15
6.7	100	845	12.50
7.5	85	802	13.15
8.0	100	1007	10.50
9.5	125	1496	7.07

*Reg. U.S. Pat. Off.

proved themselves highly successful in dozens of plants.

War has placed new emphasis on food processing. It has developed the dehydrated foods industry to full stature and electrostatic air cleaning is playing its part. Powdered milk plants use Precipitrons to keep dust out of the large volumes of warm air required for dehydration. Thus, the plant can be built in the city close to distribution centers and labor supply. Formerly, they were located less conveniently in the country where clean air was plentiful.

Experimental measures

Blast-furnace gases are used as fuel for engines and furnaces. Naturally, dust in the gas is injurious—it is ruinous to engine valves and cylinder walls and gums up furnace nozzles. A trial Precipitron on one steel company's blast-furnace gas supply gives hopeful indication that it can cope with this severe dust problem.

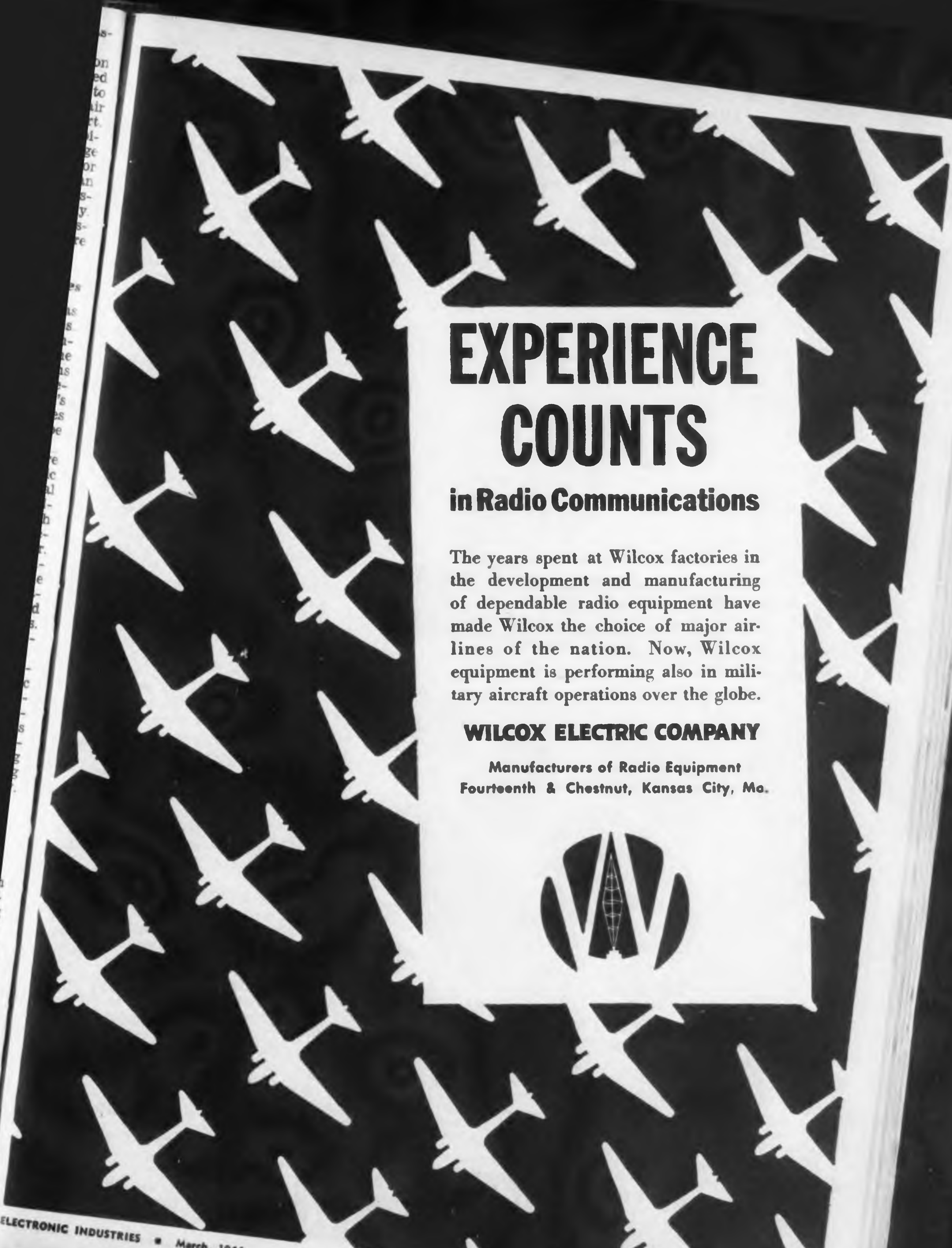
Automotive engine builders are experimenting with electrostatic air cleaners for reducing internal wear caused by road dust. Railway car use was tried out with highly successful results just before the U. S. entered the war. When materials are again available, an improved version of the unit will be built—it will be suitable for existing and new railroad coaches, diners, and Pullmans. With Precipitron every car can become a smoking car.

Some time ago a major improvement was effected in electrostatic air cleaner construction. Engineers have developed a dust-collector cell having collector plates that stand on edge. This new design greatly simplifies cleaning procedure and permits washing solution to drain off more rapidly.

High Frequency Heating Advantages in Plastics

High frequency heating is an important tool in the plastic industry, reported Gregory W. Blessing at the December meeting of the Plastic Institute Alumni Association, but one that will require specific development. Mr. Gregory is the inventor of "Thermoplastic Fusion," a method of bonding metal to metal by using plastics as the bonding agent and fusing the plastic material by high frequency heating. Covering the developments in the plastic field centering around the use of high frequency heating, he pointed to the following advantages:

1. Reduces time cycles in the press; 2. reduces pressure required in molding; 3. improves flow of material resulting in less internal strain in the molded part; 4. im-


EXPERIENCE
COUNTS
in Radio Communications
The years spent at Wilcox factories in the development and manufacturing of dependable radio equipment have made Wilcox the choice of major airlines of the nation. Now, Wilcox equipment is performing also in military aircraft operations over the globe.
WILCOX ELECTRIC COMPANY
Manufacturers of Radio Equipment
Fourteenth & Chestnut, Kansas City, Mo.

proves flow of material allowing use of inserts with less danger of mold pin breakage as well as permitting the use of smaller inserts 5. makes it possible to mold either more intricate or larger parts.

On the other hand, he stated there were some things we must know more about, such as:

1. A better means of heating molded powder making it unnecessary to make preforms; 2. the ideal molding material that will not gas or sweat excessively causing sticking to the electrodes; 3. variations in the exact time cycles in heating of the material due to variations in bulk of the material, variations in the apparent impedance of one preform to another due to chemical differences in the materials from one lot to another; 4. the change-over from one molded product to another entails some degree of technical knowledge on the part of the set-up man. Some of the existing equipment could be improved in this respect.

Visualizing Screens Needed for Aircraft Control

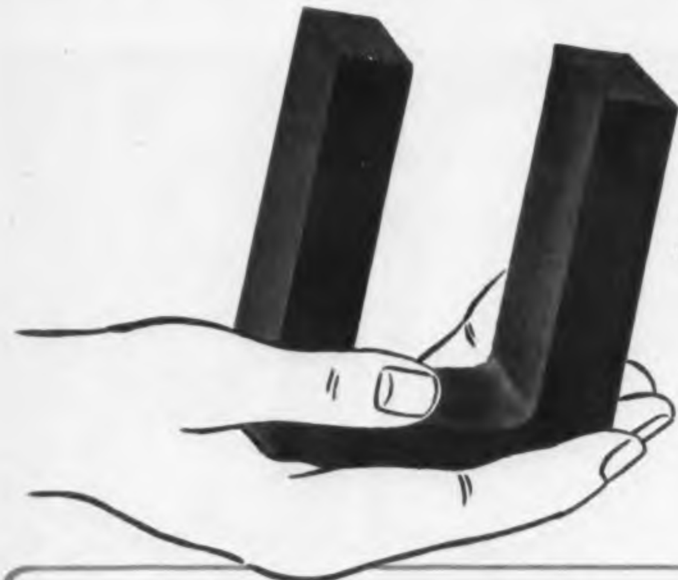
Pointing out the grave need for advance planning for better air traffic control, Glen A. Gilbert. Chief, Air Traffic Control Division of the Civil Aeronautics Administration, told the American Institute of Electrical Engineers that the increase in air traffic by 1950 over that existing in 1941 will be approximately 14 times by air carrier aircraft, 18 times for private aircraft, and 10 times for military aircraft. This means, he added, that schedule air passenger traffic by 1950 will increase approximately ten billion passenger miles; air cargo will increase to six hundred million ton miles of freight and express; there will be a total of approximately five hundred thousand aircraft in service as compared with about thirty thousand before the war.

Mr. Gilbert's address was devoted primarily to methods of radio traffic control, and he states that improvements in equipment and in its use which are now ready and which the Civil Aeronautics Administration can place in effect in the immediate future will permit an increase in capacity to at least four times its present capacity. Even this increase is nowhere near enough for the future. "The improvements now planned will be merely stop-gaps," he said.

Collision devices

Although there has been widespread opinion that radio detection devices will greatly change air traffic control in the immediate postwar period, this does not seem likely. Such equipment, he points out.

CHECK THIS FASTER HF COIL ASSEMBLY METHOD . . .



WITH PRE-ASSEMBLED

Two-piece

HIPERSIL* CORES

Now you can eliminate the time-consuming operation of stacking hundreds of tissue-thin core laminations by hand for High-Frequency Communications Equipment. Pre-assembled Type C HIPERSIL cores are delivered to you in just TWO ready-to-assemble pieces per loop. Westinghouse winds a thin strip of HIPERSIL to form, bonds it, then cuts it in two.

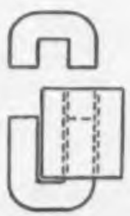
These split-type cores of HIPERSIL are available in a complete range of standard sizes, or they can be furnished uncut in rectangular or circular shapes if desired.

GET THE FACTS ABOUT HIPERSIL TYPE C CORES... write for **HIPERSIL BOOK, B-3223-A.** It contains performance facts and application data that will help speed production of vital communications equipment to the fighting forces. Address: Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-70423

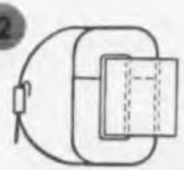
Registered Trade-Mark, Westinghouse Elec. & Mfg. Co., for HIgh PERmeability SILicon steel.

COMPARE THIS WITH YOUR PRESENT CORE ASSEMBLY METHODS

1 Core is placed around coil.

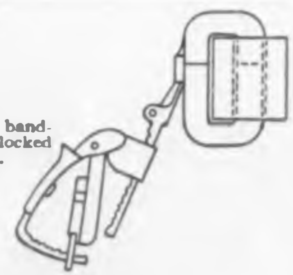


2



Core parts are butted together. Strap is threaded through seal and . . .

3 . . . tightened with banding tool. Band is locked in place with seal.



Banding Straps, Seals and Tools available from Westinghouse. See Page 9 of booklet B-3223-A.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

HIPERSIL CORES

is immediately concerned with detecting the presence of objects that will not cooperate, such as enemy airplanes. What is required is something that will reveal the presence of all aircraft that will cooperate, and this requires a different technic. Already, he says, there has been developed a vertical separation indicator by means of which the pilot may determine at a glance the vertical separation between his aircraft and other aircraft within a fixed radius.

A somewhat different device, he believes, might be developed as a "horizontal separation indicator." Such equipment would include a screen on which various size dots would indicate the relative position of other aircraft located within an area ahead of the aircraft concerned, and at least 45 deg. above and below as well as to the right and left. Development of such an automatic aircraft position recorder would materially contribute to the reduction of one of the major limitations of the present air traffic control system—the use of the voice as a communication medium. He added:

"With the establishment of automatic air traffic control devices in aircraft and with the provision of corresponding ground facilities, there appears to be but one remaining need of air traffic control which will require additional ground facilities. This is the constant portrayal of actual positions of aircraft to controlling personnel.

"By the installation of 'scanning screens' in airport traffic control towers, it appears that this requirement can be met. One screen would portray the positions of aircraft in a horizontal plane within perhaps 25 miles of the airport. The aircraft positions would be indicated by a spot of light which would be constantly moving as the aircraft positions change. Another screen would show the relationship of aircraft in a vertical plane along the path followed by aircraft when approaching the airport under instrument weather conditions. A dot appearing on this screen would indicate the altitude of the aircraft and its position in the holding flight path."

Skillin to Great American

Walter F. Skillin has been made a vice-president of Great American Industries, Meriden, Conn. He was formerly chief engineer for Chandler-Evans Division of Niles-Bement-Pond and received his engineering training in the Lynn and Schenectady plants of General Electric. He was also six years on the engineering staff of the Fafnir Bearing Co., New Britain, Conn.

HOW TO SMOOTH OUT AIRCRAFT VOLTAGE VARIATIONS

VOLTAGE variations inherent in aircraft electrical systems may handicap the performance of precision electronic or other electrically powered devices you manufacture. If so, a Webster Voltage Regulator may solve the problem for you as it has for other manufacturers of airborne equipment. Tell us about your problem . . . we will be glad to analyze it for the applicability of Webster Voltage Regulators. No obligation, of course.

LOOK TO WEBSTER PRODUCTS

TODAY	*TOMORROW*
Dynamotors and Voltage Regulators	**World-Acclaimed Record Changers**

WEBSTER PRODUCTS

3825 W. ARMITAGE AVE. CHICAGO 47, ILLINOIS

On Structure of Wool Fibers

In the October 1943 issue of the Journal of Research of the National Bureau of Standard, C. W. Hock and H. F. McMurdic report an investigation of wool fibers with an electron microscope. The growing wool hair has a bulbous root situated below the surface of the skin and a filamentous shaft that extends above the skin surface. The shaft, in turn, is made up of dead cellular units which are arranged in layers: an outer layer of scales, the cuticle, a middle region called the cortex, and a central core or medulla.

Methods for the preparation of the specimen are discussed. Scale and cortical cells being responsible for the mechanical properties of the wool fiber, their structure has been studied. Fine microfibrils were found within the cortical cells, while the scale cells show little internal organization.

Spectro-Chemical Analysis

In a paper read at the 28th Annual Meeting of the Optical Society of America, in Pittsburgh, October 1943, E. A. Boettner, Wyandotte Chemicals Corp., and A. P. Brewington, Lawrence Institute of Technology, Detroit, describe a device for the application of multiplier phototubes to quantitative spectrochemical analysis. A bridge circuit incorporating two multiplier phototubes (RCA 931) has been adapted to indicate the ratio of intensities of spectral lines when the tubes are mounted on the spectrograph in place of the photographic film.

Abstracts of Patents Available

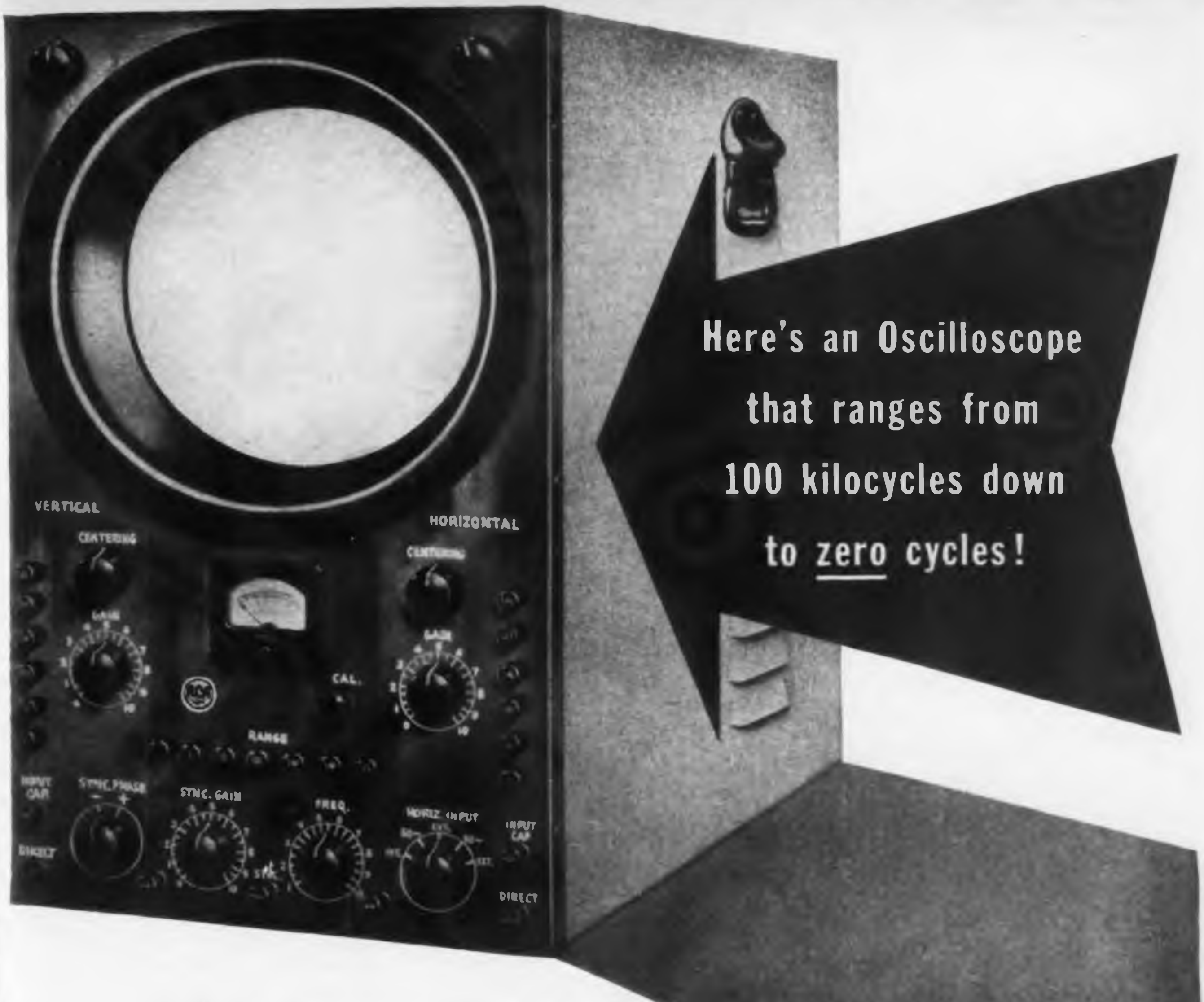
The Office of Alien Property Custodian, Room 311, Field Building, Chicago 3, Illinois, plans to publish abstracts of electrical, mechanical and chemical foreign-owned U. S. patents most of which are available under simple licensing terms.

The office is sending out questionnaires to persons and firms interested in licenses to determine whether they think it necessary to publish descriptions of 37,500 vested patents and applications in the mechanical and electrical fields. It is not possible to prepare abstracts, as has been done for chemical patents, but a drawing and a typical claim would be reproduced. About 1000 of these abstracts would be arranged in one booklet, according to subject matter, available at a cost of $1.00 to $1.50 each, depending on the probable demand for the material as revealed by the present survey.

Honor POW Strauss

Sgt. George B. Strauss, Jr., a valued employe of Chicago's Rauland Corp. to the time of his enlistment in the Air Corps in March, 1942, became a Nazi prisoner last summer when his Flying Fortress "The Hellions" and fellow crew were shot down in action over Hanover, Germany. As the Rauland plant is heavily engaged in the production of electronic communications equipment for the U. S. Signal Corps it was chosen by army officials as the scene of the impressive ceremony for proxy presentation of air medal and oak leaf cluster to Sgt. Strauss—his mother receiving the honor in his behalf.

President E. M. Rauland, the Rauland Corp., took a prominent part in the absentee award of an Air Medal to POW ex-employe Sgt. Strauss. Others are: Major L. M. Eok and Mrs. Mary Strauss



RCA Type 327-A D.C. Oscilloscope

THAT'S why it's called a D.C. Oscilloscope: because it uses direct coupled amplifiers having a low frequency characteristic that holds good all the way down to *no* frequency—in other words, direct current.

Equipped with 9" tube—RCA 914 high vacuum type.

Identical horizontal and vertical amplifiers.

Direct connection (capacity coupling) may be made to either pair of deflecting plates.

Vacuum tube (non-gaseous) timing axis oscillator operates down to 1 cycle per second. Special feature for converting normal timing axis to a single sweep circuit for study of transient phenomena.

Ideal for photographic work: combined blanking circuit provides increased intensity and illumination only during sweep.

Fitted with push button switches for fast manipulation.

AMPLIFIER CHARACTERISTICS

FREQUENCY RANGE
0 to 100,000 cycles per second.

DEFLECTION SENSITIVITY
DC—.06 volts per inch.*
AC—.02 volts RMS per inch.*
AC direct to deflecting plates —52* volts RMS per inch.

MAXIMUM INPUT
AC—800 volts for 8" deflection.*
DC—240 volts for 4" deflection.*

ATTENUATOR RANGES
4 steps of 10 to 1 each, with fine control over each range.

*Approximate

NOTE: Deliveries as scheduled under General Scheduling Order M-293 of WPB. Please address inquiries to Test and Measuring Equipment Section, Radio Corporation of America, Camden, New Jersey.

RCA

Test & Measuring Equipment

RADIO CORPORATION OF AMERICA

WHAT'S NEW

(*Continued from page 194*)

Solderless Terminals

A pre-insulated terminal designed for mass production has the insulation permanently bonded to the copper of the terminal so that it cannot be accidentally removed. Pre-insulation eliminates the need for buying, stocking and applying insulating sleeving to crimped terminals. These terminals require only one operation — merely to crimp the terminal on the wire with the installation dies. The pre-insulation takes the contour of the crimp without distortion. Identification of terminals and matching dies is made easy by marking each of the two sizes with a distinctive color — red for wire sizes 22 to 18, blue for wire sizes 16 to 14. Manufactured by Aircraft-Marine Products, Inc., 1591C N. 4th St., Harrisburg, Pa.

Cellophane-Tape Recorder

A new sound-recording machine, capable of up to eight hours of recording and automatic playback, has been developed by the Fonda Corp., 245 E. 23 St., New York. The first commercial model not much larger than a table-model radio receiver, is a precision instrument which records and plays back on cellophane tape which is a little more than an inch in width, an endless loop 320 ft. long and permits up to eight hours of recording at a cost of only 50 cents per hour to the consumer. At present the Fonda tape recorder is available in three models: the 8-hour portable recorder, the one-to-eight hour stationary unit for airports, radio broadcasting stations and governmental use; and a small unit which records for up to 1-hour.

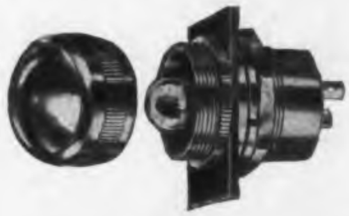
The problem of how to press the sound track on the tape with a needle, without cutting the tape, was Engineer Jay Fonda's first problem. This was solved through the adoption of a yieldable felt bed directly under the recording needle. The tape runs under the needle at a rate of about 40 ft. a minute.

Aircraft Relay

A new solenoid type 50 amp. aircraft relay has been developed by the Hart Mfg. Co., Hartford, Conn. This relay has been developed primarily for the aviation field and is for controlling circuits for landing lights, fuel pumps, gun firing controls, etc. Weight is below .6 lbs.; it will withstand a surge load of 400 amps. without injury to the contacts. Leads are fully protected, and it will withstand vibration of 5 to 55 cycles per second with a total excursion of 1/16 in. in any direction.

Pilot Light Assembly

The Dial Light Co. of America, Inc., 90 West St., New York, N. Y., has developed a new pilot light assembly known as the "Compacto". It is intended to serve two primary purposes: (1) To adapt a large jewel holder to a panel where mounting space behind the panel is limited. (2) To provide a large surface light on a low voltage panel. It is made of brass, or aluminum, with the socket housing made of Navy specification bake-



lite sealed with bakelite varnish. The screw-in type jewel holder facilitates bulb replacement. Finishes in 7 approved platings. Lenses may be smooth or diamond-faced; if smooth, they may be clear color, sandblasted on back, or sandblasted over-all. Lense colors may be red, green, amber, blue, yellow, opal white or clear. The unit has silver-plated vibration-proof terminals, and may be had grounded or ungrounded. The socket accommodates the following lamps in all voltages: T3¼ miniature bayonet base single contact lamps; also TS-53 miniature bayonet base lamps and Mazda No. 51 G3½ miniature bayonet base lamps.

Parts Identification

Recent military orders have made it necessary in many cases to individually mark aircraft and radio replacement parts. Avery Adhesives, 451 East Third St., Los Angeles 13, has developed a label that is being widely used for this application. These stickers are mounted on a translucent tape so that they may be rapidly run through an Addressograph machine where they are given their code numbers. Other features of Kum-Kleen stickers are that they are applied without moistening and, after they have served their purpose, can be peeled off without scraping the surface of the parts.

Pressure Switch

Hercules Electric & Mfg. Co., 2416 Atlantic Ave., Brooklyn, N. Y., has developed a new type of electrical pressure switch with pressure ranges from five to five thousand pounds. The switch is equipped with a direct action gage for hydraulic pressures, operating the switch. Pictured is model H-3-2a, overall dimensions being 10 x 7 x 3 in.

HISTORIC FIRSTS

When trans-Atlantic communication became a fact

It was way back in 1907 — October 17, to be exact — when trans-Atlantic radio communication was first established, and it was Leonard R. Johnstone, at present acting chief clerk in the Los Angeles office of Press Wireless, who was at the key. He tells of that experience and of others leading up to it in the Press Wireless "Signal". He says:

"My first experience with wireless dates back to 1896 when I had a chance to pry into the methods then employed. At that time I was working in a commercial office and was picked out of many others to take part in some tests which the late John W. Mackay and his assistant, James Cuttriss, were conducting in North Carolina in an endeavor to establish communications through space without wires. Their equipment was a closely guarded secret and, being merely an operator, I did not get as well acquainted with their apparatus as I would have liked. They were quite confident they would achieve success, but after several weeks' tests, the experiments were given up as unworkable and their dream abandoned.

Marconi's first attempts

"At the same time Guglielmo Marconi was working out his ideas at his home in Bologna, Italy. With a small induction coil and dry cells used for a transmitter, he had strung wires on bamboo poles in his back yard with astounding results. Later, he went to London and met some of the British government representatives and prevailed on them to give his invention a trial. He was then only a young man with the appearance of a boy. He was given an audience, however, which resulted in his receiving permission to conduct tests across the English Channel to France.

"These tests were very successful as were also his tests between Dover and the Goodwin Light Ship. From then on, with the use of Leyden Jars, a ten-inch induction coil and relays operated by dry "Q" cell batteries for his hook-up as a receiver, he achieved remarkable results. With this equipment he was able to transmit and receive at a distance of eighty miles from point to point. The detector he used in connection with his relays was the "Coherer," made by two brothers, Dick and Jack Cave, at Dalston, England.

"This little tube, very small in size, had two silver plugs in the center with soft metal filings in between the contacts which were connected each side of the contacts and came out each end of the tube. These were connected to the relay circuits which operated the Morse inker recorder. The incoming signals, make and break, were regulated by this little tube. The filings, contacting and releasing during the period of the incoming signal, also controlled the Morse recorder which registered dots and dashes.

"The tuning was on 'A' 600 meters and on 'B' 800 meters. There were also two aerials, one for each wavelength, and these had to be changed over when shifting from one wave to another. When the plain aerial was used, these tunings had to be disconnected.

"The inker recorder in the receiving circuit worked in a similar fashion to the Creed, only it made a lot of noise and, if you could not read the slip, you could always rely on reading the message from sound. At Glace Bay they used "High Hats" — coils made from the cylinders of ten-inch coils wound for long wave tuning. In the circuit were twelve Fleming Valves mounted on ebonite bases with heavy asbestos under them for protection. I shall never forget the intense heat from these valves during reception. They were right at my head and, I'm sure we could easily have fried an egg or two on it, while receiving.

"I had many thrills in the early days of wireless. The inauguration of the first trans-Atlantic commercial communication October 17, 1907 was quite an event. It was established between Glace Bay on Cape Breton Island and Clifden, Ireland

(Turn page)

Mr. Marconi gave a champagne dinner for all the celebrities and newspaper correspondents who were there and permitted each correspondent (there were about twenty-five of them) to send a message not exceeding fifty words.

"The most harrowing and exciting time of my career was when the Titanic was sunk by an iceberg in 1912. I was in charge of the Halifax station when that happened, and I shall never forget it. We were on duty three days and nights with almost no sleep. We were advised of the accident long before the outside world knew anything about it. Hundreds of messages were relayed from the Cape Race Newfoundland station to Halifax by cable.

"Marconi was really a fine man to know and, in spite of so much competition, he was very quiet about the project and would never say anything against any of his competitors. In fact, he often praised them and wished them success. There was excess jamming of the air at that time with Slaby-Arco and the old plain aerials and many other contraptions buzzing the ether. Marconi always held Dr. Lee DeForrest in the highest esteem, but he did not seem so well disposed towards Professor Fessenden who was pumping out the letter 'D' twenty-four hours a day when Marconi was trying to establish communication with Ireland. He often voiced his resentment, but when the 'D' operator at Brant Rock broke down, Marconi beat him to it and opened communications with Ireland in spite of the heavy atmospheric and terrific lightning splashes. I got a real kick out of having the honor of sending the first message across the Atlantic for this was the beginning of Commercial Trans-Atlantic Communication."

Comdr. McDonald Outlines FM's Future

In letters addressed to newspaper publishers throughout the country, Comdr. E. F. McDonald Jr., president of Zenith Radio Corp., Chicago, presents a striking summary of the future development before frequency modulation, and urges that newspapers consider postwar operation of FM transmitters as part of their own promotion activities.

Quoting from Comdr. McDonald's letter:

"This letter is not a bid for publicity, nor is it intended to benefit either Zenith or the radio industry, as plenty of FM stations will operate whether or not you act. We have no apparatus or transmitting equipment to sell you. My sole purpose is to point out the opportunity FM offers to the press of the United States in helping it retain the leadership in molding public opinion it has held for the past century.

Dominate locally

"FM is an entirely new method of broadcasting. It was off to a flying start when war interrupted production of new radio receivers and construction of new broadcasting stations. Its superiority to the amplitude modulation now used for standard broadcasting is so striking that I believe it will quickly dominate the field of local broadcasting in the postwar period. Moreover, it is ideally adapted to the needs of a newspaper.

1. FM broadcasting stations are much less expensive to erect and operate than the old type amplitude modulation stations.
2. There will be plenty of FM channels available; wavelengths are not, as with present amplitude modulation, limited to a fortunate few.
3. FM erases static, both man-made and nature-made, and transmits programs in its area with dependability, fidelity, and realism hitherto unknown.
4. While the range of an FM transmitter is limited, it will cover the heart of any newspaper circulation area without interference from other stations at any hour of day or night.
5. FM is, in my opinion, destined

to replace most of the present-day stations except long-range clear channel stations. Many will disagree with me on this statement, but may I suggest that many were not in agreement with me some years ago when I stated, as I still state, that television was, and is, just around the corner, for stock salesmen only.

Most receivers will have FM

"FM faces none of the economic hurdles that have held back television. It is here. I grant you that not more than one per cent of existing radio sets are equipped to receive FM, but I predict that when the war is over it will be difficult, if not impossible, to sell any radio for forty dollars or more that does not have FM, and prices may go well under this.

"Now I am going to make an unorthodox suggestion with which you may not agree. I feel that it is a mistake for a newspaper owning a broadcasting station to compete with itself by selling radio time for advertising. I believe it will pay many newspapers to erect an FM station and charge the cost of its operation to advertising the newspaper. This will build good will and win the gratitude of the public by eliminating the annoyance of commercial announcements, plug-uglies if you will, that the public resents on the radio today. I speak from experience when I say that an FM station presenting good programs without commercial sponsorship will win and hold a large share of the radio audience. If you, on the other hand, want to compete with yourself by selling time on your FM station, you may, but you will not enjoy the audience and popularity you will without advertising.

"We have operated Zenith FM radio station WWZR in Chicago for nearly four years, and sold no advertising. We use no live talent—use only high fidelity transcriptions and recordings, of which there are splendid services available. We make only two announcements an hour, and even these are recorded. On one of these announcements we present the merits of Zenith as you could present the merits and features of your publication. We find that this practice creates no public resentment.

War plants and restaurants

"The number of FM sets in Chicago is limited, but there are scores of restaurants catering to thousands of customers who use our FM music constantly in preference to any other music, radio or otherwise, available. In addition to this, there are about fifty war plants, employing thousands upon thousands of

TYPES OF SUPERIOR TUBING IN MANY METALS—MAX. OD—5/8"

MECHANICAL—Analyses generally handled are SAE 1010, 1015, 1020, 1025, and 1035. They are used wherever tubes are machined, formed, bent, etc.

AIRCRAFT—Requirements of this industry cover every analysis. Major production is in SAE 4130X, SAE 1025, SAE 1010, Stainless Types 304, 321, and 347, Inconel and Aluminum. Government specifications in constant use are AN-WW-T-846, AN-WW-T-850A, AN-WW-T-855, AN-WW-T-858, AN-WW-T-861, and AN-T-43. Also certain AMS specifications, with reservations because of size range or availability of redraw stock. As substitutes become available, Superior will advise customers as far in advance as possible. Practically all of these changes will be forced by war conditions, but we are confident that the substitutes will be every bit as effective for the application as the material being supplanted.

INSTRUMENT TUBING—In this field, Superior furnishes hypodermic needle tubing, metal tubing for surgical instruments and parts, pointer tubing for electrical instruments, flattened tubing for Bourdon Springs. The hypodermic needle tubing is available in all standard sizes in the temper developed over a period of years, as most suitable for the application. The pointer tubing is generally aluminum where you get the combination of extreme lightness and maximum strength. For Bourdon Springs, Superior uses SAE 4130 X and Beryllium Copper.

CORROSION RESISTANT TUBING—In this category, Superior places the Stainless Steels, Nickel, Monel, Inconel, Copper and Aluminum. All of these are handled more or less regularly. The use of these alloys is indicated wherever you would find the problem of corrosion, whether because of acids, atmosphere, etc.

TUBING FOR ELECTRONIC APPLICATIONS—At the present time, Superior is furnishing Seamless Nickel, Monel, Inconel and Stainless. The tubes are used as anodes and cathodes in practically all types of Electronic tubes. In addition, we produce Lockseam Sleeves** made from Nickel strip and also some Lapsleeves made in somewhat the same way. Also tubing with special magnetic and glass sealing properties can be obtained. We urge you to get in touch with us when you are developing a design.

** U. S. Patented

SUPERIOR

THE BIG NAME IN SMALL TUBING

SUPERIOR TUBE COMPANY, NORRISTOWN, PENNSYLVANIA

FOR EVERY SMALL TUBING APPLICATION FROM 5/8" OD DOWN

SUPERIOR Seamless in various analyses. WELDRAWN Welded and drawn Stainless, "Monel" and "Inconel"

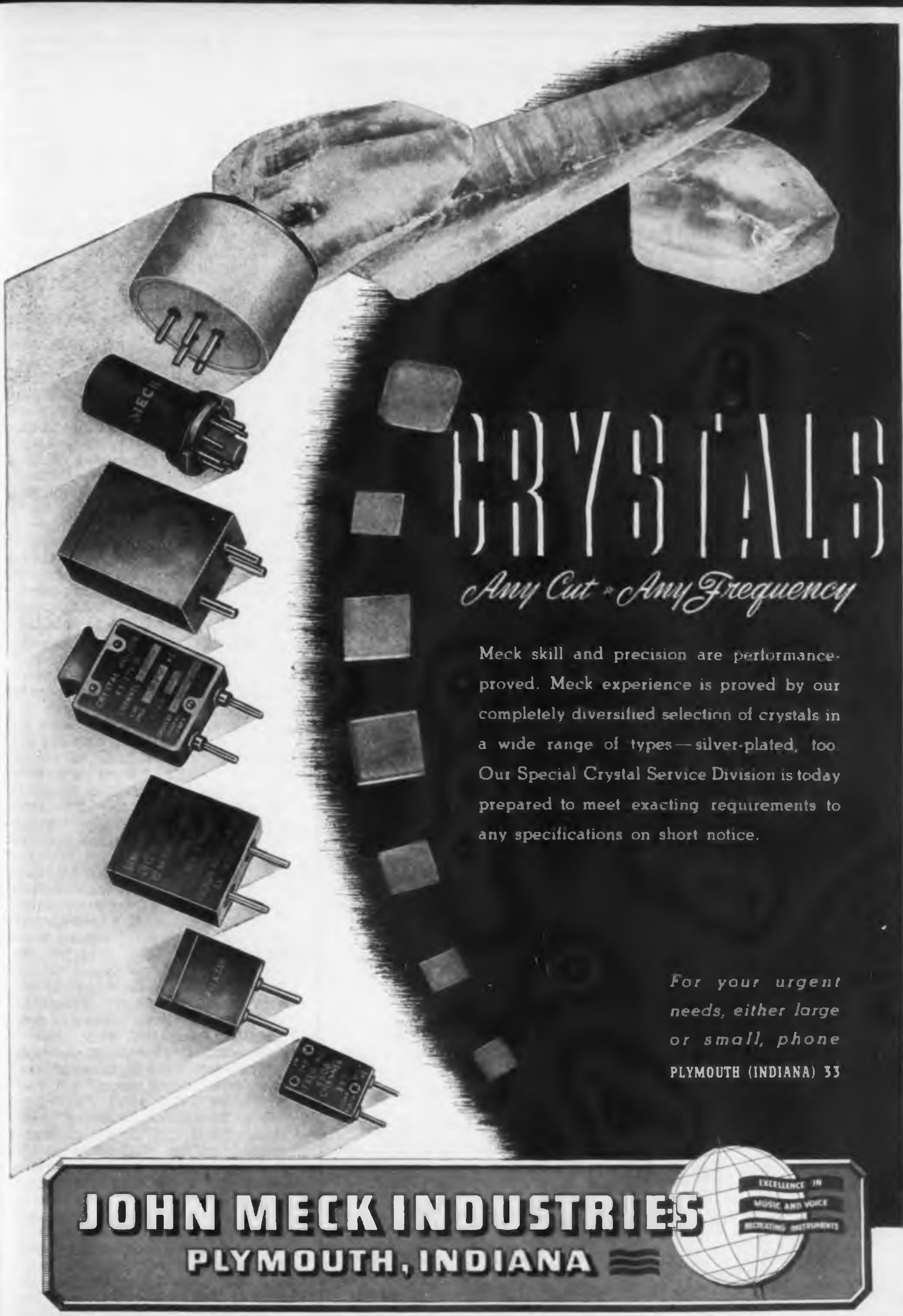
SEAMLESS and Patented LOCKSEAM Cathode Sleeves war workers in their factories, who entertain their workers and maintain production levels with music from our FM station.

"I have long felt that publishers of the printed word, who have molded public opinion for so long, are best qualified to be, and should be, the major owners of broadcasting stations. The Chicago Tribune went into broadcasting in 1923 and has done a splendid job for the public, and for itself, with its standard broadcasting station, WGN; recently it has broadened its service with FM radio Station WGNB. Many publishers missed the opportunity to get AM wavelengths when radio was young. Opportunity knocks again because FM wavelengths are available now, but applications to FCC for FM are already many. The FM audience of today is not large; neither was the audience for standard broadcasting stations when the original broadcasters entered that field and secured their valuable wavelengths. After the war, the FM audience will grow much more rapidly than the original radio audience did in the early days of radio.

"If you are interested and would like technical details about cost of stations, cost of operation, area coverage, etc., please write. We have set up a department to answer your questions, but, as I said earlier in this letter we have no apparatus or transmitting equipment to sell you."

The Civilian Replacement-Tube Situation

Following is text of a memorandum sent by George Barbey, president of the National Electronic Distributors Association, to the members of that group, reporting on the recent interesting changes that have been taking place in the civilian replacement tube situation. Mr. Barbey is himself a radio distributor, with places of business at Reading and Lancaster, Pa., but has been devoting much of his time and effort to the national tube situation, with frequent trips to Washington. Says Mr. Barbey: "For about a year, WPB has been announcing figures indicating the number of radio tubes shipped from the manufacturers for replacement purposes. NEDA always took exception to these figures, because it did not seem possible that an average of 1,500,000 tubes per month were reaching distributors, and service men, especially, before 'L-265' and 'MR' when a large number of civilian tubes were sidetracked by priority orders. It was finally agreed that the tubes were being shipped but that distribution was faulty. Certain distributors


CRYSTALS
Any Cut • Any Frequency
Meck skill and precision are performance-proved. Meck experience is proved by our completely diversified selection of crystals in a wide range of types — silver-plated, too. Our Special Crystal Service Division is today prepared to meet exacting requirements to any specifications on short notice.
For your urgent needs, either large or small, phone
PLYMOUTH (INDIANA) 33
JOHN MECK INDUSTRIES
PLYMOUTH, INDIANA
EXCELLENCE IN MUSIC AND VOICE RECREATING INSTRUMENTS

who in prewar days did very little tube business, suddenly blossomed out with comparatively large stocks. Certain retail dealers and service organizations suddenly appeared in a jobbing position. Tubes bearing set names were proportionately more abundant than the general market would warrant. A black market developed in a number of locations. At this point a NEDA committee went to work to analyze conditions, and make recommendations for a more equitable distribution of the available supply.

Plan too radical

"On August tenth, 1943, your committee filed a 13-page report with the Office of Civilian Requirements, Wholesale and Retail Division, and Radio and Radar Division of WPB. Copies were also mailed to all members of the Radio Manufacturers' Tube Committee. This report covered a review of conditions, recommendations, and a complete plan for distribution, with tentative forms for putting the plan into operation. The manufacturers called the plan 'radical.' At any rate, it caused a lot of discussion, and the current directives probably go as far along with this program as it is possible to do at this time.

"Your NEDA tube committee continued to remind the various divisions of WPB that the much talked of and much promised tube production would be of little value if a new plan of distribution were not developed co-incident with the production. Well, it looks as though we have BOTH of them here. Final details are not available, but seem to size up as follows: The tubes heretofore available for replacement purposes came from contract over-runs, military rejects, and small runs made possible by material and facilities, sandwiched in between large government orders. It seems these tubes totalled an average of 1,500,000 per month, but it is obvious that this program permitted no choice of types. Certain important types therefore became very scarce. The new production directive designates types and comparative quantities, very close to your committee's recommendations, which were based on the number of each type needed per million manufactured. The total number of tubes available, including over-runs, rejects, and the 'directive production' is not predictable at this time, because of military requirements, facilities and man-power problems. It will also take from 30 to 60 days to get some types into production and probably three or six months to get all of the scarce types into distribution channels. But, the over-all production picture is certainly much more encouraging. (*Turn page*)

INSPECTION

★ ★ ★

Federal is a leading manufacturer of aerial navigation, broadcast and general communications equipment. Its outstanding contributions through the years have made the name Federal synonymous with radio development and progress.

Key to the excellence of Federal Crystals is intensive, step-by-step inspection, geared to strict production tolerances.

And behind this painstaking process are world famous engineers, skilled technicians, highly developed precision machinery.

As a result, Federal has earned a reputation for crystals of the highest standard—crystals which are today filling a vital role in wartime radio.

Remember, Federal's comprehensive facilities can fill any crystal need . . . from the lowest frequency bar to the highest oscillator plate.

And with every crystal goes the Federal stamp of approval, an assurance of uniform performance under the most difficult operational conditions.

When it's crystals you want—call Federal.

Federal Telephone and Radio Corporation

AN IT&T ASSOCIATE

Newark, N. J.

"The first requirement for equitable distribution is a definite interchange of tubes by the manufacturers. This has been covered by a directive based on 1941 sales, as reported to WPB. Details as to distribution from factory to jobber have not been announced, but it is assumed that the manufacturers who have been doing a good allotment job will be allowed to continue for a short time, while the manufacturers who have not developed an allotment basis of distribution will be directed to do so. In the meantime, WPB has not actually frozen present stocks of tubes in the hands of the manufacturers, but has held up shipments until the manufacturers have reported present inventories to WPB. The manufacturers have also been directed to formulate an allotment plan of distribution based on 1941 sales of replacement tubes.

"Distributors may find your regular tube shipments held up for several weeks. You probably will get your usual monthly shipment before Feb. 1. Scarce types under this program will probably not appear in any quantity before March 1. Don't be too optimistic about immediate results, but you can begin to talk encouragingly to your customers. Things are looking up."

GLOBAL JOB FOR SERVICE ENGINEERS

By W. L. Johns*

● Leading lives no more predictable than the tides of battle, field service engineers of the radio and electronics industry during 1943 have had an important part in turning the tide of battle against the Axis.

Global war has meant a global job for these unsung heroes of war industry. It has meant taking on new responsibilities of tremendous scope and importance, while at the same time meeting vastly increased demands from commercial customers. The job of installing and servicing electronic equipment for the armed forces of the United Nations around the world, and of training military and naval operating personnel, has naturally come first. The next most important job has been to keep home-front equipment, such as radio, motion picture, plant broadcasting, and industrial apparatus in good repair. Such equipment is vital to home-front communications, production and morale.

Many members of the RCA Service Company's Field engineering staff have served during the year on assignment to various branches

*Vice-president and general manager, RCA Service Co.


"Y'HOGARTH SAYS HE CAN'T FEEL
REALLY LOST WHEN HE HAS
HIS ECHOPHONE EC-1 ALONG"

of the Army, Navy, Air Force, and Marine Corps. Others have been rushed from civilian assignments to attend to emergency service calls from the armed forces.

Neither the extent nor the nature of this work can be revealed at this time, for obvious reasons. It may be stated, however, that RCA field engineers have served during the year on fighting fronts in the South Pacific, the Aleutians, Iceland, England, Africa, Sicily, and Italy. Their work has included installation and maintenance of equipment, much of it secret, training of personnel, and checking performance and testing new designs under combat conditions.

One man was assigned to a specific job on Navy equipment at Pearl Harbor. He had scarcely unpacked when he was sent out to handle an emergency job on one of the Southern Pacific Islands. He never got back to his original base, but spent a year hopping from island to island in a huge triangle extending from New Caledonia to Guadalcanal to the Fiji Islands, serving as trouble-shooter and check-up expert on airborne electronic equipment. He traveled over 100,000 flying miles and experienced a solid week of Jap bombing on Guadalcanal.

Even in the testing and servicing of equipment on coastwise vessels, the field engineer has met unusual requirements. He may be called from his bed in the middle of the night for a job expected to detain him for only a few hours. He may be put ashore several days later and 1,000 miles from home. Or he may spend the next six months at an island naval base, or find himself in a ringside seat for a skirmish with an enemy submarine. All of these things and many more have happened. Security often demands that these men travel under secret orders. Once aboard ship with a job to do, they must accept the fortunes of war if an emergency dictates a sudden departure or change of course before the job is finished.

Broadcast equipment

Installations of broadcast equipment during 1943 had been confined mainly to those intended for use in disseminating war information and propaganda designed to further United Nations objectives. Such projects have taken field engineers to Brazzaville, in French Equatorial Africa; to Leopoldville, the Belgian Congo; to Rio de Janeiro, and to England, where they have supervised installations of 50-kilowatt international short wave transmitters.

At Brazzaville it was necessary to build a stretch of narrow-gage railroad and push small trucks or

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One technically qualified man familiar with inventions and patents to act as Liaison Engineer between development engineers and the Patent Department. Must have training, ability, and personality such that he can work with all engineers and write up disclosures for them for submission to Patent Attorney.

Mechanical engineers with experience in radio receiver and transmitter layout and design, including dials, drives, chassis, and tuning systems.

Immediate work will be associated with war and military projects, but these positions have excellent post-war possibilities for the right men. Employment subject to war manpower regulations.

Write directly to Chief Engineer, Bendix Radio Division, Baltimore, Maryland, giving complete details of education and experience.

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"dollies" over it by hand to get the heavy parts of the transmitter to the construction site. Lacking cranes and derricks, long poles were used to slide equipment into place. A borrowed bathtub served to collect distilled water used in testing the equipment. Scarcely a man on the job escaped malaria. But the transmitter was completed a month ahead of schedule, despite these difficulties.

The application of electronics to various industrial operations is a comparatively new field in which great strides have been made during the year. These applications include plant sound systems to carry communications and music to industrial workers, and the electron microscope for inspection and study of the structure of metals, plastics, chemicals and other materials (as well as for biological studies in hospitals and medical research institutions). They also include radio-frequency heating devices, used in such processes as molding and bonding of wood and plastics; case-hardening, annealing, soldering, and welding of metals; baking paint finishes, and drying textiles.

With new civilian equipment unavailable because of production restrictions, the successful use of motion pictures for home-front morale building has depended upon maintaining existing theater sound and projection systems in good operating condition.

Although this task has been complicated by material shortages, and shortages of trained personnel, our staff has been able to care efficiently for the inspection and servicing needs of thousands of this nation's theaters.

In addition, our field engineers have installed a large number of theater sound equipments for use by various branches of the armed forces and other government agencies. Such installations have been made in Washington and in training camps, recreation centers, etc.

Services rendered to military and naval forces have given our field engineers a vast experience in dealing with the new electronic devices now used exclusively for war purposes. The benefits of this experience will be invaluable to postwar America when adaptations of these devices are developed to provide new peacetime services.

In the broadcast transmitter field after the war, a major task for the field engineers may very well be the widespread installation of television broadcast systems and automatic television relay stations. We are given to understand that this development may not get well under way for a little time after the end of the war, but in the meantime there will be plenty to do in the way of accumulated in-

stallation and replacement work for radio stations.

New installations of rf heating and other industrial equipment, as well as plant broadcasting systems, are expected to constitute an increasingly large and important phase of field engineering work after the war. This type of equipment has proven its practical value in war industry, and will surely find wider usage in the years ahead.

In theater sound and projection systems, as in broadcast equipment, the service engineer envisages a large amount of installation and replacement work, beginning as soon as the necessary equipment becomes available for civilian use.

For the present, war requirements must continue to occupy the center of the stage for the "dial doctors" whose brains and scopes and meters are so important to the radio and electronics phase of this global conflict. While meeting these requirements, they are also making every effort to keep up necessary civilian service here at home, and gaining knowledge and experience that will continue to serve us in the postwar "Age of Electronics."

FCC ENGINEERS OUTLINE THEIR PROBLEMS AT IRE TECHNICAL MEETING—See page 113

Jett Outlines Procedure in FCC Operations

E. K. Jett, until last month chief engineer of FCC and now a Commissioner, pretty thoroughly authorized the duties and responsibilities of FCC and then delved into a few outstanding facts which he thought would be of interest to engineers who have occasion to do business with the Commission.

First, it is apparent from the applications filed with the Commission that many engineers are not too familiar with the exact nature of the Commission's engineering work and the provisions of its rules, regulations, and technical standards. The Commission's engineers are responsible for reporting to the Commission upon all engineering features of each application filed for construction permit, licenses, special authorizations, or modifications of any of the foregoing. These reports primarily are concerned with questions of frequency allocations, possible interference between stations, power, types of emission, points of communication, types of equipment, hours of operation, nature of service, possible duplication of service, and many other factors of a miscellaneous nature.

Many of these applications are coordinated by telephone, by conference, by correspondence, or by study with the policies and objectives of the Commission and of other Government departments and agencies. In addition, many applications and associated regulatory problems are precedent cases and require engineering studies and reports, looking to the establishment of new policies or regulations. A large proportion of the applications must be reviewed in relation to existing international agreements to which the United States is signatory.

When formal hearings before the Commission are conducted, the Commission's engineers must be prepared to provide factual engineering testimony. Rules and regulations pertaining to technical matters frequently are drafted in preliminary form by FCC engineers in consultation with industry, Government, and licensee representatives for subsequent consideration by the Commission. As a part of the war effort this work has been extended to include matters coming before the Board of War Communications. Indeed, at times the Engineering Department is called upon to prepare or supervise the preparation of technical reports, data, or recommendations for the benefit of other departments or agencies of the Government, which from time to time request factual information to assist them in carrying on their functions.

Guiding procedure

He stated that it was important that commercial radio engineers and consultants who have business with the Commission have adequate knowledge of the limitations and conditions imposed by related regulations and by the broader provisions of statute and treaty. He pointed out that the Commission's engineers realize that many scientifically minded and practical engineers have a natural dislike for such administrative details and, accordingly, the Engineering Department has always endeavored to give them as much guidance and assistance as possible in procedural matters and in directing attention to pertinent regulations.

In turn, commercial engineers consistently have been of service in keeping the FCC engineers advised of current engineering developments, practical problems encountered in the field, and the engineering treatment of those problems. Since by the very nature of duties performed by the FCC it must devote a majority of time to work at a desk, it is necessary that engineers of the Commission depend to

a large extent upon continuing liaison with industry and Government agencies using radio apparatus and with the professional consultants for keeping abreast of the latest contributions to the art. He expressed the hope that this collaborated exchange of information would be continued in the future.

Police and Aviation Communication Problems

W. N. Krebs explained the nature of work performed by the safety and special services division of the engineering department in administering for the Federal Communications Commission the engineering aspects of the police, aviation, marine, experimental, amateur, and War Emergency radio services and in determining technical qualifications of radio operators licensed by the Commission. Since Pearl Harbor, this work has been focused on objectives contributary to the war effort and requires extensive coordination with other government departments.

Police, aviation, and maritime services involve very large numbers of radio stations, with many mobile stations operating in diversified geographical areas. In consequence there are numerous international considerations and treaty limitations, of which cognizance must be taken by the regulatory body and by engineers concerned with the design of equipment for these services. These services require large numbers of licensed radio operators; the issuance of licenses for such operators involves consideration of citizenship, examinations, and determination of necessary qualifications.

At present there are more than 1800 licensees of municipal police stations and 43 state licensees, operating approximately 16,000 transmitters. Congestion of channel occupancy because of the accelerated expansion of this service caused by the war is becoming a serious problem. In addition to use by municipal and state police departments, some of the 60 frequencies allocated to this service are used to a limited extent by fire departments of certain municipal licensees. Although it appears that needed additional frequencies for the police service eventually may be available above 100 megacycles, it has not been established to the satisfaction of the Commission's Engineering Department that use of such frequencies will be reliable or adequate for mobile police service.

Although war conditions have caused a temporary decrease in the number of stations licensed in the aviation radio service, there are problems of frequency allocation which will become acute with the anticipated postwar expansion of aviation. Many commercial aeronautical facilities are now operating in conjunction with the military forces, and facilities remaining for commercial use are being operated to the limit of their capacity.

The resultant volume of radio traffic arising from these combined operations has increased congestion on available radio communication channels and it is very probable that a postwar reallocation of frequencies in the aviation service will be necessary to insure greater efficiency in the use of frequencies and to provide adequate radio facilities for purposes of communication and safety of navigation upon which aircraft in flight are dependent. The need for early availability of very high frequency equipment for aircraft and ground stations was stressed in view of serious congestion now prevalent on the low frequencies used by airport control stations and the predicted postwar increase in the number of airports.

The practical administration of the radiotelegraph provisions of the Safety of Life at Sea Convention, the ship radio technical and operator requirements of the Communications Act of 1934, and the provisions of the International General Radio Regulations with respect to the maritime services is to a large extent delegated to the Commission's Engineering Department, including the 22 port offices of its Field Division.

Numerous types of ship and lifeboat radio equipment have been inspected and tested by the Commission's engineers for type approval under the regulations of the Commission, in coordination with the Navy Department, Coast Guard, and Maritime Commission, in addition to the administration of technical requirements covering artificial antennas, emergency antennas, antenna safety links, and other wartime safety measures in connection with radio installations on merchant vessels.

In the future it is anticipated that new types of automatic distress alarms may be developed, especially for use on the Great Lakes and on inland waters of the United States. It is reported that the operation of specially designed automatic ringers has been very successful during a period of several months' use on board many Great Lakes vessels in connection with ship-shore radiotelephone service, which has its greatest use on these waters. There is need for early development of very high frequency communication facilities for short distance maritime telephony to relieve congestion on the intensively used medium frequencies.

Although there has been a marked decrease in the number of

licensed coastal telegraph stations, except in Alaska, through the effect of naval and censorship restrictions imposed on ship-shore traffic, many of the formerly-licensed coastal stations are maintained in readiness for immediate operation if and when their reactivation becomes necessary. On the Great Lakes, on the Mississippi River and connecting waters, along the Atlantic, Gulf, and Pacific coasts, and in Alaska, maritime telephony to a large extent has replaced the use of telegraphy and is necessarily becoming subject to an increasing degree of government regulation.

Determining Best Possible Spectrum Allocation

P. F. Siling, chief of the international division, engineering department, Federal Communications Commission, discussed briefly the work of the International Division in building up good international relationships as regards communications and the preparatory work for telecommunications treaties, agreements and other arrangements. He also touched upon the efforts made to reduce international interference and to provide a well-knit international communications system on an engineering basis.

He stated that the International Division maintains the master frequency records of the Commission which consist of an accurate record of allocated, assigned and received frequencies, both Government and non-Government, and in so far as possible, an up-to-date record of the use of all frequencies by all countries of the world. These master frequency records are consulted in connection with any new frequency assignment made by the Commission or by the Government Departments using radio in order to make sure that the best possible assignment is made.

He pointed out that assignment of frequencies to Government stations and classes of stations is made by the President upon the advice of the Interdepartment Radio Advisory Committee. Mr. Siling discussed the problems in connection with the work of preparing an orderly and systematic reallocation of radio frequencies recommending that exclusive bands be set aside internationally for each service and basing his hopes that space can be found in the radio spectrum for every essential service upon the moving out of the high portion of the spectrum those services which can be effectively handled in the very high or ultra-high portion of the spectrum, and, similarly, those from the very high portion of the spectrum that may be handled effectively and perhaps

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He discussed the advantages of employing multiplex systems together with single side band transmission in the fixed service and the possible establishment of multichannel communications between the United States and Europe by means of automatic relays at a point in the Western Hemisphere near the equator, thus making use of general north-south circuits rather than east-west in order to overcome ionosphere disturbances. With the further thought that east-west transmissions are best near the equator, he speculated upon the possibilities of a trunk line transmission belt around the world at approximately 20 deg. North Latitude, with north-south circuits feeding into this trunk line at appropriate points.

Mr. Siling discussed briefly the information needed which would enable engineers to determine in what portion of the spectrum the various services should be placed and the bandwidth of emission that should be employed for television, both black and white and color, and asked the following questions:

1. Is the use of single side band or vestigial side band transmission practicable for the mobile services?
2. How about the use of vestigial side band transmission for high speed telegraph?
3. How can we improve the characteristics of receivers now employed in the various services, with particular emphasis placed on stability and discrimination against adjacent channel interference?
4. What are the lowest practicable tolerances which may be met by equipment manufactured for each service after the war?
5. What means can be employed to reduce radiation outside of the required band of emission?
6. Considering the international communications system as a whole, what practical methods can be found for utilizing to a maximum, multiplex systems with single side band transmission?

Noise Levels Important in Broadcast Allocations

George P. Adair, assistant chief engineer, Federal Communications Commission, representing the Broadcast Division of the Engineering Department of FCC, gave a brief summary of the duties and organization of that division. He then pointed out that many of the problems concerning broadcast which had become relatively unimportant during the war period were again before the industry and the


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government, accompanied by new and bigger problems. Among these is the revision of the method of determining interference between stations, particularly when the interference is from more than one source. He then gave brief statistics on areas and populations served by broadcast stations which indicate that the need for improvement in rural coverage is more urgent than that of urban coverage and discussed several methods whereby this might be accomplished.

Average levels

He pointed out even though it was determined that there was a need for extension of the standard broadcast band either upward or downward, there were other services operating in these frequencies and any extension would involve many complications. Preliminary analysis of recordings of noise made by the Commission indicate wide differences in the average noise level throughout various portions of the United States which would indicate consideration should be given to the desirability of taking such average noise levels into account in allocating broadcast facilities.

With respect to FM, television and facsimile he reported that the Commission has greatly expanded its recording program on the higher frequencies in an effort to determine the proper portion of the spectrum for these facilities. Particular efforts are being made to determine the cause, effect and cure, if possible, of so-called bursts.

ANALYZES ENEMY RADIO

(Continued from page 114)

modulating the power amplifier tubes. Output was measured as 65 watts, an efficiency of approximately 65 per cent. Frequency stability was found to be excellent. Fixed and trailing wire antenna are available to the radio operator and are tuned by remote antenna matching units by the use of selsyn motors.

The EZ2 direction-finder receiver is used in conjunction with the FUG 10 and is adapted from the commercial German Telefunken direction-finder of prewar days (1933) with few modifications. The frequency coverage is 165 to 1000 kilocycles in two bands. The services provided are visual homing, aural homing, D/F bearings, and all-around communications. A conventional sense antenna is used in conjunction with an iron-core loop. The receiver is operated by the navigator who has mechanical remote controls located at his feet. The remainder of the equipment comprises local and remote control

boxes, interphone amplifier, and dynamotors. These instruments have been designed to give complete control facilities where they are needed and accomplish this purpose.

The newest German airborne command set, the FUG16Z, is installed in all the newer bomber and fighter aircraft. The frequency coverage of the transmitter and receiver is 38-42 megacycles, with 4 spot frequencies set with click stops similar to FUG 10 transmitters and receivers.

Remote control

In most installations, the FUG 16Z cannot be controlled locally in flight. We have found recent sets which provide for remote tuning of the receiver by the addition of a tuning motor and gang condenser. This enables the pilot to tune in to a station that may be off frequency a few kilocycles. Tests have proved this set capable of operation up to 250 miles at an altitude of 25,000 ft. Recent reports have noted an additional tuning mechanism and loop to facilitate navigational aid to the pilot.

The receiver E16Z, is a 9-tube superheterodyne. Only one type tube is used, the RV-12 P 2000. This rf pentode is connected as a diode, triode and pentode, as the occasion demands. The intermediate frequency is 3000 kilocycles.

The transmitter S16Z utilizes two RL-12P 35 transmitting tubes in a conventional MOPA circuit. Output was measured as 40 watts, with a plate voltage of 400 volts at 210 milliamperes supplied to the receiver and transmitter from the dynamotor unit. The oscillator circuit incorporates negative temperature coefficient condensers for frequency stability. The output is fed to the antenna matching unit through a concentric cable.

The modulator, located between the transmitter and receiver, consists of two RV-12P 2000 tubes in a two-stage circuit, one being the grid modulator tube and the other the power amplifier tube of the transmitter.

The German notsender, NS 2 Sea Rescue Set, is crystal controlled, and operates on 500 kilocycles, the international distress frequency. It sends an SOS automatically. It can also be keyed manually. The antenna is hoisted by a balloon inflated by a hydrogen generator, which is activated by being placed in water. If a wind of seven miles per hour or more is blowing, a box kite is used in place of the balloon. The German NS2 sea rescue set is the prototype of the American SCR-578.

In general, German airborne electrical design is sound but not advanced. The mechanical design, incorporating die castings and spe-

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City ____________ *P. O. Zone* ________ *State* ________ cially designed parts, is of excellent quality. The primary design, with magnesium die castings fitted together with dowel pins and electrical plugs and jacks, is to facilitate easy servicing. An outstanding feature which becomes apparent upon examination of the airborne equipment is the neat cabling, which is "snaked" through in an orderly fashion and also is color-coded for ease in re-wiring.

One thing the Germans have done to attain mass production is to standardize. In certain instances chassis are only partly filled with parts, which indicates that the same chassis is used for other installations. Tubes also have been standardized. Most of the German installations use the RV-12P 2000 rf receiving tube or the RL-12P 35 power amplifier tube. Of the thirty-one tubes used in the entire radio set FUG 10, these two types are the only ones used.

One of the first Japanese sets received by the Signal Corps was a receiver, transmitter and dynamotor removed from a Zero fighter which crashed on a Pacific Island in February 1942. This receiver — 7 x 9 in. — is a five-tube superheterodyne of obsolete construction compared to Signal Corps standards. The transmitter utilizes a crystal oscillator modulated by a single tube. Both tubes in the transmitter were marked UX 47, which is identical to the American UY 47, except that the plate lead is brought out of the top of the glass envelope.

The entire installation represents a command set of very crude construction. The coils are wound on bakelite forms, with poor insulation and no tropicalization. Many of the parts were either bought on American distress markets back about 1930-1932, or are very good replicas. All the tubes bear American nomenclature and are identical in construction to American glass tubes. The overall electrical design and construction of this set is about 10 years old from our viewpoint.

The latest Japanese airborne radio communication set that has been received is the Model 99 Type 3, removed from a Type 97 light bomber which crashed September 30, 1943 in China. The components consists of a receiver, covering 2.5-5 megacycles; dynamotor, antenna matching unit, control unit, and primary voltage control box. The emission is cw, mcw, or phone. The normal range is about 75 miles at 10,000 ft, and a possible range of 150 miles using phone under favorable conditions and altitudes, and up to 300 miles using cw.

The receiver uses four type 6F7 tubes. These tubes are identical to the American 6F7, except that they use an octal base and metal envelope in place of the American

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7-prong base and glass envelope. Each tube, being a pentode and triode in the same envelope, serves as a dual-purpose tube. The eight stages consist of one radio frequency stage, one mixer, one high-frequency oscillator, two intermediate frequency stages, second detection, beat oscillator, avc stage, and audio stage. Plate voltage was measured as 250 volts.

The transmitter utilizes a crystal oscillator, modulated by a single audio modulator tube. Both tubes are type 807s. The frequency tuning control is a combination variometer-condenser and the antenna coupling is accomplished by the use of a variometer. When mcw or phone is used, a 50,000 ohm resistor is placed in series with the oscillator plate to prevent the tube from exceeding its maximum rating during modulation peaks. Celluloid covers are placed on the variometers and movable condensers, but are not dustproof. As in the receiver, all parts are clearly marked and servicing is made easy by neat wiring and test panels.

Japs not original

It is recognized that the Japs are usually not original but are extremely quick to tool up and reproduce. The physical construction of Model 99, Type 3, set is exceedingly neat and facilitates easy servicing by clearly marked parts and test panels for measuring voltage. Wiring is neatly carried throughout, and does much to dispel the idea that Japanese are capable of only copying. A number of the points of design resembling American technic have been adapted rather than copied. However, it must be remembered that American and British designs have advanced to higher frequencies and the facility of push-button tuning for both transmitters and receivers.

Let us turn to the German ground signal equipment. The German RANK radio set consists of the transmitter 10 WSc and receiver UKWEe. This is an amplitude modulated set covering a frequency range of 27.2-33.4 megacycles. The transmitter and receiver operate from separate external dynamotor power supplies. Normally the drain from a 12-volt storage battery is 7.2 amperes for the transmitter and 4.0 amperes for the receiver. Under these conditions the transmitter output into an antenna load of 40 ohms is 5 watts.

The transmitter and receiver utilize identical tuning mechanisms. A large circular dial-face clearly marked in 50 divisions is used. Provision is made for setting up two pre-selected "flick" channels. An uncalibrated auxiliary dial is employed on the receiver to provide fine tuning. The dial of the trans-

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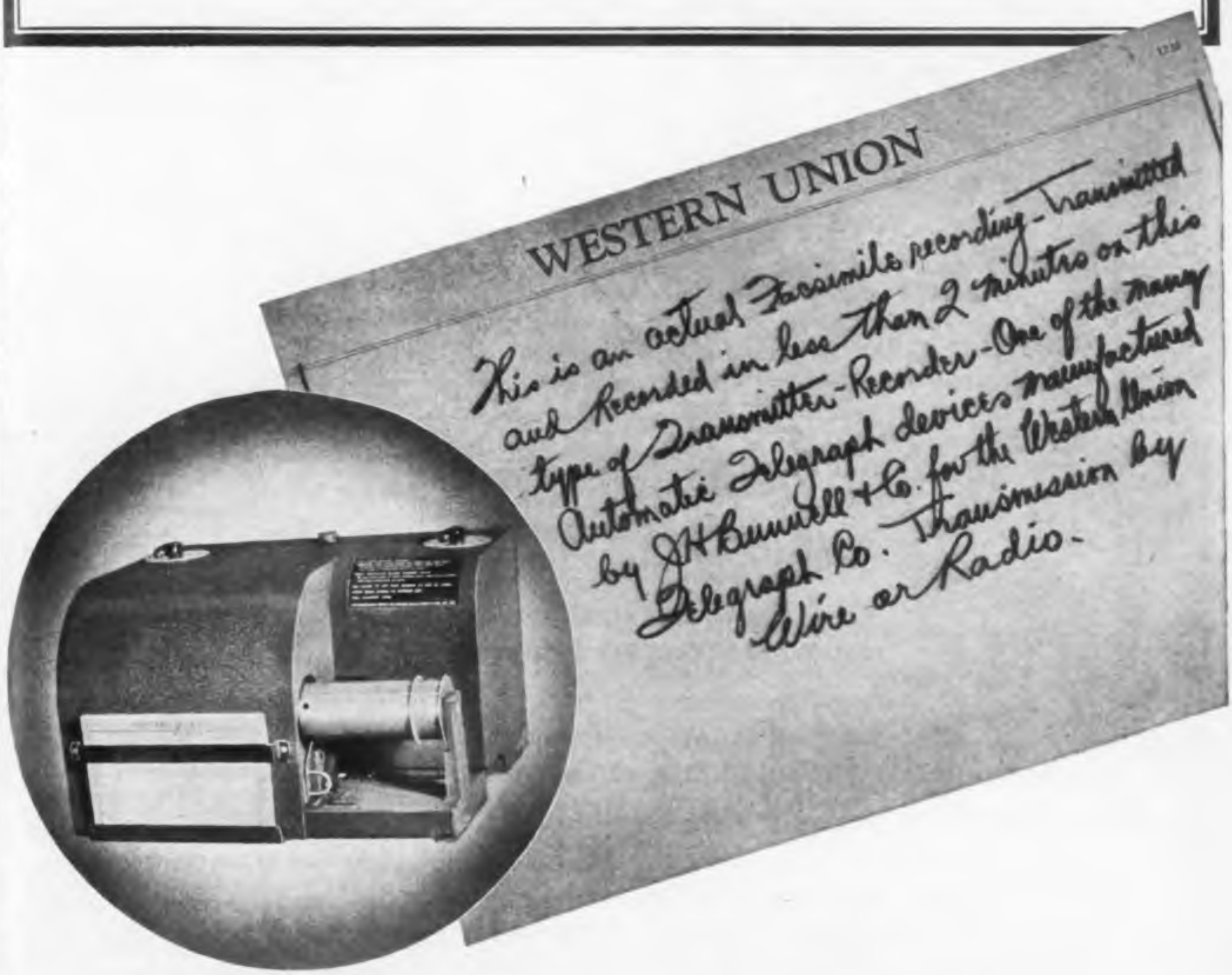

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mitter is calibrated very accurately and it is possible that netting may be accomplished without the use of auxiliary equipment. It is a very simple matter to set up the preset channels. Transmitter dial error does not exceed 7.5 kilocycles throughout the dial scale and dial "flick" resettability error has been found to be less than 750 cycles per second.

The receiver is a conventional superheterodyne. The oscillator is self-excited and is stabilized by the use of temperature compensating condensers.

The transmitter is a self-excited oscillator with a single tube final amplifier, using an RL-12 P 35 tube in each stage. The oscillator operates at one half the output frequency. One type RV-12P 4000 tube is used as a grid modulator and mcw oscillator.

As in the receiver, the transmitter oscillator is stabilized by the use of temperature compensating condensers. Neon tube voltage stabilizers are used in the oscillator plate supplies of both the receiver and transmitter. During tests on battery voltage drift the transmitter varied no more than plus or minus 250 cycles for battery voltages ranging from ten to fourteen volts. The receiver varied less than plus or minus four kilocycles for the range of battery voltages, representing .013 per cent at 30 megacycles. As to temperature drift, the transmitter and receiver displayed a high degree of stability.

Transmitter stability

The transmitter stability between + 30 deg. C. and + 75 deg. C. is comparable to that which might be expected of a crystal controlled transmitter. The effects of vibration were found to be negligible. This equipment when used in battle had apparently been sealed against fine sand by means of pitch inserted in the cracks between the front panels and the housing.

The German tornister or pack set FU f, is the one used in greatest quantities by the communications personnel of the ground forces.

The set is a transmitter-receiver combination, capable of operation on cw or voice. The set is housed in two cases, one containing the transmitter and receiver and the other containing the power supply and remote control unit and accessories.

This transmitter operates on a frequency range from 4500 to 6670 kilocycles, while the receiver has a wider range, from 3000 to 6000 kilocycles.

The transmitter is an MOPA type. The receiver is the conventional superheterodyne pack. The I.F. frequency of the receiver is 2000 kilocycles, and the set can be quickly calibrated by the use of a

Controlled MANUFACTURE ASSURES ADHERENCE TO SPECIFICATIONS

Recently our plant was inspected by a group of well-known ceramic engineers who were particularly impressed by our quality and dimensional control methods.

Their verdict was: "the best we have seen in the industry".

We were not fishing for this gratifying compliment. Our job is to make the Steatite Insulators to conform to customer's specifications, and precision control of our manufacturing process is an integral part of our organization.

When making new parts for a customer, we provide a unique production checking service including a preview of the actual part in the form of an advanced sample accompanied by a detailed sample report.

After customer's approval of the sample and report, adherence to specifications is guaranteed.

General Ceramics AND STEATITE CORP.

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5288

glow-quartz resonator. The use of remote operation by the Germans is typical of all of their ground signal sets. It is possible, for example, by using the remote control unit, for the officer in the remote operation to modulate the transmitter at the observer's point by merely flicking the switch. In a similar manner it is also possible, by use of a bell located at the remote location, for the officer to talk back, modulating the pack set at the observer's point. Then there is a third fitting on the switch which allows the remote line to be operated as a field telephone.

Carrier equipment

The German telephone carrier unit model TF-b2 is comparable to the Bell System's type H-1 carrier equipment. It provides one telephone circuit in addition to the regular voice frequency when operated on a two wire line. Signaling is accomplished by shifting the carrier frequency 500 cycles. Transmission is single side band suppressed carrier; in one direction it transmits the upper side band of eleven kilocycles and in the other direction it transmits the lower side band of eleven kilocycles.

The range is about 16 miles when used with German field telephone cable; this is a cable similar to American spiral-four. On open wire lines the range is approximately 125 miles.

The Japanese direction finder and intercept receiver type 94, Model No. 1, is a loop direction finder covering the frequency range of 100 to 2000 kilocycles. The receiver is a tuned radio frequency set employing three stages of rf amplification, a heterodyne detector, and two stages of audio amplification. The components and circuits employed are comparable to those used in American sets of the 1925-1930 period.

The loop assembly consists of a "T" shaped mast and cross arm, forming a frame, upon which is wound a six-turn, unshielded, diamond shaped loop approximately 16 sq. ft. in area.

The outstanding feature of the Japanese direction finder is its portability. This makes it ideal for use in jungles or other difficult terrain.

The Japanese "walkie talkie" Model No. 66 is a superregenerative transceiver similar to those used in this country by the radio amateurs during the early 1930's. This set uses a type UZ-12C dual triode tube similar to the American type 30. Various bands of frequencies are used in the 2 megacycle to 90 megacycle range. The power requirements are 6 volts and 150 volts dc, supplied by batteries in a separate box. In general the layout of both parts and wiring is

complex and difficult to trace or repair. The front panel is complicated by switches and dials, all of which have to be adjusted for any one frequency.

In comparison with the United States "Walkie Talkies" and "Handie Talkies" using superheterodyne receivers and crystal control, the Japanese set is very difficult to operate satisfactorily under conditions of humidity and woody terrain. This set was picked up in a creek at Kiska.

The Japanese command transmitter Model 94 No. 2 Type B is a man pack set designed for use at Division Headquarters. This radio set is an exception to the usual Japanese run of inferior quality equipment. It is very well constructed and its ruggedness, simplicity, and general excellence of design are worthy of note. Considering the specific purpose for which this set was designed, it is unexcelled by any similar American equipment.

It consists of a transmitter, receiver and gasoline engine power supply unit. Frequency coverage of the transmitter is from 950 to 6675 kc and the transmitter power output averages about 85 watts over this range.

The receiver covers from 140 to 15,000 kc. It is superheterodyne type with a 100 kc intermediate frequency for the range 140 to 1050 kc. For the remainder of the frequency range up to 15,000 kc the intermediate frequency is 400 kc.

The receiver is powered by batteries, while the transmitter uses a very well designed gasoline engine unit. This machine delivers approximately 914 watts and weighs 103 pounds complete, which is approximately ⅓ of the weight of our corresponding power unit, the PE-49. The supply to the transmitter itself is 5 amperes at 12 volts and 175 milliamperes at 1300 volts.

In general, German ground components are well built and thoroughly designed. All parts are marked with terminal numbers to facilitate easy replacement. Wiring is small and neatly cabled. Dials are well machined and very accurate. Backlash is at a minimum. In all sets emphasis is placed on design for mass production.

Japanese ground parts are of rather obsolete design and in some cases very inferior to American parts. Japanese coil forms are in general very poor. Usually wooden or molded mud insulation coils are used, even in equipment operating up to 90 megacycles. Jap transformers are usually unpotted and there is no evidence of weatherproofing. Jap crystals and holders are, however, of good design. Several Jap holders examined have been very accurately molded; crystals accurately ground.

Who Said The "Ham" Is Finished?

THERE have been rumors to the effect that the radio Amateurs were going to be denied their old frequency bands, and given new bands of such high frequency as to be useless for medium and long distance communication.

Some rumors say "Remember the last War? We are going to get the same treatment this time!"

Now, we don't believe the "Hams" should be denied their rightful place on the air in bands suitable for communication beyond the horizon — — and further, we do not believe that our Government would want to see those privileges denied.

Are not the "Hams" fighting on many battlefronts, working in war factories and laboratories for a New World wherein the individual will be able to live and enjoy his hobbies, his church and other personal freedoms which go to make up a healthy, happy world?

It is well-known among Government officials whose task it was to build our great war-time communications system that from the rank and file of amateurs came executives, instructors and thousands of engineers and operators. Without this nucleus of experienced men, it would no doubt have taken a much longer time to reach the present high degree of perfection in the communications branch of our fighting forces.

In every emergency Amateurs have proved their ability and willingness to come to the aid of their Country — — who would be so unjust as to want to deny them their small place in the radio spectrum? We do not believe these rumors that the "Ham" will be denied his privileges, we believe rather that those who speak so much of justice coming out of this war will see to it that the Amateur receives his just reward.

The entire radio industry knows well, and appreciates the many contributions "Hams" have made for the advancement of high frequency radio communications, and surely they too can be counted on to assist the "Ham" in regaining his privileges *when the right time comes.*

HAMMARLUND MANUFACTURING CO., Inc.

460 West 34th Street, New York 1, N. Y.

POSTWAR PRODUCTS

(*Continued from page* 107)

in which evaluation is attempted must never become blind or even dim-eyed to this paramount consideration.

The report is now ready for a "conclusion" section. This should be brief. It cannot be an argument. It must simply give an easily digested sentence, paragraph or page by which the reader can say, "This is what it all boils down to." It need not amount to a summary. All it needs to do is say, after considering all of the negative and positive internal factors, then evaluating them, this product could or could not under certain circumstances become a profitable addition to our line? To make any other conclusion is indicative of muddy thinking or of improperly done preliminary work. Whoever the report is intended for will only have to substantially repeat the work or else shelve it for decision or indecision. In such a case, no one gains. For better or for worse come out to a clean cut decision.

It is often desirable to add recommendations following the conclusion. This is simple in the case of the "bad" or negative product. Simply recommend that it be avoided and suggest such other items as many have appeared for alternative consideration. The mere fact that the unsuited product has shown definite negative factors will serve as a suggestion system for a more suited product. In other words, the report should have taught the manufacturer something he did not know about his plant.

With a product favorably reported, the recommendations can take a somewhat more important role. They can go so far as to point out what additional organization equipment or space will be necessary. They can show where these can be obtained and make suggestions as to when the product might be timed into the operation. In some cases a valuable recommendation section has furnished a complete working plan projected over a five year period. This type of recommendation is not "crystal gazing" but is rather a kind of foresight.

The month or so and the four or five figure expense that precedes a new product report of this sort, while not a guarantee of its success, comes very close to being cheaply purchased insurance against real trouble. This business of taking a crack at a new idea, pounding the living daylights out of an organization for six months and then waking up to find that it just isn't clicking, happens often.

In fact, many of the more level-headed, seasoned executives of our electronics industries have been

Rheostats and potentiometers in wire-wound and composition-element types.

Midget controls in both types. Matched in external appearance and dimensions. Mechanically interchangeable.

Large line of controls for sound systems—constant-impedance attenuators, L-pads, T-pads, faders, mixers, etc.

25 and 50 watt power rheostats featuring exceptionally rugged construction.

Greenohms—well-known green-colored cement-coated power resistors found in the most rugged assemblies.

Glasohms—glass-insulated miniature power resistors and heaters. Also flexible resistors.

Etc. etc.

Products of "THE HOUSE OF RESISTORS"

★ Builders of rugged equipment specify CLAROSTAT for resistors, controls and resistance devices as a matter of habit. They know through years of experience, especially out in the field, that Clarostat components are *tough*—electrically and mechanically. Thus one more clause in their insurance against equipment failure and excessive servicing.

Today Clarostat is engaged 100% in the war effort. The facilities of two large plants are concentrated exclusively on meeting the requirements of our armed forces. But after Victory is won "The House of Resistors" will convert back to civilian production, with vastly increased capacity to meet the needs of its many business friends.

★ *Submit Your Problems . . .*

If they have to do with resistance—fixed, adjustable, or ballast—send them along for our engineering collaboration. We either have standard items in our extensive line that will meet your needs, or we can build special units. Let us quote on your requirements.

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Controls and Resistors

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burned and are now completely reformed. Many others, especially in the decade to come, will throw good money after bad — hopefully trying to salvage a substantial deferred asset — when an apparently costly "basic" investigation of the internal factors would have "taken up a lot of time getting going" but would have resulted in not having that "deferred asset" at all. Any gambler knows it is much safer to use loaded dice than to take a chance. For a gambler, this is not only illegal but immoral. In business when seeking a new product, we are entering a gambling game. There is neither law nor moral restraint on a detailed examination of the dice that control our potential product.

The recommendation that ends our report is really a decision on how and when to play with that set of dice. Again there is no restriction against going ahead anyway — but with eyes wide open and foot on the brake pedal — down a charted highway.

Either at the beginnning or end of any report some sort of an index and a more or less complete listing of the sources relied on should be included. The preparation of this is purely mechanical and needs no discussion here. It is, however, both useful and necessary.

As much or as little expense as is desired can be put into the physical make-up of a report. Where much time and energy have gone into its preparation it is foolish to have it appear amateurish in form. On the other hand, an expensive method of duplication and fancy cover treatment serve only to impress a certain type of individual. If it is intended that one or more of these are to be impressed, no expense is too great. If the report is intended for seasoned, level-headed people, it is only necessary that the story be neatly, clearly and permanently presented.

The person chosen to prepare the report must be capable of doing a job. If no one in the organization is suited, get outside assistance. It seems more expensive but next year or the year after in retrospect it will develop that the cost was reasonable.

Introduction, field, listing of factors, negative and positive points, their evaluation, conclusion and recommendations. By following this framework, a new product can be made to tell the story skillfully. If the item, tube, condenser, resistor or complete industrial installation, is worthwhile considering it is worthwhile doing an "internal factor" study for. If it can't stand the arc-light of planned scientific investigation, it is not the product for our plant. A properly prepared report will soon give the answer.

WIDE READING

(Continued from page 184)

Tuning Fork Frequency Meter

H. L. Clark and J. E. Hancock (Instruments, February, 1944)

If a tuning fork is so mounted as to be free to vibrate and a sinusoidal disturbing force of much lower frequency than the resonance of the fork is applied, the fork motion will be in phase and proportional to the disturbing force. When the applied force is exactly the same as the fork resonance frequency, the resulting motion is limited only by damping or resistance in the mechanical system and is 90 deg. out of phase with the disturbing force. If the force is of much higher frequency, the motion will be small and 180 deg. out of phase with the applied force.

In the narrow frequency band corresponding to the resonant peak, there is rapid shift in the phase angle between driving force and fork motion. Over a narrow frequency band this phase angle is proportional to the deviation of the applied frequency from the resonant frequency of the tuning fork. A frequency measuring instrument which makes use of this phenomenon is commercially available for research work on steam turbine governors. The phase angle between the motion of the fork and the applied line frequency is indicated or recorded. Instrument and performance are described in detail.

Single-Section m-Derived Filters

C. W. Miller (Wireless Engineer, London, January, 1944)

A method to find the total insertion loss and the total phase shift for one complete section of m-derived networks is given. Input and output resistances of all networks considered are equal to

$$R = (L_k/C_k)^{1/2} = 2\pi f_c L_k = 1/2\pi f_c C_k,$$

where f_c is the cut-off frequency.

Two types of networks, A and B, are distinguished. A-type network sections are constructed by connecting identical m-derived half sections so that the image impedance of the resulting complete section is the same for all values of m; low-pass series derived T, high pass series derived T, low pass shunt derived π and high pass shunt derived π networks are obtained. In B-type network sections the other free terminals of the m-derived half sections are joined together; low pass series derived π, high pass series derived π, low pass shunt derived T, and high pass shunt derived T networks are obtained.

Insertion loss L and phase shift B for any single section A-type net-

work are given by the following expressions:

$$L = 10 \log_{10} (X^2 + Y^2) \text{ decibels}$$
$$B = \tan^{-1} (\pm Y/X) \text{ deg.,}$$

where $X = (1 - 2m^2K^2)/[1-(1-m^2)K^2]$ and $Y = mK\,(2-K^2)/[1-(1-m^2)K^2]$,

K being equal to f_c/f for low pass arrangements and equal to f/f_c for high pass arrangements. The plus sign refers to low pass arrangements, while the minus sign refers to high pass arrangements. f is the operating frequency.

The same expressions are valid for B-type filter sections if Y is replaced by

$$Y^1 = mK\left\{1+(1-K^2)/[1-(1-m^2)\,K^2]^2\right\}$$

Curves showing the variation of B and L with K for typical values of m are given for both type filters and for filters terminated at both ends by the ideal image impedance. The behaviour of different type filters as indicated by these curves is compared, and the influence of resistance associated with the coils used is considered. Formulas for half-section filters are also stated.

Determination of Thorium

S. L. Parsons (Journal of the Optical Society of America, December, 1943).

A method for the spectrographic determination of 1 to 2 per cent thorium in tungsten filament wire was developed for wires of from 0.004 to 0.013 in. diameter. A standard deviation of 3.54 per cent was obtained. The intensities of the 2899.3 A thorium line and of the 2904.0 A tungsten line were compared in an ac arc of 2200 volts and 2.4 amperes. It was found most suitable to prepare the light source by drilling holes into both carbon electrodes and to pack short lengths of wire into each. Routine control by this method has been established for some time.

Regulated Dry-Plate Rectifier

A. Rosenstein and H. N. Barnett (Electrical Engineering, January, 1944)

A fully automatic regulating circuit for selenium rectifiers has been developed. Output voltages are maintained constant to one-half of one per cent even when the rectifier is subjected to widely varying loads and large changes in input line voltage.

The dc output voltage of the selenium rectifier is passed through a specially designed filter, a variation of the Wien bridge, to eliminate the ripple, and then compared against a constant dc voltage. The voltage difference is amplified and

used to form the basis for a dc phase-shifting network that controls the grids of a pair of thyratrons, so that the thyratron output depends on the voltage difference. It is fed to the secondary windings of saturable reactors that are in series with the primary windings of the rectifier power transformers.

An increase in load tends to lower the rectifier voltage, the decrease in voltage is amplified and used to shift the thyratron grids forward to cause greater saturating current to flow through the reactors decreasing the drop across the reactors and increasing the voltage across the power transformer.

Testing of Insulating Materials

A. R. Dunton (Journal of the Institution of Electrical Engineers, Part 1, London, Nov. 1943)

An account is given of some specialized tests to establish moisture and heat resistance of insulating materials. Also the selection of paper for synthetic-resin varnished-paper products is discussed. Substitutes for natural silk are suggested, and electrical uses for modern materials mentioned.

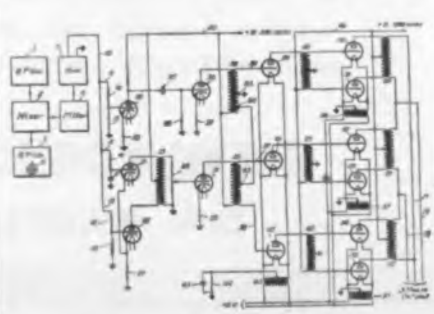
NEW PATENTS

(*Continued from page* 210)

the capacity increases as the resistance decreases. An explanation for this effect is given, and it is proposed to use these impedances as variable condensers, the capacitance of which is controlled by varying direct or low frequency currents passing through them. An amplifier, a voltage divider, a crystal filter and an automatic volume control circuit incorporating the variable capacitance control are shown and described. W. Lehfeldt, Alien Property Custodian, (F) Nov. 19, 1940, (I) Sept. 28, 1943, No. 2,330,499.

Single Phase Polyphase Converter

The frequency of the beat frequency oscillator is variable. Its output is applied to the grids of tubes 21, 22, 90 deg. out of phase with respect to the input to the grid of tube 20. Consequently, the voltages at the grids of tubes 30 and 31 are 90 deg. out of phase, and, this two phase output is converted into a three phase output by transformers 34 and 35, the secondary windings of which are connected in accordance with the known "Scott connection." The following tubes are amplifiers. P. B. Wickham, George W. Borg Corp., (F) March 24, 1941, (I) Nov. 2, 1943, No. 2,333,502.



FAST CAPACITORS

FOR WAR ...and POSTWAR

Like others in the industry, we too are confronted with the postwar problem ... BUT, we are fully conscious that VICTORY must come *first*! The important task of "getting there fustest with the mostest" is far from finished. We are making our contribution with not too much emphasis on postwar planning ... concentrating on the production of vital parts to help win the war.

Nevertheless, we face the postwar era with confidence ... secure in the knowledge that no job is too formidable for American ingenuity. The solution of today's problems renders tomorrow's insignificant by comparison.

The Capacitors we manufacture are critical components of numerous Radio and Electronic devices urgently needed now by our Armed Forces. Tomorrow, FAST Capacitors will be ready again for peacetime pursuits and postwar realities. May we suggest you consult us on your future requirements ... we are certain our Quarter-Century experience will prove helpful.

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Standard or Special Units to Meet Every Need

FAST Condensers and Capacitors are produced in many types and sizes, in standard and special designs, for a great variety of electronic and electrical applications in industry. Paper Capacitors—Oil or Wax impregnated—Rectangular or Tubular—in sizes from the smallest to the largest. Units specially engineered.

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J. R. Longstaffe, Ltd., 143 Berkeley Street, Toronto, for Special Applications

Electronic Switch

The electronic switch is to connect automatically a spare oscillator or amplifier to a load in the case of non-operation of the main oscillator or amplifier, for instance in carrier-wave telephony systems. The oscillator is operating the switch upon a transient or a permanent variation in one of its operating characteristics. G. Hepp, Alien Property Custodian, (F) July 8, 1941, (I) Sept. 28, 1943, No. 2,330,582.

Transmission Line Matching

The problem is to match a transmission line of a given characteristic impedance Z_o with an antenna or load circuit of a widely different impedance Z_L without restricting the frequency band width of the antenna or circuit. An even number n of quarter wave line sections is inserted in series between the load circuit and the transmission line. The impedance ratios Z_k/Z_o are to be made equal to $(Z_L/Z_o)^{(2k-1)/2n}$ Z_k being the impedance of the kth section. P. S. Carter, RCA, (F) May 30, 1942, (I) Sept. 14, 1943, Re. 22,374.

PROPOSE STANDARD SYMBOLS

(*Continued from page* 115)

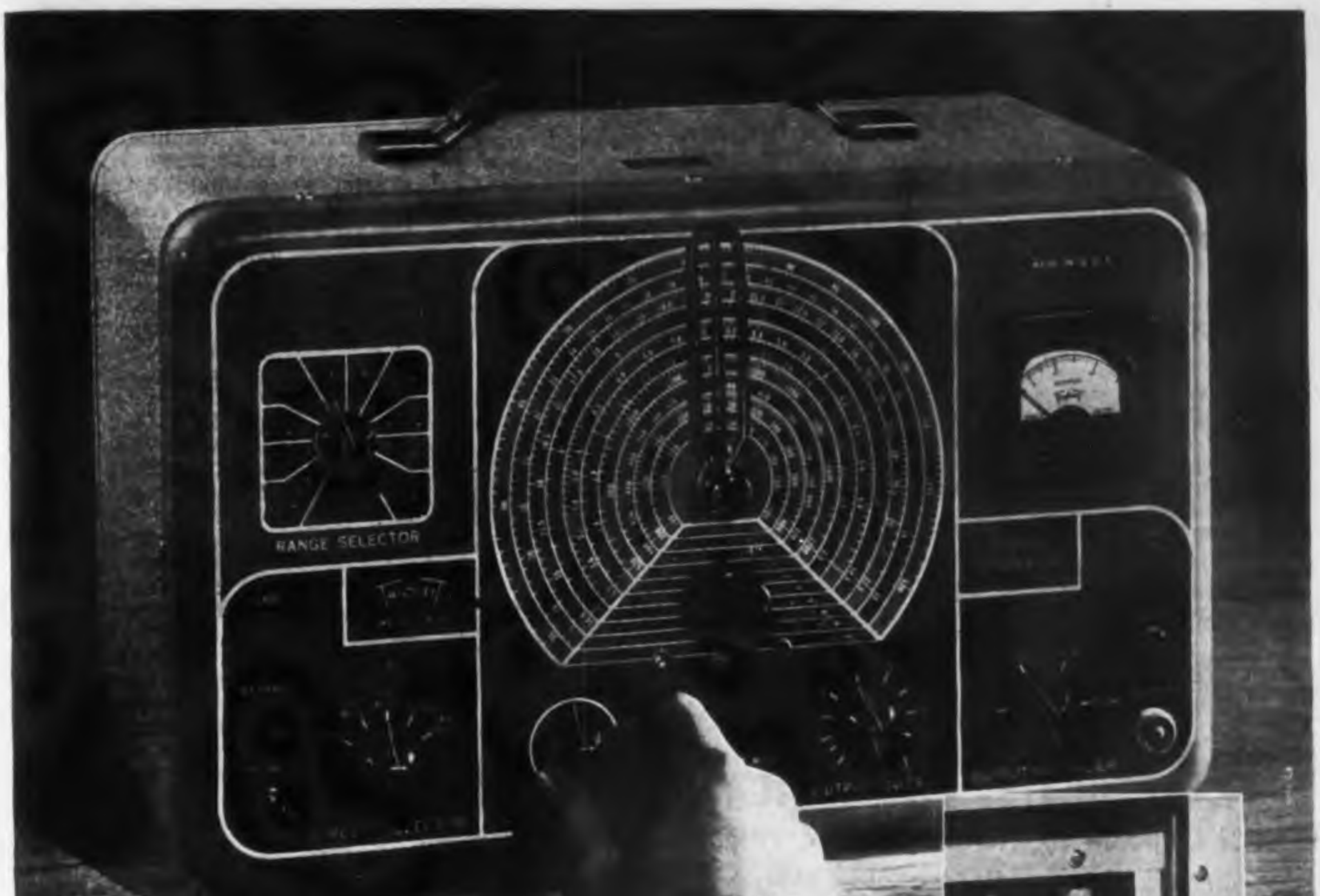
followed by the conference, was to condemn the use of the capacitor/contactor symbol for use by either group and to substitute slight variations for two applications. This will be evident by reference to page 115 where the basic items heretofore covered by duplicate symbols are shown.

Here the top row represents the controversial symbols widely used in electrical power and industrial circuits, and the lower row those used in radio and communication circuits. All other symbols were not in difficulty and were not discussed. The middle row indicates those which have been recommended at this conference, and which are now being considered by various standardizing agencies and committees for the operating groups.

Stop confusion

It was believed by those present that the use of these symbols as extensively and as soon as it was practicable to do so, would do much toward the clearing up of present ambiguity.

It is to the advantage of potential authors and writers on electronic subjects to utilize these symbols inasmuch as it will speed the day when a single symbolic language is used by all, which will give their products much wider acceptance in all fields where electronic tubes are becoming important because, as mentioned by Lt. Col. Richard Ranger of the Army-Navy Electronic Standardization Agency, "The strength of a standard is measured by the breadth of its acceptance."



MODEL NO. 1632

Signal Generator

CONTINUOUS COVERAGE—100 KC. TO 120 MC. • ALL FREQUENCIES FUNDAMENTALS

• Triple shielding throughout. Steel outer case, steel inner case, plus copper plating.

A complete wide-range Signal Generator in keeping with the broader requirements of today's testing. Model 1632 offers accuracy and stability, beyond anything heretofore demanded in the test field, plus the new high frequencies for frequency modulated and television receivers, required for post-war servicing. Top-quality engineering and construction throughout in keeping with the pledge of satisfaction represented by the familiar Triplett trademark.

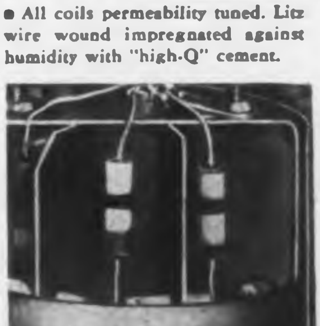
Of course today's production of this and other models go for war needs, but you will find the complete Triplett line the answer to your problems when you add to your post-war equipment.

• All coils permeability tuned. Litz wire wound impregnated against humidity with "high-Q" cement.

Triplett

ELECTRICAL STANDARDS ARE SET BY TRIPLETT **INSTRUMENT CO.**

BLUFFTON OHIO ★ ★ ★



• Note sections individually shielded with pure copper. Entire unit encased in aluminum shield.

ENGINEERS DISCUSS FM

By Maj. Edward W. Armstrong

(*Continued from page* 111)

appraisal or a reshuffling of the situation, and services needing greater space would be given additional allocations.

As a result, the No. 1 television band was moved up to the band marked "Government" between 60 and 66, so that the new assignment became as it is at present.

While this hearing was going on there was a most determined effort made to sell as many television sets in the No. 1 band as possible, so that it would not be possible to allocate that to FM broadcasting without working hardship on the purchasers of those sets. Some of you may remember some three or four years ago the dust-up in Washington. That which I have just told is the news behind the news, as they say in Washington. Actually on the surface it seemed that the controversy was about certain standards of television transmitters and receivers. But the background of it was what I have just stated to you, the undertaking to block FM by filling up the No. 1 television band with receivers.

Television didn't lose a band. It was given the same number of bands below the 129 megacycles as it had before. One of them was shifted up a matter of a few megacycles. But the enthusiasm to develop television disappeared after FM got the band from 42 to 50 megacycles.

That solved the immediate problem for FM. It went ahead and as you know was going great guns at the time of Pearl Harbor. From the looks of the room it is going to go greater guns after the Battle of Tokyo. There will be new broadcasting people into whose heads the idea of going into broadcasting never entered.

I look to see the day when broadcasting stations will be as reliable, will require as little attention, and will be turned on with as little thought as a public address system is turned on. There is no doubt that that could be done in the course of a couple of years of engineering. It means that there will be greater demands for channels than we have yet envisioned. None of us can foresee how far this is going.

The FM Broadcasters have appraised as a minimum for the immediate postwar period a block which you will see to the left of the chart. We think that there need be no conflict between FM and television. We feel that the block which you see there, which is capable of giving a national service immediately after the war, will be sufficient to furnish a postwar

industry of the scope that you heard the manufacturers forecast this morning.

By C. M. Jansky, Jr.

(Continued from page 111)

coverage areas which will be the same day and night. When the original needs of FM broadcasting were presented to the Federal Communications Commission in 1940, adequate provision was made for it in the allocation structure in so far as it was possible to foresee the need at that time. We have before us continued evidence of the extent to which the Federal Communications Commission and the members of its Engineering Staff have worked and are continually working assiduously to guide the orderly development of FM.

By Dr. W. R. G. Baker

(Continued from page 112)

that our approach to the problems of Panel 5 and the other system panels, assuming we desire to be realistic, must be somewhat as follows:

The basic problems of the systems panels are standards and frequency allocations. With respect to the standards, we have only the facts in hand to consider. What circuits, tubes, or other tools that will be available 2, 5, or 10 years from the present are not sufficiently evident to hazard a guess as to their effect on system standards. If we attempt to broaden our objective to include much beyond our present knowledge, I do not believe we will be ready to undertake our postwar responsibilities. This may sound pessimistic, but I believe it is simply realistic.

Considering the allocation problem, we have a somewhat more flexible situation. Within rather narrow limits, services can be shifted in position in the spectrum. These limits are determined by certain factors among which are the effect of such a shift on other services, the investment jeopardized by the shift and the knowledge available at the time as to the effect of such a change on the service rendered to the consumer. I am afraid with these limitations we cannot afford to make any radical changes in allocation, if we are to establish commercial service soon after the war. The preceding is from the viewpoint of the system panels.

On the other hand, Panel 1 is not operating under any such limitations. While this panel probably cannot do much with future system standards, it can assume that the present standards may remain substantially the same and extend the frequency allocation in accordance with any pattern it desires. This was done with the present

EVERY *Electro-Voice* Microphone is

One outstanding Electro-Voice achievement is the Model 7-A, a desk mounting type communication microphone. Designed for and approved by the CAA, this microphone is extensively used for airport landing control in addition to a number of other sound pick-up applications. The smooth frequency curve, rising with frequency, gives extremely high intelligibility, even under the most difficult conditions.

Another . . . the now-famous Model T-45 "Lip Mike". . . a noise-cancelling Differential Microphone . . . was designed by Electro-Voice in close collaboration with the Fort Monmouth Signal Corps.

Every Dynamic, Carbon and Velocity Microphone in our complete line is DESIGNED by ELECTRO-VOICE.

We maintain a network of distributors throughout the country. If your limited quantity needs can be filled by any of our Standard Model Microphones, with or without minor modifications, we suggest that you contact your nearest radio parts distributor.

Electro-Voice MICROPHONES

ELECTRO-VOICE MANUFACTURING CO., INC.
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television channels and while no tangible results have been obtained to date, some progress would probably have been made but for the war. In any case, we should assume that once the limitations of the war have been lifted, a serious effort will be made to utilize commercially, other portions of the spectrum.

We might then proceed as follows:

(1) The system panel to concentrate on such standards and allocations as fall within the bounds of our present knowledge.
(2) Panel 1 to extend the allocation in accordance with some reasonable pattern and submit the plan to the responsible system panel.
(3) The system panel would either accept the proposal of Panel 1, or cooperatively develop an acceptable plan.
(4) The allocation plan would then be submitted to Panel 2.

Even though this plan is not without faults, it would at least provide a base from which the industry could carry on. Obviously, if the war lasted a considerable period, certain technical advances might be reduced to practice to a sufficient degree to warrant modifying either or both the system standards and frequency allocations.

FM TECHNICAL QUESTIONS ANSWERED

(*Continued from page* 112)

an intense field. As stations are being licensed at the present time — that is, all have substantially the same radiated power within an area — I don't believe there is going to be much trouble from cross modulation.

If you have a 50 kilowatt station in town on the highest building, and a 1 kilowatt station on an adjacent or nearly adjacent frequency, and the two are widely separated geographically, then if you are in the shadow of the 50 kilowatt station you may have difficulty in receiving the farther away 1 kilowatt station.

It is a practical allocation problem, and the best solution for it is to see that if you do have 50 kilowatt stations in the center of town, that you put them on the closely adjacent wavelength and keep the 1 kilowatt station as far off as possible from the vicinity of the band wherein the 50 kilowatt stations are allocated.

"Will there be FM automobile sets, and what is being done to suppress automobile ignition?"

MAJOR ARMSTRONG: Yes, there will surely be automobile sets.

In regard to the second part of the question, as to what is being

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control fluctuating voltage to ±½%

- Stabilize at any load within their ratings.
- Hold constant varying A. C. input voltage to ± ½%.
- Quick action . . . fluctuating input voltage is stabilized within 2 cycles. Variations cannot be observed on an ordinary volt meter.
- Wide A.C. input voltage limits . . . 95 to 130 volts.
- Entirely automatic . . . no moving parts . . . requires no maintenance . . . connect it and forget it.

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ENDBELL MODEL

DIMENSIONS IN INCHES

Index Ref. No.	L 50~	L 60~	W	H
G-5	13 1/8	12 1/8	9 5/8	8 1/2
G-6	14 5/8	14	14 3/4	11 7/8
G-7	17 1/8	16 3/8	14 3/4	11 7/8

INPUT 95-130 V 60 CYCLES 1-PHASE OUTPUT 115 V PLUS OR MINUS ½%

WATTS	CASED Cat. No.	CASED Net Wt.	Index Ref. No.	UNCASED Cat. No.	UNCASED Net Wt.
30	VR-1	8 lbs.	G-1	VR-107	6 lbs.
30	VR-1-A†	8 "	G-1	VR-107-A†	6 "
60	VR-2	18 "	G-2	VR-207	16 "
120	VR-3	26 "	G-3	VR-307	22 "
250	VR-4	46 "	G-4	VR-407	36 "
500	VR-5	70 "	G-5		
1000	VR-6	140 "	G-6		
2000	VR-7	200 "	G-7		

†OUTPUT 6.0 or 7.5 VOLTS PLUS OR MINUS ½%

INPUT 190-260 V 60 CYCLES 1-PHASE OUTPUT 220/230 V ± ½%

WATTS	CASED Cat. No.	CASED Net Wt.	Index Ref. No.
2000	VR-7-A	200 lbs.	G-7

INPUT 95-130 V 50 CYCLES 1-PHASE OUTPUT 115 V PLUS OR MINUS ½%

WATTS	CASED Cat. No.	CASED Net Wt.	Index Ref. No.	UNCASED Cat. No.	UNCASED Net Wt.
25	VR-155	8 lbs.	G-1	VR-158	6 lbs.
60	VR-255	21 "	G-2	VR-258	19 "
120	VR-355	26 "	G-3	VR-358	23 "
250	VR-455	50 "	G-4	VR-458	42 "
500	VR-555	80 "	G-5		
1000	VR-655	150 "	G-6		
2000	VR-755	220 "	G-7		

INPUT 190-260 V 50 CYCLES 1-PHASE OUTPUT 220/230 V ± ½%

WATTS	CASED Cat. No.	CASED Net Wt.	Index Ref. No.	UNCASED Cat. No.	UNCASED Net Wt.
25	VR-521	8 lbs.	G-1	VR-510	6 lbs.
60	VR-522	21 "	G-2	VR-520	19 "
120	VR-523	26 "	G-3	VR-530	23 "
250	VR-524	50 "	G-4	VR-540	42 "
500	VR-525	80 "	G-5		
1000	VR-526	150 "	G-6		
2000	VR-527	220 "	G-7		

CASED MODEL

DIMENSIONS IN INCHES

Index Ref. No.	L	W	H
G-1	8 3/8	3 7/16	4 1/2
G-2	11 3/8	5 3/8	5 3/8
G-3	15	6	6 1/2
G-4	18 3/8	7	8 7/8

UNCASED MODEL

DIMENSIONS IN INCHES

Index Ref. No.	L	W	H Max.
G-1	7 5/16	3	3 5/8
G-2	7 7/8	5 11/16	5 3/8
G-3	12 7/16	5 11/16	5 3/8
G-4	15 9/16	6 3/4	7

Raytheon RectiChargeRs (battery chargers) . . . complete range of units from 1 to 12 amps . . . many models for 50 cycles input.

Raytheon RectiFilteRs (battery eliminators) . . . wide range of models available for varied operations . . . 50 or 60 cycles.

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done to suppress automobile ignition, we have to go back to the prewar period. At that time both the radio industry and the automobile industry, the Society of Automobile Manufacturers, were jointly considering the problem and had gotten to the point where they had determined that at the cost of about one dollar, automobiles could be equipped with suppressers.

I think the first part of this question really answers the second, because with FM sets available in automobiles, the first automobile manufacturer to advertise that his car is equipped with suppressers, so that there will be no interference with FM sets, will certainly have a selling point. I think they will all follow.

MR. JETT: In connection with that question on interference resulting from automobile ignition and so forth, it seems to me that today more than ever we ought to think in terms of interference from diathermy machines and induction heating equipment, all of those devices that really do raise very serious problems from the standpoint of providing good broadcast service, or good radio communication, for that matter.

In 1938 the Commission recommended to Congress that the Communications Act be amended giving the Commission the power to regulate the interference that might result from radio frequency generators, so-called non-communications devices, or devices that are not used for communication but are causing interference to radio communication. About a month or so ago, the Senate Interstate Commerce Committee held hearings in connection with some modifications of the Communications Act, and several of us who appeared at that hearing stressed the need for further legislation to control radiation from these particular devices that I have been talking about.

I certainly hope that FMBI — for that matter, all of the industry — will become interested in that subject, because we in our field service of the FCC have observed an ever-increasing amount of interference resulting from that type of equipment. Something ought to be done about it.

"Major Armstrong, would you like to say something about the quality angle?"

MAJOR ARMSTRONG: Nearly three years ago I saw a demonstration in the Bell Telephone Laboratories of a 15,000 cycle record. It is both a new record and a new pickup device for use in conjunction with it which makes this thing possible.

The demonstration was so startling when it was compared with

. . . to keep fighting radios on the beam!

Under pressure of war's demands for immense quantities of radio equipment for use on land, at sea and in the air, crystal grinding techniques have been revolutionized.

More than 9,000,000 crystals have been produced for war by Western Electric to date. One of our shops now makes as many crystals in a day as the whole industry used to turn out in a year! And four such Western Electric shops are now working.

In other phases of Western Electric's war work, much the same thing has been happening. Radio receivers and transmitters of many types have been produced by the tens of thousands—mikes of all types totaling more than 600,000—over half a million headsets—vacuum tubes by the millions.

As a natural result of Western Electric's years of leadership in telephone and radio work, this Company is today *the nation's largest producer of electronic and communications equipment for war.*

To speed Victory, buy War Bonds regularly—all you can!

75TH ANNIVERSARY

Western Electric

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ARMY E NAVY

the existing recordings, transcriptions, which we are now using, that the effect was to make you believe there was something wrong with the particular standard type of transcription records. Not until those records or transcriptions were compared with the old, or home type of records, did you get the full force and effect of what this new record would do.

Mr. Lack has told me that in the postwar period these records will be generally available, and I think that they will enable the stations, which cannot be connected up by 15,000 cycle lines, to put on a service which will be superior in service to anything which can be sent over existing lines, even though FM transmitters may be used for the radio part of the transmission.

"There is every reason to believe that television will be 'ready' as soon after the war as the manufacture of equipment can be resumed. A sound channel on the television transmitter apparently enjoys all the advantages of FM. Why should not the broadcasting stations install television transmitters rather than FM transmitters even if they only partially operate them with a sound program only until sufficient television receivers are in operation?"

"Assuming that television will be delayed two or three years after the war, what justification does the broadcast station have for installing FM, probably operating it at a loss for a few years and then junking it in favor of television?"

"Has there been proposed any allocation plan whereby FM bands of sufficient width will be allocated, so that at a future date FM stations could add video and thus become television stations?"

MR. JETT: A television transmitter, of course, is not used for broadcasting sound, and the sound track for television is carried on a separate transmitter, and therefore the person who asked that question should not worry about the possibility of using his video transmitter for the transmission of sound later on.

I don't think it will ever be necessary to junk an FM transmitter in favor of television, because, in my opinion, the two services, while competitive to a limited extent, will stand on their own feet and operate as separate services to the public; that is to say, oral broadcasting and television.

We assign a sound track along with the television channel. Most of you know the television channel is 6 megacycles wide, and $4\frac{1}{2}$ of the 6 megacycles are used for the video, the other $1\frac{1}{2}$ megacycles occupy the guard band and the

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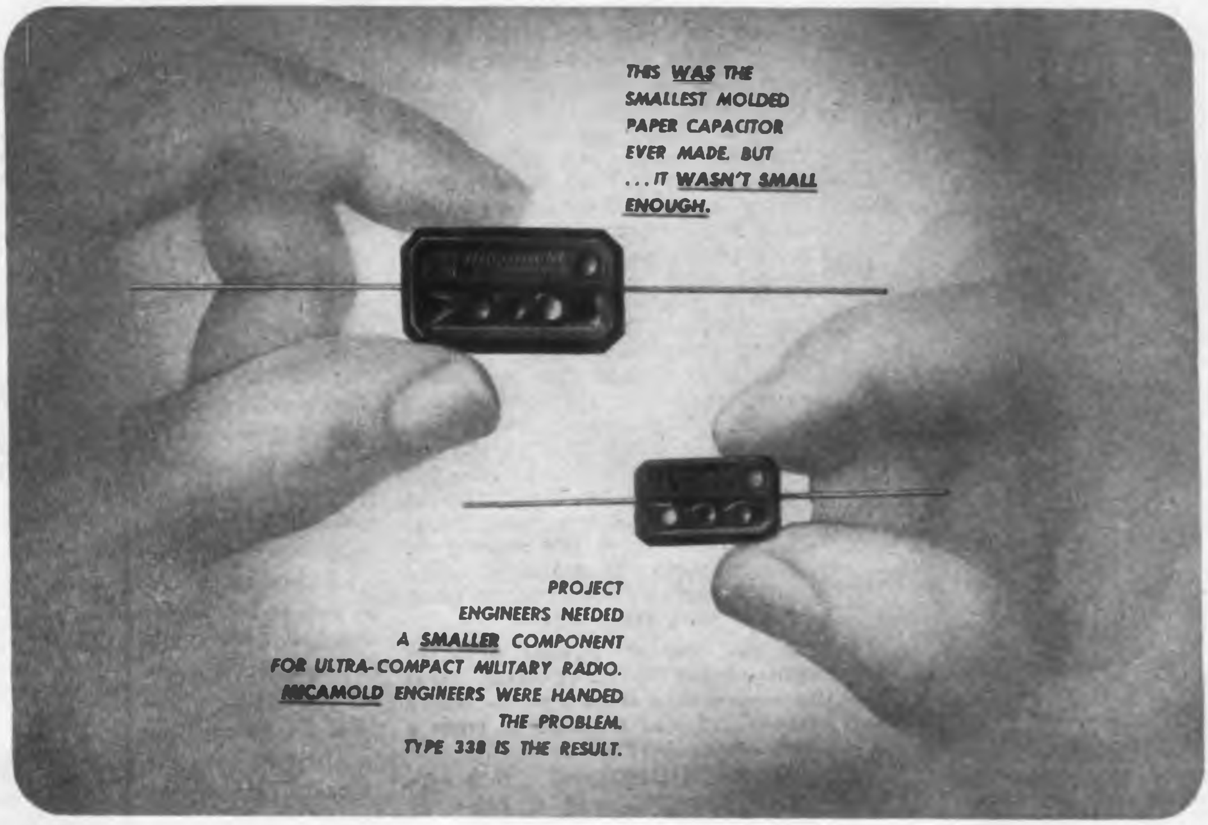

The Type 338 is a paper by-pass capacitor molded in bakelite. Specially designed manufacturing equipment was built to produce it. The Type 338 is very small, measuring only $3/4''$ x $7/16''$ x $7/32''$. And it weighs but 2.5 grams. These units are used in large quantities in their special application.

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channel for the sound accompanying television. As the channels are assigned for television, we also assign the FM sound channel.

I don't think that FM broadcasting as such, as distinguished from television — when I say television I am automatically including the sound that must necessarily go along with television — should be used for sound track purposes for television. There are lots of reasons for it. In the first place, if you listened to an FM channel in the FM band that was carrying sound for television, the whole thing would be incoherent, unless you could see the picture at the same time.

Furthermore, we have only 35 channels, and, as I said to the Senate Interstate Commerce Committee, I think 35 channels assigned to FM for broadcasting purposes is wholly inadequate, that we should have at least twice that number of channels for an effective, nationwide, competitive system of FM broadcasting.

Similarly, I feel that we should have twice the number of television channels. There are only 18 television channels. I don't really see how we are going to do an effective job with 36. However, I did make the statement that I thought we should have twice the number of television and FM channels, and I think I was very conservative when I made that statement.

"Is the use of booster or relay transmitters to cover large rural areas practical from a performance standpoint and economical from a cost standpoint?"

MAJOR ARMSTRONG: It is certainly practical, and it certainly can be done.

As to the economics of it, that is one of those things that we feel our way along with, and in some cases will succeed and perhaps in others will not immediately succeed, but eventually I am very sure that it will be found to be the economic way in most cases.

MR. JANSKY: Yes, I presume it is technically feasible in some instances, but there again you may run into costs that make it cheaper to put up two antennas. It is possible to make an antenna that will respond to two frequencies, but when you get through you might wish you hadn't done it.

"What is the highest frequency that FM stations may be practically operated—technically, not legally?"

MR. JANSKY: That is an apparatus question and not a system question, and I don't want to answer the question with respect to apparatus without answering it with respect to the broadcasting system. We have STL link circuits operating on frequencies as high as 330 megacycles. However, in my opinion, that does

not mean that we could make a complete and adequate FM broadcast service of primary nature, establish it at 330 megacycles, because a lot of other things enter into that

One of them is that according to all the information I have been able to gather — and here again I may be wrong, but I doubt it — it is not practical today to generate continuous radio frequency power such as is necessary for the transmission of video or sound, power in terms of kilowatts rather than in terms of watts, at frequencies much above 100 megacycles.

Therefore, if you want a service which needs power in kilowatts, you are going to have to stay below about that.

"What are the engineering possibilities and the legal (FCC) restrictions to be expected from dual operation of FM arrays from a common steel tower supporting structure? I have in mind a plan whereby several FM broadcasters will rent space on a common tower which is constructed by an interested tower manufacturing concern."

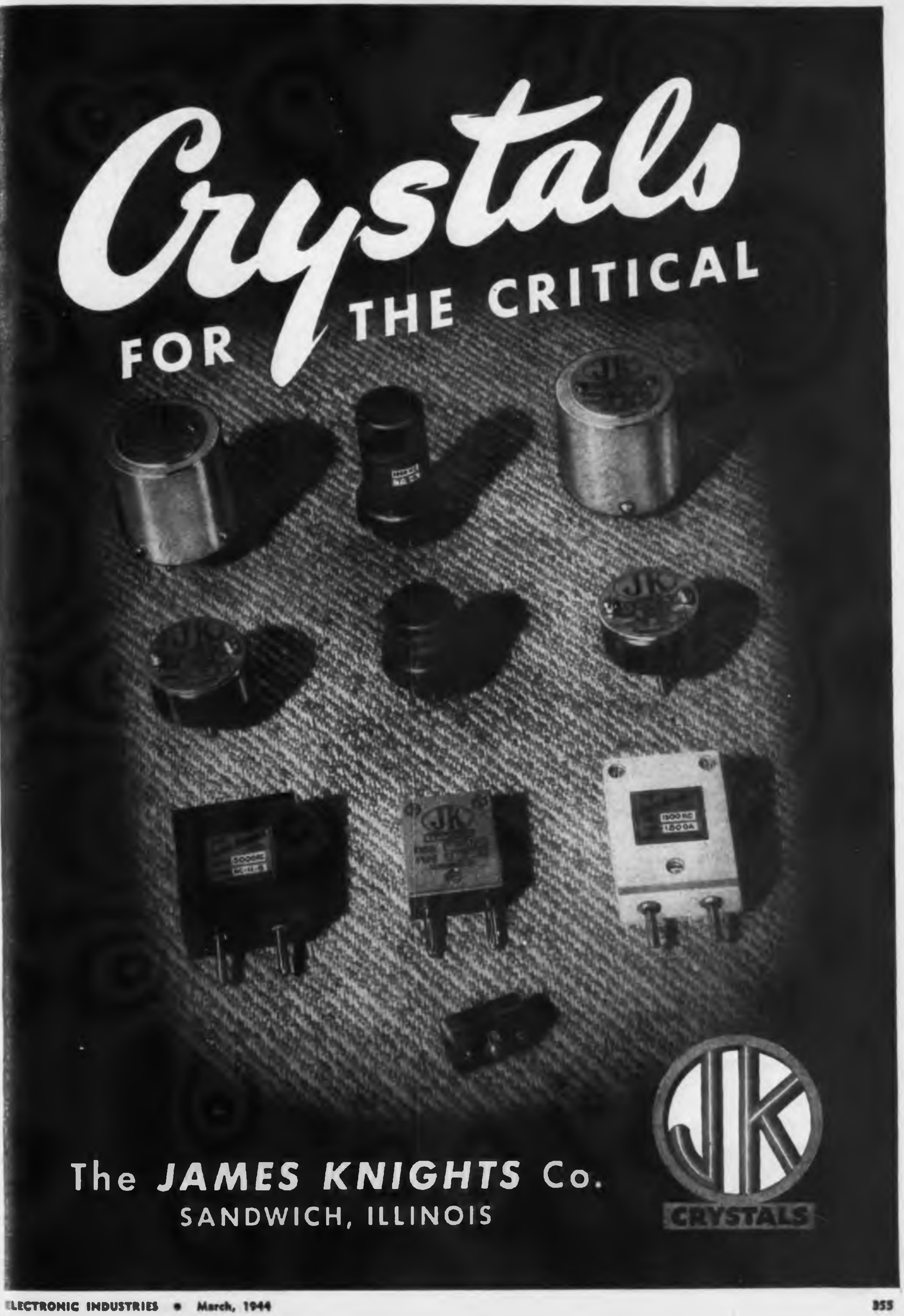
MR. ADAIR: With respect to the engineering possibilities, I see no particular reason why more than one FM antenna cannot be located on the same support. With respect to the legal restrictions, although I have been accused of playing in the lawyer's backyard, too, I am not a lawyer, and I can't state what legal restrictions can be made.

With respect to the FCC policies at the present time, we have a rule which prohibits the use of a common antenna by two standard broadcast stations. Whether that will be carried over into FM I can't say, but that is another point which will have to be given consideration in the overall picture.

"Would it be more efficient and economical to connect the stations by telephone lines instead of beaming programs? Wouldn't this affect the quality? If the telephone company perfects lines to carry the possible frequencies of FM will the beaming of programs from one station to another be prohibited?"

MAJOR ARMSTRONG: That depends on where you are and what type of network you are proposing to run. I am answering the question as of today, and I will answer it later as of the future.

Take the case of rough terrain, such as New Ehgland, where no one has yet succeeded in building a telephone line up the mountain which will last throughout the winter. The only possible way of getting service there is by rebroadcasting or, as it will eventually be done, by beaming 300 or 500 megacycle programs around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among the mountain tops. In such a situation, no wider line of development could possibly compete.

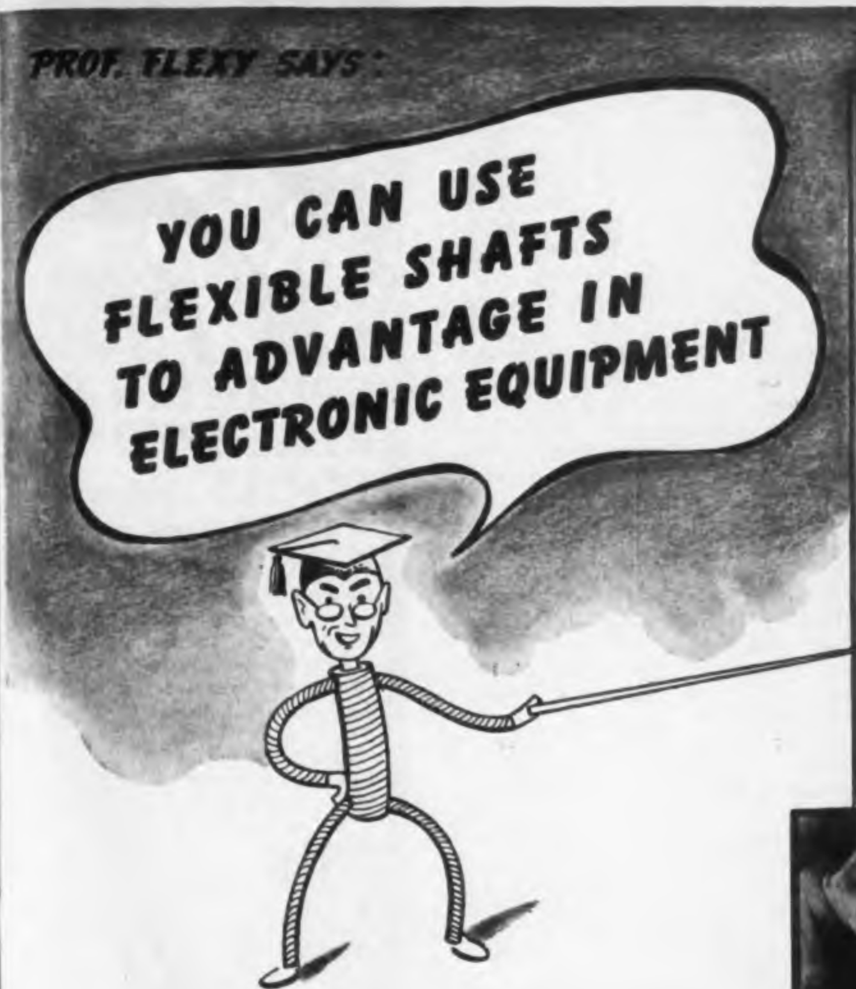
Take the situation down around Clingman's Peak where again we have a high mountain. There you can put telephone lines up the mountain. Yet, when the time came to make the selection, Mr. Gordon Gray put in a 330 megacycle relay from where his studio is in Winston-Salem to the peak where he has the broadcasting station, a matter of 125 miles. Similarly, he will undoubtedly put 300 or 500 megacycle relays on the top of Clingman's Peak and extend it we don't know how far. But you could sit down tomorrow and lay out a system which would cover a radius of 500 miles in that country without difficulty and without affecting the quality, because one thing which can be done in FM which cannot be done with AM is the ability that you have to go from one relay to another without bringing the moduation of the program down to audibility, through rectifiers and modulators, to get it back up at radio frequency again. You merely change the frequency by heterodyne, and the distortion is insignificant. I doubt if you could measure it with any of the existing distortion measuring equipment.

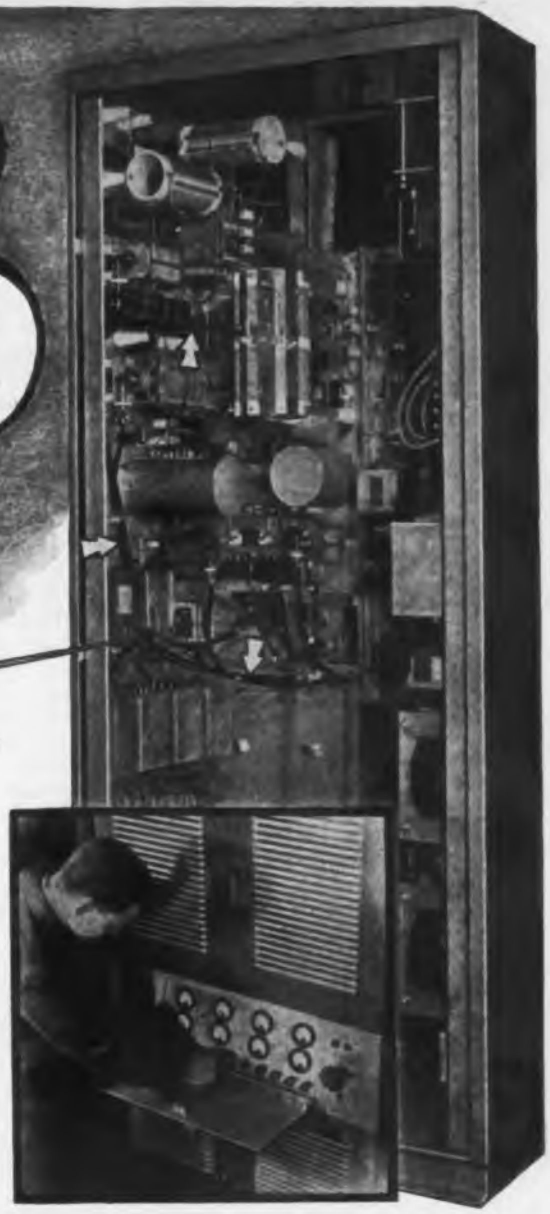
There is no doubt at all that the laboratories of the AT&T have been working very hard on the problem of meeting the new requirements of FM.

I would be inclined to think that in the postwar period they could probably beat the performance of an FM relay across the continent. I doubt if they could beat it for a system of 500 miles, which I think we could sit down now and design. We would probably want to design the second 500 miles of that link in the light of the experience gained in the operation of the first 500 miles. But certain it is that some day over these long distances there is going to be a competitive situation between wire and beamed radio transmission. How it will come out we will have to wait for the future to tell us.

But it is very practical at the present time to connect up large regions by beamed relays, and I think at the present time it can be done more economically and better than with wire line transmission.

MR. JETT: When we think in terms of setting up a radio network for relaying channels, providing relay channels for FM, we must also think in terms of the relay channels required for television. In my opinion, there will be applications filed with the Commission not just for a series of towers to carry radio relay channels for FM, but also a series of towers between the cities that the Major has referred to and, ultimately, nationwide to carry FM programs and





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FLEXIBLE SHAFTS — AIRCRAFT ACCESSORIES — MOLDED PLASTICS — MOLDED RESISTORS — FLEXIBLE SHAFT TOOLS oral standard band program service, and television program, and also the marginal services such as the private line telegraph services for stock brokers. That activity, in all probability, will be carried on by a common carrier, a company which may possibly be competitive with the telegraph company or the telephone company, or it may be one or the other of those two companies, I don't know which. It is possible that it may be a new company.

I know that I have heard several people talk recently about the possibilities of installing such a nationwide system to provide for the needs of all these various services about which I have been talking. One man, I remember, said that he had 20 million dollars to put on the dotted line right now to organize such a company. Well, that is the kind of talk that is going around, and that we hear about, but it does raise the important question of policy from the standpoint of how many of these networks we are going to allow to group up, and whether we are going to have a forest of towers all over the United States operating one set independently for FM and another for television and another for these so-called marginal services I spoke of; or, perhaps indeed, telephone channels may ultimately be used in lieu of wire lines, that is, radio telephone channels.

We don't know the answer, but we do know, as the result of our talks with industry people, in both the wire and radio field, that there is a serious question from the economic standpoint as to whether or not the radio relay system can be operated as cheaply or cheaper than a carrier system by wire or a coaxial system.

"What measures are being taken to avoid the possibility of 2 FM bands growing out of postwar development?"

MR. JETT: As to what measures are being taken to avoid the possibility of 2 FM bands growing out of the postwar development, we are not taking any measures to avoid that possibility, if the studies made by the various technical groups find that it would be a desirable thing to have two bands.

"Why don't we do away with the 40-50 megacycles band for FM and allow FM broadcasting in the sound channel of television in those hours that the television and sound channel won't be working together?"

MR. JETT: I don't think it makes good sense, engineeringly speaking. In the first place, you have 18 channels instead of 36, because there are 18 sound tracks that accompany 18 television channels. In the second place, those 18

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MR. SHEPHARD: FCC rules at the present time prohibit a television licensee from using his sound track when he isn't using his video. Do they have to operate together under the present commercial rules?

MR. JETT: For commercial service, but under the experimental, they think they could operate individually.

FM MANUFACTURERS PLAN FOR FUTURE

By Charles M. Srebroff

(*Continued from page* 112)

studio equipment, measuring equipment and the necessary material for the erection of a suitable antenna. This will entail that the prospective broadcaster has only to supply the building or the space in which the installation is to be made and the tower, roof or the mountain top on which to erect the antenna.

Besides the apparatus, Rel will be prepared to make arrangements to supply all of the engineering and data required for the FCC construction permit filing. We will also make available information regarding programming, advertising, operating costs and as a matter of fact, we intend to make available for the package buyer all he wants to know. This means that at one source he will easily and quickly secure the necessary data to get on the air. In plain and straightforward language, the package will be supplied from "soup to nuts."

Rel's FM transmitters will range in power from 1 to 50 kw. Complete engineering will be made available to all purchasers of transmitters.

By Lee McCanne

(*Continued from page* 112)

Two features from our better models of the 1941 line and 1942 line FM — AM home sets we believe have outstanding merit. One of these is the providing of push buttons which may be pre-set for any desired combination of AM stations and FM stations mixed together. This is accomplished by an automatic range switch which shifts from AM band to FM band or vice versa as you push the button to turn the dial to the desired station. This is the simplest means

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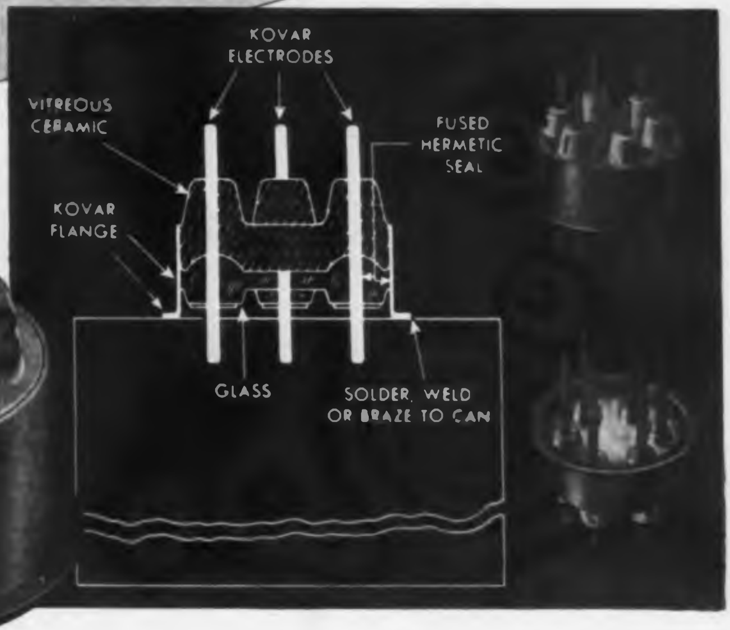

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of handling the range switch problem for the casual operator of a radio set.

The other unusual feature has to do with phonograph reproductions in an FM radio-phonograph combination. Stromberg-Carlson has provided for forthcoming better phonograph records in its better FM sets by a circuit arrangement which switches in a scratch filter whenever the push button for an AM radio station is pressed, but eliminates that scratch filter and allows the full tonal response from new records to be reproduced if the push button for an FM radio station is pressed.

We believe FM provides the best means for transmitting and reproducing the sound track of television pictures, but that FM receiving sets will provide a large postwar market before the new television standard can be established and transmitters built and installed. The addition of a television picture receiver to a postwar FM — AM radio-phonograph combination should provide a complete service in the most convenient form.

By C. R. Barhydt
General Electric

I will say at the outset that FM will dominate our product design and merchandising and advertising program in the postwar period. Tentative plans which at the present time are in the paper stage only, call for FM receivers in all but the lower-priced brackets. We believe that our first postwar line produced under unrestricted conditions will consist of FM models to the extent of approximately 20 per cent by units and 60 per cent by dollar volume.

At first glance it would seem that the figure of 20 per cent for units is small. It must be remembered, however, that in normal times, judged by prewar standards, the small 5 and 6-tube ac/dc sets, including all types, comprised between 60 and 70 per cent of all sets produced. Omitting the ac/dc sets from the picture, we expect our postwar line to consist of FM sets to the extent of 80 to 90 per cent of all remaining types. The broadcaster is interested in coverage which is represented by the actual number of units in operation. A detailed survey made by our company about 6 months ago indicates a probable deferred demand at the end of 1944 of approximately 25 million receivers. About 3 weeks ago the National Association of Manufacturers published an estimate of deferred demand existing at the present time of 20 million. A rise in the deferred demand of 5 million sets during 1944 would bring these estimates exactly together.

(Turn page)

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GENERAL ELECTRIC

Having then arrived by conservative analysis at a pent-up demand of 25 million receivers at the end of 1944, and assuming that other manufacturers feel at least as optimistic about FM as General Electric, we may expect a production of approximately 5 million FM receivers for the first full year of production following the lifting of all restrictions on manufacturing. Fifteen million FM sets should be in the hands of the public at the end of 5 years.

We at General Electric are not planning to produce FM receivers which do not provide the superior advantages which FM has to offer. We believe that the future success of FM will depend on maintaining high standards of performance. This does not necessarily mean that FM will be confined to the high-priced end of the line. We believe that it would be possible to produce FM receivers with excellent performance at the present time that could retail at $60, based on prewar prices. To reduce prices below this figure and at the same time maintain the high levels of performance which FM receivers must have, is not going to be an easy job. We think, however, that it can and will be done.

By W. R. David
General Electric

Our plans for the future are very definite. We intend to manufacture and offer for sale a complete line of FM transmitting equipment from microphone to antenna and in addition, medium and high power AM transmitters both conventional and international. Work on these lines will be started as soon as our engineers are released from war work. Manufacturing will start as soon as we are authorized to produce transmitting equipment for commercial use.

By J. E. Brown
Zenith

In developing its postwar FM receiver planning, Zenith is of the opinion that the major problem before the industry is that of the extension of the FM band to some upper frequency limit greater than 50 megacycles. It seems logical that the FM band might incorporate the space from 42-56 megacycles. Therefore Zenith planning calls for extension of the tuning range in its receivers to cover this band.

The greatest service the receiver industry can perform for the new FM broadcasting business is to secure the widest possible circulation of FM receivers. We believe this is best accomplished by making receivers combination FM and AM so that the purchasers of new receivers in the price brackets in

which FM can fit will automatically be set up to receive FM service as it expands.

By Arthur Freed
Freed Radio Corp.

After the war we will continue, as before, to concentrate our efforts on serving the quality market for FM receivers.

Too little attention has been paid to the antenna requirements of FM. To insure complete satisfaction, FM sets should have better antenna systems than those provided in the past. We have started doing that job already by urging builders of postwar homes to include antenna connections in every room in which a radio may be used, and to build an adequate aerial into every home.

By James S. Rasmussen
Crosley

In 1940 and 1941 Crosley produced high-quality FM receivers, mainly combination FM-AM sets, ranging from $125 to $275 in price. As soon as the war is over and peacetime production can be resumed, Crosley will be back in the field, again producing high-quality receivers in about the same price range.

By C. B. Jolliffe
RCA Victor

Prior to the war RCA had developed and was ready to put into application some novel FM circuits. We expect to incorporate these circuits in apparatus produced in the postwar period. We manufactured and supplied FM broadcast transmitters prior to the war. As soon as civilian production is resumed we plan to offer for sale a complete line of FM transmitters.

In the postwar period, all RCA standard broadcast audio equipment will meet the present standards of fidelity for FM and consequently all standard equipment will be satisfactory for use with FM transmitters. RCA has produced test and monitoring equipment required by FM stations and we expect to continue to offer this apparatus for sale. RCA plans also to supply FM antennas suitable for use on steel towers or existing structural supports. RCA will be able to furnish studio-transmitter link circuit equipment and accessories. In fact, we plan to be in the same position as we have been in the AM broadcasting field; that is, we will offer a complete and coordinated line of studio, transmitter and accessory equipment.

With respect to the other portion of the FM system in which the public is interested—the receiver—as one of the larger producers of home radio sets, we expect to offer for sale to the public FM receivers of high quality design at reasonable prices.


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#1½ Blower reduces space requirements for heat dissipation. Unexcelled for applications in electronic equipment.
OUTPUT . . . 15 C.F.M. at 8000 R.P.M.
HOUSING . . . High impact plastic
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WEIGHT . . . Housing and wheel 2 ounces
Bulletin including complete performance specifications available on request.
L-R MANUFACTURING COMPANY
TORRINGTON, CONN.

CONTROL METHODS

(Continued from page 119)

Fig. 4a is used to couple the gage to the oscillograph. The value of R should be at least as great as the resistance of the gage used, and may be adjusted to give the required gage current.

For the vibration frequency range usually found in industrial devices, a high quality microphone transformer, of the type designated "carbon microphone-to-grid," will give a substantial boost in the output level, so as to operate an oscillograph that has only one stage of amplification (the usual 3 in. model).

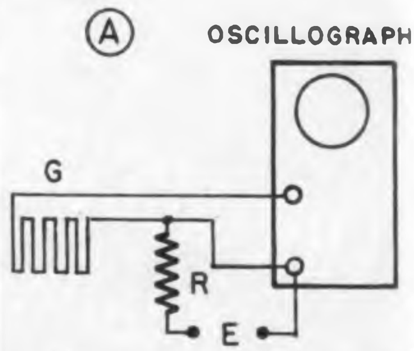

Fig. 4A—Method used to connect a strain gage to an oscillograph

To take note of resistance changes which may amount to only a few tenths of a milliohm, a better-than-ordinary bridge must be used because the "answer" may lie entirely on the 4th or 5th-place dial. The problem is eased somewhat by the care in which all units are standardized to a given resistance, within, say, one ohm, which permits the coarser dials of the bridge to be eliminated. This is done by connecting a dummy gage into an opposing arm and using the bridge adjustment dials to take care of the strain variations only.

In bridge equipment developed for this service, means are provided to incorporate the sentivity factor of the gage into the ratio-arm, so that dials are calibrated—not in ohms, but in micro-inches of strain.

Since the measuring equipment must, of necessity, be placed at a distance from the gage, the manner in which the leads are installed requires attention. Numerous factors may cause false reading. Temperature effects are important, although the gage wire used has an extremely low temperature-coefficient, because abnormal strains may be induced in the gage by the expansion of the test surface at increased temperatures.

Since in the original use for this equipment strain indications caused by applied forces only are wanted, those due to temperature effects only confuse the test. To others, this may seem unusual, since strain gages make good temperature indicators when cemented to a surface of a material with a known

temperature coefficient, provided that surface is not strained by other stresses. Temperature effects from the connection leads may be important, but in either case, the use of a dummy gage mounted in a location near the main gage, but not stressed, will nullify these changes.

In Fig. 4b, two gages are shown, both mounted at a distance from the indicator, together with two fixed resistors, so that the complete bridge circuit is established at the remote point, with some means (not shown) of securing a satisfactory balance initially. The gages may be connected aiding, (as shown) where both contribute to the unbalance, or opposing where the stress differences are noted (gages in adjacent arms), or only one active gage may be used.

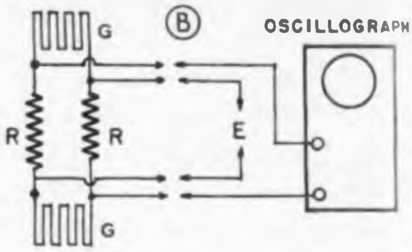

Fig. 4B—Where two strain gages are used, they may be connected to the oscillograph in this manner

Here, the well-known basic characteristic of a bridge is utilized—where large variations in the impedance of the leads from the bridge to the power source (battery or oscillator) and to the detector (galvanometer, meter, or amplifier) can be handled without affecting the accuracy of the reading. This principle will take care of any chattering contacts and slip-ring variations which are usually necessary when studying the stresses of moving parts. It might be mentioned in passing, that this is an extremely useful principle to keep in mind in remote indicator and control circuits of many kinds, where tests on fast moving objects are to be made.

Gages are rarely used singly, and in certain tests many effects are watched continually during a run. Here the matter of switching comes in, and variations in contact resistance must be carefully considered. Such variations must not exceed a few micro-ohms in many tests.

Simple as the problem of computing stress components is, when straight push or pull effects only are effective, in many cases when a strain gage is cemented to a surface that is later warped or bent into a curved form when the stress is added, it is stretched or compressed according to rather complex rules. Here the answer must also include such factors as the thickness of the cement, etc.

A very large number of the problems associated with industrial designs have been linked with arbitrarily assigned safety factors that

take care of the unknown factors associated with stresses.* Within the past few years a variety of test methods have been devised whereby the uncertainty of many of these factors has been wiped out. While it is not possible to point out in this resume many of the various applications of these gages to strain determinations, it is of interest to note a few uses that are outside of this field. The measurement of temperature has been mentioned. Expansion due to temperature can be found in many locations where stresses caused by other factors are not present. Velocity of bullets in a gun barrel has been measured by noting on an oscillograph the travel time of the expansion wave along the outside of the barrel, by using several gages distributed along its length.

Weight has been measured with strain gages attached to the balance arms. The gages are frequently used in wind tunnel experiments. Roadbed loads can be noted under various conditions of travel. Certain physical constants can be determined by noting the velocity of sound travel throughout its mass and its attenuation. For example, the attenuation of a sound wave across a welded joint can give some evidence as to its quality. Fluid pressure in tanks and against dams can be measured or the pressure changes in an engine cylinder. Special crossed-gages are in use for measuring torque, and by an extension of this principle, the measurements of the driven loads on a shaft. By noting the strain on a mass-spring arrangement velocity and acceleration can be measured.

*The importance of these studies is indicated by the remarkable growth of an organization devoted solely to the investigation of means for studying stresses: The Society for Experimental Stress Analysis, (Cambridge Mass.).

RECONVERSION PLANS

(*Continued from page* 103)

When the responsible contracting officers and their staffs have evaluated the considerations in each specific contract included in a termination program, their reports will be subject to review by the special review board of the technical service involved. Each case will be reviewed when it involves more than one contractor and a sizable number of workers or amount of productive equipment. After approval by the chief of the technical service concerned, each board's decision will be forwarded to the Commanding General, Army Service Forces, for further comment in the case of privately owned plants and final authorization in the case of Government-owned installations.

A top-side review board in Army Service Forces headquarters will consider all cases and make recom-


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Tough assignments are part of our day's work. Whatever the product — instrument housings, boxes, chassis—we're geared to design, fabricate, and finish.
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mendations to the Commanding General, ASF. This final board of review will discuss the problems involved with the other Government agencies responsible for procurement, and with the War Production Board and War Manpower Commission, so that final action may reflect the views of all agencies.

Members of the Signal Corps Board of Review are Colonel Conrad E. Snow, Director, Legal Division, Chairman; Colonel William M. Mack, Chief, Procurement Division, and Colonel Ralph L. Hart, Chief, Production Division.

No huge surplus

It is important for the industry to realize that despite rumors, the Signal Corps has NOT accumulated any huge surpluses of electronic-radio equipment. In fact, it is understood that the Army has actually an overall reserve of such apparatus sufficient to meet a few months' supply. Of course, there have been some surpluses in a few standard radio items, such as batteries, which have resulted mainly at the production factories themselves through "rejects" and these have been sold for civilian use.

It is believed that following the war demobilization the requirements for ship and shore station radio equipment service will be definitely limited because much of the equipment which has been purchased in 1942-44 for the greatly expanded Navy will continue to be used for several years. New procurement will be contingent upon postwar developments of sufficient importance to warrant the replacement of apparatus in the category of modern equipment. Otherwise, unless the war lasts longer than two years, it is authoritatively viewed there is sufficient equipment already on order for the Pacific offensive.

Of necessity, curtailment in military production, including substantial cutbacks in both the programs of the Army and Navy and Lend-Lease, will arise after the European war phase is finished, it is viewed. The production curtailments, of course, will be dependent to a major degree on the destruction of equipment and salvage results after the projected offensives.

The general principles which have arisen in regard to reconversion to civilian production in the consideration of this problem by the Radio Manufacturers Association have been that no individual company should be penalized by virtue of its war production position; that the government should establish a future starting date of any shipments of civilian sets, at least six months in advance; that any manufacturers' quotas should be established quarterly by the Armed Services, with three months'

"Give us SLEEVING that's RUGGED..."

Operator at the Muskegon plant of Anaconda Wire & Cable Co. slipping Natvar sleeving on coil leads.

THAT was Anaconda Wire & Cable Company's first requirement for the sleeving to be used on coils they are building for certain vital war equipment.

"Give us sleeving that's rugged . . . it has to do more than pass the standard tests, because it will have to take plenty of punishment after it leaves here. We know where these coils are going . . . and we know *they've got to stand up!*

"And another thing — most of them are needed *yesterday*, so we're shipping 'em out each day as soon as they pass final tests. We run into trouble if the sleeving isn't smooth on the inside — it slows us down because most of our leads are dead soft or stranded. It may sound like a little thing — but it's important.

"Besides, we want fast color and fast delivery."

What are *your* requirements? Write, wire, or phone us, and we will ship at once, either from nearby wholesaler's stock or direct from our own.

Natvar

- Varnished cambric—straight cut and bias
- Varnished cable tape
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Write for bulletins

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225 RANDOLPH AVENUE ★ WOODBRIDGE NEW JERSEY

advance notice of such quarterly quotas and with provision of quarterly deferments of quotas; and that each manufacturer should determine the set models to be built, while there should be no "Victory" models established. The RMA also feels that price levels should not be established, but, if this is unavoidable, prices should be fixed in accordance with the current costs of production.

When reconversion comes, the electronic-radio industry will have it appears, a huge backlog of equipment demands. This was pictured at the meetings of the FM Broadcasters and the Institute of Radio Engineers with FCC Chief Engineer E. K. Jett, now Commissioner, reciting that the postwar future looms with electronic-radio requirements for 500,000 airplanes by 1950, for a four-ocean navy and a huge Army communications system, police radio, harbor radio, FM broadcasting, television, facsimile, etc. In addition, the war-ridden foreign countries and the Latin American nations promise to be huge customers of the American industry.

POLAROGRAPHIC ANALYSIS

(*Continued from page* 120)

the region immediately around the mercury and the rate of drop formation. Calibration of the apparatus with solutions of known concentration, while other factors remain constant, provides the information for determining quantitatively the composition of unknown solutions.

The potential of the midpoint of the step is characteristic of the reacting substance and its value is not affected by changes in concentration. In practice, a supporting electrolyte, which deposits at a higher potential than the other constituents, is added to carry most of the current and reduces the resistance of the solution, thereby concentrating the fall of potential at the dropping electrode. In these studies ammonium chloride was used.

Iron is usually the most common impurity in storage batteries which causes discharge and sulfation.

Antimony is alloyed with lead in the grids of storage battery plates to the extent of 5 to 15 percent. It is an important cause of self-discharge and sulfation. The amount is so infinitesimal that previous investigators have been unable to find measurable amounts, but there is no doubt that this electrolysis of antimony takes place. There are rarely more than a few micrograms of lead per milliliter. Divalent lead may be determined quantitatively in the presence of iron and antimony in battery acid with the polarograph and all three of these metals can

War Standard Instruments
AND ACCESSORIES

3½" ROUND
flush mounting, bakelite case.

Types **MR35-MR34,** in Weston Models 301-425-476, in all listed combinations in American War Standard C 39.2 — 1944

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flush mounting, bakelite case.

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THERMOCOUPLE CONVERTERS
per AWS C 39.4—1943.. in all applicable ranges

RESISTORS
Types MFA—MFB—MFC... per AWS C 75.5 — 1943 . . . in all listed ranges.

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Types MSA—MSB—MSC... per AWS C 39.5 — 1943 . . . in all listed ranges.

A. W. S. instruments by Weston are the standard Weston instruments, with the required additional scale markings, and studs as specified. The instrument movements ... *therefore their long term dependability* . . . remains unchanged. Further, these panel meters still provide the thin movement and case . . . the original Weston design which, together with their enduring characteristics, *always* has distinguished instruments bearing this name. Inquiries invited. Approvals can be quoted. Weston Electrical Instrument Corporation, 616 Frelinghuysen Avenue, Newark 5, New Jersey.

Laboratory Standards .. Precision DC and AC Portables .. Instrument Transformers .. Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

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Specialized Test Equipment .. Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

be evaluated with about the same precision.

Calibration curves for antimony in the presence of constant amounts of iron and lead and at concentrations which would be found in storage batteries are shown in Fig. 3. The curves start at zero applied potential, but in strong ammonium chloride solution the dropping electrode acquires a small positive potential with respect to the pool of mercury when no external voltage is applied in the closed electrical circuit. Curve 1 of Fig. 3 was made with a blank solution of three-normal ammonium chloride. The slight

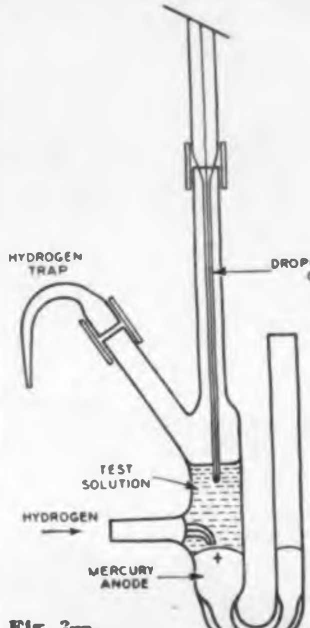

Fig. 2—Polarographic cell

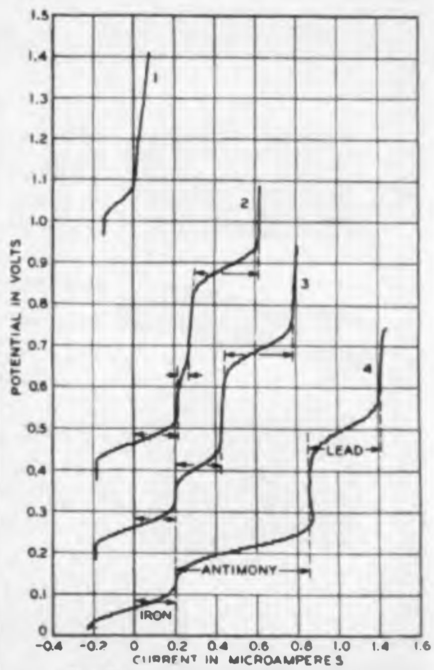

Fig. 3—Changes in current, as the potential applied to the electrodes increases, are recorded. To avoid superimposition of curves the vertical scale indicates voltage differences so that curves start at different points

Not in all Presto history have we ever produced so much of such importance . . .

As leading manufacturers of sound recording equipment, Presto has been an ever-increasing source of highly important electronic equipment for military uses.

Our facilities have been expanded — our knowledge and experience greatly broadened —our manufacturing and technical know-how daily widened.

The result will be evident in Presto post-war production and products. In the interim we are all set to cut another record in 1944—to make it an even greater year in Presto production for victory!

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P.S. Invest in invasion in 1944! Not all can fight, but we all can work, sweat and save for our future. Use every dollar and dime you can spare to back the attack with War Bonds.

Presto Recording Corporation

NEW YORK 19, N. Y., U. S. A.

World's Largest Manufacturers of Instantaneous Sound Recording Equipment and Discs slope of the curve is due to the ohmic resistance of the circuit.

Curves 2 and 3 show how the width of the steps increases with increasing concentration of antimony in the presence of 0.1 milliliters of 0.001 molar solutions of iron and lead.

From these curves, linear relations between antimony concentration and iron concentration and the respective step widths are obtained; the data are good to about 10 per cent at these extreme dilutions.

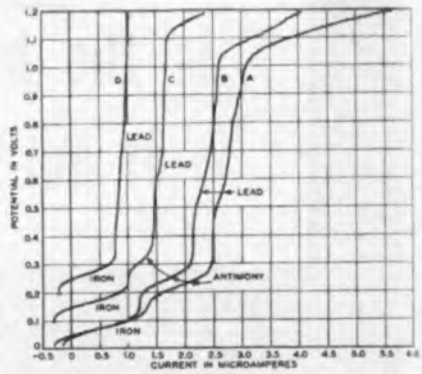

Fig. 4—Polarograms showing iron, antimony and lead content of the electrolyte of a commercial storage battery

Representative polarograms obtained from the electrolyte of a commercial storage battery are shown in Fig. 4. Curves A and B were made when the battery was completely discharged and C and D after charging twenty-four hours. Samples A and C were taken above the plates and B and D between them.

These and many similar polarograms showed that both old and new batteries contain about 0.005 percent of iron in the electrolyte. The amount is somewhat higher in a discharged battery and is from two to three times that found in the long life, stand-by batteries, used in telephone offices. Both types contain from 0.0003 to 0.0015 percent of antimony in solution when fully charged. After discharge this may increase to 0.0025 percent. Acid from a dead automobile battery over four years old contained nearly 0.01 percent of antimony. There was little difference in iron concentration in samples taken between and above the plates. The lead content of the electrolyte is surprisingly low, 0.0015 percent, although it increases slightly during discharge.

These studies demonstrated that the polarograph is a valuable adjunct to the study of the life and capacity of lead storage batteries. It can detect a few micrograms of iron, antimony and lead in their electrolyte and quantitative determinations of these impurities can be made in each others presence with from 1 to 2 milliliters of solution.


CATALIN
Tomorrow's radio must, to the eye as well as to the ear and hand, encompass and symbolize the tremendous advances now being made in transmission and reception techniques.
Of all radio housing materials, Catalin, the gem of plastics, possesses the qualities that will prove most essential to accelerated postwar radio manufacturing and merchandising.
Romanced here, and in the spirit of radio's bright opportunities, this interpretation of a design by Charles Leslie Fordyce is expressive of what Catalin promises . . . unmatched qualities of gem-like color and beauty!
Now is the time to pencil onto paper or prepare in visual form thoughts keyed to the anticipated desires of this forthcoming market.
The Catalin staff is ready to cooperate with manufacturers in all fields—on present and future plastic problems. Inquiries invited.
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CAST RESINS • MOLDING COMPOUNDS • LIQUID RESINS
Catalin and Loalin
Catalin
are Reg. Trademarks

MULTIWINDING MOTORS

(*Continued from page* 105)

Differential units, wound with 2-phase stators and single-phase rotors may be used as synchroscopes or phase angle indicators where only single phase supplies are available. A balanced 2-phase supply for producing the required rotating field for the stator is obtained by means of a phase-shifting network of some type. The rotor has a cylindrical form of winding, and changes of rotor position have but a small effect on the electrical constants of the stator windings (when the rotor is not loaded there is no effect). This makes this unit particularly useful when used in electronic circuits where L and Q factors have a bearing on circuit operation, and removes the objection found in standard types of self-synchronous units having salient pole rotors.

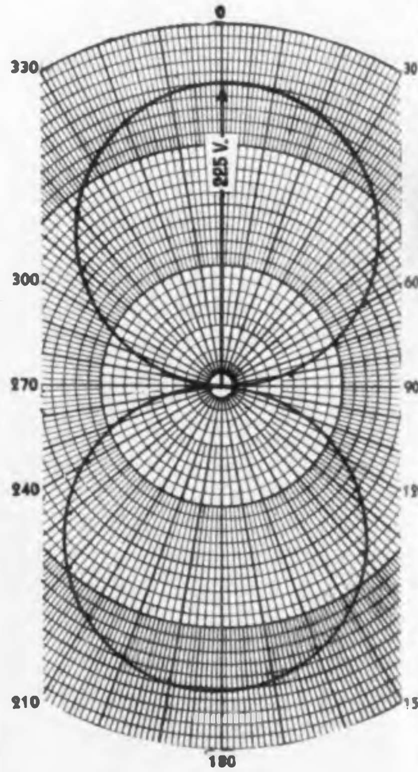


Fig. 4—Secondary voltage pattern of a Circutrol (782-02) for various positions of the shaft

A series of 2-phase lightweight, low-inertia units operating on an induction principle have also been made available. The rotors (as in photo) weigh only 2 grams and are supported in jewel bearings for minimizing friction. The required driving power is so low that they may be used with gyros and diaphragm instruments for electric pick-offs. The unit operates on a different principle from synchronous repeaters of the other types. Two secondary windings of transformer are mounted at right angles to each other with

Characteristics of Telegon units

TYPE NO.	318E-001E	318L-001	318S-8410
Frequency — cycles per sec.	700	400	400
Voltage volts	85	26	110
Current ma	34	110	18
Power watts	1.5	1.5	1.3
Terminals	4	5	6
Weight ounces	4	4	5

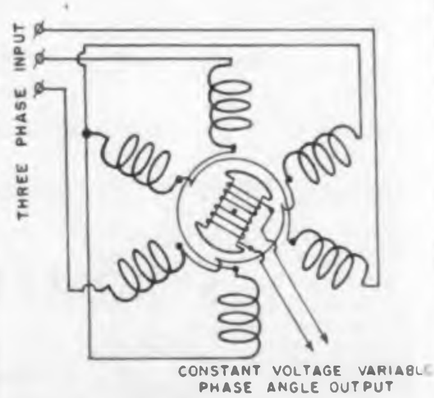
NOTE: long pivot at terminals' end is standard.

their axes at right angles to each other and to the rotating shaft. In order to keep the inertia at a minimum and to eliminate all slip contacts, the windings are all permanently mounted in the case and do not rotate. The primary is a single solenoid winding with its axis aligned with the shaft. On the absence of a rotor, the primary flux is at right angles therefore to both secondary windings and no voltage will be induced in either of them, since a symmetrical balance is maintained in manufacture.

The rotor shaft consists of a hollow soft iron tube, with its axis coinciding with that of the primary coil. Soft iron vanes are mounted at each end of this tube giving a radial field component which upsets the balance between the primary and the secondaries.

The latter windings therefore deliver two voltages whose amplitude depends upon the position of the vanes. These voltages are delivered to other units over the interconnection wires to produce an excentric field in those units which pulls their vanes into the same angular position, within 3 deg. or less with the application of certain types of compensation. A combination Circutrol-electronic application useful as a remote indicator is shown in Fig. 3.

In other words, the vanes carried by the rotor are so aligned with respect to the balanced secondary winding that the voltage induced in the latter is zero. When the prime mover rotates the vanes, the voltage induced in the winding is then amplified and fed to one phase of



Three-phase rotatable transformer

BOTTLENECK BUSTERS
No. 1 of a Series

The Toy Soldier Caster that went to *War*

BOTTLENECK:

Both ends of tens of thousands of choke coils had to be solder-sealed. Hand soldering was too slow. Machines were needed to do the job at the rate of several a minute.

HOW BROKEN:

From a Gilbert toy with which small boys cast regiments of tin soldiers, Sickles production engineers designed a device that would do the job. The tin-soldier mold was adapted to mold seals on both ends of the choke coil, simultaneously. The electric melting pot was used, a metering valve was devised, and in a few days, the sealer was in full production. The original sealer and many more like it are in daily service.

American ingenuity like this, all along the production front, is helping to speed Victory. Here at Sickles, there are many examples of "bottleneck busting" that have sent intricate condensers, choke coils, other electronic devices speeding to communications manufacturers who needed them quickly.

If quality and speed are your twin needs, specify Sickles equipment.

THE F. W. SICKLES COMPANY • CHICOPEE, MASSACHUSETTS

ARMY E NAVY

SICKLES *Electronic Specialties*

Rotor of the Circutrol is extremely light, almost inertialess

a 2-phase motor, the other phase of which is continually energized. The motor is geared to the stator of the Circutrol unit and will turn in such a direction that the latter is returned to the null position, at which point no voltage is induced and the motor stops.

A torque of approximately 1 oz./in. is available at the motor shaft and may be increased through the use of gearing. If the prime mover runs in the opposite direction, the induced voltage will have the opposite phase relations with the result that the motor will run in the opposite direction. A companion piece which is frequently associated with this motor is the low-inertia drag-cup motor, which is discussed later.

Due to the long magnetic circuit flux path required in this design and the large air gaps, this vane type of unit is inefficient at low frequencies, such as 60 cycles, and

Complete rotatable transformer, type 787-01

Teletorque instrument

The ALDEN PRODUCTS Guide

A Directory To The Best In Adaptors, Connectors, Cable Assemblies, Grid Shields and 296 Other Components and Products

ADAPTORS

If it's adaptors you need . . . we can fulfill your regular requirements on practically any and all types . . . for special requirements our basic methods of production plus a wide variety of component parts will enable us to solve your adapter problems and fulfill your needs.

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Skills in producing precision components are now being employed in the manufacture of Facsimile Equipment by us:

1. Photo Transmission and Recording Equipment of high fidelity.
2. Continuous Automatic Recording, free from the usual problems of inertia and lag in other systems, affords unlimited speed in either words-per-minute or area to be reproduced.
3. Instrument Recording of electrical impulses as they occur with all the minute variations of intensity and duration.
4. Tape Recordings for reliable communication on poor circuits and reception conditions with or without synchronization.

HIGH ALTITUDE CONNECTOR

This connector was developed for a leader in the aviation instrument industry to meet his sudden requirement for a connector to withstand 10,000 volts at 40,000 feet and is now released for others . . . both male and female contacts have strain relief protectors for the lead and special baffles to permit long leakage paths that prevent breakdowns or flash-overs.

SOCKETS

When you come to socket requirements . . . specify Alden Sockets to assure long life (tested to 250,000 insertions without failure)—line ranges from television high voltage rectifier tube sockets to extra high quality instrument sockets all with parallel precision contacts. Example: Tube checkers use our sockets because contacts will not fail. Special requirements fulfilled quickly and efficiently.

CABLE ASSEMBLIES

The banks of Wardwell high-speed braiders provide leads in any color for any cable coding requirements. Specialty braiders provide shielding or overbraiding of any character for complex requirements or any kind of covering with leads brought out wherever needed. Any type of cable assembly, such as formed, laced, braided or shielded, can be made up to your print with wire of your choice, all handled efficiently in large or small quantities by our skilled Assembly Department.

PL-114 (MODIFIED CONNECTOR)

Just released. This is a conventional connector but with special contacts and moldings developed for the Army to simplify wiring. Provides strain relief and complete insulation for each lead to withstand severest vibration even when unskillfully soldered in the field.

CATHODE RAY CONNECTORS

Designed to such a high standard that it has met the requirements of all high grade Radar equipment, whether operated at sea level or high altitude. As is usual of all Alden connectors, it provides strain relief and complete insulation of each lead in a compact space. Supplied with leads for all requirements.

INSULATED GRID CAP SHIELD

Here is a simple electrostatic tube grid cap shield with a patented bakelite lining development particularly adapted for air service . . . fits metal tubes and prevents chafing on grid lead . . . eliminates noise . . . prevents the grid from shorting with steel shield that grounds to the tube shell.

SPECIALTY MOLDING

These three standard telegraph key knobs, designed to fit American and British requirements, illustrate the flexibility of our fast and efficient Plastic Molding Department. Multiple processes, including single cavity molds, magazine presses and the like, save costs and time in production.

B-19 TELEGRAPH KEY

Here is one of several telegraph keys built to Wartime Specifications. Other types built to Signal Corps Specifications are J-37, J-45, J-41, J-41A, J-38, J-47.

ALDEN PRODUCTS COMPANY

Manufacturing Product Engineers

Employing the Cumulative Skill of a Quarter Century

117 NORTH MAIN STREET BROCKTON, 64, MASSACHUSETTS

Rotor used in rotable transformer and phase shift Circutrol

so is more commonly used in 400 or 800 cycle equipment. The voltage of either secondary winding varies in amplitude approximately as a sine function as the rotor is turned. This relation is practically perfect in the larger units.

Other applications of Circutrol units include their use as variable output alternators and modulators where the rotation frequency modulates the input frequency, and as 3-phase induction regulators. A list of many of the basic types of these units are compiled in the Tables of Characteristics shown, covering the Teletorque, Circutrol and Telegon principles.

Telegon motor unit, type 315-F

X-Ray Analyzes Art Treasures

● Analytical studies of art treasures on a technical basis are revealing many interesting facts about the customs of painters. Among the problems tackled is that of looking under the paint with X-rays. This approach to art with the cold analysis of a scientist may seem out of place, but it has produced methods of determining authenticity of value.

X-ray technic permits separate studies of the canvas or wood upon which the artist worked, the plaster base above it, the paint layers, and finally the varnish making up the protective layer. X-rays generally in the "soft" ray range have shown the extent to which certain early masters have been restored, in some cases to an extent where little or none of the visible outler layer remains. In some cases "restoring" has been done at many periods, since the different technics and ingredients in the painter's pigments and vehicle generally react differently under the X-ray. In fact, the technic has been applied to so many important paintings that the particular style of many artists can be detected and

ACADIA POLYSTYRENE

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Send for complete data giving physical properties of Acadia Polystyrene, plus a table of specifications on its electrical properties.

Acadia Styraloy

Flexible at −100°F and has many of the electrical properties of Polystyrene. Ideal for numerous electrical applications. Write for information on forms now available, and data on physical and electrical properties.

● Acadia Polystyrene is an outstanding plastic for the electrical field, offering an unusual combination of highly desirable electrical properties. Dielectric strength and power factor offer a favorable comparison with the electrical strength of ceramics and mica, and a considerable advantage over other commercial plastics.

Consider also these values: zero water absorption; relative freedom from adverse effects by acids, alkalies, alcohol, stack gases, weather, etc; an excellent dielectric constant value, and high tensile strength of 3500 to 5000 lbs. per sq. in. Add to these Acadia's wide experiance in the plastics field, and you have the reasons why Acadia Polystyrene merits your investigation.

Complete details are available on request—for quick reference some of Polystyrene's outstanding values are given here:

Dielectric Constant	2.5 to 2.6 at frequencies 10^6
Power Factor, 60 cycles	.0001 to .0003
10^3 cycles	.0001 to .0003
10^6 cycles	.0001 to .0008
Dielectric Strength, Volts/Mil ⅛" thickness	
Short time	500 to 700
Step by step	450 to 600
Volume Resistivity, ohms-cms	10^{17} to 10^{19}
Heat Resistance	150°F to 175°F
Softening Point	190°F to 250°F
Specific Gravity	1.05

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the names of the original and restoring artists can be determined.

Like many other electronic aids an X-ray analysis does not call out a yes or no answer directly on any problem, but adds immeasurably to the data used by an expert in arriving at a conclusion or opinion. The technic is generally that of obtaining contact prints where photographic paper is placed over the front of the master (sensitive side out), the X-rays striking from the back.

Infra red analysis

Infra-red photographs likewise are of considerable value, in that they give datum of a still different nature. They are possibly of greater actual value than X-rays in that they permit a more detailed analysis of the paint surface than is seen by the eye. These sub-visual rays are reflected differently from ordinary visual rays, and it happens that surface varnish, even if highly discolored and dirty, becomes more transparent permitting many details otherwise obscure to become visible. This analysis is made from photographs, made in the usual way, but with an infra-red flood lamp and camera and film suitable for that illumination. Ultra violet rays are also useful at times showing the condition of the surface layer of varnish or enamel, since such rays do not penetrate to any great depth.

War Research and Postwar Trends

Foreseeing reliable home and office radio facsimile recorders printing news at the rate of several hundred words a minute and pictures equal in quality to the best in newspapers, E. W. Engstrom, Research Director of RCA Laboratories, placed this service alongside television and FM as a definite possibility for expansion early in the postwar period.

Addressing several hundred members of the American Marketing Association at a "Radio-in-Wartime" luncheon at the Hotel Sheraton, New York, Mr. Engstrom said that facsimile can now be made available, but that a comprehensive market survey is needed to indicate the form it should take and the kind of services it should render.

Facsimile receivers built before the war were used experimentally by several broadcasting companies in sufficient numbers to indicate public reaction and to clarify the special problems of developing this type of service.

In discussing "Postwar Trends Resulting from Radio-Electronic Research," Mr. Engstrom pointed

Suppose you said—
"Let there be No Red Cross!"

SUPPOSE you turned your face away . . . suppose you said, "I have done enough." . . .

Suppose there were no blood centers . . . no plasma for the wounded . . . suppose there were no Red Cross rest homes . . . no bed for your boy when he is furloughed from the front. . . .

No "coffee and" at the end of a long march, no cigarettes, no magazines, no books in the hospitals behind the lines. . . .

Suppose our men in enemy hands received no weekly food packages . . . suppose they were left to scrape along, living on alien bread. . . .

Suppose there were no Red Cross to march beside our men in every land . . . no helping hand to do a mother's work. . . .

Then could you sleep at night?

You, with a son in the service?

* * *

When you say, "Thank God for the Red Cross!" remember this . . . It is *your* Red Cross . . . *your* bandage and *your* blood.

Yes, and your money, too!

Of course, you have given before, generously and from your heart. Of course, you will give again . . . you who have always given for others.

But this year, when the need is greater than ever before. . . . When it is *your own sons* we serve. . . . This year, when you figure how much to give, think first, "Suppose there were no Red Cross?"

Then dig deep and be glad. For wherever he is

The RED CROSS is at his side and the Red Cross is YOU!

THIS SPACE CONTRIBUTED BY "ELECTRONIC INDUSTRIES" not only to television, FM, and facsimile, but also to new developments in electronics such as radio frequency heating in industrial processes, the electron microscope, and radio-electronic control and navigation devices.

All of these advances in radio-electronics provide a concept of postwar readiness in the radio industry.

Contributing to this concept, Mr. Engstrom further explained, are five factors:

1. A large number of scientific workers skilled in the use of radio and electronics.
2. A large number of young men and women returning from the armed services, who will be skilled in the use and maintenance of complex radio and electronic equipment.
3. A much expanded radio and electronic manufacturing industry.
4. A large number of men and women who will wish to continue employment in the radio-electronic field.
5. A pent up desire for the new things which radio and electronics can provide.

Adair Advanced to FFC Chief Engineer

George T. Adair who has been FCC assistant chief engineer in charge of broadcasting since December 16, 1941, has been appointed to succeed E. K. Jett who is now a commissioner. Philip F. Siling, chief of the FCC International Division, was named assistant chief engineer in charge of broadcasting. Adair will replace Jett as the Commission observer on RTPB.

Army Materiel Prices Show Sharp Decline

(*See also page* 102)

General Albert J. Browning, Director of Purchasing, Army Service Forces, reports that item prices for Army materiel are showing a sharp decline. In the scaling of contract prices between Jan. 1942, and Dec. 1943, the Signal Corps achieved the best record in the Army with a decline of 28.3 per cent in the prices of radio-radar equipment.

As a specific example of price reduction secured by the Signal Corps, General Browning pointed out that the cost of a radio transmitter had been scaled down from $3,194 to $1,302. He added that the overall savings during the two-year period of Jan. 1942 through Dec. 1943 as a result of price analysis amounted to more than nine billion dollars in comparison with the prices prior to Jan. 1942.

Assistant Director of A. S. F. Purchases, Glen A. Lloyd reported that "we will have to effect a greater control of prices paid to subcontractors under War Department prime contracts" because a study made during 1943 showed that 51% of every dollar received by the Army's largest prime-contractors is spent by them with sub-contractors and suppliers.

Postwar Possibilities of Piezo-electric Crystals

By L. A. Elbl*

• And what about crystals? That is the question many people are asking regarding the use of piezo-electric crystals in the postwar world of tomorrow. Surely, no one can answer this question definitely, but the author wishes to offer a few predictions. Future applications of quartz crystals stump even the imagination, but will these numerous appliances use anywhere near the number of crystals now used by our Armed Forces? If so, what fields will use the largest number?

There will be far fewer crystals manufactured immediately after the war than at present. However, there will be an increasing use of crystals as postwar business develops. The fields using large numbers of crystals will be radio, radio detection devices, two-way communication, the telephone, television, amateurs, and electronic music.

Quartz crystals will continue to fix the frequency of radio broadcasting transmitters because they have no equal in this field. They will also be used in many types of receivers. One company already has come forth with a crystal controlled receiver for home use. Other companies probably will follow suit. Push button tuning became a standard fixture on receivers before the war, but has not proven exactly satisfactory because it gets out of adjustment. Postwar push button tuning will be crystal-controlled and cannot get out of adjustment. Nor will this push-button tuning operated by crystals be confined to radio. A crystal controlled "juke box" already has been developed. Increasing numbers of filter crystals will be used in all types of radio equipment. Also let me mention FM or frequency modulation. Many of the new FM sets contain crystals.

Very little information is published about radio detection due to the war, yet everyone realizes its importance in the present conflict. Without doubt, it saved England in

*Engineering Dept., Crystal Products Co., Kansas City, Mo.

the blitz of 1941 and is playing an important part in all present engagements. In principle, it is very similar to Langevin's original submarine detector. Doubtless, it will play an important part in the postwar world and radio detectors use crystals. Let me mention just one device which has been developed, the "geophone" by name. Using the same detection principle, this device is used by geologists in locating metallic ore deposits in the earth and can be used for tracing the path of a metal pipe under pavement, or even under water. It can also be used for locating flaws in metal.

A modified walkie-talkie of the type used in the Army today will find increasing use for two-way communication. These will be used by police, aviation, railroads, bus lines, truck lines, fire fighting, mining, farming, public utilities, and for inter-office communication. Think of the convenience in each field. Recently an article appeared in the press reporting that gas men would be given radio training so that in reading gas meters, reports could be called in to a central office which would automatically figure all gas bills. There are hundreds of similar applications using walkie-talkie. A single person could direct several trucks over regular routes being in constant communication, giving orders, and directing their progress.

Used in telephone

Another potential user of large numbers of quartz oscillators is the telephone. After the war, we will have telephones in cars, boats, planes, etc. The radio telephone will be common. Even our public telephone will probably be quartz crystal controlled. At present, there is a coaxial cable running from New York to Washington over which hundreds of telephone conversations can be sent at a fraction of the cost of a call on a regular line. This line, which is crystal controlled, has proven so satisfactory, postwar will probably see numerous similar lines all over the United States, controlled by crystals.

Television is another field that will use quartz crystals. After the war we expect television service to be as commonplace as radio reception. Such being the case, we have a possibility here for large numbers of quartz crystals.

Amateurs will consume large numbers of quartz crystals after the war. Before the present conflict, there were 50,000 amateurs in the United States. After the war there may be three times this number, with much improved short wave technics.

Other potential users of crystals are devices for weather forecasting,

SURE, that Saturday night pay envelope's bulging. But let me tell you something, brother, before you spend a dime . . . *That money's mine too!*

I can take it. The mess out here. And missing my wife and kid.

What I *can't* take is you making it tougher for me. Or my widow, if that's how it goes. And brother, it *will* make it tough—if you splurge one dime tonight. You're making money. More money than there's stuff to buy. Money that can sock the cost of living to kingdom come —if you blow it! So hang on, till the job's done. On to every last dime —till the squeal means a hole in the seat of your pants!

You're working . . . and *I'm fighting* . . . for the same thing. But *you* could lose it for both of us—without thinking. A guy like you could start bidding me right out of the picture tonight. And my wife and kid. There not being as much as everybody'd like to buy—and you having the green stuff. But remember this, brother—everything you buy helps to send prices kiting. Up. UP. AND UP. Till that fat pay envelope can't buy you a square meal.

Stop spending. For yourself. *Your* kids. And mine. That, brother, is sense. Not sacrifice.

Know what I'd do with that dough . . . if I'd the luck to have it?

I'd buy War Bonds—and, God, would *I* hang on to them! (Bonds buy guns—and give you four bucks for your three!) . . . I'd pay back that insurance loan from when Mollie had the baby . . . I'd pony up for taxes cheerfully (knowing they're the cheapest way to pay for this war) . . . I'd sock some in the savings bank, while I could . . . I'd lift a load off my mind with more life insurance.

And I wouldn't buy a shoelace till I'd looked myself square in the eye and knew I couldn't do without. (You get to knowin'—out here— what you can do without.)

I wouldn't try to profit from this war—and I wouldn't ask more for anything I had to sell—seeing we're all in this together.

I've got your future in my rifle hand, brother. But you've got both of ours, in the inside of that stuffed-up envelope. You and all the other guys that are lookin' at the Main Street shops tonight.

Squeeze that money, brother. It's got blood on it!

Use it up . . . wear it out, make it do...or do without

HELP US KEEP PRICES DOWN

A United States war message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America smoke recorders, teletype, radio printing and radio photography. Another distinct possibility is electronic music. An organ similar to the electric organ could be built which would contain precision crystals for controlling all tones. The remarkable thing about the organ would be the fact that it would never need tuning. But why stop with an organ? The tone of almost any instrument could be produced with the proper combination of crystals.

The author also predicts expanding uses of Rochelle salts and the possible use of tourmaline crystals. With the emphasis upon higher frequencies, most companies are doing extensive research on tourmaline crystals, since it is possible to go to higher frequencies with tourmaline than with quartz.

FM Must Have Sound Planning

By James Lawrence Fly
Chairman FCC

The great opportunities of FM represent a challenge to all of us and to the industry's planning agencies, and I would stress the importance of overall, sound, long range planning. Much has to be done. The most readily obvious danger to FM may well be in the hurry-up schemes for mass production.

The very quality that distinguishes FM can be choked off at the studio, at the studio transmitter link, in the program transmission lines, at the transmitter, and, not least of all, at the receiver. The frequency range delivered by the processes of frequency modulation can be no broader than the narrowest choke point, from the point of origin to the ear.

Quantity vs. quality

FM stands today on the threshold of as tremendous a development as did the AM in the 1920's —perhaps a much greater development and a faster rate of growth. Five hundred thousand receivers were placed in operation between the date of the commercialization of frequency modulation and the freeze orders. That we are going ahead is certain. What we must doubly assure ourselves is against such things as hasty manufacturing on a quantity basis perhaps of all too cheap equipment. Let us not manufacture the very transmitting and particularly receiving equipment which will destroy the great advantages of FM. Let's plan the optimum in terms of the public service made possible by this great invention.

Physicists Discuss Electronic Topics

Following are abstracts of some of the papers of electronic interest presented during the Pasadena meeting of the American Physical Society, held Dec. 27 at the California Institute of Technology. Dr. A. W. Hull of Schenectady, N. Y., is president of the Society, and Dr. Karl K. Darrow, New York City, is secretary.

Analysis of a Multivibrator

S. C. Snowden, California Institute of Technology (Introduced by W. H. Pickering)

A theoretical analysis of the action of a fundamental multivibrator has been undertaken along the lines of Van der Pol's analysis. A more exact approximation to the transfer characteristic has been used and an exact solution of the equation has been found in the case where the shunt capacities of the tubes can be neglected. In this approximation, the period of oscillation, has been calculated and checked experimentally. The limiting frequency of oscillation in which the waveform is sinusoidal can be calculated as in Van der Pol's case. The results agree with experiment within three per cent.

A Voltage Regulator for High Voltages

W. H. Pickering and S. C. Snowden, California Institute of Technology

The standard degenerative voltage regulator circuit usually becomes difficult to use at voltages above a few kilovolts. This is particularly true in applications where the positive terminal is grounded. The new circuit avoids the difficulties by using a radio frequency signal modulated by the variations in output voltage to transmit these variations across the potential difference to a tube in series with the high potential bus. The voltage limitations are accordingly removed and furthermore, either terminal of the output may be at ground potential. The sensitivity of the regulator depends as usual upon the total effective amplification of the circuit. Long-time stability depends on the stability of the amplitude or frequency of the radio-frequency signal.

Excitation of Electromagnetic Waves in Wave-Guides and Cavities

John Miles, California Institute of Technology (Introduced by R. A. Millikan)

The impedance of thin transverse wires in rectangular wave-guides and cavities has been evaluated by application of the vector potential. Both the resistive and the reactive components have been obtained,

and one is thus enabled to place a driving or receiving element so as to match a given source or load for the maximum power transfer. The problem of short circuiting wires has also been calculated. The solution of the analogous problems in a circular wave-guide is indicated.

X-Ray Inspection of Spotwelds in Aluminum Alloys

R. C. McMaster, California Institute of Technology (Introduced by R. A. Millikan)

This paper presented preliminary results of a study whose purpose is to develop practical industrial methods for the non-destructive testing of spotwelds in aluminum alloys. Procedures for X-ray inspection using industrial equipment have been developed, and correlations have been obtained between radiographs of spotwelds and spotweld structure, quality and strength. The scope and limitation of the method are indicated through the presentation of results of tests on thousands of industrially-made spotwelds. The results of preliminary tests employing fluoroscopic and special X-ray equipment are outlined.

Electronic Postwar Outlook

*By Walter Evans**

● For a dozen months past much has been said about the fuller life we are all going to lead in the post war period by reason of wartime developments in radio and its companion activities, television and industrial electronics. A good bit of what has been said is based on recognized facts and sound thinking. But a good bit more has resulted from the great appeal of the subject—because of the spectacular part radio and its by-products have played in the war.

Consequently, it seemed to me that you might be interested in a factual evaluation of the postwar prospects from us, who have to make our daily bread by the design, manufacture and marketing of the products—and who have to develop the applications which have been so plentifully suggested. Some of the remarks I have in mind may seem a little blunt in the light of forecasts you have seen or heard, but they are the facts as they appear to us at this stage. We are going to have to place our bets on these facts to keep the greatest number of our people gainfully employed.

At the start of the war it was estimated that there was approximately 250 million dollars annual

* Vice-president in charge of Radio, Westinghouse Electric and Mfg. Co. From an address before Radio Executives Club of New York, N. Y.

productive capacity in radio and electronic manufacturing facilities in the United States. This included the five or six major suppliers of communication, military and broadcasting apparatus, the entire receiving set industry and all the facilities associated with the Bell System which readily could be converted to military radio and communication equipment.

Capacity multiplied 51 times

With increases in plant facilities, and an enormous program of subcontracting, that original capacity has been greatly multiplied. In the case of our own company the output has been stepped up 51 times (not per cent) since a state of emergency was first declared. Clearly there will be ample productive capacity to accommodate the most optimistic estimates.

Let me give you one quick illustration of what this means. We were recently figuring what would be required to equip the entire prewar air transport fleet of America with a certain type of military aviation system, which would greatly increase the safety of domestic air transportation. Equipment for all of those planes could be turned out in just eight days, using only one of the Westinghouse plants now manufacturing this material.

Spectrum expansion

In fact, most of the prewar problems are now subject to adequate solution because of improvements, simplification and the use of multiple purpose circuits; of various forms of automatic controls; of tubes using new elements—even new principles; of frequency bands opened up many times wider than the whole available spectrum when the war began.

It is our considered belief that all of the technical answers are on hand for a usable and acceptable television system. This includes the probability of a reasonably priced receiver, and a practical means of getting the shows across the country by means of radio links, or one of the more recently developed type of metal conductors. While the technical answers are here some of the other answers are not, and it seems to me that much of the solution of the remaining problems rests with the broadcasters.

But all of these things will take a reasonable time after we are free of war requirements. Most of the receiver manufacturers indicate that they will bring out receiving sets very similar to the last models they built. Improvements resulting from war development will be added only as they can be assimilated by the

industry. But at the beginning it is going to be a race among the manufacturers for a slice of the largest replacement market for years to come.

Frequency modulation, however, may prove to be a "must" in all their line of medium-to-high priced sets. Not so much on its proven use, as on the fact that it had had one of the outstanding promotions of the decade. Certain advantages are evident but restricted in scope. In the metropolitan areas it is unlikely to experience better signal or quality than from the present standard 50 kilowatt stations—up to the line where their fading band starts. In the middle of the broadcast band the line where fading frequently sets in at night with resulting impaired quality is at a distance of about 25 to 30 miles. From that point out to the limit of the FM range, FM stations will have advantage. That is, generally speaking, the extreme suburban area. Beyond this restricted belt coverage must still come from standard AM stations.

If FM were to generally replace the local stations their service would be somewhat improved. The locals are now restricted rather badly by heterodyne interference from similar stations on the same channel. The short-range characteristics of FM in this case would be an advantage and would stretch out the useful night time range of the locals from a present 10 to 18 miles, to perhaps 30 or 40 miles, depending upon the topography and site.

Contrary to some opinions, either system is capable of equivalent quality, and all present transmitters produce better quality than the receivers are able to reproduce. The vast majority of the buying public has never been willing to pay for the marginal quality in a receiver necessary to take advantage of that quality already available at the transmitter.

But, because of the interest aroused in FM, it looks like the receiver manufacturers are in for it —like the free wheeling of a dozen years ago in the automotive industry. Whether it survives longer than its automotive predecessor remains to be seen.

1943's achievements

Probably the outstanding electronic achievement of 1943 was the reflowing of tin, which within a year's time became the standard method of most of the steel mills manufacturing tin plate. Low frequency transmitters of some 600 kilowatts capacity are coupled to the tin line and reflow the dark gray, porous electroplated sheet into bright non-porous commercial tin plate. The method saves about

65 per cent of the tin formerly necessary for making tin plate. And, because of the shortage of that critical metal, the method was rapidly adopted.

To name just a few of the outstanding applications on which development work is well along: the molding of plastics, annealing of electrical steel, bonding of plywood, brazing and soldering, hardening and tempering of metals, production of alloy steel, inspecting for porosity on metal sheet and castings, dynamic balancing, vibration fatigue of materials, remote power line operation and metering and high speed X-ray inspection of castings and forgings. There are also many other uses which have proved out in the laboratories and are ready for postwar markets.

So far, I've stayed pretty much with the facts as they can presently be observed, rather than forecast. Now I'd like to ask you to do the star-gazing.

Many of you will remember that, during the last war, we heard the swan song of the spark radio set and the advent of the three-element vacuum tube. Out of that World War I development grew the broadcasting business, the receiver industry, talking movies, and others, none of which was in prospect before the war. From what I've mentioned of the work being done, it is quite apparent that the research and development during the present war is perhaps a thousand times that of the last. It seems a conservative estimate that twenty years of normal development has been crowded into the past four years, and most of it thus far restricted for military use.

So we will end up this war with a simply terrific amount of technic, know-how and facilities. All that's needed to start a few new industries is to know what service, as yet unborn, what facility yet unknown, would be useful in the American home, in industry, transportation or in the amusement field. That's the sixty-four dollar question, the one that engineers aren't equipped to answer. That kind of question is in your field, and if you can produce the answer, it's an even break we can work it out.

Rotary Converters

A new bulletin describing its small rotary converters has been issued by Kato Engineering Co., Mankato, Minn. Two models are illustrated, one for 225 volt-amperes and the other of 350 volt-ampere continuous duty capacity. Accompanying it is a list giving engineering specifications of a number of models varying in capacity from 32 to 1000 watts. The list includes prices.

RADIO ELECTRONIC PRODUCTION

By Frank H. McIntosh*

• Radio-electronic equipment is doing an outstanding job and contributing directly in the saving of lives and coordinating all military activity and, we believe, materially helping to shorten this war. We are happy to tell you what the industry and the Army and Navy have done and are doing and expect to do in this field. We will also include information on the situation at home and give you as much data as we can as to the postwar probabilities. And they are probabilities, because no one knows just what the postwar situation will be. This survey will include the following general subjects: radio before the war; radio during conversion; radio during the war; radio coming out of the war; and some estimates as to the future of radio.

The year 1941 was the last production year before the war started, and is the year used as a basis for estimating the reasonably normal condition of the industry. During this year 13,000,000 civilian radio receivers were produced, for which approximately 100,000,000 receiving tubes were used. Of the 13,000,000 sets produced, approximately 11,000,000 of them were sold and of these 11,000,000 approximately 8,000,000 replaced old receivers. This means a net increase of around 3,000,000 sets in the set ownership in the country, which brought the total home sets to approximately 52,000,000. Other figures indicate that there were also some 6,000,000 to 8,000,000 car sets in operation, which brought the grand total of sets to something like 60,000,000.

In the broadcast field we had some 920 broadcast stations, some 1,900 police installations, some 2,900 aircraft installations, some 60,000 amateur radio stations, some 800 forestry, some 6,500 international and other radio services.

Very considerable interest was expressed in FM frequency-modulation type of transmission and considerable interest in television, although both of these services were feeling the need for the commercial support which had made the standard broadcast industry a sound institution.

Radio is perhaps the most efficient means of mass communication yet developed. There is no medium which requires so little power, so little time and so little labor to make available throughout the entire country, the thoughts of one or more individuals. Because of this relatively high efficiency it has been possible to supply to a fairly satisfactory extent the minimum requirements of both the listener and the operator of radio stations during the war.

Military demand exceeded expectations

During the first part of 1942 the manufacturing industry was notified that civilian production must stop and conversion to military production must take over. This brought a strange situation to most companies and vigorous opposition was received to this change from a familiar and profitable production of receivers to complicated military production, the need for which seemed remote. The April 29, 1942, deadline was set and conversion was mandatory, although some extensions were given to work out existing inventories or to hold labor until war contracts could be obtained.

It was hard then to believe that the Military would require the total capacity of what we thought a very large industry. It was not long, however, until the requirements from military production flowed in like a tidal wave. The disgruntled producers who had lost their civilian production were plenty busy trying to work out some of these production requirements. and a fundamental change was necessary concerning the need for quality to withstand the recent rugged application to military use, a quality not necessary in civilian production. So it was a combination of problems. One of quality and quantity, one of development and design. The figures which will be given later will show that the industry did a fine job in solving most of these problems.

Maintenance and repair

As a result of conversion to war uses, civilian expansion in the radio-electronic field has stopped, except where civilian activity has or is producing directly for the war effort, such as industrial plants producing war goods, companies which are carrying messages or traffic in the interests of the war effort, policing organizations providing law and order, and the mediums for morale, psychological

*Chief of Domestic & Foreign Branch, Radio & Radar Div., WPB. From an address before American Marketing Ass'n, New York City.

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③ Properly designed generators are ESSENTIAL

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and incentive news transmission, such as newspapers and radio and magazines.

The problem at the termination in April, 1942, became one of maintenance and repair—how to keep the essential services, those essential to the war effort, in a healthy operating condition, utilizing a very minimum of critical materials, facilities and labor and yet providing an adequate solution to the problem. At this time our biggest problems were those of materials—copper, nickel, tungsten, steel, molybdenum, rubber, aluminum and the various critical alloys—and we soon found out that the production capacity or at least the capacity for assembling materials was greater than the supply of many of the raw materials. Because of this a conservation program was introduced, a priority system set up which would change from time to time as the pressure for better solution to the problems built up.

Essential to other industries

Radio, like every other industry, had its troubles. After several months it was recognized that radio and other electronic equipment was essential for the operation of practically all other war goods.

Concerning radio during the war, some information has already been given to indicate electronics has and is helping to save many lives, direct nearly all operations, direct and help set the guns to destroy our enemy, to guard our planes and defenses, to record and guide us in planning.

You have been told of the episode in the Pacific where **electronic ranging and detecting equipment made possible the destruction of enemy fighting craft at considerable distances (some 18 to 20 miles). This occurred in the dead of night when visibility was very low and made worse by heavy fog—yet our warship operators could see very substantial distances through the detecting equipment, spotted and recognized the enemy, and fired salvos as directed by the equipment which destroyed the enemy warships—all without their knowing what hit them!** This is only one case. There are many more. This illustrates the use of electronic equipment. There may be variations of the device or similar devices which are contributing to our side.

The amazing submarine detecting devices now in use, together with far-reaching coordinated activity, has brought home to us the progress in reducing the loss at sea. It may be that this submarine menace will never again be a major factor in warfare. The submarine's effectiveness lies mainly in its ability to hide, as it does to the eye, when it submerges. This procedure is no longer completely effective and the submarine therefore is at the mercy of the patrol bomber or vessel when its position is definitely known.

All depends on radio

Radio is used on ships, tanks, airplanes, used by the troops, and used in submarines. The coordination of the entire works depended upon radio. Therefore, priority was given to this particular field in many instances to satisfy their small requirements for raw materials. In the civilian field it was necessary to introduce standards to eliminate waste in maintenance and repair parts for civilian home sets and to recommend that our transmitting stations be reduced slightly in power to further conserve the consumption of replacement parts and tubes. In regard to the standardization of home radio receivers and parts, the most frequently felt were electrolytic condensers, paper condensers, transformers, volume controls and vacuum tubes. Four standards were developed covering the most critical common components which in the aggregate required the most materials and facilities in their production to satisfy the needs of the country—volume controls, condensers (2 types), and transformers. These standards were developed through Industry Advisory Committees by the manufacturers of the components and after this was done the standards were reviewed by the American Standards Association and put out under their name in order to give the standards national recognition. These standards make all manufacturers' products satisfy certain desirable minimum quality standards and tend to reduce duplication of home replacement parts in inventories of distributors, which in turn conserve materials.

As an example of the reduction of types and simplification resulting from these standards, 2700 types of volume controls were reduced to 12 types, 450 types of electrolytic condensers were reduced to 10 types, 370 paper type condensers were reduced to 9 types, and 250 transformers and chokes were reduced to 12 types. Broadcast stations have been reduced in power 1 decibel, which as was to be expected, has not noticeably affected the coverage of such stations but has had a very definite beneficial effect on requirements for mica condensers, resistors and even vacuum tubes.

I would like to bring to your attention the fact that requirements are now down to a minimum point

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This book presents a complete explanation of the various types of cathode-ray tubes and what role each element within the device plays in making visible the voltages and currents encountered in various kinds of tests.

More than half the book is devoted to the practical applications of the cathode-ray tube oscillograph. Oscillograms, made in the Laboratory maintained by the author, have been used to illustrate this section of the book, so that the reader may know just what image he should see under any given circumstances.

This volume is not an engineering text. There is, however, contained in the volume a complete and elaborate explanation of the theory of the tube. It is this information plus the practical applications, which make this book so valuable.

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and the diversion of production necessary to satisfy these requirements is just as low as is practicable. This position we now have is still inadequate. Our requirements are still going up. Our slogan for electronic devices is "For every 3 in '43, we need 4 in '44."

We have also problems in connection with new developments and changes due to actual experience, which as you may know, have a very major effect upon production. Industry, however, is doing a remarkable job, as evidenced by the fact that more radio equipment is now produced in 20 days than the entire industry produced in our peak year before Pearl Harbor.

Since the curtailment in 1942 no civilian production of materials has been engaged in for some time and until the stocks on distributors' shelves are very materially reduced it may be said that these large inventories, together with the extra sets per home, have been a useful and healthy cushion. We feel encouraged at this time and believe that the low tide has been reached and that conditions will not be worse but definitely better in the future.

2% civilian, 98% military

Home radio receivers are not the only problem in which we deal. As mentioned above, police, aircraft, international carriers, international broadcasting, forestry and many other radio services are essential and require materials for their operation. With all these requirements the total for maintenance and repair compared to the Military production is less than 2 percent.

The Office of War Information is doing an important job in worldwide dissemination of the views of the United States and upholding the idea that perhaps we are not such bad fellows after all throughout the world, and they are helping us to win the war directly through the power of the radio word from stations whose radiations are directed toward occupied and enemy countries.

As an interesting example, **one of OWI's engineers, working over in North Africa at the time, has been given the credit for suggesting that the international distress frequency of 600 meters, which is monitored by all operators of radio equipment, be used to order the Italian fleet to surrender and make for an Allied port—thus solving the problem of how to get the message to the Italian navy when Italy surrendered unconditionally.**

It can be seen from the figures referred to above that in general the radio picture is good, that we still have more than an average of one set per home and that practically 90 percent of homes are equipped with radio. It does show, however, an increase over normal times in the number of radio homes without radio service. This figure is 7.8 per cent according to this data, while the prewar figure was something between 4 and 6 per cent.

In connection with our program and plans for the coming year we have included a minimum requirement for civilians in our regular scheduled production of radio receiving tubes and the production of the tubes for civilians has been concentrated on types known to be most in demand. While we don't expect a sudden and complete recovery of this relatively small per cent, we do expect a definite improvement in the situation. Necessary steps to provide a balanced stock of tubes at each manufacturer's plant for his distributors made necessary by the concentration of types to increase production are being made at this time.

Every one is talking about postwar. However, in the electronic field it may very well be that the requirements for this equipment will continue in high demand when some of the other war programs are being curtailed.

It has been suggested that I make some comment on the postwar radio picture. What I have to say concerns purely my own ideas and thinking.

Postwar plans

Will these developments which have been made during the war open a new world to us after the war? The answer to that question is "yes" and "no." There have been very marked advances and technics in solving difficult problems. However, this development has been concentrated on specialized equipment, which in some respects has purely military value. The period after the war will not revolutionize the industry. The wartime development will permit a more rapid advance in industrial heating and other activities from a technical standpoint. However, there are operational problems which may be more of a controlling factor than the technical advance during the war.

Our greatest demand will be for home radio receivers and the greatest technical advance having something definite to offer the public is television, while FM also has some definite appeal. In this field of television many things have yet to be done: (1) Channels must be determined in which they are going to operate, (2) Standards of quality and determination of special technical factors must be made, (3) Production of home sets and method of programming must be developed, (4) A commercial market must be available in order to provide an ampetus to move for-

ward in this field. These comments are true of FM also, and most of you are familiar with FM.

High standards

It is interesting to note that radio sets for homes are not necessarily purchased because they are needed, nearly as much as because they are sold, by some new feature or gadget or on the basis that the cost of repair of the old set would provide a substantial amount on a new set.

It is definitely true, however, that **the curtailment of home radios brought about by war necessity early in 1942, provides a market for radio receiver sales, between $10,000,000 and $21,000,000, according to the estimates we have received.**

It is quite possible that the type of experience and the quality of production required by the Army and Navy in their contracts will have a definite beneficial effect on making a quality home set more common. This is not to indicate that previous production has not been satisfactory, but to indicate that these companies now are used to high standards and are tooled and geared for such production and will find it to their advantage both economically and from a sales standpoint to continue in a measure their present high standard of quality.

32,500,000 "Homes Having Radio Sets"

The broadcasting industry now seems agreed upon accepting 32,500,000 as the total number of "radio homes" in the U. S. This figure, we find on careful inquiry, they mean to be the number of homes possessing a radio set in any condition, operable or not-operable, with or without tubes or batteries!

In our own figures for total homes with radios, as compiled for many years back, we have considered only homes with operable sets, capable of receiving broadcast programs. Thus our figure published on our statistical page, recently, "30,000,000 homes with radios," agrees fairly well with the broadcasters' new total of "32,500,000 homes possessing sets, operable or not-operable" if the latter be diminished by the 8 percent of outages which all agree now exist, due to set breakdowns and lack of tubes and batteries.

We are glad to go along with the broadcasters in their new 32,500,000 total, for the sake of unity. But we still feel that "homes with operable radios" is the key figure in which the industry is really interested and concerned.

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Ultra-Violet Worker Identification

That old black magic of black light is serving in a number of war plants as a positive method of identification of employes. If the employe, when entering the plant, has lost his button, or if the usual method of identification is not entirely satisfactory, he must thrust his hand through an opening in a curtain for u-v inspection. All legitimate employes have one hand marked with a semi-permanent invisible fluorescent ink symbol known only to the guards in the plant's protective organization. Accurate duplication of the symbol by unscrupulous individuals is made impossible by several factors. The ultra-violet equipment is marketed by Sun-Kraft, Inc., Chicago, Ill.

Railroads Could Use Many Electronic Safety Devices

Application of the railroads for wavelength assignments and membership on the new Radio Technical Planning Board, indicate that at last the executives of the steam-operated lines are yielding to public pressure that radio and other means be provided to stop the current crop of fatal wrecks.

Terrible tolls of human life recently taken when flagmen sent back have failed to stop oncoming express trains, could be avoided, it is pointed out, by having continuous radio communication between each train and the dispatcher's headquarters as well as with other trains. Engineers and conductors would then keep in close personal touch with all nearby train crews by radio telephone. Such radio communication would save lives and also ordinary train delays—compared with the present archaic practice of sending a brakeman with lantern or flag, half a mile back, and then waiting for his return.

Every ship and every plane is in constant touch with the rest of the world by radio—but every railroad train crew is utterly isolated while in motion. "The passenger who boards a crack American flyer from New York to Chicago, enjoys every modern luxury, but, communicationwise, he is as isolated as if he were on camelback in the Sahara desert," said a recent speaker. "Yet the passenger on the Twentieth Century or Broadway Limited might easily enjoy telephone connection with the whole country and transact any necessary business enroute."

Electronic signal systems for railroad operation are now being developed which will speed up train operation by performing half-a-dozen switching and signalling functions simultaneously, without the delays of present step-by-step operation.

On freight trains radio communication not only between the locomotive and caboose and also with the lonely brakeman patrolling the mid-train car tops, is now a simple possibility, especially with the modern light walkie-talkies which will be available for postwar civilian use, based on military experience.

Even the dismal railroad waiting rooms in small towns, might be made cheerful and inviting, for music and news could easily be transmitted over existing telegraph wires, followed by shipping and other public relations statements which railroad officials wish distributed to their customers, along the line. All this could be done at minimum outlay.

Formica Film Premiere

"The Formica Story," a 45-minute sound film in color, chronicling the history of the laminated plastics industry, had its premiere Feb. 25 at the Waldorf-Astoria, New York. The film tells in detail how laminates are made and used and what useful qualities they possess to adapt them to future applications. D. J. O'Conor, co-founder and president of the Formica Co. which had its beginning in 1916 with an annual production of $25,000, reported that the company had exceeded $17,000,000 in sales last year.

Never before has so much responsibility rested on the shoulders of radio engineers. But never has there been the slightest doubt that they would continue to meet this responsibility with enterprise and energy—always a move or more ahead of anything the enemy could contrive.—*Sir Noel Ashbridge, chief engineer BBC, London*

There is an apparent discrepancy at this point.

The pages are either missing or the pagination is incorrect.

The filming is recorded as the book is found in the collections.

Oil well rock bit (red-hot) being hardened in experimental Westinghouse induction heating furnace. (Right) brazing a fillet along the inside edge of hollow airplane propeller

New Jobs for Induction Heating

Present methods for manufacturing hollow propeller blades for airplanes require a copper or copper-alloy fillet in the leading and trailing edges to alleviate sharp corners in these regions. Welding on the outside edge is not sufficient to hold the two pieces together and it is, of course, impossible to weld along the inside edge. By induction-heating, according to Westinghouse, beads of brazing material are laid along the inner edge. The propeller is then moved edgewise through the output coil of the oscillator and the beads are fused, securely binding the edges together. This work has been done with a torch but it takes much longer, requires greater skill and results in greater warpage of the blades.

Must be tough

Oil-well drill bits must be tough to bore through solid rock. The tougher they are the longer they can stay on the job down in the well. Each time they are brought up for replacement they are raised laboriously perhaps thousands of feet. Drill bits get their toughness from a layer of tungsten carbide deposited on the teeth under high heat. Common practice utilizes a torch for the work. The operator slowly carbides each of the 20 teeth, one at a time.

Experiments in the high-frequency laboratory indicate that the whole bit can be carbided in a few seconds by passing the toothed cutter into the field of a high-frequency oscillator. The carbide particles are held in place by an adhesive coating until they merge with the steel base. The new method heats all 20 teeth uniformly and cuts down the time required for the process.

See Radio Equipment on 500,000 Planes

Charles I. Stanton, Administrator of Civil Aeronautics, told a joint meeting of the Institute of Radio Engineers and American Institute of Electrical Engineers in New York, February 24 of the rapidly expanding need for more and better radio communications on the nation's airways. In 1932, he said, radio and communications represented 20 percent of the total expenses for aircraft maintenance and operation, but that "today they account for 60 percent of the total." He predicted there would be "500,000 civil airplanes" in the United States "in the postwar decade." Most of them would be privately owned and many of them would have to be equipped with radio. This, he added, would be apart from the needs of commercial craft.

Mr. Stanton said the private flier would want radio to make his flying simpler and safer. The radio compass will probably be standard factory equipment, except on the lowest-priced planes and training machines that stay near their base airports, he said.

"Perhaps most important, the private flier will need and demand radio for his use in obtaining weather information," Mr. Stanton went on. "There can be no safety in widespread private flying without rapid transmission of such information to planes in flights."

He visualized such equipment as a receiver operating on the very high frequencies with direction-finder attachment, and asserted that "at least one company is prepared to produce the receiver alone for less than $30." Many private owners also will want a transmitter, and this, he said, "should not cost more than $50 on a mass-production basis."

Tremendous Expansion For Television Predicted

Television will move rapidly as soon as peace comes, and high speed facsimile in conjunction with radio relay circuits or special cables and wires may exert a radically new influence on domestic communications, Ralph R. Beal, former Research Director and now assistant to the vice president in charge of RCA Laboratories, reported Feb. 25 to the members of the San Francisco Engineering Council.

Great strides taken

Mr. Beal said that the full development of television "may take five years, or it may take ten," but assured his audience that by means of automatic, unattended radio relay stations, spaced at intervals across the country, the "East will look in on the West and the West on the East." The RCA executive pointed out that great strides have been made in pushing the frontiers of radio into the very high and ultra-high frequency regions of the spectrum with the result that "much has been learned about the generation and propagation of frequencies from 30,000 to 3,000,000 kilocycles." In these high frequencies are "the wide paths necessary for television and other new services," he said.

The expansion of television will be tremendous, he reminded the engineers, citing that "it is well within reason to estimate that several hundred television stations can be placed in operation in the United States during the decade following cessation of hostilities." This, he added, will provide employment for a wide range of arts and trades.

Meanwhile, according to a London report, an eight-man television "development committee" has been appointed in Great Britain.

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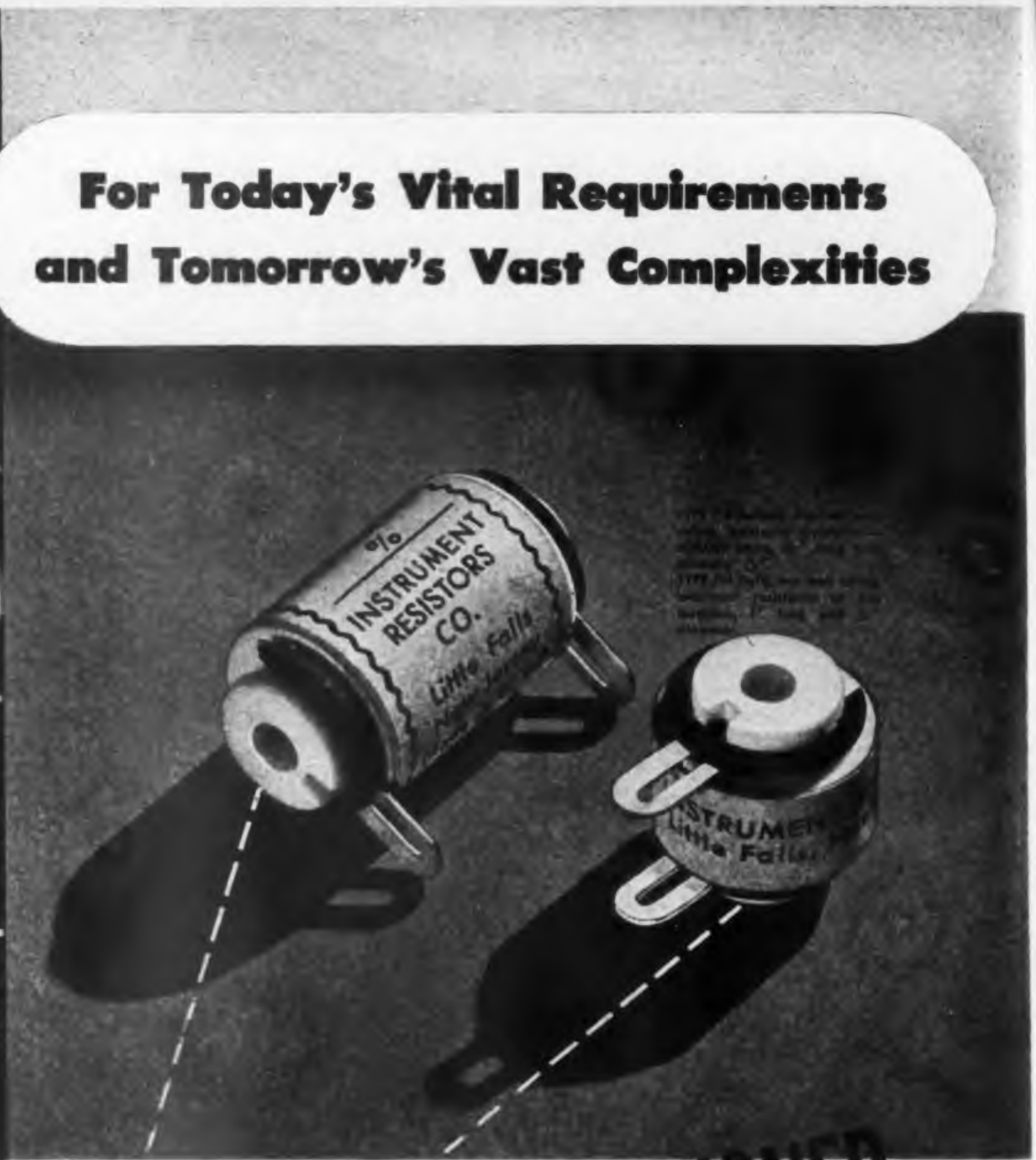

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IN-RES-CO precision units are ideally suited for post-war plannings because each is application-designed for specific functioning. By specialization, IN-RES-CO resistors are offered without price premium for their extra quality . . . custom windings at stock prices. Inquiries—for present essential, or future industrial needs — are invited. Literature on request.

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Improved Design Foreseen for Postwar

(See page 113)

The solution of field service problems in the radio and television receiver field after the war, reported Irwin W. Stanton (RCA Service Co., Inc.), will require increasing emphasis on "design technic"—the planned incorporation in the product of those qualities which insure satisfactory performance under normal or average conditions.

There will always be a need for field service to cope with local operating conditions and the human element involved in the operation of the instrument. Economically, there are definite limits as to how far a design engineer may go toward meeting the requirements of extreme operating conditions. The majority of consumers should not be penalized by inclusion of features which substantially affect the selling price and satisfy only a few. Within these limits, design technic is the key to customer satisfaction and minimized field service requirements.

If parts do not have sufficient safety factors, if they are not carefully inspected during manufacture, if adequate life tests are not made to determine their reliability, or if proper humidity, temperature, and vibration tests are not made, troubles of an epidemic nature may be expected in the field.

Troubles arising from excessive vibration and rough handling in transit can be kept to a minimum by careful attention to stability of adjustments under vibration, weight of components and methods of securing them on the chassis, and the mounting of the assembly in the cabinet. Simplification of the product, reducing the number of operations in its manufacture, contribute toward elimination of human error on the assembly line.

Finally, although difficulties due to abnormal local operating conditions can usually be dealt with most effectively in the field, the engineer can limit them by careful consideration to sensitivity, selectivity, image response, signal to noise ratio, and the shielding of circuits likely to be receptive to interference.

Radio in Italian Invasion

The establishment of communications facilities, both wire and radio, for the now battle-experienced Fifth Army, led by Lieutenant General Mark Clark, has achieved a record of not only unprecedented installations under combat conditions, but the performance of many deeds of heroism by Signal Corps personnel during the sanguinary days and nights after the Allied spearheads of this first truly great international American field Army of this war set foot on Italian soil.

During the first twenty-two days of the invasion, Signal Corps units had installed a grand total of 5,305 miles of assault wire, field wire and cable. This average of better than 240 miles of line laid per day will probably stand unequalled in the history of communications until the final, all-out assault on Hitler's Europe, according to a report from the Italian front just received by the War Department.

Radio, of necessity, was employed initially in all operations of the Fifth Army, including the bitterly-contested beachhead landings at Salerno and Paestum. But today as the troops of the Fifth Army press slowly but surely on toward Rome, an extensive network of wire is being laced in behind them. The report noted that the cobweb of wire is so interspun that to attempt to estimate accurately the thousands of miles of the metallic thread that gives ready, dependable communication would be an impossible undertaking.

In the beachhead landings, numerous small portable radio sets were carried ashore by the invading troops even in the fact of withering enemy fire as at Salerno. Higher-powered radio units, housed in especially-constructed shelters and mounted in the Army's prize amphibious vehicles—the DUKW, or DUCK, as it is more commonly known—were lowered over the sides of invasion vessels, churned through the waters of the Salerno Gulf and lumbered up the hostile shore.

Besides the wire facilities on the combat fronts in Italy, radio links are most numerous and highly important communications media. For example, the radio sets travel right to the advanced positions of the troops. It was interesting to note that when a heavy German attack was launched north of the point where Highway 18 crosses the Sele River, sixteen powerful radio sets had just been installed and linked with supporting nets. The Nazi attack was successful in that it forced the temporary withdrawal of all Allied units, except the radio team of a Signal battalion which received orders to hold on at any cost. For twenty hours this unit was the most advanced of the Fifth Army and was almost four miles ahead of all other support. At no time, during the enemy thrust, had communications been lost, although a German patrol crossed the river at one point and attempted to destroy a transmitter installation. But radio operators, maintenance men and officers, only having submachine guns, rifles and carbines, repulsed the patrol with losses.

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ELECTRONICS IN ACTION

Homogenized Heat

Boil a potato; broil a steak; bake a loaf of bread—in every case the heat flows from the outside to the inside. Result: the outside is always "well done" while the inside is still "rare." In the kitchen this may be a desirable situation, but in the plastics industry a similar condition made trouble—until high-frequency heat, generated by electron tubes, came into the picture.

For in molding thermosetting plastics, a briquet, or preform, of the material must be heated *uniformly* to soften it for molding. Too much heat causes the outside of the preform to "set" prematurely; too little heat leaves a hard lump in the center.

By the application of high-power radio waves to this heating job, heat can be generated *uniformly* throughout the plastic preform. The entire mass softens at once—without a hard external "crust." Because the heat is "born" inside of the plastic material the temperature can be increased rapidly, valuable time is saved, better plastic products result. This is homogenized heat! A new tool of industry!

This new heating method can be applied to many substances—wood, glue, paper, textiles, rubber, foods, tobacco, leather. It is clean—quiet—efficient—extremely fast—and can be controlled with extreme accuracy.

You may have a problem where this new application of electronic tubes would prove useful—or even revolutionary. If so, write us about it. *Remember, the Magic Brain of all electronic equipment is a tube—and the fountain-head of modern tube development is RCA.* Write today. Address: RCA, Dept. 68-7P, Camden, New Jersey.

A new booklet—"RCA ELECTRONICS IN INDUSTRY"—shows some of the ways RCA is prepared to help put electronics to work. It may suggest applications important to your business. Free on request. Please use business letterhead when writing. Address—Dept. 68-7B, RCA, Camden, New Jersey.

RADIO CORPORATION OF AMERICA