DIRECTORY ISSUE — JUNE • 1944

electronics

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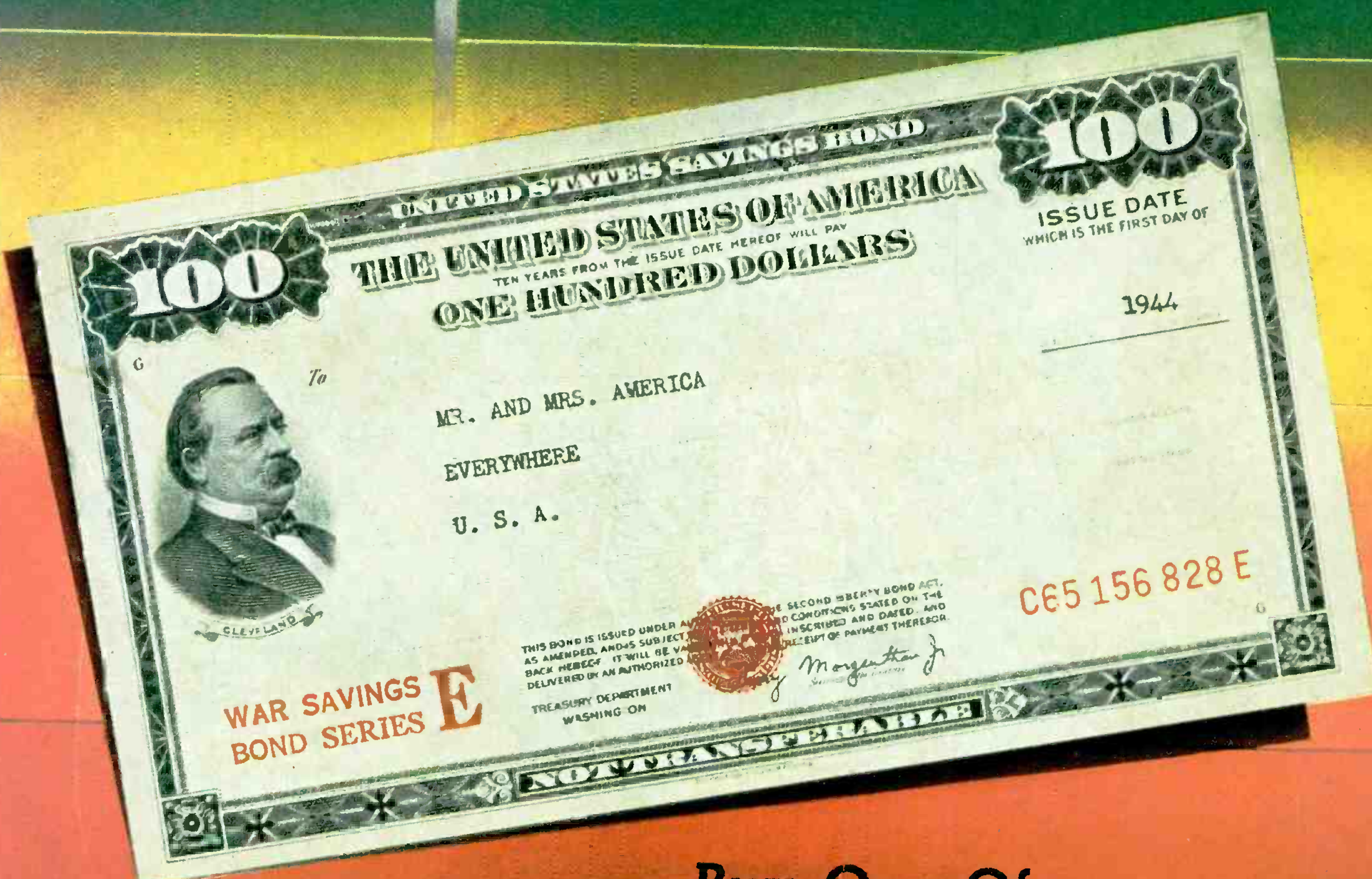

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DIRECTORY ISSUE—JUNE • 1944

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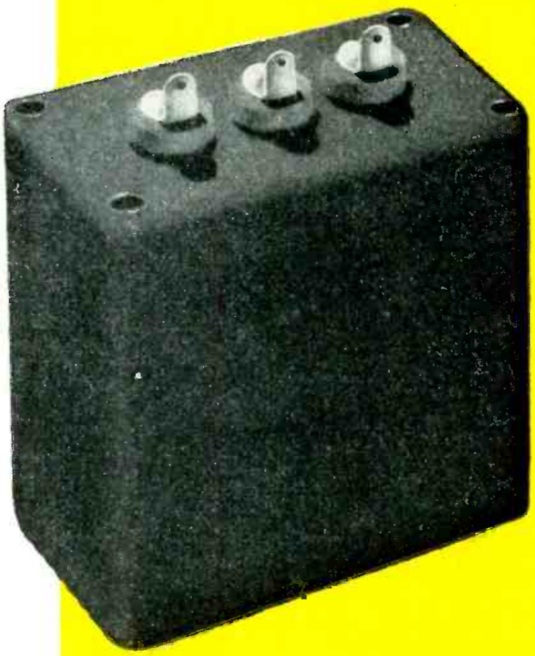

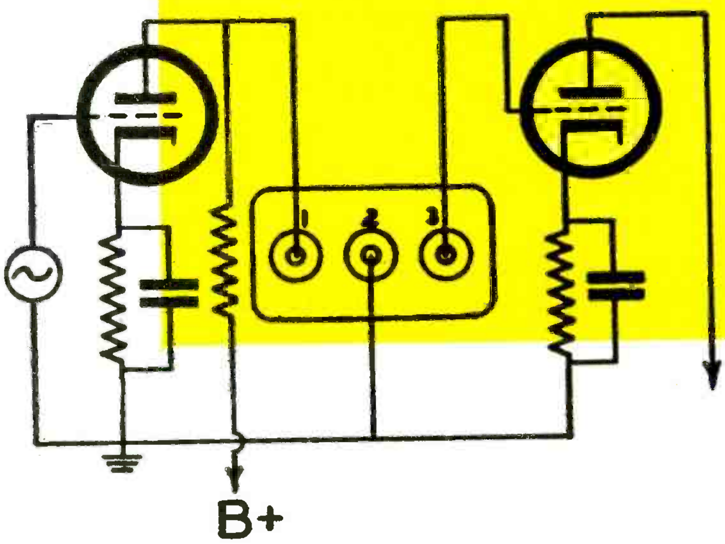

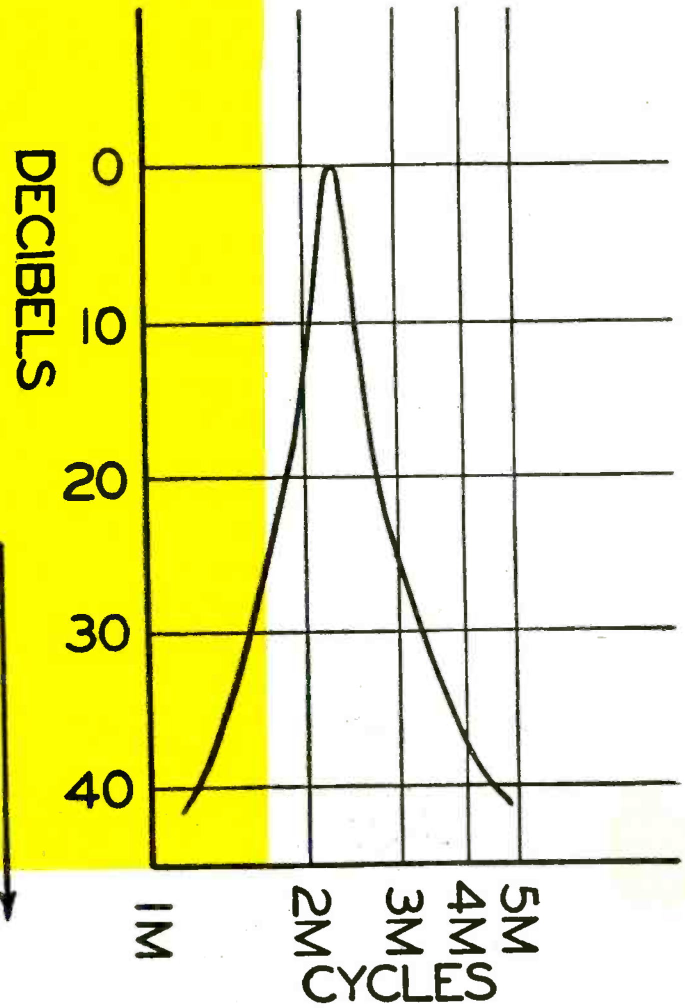

Interstage filters lend themselves to effecting gain simultaneously with their frequency discrimination. The unit illustrated is a band pass unit which provides a 2:1 step-up ratio, with band pass attenuation of 40 DB per octave. This unit employs a dual alloy magnetic shield which reduces inductive pick-up to 150 Mv. per gauss. The dimensions in its hermetically sealed case are 1½ x 2½ x 2½. Filters of this type can be supplied for any band pass frequency from 200 to 10,000 cycles.

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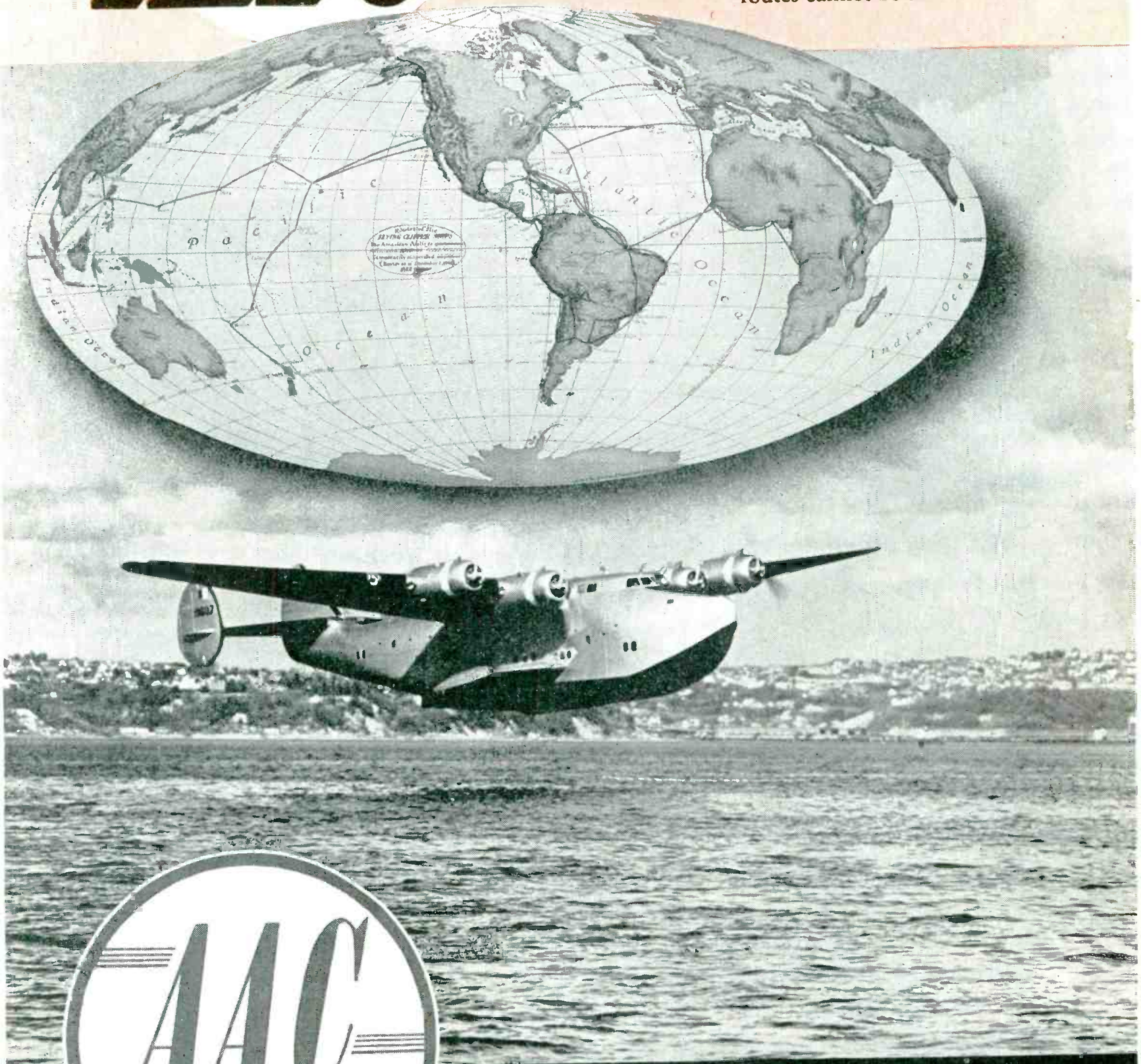

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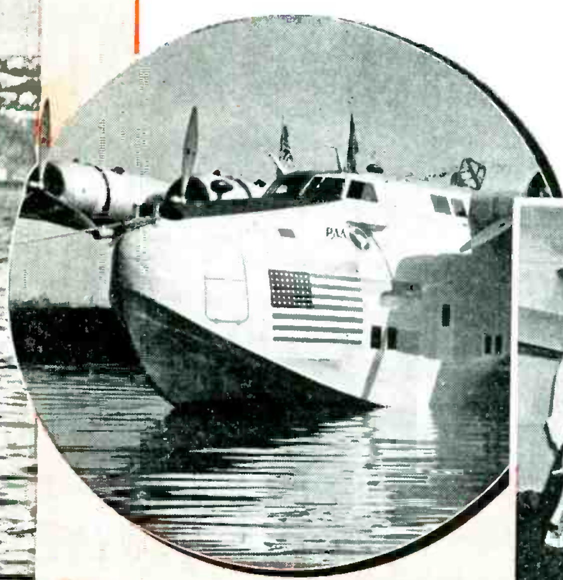

In war as in peace the PAA Clippers serve humanity. Here 1810 pounds of medical supplies go aboard at LaGuardia Field.

(E-54)

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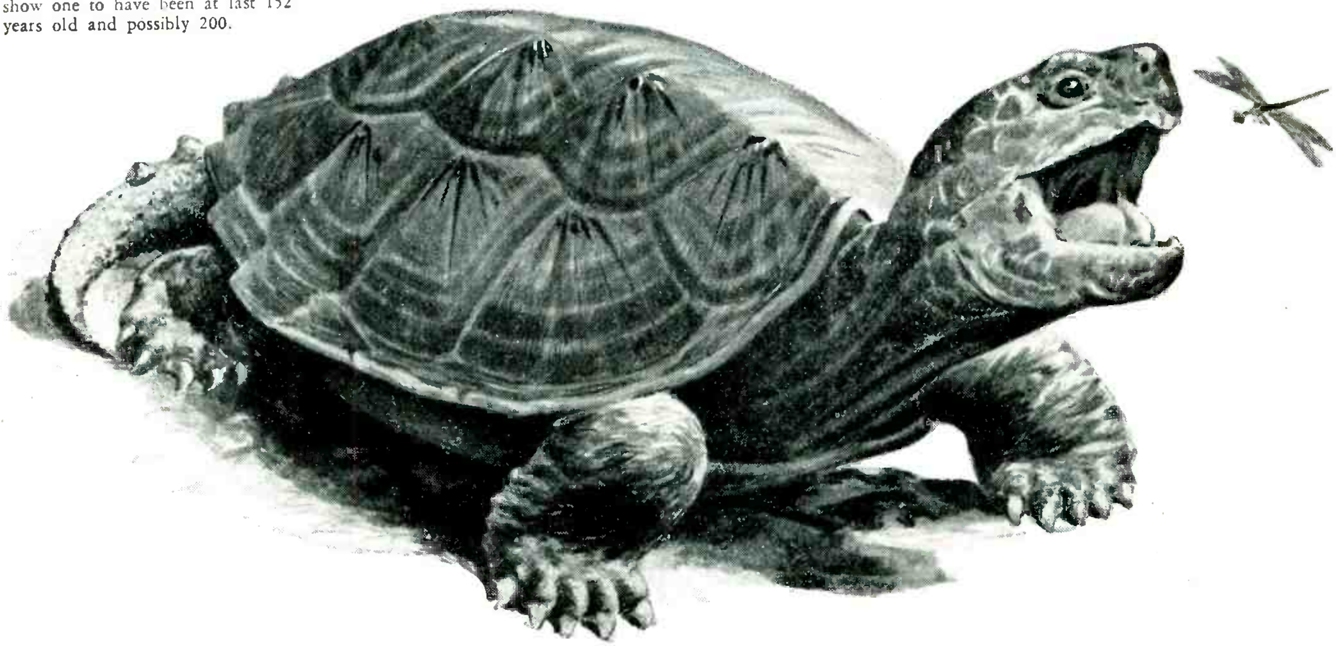

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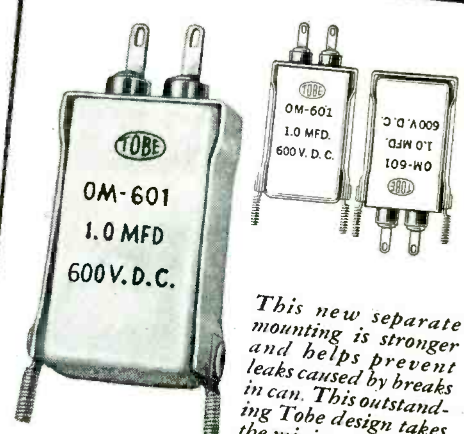

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STANDARD CAPACITY TOLERANCE . . . 10%
TEST VOLTAGE . . . Twice D. C. rating
GROUND TEST . . . 2,500 Volts, D. C.
OPERATING TEMPERATURE . . 55°F to 185°F

SHUNT RESISTANCE
.05 to 0.1 mfd. 20,000 megohms
.25 to 0.5 mfd. 12,000 megohms
1.0 to 2.0 mfd. 12,000 megohms
POWER FACTOR
At 1,000 cycles—.002 to .005
CONTAINER SIZE
Width ⅝", length 1 5/16", ht. 2¼"
MOUNTING HOLE CENTERS . . . . . 1½"

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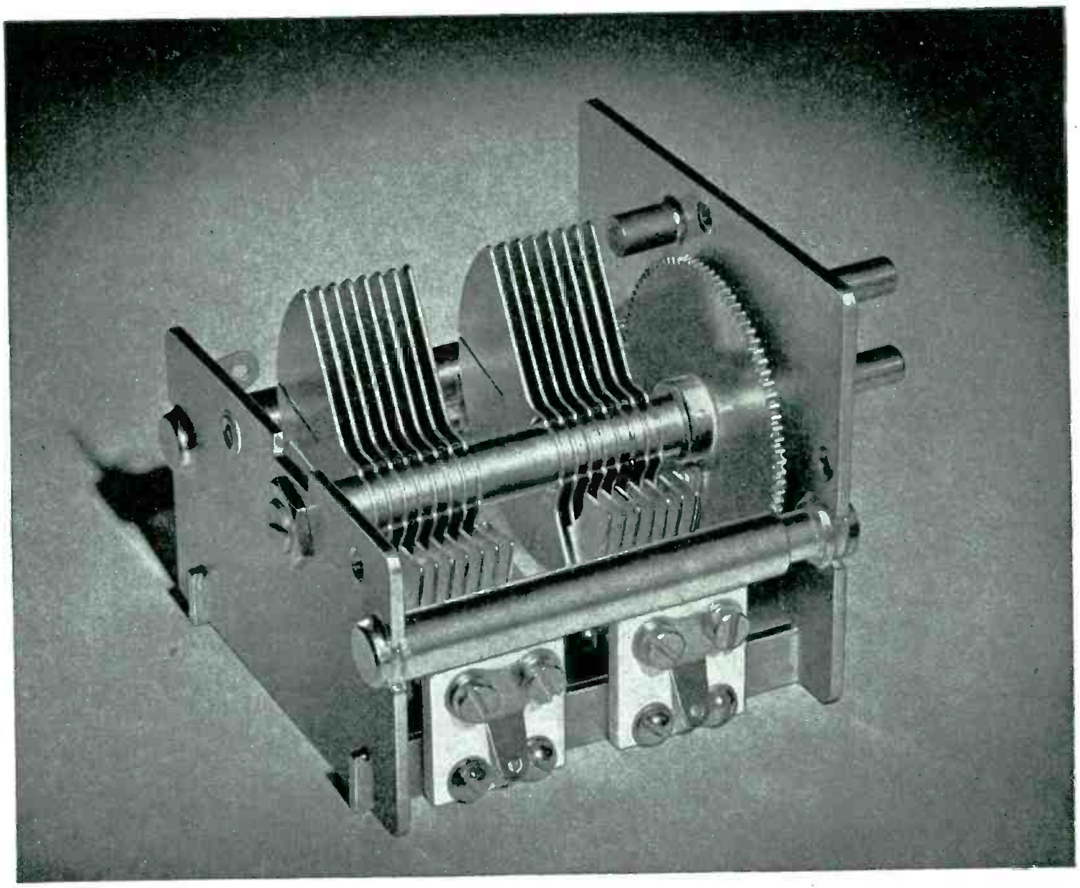

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2. Steatite with aluminum oxide coating	Where there is danger of distilled metal condensing on surface of the insulator.	Aluminum oxide coating increases roughness of surface preventing formation of metallic leakage paths on the insulator.
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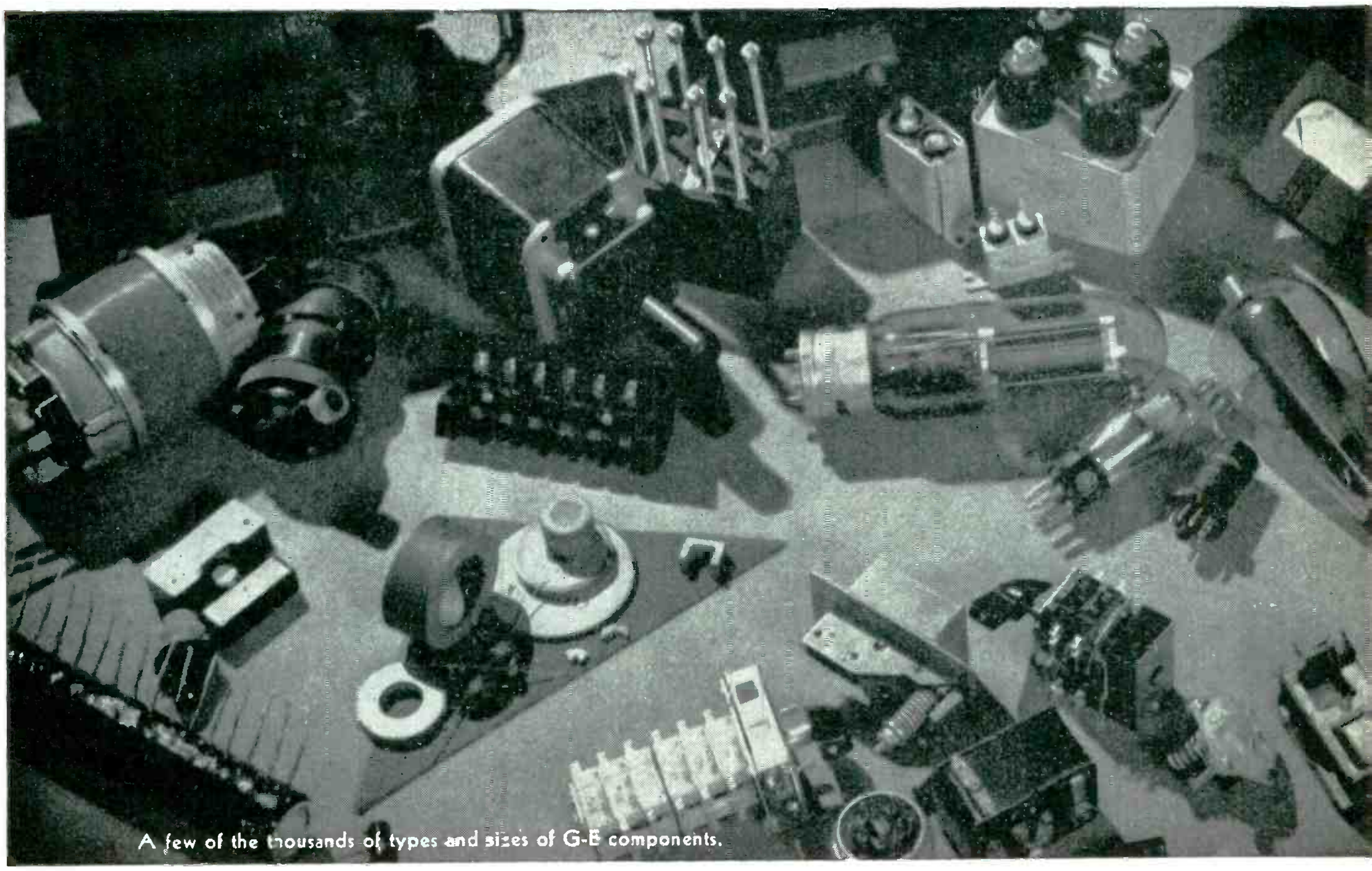

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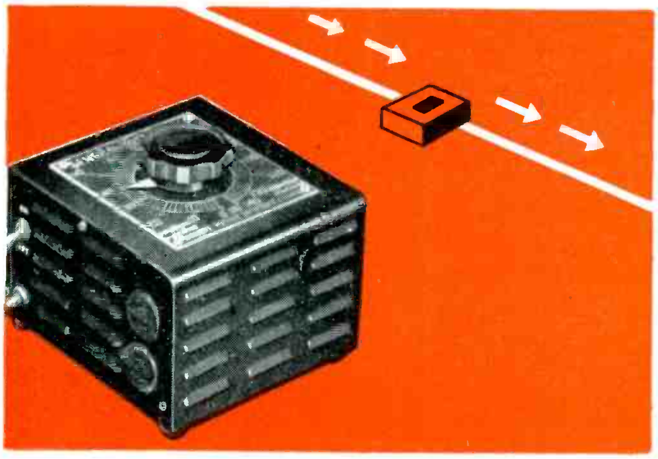

VARIABLE-VOLTAGE AUTOTRANSFORMER used for smooth control of uninterrupted voltage and small amounts of power. Mechanically strong, compact, and light in weight, designed for panel or bench mounting. Operates on low input power and low exciting current, with high efficiency and excellent regulation throughout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

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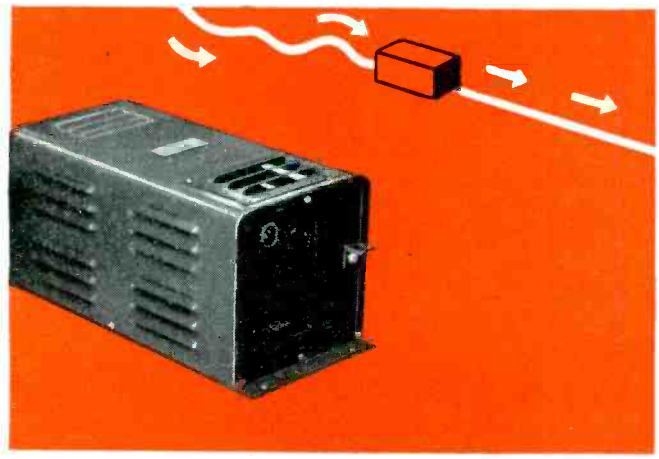

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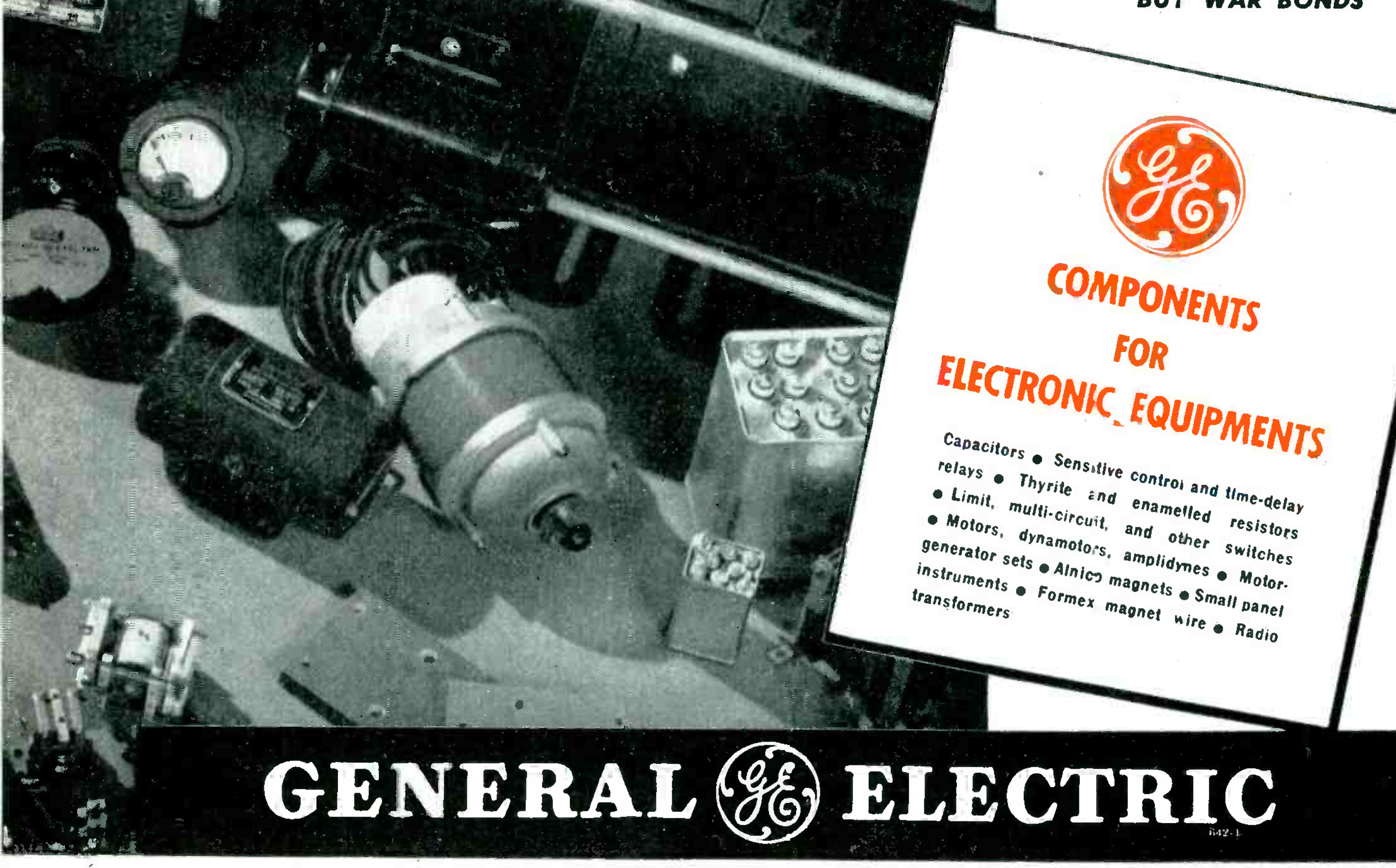


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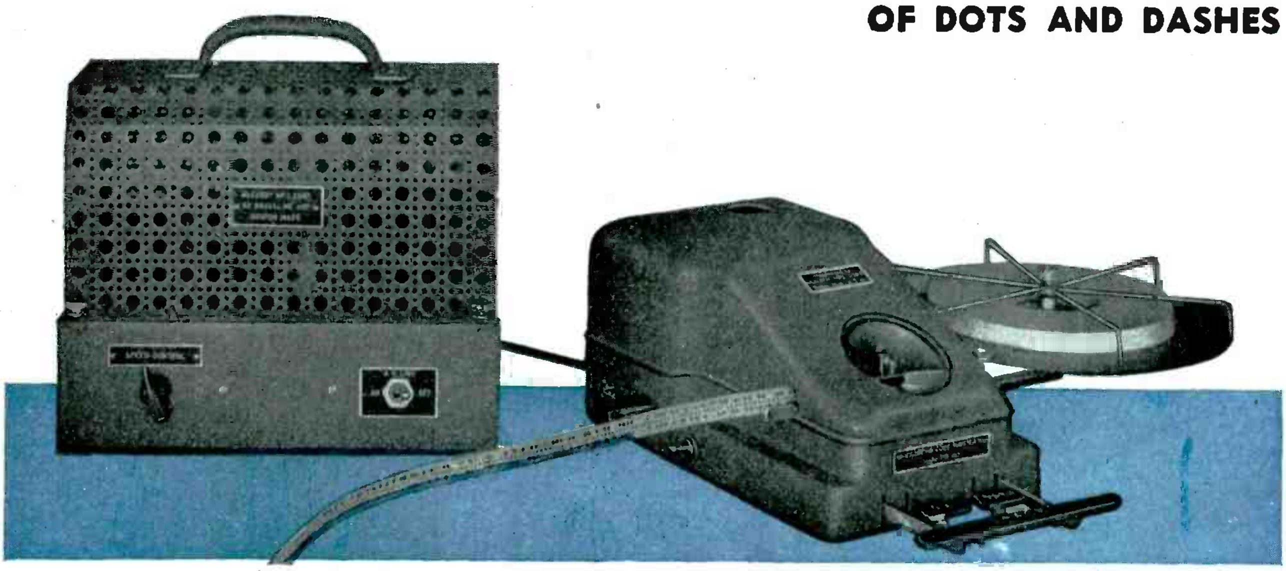

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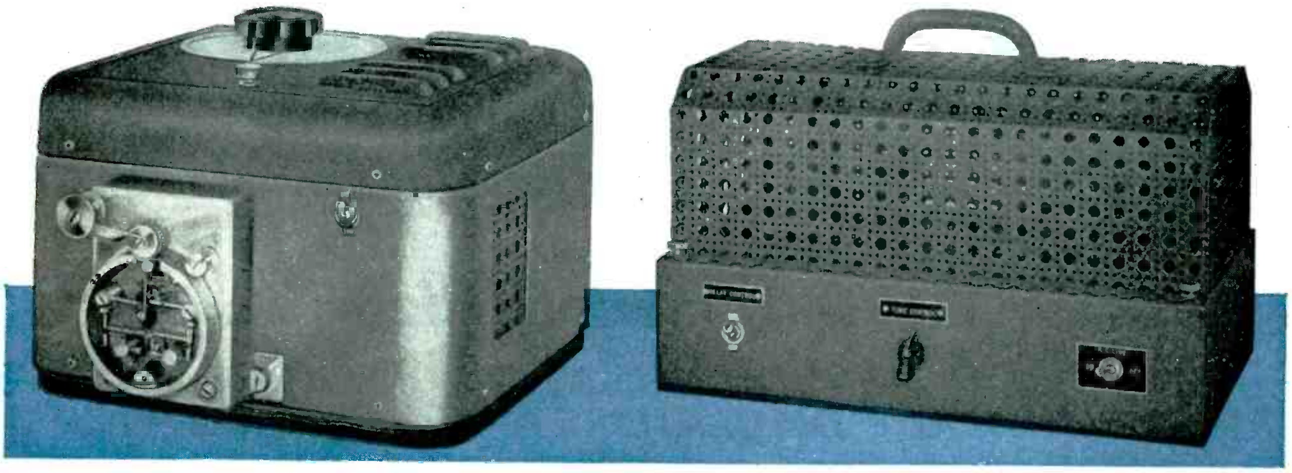

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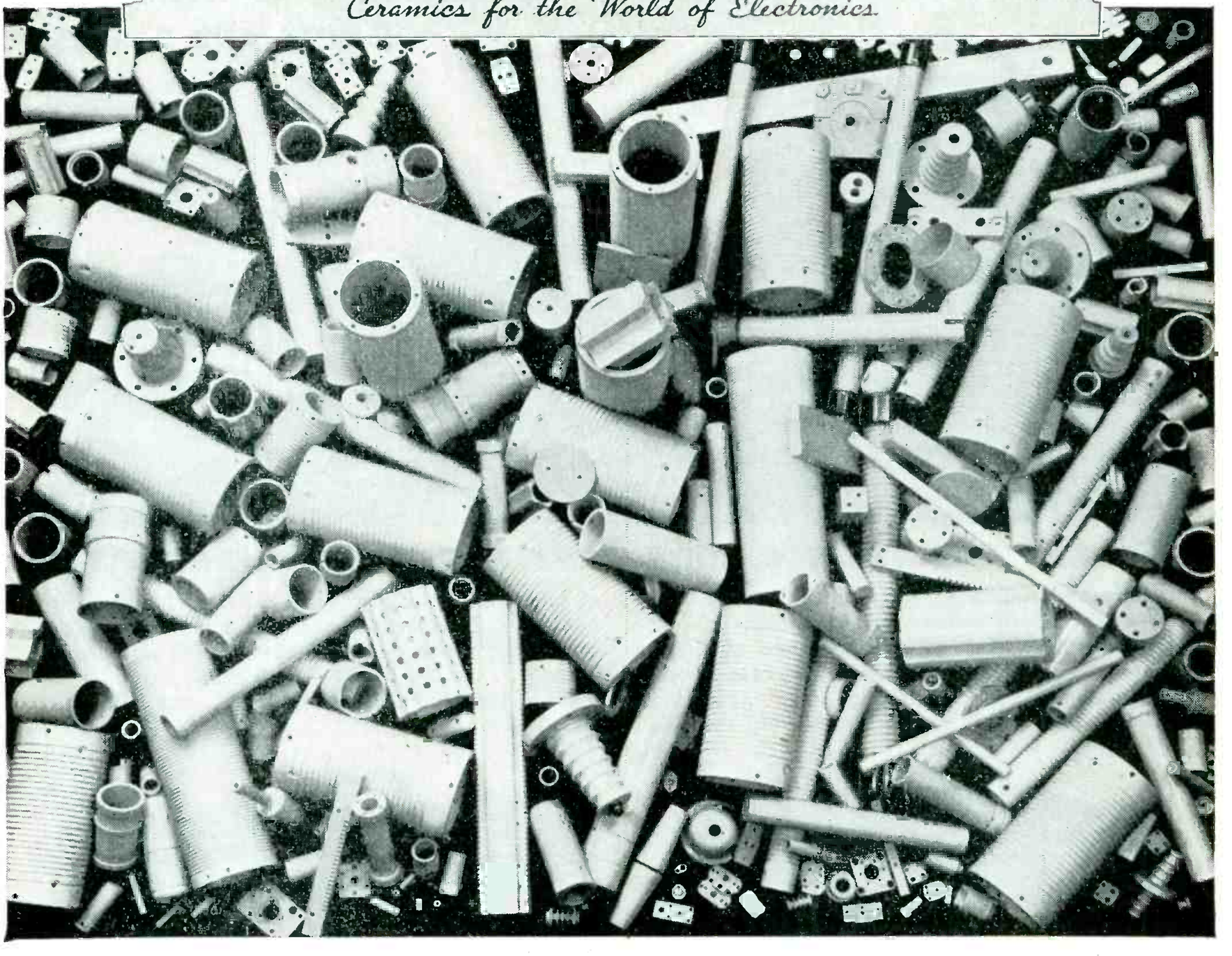

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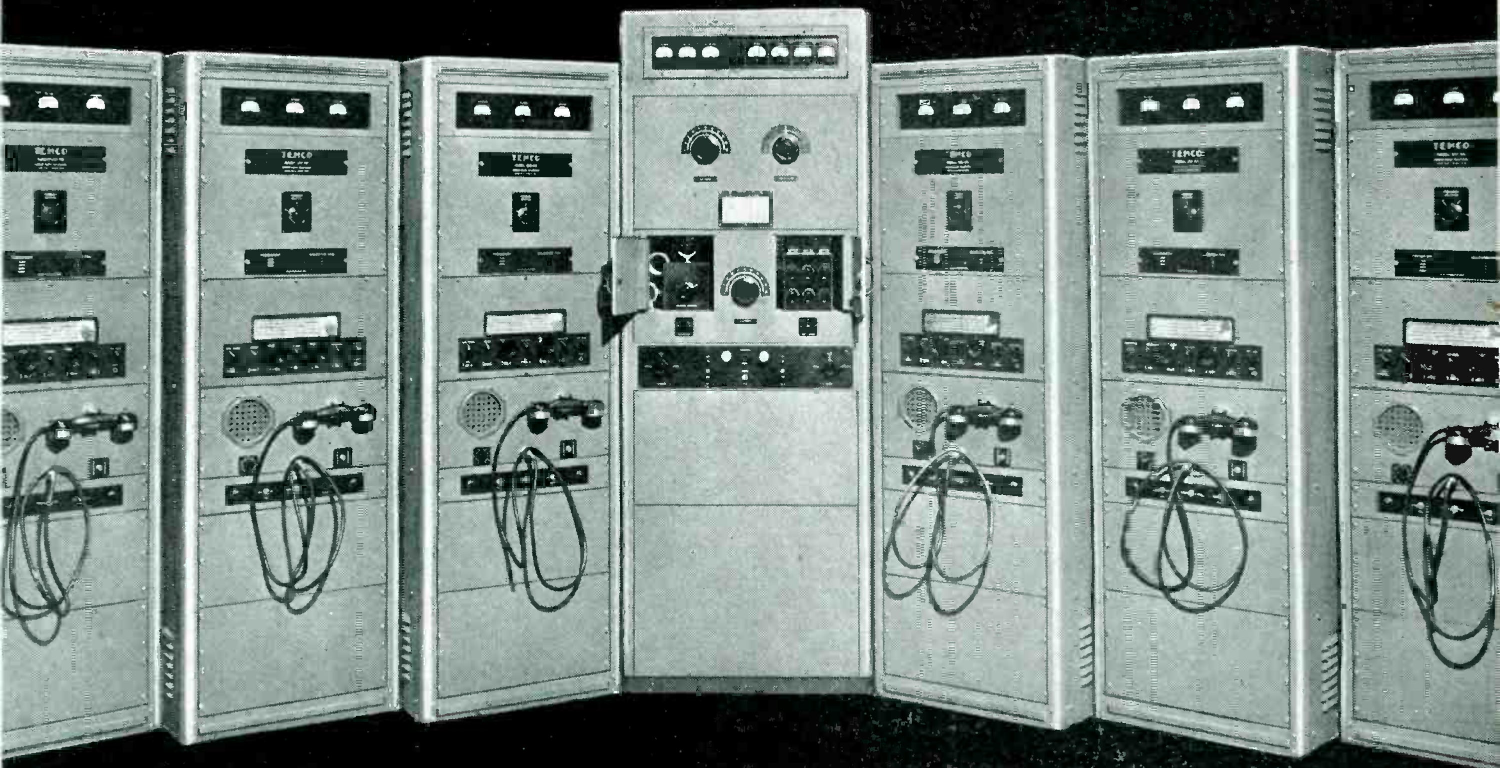

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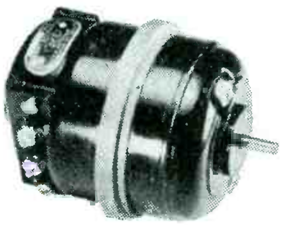

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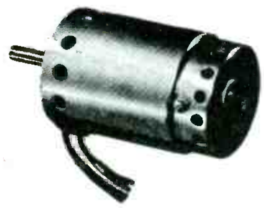

MODEL J31B

400 to 1200 Cycles variable frequency 115 Volts. 15 oz. Diameter $1\frac{15}{16}$". Length $2\frac{29}{32}$".

MODELS J49 AND J49A

115 Volts, 1/250 H.P. Weight 16 oz. Diameter $1\frac{3}{4}$". Length $2\frac{11}{16}$".

J49—60 Cycles
J49A—400 Cycles

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28 Volts D.C. Torque unit. Developes 5 oz. in. throughout 90° swing. Diameter $1\frac{3}{4}$". Length $2\frac{11}{16}$".

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Delivers 10 cu. ft. per minute of free air. Weight 21.5 oz. Overall diameter $3\frac{11}{16}$". Overall length $4\frac{1}{16}$".

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MODEL J52 —400 TO 1200 CYCLES VARIABLE FREQUENCY, 115 Volts. Delivers 17 cu. ft. per min. of free air. Diameter $3\frac{11}{16}$". Length $4\frac{1}{16}$".

MODEL J53 —28 VOLTS D.C. Delivers 22 C.F.M.

MODEL J54 (Midget)—60 CYCLES, 115 VOLTS Delivers 6 C.F.M.

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Loss factor, 1 megacycle 0.013
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Dielectric constant is unchanged from 50 kilocycles to 10 megacycles.
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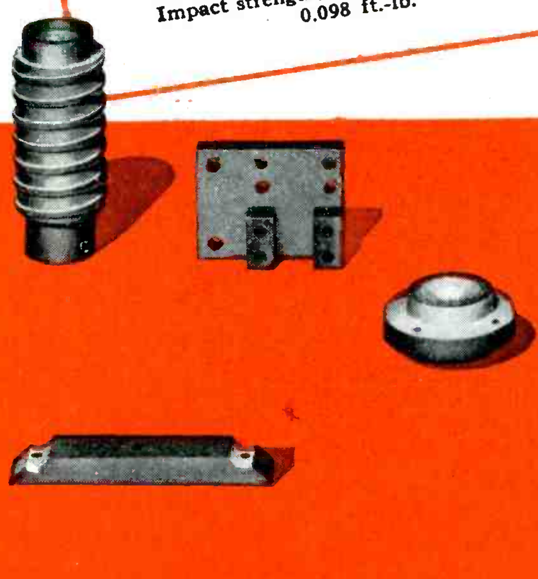
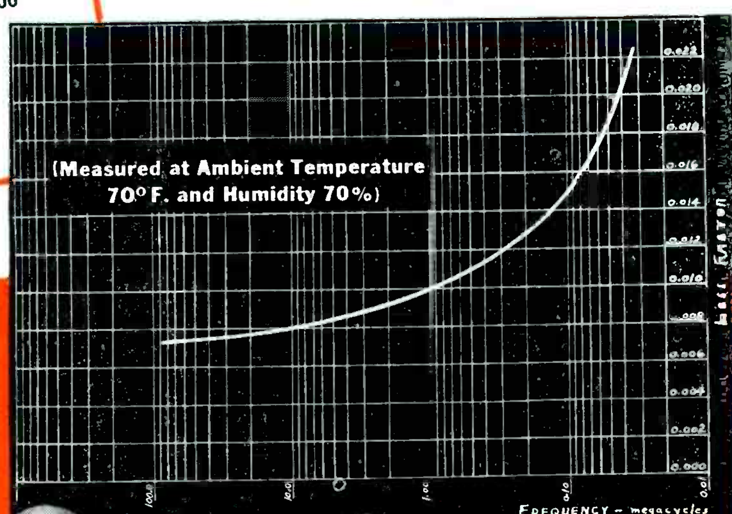
After 96 hours at 85° F. and 85% relative humidity, with 1 inch electrode spacing.
Specific gravity 3.0
Impact strength, Charpy, ¼ in. x ¼ in. 0.098 ft.-lb.





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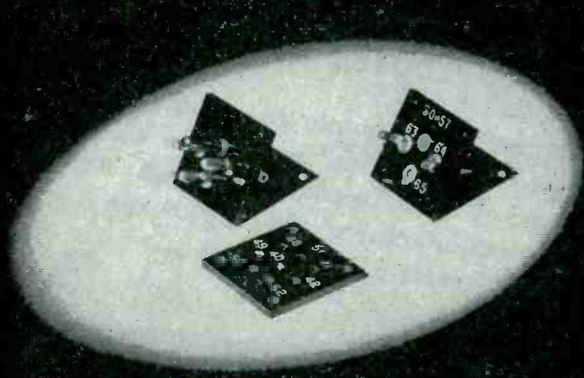


Parts of National Vulcanized Fibre and Phenolite, laminated Bakelite are used widely in communication instruments of every description. This is because of their great dielectric strength, lightness in weight and exceptional wearing qualities.

THE ruins of shattered Jap buildings on captured Namur lay around these Marine Signalmen as they hurriedly set up communications. There's no limit to calls here—the advance moves on—thanks to the skill of our signalmen and the high efficiency of our communications equipment. Important in the dependable operation of these instruments are the countless parts made of plastics like National Vulcanized Fibre and Phenolite, laminated Bakelite.

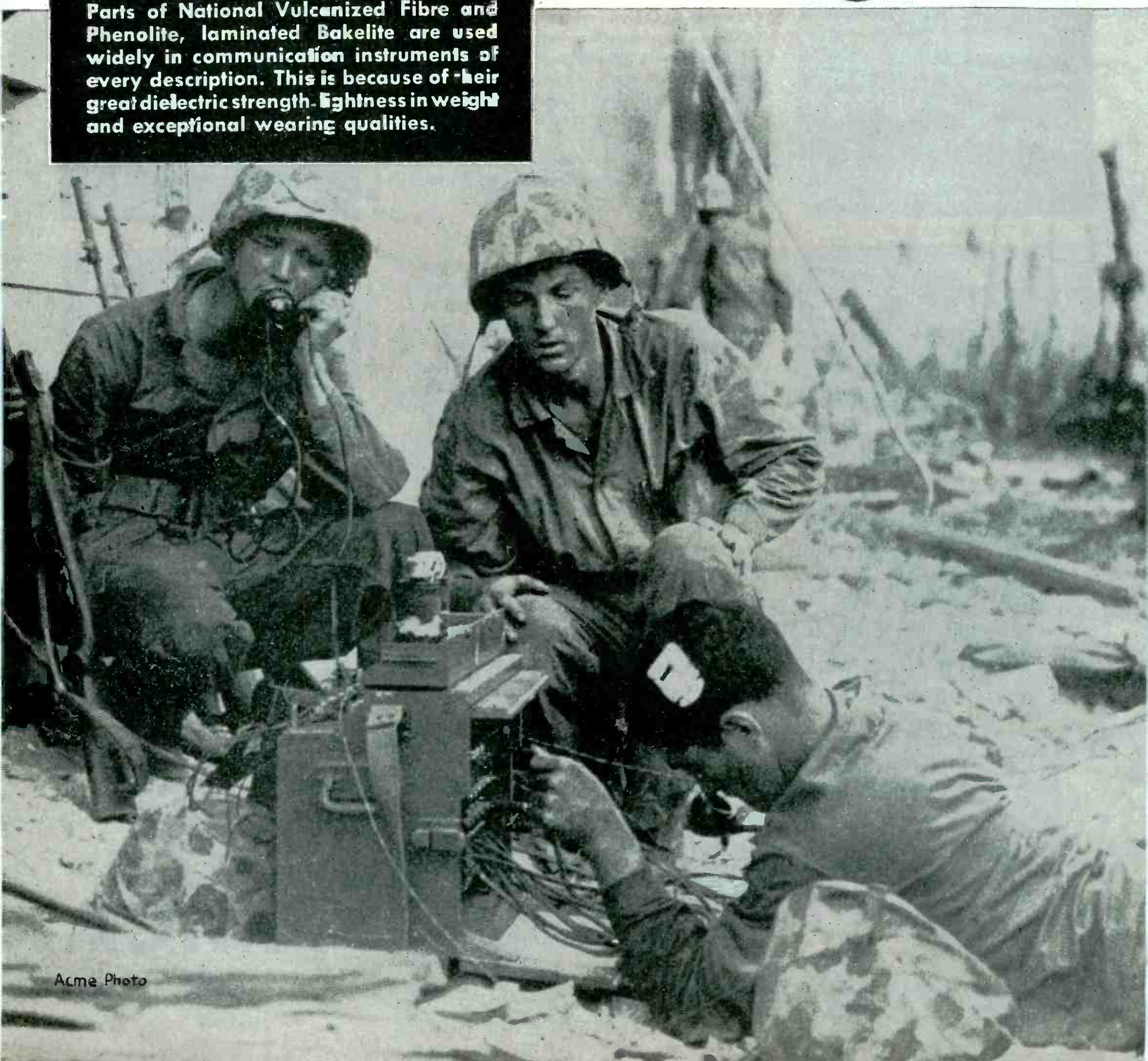
The electronic engineers of America are doing a great job at the battle front—and on the home front.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION NEMA MEMBER

NATIONAL VULCANIZED FIBRE CO

WILMINGTON DELAWARE

Offices in Principal Cities

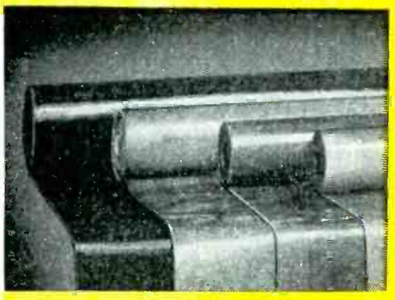


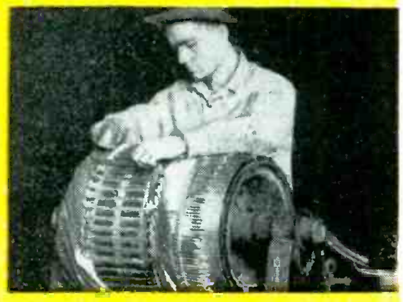
Acme Photo

EMPIRE

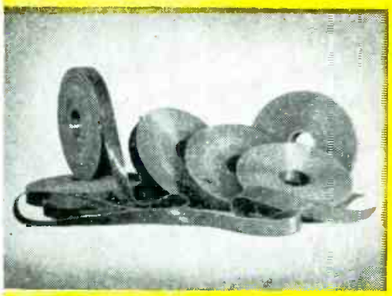
VARNISHED CLOTHS & TAPES

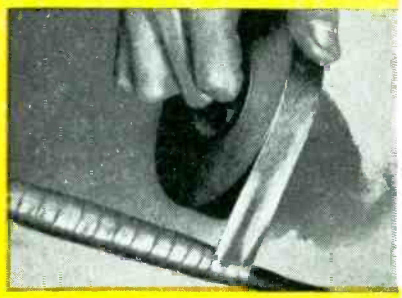
"EMPIRE," the oldest name in varnished cloth and paper insulation, symbolizes the fifty-year span of Mica Insulator Company's experience in manufacturing this highly specialized form of electrical insulation.



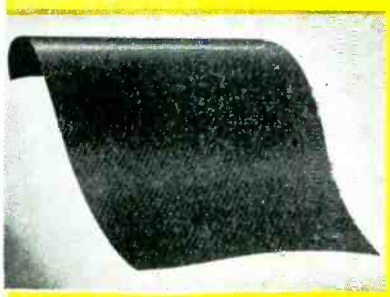


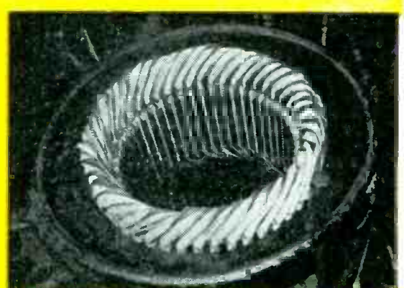
EMPIRE CLOTHS are carefully selected to facilitate impregnation, canvas and duck being used where greater thickness and higher mechanical strength are required; silk, rayon or fine cambric where insulating space is at a premium. EMPIRE varnishes are especially formulated under laboratory supervision for specific uses, and are chosen for their ability to penetrate the base material and provide a smooth surface.





EMPIRE BIAS-CUT TAPES have elongation properties not possessed by standard straight-cut tape. They are ideal for application to conductors and coils, conforming more readily to irregular surface. Extra stretch avoids the coning effect produced when wrapped helically. Available in yellow (suitable for continuous oil immersion,) or black (for higher dielectric strength).





EMPIRE VARNISHED FIBERGLAS, in both full-width cloths and in straight-cut tapes, is impregnated with either yellow or black varnish to provide a highly flexible, mechanically strong class "B" insulation, permitted to withstand a "hottest spot" temperature of 266° F. May be slit into any tape width specified by the customer. An ideal slot insulating material for use in the presence of humidity, oil, grease, dirt and frequency of overload.

BRANCH OFFICES

For convenient and expert service, call upon the Mica Insulator Company representative at the following branch office addresses.

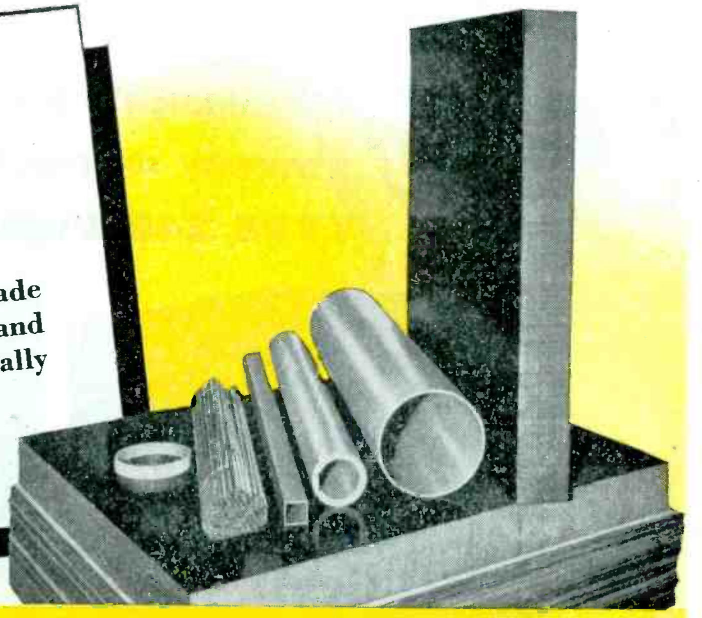
Chicago: 600 West Van Buren Street • Cleveland: 1276 West 3rd Street • Detroit: Book Building • Cincinnati: 3403 Hazelwood Avenue • San Francisco: 235-241 San Bruno Avenue • Seattle: 2122 Fourth Avenue • Los Angeles: 449 South San Pedro Street

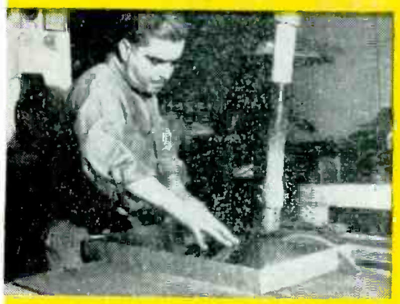
MICA

LAMICOID

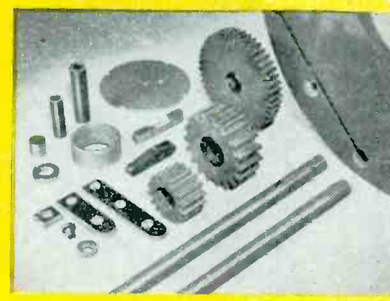
LAMINATED PLASTIC

LAMICOID sheets, rods and tubes—made from a variety of paper, cloth, asbestos and Fiberglas bases, are bonded with especially selected thermo-setting resins to meet special requirements.





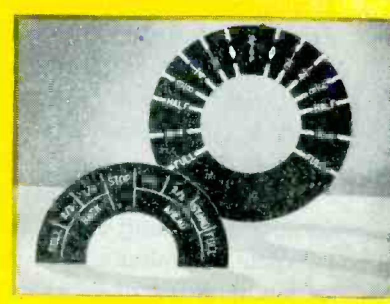
MECHANICAL LAMICOID offers high mechanical strength, dimensional stability and resistance to moisture and shock. Strong, dense and nonhygroscopic, it is easily punched, sheared, sawed or machined into intricate shapes. Available in rods and tubes with a wide range of diameters, and in sheets (36 x 42 standard size) in all thicknesses.



ELECTRICAL LAMICOID is manufactured particularly for applications requiring low power factors and low dielectric loss at high frequency ranges. Widely used in the manufacture of insulating components in the electrical manufacturing and electronic fields, it is suitable for both high and low voltage uses.

ENGRAVING LAMICOID—A combination sandwich-type opaque laminated sheet which permits pantograph engraving or sandblasting. Also furnished in translucent form for uses requiring "rear" illumination of dial, signs or indicia. Ideal for uses requiring small quantities.

Fabrication facilities for all types of electrical, mechanical and engraving Lamicoid applications are available through our fabricators at the addresses below:

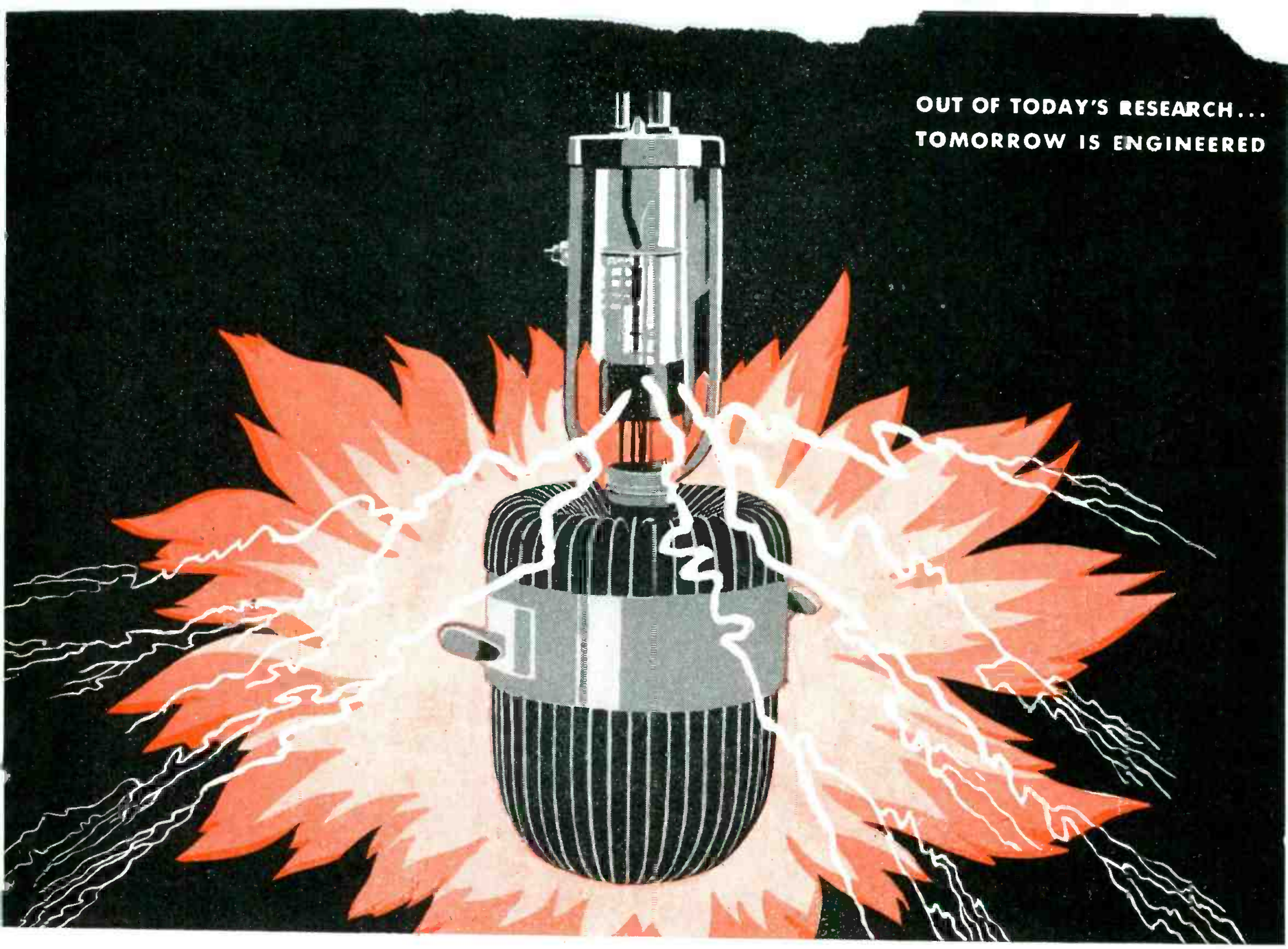


FABRICATORS

Mica Insulator Company, 200 Varick Street, New York 14, N. Y. Insulating Fabricators, Inc., 12 East 12th Street, New York 3, N. Y. • Insulating Fabricators of New England, Inc., 22 Elkins St., S. Boston 27, Mass. • Lamicoid Fabricators, Inc., 3600 Potomac Avenue, Chicago 51, Illinois • The Kirby Company, 13000 Athens Avenue, Cleveland 7, Ohio

INSULATOR COMPANY

200 VARICK STREET, NEW YORK 14, N. Y.



RECORD BREAKING HEAT WAVE

INDUCTION HEATING through powerful high-frequency radio waves is breaking records in speeding up production of bonded plywoods, tin plating and in other industrial applications.

Of prime importance to the efficiency and stability of such high-frequency circuits is insulation whose composition and strength is master of both power and heat.

Permanent in their hardness, strength and rigidity, ALSIMAG Ceramic Insulators are not subject to distortion, warping or shrinking.

ALSIMAG bodies, each with its particular characteristics, are available to meet all insulating requirements. Our engineering and research people will gladly cooperate in today's design—tomorrow's production.

CHARACTERISTICS OF ALSIMAG INSULATORS

•

High Mechanical Strength
Permanent Rigidity
High Dielectric Strength
Low-Loss Factor
Will Not Absorb Moisture
Chemically Inert

AMERICAN LAVA CORPORATION

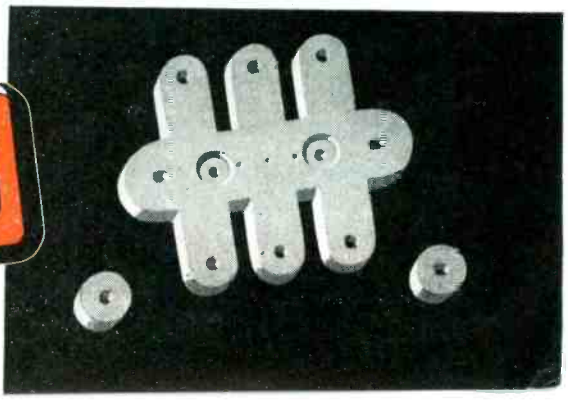
CHATTANOOGA 5, TENNESSEE

ARMY E NAVY

Army-Navy "E"
First Awarded July 27, 1942
Second Award: "Star" February 13, 1943
Third Award: "Star" September 25, 1943

ALSIMAG
TRADE MARK REGISTERED U. S. PATENT OFFICE

CERAMIC INSULATORS



THE SECRET OF TOP QUALITY FASTENERS

EVERY EIGHTH WORKER IS AN INSPECTOR

As a principal source of supply for aircraft fasteners, National Screw produces an exceptionally complete line of AN and NAS bolts, nuts, screws, rivets and other headed and threaded products, including many "specials" designed by individual aircraft manufacturers.

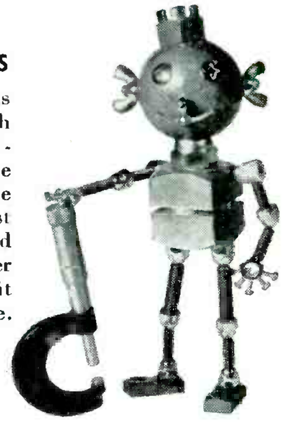
Because we know that rigid inspection is the best insurance of quality, our inspection department comprises 12 per cent of our factory personnel. This results in a standard of uniformity and freedom from rejection that is extraordinary in the industry.

National's engineering and metallurgical experience, modern manufacturing and heat-treating facilities, large capacity and closely integrated production layout, including our own wire mill, equip us to give our customers exceptional service.

Substantial savings to our customers have been effected in many cases by cost cutting methods which we have developed, particularly in adapting cold heading to many parts previously made milled from bar.

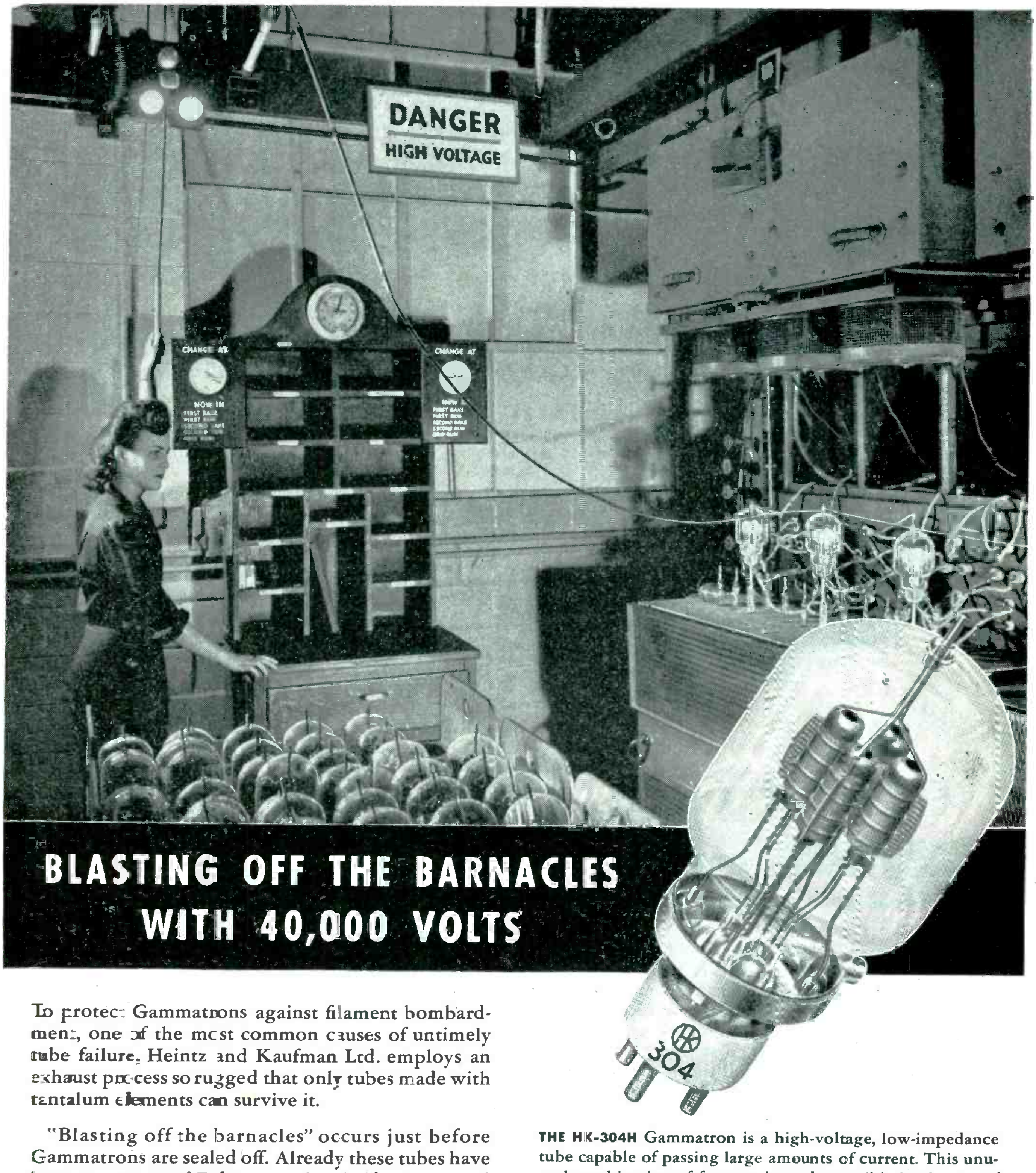
SPECIAL AIRCRAFT PRODUCTS

NATIONAL aviation products include many special parts, such as carburetor studs, motor mounting bolts, stainless eyebolts, brake adjustment screws, gyroscope struts, dome nuts—to name just a few. Our engineers will be glad to work with you on any fastener problem and give you the benefit of *National's* wide experience.



National
HEADED AND THREADED
PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.



BLASTING OFF THE BARNACLES WITH 40,000 VOLTS

To protect Gammatrons against filament bombardment, one of the most common causes of untimely tube failure, Heintz and Kaufman Ltd. employs an exhaust process so rugged that only tubes made with tantalum elements can survive it.

"Blasting off the barnacles" occurs just before Gammatrons are sealed off. Already these tubes have been run at 3,000° F. for more than half an hour, and have been exhausted to 1/10,000,000,000 of atmospheric pressure.

A red light flashes, and a warning bell rings as 40,000 volts are applied between grids and plates. A blue-white flicker marks the passing of the last bit of gas.

Before a tube can endure such punishment it must be built like a Gammatron—clean and sturdy, without internal insulators or chemical getter. Then it will take the kind of exhausting that insures its staying on the air for thousands of hours.

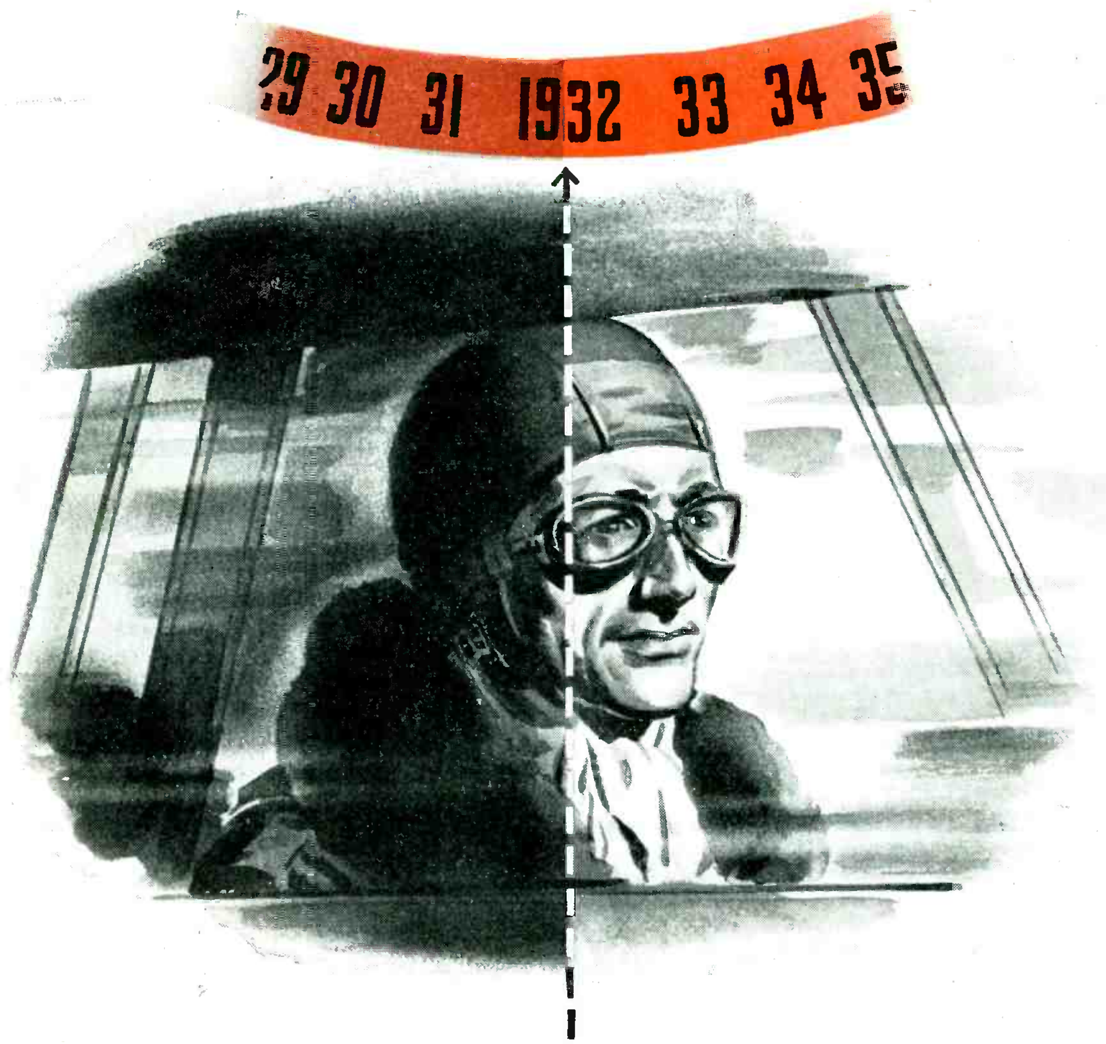
THE HK-304H Gammatron is a high-voltage, low-impedance tube capable of passing large amounts of current. This unusual combination of features is made possible by the use of four separate sets of tube elements operating in parallel within one glass envelope. Max. plate dissipation, 300 watts.

★ *BUY AN EXTRA WAR BOND THIS MONTH* ★

HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO • CALIFORNIA, U. S. A.

Gammatron Tubes



CLEAR GUIDANCE FOR

CLOUD-BLINDED PILOTS

In 1932, fog and low-hanging clouds lost many of their terrors. For then, with air travel well beyond its pioneering phase, the newly-improved radio communication system was making it possible for pilots to talk back and forth with ground station personnel . . . to get their bearings at all times . . . to bring their passengers safely through on days when airports were invisible.

In that year pioneering in electronics was yielding a rich harvest. Many developments long in preparation were being completed. One example was the aviation radio equipment then manufactured by Foote, Pierson, among the first of its kind used on transport planes to keep pilot and port in close touch ...to bring the liner to the field straight as a homing pigeon...on the beam every mile of the way.

In back of this accomplishment were 48 years of experience . . . years of experiment, and of many tough jobs licked . . . years of making many kinds of communications equipment, precision instruments, X-ray apparatus and other products where close tolerances put a premium on technical skill and exactness.

The facilities which produced these units and which are now serving war needs will be available again on V-Day. But don't wait until that day to talk with us and plan with us.

FOOTE · PIERSON & CO · INC

MANUFACTURERS OF PRECISION INSTRUMENTS SINCE 1896

75 Hudson Street FP Newark 4, N. J.

5883

TKL

THE *newest* MEMBER OF ALLIED'S

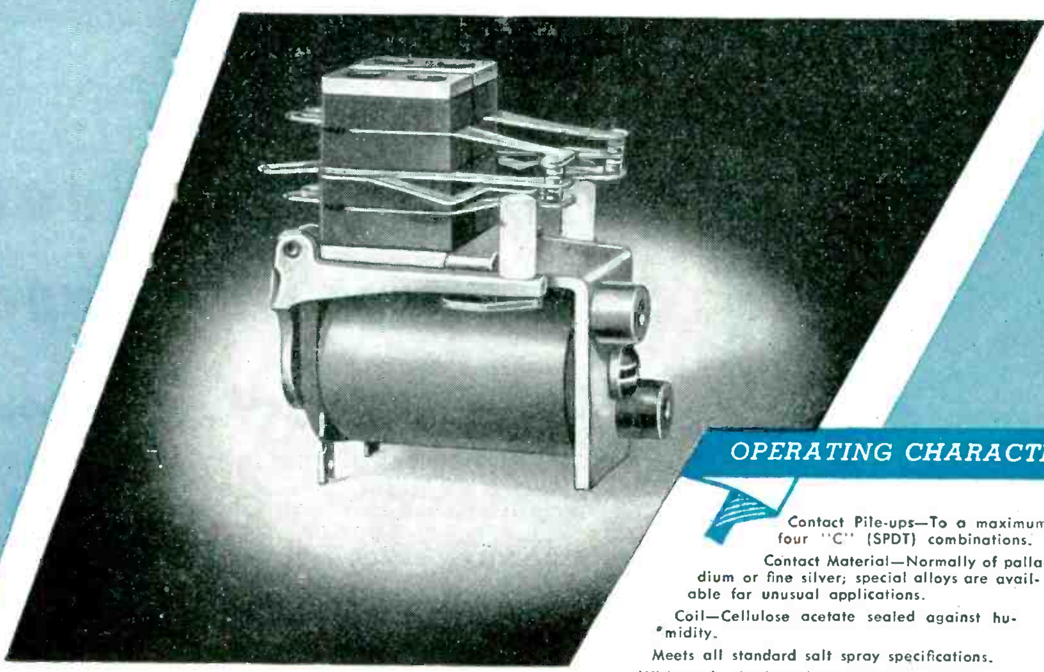
TELEPHONE TYPE RELAY LINE

MAXIMUM MAGNETIC EFFICIENCY . . . MINIMUM SIZE

TKL, latest of the Allied telephone type group, is an unusually compact relay with double contact pile-ups especially developed to meet the insistent demand for a small feather-weight relay of high magnetic efficiency.

TKL has a maximum rated power consumption of 1.5 watts for continuous duty. . . . Maximum sensitivity with a single A or B contact arrangement is 0.3 watts.

The unit illustrated features the use of Mycalex insulation for high frequency, low loss operation. It is also available with varnish impregnated bakelite insulation for standard switching service.



OPERATING CHARACTERISTICS

Contact Pile-ups—To a maximum of four "C" (SPDT) combinations.

Contact Material—Normally of palladium or fine silver; special alloys are available for unusual applications.

Coil—Cellulose acetate sealed against humidity.

Meets all standard salt spray specifications.

Withstands shock and vibration to 10 Gs.

Designed to conform with Army, Navy and CAA specifications.

Dimensions—1-7/16 by 15/16 by 1-1/16 inches (minus contact pile-ups).

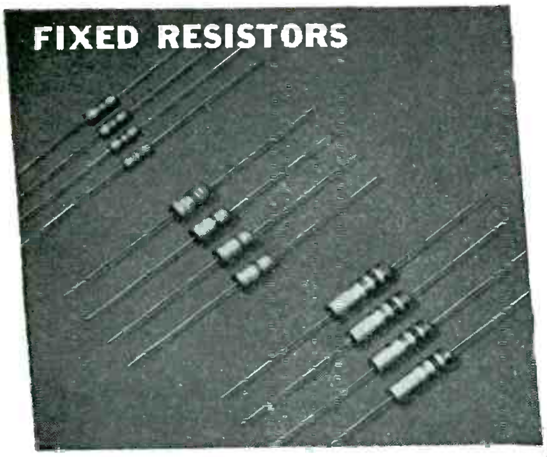
Weight—1 1/2 ounces (minus contact pile-ups).

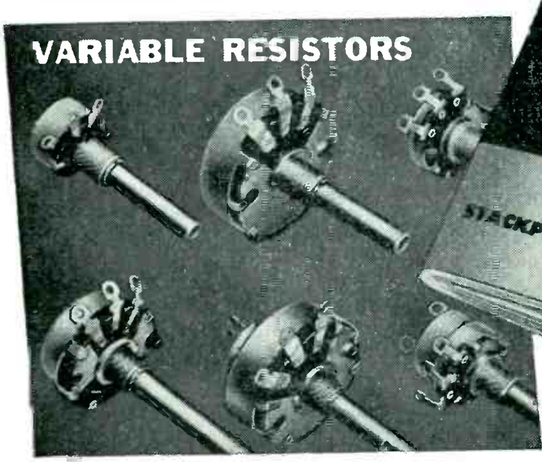
ALLIED CONTROL COMPANY

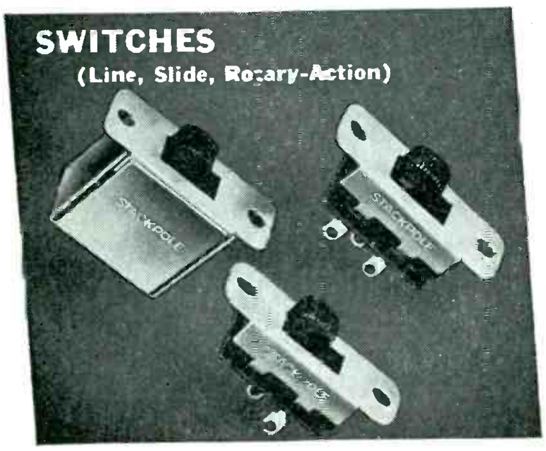
INCORPORATED

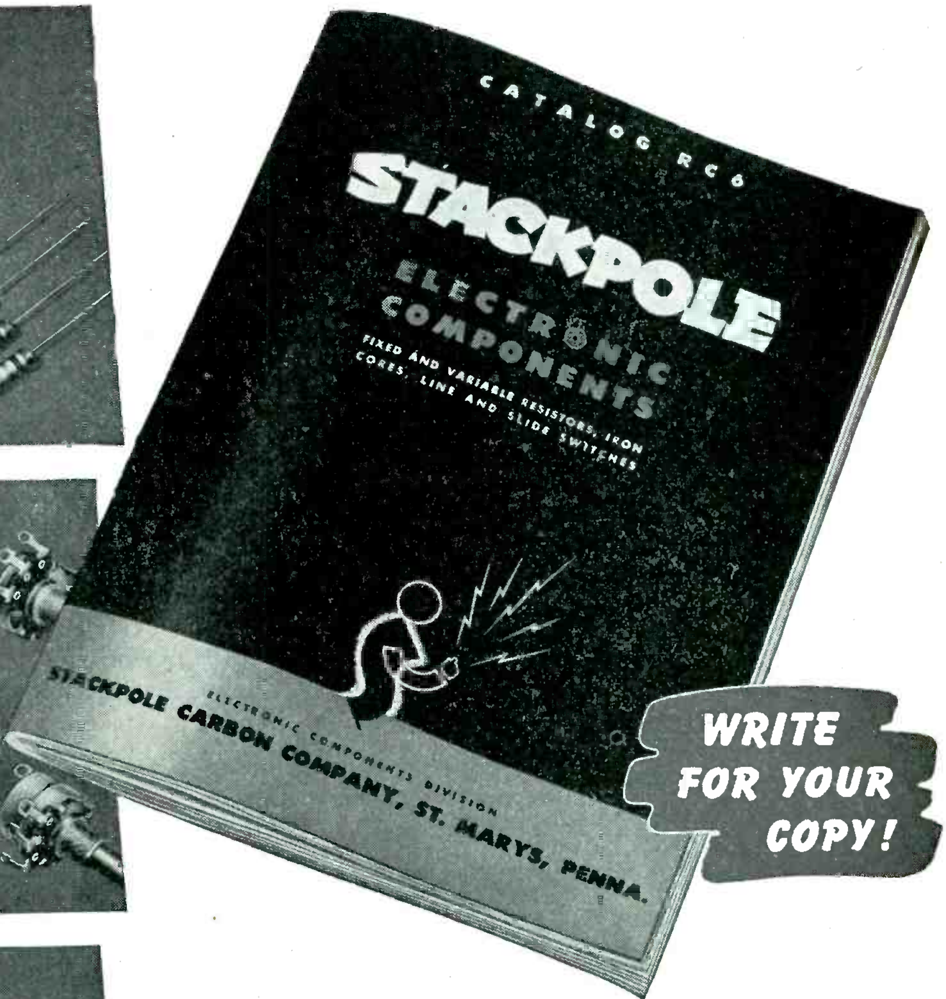
2 EAST END AVENUE • (AT 79th STREET) • NEW YORK 21, N. Y.

FACTORIES: NEW YORK CITY • PLANTSVILLE, CONN. • CHICAGO, ILL.









...for today's needs ...for post-war planning

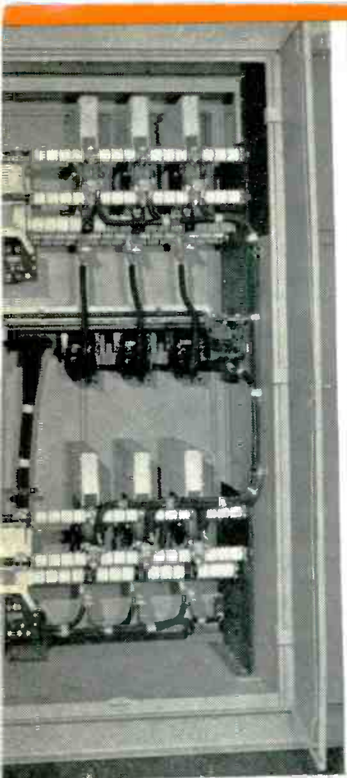
USE this new 1944 Stackpole Electronic Components catalog as your guide to up-to-the-minute Fixed or Variable Resistors; Iron Cores; and inexpensive line, slide, or rotary-action Switches. In addition to *complete* information and dimension diagrams on the components, you'll find data pages and charts that will prove mighty handy in your daily work. Please ask for Catalog RC6.

STACKPOLE CARBON COMPANY, ST. MARYS, PA.

STACKPOLE

BRUSHES FOR ALL ELECTRICAL ROTATING EQUIPMENT • CONTACTS WELDING RODS, ELECTRODES, AND PLATES • CARBON PIPE • BRAZING BLOCKS • RHEOSTAT PLATES & DISCS CARBON REGULATOR DISCS • PACKING, PISTON, & SEAL RINGS • SINTERED IRON COMPONENTS, ETC.


WGEO
G-E PREVIEW OF A
NEW 100-KW TRANSMITTER
with features that
set the standard for post-war
broadcast equipment . . . FM · TELEVISION · AM
GENERAL ELECTRIC



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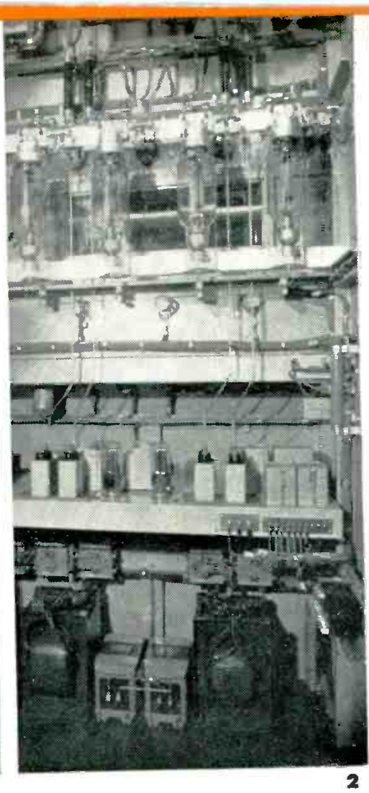

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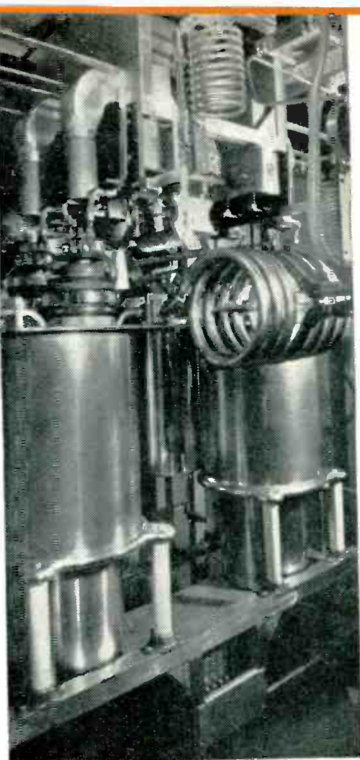


3

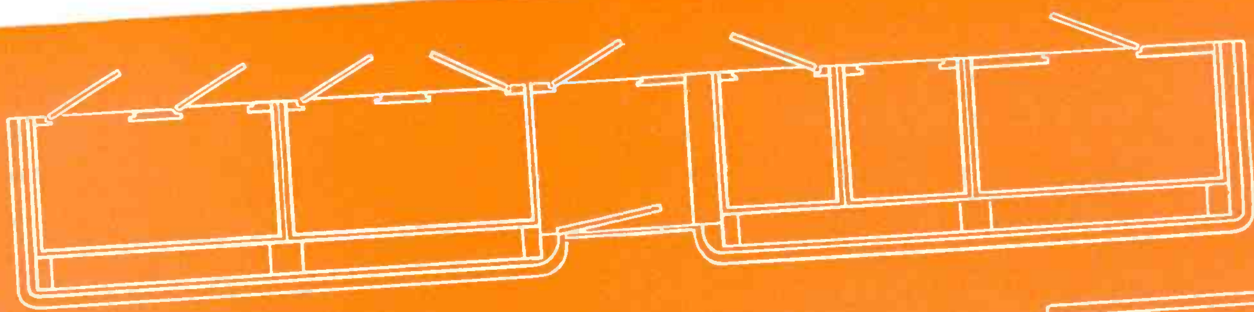
4

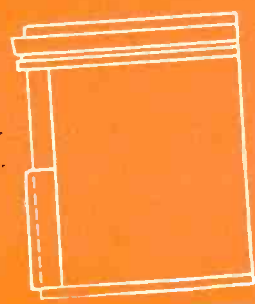
1 ***For reliable primary power control,*** 5000-volt air-break contactors are used for plate "start" and "run." These contactors are designed for highly repetitive operation, and for single-shot automatic reclosure. These contactors can be safely connected to a 150,000 kva power system, as they handle all overloads on the secondary side of the connected transformers and are backed up by silver-sand fuses.

2 ***For effective inspection and maintenance,*** ready access is provided to all electrical and mechanical parts. Heavy-duty cubicle construction permits mounting of components on walls, front panel and roof. The audio-driver cubicle illustrated shows typical construction. Cubicle floors are covered with long-life inlaid linoleum.

3 ***The power amplifier*** assembly is simple, compact, and trouble-free. For quick frequency changing, the inner cylinders of the concentric plate capacitors are raised and lowered by a motor-driven carriage to pre-set positions. All parts of this assembly are readily accessible from an ample aisle completely surrounding the tube-and-circuit unit within the cubicle.

4 ***Water-cooling troubles ended!*** These modulator tubes, and the tubes for other high power stages, are water-cooled through semi-flexible plastic insulating tubing, transparent throughout its entire length. Transmitter cubicles are pressurized with filtered air for cooling and cleanliness.





FLOOR PLAN AND END ELEVATION. The total length of the transmitter is 39' 6"; height 7' 6"; depth 6' 6". The transmitter proper consists of four cubicles, each 8' wide and 5½' deep. A wide passageway is provided in the center of the transmitter; and electric interlocks prevent transmitter from being placed in operation until all entrance doors are closed.

• Tune in General Electric's "The World Today" and hear the news from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS network. On Sunday evening listen to the G-E "All Girl Orchestra" at 10 E.W.T. over NBC.

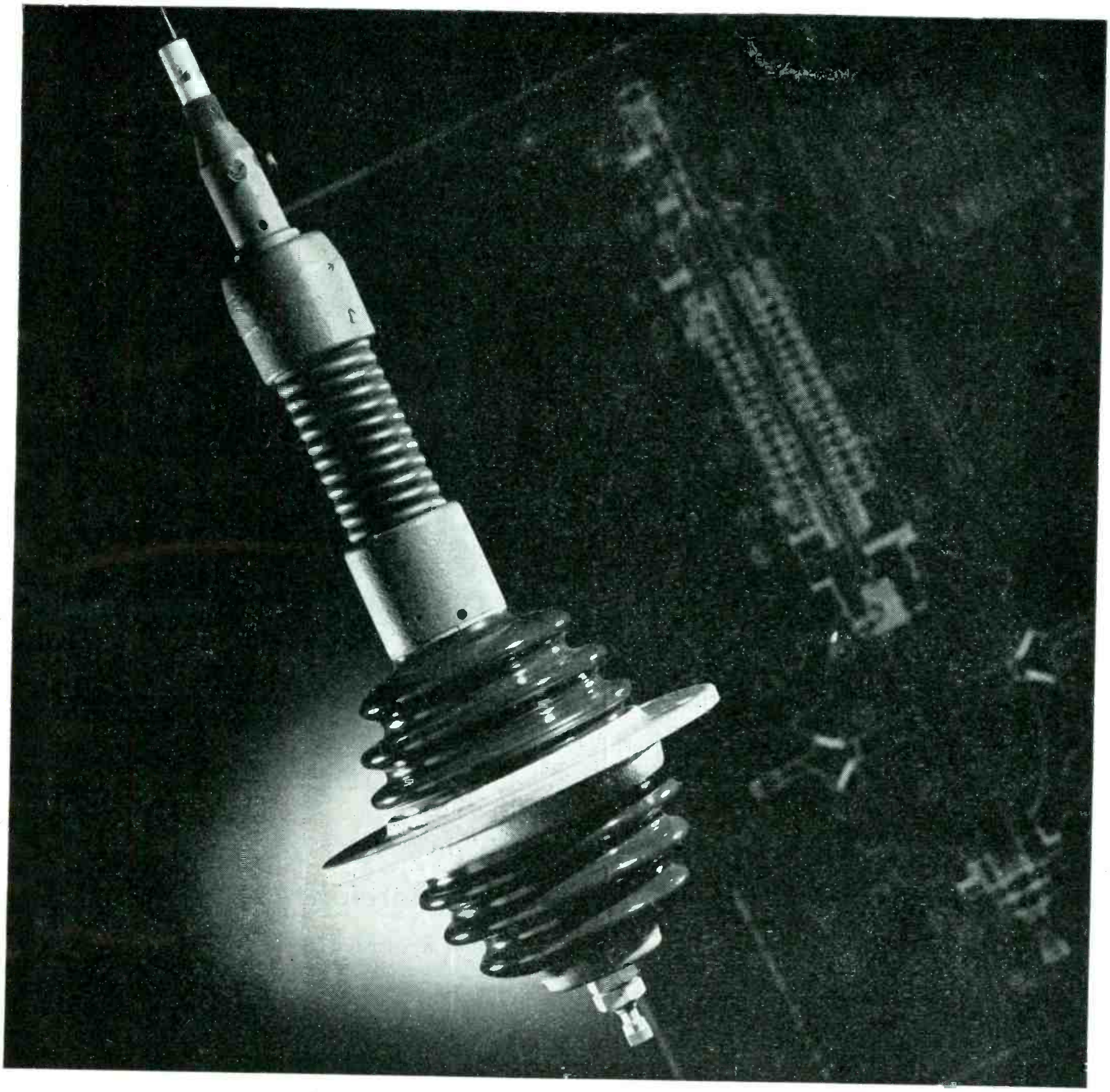
COME TO SCHENECTADY: — to see the pattern of tomorrow's transmitters . . . to see G. E.'s proving-ground stations — FM, AM, and Television . . . to discuss how you can reserve the equipment you want for prompt post-war delivery.

STATION AND STUDIO EQUIPMENT • TRANSMITTERS • ANTENNAS • ELECTRONIC TUBES • RECEIVERS

GENERAL ELECTRIC **FM · TELEVISION · AM**

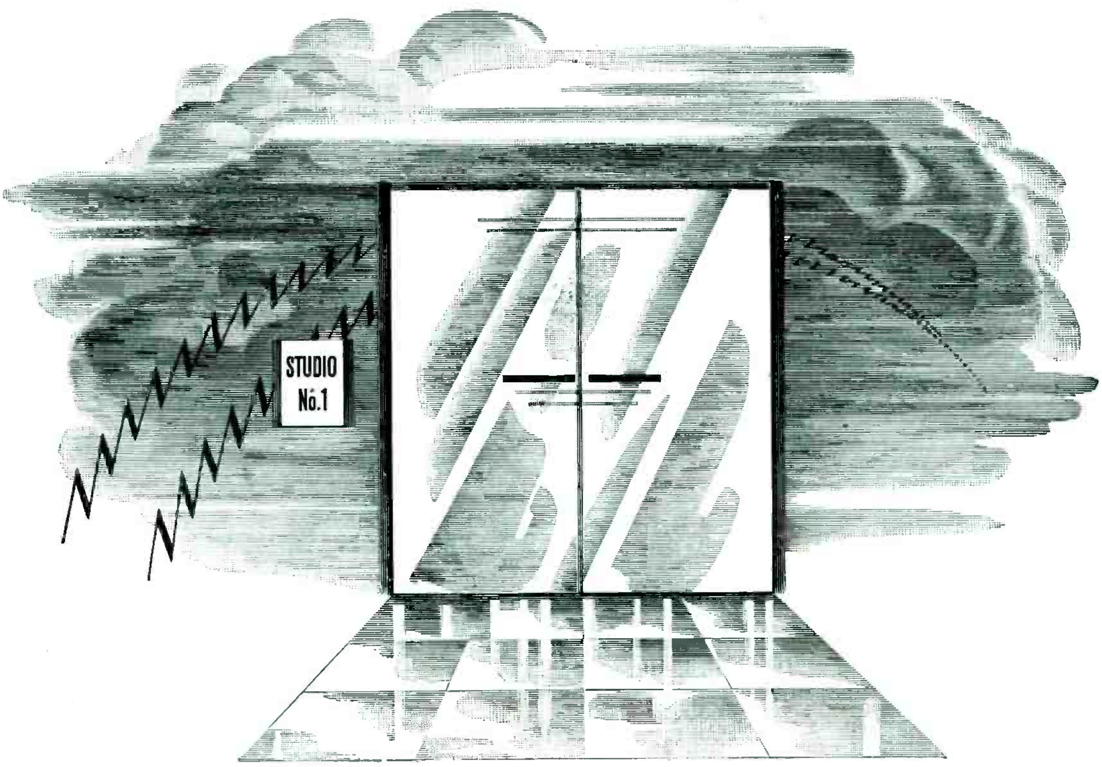
160-C8

See G.E. for all three!



ARMY
E
NAVY

YOUR NEW "STUDIO ONE"



...something to think about, now that you're on the threshold of full-scale commercial television

No top-flight broadcasting station will be without one...a year after victory.

The big question *now* is "How soon can a television studio be operated profitably?" The DuMont organization can help you answer that one...through a new service which makes DuMont's extensive telecasting background yours to command.

DuMont has pioneered in designing and equipping three television stations...has operated its own station—W2XWV, New York—for more than three years.

These invaluable, "tried-under-fire" experiences are summed up in amply illustrated guide-books, now on the presses.

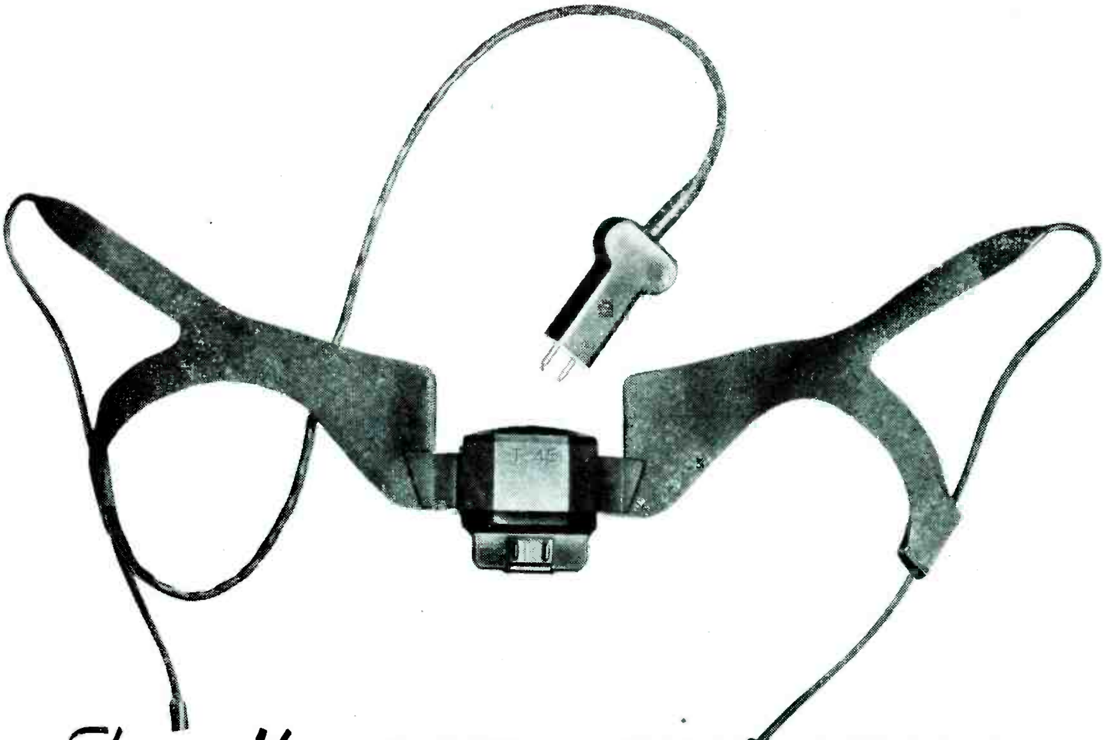
"Planning Your Television Station" tells you how to have a low-cost telecast operation...describes the compact equipment units that make it possible for you to expand without replacement losses.

Also discussed is the DuMont Equipment Reservation Plan that helps you become "first with television" in your area.

Plan now for your new "Studio One"... your place in the sun with television. Write us at the address below.

DUMONT *Precision Electronics and Television*

ALLEN B. DUMONT LABORATORIES, INC., GENERAL OFFICES AND PLANT, 2 MAIN AVENUE, PASSAIC, N. J.
TELEVISION STUDIOS AND STATION W2XWV, 515 MADISON AVENUE, NEW YORK 22, NEW YORK



Electro-Voice DIFFERENTIAL MICROPHONE

Model T-45 is its U.S. ARMY DESIGNATION

Developed by Electro-Voice engineers in collaboration with the Fort Monmouth Signal Laboratory, this Differential "Lip Mike" carries the voice clearly and distinctly above the roar of battle. Ambient sounds and reverberation are reduced to negligible levels.

- *Frequency response substantially flat from 200-4000 cps.*
- *Low harmonic distortion*
- *Cancellation of ambient noise, but normal response to user's voice*
- *Self-supporting, to free both hands of the operator*
- *Uniform response in all positions*
- *Usable when gas mask, dust respirator or oxygen mask is required*
- *Unaffected by temperature cycles from −40° F. to +185° F.*
- *Ability to withstand complete immersion in water*
- *Physical strength to withstand 10,000 drops*
- *Weight, including harness, cord and plug, less than 2 ounces.*

Electro-Voice MICROPHONES

Our full line includes Carbon, Dynamic and Velocity models . . . all at popular prices . . . for public address, industrial sound, sound recording and speech transmission applications. Consult your local radio parts jobber.

ELECTRO-VOICE MANUFACTURING CO., INC. • 1239 SOUTH BEND AVENUE • SOUTH BEND 24, INDIANA
Export Division: 13 East 40th Street, New York 16, N. Y. — U. S. A. Cables: ARLAB

Again Available

TO MEET MOST PRODUCTION SCHEDULES!

At WESTON, production finally has outstripped the overwhelming war demand for panel and other instruments . . . making WESTONS again obtainable on a basis to meet most war production schedules.

To experienced instrument users, this means they again can obtain the instruments whose design and manufacture incorporate the broadest instrument experience in surmounting the requirements of exacting applications. The instruments whose consistent, uniform performance simplifies their problems of inspection, handling and other burdensome procedure . . . and whose dependable, long-term accuracy assures better operating performance from the devices into which they're built.

Why not discuss your instrument schedules with WESTON, today . . . and be sure of obtaining the added product efficiency which authentic WESTONS provide.

Weston Electrical Instrument Corporation
618 Frelinghuysen Avenue, Newark 5, New Jersey

- *Panel & Switchboard Instruments (DC, AC, and Thermo)*
- *Precision DC and AC Portables*
- *Instrument Transformers*
- *Specialized Test equipment*
- *Laboratory Standards*
- *Sensitive Relays*
- *Light Measurement Instruments*
- *Aircraft Instruments*
- *Electric Tachometers*
- *Dial Thermometers*

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

G-E MYCALEX washers, spacers and other small parts are now being fabricated by punching at a much faster rate than by the regular methods of cutting and drilling. As a result, greater quantities can be produced at savings both in time and money to you. In one instance, production of a G-E mycalex part was quadrupled by the use of the punching process . . . unit cost being decreased by 70%.

Because G-E mycalex is outstanding in its ability to meet severe requirements of high mechanical and dielectric strength, high arc resistance and low losses at high frequencies—many manufacturers are today economically using these small G-E mycalex parts as electronic insulation in variable condensers and similar applications with exceptional results.

But there are many other reasons why G-E mycalex has for more than 21 years helped solve the toughest insulation problems. For instance, metal parts may be inserted or combined with G-E mycalex during the process of molding, so—if you are looking for a suitable insulator that is flexible and unique . . . investigate G-E mycalex.

And—if you prefer to have G-E mycalex fabricated for you, there are specialists in this field. A list of these fabricators and detailed information about G-E mycalex, including a free sample, will be sent at your request. Just fill out the coupon.

Remember, behind G-E mycalex is General Electric's unequaled experience in electronics. . . . *General Electric, Schenectady, N. Y.*

TUNE IN General Electric's "The World Today" and hear the news from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday evening listen to the G-E "All-Girl Orchestra" at 10 E.W.T. over NBC.

FREE—
G-E MYCALEX BULLETIN

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC CO.
Schenectady, N. Y.

Please send me a free sample of G-E mycalex and your descriptive booklet explaining the methods and tools to use for machining G-E mycalex.

(If you wish a list of fabricators of G-E mycalex, check here________.)

*Name*____________________

*Company*____________________

*Address*____________________

Over 21 Years of Mycalex Experience—Your Assurance of Quality

GENERAL ELECTRIC

177-M-C3-9915

Facts YOU SHOULD KNOW ABOUT RELAY SENSITIVITY

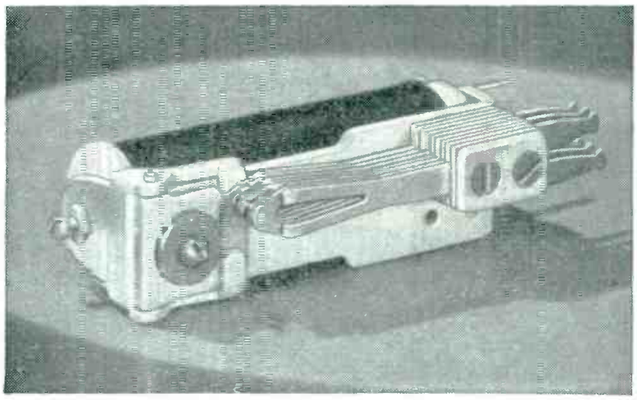
SO YOU would like a *sensitive* relay for that remote control circuit!

Sensitivity is important for many relay applications. And if that is *all* you want, there's no problem. It's easy to build a relay that will "operate" on a small amount of power.

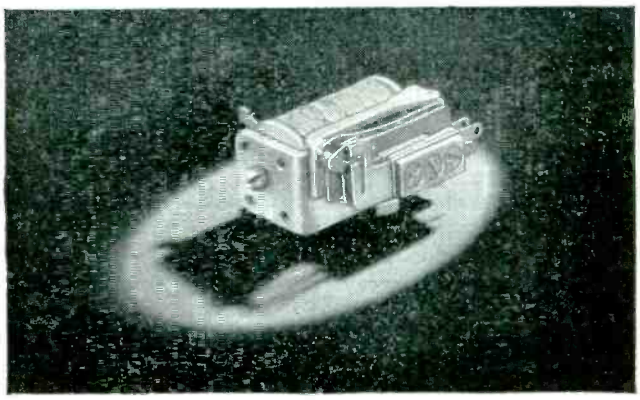
But sensitivity without contact reliability is useless. So what you *really* want is a relay that is not only sensitive, but also has the contact pressure needed for reliability under actual service conditions.

Sensitivity and contact reliability are opposing factors. To get a high measure of both qualities in one relay calls for an exacting balance between electrical, mechanical and magnetic design factors. We've been building such relays for years—to meet hundreds of requirements, from complex telephone switching circuits to simple control functions on aircraft and radios.

Next time you need a *sensitive* relay, let the Automatic Electric field engineer show you how to get sensitivity *plus* contact reliability. No matter what the nature of your problem, there is an Automatic Electric relay that will give you both.



The Automatic Electric Class B Relay shown here combines high sensitivity and contact reliability. It has a highly efficient magnetic circuit, long wearing mechanical structure, independent twin contacts, and capacity for any number of springs up to 26. Contact pressures average 20 grams per contact. Compare this with "sensitive" relays having contact pressures of less than five grams.



For high sensitivity and contact reliability in small space, your best bet is the Class S Relay shown here. Especially designed to meet the severe conditions of operation on fast modern aircraft, it is also recommended where space is at a premium. Because of the great demand for Class S Relays for vital war products, we urge that you avoid its use except where no other relay will serve.

Relays AND OTHER CONTROL DEVICES *by* AUTOMATIC ELECTRIC

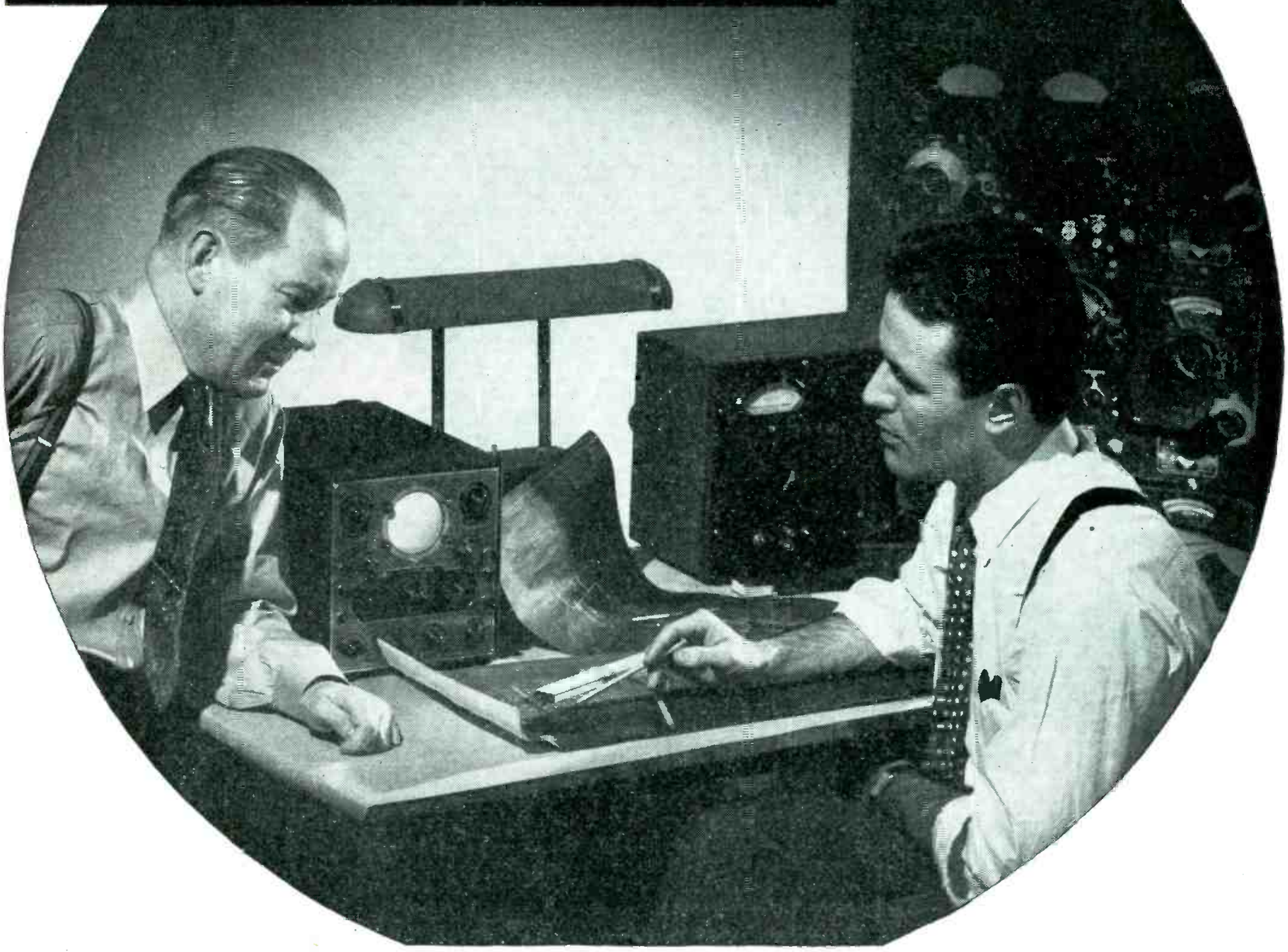
ARMY E NAVY

AUTOMATIC ELECTRIC SALES CORPORATION
1033 West Van Buren Street • Chicago 7, Ill.

In Canada: Automatic Electric (Canada) Limited, Toronto

PARTS AND ASSEMBLIES FOR EVERY ELECTRICAL CONTROL NEED

soldiers in mufti



One of the most important men on the production front is the electronic engineer. Working long and hard hours, his time is spent devising and planning electronic equipment that will give the Allied forces overwhelming superiority on the battlefront. He was "drafted" early in the war and has devoted his special skills unstintingly to the successful prosecution of the war effort. The electronic engineer is truly a soldier on the homefront.

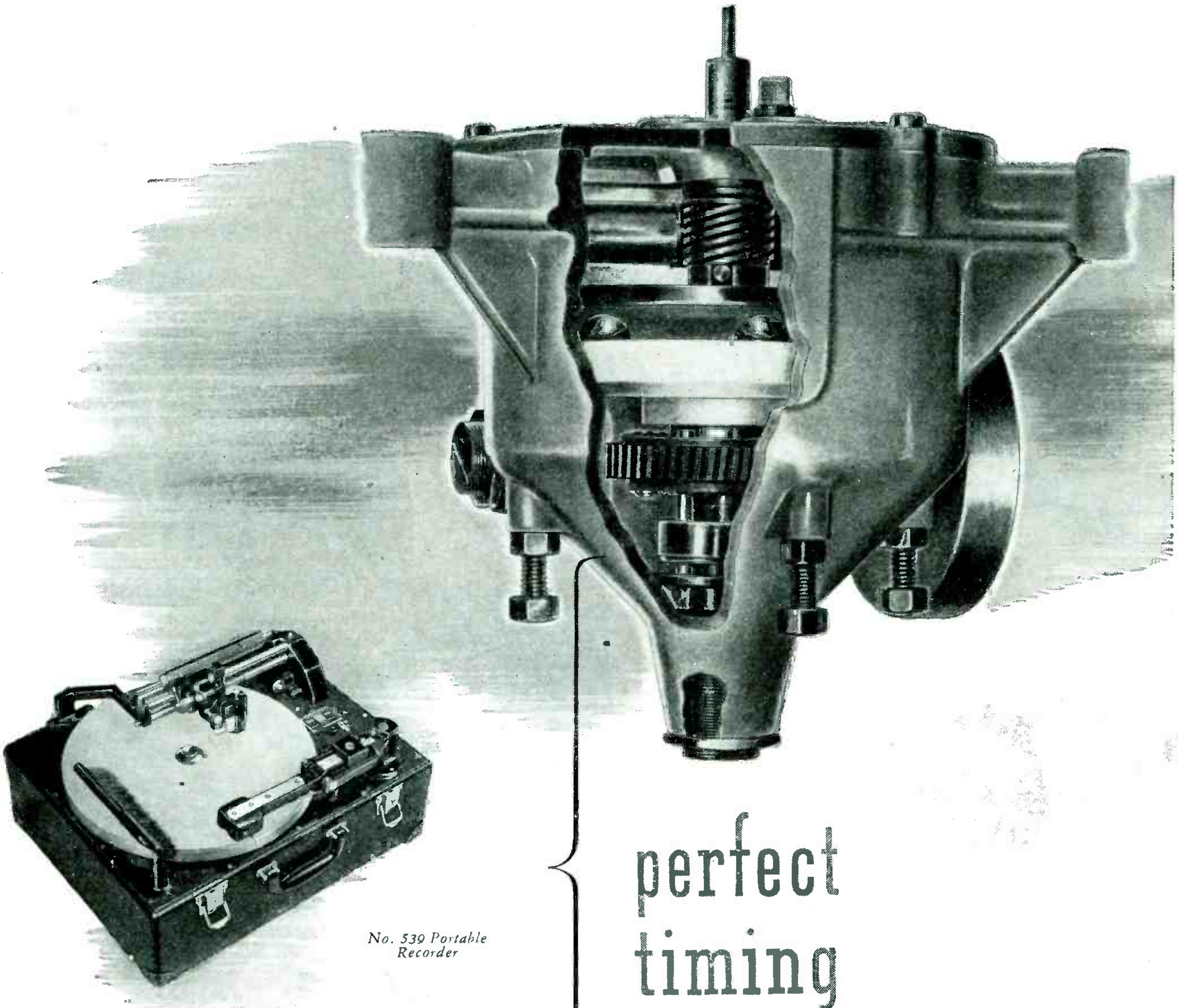
Raytheon engineers are continually devising new electronic products which contribute to the immeasurably important role that advanced electronic equipment is playing in winning the war. Raytheon electronic tubes and equipment are built to more than meet severe wartime requirements. The "Plus-Extra" quality, dependability and stamina of Raytheon products have established Raytheon as one of the leading manufacturers in the electronic field.

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

RAYTHEON

RAYTHEON MANUFACTURING COMPANY
Waltham and Newton, Massachusetts

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



No. 539 Portable Recorder

perfect timing

Fifteen minute transcriptions play back with split-second accuracy.

Where seconds count, maintaining broadcasting schedules or dubbing sound to synchronous-driven movie films, you're offered the perfect timing of the Fairchild Portable Recorder turntable drive.

The motor is synchronous. The drive is positive. Two speeds: 33.3 rpm by worm and gear; 78 rpm by precision friction-ball-race stepup. The only necessary interlocking device to other synchronous equipment is the A.C. line.

With professional use in mind, all Fairchild portable recording instruments are built to meet the exacting requirements of the radio and communications fields. To electronic skill Fairchild has added the plus of exceptional mechanical skill — skill long practiced in .0002" tolerance production of aerial cameras, aircraft sextants and aircraft computing gun sights.

The result of persistent research to provide studio-quality recording in the field is the Fairchild No. 539 Portable Recorder. Descriptive and priority data are available.

Fairchild CAMERA AND INSTRUMENT CORPORATION

88-06 Van Wyck Boulevard, Jamaica 1, N. Y. • *New York Office:* 475 Tenth Avenue, New York 18, N. Y.

SOUND EQUIPMENT—PRECISIONIZED—*mechanically and electronically*—FOR FINER PERFORMANCE

THIS BIG 28 PAGE BROCHURE IS "MUST" READING FOR ENGINEERS

Don't fail to get your hands on a copy of this book of data. It's the "last word" on the subject of glass-bonded mica, from the history of the product to its almost-endless applications. It shows that MYKROY differs in formula from the earlier glass-bonded mica materials, and states the case for MYKROY as the perfect dielectric for the more exacting needs of all high frequency circuits.

Here is a wealth of information about advanced insulation, including many useful charts and graphs. Here are results of tests, and the official ratings.

This book will show you why we can solve your insulating problems and help to improve the efficiency of your product. It will show why our plant and facilities have been increased more than 4000%, and that there is NO SHORTAGE of MYKROY.

Use the coupon to order your copy. But please fill in firm name and title clearly.

SEND FOR YOUR FREE COPY TODAY

ELECTRONIC MECHANICS INC. 70 Clifton Boulevard, Clifton, New Jersey, U. S. A.

Gentlemen: Yes! I want the book of facts about the advanced electrical and mechanical properties of MYKROY insulating material.

Name.. Title..................

Company..

Address..

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CHICAGO 47: 1917 NORTH SPRINGFIELD AVENUE
EXPORT OFFICE: 89 BROAD ST., NEW YORK 4, N. Y.

Build More Stable Resistors with D-H Manganin

... FIRST CHOICE FOR BUREAU OF STANDARDS TYPE RESISTANCE STANDARDS

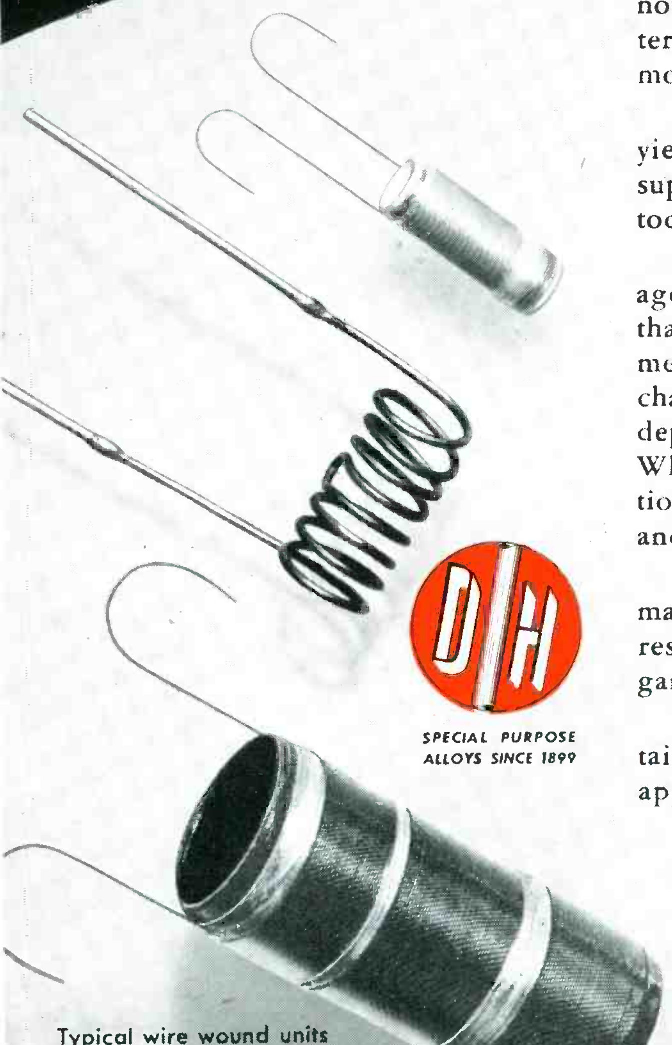
Because resistance values, in precision apparatus, must not change with age or temperature variations encountered in normal operation, Driver-Harris Manganin is the most widely used.

Originally imported, because no domestic process had yielded a comparable grade, D-H Manganin of vastly superior physical and electrical characteristics is available today . . . the result of unceasing Driver-Harris research.

Technically advanced, exclusive D-H drawing and ageing methods produce Manganin of such fixed stability that it is not subject to "drift". Special "tempers" and mechanical properties are allied with the perfect electrical characteristics of D-H Manganin to make it the most dependable resistance alloy for precision bobbins, Wheatstone Bridges, decade resistance boxes, potentiometers and National Bureau of Standards type resistance standards.

If fixed stability and constant resistance under normally variable operating conditions are "musts" in your resistor design considerations, use Driver-Harris Manganin to meet these more exacting specifications.

Write today for the special Manganin bulletin containing complete engineering data, wire and shunt applications.



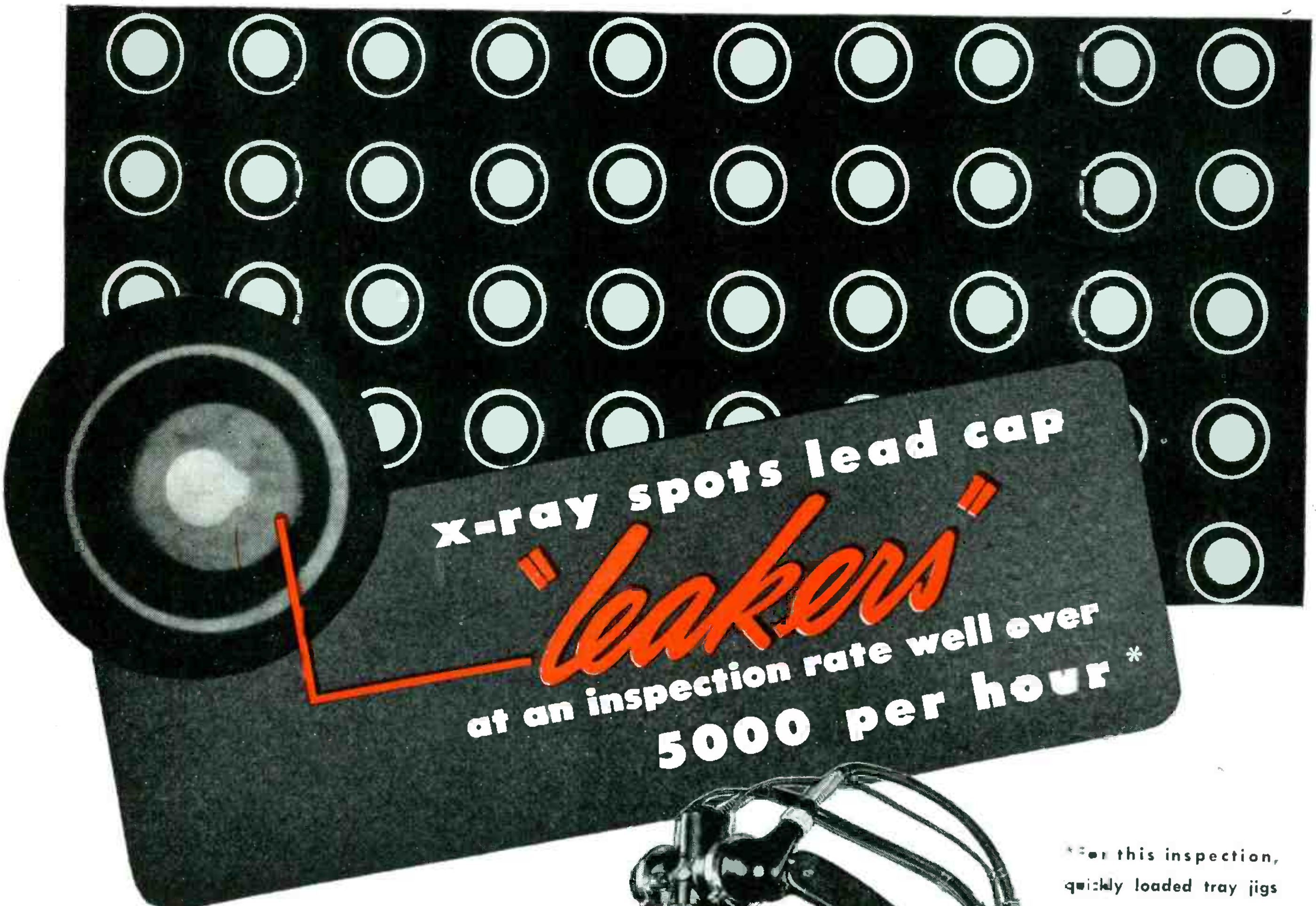
Typical wire wound units contained in Bureau of Standards type resistors

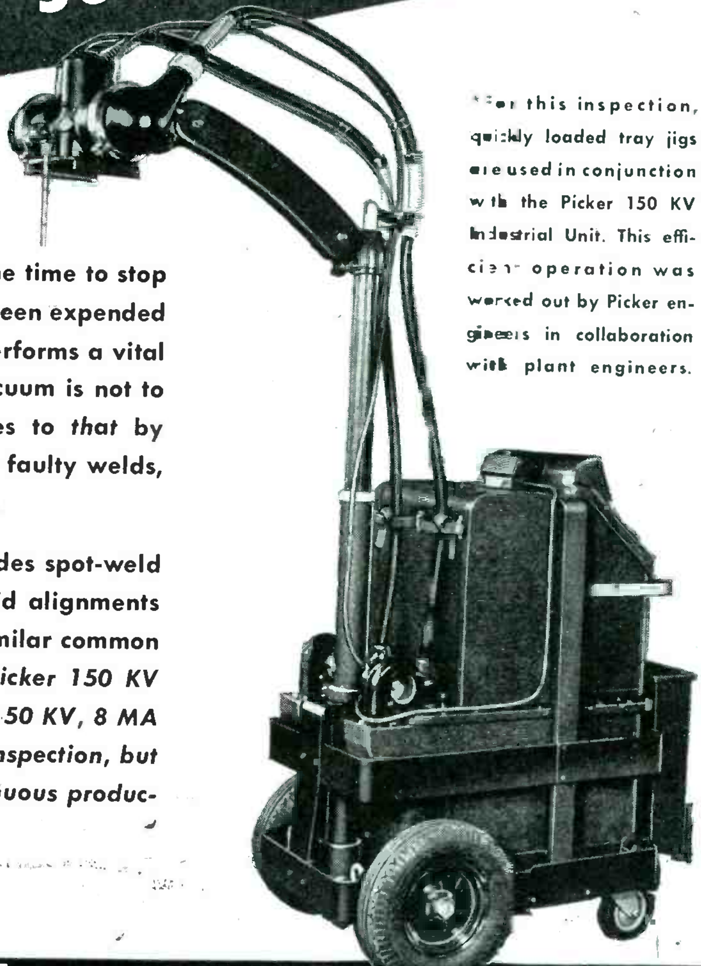
D-H

SPECIAL PURPOSE ALLOYS SINCE 1899

Driver-Harris
COMPANY
HARRISON, N. J.

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco, Seattle





*For this inspection, quickly loaded tray jigs are used in conjunction with the Picker 150 KV Industrial Unit. This efficient operation was worked out by Picker engineers in collaboration with plant engineers.

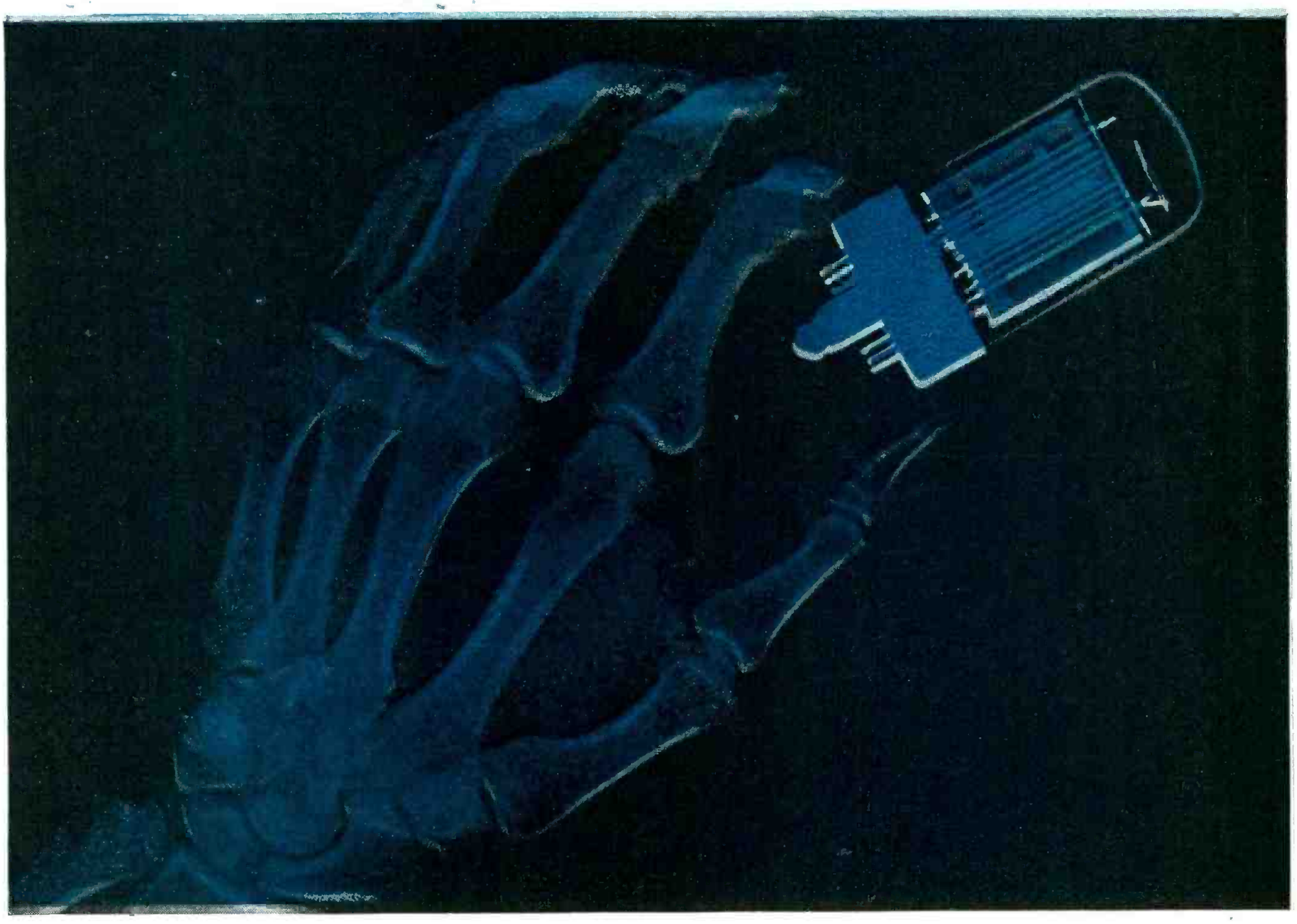
A leak in a cathode ray tube is a disaster . . . so the time to stop it is *before* precious man hours and material have been expended on final assembly. Tiny as it is, this terminal cap performs a vital function and must be structurally perfect if the vacuum is not to bleed through it. Routine x-ray examination sees to *that* by disclosing internal weaknesses, such as porosity or faulty welds, which would affect performance, *before* assembly.

In the electronic industries, radiography also provides spot-weld control . . . checks on accuracy of filament and grid alignments . . . discloses imperfect joints, broken leads, and similar common defects in condensers, resistors, assemblies. *The Picker 150 KV X-Ray Unit, either stationary or portable, rated at 150 KV, 8 MA operation, has been found ideal not only for such inspection, but also in hundreds of other applications where continuous production x-ray inspection is required.*

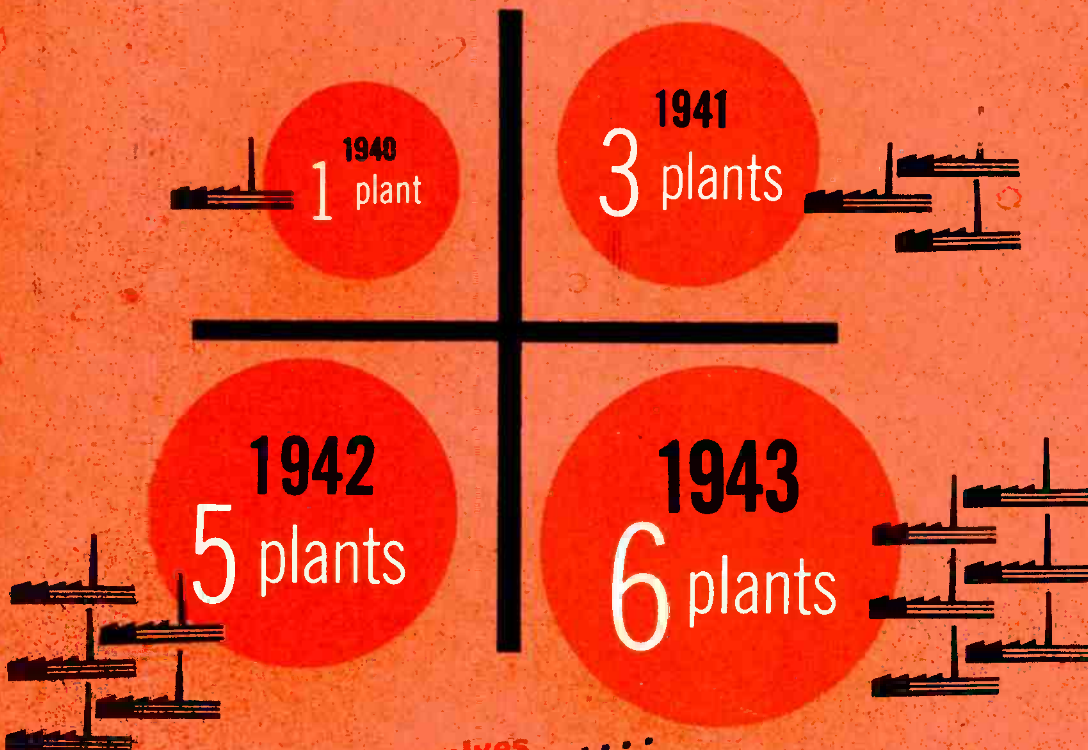
industrial **PICKER** x-ray **sets the pace in x-ray**

PICKER X-RAY CORPORATION • New York, N. Y.
WAITE MANUFACTURING DIVISION • Cleveland, Ohio

YOUR LOCAL PICKER ENGINEER WILL BE GLAD TO DISCUSS YOUR OWN INSPECTION PROBLEMS WITH YOU



an outstanding record of achievement



the facts speak for themselves . . . . .

With the skill and experience of 34 years of capacitor specialization, Cornell-Dubilier meets the urgent needs of war production. Since 1910, thru every phase of capacitor development, our growth parallels that of the electronic industry. We have not only kept pace with it but have anticipated new trends.

Today there are more C-D capacitors in use than any other make. This tremendous increase in production has been accomplished while maintaining C-D's high standards of quality and dependability. Our name is synonymous with reliability . . . that's why C-D's are first with 4 out of 5 engineers. Our facilities and specialized skills are at your service. Write today to Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.

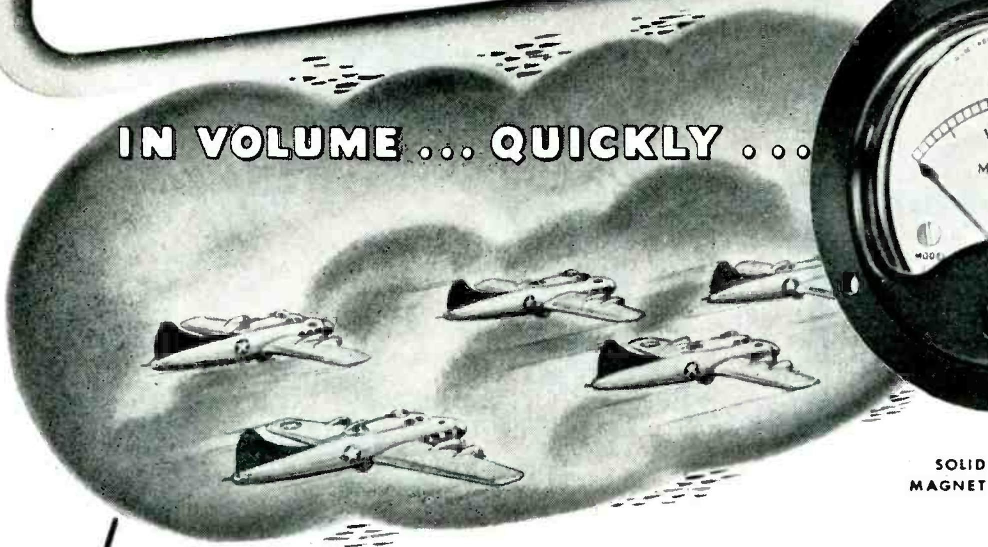
TYPE YAT
compact, low capacity Dykanol "G" bypass capacitor; hermetically sealed: in specially-treated, drawn metal containers.
Range at 600V, .05 mfd. to 1 mfd.
Range at 100V, .05 mfd. to .5 mfd.

Cornell-Dubilier Capacitors

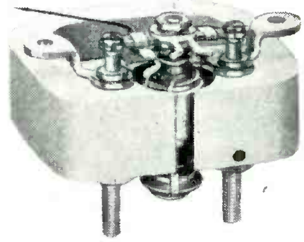
MICA • DYKANOL • PAPER • WET AND DRY ELECTROLYTICS

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

G-M *Can Supply* METERS



SOLID MAGNET



if . . . THESE SPECIFICATIONS MEET YOUR D-C METER REQUIREMENTS . . .

G-M's production facilities can now serve a few additional volume users of meters . . . and assure deliveries in keeping with today's wartime needs • Over 100,000 meters have been supplied for one aircraft application alone . . . if the specfications below meet your requirements . . . and if your problem is quick delivery . . . write, wire or phone today.

Avail yourself of both our engineering and production facilities for quick attention and experienced service.

1. General—Designed to conform to "American War Standards C39.2-1944" for Electrical Indicating Instruments.
2. Size—2½", Round, Flush Mounting, Panel Type.
3. Case—Standard case is of moulded bakelite. Available also in metal (brass) case.
4. Solid alloy-steel magnet (not laminated).
5. Range, D-C—Available from 0-200 micro-amperes to 0-10 amperes, or 0-3.0 volt to 0-200 volts, D-C.

G-M

G-M LABORATORIES INC.

4313 NORTH KNOX AVENUE, CHICAGO 41, ILLINOIS

Buy WAR BONDS & STAMPS

FIRST OF THE U. H. F. CABLES

Offered in 1937 by AMPHENOL

First Today—

Is Amphenol Polyethylene, Solid Dielectric, Low-Loss, High-Frequency, Coaxial Cable

That first ultra-high-frequency cable was a polystyrene bead cable—born of much study and endless laboratory work. It took the place of ceramic and fibre insulated lines. Thus, Amphenol became the pioneer in low-loss cable manufacture—a logical development of leadership in quality radio equipment—firmly established with radio experimenters and "ham" operators long before war developments required the mass production of U.H.F. cable.

Since that first polystyrene bead cable Amphenol has worked shoulder-to-shoulder with the designers and developers of equipment for radio, frequency modulation, television . . . since 1941 at the right hand of Army and Navy engineering officers playing an important part in wartime electronic developments.

Today, Amphenol's R G Polyethylene standard—Army-Navy type—cables feature quality materials, Amphenol workmanship in every inch . . . product of Amphenol's latest type extruding equipment, skilled personnel, seasoned staff and second-to-none laboratory. Write for the catalog of AMPHENOL RG Cables.

Clean, smooth, properly centered polyethylene covered wire is extruded by this machine.

By a dozen different searching tests Amphenol RG Cable is proved before it is shipped.

Depend upon **AMPHENOL** *Quality*

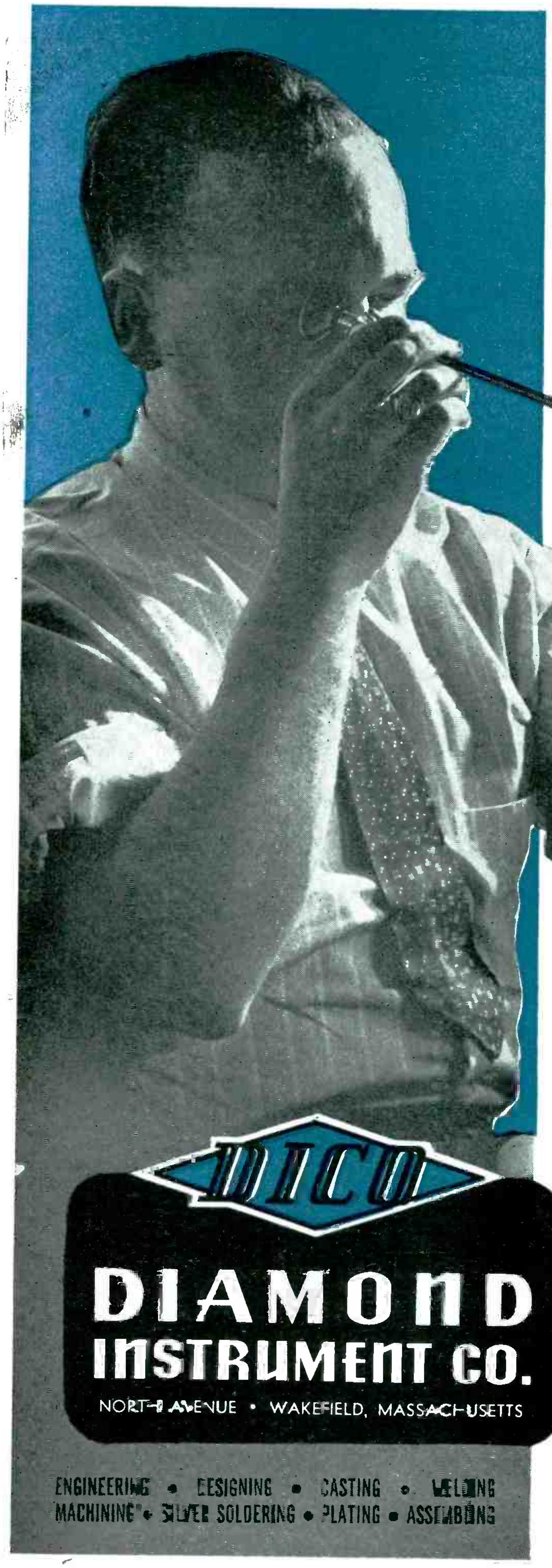
Connectors
Fittings
Conduit
Cable
Radio Parts
Synthetics

AMERICAN PHENOLIC CORPORATION
1830 S. 54th Avenue, Chicago 50, Illinois

SILVER

Inside and Out

TO PERFORMANCE SPECIFICATIONS



You can't tell from the outside how well the inner surface is plated.

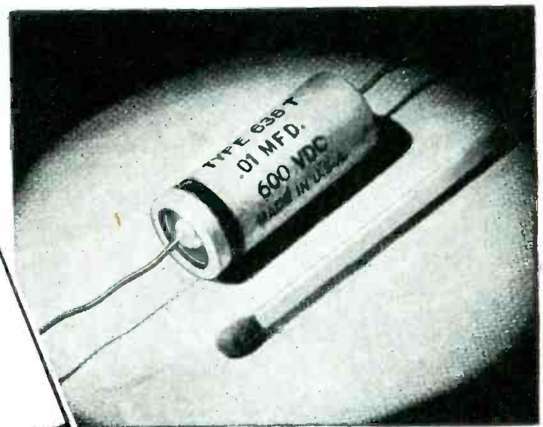
So DICO inspectors resort to surgical instruments, using the cystoscope for critical scrutiny of the entire inside surface of this metal bellows . . . for the performance specification requires complete silver plating—inside and out—to protect the thin metal against corrosion that would cause service failure of vital equipment.

But, more important than the inspection technique, DICO engineering originated also the specialized production method that ensures adequate silver plate in every crevice and corrugation of this piece.

Your difficult problems also will yield to DICO experience and ingenuity in the industrial application of silver and gold plate. At your request, our representative will furnish detailed information about available DICO services.

MIDGET OIL-FILLED *Capacitors*

... used as Mica-Capacitor Alternates and in Space-Saving Assemblies

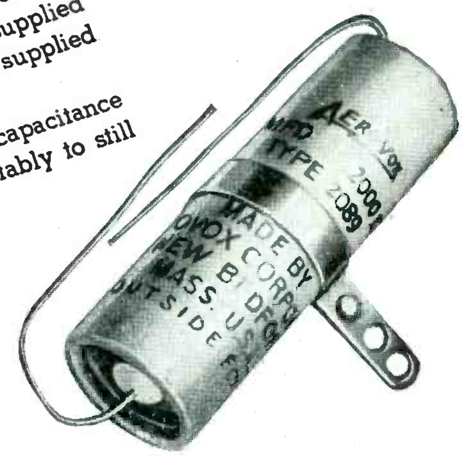


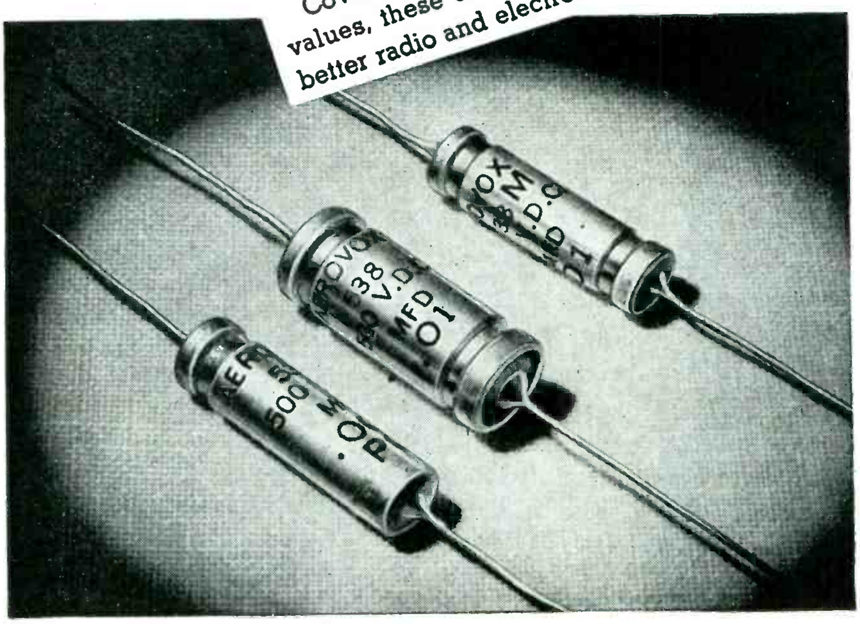
● Aerovox tubular oil-filled capacitors combine top performance with extreme compactness. Smaller Type '38 units serve as mica-capacitor alternates, meeting all standard test specifications as such.

These capacitors are hermetically-sealed in tiny metal cans or tubes. The Aerovox double-rubber bakelite terminal insulator assembly is used (or other suitable gasket material, depending on impregnant and fill). Case normally insulated from section, but grounded cases are available. Smaller Type '38 normally supplied without insulating outer tube. Larger Type '89 normally supplied with insulating outer tube and center mounting strap.

Covering a wide range of working voltages and capacitance values, these oil-filled tubulars are contributing notably to still better radio and electronic assemblies.

WRITE FOR LITERATURE





Smaller Type '38: 300, 500 and 600 v. D.C.W., .001 to .01 mfd.; and 800 v., .001 to .005 mfd.

Larger Type '89: 400 v., .015 to .5 mfd.; 600 v., .015 to .25 mfd.; 1000 v., .006 to .1 mfd.; and 2000 v., .006 to .05 mfd.

Unless otherwise specified, units are supplied with Aerovox Hyvol oil impregnant and fill. Available also with mineral oil.

Type '38 tolerances up to but not including .01 mfd., minus 20% plus 50%; .01 mfd., minus 10% plus 40%.

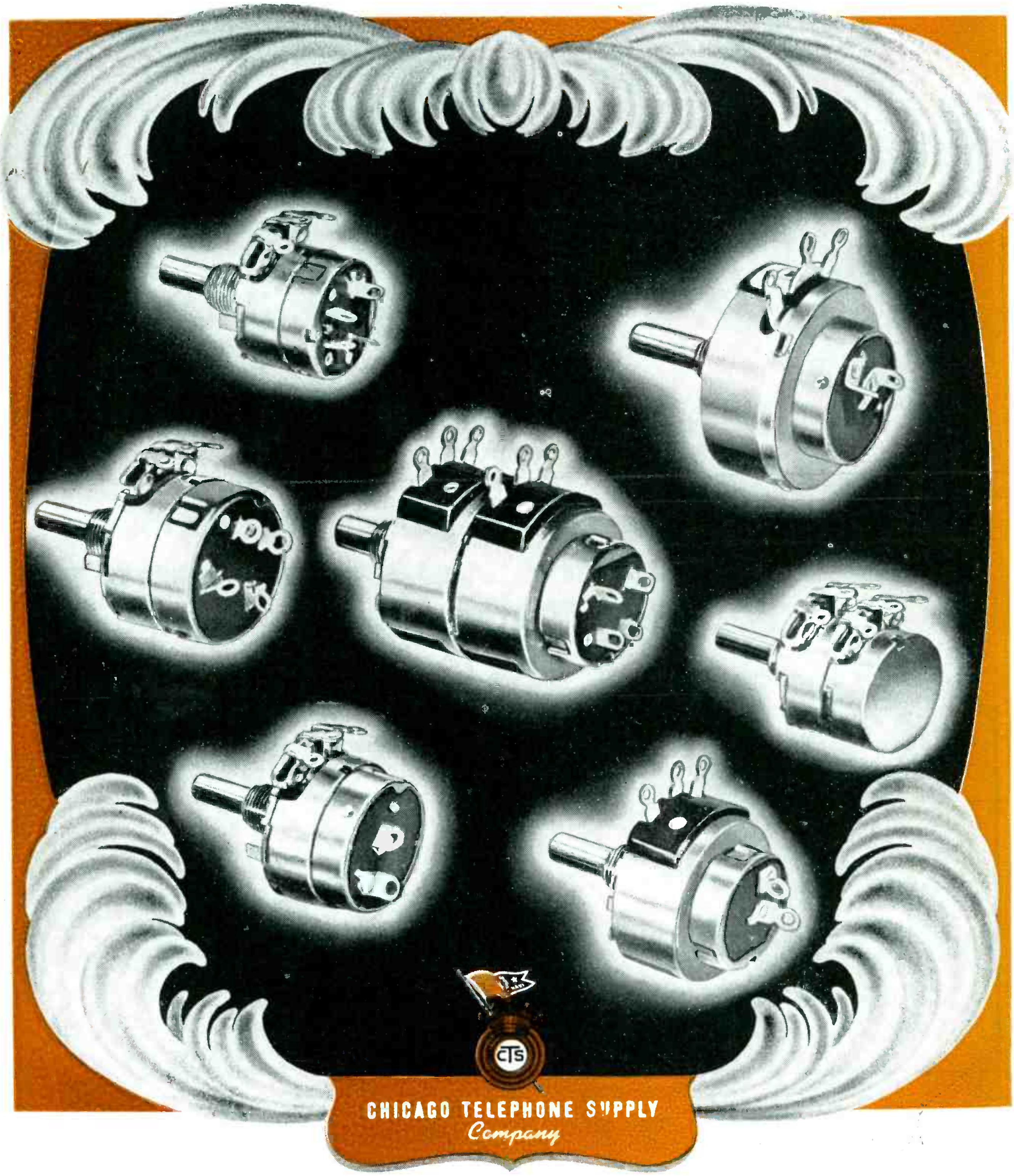
Type '89 tolerances up to .009 mfd., inclusive, minus 20% plus 50%; .01 to .09 mfd., minus 10% plus 40%; higher than .09 mfd., minus 10% plus 20%.

AEROVOX *Capacitors*

INDIVIDUALLY TESTED

AEROVOX CORPORATION, NEW BEDFORD, MASS., U. S. A. • SALES OFFICES IN ALL PRINCIPAL CITIES

Export: 13 E. 40 ST., NEW YORK 16, N. Y. • Cable: 'ARLAB' • In Canada: AEROVOX CANADA LTD., HAMILTON, ONT.



ELKHART • INDIANA

As specialists for over sixteen years in the production of variable resistors, Chicago Telephone Supply Company is now employing its knowledge and skill in manufacturing electronic materials for the military. When peace is restored, production will be devoted to meeting the demands of the electronic industries for quality, master craftsmanship and unequalled service.

VARIABLE RESISTORS, PLUGS, JACKS, SWITCHES, TELEPHONE GENERATORS, RINGERS

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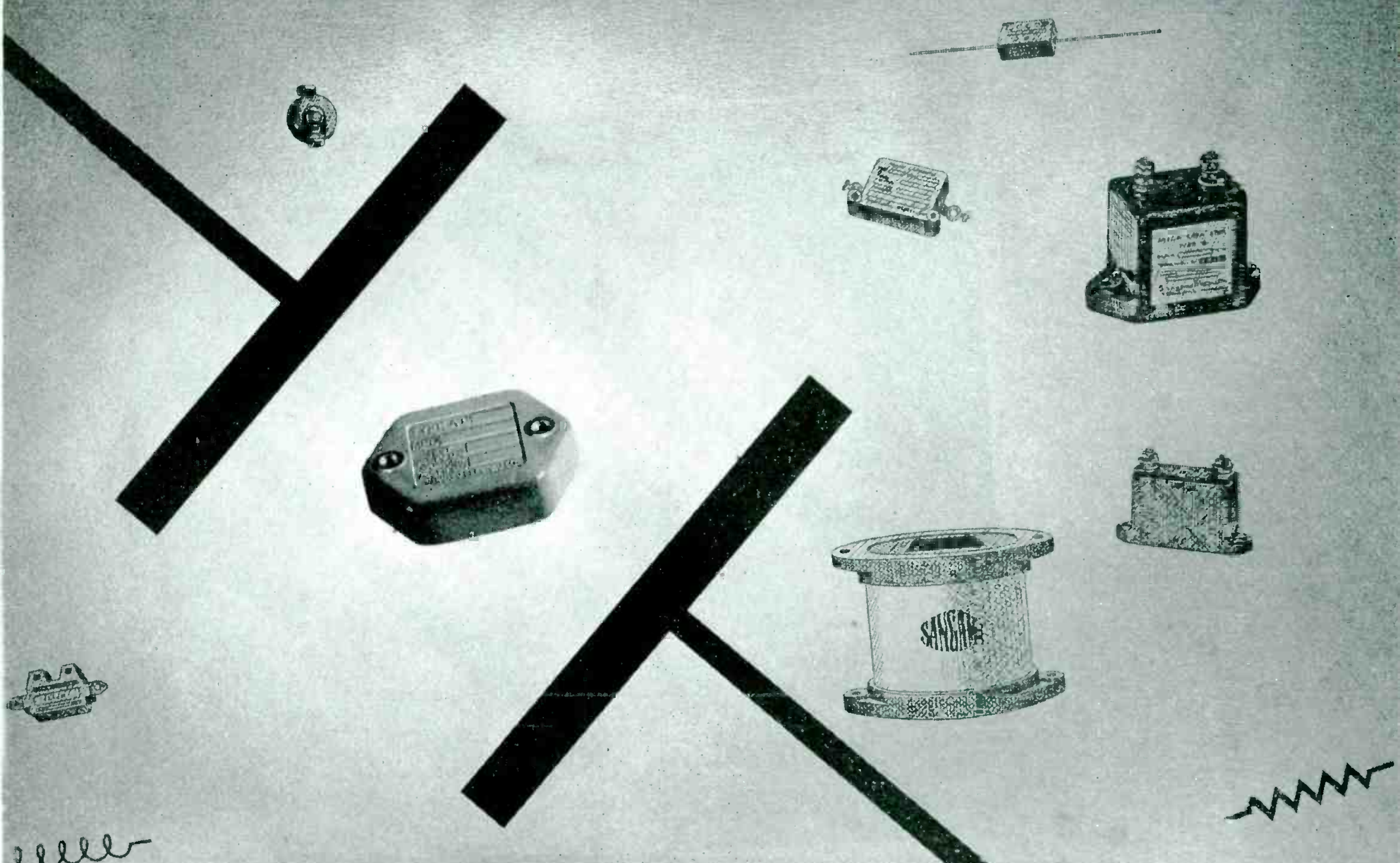
Manufacturers of Quality Electro-Mechanical Components Since 1896

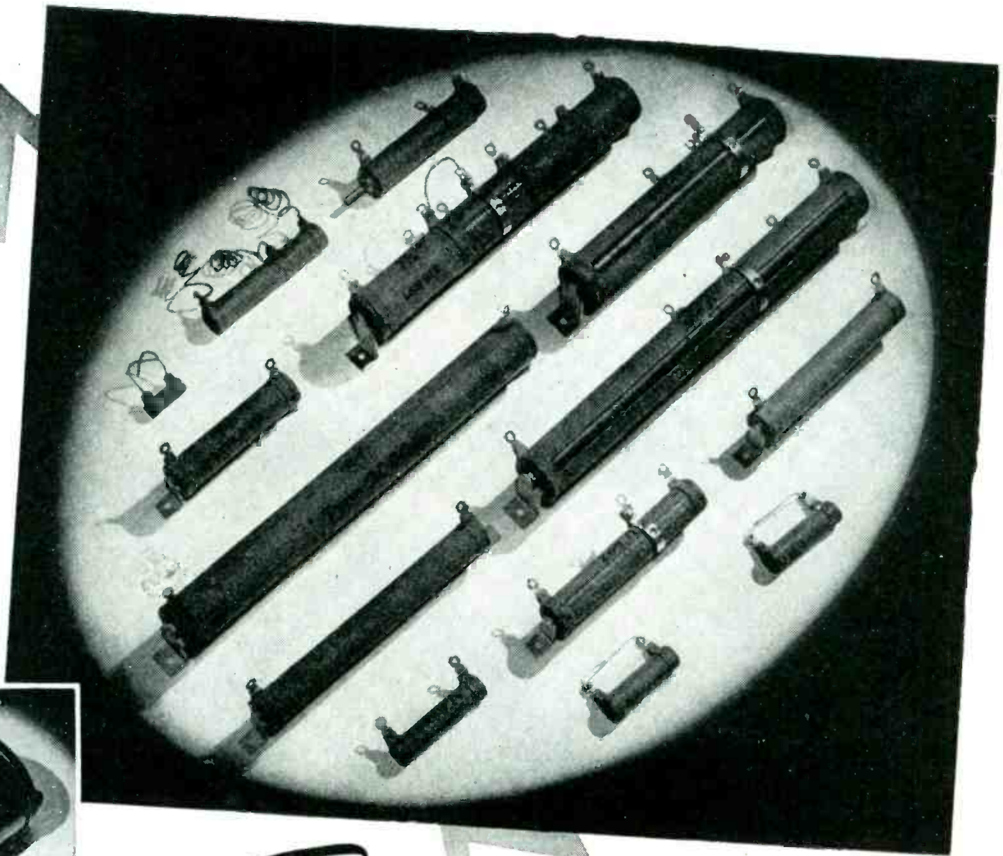


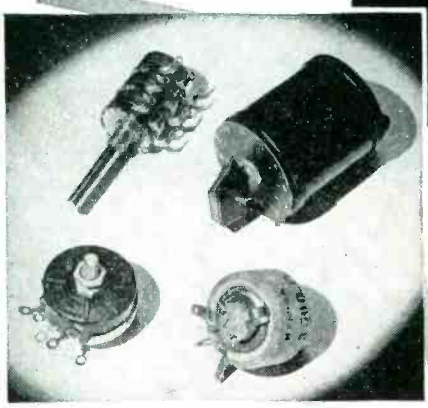
Sangamo Capacitors Can Take It!

Sangamo Type A capacitors have been manufactured continuously since 1925. As the first mica capacitor to be moulded in bakelite, it has been incorporated into the designs of many transmitters and receivers. Designated under the War Standard as Case Styles CM55 and 60, this unit is available in all characteristics from B through F and in the entire range of voltages and capacities listed in these standards. While comparatively small in physical size, the "Type A" has been called upon to do an exceedingly big job in low-powered, medium, and quite often in high-powered transmitters, where the ability of a capacitor to stand up and handle comparatively large amounts of RF current is of paramount importance. The continued application of the Type A capacitor in these transmitters is adequate proof of its ability to meet these requirements. Manufactured under War Standard specifications calling for severe immersion tests, extreme temperature ranges, definite retrace or drift characteristics, this capacitor is an outstanding example of the advanced enginering design and manufacture inherent in the entire line of Sangamo Mica Capacitors.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS





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 . . .***

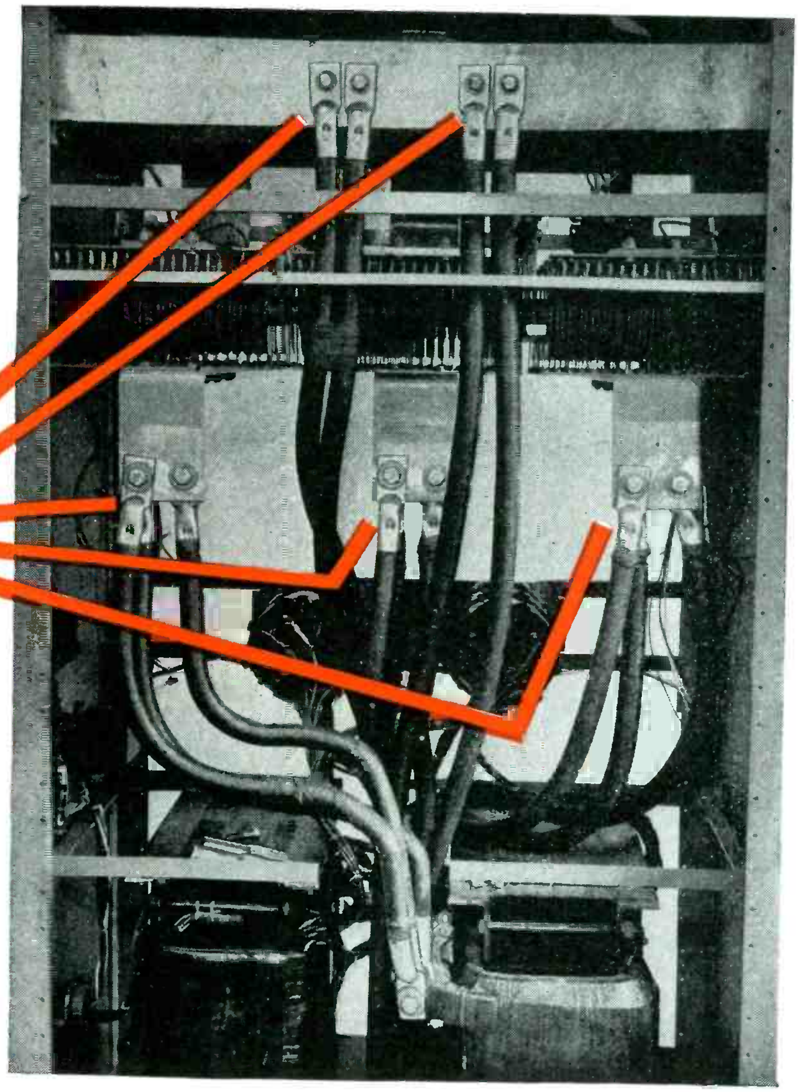
If they have to do with resistance—fixed, adjustable, or ballast—send them along for our engineering collaboration. We either have standard items in our extensive line that will meet your needs, or we can build special units. Let us quote on your requirements.

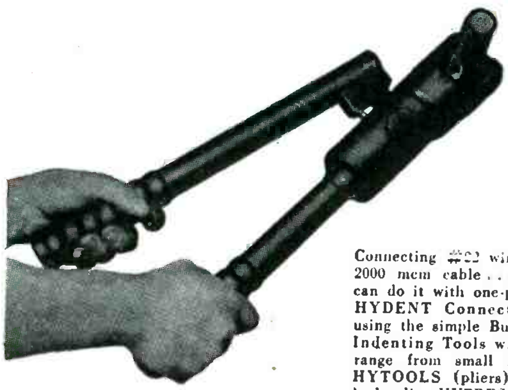
CLAROSTAT

Controls and Resistors

CLAROSTAT MFG. CO., Inc. • 285-7 N. 6th St., Brooklyn, N. Y.

Hydent CONNECTORS





Connecting #22 wire or 2000 mcm cable . . . you can do it with one-piece HYDENT Connectors, using the simple Burndy Indenting Tools which range from small hand HYTOOLS (pliers). to hydraulic HYPRESSES.

The Modern Way

. . . to make permanent electrical connections *permanent!*

On circuits everywhere, you now see modern Burndy HYDENT (Indent Type) connections like those above . . . in place of old-fashioned connections made by methods which were time-consuming and uncertain.

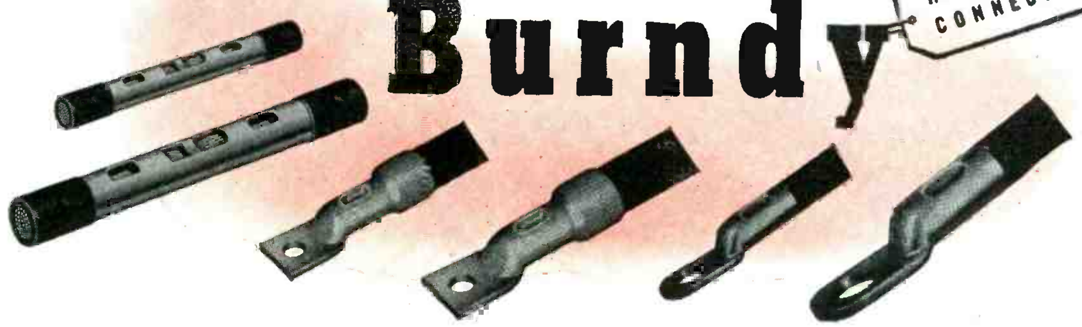
The Indent connection has been widely adopted because the indenting principle removes all uncertainty over the strength and permanency of the connection. Further, the HYDENT connectors used are of *one-piece, pure copper* construction . . . assuring highest electrical conductivity. And they are installed in a *fraction of the time* . . . another feature industry likes, too.

Pioneered and proved by utility engineers, the HYDENT connection has been a significant aid to our war effort . . . and will contribute materially to product and production efficiency in the days to come. Bulletin on HYDENT Connectors gladly sent on request.

BURNDY ENGINEERING CO., INC., 107 Bruckner Boulevard, New York 54, N. Y.
IN CANADA: Canadian Line Materials, Limited, Toronto 13

Burndy

Headquarters for CONNECTORS



A FEELING FOR SCIENTIFIC PROGRESS

"EVERYBODY talkin' 'bout heaven aint goin' there". No more will mere talk secure a ticket to Post War's "promised land", where big profits may depend on low production costs. Why not, then, ride through with a contract manufacturer who has the *peace-time* cost-conscious skill and ability?

We've been "Man-Friday" to American Industry since it was in swaddling clothes... ever since Thomas Edison shed light on the world with his carbon filament electric lamp.

We've had a hand in shaping scientific progress... we've fabricated many component parts of *pace-setting* mechanical and electrical products for other manufacturers since 1888 . . . our experience spans more than a half-century of precision manufacturing developments. *All hands at Lewyt's are cost sensitive.*

Lewyt is *not* a war baby. Lewyt is a "Manufacturer's Manufacturer" with 56 years' experience. We'd like to talk with production engineers up against today's wartime requirements, and those thinking ahead to peace-time problems. Maybe we can't figure on your job *now*, but we *can* quote on WAR BONDS. They start at $18.75.

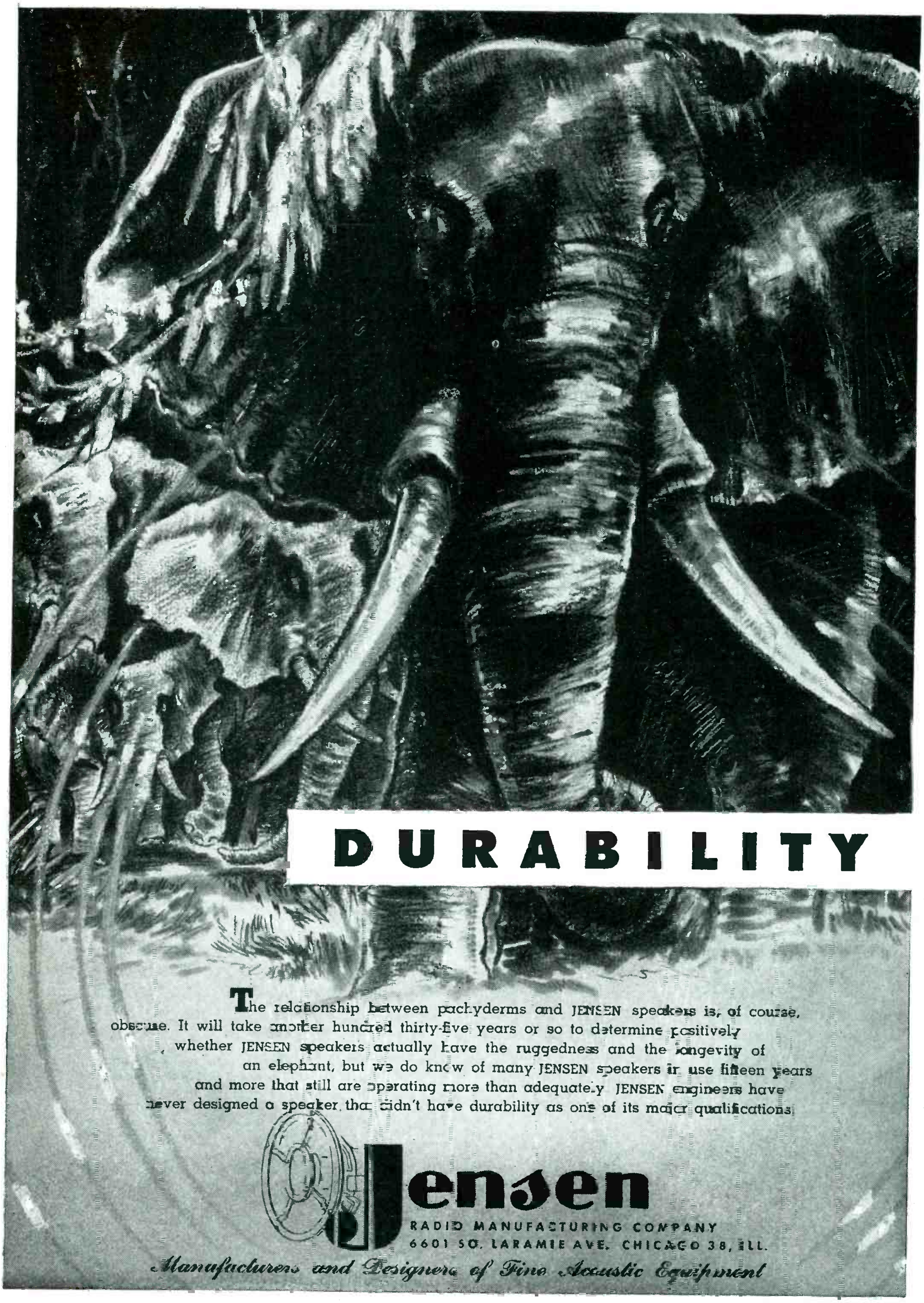
ARMY E NAVY

ESTABLISH AN ACQUAINTANCE WITH OUR PRODUCTION SKILLS

We specialize in electric and electronic instruments, chassis and housings; mechanical and electrical assemblies; highest precision machine work; sheet metal fabrications; all types of welding, product finishing, etc. Consult Thomas Register for Lewyt listings. Write on your business stationery for illustrated 48-page book, "Let Lewyt Do It" . . . no charge, no obligation. LEWYT CORPORATION 62 BROADWAY, BROOKLYN 11, N. Y.

Lewyt

LET LEWYT DO IT


DURABILITY
The relationship between pachyderms and JENSEN speakers is, of course, obscure. It will take another hundred thirty-five years or so to determine positively whether JENSEN speakers actually have the ruggedness and the longevity of an elephant, but we do know of many JENSEN speakers in use fifteen years and more that still are operating more than adequately. JENSEN engineers have never designed a speaker that didn't have durability as one of its major qualifications.
Jensen
RADIO MANUFACTURING COMPANY
6601 SO. LARAMIE AVE. CHICAGO 38, ILL.
Manufacturers and Designers of Fine Acoustic Equipment

BAKELITE

TRADE-MARK

FOR HIGH PERFORMANCE AT HIGH FREQUENCIES

Laminated Plastic Sheets made with* BAKELITE *Laminating Plastics

Increasing need for high-frequency equipment has called for vast increases in the production of paper-base laminated plastics known as XXX and XXXP grades. These plastics are made with a higher percentage of Bakelite resins than other grades of laminates, providing much higher electrical values for the exacting demands of H.F. applications.

Type XXX, recommended for high-humidity conditions, possesses minimum cold-flow and excellent machining characteristics. Type XXXP has lower dielectric losses and is more suitable for hot punching work. It is also recommended for high-humidity applications. Its cold-flow is greater than that of the XXX type. The loss factor of these materials is as low as .12 at 1,000,000 cycles *(A.S.T.M. D-150-39-T)*; water absorption is as low as 1.0 per cent *(A.S.T.M. D-229-39)*.

Ask your laminator about the special grades of paper-base laminates for high-frequency use. If you have a problem involving an essential product, our field engineers and development laboratories are at your service. Or write for Booklet 7-L, "Bakelite Laminating Plastics."

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Unit of Union Carbide and Carbon Corporation

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Laminating Plastics

W. A. PATTERSON, *President of United Air Lines*

"...YOU SAY VIBRATOR POWER SUPPLIES CAN INCREASE SAFETY AND COMFORT IN PLANES?"

MR. W. A. PATTERSON, *President of United Air Lines, recently said—*

> *"It is our belief that the war has advanced public acceptance of the airplane as a mode of transportation by 20 years. The airlines, like every other service that caters to the public, must anticipate their passengers' expectations of new facilities for greater comfort and safety. United will put in service new, huge 44-50 passenger Mainliners offering comforts, conveniences and thoughtful appointments surpassing anything heretofore known, and flying from coast to coast in 11 hours with new devices to assure safe flight."*

E-L is ready right now with Vibrator Power Supplies to bring passengers the greater comfort of fluorescent lighting as well as the convenience and safety of radio and radio-telephone. E-L Black Light equipment is available as a safety device for instrument panel illumination at night to eliminate blinding interior glare and to provide clear, sharply defined instrument calibration. Engineered to specific space and voltage requirements, Electronic Laboratories products are used wherever current must be changed in voltage, frequency or type. E-L engineers invite inquiries.

E-L STANDARD POWER SUPPLY MODEL 307

For the operation of standard 110 volt AC equipment, such as radios and small motors, from a 6 volt battery. Characteristics: Input voltage, 6 v. DC; Output voltage, 115 v. AC; Output power, 100 watts: Output frequency, 60 cycles.

Dimensions: 7½x8¼x10¾ in. *Weight:* 23½ pounds.

Write for further information of this and other models of the extensive E-L line.

ARMY NAVY

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INDIANAPOLIS

VIBRATOR POWER SUPPLIES FOR LIGHTING, COMMUNICATIONS, AND ELECTRIC MOTOR OPERATION • ELECTRIC, ELECTRONIC AND OTHER EQUIPMENT

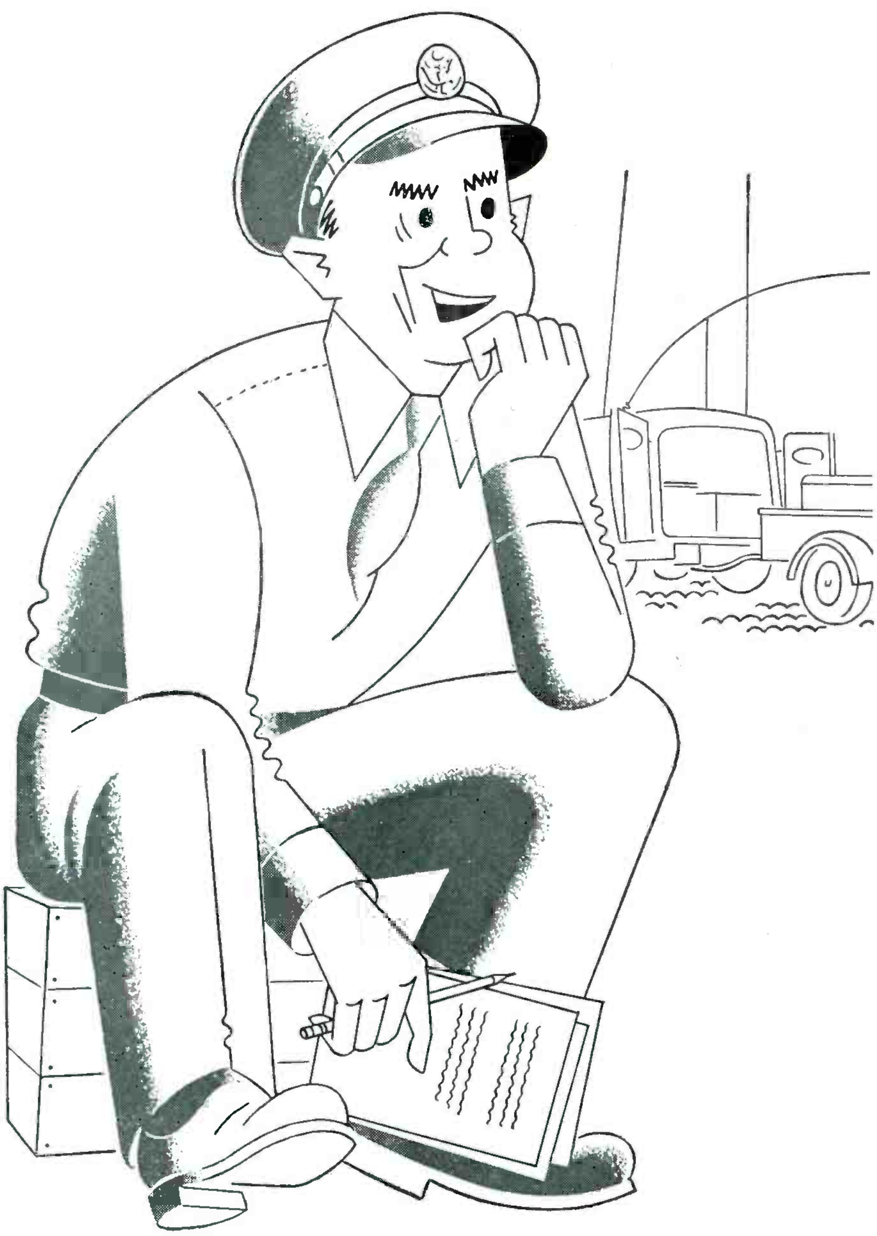
NEW LETTER CONTEST for SERVICEMEN!

ELEVEN 1st PRIZE WINNERS IN 5 MONTHS IN CONTEST No. 1!

Yes sir, guys, the hundreds of letters received were so swell that *double* first prize winners had to be awarded each of the first four months and there were *triple* first prize winners the fifth and last month . . .

SO–HERE WE GO AGAIN!

Get in on this NEW letter contest—write and tell us your *first hand* experiences with *all* types of Radio Communications equipment built by Hallicrafters including the famous SCR-299!



RULES FOR THE CONTEST

Hallicrafters will give $100.00 for the best letter received during each of the five months of April, May, June, July and August. (Deadline: Received by midnight, 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.

BUY A WAR BOND TODAY!

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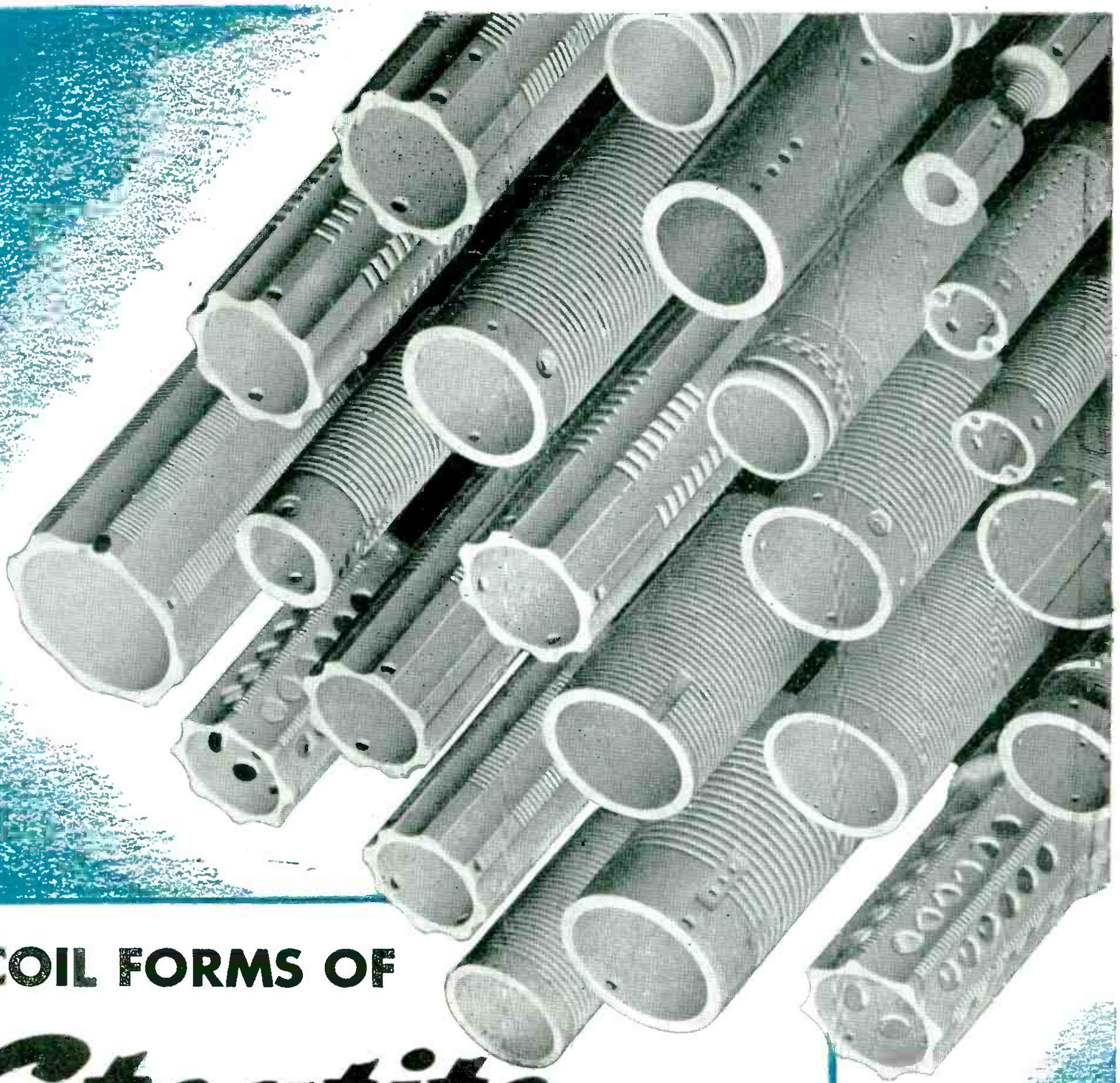
THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.



COIL FORMS OF

Steatite BODY (302)

and *Centradite BODY (400)

CENTRALAB occupies a distinctive place in the industry with its Coil Forms of Steatite and Centradite*. Countless new uses for these ceramics are being developed daily in industry. The unique electrical and physical characteristics of these ceramics are being combined in various ways to form new applications. Our laboratory and engineering facilities are at your disposal. Write for Bulletin 720.

*Centradite is the ideal where low thermal expansion, high resistance to heat shock, low porosity and low loss factors are required.

Producers of Variable Resistors • Selector Switches • Ceramic Capacitors, Fixed and Variable • Steatite Insulators.

ARMY NAVY

Centralab

Division of GLOBE-UNION INC., Milwaukee

WHAT EQUIPMENT IS NEEDED FOR ELECTRONIC HEATING?

HERE'S SIMPLIFIED INFORMATION BASED ON YOUR QUESTIONS

Many questions about electronic heating of *non-metals* come to the attention of RCA engineers. A few, dealing with equipment, are summarized and answered briefly below.

Q. What equipment is needed for an electronic heating installation?

A. Briefly: an electronic generator, a "load-tuning" unit, and the electrodes. (See Fig. 1.) In some cases, special high-frequency transmission line is required to carry power from the generator to the electrodes if the distance is more than a few feet.

Q. What are the functions of these units?

A. The *electronic generator* (see Fig. 2) converts power from the 60-cycle power line to high-frequency power. This is done by means of electron tubes and associated equipment. The load-tuning unit is a device which electrically "gears" the high-frequency power to the load. In a sense it corresponds to the transmission in an automobile. The electrodes are the means of applying power to the load; they usually consist of two flat plates. The work is placed between them.

Q. How does the electronic generator work?

A. Fig. 2 shows a simplified diagram of the electronic generator. The *oscillator* is an electrical circuit containing one or more large electron tubes. These tubes and the circuit components convert high-voltage d-c (supplied by the transformer and rectifier) to high-frequency alternating current (frequencies up to 20 million cycles per second or more are not uncommon). There are no moving parts, of course. The efficiency is usually 50% to 75%. In some cases the high-voltage transformer is mounted outside the generator cabinet.

Q. Do tubes last very long?

A. Yes. A good average figure is 5,000 hours of operation. Many tubes give much longer service when operated with ordinary care.

Q. Is equipment available?

A. Yes. RCA can supply—on priority—standard electronic heating equipment rated at up to 100-kw. output (340,000 BTU per hour). Descriptive bulletins are available on request (see coupon).

Q. What materials can be heated?

A. Many non-metallic materials can be economically heated by electronic means. For example: wood, rubber, plastics, resins, chemicals, glass, ceramics, foods, textiles, paper. (Metals can also be heated electronically, but are not considered in this discussion.)

Q. Is the equipment hard to operate?

A. No. Once the process has been "set up," any intelligent worker can operate the equipment without difficulty.

Q. How is equipment maintained?

A. The RCA Service Company makes regular inspections of RCA installations on a yearly contract basis. Tube replacement is included in the contract.

For further information, address: RCA, Electronic Apparatus Section (70-46H), Camden, N. J.

LISTEN TO *"The Music America Loves Best" on the RCA program every Saturday, 7:30 P.M., E.W.T., Blue Network*

★ BACK THE ATTACK . . . BUY MORE THAN BEFORE

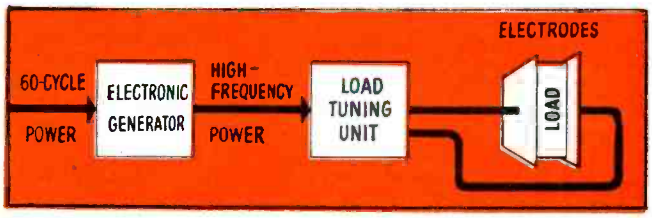


Fig. 1. Elements of an electronic heating installation. Standard 60-cycle power is converted by electron tubes to high-frequency (radio-frequency) power for heating.

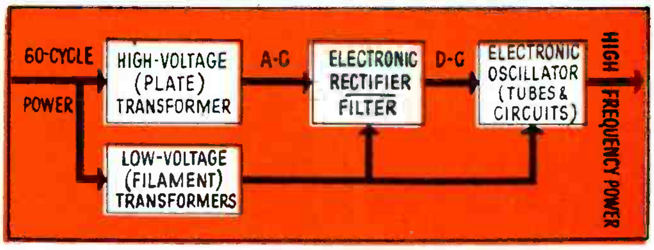


Fig. 2. Simplified block diagram of an electronic generator. In large units, the transformer is located outside the generator enclosure.

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION • CAMDEN, N. J.

LEADS THE WAY . . *In Radio . . Television . . Tubes . . Phonographs . . Records . . Electronics*

SEND THIS TODAY! RCA, Electronic Apparatus, Section, Camden, N. J.

Please send me the booklets checked, which tell more about economical electronic heating.

- ☐ "Heating Wood with Radio-Frequency Power"
- ☐ "R-F Heating Speeds Plastic Molding"
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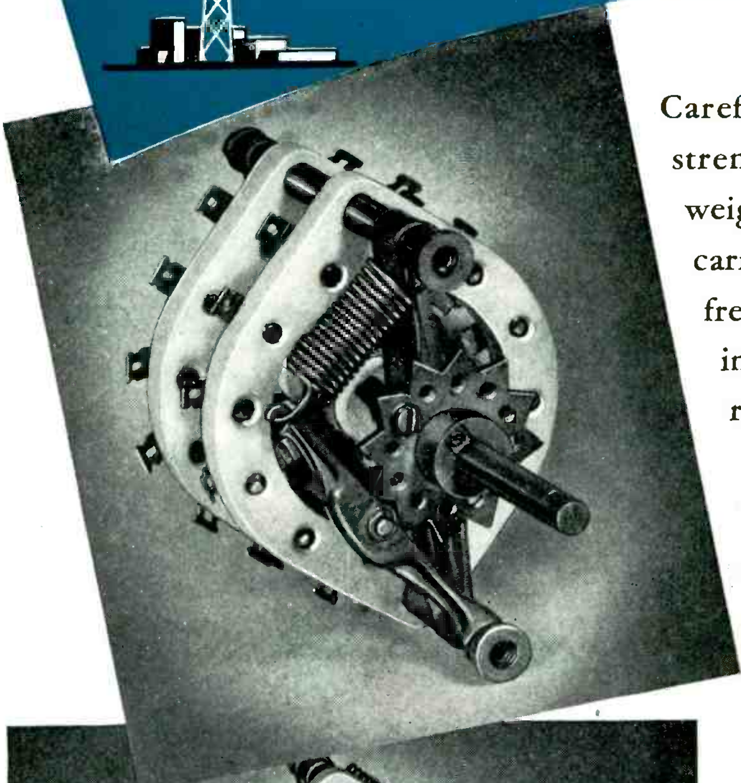
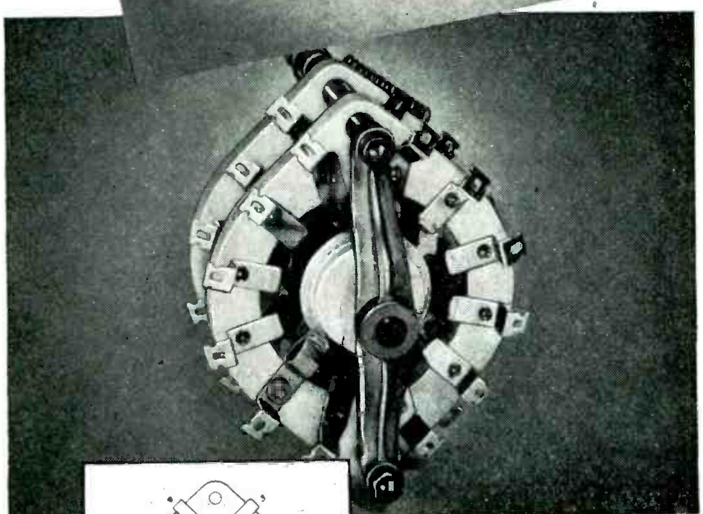
[70-46H]

Standardized RADIO



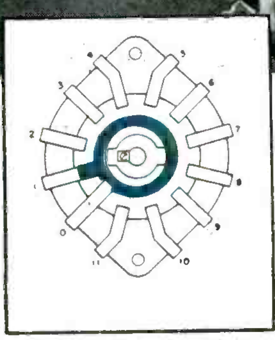
Carefully designed to provide maximum strength and rigidity with a minimum of weight, Sterling Switches have high current carrying capacity, particularly in the power frequency range. The use of pure silver eliminates the need for high spring pressures, required to cut insulating oxides on the electro-plated contacts commonly used. With Sterling Switches, turning torque is reduced to a minimum.

STERLING SWITCHES



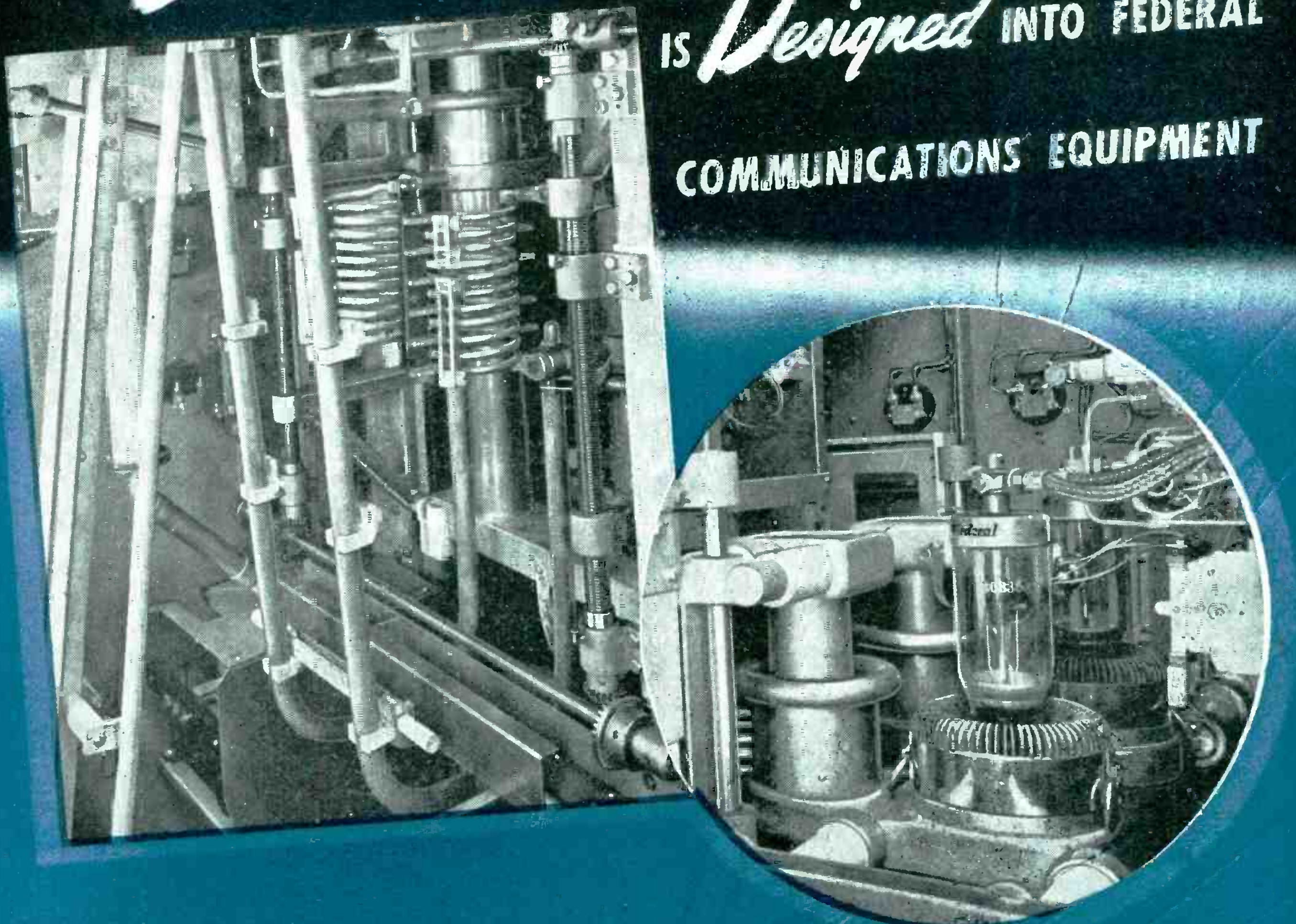
In both standard models (Nos. 86S and 88S) a carefully planned arrangement assures maximum voltage flash-over between contacts and between rotor and frame. A multiplicity of rotor and detent combinations permits a great variety of wiring arrangements on No. 86S.

Front and rear views of No. 86S Sterling Switch are illustrated, the diagram showing a typical rotor style.



Communication

THAT *Extra Margin* OF PERFORMANCE IS *Designed* INTO FEDERAL COMMUNICATIONS EQUIPMENT



Federal, long recognized as a manufacturer of better vacuum tubes, now leads with new production methods resulting in still greater tube efficiency and length of life. Everywhere, it's Federal tubes for superior transmitting and industrial power performance.

The Federal name on communications equipment signifies exacting radio-mechanical design built in . . . plus every extra performance-giving factor.

Federal research and design development are continuous . . . adding new concepts of operation over and beyond accepted performance ratings. This extra care adds ruggedness and high performance dependability to Federal equipment.

Transmitters built by Federal are designed for smooth adjustment over the full frequency range. They are made in a great variety of frequency ranges and power sizes . . . from walkie-talkie to 200 KW transmitters . . . in frequencies of 16 Kilocycles to the upper limit of the radio frequency spectrum.

Back of every Federal transmitter are almost three decades of engineering and manufacturing experience which assure the ability to produce any type or power of communications equipment . . . for point-to-point, broadcast, radio telephone or telegraph or for aircraft, marine or mobile stations.

Look to Federal for the finest in radio communications equipment . . . now and in the future!

Federal Telephone and Radio Corporation

AN IT&T ASSOCIATE

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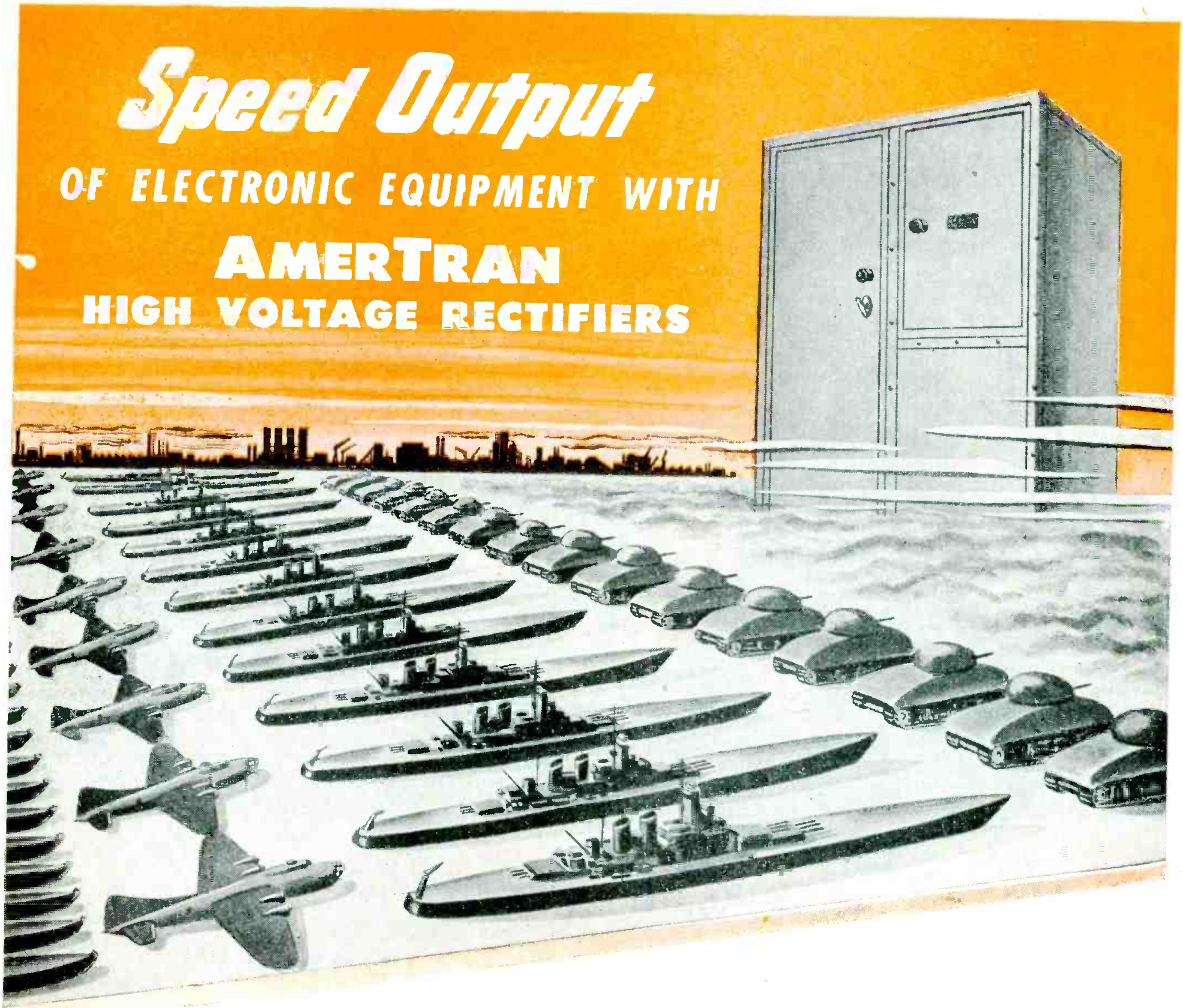

Many manufacturers of naval, aircraft and land communications equipment know that they have better assurance of meeting exacting delivery schedules when the High Voltage Rectifiers are made by AmerTran. Acceptance is also assured through our familiarity with special applications, including navigating and locating devices.

AmerTran Rectifiers can be made to conform in general appearance with other apparatus with which they may be associated.

Delivery is assured by our access to stable material sources, plus a proved, fast production system that employs certain recently developed techniques.

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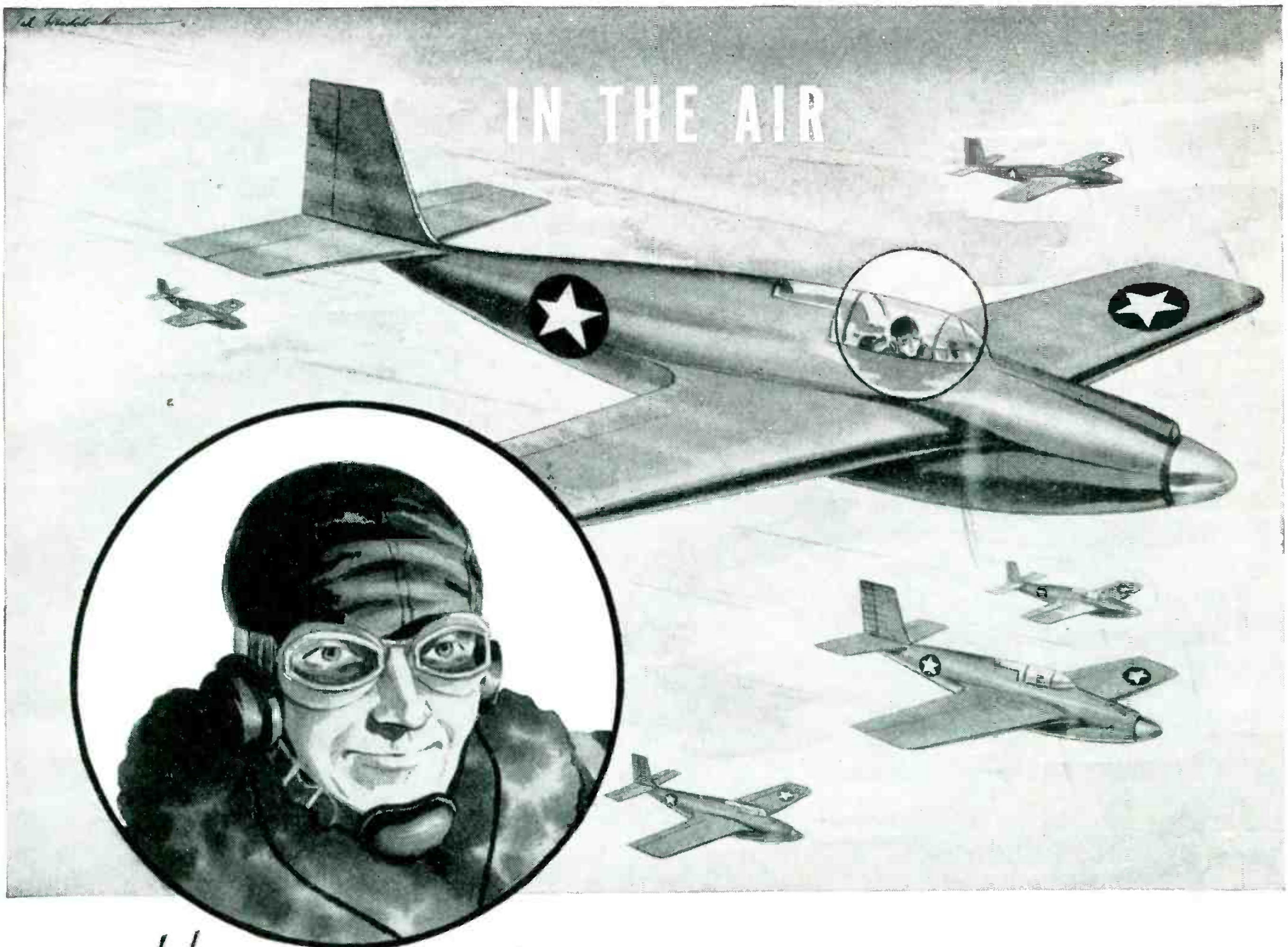

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BRUSH SURFACE ANALYZER

means to Him

Surface smoothness on the vital moving parts of his plane has been measured to one-millionth of an inch by the Brush Surface Analyzer. Such precision assures his safety.

The diamond stylus of this instrument explores surface finishes, and its movement is amplified up to one hundred thousand times, then immediately recorded on a moving paper chart for permanent record.

If accuracy is essential in your business, write today for a fully illustrated bulletin on what the Brush Surface Analyzer can do for you.

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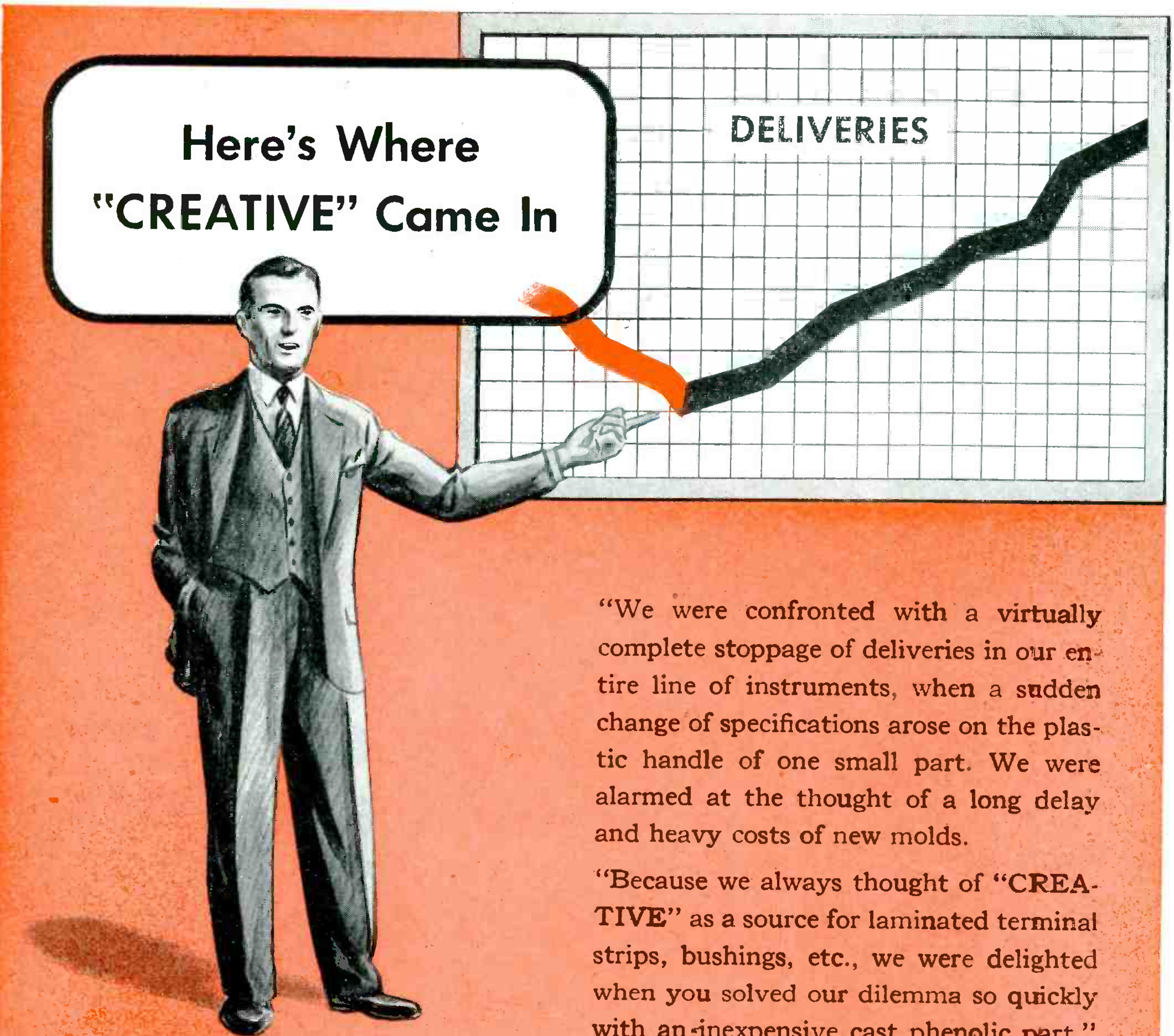

"We were confronted with a virtually complete stoppage of deliveries in our entire line of instruments, when a sudden change of specifications arose on the plastic handle of one small part. We were alarmed at the thought of a long delay and heavy costs of new molds.

"Because we always thought of "CREATIVE" as a source for laminated terminal strips, bushings, etc., we were delighted when you solved our dilemma so quickly with an inexpensive cast phenolic part."

—The above is an excerpt from one of many similar letters in our files.

In these times of sudden specification changes, whip your plastic problems by calling on "CREATIVE". Frequently we can solve your problem right from stock with such parts as insulating grommet bushings, shown at the left . . . or we can fabricate to your specifications in suitable materials.

Take the first step NOW—send us blue prints for quotations and delivery promises.

Creative PLASTICS CORP.

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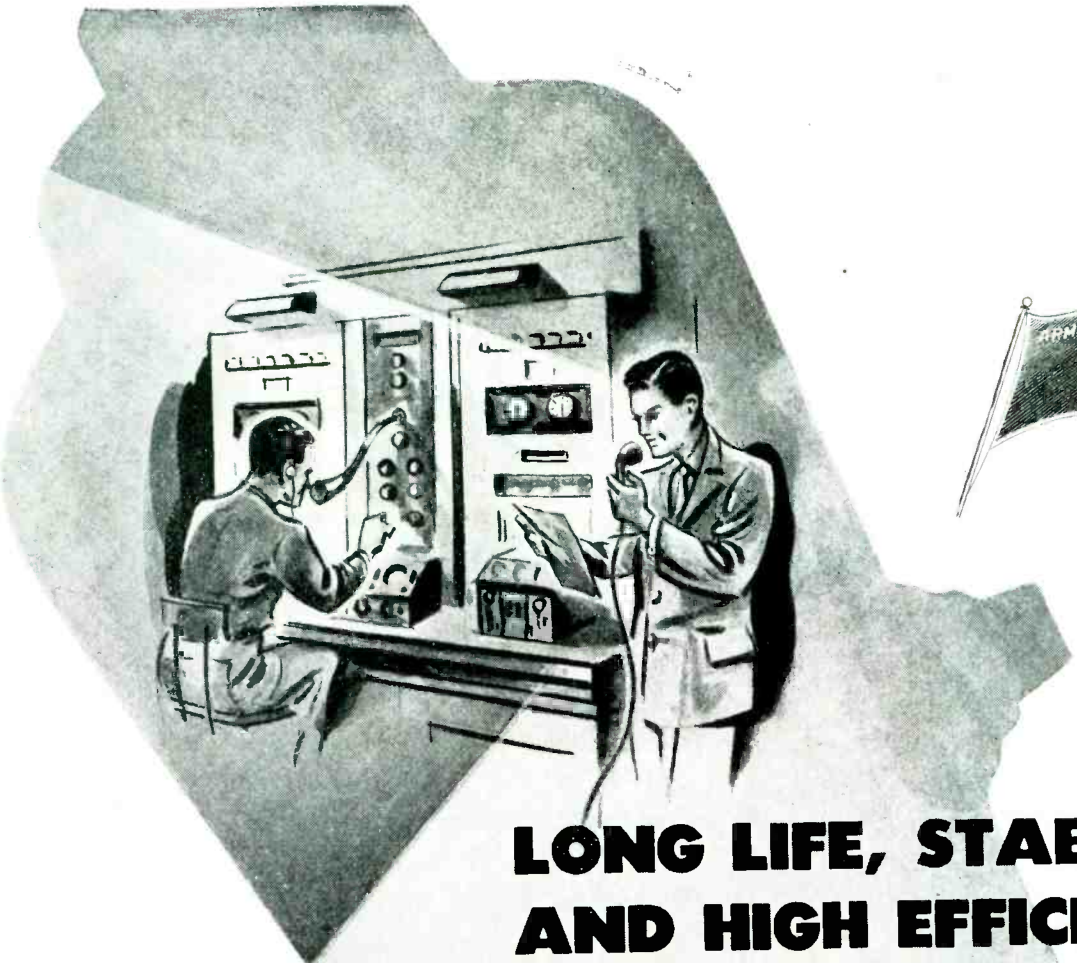
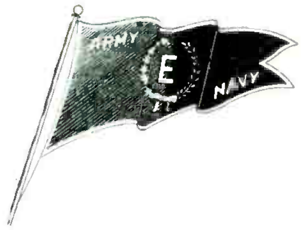
"CREATIVE" INSULATING GROMMETS

Five important characteristics save time and labor in wiring operations:—1. All holes are concentric . . 2. All threads are clean and lubricated . . . 3. All parts have geared collars and are matte finished for quick handling . . . 4. All corners are chamfered to protect against fraying . . . 5. Four standard sizes, all immediately available from stock. *Send for free sample card.*

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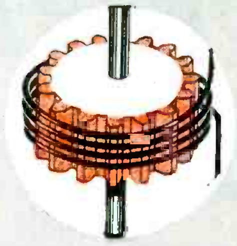
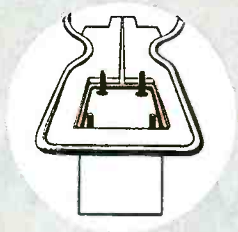
EE
EE200

HOW *Scientific Electronic* HEATING EQUIPMENT CAN

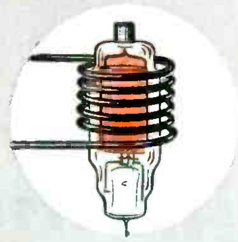
improve production . . . save time and money



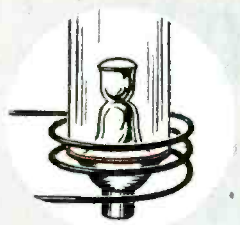
Electronic heat can surface harden gear teeth or localized areas in seconds instead of hours . . . with precise control over depth and degree of hardness.



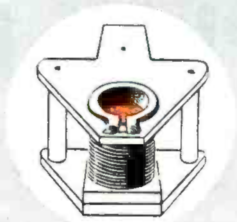
Electronic heat is revolutionizing brazing and soldering operations. Speed and efficiency are increased and wasteful after-cleaning operations are eliminated.



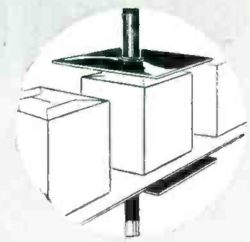
Electronic heat reaches through glass walls to degas metal elements in radio and fluorescent tubes without affecting the envelopes. Action is instantaneous.



Electronic heat can bond glass to metal faster with finer control of heated area. Often increases production units from hundreds to thousands per hour.



Electronic heat is ideal for soft metal melting pots. Lowers operating costs. Assures longer life of pot. Reduces gas inclusions of the smelt. Ends fire hazards.

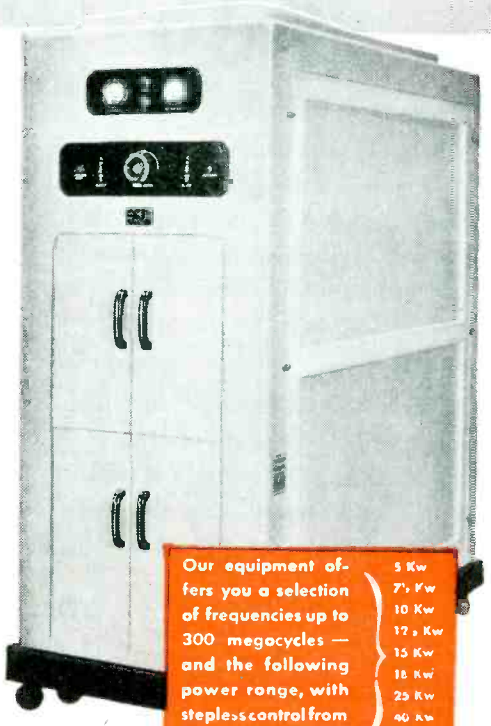


Electronic heat seals packages rapidly and completely in matters of seconds on continuous production lines. Packaged goods containing foods are sterilized.

This company has been designing and building Electronic heating units (induction and dielectric) *since 1921*. We have the advantage of *23 years* of pioneering knowledge and experience in this specialty.

Our equipment (known as "bombarders") has been used with satisfaction by the nation's leading electronic tube manufacturers for almost a quarter of a century, for exhausting and testing tubes.

Our apparatus has been time-tested for high efficiency and economy of operation, and is built to minimize maintenance problems. Our greater *variety* of models permits choosing the unit which is exactly suited to your application, and offers the *correct combination* of *power and frequency* which your jobs demand. You cannot get a power-wasting "misfit" machine from us. Before selecting any electronic heater, it will pay you to write us.



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DIVISION OF "S" CORRUGATED QUENCHED GAP COMPANY
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Designers and Builders of High Frequency Converters Since 1921

TALK TO TAYLOR NOW ABOUT THE PART LAMINATED PLASTICS WILL PLAY IN YOUR POST-WAR PRODUCTS

To help you *now* with your post-war plans, we have created and manned a Post-War Development Department. This Department has *no duties* other than those of discussing with forward-looking manufacturers the contributions that Vulcanized Fibre, Phenol Fibre, or Phenolastic Fibre* can make to the performance and economy of the products of tomorrow.

Before you decide that a product or a part can best be made from aluminum or glass, steel or wood, or any other material, it will pay you to find out whether or not that product or part can be made better, cheaper, or faster in laminated plastics. Consultation on such problems with the engineers in our Post-War Development Department is yours for the asking, without cost or obligation. Write us, in complete confidence, about your plans and problems.

Mass-produced by machining from tubes of Phenol Fibre, this radio part combines light weight, high dielectric quality, low moisture-absorption, and the ability to stand severe shock. Whatever combination of qualities you require, it's a rare case indeed that can't be solved by Laminated Plastics.

A new development by which finished sheets of Phenol Fibre can be reheated in your own plant and formed permanently to almost any shape in inexpensive, wooden dies.

POST-WAR DEVELOPMENT DEPARTMENT OF

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SPECIFY SYLVANIA AND BE SURE

AN ELECTRONIC DEVICE is no better than its most vital part—the electron tube. A reputation for high quality manufacture won many important wartime assignments in electronics for Sylvania. A few of the electronic devices, tubes and parts made by Sylvania are shown here. There are many more, some of which are military secrets. For information about Sylvania quality electron tubes and products, write Sylvania Electric Products Inc., 500 Fifth Avenue, New York 18, New York.

"To Serve an Electronic World"

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ELECTRIC PRODUCTS INC.

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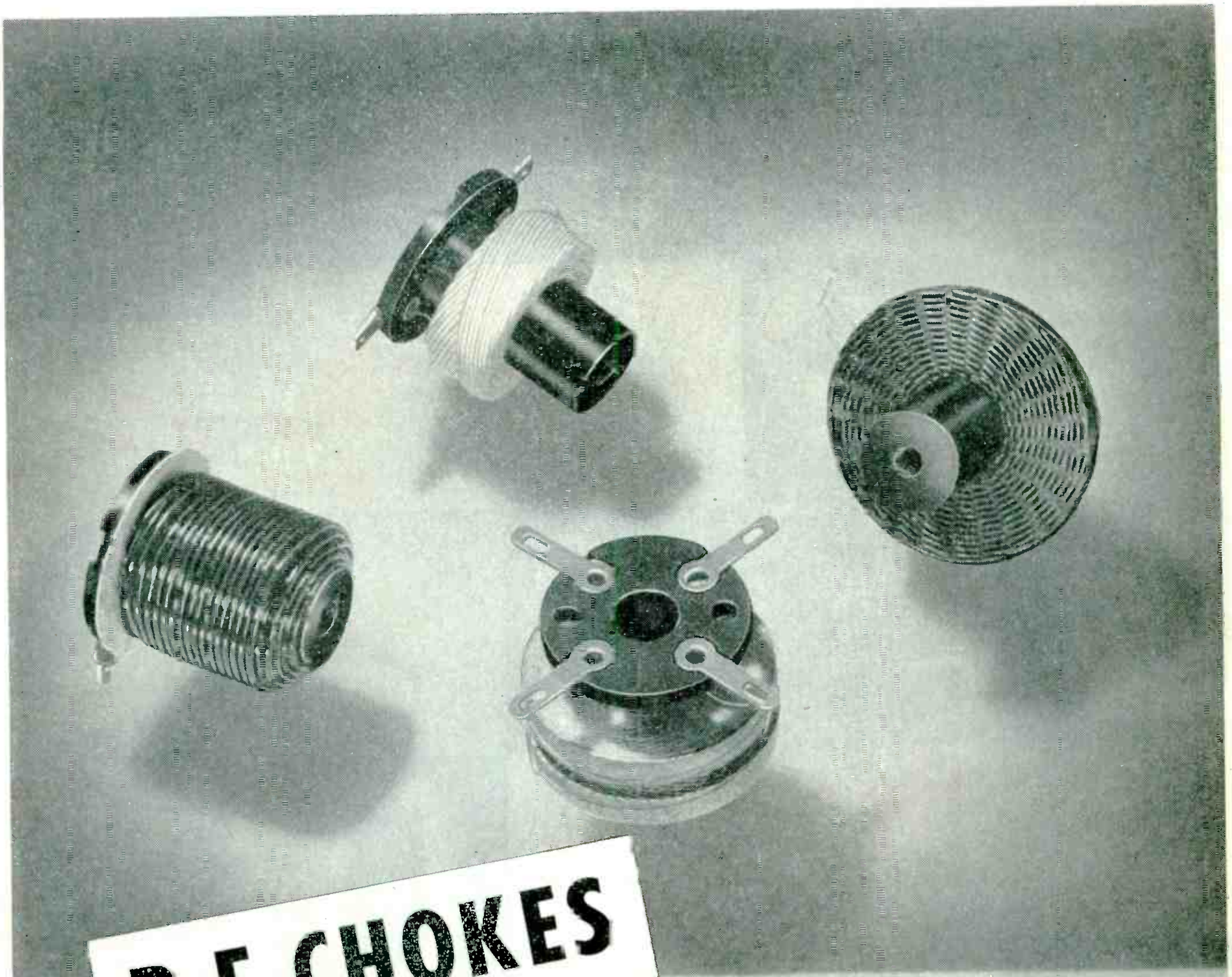

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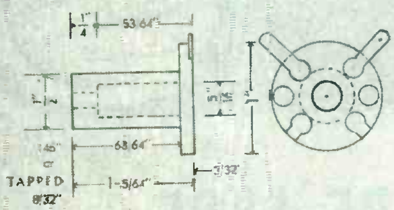
MILLIONS of precision Radio Frequency Chokes of standard and special design are used in military and naval communications equipment. Because these vital components are required in enormous quantities, all on rapid delivery schedules, *AUTOMATIC* is a dependable source of supply for the Army and Navy.

Whether small or large, precision adjusted or wound to turns, *AUTOMATIC* can meet your need for quantity production of R-F Chokes as well as R-F and I-F Coils of any design, audio and power transformers, or complete assemblies incorporating them.

You can rely on *AUTOMATIC* for prompt service and large volume deliveries.



The molded Bakelite bobbins, upon which the chokes illustrated are wound, are carried in stock to these dimensions.

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COMPLETE ELECTRONIC ASSEMBLIES & COMPONENT PARTS

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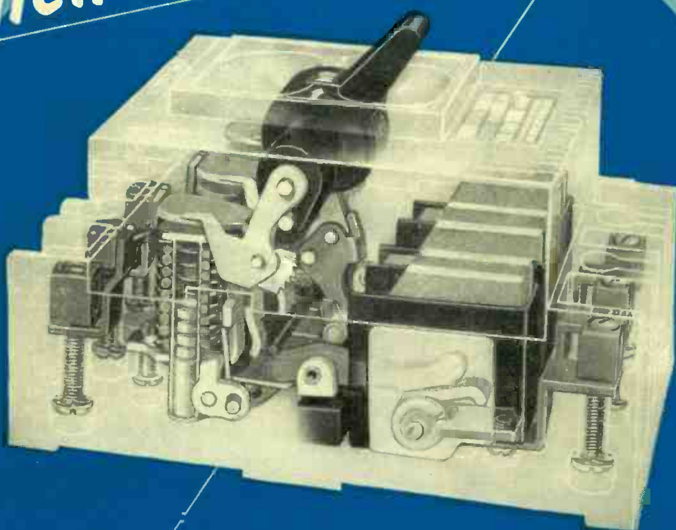
The Protection You Want When You Want It



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MAGNETIC CIRCUIT BREAKERS

Both Time Delay and Instantaneous Trip Types

In order to prevent nuisance trips on harmless overloads and starting surges, Heinemann provides a time delay type breaker which allows a specified time lapse before tripping on overloads, though it trips instantly on short circuits. Time delay breakers are available in any one of three inverse time delays, the lapse being governed by liquids of different viscosities. The same breaker can be had without time delay characteristics, simply as a straight instantaneous trip type. Ampere ratings between 10 milliamperes and 50 amperes may be matched accurately to the load by proper wire size and ampere turns on the magnet coil. Magnetic blowout provides high and fast interrupting capacity. Make it a point to contact Heinemann engineers on any problem of circuit and vacuum tube protection.

HEINEMANN CIRCUIT BREAKER CO.

Subsidiary of Heinemann Electric Co., Est. 1888

97 PLUM STREET **TRENTON, N. J.**

Right on the nose
ON EVERY COUNT!

Of course, this is a simulated laboratory report. But the conclusions reached are real and true, whether obtained by testing instruments or by actual duty.

One important reason for the performance of ***LEXEL** insulated wire and cable is the fact that the insulation is CENTER-SEALED. ***LEXEL** forms a continuous helical tube in which the conductor is automatically and permanently centered through every inch of its length. The tube seals itself by heat. Insulation is uniformly effective at all points.

***LEXEL** Insulation Wire is an approved military specification for compact installations in low-tension service, such as controls, instruments, lead-in and hook-up wires and electronic circuits.

Ask for additional information and names of manufacturers who supply ***LEXEL** (cellulose acetate butyrate) insulated wire.

CUSTOM-MADE INSULATION

As a regular service, Dobeckmun engineers also develop laminated insulation products, custom-made to special purpose specifications, such as Dobar insulation paper for slot cell and phase insulation of motors, and insulation for shipboard cables and other uses. If your requirements are unusual, call on us.

*"LEXEL" is a registered trade-mark of The Dobeckmun Company.

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NO Burning
NO Pitting
NO Sticking

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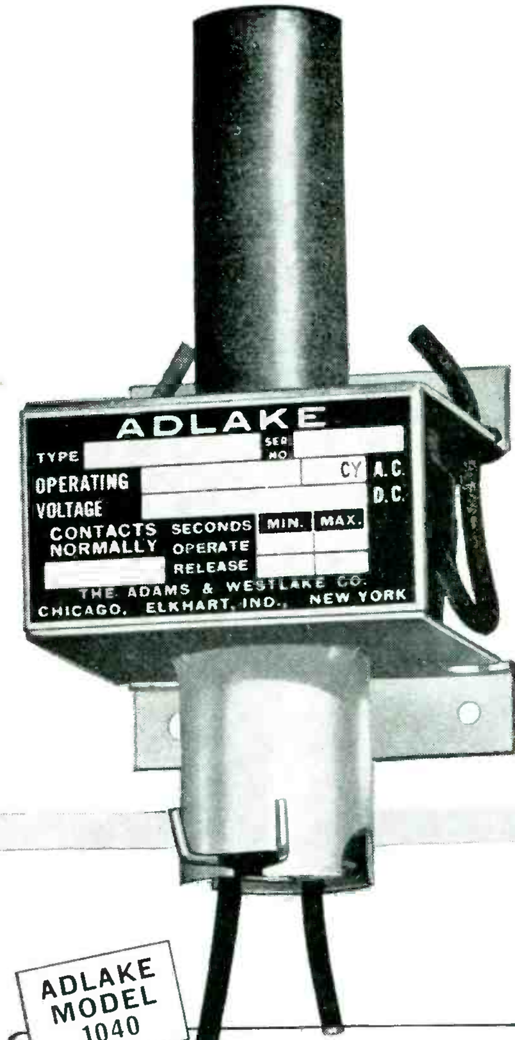


ADLAKE MODEL 1040

For panel mounting. Can be supplied with quick or time delay action; normally open or normally closed; and for A.C. or D.C. energization. Contact rating *up to 100* amps. A.C.; proportional D.C. ratings.

Automatic Control Is Really Automatic with Adlake Plunger-type Mercury Relays

Put Adlake Plunger-type Mercury Relays of correct capacity and rating on your control panel and you've really got *automatic* control. No inspection. No cleaning. No servicing. Here's why . . .

The contact mechanism of Adlake Plunger-type Mercury Relays is *hermetically sealed inside* a glass or metal cylinder.

Dirt and dust *can't get inside* to "gum up" operation. And, because contact is made by *liquid metal* (mercury), it is positive, chatterless, silent and *impervious to burning, pitting and sticking.*

For many kinds of service, particularly those considered "difficult," there is no other type of relay that can give such dependable service.

There's a lot more about Adlake Relays that every engineer should know.

Our complete bulletin tells the story. Ask for it —no obligation.

"Back the Attack—Buy Bonds"

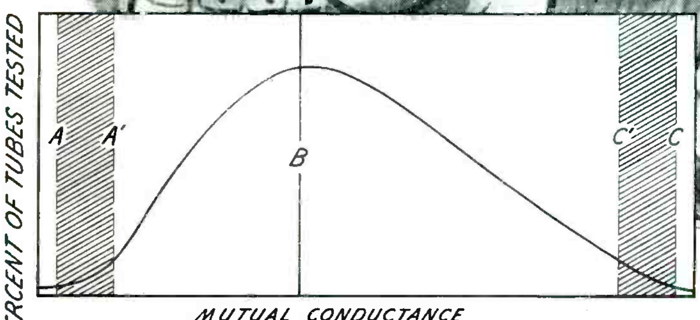
Adlake TRADE MARK

THE ADAMS & WESTLAKE COMPANY

ESTABLISHED IN 1857 · ELKHART, INDIANA · NEW YORK · CHICAGO

MANUFACTURERS OF ADLAKE HERMETICALLY SEALED MERCURY RELAYS FOR TIMING, LOAD, AND CONTROL CIRCUITS

"Right On The Button"



DISTRIBUTION CURVE—TRANSCONDUCTANCE

Conscientious electronic equipment manufacturers avoid special selection of tubes. When a battlefront tube replacement is made, they want "on the button" performance. They allow for possible additive effects of tolerances for other components — and for the many minor differences of equipment assembly, wiring, and adjustment. Also they realize it is impracticable to manufacture all electronic tubes of a given type exactly alike. Yet they demand and deserve close observance of their tolerances for each tube characteristic. (See A and C on the distribution curve.) Hytron insists on still tighter factory specifications. (Compare A′ and C′.)

Hytron goes still further. Based on past experience — its own and others' — whenever practicable a "bogie", or desired goal, for each characteristic is set. (Compare B.) Controlled design and production aim at producing the majority of tubes with this preferred value, which is not necessarily and arbitrarily midway between tolerances. It is rather the ideal for peak performance—dictated by experience and attainable if exact duplication were possible.

Specify Hytron for tighter specifications — for "bogie"-controlled production — for uniform performance.

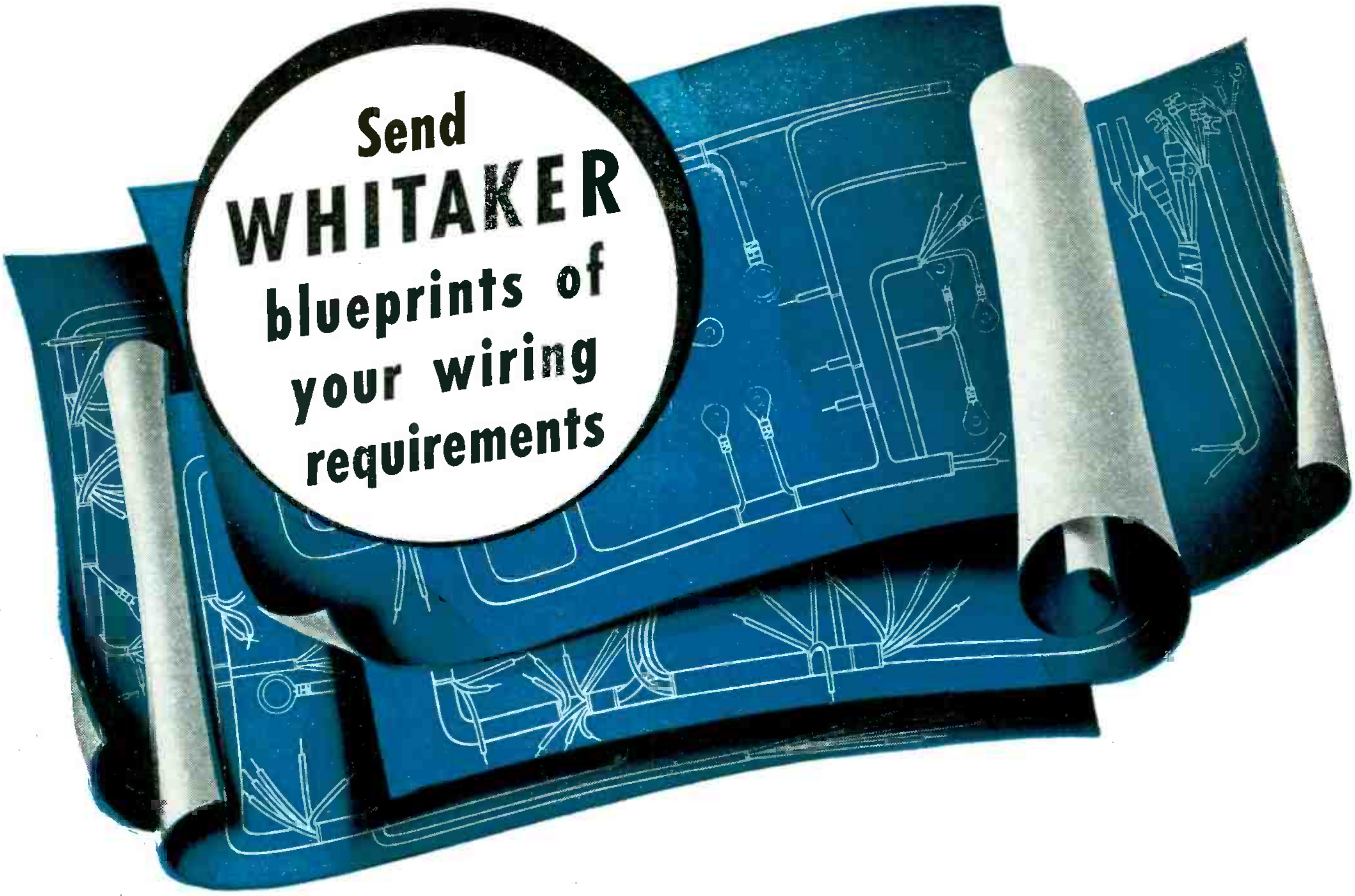
OLDEST EXCLUSIVE MANUFACTURER OF RADIO RECEIVING TUBES

HYTRON CORPORATION ELECTRONIC AND RADIO TUBES

SALEM AND NEWBURYPORT, MASS.

HYTRON RADIO TUBES

BUY ANOTHER WAR BOND



WHITAKER

has the experience and facilities to produce

★ WIRING HARNESSES ★ BONDING JUMPERS

★ CABLE ASSEMBLIES ★ AIRCRAFT and RADIO CABLE PRODUCTS

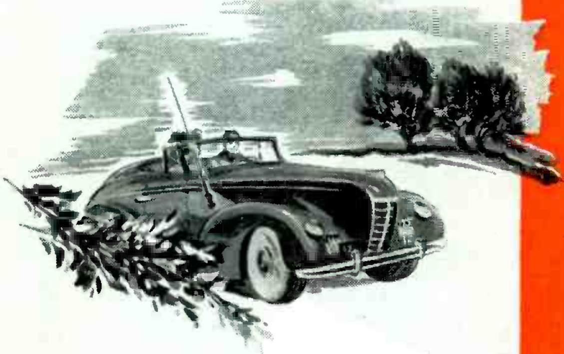
Roll up your blueprints and specifications —dictate a letter outlining your needs— and dispatch your wiring problem to the nearest Whitaker plant. We welcome inquiries covering either war-time or post-war production . . . Backed by a quarter of a century of specialized experience producing wire and cable products, Whitaker has the facilities for large-scale production —plus the ability and "know-how" for quickly turning out cable assemblies to meet rigid specifications.

In addition to an engineered wiring service, Whitaker also offers a quality line of standard cable products. There will be no obligation involved in your getting the facts, so why not write today!

WHITAKER CABLE CORPORATION

(Formerly Whitaker Battery Supply Company)

Kansas City, Mo. · St. Joseph, Mo. · Philadelphia · Oakland



Yesterday *and* TODAY

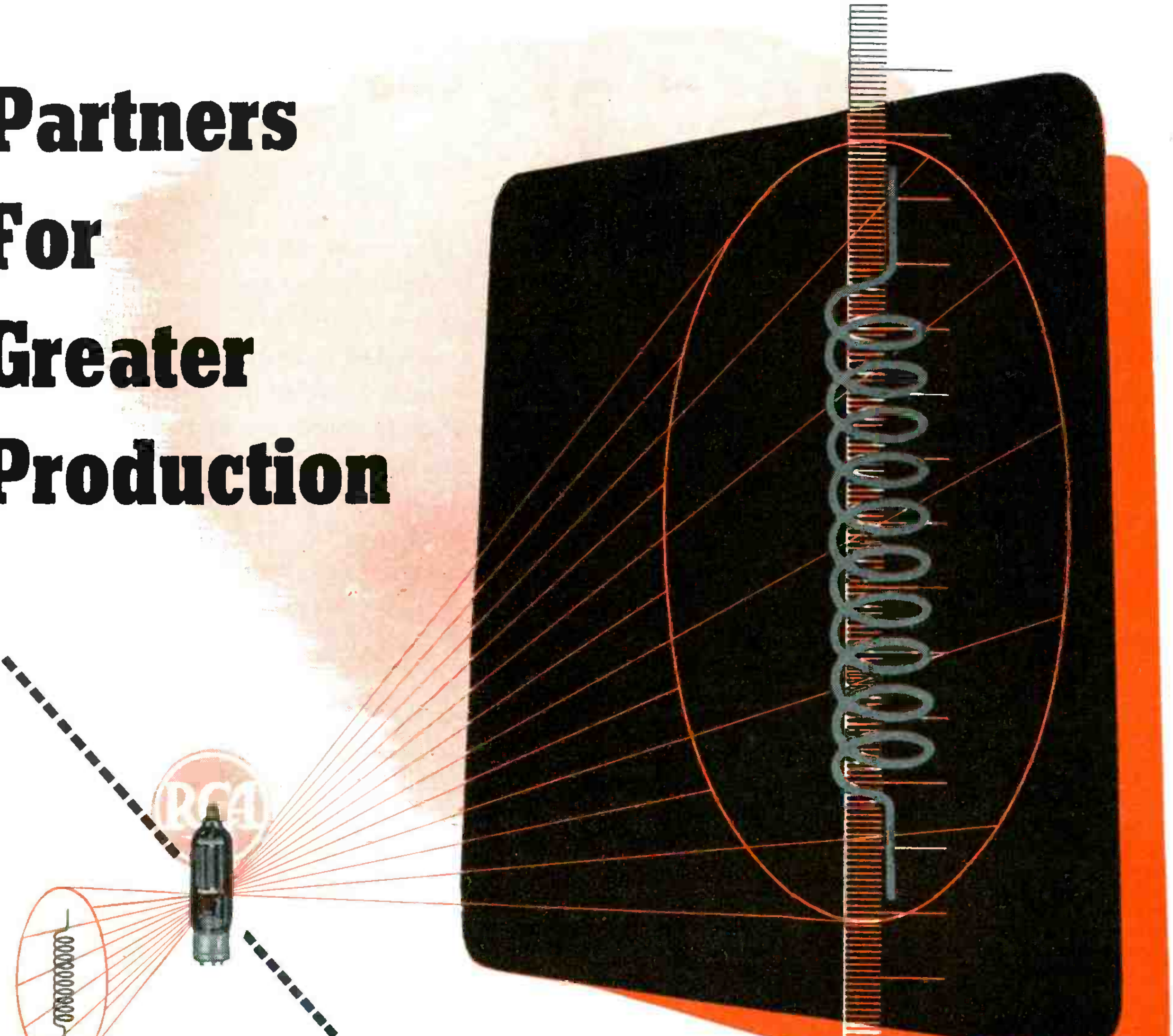
WARD *ANTENNAS*

The year before Pearl Harbor, WARD PRODUCTS CORPORATION manufactured and sold *better than 90%* of all aerials used by leading manufacturers of automobiles, radios and portable radios. That commanding position was made possible by superior designing ability, manufacturing knowledge and production efficiency.

That expertness of antenna manufacturing is today being totally applied to the war effort . . . and in wartime, as in peacetime, WARD is the leading manufacturer of antennas. The name WARD is found on aerials used on command cars, tanks, planes—on communication units of all kinds—on battle fronts all over the world. . . . The knowledge that is being gained from this wartime effort will mean new and improved products in peacetime. If the use or specifying of antennas is included in your post-war planning, look to WARD!

THE WARD PRODUCTS CORPORATION, 1523 E. 45TH STREET, CLEVELAND, OHIO

Partners For Greater Production



CALLITE . . . specialists in tube components . . .
and America's leading Tube Manufacturers

The task of further increasing electronic production this year necessitates, more than ever, the pooling of knowledge and resources. Manufacturers, who ordinarily would not go outside their own organizations for components, today find it practical and expedient to call in *specialists*.

We, at Callite, are such specialists.

We have long enjoyed the confidence of leading electronic and electrical parts and equipment manufacturers. We have devoted many years to pioneering and development work in this field and we have extensive facilities for fulfilling your metallurgical requirements.

For several years, RCA has entrusted a part of its requirements for certain special components such as tungsten and molybdenum wire, tungsten leads for hard glass, tungsten filaments, and tungsten and molybdenum powders to Callite.

Working closely with many industries keeps us in touch with design trends and new developments. Our engineers will be glad to advise on your current technical problems or assist in working out your postwar plans. If you are in the market for metallurgical components, investigate our *specialized abilities*. Callite Tungsten Corporation, 544 Thirty-ninth St., Union City, N. J. Branch Offices: Chicago and Cleveland.

ARMY E NAVY — CALLITE TUNGSTEN CORPORATION — CT

Callite

Specialists in hard glass leads, tungsten and molybdenum wire, rod and sheet, formed parts and other components for electronic tubes and incandescent lamps.

PIONEERS IN TUNGSTEN METALLURGY OVER 25 YEARS

Standard of Excellence

Bliley Crystal Units are doing a great wartime job. Increased engineering knowledge, expanded facilities, and improved production techniques have emerged from this effort. This wartime experience will be reflected in peacetime application.

Bliley Crystals will again take their rightful place with their pre-war record of dependability, accuracy and user acceptance. Not counting applications covered by wartime secrecy necessities, there will be Bliley Precision-made Crystals for diathermy, ultrasonic generators, pressure gauges, carrier-current communications systems, radio frequency filters, and precision interval timers. And, of course, in greater quantities than ever before, frequency controlling crystal units for all radio communication necessities, F. M. or A. M., fixed, portable, mobile or air borne. As always, Bliley Engineers are ready to extend their assistance to you . . . call on them freely.

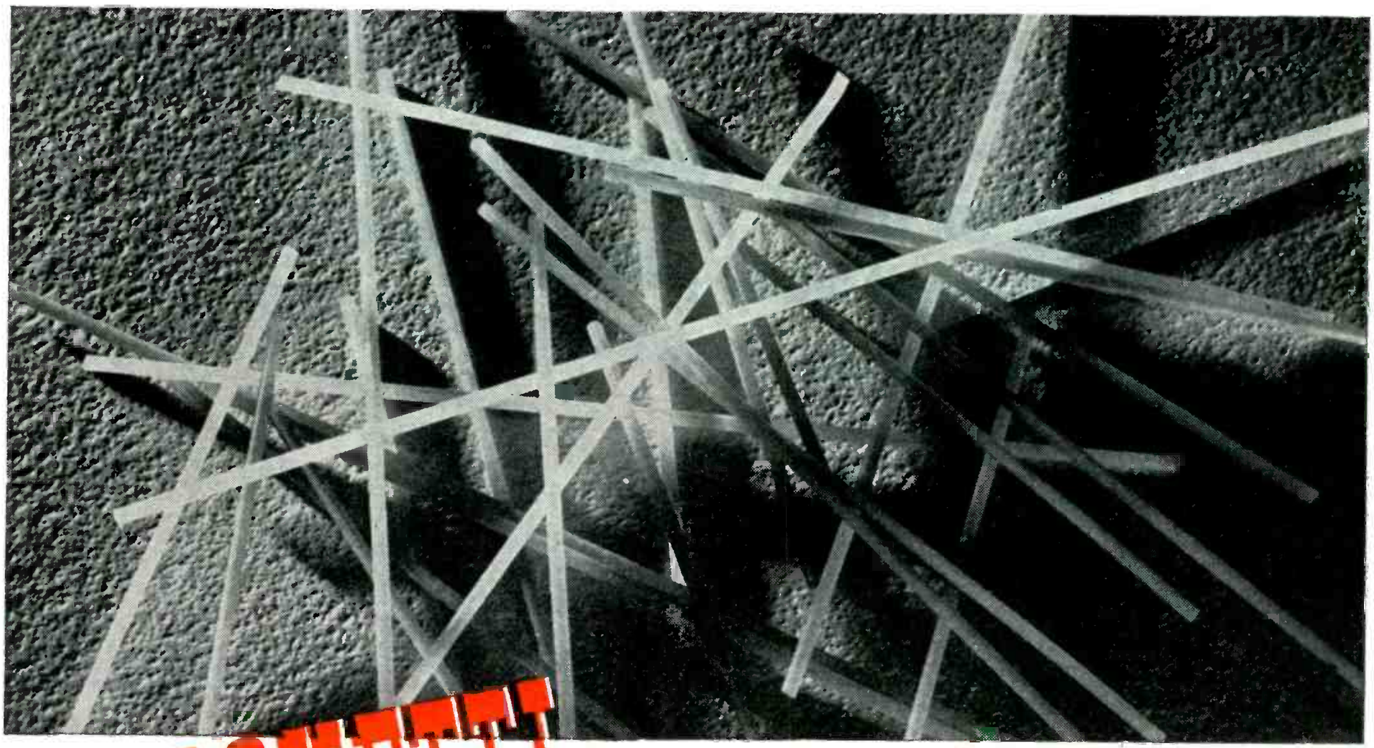
OFFICIAL SIGNAL CORPS PHOTO
SCR-299 MOBILE RADIO STATION

BLILEY CRYSTALS
Accurate
Dependable

BLILEY ELECTRIC COMPANY . . . ERIE, PA.

Bliley Crystals

Westinghouse Electronic Tubes . . . doing a job on every front, in every battle, in every war industry



SPAGHETTI does a better job than steel . . .

To help meet the sky-rocketing demand for Westinghouse Electronic Tubes, Westinghouse has devised a simple but ingenious time-saver. When welding certain filaments, instead of inserting a piece of steel into the filament coil to keep it in alignment, we use a strip of spaghetti. The spaghetti is then burned out and the whole job completed in 1½ minutes instead of 5. This is but one example of how Westinghouse resourcefulness has enabled us to increase production 30 times. Today, we're not only meeting time and quality "musts" on Government contracts—we're also continuing to supply the heavy demands of war industry. Your nearest Westinghouse Office or Distributor will be glad to receive your inquiries for Westinghouse Tubes.

Westinghouse Electric & Manufacturing Company, Bloomfield, N. J.

These Westinghouse Tubes Now Available in Limited Quantities

WL-195	Pliotron
WL-196	Pliotron
WL-463	Pliotron
KU-610	Thyratron
KU-627	Thyratron
KU-628	Thyratron
KU-629	Thyratron
WL-632A	Thyratron
WL-651/656	Ignitron
WL-652/657	Ignitron
WL-655/658	Ignitron
WL-672	Thyratron
KU-676	Thyratron
WL-677	Thyratron
WL-681/686	Ignitron
WL-710	Ballast Tube
WL-788	Ballast Tube
WL-857B	Phanotron
WL-892	Pliotron
WL-895	Pliotron
WL-896	Ballast Tube

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Quality Controlled ELECTRONIC TUBES

FLEXIBLE VARNISHED OIL TUBING:

This TURBO insulation meets the diversity of requirements necessary to stand up against general break-downs, impairment through moisture absorption, and the general deteriorating influences caused by acids, alkalis, etc.

EXTRUDED TUBING:
resistant to sub-zero temperatures

Where the effects of extreme low temperatures are apt to induce insulation embrittlement, TURBO Extruded Tubing is especially suited. Sudden climatic changes, wide fluctuations in temperature, or refrigerant operating conditions will not effect the dependability

VARNISHED GLASS TUBING:
resistant to extremely high heat

The extensive use of this TURBO product is directly attributable to its excellent characteristics under high heat conditions. Heavy duty operating conditions, confined areas where ventilation is minimized and other similar problems are solved

WIRE IDENTIFICATION MARKERS:

The facilitating of production and assembling operations, with corresponding increases in functional efficiency, are effected with this TURBO insulation product. Available in any size, length or color, these TURBO markers are strictly in accord with Army, Navy and Air Corps

TURBO

VARNISHED TUBING • SATURATED SLEEVING

New products, processes and equipment have already made their appearance as the result of the scientific advances induced by the intensified war demands; the picture is clear in requiring greater advances in functional efficiency.

TURBO engineers and technicians are abreast of the new developments, designs and improvements. For example, the "flash" point of TURBO Tubing, already high, is being forced to ever higher levels. This means increased protection from combustion hazards—more essential even than "slow" burning. It means the fire never gets a chance to start. Conversely, embrittlement temperatures—the antidote to cracking—are being constantly lowered. TURBO looks ahead.

★ ★ ★

Write for sample board and list of standard sizes. It's a ready reference and handy gauge—free without obligation.

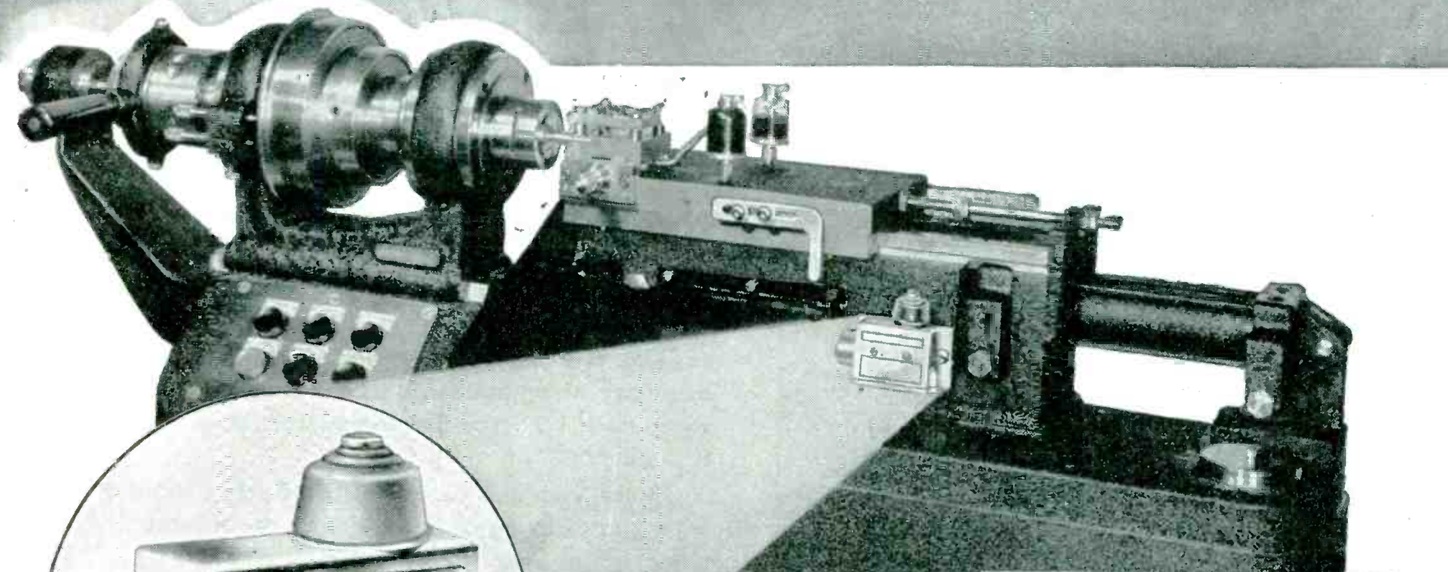
IF IT'S TURBO IT SAFE-GUARDS

WILLIAM BRAND and CO.
276 FOURTH AVE., N. Y. • 325 W. HURON ST., CHICAGO, ILL.

MANUFACTURERS OF MICA PLATE, BLOCK MICA, VARNISHED TUBING & CAMBRIC

Die cast enclosed MICRO SWITCHES

CONTROL THE AUTOMATIC CYCLE OF THE GILMAN HYDRAULIC TURNING MACHINE



The basic Micro Switch is a thumb-size, feather-light plastic enclosed, precision, snap-action switch, Underwriters' listed and rated at 1200 V.A. at 125 to 460 volts a-c. Capacity on d-c depends on load characteristics. Accurate repeat performance is experienced over millions of operations. Wide variety of basic switches and actuators meets requirements varying from high vibration resistance to sensitivity of operating force and motion as low as 2/1000 ounce-inches. Many types of metal housing are available.

THE hydraulic turning machine, manufactured by the Gilman Engineering Works of Janesville, Wisconsin, makes use of the long life, dependability, and accuracy of repeat performance of the Micro Switch to control its entire operating cycle automatically.

Actuation of the Micro Switch at the exact point in the movement of the hydraulically driven slide when the Elgin Head has completed a cut swings the slide away from the work. This motion actuates a second Micro Switch which controls automatic return of the slide to its starting position.

The die cast enclosure of the Micro Switch, mounted on the apron of the machine, provides rugged conduit connection, and a synthetic rubber bellows on the operating plunger protects against the entrance of coolant, oil, chips, and dirt throughout the switch life of millions of operations.

The small size of the Micro Switch and a wide selection of easy-to-use actuators and enclosures has fitted it into many special additions to machines already installed, as well as to new designs. The Micro Switch has electrical capacity, at line voltage, to control many classes of single phase motors directly, without intermediate relays or contactors, providing accurate, positive, trouble-free control.

Send for Micro Switch Catalog-Handbook No. 60 for complete details on the wide range of housings, actuators, and electrical characteristics in which Micro Switches are available. If the switch is desired for aircraft use, also ask for Handbook-Catalog No. 70.

Let's All Back the Attack
Buy EXTRA War Bonds!

Micro Switch Corporation, Freeport, Ill.
Branches: 43 E. Ohio St., Chicago (11) • 4900 Euclid Ave., Cleveland (3)
11 Park Pl., New York City (7) • 1709 W. 8th St., Los Angeles (14) • Sales & Engineering Offices: Boston - Hartford

The trademark MICRO SWITCH is our property and identifies switches made by Micro Switch Corporation

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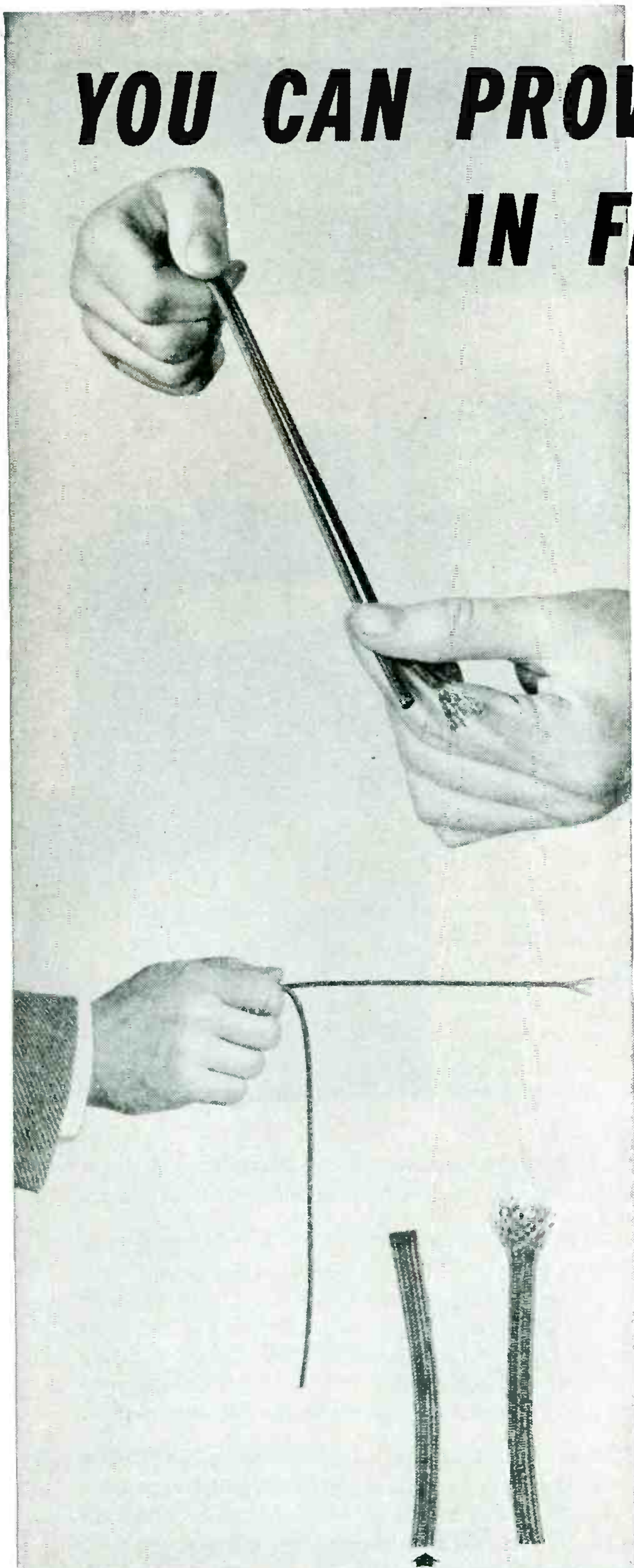
MICRO (MS) SWITCH

TRADE MARK

MADE ONLY BY MICRO SWITCH CORPORATION, FREEPORT, ILL., U. S. A.

YOU CAN PROVE TO YOURSELF IN FIVE SECONDS...



THIS—NOT THIS

That new BH Fiberglas "extra Flex" Sleeving is more flexible than saturated sleeving

WE'VE TOLD YOU about the non-fraying quality of the new BH Sleeving. But don't forget the extra flexibility we've built into it. You can prove this to yourself with the five-second test of sleeving flexibility:

Obtain from us a sample of BH Extra Flexible Fiberglas Sleeving equal in size to the saturated sleeving you use now.

Following Figure 1, hold eight-inch lengths of both BH Extra Flexible Fiberglas Sleeving and saturated sleeving between the thumbs and fingers of both hands. Stretch both sleevings to make them straight.

Now release the sleeving ends held in your left hand. Instantly, the new BH Fiberglas Sleeving will fall limp, proving its extra flexibility. The saturated sleeving will remain straight, practically inflexible. The comparison is shown in Figure 2.

NON-FRAYING • FLEXIBLE • HEAT-RESISTANT
NON-INFLAMMABLE • WATER-RESISTANT
NON-CRYSTALLIZING at LOW TEMPERATURES

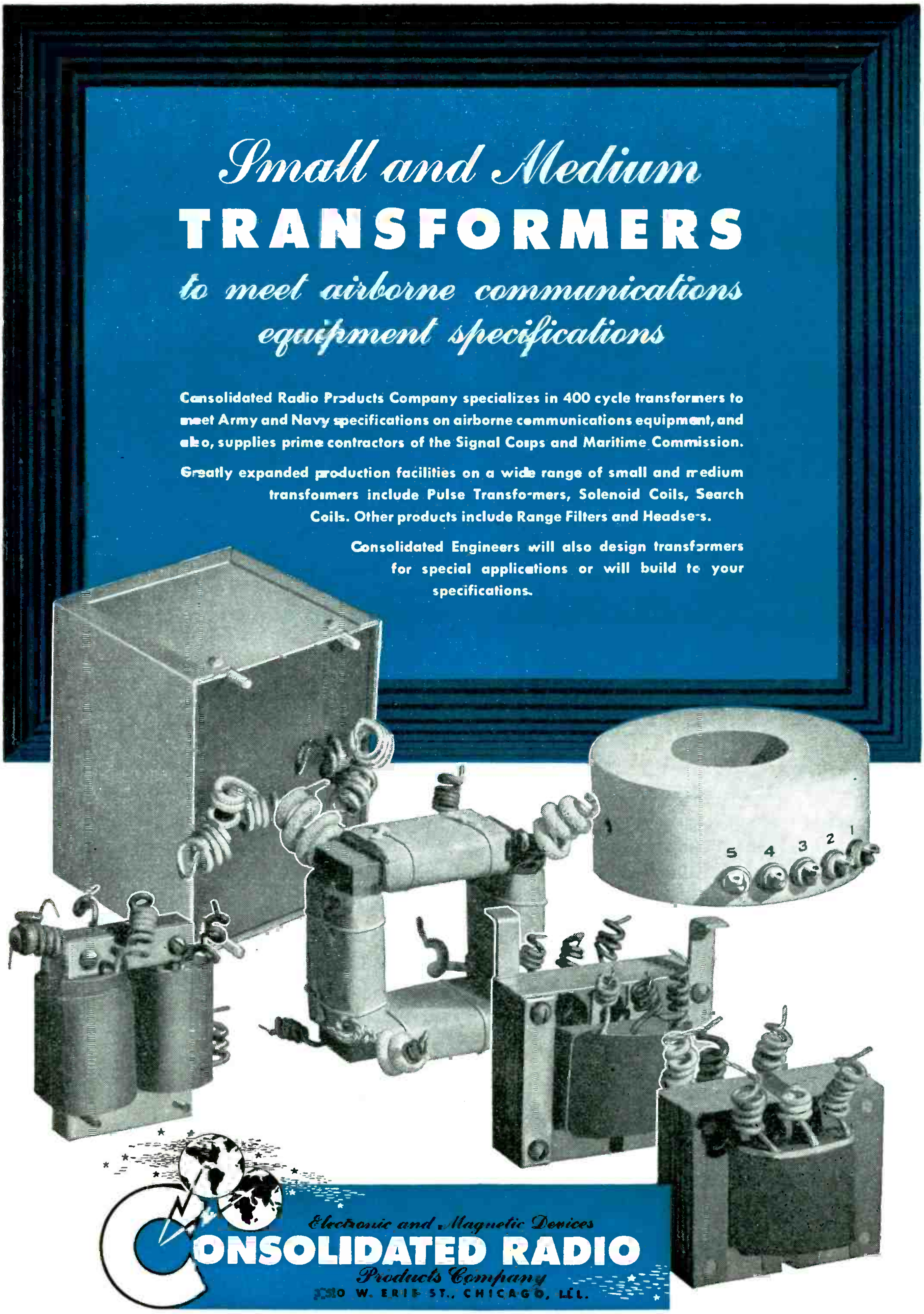
The new BH Extra Flexible Fiberglas Sleeving is woven from the choicest continuous-filament Fiberglas yarns. It possesses high dielectric strength, is water-resistant and, like all BH Sleeving and Tubing—is non-inflammable.

All sizes from No. 20 to ⅝", 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. E, 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.


Small and Medium
TRANSFORMERS
to meet airborne communications equipment specifications
Consolidated Radio Products Company specializes in 400 cycle transformers to meet Army and Navy specifications on airborne communications equipment, and also, supplies prime contractors of the Signal Corps and Maritime Commission.
Greatly expanded production facilities on a wide range of small and medium transformers include Pulse Transformers, Solenoid Coils, Search Coils. Other products include Range Filters and Headsets.
Consolidated Engineers will also design transformers for special applications or will build to your specifications.
5
4
3
2
1
Electronic and Magnetic Devices
CONSOLIDATED RADIO
Products Company
350 W. ERIE ST., CHICAGO, ILL.

Let THEM do the Talking

On land and sea, in the air and under the sea, success in combat rests heavily on Communications . . . the ability *to talk* over distances of a few feet or many miles. But here at home, the success of our effort depends greatly on the ability of all of us *not to talk* . . . to keep to ourselves the things we are doing and the things we are going to do.

We in the Electronic Industry have been asked greatly to increase our output of many types of Communications equipment. We'll do *that* job, but its effectiveness must not be hurt by any careless conversation on our part. Let the man with the "mike" do all the talking.

THE ROLA COMPANY, INC., 2530 Superior Avenue, Cleveland 14. Manufacturers of Transformers, Coils, Headsets and other Electronic parts for Communication Systems.

ROLA

Let's do more in forty-four!

MAKERS OF THE FINEST IN SOUND REPRODUCING AND ELECTRONIC EQUIPMENT

THE COST OF
Tomorrow's Peace

Today peace-loving Americans are united with thirty-three other nations in a common objective of destruction.

Millions of our fine, young men and women find themselves invading foreign lands in order that their own shores may be spared, and their free way of life preserved.

Their sacrifices will be great. Their job will be well done.

But what of the job they will expect of us when they have finished theirs . . . the job of turning their hard-won victory into a lasting pattern of peace?

Can we come up to their great expectation? We must realize that this is the last opportunity of our generation. We must do a better job of it than we did in the Twenties and the Thirties.

We have our backs to the wall, and the scars of World War I and a thirteen-year depression still are upon us. The final test of our way of life is at hand!

As we look over our shoulder into the immediate past, we see little to encourage us. But we also see much to make us pause. We see a tremendous fighting machine, created in a matter of months by the miraculous organization of our resources.

We, the largest of the peace-loving nations, have overnight become masters at the business of waging war. Today, as a result of the co-ordination of industry, labor, and government, we are producing *for war alone* as much as our total normal production for peace.

* * *

We have amply demonstrated our ability to harness the vast productive capacity we possess. Why cannot these resources, which we have organized so efficiently for the destruction of life and property, be directed toward the destruction of the causes of war?

May not the patriotic and emotional strength and the unity of action which have been stimulated for the purpose of winning the war be directed, at least equally well, toward the attainment of world peace and international harmony?

If they are not so directed, what lies ahead but another war? And how can America, in a world that is so rapidly shrinking in size, avoid involvement in *any* of tomorrow's conflicts?

International peace is an ambitious dream and its price is high, but the price of war is even higher. Our world cannot long survive the periodic waste of its human and material resources.

Our country can be the most potent single force in bringing about the international understanding that leads to peace, in developing the unity that will make the most of the ample resources nature has provided everywhere.

* * *

There is no unity in selfishness. There can be no unity if any one of the great powers fails to do its part in determining and eliminating from the world the basic causes of aggression.

These basic causes stem from greed and the suppression of opportunity for individual progress; for self-preservation is the first law of nature.

Mussolini's dramatic march on Rome in 1922 was made possible by disillusioned veterans of World War I who could find no jobs and whose future held no promise. Some of Hitler's most determined followers came from the same ranks.

Men denied the opportunity to make a living, for themselves and for their children, are easy prey to false doctrines and dangerous "isms."

In any realistic appraisal of our domestic problems—economic, labor, racial—it is clear that we can solve them, not by waiting until we reach some utopian accord, but by making a series of compromises. We do this because we know how discord can impair the very roots of private enterprise, self-government, and self-discipline—the essentials of a dynamic democracy.

Similarly, peaceful reconstruction of our world economy depends on the ability of nations to reconcile their differences in a series of working agreements.

If we in the United States want lasting peace and if we want to preserve our democratic way of life, we must take over our full share of the task of initiating these compromise measures. Acknowledging our inescapable responsibility as the greatest economic and military power in the world, we must attempt to insure the free flow of world trade, and develop—with profit for both parties—backward areas abroad as well as at home. And we must do this by making all nations share the responsibility, not by allowing ourselves to be manoeuvered into being an international Santa Claus.

With our allies, we will have to see to it that the devastated portions of the world rehabilitate themselves as quickly as possible; that practicable and realistic trade and economic relations between nations are developed; and that the energies and productive capacities of these nations are set free to function in a climate that is favorable to the growth of free enterprise and individual initiative. As the most powerful economic force on earth, we have the most to gain and the most to lose at the peace table; and we must never forget that with our power comes responsibility.

We cannot hope to solve all of the problems of all nations—nor even all of our own—but our way can become the way for more of the world's humanity. Our strength can become the guiding spirit of the smaller nations.

* * *

In the development of a sound American foreign policy, let us take care not to attempt to control the destinies of other nations. Let us remember that we must set the example of self-determination of independent, free peoples.

Freedom is essential to international peace; and free competition—whether it be between individuals, between businesses, or between nations—is the mainspring, the synchronizer, and the preserver of freedom. For competition always is synonymous with private enterprise.

We are not a covetous nation. We have no territorial ambitions. Our international commercial aspirations are dominated by the conviction that we have a great stake in world unity and world prosperity. We know that we can no longer live apart from other nations and that we cannot ignore the fundamental elements which affect the well-being of other countries.

Our foreign policy must encompass a world of trade, and help develop it.

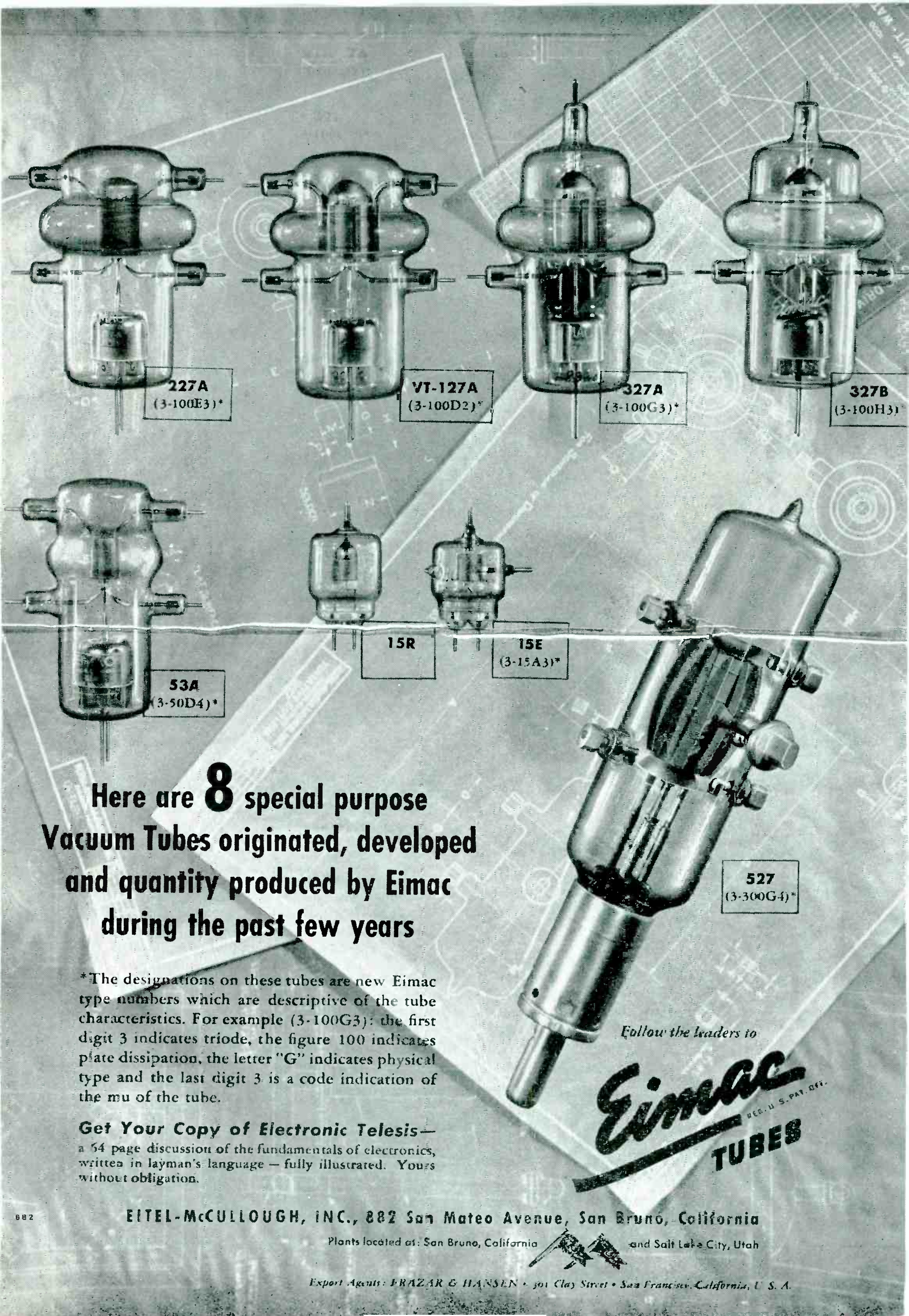
We dare not blunder in the execution of that foreign policy if the American way of life is to survive. A democracy resolved upon isolation is doomed in the world of tomorrow.

Let us resolve that out of this devastating catastrophe we shall emerge with fuller understanding and greater determination to build the kind of world which can materialize only if this country has the vision and the will to see it through.

We still are free to decide our own fate—still free to shape our own future. We still are free to preserve the liberty and happiness that has made our country the hope of the world.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.


227A
(3-100E3)*
VT-127A
(3-100D2)*
327A
(3-100G3)*
327B
(3-100H3)*
53A
(3-50D4)*
15R
15E
(3-15A3)*
527
(3-300G4)*
Here are 8 special purpose Vacuum Tubes originated, developed and quantity produced by Eimac during the past few years
*The designations on these tubes are new Eimac type numbers which are descriptive of the tube characteristics. For example (3-100G3): the first digit 3 indicates triode, the figure 100 indicates plate dissipation, the letter "G" indicates physical type and the last digit 3 is a code indication of the mu of the tube.
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a 64 page discussion of the fundamentals of electronics, written in layman's language — fully illustrated. Yours without obligation.
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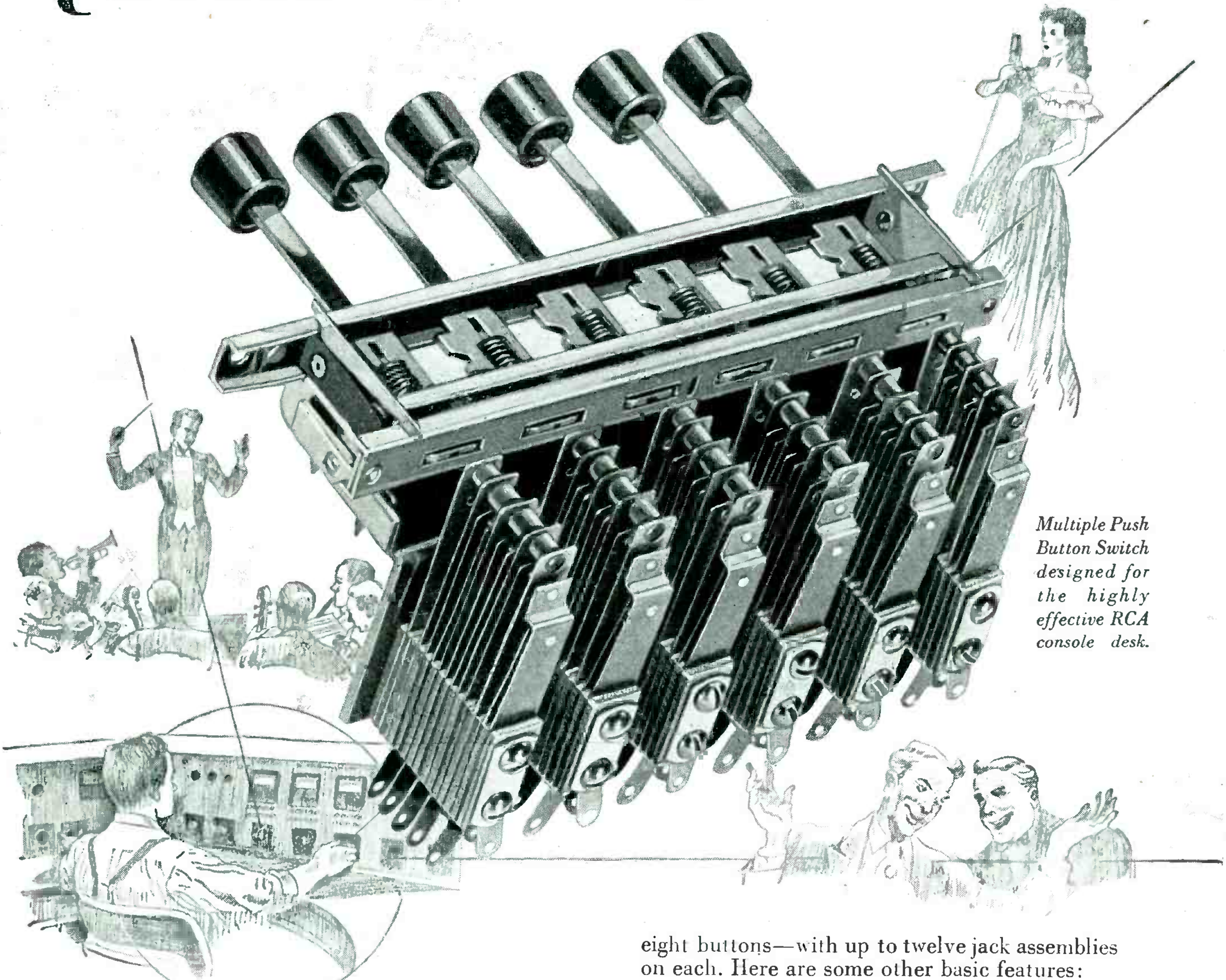
QUICK CHANGE ARTIST



Multiple Push Button Switch designed for the highly effective RCA console desk.

"Quick Change Artist" may be a somewhat fanciful title, but it helps to describe this Mallory multiple push button switch which was originally designed to perform lightning changes in network programs. Installed in the broadcasting studio console, several circuits could be completed instantaneously.

There's another way in which this switch lives up to its name. It's adaptable to many other applications—particularly those having to do with testing equipment for vacuum tubes and other electronic parts. It has a capacity of up to eight buttons—with up to twelve jack assemblies on each. Here are some other basic features:

- **Case hardened parts throughout.**
- **Low-resistance—achieved by silver contacts that have a wiping, self-cleaning action.**
- **Adaptability to audio and DC circuits, relay and meter switching, monitoring, public address and studio console switching.**
- **Availability in latching or non-latching types.**

You are invited to check these features against your own requirements—and to call on Mallory's extensive experience in meeting unusual switching needs. It's amazing how often Mallory products, already serving one phase of industry, can be readily adapted to other phases, solving the most difficult problems. Just send a sketch or description of the installation you have in mind.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving the Aviation, Electrical, Electronics and Industrial Fields

P. R. MALLORY & CO. Inc.
MALLORY

ARMY E NAVY

The Best War Buy Is War Bonds

Approved Precision Products

CROSS TALK

►**BATTLE** . . . The lines are now being drawn for the next battle of television.

Heavy artillery, and smoke screens, are being brought to bear on the followings points of view: (1) Television should start off at the end of the war with present-day standards and on present-day frequencies. (2) Television should wait another year or two for further research to make sure that the ideal system has been developed. (3) Television should go to much higher frequencies so that greater detail and color will be possible.

Manufacturers of radio receivers in general are on the side which feels that the sooner television gets going, the better. Enthusiasts for FM are on the side of those who say "Wait. The final system has not yet evolved. Put television on the higher frequencies." CBS prefers that television go back to the laboratory (See New York Times May 3, letter to the editor from Paul Kersten.) NBC prefers that television get on the air quickly and that the future be allowed to take care of itself.

Very little is said about the effects of multipath transmission within cities where such anomalies become very troublesome as the frequency is raised and as the band width is increased. FM enthusiasts cannot speak without bias—they have their eyes on at least one of television's present channels. Opinions of eminent psychologists or color experts who state that color will add immeasurably to the value of television can be discounted. The movies got along for many years without color, and many effective movies are presented in black-and-white today.

No one can doubt the desirability of a 1000-line picture, brighter, bigger, steadier than is possible today. Full color is desirable. No one can doubt that manufacturers will be hungry for television sets to sell; nor that many citizens returning from the war will want jobs designing, building, selling and servicing television receivers or working in television stations. No one can doubt that the public will not wish to buy an expensive receiver likely to be obsolete the following year.

The questions that must be decided are: (1) If television goes back to the laboratory, what will be its status in one, two or three years? (2) Will the delay be worth it? (3) What happens to frequency assignments in the meantime? (4) If television is put on 300–1000 megacycles, will the transmission difficulties ruin the advantages gained by use of the wider bands available? (5) What is the chance that television receivers operating on present standards will become worthless within one, two or three years because of further research? (6) Will television sales on present standards inhibit further progress?

Such questions must be studied by the RTPB and then by FCC before the television battle is finally won.

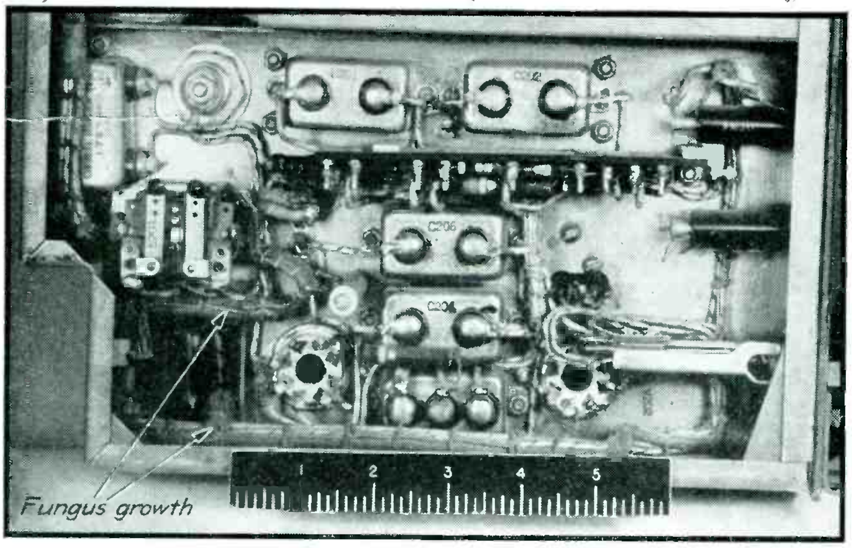
►**MORSE** . . . On May 24, 1844, just 100 years ago, Samuel Finley Breeze Morse tapped out his historic telegraph message, "What hath God wrought!" Within the century that followed the entire world has been tied together with wires, tenuous but sure avenues of communication between peoples of different races and lands. In spite of great skepticism and ridicule the inventor brought his work to a successful conclusion.

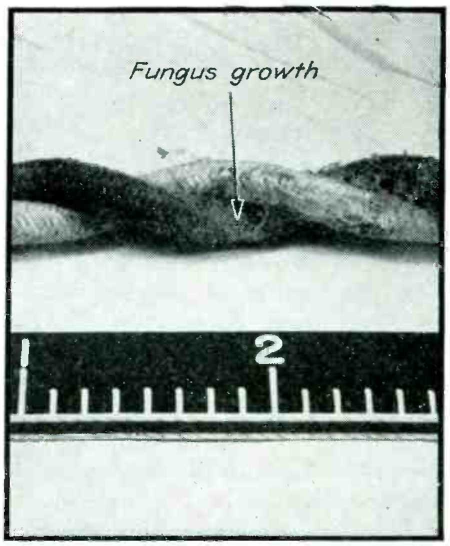
In the general acclamation over this centenary of Morse's invention of the telegraph and in the general criticism of the Kilgore bill which puts the government in the research business, no one seems to have remembered that only through a grant of $30,000 to Morse by the Government was the development accomplished. Commercial companies saw no prospect of profit in the idea of connecting cities together by wires.

Not only is this a precedent for Government financing of research, but the reported $135,000,000 per year which is being spent by Government through NDRC for wartime research is another precedent. Only the post-war revelations of NDRC accomplishments will enable us to assay the benefits therefrom.

Fungus-Proofing

Electronic equipment used in the tropics frequently fails because serious leakage-paths are introduced by molds thriving under conditions of high relative humidity. Fungicides suitable for use in protective sprays for chassis, and the organic vehicles which hold them in place, are discussed. Protective methods for component parts are also suggested





Interphone amplifier section of Signal Corps SCR-528 radio set, showing fungus growth on cabling, and close-up of twisted-pair

TROPICALIZATION, or the moisture and fungus-proofing of electronic equipment, has been under investigation for many years. It is of considerable immediate importance and will also have much to do with the performance of American apparatus in the post-war period.

A pin-hole in the protective coating of a capacitor or coil may cause no difficulty in a dry climate. But in countries where the normal relative humidity ranges around 90, with the thermometer hovering close to the 100 deg mark and condensation taking place each night, such an opening is certain to represent trouble.

It cannot be pointed out too strongly that moisture-proofing alone is rarely adequate protection in tropical climates. The material used for protecting equipment against moisture must not itself provide a home and food for fungus. This fact has frequently been overlooked. Many growths affecting equipment performance in, say, the South Pacific, may not be native. They may be transported in a dormant state from the United States, becoming active when encountering a favorable combination of humidity and temperature.

Common Equipment Failures

Among components that give trouble are:

Paper Capacitors—Wax coating frequently ruptures, and moisture lowers the insulation resistance.

Metal-Case Capacitors—Some seals do not adequately withstand moisture, and seepage occurs.

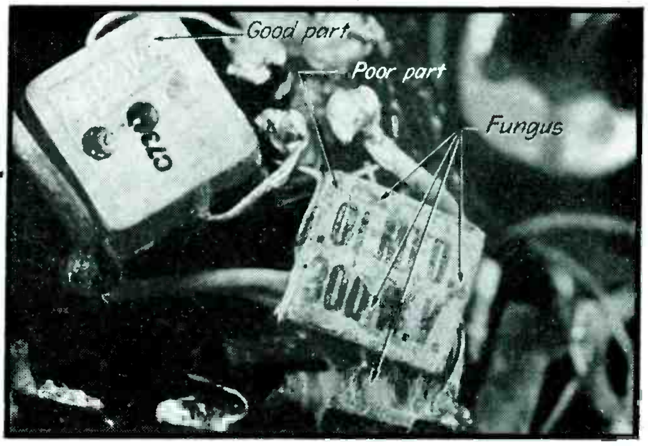
Transformers—Absorption of water sometimes takes place through cracks in the impregnation, thus lowering insulation resistance. Resistance between windings may drop from several thousand megohms to a few thousand ohms in less than a week. A heavy rainstorm may cause this in one night.

Cotton-Braided Wire—Unprotected insulation becomes saturated with moisture and creates propagation places for all types of mold. Growth takes place rapidly and, as fungus retains water, the surface

TYPICAL VEHICLES

- Nitrocellulose Lacquers
- Mixed Cellulose Ester Lacquers
- Natural Gum Varnishes
- Phenolic Varnishes
- Vinyl Lacquers
- Urea and Melamine Enamels
- Styrene Lacquers
- Alkyd Enamels
- Hydrocarbon Resin Lacquers
- Rubber Resin Lacquers

Procedure



Close-up of two capacitors in Signal Corps SCR-610 equipment, showing how moisture-proofing material provided a home and food for molds in one case while the other component part was unaffected

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insulation may develop a resistance of a few ohms per yard.

Molded-Phenolic Pieces—Many fillers absorb considerable amounts of water, causing the parts to swell and at times to break up. Short circuits may also occur through the pieces.

Laminated-Phenolic Parts—Canvas or cotton-base laminated sheet, due to wick action of the textile, may aborb water at a rapid rate, causing the adhesives to loosen, and the laminations to separate.

R-F Coils—Leakage paths often occur between terminals when laminated phenolics are used to support the terminals, and the "Q" of the coil is sometimes seriously affected.

Research Approach

Much of the difficulty experienced with sets in use in tropical climates is caused by wax, a material which offers food and lodging to most bacteria. As many component parts are wax-filled or wax-coated, a toxic over-coating for completed assemblies had to be devised which would not appeal to fungi, and which would at the same time moisture-proof all parts.

It appeared that tropicalization must be divided into two phases; one, the overall treatment of assembled sets, and two, the coating of individual component parts (especially those in reserve stores). Research work was undertaken and the program was divided into the following headings:

(1) Investigation of Protective Lacquers
(2) Investigation of Fungicides
(3) Investigation of Specific Component Part Insulation
(4) Investigation of Protective Methods Other Than the Use of Organic Coatings

Organic Vehicles

After consultation with manufacturers of raw materials, 39 types of organic vehicles were selected for test, together with 29 fungicides.

The main goals sought after in vehicles were:

(a) *Low Vapor-Permeability.*

The maximum practical diffusion constant should be, we believe, 2.5×10^{-8} with a film thickness of about 0.003 in. Beyond that figure there appears to be danger of vapor penetration.

As a check on vapor-diffusion tests, 6 by 2-in. low-carbon steel panels were coated and, after thorough drying, were immersed for two weeks in distilled water. Some of the vehicles so tested fell by the wayside within 48 hours. Eight of those with 15-minute drying-time prevented corrosion of the metal, including two showing the best vapor-diffusion constant. On a few panels the results of the immersion tests were at variance with vapor-diffusion tests. Of the vehicles with satisfactory moisture-resistant qualities and fast-drying performance, the investigators selected one that had minimum variation between wet and dry dielectric strength.

(b) *Minimum Solvent Action.*

Many organic vehicles require strong solvents that would irreparably injure certain component parts. Among these solvents the most severe are ketones and esters. Alcohols and hydrocarbons are the least severe.

(c) *Rapid Drying-Time.*

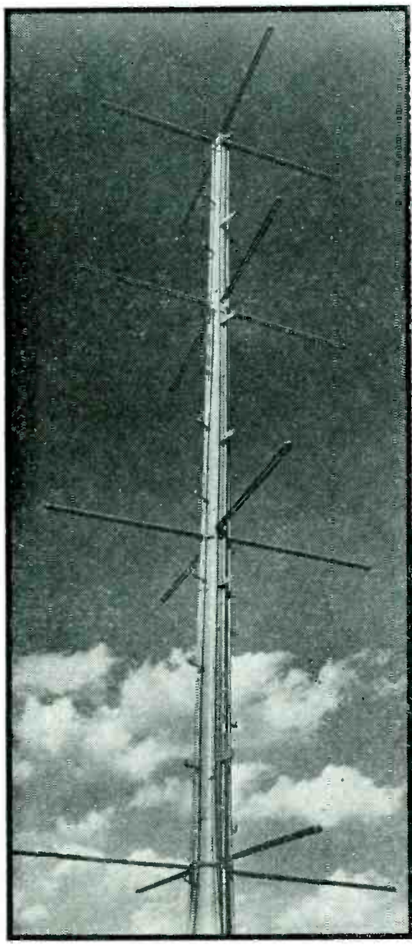
Minimum drying time is obtained from lacquers, several hav-

(*Continued on page 224*)

TYPICAL FUNGICIDES

Bordeaux Mixture	Mercuric Oxide
Copper Phosphate	Copper Thiocyanate
Cuprous Oxide	Phenyl Mercury Oleate
Copper Acetate	Phenyl Mercury Acetate
Mercuric Chloride	Phenyl Mercury Nitrate
Ethylene Chloride	Phenyl Mercury Borate
Carbon Disulfide	Silver Chromate
Ethyl Mercuric Chloride	Ethyl Mercury Oleate
Phenols	Para-Formaldehyde
Hydrocyanic Acid	Para-Dichlorbenzene
Copper Oleate	Chlorinated Phenols
Copper Naphthenate	Ethylene Oxide

FREQUENCY MODULATION



Analysis of the probable post-war growth of f-m broadcasting in the United States. Twenty million receivers and 2000 transmitters expected to provide high-quality nation-wide coverage, with equal day and night service, five years after the war ends

THERE ARE NOW on the horizon two new services for the broadcaster to offer to his audience. One of these is frequency modulation, the other is television. Both of these had some start before the war and f-m, in particular, made considerable progress. The impact of the war on television, plus its relatively unsettled state before the war, can result in a re-examination of television after the war to the point where it may not become an immediate public service.

Frequency modulation is not encumbered with any problems which will affect service now being rendered to the public or which will delay or hold up its immediate post-war expansion. Since frequency modulation is nearest on the horizon, it is proposed to discuss its possible practical effects on the broadcaster and some of the reasons why the broadcaster should not only do post-war thinking, but post-war planning on f-m in the interest of maintaining himself in business.

The Federal Communications Commission promulgated a complete set of rules for f-m which set it up as a business on the same substantial level as a-m broadcasting. All available channels were snapped up quickly in some parts of the United States by farseeing interests both in and out of the present broadcasting business.

It is very likely that additional channels will be provided. F-M channels now are situated between 42 and 50 Mc. It is possible that this space may be extended to 56 Mc, which would almost double the present number of channels. This would make possible a great expansion in the numbers of broadcasting stations in any one locality. It would also make possible the entry of new people into the broadcasting business and could also remove inequalities of assignments which some broadcasters feel exist in the older a-m structure. Many broadcasters, now having what they regard as inferior assignments, and anxious to improve their position, would have the opportunity to do so. The soundness of this reasoning has already been proven in at least one large city.

Evaluation of Post-War Broadcasting Industry

To evaluate properly the post-war broadcasting industry, it will be necessary to estimate, as well as one can, the number of f-m receivers and the number of f-m stations which may reasonably be expected to be in operation five years after the war. It will be necessary to make some estimate of the burden which f-m will place on the electromagnetic spectrum.

To be able to convey our proposals for f-m service in terms of a-m service with which the average man is already familiar, some comparisons between the two types of service will also be in order. To orient our thinking in this matter, consider the present status of frequency modulation as given in Table I. Scattered and uncorrelated as this data is, it nevertheless indicates the beginning of a pattern which may be followed in our quest for data on f-m broadcasting.

Based on the experience of a-m broadcasting, Fig. I and Table II provide some clue as to the degree to which United States homes may be provided with radio receivers. Because of the difference in propagation characteristics between the a-m band and the channels available for f-m service, Fig. 1 and Table II cannot be used directly to provide comparable data for f-m broadcasting. If, however, we assume that we can conveniently and economically serve all of the population in the Northeastern States, all in the North Central, all in the Pacific and one half of those in the Southern States, 105,000,000 persons or 28,000,000 homes will be available as a market for f-m broadcasting. This represents the market which, under present conditions, can be served economically.

Not all of the 28,000,000 homes can be served by f-m broadcasting

and Its Post-War Future

By J. E. BROWN *Assistant Vice President, Zenith Radio Corporation, Chicago, Ill.*

in the period immediately following the end of the war. Economic consideration indicates that the large metropolitan areas will probably be provided with service first.

Estimate of Number of F-M Receivers

Approximately 67,000,000 persons (or 51 percent of the population of the country) live in metropolitan areas and, from a marketing point of view, will be ready for widespread f-m service as soon as it can be provided. This represents 17½ million homes. About 10 percent of these homes will probably not have radio receivers, leaving a total of about 16,000,000 dwellings as an immediate potential post-war market in metropolitan areas. Within five years after the end of the war, the 28,000,000 homes in the regions designated above should be supplied with adequate f-m service.

Within a five year period two-thirds of these families may be expected to own f-m receivers. It may be noted that approximately 90 percent of these homes are already equipped with a-m receivers. A total of 18,600,000 receivers appears reasonable at the end of five years on the basis of a static population. The Census Bureau predicts a 14 percent increase in the number of families from 1940 (for which our statistics apply) to 1950. By 1950 as many as 21,000,000 families may be expected to own f-m receivers. From this reasoning we arrive at a figure of between 18,000,000 and 22,000,000 f-m receivers in American homes within five years after the war.*

There is another factor to take into account which will probably place the figures calculated above on the conservative side. By 1933, after about ten years of a-m broadcasting, more than 20,000,000 homes had radio receivers. This growth took place in a period when the average production of radio sets was about 2,630,000 receivers per year, and when the cost of radio receivers (particularly in the early part of that decade) was relatively high. As a result of considerable development in f-m equipment for war purposes, and more than adequate and well organized production facilities, the cost of f-m receivers in the period following World War II will be far less than the cost of a-m receivers produced after World War I, and they will produce infinitely superior results. Furthermore, Table III shows a pronounced tendency to have more than one radio set in American homes, which would further tend

* Data for calculating the number of f-m receivers is taken from the 1940 census. Data for estimating the number of transmitters is taken from population figures for 1943 ration book, Series P3, No. 38, "Estimated Population as of March 1943".

TABLE I—PRESENT STATUS OF FREQUENCY MODULATION

1. There are 51 f-m stations operating on a commercial program basis
2. There are at least 10 experimental and educational stations on the air
3. More than 50,000,000 people reside in the areas now served by f-m stations
4. Approximately 120 applications for construction permits or re-instatement are now on file with the FCC
5. A recent survey indicates that 144 companies plan to open f-m stations as soon as possible after the war
6. Applications for f-m stations cover districts ranging from the 2500 square miles with a population of 500,000 proposed for Springfield, Massachusetts, to the 69,400 square miles with a population of 4,346,000, eventually to be covered by the Gordon Gray station on Clingman's Peak in North Carolina
7. There are more than 600 principal trading centers in the U. S.
8. There are 137 metropolitan areas, made up of densely populated divisions in and around cities of 50,000 or more inhabitants. These areas include 237 metropolitan counties which contain more than half the nation's population
9. There are over 1000 cities of 10,000 population or more. At least two-thirds of these are sufficiently distinct from the metropolitan areas to support f-m stations
10. Power-for-power, an f-m station will frequently provide superior coverage up to and somewhat beyond the primary service area of regular a-m broadcasting stations
11. The service area of a 250-watt f-m broadcasting station is more than 4 times that of a 250-watt 1000 kc a-m broadcasting station at night

TABLE II — GEOGRAPHICAL DISTRIBUTION OF POPULATION

Northeastern States	35,914,000
North-central States	40,094,000
Southern States	41,504,000
Pacific States	9,675,000
Mountain States	4,133,000

to make the above estimate conservative.

Outlook for F-M Transmitters

Certainly there will be no f-m receivers in operation if there are no transmitters available for originating program material. This brings us to a discussion of the number of f-m transmitters which can be profitably placed into service. Such an analysis can be made by considering only those factors contributing to the public requirements for f-m service. However, any estimates based on this assumption alone must be guided by the availability of suitable f-m channels. Particularly at the present time when problems of frequency allocation are under consideration, study of both of these problems may be useful in appraising the number of channels which should be made available for f-m service.

Based entirely on our present view of radio broadcasting and the services rendered by broadcast stations, it is possible to look forward to a continuous growth until approximately 1,900 f-m broadcasting stations are in operation. Other estimates place this figure at 2,000 stations. The major part of this growth should take place in the five year period following the war. As shown in Table IV, a total of 1899 f-m broadcasting stations (including 250 educational stations) should be built during this period.

Underlying these figures are the following three assumptions which are believed to be reasonable and representative of good engineering and economic practice:

(1) At the present time there are 22 channels allocated to Class B stations designed for coverage of areas comprising a basic trade area and a "principal city". Usually this area is composed of a principal city, one or more cities, and the areas adjacent to these cities. A Class B station would serve such cities as Chicago and New York.

(2) Assuming that a new band of 6 Mc is added to the group of Class B channels from 50 to 56 Mc for example, a total of 52 Class B channels will be provided, each 200 kc. wide. This is shown in Fig. 2.

(3) Good engineering practice dictates that stations in a given area should be separated by at least one channel. Thus, a maximum of 26 channels would be available in any given area.

F-M stations in any given locality are assigned channels on the basis of 3 stations for national network programs in addition to a block of stations based upon the population of the area to be served. For the largest metropolitan areas one station is allotted for every 200,000 persons whereas in the towns having from 50,000 to 100,000 persons, one station is alloted for every 75,000 persons. In Table IV, the mean population is taken as the basis for calculating the number of stations, except for the 12 largest metropolitan areas and the towns 50,000 or less. Calculations for the 12 metropolitan trade areas having a population of 1,000,000 or more are given in Table V.

Of the 250 non-commercial stations, 100 stations are allowed for various colleges and universities throughout the United States. Approximately 135 stations for the principal cities in the major metropolitan districts and 15 stations for smaller cities with active educational programs will be needed.

F-M Stations for Complete National Coverage

To give complete year-round coverage of the United States which will provide every listener with a reasonable choice of programs, at least 800 f-m broadcasting stations must be located in cities having a population of less than 50,000 persons. The geographical distribution of these stations in the various states should be made equitably upon the basis of the rural population to be served. This distribution

TABLE III—RETAIL RADIO SALES IN THE UNITED STATES

Year	Total Sets Sold		Homes With Radio Sets
1937	8,064,780		26,666,500
1938	7,100,000		27,500,000
1939	10,538,000		28,700,000
1940	11,150,000		29,300,000
1941	13,100,000		30,300,000
1942	4,400,000		30,800,000
Total	54,352,780	Increase in Homes With Radio Sets	4,133,500

TABLE IV—ESTIMATE OF REQUIRED NUMBER OF F-M STATIONS FOR U. S. SERVICE

Areas whose population is:	No. of such areas	Est. Mean Population	Population Served by Each Station	No. of Stations on Population basis	No. of National Stations	Total No. of Stations
1,000,000 or more	12	(See Table V)	200,000	145	36	181
400,000 to 1,000,000	27	700,000	175,000	109	81	190
100,000 to 400,000	86	250,000	125,000	172	258	430
50,000 to 100,000	12	75,000	75,000	12	36	48
50,000 or less	..	....	75,000	....	...	800
			Commercial Stations			1,649
			Non-commercial stations			250
			Total			1,899

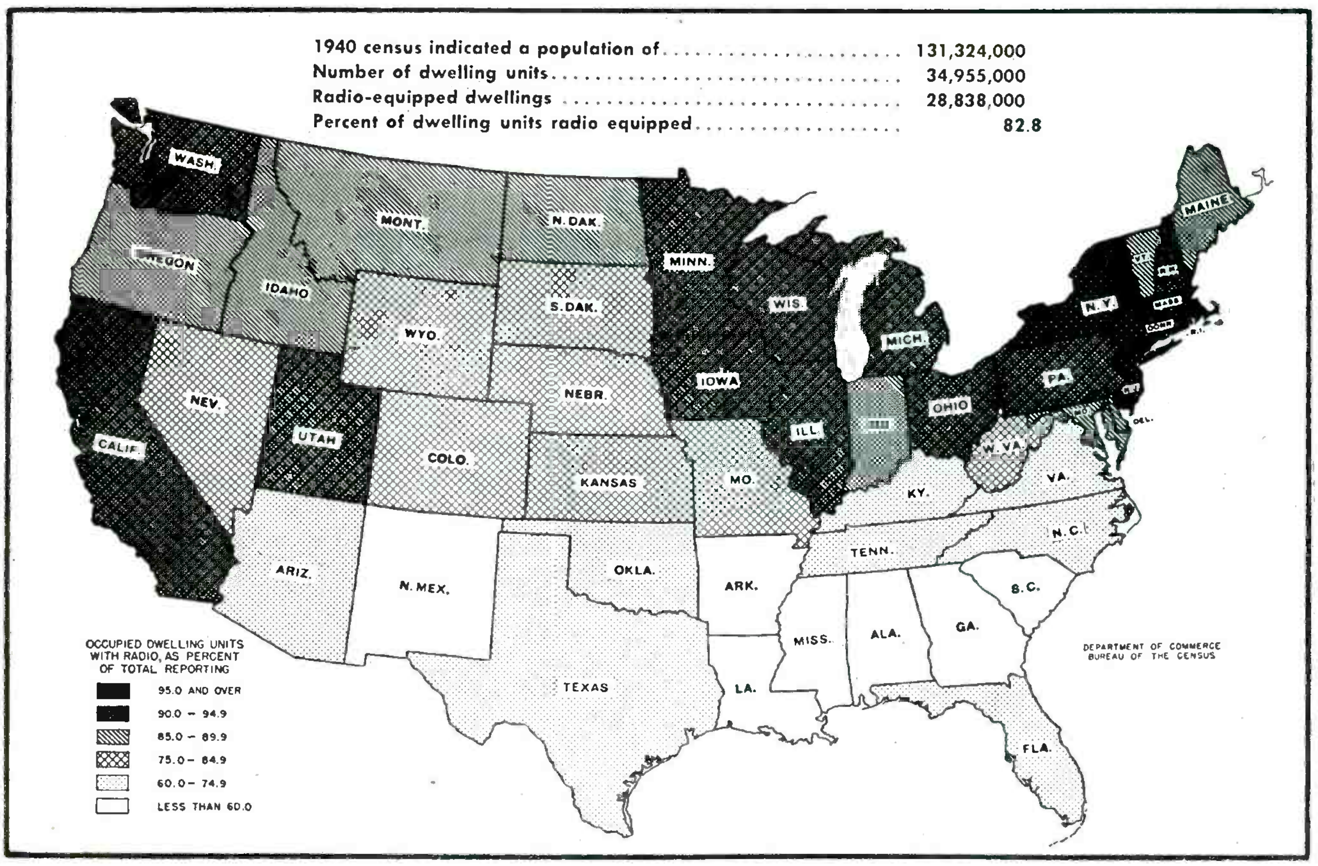


FIG. 1—Home radio receivers in the United States, by States, 1940

may be most easily worked out by subtracting from the total population of each State that population residing in concentrated trade areas serving 50,000 persons or more. Economic considerations may make it difficult to apply this method of reasoning to a few sparsely settled areas, but, generally speaking, the proposed method is believed to be sound in principle and entirely practical in its application.

The method of arriving at the number of stations required for rural population is based on the assumption that adequate service can be maintained by alloting one station for each 75,000 persons. The total civilian population of the United States, based on ration book No. 2 registrations,** was 128,231,000. Of these 68,403,000 persons live in the metropolitan areas of the United States; 59,829,000 persons live in the districts which do not include cities of at least 50,000 population. If we allot one station for each group of 75,000 persons of the 59,829,000 persons living in rural districts, we arrive at the figure of 800 stations required for rural use.†

The above figures, which indicate a rapid growth in the number of f-m stations until a total of something like 1900 is reached, are based on pre-war thinking in regard to transmitter installation and operating costs, and program availability and cost. Progress in these fields would greatly increase the number of stations which would be practical for use in the non-metropolitan areas. Under the f-m broadcasting system, the ability of a trading district to support a transmitter, rather than the availability of frequencies, should be and undoubtedly will be the major factor in determining how many stations will exist in a given area. The growth of f-m broadcasting in the days immediately following the war will be limited only by the availability of transmitters and receivers. At least 60 percent of the predicted growth of the number of transmitters should take place in the first three years following the war.

Comparison of F-M and A-M Service Areas

Many broadcasters have failed to become interested in frequency modulation because of an opinion, now thoroughly disproved, that the transmission range of an f-m station is limited to such a small service area as to represent an uneconomical undertaking. The facts of the case are that power-for-power, an f-m station will frequently provide superior coverage up to, and somewhat beyond, the primary service area of regular a-m broadcasting stations on a day-and-night, 365-day year basis. In fact, at lower powers and in the areas of low earth-conductivity, the service is superior.

The service area of most a-m broadcasting stations is now so limited by heterodynes and interference that an f-m station will offer better service, unless and until the f-m structure becomes so

** This data was issued by the Bureau of Census on October 31, 1943.

† The predicted number of f-m stations required to serve rural areas was originally based on an analysis of population distribution and economic factors existing in a number of typical states. The value of 800 stations arrived at by simple allocation of one station per 75,000 rural population checks closely with the figure secured by the more complicated methods of analysis.

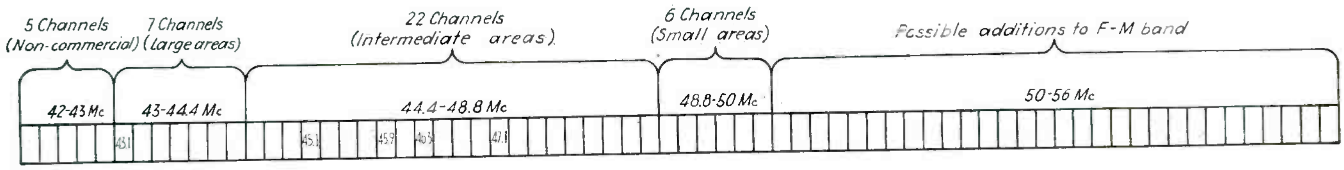


FIG. 2—Allocations in present f-m band and possible extension of the band

burdened with f-m stations as to make proper operation impossible from an engineering standpoint. This can be proven by listening to both services at night at some point fifty to sixty miles outside Chicago or New York, in which cities there are a large number of both f-m and a-m broadcast stations. In general, it will be found impossible to hear the local 100-watt, 250-watt and 1000-watt a-m stations at these distances, or if heard, signals will be burdened with heterodynes to the point where they have no entertainment value. The same situation will generally apply to 5000-watt stations. It will be found, however, that even those f-m stations operating on 1000 watts will give 100 percent service day or night, 365 days in the year.

Thus f-m stations can produce an interference-free quality service which even 50 kw clear channel a-m stations frequently fail to produce. These facts all apply to primary service areas — those areas in which, presumably, the broadcaster makes his living. These are the reasons why broadcasters not occupying clear channels will consider seriously the establishment of f-m stations when such installations can again be made.

Field Strength Determinations

So far, consideration has been given to a distribution of f-m stations on the basis of population, without regard to primary service area. Much has been written regarding the "line of sight" characteristics of transmission on high frequencies and it is logical to reason that this limitation would make the comparison even more unfavorable for f-m. This reasoning may entirely fail to give the correct answer, however, for it is necessary to consider all of the factors which influence transmission distances and which limit service areas. The more important of these factors are power, antenna height, directivity, soil conductivity and nature of the topography of the area to be served, and the strength of man-made or natural interfering signals.

Consider the case of the standard broadcast station operating, for example, on 1000 kc with a power of 250 watts and an antenna 200 feet high. Such a station could be expected to produce an effective field intensity of about 75 millivolts per meter at one mile. The lowest signal strength that will give satisfactory broadcast reception is, of course, a function of the interference level at the receiver and will vary through wide limits. It has been general experience that a signal strength of 500 microvolts per meter gives a satisfactory signal-to-noise ratio in average rural locations for perhaps 90 percent of the time. This level is used by the FCC as the limit of good coverage.

If the figure of 500 microvolts per meter is used as the limit for satisfactory reception, and if we assume that the station is erected where average soil conditions exist, a non-directional antenna will provide a service area within a radius of about 39 miles, representing an area of 4,800 sq. miles. Since there are only a very limited number of broadcast channels available, a station of this type could not economically be given exclusive use of a channel and it would be necessary to assign other stations to the same channel. In so doing it is necessary to take into account both nighttime and daytime conditions.

Now, nighttime signals from a standard broadcast station may produce strong interferences with other stations at great distances. A station which produces a useful daytime signal at only 50 miles may seriously limit the service area of another station 2000 miles away at night.

TABLE V—PROPOSED ALLOCATION OF F-M STATIONS IN METROPOLITAN AREAS OF MORE THAN ONE MILLION PERSONS

Area	Population Served	Number of Stations (3, plus 1 for each 200,000 persons)
New York	10,991,000	26*
Chicago	4,532,000	25
Los Angeles	3,135,000	19
Philadelphia	2,962,000	18
Boston	2,692,000	16
Detroit	2,566,000	16
Pittsburgh	2,082,000	13
San Francisco	1,725,000	11
St. Louis	1,496,000	10
Cleveland	1,199,000	9
Baltimore	1,197,000	9
Washington, D. C.	1,179,000	9

* Maximum number of channels assumed in this analysis.

Interference Factors

In view of these facts, interference limits have been adopted by the FCC in an effort to make the best possible use of the limited number of channels which are available. In the example which just has been examined, the station would fall in the local Class III B group and nighttime protection would extend only to the 4,000 microvolt-per-meter contour. The radius for the 4,000 microvolt-per-meter contour is only about 11.5 miles, so that the nighttime service area has been reduced from 4800 square miles to only 414 square miles. The range has therefore been reduced until the nighttime service area is less than one-tenth of the daytime service area.

Let us consider the case of a 250 watt f-m transmitter operating with an antenna also 200 ft. high and having unity gain, and operating on a carrier of 46 Mc. Again, the useful range of such a station is partially limited by the prevailing noise level. As a result of the inherently low static level on 46

Mc and due to the advantages of f-m reception, a signal of 50 microvolts per meter has been found to give good service. On this basis adequate signal strength will be laid down for a radius of 24 miles, thereby serving an area of 1,800 miles either day or night, substantially independent of static level. The service area of the f-m station is thus more than four times that of the standard broadcast station at night. In the daytime, the f-m station would serve an area a little less than one-half of that of the standard broadcast stations.

In terms of completely dependable 100 percent coverage, this comparison is by no means unfavorable to the f-m station. Perhaps the most important consideration here is that the range of the f-m station can be extended by increasing the power, increasing the antenna gain, or by taking advantage of available tall buildings to obtain greater antenna height. This extension of local coverage can be obtained with negligible increase in the "nuisance range" of the station. Such extension or range for the standard broadcast station cannot be obtained without greatly increasing the skywave signal and consequent interference caused at great distances.

Soil conditions and frequency have a profound effect on the coverage of standard broadcast stations. For example a low-power regional station located in the central plains area of the United States and operating on a low frequency channel may have greater coverage than a 50-kw station in the New England area.

The Question of Fidelity

Much has been said about the fidelity of transmissions. There are some who say that the public is not interested in this fidelity. There are others whose thinking has been so superficial that they claim that improvement in broadcast receivers and speakers can make the a-m service the equivalent to the f-m service from a fidelity standpoint.

To those who question the public's interest in the higher fidelity of the f-m service, it can be said that enough practical f-m field experience is available to prove that higher fidelity does have definite public interest, and that it is liked and appreciated, and is a logical natural advance in radio progress.

To those who believe that the a-m service can be made to compare with the f-m service from a quality standpoint, it is pointed out that unless FCC changes the present a-m broadcasting structure, this can never be accomplished. Broadcasting stations now operate on channels spaced 10 kc apart. Radio receiver manufacturers must design their receivers with enough selectivity to separate one station from another. The best of receiver circuits do not dare be broad enough to accept the inter-station interference which exists half way between channels. This means that the fidelity of a-m broadcast receivers is defined and limited to something less than 5000 cycles. Improvements in speakers or circuits or any part of the system cannot overcome this limitation. It can only be overcome by spacing broadcasting stations further apart than 10 kc.

An engineering evaluation of proper spacing would indicate that stations ought to be at least 20 kc apart. Whether this can be done with the present broadcasting structure is extremely problematical. It is not believed that it can be done unless the number of broadcast stations assigned to the present a-m broadcast band is considerably reduced.

Primary Coverage with "Super Power"

At this point we might want to raise our sights to that level where f-m broadcasting can take over the requirements of primary coverage for broadcasting entirely. This could mean that only superpower stations would be licensed in the broadcast band. Let us say nothing less than 50 kw, and these on clear channels only. This would provide rural service throughout the United States which might not be generally available everywhere from a-m and f-m stations. The f-m service would provide a primary service in every locality in which it is established.

There are some who will say that f-m is an expensive service, that the receivers are complicated and that they are not available in small table models of a size and price comparable to a-m sets. The answer is clear. In the last five years of the radio receiver industry, nearly all receivers sold, whether they were $9.95 models or sets selling for hundreds of dollars, were superheterodynes. The initial comment made by the people in the industry 15 years ago, when superheterodynes were first proposed, was that they were complicated and expensive and could not be manufactured cheaply. There can be no question but what f-m receivers will follow this same pattern. Whether we like it or not, the laws of economics cannot be circumvented.

The question will then be asked, how can you produce high fidelity in a $9.95 f-m receiver? The answer to this one is that probably

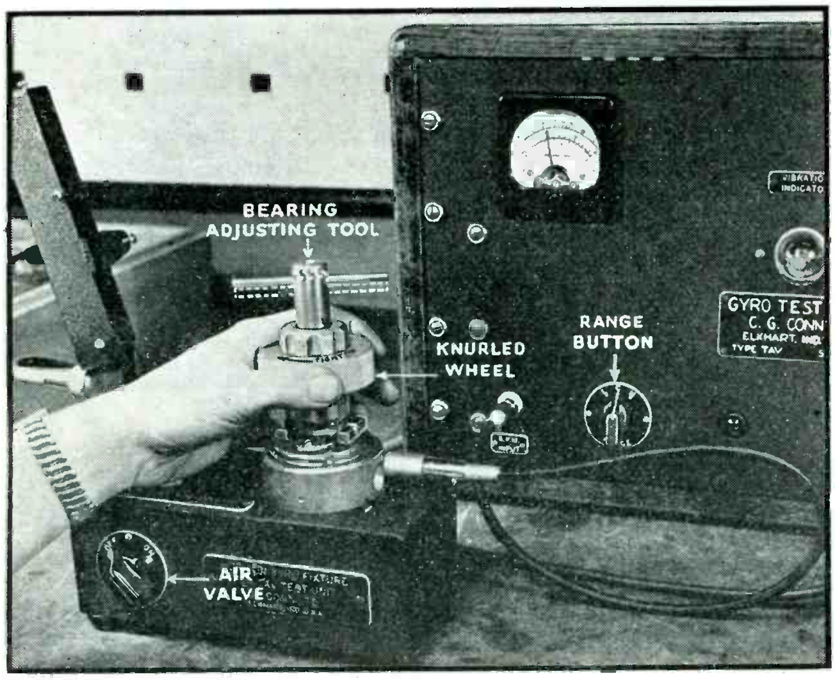
(*Continued on page* 262)

TABLE VI—CLASSIFICATION OF BROADCAST STATIONS

Class	Station Classification FCC Designation	Power in kw	Field strength (μ per meter) for which protection is assured: Day	Night
Dominant Clear Channel	IA	50	100	Not duplicated
Dominant Duplicated	IB	10–50	100	500
Secondary	II	1/4 to 50	2500	Not operated
Regional	IIIA	1 to 5	500	2500
Regional	IIIB	1/2 to 1 night, 1 to 5 day	500	4000
Local	IV	0.1 to 0.25	500	4000

AN ELECTRONIC Tachometer, Accelerometer and Vibrometer

Utilizing principles applicable to many industrial problems, unit cuts time of testing gyroscope rotors to small fraction of that previously needed. Electronic device rapidly and accurately measures rotational speed, acceleration, and vibration



Bearing adjustments can be made to permit a gyro to coast from full speed to rest in a specified time, indicated on the meter. Such adjustments can be made in a few seconds, whereas previous practice was to measure coast time (in the neighborhood of ten minutes) and then make successive adjustments after the gyro had come to rest

INCREASED SPEED of production, coupled with the need for greater precision in manufactured products of recent design, necessitates improved methods of inspection. In the case of gyroscope rotor assemblies manufactured by C. G. Conn, Ltd., the units must be tested without any appreciable load being applied to them. In such cases, electronic methods afford an excellent means of carrying out the necessary tests.

The Conn gyro test unit is designed primarily to assist in adjusting and testing gyroscope rotor assemblies and combines in one unit the functions of a tachometer to indicate rotor speed, an accelerometer to indicate the rate of change of rotor speed, and a vibrometer to indicate visually and audibly the vibration present in a rotor assembly. The principles involved are applicable to a wide variety of industrial problems.

A functional block diagram of the essential elements of the test unit are shown in Fig. 1. The rotor under test is mounted in a fixture and, by means of an air jet, is rotated at a fairly high speed to simulate operation in a gyro-horizon indicator or directional gyro. Two pickups are mounted in the fixture in such a manner that rotation of the rotor produces varying voltages in each of the pickups.

Voltage from the crystal pickup, employed to operate the vibrometer, is fed to a Class A amplifier whose output feeds a peak-discharge circuit using a gas tetrode. The plate circuit of the gas tetrode operates a peak-vibration indicator lamp. The output from the Class A voltage amplifier also feeds a Class A power amplifier which operates a speaker. The indicator lamp and speaker are used to provide visual and aural indications of the vibrations occurring when the gyro rotor is set in motion.

Voltage from the electrostatic pickup is employed to operate the tachometer and accelerometer circuits. The tachometer, or frequency indicating channel, measures the speed of rotation of the gyro rotor. It consists of four electronic elements: (1) a Class A voltage amplifier for increasing the magnitude of voltage obtained from the electrostatic pickup, (2) a Class C limiter amplifier which

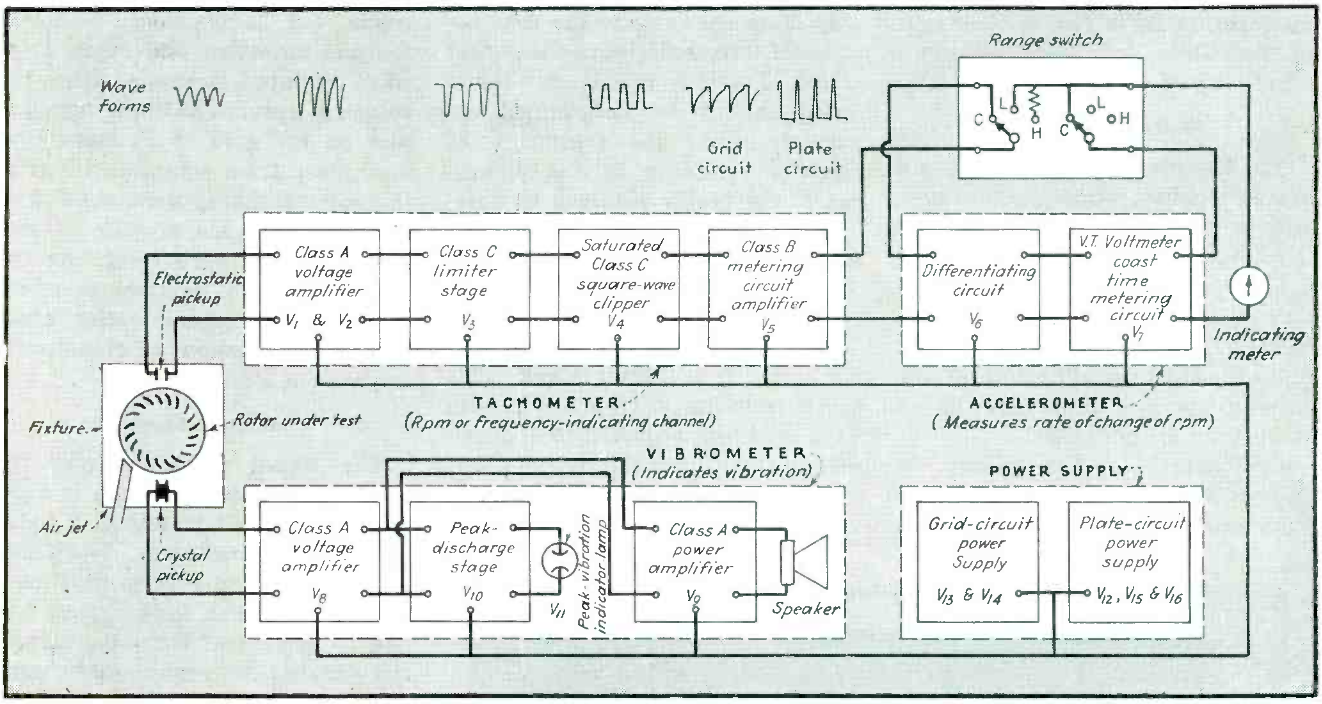
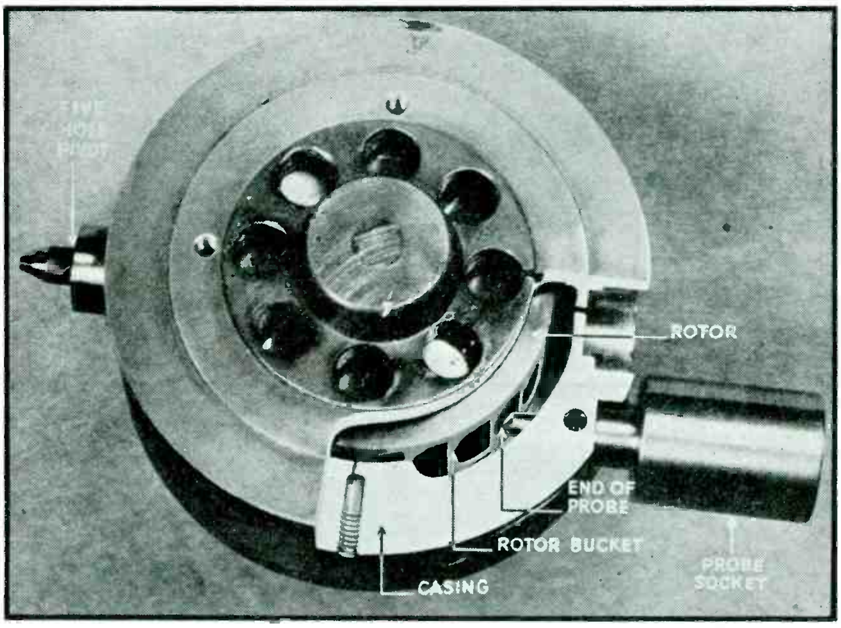


FIG. 1—Block diagram illustrating functional elements of tachometer, accelerometer, and vibrometer. The curves at upper left illustrate oscillographic wave forms observed in portions of the circuit above which they appear

FIG. 2—Cut-away view of gyro rotor showing probe pick-up arrangement →



provides additional gain and introduces some limiting action, (3) a saturated Class C square-wave clipper whose output is essentially a rectangular wave, and (4) a Class B metering-circuit amplifier that produces a series of sharp pulses or peaks of plate current.

The output of the tachometer is fed to a range switch and when this switch is on position L or H, the tachometer is connected to an indicating meter which averages the energy of the pulses from the metering circuit and reads low or high values of rotational speed. The number of pulses is proportional to the speed of the gyro rotor, hence the meter indication is also proportional to the gyro rotor speed.

When the range switch is placed on position C the output of the tachometer is fed into the accelerometer, which measures the rate of change of rotational speed. The accelerometer consists of two electronic elements: (1) a differentiating circuit whose output is proportional to the acceleration rather than to the speed of the gyro rotor, and (2) a vacuum-tube voltmeter or amplifier whose plate circuit feeds the indicating meter.

The wave forms at the top of Fig. 1 indicate the voltage wave forms existing in the various circuits with which they are associated.

Electrostatic Pick-up

Considering the tachometer and accelerometer portions of the circuit, rotational speed input is obtained from an electrostatic pickup placed close to the rotor vanes or buckets.

The rotor constitutes one electrode of the electrostatic pickup while the second electrode is a small probe, shown in Fig. 2. As the rotor buckets (or vanes) pass by the probe, the change in capacitance between the probe and the vanes causes a displacement current to flow through the series resistor R_1 of Fig. 3. The voltage drop developed across R_1 is fed to the input of the Class A voltage amplifier, consisting of V_1 and V_2.

Voltage Amplifier

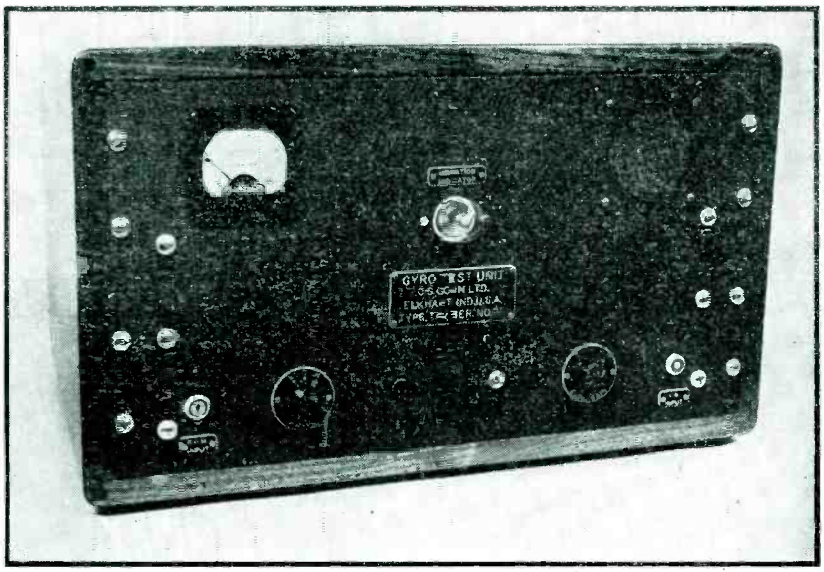
The voltage amplifier circuit is a conventional resistance-coupled type with a gain of approximately 100 per stage. This circuit operates as a Class A amplifier for input signals of less than about 10 millivolts but V_2 clips off the top of the signal and commences modification of the wave shape for input signals of more than 10 millivolts.

Oscillograms of the voltage obtained from the gyro vanes show that the voltage varies considerably from one cycle to the next because of irregularities in the bucket strips. For this reason, rotational speed cannot be determined accurately from the frequency of electrical voltages in the pickup, but is preferably obtained by integrating clipped pulses in the manner to be described.

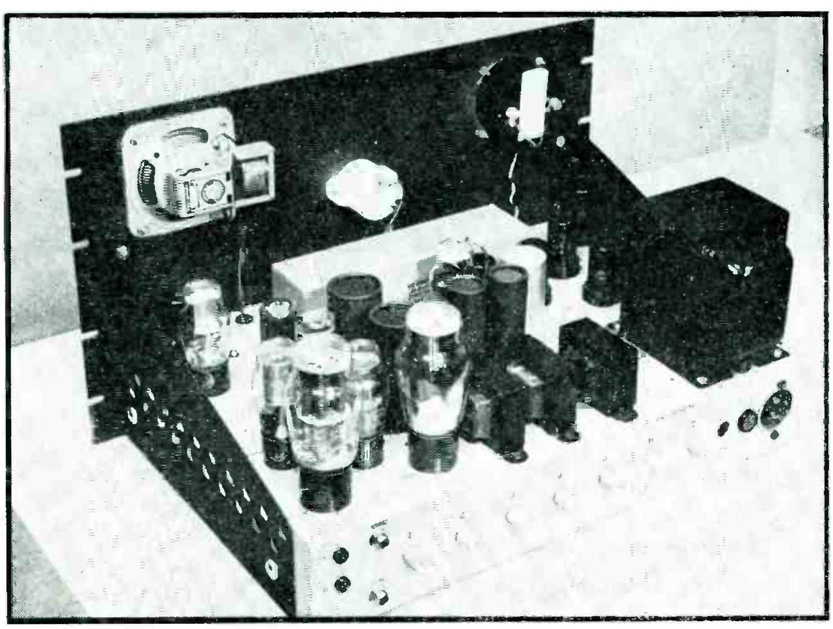
Limiter Stage

The output of the voltage amplifier is fed to a limiter stage. This stage contains a triode, V_3, with fixed grid bias adjusted to approximately four times the cut-off value, or about 20 volts for a 6SF5.

The limiter stage functions to block out extraneous voltages, thermal agitation and other noise when no input is applied from the rotating gyro. The high negative bias on the grid of V_3 stops low-level noise from actuating its grid, thereby stabilizing the operation of the circuit in the absence of signals from the gyro rotor. At the same time, V_3 contributes some squaring or clipping action since all negative portions of signal voltage are cut off.



Front-panel view of gyro test unit



Interior of gyro test unit

Clipper Stage

The signal obtained from the outpt of the limiter stage is relatively large and is fed to a saturated Class C clipper. The function of the clipper is to produce a wave of the same fundamental frequency as that of the input signal, but having a rectangular wave shape whose magnitude is independent of that of the input signal.

The signal voltage applied to the grid of V_4 is of such magnitude that on negative portions of the cycle the grid is driven beyond cut-off and the part of the wave more negative than that necessary to reach cut-off is eliminated. On positive peaks the grid is driven positive so that plate saturation is reached. The part of the wave more positive than that required to produce saturation is likewise eliminated. The resultant wave obtained from the plate V_4 is essentially rectangular. Slight rounding of the corners is caused by the loading effect of the coupling network to V_5. This rounding effect becomes more pronounced at high frequencies but does not interfere with proper operation.

The magnitude and shape of the square wave delivered by V_4 are practically independent of the magnitude or shape of the input signals, provided the input is greater than 2 millivolts. Most gyro rotors produce a voltage of 5 millivolts or more when used with the probe pickup already described.

Metering Circuit Amplifier

A study of the schematic wiring diagram of Fig. 3 might lead to the conclusion that the metering circuit is a conventional amplifier. There are important differences, however, since the metering stage further modifies the signal received

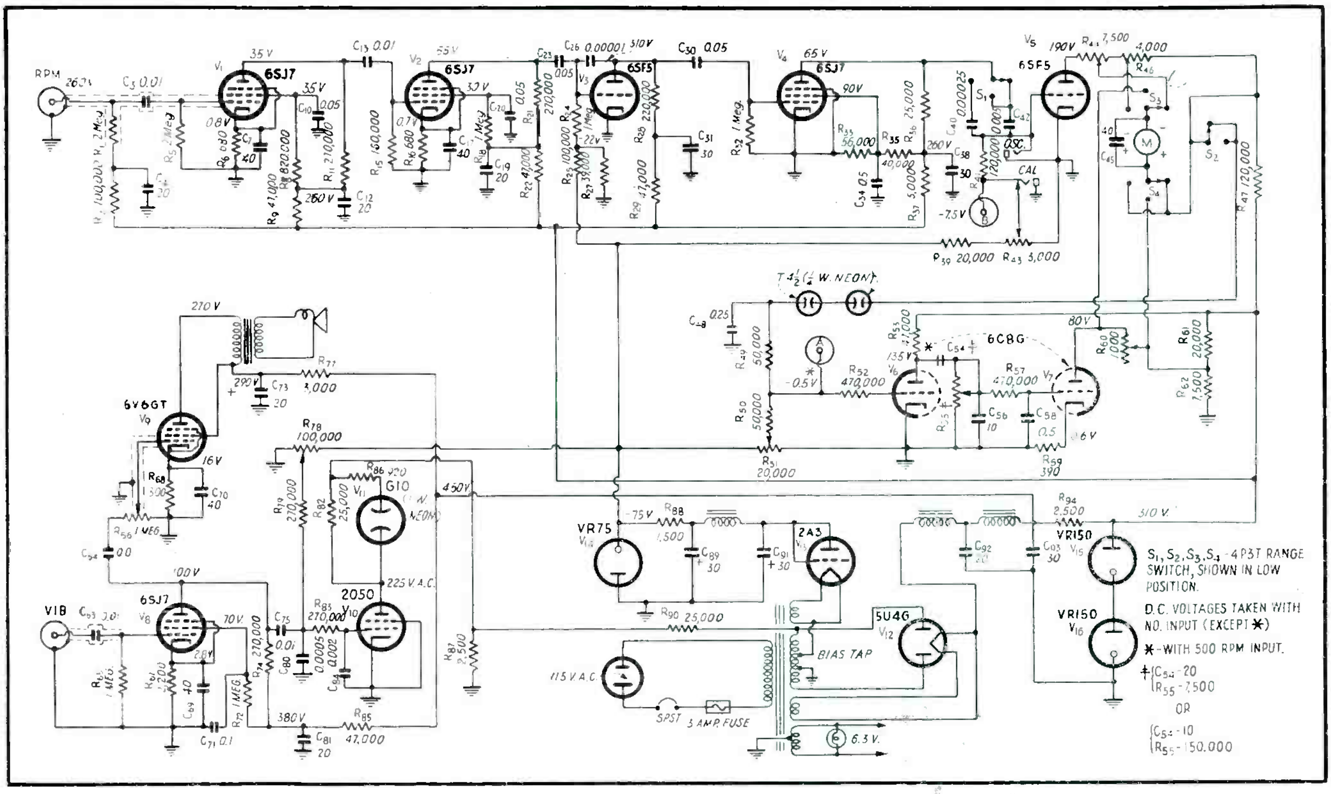


FIG. 3—Schematic wiring diagram of Conn electronic gyro test unit. The tube complement corresponds to the tube designations given in Fig. 1

from the clipper to form a series of sharp pulse waves of plate current of uniform height.

A fixed negative voltage, somewhat greater than cut-off is applied to V_5. With no signal input, therefore, V_5 draws no plate current. When a signal is applied, negative peaks merely make the grid more negative, while positive peaks cause V_5 to draw pulses of plate current.

The time constant of the input circuit to V_5, consisting of R_{41} and either C_{40} or C_{42}, is short, so that the coupling capacitor becomes fully charged at a time interval which is short compared to the period of pulses from the gyro rotor. Therefore, the current which flows through resistor R_{41} reaches its maximum value and drops to zero in a period of time less than the shortest half cycle of the input signal. A pulse of voltage is produced by the surge of current through R_{41} and this is applied to the grid of V_5. Pulses in a positive direction cause V_5 to draw plate current, while pulses in a negative direction are eliminated by the fixed-cut-off bias. Since the pulses of grid voltage are complete before the end of any half cycle, plate current pulses will all be the same in magnitude but there will be a larger or smaller number of them per unit time, depending upon the speed of the gyro rotor.

With the range switch set on position *L* or *H* (Fig. 1), output of V_5 in the metering circuit amplifier is connected to the indicating meter. The movement of the meter has sufficient mechanical inertia so that it cannot follow the rapid individual plate current pulses of V_5. However, it is able to produce a reading which is proportional to the integral, or average value of the plate current pulses. Since these pulses are of constant amplitude but vary in frequency, the meter reading will also be proportioned to the frequency and may be calibrated in terms of revolutions per minute. Plate current flowing through V_6 as indicated by the meter is a measure of the input frequency or speed of rotation of the gyro rotor.

With switch on position *L*, the meter indicates speeds of from 160 to 400 cps or 400 to 1000 rpm for a rotor having 24 buckets. With the switch on the high position *H*, frequencies from 2000 to 6,000 cps or speeds of 5,000 to 15,000 rpm may be measured.

Accelerometer or Coast-time Meter

When the test unit is used to measure coast-time (deceleration, or negative acceleration) the range switch is thrown to position *C* (Fig. 1). This connects the output of the tachometer to the differentiating circuit and vacuum-tube voltmeter of the accelerometer, while at the same time the indicating meter is connected to the output circuit of the vacuum-tube voltmeter, V_7.

Since the output of V_5 is proportional to the frequency of rotation of a gyro rotor, a differentiating circuit is required to produce a reading proportional to acceleration. The differentiating stage is intended to detect the slow change in plate voltage of V_6 encountered when a gyro rotor coasts.*

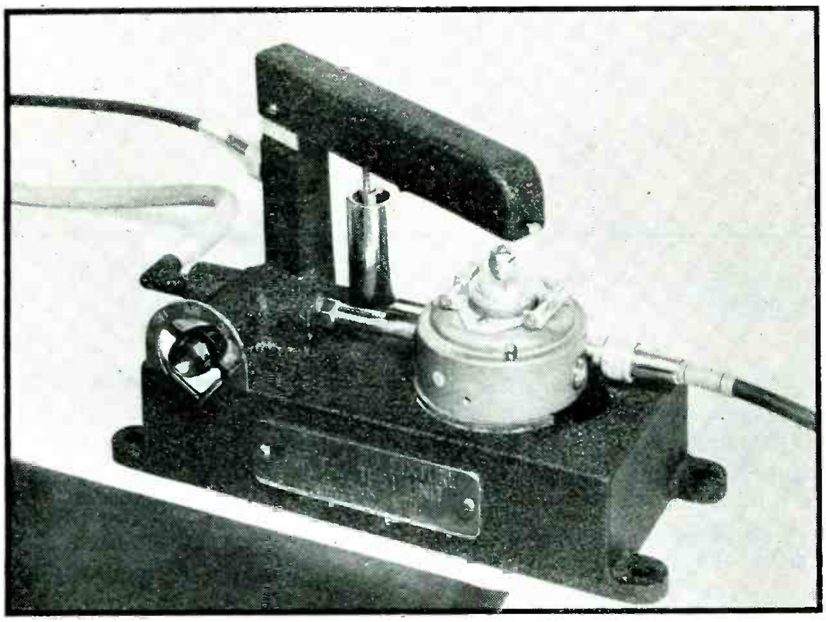
For such low frequencies, any reasonable coupling capacitor would introduce a serious error in the re-

* Ordinarily the rotor would coast for about ten minutes before coming to rest from an initial speed of about 10.000 to 13,000 rpm and require one to two minutes to coast from 1000 rpm to 500 rpm, the speed range used for deceleration measurements.

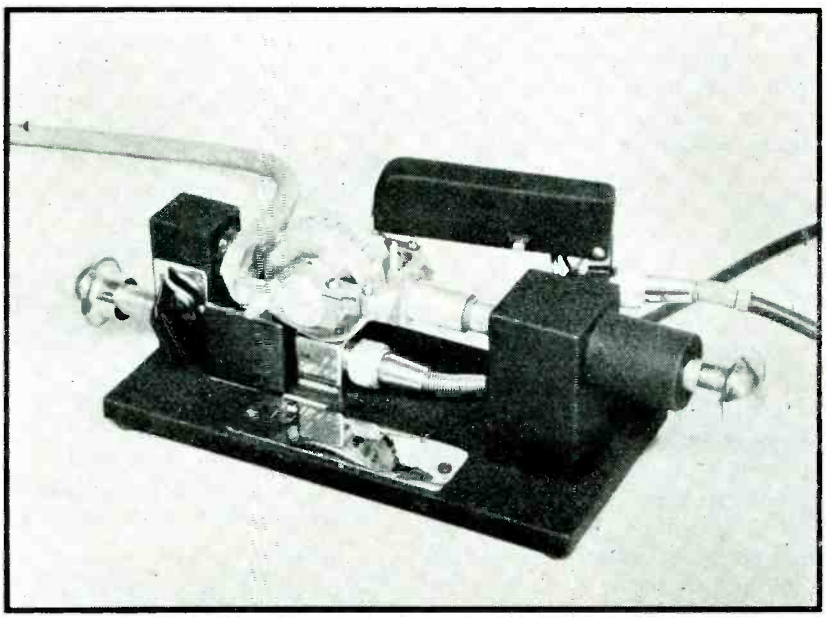
sponse of the differentiating stage. Therefore direct coupling is required, and this is accomplished by means of two neon glow—lamps, connected in series, and marked T-4½ in Fig. 3.

The voltage drop across a glow lamp is nearly independent of the current through it, within certain limits. This characteristic of the glow lamp makes possible a reduction in the absolute value of the voltage, from the plate of V_5 to the grid of V_6, without altering the magnitude of the voltage change. For example, for the circuit as shown, a change of plate voltage of V_5 from 160 to 150 volts, will produce a change of from 40 volts to 30 volts at the grounded end of the glow lamps. Since the voltage drop across each lamp is approximately 60 volts, or 120 volts for the two in series, in the example cited above, it will be seen that the lamps have been used to subtract a constant value of approximately 120 volts from the plate voltage change of V_5.

The voltage derived from V_5 through the glow lamps is positive with respect to ground. It is applied to the grid of V_6 in series with a negative voltage derived from the supply. The value of this negative voltage is adjusted by means of R_{51} so that the grid voltage is minus 0.5 volt at 500 rpm, or minus 6.5 volts at 1,000 rpm of gyro rotor. Thus, the plate current of V_6 is relatively high at low rotor speed and low at the higher rotor speed of about 1,000 rpm. As a result, the voltage on the plate of V_6 is high at high rotor speeds and low at low rotor speed. It may be said, therefore, that the voltage on plate of V_6 is proportional to the rotor frequency, at least within the range of useful operation.



Horizon gyro fixture



Directional gyro fixture

Differentiator

Capacitor C_{54} and resistor R_{55} in the plate circuit of V_6 constitute the differentiating circuit, so that the grid voltage applied to V_7 is proportional to the deceleration of the rotor.

The operation of the circuit may be described in the following manner: The signal voltage applied to the grid of V_7 is proportional to the voltage across R_{55}, or to the current which flows through capacitor C_{54} and resistor R_{55}. If the resistance of R_{55} is small compared to the capacitive reactance of C_{54}, the current through these two circuit elements is proportional to the time rate of change of the voltage across the combination. However, this voltage is the varying plate voltage of V_6. The grid voltage on V_7, therefore, is proportional to the rate of change of the plate voltage of V_6, which is proportional to the speed of the gyro rotor. Hence signal voltage on V_7 is proportional to deceleration of the gyro rotor.

Coast-Time Amplifier

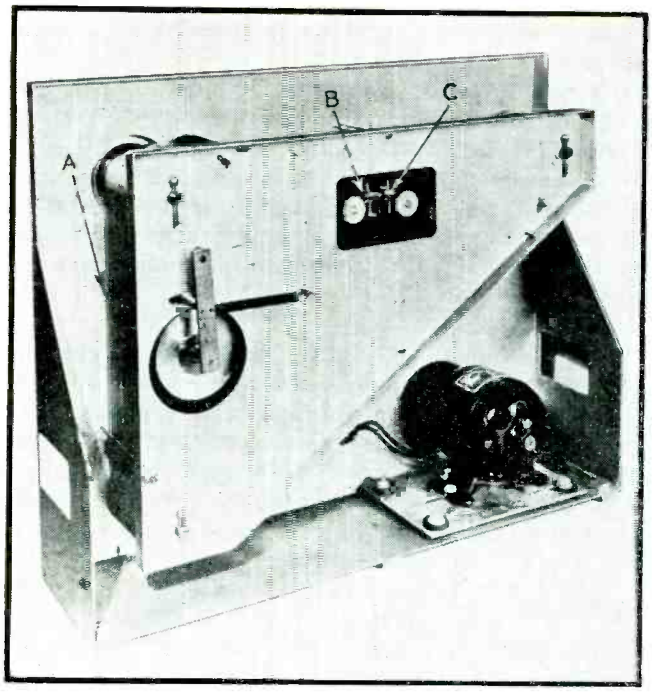
The coast-time amplifier, V_7, is a vacuum-tube voltmeter operated at low plate voltage. With no signal applied to its grid, V_7 draws sufficient plate current to cause the indicating meter to read approximately full scale. The voltage developed across R_{55} by a decelerating rotor is negative and therefore reduces the plate current drawn by V_7. The amount by which the plate current of V_7 is reduced is determined by the voltage developed across R_{55}, which depends upon the rate at which the gyro rotor is de-

(*Continued on page* 310)

Radiotelephone operators at No. 1 Wireless School in Montreal quickly recognize and correct their own speech defects after hearing them played back by this Bell Labs "Mirrophone"

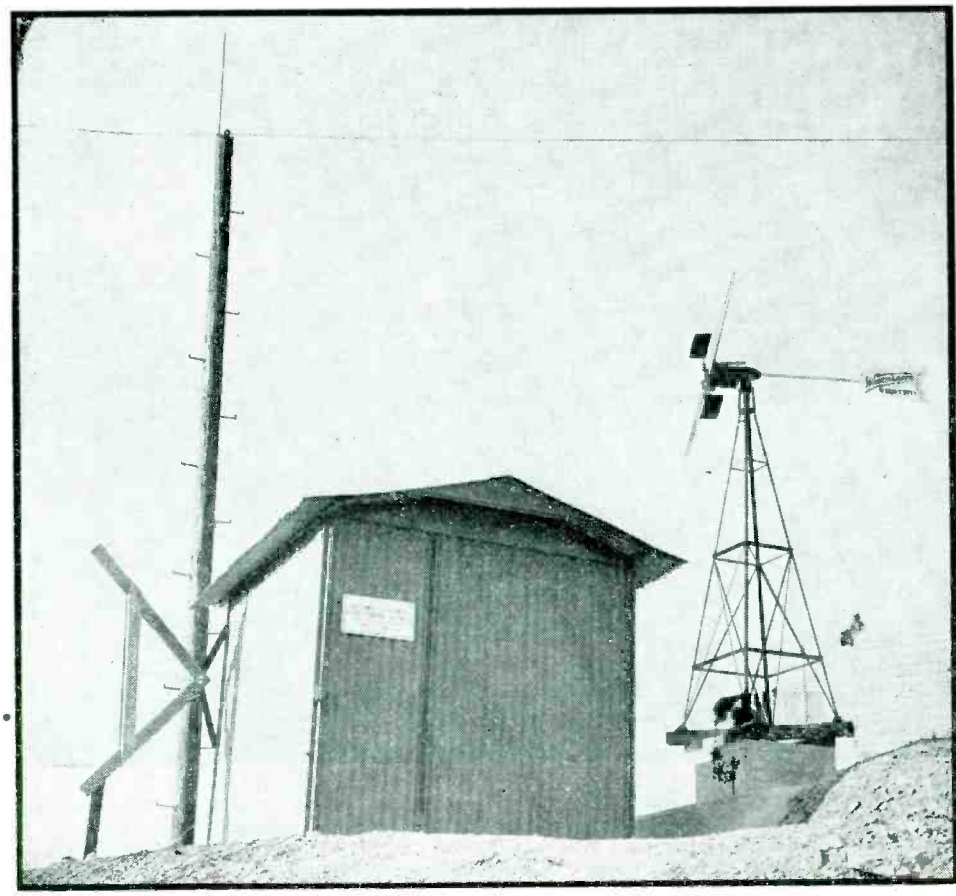
Speech-Training Machine

RCAF radiotelephone operators practice correct, clear and peppy speaking before a magnetic-tape sound recorder to prevent "washouts" due to misinterpretation of orders



A 100-foot endless tape of special magnetic steel called "Vicalloy" (at *A*) provides a full minute of voice recording. At *B*—wiping-out coil; *C*—recording and playback coil

Speech instructor George L. Long uses a collection of electronic devices to demonstrate that articulation depends upon full use of the lips, tongue, teeth and palate



UHF

By

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Flint Peak repeater station, showing a pole supporting the 2,726-kc receiving antenna, the 312-Mc transmitting antenna with square-corner reflector, the building housing the equipment and a wind-driven generator

COMMUNICATIONS agencies attempting to use receiving equipment in the downtown areas of large cities have long been faced with the problem of high noise levels from electrical induction sources. This condition, together with numerous other causes of signal attenuation, frequently makes it desirable to establish receiving stations in more favorable locations and to relay transmissions to the city via radio.

Poor daytime reception from 100-watt medium-frequency stations located at isolated mountain dams led to the development of an ultra-high-frequency repeater for the Los Angeles County Flood Control District. A suitable location was selected on 1900-foot Flint Peak, near the center of the heavily populated area of Southern California. This site is nine miles visual distance from KFCD, the headquarters station in the city of Los Angeles, where transmissions from the various dams must be received.

A permit for the construction of the repeater was issued by the FCC on March 19, 1941, and the call-letters W6XFE were assigned. The station was placed in service in November of that year.

It was considered desirable to arrange the equipment so that it could be turned on or off at any time by radio remote control from Los Angeles. This was accomplished by means of an auxiliary circuit and selective relays.

Medium - frequency reception was satisfactory at night so it was also desirable to render the repeater inoperative during the hours of darkness. This was accomplished by equipping the station with a clock-switch.

W6XFE gear is shown in block-diagram form in Fig. 1 and schematically in Fig. 2.

Medium-Frequency Receiver

The repeater equipment utilizes a conventional superheterodyne for reception of signals on 2,726 kc.

The receiver incorporates one stage of r-f preselection, two stages of iron-core i-f amplification, a crystal-controlled (Pierce) oscillator for fixed channel reception, and one stage of a-f amplification.

Automatic volume control voltage is obtained from one diode of a 7C6 tube. The output of the triode section of the 7C6 is coupled to the grid of a zero-bias isolating stage operating control relays and to the transmitter modulator tube.

Relay Control

Coupling and filter networks isolate automatic control circuits from normal audio circuits.

One triode section of a 7N7 tube is used as a zero-bias isolation amplifier and the other section of the tube is biased to operate as a grid-controlled d-c rectifier. A band-pass filter network is used to prevent the automatic control from operating on frequencies other than the 1000-cps dial-tone transmitted by a pulsing dial at the Los Angeles station.

A 10,000-ohm sensitive relay is

REPEATER STATION

Transmissions on 2,726 kc from isolated mountain dams are relayed to flood-control headquarters during noisy daylight hours. The centrally-located and unattended 312-Mc equipment at W6XFE may be turned on or off at any time by radio remote control from KFCD. A clock-switch renders it inoperative after dark

connected in the plate circuit of the 7N7 rectifier section. This relay serves to pulse the stepping relay, which was constructed to permit automatic re-set when the last contact is reached. The filament and re-set relays have holding contacts which lock them in place as the stepping arm passes their contact. All holding circuits are broken when the stepping relay is dropped to its zero position.

A seven-dash dial-pulse from the control desk at the Los Angeles station lifts the stepping arm to the contact which closes and holds the filament relay. Filament current is thus supplied to the oscillator and modulator tubes of the 312-Mc transmitter. After a 30-second pause to permit the tubes to warm up, a second seven-dash pulse is transmitted and plate power is applied. The circuit is in operation as soon as plate power is applied and reception of the repeater channel is available on a loudspeaker in the control room in Los Angeles.

When service from the repeater channel is not desired, a dial pulse of six dashes on the 2,726-kc carrier of KFCD lifts the stepping arm to the re-set contact and the relay drops to zero. This procedure gives the central station operator control of the unattended transmitter and serves to conserve battery power when the repeater channel is not used.

U-H-F Transmitter

Two type HY615 tubes are used in a push-pull, tuned plate-tuned cathode, oscillator circuit. The heater supply leads are twisted and pulled through the cathode

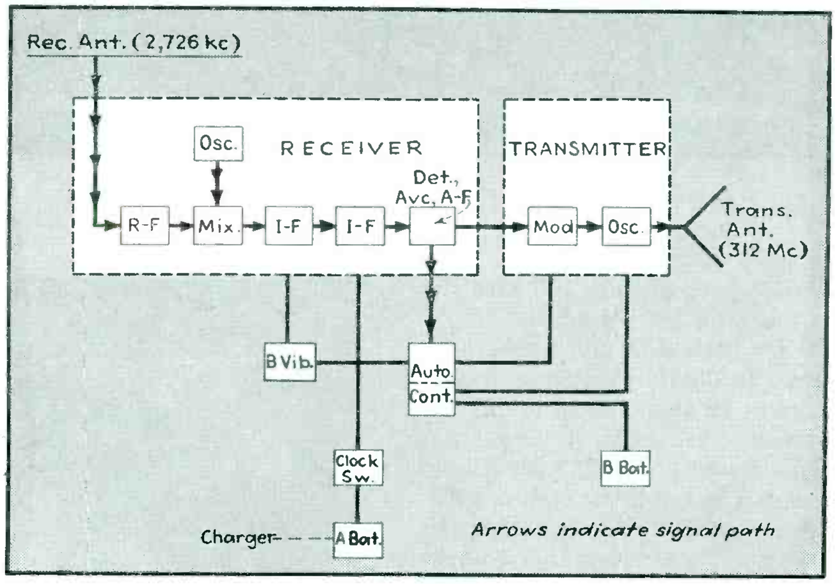
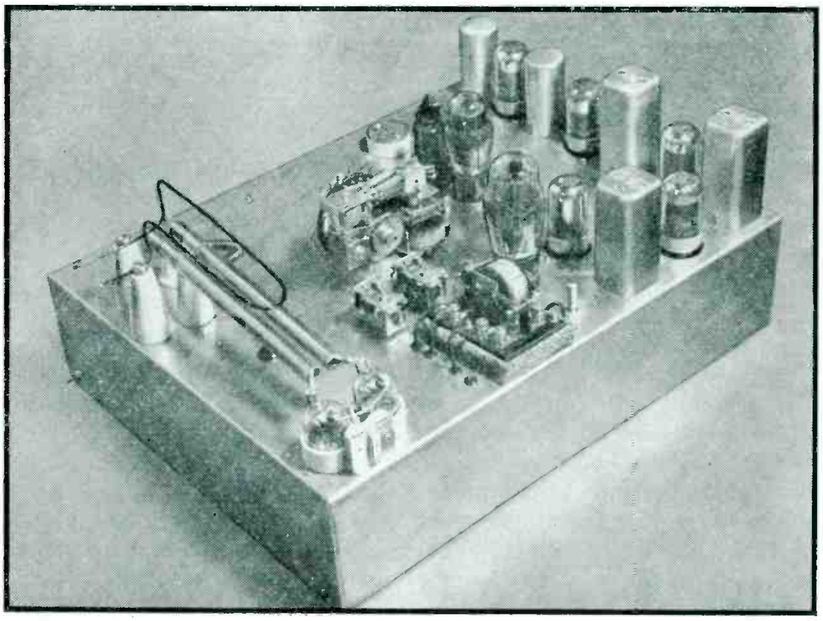
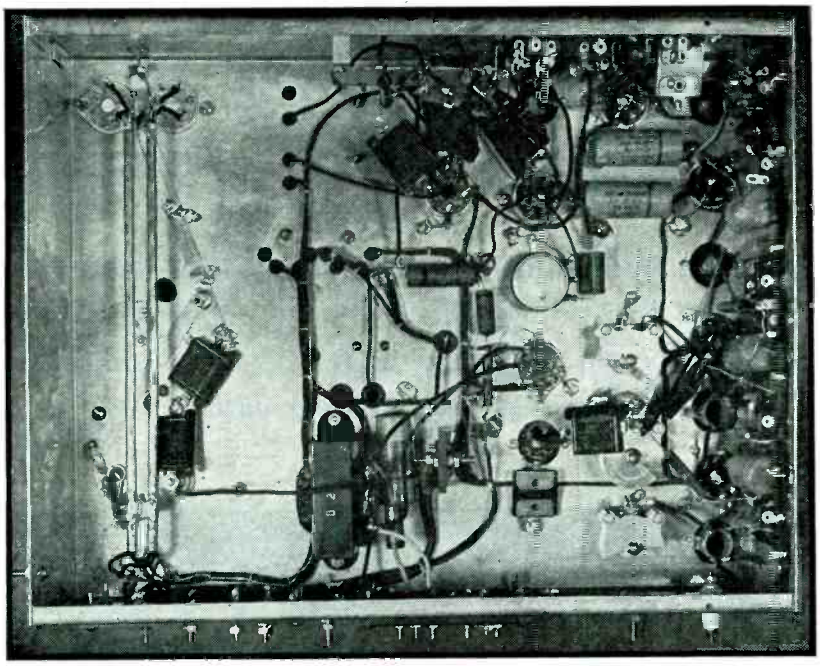


FIG. 1—Block diagram of W6XFE gear, comprising a medium-frequency superheterodyne automatically controlling and modulating an ultrahigh-frequency oscillator. Details are given in the schematic of Fig. 2



Top view of repeater unit. The receiver is at the right, relays in the center and transmitter at the left



Bottom view of chassis. HY615 cathode-tuning lines appear at the left

on a 4 ft. by 4 ft. frame. The excited element is 95 percent of a half-wavelength. The active element is current-fed by means of a short tuned transmission line and "hairpin" coupling-link placed in inductive relation to the plate line of the transmitter.

All elements and feeder measurements were calculated and later checked by actual operating measurements. The calculations were found to be sufficiently accurate. Standing waves on the feeder lines are checked by moving a metal rod or a finger along in close relation to the line and watching the dips on the plate meter of the transmitter. Insulation problems were greatly simplified by having all points of mechanical contact at ground potential.

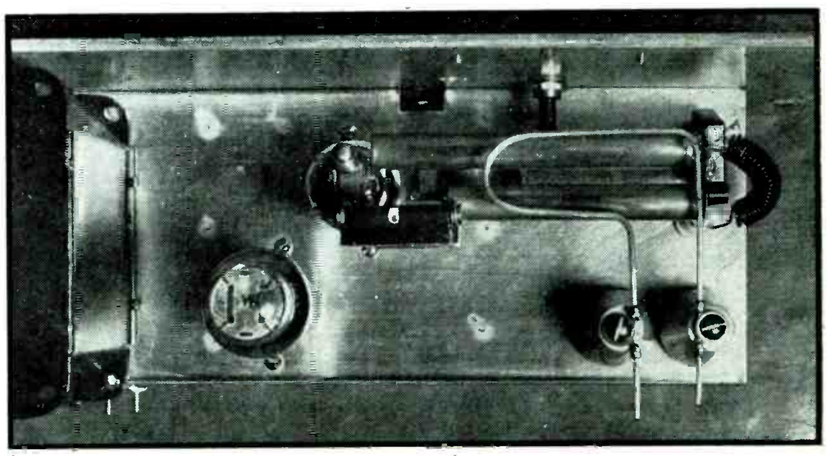
The 312-Mc receiving antenna

lines to keep heaters and cathodes at the same r-f potential.

Very little difficulty was experienced in obtaining strong oscillations at frequencies up to 325 Mc. A marked reduction in output was experienced above 325 Mc and it was not possible to obtain satisfactory oscillations above 350 Mc.

Frequency drift over a 24-hour period was quite a factor in the operation of the original 312-Mc oscillator. The drift was traced to extreme temperature fluctuations encountered on the unprotected mountain peak. It was necessary to redesign the plate and cathode lines to maintain the all-important constant center-spacing of the copper tubing. Heavy-wall, larger-diameter tubing was used with a single-point tuning-fork type mounting. Flexible leads were provided to connect the open ends of the plate line to the tube connections.

The transmitting frequency is determined by the length of the lines, spacing between the lines and by the setting of the shorting bar at the closed end of the lines. Adjustable "penny size" plates have recently been installed across the tube end of the lines. Frequency is measured by Lecher wires and a General Radio type 758-A wavemeter. Approximately 3 watts output is realized.



Simple super-regenerative receiver used at KFCD in Los Angeles to pick up signals from W6XFE, nine miles away on Flint Peak

The HY615's are plate-circuit modulated by a 6K6G pentode operated from the transmitter power supply and driven by the associated receiver.

Antenna Systems

The receiving antenna for the 2,726-kc receiver is a conventional single-wire type.

The radiating system for the 312-Mc repeater transmitter is a square-corner reflector type with the excited element near the focal point and 0.5 wavelength in front of the vertex of the reflector frame. The 0.6-wavelength reflector elements are spaced 4 in. apart on the roof of the office building in which the Los Angeles station is located is similar in design. Because of the physical proximity of this antenna to the tuning house for the KFCD 2,726-kc transmitting antenna, it was more convenient to voltage-feed the active element to the u-h-f receiver located in the tuning house.

Field strength measurements show a 30-db front-to-back signal difference for the parasitic reflector type of square-corner antenna used.

Power Supply

Power for the mountain-top station is developed by a heavy-duty wind-driven Wincharger and a 600 ampere-hour storage battery. Heavy-duty B batteries are used for plate power on the modulator and u-h-f oscillator. Plate supply for the 2,726-kc receiver and the relay control tube is developed by a vibrator power unit.

Time Switch

A weight-driven time-switch turns the 2,726-kc receiver and relay control tube's plate and filament power on at 8:00 A.M. and off at 5:00 P.M. Satisfactory communication is possible on the regular low-frequency channel during the balance of the 24-hour day. This procedure conserves battery power at the repeater station.

Battery-Charging Problem

Current consumption of the repeater equipment is 4½ amperes at 6 volts in the stand-by condition and 5¼ amperes when transmitting messages to the headquarters in Los Angeles.

The wind-driven charger scheme is not entirely satisfactory during certain months of the year and will ultimately be supplemented with an engine-driven charging system for prolonged periods of calm weather.

The receiver used in Los Angeles is a simple oscillator with a single type HY-615 tube used as a self-quenching super-regenerative detector. Tuning is accomplished by means of a dial-operated copper wedge between the copper tubes forming the resonant circuit, at the tube end.

U-H-F Receiver

One stage of a-f amplification is used at the receiver, on the roof of the building, to feed a 500-ohm audio line running down to the control desk on the fourth floor. An additional amplifier for the repeater channel is mounted on a channel rack in the control room of KFCD.

Filament and plate power are supplied to the receiver by a small a-c power unit located within the antenna tuning house. Relay control from the fourth floor turns the receiver on and off.

An early attempt to locate the u-h-f receiver in the control room, with a concentric feeder to the antenna on the roof, was not successful because of high losses in the transmission line at 300 Mc.

Performance Data

A routine service trip is made to the station on the mountain at 30-day intervals.

Reliable average signal levels over the 9-mile visual signal path have been obtained for a period of more than two years. Short duration fading and signal attenuation of approximately 4 db has been observed during periods of heavy rain.

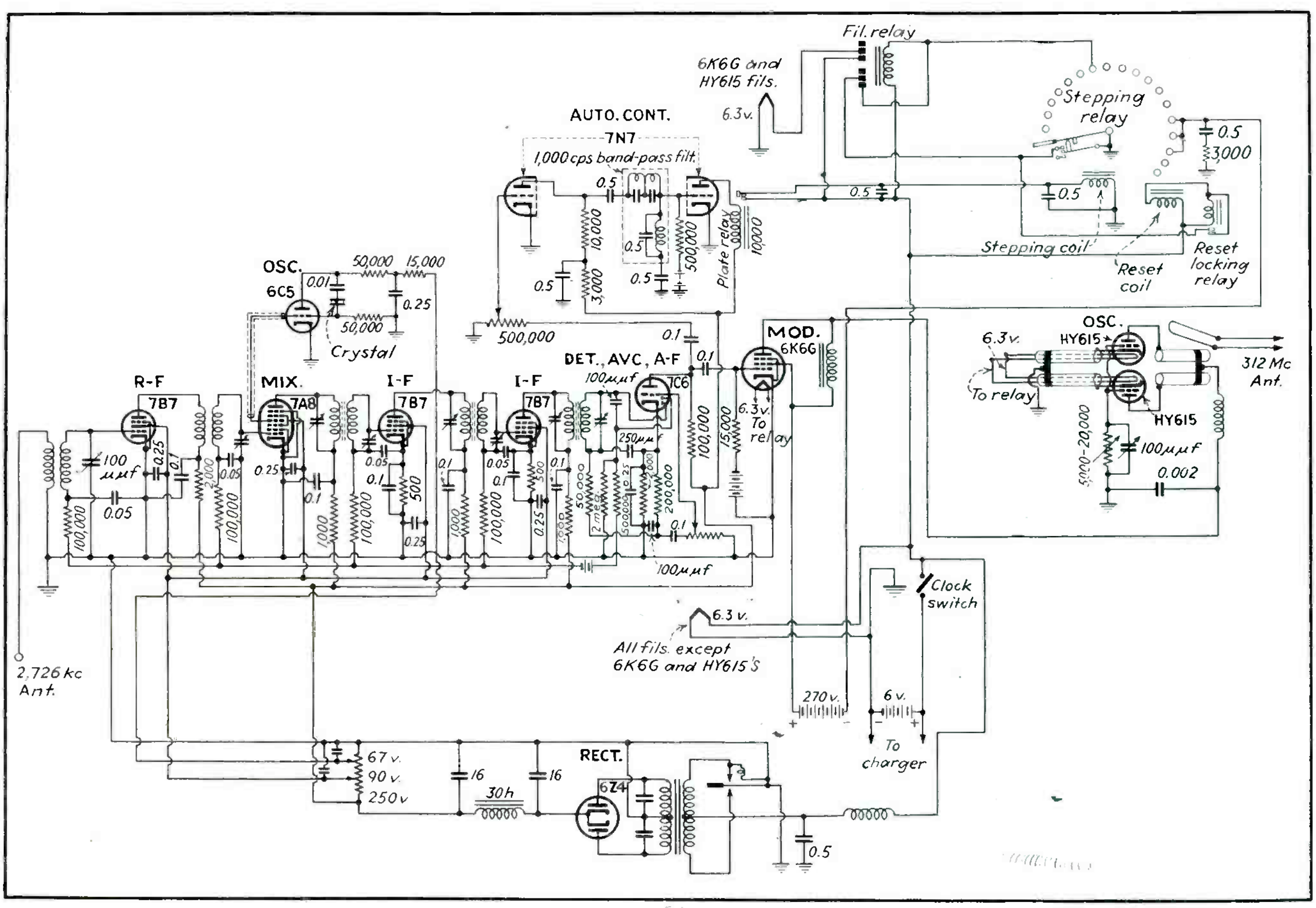
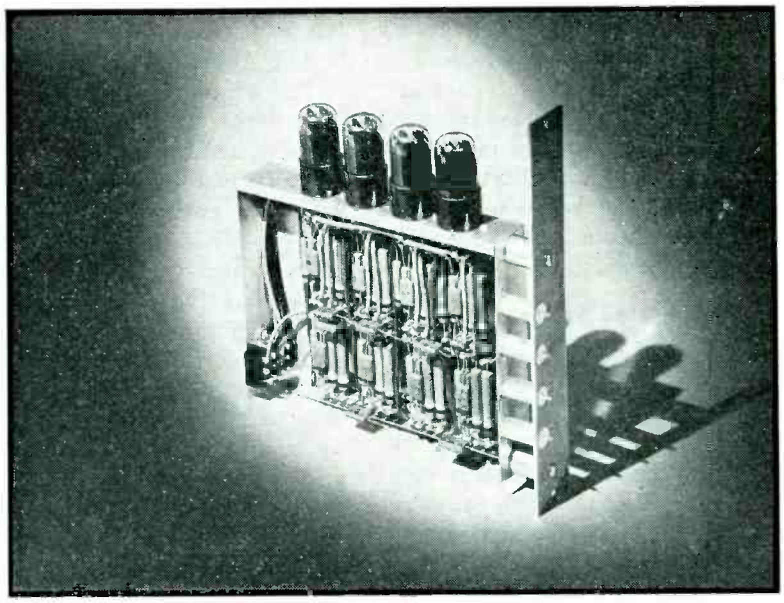


FIG. 2—Schematic of mountain-top radio repeater unit shown on a preceding page in block-diagram form

Counter decade using four standard-size tubes. The four neon indicating lamps are mounted on the vertical front panel, with their ends protruding



A Four-Tube

ELECTRONIC COUNTERS have been in use for many years, principally for such research purposes as counting cosmic rays, but this essentially experimental equipment has generally been both bulky and costly. It was felt that a simple electronic counter, economical to manufacture and dependable under a wide variety of conditions, would find definite applications in industry and other fields where the characteristics of electromagnetic or mechanical counters place operating speed limits on associated machinery or apparatus.

Rather than attempt to develop all of the many applications, it was decided to concentrate on the counter decade that forms the basic unit for every application. With appropriate input circuit accessories and a suitable number of these decades (one for each digit in the maximum quantity to be counted), the special requirements of particular applications are readily met.

After due consideration, it was decided that the counter decade should use a system involving a minimum number of parts and tubes to represent the numbers from 0 to 9. Various combinations of four numbers may be used to constitute a full decade, such as 1-2-2-5, 1-2-3-4 and 1-2-4-8.[1] The last combination, 1-2-4-8, is a binary progression that may represent the numbers 0 to 16 if properly used.

The binary system is well adapted to electronic counting. A series of trigger circuits may be connected in such a manner that two pulses from one circuit may cause one operation of the succeeding circuit. The binary system of notation is difficult to interpret, however, since all of us have been educated to interpret numbers by the decimal system. For this reason it is necessary to introduce a method of stopping the binary counting progression at the count of ten and resetting the electronic counter to zero. This is accomplished easily and automatically by two feedback capacitors, to be described later.

Development of Counter Decade

During the development of the counter decade, it became apparent that if coupling tubes were to be used between counter stages, much of the economy of the binary system would be lost and almost the same number of tubes and component parts would be used for a decade as in conventional counter circuits like the round-the-ring and conjugate pair types.

After some experiment, it was decided that two Eccles-Jordan type trigger circuits should not be coupled directly from the plate of one side of the first tube to the two following grids through capacitors. While this method of coupling can be adjusted to operate, it was found quite critical because the two coupling capacitors required cancelled the trigger action of the two grids.

What is believed to be a new principle was evolved to accomplish coupling. The final circuit for the

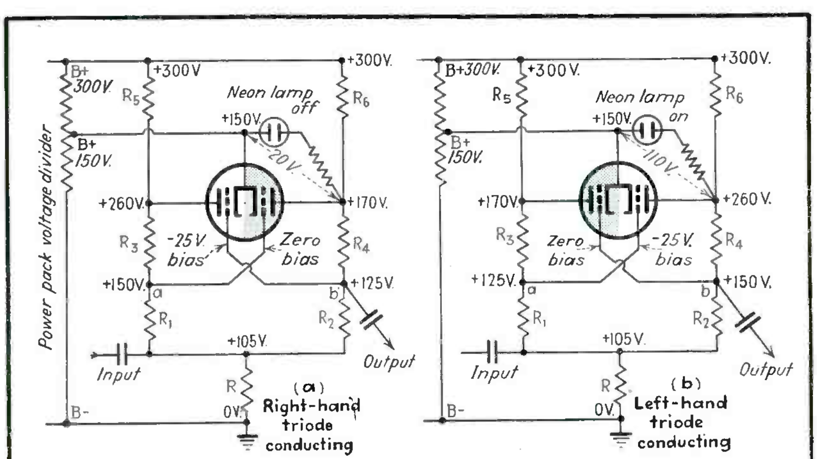
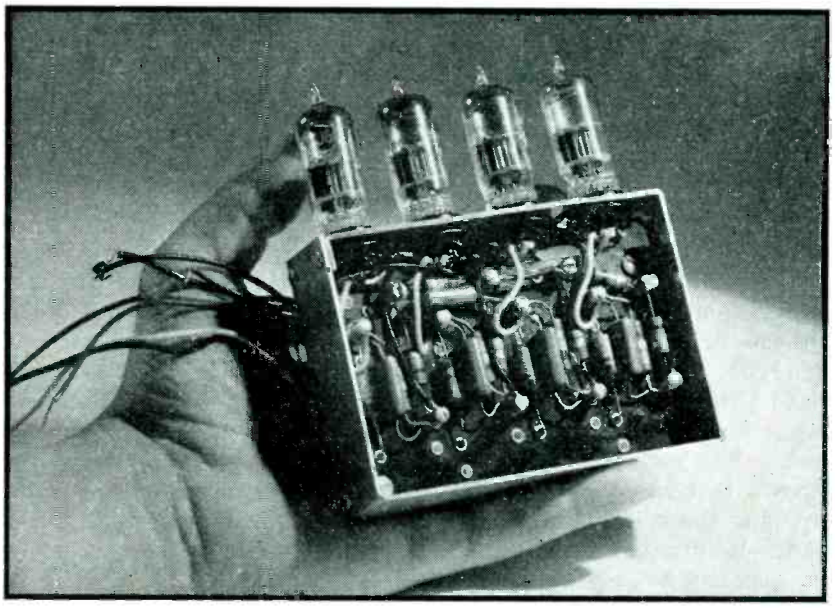


FIG. 1—Simplified version of one stage of the counter decade, giving potentials with respect to ground for the two possible operating conditions



Complete counter decade using four miniature 6J6 tubes. Additional resistors and capacitors are on the other side of the vertical insulating strip. Neon indicating lamps are remotely mounted on another panel

By

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COUNTER DECADE

Utilization of Eccles-Jordan trigger circuits in the binary progression 1-2-4-8, with ingenious use of two capacitors to give forced resetting at the count of ten, makes possible a compact unit having many counting and measuring applications

counter decade comprises four stages, each employing an ordinary dual-triode vacuum tube (such as a 6SN7, 6N7, 6J6, etc.) arranged in an Eccles-Jordan trigger circuit in conjunction with an indicating neon lamp. The basic functioning of alll stages is alike, and is dependent upon shifting of operating potentials back and forth between the two sets of values indicated on the simplified circuit for the first stage, shown in Fig. 1.

Operation of Trigger Circuit

Note first that a fixed potential of +150 volts (with respect to B − and ground) is applied to the cathode of the tube at all times by the power pack. Grid and plate potentials are obtained from the resistance network included in the basic circuit, however, and depend upon relative currents through the two branches of the network.

Assume that the grid of the right-hand triode is essentially at cathode potential (zero bias) as indicated in Fig. 1(a), and assume that no signal pulses have yet arrived. At zero bias, the right-hand triode will conduct saturation plate current, and its plate-cathode voltage drop will be low (actually it is 20 volts, lower than the extinction voltage of the neon lamp connected across this section). For this assumed initial condition, then, the neon lamp in the stage is extinguished.

The grid bias voltages should be examined next, since they control the switch-over from one triode section to the other in a stage. These bias voltages are obtained from points *a* and *b* on the two branches of the resistance network.

Redrawing the circuit in the form shown in Fig. 2 will help to show why points *a* and *b* give different bias values. If the tube were removed, each branch of the resistance network would act simply as a bleeder across the power supply (like left-hand branch R_5-R_3-R_1-R in Fig. 2), and voltages would divide in proportion to resistance values. Under this condition point

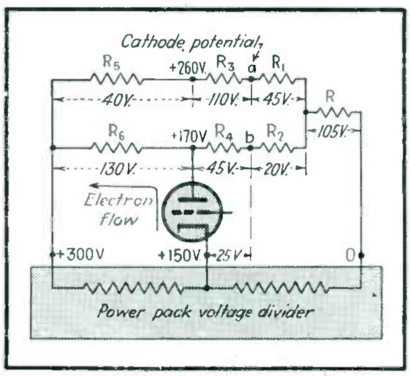

FIG. 2—Diagram illustrating how current drawn through R_6 by the conducting triode section upsets potentials in one branch of the resistance network

a and point *b* would be essentially at cathode potential (+150 volts above ground).

With the right-hand triode section conducting, however, it draws current through R_6 as shown in Fig. 2, and greatly increases the voltage drop across R_6. This leaves less voltage for R_4 and R_2, and hence drives point *b* in a negative direction with respect to the cathode. A shift of 25 volts was found sufficient to drive a triode section to cutoff, and resistor values were accordingly chosen to give this distribution of voltages.

Returning to Fig. 1(a), note that the grid of the right-hand triode is connected to point *a* (which is at cathode potential, as assumed for this explanation and as required for saturation plate current in this section). The grid of the left-hand triode goes to point *b*, which is at +125 volts with respect to ground and hence 25 volts negative with respect to the cathode. This being essentially the cutoff bias, the left-hand triode is nonconducting under the initial assumed conditions.

The stage is stable in this condition until a negative pulse (with respect to ground) is applied to its input circuit. Any positive pulse fed into the stage has no effect, because it is dissipated in the low impedance of the conducting triode section.

Upon arrival of a negative pulse at the input, both grids swing in a negative direction (just as if a battery were connected across *R* with its positive terminal going to ground). There is no direct effect in the nonconducting left-hand triode since its grid is already at negative cut-off, but the negative grid swing of the right-hand triode stops its plate current. The resulting redistribution of voltage drops across R_3, R_4 and R_2 places point *b* at cathode potential as indicated in Fig. 1(b). Thus the grid of the left-hand triode swings positive to zero bias, and the left-hand triode conducts. Point *a* goes 25 volts negative with respect to the cathode, keeping the grid of the right-hand triode negative once it is driven negative by a negative input pulse. Thus, original circuit conditions with respect to right and left-hand triodes are reversed.

With the right-hand triode nonconducting, its plate-cathode voltage goes up to about 110 volts, above the striking value of the neon lamp, and the lamp glows.

Arrival of a second negative pulse again triggers the stage, returns it to the original conditions of Fig. 1(a), and extinguishes the neon lamp. Also, the swing in the potential of point *b* from the +150 v of Fig. 1(b) to the +125 v of Fig. 1(a) produces a negative pulse that is transmitted through the output capacitor of the stage to the input of the next stage.

Summarizing, then, every negative pulse blocks the conducting triode section and makes the other section conducting, every alternate negative input pulse lights the neon lamp, and the intervening alternate negative input pulses put out the neon lamp and simultaneously transmit a negative pulse to the next stage.

Operation of Counter Decade

A complete counter decade employs four identical stages of the type just discussed, connected together as shown in Fig. 3. The stages are numbered 1, 2, 4 and 8 according to the binary system; the number assigned to each stage is equal to the number of negative pulses required at the input of the decade to make the neon lamp in the stage come on the first time.

In preparation for a count a

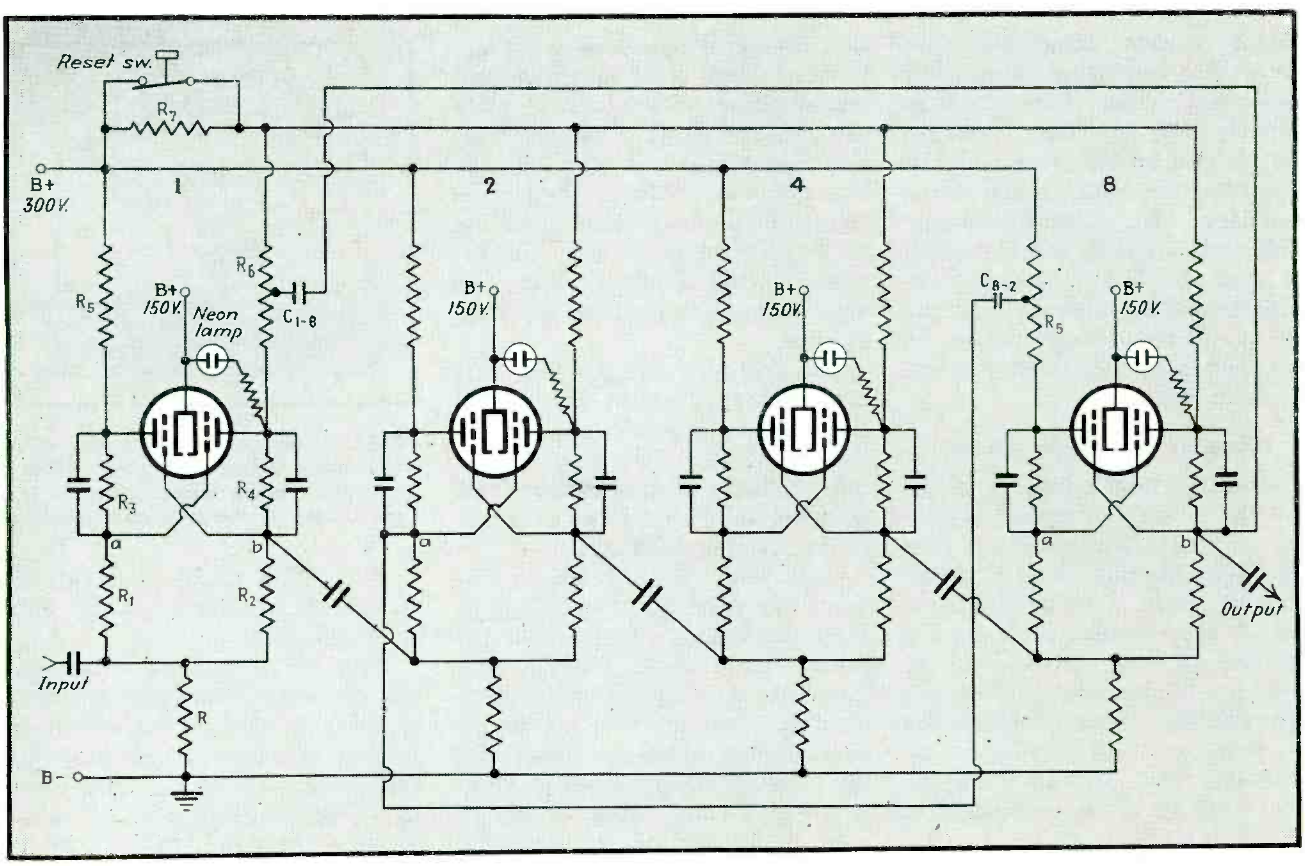

FIG. 3—Complete circuit of the four-tube counter decade

momentary displacement of the reset switch inserts a common dropping resistor R_7 in the voltage supply line to all right-hand triodes. This drives the grids of all left-hand sections negative, so that the decade is preset with all right-hand triodes conducting and all neon lamps extinguished. Each stage following the first receives a negative triggering impulse upon every second operation of the stage preceding. Progression through a count from zero to nine will therefore occur as shown in Fig. 4.

For its tenth operation, the decade must transmit a negative pulse to the succeeding decade and must reset to its original zero condition as required by the decimal system. This means that the tenth pulse must put out all lamps. The count of 10 in the binary system calls for lamps 8 and 2 being on, hence lamp 1 (on for the 9 count) will go out automatically. Forced resetting therefore means putting out lamp 8 and preventing lamp 2 from coming on.

After the ninth pulse, the left-hand sections are conducting in both stage 1 and stage 8. When stage 1 is reversed by the 10th pulse, a negative pulse obtained from a tap on R_6 in this stage is fed through capacitor C_{1-8} to stage 8, causing point *b* of this stage to swing negative. This drives the grid of the conducting left-hand section of stage 8 negative, causing a switchover and putting out neon lamp 8. (All points on R_6 of stage 1 are driven negative by arrival of the tenth pulse; the magnitude of the swing depends on the position of the tap, and can be as high as 90 volts at the plate end of R_6, so the magnitude of the pulse is readily adjusted. It must be large enough to cause switchover by itself, but not too large because at the eighth count it must be overpowered by the negative pulse which comes from stage 4 and correctly triggers stage 8 to turn on its lamp.)

In an essentially similar manner, a positive pulse obtained from a tap on resistor R_5 of stage 8 during the forced switchover of this stage is fed through capacitor C_{8-2} to point *a* of stage 2, where it completely overwhelms the negative pulse fed into this stage from stage 1. Since the lamp for stage 2 was out after

Pulse No.	Stage 1	Stage 2	Stage 4	Stage 8	Count
0	R	R	R	R	= 0
1	L	R	R	R	= 1
2	R	L	R	R	= 2
3	L	L	R	R	2 + 1 = 3
4	R	R	L	R	= 4
5	L	R	L	R	4 + 1 = 5
6	R	L	L	R	4 + 2 = 6
7	L	L	L	R	4 + 2 + 1 = 7
8	R	R	R	L	= 8
9	L	R	R	L	8 + 1 = 9
10	R	R	R	R	Forced reset to 0

FIG. 4—Unshaded circles represent neon lamps that are ON in a four-lamp decade for a progression through a count from zero to nine. The tenth input pulse restores the decade to the zero condition and sends one negative pulse to the next decade. The letter *R* means that the right-hand triode in that stage is conducting, while *L* has the same meaning for the left-hand triode

the ninth impulse, it therefore stays out. (All points on R_5 of stage 8 are driven positive by the forced switchover of the stage; the magnitude of the swing depends on the position of the tap, and can be as high as 90 volts at the plate end of R_5, so the required pulse amplitude is easily obtained.)

Switchover thus provides the correct potential shift for forced resetting of the decade, and the correct direction of shift is obtained by making the capacitor connection to the correct resistor (R_6 or R_5). As before, positive pulses getting into stage 8 through C_{1-8} during previous counts have no effect because they are dissipated in the low-impedance path provided by the conductive section of stage 8.

A negative pulse from stage 8 through C_{8-2} to stage 2 at the arrival of the eighth pulse is not contrary to the normal input signal at that time. For all lower counts than 8 there is no switchover in stage 8 and hence no pulses are sent through C_{8-2} to cause trouble. Capacitors C_{8-2} and C_{1-8} thus provide forced resetting after a count of nine without affecting normal operation at any of the lower counts.

The capacitors across resistors R_3 and R_4 in each stage serve to short out these resistors momentarily during each impulse, thereby increasing the magnitude of the impulse available for triggering action.

An unusual feature of this type of counter decade is the ability to operate at pulse rates ranging all the way from above 100 kc down to as low a rate as desired, with no substantial changes in circuit constants. It is only necessary to provide a negative pulse at the input that is approximately the correct amplitude and shape. When sine-wave input exists, as from an oscillator that is started and stopped at the beginning and end respectively of the interval to be measured, a single multivibrator stage is generally inserted between the oscillator and the decade input for pulse-shaping purposes.

Discussion of Applications

Welding Timer. The counter decade may be reset to zero, then selected counters may be turned on before a count. If, for example, in a 0-to-9 counter lamps 2 and 1, or a count of three, are turned on by resetting inversely, then the output will operate when 7 pulses have passed through the counter. In this manner, a counter may be made predetermined.

In the case of welding timing, the counter may be operated from the 60-cycle power frequency, and after a predetermined reset will count the exact number of cycles going into a weld. In the same field, the counter may be used as a cycle counter to check present timing equipment.

Interval Timer. One of the widest present uses of electronic counters is in the field of interval timing. In this application, a crystal-controlled oscillator frequency is fed into the counter by an electronic switch or gate operated by initiating and terminating pulses from the time interval. If a 100-kc crystal is used as the initial counting frequency, the accuracy of the time interval will be +0 and −0.00001 second for an interval as long as desired. In many cases, this interval is one second and is read on 5 decades. The accuracy in this case would be 0.01 percent for a full-scale reading.

Many variations of this type

(*Continued on page* 358)

Accurate Sorting of COLORED OBJECTS

Tiles emerging from kilns on conveyor-belts are automatically shuttled into proper bins. Method involves conversion of color into electrical impulses by spectro-photoelectronic means, utilizing cathode-ray oscilloscopes and phototubes

ROUTINE TESTS of many electrical devices are based upon electrical characteristics. Often, only one point on the characteristic is utilized in order to simplify the testing procedure, but occasions arise which make it desirable to use the entire curve under dynamic conditions.

If a test can be arranged so that the electrical output given by a particular input is repeated at regular, short intervals, then the cathode-ray oscilloscope may frequently be employed. This ordinarily implies the need for an attendant at the oscilloscope, but methods have been devised which eliminate this necessity.

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Several applications of an automatic method of testing which may be utilized on production lines will be described. Some of these apply directly to the electrical characteristics of test specimens, while others make use of electrical characteristics which are derived from such primary factors as spectral transmittance or reflectance.

Basic C-R Tube Method

Assume that a production-line test of the plate characteristic of vacuum tubes is to be made. By using any of several circuits which have been described in detail[1, 2], the plate current-plate voltage curve for selected operating conditions may be obtained on the screen of a cathode-ray tube. If tolerance limits for the plate characteristic are defined, these upper and lower limits may be expressed in terms of two curves on the screen, shown as (a) and (b) of Fig. 1.

Assume that any tube under test which exhibits a plate characteristic lying inside the shaded area between the curves is to be graded satisfactory, and any tube which exhibits a characteristic lying outside the shaded area is to be rejected. If the shaded area is covered with an opaque mask, the light output from the screen will be suppressed as long as the spot remains between the limiting curves, as will be the case for all satisfactory tubes. However, in the case of a defective tube the luminous spot will fall below the mask, and light will be emitted from the screen.

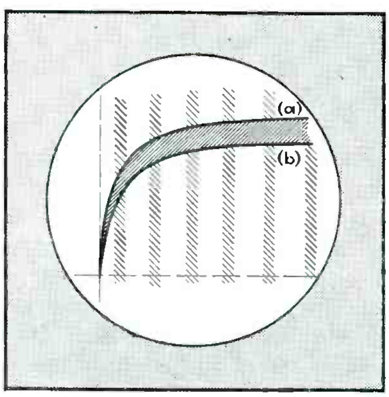

FIG. 1—Cathode-ray oscilloscope screen, showing mask between upper (a) and lower (b) tolerance curves. The additional vertical stripes avoid continuous light output when items under test are defective

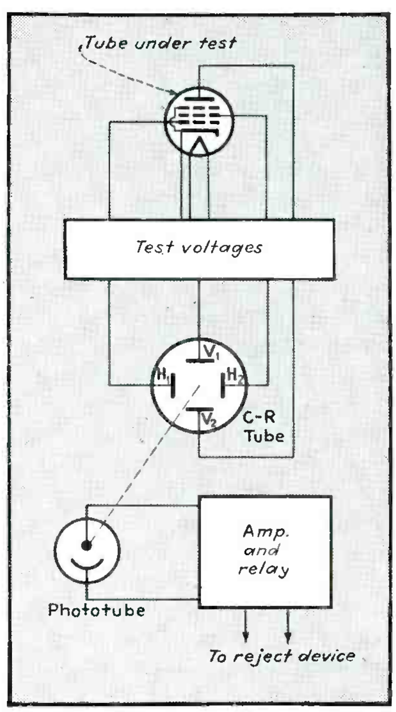

FIG. 2—Method of automatically rejecting defective vacuum tubes by photo-electronic means, used as a basis for the tile-sorting device discussed in the text

Adding Automatic Operation

If the screen of the cathode-ray tube is placed within the compass of a photoelectric surface, it will then be possible to convert the light energy of the cathode-ray spot to electrical energy whenever the spot falls outside the area covered by the mask.

The output of the phototube or other photosensitive surface may then be amplified and used to actuate thyratrons which control the mechanical operation of removing the rejected tube from the output.

Such an arrangement is shown schematically in Fig. 2.

If an a-c amplifier is to be used with the phototube, an improvement in operation will result from square-wave modulation of the electron stream, or the addition of a number of opaque vertical stripes (Fig. 1) across the face of the cathode-ray tube screen. The purpose of the square-wave modulation, or of these stripes, is to break up the trace produced by the traveling spot so that it is impossible for continuous light output to occur when the tube under test yields a curve which falls mostly on the unmasked area. This situation would exist in the case of a "dead" tube, and might exist when the tube under test possesses a defective characteristic.

General Applications

Many applications of the procedure just outlined will be useful to the engineer who deals with testing or sorting problems in other fields in which the entire characteristic curve of a device must be considered. For example, it offers a solution to the problem of checking the frequency response of microphones, amplifiers, filters, or other devices, at a rapid rate. If the useful input-frequency range of the device is "swept" by means of a motor-driven oscillator frequency-control or other frequency-modulating system, the rectified output may be filtered and used to produce the required frequency response characteristic.

In the case of an audio-frequency device, such as a crystal pickup cartridge which is to be tested for response from 30 to 10,000 cycles per second, it is likely that several seconds may be required to complete a test cycle. The time-constant of the output filter must be sufficiently large to smooth 30 cycles and, unless means are provided for lowering this time-constant as the test frequency is increased, the rate of frequency variation must remain low enough to prevent smoothing of sharp anomalies in the characteristic.

The horizontal sweep of the cathode beam may be accomplished by mechanical as well as by electronic means, and this may be desirable in those instances which require relatively long periods for completing the test cycle, or which might dictate a non-linear sweep motion.

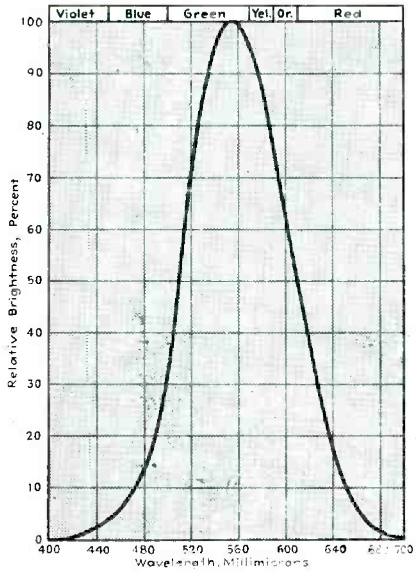

FIG. 3—Standard visibility curve for the average human eye, with wavelength ranges corresponding to common colors

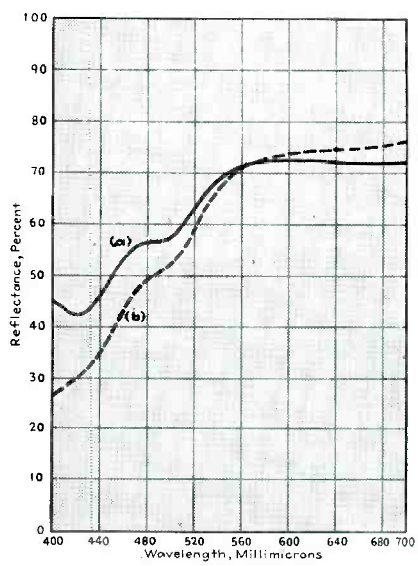

FIG. 4 — Spectrophotometric curves representing color analysis of light reflected from two samples having slightly different colors, sample (a) representing colonial ivory and sample (b) jonquil yellow

The Color Problem

Going one step further with the same techniques, an experimental apparatus has been constructed to sort articles of the same shape, but having different colors. This applies particularly to colored tiles, as they emerge from the kilns on conveyor belts.

Because of the selective placement necessary in the various temperature and atmospheric zones in the kilns, different colored glazes are frequently unloaded at the same time. It may also happen that different firing conditions imposed upon the same glaze material will result in color variations. The method of selection, if it is to compare with the human eye, must therefore make use of the spectral reflectance curves of the various tiles.

The color of any object is determined by the energy-wavelength distribution of light reflected by the object to the eye. The normal eye, in addition, exhibits a selective response, which may be satisfactorily expressed by the standard visibility curve shown in Fig. 3. This curve represents the relative efficiency of the eye in converting radiant energy to visual response, or brightness, at each wavelength in the range of 400 to 700 millimicrons.

The visual response is greatest for yellow-green light of approximately 550 millimicrons, and may be seen to fall off rapidly at each end of the visible spectrum, so that violet light in the range below 430 millimicrons and red light in the range above 680 millimicrons are usually of little importance in determining the color, as compared with the remainder of the spectrum.

If the light reflected to the eye by an object has constant energy distribution at all wavelengths, the object appears white or neutral gray; otherwise some color is apparent. A change in the spectral character (color) of the illumination will cause a corresponding change in the character of the light reflected from the object to the eye. For example, white paper will appear red when illuminated with red light. The definition of the color of an object therefore becomes a problem.

Probably the most precise method of color definition is that which makes use of the spectrophotometric curve. Such a curve shows the percentage of vertically incident light reflected by the object at each wavelength. The spectrophotometric curves of two samples of enameled porcelain, determined by the GE recording spectrophotometer, are given in Fig. 4. Curve (a) is

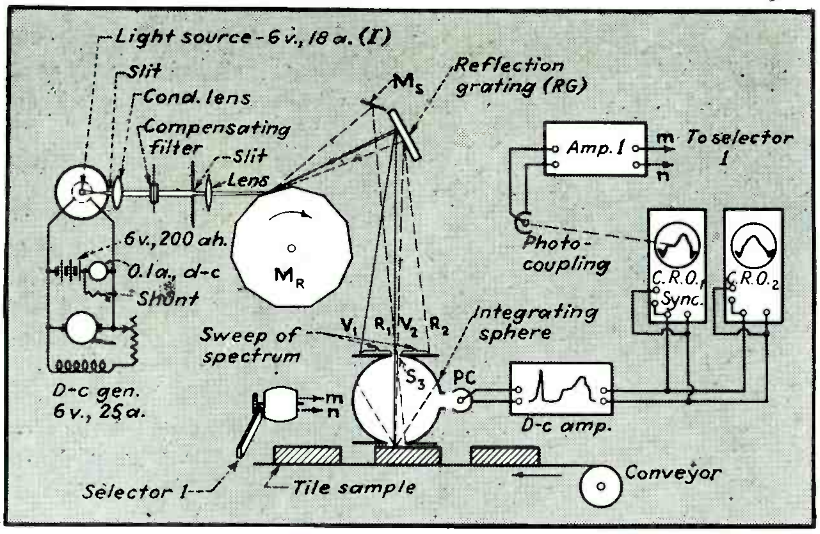

FIG. 5—Arrangement for sorting colored objects, showing one selection channel

obtained from a colonial ivory and curve (b) is from a jonquil yellow.

Details of Tile-Sorter

Referring to Fig. 5, light from an incandescent lamp, I, passes through a combination of slits and condensing lenses and a compensating filter and falls on the rotating polygonal mirror M_R. A narrow band of light is thus caused to sweep repeatedly across the mirror M_S and the reflection grating RG. The reflection grating has the property of spreading out white light into a spectrum similar to that obtained from a prism, but has the advantage of greater angular spread with more linear displacement on the wavelength scale.

The sweep of the narrow band of light across the reflection grating results in a reflected spectrum sweeping across the slit S_3 at short, regular intervals. During each sweep period, reasonably pure monochromatic light of every wavelength, from violet to red, successively irradiates the tile under test while the tile is traveling under the open bottom of the integrating sphere. Light reflected from the tile illuminates the highly reflecting interior surface of the integrating sphere, and the diffuse, reflected light from the sphere is picked up by the phototube, PC.

Arrangement of Electronic Gear

The output waveform of the phototube will depend on a number of factors, including especially the spectrophotometric characteristic of the tile specimen. This spectrophotometric curve is distorted by the phototube, due to the nonuniformity of its spectral response. Obviously, if the results are to be useful, the spectral response of the phototube should approximate that of the human eye, or should at least be fairly constant throughout the visible portion of the spectrum.

Although the phototube output waveform is decidedly inferior to the spectrophotometric curve, it does contain enough information to identify the color of the tile passing through the apparatus, for no tile having a different spectral reflectance curve can produce the same waveform.

The spectral reflectance waveform obtained from the tile, plus a synchronizing pulse obtained from mirror M_S as it is swept by the moving band of light from the rotating mirror, produces one complete cycle of the phototube excitation to the d-c amplifier. The output of this amplifier is used to drive the vertical deflecting plates of two or more cathode-ray oscilloscopes. The synchronizing pulse precedes the spectral waveform by a definite time and triggers the horizontal sweep generator at the proper instant. This timing arrangement has proved especially useful because of slight imperfections in the alignment of the segments making up the rotating polygonal mirror.

Each oscilloscope screen is provided with a mask designed to cover the allowable variations in color response for each type of tile to be selected. An individual photosensitive surface and amplifier, coupled to one masked cathode-ray tube screen, will complete a single selection channel.

The electrical output of each selection channel is connected to a back-contact relay, acting through a motor-driven time-delay device in such a way that a tile selected by the channel is mechanically shoved into its appropriate bin. A lever operated by each tile, as it passes beneath the integrating sphere, switches the electron beam on and off, avoiding operation between tiles.

Design Precautions

For close tolerance limits in color selection, many precautions are necessary.

The power supply to the light source must be regulated carefully. Direct-current excitation of the lamp is necessary, and a lead storage battery floating on the line without net charge or discharge is fairly good insurance against voltage fluctuation. Gradual blackening of the lamp will occur, but this difficulty may be overcome by the use of a variable compensating filter and a white reference standard.

The spectrophotometer phototube should have a spectral response characteristic similar to the RCA 926, which has the S3 sensitive surface. D-C amplification of its output is necessary to avoid unequal phase shifts of the various frequency components, since these will begin with a fundamental of 15 to 30 cps and may extend upward by a factor of 10.

Design data on d-c amplifiers may be obtained from many sources, but one recent publication is notable.[3] In an attempt to avoid the instabilities associated with d-c amplifiers, the use of a carrier system has recently been considered.

The writer wishes to thank Messrs. C. R. Granberry, Robert Anwyl, A. S. Jackman, J. H. Mitchell, and A. P. Deam for their help on the project.

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STUDYING Thermal Behavior OF HOUSES

Four thyratrons and a pentode provide electronic control for an electrical model of each house under study, and are connected to an electrical power source representing the furnace. A 24-hour heating cycle is thus scaled to 1/60th sec, and results determined with a cathode-ray oscilloscope and two ammeters. Fuel-conserving conclusions are given

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THE ANALYTICAL SOLUTION of problems of thermal transients in thermal networks of any but the simplest character is very tedious. Experimental solutions of these problems with laboratory heat networks are not easy.

The flow of heat through conductors which have thermal resistance and capacitance and the flow of electricity through electrical conductors which have resistance and capacitance are subject to analogous laws and hence to the same differential equation. It is possible to construct an electric circuit model whose resistance and capacitance represent to a scale the resistance and capacitance of a thermal network. Further, one can apply to the electrical model scaled voltages to represent temperature sources and scaled current sources to represent heat current sources.

After applying scaled stimuli and boundary conditions to the model, one can measure voltages and currents as functions of time and infer the nature of the response of the thermal network to corresponding stimuli and boundary conditions. A cycle of actions of several hours' or even days' duration in the heat network may be represented by an analogous cycle in an electrical network in a fraction of a second if a proper scaling of parameters is used.

This article describes the use of electronics in the study of the ther-

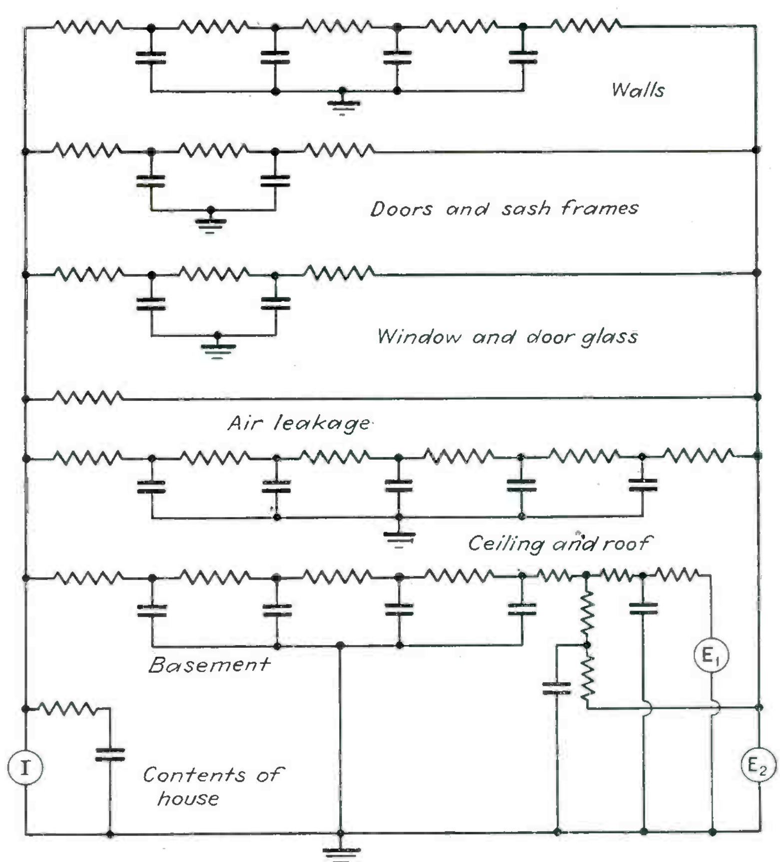

FIG. 1—Thermal resistance-capacitance network of a house. Potential E_1 represents the temperature of ground water, E_2 represents the outside temperature and I represents the furnace

mal behavior of houses. The methods here used could be readily applied to a large number of problems in which the same linear differential equations appear and in which, likewise, an analytic solution is laborious.

The Problem

The thermal networks and sources of three houses with identical external dimensions but different insulation properties were used. The problems were to determine, for a range of constant outside temperatures, the following:

1. The steady heat current required of the source to maintain the inside of the house at 70°F when the outside temperature is constant.
2. The saving in daily average heat current when the thermostat is set to a lower temperature for a period and then reset again to bring the house temperature back to 70°F. The saving in heat current is to be determined as a function of the number of hours per day during which the inside temperature is below 70°F. Constant outside temperature is assumed.
3. The minimum temperature of the house during the lower temperature period of problem 2 is to be determined.

Solution to the Problem

In a thermostatically controlled house, the furnace acts in the following manner. At some time in the morning, the thermostat is raised from a lower temperature setting to another setting, for instance, 70°F. The furnace then acts as a constant heat current source, raising the temperature of the house until it reaches 70°F; at this point, the furnace effectively acts as a constant temperature source maintaining the house at 70°F until some time in the evening, when the thermostat is reset at a lower temperature. The furnace is then effectively removed from the heat circuit until the thermostat is again set at 70°F, or until the house reaches the lowered setting of the thermostat. If the house temperature reaches the lowered setting, the furnace acts as a constant temperature source until the thermostat setting is raised, at which point it changes over to a constant current source again and the cycle is repeated.

An electrical source which behaves in the above manner was constructed and connected to electrical circuit models of the houses under study. The 24-hour cycle in a house was scaled to 1/60 second in the electrical model. The reading of a d-c ammeter gave the solution of problem 1, the steady heat current required. The reading of a second d-c ammeter gave the answer to problem 2, the saving when the thermostat is turned down. An oscilloscope pattern indicated directly a plot of values of inside temperature as a function of time, answering problem 3 and indicating how long the house temperature is below 70° F. The general conclusions were:

1. The saving accomplished by turning the thermostat down for a part of the day is small, in this case being never greater than 6 percent for periods of 8 hours below 70°F.
2. The percentage saving is smaller as the outside temperature is lowered.
3. The percentage saving varies roughly with the square of the time during which the house is at lower temperature.
4. For small changes in house temperature, transient inside tem-

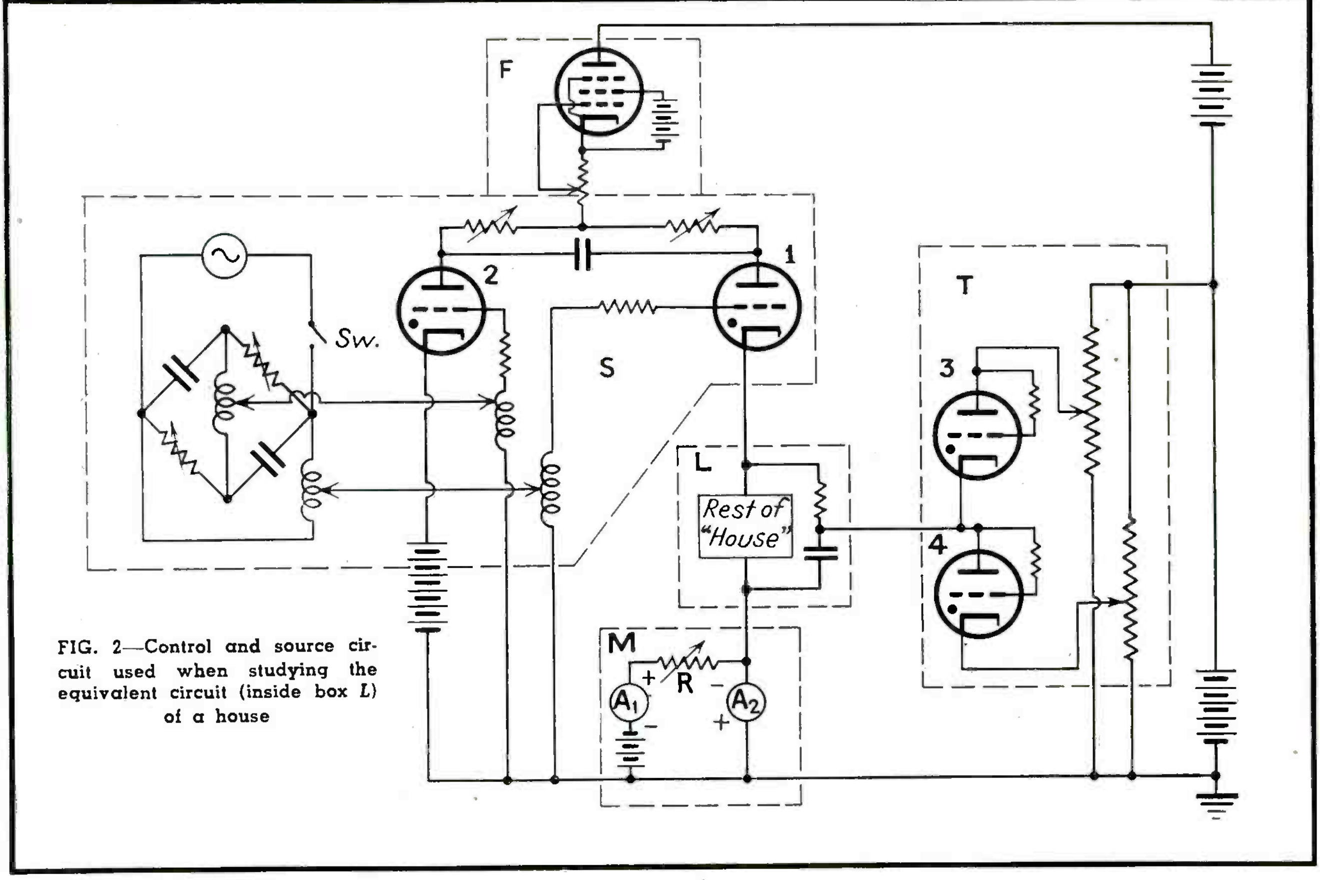

FIG. 2—Control and source circuit used when studying the equivalent circuit (inside box *L*) of a house

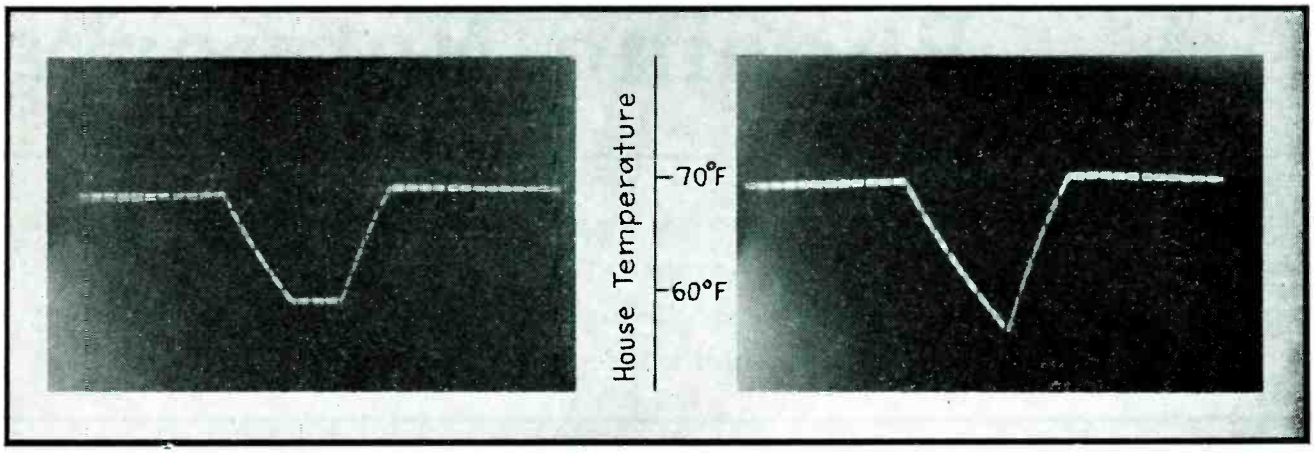

FIG. 3—Representative oscilloscope patterns of house temperature plotted against time of day. Each pattern represents a 24-hour day during which outside temperature was 0°F. *Left:* Heat supplied during low period. *Right:* No low-period heat

peratures are nearly linear functions of time.

The House Network

Figure 1 represents the thermal network of the houses studied. The resistors in the top row represent the series resistances formed by the layers of the wall. In thermal quantities they have the units deg-hr/Btu; in the electrical model the units are volt-sec/coulombs, or ohms.

The capacitors in the top row represent the lumped capacitances of the layers of the wall. In thermal quantities their units are Btu/deg; in the electrical model the units are coulombs/volt, or farads. Similar statements apply for the other resistances and capacitances.

In Fig. 1, *I* represents the furnace, a heat current source. When operating at maximum output it is a constant-current source, the rate of current flow being in the units Btu/hr, corresponding to coulombs/second, or amperes.

Constant voltage E_1 represents the ground temperature under the surface; this voltage is necessary since some heat flows through the basement floor to the ground.

Numerically, the values of parameters in the thermal and electrical circuits are not equal, the electrical constants being scaled to give sensible size parameters, sources, and time relationships. As has been mentioned, 24 hours in the thermal network corresponds to 1/60 second in the electrical network.

Electronic Circuit Used

The control and source circuit is shown in Fig. 2. Part *L* of the circuit represents the load, that is, the house network. The capacitor shown within *L* represents the capacitance of the contents of the house. The "temperature" of this part is recorded on the oscilloscope. E_1 and E_2 of Fig. 1 have been omitted in *L* to simplify the circuit.

Section *F* is the "furnace" which is, when full on, a constant-current source. The tube (five 6F6's in parallel in the actual circuit) is biased to cause it to give constant current over the range used for its plate voltage.

Section *S* is the timing circuit, and is a conventional inverter circuit fed by a constant-current source. Thyratrons 1 and 2 are triggered by peaking transformers, one of which is fed through a phase-shifting network in order that the portion of the cycle during which tube 2 is conducting is a variable. The portion of the cycle during which tube 2 conducts represents the lower temperature period in the heat cycle.

Part *T* of the circuit acts as a thermostat. Tubes 3 and 4 are thyratrons whose grids are tied to the plates by means of resistors. If the voltage across either tube rises to about 15 volts in the conducting direction, the tube conducts, maintaining a plate voltage of 15 volts. During part of the cycle tube 1 in section *S* is conducting. When the "house" gets to "70°", its further rise in "temperature" is prevented by tube 4 in section *T*. The current source then feeds enough current to the "house" to maintain it at "70°", and the remainder of its constant current goes to the thermostat circuit. When tube 2 of section *S* conducts, the "house" voltage begins to decrease. When this voltage decreases to a predetermined point, tube 3 of section *T* maintains the voltage constant by providing current to keep the "house" voltage constant until the current of the "furnace" comes through tube 1 again.

With these elements described, one can now trace the cyclic action of the control circuit. If tube 1 in section *S* is conducting, tube 4 in section *T* maintains "house" voltage at a value corresponding to 70°F. Then the peaking transformer in the grid circuit of tube 2, section *S*, fires tube 2 and the "house" voltage drops but never goes below a value dictated by tube 3 of circuit *T*. At a later predetermined point in the cycle, the peaking transformer of tube 1, section *S*, fires tube 1 and the "house" voltage increases to the value representing 70°F, at which point it is maintained by tube 4, circuit *T*.

The relative phase angles of the peaking transformers thus determine what portion of the cycle the "house" is below a voltage corresponding to 70°F. The oscilloscope traces of "house" voltage reproduced in Fig. 3, show the temperature as a function of time for two instances in the problem studied. The "time-off" period may be altered by shifting the phase of the peaking transformers, and different outside conditions may be represented by changing the voltages in section *T* of Fig. 2.

(*Continued on page* 362)

Phasing Networks

Graphical methods are applied to the design of phase-shifting and impedance-matching networks required to distribute power properly in directional antennas. Compared to conventional network analysis the vector method results in economy of circuit components and simplified design procedure

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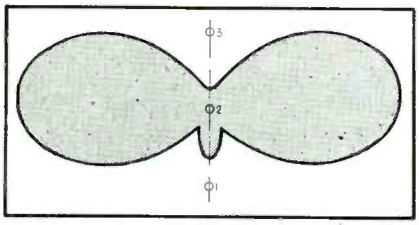


FIG. 1—Desired radiation pattern, which can be produced by the antenna array of Fig. 2

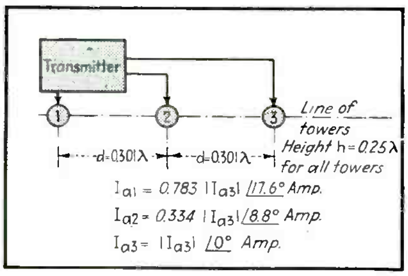


FIG. 2—Antenna array required to produce the radiation pattern of Fig. 1

VECTOR synthesis is a convenient mathematical tool which is very helpful to the designer of r-f phase-shifting and impedance-matching networks for the directional arrays used by many broadcast stations. Not only does this combination graphical and mechanical technique afford a clear understanding of the operation of a-c circuits, but it can also be used to "synthesize" network designs which display great simplicity when compared to circuits determined by ordinary methods. Problems in the design of phasing networks for directional antenna arrays are particularly susceptible to solution by vector methods.

Principles of Vector Synthesis

In general, the synthesis of a network by vector manipulation usually reduces to the following problem: Given a pair of vectors I_1 and E_1, representing the current through and the voltage across an impedance, it is required to establish a circuit which will transform I_1 and E_1 into another pair of vectors, I_2 and E_2. The latter pair of vectors is usually specified by the conditions of the problem.†

When the input and output impedances R_1 and R_2 between which the network must operate are known, the two currents are related by a simple law which equates input and output powers:

$$I_1^2R_1 = I_2^2R_2$$

The method of designing a network by vector synthesis may be most easily outlined by means of a specific example. To illustrate the general method, let it be required to design phasing networks suitable for providing currents of the desired magnitude and phase to three vertical radiators, in order to produce the radiation pattern shown in Fig. 1.

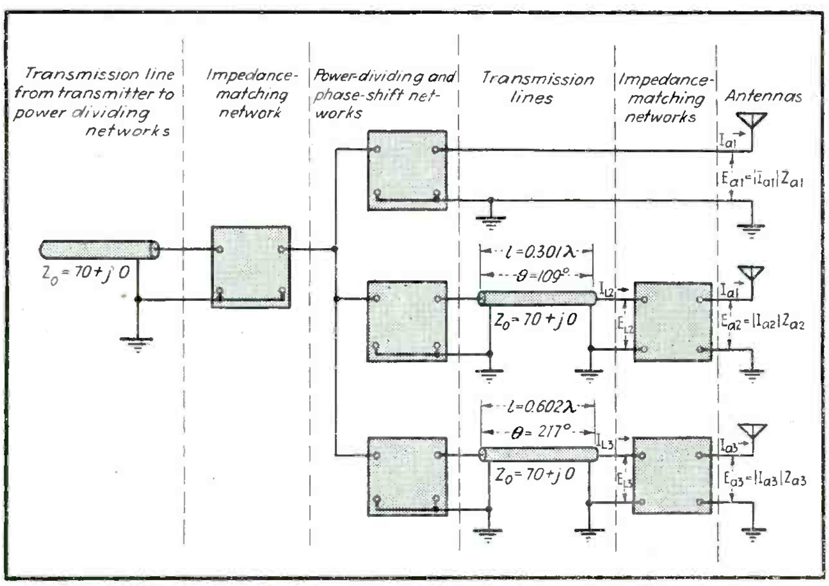


FIG. 3—Block diagram of system of networks and transmission lines for feeding antennas with the currents and voltages necessary to produce directional radiation pattern

† If the circuit is free from dissipation, the second pair of vectors is subject to the restriction.

$$\tfrac{1}{2}(E_1I_1^* + E_1I_1) = \tfrac{1}{2}(E_2I_2^* + E_2^*I_2)$$

in which the asterisk (*) denotes the conjugate function. This equation states that the network must neither create nor destroy power.

for Broadcast Arrays

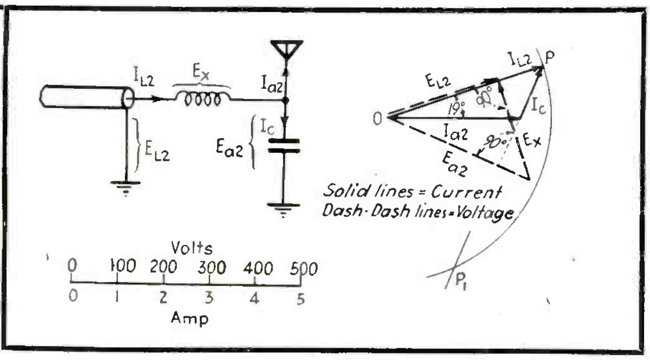


FIG. 4—L-type network for matching impedance of transmission line to impedance of antenna 2, with vector diagram from which design of the network is derived

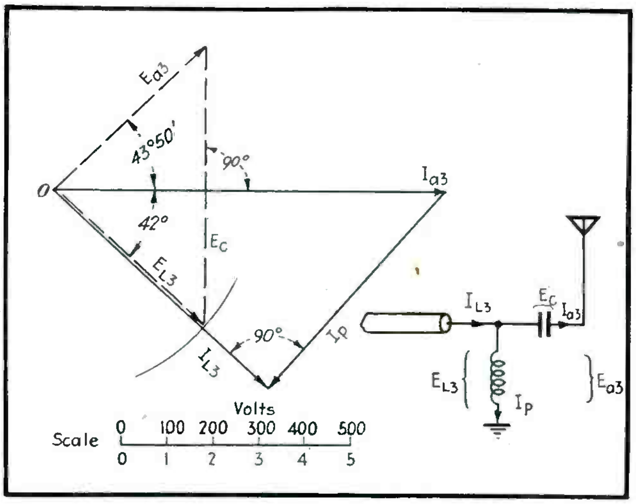


FIG. 5 (*RIGHT*)—Impedance-matching network of the L-type for matching antenna 3 to a 70-ohm transmission line. Vector diagram illustrates method of designing this circuit

An analysis of this radiation pattern reveals that the towers must be 0.25 λ high, separated by a distance 0.301 λ, and fed with currents whose magnitudes and relative phases are as given in Fig. 2. A block diagram showing the elements of a suitable system of networks to produce the desired radiation pattern is shown in Fig. 3.

The problem at hand is now to design, by methods of vector synthesis, impedance-matching networks between the transmission lines and the antennas, power-dividing and phase-shift networks, and the impedance-matching circuit which connects the transmission line from the transmitter to the three power-dividing and phase-shift networks. (It should be noted from Fig. 2 that antenna 1 is located at the transmitter and consequently does not require a transmission line, as do the other two antennas.)

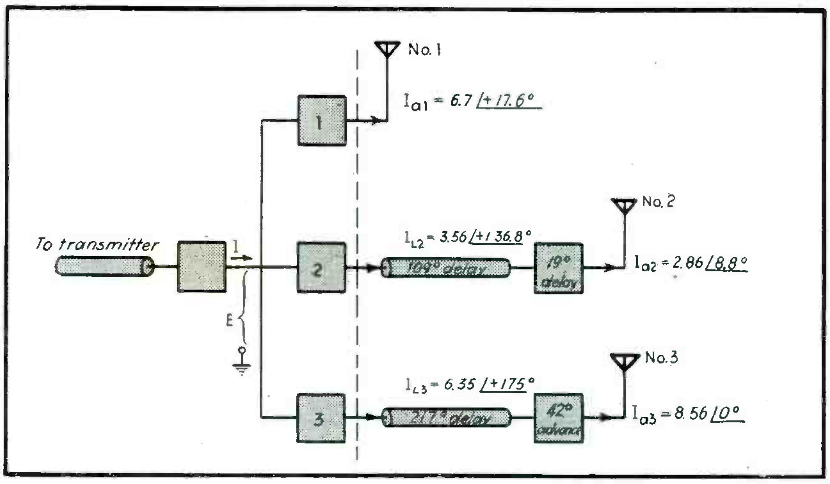


FIG. 6—Block design illustrating the summary of phase shifts occurring between the power-dividing networks and the antenna

Example of Vector Synthesis

To design a feed system for the array of Fig. 3, it is necessary to start at the antennas and work back through each network and transmission line toward the transmitter. The conditions of the problem yield the following information regarding antenna currents, impedances, and powers:

$$I_{a1} = 6.7\underline{/17.6°} \text{ amperes}$$
$$I_{a2} = 2.86\underline{/8.8°} \text{ amperes}$$
$$I_{a3} = 8.56\underline{/0°} \text{ amperes}$$
$$Z_{a1} = 28.7 + j39 = 48.4\underline{/53.67°} \text{ ohms}$$
$$Z_{a2} = 108 - j45 = 117\underline{/-22.63°}$$
$$Z_{a3} = 38.5 + j37 = 53.5\underline{/43.83°}$$
$$P_{a1} = 1290 \text{ watts}$$
$$P_{a2} = 890 \text{ watts}$$
$$P_{a3} = 2820 \text{ watts}$$

where I_{a1}, I_{a2}, and I_{a3} are currents in antennas 1, 2, and 3 respectively, and the angles represent phases relative to that of I_{a3}. The quantities Z_{a1}, Z_{a2}, and Z_{a3} are the impedances of antennas 1, 2, and 3, respectively, and P_{a1}, P_{a2}, and P_{a3} are the powers in antennas 1, 2, and 3, respectively.

From this data the voltage applied to the antennas and the currents in the transmission lines (whose impedance is $Z_o = 70 + j0$) can be determined as follows:

$$E_{a1} = |I_{a1}|\, Z_{a1} = 6.7 \times 48.4\underline{/53.67°} = 324\underline{/53.67°} \text{ volts}$$
$$E_{a2} = |I_{a2}|\, Z_{a2} = 2.86 \times 117\underline{/-22.63°} = 335\underline{/-22.63°} \text{ volts}$$
$$E_{a3} = |I_{a3}|\, Z_{a3} = 8.56 \times 53.5\underline{/43.83°} = 458\underline{/43.83°} \text{ volts}$$
$$I_{L2} = \sqrt{P_{a2}/Z_o} = \sqrt{890/70} = 3.56 \text{ amp.}$$
$$I_{L3} = \sqrt{P_{a3}/Z_o} = \sqrt{2820/70} = 6.35 \text{ amp.}$$
$$E_{L2} = Z_o I_{L2} = 70 \times 3.56 = 250 \text{ volts}$$
$$E_{L3} = Z_o I_{L3} = 70 \times 6.35 = 444 \text{ volts}$$

where E_{a1}, E_{a2}, and E_{a3} are the voltages applied to antennas 1, 2, and 3 respectively and the phase angle of each voltage is referred to the corresponding antenna current as a reference, I_{L2} and I_{L3} are the magnitudes of the currents in the transmission lines feeding antennas 2 and 3, and E_{L2} and E_{L3} are the mag-

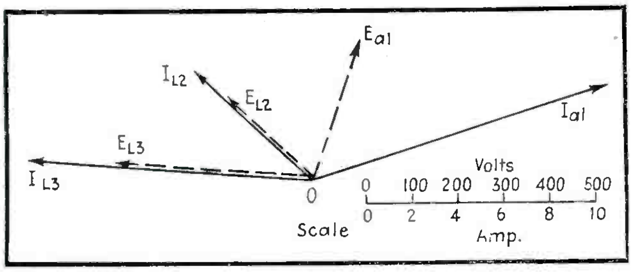
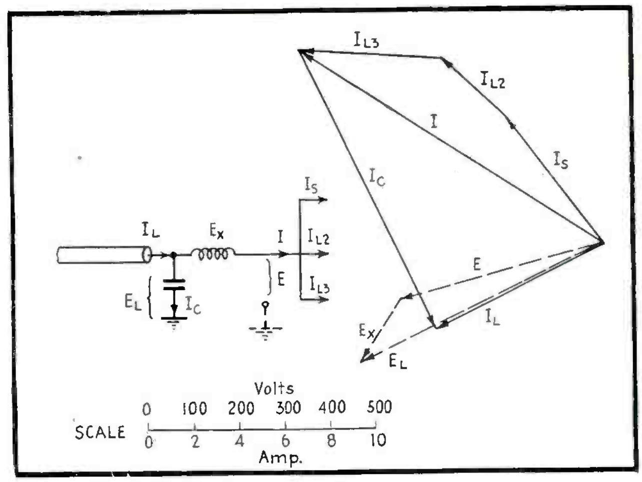


FIG. 7—Vector diagram of voltages and currents which must be produced by phase-shifting and power-dividing networks

FIG. 9—Vector diagram for input circuits →



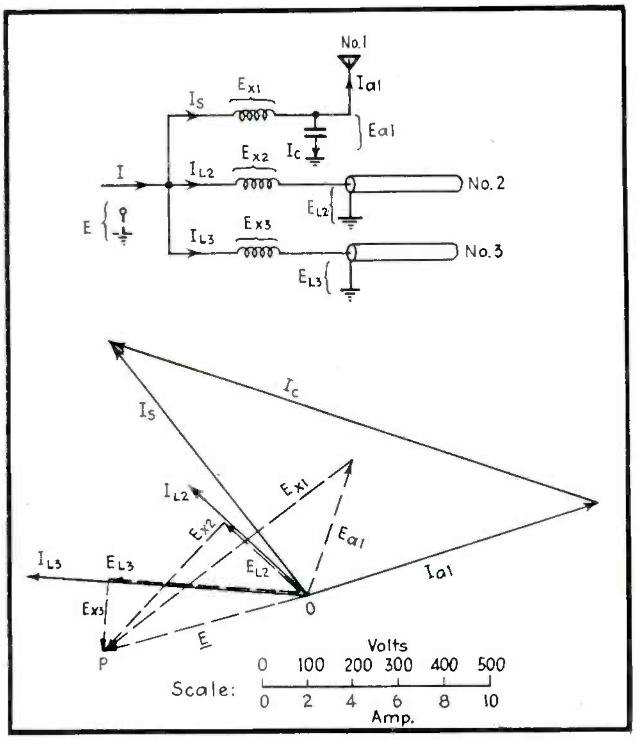


FIG. 8—Synthesis of phasing and power-dividing networks

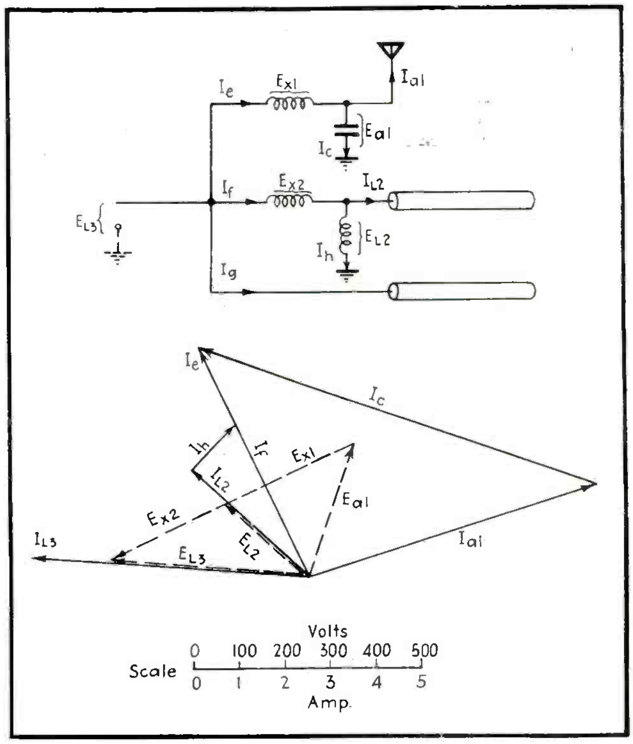


FIG. 10—Alternative design of phasing networks →

nitudes of the voltages across these transmission lines. With this data, the impedance-matching networks between the transmission lines and the antennas can now be designed.

Design of Network for Matching Impedances

The sketch in Fig. 4 illustrates the synthesis of a network for matching the line impedance of $Z_o = 70\angle 0°$ ohms to the center antenna impedance of 117 $\angle -22.63°$ ohms. We begin by drawing a vector of length 2.86 units to represent the antenna current I_{a2}. This vector can be drawn in any convenient direction but since it is used as the reference vector, it will be drawn along the x-axis. To some suitable voltage scale, the vector for the antenna voltage E_{a2}, at an angle of $-22.63°$ with respect to I_{a2}, can also be drawn.

An L network of the type shown will give the impedance transformation. For such a network, Kirchhoff's law for branching currents must be satisfied, i.e., $I_{L2} = I_{a2} + I_c$, where I_c is the current through the capacitor. Therefore the tips of I_{L2} and I_c must coincide at some point P which lies on a circle of radius $I_{L2} = 3.56$, drawn from 0 (zero) as a center. Since the current through a reactance forms a 90-deg angle with the voltage across it, we may lay out I_c at right angles to E_{a2}, and the intersection of I_c with the circle locates the point P.

The potential E_{L2} must equal the sum of E_x and E_{a2}. Therefore, the tail of E_x must lie on the tip of E_{a2}, and the direction of E_x is normal to the current I_{L2} through the inductance. The magnitude of E_x is determined by the point of intersection with I_{L2}, and the voltage triangle is completed by drawing E_{L2} from 0 (zero) to the point of intersection of E_x with current I_{L2}.

Because I_c leads E_{a2} by 90 deg, the parallel reactance must be that due to a capacitance. Similarly, since E_x leads I_{L2} by 90 deg, the series reactance must be that due to an inductance. The magnitudes of the required reactances are obtained by dividing the length of a vector representing voltage across a reactance by the length of the corresponding current vector, i.e., $X_L = E_x/I_{L2}$, and $X_c = E_{a2}/I_c$.

The network of Fig. 4 is a delay network because I_{a2} lags behind L_{L2}. Had we chosen to extend I_c in the opposite direction, intersecting the circle at P_1, a phase-advance network would have been obtained.

Choice of Configuration

The choice between the phase-advance and the phase-delay configuration is purely a matter of convenience. Any impedance transformation problem may be solved by either network. However, in designing the matching circuit for antenna 3 we choose the phase-advance network because this choice happens to simplify design of the phasing networks. We begin the construction of the vector diagram for antenna 3 (Fig. 5) by drawing vectors I_{a3} and E_{a3}. The series capacitor introduces a voltage E_c which adds to E_{a3}, but in a direction normal to I_{a3}. Then, a circle of radius E_{L3} locates the tip of E_c, and the vector I_{L3}, whose length is known, is drawn through the point of intersection. The vector I_p, drawn normal to and lagging I_{L3}, completes the construction.

Phasing Networks

A summary of the phase shifts in the lines and antenna tuning units is given in Fig. 6. Each of the two transmission lines introduces a delay (in degrees) of $\theta = 360\ l/\lambda$, where l is the length of the line and λ is the wavelength. For $\lambda = 0.301$ the delay is 109 deg, and for $\lambda = 0.602$ the delay is 217 deg. The apparatus to the left of the dotted line in Fig. 6 is required to divide the transmitter power into three parts and distribute it among the three antennas with the required phase angles and amplitudes. Figure 7 represents the three voltages and currents leaving the phasing apparatus at the dotted lines of Fig. 6.

The remaining problem is that of selecting a voltage vector E which can be rotated and transformed by means of three separate reactance networks to produce E_{a1}, E_{L2}, and E_{L3}. An important point is that the vector E may be of any magnitude and of any phase, and we may therefore select E to suit our own convenience. Referring to Fig. 8 we see that reactances in series with transmission lines 2 and 3 produce voltage vectors E_{x2} and E_{x3} which intersect at P. The vector E, drawn from 0 (zero) to P, is then a convenient vector to represent the input voltage.

Since the antenna current I_{a1} is far removed in direction from E, it is necessary to obtain somehow a new current I_s that is at least within 90 deg. of E. This is accomplished by introducing a parallel capacitance across antenna I_s, producing the current I_c leading E_{a1} by 90 deg. An inductance in series with I_s introduces a voltage vector E_{x1}, drawn from the tip of E_{a1} by 90 deg. An inductance in I_s perpendicular to E_{x1} we have satisfied all the conditions of the problem.

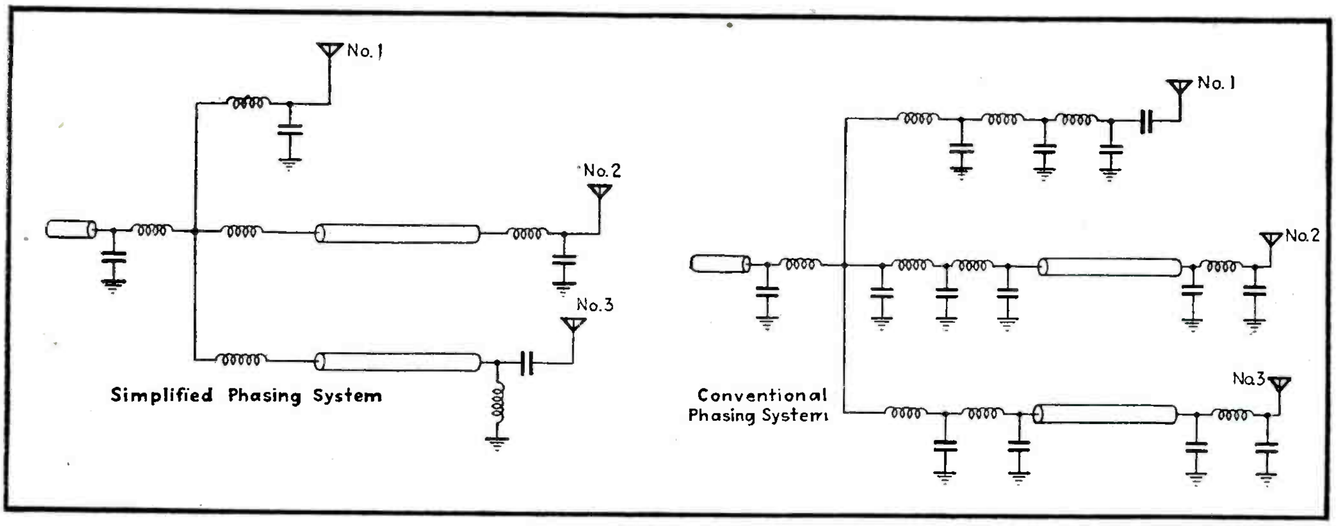
Input Circuit

An input circuit, to provide a load impedance of $70 + j0$ ohms for the transmitter, is illustrated in Fig. 9. The total current I is obtained by adding vectorially the three branch currents I_s, I_{L2} and I_{L3}. By adding a series inductance to produce E_x, and a parallel capacitance to produce I_c, the voltage and current triangles are all properly completed.

Alternative Solution

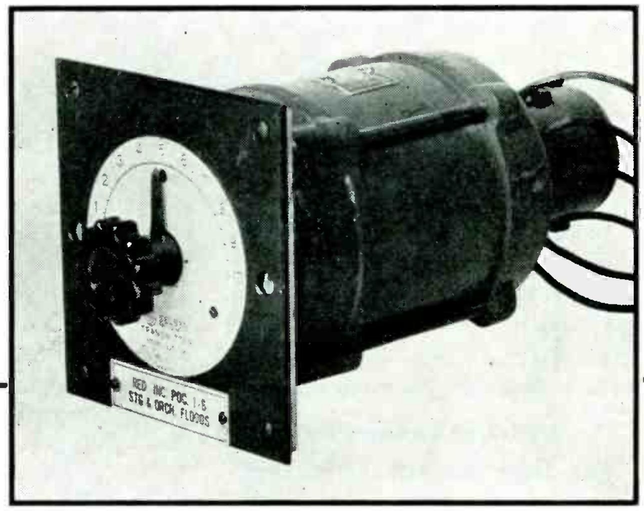
In an earlier paragraph, it was stated that any voltage vector E (Fig. 8) could be selected when designing the phasing networks. Suppose, for instance, that antenna 3 is thought to be the dominant element in the array and that we wish to do all the tuning in the networks feeding antennas 1 and 2. Then, E_{L3} is the input voltage, as shown in Fig. 10. The design in this case follows the same principles established in previous examples.

Completed simplified system of networks designed by vector synthesis, and equivalent system of networks designed by conventional methods



Grid Control of

Summary of typical phase-shifting circuits which enable smooth control of thyratrons and ignitrons to be obtained



Selsyn transmitter for obtaining phase shift from 3-phase power

The usefulness of the gas-filled electron tube lies in its low, constant, internal voltage drop and the resulting high circuit efficiency for large currents. However, the ionization of the gas which permits this low drop also prevents the control grid from stopping the current flow when it has once begun. Hence, the most usual application of thyratrons is on an alternating current system where the periodic reversal of the anode voltage permits deionization and a chance for the grid to regain control. After the current has ceased flowing, a negative grid will prevent its restarting even though the anode has again become positive. It is by retarding the application of the tripping voltage to the grid until the desired time in the positive cycle that the average current in the thyratron is controlled.

For some simple "On-Off" actions, it is possible to operate the grid from a d-c supply, but to obtain a smooth control of the grid-firing angle throughout the required part of the positive cycle, it is necessary to use firing circuits which operate wholly or partially from the same a-c supply used for the anode circuit.

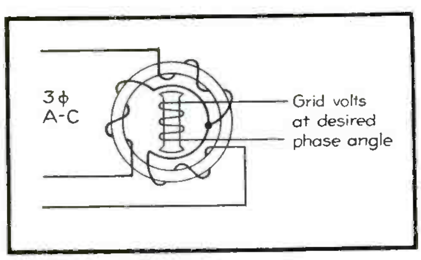
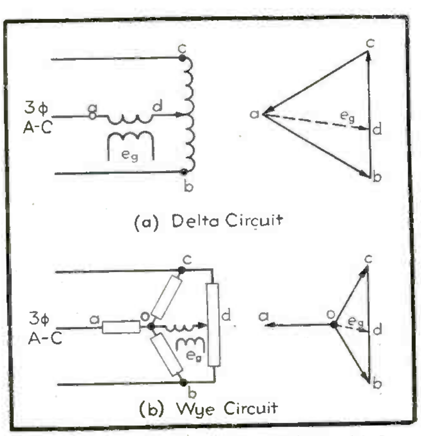


Fig. 1—Use of Selsyn for grid control by which any desired phase may be applied to the grid



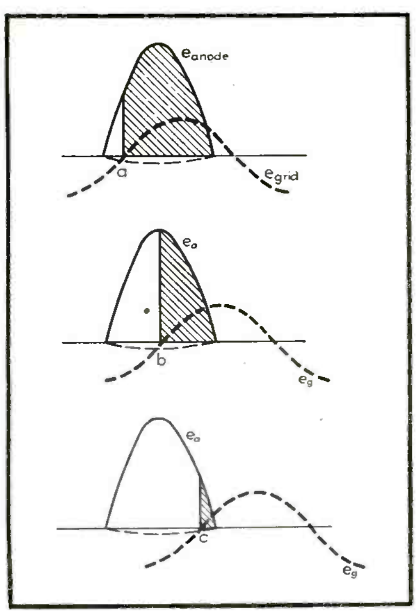


Fig. 3—Grid control by phase shift. Shaded area indicates tube conduction; dotted line is critical grid firing curve

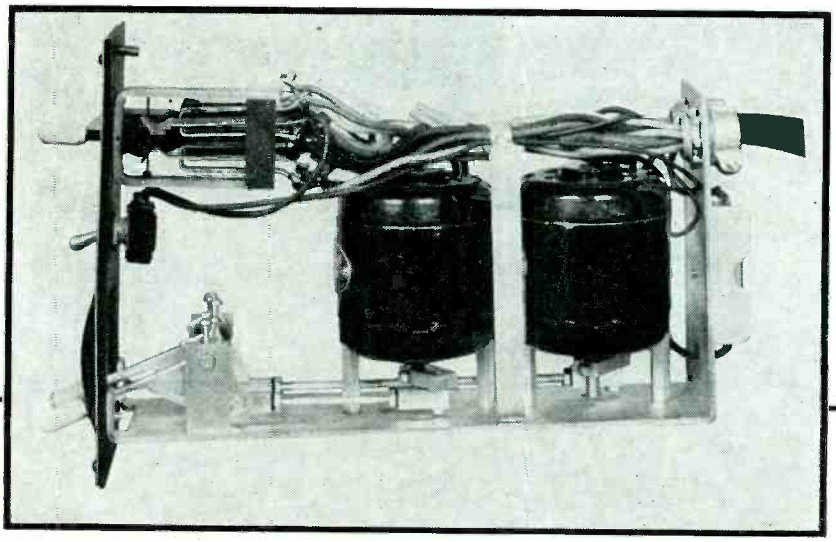
Fig. 2—Auto-transformer or potentiometer to add a fixed voltage to a variable out-of-phase voltage for limited degrees of phase shift

Three Fundamental Methods of Obtaining Phase Shift

If a 3-phase supply is available, we may use a form of transformer wound with a 3-phase stator and a rotatable secondary by means of which we can apply any desired phase to the grid circuit. This is the familiar "selsyn" or "autosyn" device, as shown in Fig. 1.

For limited phase shift, we may add a constant voltage of fixed phase to a variable out-of-phase voltage by means of an autotransformer or potentiometer placed across the second phase winding as in Fig. 2. The vectors show that this method will change the amount as well as the phase of the grid voltage, but, since the thyratron

Gas-Filled Tubes



Two rotary control inductors with switches in a control unit used as in Fig. 6

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critical firing voltage is usually very near zero, this change in the amount of grid voltage is not detrimental.

Grid-Shift Circuits Obtained from Single-Phase A-C

However, 3-phase often is not available and it is necessary to obtain our phase shift from a single-phase circuit by means of resistance-reactance bridges and such devices. These may be divided into: (1) those which change components of the bridge circuit to obtain a definite phase shift of a constant amplitude voltage, (Fig. 3), and (2) circuits which combine a fixed phase shift obtained from the a-c supply, with a variable d-c voltage (Fig. 4).

First to be considered are the bridge type of phase-shift circuits. These usually are composed of a transformer having a mid-tap and reactance and resistance legs to form the other two sides of the bridge.

The circuit of Fig. 5a combines a resistor and a capacitor. The values of capacitance required for reasonable impedances at the normal commercial frequencies, such as 60 cycles, are usually so large that variation of the capacitance is not practical. Therefore, the resistive element is varied. This usually consists of a small rheostat which may be operated by hand or by automatic mechanical control means of conventional design.

If the bridge consists of a resistor and a reactor, as in Fig. 6, we have a greater freedom of action, since either the resistor or the inductance of the reactor may be varied. For instance, the reactor may consist of a solenoid whose core may be withdrawn, or a small induction regulator in which the rotor and stator may be moved with respect to each other. Or the inductance may be of the saturable reactor type in which direct current supplied to one winding of the reactor will saturate the core and thus vary the a-c reactance of the other winding. This has the added advantage that the direct current is insulated from the thyratron grid circuit.

Grid Circuit Waveform

Because of the rather severe third harmonic that appears in the a-c circuit of a saturable reactor, the grid circuit wave form will no longer be sinusoidal, but becomes more of a square wave form. This, however, is quite desirable for a grid tripping circuit.

A bridge circuit using only one variable element cannot fully swing the output vector (since one leg

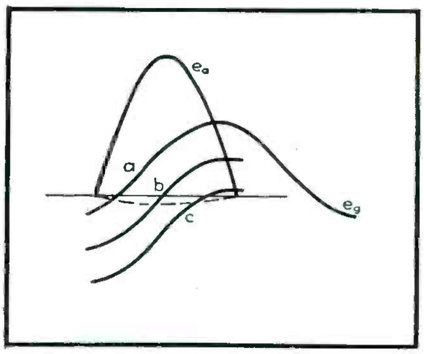


Fig. 4—Grid control by fixed alternating and variable direct voltages. Compare this with Fig. 3

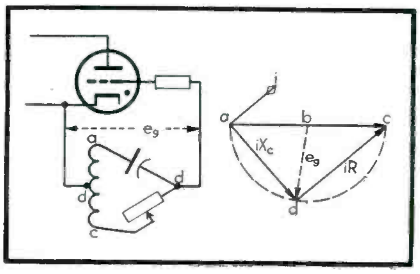


Fig. 5—Resistor-capacitor phase-shift network

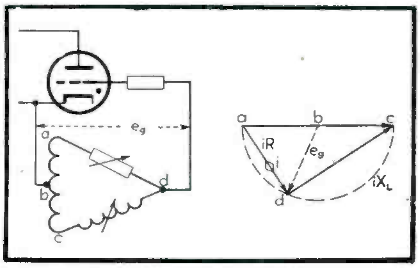
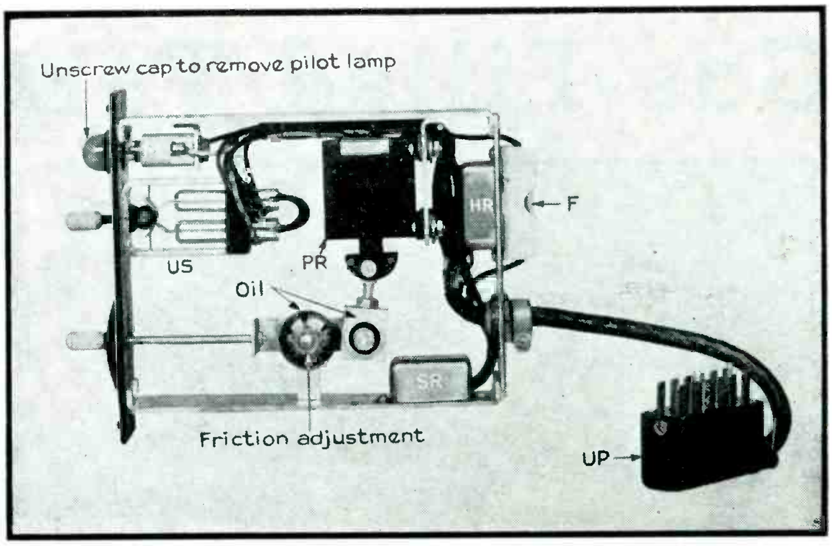


Fig. 6—Resistor-reactor phase-shift network

cannot be reduced to zero). But by combining capacitors and inductances in one leg, it is possible to obtain a phase shift of almost 360 deg as the inductance of the reactor is varied past the resonant point.

The variable resistance for the bridge may be obtained directly or may be reflected through a transformer placed in one leg. A number of interesting electronic circuits have been developed to supply this resistance element.

Two circuits are shown (Figs. 7a and 7b) in which electronic tubes replace the resistance directly. There is also a certain amount of rectification in Fig. 7b which changes the d-c component of the grid voltage.



Small solenoid with adjustable core, PR, in a unit control panel

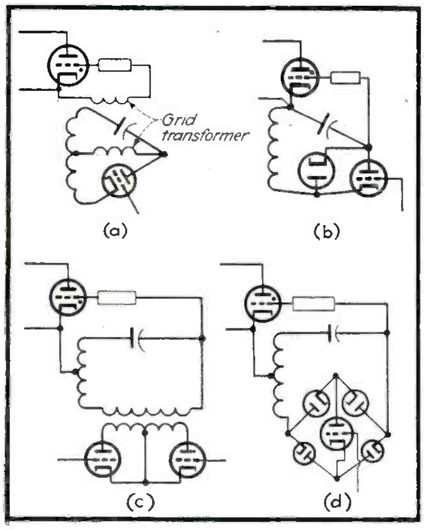


Fig 7—Vacuum tubes replacing resistor of Fig. 5

Circuits which reflect the resistance through a transformer are particularly useful because this permits insulation of the control circuit from the thyratron circuit. The simplest of these are the biphase, half-wave rectifier (Fig. 7c) and the bi-sected rectifier square in which one tube does the work of the two tubes of the previous circuit. This last circuit is sometimes used directly in the bridge, as in Fig. 7d.

Grid Shift Using Fixed Phase and Variable Direct Current

One of the most used forms of this type of control is that of Fig. 8, using a 90-deg phase shift on which is superimposed direct voltage which may be varied from the positive peak voltage to the negative peak voltage of the a-c component. Theoretically, this permits the transmission of an integrated voltage proportional to the d-c control voltage. Under practical consideration, however, the load is rarely a pure resistive load, but is inductive or contains a back emf so that the actual relation of power output is not so linear.

Because there is no inductance in the grid circuit and the incidental capacitances are small, this system is capable of extremely high-speed operation. But, for the same reason, it is susceptible to high-frequency transients, and the small angle of intersection between the controlled voltage and the critical grid voltage at the beginning and end of the cycle makes it somewhat critical to tube characteristics and temperature unless it is used in some self-balancing overall control circuit.

Another ingenious circuit of this type has been used for a number of

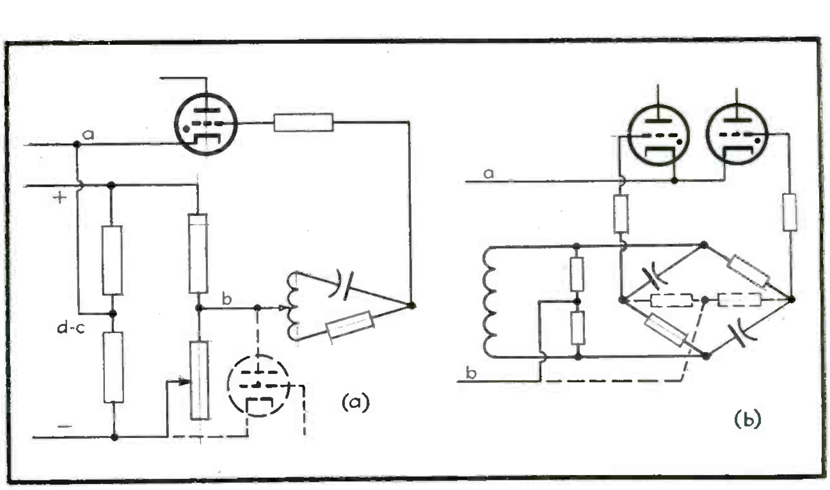


Fig. 8—Control by varying d-c voltages. At (a), a tube (shown as dotted) is employed as the variable resistor; at (b), circuit variation to control two thyratrons and to obtain mid-tap

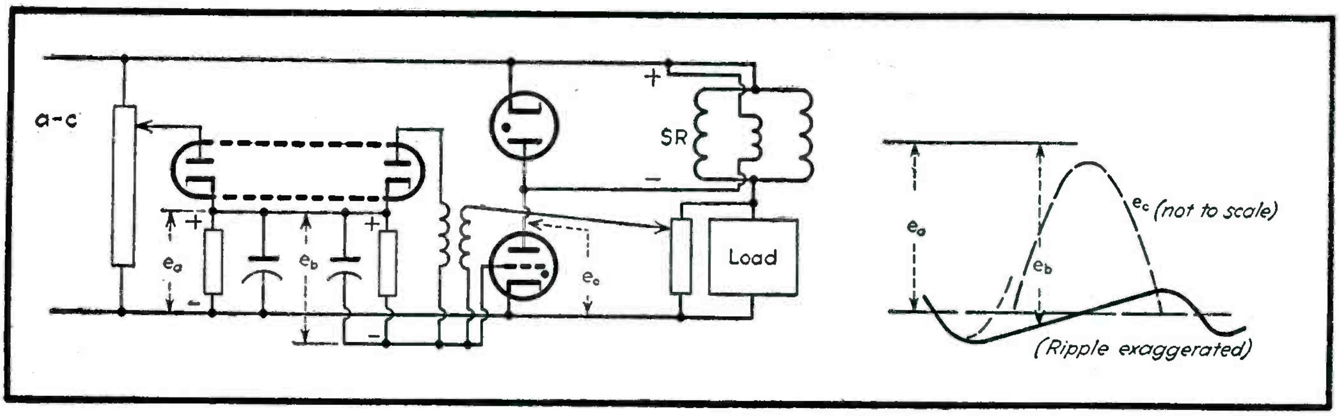


Fig. 9—Grid control for saturable reactor excitation, with curves of wave form

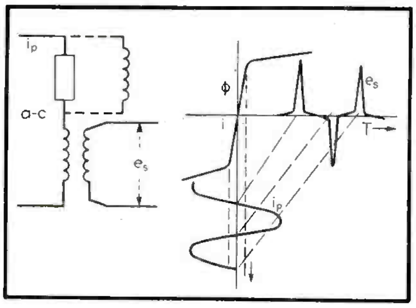
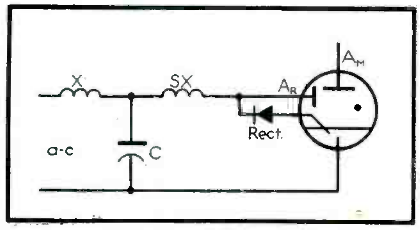


Fig. 10—(left) Use of peaking transformer. The series impedance may be resistive or reactive (shown as dotted)

Fig. 11—(right) Ignition firing by saturable reactor, *SX*. *X* is a current limiting reactor; *C* is an energy storage capacitor, A_m and A_r are main and relieving anodes respectively



years to supply the d-c saturable reactors for power and heating uses. This circuit, shown in Fig. 9, combines a long time constant (e_a) and short time constant (e_b) capacitor-resistor timing circuit and a twin-diode rectifier.

A feedback transformer from the load supplies the excitation for the short time constant network, tending to force the grid negative; and the long time constant network, which tends to turn the thyratron on, is supplied from a control voltage which may be of any frequency or phase. Only a few milliamperes are drawn from the control circuit so that this control, although somewhat slow in operation, lends itself very well to controls requiring much preliminary switching and superimposed control signals such as the preselected and preset lighting effects required for theater lighting control. The voltage feedback feature compensates to a great extent for changes in load.

Peaking Transformers

For greatest accuracy in firing a thyratron at an exact point in the phase, it is customary to insert a "peaking transformer" in the grid firing circuit after it has passed through the phase-shift network. This peaking transformer is a type of saturated transformer permitting a very sharp sliver of voltage, only a few electrical degrees wide, to be generated once each half cycle. Thus, the thyratron is fired during these few degrees if it is to be fired at all during the cycle. Figure 10 shows a typical peaking transformer and the output voltage wave shape.

Ignitron Firing

Another similar form of peaking action may be produced by means of a saturating reactor made of some magnetic material having a very sharp bend to the saturation curve, such as "Nicaloi". This saturating reactor, in the circuit shown in Fig. 11, will permit a sudden surge of current to be passed through an ignitron igniter which is similar in action to the surge of voltage from a peaking transformer. This type of circuit is often used in the large pumped-type of ignitron rectifier. When the arc has started, the igniter current is transferred to a "relieving" electrode which protects the starter from excess current and heating. A blocking layer rectifier is placed in series with the igniter to prevent damage due to reverse current.

Anode Firing

An ignitron tube for control circuits such as resistance welding is usually fired by the principle known as "anode firing" (Fig. 12). In this circuit, a firing thyratron is connected between the ignitron anode and the igniter. When the thyratron grid is fired in the usual way, the igniter is thus connected to the ignitron anode, but as soon as the ignitron is ionized and becomes conducting, the voltage

SYMBOLS

As a means of trying out some new symbols recommended by recent ASA committees, Mr. Cockrell has granted *Electronics* permission to use these new symbols in the diagrams in this article.
Half-loops represent inductors; capacitors are indicated by adjacent straight and curved lines. Variable capacitors would have arrows drawn through the plates at a 45-deg. angle.

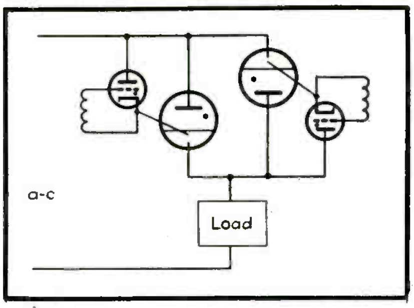


Fig. 12—Anode firing of ignitrons by thyratrons acting as single-phase a-c switches

across the thyratron and igniter drops to the inter-electrode potential of the ignitron (below 20 volts), and the thyratron is extinquished, thus protecting the igniter.

Because the thyratron cathode is floating except for its connection to the igniter, it is necessary that it be fired through a grid transformer. Its grid circuits (Fig. 13) often consist of three transformer secondaries. The first (T-1) is an out-of-phase voltage which holds the grid quite negative. The second (T-2) is an in-phase voltage not quite equal to the first out-of-phase voltage, which is energized when the thyratron is to conduct. The third (T-3) is the secondary of a peaking transformer which may be phase-shifted and which, combined with the second "turn-on" voltage, permits the thyratron to fire when the second transformer is energized.

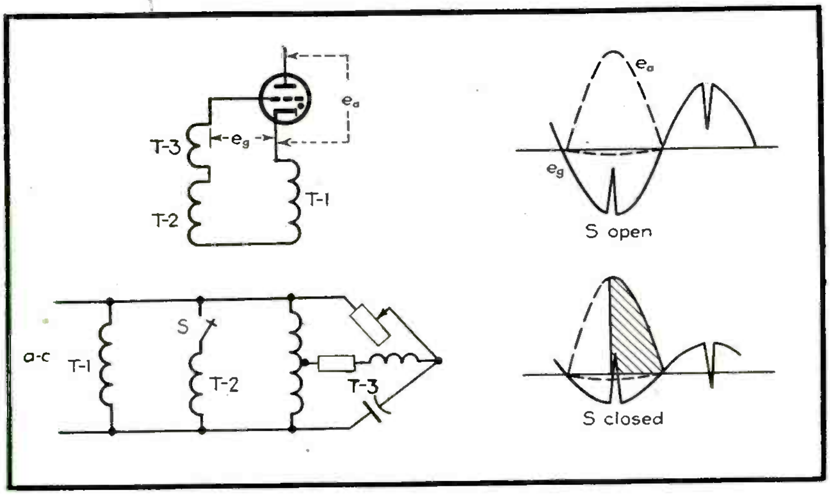


Fig. 13—Three-transformer grid circuit for thyratron used to fire an ignitron as in Fig. 12. T-1 supplies hold-off voltage; T-2 supplies turn-on voltage, T-3 supplies peaking voltage, adjustable phase; S is a control switch

Since resistance welders are inherently low power factor lagging loads in which the thyratron is fired somewhere between 45 and 135 electrical degrees, this circuit is quite satisfactory for this operation.

Cautions to be Observed

It must be remembered that each time the grid of an electron tube goes positive it tends to draw grid current. This current is usually minimized by inserting a resistor in series with the grid. From a theoretical standpoint, this should be as high as possible, but from a practical standpoint, due to small parasitic currents caused by grid contamination, capacitances, insulation leakage, etc., this resistance is usually limited to 50,000 or 100,000 ohms, although for shield-grid thyratrons this may be raised to a megohm or more.

Grid Rectification

Sometimes, a small capacitor is placed in parallel with this grid resistor (Fig. 14) to be charged by grid rectification on the inverse cycle and thus force the grid slightly more negative than usual. This compensates for any small phase shifts which have occurred between the anode potential and the grid transformer winding, and prevents the tube from being turned on full by too much grid retard which might possibly make the grid positive at the beginning of the following positive anode cycle.

Other Considerations

If a grid transformer is placed in the phase-shifted circuit to permit firing of an insulated thyratron or to permit firing a second thyratron on the inverse cycle, it must be remembered that the reactance of a transformer will load the phase-shift circuit and this must be allowed for in computing the vectors. This also applies if a peaking transformer is used.

It is customary in some circuits to place a small capacitor (Fig. 15) between the grid and cathode for protection against surge and transient voltages. The effect of this capacitor, usually less than 0.01 μf, must be allowed for in the grid circuit design.

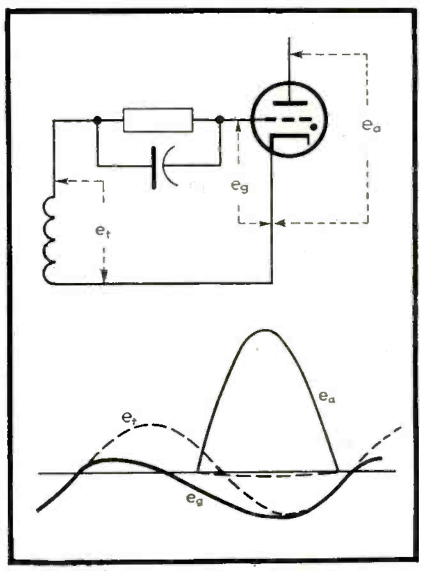


Fig. 14—Phase advance obtained by grid rectification

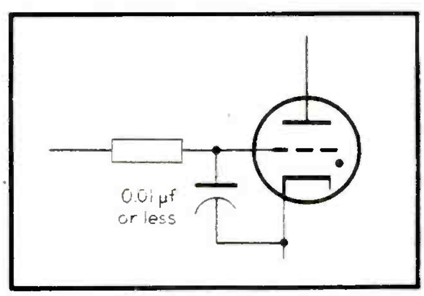
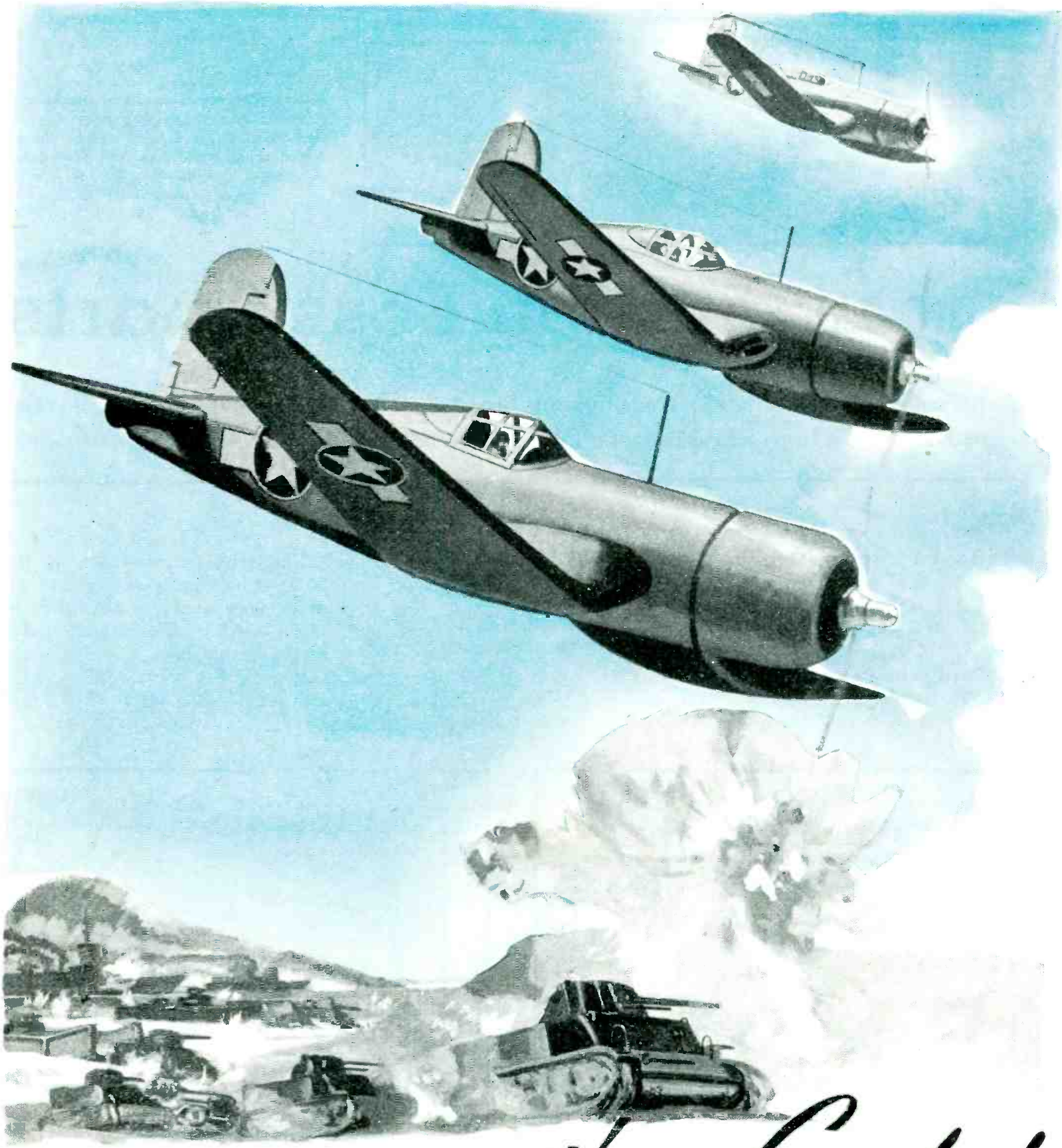


Fig. 15—Grid-cathode capacitor for protection against surge or transient voltages



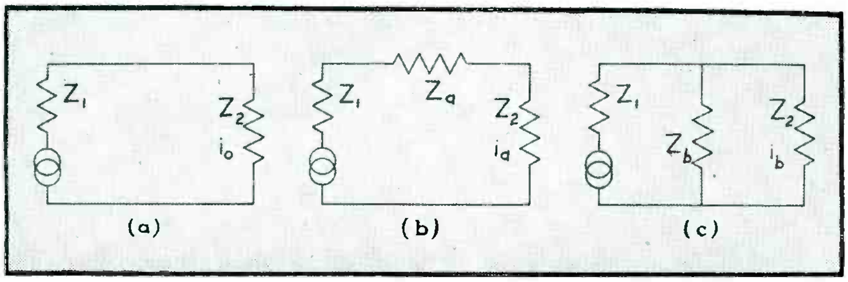


FIG. 1—Equivalent circuit of transmission line (a), same circuit with inserted series impedance (b), and same circuit with inserted shunt impedance (c). Accompanying charts give insertion loss or gain in these circuits

Transmission Loss Charts

Nomographs for calculating transmission losses or gains caused by insertion of a series impedance into a line or bridging of an impedance across a line, in three ranges of values

By JACK G. ROOF

Oregon State College
Corvallis, Oregon

If an emf E acts through an impedance Z_1 onto an impedance Z_2 in series, as in Fig. 1 (a), the current in Z_2 is given as $i_o = E/(Z_1 + Z_2)$. If a series impedance Z_a is placed between Z_1 and Z_2 as in Fig. 1(b), the current now flowing through Z_2 is $i_a = E/(Z_1 + Z_2 + Z_a)$. The absolute ratio of the currents in these two instances is

$$\left|\frac{i_o}{i_a}\right| = \left|\frac{Z_1 + Z_2 + Z_a}{Z_1 + Z_2}\right| = \left|\frac{1 + Z\ \angle\theta}{Z\ \angle\theta}\right|,$$

where $Z\ \angle\theta \equiv (Z_1 + Z_2)\ /\ Z_a$

Similarly, for the case of the bridged impedance of Fig. 1(c), i_o is as above, and $i_b = EZ_b/(Z_1Z_b + Z_2Z_b + Z_1Z_2)$. The absolute value of the current ratio is

$$\left|\frac{i_o}{i_b}\right| = \left|\frac{Z_1Z_b + Z_2Z_b + Z_1Z_2}{Z_1Z_b + Z_2Z_b}\right| =$$

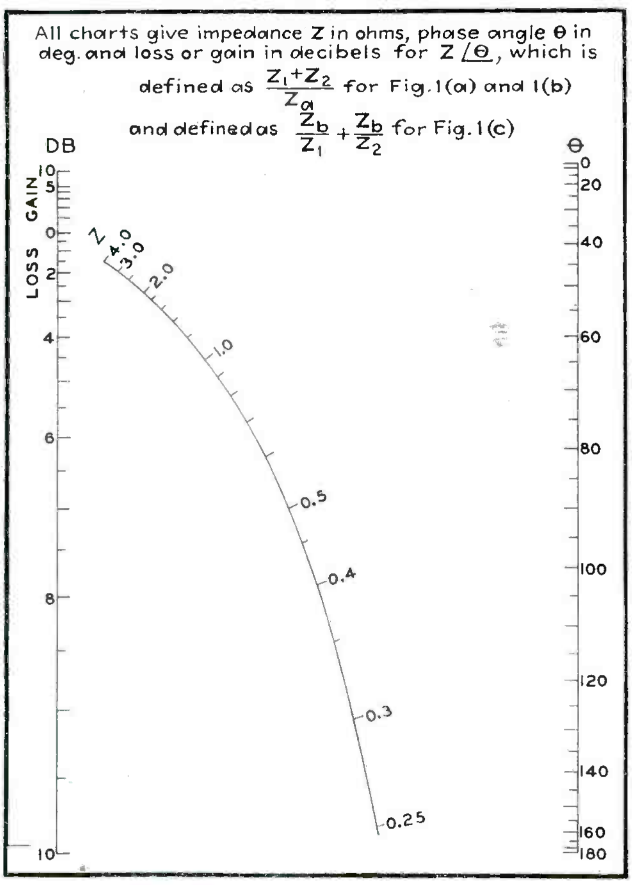


FIG. 2—Chart for small values of impedance Z and large db losses and gains

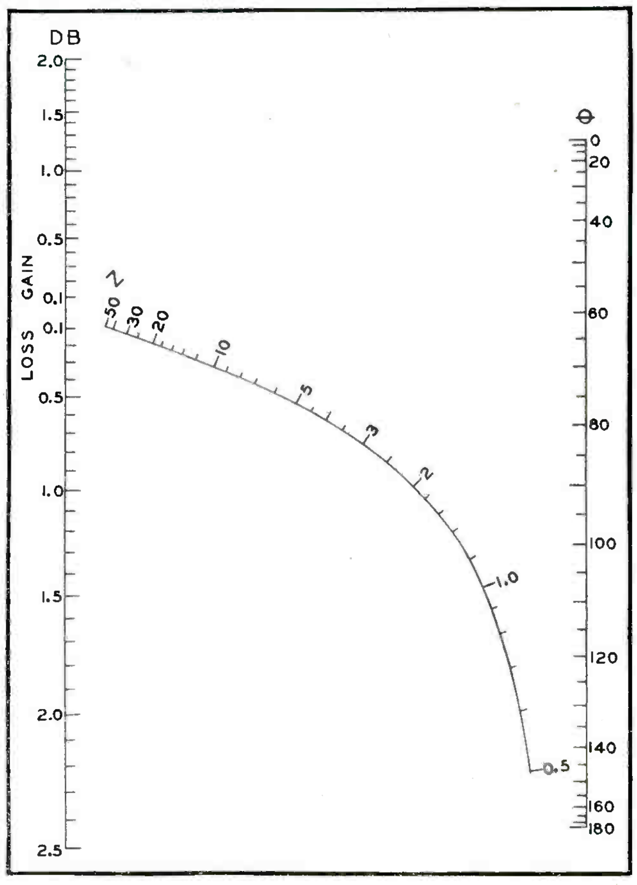


FIG. 3—Chart for intermediate values of Z and intermediate db losses and gains

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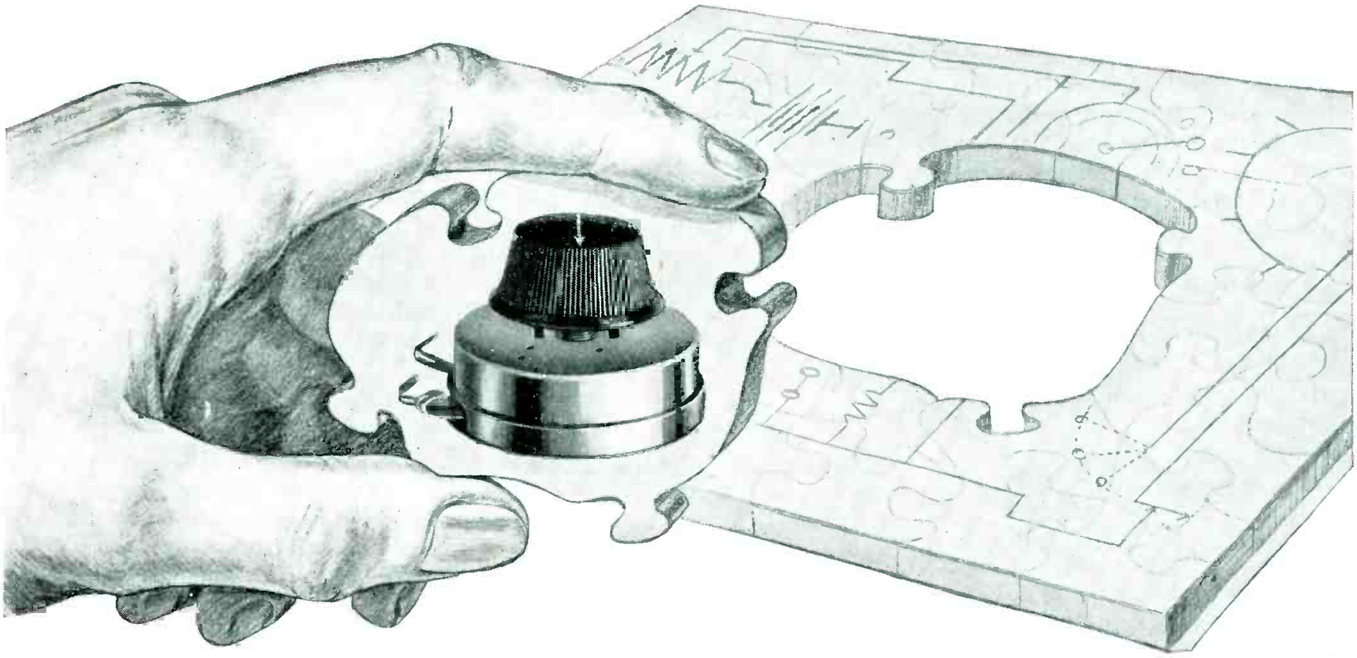

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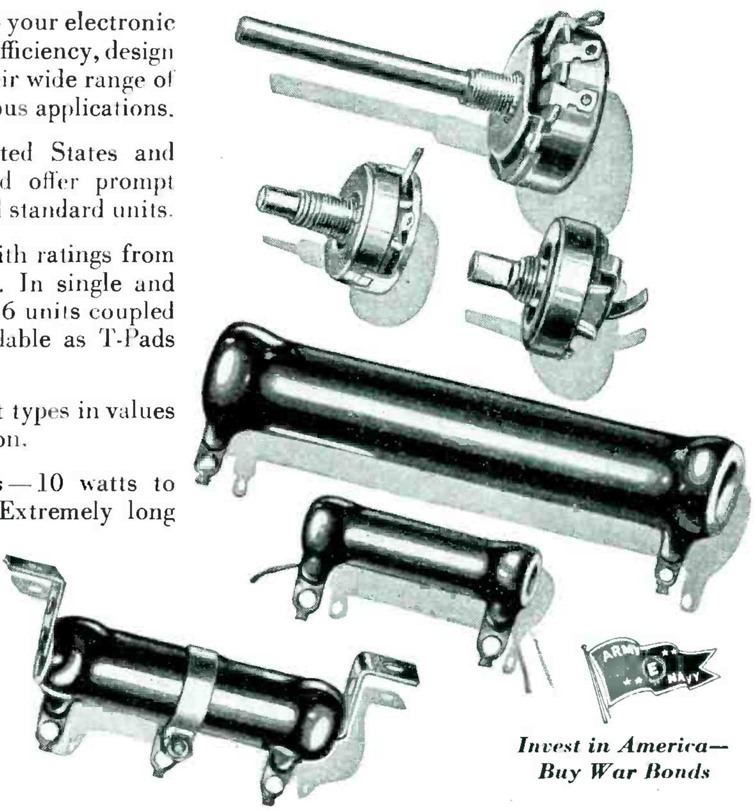

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$$\left| \frac{\frac{Z_b}{Z_1} + \frac{Z_b}{Z_2} + 1}{\frac{Z_b}{Z_1} + \frac{Z_b}{Z_2}} \right| = \left| \frac{1 + Z \angle\theta}{Z \angle\theta} \right|,$$

$$\text{where } Z \angle\theta \equiv \frac{Z_b}{Z_1} + \frac{Z_b}{Z_2}.$$

Thus, in either case the same general equation results, with a necessarily different definition of $Z\angle\theta$ in the two set-ups. The decibel loss due to the current decrease after insertion of the impedance is given by

$$DB = 20 \log_{10} \left| \frac{i_o}{i_{a,b}} \right| = 20 \log_{10} \left| \frac{1 + Z \angle\theta}{Z \angle\theta} \right|$$

Carrying out the indicated addition of unity to $Z \angle\theta$ and the subsequent division of this sum by $Z \angle\theta$, one obtains

$$DB = 20 \log_{10} \sqrt{\frac{Z^2 + 2Z\cos\theta + 1}{Z^2}} =$$

$$10 \log_{10} \left(\frac{Z^2 + 2Z\cos\theta + 1}{Z^2} \right) \quad (1)$$

In this equation DB is so defined that a positive value means a loss and a negative value means a gain in transmission. To convert Eq. (1) to a type for which a nomograph may readily be constructed, one may make the following change in form:

$$10^{DB/10} = \frac{Z^2 + 1}{Z^2} + \frac{2}{Z} \cos\theta$$

which is of the form $f(DB) = \phi(Z) + \psi(Z) \cdot F(\theta)$. This latter type of equation is known to be one for which a nomograph is calculable.[1]

Nomographs emphasizing two ranges of DB loss (or gain) are shown in Fig. 2 and 3. The charts are labelled so as to indicate whether there is a loss or a gain in transmission due to insertion of the new impedance. When $\cos\theta$ is negative it is sometimes possible for DB to be negative, indicating a transmission gain.

Improving Accuracy

Because of the particular form of Eq. (1), the accuracy at low values of DB and high values of Z is not very good. However, when Z^2 is large compared to unity, this equation can be simplified to give

$$10^{DB/10} \backsimeq 1 + \frac{2}{Z} \cos\theta, \text{ or}$$

$$10^{DB/10} - 1 \backsimeq \frac{2}{Z} \cos\theta \quad (2)$$

which is a good approximation if $Z^2 \gg 1$ and if θ is not too near 90°. This equation has the form $f_2(DB) = \psi(Z) \cdot F(\theta)$, which may be represented in various forms of nomographs.

Ordinarily, because $F(\theta)$ involves $\cos\theta$, which passes through zero and has negative values, the usual scheme of three parallel logarithmic scales would not be practical. However, since the approximate Eq. (2) is not valid for values of θ near 90°, this objection is of no significance. Figure 4 gives such a nomograph for high values of Z and low values of DB for $0 < \theta < 80°$ and $110° < \theta < 180°$. In this chart, use of the scale of $\theta < 80°$ requires reading a transmission loss; for $\theta > 100°$, a gain. The maximum possible error in this chart comes with use of $\theta = 80°$ or 100° and $Z = 20$, in which case the absolute value of DB is about 13 percent low. This error decreases very rapidly as Z becomes larger or θ deviates further from 90°, being only 3.5 percent for $\theta = 70°$ and $Z = 40$.

The accuracy in Fig. 2 and 3 is limited only by the ability to construct, reproduce, and read the nomographs accurately. If a nomograph giving more precise values of losses and gains over a specific range of Z and θ were needed, it could be readily constructed along the lines indicated above.

1. Suppose an impedance $Z_a = 150\angle 15°$ is inserted in series between a generator of impedance $Z_1 = 500\angle 60°$ and a receiver of impedance $\overline{Z_2} = 200\angle 90°$. Then

$$Z \angle\theta \equiv (Z_1 + Z_2)/Z_a$$

has a value of approximately $4.53\angle 53.4°$. Use of Fig. 3 shows for $\overline{Z = 4.53}$ and $\theta = 53.4°$ a *loss* of approximately 1.16 decibels by insertion of the series impedance specified.

2. Suppose an impedance $Z_b = 500\angle 120°$ is bridged across a receiver of impedance $Z_2 = 25\angle 15°$ which is being powered by a generator of impedance $Z_1 = 10 \angle 30°$. Then $Z \angle\theta \equiv \frac{Z_b}{Z_1} + \frac{Z_b}{Z_2}$ has a value of approximately $65.5 \angle 137.5°$. Fig. 3 shows a *gain* of approximately 0.10 db by use of this impedance bridge.

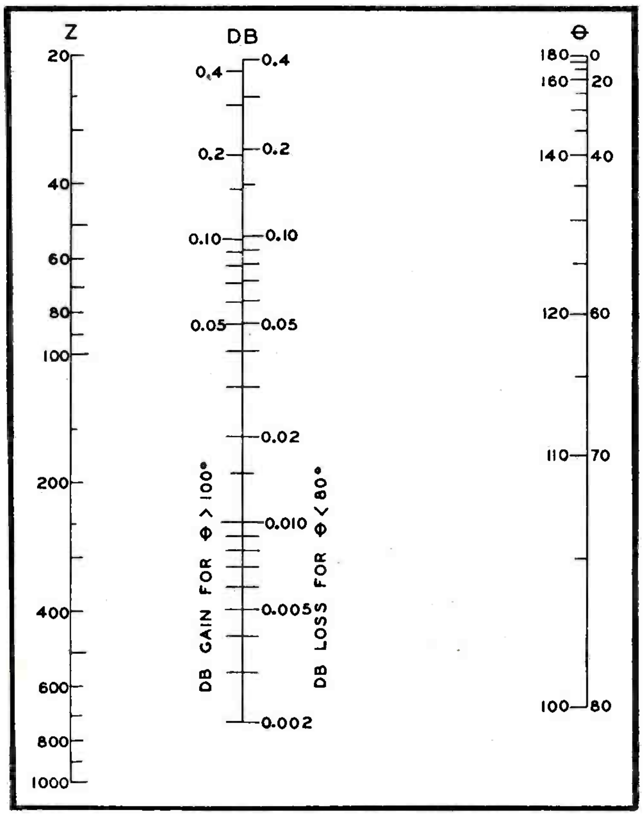

FIG. 4—Chart for large values of impedance Z and small db losses and gains

References

(1) Davis, D. S., "Empirical Equations and Nomography," McGraw-Hill Book Co., New York, 1943

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A Directory of

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In preparing this war-year Directory we have endeavored to list companies by products as an immediate buyers' guide for war materials. Moreover, we have listed products which companies have indicated that they will continue to manufacture after the war. Thus, this Directory should be useful as a buyers' guide for the present emergency as well as for post-war planning.

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General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Cal.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
H-W Mfg. Co., 3124 Larga Ave., Los Angeles, Cal.

ELECTRONIC and ALLIED PRODUCTS

J. B. T. Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, N. Y.
Radio City Products Co., 127 W. 26th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Frequency Laboratories, Inc., Boonton, N. J.
Readrite Meter Works, College Ave., Bluffton, Ohio
Roller-Smith Co., Bethlehem, Pa.
Simpson Electric Co., 5218 W. Kinzie St., Chicago 24, Ill.
Sound Equipment Corp., 6245 Lexington Ave., Hollywood, Calif.
Supreme Instrument Corp., Greenwood, Miss.
Televiso Products, Inc., 6533 N. Olmsted Ave., Chicago, Ill.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

COLOR ANALYZERS

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.
Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Photobell Corp., 116 Nassau St., New York 7, N. Y.
Photovolt Corp., 95 Madison Ave., New York, N. Y.
Pho-Tron Instrument Co., 5713 Euclid Ave., Cleveland, Ohio
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Saxl Instrument Co., 38 James St., East Providence, R. I.
White Research, 899 Boylston St., Boston, Mass.

HARMONIC ANALYZERS

Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago, Ill.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Cal.
Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
White Research, 899 Boylston St., Boston, Mass.

NOISE ANALYZERS

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Ferris Instrument Co., 110-112 Cornelia St., Boonton, N. J.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Measurements Corp., Boonton, N. J.
Radio Corp. of America, Camden, N. J.
Sprague Electric Co., 189 Beaver St., North Adams, Mass.
Televiso Products, Inc., 6533 N. Olmsted Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SURFACE ANALYZERS

Brush Development Co., 3311 Perkins Ave., Cleveland, O.
Physicists Research Co., 343 S. Main St., Ann Arbor, Mich.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.

TRANSMISSION ANALYZERS

Daven Co., 191 Central Ave., Newark 4, N. J.

Anodes

CARBON ANODES

Becker Bros. Carbon Co., 3450 S. 52nd Ave., Cicero, Ill.
Dixon Crucible Co., Joseph, Monmouth St., Jersey City, N. J.
General Electric Co., Schenectady, N. Y.
National Carbon Co., Inc., Cleveland 1, Ohio
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., Tannery St., St. Mary's, Pa.
United States Graphite Co., Saginaw, Mich.

METAL ANODES

American Brass Co., Waterbury, Conn.
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.
Bishop & Co. Platinum Works, J., 12 Channing Ave., Malvern, Pa.
Chase Brass & Copper Co.,236 Grand St., Waterbury 91, Conn.
Division Lead Co., 836 W. Kinzie St., Chicago, Ill.
Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Tungsten Mfg. Co., 502 23rd St., Union City, N. J.
Goldsmith Bros. Smelting & Refining Co., 58 E. Washington St., Chicago, Ill.
Handy & Harmon, 82 Fulton St., New York, N. Y.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
National Lead Co., 111 Broadway, New York, N. Y.
Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.
Rice's Sons, Inc., Bernard, 325 5th Ave., New York, N. Y.
Superior Tube Co., Norristown, Pa.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.

Antennas

RECEIVING ANTENNAS

Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kansas.
Airplane & Marine Instruments, Clearfield, Pa.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway S., Mt. Vernon, N. Y.
Amy, Aceves & King, Inc., 11 W. 42nd St., New York, N. Y.
Andrea Radio Corp., 4320 34th St., Long Island City, N. Y.
Bassett, Inc., Rex, 500 S.E. Second St., Ft. Lauderdale, Fla.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Brach Mfg. Corp., L. S., 55 Dickerson St., Newark, N. J.
Cardy-Lundmark Co., 1801 West Byron St., Chicago 13, Ill.
Communication Products, Inc., 744 Broad St., Newark 2, N. J.
Cornish Wire Co., 15 Park Row, New York, N. Y.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
Fishwick Radio Co., 430 Colorado Bldg., Washington, D. C.
Fleron & Son, Inc., M. M., 113 N. Broad St., Trenton, N. J.
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago 51, Ill.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
Harco Steel Construction Co., 1180 E. Broad St., Elizabeth, N. J.
Heyer Product Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hoyt Electrical Instrument Works, Boston, Mass.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
J. F. D. Mfg. Co., 4111 Fort Hamilton Pkwy., Brooklyn, N. Y.
Jefferson-Travis Radio Mfg. Corp., 245 East 23rd St., New York, N. Y.
Johnson Co., E. F., Waseca, Minn.
Lafayette Radio Corp., 901 W. Jackson Blvd., Chicago 7, Ill.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Link, Fred M., 125 W. 17th St., New York, N. Y.
Mec-Rad Div., Black Industries, 1440 E. 222nd St., Cleveland 17, Ohio (H. F. Components)
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Noblitt-Sparks Industries, E. 17th St., Columbus, Ind.
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Philson Mfg. Co., Inc., 156 Chambers St., New York, N. Y.
Premax Products Div., Chisholm-Ryder Co., College & Highland Aves., Niagara Falls, N. Y.
Quam-Nichols Co., 526 East 33rd Place, Chicago, Ill.
Radiart Corp., 3571 W. 62nd St., Cleveland, Ohio
Radio Corp. of America, Camden, N. J.
Schott Co., Walter L., 9306 Santa Monica Blvd., Beverly Hills, Calif.
Schuttig & Co., 9th & Kearney Sts., N. E., Washington 24, D. C.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Stromberg-Carlson Telephone Mfg. Co., 100 Carlson Rd., Rochester, N. Y.
Technical Appliance Corp., 516 W. 34th St., New York, N. Y.
Trebor Radio Co., Pasadena, Calif.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Utilities Service Co., 1 Pine St., Allentown, Pa.
Ward Products Corp., 1523 E. 45th St., Cleveland, Ohio
Whisk Laboratories, 145 West 45th St., New York, N. Y.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.

TRANSMITTING ANTENNAS

Aero Communications, Inc., 231 Main St., Hempstead, Long Island, N. Y.
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kans.
Airplane & Marine Instruments, Inc., Clearfield, Pa.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Andrew Co., 363 E. 75th St., Chicago 19, Ill.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bassett, Inc., Rex, 500 S. E. Second St., Ft. Lauderdale, Fla.
Blaw-Knox Co., Farmers Bank Bdg., Pittsburgh, Pa.
Communication Products Co., Inc., 744 Broad St., Newark 2, N. J.
Erco Radio Laboratories, Inc., Fenimore Avenue, Hempstead, N. Y.
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
Grady Instrument Co., 11 Bailey Ave., Watertown 72, Mass.
Harco Steel Construction Co., Inc., 1180 E. Broad St., Elizabeth 4, N. J.
Hoke Vertical Radiator Co., 135 S. Market St., Petersburg, Va.
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, L. I., N. Y.
Jefferson-Travis Radio Mfg. Corp., 245 East 23rd St., New York, N. Y.
Johnson Co., E. F., Waseca, Minn.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Lehigh Structural Steel Co., 17 Battery Pl., New York, N. Y.
Lingo & Son, John E., 28th St. & Buren Ave., Camden, N. J.
Link, Fred M., 125 W. 17th St., New York, N. Y.
Locke Insulator Corp., S. Charles & Cromwell St., Baltimore, Md.
Mec-Rad Div., Black Industries, 1440 E. 222nd St., Cleveland 17, Ohio (H. F. Components)

National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Radio Engineering Labs., Inc., 35-54 36th St., Long Island City, N. Y.
Radio Receptor Co., 251 W. 19th St., New York, N. Y.
Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Schuttig & Co., 9th & Kearney Sts., N. E., Washington 24, D. C.
Truscon Steel Co., Youngstown, Ohio
Utilities Service Co., 1 Pine St., Allentown, Pa.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Wincharger Corp., 7th & Division Sts., Sioux City, Iowa
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Michigan

Attenuators

see Controls

Ballasts

see Tubes

Batteries

DRY BATTERIES

Acme Battery Corp., 59 Pearl St., Brooklyn, N. Y.
Bond Electric Corp., Div. of Western Cartridge, New Haven, Conn.
Bright Star Battery Co., 200 Crooks Ave., Clifton, N. J.
Burgess Battery Co., Foot of Exchange St., Freeport, Ill.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
General Dry Batteries, Inc., 13000 Athens Ave., Cleveland, Ohio
Marathon Battery Co., Wausau, Wisc.
National Carbon Co., Inc., Cleveland 1, Ohio
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
Philco (Battery Division), Philadelphia, Pa.
Ray-O-Vac Co., Madison, Wis.
Southern Battery Co., Appomattox, Va.
United States Electric Mfg. Corp., 222 W. 14th St., New York, N. Y.
Western Cable Battery Co., Inc., 395 Sibley St., St. Paul, Minn.

STORAGE BATTERIES

American Battery Co., 17 E. Jefferson St., Chicago, Ill.
Am-plus Storage Battery Co., 425 W. Superior St., Chicago, Ill.
Auto-Lite Battery Corp., P. O. Box 931, Toledo, Ohio
Automatic Electrical Devices Co., 324 E. 3rd St., Cincinnati, Ohio
Bowers Battery & Spark Plug Co., Reading, Pa.
Edison Storage Battery Div., Thomas A. Edison, Inc., Main St. at Lakeside Ave., West Orange, N. J.
Electric Auto-Lite Co., Toledo 1, Ohio
Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia, Pa.
General Lead Batteries Co., 196 West Railway Ave., Paterson, N. J.
General Storage Battery Co., 2005 Locust St., St. Louis, Mo.
Globe Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.
Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
K. W. Battery Co., 3705 N. Lincoln Ave., Chicago, Ill.
Koehler Mfg. Co., Marlboro, Mass.
Monark Battery Co., Inc., 1240 N. Homan Ave., Chicago, Ill.
National Battery Co., First National Bank Bldg., St. Paul, Minn.
Philco Corp., (Storage Battery Division), Philadelphia, Pa.
Prest-O-Lite Battery Co., 4500 W. 16th St., Indianapolis, Ind.

Solar Corp., 944 W. Bruce St., Milwaukee, Wis.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Universal Battery Co., 3410 S. La Salle St., Chicago, Ill.
Western Cable Battery Co. Inc., 395 Sibley St., St. Paul, Minn.
Willard Storage Battery Co., 246 E. 131st St., Cleveland 1, Ohio

Bearings, Miniature

Ace Mfg. Co., 1255 E. Erie Ave., Philadelphia, Pa.
Bird & Co., Waltham, Mass.
General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
Miniature Precision Bearings, Keene, N. H.
Moraine Products Div., General Motors Corp., Dayton, Ohio

Bellows

Chicago Metal Hose Corp., 1309 S. Third Ave., Maywood, Ill.
Clifford Mfg. Co., 564 E. First, Boston, Mass.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.

Blanks, Recording

see Discs

Blowers, Small

Chelsea Fan & Blower Co., 1206 Grove St., Irvington, N. J.
Eastern Air Devices, Inc., 585 Dean St., Brooklyn, N. Y.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
Heinze Electric Corp., Lowell, Mass.
Kahle Engineering Co., 1307 Seventh St., North Bergen, N. J.
L-R Manufacturing Co., 65 New Litchfield St., Torrington, Conn.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Smith Mfg. Co., F. A., P. O. Box 509, Rochester, N. Y.

Blueprinting Machinery

Ozalid Products Div., General Aniline & Film Corp., 1500 Ansco Rd., Johnson City, N. Y.
Paragon-Revolute Corp., 97 South Ave., Rochester 4, N. Y.
Pease Co., C. F., 2643 W. Irving Park Rd., Chicago, Ill.
Peck & Harvey, 4327 Addison St., Chicago, Ill.
Shaw Blue Print Machine Co., Inc., 7 Campbell St., Newark, N. J.
Wickes Brothers, 515 N. Washington Ave., Saginaw, Mich.

Bombarders

Eisler Engineering Co., 763 S. 13th St., Newark, N. J.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Scientific Electric Div. of "S" Corrugated Quenched Gap Co., 119 Monroe St., Garfield, N. J.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.

Breakers

CIRCUIT BREAKERS (for electronic applications)

Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Burlington Instrument Co., Burlington, Iowa
Federal Electric Products Co., Inc., 50 Paris St., Newark, N. J.
General Electric Co., Bridgeport, Conn.
Heinemann Circuit Breaker Co., 97 Plum St., Trenton 2, N. J.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Leach Relay Co., 5915 Avalon Ave., Los Angeles, Calif.
Littelfuse, Inc., 4755 Ravenswood Ave., Chicago, Ill.
Penn Electric Switch Co., Goshen, Ind.
Roller-Smith Co., Bethlehem, Pa.
Smith Mfg. Co., F. A., P. O. Box 509, Rochester, N. Y.
Spencer Thermostat Co., Attleboro, Mass.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Trumbull Electric Mfg. Co., Plainville, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Bridges

ELECTRICAL MEASUREMENT BRIDGES

see Analyzers
also Testers

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Baldwin Locomotive Works, Eddystone, Pa.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Central Scientific Co., 1700 Irving Park Rd., Chicago, Ill.
Clough-Brengle Co., 5501 N. Broadway, Chicago 22, Ill.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Electronic Supply Co., 207 Main St., Worcester, Mass.
Federal Instrument Co., 3931 47th Ave., Long Island City, N. Y.
Foxboro Co., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gray Instrument Co., 64½ W. Johnston St., Philadelphia, Pa.
Grenby Mfg. Co., Plainville, Conn.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Marion Instrument Co., Manchester, N. H.
Oregon Electronic Mfg. Co., 206 S.W. Washington St., Portland 4, Oreg.
Photobell Corp., 116 Nassau St., New York 7, N. Y.
Radio City Products Co., Inc., 127 West 26th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Roller-Smith Co., Bethlehem, Pa.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Tagliabue Mfg. Co., C. J., 540 Park Ave., Brooklyn 5, N. Y.
Tech Laboratories, 7 Lincoln St., Jersey City, N. J.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 4, Pa.
Triplett Electrical Instrument Co., 286 Harmon Rd., Buffton, Ohio
United Transformer Co., 150 Varick St., New York, N. Y.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
White Research, 899 Boylston St., Boston, Mass.
Winslow Co., 9 Liberty St., Newark, N. J.

Broadcast Monitors

see Monitors, Broadcast

ELECTRONIC and ALLIED PRODUCTS

Brushes, Carbon & Graphite

Becker Brothers Carbon Co., 3450 S. 52nd Ave., Chicago, Ill.
Calebaugh Self-Lubricating Carbon Co., 2245 E. Ontario St., Philadelphia, Pa.
Carbon Engineering Corp., Slinger, Wis.
Carbon & Graphite Corp., 249 W. Broadway, New York, N. Y.
Dixon Crucible Co., Joseph, Monmouth St., Jersey City, N. J.
Electro-Nite Carbon Co., 1133 E. Columbia Ave., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Graphite Metallizing Corp., 1000 Nepperhan Ave., Yonkers, N. Y.
Helwig Co., 2548 N. 13th St., Milwaukee, Wisc.
Henrite Products Corp., Ironton, Ohio
Keystone Carbon Co., 1935 State St., St. Mary's, Pa.
LeCarbone Co., Myrtle Ave., Boonton, N. J.
LeValley-Vitae Carbon Brush Co., Rombout Ave., Beacon, N. Y.
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y.
National Carbon Co., Carbon Products Div., Cleveland, Ohio
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Pittsburgh Carbon Brush Co., 811 Fulton St., Pittsburgh, Pa.
Pure Carbon Co., St. Mary's, Pa.
St. Mary's Carbon Co., St. Mary's, Pa.
Snarr & Co., Geo. W., 110 S. Ninth St., St. Louis, Mo.
Southern Carbon Brush Co., 109 N. 11th St., Birmingham, Ala.
Speer Carbon Co., Lincoln Ave., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
Superior Carbon Products, Inc., 9112 George Ave., Cleveland, Ohio
United States Graphite Co., 1621 Holland Ave., Saginaw, Mich.

Cabinets

CABINETS, CHASSIS AND PANELS

Accurate Molding Corp., 116 Nassau St., Brooklyn 1, N. Y.
Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Calif.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway S., Mt. Vernon, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Arpin Mfg. Co., 422 Aldin St., Orange, N. J.
Atlas Products Corp., 30 Rockefeller Plaza, New York, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Caswell-Runyon Co., Huntington, Ind.
Churchill Cabinet Co., 2119 Churchill Ave., Chicago 22, Ill.
Cole Steel Equipment Co., 349 Broadway, New York 13, N. Y.
Columbia Metal Box Co., 260 E. 143rd St., New York, N. Y.
Controls Inc., Hillcrest Rd., Towaco, N. J.
Corry-Jamestown Mfg. Co., Corry, Pa.
Creative Plastics Corp., 975 Kent Ave., Brooklyn, N. Y.
Crowe Nameplate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Dahlstrom Metallic Door Co., Buffalo St., Jamestown, N. Y.
DeWald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.
Edwards, Inc., T. J., 121 Beach St., Boston 5, Mass.
Electric Auto-Lite Co., Toledo 1, Ohio
Electrical Insulation Co., Inc., 12 Vestry St., New York, N. Y.
Electronic Supply Co., 207 Main St., Worcester, Mass.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Erie Art Metal Co., 1602 East 18th St., Erie, Pa.
Erie Can Co., 816 W. Erie St., Chicago, Ill.
Etched Products Corp., 39-01 Queens Blvd., Long Island City, N. Y.
Falstrom Co., 7 Falstrom Court, Passaic, N. J.
Federal Electric Products Co., Inc., 50 Paris St., Newark, N. J.
Franklin Fibre-Lamitex Corp., 12th & French St., Wilmington, Del.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Hadley Co., Robert M., 711 E. 61st St., Los Angeles, Calif.
Hoffman Radio Corp., 3430 South Hill St., Los Angeles 7, Calif.
Industrial Sound Products Co., 3597 Mission St., San Francisco, Calif.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Karp Metal Products Co., 129 30th St., Brooklyn, N. Y.
Kent Metal Products Co., Inc., Porter Ave. at Johnson Ave., Brooklyn, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Lewyt Corp., 60 Broadway, Brooklyn, N. Y.
Lindsay & Lindsay, 222 W. Adams St., Chicago 4, Ill.
Metallic Arts Co., 243 Broadway, Cambridge, Mass.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Co., 61 Sherman St., Malden, Mass.
New England Etching & Plating Co., 25 Spring St., Holyoke, Mass.
Northern Laboratories, Ltd., 50 Church St., New York 7, N. Y.
Olesen Illuminating Co., Ltd., Otto K., 1560 Vine St., Hollywood 28, Calif.
Par Metal Products Corp., 32-62 49th St., Long Island City, N. Y.
Paramount Radio Corp., 967 32nd St., Oakland, Calif.
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.
Plastic Fabricators, Inc., 440 Sansome St., San Francisco, Calif.
Premier Metal Etching Co., 21-03 44th Ave., Long Island City, N. Y.
Radiad Service, 720 West Schubert Ave., Chicago, Ill.
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Richardson Co., Lockland, Ohio
Schuttig & Co., 9th & Kearney Sts., N.E., Washington 24, D. C.
Screenmakers, 64 Fulton St., New York, N. Y.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Simpson Mfg. Co., Mark, 188 West Fourth St., New York, N. Y.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.
Syracuse Ornamental Co., 581 So. Clinton St., Syracuse, N. Y.
Templetone Radio Co., Mystic, Conn.
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.
Tork Clock Co., 1 Grove St., Mt. Vernon, N. Y.
Trebor Radio Co., Pasadena, Calif.
Tri-United Plastics Corp., 20-30 Grand Ave., Brooklyn 5, N. Y.
Union Aircraft Products Corp., 380 Second Ave., New York, N. Y.
Victory Manufacturing Co., 1722 W. Arcade Pl., Chicago 12, Ill.
Wallace Mfg. Co., Wm. T., Chili & Madison Aves., Peru, Indiana
Watterson Radio Mfg. Co., P. O. Box 51, Dallas 1, Texas
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago, Ill.
Wilcox-Gay Corp., Charlotte, Michigan
Willor Mfg. Co., 794 East 140th St., New York 54, N. Y.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Michigan.
Wurlitzer Mfg. Co., Rudolph, North Tonawanda, N. Y.

Cable

see also Wire

COAXIAL CABLE

Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Andrew Co., 363 East 75th St., Chicago 19, Ill.
Belden Mfg. Co., 4673 W. Van Buren St., Chicago 55, Ill.
Boston Insulated Wire & Cable Co., 65 Bay St. (Dorchester), Boston, Mass.
Brach Mfg. Corp., L. S., 55 Dickerson St., Newark, N. J.
Chicago Metal Hose Corp., 1315 S. 3rd Ave., Maywood, Ill.
Communication Products Co., Inc., 744 Broad St., Newark 2, N. J.
Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago, Ill.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Insulated Wire Corp., 53 Park Pl., New York, N. Y.
General Radio Co., 30 State St., Cambridge, Mass.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Ilsco Copper Tube & Product, Inc., Mariemont Ave., Mariemont 3, Ohio
Isolantite, Inc., 343 Cortlandt St., Belleville, N. J.
Johnson Co., E. F., Waseca, Minn.
Link, Fred M., 125 W. 17th St., New York, N. Y.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
Okonite Co., Passaic, N. J.
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y. (test equipment)
Simplex Wire & Cable Co., 79 Sidney St., Cambridge 39, Mass.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Uniform Tubes, Shurs Lane & Lauriston St., Roxborough, Philadelphia, Pa.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.

Capacitors

FIXED CAPACITORS

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass. (Electrolytic, Mica, Oil, Paper)
Aircraft-Marine Products, Inc., 1523 N. Fourth St., Harrisburg, Pa.
American Condenser Corp., 4410 Ravenswood Ave., Chicago, Ill. (Electrolytic, Paper)
Atlas Condenser Products Co., 548 Westchester Ave., Bronx, N. Y. (Electrolytic, Paper)
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill. (Paper)
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa. (Air, Oil)
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio (Air)
Capacitrons, Inc., 318 W. Schiller St., Chicago, Ill. (Oil, Paper)
Cardwell Mfg. Co., Allen D., 81 Prospect St., Brooklyn, N. Y.
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis. (Ceramic, Mica)
Condenser Corp. of America, 1000 Hamilton Blvd., South Plainfield, N. J. (Electrolytic, Mica, Oil, Paper)
Condenser Products Co., 1375 N. Branch St., Chicago, Ill. (Electrolytic, Oil, Paper)
Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio (Paper)
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J. (Electrolytic, Mica, Oil-filled, Motor-starting, Paper, Air, X-Ray, etc.)
Cosmic Radio Co., 699 E. 135th St., New York, N. Y.
Crowley & Co., Henry L., 1 Central Ave., West Orange, N. J.
Deutschmann Corp., Tobe, Canton, Mass. (Paper, Mica, Electrolytic, Oil, Ceramic, Air, etc.)

Dumont Electric Co., 34 Hubert St., New York, N. Y. (Electrolytic, Mica, Oil, Paper)
Eitel-McCullough, Inc., San Bruno, Calif. (Vacuum)
Electrical Reactance Corp., Franklinville, N. Y.
Electro-Motive Mfg. Co., S. Park & John Sts., Willimantic, Conn. (Mica)
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Erie Resistor Corp., 640 W. 12th St., Erie, Pa. (Ceramic)
Fast & Co., John E., 3101 N. Pulaski Rd., Chicago 41, Ill.
General Electric Co., Schenectady, N. Y. (Air Trimmer, Oil, Paper, Vacuum, Radio-Frequency blocking & by-pass, High-Frequency Power or Plate)
General Electronics Inc., 101 Hazel St., Paterson, N. J.
General Radio Co., 30 State St., Cambridge 39, Mass. (Air, Mica, Paper)
Girard-Hopkins, 1000 40th Ave., Oakland, Calif. (Oil, Paper)
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Good All Electric, 320 N. Spruce St., Ogalala, Neb. (Oil, Paper)
H. R. S. Products, 5707 W. Lake St., Chicago, Ill.
Illinois Condenser Co., 1160 N. Howe St., Chicago, Ill. (Electrolytic, Oil, Paper)
Industrial Condenser Corp., 1725 W. North Ave., Chicago, Ill. (Ceramic, Electrolytic, Mica, Oil, Paper)
Jennings Radio Mfg. Co., R. 3, Box 22, San Jose, Calif. (Vacuum)
Johnson Co., E. F., Waseca, Minn. (Air, Oil)
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill. (Oil & Wax filled, Paper, Oil, Impregnated & Wax Impregnated)
Lapp Insulator Co., 31 Gilbert St., Le Roy, N. Y. (Ceramic)
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind. (Electrolytic)
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind. (Electrolytic, Paper)
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn 6, N. Y. (Ceramic, Electrolytic, Mica, Oil, Paper)
Muter Co., 1255 S. Michigan Ave., Chicago. Ill. (Ceramic)
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
Noma Electric Corp., 55 West 13th St., New York, N. Y. (Mica)
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Polymet Condenser Co., 699 East 135th St., New York, N. Y.
Potter Co., 1950 Sheridan Rd., North Chicago, Ill. (Oil, Paper)
Radio Corp. of America, Camden, N. J. (Mica, Oil, Paper)
Rothenstein, Albert, 135 Liberty St., New York, N. Y.
Sangamo Electric Co., Springfield, Ill. (Mica, Ceramic, Paper)
Sickles Co., F. W., 165 Front St., Chicopee, Mass. (Mica, Silver Mica)
Solar Mfg. Corp., 285 Madison Ave., New York 17, N. Y. (Ceramic, Electrolytic, Mica, Oil, Paper)
Sprague Electric Co., 189 Beaver St., North Adams, Mass. (Electrolytic, Mica, Oil, Paper)
Teleradio Engineering Corp., 484 Broome St., New York, N. Y. (Mica)
Telex Products Co., Telex Park, Minneapolis, Minn. (Mica)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (Oil, Paper)
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Michigan

COMPRESSED GAS CAPACITORS

Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Johnson Co., E. F., Waseca, Minn.
Lapp Insulator Co., 31 Gilbert St., Le Roy, N. Y.

VARIABLE RECEIVER TUNING CAPACITORS

American Steel Package Co., Squire Ave., Defiance, Ohio
Barker & Williamson, Upper Darby, Pa.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cardwell Mfg. Corp., Allen D., 81 Prospect St., Brooklyn, N. Y.
Federal Mfg. & Engrg. Corp., 199-217 Steuber St., Brooklyn 5, N. Y.
General Electric Co., Schenectady, N. Y.
General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Grenby Mfg. Co., Plainville, Conn.
Halstead Traffic Communications Corp., 155 East 44th St., New York, N. Y.
Hammarlund Mfg. Co., 460 W. 34 St., New York, N. Y.
Hoffman Radio Corp., 3430 S. Hill St., Los Angeles 7, Calif.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Co., 61 Sherman St., Malden, Mass.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago 10, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Radio Condenser Co., Camden, N. J.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.

VARIABLE TRANSMITTER TUNING CAPACITORS

Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cardwell Mfg. Corp., Allen D., 81 Prospect St., Brooklyn, N. Y.
Federal Manufacturing & Engrg. Corp., 199-217 Steuben St., Brooklyn 5, N. Y.
General Electric Co., Schenectady, N. Y.
General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J.
Hammarlund Mfg. Co., 460 W. 34th St., New York, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson, E. F., Waseca, Minn.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Lapp Insulator Co., 31 Gilbert St., LeRoy, N. Y.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Co., 61 Sherman St., Malden, Mass.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago 10, Ill.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago, Ill.
Wilcox Electric Co., 1400 Chestnut St., Kansas City, Mo.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.

VARIABLE TRIMMER CAPACITORS

American Steel Package Co., Squire Ave., Defiance, Ohio
Automatic Winding Co., 900 Passaic Ave., East Newark, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cardwell Mfg. Corp., Allen D., 81 Prospect St., Brooklyn, N. Y.
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
Erie Resistor Corp., 640 W. 12th St., Erie, Pa.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Guthman, Inc., E. I., 15 S. Throop St., Chicago, Ill.
Hammarlund Mfg. Co., 460 W. 34 St., New York, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg Co., James, 150 Exchange St., Malden, Mass.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
National Co., 61 Sherman St., Malden, Mass.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago 10, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago 18, Ill.
Teleradio Engineering Corp., 484 Broome St., New York, N. Y.

Cells

PHOTO-ELECTRIC CELLS

see Phototubes

Cements

RADIO CEMENTS

Alden Products Co., 117 Main St., Brockton, Mass.
American Products Mfg. Co., 8127 Oleander St., New Orleans, La.
Bakelite Corp., 30 E. 42nd St., New York, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Crowley & Co., Henry L., 1 Central Ave., West Orange, N. J.
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Linicky & Co., Leslie L., 29 E. Madison St., Chicago, Ill.
Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.
Paisley Products, Inc., 1770 Canalport Ave., Chicago 16, Ill.
Plax Corp., 133 Walnut St., Hartford, Conn.
Schott Co., Walter L., 9306 Santa Monica Blvd., Beverly Hills, Cal.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Zapon Div. Atlas Powder Co., Ludlow St., Stamford, Conn.
Zophar Mills, Inc., 112 26th St., Brooklyn 32, N. Y.

Ceramics

see Insulation

Chambers, Test

HUMIDITY, PRESSURE, TEMPERATURE

American Coils, Inc., 27 Lexington St., Newark, N. J.
American Instrument Co., 8010 Georgia Ave., Silver Spring, Md.
Audio Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Deepfreeze Division, Motor Products Corp., 2301 Davis St., N. Chicago, Ill.
Distillation Products, Inc., 755 Ridge Rd., W. Rochester, N. Y.
Industrial Filter & Pump Mfg. Co., 1621-25 W. Carroll Ave., Chicago, Ill.
Kold-Hold Mfg. Co., 446 North Grand Ave., Lansing, Mich.
Mobile Refrigeration, Inc., 38-32—54th St., Woodside, Long Island, N. Y.
Northern Laboratories, Ltd., 50 Church St., New York 7, N. Y.
Radio Corp. of America, Camden, N. J.
Revco Inc., Deerfield, Mich.
Sparkes Mfg. Co., Ltd., 318 Jefferson St., Newark, N. J.
Tenney Engineering, Inc., 8 Elm Street, Montclair, N. J.
Young Bros. Co., 6500 Mack Ave., Detroit, Mich.

ELECTRONIC and ALLIED PRODUCTS

Changers

AUTOMATIC RECORD CHANGERS

Admiral Corp., 444 Lake Shore Drive, Chicago 11, Ill.
Andrea Radio Corp., 43-20 24th St., Long Island City, N. Y.
Chicago Sound Systems Co., 2124 S. Michigan Avenue, Chicago, Ill.
Farnsworth Television & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.
General Electric Co., Schenectady, N. Y.
General Industries Co., Taylor & Olive Sts., Elyria, Ohio
General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago 10, Ill.
Philco Co., Tioga & C Sts., Philadelphia 3, Pa.
Radio Corp. of America, Camden, N. J.
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.
Rock-Ola Mfg. Corp., 867 N. Kedzie Ave., Chicago, Ill.
Seeburg Corp., J. P., 1510 N. Dayton St., Chicago, Ill.
Sillcox Radio & Television Corp., 70 Pine St., New York, N. Y.
Talking Devices Co., 4451 W. Irving Park Rd., Chicago, Ill.
Trav-Ler Karenola Radio & Television, 1028 W. Van Buren St., Chicago, Ill.
Webster Products, 3825 Armitage Ave., Chicago 47, Ill.
Wilcox Gay Corp., Charlotte, Mich.
Wurlitzer Mfg. Co., Rudolph, North Tonawanda, N. Y.

Changers, Frequency

see Vibrators

Chassis

see Cabinets

Chokes

POWER and AUDIO CHOKES

Aladdin Radio Industries, Inc., 501 West 35th St., Chicago, Ill.
Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Calif.
American Communications Corp., 306 Broadway, New York, N. Y.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Aray Mfg. & Supply Co., Inc., 3107 Pine St., St. Louis 3, Mo.
Audio Development Co., 2833-13th Ave S., Minneapolis, Minn.
Best Mfg. Co., Inc., 1200 Grove St., Irvington 1, N. J.
Chicago Transformer Corp., 3501 W. Addison St., Chicago, Ill.
Coto-Coil Co., Pavilion Ave., Providence, R. I.
Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Dinion Coil Co., Inc., 1 North St., Caledonia, N. Y.
Doyle, Inc., James W., 2734 N. Pulaski Rd., Chicago 39, Ill.
Electricoil Transformer Co., 421 Canal St., New York, N. Y.
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Supply Co., 207 Main St., Worcester, Mass.
Electronic Transformer Co., 207 W. 25th St., New York, N. Y.
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Essex Electronics, 1060 Broad St., Newark 2, N. J.
Federal Instrument Co., 3931-47th Ave., Long Island City 4, N. Y.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Foster Co., A. P., 719 Wyoming Ave., Lockland 15, Ohio
Franklin Transformer, 65 22nd Ave. N. E., Minneapolis, Minn.
Freed Transformer Co., 72 Spring St., New York, N. Y.
Gardiner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
General Transformer Corp., 1250 W. Van Buren St., Chicago 24, Ill.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Good All Electric, 320 N. Spruce St., Ogalala, Neb.
Hadley, Robert M. Co., 711 E. 61st St., Los Angeles, Cal.
Halldorson Co., The, 4500 Ravenswood Ave., Chicago 28, Ill.
Hardwick, Hindle, Inc., 40 Hermon St., Newark, N. J.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn, N. Y.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles 36, Cal.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
International Transformer Co., 396 Broadway, New York, N. Y.
Jefferson Electric Co., Bellwood, Ill.
Kenyon Transformer Co., 840 Barry St., New York, N. Y.
Langevin Co., Inc., 37 W. 65th St., New York, N. Y.
Lectrohm, Inc., 5125 W. 25th Pl., Cicero, Ill.
Magnetic Windings Co., Div. Essex Wire Corp., 16th & Butler Sts., Easton, Pa.
Merit Coil & Transformer Corp., 311 N. Desplaines St., Chicago, Ill.
National Co., 61 Sherman St., Malden, Mass.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radionic Controls, 3758 Belmont Ave., Chicago 18, Ill.
Radionic Transformer Co., 411 S. Sangamon St., Chicago, Ill.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Red Arrow Electric Corp., 100 Coit St., Irvington, N. J.
Rola Co., Inc., 2530 Superior Ave., Cleveland, Ohio
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Smith Mfg. Co., Nathan R., 105 Pasadena Ave., S. Pasadena, Calif.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Transformer Corp., 500 N. Halstead St., Chicago, Ill.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Telex Products Co., Telex Park, Minneapolis 1, Minn.
Thermador Elec. Mfg. Co., 5119 S. Riverside Drive, Los Angeles, Calif.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51 St., New York, N. Y.
United Transformer Co., 150 Varick St., New York, N. Y.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Walsh Engineering Co., 34 DeHart Place, Elizabeth, N. J.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

R. F. and I. F. CHOKES

Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Albion Coil Co., Albion, Ill.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bridgeport Mfg. Co., Bridgeport, Ill.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Burnett Radio Lab., Wm. W. L., 4814 Idaho St., San Diego, Calif.
DX Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
Electronic Products Mfg. Co., 7300 Huron River Drive, Dexter, Michigan
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Erwood Co., 223 W. Erie St., Chicago, Ill.
Essex Electronics, 1060 Broad St., Newark 2, N. J.
Fast & Co., John E., 3101 N. Pulaski Road, Chicago 41, Ill.
Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.
Ferranti Electric Inc., 30 Rockefeller Plaza, New York, N. Y.
Gardiner Eectric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
General Winding Co., 420 West 45th St., New York, N. Y.
Gold Shield Products, 25 W. Broadway, New York, N. Y.
Guthman & Co., E. I., 15 S. Throop St., Chicago, Ill.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hammarlund Mfg. Co., 460 W. 34th St., New York, N. Y.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 1, N. Y.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Lectrohm, Inc., 5125 W. 25th Pl., Cicero, Ill.
Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Miller Co., J. W., 5917 S. Main St., Los Angeles, Cal.
Muter Company, 1255 S. Michigan, Chicago, Ill.
National Co., 61 Sherman St., Malden, Mass.
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radionic Transformer Co., 411 S. Sangamon St., Chicago, Ill.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Sound Equipment Corp., 6245 Lexington Ave., Hollywood, Calif.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago, Ill.
Stanwyck Winding Co., 102 S. Lander St., Newburgh, N. Y.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Teleradio Engineering Corp., 484 Broome St., New York, N. Y.

Clips

TEST and TUBE CLIPS

Alden Products Co., 117 Main St., Brockton, Mass.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Chase Brass & Copper Co., Waterbury 91, Conn.
Dante Electric Mfg. Co., Bantam, Conn.
Electric Auto-Lite Co., Wire Div., Port Huron, Mich.
Fahnestock Electric Co., 46-44 11th St., Long Island City, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Micarta Fabricators, Inc., 4619 Ravenswood Ave., Chicago, Ill.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Morse Co., Frank W., 301 Congress St., Boston, Mass.
Mueller Electric Co., 1583 E. 31st St., Cleveland, Ohio

National Co., 61 Sherman St., Malden, Mass.
Penn Union Electric Corp., 315 State St., Erie, Pa.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.
Zierick Mfg. Corp., 385 Gerard Ave., New York, N. Y.

Coils

POWER and A. F. COILS and WINDINGS

Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Calif.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Anaconda Wire & Cable Co., 25 Broadway, New York. N. Y.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill.
Coto-Coil Co., Pavilion Ave., Providence, R. I.
Dano Electric Co., 93 Main St., Winsted, Conn.
Davis & Co., Dean W., 549 W. Fulton St., Chicago, Ill.
Dinion Coil Co., Inc., 1 North St., Caledonia, N. Y.
Doyle, Inc., James W., 2734 N. Pulaski Rd., Chicago, Ill.
Electrical Coil Winding Co., 2734 Saunders St., Camden, N. J
Electrical Specialty Co., 2304 Washington St., Boston, Mass.
Electricoil Transformer Co., 421 Canal St., New York, N. Y.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Federal Instrument Co., 3931-47th Ave., Long Island City 4, N. Y.
Ferranti Electric Inc., 30 Rockefeller Plaza, New York, N. Y.
Foster Co., A. P., 719 Wyoming Ave., Lockland 15, Ohio
Freed Transformer Co., 72 Spring St., New York, N. Y.
Gardner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
General Winding Co., 420 West 45th St., New York, N. Y.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Guthman & Co., Edwin I., 15 S. Throop St., Chicago, Ill.
Hadley Co., Robert M., 711 East 61st St., Los Angeles, Calif.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Avenue, Brooklyn, N. Y.
Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles 36, Calif.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Instrument Resistors, Inc., Little Falls, N. J.
International Transformer Co., 396 Broadway, New York, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Langevin Co., Inc., 37 W. 65th St., New York, N. Y.
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.
Magnetic Windings Co., Div. of Essex Wire Corp., 16th & Butler Sts., Easton, Pa.
Merit Coil & Transformer Corp., 311 N. Desplaines St., Chicago, Ill.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Northelfer Winding Labs., 111 Albermarle Ave., Trenton, N. J.
Philco Co., Tioga & C Sts., Philadelphia 3, Pa.
Premier Crystal Laboratories, Inc., 55 Park Row, New York 63, N. Y.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Radio Corp. of America, Camden, N. J.
Radionic Control, 3758 Belmont Ave., Chicago 18, Ill.
Radionic Transformer Co., 411 S. Sangamon St., Chicago, Ill.
Rola Co., Inc., 2530 Superior Ave., Cleveland, Ohio
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Smith Mfg. Co., Nathan R., 105 Pasadena Ave., S. Pasadena, Calif.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Coil Products, 2329 N. Pulaski Rd., Chicago, Ill.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Teleradio Engineering Corp., 484 Broome St., New York, N. Y.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
Ungar, Inc., Harry A., 615 Ducommun St., Los Angeles 12, Calif.
United Transformer Co., 150 Varick St., New York 13, N. Y.
Walsh Engineering Co., 34 DeHart Place, Elizabeth, N. J.
Webster Electric Co., 1900 Clark St., Racine, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.
Whisk Laboratories, 145 W. 45th St., New York, N. Y.

R. F. RECEIVING or TRANSMITTING COILS

Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.
Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Albion Coil Co., Albion, Ill.
Alden Products Co., 117 Main St., Brockton, Mass.
American Communications Corp., 306 Broadway, New York, N. Y.
Andrew Co., 363 E. 75th St., Chicago 19, Ill.
Aray Mfg. & Supply Co., Inc., 3107 Pine St., St. Louis 13, Mo.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bridgeport Mfg. Co., Bridgeport, Ill.
Burnett Radio Lab., Wm. W. L., 4814 Idaho St., San Diego, Calif.
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill.
Coto-Coil Co., Pavilion Ave., Providence, R. I.
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
Electric Specialty Co., 2304 Washington St., Boston, Mass.
Electricoil Transformer Co., 421 Canal St., New York, N. Y.
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Erco Radio Labs., Inc., Fenimore Ave., Hempstead, N. Y.
Essex Electronics, 1060 Broad St., Newark 2, N. J.
Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.
Ferranti Electric Inc., 30 Rockefeller Plaza, New York, N. Y.
Gardner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
General Winding Co., 420 West 45th St., New York, N. Y.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
E. I. Guthman & Co., 15 So. Throop St., Chicago, Ill.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hammarlund Mfg. Co., 460 W. 34th St., New York, N. Y.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 1, N. Y.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Johnson Co., E. F., Waseca. Minn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Langevin Co., Inc., 37 W. 65th St., New York, N. Y.
Lawton Products Co., 624 Madison Ave., New York 22, N. Y.
Leotone Radio Co., 63 Dey St., New York 7, N. Y.
Meissner Mfg. Co., Mount Carmel, Ill.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Miller Co., J. W., 5917 S. Main St., Los Angeles, Cal.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
National Co., 61 Sherman St., Malden, Mass.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Philco Co., Tioga & C Sts., Philadelphia 3, Pa.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Craftsmen, 1341 So. Michigan Ave., Chicago 5, Ill.
Ross Mfg. Co., 3241 S. Indiana Ave., Chicago 27, Ill.
S-W Inductor Co., 1056-58 N. Wood St., Chicago, Ill.
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Sound Equipment Corp. of California, 6245 Lexington Ave., Hollywood, Calif.
Standard Coil Products Co., 2329 N. Pulaski Road, Chicago 18, Ill.
Standard Winding Corp., 2-4 Johnes St., Newburgh, N. Y.
Stanwyck Winding Co., 102 Lander St., Newburgh, N. Y.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Teleradio Engineering Corp., 484 Broome St., New York, N. Y.
Transmitter Equipt. Co., 345 Hudson St., New York 14, N. Y.
Ungar, Inc., Harry A., 615 Ducommun St., Los Angeles 12, Calif.
Webber Co., Earl, 1313 Randolph St., Chicago 7, Ill.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

SOLENOID COILS

Aladdin Radio Industries, Inc., 501 West 35th St., Chicago, Ill.
Albion Coil Co., Albion, Ill.
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee, Wis.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.
Consolidated Radio Products Co., 350 W. Erie St., Chicago, Ill.
Coto-Coil Co., Pavilion Ave., Providence, R. I.
Davis & Co., Dean W., 549 W. Fulton St., Chicago, Ill.
Dinion Coil Co., Inc., 1 North St., Caledonia, N. Y.
Doyle, Inc., James W., 2734 N. Pulaski Rd., Chicapo, Ill.
Eclipse Aviation Div. of Bendix Aviation, Bendix, N. J.
Electric Auto-Lite Co., Toledo 1, Ohio
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Electrical Coil Winding Co., 2734 Saunders St., Camden, N. J.
Electricoil Transformer Co., 421 Canal St., New York, N. Y.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Essex Electronics, 1060 Broad St., Newark 2, N. J.
Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.

ELECTRONIC and ALLIED PRODUCTS

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Gardner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Avenue, Brooklyn 1, N. Y.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Instrument Resistors, Inc., Little Falls, N. J.
International Transformer Co., 396 Broadway, New York, N. Y.
Jefferson Electric Co., Bellwood, Ill.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Langevin Co., Inc., 37 West 65th St., New York, N. Y.
Leotone Radio Co., 63 Dey St., New York, N. Y.
Madison Electrical Prods. Corp., Madison, New Jersey
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Magnetic Windings Co., Div. of Essex Wire Corp., 16th & Butler Sts., Easton, Pa.
Merit Coil & Transformer Corp., 311 N. Desplaines St., Chicago, Ill.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Northelfer Winding Labs., 111 Albermarle Ave., Trenton, N. J.
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.
R. B. M. Mfg. Co., Div. of Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Radionic Controls, 3758 Belmont Ave., Chicago 18, Ill.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Rola Co., Inc., 2530 Superior Ave., Cleveland, Ohio
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Smith Mfg. Co., Nathan R., 105 Pasadena Ave., S. Pasadena, Calif.
Special Chemicals Corp., 30 Irving Place, New York, N. Y.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago, Ill.
Standard Winding Co., 2-4 Johnes St., Newburgh, N. Y.
Thermador Elec. Mfg. Co., 5119 S. Riverside Drive, Los Angeles, Calif.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
Trebor Radio Co., Pasadena, Calif.
Ungar, Inc., Harry A., 615 Ducommun St., Los Angeles 12, Calif.
Webber Co., Earl, 1313 W. Randolph St., Chicago 7, Ill.
Webster Electric Co., 1900 Clark St., Racine, Wisc.
Wellman Manufacturing Co., 7122 Melrose Ave., Los Angeles 46, Calif.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheeler Insulated Wire Co., 378 Washington Ave., Brilgeport, Conn.

Coil Winding Machines

see Machines

Colorimeters

PHOTO-ELECTRIC COLORIMETERS

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Coleman Electric Co., 310 Madison St., Maywood, Ill.
DeJur Amsco Corp., 6 Bridge St., Shelton, Conn.
Electronic Products Co., 19 North First St., Geneva, Ill.
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.
Frober-Faybor Co., Chagrin Falls, Ohio
Gamma Instrument Co., Inc., 95 Madison Ave., New York 16, N. Y.
General Electric Co., Schenectady, N. Y.
National Technical Laboratories, 820 Mission St., South Pasadena, Calif.
Pfaltz & Bauer, Inc., 350 Fifth Ave., New York, N. Y.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Photovolt Corp., 95 Madison Ave., New York, N. Y.
Pho-Tron Instrument Co., 5713 Euclid Ave., Cleveland, Ohio
Radio Corp. of America, Camden, N. J.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Saxl Instrument Co., 38 James St., East Providence, R. I.
Schaar & Co., 754 W. Lexington St., Chicago, Ill.
Scientific Glass Apparatus Co., Bloomfield, N. J.
White Research, 899 Boylston St., Boston, Mass.

Condensers

see Capacitors

Connectors

CABLE CONNECTORS and COUPLINGS

A. B. C. Products, Inc., 11952 Montana Ave., W. Los Angeles 24, Calif.
Airadio, Inc., Melrose Ave. & Battery Pl., Stamford, Conn.
Aircraft-Marine Prods., Inc., 1523 N. 4th St., Harrisburg, Pa.
Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Alden Products Co., 117 Main St., Brockton, Mass.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
American Radio Hardware Co., 152 MacQuesten Pkway, S., Mt. Vernon, N. Y.
Andrew Co., 363 E. 75 St., Chicago 19, Ill.
Astatic Corp., 830 Market St., Youngstown, Ohio
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Atlas Sound Corp., 1443 39th St., Brooklyn, N. Y.
Automatic Metal Products Co., 315 Berry St., Brooklyn, N. Y.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York 54, N. Y.
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.
Chase Brass & Copper Co., Waterbury 91, Conn.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Connector Corp., 401 N. Broad St., Philadelphia 8, Pa.
Dante Elec. Mfg. Co., Bantam, Conn.
Diamond Instrument Co., North Ave., Wakefield, Mass.
Dossert & Co., 242 W. 41st St., New York, N. Y.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Electric Auto-Lite Co., Wire Div., Port Huron, Mich.
Federal Mfg. & Engrg. Corp., 199-217 Steuben St., Brooklyn, N. Y.
General Electric Co., Bridgeport, Conn.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Harwood Co., Division of Los Angeles Corp., 540 N. La Brea, Los Angeles 36, Calif.
Heyman Mfg. Co., Kenilworth, N. J.
Hubbell, Inc., Harvey, Bridgeport 2, Conn.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Jones, Howard B., 2300 Wabansia Ave., Chicago, Ill.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kolka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Monowatt Electric Corp., 66 Bissell St., Providence 7, R. I.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
Northam Warren Corp., Stamford, Conn.
O. Z. Electrical Mfg. Co., 262 Bond St., Brooklyn, N. Y.
Penn-Union Electric Corp., 315 State St., Erie, Pa.
Precision Specialties, 220 North Western Ave., Los Angeles, Calif.
Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.
Rice's Sons, Inc., Bernard, 325 Fifth Ave., New York, N. Y.
Sherman Mfg. Co., H. B., 22 Barney St., Battle Creek, Mich.
Thomas & Betts Co., Inc., 36 Butler St., Elizabeth, N. J.
Trumbull Electric Mfg. Co., Plainville, Conn.
Ucinite Co., 459 Watertown St., Newtonville, Mass.
United-Carr Fastener Corp., 31 Ames St., Cambridge 42, Mass.
United States Rubber Co., 1234 Sixth Ave., New York 20. N. Y.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.
Wood Electric Co., Inc., W. D., 826 Broadway, New York, N. Y.
Zierick Mfg. Corp., 385 Gerard Ave., New York, N. Y.

Contacts

see Points

Contactors

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
Arrow-Hart & Hegeman Elec. Co., 103 Hawthorn St., Hartford, Conn.
Automatic Electric Mfg. Co., 10 State St., Mankato, Minn.
Colt's Patent Fire Arms Mfg. Co., 1429 Park St., Hartford, Conn.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago 32, Ill.
General Electric Co., Schenectady, New York
Guardian Electric Mfg. Co., 1621 Walnut St., Chicago, Ill.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford 6, Conn.
Johnson Co., E. F., Waseca, Minn.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Tork Clock Co., 1 Grove St., Mt. Vernon, N. Y.
Trumbull Electric Mfg. Co., Plainville, Conn.
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.
Warrick, Charles F., 16251 Hamilton Ave., Detroit 3, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

Controls

ATTENUATORS

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Clarostat Mfg. Co., Inc., 130 Clinton Street, Brooklyn 1, N. Y.
Daven Co., 191 Central Ave., Newark 4, N. J.
DeWald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.
Electronic Products Co., 19 North First St., Geneva, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
H-B Electric Co., 6122 N. 21st St., Philadelphia, Pa.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Madison Electrical Products Corp., Madison, N. J.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.

Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago 39, Ill.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Tech Laboratories, 7 Lincoln St., Jersey City, N. J.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Variaten Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
White Research, 899 Boylston St., Boston, Mass.
Zephyr Products Corp., 160 E. 116th St., New York 29, N. Y.

VOLUME and TONE CONTROLS

Allen Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wisc.
Chicago Telephone Supply Co., 1142 W. Beardsley Ave., Elkhart, Ind.
Clarostat Mfg. Co., Inc., 130 Clinton Street, Brooklyn 1, N. Y.
Daven Co., 191 Central Ave., Newark 4, N. J.
DeJur Amsco Corp., 6 Bridge St., Shelton, Conn.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Haines Mfg. Co., 248 McKibben St., Bklyn. 6, N. Y.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Avenue, Chicago 38, Ill.
Madison Electrical Products Corp., Madison, New Jersey
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Precision Resistor Co., 334 Badger Ave., Newark, N. J.
Stackpole Carbon Co., St. Mary's, Pa.
Tech Laboratories, 7 Lincoln St., Jersey City, N. J.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Wirt Co., 5521 Greene St., Philadelphia, Pa.
Wurlitzer Mfg. Co., Rudolph, North Tonawanda, New York

Converters

ROTARY CONVERTERS

see Generators

VIBRATOR TYPE

ABC Radio Laboratories, 3334 N. New Jersey St., Indianapolis 5, Ind.
American Television & Radio Corp., 300 E. 4th St., St. Paul, Minn.
Electronic Laboratories, Indianapolis, Ind.
Kurman Electric Co., 3030 Northern Blvd., Long Island City, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill.
Radiart Corp., 3571 W. 62nd St., Cleveland, Ohio
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Vibrapower Co., James, 1551 Thomas St., Chicago, Ill.

Cores

POWDERED IRON CORES

Advance Solvents & Chemical Corp., 245 Fifth Ave., New York, N. Y.
Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Crowley & Co., H. L., 1 Central Ave., West Orange, N. J.
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.
Ferrocart Corp. of America, P. O. Box 126, Hastings-on-Hudson 6, N. Y.
General Aniline Works, Div. of General Aniline & Film Corp., 435 Hudson St., New York, N. Y.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Mallory Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Mepham Corp., G. S., 2001 Lynch Ave., East St. Louis, Ill.
Moraine Products Div., General Motors Corp., Dayton, Ohio
Pyroferric Corp., 175 Varick St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Stackpole Carbon Co., Tannery St., St. Mary's, Pa.

Couplings

COAXIAL CABLE COUPLINGS

see Connectors

Crystals

CRYSTAL FINISHING EQUIPMENT

Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Consolidated Diamond Saw Blade Corp., 420 Yonkers Ave., New York, N. Y.
Diamond Tool Replacement Co., Div. of Oscap Mfg. Co., Inc., 207 W. Saratoga St., Baltimore 1, Md.
Felker Mfg. Co., Torrence, Calif.
Good All Electric, 320 N. Spruce St., Ogalala, Neb.
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, L. I., N. Y.
Linick & Co., Leslie L., 29 E. Madison St., Chicago, Ill.
Martindale Electric Co., 617 Edgewater Br., Cleveland, Ohio
Merkle-Korff Gear Co., 213 N. Morgan St., Chicago 7, Ill.
National Research Corp., 100 Brookline Ave., Boston, Mass.
Parker Engineering Prods. Co., 16 West 22nd St., New York 10, N. Y.
Vreeland Lapidary Mfg. Co., 2020 Southwest Jefferson St., Portland, Oregon

QUARTZ CRYSTALS and HOLDERS

Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kansas
Alden Products Co., 117 Main St., Brockton, Mass.
American Jewels Corp., Attleboro, Mass.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Bassett, Inc., Rex, 500 S. E. Second St., Fort Lauderdale, Fla.
Beaumont Elec., 1304 S. Indiana Ave., Chicago, Ill.
Bendix Radio Div., Bendix Aviation Corp., 920 E. Fort St., Baltimore, Md.
Bliley Electric Co., Erie, Pa.
Breon Laboratories, Williamsport, Pa.
Burnett Radio Lab., Wm. W. L., 4814 Idaho St., San Diego, Calif.
C. W. Mfg., 3800 Brooklyn Ave., Los Angeles, Calif.
Cambridge Thermionic Corp., 447 Concord Ave., Cambridge, Mass.
Carlisle Crystal Corp., 132 N. Hanover St., Carlisle, Pa.
Collins Radio Co., 855 35th St., N. E., Cedar Rapids, Iowa
Commercial Crystal Co., 112 N. Water St., Lancaster, Pa.
Commercial Equipment Co., 1416 McGee St., Kansas City, Mo.
Commercial Radio Equip. Co., 7134 Main St., Kansas City, Mo.
Cryco, Inc., 1516 Mission St., S. Pasadena, Calif.
Crystal Lab., Inc., 801 W. Maple St., Wichita, Kansas
Crystal Products Co., 1519 McGee St., Kansas City, Mo.
Crystal Research Lab., Inc., 29 Allyn St., Hartford, Conn.
Dallons Laboratories, 5066 Santa Monica Blvd., Los Angeles, Calif.
Daughetee Mfg., 228 N. Clinton St., Chicago, Ill.
Diamond Drill Carbon Co., 63 Park Row, New York, N. Y.
L. A. Dow, 2208 4th Ave., Seattle, Wash.
DX Crystal Co., 1841 West Carrol Ave., Chicago, Ill.
Eidson's, 1309 N. 2nd St., Temple, Texas
Electric Appliances Corp., 120 W. North St., Indianapolis, Ind.
Electrical Prod. Corp., 950-30th St., Oakland, Calif.
Electronic Ind. (Ill.), Sandwich, Ill.
Electronic Ind. (Iowa), 517 Fourth Ave., S. E., Cedar Rapids, Iowa
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
Electronics Products Mfg. Corp., 7300 Huron River Drive, Dexter, Mich.
Elkay Radio Products, 305-309 E. Walnut St., Oglesby, Ill.
Etched Products Corp., 39-01 Queens Blvd., Long Island City, N. Y.
Federal Engineering Co., 37 Murray St., New York, N. Y.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Foote Mineral Co., 1609 Summer St., Philadelphia, Pa.
Franklin Transformer, 607-609 22nd Ave., N. E., Minneapolis 4, Minn.
Frequency Measuring, 1816 Walnut St., Kansas City, Mo.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
General Crystal Corp., 1775 Foster Ave., Schenectady, N. Y.
General Electric Co., 1 River Road, Schenectady, N. Y.
General Piezo Co., 2614 State Ave., Kansas City, Kans.
General Quartz Lab., Cosmopolitan Bldg., Irvington on Hudson, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gibbs & Co., Thomas B., Div. of George W. Borg Corp., 814 Michigan St., Delavan, Wis.
Good-All Electric, 320 N. Spruce St., Ogalala, Neb.
Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
Harvey Radio Lab., Inc., 447 Concord Ave., Cambridge, Mass.
Harvey-Wells Communications, Inc., North St., Southbridge, Mass.
Hatcher & Fisk, 125 Kansas Ave., Topeka, Kan.
Hearing Aid Lab., 1404 Franklin St., Michigan City, Ind.
Henney Motor Co., Gentleman Products Div., Freeport, Ill.
Henry Mfg. Co., 2213 Westwood Blvd., Los Angeles 25, Calif.
Higgins Industries, Inc., 2221 Warwick Ave., Santa Monica, Calif.
Highpower Crystal Co., 2035 W. Charleston St., Chicago, Ill.
Hoffman Co., P. R., 321 Cherry St., Carlisle, Pa.
Hollister Crystal Co., Boulder, Colo.
Howard Mfg. Co., 15 Fourth St., Council Bluffs, Iowa
Hudson American Corp., 25 W 43rd St., New York, N. Y.
Hunt & Sons, G. C., 544 Hanover, Carlisle, Pa.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Jefferson Inc., Ray, 40 E. Merrick Rd., Freeport, Long Island, N. Y.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Kemlite Laboratories, 1809 N. Ashland Ave., Chicago, Ill.
Keystone Piezo Co., 2020 W. Liberty Ave., Pittsburgh 26, Pa.
Knights Co., James, 131 S. Wells St., Sandwich, Ill.
Lenoxite Div., Lenox, Inc., 65 Prince St., Trenton, N. J.
Leuck Crystal Lab., 245 S. 11th St., Lincoln, Neb.
Link, Fred M., 125 W. 17th St., New York, N. Y.
Majestic Radio & Tel. Corp., 2600 W. 50th St., Chicago, Ill.
Meck Industries, John, Liberty St., Plymouth, Ind.
Mica Products Mfg. Co., 69 Wooster St., New York, N. Y.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Miller, August E., 9226 Hudson Blvd., North Bergen, N. J.
Monitor Piezo Prod., 1500 Mission St., South Pasadena, Cal.
National Scientific Products Co., 5013 N. Kedzie Ave., Chicago 25, Ill.
North Amer. Phillips Co., Inc., 100 East 42nd St., New York 17, N. Y.
Ogush, Inc., William B., 33 W. 60th St., New York, N. Y.

ELECTRONIC and ALLIED PRODUCTS

Pacific Radio Crystal Co., 1035 Post St., San Francisco, Cal.
Pan-Electronics Laboratories, Inc., 498 Spring St., N. W., Atlanta, Ga.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Petersen Radio Co., 2800 W. Broadway, Council Bluffs, Iowa
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Piezo Electric Products Co., 104 Fifth Ave., Brooklyn Park 25, Md.
Precision Instrument Mfg. Co., Inc., 57-02 Hoffman Dr., Elmhurst, L. I., N. Y.
Precision Piezo Service 427 Mayflower St., Baton Rouge, La.
Premier Crystal Labs., Inc., 63 Park Row, New York, N. Y.
Quartz Lab., Inc., 1513 Oak St., Kansas City, Mo.
Quartz Products Co. of New York, 304 E. 45th St., New York, N. Y.
R. E. C. Mfg. Corp., 1250 Highland St., Holliston, Mass.
Radell Corp., 6327 Guilford Ave., Indianapolis, Ind.
Radio Corp. of America, Camden, N. J.
Radio Specialty Mfg. Co., 403 N. W. 9th Ave., Portland, Oregon
Reeves Sound Lab., Inc., 62 W. 47th St., New York, N. Y.
R-9 Crystal Co., Inc., 909 Penn Ave., Pittsburgh, Pa.
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Scientific Radio Products, 738 W. Broadway, Council Bluffs, Iowa
Scientific Radio Service, 4301 Sheridan St., University Park, Md.
Sentry Crystal Co., 206 S. W. Washington St., Portland, Ore.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y. (test equipment.)
Sipp-Eastwood Corp., 39 Keen St., Paterson, N. J.
Smith Lab., M. L., 16 Field St., Kane, Pa.
Somerset Laboratories, 124 Valleybrook Ave., Lyndhurst, N. J.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago, Ill.
Standard Piezo Co., Woolworth Bldg., Carlisle, Pa.
Standard Plastics, 1548 S. Robertson Blvd., Los Angeles 35, Calif.
Telephonics Corp., 350 West 31st St., New York, N. Y.
Telicon Corp., 305 East 63rd St., New York, N. Y.
Turner Company, 909 17th St., Cedar Rapids, Iowa
Union Piezo Co., 701 McCarter Highway, Newark, N. J.
Universal Television System, 112 W. 18th St., Kansas City, Mo.
Valpey Crystals, Highland St., Holliston, Mass.
Vreeland Lapidary Mfg. Co., Portland, Ore.
Wallace Mfg. Co., Wm. T., Chili & Madison Aves., Peru, Indiana
Wellman Mfg. Co., 7122 Melrose Ave., Los Angeles 46, Calif.
Western Electric Co., 195 Broadway, New York, N. Y.
Wilcox Elec. Co., Inc., 14th & Chestnut, Kansas City, Mo.
Wynne Precision Co., 114½ N. Hill St., Griffin, Ga.

ROCHELLE SALT CRYSTALS

Atlas Products Corp., 30 Rockefeller Plaza, New York, N. Y.
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio.
Tibbetts Laboratories, Camden, Maine.

Cutting Heads

see Recorders, Sound

Dial Lights

see Lights

Dials

see also Knobs, Pointers

Alden Products Co., 117 Main St., Brockton, Mass.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Austin Co., O., 42 Greene St., New York, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bastian Bros. Co., 1600 N. Clinton Ave., Rochester, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cardy-Lundmark, 1801 West Bryon St., Chicago 13, Ill.
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Daven Co., 191 Central Ave., Newark 4, N. J.
Dearborn Glass Co., 2414 W. 21st St., Chicago, Ill.
Eastern Etching & Mfg. Co., Chicopee, Mass.
Emeloid Co., 287 Laurel Ave., Arlington, N. J.
Erie Resistor Corp., 640 W. 12th St., Erie, Pa.
Etched Products Corp., 39-01 Queens Blvd., Long Island City, N. Y.
Felsenthal & Sons, G., 4122 W. Grand St., Chicago 49, Ill.
Flock Process Corp., 17 W. 31st St., New York 10, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Grammes & Sons, Inc., L. F., 366 Union St., Allentown, Pa.
Hopp Press, Inc., 460 W. 34th St., New York, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Long Island Engraving Co., 19 West 21st St., New York 10, N. Y.
McInerney Plastic Co., 655 Godfrey Ave., S. W., Grand Rapids 1, Michigan
Mica Insulator Co., 200 Varick St., New York, N. Y.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Co., 61 Sherman St., Malden, Mass.
New England Etching & Plating Co., 25 Spring St., Holyoke, Mass.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Plastic Fabricators, Inc., 440 Sansome St., San Francisco, Calif.
Premier Crystal Laboratories, Inc., 63 Park Row, New York, N. Y.
Premier Metal Etching Co., 21-03 44th Ave., Long Island City, N. Y.
Printloid, Inc., 95 Mercer St., New York, N. Y.
Richardson Co., Lockland, Ohio
Screenmakers, 64 Fulton St., New York 1, N. Y.
Silk Screen Supplies, Inc., 33 Lafayette Ave., Brooklyn, N. Y.
Sillcocks-Miller Co., 10 Parker Ave., W. South Orange, N. J.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Waterbury Button Co., 835 S. Main St., Waterbury, Conn.
Worcester Moulded Plastics Co., 8 Grafton St., Worcester, Mass.

Direction Finders

see Radio Compass Receivers

Discs

BLANK RECORDING DISCS

Advance Recording Products Co., 36-12 34th St., Long Island City, N. Y.
Allied Recording Products Co., 21-09 43d Ave., Long Island City 1, N. Y.
Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y.
Dearborn Glass Co., 2414 W. 21st St., Chicago, Ill.
Dossert & Co., 242 W. 41st St., New York, N. Y.
Duotone Co., 799 Broadway, New York, N. Y.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Federal Recorder, Elkhart, Ind.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
General Electric Co., Schenectady, N. Y.
Gould-Moody Co., 395 Broadway, New York, N. Y.
Gray Mfg. Co., 16-30 Arbor St., Hartford, Conn.
Home Recording Co., 9 E. 19th St., New York, N. Y.
Howard Radio Co., 1735 Belmont Ave., Chicago 13, Ill.
Mirror Record Corp., 58 W. 25th St., New York, N. Y.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Sound Devices Co., 160 East 116th St., New York, N. Y.
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York, N. Y.
Talking Devices Co., 4447 Irving Park Rd., Chicago, Ill.
Wilcox Gay Corp., Charlotte, Mich.
Zephyr Products Corp., 160 E. 116th St., New York 29, N. Y.

Discs, Rectifier

see Rectifiers

Dividers

VOLTAGE DIVIDERS

see Resistors, Wire Wound

Drafting Equipment

Alteneder Co., Theo., 1217 Spring Garden St., Philadelphia 23, Pa.
American Pencil Co., 504 Willow Ave., Hoboken, N. J.
American Photocopy Equipment Co., 2849 N. Clark St., Chicago, Ill.
Arkwright Finishing Co., Turks Head Bldg., Providence, R. I.
Bruning Co., Inc., Charles, 4700 Montrose Ave., Chicago, Ill.
Cardinell Corp., Montclair, N. J.
Carter's Ink Co., Cambridge, Mass.
Dietzgen Co., Eugene, 2425 Sheffield Ave., Chicago, Ill.
Dixon Crucible Co., Joseph, Jersey City, N. J.
Eagle Pencil Co., 703 East 13th St., New York, N. Y.
Emmert Mfg. Co., Waynesboro, Pa.
Eraser Co., 231 W. Water St., Syracuse 2, N. Y.
Faber, Inc., A. W., 41 Dickerson St., Newark 4, N. J.
Faber Pencil Co., Eberhard, 37 Greenpoint Ave., Brooklyn, N. Y.
General Pencil Co., 67 Fleet St., Jersey City, N. J.
Gold Shield Products Co., 25 W. Broadway, New York, N. Y.
Higgins Ink Co., Inc., 271 Ninth St., Brooklyn 15, N. Y.
Holliston Mills, Inc., Norwood, Mass.
Hunter Electro Copyist, Inc., 430 S. Warren St., Syracuse, N. Y.
Keuffel & Esser Co., 303 Adams St., Hoboken, N. J.
Koh-I-Noor Pencil Co., Bloomsbury, N. J.
Ozalid Products Div., General Aniline & Film Corp., 25 Ansco Rd., Johnson City, N. Y.
Paragon-Revolute Corp., 97 South Ave., Rochester 4, N. Y.
Pease Co., C. F., 2601 W. Irving Park Rd., Chicago, Ill.
Photo Reproducing Eqpt. Co., Chatham, N. J.
Post Co., Frederick, 3650 Avondale Ave., Chicago 90, Ill.
Reliance Devices Co., Inc., 30 Irving Place, New York 3, N. Y.
Staedtler, J. S., Inc., 53-55 Worth St., New York, N. Y.
Starrett Co., L. S., 165 Crescent St., Athol, Mass.
United States Blue Print Paper Co., 207 S. Wabash Ave., Chicago, Ill.

Universal Drafting Machine Co., 1426 W. Third St., Cleveland, Ohio
Weber Co., F., 1220 Buttonwood St., Philadelphia 23, Pa.
White Co., David, 315 Court St., Milwaukee, Wisc.
Wickes Bros., 515 N. Washington St., Saginaw, Mich.
Williams, Brown & Earle, Inc., 918 Chestnut St., Philadelphia, Pa.

Dynamotors

see Generators

Enamels

see Finishes

Equalizers

see Filters

Escutcheons

see also Dials, Scales

Alden Products Co., 117 Main St., Brockton, Mass.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Austin Co., O., 42 Greene St., New York, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Daven Co., 191 Central Ave., Newark 4, N. J.
Eastern Etching & Mfg. Co., Chicopee, Mass.
Emeloid Co., Inc., 287 Laurel Ave., Arlington, N. J.
Erie Resistor Corp., 640 W. 12 St., Erie, Pa.
Etched Products Corp., 39-01 Queens Blvd., Long Island City, N. Y.
Farley & Loetscher Mfg. Co., Dubuque, Iowa
Flock Process Corp., 53 W. 21st St., New York 10, N. Y.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, N. Y.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Grammes & Sons, Inc., L. F., 366 Union St., Allentown 2, Pa.
Hopp Press, Inc., 460 West 34th St., New York, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Long Island Engraving Co., 19 West 21st St., New York 10, N. Y.
Meyercord Co., 5323 W. Lake St., Chicago, Ill.
New England Etching & Plating, 25 Spring St., Holyoke, Mass.
Plastic Fabricators, Inc., 440 Sansome St., San Francisco, Calif.
Premier Metal Etching Co., 21-03 44th Ave., Long Island City, N. Y.
Screenmakers, 64 Fulton St., New York, N. Y.
Sillcocks-Miller Co., 10 Parker Ave. W., South Orange, N. J.
Syracuse Ornamental Co., 581 So. Clinton St., Syracuse, N. Y.
United-Carr Fastener Corp., 31 Ames St., Cambridge 42, Mass.
Victory Mfg. Co., 1722 W. Arcade Pl., Chicago 12, Ill.

Facsimile Receivers and Transmitters

see Receivers & Transmitters

Fibre

see Insulation

Filter Chokes

see Chokes, Power & Audio

Filters

ELECTRIC WAVE SECTION FILTERS

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Audio Development Co., 2833 13th Ave., S., Minneapolis, Minn.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Freed Transformer Co., 72 Spring St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles 36, Calif.
International Transformer Co., 396 Broadway, New York, N. Y.
Kenyon Transformer Co., 840 Barry St., New York, N. Y.
Miller Co., J. W., 5917 S. Main St., Los Angeles, Calif.
Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
United Transformer Co., 150 Varick St., New York, N. Y.

EQUALIZER FILTERS

Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Calif.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Audio Development Co., 2833 13th Ave. S., Minneapolis, Minn.
Audio Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Daven Co., 191 Central Ave., Newark 4, N. J.
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Grenby Mfg. Co., Plainville, Conn.
Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles 36, Calif.
International Transformer Co., 396 Broadway, New York, N. Y.
Kenyon Transformer Co., 840 Barry St., New York, N. Y.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Schuttig & Co., 9th & Kearney Sts., N. E. Washington 24, D. C.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
United Transformer Co., 150 Varick St., New York, N. Y.

NOISE FILTERS

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Andrea Radio Corp., 43-20 24th St., Long Island City, N. Y.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Avia Products Co., 749 N. Highland, Los Angeles, Calif.
Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio
Cornel-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J.
Deutschmann Corp., Tobe, Canton, Mass.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Erie Resistor Corp., 640 West 12th St., Erie, Pa.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Freed Radio Corp., 200 Hudson St., New York, N. Y.
General Winding Co., 420 West 45th St., New York, N. Y.
Girard-Hopkins, 1000 40th Ave., Oakland, Cal.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Industrial Condenser Corp., 1725 W. North Ave., Chicago, Ill.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kenyon Transformer Co., 840 Barry St., New York, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Measurements Corp., Boonton, N. J.
Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Solar Mfg. Corp., 285 Madison Ave., New York 17, N. Y.
Sprague Electric Co., 189 Beaver St., North Adams, Mass.
Technical Appliance Corp., 516 W. 34th St., New York, N. Y.
United Transformer Co., 150 Varick St., New York 13, N. Y.
Whisk Laboratories, 145 W. 45th St., New York, N. Y.

Finders, Direction

see Radio Compass Receivers

Finishes

INSULATING ENAMELS

Alden Products Co., 117 Main St., Brockton, Mass.
Bakelite Corp., 30 E. 42nd St., New York 17, N. Y.
Day & Co., James B., 1872 Clybourn Ave., Chicago, Ill.
Franklin Paint & Varnish Co., Benjamin, 4820 Langdon St., Philadelphia, Pa.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Lilly Varnish Co., 670 S. California St., Indianapolis, Ind.
Lowe Bros. Co., 436 E. Third St., Dayton, Ohio
Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.
Master Finishers, Inc., 2415 Prairie Ave., Chicago 24, Ill.
Murphy Varnish Co., 224 McWhorter St., Newark, N. J.
New Wrinkle, Inc., 314 W. First St., Dayton 2, Ohio
Pratt & Lambert, Inc., 75 Tonawanda St., Buffalo, N. Y.
Roxalin Flexible Finishes, Inc., 800 Magnolia Ave., Elizabeth, N. J.
Schott Co., Walter L., 9306 Santa Monica Blvd., Beverly Hills, Calif.
Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y.
Watson-Standard Co., 225 Galveston St., Pittsburgh, Pa.
Zapon Div., Atlas Powder Co., Ludlow St., Stamford, Conn.

INSULATING VARNISH

Aluminum Finishing Corp., 1119 E. 22nd St., Indianapolis, Ind.
American Products Mfg. Co., 8127 Oleander St., New Orleans, La.
Arco Co., 7301 Bessemer Ave., Cleveland 4, Ohio
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Bakelite Corp., 30 E. 42d St., New Work 17, N. Y.
Day & Co., James B., 1872 Clybourn Ave., Chicago, Ill.
Dolph Co., John C., 168 Emmett St., Newark, N. J.
Durez Plastics & Chemicals, Inc., 1922 Walck Road, North Tonawanda, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.

ELECTRONIC and ALLIED PRODUCTS

General Electric Co., Bridgeport, Conn.
George Co., P. D., 5200 N. Second St., St. Louis, Mo.
Haynes Laboratories, Inc., C. W., 61 Chandler St., Springfield, Mass.
Hilo Varnish Corp., 42 Stewart Ave., Brooklyn, N. Y.
Insl-X Co., Inc., 857 Meeker Ave., Brooklyn, N. Y.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Jones-Dabney Co., Smith & Proback Sts., Louisville, Ky.
Lastik Products Co., American Bank Bldg., Pittsburgh, Pa.
Lilly Varnish Co., 670 S. California St., Indianapolis, Ind.
Lowe Brothers Co., 436 E. Third St., Dayton, Ohio
Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.
Makalot Corp., 262 Washington St., Boston, Mass.
Marblette Corp., 32-21-30th St., Long Island City, N. Y.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
Murphy Varnish Co., 224 McWhorter St., Newark, N. J.
New Wrinkle, Inc., 314 W. First St., Dayton 2, Ohio
Pratt & Lambert, Inc., 75 Tonawanda St., Buffalo, N. Y.
Production Engrg. Corp., 666 Van Houten Ave., Clifton, N. J. (Service)
Robertson Chemical Co., 9808 Meech Ave., Cleveland, Ohio
Standard Insulation Co., 74 Paterson Ave., East Rutherford, N. J.
Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y.
Sterling Varnish Co., Haysville, Pa.
Synar Corp., Wilmington, Del.
Watson-Standard Co., 225 Galveston St., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Zapon Div., Atlas Powder Co., Ludlow St., Stamford, Conn.
Zophar Mills, Inc., 118-26th St., Brooklyn 32, N. Y.

LACQUER FINISHES

Alden Products Co., 117 Main St., Brockton, Mass.
American Products Mfg. Co., 8127 Oleander St., New Orleans, La.
Arco Co., 7301 Bessemer Ave., Cleveland 4, Ohio
Bakelite Corp., 30 E. 42d St., New York 17, N. Y.
Communication Products Co., Inc., 744 Broad St., Newark 2, N. J.
Day & Co., James B., 1872 Clybourn Ave., Chicago, Ill.
Dolph Co., John C., 168 Emmett St., Newark, N. J.
du Pont de Nemours & Co., E. I., 626 Schuyler Ave., Arlington, N. J.
Durez Plastics & Chemicals, Inc., 1922 Walck Road, North Tonawanda, N. Y.
Egyptian Lacquer Mfg. Co., 1270 Sixth Ave., New York, N. Y.
Franklin Paint & Varnish Co., Benjamin, 4820 Langdon St., Philadelphia, Pa.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Haynes Laboratories, Inc., C. W., 61 Chandler St., Springfield, Mass.
Hilo Varnish Corp., 42 Stewart Ave., Brooklyn, N. Y.
Johnson & Co., S. C., Industrial Div., Racine Wisc.
Jones-Dabney Co., Smith & Proback Sts., Louisville, Ky.
Lilly Varnish Co., 670 S. California St., Indianapolis, Ind.
Lowe Brothers Co., 436 E. Third St., Dayton, Ohio
Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.
Makalot Corp., 262 Washington St., Boston, Mass.
Marblette Corp., 32-21-30th St., Long Island City, N. Y.
Master Finishes, Inc., 2415 Praria Ave., Chicago 24, Ill.
Monsanto Chemical Co., Merrimac Div., Everett, Mass.
Murphy Varnish Co., 224 McWhorter St., Newark, N. J.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
New Wrinkle, Inc., 314 W. First St., Dayton 2, Ohio
Pratt & Lambert, Inc., 92 Tonawanda St., Buffalo, N. Y.
Roxalin Flexible Finishes, Inc., 800 Magnolia Ave., Elizabeth, N. J.
Schott Co., Walter L., 9306 Santa Monica Blvd., Beverly Hills, Calif.
Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Watson-Standard Co., 225 Galveston St., Pittsburgh, Pa.
Zapon Div., Atlas Powder Co., Ludlow St., Stamford, Conn.

Flock & Flocked Paper

Cellusuede Products, Inc., Rockford, Ill.
Flock Process Corp., 53 West 23rd St., New York 10, N. Y.

Forks

ELECTRICALLY DRIVEN TUNING FORKS

American Time Products, Inc., 580 Fifth Ave., New York 19, N. Y.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago, Ill.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gibbs & Co., Thomas B., Div. of George W. Borg Corp., 814 Michigan St., Delavan, Wisc.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Riverbank Laboratories, Geneva, Ill.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.

Forms

COIL FORMS

Accurate Molding Corp., 116 Nassau St., Brooklyn 1, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
American Lava Corp., Kruesi Bldg., Chattanooga, Tenn.
Auburn Mfg. Co., 110 Stack St., Middletown, Conn.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bud Radio Inc., 2118 E. 55th St., Cleveland, Ohio
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wisc.
Continental Diamond Fibre Co., 16 Chapel St., Newark, Del.
Corning Glass Works, Corning, N. Y.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
Crowley & Co., Inc., Henry L., 1 Central Ave., W. Orange, N. J.
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
Electrical Insulation Co., Inc., 12 Vestry St., New York, N. Y.
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
General Ceramics & Steatitie Corp., Keasbey, N. J.
General Winding Co., 420 West 45th St., New York, N. Y.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Guthman & Co., E. I., 15 S. Throop St., Chicago, Ill.
Hammarlund Mfg. Co., 460 W. 34th St., New York, N. Y.
Hawley Products Co., St. Charles, Ill.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
Insulating Tube Co., Inc., 26 Cottage St., P. O. Box 1, Poughkeepsie, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Isolantite, Inc., 343 Cortland St., Belleville, N. J.
Johnson Co., E. F., Waseca, Minn.
Lenoxite Div., Lenox, Inc., 65 Prince St., Trenton, N. J.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Munsell & Co., Eugene, 200 Varick St., New York, N. Y.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.
National Co., 61 Sherman St., Malden, Mass.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
National Tile Co., Anderson, Ind.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
Ohio Brass Co., Mansfield, Ohio
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Plax Corp., 133 Walnut St., Hartford, Conn.
Precision Paper Tube Co., 2033 W. Charleston St., Chicago, Ill.
Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.
Speer Resistor Corp., St. Mary's, Pa.
Taylor Fibre Co., Norristown, Pa.
Thomas & Sons Co., R., Lisbon, Ohio
Ucinite Corp., 459 Watertown Ave., Newtonville, Mass.
Victory Manufacturing Co., 1722 W. Arcade Place, Chicago 12, Ill.

Fuses

Bussmann Mfg. Co., University at Jefferson, St. Louis 4, Mo.
Chase-Shawmut Co., Newburyport, Mass.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Eagle Electric Mfg. Co., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
General Electric Co., Bridgeport, Conn.
Littelfuse, Inc., 4755 Ravenswood Ave., Chicago, Ill.
Monarch Fuse Co., Ltd., Jamestown, N. Y.
Ohmite Mfg. Co., 4835 W. Flourney St., Chicago, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Pierce Renewable Fuse Inc., 111 Hertel Ave., Buffalo, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Galvanometers

see Meters

Gases

GASES, RARE

Air Reduction Sales Co., 60 East 42nd St., New York, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York, N. Y.

Gauges, Strain

American Instrument Company, Silver Spring, Md.
Baldwin-Locomotive Works, Eddystone, Pa.
Consolidated Engineering Corp., 1255 E. Green St., Pasadena, California.
Foxboro Co., Foxboro, Mass.
General Electric Company, Schenectady, N. Y.
Hathaway Instrument Company, 1315 S. Clarkson St., Denver, Colorado
Metzger & Son, F. F., Philadelphia, Pa.
Miller Corporation, William, Pasadena, Calif.
Olsen Testing Machine Company, Philadelphia, Pa.
Pratt & Whitney, Hartford, Conn.
Saxl Instrument Company, Inc., East Providence, R. I.
Starrett Company, L. S., 165 Crescent St., Athol, Mass.
Waugh Labs, Div. of Waugh Equipment Co., 420 Lexington Ave., New York, N. Y.

Gears, Precision

Ace Mfg. Co., 1255 E. Erie Ave., Philadelphia, Pa.
Gray Mfg. Co., 16-30 Arbor St., Hartford, Conn.
Perkins Machine & Gear Co., 130 Circuit Ave., Springfield, Mass.
Quaker City Gear Works, 1910-32 N. Front St., Philadelphia, Pa.
Shakeproof, Inc., 2501 N. Keeler Ave., Chicago 39, Ill.

Generators

DYNAMOTORS, ROTARY CONVERTERS

Air-Way Electric Appliance Corp., 2101 Auburn Ave., Toledo, Ohio
Alliance Mfg. Co., Alliance, Ohio
Allis Chalmers Mfg. Co., Milwaukee, Wisc.
Black & Decker Mfg. Co., Kent, Ohio
Brown-Brockmeyer Corp., 1000 S. Smithville Rd., Dayton, Ohio
Burke Electric Co., 12th & Cranberry St., Erie, Pa.
Carson Machine & Supply Co., Box 4547, Oklahoma City 9, Okla.
Carter Motor Co., 1608 Milwaukee Ave., Chicago 47, Ill.
Caterpillar Tractor Co., Peoria, Ill.
Century Electric Co., 1806 Pine St., St. Louis 4, Mo.
Clements Mfg. Co., 6650 S. Narragansett Ave., Chicago, Ill.
Columbia Electric Mfg. Co., 4519 Hamilton Ave., N. E., Cleveland, Ohio
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Continental Electric Co., Inc., 325 Ferry St., Newark, 5, N. J.
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J.
Diehl Mfg. Co., Somerville, N. J.
Dormeyer & Co., A. F., 4316 N. Kilpatrick Ave., Chicago, Ill.
Eastern Air Devices, Inc., 585 Dean St., Brooklyn, N. Y.
Eclipse Aviation Div. of Bendix Aviation Corp., Bendix, N. J.
Eicor, Inc., 1501 W. Congress St., Chicago, Ill.
Electric Indicator Co., 21 Parker Ave., Stamford, Conn.
Electric Products Co., 1725 Clarkstone Road, Cleveland 21, Ohio
Electric Specialty Co., 211 South St., Stamford, Conn.
Electrical Engrg. & Mfg. Corp., 4606 W. Jefferson Blvd., Los Angeles 16, Calif.
Electrolux Corp., Greenwich, Conn.
Eureka Vacuum Cleaner Co., Detroit, Michigan
Fidelity Electric Co., 332 No. Arch St., Lancaster, Pa.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
General Electric Co., Schenectady, N. Y.
Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Holtzer-Cabot, Signal Div., 400 Stuart St. Boston 17, Mass.
Homelite Corp., Port Chester, N. Y.
Imperial Electric Co., 84 Ira Ave., Akron 1, Ohio
Janette Mfg. Co., 556 W Monroe St., Chicago, Ill.
Kato Engineering Co. 530 N. Front St., Mankato, Minn.
Lawrence Aeronautical Corp., Stiles St., Linden, N. J.
Leland Electric Co., 1501 Webster St., Dayton, Ohio
Master Electric Co., 126 Davis Ave., Dayton, Ohio
Midco Mfg. & Distr. Co., Sheboygan, Wis.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Onan & Sons, D. W., 43 Royalston Ave., Minneapolis, Minn.
Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif.
Penn Boiler & Burner Mfg. Corp., Fruitville Road, Lancaster, Pa.
Pioneer Gen-E-Motor Corp., 5841 W. Dickens Ave., Chicago, Ill.
Quality Electric Co., Ltd., Los Angeles, Calif.
Redmond Co., A. G., 201 Monroe St., Owosso, Mich.
Reliance Electric & Engrg. Co., 1084 Ivanhoe Rd., Cleveland, Ohio
Robbins & Myers, 1345 Lagonda Ave., Springfield, Ohio
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Trav-ler Karenola Radio & Television Corp., 1028-36 W. Van Buren St., Chicago, Ill.
United Engineering Co., 3317 N. Crawford Ave., Chicago, Ill.
Warren Telechron Co., Ashland, Mass.
Webster Products, 3825 Armitage Ave., Chicago 47, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wincharger Corp., 7th & Division, Sioux City, Iowa
Wyse Laboratories, Dayton, Ohio

GAS AND HAND-DRIVEN GENERATORS

Bendix Aviation Corp., Bendix, N. J.
Burke Electric Co., 12 & Cranberry St., Erie, Pa.
Carter Motor Co., 1608 Milwaukee Ave., Chicago 47, Ill.
Continental Electric Co., Inc., 325 Ferry St., Newark 5, N. J.
Delco Appliance Div., General Motors Corp., 391 Lyell Ave., Rochester, N. Y.
Electric Products Co., 1725 Clarkstone Road, Cleveland 21, Ohio
Electric Specialty Co., 211 South St., Stamford, Conn.
General Electric Co., Schenectady, N. Y.
Homelite Corp., Port Chester, N. Y.
Kato Engineering Co., 530 N. Front St., Mankato, Minn.
Midco Mfg. & Distributing Co., S. 13th & Kentucky Ave., Sheboygan, Wis.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Onan & Sons, D. W., 43 Royalston Ave., Minneapolis, Minn.
Pioneer Gen-E-Motor Corp., 5841 W. Dickens Ave., Chicago, Ill.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Warwick Mfg. Corp., 4640 W. Harrison St., Chicago, Ill.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.
Wincharger Corp., 7th & Division, Sioux City, Iowa

SIGNAL GENERATORS

Airadio, Inc., Stamford, Conn.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Baldwin Locomotive Works, Eddystone, Pa.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Bendix Aviation Corp., Bendix Radio Division, Baltimore, Md.
Bendix Aviation Corp., Marine Div., 1 Hanson Place, Brooklyn, N. Y.
Boonton Radio Corp., Boonton, N. J.
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill.
Clough-Brengle Co., 5501 N. Broadway, Chicago 22, Ill.
Dayco Radio Corp., 915 Valley St., Dayton 4, Ohio
Electric Indicator Co., 21 Parker Ave., Stamford, Conn.
Espey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
Fada Radio & Electric Co., Inc., 30-20 Thomson Ave., Long Island City, N. Y.
Federal Mfg. & Engineering Corp., 199-217 Steuben St., Brooklyn, N. Y.
Ferris Instrument Co., 110-112 Cornelia St., Boonton, N. J.
Freed Radio Corp., 200 Hudson St., New York, N. Y.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Cal.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Measurements Corp., Boonton, N. J.
Meissner Mfg. Co., Mt. Carmel, Ill.
Monarch Mfg. Co., 2014 N. Major Ave., Chicago, Ill.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Packard Bell Co., 1115 So. Hope St., Los Angeles, Calif.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, N. Y.
Radex Corp., 1322 Elston Ave., Chicago, Ill.
Radio City Products Co., 127 W. 26th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.
Reiner Electronics Co., 152 West 25th St., New York, N. Y.
Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Cal.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Superior Instruments Co., 227 Fulton St., New York, N. Y.
Technical Devices Corp., Bloomfield, N. J.
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York, N. Y.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago, Ill.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.
White Research 899 Boylston St., Boston, Mass.

SQUARE WAVE GENERATORS

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Audio-Tone Oscillator Co., 237 John St., Bridgeport, Conn.
Belmont Radio Corp., 521 W. Dickens Ave., Chicago, Ill.
Browning Labs., Inc., 750 Main St., Winchester, Mass.
DuMont Laboratories, Inc., Allen B., 2 Main Ave., Passaic, N. J.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Fada Radio & Electric Co., Inc., 30-20 Thomson Ave., Long Island City, N. Y.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio.
Measurements Corp., Boonton, New Jersey
Radio Corp. of America, Camden, N. J.
Reiner Electronics Co., 152 West 25th St., New York, N. Y.
Transmitter Equipment Co., 345 Hudson St., New York 14, N. Y.
White Research, 899 Boylston St., Boston, Mass.

Geophysical Apparatus

Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Consolidated Engineering Corp., 1255 E. Green St., Pasadena, Calif.
Engineering Laboratories, Inc., 624 E. Fourth St., Tulsa, Okla.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Fisher Research Lab., 1961 University Ave., Palo Alto, Calif.
Geophysical Instrument Co., Key Blvd. & Nash St., Arlington, Va.
Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Heiland Research Corp., 130 East Fifth St., Denver, Colo.
Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago, Ill.

Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.
Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Western Geophysical Co., 711 Edison Bldg., Los Angeles 11, Calif.
White Research, 899 Boylston St., Boston, Mass.

Graphite

COLLOIDAL GRAPHITE

Acheson Colloids Corp., Port Huron, Mich.
Asbury Graphite Mills, Asbury, N. J.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
Grafo-Colloids Corp., Sharon, Pa.

Harnesses

WIRE HARNESSES

Aircraft-Marine Products, Inc., 1523 N. 4th St., Harrisburg, Pa.
Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Airplane & Marine Instruments, Inc., Clearfield, Pa.
Alden Products Co., 117 Main St., Brockton, Mass.
Ansonia Electrical Co., Ansonia, Conn.
Aray Mfg. & Supply Co., Inc., 3107 Pine St., St. Louis 13, Mo.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 55, Ill.
Branston Electric Mfg. Co., 61-65 Gill Place, Buffalo 13, N. Y.
Diamond Instrument Co., North Ave., Wakefield, Mass.
Eagle Mfg. Co., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eby, Inc., Hugh, H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Electric Auto-Lite Co., Toledo 1, Ohio
Electric Auto-Lite Co., Wire Div., Port Huron, Mich.
Electronic Supply Co., 207 Main St., Worcester, Mass.
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Forest Electronic Co., 320 E. 65th St., New York, N. Y.
General Motors Corp., Packard Electric Div., Warren, Ohio
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
J. F. D. Mfg. Co., 4111 Fort Hamilton Pkwy., Brooklyn, N. Y.
Jefferson, Inc., Ray, 40 E. Merick Rd., Freeport, L. I., N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Lafayette Radio Corp., 901 W. Jackson Blvd., Chicago 7, Ill.
Lewyt Corp., 60 Broadway, Brooklyn, N. Y.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
Paranite Wire & Cable, Div. Essex Wire Corp., Fort Wayne, Ind.
Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Schott Co., Walter L., 9306 Santa Monica Blvd., Beverly Hills, Calif.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Union Aircraft Products Corp., 380 Second Ave., New York, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York, N. Y.
Whittaker Cable Corp., North Kansas City, Mo.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.

Headphones

Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Aviometer Corp., 370 West 35th St., New York 1, N. Y.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Cannon Co., C. F., Springwater, N. Y.
Connecticut Telephone & Electric Div. of Great American Industries, 70 Britannia St., Meriden, Conn.
Consolidated Radio Co., 350 W. Erie St., Chicago, Ill.
Eby Co., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Murdock Mfg. Co., William J. Chelsea, Mass.
Myers & Sons, E. A., Radioear Bldg., Mt. Lebanon, Pittsburgh, Pa.
National Scientific Products Co., 5013 N. Kedzie Ave., Chicago 25, Ill.
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Quam-Nichols Co., 526 East 33rd Place, Chicago, Ill.
Radio Speakers, Inc., 221 E. Cullerton St., Chicago, Ill.
Rola Co., Inc., 2350 Superior Ave., Cleveland, Ohio
Shure Bros., 225 W. Huron St., Chicago, Ill.
Speak-O-Phone Recording & Equipment Co., 23 W. 60 St., New York, N. Y.
Telex Products Co., Telex Park, Minneapolis, Minn.
Telephonics Corp., 350 West 31st St., New York, N. Y.
Tibbets Laboratories, Camden, Maine.
Trimm Radio Mfg. Co., 1770 W. Berteau Ave., Chicago, Ill.
Universal Microphone Co., 424 Warren Lane, Inglewood, Calif.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.

Heads, Cutting

see Recorders—Sound

Heating, Electronic

Aero Communications, Inc., 231 Main St., Hempstead, Long Island, N. Y.
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Belmont Radio Corp., 5921 W Dickens Ave., Chicago 39, Ill.
Branston Electric Mfg. Co., 65 Gill Place, Buffalo 13, N. Y.
Budd Induction Heating, I Detroit, Michigan
Bunnell & Co., J. H., 215 Ful St., New York, N. Y.
Burdick Company, Milton, Wisconsin
Cyclonics Mfg. Co., Inc., 3906 Hudson Blvd., Union City, N. J.
DeForest Labs., Lee, 5106 Wilshire Blvd., Los Angeles, Calif.
Duramold Div. of Fairchild Eng. & Airplane Co., 30 Rockefeller Plaza, New York, N. Y.
Ecco High Frequency Electric Corp., 7020 Hudson Blvd., North Bergen, N. J.
Electron Equipment Corp., 917 Meridian Ave., S. Pasadena, Calif.
Federal Electric Co., Inc., 8700 South State St., Chicago 19, Ill.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Fischer Corp., 703 Ivy Street, Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Girdler Corp., Thermex Div., 224 E. Broadway, Louisville, Ky.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill.
Induction Heating Corp., 389 Lafayette St., New York, N. Y.
Johnson Co., E. F., Waseca, Minn.
Kahle Engineering Corp., 1307 Seventh St., North Bergen, N. J.
Kurman Electric Co., 35-18 37th St., Long Island City, N. Y.
Lepel High Frequency Laboratories, 39 West 60th St., New York, N. Y.
Liebel-Florsheim Corp., Cincinnati, Ohio
North American Philips Co., Inc., 100 East 42nd St., New York 17, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio
Radio Corp. of America, Camden, N. J.
Radio Craftsmen, 1341 So. Michigan Ave., Chicago 5, Ill.
Radio Frequency Laboratories, Inc., Boonton, N. J.
Radio Receptor Co., 251 W. 19th St., New York, N. Y.
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
"S" Corrugated Quenched Gap Co., Scientific Electric Div., 111 Monroe St., Garfield, N. J.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Therapeutic Oscillator Company, Des Moines, Iowa
Van Norman Company, Springfield, Mass.
Westinghouse Electric & Mfg. Co., Radio & X-Ray Div., Baltimore, Md.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Weltronic Co., 20735 Grand River Ave., Detroit, Mich.

Holders

CRYSTAL HOLDERS

see Crystals

Horns

SPEAKER PROJECTOR HORNS

Altec Lansing Corp., 1680 Vine St., Los Angeles, Calif.
Atlas Sound Corp., 1443 39th St., Brooklyn, N. Y.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Erwood Co., 223 W. Erie St., Chicago, Ill.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Hawley Products Co., St. Charles, Ill.
Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago, Ill.
Langevin Co., Inc., 37 West 65th Street, New York, N. Y.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
National Scientific Product Co., 5013 N. Kedzie Ave., Chicago 25, Ill.
Olsen Illuminating Co., Ltd., Otto, 1560 Vine St., Hollywood 28, Calif.
Operadio Mfg. Co., St. Charles, Ill.
Oxford Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.
Racon Electric Co., Inc., 52 E. 19th St., New York 3, N. Y.
Radio Corp. of America, Camden, N. J.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
S. O. S. Cinema Supply Co., 449 West 42nd Street, New York 18, N. Y.
Simpson Mfg. Co., Inc., Mark, 188 W. Fourth St., New York, N. Y.
University Laboratories, 225 Varick St., New York, N. Y.
Utah Radio Products Co., 820 Orleans Street, Chicago, Ill.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.

Indicators

CAPACITOR LEAKAGE INDICATORS

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Leeds & Northup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Radio Corp of America, Camden, N. J.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.

POWER LEVEL INDICATORS and RECORDERS

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
Daven Co., 191 Central Ave., Newark 4, N. J.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Marion Instrument Co., Manchester, N. H.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Monarch Mfg. Co., 2014 N. Major Ave., Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Westinghouse Electric & Mfg. Co.. East Pittsburgh, Pa.

VOLUME INDICATORS

see Meters

Inductors

see Coils

Insulation

see also Tubing, Finishes

BEAD INSULATION

American Lava Corp., Kruesi Bldg., Chattanooga, Tenn.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
Corning Glass Works, Corning, N. Y.
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
International Products Corp., Baltimore 18, Md.
Isolantite, Inc., 343 Cortlandt St., Belleville, N. J.
Johnson Co., E. F., Waseca, Minn.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago, 47, Ill.
Ogush, Inc., William B., 33 W. 60th St., New York, N. Y.
Plax Corp., 133 Walnut St., Hartford, Conn.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Saxonburg Potteries, Saxonburg, Pa.
Steward Mfg. Co., D. M., E. 36th St., Chattanooga, Tenn.
Taylor Fibre Co., Norristown, Pa.

CERAMIC INSULATION

Acadia Synthetic Products Div., Western Felt Works, 4035 Ogden Ave., Chicago 23, Ill.
Akron Porcelain Co., Cory Ave., & Belt Line, Akron, Ohio
American Lava Corp., Kruesi Bldg., Chattanooga, Tenn.
Centralab Div. of Globe Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wisc.
Cook Ceramic Mfg. Co., 500 Prospect St., Trenton, N. J.
Crowley Co., Henry L., 1 Central Ave., West Orange, N. J.
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
Fleron & Son, Inc., M. M., 113 N. Broad St., Trenton, N. J.
General Ceramics & Steatite Corp., Keasbey, N. J.
General Electric Co., Schenectady. N. Y.
General Porcelain Co., 951 Pennsylvania Ave., Trenton, N. J.
Hartford Faience Co., 271 Hamilton St., Hartford, Conn.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Works, Inc., Mulberry St. & New York Ave., Trenton, N. J.
International Products Corp., Baltimore 18, Md.
Isolantite, Inc., 343 Cortlandt St., Belleville, N. J.
Johnson Co., E. F., Waseca, Minn.
Knox Porcelain Corp., 200 Mynderse Ave., Knoxville, Tenn.
Lapp Insulator Co., 31 Gilbert St., Le Roy, N. Y.
Lenoxite Div., Lenox, Inc., 65 Prince St., Trenton, N. J.
Locke Insulator Corp.. S. Charles & Cromwell Sts., Baltimore, Md.
Louthan Mfg. Co., 2000 Harvey Ave., East Liverpool, Ohio
McDanel Refractory Porcelain Co., 510 Ninth Avenue, Beaver Falls, Pa.
Metsch Refractories Co., East Liverpool, Ohio
Mica Products Mfg. Co., 69 Wooster St., New York, N. Y.
Mycalex Corp. of America, 60 Clifton Blvd., Clifton, N. J.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.
National Porcelain Co., 400 Southard St., Trenton, N. J.
National Tile Co., Anderson, Ind.
Ohio Brass Co., Mansfield, Ohio
Pacific Clay Products, 306 West Ave., 26, P. O. Box 145, Sta. A., Los Angeles, Calif.
Pemco Corp., Plastics Div., 5601 Eastern Ave., Baltimore, Md.
Porcelain Insulator Corp., 447 E. Main St., Lima, N. Y.
Porcelain Products, Inc., 124 Front St., Findlay, Ohio
Porcelier Mfg. Co., Greensburg, Pa.
Saxonburg Potteries, Saxonburg, Pa.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Star Porcelain Co., 61 Muirhead Ave., Trenton, N. J.
Steward Mfg. Co., D. M., East 36th St., Chattanooga, Tenn.
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
Thomas & Sons Co., R., Lisbon, Ohio
Union Electrical Porcelain Works, Trenton 5, N. J.
Universal Clay Products Co., 1505 E. First St., Sandusky, Ohio
Washington Porcelain Co., Washington, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wisconsin Porcelain Co., Sun Prairie, Wisc.

FABRIC INSULATION

Auburn Mfg. Co., 110 Stack St., Middletown, Conn.
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Baer Co., N. S., 9 Montgomery St., Hillside, N. J.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
Dobeckman Co., 3300 Monroe Ave., Cleveland, Ohio
Electro Technical Products, Inc., Nutley 10, N. J.
Endurette Corp. of America, Cliffwood, N. J.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Greenhut Insulation Co., 31 W. 21 St., New York, N. Y.
Holliston Mills, Inc., Norwood, Mass.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
McInerney Plastics Co., 655 Godfrey Ave., S. W., Grand Rapids 1, Mich.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
National Vulcanized Fibre Co., Maryland Ave., Wilmington, Del.
New Jersey Wood Finishing Co., Electrical Insulation Dept., Woodbridge, N. J.
Standard Insulation Co., 74 Paterson Ave., East Rutherford, N. J.
Taylor Fibre Co., Norristown, Pa.
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.
Varflex Corp., N. Jay St., Rome, N. Y.
Wright & Sons Co., Wm. E., West Warren, Mass.

FIBRE INSULATION

Acme Folding Box Co., Inc., 141 East 25th St., New York, N. Y.
American Felt Co., Glenville, Conn.
Auburn Mfg. Co., 110 Stack St., Middletown, Conn.
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Baer Co., N. S., 9 Montgomery St., Hillside, N. J.
Brandywine Fibre Products Co., 14th & Walnut Sts., Wilmington, Del.
Brown Co., 500 Fifth Ave., New York 18, N. Y.
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Franklin Fibre-Lamitex Corp., 12th & French Sts., Wilmington, Del.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Halowax Products Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Hawley Products, St. Charles, Ill.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Keasbey & Mattison Co., Ambler, Pa.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Lamicoid Fabricators, 3600 W. Potomac Ave., Chicago, Ill.
Lincoln Fibre & Specialty Co., Newport, Del.
McInerney Plastics Co., 655 Godfrey Ave., S W., Grand Rapids 1, Mich.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
National Vulcanized Fibre Co., Maryland Ave., Wilmington, Del.
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.
Precision Fabricators, Inc., 120 N. Fitzhugh St., Rochester, N. Y.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.
Stevens Paper Mills, Inc., Windsor, Conn.
Taylor Fibre Co., Norristown, Pa.
Varflex Corp., N. Jay St., Rome, N. Y.
West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington 99. Del.

GLASS INSULATION

B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Bentley, Harris Mfg. Co., Hector & Lime Sts., Conshohocken, Pa.
Brand & Co., William, 276 Fourth Ave., New York, N. Y.
Corning Glass Works, Corning, N. Y.
Creative Plastics Corp., 963 Kent Ave., Booklyn. N. Y.
Electro Technical Products, Inc., Nutley 10, N. J.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
International Products Corp., 2554 Greenmount Avenue, Baltimore 18, Md.
Kilburn Glass Co., 22 S. Worcester St., Chartley, Mass.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
National Varnish Products Corp., 211 Randolph Ave.. Woodbridge, N. J.
New Jersey Wood Finishing Co., Electrical Insulation Dept., Woodbridge, N. J.
Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo 1, Ohio
Rome Cable Corp., 330 Ridge St., Rome, N. Y.
Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.
Standard Insulation Co., 74 Paterson Ave., E. Rutherford, N. J.

GLASS BONDED MICA INSULATION

Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
General Electric Co., Schenectady. N. Y.
International Products Corp., Baltimore 18, Md.
Mycalex Corp. of America, 60 Clifton Blvd., Clifton, N. J.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.

PAPER INSULATION

Acme Folding Box Co., Inc., 141 East 25th St., New York, N. Y.
Auburn Mfg. Co., 110 Stack St., Middletown, Conn.
Baer Co., N. S., 9 Montgomery St., Hillside, N. J.

ELECTRONIC and ALLIED PRODUCTS

Brown Co., 500 Fifth Ave., New York 18, N. Y.
Central Paper Co., Muskegon 28, Michigan
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Cottrell Paper Co., 88 Purchase St., Fall River, Mass.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
Electro Technical Products, Inc., Nutley 10, N. J.
Endurette Corp. of America, Cliffwood, N. J.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Greenhut Insulation Co., 31 West 21st St., New York, N. Y.
Hartford City Paper Co., Hartford City, Indiana
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Lamicoid Fabricators, 3600 W. Potomac Ave., Chicago, Ill.
Manning Paper Co., John A., Troy, N. Y.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mica Products Mfg. Co., 69 Wooster St., New York, N. Y.
Mitchell-Rand Insulation Co., 51 Murray St., New York, N. Y.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
New Jersey Wood Finishing Co., Electrical Insulation Dept., Woodbridge, N. J.
Precision Fabricators, Inc., 120 N. Fitzhugh St., Rochester, N. Y.
Riegel Paper Corp., 342 Madison Ave., New York 17, N. Y.
Rome Cable Corp., 330 Ridge St., Rome, N. Y.
Schweitzer Paper Co., 142 Miller St., Newark, N. J.
Smith Paper Co., Inc., Lee, Mass.
Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.
Standard Insulation Co., 74 Paterson Ave., East Rutherford, N. J.
Stevens Paper Mills, Inc., Windsor, Conn.
Taylor Fibre Co., Norristown, Pa.
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.
West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington 99, Del.

PLASTIC INSULATION

Acadia Synthetic Products, Div. Western Felt Works, 4035 Ogden Ave., Chicago 23, Ill.
Accurate Molding Corp., 116 Nassau St., Brooklyn 1, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
Aluminum Finishing Corp., 1119 E. 22nd St., Indianapolis, Ind.
American Phenolic Corp., 1830 S. 54th St., Chicago, Ill.
American Products Mfg. Co., 8127 Oleander St., New Orleans, La.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Baer Co., N. S., 9 Montgomery St., Hillside, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bastian Bros. Co., 1600 N. Clinton St., Rochester, N. Y.
Blum & Co., Inc., Julius, 532 W. 22nd St., New York, N. Y.
Brand & Co., 276 Fourth Ave., New York, N. Y.
Burndy Engrg. Co., Inc., 107 Eastern Blvd., New York, N. Y.
Carter Products Co., 6921 Carnegie Ave., Cleveland, Ohio
Catalin Corp., 1 Park Ave., New York, N. Y.
Celanese Celluloid Corp., 180 Madison Avenue, New York 16, N. Y.
Cincinnati Moulding Co., 2037 Florence Ave., Cincinnati 6, Ohio
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J.
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
Davis Plastics Co., Joseph, Arlington, N. J.
Dow Chemical Co., Midland, Mich.
Durez Plastics & Chemicals, Inc., 1922 Walck Rd., North Tonawanda, N. Y.
Electrical Insulation Co., Inc., 12 Vestry St., New York, N. Y.
Extruded Plastics, Inc., Norwalk, Conn.
Farley & Loetscher Mfg. Co., Dubuque, Iowa
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Formica Insulation Co., 4662 Spring Grove Ave., Cincinnati, Ohio
Franklin Fibre-Lamitex Corp., 12th & French St., Wilmington, Del.
Garfield Mfg. Co., Garfield, N. J.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, Long Island, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Plastics Dept., 1 Plastics Ave., Pittsfield, Mass.
Gering Products, Inc., 7th & Monroe Ave., Kenilworth, N. J.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Goodyear Tire & Rubber Co., Plastics & Chemical Div., 1144 E. Market St., Akron, Ohio
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Halowax Products Div., Union Carbide & Carbon Corp., 30 East 42nd St., New York, N. Y.
Hodgman Rubber Co., Framingham, Mass.
Hope Webbing Co., Providence, R. I.
Industrial Synthetics Corp., 60 Woolsey St., Irvington, N. J.
Insulating Tube Co., Inc., 26 Cottage St., P. O. Box 1, Poughkeepsie, N. Y.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
International Products Corp., Baltimore 18, Md.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Johnson Co., E. F., Waseca, Minn.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Kurz-Kasch Co., 1415 S. B'way, Dayton, Ohio
McInerney Plastics Co., 655 Godfrey Ave., S. W., Grand Rapids, Mich.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mica Products Mfg. Co., 69 Wooster St., New York, N. Y.
Mills Corp., Elmer E., 812 W. Van Buren St., Chicago, Ill.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
National Vulcanized Fibre Co., Maryland Ave., Wilmington, Del.
Northwest Plastics, Inc., 2333 University Ave., St. Paul 4, Minn.
Oris Mfg. Co., Thomaston, Conn.
Panelyte Div., St. Regis Paper Co., 230 Park Ave., New York, N. Y.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Philadelphia 34, Pa.
Plax Corp., 133 Walnut St., Hartford, Conn.
Precision Fabricators, Inc., 120 N. Fitzhugh St., Rochester, N. Y.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Respro, Inc., Wellington Ave., Cranston, N. J.
Richardson Co., Lockland, Ohio.
Rogers Paper Mfg. Co., Manchester, Conn.
Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.
Surprenant Electrical Insulation Co., 84 Purchase St., Boston, Mass.
Synthane Corp., Oaks, Pa.
Taylor Fibre Co., Norristown, Pa.
Ucinite Co., 459 Watertown Ave., Newtonville, Mass.
Waterbury Button Co., 835 S. Main St., Waterbury, Conn.
Werner Co., Inc., R. D., 380 Second Ave., New York 10, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilmington Fibre Specialty Co., Wilmington 99, Del.
Worcester Moulded Plastics Co., 8 Grafton St., Worcester 8, Mass.

STEATITE INSULATION

American Lava Corp., Chattanooga, Tenn.
Centralab Div. of the Globe Union, Inc., 900 E. Keefe Ave., Milwaukee, Wisc.
Cook Ceramic Co., 500 Prospect St., Trenton, N. J.
Crowley & Co., Inc., Henry, 1 Central Ave., W. Orange, N. J.
General Ceramics and Steatite Corp., Keasbey, N. J.
General Electric Co., Schenectady, N. Y.
Isolantite, Inc., 343 Cortlandt St., Belleville, N. J.
Johnson Co., E. F., Waseca, Minn.
Lapp Insulator Co., LeRoy, N. Y.
Lenoxite Div., Lenox, Inc., 65 Prince St., Trenton, N. J.
Locke Insulator Corp., Baltimore, Md.
Louthan Mfg. Co., The, 2000 Harvey Avenue, E. Liverpool, Ohio
National Porcelain Co., 400 Southard St., Trenton, N. J.
National Tile Co., Anderson, Indiana
Pacific Clay Products, 306 West Ave., Los Angeles, Calif.
Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y.
Saxonburg Potteries, Saxonburg, Pa.
Star Porcelain Co., The, Trenton, N. J.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
Wisconsin Porcelain Co., Sun Prairies, Wisc.

Insulators

Acme Folding Box Co., Inc., 141 East 25th St., New York, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
American Lava Corp., Kruesi Bldg., Chattanooga, Tenn.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
Arens Controls, Inc., 2253 S. Halsted St., Chicago 8, Ill.
Armstrong Cork Co., Lancaster, Pa.
Burndy Engineering Co., 107 Eastern Blvd., New York, N. Y.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
Electronic Mechanics, Inc., 70 Clifton Ave., Clifton, N. J.
Electronic Supply Co., 207 Main St., Worcester, Mass.
Fleron & Son, Inc., M. M., 113 N. Broad St., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Hanovia Chemical & Mfg. Co., 233 New Jersey & R. R. St., Newark, N. J.
International Products Corp., Baltimore 18, Md.
Isolantite, Inc., 343 Cortlandt St., Belleville, N. J.
Johnson Co., E. F., Waseca, Minn.
Lapp Insulator Co., 31 Gilbert St., LeRoy, N. Y.
Locke Insulator Corp., S. Charles & Cromwell Sts., Baltimore, Md.
McDanel Refractory Porcelain Co., 510-9th Ave., Beaver Falls, Pa.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.
National Co., 61 Sherman St., Malden, Mass.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Philadelphia Mica Corp., 3515 N. 10 St., Philadelphia 40, Pa.
Porcelain Products, Inc., 124 W. Front St., Findlay, Ohio
Premax Products Div., Chisholm Ryder Co., College & Highland Aves., Niagara Falls, N. Y.
Saxonburg Potteries, Saxonburg, Pa.
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
Taylor Fibre Co., Norristown, Pa.
Thomas & Sons Co., R., Lisbon, Ohio
Victor Insulators, Inc., Victor, N. Y.
Waterbury Button Co., 835 S. Main St., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MAST FOOTING and TOWER INSULATORS

Lapp Insulator Co., 31 Gilbert St., Le Roy, N. Y.
Locke Insulator Corp., S. Charles & Cromwell Sts., Baltimore, Md.

Insulators, Vibration

see Mountings

Intercommunicators

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Ansley Radio Corp., 21-10 49th Ave., Long Island City, N. Y.
Autocrat Radio Co., 3855 N. Hamilton Ave., Chicago, Ill.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Banks Mfg. Co., 1105 W. Lawrence Ave., Chicago, Ill.
Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago 39, Ill.
Bogen Co., David, 663 Broadway, New York 12, N. Y.
Bond Products Co., 13139 Hamilton Ave., Detroit, Mich.
California Telephone & Elec. Co., 6075 W. Pico Blvd., Los Angeles 13, Calif.
Cannon Electric Development Co., 3209 Humboldt, Los Angeles 31, Calif.
Dalmo Victor, Inc., 620 York St., San Francisco, Calif.
De Wald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Executone, Inc., 415 Lexington Ave., New York, N. Y.
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
Godfrey Mfg. Corp., 171 S. 2nd St., Milwaukee, Wisc.
Halstead Traffic Communications Corp., 155 E. 44th St., New York, N. Y.
Industrial Sound Products Co., 3597 Mission St., San Francisco, Calif.
Karadio Corp., 2233 University Ave., St. Paul, Minn.
Kegron Mfg. Co., Inc., 570 Lexington Ave., New York, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Lake Mfg. Co., 2323 Chestnut St., Oakland, Calif.
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Meck Industries, John, Plymouth, Ind.
Megard Corp., 1601 S. Burlington, Los Angeles, Calif.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
National Intercommunicating Systems, 2434 Montrose Ave., Chicago 18, Ill.
Newcomb Audio Products Co., 2815 S. Hills St., Los Angeles 18, Calif.
Operadio Mfg. Co., St. Charles, Ill.
Oxford Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.
Pacific Div. Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif.
Philco Corp., Philadelphia, Pa.
Powers Electronic & Communication Co., Glencove, L. I., N. Y.
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.
Radio Corporation of America, Camden, N. J.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Regal Amplifier Mfg. Corp., 20 West 20th St., New York, N. Y.
Remler Co., Ltd., 2101 Bryant St., San Francisco, Calif.
Schulmerich Electronics, Inc., Sellersville, Pa.
Select-O-Phone Co., 1012 Eddy St., Providence, R. I.
Setchell Carlson, Inc., 2233 University Ave., St. Paul 4, Minn.
Simpson Mfg. Co., Inc., Mark, 188 West Fourth St., New York, N. Y.
Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago, Ill.
Telautograph Corp., 16 West 61st St., New York 23, N. Y.
Telemotor Corp., 260 Fifth Ave., New York, N. Y.
Templetone Radio Co., Mystic, Conn.
Trav-Ler Karenola Radio & Television Corp., 1028 W. Van Buren St., Chicago, Ill.
Trebor Radio Co., Pasadena, Calif.
Victory Radio Corp., 155 West 72nd St., New York, N. Y.
Warwick Mfg. Corp., 4640 W. Harrison St., Chicago, Ill.
Watterson Radio Mfg. Co., P. O. Box 54, Dallas 1, Texas.
Webster Electric Co., 1900 Clark St., Racine, Wisc.
Western Sound & Electric Laboratories, Inc., 3512 W. St. Paul Ave., Milwaukee, Wisc.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

Inverters

Air-Way Electric Appliance Corp., 2101 Auburn Ave., Toledo, Ohio
Allis-Chalmers Mfg. Co., Milwaukee, Wisc.
American Television & Radio Co., 300 E. Fourth St., St. Paul, Minn.
Apex Electric Mfg. Co., 1070 E. 152nd St., Cleveland, Ohio
Benwood Linze Co., 1815 Locust St., St. Louis, Mo.
Carter Motor Co., 1608 Milwaukee Ave., Chicago, Ill.
Chereton Products Co., 4801 Woodward Ave., Detroit 1, Mich.
DeWald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.
Diehl Mfg. Co., Somerville, N. J.
Eclipse Aviation, Div. of Bendix Aviation, Bendix, N. J.
Electric Specialty Co., 211 South St., Stamford, Conn.
Electrical Engineering & Mfg. Co., Los Angeles, Calif.
Electron Equipment Corp., 917 Meridian Ave., S. Pasadena, Calif.
Electronic Laboratories, Inc., Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
Gibbs & Co., Thomas B., Div. of George W. Borg Corp., 814 Michigan St., Delavan, Wisc.
Holtzer-Cabot, Signal Division, 400 Stuart St., Boston 17, Mass.
International Transformer Co., 396 Broadway, New York, N. Y.
Janette Mfg. Co., 556 W. Monroe St., Chicago, Ill.
Leland Electric Co., 1501 Webster St., Dayton, Ohio
Master Electric Co., 100 Davis Avenue, Dayton, Ohio
Oak Mfg. Co., 1260 Clybourn Ave., Chicago 10, Ill.
Pioneer Gen-E-Motor Co., 5841 Dickens Avenue, Chicago, Ill.
Russell Electric Co., Chicago, Ill.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Union Switch & Signal Co., Swissvale, Pa.
Webster Products, 3825 Armitage Ave., Chicago 47, Ill.
Westinghouse Elec. & Mfg. Co., Lima, Ohio
Wincharger Corp., 7th & Division, Sioux City, Iowa

Irons

ELECTRIC SOLDERING IRONS

Acme Electric Heating Co., 1217 Washington St., Boston, Mass.
American Electrical Heater Co., 6110 Cass Ave., Detroit, Mich.
Brach Mfg. Corp., L. S., 55 Dickerson St., Newark, N. J.
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Cole Radio Works, 86 Westville Ave., Caldwell, N. J.
Drake Electric Works, 3656 Lincoln Ave., Chicago, Ill.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Electric Soldering Iron Co., Deep River, Conn.
General Electric Co., Schenectady, N. Y.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Hexacon Electric Company, 161 W. Clay Ave., Roselle Park, N. J.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Jackson Electro Corp., 124 Bleeker St., New York, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kelnor Mfg. Co., Central Tower Bldg., San Francisco, Calif.
Landers, Frary & Clark, 47 Center St., New Britain, Conn.
Lenk Mfg. Co., Newton Lower Falls, Mass.
Philmore Mfg. Co., 113 University Pl., New York. N. Y.
Sound Equipment Corp. of California, 6245 Lexington Ave., Hollywood, Calif.
Sta-Warm Electric Co., 565 N. Chestnut St., Ravenna, Ohio
Stanley Works, New Britain, Conn.
Trent Co., Harold E., 55th St. & Wyalusing Ave., Philadelphia 27, Pa.
Ungar, Inc., Harry A., 615 Ducommun St., Los Angeles, Calif.
Vasco Electrical Mfg. Co., 4116 Avalon Blvd., Los Angeles, Calif.
Vulcan Electric Co., 600 Broad St., Lynn, Mass.
Wellmade Electric Mfg. Co., Railroad Sq. & Church St., Torrington, Conn.

Jacks

see also Plugs

A.B.C. Products, Inc., 11952 Montana Ave., W. Los Angeles, Calif.
Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Alden Products Co., 117 Main St., Brockton, Mass.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
American Radio Hardware Co., Inc., 152 MacQuesten pkway. S. Mt. Vernon, N. Y.
Audio Development Co., 2833 13th Ave., S., Minneapolis, Minn.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Automatic Metal Products Co., 315 Berry St., Brooklyn, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ill.
Connecticut Telephone & Elec. Div. of Great American Industries, Inc., 70 Brittania St., Meriden, Conn.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Electronic Products Mfg. Corp., 7300 Huron River Drive, Dexter, Mich.
Federal Mfg. & Engrg. Corp., 199 Steuben St., Brooklyn, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Insuline Corp. of America, 36–02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Mossman, Inc., Donald P., 6133 Northwest Highway, Chicago 31, Ill.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Standard Electric Time Co., 89 Logan St., Springfield, Mass.
Telephonics Corp., 350 West 31st St., New York, N. Y.
Trav-ler Karenola Radio & Television Corp., 1028 W. Van Buren St., Chicago, Ill.
Ucinite Co., 459 Watertown Ave., Newtonville, Mass.
Universal Microphone Co., 424 Warren Lane, Inglewood 31, Calif.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.

ELECTRONIC and ALLIED PRODUCTS

Keys and Coding Equipment

Alden Products Co., 117 Main St., Brockton, Mass.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Bud Radio, Inc., 2118 E. 55 St., Cleveland, Ohio
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Electro-Medical Laboratory, Inc., Holliston, Mass.
Federal Manufacturing & Engineering Corp., 199-217 Steuben St., Brooklyn, N. Y.
Fleron & Son, Inc., M. M., 113 N. Broad St., Trenton, N. J.
Foote Pierson & Co., Inc., 75 Hudson St., Newark 4, N. J.
General Communication Co., 681 Beacon St., Boston 3, Mass.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Gray Manufacturing Co., 16-30 Arbor St., Hartford, Conn.
Haydon Mfg. Co., Forestville, Conn.
McElroy Manufacturing Corp., 82 Brookline Ave., Boston, Mass.
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.
Simpson Mfg. Co., Inc., Mark, 188 W. Fourth St., New York, N. Y.
Telegraph Apparatus Co., 325 W. Huron St., Chicago, Ill.
Telephonics Corp., 350 West 31st St., New York 1, N. Y.
Teleplex Co., 107 Hudson St., Jersey City, N. J.
Vibroplex Co., Inc., 833 Broadway, New York, N. Y.
Wallace & Tiernan Products, Inc., Belleville, N. J.
Winslow Co., Inc., 9 Liberty St., Newark, N. J.

Knobs

see Dials
also Pointers

Alden Products Co., 117 Main St., Brockton, Mass.
American Insulator Corp., New Freedom, Pa.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Creative Plastics Corp., 975 Kent Ave., Brooklyn, N. Y.
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Daven Co., 191 Central Ave., Newark 4, N. J.
Davies Molding Co., Harry, 1428 N. Wells St., Chicago 10, Ill.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphiaa 13, Pa.
Eclipse Moulded Products Co., 5151 North 32nd St., Milwaukee 9, Wisc.
Emeloid Co., 291 Laurel Ave., Arlington, N. J.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Erie Resistor Corp., 640 W. 12 St., Erie, Pa.
Garfield Mfg. Co., Garfield, N. J.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Imperial Molded Products Corp., 2925 W. Harrison St., Chicago, Ill.
Insulation Mfg. Co., 11 New York Ave., Brooklyn, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Kurz Kasch, Inc., 1415 S. Bway, Dayton, Ohio
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.
National Co., 61 Sherman St., Malden, Mass.
New England Radiocrafters, 1156 Commonwealth Ave., Brookline, Mass.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Radio City Products Co., 127 West 26th St., New York, N. Y.
Richardson Co., Lockland, Ohio
Rogan Brothers, 2001 S. Michigan Ave., Chicago, Ill.
Syracuse Ornamental Co., 581 So. Clinton St., Syracuse, N. Y.
Victory Mfg. Co., 1722 W. Arcade Place, Chicago 12, Ill.
Worcester Moulded Plastics Co., 8 Grafton St., Worcester, Mass.

Lacquer

see Finishes

Lights

DIAL LIGHTS

Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Carlton Lamp Corp., 730 South 13th St., Newark, N. J.
Cinch Mfg. Corp., 2335 W. Van Buren St., Chicago, Ill.
Dial Light Co. of America, 900 Broadway, New York 3, N. Y.
Drake Mfg. Co., 1713 Hubbard St., Chicago, Ill.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kopp Glass, Inc., 1 E. 42nd St., New York 17, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis. Ind.
National Union Radio Corp., 15 Washington St., Newark 2, N. Y.
Signal Indicator Corp., 894 Broadway, New York 3, N. Y.
Tung-Sol Lamp Works, Inc., 95 Eighth Ave., Newark, N. J.
Westinghouse Lamp Div., Westinghouse Elec. & Mfg. Co., Bloomfield, N. J.

PILOT LIGHTS

Alden Products Co., 117 Main St., Brockton, Mass.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Bryant Electric Co., 1421 State St., Bridgeport, Conn.
Bardwell & McAllister, 7636 Santa Monica Blvd., Hollywood, Calif.
Carlton Lamp Corp., 730 South 13th St., Newark, N. J.
Conn, Ltd., C. G., Elkhart, Ind.
Dial Light Co. of America, Inc., 900 Broadway, New York 3, N. Y.
Drake Mfg. Co., 1713 W. Hubbard St., Chicago, Ill.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Gothard Mfg. Co., 1300 North 9th St., Springfield, Ill.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford 2, Conn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kirkland Co., H. R., 8-10 King St., Morristown, N. J.
Kopp Glass, Inc., 1 E. 42nd St., New York 17. N. Y.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind.
National Union Radio Corp., 15 Washington St., Newark 2, N. Y.
Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y.
Signal Indicator Corp., 894 Broadway, New York, N. Y.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Westinghouse Lamp Div., Westinghouse Elec. & Mfg. Co., Bloomfield, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.

Lines

COAXIAL LINES

see Cable

Locknuts

see Nuts

Lockwashers

see Washers

Loudspeakers

Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Cal.
Atlas Sound Corp., 1443 39th St., Brooklyn, N. Y.
Austin Electronic Mfg. Co., Warren, Pa.
Best Mfg. Co., 1200 Grove St., Irvington, N. J.
Boom Electric Amplifier Corp., 1227 W. Washington Blvd., Chicago, Ill.
California Telephone & Elec. Co., 6075 W. Pico Blvd., Los Angeles 35, Calif.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Cinaudagraph Speakers, Inc., 3911 S. Michigan Ave., Chicago, Ill.
Dilks, Inc., Norwalk, Conn.
Flock Process Corp., 53 W. 21st St., New York 10, N. Y.
Gates Radio Co., 220 Hampshire St., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
Guided Radio Corp., 100 Sixth Ave., New York, N. Y.
Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago, Ill.
Langevin Co., Inc., 37 W. 65th St., New York. N. Y.
Leotone Radio Co., 63 Dey St., New York 7, N. Y.
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
National Co., 61 Sherman St., Malden, Mass.
National Scientific Products Co., 5013 N. Kedzie Ave., Chicago 25, Ill.
Olesen Illuminating Co., Ltd., Otto, 1560 Vine St., Hollywood 28, Calif.
Operadio Mfg. Co., 13th & Indiana Sts., St. Charles, Ill.
Oxford Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Powers Electronic & Communication Co., Inc., Glen Cove, N. Y.
Quam-Nichols Co., 526 East 33rd Place, Chicago, Ill.
Racon Electric Co., Inc., 52 E. 19th St., New York 3, N. Y.
Radio Speakers, Inc., 221 E. Cullerton St., Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Rola Co., Inc., 2530 Superior Ave., Cleveland, Ohio
Schulmerich Electronics Co., Sellersville, Pa.
Simpson Mfg. Co., Mark, 188 West Fourth St., New York, N. Y.
University Laboratories, 225 Varick St., New York, N. Y.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.

Lugs & Terminals

Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Aircraft-Marine Products, Inc., 1523 N. 4th St., Harrisburg, Pa.
American Brass Co., Waterbury, Conn.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 55, Ill.
Burndy Engineering Co., 107 Eastern Blvd., New York 54, N. Y.
Cinch Mfg. Corp., 2335 W. Van Buren St., Chicago, Ill.

Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Dante Electric Mfg. Co., Bantam, Conn.
Dossert & Co., 242 W. 41st St., New York, N. Y.
Eastern Specialty Co., 3617–19 N. Eighth St., Philadelphia, Pa.
Electric Auto-Lite Co., Wire Div., Port Huron, Mich.
Federal Screw Products Co., 224 W. Huron St., Chicago 17, Ill.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Grammes & Sons, Inc., L. F., 344 Union St., Allentown 2, Pa.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Heyman Mfg. Co., Kenilworth, N. J.
Ideal Clamp Mfg. Co., 202 Bradford St., Brooklyn, N. Y.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Industrial Screw & Supply Co., 713 W. Lake St., Chicago 25, Ill.
Insuline Corp. of America, 36–02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Jones, Howard B., 2300 Wabansia Ave., Chicago, Ill.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago, Ill.
Krueger & Hudepohl, 232–8 Vine St., Cincinnati 5, Ohio
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.
Morse Co., Frank W., 301 Congress St., Boston, Mass.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
Penn-Union Electric Corp., 315 State St., Erie, Pa.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Radex Corp., 1322 Elston Ave., Chicago 22, Ill.
Rajah Co., Locust Ave., Bloomfield, N. J.
Shakeproof, Inc., 2501 N. Keeler Ave., Chicago 39, Ill.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Smith Mfg. Co., Nathan R., 105 Pasadena Ave., S. Pasadena, Calif.
Stewart Stamping Corp., 621 East 216th St., New York, N. Y.
Stimpson Co., Edwin B., 74 Franklin Ave., Brooklyn, N. Y.
Thomas & Betts Co., 36 Butler St., Elizabeth, N. J.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Waterbury Button Co., 835 S. Main St., Waterbury, Conn.
Zierick Mfg. Co., 385 Gerard Ave., New York, N. Y.

Machines

COIL WINDING MACHINES

Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Armature Coil Equipment, Inc., 2605 Vega Ave., Cleveland 3, Ohio
*Chapman Electrical Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Electric Service Manufacturing Co., 17th & Cambria Sts., Philadelphia, Pa.
Essex Electronics, 1060 Broad St., Newark 2, N. J.
Federal Instrument Co., 3931-47th Ave., Long Island City 4, N. Y.
Good All Electric, 320 N. Spruce St., Ogalala, Neb.
Guthman & Co., Edwin I., 15 S. Throop St., Chicago, Ill.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Kahle Engrg. Co., 1307 Seventh St., North Bergen, N. J.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Meissner Mfg. Co., Mt. Carmel, Ill.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Potter & Rayfield, Inc., Hemphill Ave., Atlanta, Ga.
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Standard Coil Products Co., 2329 N. Pulaski Road, Chicago 18, Ill.
Stevens Machinery Co., 1461 W. Grand Ave., Chicago, Ill.
Universal Winding Co., 1655 Elmwood Ave., Cranston 3, R. I.

MARKING MACHINES

see Plastics & Metal Marking

TUBE MANUFACTURING MACHINES

Eisler Engineering Co., 740 S. 13th St., Newark 3, N. J.
Electronic Manufacturing Co., 20 Orange St., Newark 2, N. J.
Engineering Co., 27 Wright St., Newark, N. J.
Kahle Engineering Corp., 1307 Seventh St., North Bergen, N. J.
Radio Corp. of America, Camden, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.

Magnesium

see Metals

Magnets

PERMANENT MAGNETS

Advance Transformer Co., 14 N. May St., Chicago, Ill.
Arnold Engrg. Co., 147 E. Ontario St., Chicago, Ill.
Cinaudagraph Corp., 2 Selleck St., Stamford, Conn.
Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.
General Electric Co., Schenectady, N. Y.
Indiana Steel Products Co., 6 N. Michigan Ave., Chicago, Ill.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Simonds Saw & Steel Co., Lockport, N. Y.
Taylor-Wharton Iron & Steel Co., Highbridge, N. J.
Thomas & Skinner Steel Products Co., 1120 E. 23d St., Indianapolis, Ind.
Tri-United Plastics Corp., 20-30 Grand Ave., Brooklyn 5, N. Y.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.

Metal Marking Machines

see Plastics & Metal Marking

Metal Plating on Plastics

see Plating-Metal

Metals

ALUMINUM

Aluminum Co. of America, Gulf Bldg., Pittsburgh, Pa.
Aluminum Finishing Corp., 1119 E. 22nd St., Indianapolis, Ind.
Belmont Smelting & Refining Co., 330 Belmont Ave., Brooklyn 7, N. Y.
Fairmont Aluminum Co., Fairmont, West Va.
Reynolds Metal Co., Federal Reserve Bldg., Richmond, Va.
Uniform Tubes, Shurs Lane & Lauriston St., Roxborough, Philadelphia, Pa.

MAGNESIUM

American Magnesium Corp., 2210 Harvard Ave., Cleveland, Ohio
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.
Bohn Aluminum & Brass Corp., Lafayette Bldg., Detroit, Mich.
Dow Chemical Co., Midland, Mich.
General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.

NICKEL

Ingersoll Steel & Disc Co., New Castle, Ind.
International Nickel Co., 67 Wall St., New York, N. Y.
Lukens Steel Co., Coatesville, Pa.
Riverside Metal Co., Riverside, N. J.
Superior Metal Corp., Clearing, Ill.

POWDERED METAL PRODUCTS

Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
American Electro Metal Corp., 320 Yonkers Ave., Yonkers, N. Y.
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.
Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Chrysler Corp., Amplex Div., Detroit, Mich.
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio
Crowley & Co., Inc., Henry L., West Orange, N. J.
Ferrocart Corp. of America, Hastings-on-Hudson, N. Y.
Foote Mineral Co., 1609 Summer St., Philadelphia, Pa.
General Aniline Works, Div. of General Aniline & Film Corp., 435 Hudson St., New York, N. Y.
Handy & Harman, 82 Fulton St., New York, N. Y.
Johnson Bronze Co., Newcastle, Pa.
Keystone Carbon Co., Inc., 1935 State St., St. Mary's, Pa.
Magna Mfg. Co., 444 Madison Ave., New York, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Mepham Corp., G. S., 2001 Lynch Ave., East St. Louis, Ill.
Moraine Products Div., General Motors Corp., Dayton, Ohio
National Lead Co., 111 Broadway, New York, N. Y.
North American Philips Co., 100 East 42nd St., New York, N. Y.
Powder Metallurgy Corp., 30-48 Greenpoint Ave., Long Island City, N. Y.
Stackpole Carbon Co., St. Mary's, Pa.
United States Graphite Co., Saginaw, Michigan

SPECIAL METALS

Alrose Chemical Co., Cranston, R. I.
American Platinum Works, New Jersey, R. R. Ave., at Oliver St., Newark, N.J.
Baker & Co., 113 Astor St., Newark 9, N.J.
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.
Bishop & Co., Platinum Works, J., 12 Channing Ave., Malvern, Pa.
Brainin Co., C. S., 233 Spring St., New York, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio.
Callite Tungsten Corp., 544 39th St., Union City, N. J.
Chase Brass & Copper Co., Waterbury 91, Conn.
Chace Co., W. M., 1600 Beard Ave., Detroit, Mich.
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio
Cohn & Co., Sigmund, 44 Gold St., New York, N. Y.
Cross, H., 15 Beekman St., New York, N. Y.
Driver Co., William B., Newark, N. J.
Driver Harris Co., Harrison, N. J.
Fansteel Metallurgical Corp., 2200 Sheridan Rd., No. Chicago, Ill.
Foote Mineral Co., 1609 Superior St., Philadelphia, Pa.
General Plate Div. Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
Goldsmith Bros. Smelting & Refining Co., 58 E. Washington St., Chicago, Ill.
Handy & Harman, 82 Fulton St., New York, N. Y.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
Haynes Stellite Co., Kokomo, Ind.
International Nickel Co., 67 Wall St., New York 5, N. Y.
Jelliff Mfg. Corp., C. O., 200 Pequot Ave., Southport, Conn.
King Laboratories, Inc., 205 Oneida St., Syracuse 4, N. Y.
Makepeace Co., D. E., Attleboro, Mass.

Ney Co., J. M., Hartford, Conn.
North American Philips Co., Inc., 100 East 42nd St., New York 17, N. Y.
Philadelphia Rust-Proof Co., 3229 Frankford Ave., Philadelphia 34, Pa. (electroplating & treating)
Rapid Electroplating Process, Inc., 1414 S. Wabash Ave., Chicago, Ill. (electroplating & treating)
Scovill Mfg. Co., 99 Mill St., Waterbury 91, Conn.
Simonds Saw & Steel Co., Lockport, N. Y.
Sirian Wire & Contact Co., 260 Sherman St., Newark, N. J.
Swedish Iron & Steel Corp., 17 Battery Place, New York, N. Y.
Western Cartridge Co., East Alton, Ill.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.
Wilson Co., H. A., 105 Chestnut St., Newark, N. J.

STEEL ELECTRICAL

Allegheny-Ludlum Steel Corp., Oliver Bldg., Brackenridge, Pa.
American Rolling Mill Co., Curtis St., Middletown, Ohio
American Steel & Wire Co., Rockefeller Building, Cleveland, Ohio
Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh, Pa.
Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.
Empire Steel Corporation, N. Bowman St., Mansfield, Ohio
Follansbee Steel Corp., Third & Liberty Sts., Pittsburgh, Pa.
Granite City Steel Co., Granite City, Ill.
Newport Rolling Mill Co., Ninth & Lowell Sts., Newport, Ky.
Republic Steel Corp., Republic Bldg., Cleveland, Ohio
Thomas Steel Co., Delaware Ave., Warren, Ohio
Union Drawn Steel Div., Republic Steel Corp., Harsh Ave., S. E. Massillon, Ohio
Wheeling Steel Corp., Wheeling Steel Corp. Bldg., Wheeling, W. Va.
Youngstown Steet & Tube Co., Stambaugh Bldg., Youngstown, Ohio

THERMOSTATIC METALS

Baker & Co., 113 Astor St., Newark 9, N. J.
Brainin Co., C. S., 233 Spring St., New York, N. Y.
Callite Tungsten Corp., 544 39th St., Union City, N. J.
Chace Co., W. M., 1600 Beard Ave., Detroit, Mich.
General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
Mallory Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Wilson Co., H. A., 105 Chestnut St., Newark, N. J.

Meters

AMMETERS

Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
Bristol Co., Waterbury 91, Conn.
Burlington Instrument Co., 316 Valley St., Burlington, Iowa
Carson Micrometer Corp., P. O. Box 57, Little Falls, N. J.
Columbia Electric Mfg. Co., 4519 Hamilton Ave. N. E., Cleveland, Ohio
De Jur-Amsco Corp., 6 Bridge St., Shelton, Conn.
Electric Auto-Lite Corp., Toledo 1, Ohio
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Electronic Development Co., 2055 Harney St., Omaha 2, Nebr.
Esterline-Angus Co., P. O. Box 597, Indianapolis, Ind.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
G-M Laboratories Inc., 4313 N. Knox Ave., Chicago 32, Ill.
General Electric Co., Schenectady, N. Y.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hickock Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Hoyt Electrical Instrument Works, Boston, Mass.
J. B. T. Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Marion Electrical Instrument Co., Manchester, N. H.
Meck Industries, John, Plymouth, Ind.
Meters, Inc., 915 Riveria Drive, Indianapolis, Ind.
Norton Electrical Instrument Corp., 79 Hilliard St. Manchester, Conn.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.
Radio Corp. of America, Camden, N. J.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Readrite Meter Works, College Ave., Bluffton, Ohio
Reliance Instrument Co., 715 N. Kedzie Ave., Chicago, Ill.
Rhamstine, J. Thos., 301 Beaubien St., Detroit 26, Mich.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Simpson Electric Co., 5200-16 W. Kinzie St., Chicago 24, Ill.
Sun Mfg. Co., 6323 Avondale Ave., Chicago, Ill.
Superior Instruments Co., 227 Fulton St., New York, N. Y.
Supreme Instruments Corp., Greenwood, Miss.
Thwing-Albert Instrument Co., Penn St., & Pulaski Ave., Philadelphia 4, Pa.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Western Electro-Mechanical Co., Inc., 300 Broadway, Oakland, Calif.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Freylinghuysen Ave., Newark 5, N. J.

FIELD INTENSITY METERS

Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Fada Radio & Electric Co., Inc., 30-20 Thomson Ave., Long Island City, N.Y.
Freed Radio Corp., 200 Hudson St., New York, N. Y.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
Marion Instrument Co., Manchester, N. H.
Measurements Corp., Boonton, N. J.
Radio Corp. of America, Camden, New Jersey

FREQUENCY METERS

Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bendix Radio, Div. of Bendix Aviation Corp., Baltimore, Md.
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Browning Laboratories, Inc., 750 Main St., Winchester, Mass.
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Burnett Radio Lab., Wm. W. L., 4814 Idaho St., San Diego, Calif.
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Conn Ltd., C. G., Elkhart, Ind.
Doolittle Radio, Inc., 7421 Loomis Blvd., Chicago, Ill.
Erco Radio Laboratories, Inc., Fenimore Ave., Hempstead, N. Y.
Espey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
Fada Radio & Electric Co., Inc., 30-20 Thomson Ave., Long Island City, N.Y.
Ferris Instrument Co., Boonton, N. J.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Gurley, W. & L. E., 514 Fulton St., Troy, N. Y.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Herbach & Rademan Co., 522 Market St., Philadelphia, Pa.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Higgins Industries, Inc., 2221 Warwick Ave., Santa Monica, Calif.
Hoffman Radio Corp., 3430 S. Hill St., Los Angeles 7, Calif.
J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, Long Island, N. Y.
Lampkin Laboratories, Bradenton, Fla.
Lavoie Laboratories, Mattawan-Freehold Rd., Morganville, N. J.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Link, Fred M., 125 West 17 St., New York, N. Y.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
North American Philips Co., Inc., 100 East 42nd St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Transceiver Labs., Inc., 8627 115th St., Richmond Hill, N. Y.
Rex Rheostat Co., 3 Foxhurst Rd., Baldwin, N. Y.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Roller-Smith Co., Bethlehem, Pa.
Shuttig & Co., 9th & Kearney St., N.E., Washington 24, D. C.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, New York
Transmitter Equipment Co., 345 Hudson St., New York, N. Y.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

GALVANOMETERS

Boes Co., W. W., 3001 Salem Ave., Dayton, Ohio
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Consolidated Engineering Corp., 1255 E. Green St., Pasadena, Calif.
DeJur Amsco Corp., 6 Bridge St., Shelton, Conn.
Engelhard, Inc., Charles, 233 New Jersey R. R. Ave., Newark 5, N. J.
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago 32, Ill.
General Electric Co., Schenectady, N. Y.
Geophysical Instrument Co., Key Blvd. & Nash St., Arlington, Va.
Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Heiland Research Corp., 130 East Fifth St., Denver 9, Colo.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Marion Instrument Co., Manchester, N. H.
Metron Instrument Co., 432 Lincoln St., Denver, Colo.
Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Pfaltz & Bauer, Inc., 350 Fifth Ave., New York, N. Y.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Roller-Smith Co., Bethlehem, Pa.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Sanborn Co., 39 Osborne St., Cambridge Mass.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Simpson Electric Co., 5218 W. Kinzie St., Chicago 24, Ill.
Tagliabue Mfg. Co., C. J., 540 Park Ave., Brooklyn 5, N. Y.
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 4, Pa.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Winslow Co., 9 Liberty St., Newark, N. J.

LIGHT METERS

DeJur-Amsco Corp., 6 Bridge St., Shelton, Conn.
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Pfaltz & Bauer, Inc., 350 Fifth Ave., New York, N. Y.
Photovolt Corp., 95 Madison Ave., New York, N. Y.
Pho-Tron Instrument Co., 5713 Euclid Ave., Cleveland, Ohio
Rhamstine, J. Thos., 301 Beaubien St., Detroit 26, Mich.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

MODULATION METERS

Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Radio Corp. of America, Camden, N. J.
Sundt Engineering Co., 4757 Ravenswood Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

OHMMETERS

Associated Research, Inc., 231 South Green St., Chicago 7, Ill.
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
De Jur Amsco Corp., 6 Bridge St., Shelton, Conn.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 3, Ohio
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gray Instrument Co., 64½ W. Johnson St., Germantown, Philadelphia, Pa.
Grenby Mfg. Co., Plainville, Conn.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hearing Aid Labs., 1404 Franklin St., Michigan City, Ind.
Heyers Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Holtzer-Cabot Signal Division, 400 Stuart St., Boston 17, Mass.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Marion Instrument Co., Manchester, N. H.
Norton Electric Instrument Co., 79 Hilliard St., Manchester, Conn.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, N. Y.
Radio City Products Co., 127 W. 26th St., New York, N. Y.
Radio Corp. of America, Camden, New Jersey
Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Reiner Electronics Co., 152 W. 25th St., New York, N. Y.
Roller-Smith Co., Bethlehem, Pa.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Simpson Electric Co., 5218 W. Kinzie St., Chicago, Ill.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
Sticht Co., Inc., Herman H., 27 Park Place, New York 7, N. Y.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago, Ill.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Winslow Co., 9 Liberty St., Newark, N. J.

PH METERS AND RECORDERS

All American Tool & Mfg. Co., 1014 W. Fullerton Ave., Chicago 14, Ill.
Bristol Company, Waterbury, Conn.
Cambridge Instrument Co., Inc., Grand Central Terminal, New York, N. Y.
Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Coleman Electric Co., Inc., 310 Madison St., Maywood, Ill.
Colloid Equipment Co., Inc., 50 Church St., New York, N. Y.
Commercial Research Labs., Inc., 20 Bartlett Ave., Detroit 3, Mich.
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.
Gamma Instrument Co., Inc., 95 Madison Ave., New York, N. Y.
General Electric Co., 1 River Rd., Schenectady, N. Y.
Hellige, Inc., 3718 Northern Blvd., Long Island City, N. Y.
LaMotte Chemical Products Co., McCormick Bldg., Baltimore, Md.
Leeds & Northup Co., 4970 Stenton Ave., Philadelphia, Pa.
Leitz, Inc., E., 730 Fifth Ave., New York, N. Y.
Machlett & Son, E., 220 East 23rd St., New York, N. Y.
National Technical Labs., 820 Mission St., Pasadena, Calif.
Pfaltz & Bauer, Inc., 350 Fifth Ave., New York, N. Y.
Rascher & Betzold, 829-835 Orleans St., Chicago, Ill.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Sargent & Co., E. H., 155 E. Superior St., Chicago, Ill.
Tagliabue Mfg. Co., C. J., 540 Park Ave., Brooklyn, N. Y.
Taylor & Co., W. A., 7300 York Road, Baltimore, Md.
Technical Products Co., P. O. Box 93, Memphis, Tenn.
Thwing-Albert Instrument Co., Penn St. at Pulaski Ave., Philadelphia, Pa.
Wallace & Tiernan Products Co., Inc., Belleville, N. J.
Welch Manufacturing Co., W. M., 1515 Sedgwick St., Chicago, Ill.
Wilkens-Anderson Co., 111 N. Canal St., Chicago, Ill.

PHASE ANGLE METERS

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Andrew Co., 363 East 75th St., Chicago 19, Ill.
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 Du Pont Ave., Cleveland, Ohio
Johnson Co., E. F., Waseca, Minn.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Radio Corp. of America, Camden, N. J.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Sorensen & Co., 1 Grove St., Stamford Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

POWER LEVEL METERS

see Indicators

"Q" METERS

Boonton Radio Corp., Boonton, N. J.
Grenby Mfg. Co., Plainville, Conn.

THERMOCOUPLE METERS

Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Co., 9-11 Elm Ave., Mt. Vernon, N. Y.
Simpson Electric Co., 5218 W. Kinzie St., Chicago 24, Ill.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheelco Instrument Co., 847 W. Harrison St., Chicago, Ill.

TIME METERS

American Time Products, Inc., 580 Fifth Ave., New York 19, N. Y.
Cramer Co., R. W., Centerbrook, Conn.
Electric Tachometer Corp., Broad & Spring Garden Sts., Philadelphia, Pa.
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
Haydon Mfg. Co., Forestville, Conn.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Industrial Timer Corp., 117 Edison Place, Newark 5, N. J.
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
National Instrument Co., 246 Walnut St., Newtonville 60, Mass.
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago 39, Ill.
Warren Telechron Co., Homer Ave., Ashland, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

VACUUM TUBE VOLTMETERS

Ballantine Laboratories, Inc., Boonton, N. J.
Barber Labs., Alfred W., 34-04 Francis Lewis Blvd., Flushing, New York
Electronic Development Co., 2055 Harney St., Omaha 2, Nebr.
Espey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
Ferris Instrument Co., 110-112 Cornelia St., Boonton, N. J.
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Jackson Electrical Instrument Co., 131 Wayne Ave., Dayton, Ohio
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.
Measurements Corp., Boonton, N. J.
National Technical Laboratories, 820 Mission St., S. Pasadena, Calif.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.
Reiner Electronics Co., 152 W. 25th St., New York, N. Y.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Sound Apparatus Co., 150 W. 46th St., New York, N. Y.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Technical Devices Corp., Bloomfield, N. J.
Televiso Products, Inc., 6553 N. Olmsted Ave., Chicago, Ill.

ELECTRONIC and ALLIED PRODUCTS

Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
White Research, 899 Boylston St., Boston, Mass.

VOLTMETERS

Aerolux Light Corp., 653 Eleventh Ave., New York, N. Y.
Ballantine Laboratories, Inc., Boonton, N. J.
Boes Co., W. W., 3001 Salem Ave., Dayton, Ohio
Bristol Co., Waterbury 91, Conn.
Burlington Instrument Co., 316 Valley St., Burlington, Iowa
De Jur-Amsco Corp., 6 Bridge St., Shelton, Conn.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Electronic Development Co., 2055 Harney St., Omaha 2, Nebr.
Engelhard, Inc., Charles, 233 N. J. R. R. Ave., Newark, N. J.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Ferris Instrument Co., 110-112 Cornelia St., Boonton, N. J.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hatry & Young, 203 Ann St., Hartford, Conn.
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Hoyt Electrical Instrument Works, Boston, Mass.
J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Marion Instrument Co., Manchester, N. H.
Meck Industries, John, Plymouth, Ind.
Norton Electrical Instrument Co., 79 Hilliard St., Manchester, Conn.
Radio City Products Co., 127 W. 26th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Reliance Instrument Co., 715 N. Kedzie Ave., Chicago, Ill.
Rhamstine, J. Thos., 301 Beaubien St., Detroit, Mich.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Cal.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Corp., 9-11 Elm St., Mt. Vernon, N. Y.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Simpson Electric Co., 5200-16 W. Kinzie St., Chicago, Ill.
Sun Mfg. Co., 6323 Avondale Ave., Chicago, Ill.
Supreme Instruments Corp., Greenwood, Miss.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Televiso Products, Inc., 6553 N. Olmsted Ave., Chicago, Ill.
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 4, Pa.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Freylinghuysen Ave., Newark 5, N. J.

VOLUME INDICATOR METERS

Amplifier Co. of America, 396 Broadway, New York, N. Y.
Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
Daven Co., 191 Central Ave., Newark 4, N. J.
De Jur Amsco Corp., 6 Bridge St., Shelton, Conn.
General Electric Co., Schenectady, N. Y.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Marion Instrument Co., Manchester, N. H.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, N. Y.
Radio Corp. of America, Camden, N. J.
Rek-O-Kut Co., 173 Lafayette St., New York 13, N. Y.
Simpson Electric Co., 5218 W. Kedzie St., Chicago 24, Ill.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Worcester Moulded Plastics Co., 8 Grafton St., Worcester 8, Mass.

WATTMETERS

Audio-Tone Oscillator Co., 237 John St., Bridgeport, Conn.
Bristol Co., Waterbury 91, Conn.
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

Mica

Asheville Mica Co., 5 River Rd., Biltmore, N. C.
Brand & Co., William, 276 Fourth Ave., New York, N. Y.
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J.
English Mica Co., 220 E. 42d St., New York, N. Y.
Ford Radio & Mica Corp., 538 63rd St., Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Huse-Liberty Mica Co., 171 Camden St., Boston, Mass.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
International Products Corp., Baltimore 18, Md.
Macallen Co., 16 Macallen St., Boston, Mass.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mica Products Mfg. Co., 69 Wooster St., New York, N. Y.
Mitchell-Rand Insulation Co., Inc., 51 Murray St., New York 7, N. Y.
Munsell & Co., Eugene, 200 Varick St., New York, N. Y.
New England Mica Co., Waltham, Mass.
New Hampshire Mica & Mining Co., Washington St., Keene, N. H.
Philadelphia Mica Corp., 3515 N. 10th St., Philadelphia 40, Pa.
Schoonmaker Insulation Co., A. O., 635 Greenwich St., New York, N. Y.
Southern Mica Co., Johnson City, Tenn.
Spruce Pine Mica Co., Spruce Pine, N. C.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
U. S. Mica Mfg. Co., 1521 Circle Ave., Forest Park, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Microammeters

see Ammeters

Microfaradmeters

see Bridges

Micrometers

ELECTRONIC MICROMETERS

Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Televiso Products, Inc., 6533 N. Olmsted Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Microphones

American Microphone Co., 1915 S. Western Ave., Los Angeles, Calif.
Amperite Co., 561 Broadway, New York, N. Y.
Astatic Corp., 830 Market St., Youngstown, Ohio
Aurex Corp., 115 N. Franklin St., Chicago, Ill.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Aviometer Corp., 370 West 35th St., New York 1, N. Y.
Ballantine Laboratories, Inc., Boonton, N. J.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
California Telephone & Elec. Co., 6075 W. Pico Blvd., Los Angeles 35, Calif.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Electro Voice Mfg. Co., 1239 South Bend Ave., South Bend, Ind.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
Gates Radio Co., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Lektra Labs., Inc., 30 East 10th St., New York, N. Y.
Lifetime Sound Equipment Co., 1101 Adams St., Toledo, Ohio
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Quam-Nichols Co., 526 East 33rd Place, Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Radio Speakers, Inc., 221 E. Cullerton St., Chicago, Ill.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Shure Bros., 225 W. Huron St., Chicago, Ill.
Telephonics Corporation, 350 West 31st St., New York, N. Y.
Tibbetts Laboratories, Camden, Maine
Turner Co., 909 17th St., N.E., Cedar Rapids, Iowa
Universal Microphone Co., 424 Warren Lane, Inglewood, Calif.
Victory Radio Corp., 155 West 72nd St., New York, N. Y.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.

Microphone Stands

see Stands, Microphone

Microscopes

ELECTRON MICROSCOPES

General Electric Co., Schenectady, N. Y.
Radio Corp. of America, Camden, N. J.

Milliammeters

see Ammeters

Mirrors, Television

Glendale Optical Co., 250 Pennsylvania Ave., Bklyn., N. Y.
Laboratory Specialties, 144 South Wabash St., Wabash, Ind.
Panco Mirrors, Inc., 2958 Los Feliz Blvd., Los Angeles, Calif.
Practo Photo Access. Corp., 383 Pearl St., Bklyn., N. Y.
Semon Bache & Co., 636 Greenwich St., New York, N. Y.

Moisture Proofing Equipment

General Electric Co., Schenectady, N. Y.
Production Engineering Corp., 666 Van Houten Ave., Clifton, N. J.

Monitors, Broadcast

American Recordgraph Corp., 333 W. 52nd St., New York 19, N. Y.
Barker & Williamson, Upper Darby, Pa.
Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago, Ill.
DuMont Laboratories, Inc., Allen B., 2 Main Ave., Passaic, N. J.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Howard Radio Co., 1735 Belmont Ave., Chicago 13, Ill.
Link, Fred M., 125 West 17th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Engineering Laboratories, Inc., 35-54 36th St., Long Island City, N. Y.

Motor-Generators

see Generators

Motors

FRACTIONAL HORSEPOWER and MINIATURE

Air Associates, Inc., Teterboro, N. J.
Air-Way Electric Appliance Corp., 2101 Auburn Ave., Toledo, Ohio
Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio
Allis Co., Louis, 427 E. Stewart St., Milwaukee, Wisc.
Anco Products Company, Paterson, N. J.
Arma Corp., 254 36th St., Brooklyn, N. Y.
Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland, Ohio
Baldor Electric Co., 4353 Duncan Ave., St. Louis, Mo.
Barber-Colman Co., River & Loomis Sts., Rockford, Ill.
Bendix Aviation Corp., Bendix, N. J.
Black & Decker Electric Co., Kent, Ohio
Bodine Electric Co., 2262 W. Ohio St., Chicago, Ill.
Bogue Electric Company, Paterson, N. J.
Brown-Brockmeyer Co., 1000 S. Smithville Rd., Dayton, Ohio
Burke Electric Co., 12th & Cranberry Sts., Erie, Pa.
Carter Motor Co., 1608 Milwaukee Ave., Chicago 47, Ill.
Century Electric Co., 1806 Pine St., St. Louis 4, Mo.
Clements Mfg. Co., 6650 S. Narragansett Ave., Chicago, Ill.
Delco Products Div., General Motors Corp., 329 E. First St., Dayton, Ohio
Delco Appliance Division, General Motors Corp., 391 Lyell Ave., Rochester, N. Y.
Diehl Mfg. Co., Somerville, N. J.
Dumore Co., 14th & Racine Sts., Racine, Wis.
Eastern Air Devices, Inc., 585 Dean St., Brooklyn, N. Y.
Eicor, Inc., 1501 W. Congress St., Chicago, Ill.
Electric Auto-Lite Co., Toledo 1, Ohio
Electric Indicator Co., 21 Parker Ave., Stamford, Conn.
Electric Motor Corp., Racine, Wis.
Electric Specialty Co., 211 South St., Stamford, Conn.
Electrolux Corporation, Old Greenwich, Conn.
Emerson Electric Mfg. Co., 1824 Washington Ave., St. Louis, Mo.
Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y.
Fidelity Electric Co., 332 N. Arch St., Lancaster, Pa.
Franklin Transformer Mfg. Co., 65 22nd Ave., N. E., Minneapolis 13, Minn.
General Electric Co., Schenectady, N. Y.
General Industries Co., 304 Taylor Street, Elyria, Ohio
Hamilton Beach Company, Racine, Wisc.
Hansen Mfg. Co., Inc., Princeton, Ind.
Haydon Mfg. Co., Forestville, Conn.
Heinze Electric Corp., Lowell, Mass.
Holtzer-Cabot, Signal Div., 400 Stuart St., Boston 17, Mass.
Howell Electric Motors Company, Howell, Mich.
Janette Mfg. Co., 556 W. Monroe St., Chicago, Ill.
Kimble Electric Co., 2011 W. Hastings St., Chicago, Ill.
Kingston-Conley Electric Co., 68 Brook Ave., North Plainfield, N. J.
Kollsman Instrument Div. of Square D. Company, 80-08 45th Ave., Elmhurst, N. Y.
Lear Avia, Inc., 1718 Broadway, Piqua, Ohio
Leece-Neville Company, 5363 Hamilton Avenue, Cleveland, Ohio
Leich Electric Co., 565 W. Washington Blvd., Chicago 6, Ill.
Leland Electric Co., 1501 Webster St., Dayton, Ohio
Marathon Electric Mfg. Corp., Randolph & Cherry Sts., Wausau, Wisc.
Master Electric Co., 126 Davis Ave., Dayton, Ohio
Merkle-Korff Gear Co., 213 N. Morgan St., Chicago, Ill.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Ohio Electric Mfg. Co., 5908 Maurice Ave., Cleveland, Ohio
Oster Mfg. Co. of Illinois, John, Genoa, Ill.
Otis Elevator Company, Yonkers, N. Y.
Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif.
Packard Electric Div. of General Motors Corp., Warren, Ohio
Peerless Electric Co., 740 W. Market St., Warren, Ohio
Pioneer Gen-E-Motor Corp., 5841 W. Dickens Ave., Chicago, Ill.
Redmond, A. G., Owosso, Mich.
Reliance Electric & Engineering Co., 1084 Ivanhoe Rd., Cleveland, Ohio
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.
Robbins & Myers, 1345 Lagonda Ave., Springfield, Ohio
Sangamo Electric Co., 1301 N. 11th Street, Springfield, Ill.
Signal Electric Mfg. Co., 1915 Broadway, Menominee, Mich.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Smith Mfg. Co., F. A., P. O. Box 509, Rochester, N. Y.
Speedway Mfg. Co., 1834 S. 52nd Avenue, Cicero, Ill.
Star Electric Motor Co., 200 Bloomfield Ave., Bloomfield, N. J.
Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles, Cal.
Sunlight Electrical Div., General Motors Corp., 523 Dana Ave., Warren, Ohio
U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Calif.
Victor Electric Products, Inc., 2950 Robertson Ave., Cincinnati, Ohio
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wincharger Corp., 7th & Division, Sioux City, Iowa

PHONOGRAPH

Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio
Autocrat Radio Co., 3855 N. Hamilton Ave., Chicago, Ill.
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.
General Electric Co., Schenectady, N. Y.
General Industries Co., Taylor & Olive Sts., Elyria, Ohio
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Radio Corp. of America, Camden, New Jersey
Robbins & Myers, 1345 Lagonda Ave., Springfield, Ohio
Webster Products, 3825 Armitage Ave., Chicago 47, Ill.

TIMING

Alliance Mfg. Co., Alliance, Ohio
Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Bodine Electric Co., 2262 W. Ohio St., Chicago, Ill.
Esterline Angus Co., P. O. Box 596, Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
Hansen Mfg. Co., Princeton, Ind.
Haydon Mfg. Co., Forestville, Conn.
Holtzer-Cabot Signal Division, 400 Stuart St., Boston 17, Mass.
Leich Electric Co., 565 W. Washington Blvd., Chicago 6, Ill.
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Lux Clock Co., 95 Johnson St., Waterbury, Conn.
Merkle-Korff Gear Co., 213 N. Morgan St., Chicago, Ill.
Ohio Electric Mfg. Co., 5908 Maurice Ave., Cleveland 4, Ohio
Oster Mfg. Co. of Illinois, Genoa, Ill.
Reynolds Electric Co., 2650 W. Congress St., Chicago, Ill.
Speedway Mfg. Co., 1834 S. 52nd Ave., Cicero, Chicago, Ill.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Victor Electric Products, Inc., 2950 Robertson Ave., Cincinnati, Ohio
Wallace & Tiernan Products, Inc., Belleville, N. J.
Warren Telechron Co., Ashland, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Mountings

VIBRATION INSULATING

Firestone Tire & Rubber Co., 12 S. Main St., Akron 17, Ohio
Goodrich Co., B. F., 500 S. Main St., Akron, Ohio
Johns-Manville, 22 E. 40th St., New York, N. Y.
Johnson Rubber Co., Middlefield, Ohio
Lord Mfg. Co., 1635 W. 12th St., Erie, Pa.
Racon Electric Co., Inc., 52 E. 19th St., New York 3, N. Y.
United States Rubber, 1234 Sixth Ave., New York 20, N. Y.
Vibration Mfg. Co., 110 Stack St., Middletown, Conn.

Multipliers

VOLTMETER

Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.
Ballantine Laboratories, Inc., Boonton, N. J.
Boes Co., W. W., 3001 Salem Avenue, Dayton 3, Ohio
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Espey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.
General Electric Co., Schenectady, N. Y.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.

Instrument Resistors, Inc., 25 Amity St., Little Falls, N. J.
International Resistance Co., 401 N. Broad St., Philadelphia, Pa
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Marion Instrument Co., Manchester, N. H.
Precision Resistor Co., 334 Badger Ave., Newark, N. J.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Sprague Electric Co., North Adams, Mass.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Westinghouse Electric & Mfg. Co, East Pittsburgh, Pa.

Name Plates

see Escutcheons

Needles

CUTTING

Acton Co., H. W., 370 Seventh Ave., New York, N. Y.
Audak Co., 500 Fifth Ave., New York, N. Y.
Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y.
Capps Co., Frank L., 244 W. 49th St., New York, 19, N. Y.
Dossert & Co., 242 W. 41st St., New York, N. Y.
Duotone Co., 799 Broadway, New York, N. Y.
Eldeen Co., 504 N. Water St., Milwaukee, Wisc.
Electrovox Co., 169 Maplewood Ave., Maplewood, N. J.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Federal Recorder Co., Elkhart, Ind.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Phonograph Co., Putnam, Conn.
Gould-Moody Co., 395 Broadway, New York, N. Y.
Howard Radio Co., 1735 Belmont Ave., Chicago 13, Ill.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 21, Ill.
Paraloy Co., 600 S. Michigan Ave., Chicago, Ill.
Permo Products Corp., 6415 Ravenswood Ave., Chicago, Ill.
Phonograph Needle Mfg. Co., 42 Dudley St., Providence, R. I.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Recordisc Corp., 395 Broadway, New York, N. Y.
Recotone Corp., 21-10 49th St., Long Island City, N. Y.
Riggs & Jeffreys, Inc., 73 Winthrop St., Newark 4, N. J.
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York, N. Y.
Wilcox Gay Corp., Charlotte, Michigan

PLAY BACK

Acton Co., H. W., 370 Seventh Ave., New York, N. Y.
Audio Devices Inc., 444 Madison Ave., New York 22, N. Y.
Boetsch Brothers, 221 E. 144th St., New York 5, N. Y.
Capps Co., Frank L., 244 W. 49th St., New York 19, N. Y.
Dossert & Co., 242 W. 41st St., New York, N. Y.
Duotone Co., 799 Broadway, New York, N. Y.
Eldeen Co., 504 N. Water St., Milwaukee, Wisc.
Electrovox Co., 169 Maplewood Ave., Maplewood, N. J.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Phonograph Co., Putnam, Conn.
Gerett Corp., M. A., 724 W. Winnebago St., Milwaukee, Wisc.
Gould-Moody Co., 395 Broadway, New York, N. Y.
Harris Mfg. Co., 2422 W. Seventh St., Los Angeles, Calif.
Howard Radio Co., 1735 Belmont Ave., Chicago 13, Ill.
Jensen Industries, Inc., 737 N. Michigan Ave., Chicago 11, Ill.
Lowell Needle Co., 1 Wildore St., Putnam, Conn.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Mirror Record Corp., 58 W. 25th St., New York, N. Y.
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 21, Ill.
Paraloy Co., 600 S. Michigan Ave., Chicago, Ill.
Permo Products Corp., 6415 Ravenswood Ave., Chicago, Ill.
Pfanstiehl Chemical Co., 105 Lakeview Ave., Waukegan, Ill.
Phonograph Needle Mfg. Co., 42 Dudley St., Providence, R. I.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Recotone Corp., 21-10 49th St., Long Island City, N. Y.
Recordit Co., The, 555 Bedford Ave., University City, Mo.
Speak-O-Phone Recording & Equipment, 23 W. 60th St., New York, N. Y.
Stark Sound Engrg. Corp., P. O. 493, Fort Wayne, Ind.
Wilcox-Gay Corp., Charlotte, Mich.

Nickel

see Metals

Nickel Tubing

see Tubing, Metal & Alloy

Noise Analyzers

see Analyzers

Noise Filters

see Filters

Noise Recorders

see Recorders

Nuts

SELF LOCKING

An-cor-lox Div., Laminated Shim Co., Union St., Glenbrook, Conn.
Automatic Nut Co., Inc., Lebanon, Pa.
Boots Aircraft Nut Corp., New Canaan, Conn.
Camloc Fastener Co., 420 Lexington Ave., New York 17, N. Y.
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Clark Bros. Bolt Co., Milldale, Conn.
Columbia Nut & Bolt Co., 945 Main St., Bridgeport, Conn.
Elastic Stop Nut Corp., 2371 Vauxhall Rd., Union, N. J.
Federal Screw Products Co., 224 W Huron St., Chicago 17, Ill.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Industrial Screw & Supply Co., 713 W. Lake St., Chicago 25, Ill.
Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, Ohio.
Palnut Co., 61 Cordier St., Irvington, N. J.
Pittsburgh Screw & Bolt Corp., 2719 Peble Ave., N. S., Pittsburgh, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Midland Ave., Port Chester, N. Y.
Security Locknut Corp., 630 S. Wabash Ave., Chicago 5, Ill.
Standard Locknut & Lockwasher, Inc., Indianapolis, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Tinnerman Products, Inc., 2106 Fulton Rd., Cleveland, Ohio
United-Carr Fastener Corp., 31 Ames St., Cambridge 42, Mass.

Ohmmeters

see Meters

Optical Equipment

American Lens Co., Inc., 45 Lispenard St., New York 13, N. Y.
Bausch & Lomb, Rochester, N. Y.
Distillation Products, Inc., 755 Ridge Rd. W., Rochester, N. Y.
Eastman Kodak Co., Rochester 4, N. Y.
Electronic Products Mfg. Co., 7300 Huron River Drive, Dexter, Mich.
Gamma Instrument Co., Inc., 95 Madison Ave., New York 16, N. Y.
Herron Optical Co., 705 West Jefferson Blvd., Los Angeles 7, Calif.
Instrument Optics Co., 1872 Genesee St., Buffalo 11, N. Y.
International Industries, Inc., Ann Arbor, Mich.
Mogey & Sons, Inc., Wm., 76 Interhaven Ave., Plainfield, N. J.
Parker Engineering Products Co., 16 W. 22nd St., New York 10, N. Y.
Perkin-Elmer Corp., Glenbrook, Conn.
Scherr, George, 128 Lafayette St., New York, N. Y.
Spencer Lens Co., Buffalo, N. Y.
Square D. Company, 6060 Rivard St., Detroit 11, Michigan

Oscillators

AUDIO-FREQUENCY

American Instrument Co., 8030 Georgia Ave., Silver Spring, Md.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Audio-Tone Oscillator Co., 237 John St., Bridgeport, Conn.
Barker & Williamson, 235 Fairfield Ave Upper Darby, Pa.
Boonton Radio Corp., Boonton, N. J.
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill.
Clough-Brengle Co., 5501 N. Broadway, Chicago, Ill.
Dayco Radio Corp., 915 Valley St., Dayton 4, Ohio
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.
Espey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
Fada Radio & Electric Co., 30-20 Thomson Ave., Long Island City, N. Y.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hearing Aid Labs., 1404 Franklin St., Michigan City, Ind.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Cal.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Jackson Electrical Instrument Co., 123 Wayne Ave., Dayton, Ohio
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, L. I., N. Y.

Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Lepel High Frequency Laboratory, Inc., 39 W. 60th St., New York, N. Y.
Maico Co., Inc., 25 North 3rd St., Minneapolis 1, Minn.
Megard Corp., 1601 S. Burlington St., Los Angeles, Calif.
Millen Mfg. Co., Inc., James. 150 Exchange St., Malden, Mass.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Photobell Corp., 116 Nassau St., New York 7, N. Y.
Power Equipment Co., 627 W. Alexandrine, Detroit 1, Michigan.
Radio Corp. of America, Camden, N. J.
Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.
Reiner Electronics Co., 152 W. 25th St., New York, N. Y.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago 39, Ill.
Signal Electronic & Mfg. Co., 439 Lafayette St., New York, N. Y.
Simpson Mfg. Co., Inc., Mark, 188 W. 4th St., New York, N. Y.
Sonora & Radio & Television Corp., 2626 W. Washington St., Chicago, Ill.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Supreme Instrument Corp., Greenwood, Miss.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Televiso Products, Inc., 6533 N. Olmsted Ave., Chicago, Ill.
Templetone Radio Co., Mystic, Conn.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
United Cinephone Corp., 35 New Litchfield St., Torrington, Conn.
White Research, 899 Boylston St., Boston, Mass.

RADIO-FREQUENCY

Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Baldwin Locomotive Works, Eddystone, Pa.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Belmont Radio Corp., 5921 Dickens Ave., Chicago, Ill.
Breon Laboratories, Williamsport, Pa.
Burnett Radio Lab., Wm. W. L., 4814 Idaho St., San Diego, Calif.
Clough-Brengle Co., 5501 N. Broadway, Chicago 22, Ill.
Crystal Research Lab., Inc., 29 Allyn St., Hartford, Conn.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Epsey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
Federal Telephone & Radio Corp., 591 Broadway, Newark, N. J.
Ferris Instrument Co., Boonton, N. J.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Crystal Corp., 1775 Foster Ave., Schenectady, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Grenby Mfg. Co., Plainville, Conn.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Jackson Electrical Instrument Co., 123 Wayne Ave., Dayton, Ohio
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.
Millen Mfg. Co., Inc., James, 150 Exchange St., Malden, Mass.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Phil-American Inc., 528 E. 72nd St., New York 21, N. Y.
Premier Crystal Laboratories, Inc., 63 Park Row, New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Craftsmen, 1341 So. Michigan Ave., Chicago 5, Ill.
Radio Transceiver Labs., Inc., 8627 115th St., Richmond Hill, N. Y.
Reiner Electronics Co., 152 W. 25th St., New York, N. Y.
Signal Electronic & Mfg. Co., 439 Lafayette St., New York, N. Y.
Simpson Electric Co., 5218 W. Kinzie St., Chicago, Ill.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago 18, Ill.
Supreme Instruments Corp., Greenwood, Miss.
Televiso Products, Inc., 6533 N. Olmsted Ave., Chicago, Ill.
Templetone Radio Co., Mystic, Conn.
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
White Research, 899 Boylston St., Boston, Mass.

Oscilloscopes

CATHODE-RAY INSTRUMENTS

American Instrument Co., 8030 Georgia Ave., Silver Spring, Md.
Annis Co., R. B., 1101 N. Delaware St., Indianapolis, Ind.
Baker Chemical Co., J. T., N. Broad St., Phillipsburg, N. J.
Belmont Radio Corp., 5921 Dickens Ave., Chicago, Ill.
Browning Labs., Inc., 750 Main St., Winchester, Mass.
Clough-Brengle Co., 5501 N. Broadway, Chicago 22, Ill.
Dayco Radio Corp., 915 Valley St., Dayton 4, Ohio
Du Mont Laboratories, Inc., Allen B., 2 Main Ave., Passaic, N. J.
Electro-Medical Laboratory, Inc., Holliston, Mass.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hearing Aid Labs., 1404 Franklin St., Michigan City, Ind.
Heiland Research Corp., 130 East Fifth St., Denver 9, Colo.
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Jackson Electrical Instrument Co., 131 Wayne Ave., Dayton, Ohio
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Panoramic Radio Corp., 242 W. 55th St., New York 19, N. Y.
Phil-American, Inc., 528 E. 72nd St., New York 21, N. Y.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Radio City Products Co., Inc., 127 West 26th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Reiner Electronics Co., 152 West 25th St., New York, N. Y.
Supreme Instruments Corp., Greenwood, Miss.
Sylvania Electic Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Templetone Radio Co., Mystic, Conn.
Triplett Electrical Instrument Co., 286 Harmon Rd., Buffton, Ohio
Triumph Mfg. Co., 913 W. Van Buren St., Chicago, Ill.
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
White Research, 899 Boylston St., Boston, Mass.

Oscillographs

DIRECT WRITING

Consolidated Engineering Corp., Pasadena 5, Calif.
General Electric Co., Schenectady, N. Y.
Offner Electronics Inc., 5320 N Kedzie Ave., Chicago, Ill.
Rahm Instruments, Inc., 47 West 56th St., New York 19, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOVING-CONDUCTOR

Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Geophysical Instrument Co., Key Blvd. & Nash St., Arlington, Va.
Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Heiland Research Corp., 130 East Fifth St., Denver 9, Colo.
Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Sanborn Co., 39 Osborne St., Cambridge, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MULTI-ELEMENT

Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Electro-Medical Laboratory, Inc., Holliston, Mass.
General Electric Co., Schenectady, N. Y.
Heiland Research Corp., 130 East 5th St., Denver 9, Colo.
Metron Instrument Co., 432 Lincoln St., Denver, Colo.
Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Sanborn Co., 39 Osborne St., Cambridge, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PIEZOELECTRIC

Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Electro-Medical Laboratory, Inc., Holliston, Mass.
Tibbetts Laboratories, Camden, Maine

Panels

see Cabinets

Paper

see Capacitors, Fixed

see Insulation, Paper

see Tubing, Paper

Parts, Tube

see Tube Parts

Phonographs

ELECTRIC PHONOGRAPHS and RECORD PLAYERS

Admiral Corp., 3800 Cortlandt St., Chicago 28, Ill.
Andrea Radio Corp., 43-20 24th St., Long Island City, N. Y.
Ansley Radio Corp., 21-10 49th Ave., Long Island City, N. Y.
Autocrat Radio Co., 3855 N. Hamilton Ave., Chicago, Ill.
Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio
Boetsch Bros., 221 E. 144th St., New York 51, N. Y.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Colonial Radio Corp., 254 Rano St., Buffalo, N. Y.
Crosley Corp., 1329 Arlington St., Cincinnati 3, Ohio
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.

DeWald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.
Electro Acoustic Co., 2131 Bueter Rd. Fort Wayne, Ind.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Espey Mfg. Co., 305 E. 63rd St., New York, N. Y.
Farnsworth Television & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.
Forest Electronic Co., 320 E. 65th St., New York, N. Y.
Freed Radio Corp., 200 Hudson St., New York, N. Y.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.
General Electric Co., Schenectady, N. Y.
Godfrey Mfg. Corp., 171 S. 2nd St., Milwaukee 4, Wisc.
Harris Mfg. Co., 2422 W. Seventh St., Los Angeles, Calif.
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Meck Industries, John, Plymouth, Ind.
Midwest Radio Corp., 909 Broadway, Cincinnati, Ohio
Mills Industries, Inc., 4100 Fullerton Ave., Chicago 39, Ill.
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 21, Ill.
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles 18, Calif.
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif.
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Robinson Recording Laboratories, 355 Ninth St., Philadelphia, Pa.
Rock-Ola Mfg. Corp., 867 N. Kedzie Ave., Chicago, Ill.
Seeburg Corp., J. P., 1510 N. Dayton St., Chicago, Ill.
Sentinel Radio Corp., 2020 Ridge Ave., Evanston, Ill.
Simpson Mfg. Co., Inc., Mark, 188 West Fourth St., New York, N. Y.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Stromberg-Carlson Telephone Mfg. Co., 100 Carlson Rd., Rochester, N. Y.
Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago, Ill.
Trav-Ler Karenola Radio & Television Corp., 1028 W. Van Buren St., Chicago, Ill.
Victory Radio Corp., 155 West 72nd St., New York, N. Y.
Waters-Conley Co., 501 First St., N. W., Rochester, Minn.
Wilcox-Gay Corp., Charlotte, Mich.
Wurlitzer Mfg. Co., Rudolph, North Tonawanda, N. Y.

Photocells

see Phototubes

Pickups

INDUSTRIAL PICKUPS

Audak Co., Inc., 500 Fifth Ave., New York, N. Y.
Audio Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Consolidated Engineering Corp., 1255 E. Green St., Pasadena 5, Calif.
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.
Electronic Control Corp., 1573 E. Forrest St., Detroit, Mich.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Shure Bros., 225 W. Huron St., Chicago, Ill.
Webster Electric Co., 1900 Clark St., Racine, Wisc.

PHONOGRAPH PICKUPS

Aray Mfg. & Supply Co., Inc., 3107 Pine St., St. Louis 5, Mo.
Astatic Corp., 830 Market St., Youngstown, Ohio
Audak Co., 500 Fifth Ave., New York, N. Y.
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Boetsch Bros., 221 E. 144th St., New York 51, N. Y.
Garrard Sales Corp., 401 Broadway, New York 13, N. Y.
General Electric Co., Schenectady, N. Y.
Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Shure Bros., 225 W. Huron St., Chicago, Ill.
Tibbetts Laboratories, Camden, Maine
Webster Electric Co., 1900 Clark St., Racine, Wisc.

Pilot Lights

see Lights

Plastics

FABRICATORS of PLASTICS

Acadia Synthetic Products Div., Western Felt Works, 4035 Ogden Ave., Chicago 23, Ill.
Accurate Molding Corp., 116 Nassau St., Brooklyn 1, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.
American Insulator Corp., New Freedom, Pa.
American Molded Products Co., 1751 N. Honore St., Chicago, Ill.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
Anchor Plastics Co., 71 Grand St., New York 13, N. Y.
Aray Mfg. & Supply Co., Inc., 3107 Pine St., St. Louis 3, Mo.
Arpin Mfg. Co., 422 Alden St., Orange, N. J.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Auburn Button Works, Inc., 48 Canoga St., Auburn, N. Y.
Boonton Molding Co., Boonton, N. J.
Brach Mfg. Corp., L. S., 55 Dickerson St., Newark, N. J.
Breeze Corp., 41 S. Sixth St., Newark, N. J.
Bridgeport Molded Products, Inc., 303 Myrtle Ave., Bridgeport, Conn.
Brilhart Co., Arnold, 435 Middle Neck Rd., Great Neck, L. I., New York
Cardy-Lundmark Co., 1801 West Byron St., Chicago 13, Ill.
Celluplastic Corp., 50 Avenue L, Newark, N. J.
Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago, Ill.
Cincinnati Moulding Co., 2037 Florence Ave., Cincinnati 6, Ohio
Cleveland Plastics, Inc., 1611 East 21st St., Cleveland 14, Ohio
Colt's Patent Fire Arms Mfg. Co., Plastics Div., Hartford, Conn.
Consolidated Molded Products Corp., 409 Cherry St., Scranton 2, Pa.
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Creative Plastics Corp., 975 Kent Ave., Brooklyn, N. Y.
Davies Molding Co., Harry, 1428 N. Wells St., Chicago 10, Ill.
Davis Plastics Co., Joseph, Arlington, N. J.
Dayton Insulating Molding Co., 418 E. First St., Dayton, Ohio
Diemolding Corp., Rasbach St., Canastota, N. Y.
Dimco Plastics 207 E. 6th St., Dayton, Ohio
Eagle Plastics Corp., 23-10 Bridge Plaza So., Long Island City, N. Y.
Eclipse Moulded Products Co., 5151 North 32nd St., Milwaukee 9, Wis.
Electric Auto-Lite Co., Toledo 1, Ohio
Electronic Products Co., 19 North First St., Geneva, Ill.
Emeloid Co., 291 Laurel Ave., Arlington, N. J.
Erie Resistor Corp., 640 W. 12th St., Erie, Pa.
Felsenthal & Sons, G., 4122 W. Grand St., Chicago 49, Ill.
Formica Insulation Co., 4662 Spring Grove Ave., Cincinnati, Ohio
Franklin Fibre-Lamitex Corp., 12th & French Sts., Wilmington, Del.
Garfield Mfg. Co., Garfield, N. J.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y.
General Electric Co., Plastics Dept., 1 Plastics Ave., Pittsfield, Mass.
General Laminated Products, Inc., 175 Varick St., New York, N. Y.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hopp Press, Inc., 460 W. 34th St., New York, N. Y.
House of Plastics, 1720 Euclid Ave., Cleveland 15, Ohio
Imperial Molded Products Corp., 2925 W. Harrison St., Chicago, Ill.
Industrial Synthetics Corp., 60 Woolsey St., Irvington, N. J.
Insulating Fabricators of New England, Inc., 22 Elkins St., S. Boston, Mass.
Insulation Mfg. Co., 11 New York Ave., Brooklyn, N. Y.
Insulation Products Co., 504 Richland St., Pittsburgh, Pa.
International Products Corp., Baltimore 18, Md.
Johns-Manville, 22 E. 40th St., New York, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Keystone Specialty Co., 1372½ Cove Ave., Cleveland, Ohio
Knoedler Co., A., Lancaster, Pa.
Kuhn & Jacob Moulding & Tool Co., 1200 Southard St., Trenton, N. J.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Kurz-Kasch Co., 1415 S. Broadway, Dayton, Ohio
Lacey-Webber Co., Kalamazoo, Mich.
Lamicoid Fabricators, 3600 W. Potomac Ave., Chicago, Ill.
Maico Co., Inc., 25 North 3rd St., Minneapolis 1, Minn.
Meissner Mfg. Co., Mt. Carmel, Ill.
Mills Corp., Elmer, E., 812 W. Van Buren St., Chicago, Ill.
Molded Insulation Co., Aircraft Control Div., 335 E. Price St., Philadelphia, Pa.
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.
National Fabricated Products 2650 Beldon Avenue, Chicago 4, Ill.
Northern Industrial Chemical Co., 7-11 Elkins St., Boston, Mass.
Northwest Plastics, Inc., 2333 University Ave., St. Paul 4, Minn.
Norton Laboratories, Inc., 520 Mill St., Lockport, N. Y.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Patent Button Co. of Tenn., Inc., 2221 Century St., Knoxville 8, Tenn.
Plastic Manufacturers, Stamford, Conn.
Plax Corp., 133 Walnut St., Hartford, Conn.
Poinsetta, Inc., 95 Cedar Ave., Pitman, N. J.
Precision Fabricators, Inc., Rochester, N. Y.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
R. E. C. Mfg. Corp., 1250 Highland St., Holliston, Mass.
Recto Molded Products, Appleton St. & B. & O. R. R., Cincinnati, Ohio
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Resinous Products & Chemical Co., 222 W. Washington Sq., Philadelphia, Pa.
Resistoflex Corp., Belleville 9, N. J.
Reynolds Spring Co., Molded Plastics Div., Reynolds Bldg., Jackson, Mich.
Richardson Co., Lockland, Ohio
Rogan Brothers, 2001 S. Michigan Ave., Chicago, Ill.
Rogers Paper Mfg. Co., Manchester, Conn.
Rohm & Haas, 222 W. Washington Sq., Philadelphia, Pa.
Royal Moulding Co., 69 Gordon Ave., Providence 5, R. I.

St. Regis Paper Co., 230 Park Ave., New York, N. Y.
Sillcocks-Miller Co., 10 Parker Ave., W. S. Orange, N. J.
Sinko Tool & Mfg. Co., 351 N. Crawford Ave., Chicago, Ill.
Standard Molding Corp., Dayton, Ohio
Stokes Rubber Co., Jos. Taylor & Webster Sts., Trenton, N. J.
Synthetic Plastics Co., 88 St. Francis St., Newark, N. J.
Syracuse Ornamental Co., 581 So. Clinton St., Syracuse, N. Y.
Talking Devices Co., 4451 W. Irving Park Rd., Chicago, Ill.
Tech-Art Plastics Co., 41-01 36th Ave., Long Island City 1, N. Y.
Technical Plastics Co., 618 Clyde St., Pittsburgh 13, Pa.
Telex Products Co., Telex Park, Minneapolis 1, Minn.
Tri-United Plastics Corp., 20-30 Grand Ave., Brooklyn 5, N. Y.
Universal Plastics Corp., 235 Jersey Ave., New Brunswick, N. J.
Varflex Corp., N. Jay St., Rome, N. Y.
Victory Manufacturing Co., 1722 W. Arcade Place, Chicago 12, Ill.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Western Felt Works, 4029 Ogden Ave., Chicago, Ill.
Western Lithograph Co., 2nd St., Los Angeles, Calif.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
White Dental Mfg. Co., S. S., Industrial Division, 10 East 40th St., New York, N. Y.
Windman Bros, 3325 Union Pacific Ave., Los Angeles 23, Calif.
Worcester Moulded Plastics Co., 8 Grafton St., Worcester 8, Mass.

MANUFACTURERS of PLASTICS

American Cyanamid Co., Plastics Div., 30 Rockefeller Plaza, New York 20, N. Y.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Bakelite Corp., 30 E. 42nd St., New York 17, N. Y.
Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York, N. Y.
Catalin Corp., 1 Park Ave., New York, N. Y.
Celanese Celluloid Corp., 180 Madison Ave., New York, N. Y.
Central Process Corp., 1401 S. Circle Ave., Forest Park, Ill.
Ciba Co., Inc., 627 Greenwich St., New York, N. Y.
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Dow Chemical Co., Midland, Mich.
duPont de Nemours & Co., E. I., 626 Schuyler Ave., Arlington, N. J.
Durez Plastics & Chemicals, Inc., 1922 Walck Rd., North Tonawanda, N. Y.
Durite Plastics, Inc., 5010 Summerdale Ave., Philadelphia, Pa.
Eastman Kodak Co., Rochester 4, N. Y.
Electrical Insulation Co., Inc., 12 Vestry St., New York, N. Y.
General Electric Co., Plastics Dept., 1 Plastics Ave., Pittsfield, Mass.
Hercules Powder Co., 916 Market St., Wilmington, Del.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Makalot Corp., 262 Washington St., Boston, Mass.
Marblette Corp., 37-21 30th St., Long Island City, N. Y.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Mott-Smith Corp., 1041 M. Esperson Bldg., Houston, Texas
National Vulcanized Fibre Co., Maryland Ave., Wilmington, Del.
Nixon Nitration Works, Nixon, N. J.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Pemco Corp., Plastics Div., 5601 Eastern Ave., Baltimore, Md.
Plaskon Co., 2112 Sylvan Ave., Toledo, Ohio
Plax Corp., 133 Walnut St., Hartford, Conn.
Reilly Tar & Chemical Corp., Merchants Bank Bldg., Indianapolis, Ind.
Respro, Inc., Wellington Ave., Cranston, R. I.
Richardson Co., Lockland, Ohio
Rohm & Haas, 222 Washington Sq., Philadelphia 5, Pa.

St. Regis Paper Co., 230 Park Ave., New York, N. Y.
Synthane Corp., Oaks, Pa.
Taylor Fibre Co., Norristown, Pa.
Tennessee Eastman Corp., Kingsport, Tenn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Plastics and Metal Marking Machines

Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Annis Co., R. B., 1101 N. Delaware St., Indianapolis, Ind.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Auto Engraver Co., 1776 Broadway, New York, N. Y.
B & C Insulation Products, Inc., 261 Fifth Ave., New York 16, N. Y.
Bastian Bros Co., 1660 N. Clinton Ave., Rochester, N. Y.
Becker Bros. Engraving Co., 103 Lafayette St., New York, N. Y.
Burndy Engrg. Co., Inc., 107 Eastern Blvd., New York 54, N. Y.
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Eastern Etching & Mfg. Co., Chicopee, Mass.
Edwards, Inc., J. T., 121 Beach St., Boston 5, Mass.
General Electric Co., Pittsfield, Mass.
Good All Electric, 320 N. Spruce St., Ogalala, Neb.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Kahle Engrg. Co., 1307 Seventh St., North Bergen, N. J.
Leiman Bros., 156 Christie St., Newark, N. J.
Markem Machine Co., Keene, N. H.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.
New Method Steel Stamps, Inc., 149 Jos. Campau Ave., Detroit 7, Mich.
Numberall Stamp & Tool Co., Inc., 379 Huguenot Ave., Huguenot Park, Staten Island, N. Y.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Plax Corp., 133 Walnut St., Hartford, Conn.
Preis Engraving Machine Co., H. P., 155 Summit St., Newark 4, N. J.
R. E. C. Mfg. Corp., 1250 Highland St., Holliston, Mass.
Rogan Bros., 2003 S. Michigan Ave., Chicago, Ill.
Screenmakers, 64 Fulton St., New York, N. Y.

Plastic Insulation

see Insulation, Plastic

Plating, Metal, on Plastics

Electro Plastic Processes, 2035 West Charleston St., Chicago 54, Ill.
Metaplast Company, 205 West 19th Street, New York 11, N. Y.
Monroe Auto Equipment Co., Monroe, Michigan
Na Mac Products Co., 1027 N. Seward Street, Los Angeles 38, Calif.
Pacific Plastic & Mfg. Co., Inc., 4865 Exposition Blvd., Los Angeles 16, Calif.
Philip Sievering, Inc., 199 Lafayette Street, New York, New York

Players, Record

see Phonographs

Plugs

TERMINAL PLUGS

see also Jacks

Airadio, Inc., Melrose Ave. & Battery Place, Stamford, Conn.
Aircraft-Marine Prods., Inc., 1523 N. 4th St., Harrisburg, Pa.
Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Alden Products Co., 117 Main St., Brockton, Mass.
American Metal Products Co., 315 Berry St., Brooklyn, N. Y.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
American Radio Hardware Co., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Astatic Corp., Youngstown, Ohio
Atlas Products Corp., 30 Rockefeller Plaza, New York, N. Y.
Audio Development Co., 2833 13th Ave. S., Minneapolis, Minn.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Brach, L. S., Co., Newark, N. J.
Breeze Corp., Newark, N. J.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Burndy Engrg. Co., Inc., 107 Eastern Blvd., New York 54, N. Y.
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Cal.
Chicago Tel. & Supply Co., Elkhart, Indiana
Cinch Mfg. Corp., 2335 W. Van Buren St., Chicago, Ill.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Connector Corp., 401 North-Broad St., Philadelphia 8, Pa.
Connecticut Telephone & Electric Div., Great American Industries, Inc., 70 Britannia St., Meriden, Conn.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Federal Mfg. & Engrg. Corp., 199 Steuben St., Brooklyn, N. Y.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
General Electric Co., Bridgeport, Conn.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Heinse Electric Co., Lowell, Mass.
Insuline Corp. of America, 36-02 35th Avenue, Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
J. F. D. Mfg. Co., 4111 Fort Hamilton Pkway., Brooklyn, N. Y.
Jones, Howard B., 2300 Wabansia Ave., Chicago, Ill.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Molded Insulation Co., Philadelphia, Pa.
National Co., 61 Sherman St., Malden, Mass.
North Electric Co., Galion, Ohio
Northam Warren Co., Stamford, Conn.
Northwest Plastics, Inc., 2333 University Ave., St. Paul 4, Minn.
Philmore Mfg. Co., 113 University Place New York, N. Y.
Precision Specialties, 220 No. Western Ave., Los Angeles, Calif.
Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.
Remler Company, Ltd., 2101 Bryant Street, San Francisco, Cal.
Selector Mfg. Co., L. I. City, N. Y.
Standard Winding Co., Newburgh, N. Y.
Telephonics Corp., 350 West 31st St., New York, New York
Trav-Ler Karenola Radio & Television Corp., 1028 W. Van Buren St., Chicago, Ill.
Ucinite Co., 459 Watertown St., Newtonville, Mass.
Universal Microphone Co., 424 Warren Lane, Inglewood, Calif.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Willows Mfg. Corp., Brooklyn, N. Y.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.

ELECTRONIC and ALLIED PRODUCTS

Pointers

DIAL POINTERS

see also Knobs

also Dials

American Brass Co., Waterbury, Conn.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bastian Bros. Co., 1600 N. Clinton Ave., Rochester, N. Y.
Bud Radio, Inc., 2118 East 55th St., Cleveland, Ohio
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Eclipse Moulded Products Co., 5151 North 32nd St., Milwaukee 9, Wis.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Felsenthal & Sons, G., 4122 W. Grand St., Chicago 49, Ill.
General Electric Co., Schenectady, N. Y.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Grammes & Sons, Inc., L. F., 344 Union St., Allentown 2, Pa.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Liberty Engraving & Mfg. Co., 2911 S. Central Ave., Los Angeles, Calif.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Plastic Fabricators, Inc., 440 Sansome St., San Francisco, Calif.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Radio City Products Co., 127 West 26th St., New York, N. Y.
Worcester Moulded Plastics Co., 8 Grafton St., Worcester 8, Mass.

Points

CONTACT POINTS and ASSEMBLIES

American Platinum Works, New Jersey R. R. Ave. at Oliver St., Newark, N. J.
Baker & Co., 113 Astor St., Newark 9, N. J.
Bishop & Co., Platinum Works, J., 12 Channing Ave., Malvern, Pa.
Brainin Co., C. S., 233 Spring St., New York, N. Y.
Callite Tungsten Corp., 544 39th St., Union City, N. J.
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland, Ohio
Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.
General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
General Tungsten Mfg. Co., 502 23d St., Union City, N. J.
Gibson Electric Co., 8350 Frankstown Ave., Pittsburgh, Pa.
Independent Contact Mfg. Co., 540 39th St., Union City, N. J.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Metroloy Co., 57 E. Alpine St., Newark, N. J.
Noble Co., F. H., 535 West 59th St., Chicago, Ill.
Speer Carbon Co., St. Mary's, Pa.
Tungsten Contact Mfg. Co., North Bergen, N. J.
Wilson Co., H. A., 105 Chestnut St., Newark, N. J.

Porcelain

see Insulation—Ceramic

Posts

BINDING POSTS and TERMINALS

Accurate Molding Corp., 116 Nassau St., Brooklyn 1, N. Y.
Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne, Ind.
Alden Products Co., 117 Main St., Brockton, Mass.
American Brass Co., Waterbury, Conn.
American Insulator Co., Waterbury, Conn.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway. S., Mt. Vernon, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Baer Co., N. S., 9 Montgomery St., Hillside, N. J.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Burke Electric Co., 12th & Cranberry St., Erie, Pa.
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York, N. Y.
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.
Chase Brass & Copper Co., Waterbury 91, Conn.
Cinch Mfg. Corp., 2335 W. Van Buren St., Chicago, Ill.
Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Continental-Diamond Fibre Co., 16 Chapel St., Newark, Del.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Creative Plastics Corp., 975 Kent Ave., Brooklyn, N. Y.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
Fahnestock Electric Co., 46-44 11th St., Long Island City, N. Y.
Federal Screw Products Co., 224 W. Huron St., Chicago 17, Ill.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Industrial Screw & Supply Co., 713 W. Lake St., Chicago 25, Ill.
Insulation Mfg. Co., 11 New York Ave., Bklyn., N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Jones, Howard B., 2300 Wabansia Ave., Chicago, Ill.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
McInerney Plastics Co., 655 Godfrey Ave., S. W., Grand Rapids 1, Mich.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
Northern Industrial Chemical Co., 7-11 Elkins St., Boston, Mass.
Patton-MacGuyer Co., 17 Virginia Ave., Providence 5, R. I.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Plastic Manufacturers, Stamford, Conn.
Precision Specialties, 220 No. Western Ave., Los Angeles, Calif.
Radio Corp. of America, Camden, N. J.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Standard Electric Time Co., 89 Logan St., Springfield, Mass.
States Co., 19 New Park Ave., Hartford 2, Conn.
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia, Pa.
Variaten Cinema Engrg. Co., 1508 W. Verdugo Ave., Burbank, Calif.
Waterbury Button Co., 835 S. Main St., Waterbury, Conn.
Wood Electric Co., Inc., C. D., 826 Broadway, New York, N. Y.

Potentiometers

see Variable Resistors

Power Cord

see Wire

Power Plants

see Generators

Power Supplies

Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Calif.
American Instrument Co., 8030 Georgia Ave., Silver Spring, Md.
American Television & Radio Co., 300 E. Fourth St., St. Paul, Minn.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Benwood Linze Co., 1815 Locust St., St. Louis, Mo.
Browning Labs., Inc., 750 Main St., Winchester, Mass.
Carter Motor Co., 1608 Milwaukee Ave., Chicago 47, Ill.
Communication Equipment Co., 134 Colorado St., Pasadena 2, Calif.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Consolidated Engineering Corp., 1255 E. Green St., Pasadena 5, Calif.
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.
Electronic Corp. of America, 45 West 18th St., New York 11, N. Y.
Electronic Laboratories, Inc., Indianapolis, Ind.
Electronic Products Co., 19 North First St., Geneva, Ill.
Espey Mfg. Co., 305 East 63rd St., New York, N. Y.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
Gates Radio Co., 220 Hampshire St., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
General Transformer Corp., 1250 W. Van Buren St., Chicago 24, Ill.
Green Electric Co., Inc., W., 130 Cedar St., New York, N. Y.
Hamilton Radio Corp., 510 Sixth Ave., New York, N. Y.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Harvey-Wells Communications, Inc., North St., Southbridge, Mass.
Herbach & Rademan Co., 522 Market St., Philadelphia, Pa.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 1, N. Y.
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
International Transformer Co., 396 Broadway, New York, N. Y.
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, L. I., N. Y.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Mellaphone Corp., 714 University Ave., Rochester, N. Y.
Metron Instrument Co., 432 Lincoln St., Denver, Colo.
Radiart Corp., 3571 West 62nd St., Cleveland, Ohio
Radio Mfg. Engineers, Inc., 304 First Ave., Peoria, Ill.
Radio-Television Institute, Inc., 480 Lexington Ave., New York 17, N. Y.
Radio Transceiver Labs., Inc., 8627 115th St., Richmond Hill, N. Y.
Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Schuttig & Co., 9th & Kearney Sts. N. E., Washington 24, D. C.
Simpson Mfg. Co., Inc., Mark, 188 W. Fourth St., New York, N. Y.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
United Transformer Co., 150 Varick St., New York 13, N. Y.

Ward Leonard Electric Co., Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Powdered Metal Products

see Metals

Public Address Systems

see Sound

Pumps

VACUUM PUMPS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bendix Aircraft Corp., Bendix, N. J.
Central Scientific Co., 1700 Irving Park Rd., Chicago, Ill.
Distillation Products, Inc., 755 Ridge Rd. W., Rochester, N. Y.
Eastman Kodak Co., Rochester 4, N. Y.
Eisler Engrg. Co., 740 S. 13th St., Newark 3, N. J.
Eitel-McCullough, Inc., San Bruno, Calif.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
General Electric Co., Schenectady, N. Y.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
International Machine Works, 2207 46th St., North Bergen, N. Y.
Kahle Engineering Corp., 1307 Seventh St., North Bergen, N. J.
Kinney Mfg. Co., 3529 Washington St., Boston, Mass.
Kraissl Co., 303 Williams Ave., Hackensack, N. J.
Leiman Bros., 156 Christie St., Newark 7, N. J.
National Research Corp., 100 Brookline Ave., Boston, Mass.
Nelson Vacuum Pump Co., Geo. F., 2133 Fourth St., Berkeley 2, Calif.
New Jersey Machine Corp., 16th & Willow Ave., Hoboken, N. J.
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Roper Corp., Geo. D., Rockford, Ill.
Stokes Machine Co., F. J., 5850 Tabor Rd., Olney P. O., Philadelphia, Pa.
Sullivan Machinery Co., 929 Woodland Ave., Michigan City, Ind.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., 1433 N. Dayton St., Chicago, Ill.
Zenith Products Co., West Newton, Mass.

"Q" Meters

see Meters

Racks, Relay

Falstrom Co., Passaic, N. J.
Karp Metal Products Co., Inc., 129-30th St., Brooklyn, N. Y.
Par Metal Products Corp., 32-62 49th St., Long Island City, N. Y.

Receivers

Because of the fact that all receiver manufacturers are on a 100 percent war basis, we are listing them in this directory without type classification. In our first Directory after conclusion of hostilities we will again classify receiver manufacturers by the kind they make.

Abbott Instrument Inc., 8 W. 18th St., New York, N. Y.
Admiral Corp., 444 Lake Shore Drive, Chicago 11, Ill.
Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.
Air Associates, Inc., 5827 W Century Bldg., Los Angeles, Calif.
Air Communications, Inc., 2233 Grand Ave., Kansas City, Mo.
Air King Products Co., Inc., 1523 63rd St., Brooklyn, N. Y.
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kans.
Aircraft Radio Corp., Boonton, N. J.
Airplane & Marine Instruments, Inc., Clearfield, Pa.
Andrea Radio Corp., 43-20 34th St., Long Island City, N. Y.
Ansley Radio Corp., 21-10 49th Ave., Long Island City, N. Y.
Autocrat Radio Co., 3855 N. Hamilton Ave., Chicago, Ill.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Automatic Radio & Mfg. Co., 122 Brookline Ave., Boston, Mass.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bassett, Inc. Rex. 500 S. E. Second St., Fort Lauderdale, Fla.
Bell Radio & Television, 125 East 46th St., New York, N. Y.
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Bendix Radio, Div. of Bendix Aviation Corp., Baltimore, Md.
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Collins Radio Co., 855 35th N. E., Cedar Rapids, Iowa
Colonial Radio Corp., 254 Rano St., Buffalo, N. Y.
Communications Co., Coral Gables, Fla.
Communications Equipment Co., 134 W. Colorado St., Pasadena 2, Calif.
Crosley Corp., 1329 Arlington St., Cincinnati 3, Ohio
Delco Radio Div., General Motors Corp., Kokomo, Ind.
Detrola Corp., 1501 Beard Ave., Detroit, Mich.
DeWald Radio Mfg. Corp., 440 Lafayette St., New York, N. Y.
Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago, Ill.
Du Mont Laboratories, Inc., Allen B., 2 Main Ave., Passaic, N. J.
Echophone Radio Co., 540 North Michigan Ave., Chicago 20, Ill.
Eckstein Radio & Television Co., 1400 Harmon Place, Minneapolis, Minn.
Electronic Specialty Co., 3456 Glendale Blvd., Los Angeles, Calif.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Espey Manufacturing Co., 305 E. 63rd St., New York, N. Y.
Fada Radio & Electric Co., Inc., 30-20 Thomson Ave., Long Island City, N. Y.
Farnsworth Television & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
Freed Radio Corp., 200 Hudson St., New York, N. Y.
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago 51, Ill.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Bridgeport, Conn.
General Television & Radio Corp., 1240 W. Homan Ave., Chicago 28, Ill.
Gilfillan Bros., Inc., 1815 Venice Blvd., Los Angeles, Calif.
Grenby Mfg. Co., Plainville, Conn.
Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
Halsted Traffic Communications Corp., 155 E. 44th St., New York, N. Y.
Hamilton Radio Corp., 510 Sixth Ave., New York, N. Y.
Hammarlund Mfg. Co., 460 W. 34 St., New York, N. Y.
Harvey Machine Co., Inc., 6200 Avalon Blvd., Los Angeles, Calif.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Harvey-Wells Communications, Inc., North St., Southbridge, Mass.
Hazeltine Electronics Corp., 1775 Broadway, New York, N. Y.
Herbach & Rademan, 522 Market St., Philadelphia, Pa.
Higgins Industries, Inc., 2221 Warwick Ave., Santa Monica, Calif.
Hoffman Radio Corp., 3430 S. Hill St., Los Angeles 7, Calif.
Howard Radio Co., 1735 Belmont Ave., Chicago 13, Ill.
Hudson American Corp., 25 West 43rd St., New York, N. Y.
Islip Radio Mfg. Corp., Foot of Beacon St., Islip, N. Y.
Jefferson, Inc., Ray, 40 E. Merrick Road, Freeport, Long Island, N. Y.
Jefferson-Travis Radio Mfg. Corp., 245 East 23rd St., New York, N. Y.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Karadio Corp., 2233 University Ave., St. Paul, Minn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
King Radio Co., Inc., Kokomo, Ind.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Lear-Avia, Inc., 1718 Broadway, Piqua, Ohio
Link, Fred M., 125 West 17th St., New York, N. Y.
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Majestic Radio & Television Corp., 2600 W. 50th St., Chicago, Ill.
Maritime Radio Corp., 24 Whitehall St., New York, N. Y.
Meck Industries, John, Plymouth, Ind.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Meissner Mfg. Co., Mt. Carmel, Ill.
Midwest Radio Corp., 909 Broadway, Cincinnati, Ohio
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Co., 61 Sherman St., Malden, Mass.
Noblitt-Sparks Industries Inc., 13th & Big Four, Columbus, Ind.
Pacific Div., Bendix Aviation Corp., North Hollywood, Calif.
Pacific Electronics, Sprague at Jefferson, Spokane, Wash.
Packard Bell Co., 1115 South Hope St., Los Angeles, Calif.
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.
Phil-American, Inc., 528 E. 72nd St., New York 21, N. Y.
Philco Corporation, Philadelphia, Pa.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Pilot Radio Corp., 37-06 36th St., Long Island City, N. Y.
Precision Specialties, 220 North Western Ave., Los Angeles, Calif.
Press Wireless, Inc., Hicksville, L. I., N. Y.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Radio Corp., of America, Camden, N. J.
Radio Craftsmen, 1341 S. Michigan Ave., Chicago 5, Ill.
Radio Engineering Laboratories, Inc., 35-54 36th St., Long Island City, N. Y.
Radio Mfg. Engineers, Inc., 304 First Ave., Peoria, Ill.
Radio Navigational Instrument Corp., 500 Fifth Ave., New York, N. Y.
Radio Receptor Co., 251 West 19th St., New York, N. Y.
Radio Transceiver Laboratories, Inc., 8627 115th St., Richmond Hill, N. Y.
Radiomarine Corp. of America, 75 Varick St., New York, N. Y.
Record-O-Vox, Inc., 1379 East 8th St., Brooklyn, N. Y.
Remler Corp., 2101 Bryant St., San Francisco, Calif.
Richardson-Allen Corp, 15 West 20th St., New York 11, N. Y.
Sargent Co., E. M., 212 Ninth St., Oakland, Calif.
Schuttig & Co., 9th & Kearney Sts., N. E., Washington 24, D. C.
Scott Labs, Inc., E. H., 4450 Ravenswood Ave., Chicago, Ill.
Sentinel Radio Corp., 2020 Ridge Ave., Evanston, Ill.
Setchell Carlson, Inc., 2233 University Ave., St. Paul 4, Minn.
Sheridan Electro Corp., 2850 S. Michigan Ave., Chicago, Ill.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Signal Electronic & Mfg. Co., 139 Lafayette St., New York, N. Y.
Sonora Radio & Television Corp., 2926 W. Washington St., Chicago 28, Ill.
Sparks-Withington Co., North St., Jackson, Mich.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago, Ill.
Stromberg Carlson Telephone Mfg. Co., 100 Carlson Rd., Rochester, N. Y.
Technical Devices Corp. Bloomfield, N. J.
Technical Radio Co., 279 Ninth St., San Francisco, Calif.

ELECTRONIC and ALLIED PRODUCTS

Templetone Radio Co., Mystic, Conn.
Transmitting Equipment Mfg. Co., Inc., 345 Hudson St., New York, N. Y.
Trav-Ler Karenola Radio & Television Corp., 1036 W. Van Buren St., Chicago, Ill.
Trebor Radio Co., Pasadena, Calif.
United Cinephone Corp., Torrington, Conn.
U. S. Television Mfg. Corp., 106 Seventh Ave., New York 11, N. Y.
Victory Radio Corp., 155 West 72nd St., New York, N. Y.
Walsh Engineering Co., 34 De Hart Place, Elizabeth, N. J.
Warwick Mfg. Co., 4640 W. Harrison St., Chicago, Ill.
Watterson Radio Mfg. Co., P. O. Box 54, Dallas 1, Texas
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago, Ill.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., Radio X-Ray Div., Baltimore, Md.
Wilcox Electric Co., 1400 Chestnut St., Kansas City, Mo.
Wilcox-Gay Corp., Charlotte, Mich.
Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

RADIO COMPASS RECEIVERS

Air Communications, Inc., 2233 Grand Ave., Kansas City, Mo.
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kansas
Airplane & Marine Instruments, Inc., Clearfield, Pa.
Andrea Radio Corp., 43-20 24th St., Long Island City, N. Y.
Ansley Radio Corp., 21-10 49th Ave., Long Island City, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bassett, Inc., Rex, 500 S. E. Second St., Ft. Lauderdale, Fla.
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago 39, Ill.
Bendix Radio Div. of Bendix Aviation Corp., Baltimore, Md.
Crosley Corp., 1329 Arlington St., Cincinnati 3, Ohio
Erie Art Metal Co., 1602 East 18th St., Erie, Pa.
Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Finch Telecommunications, Inc., Passaic, N. J.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Cal.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
Grady Instrument Co., 11 Bailey Ave., Watertown 72, Mass.
Gray Radio Co., 730 Okeeshobee Rd., West Palm Beach, Fla.
Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Islip Radio Manufacturing Corp., Inc., Islip, New York
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, L. I., N. Y.
Jefferson-Travis Radio Mfg. Corp., 380 Second Ave., New York, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Lear-Avia, Inc., 1718 Broadway, Piqua, Ohio
Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
Panoramic Radio Corp., 242 W. 55th St., New York 19, N. Y.
Press Wireless, Inc., Hicksville, L. I., N. Y.
Radio Corp. of America, Camden, N. J.
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Washington
Radio Mfg. Engineers, Inc., 304 First Ave., Peoria, Ill.
Radio Navigational Instrument Corp., 500 Fifth Ave., New York, N. Y.
Radiomarine Corp. of America, 75 Varick St., New York, N. Y.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Sargent Co., E. M., 212 Ninth St., Oakland, Calif.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Technical Radio Co., 279 Ninth St., San Francisco, Calif.
U. S. Television Manufacturing Corp., 106 Seventh Ave., New York 11, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Western Electric Co., 195 Broadway, New York, N. Y.
Wilcox Electric Co., 1400 Chestnut St., Kansas City, Mo.

FACSIMILE RECEIVERS

Alden Products Co., 117 Main St., Brockton, Mass.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Finch Telecommunications, Inc., Passaic, N. J.
General Electric Co., Schenectady, N. Y.
Press Wireless, Inc., 1917 Tribune Tower, Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.
Wilcox Gay Corp., Charlotte, Mich.

Record Changers

see Changers, Record

Record Players

see Phonographs

Recorders

see Indicators

FREQUENCY RECORDERS

Audio Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Conn Ltd., C. G., Elkhart, Ind.
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Schuttig & Co., 9th & Kearney Sts. N. E., Washington 24, D. C.
Sound Apparatus Co., 150 W. 46th St., New York, N. Y.
White Research, 899 Boylston St., Boston, Mass.

Recorders, Sound

RECORDERS and CUTTING HEADS

Allied Recording Products Co., 21-09 43rd Ave., Long Island City 1, N. Y.
Amertype Recordgraph Corp., 333 W. 52nd St., New York 19, N. Y.
Andrea Radio Corp., 43-20 24th St., Long Island City, N. Y.
Annis Co., R. B., 1101 N. Delaware St., Indianapolis 2, Ind.
Astatic Corp., 830 Market St., Youngstown, Ohio
Audak Co., Inc., 500 Fifth Ave., New York, N. Y.
Audio-Tone Oscillator Co., 237 John St., Bridgeport, Conn.
Autocraft Radio Co., 3855 N. Hamilton Ave., Chicago, Ill.
Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Boetsch Brothers, 221 E. 144th St., New York 51, N. Y.
Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Dictaphone Corp., 420 Lexington Ave., New York, N. Y.
Dossert & Co., 242 W. 41st St., New York, N. Y.
Duotone Co., 799 Broadway, New York, N. Y.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y.
Federal Instrument Co., 3931-45th Ave., Long Island City 4, N. Y.
Federal Recorder Co., Elkhart, Ind.
Galvin Mfg. Corp., 4545 W. Augusta Blvd., Chicago 51, Ill.
Garod Radio Corp., 70 Washington St., Brooklyn, N. Y.
Gates Radio Co., 220 Hampshire St., Quincy, Ill.
General Electic Co., Schenectady, N. Y.
General Industries Co., Taylor & Olive Sts., Elyria, Ohio
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Gray Mfg. Co., 16-30 Arbor St., Hartford, Conn.
Halstead Traffic Communications Corp., 155 East 44th St., New York, N. Y.
Howard Radio Co., 1735 Belmont Ave., Chicago 13, Ill.
Jefferson-Travis Radio Mfg. Co., 245 East 23rd St., New York, N. Y.
Lear Avia, Inc., 1718 Broadway, Piqua, Ohio
Memovox, Inc., 9242 Beverly Blvd., Beverly Hills, Calif.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Montgomery Bros., 61 Fremont St., San Francisco, Calif.
Music Master Mfg. Co., 542 S. Dearborn St., Chicago 21, Ill.
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Proctor Co., B. A., 2 W. 45th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.
Radiotone Div., Robinson Houchin Optical Co., Columbus, Ohio
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Rek-O-Kut Co., 173 Lafayette St., New York 13, N. Y.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Robinson Recording Laboratories, 35 S. Ninth St., Philadelphia, Pa.
Scully Machine Co., 62 Walter St., Bridgeport, Conn.
Shure Bros., 225 W. Huron St., Chicago, Ill.
Simpson Mfg. Co., Inc., Mark, 188 W. 4th St., New York, N. Y.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago, Ill.
Sound Apparatus Co., 150 W. 46th St., New York, N. Y.
Sound Scriber Corp., 82 Audubon St., New Haven, Conn.
Speak-O-Phone Recording & Equipment Co., 23 W. 60th St., New York, N. Y.
Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago, Ill.
Talking Devices Co., 4447 W. Irving Park Rd., Chicago, Ill.
United Sound Engrg. Co., 6642 Santa Monica Blvd., Hollywood, Calif.
Webster Electric Co., 1900 Clark St., Racine, Wisc.
Webster Products, 3825 Armitage Ave., Chicago 47, Ill.
Western Sound & Electric Laboratories, Inc., 3512 W. St. Paul Ave., Milwaukee, Wisc.
Wilcox-Gay Corp., Charlotte, Mich.

NOISE RECORDERS

Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Electronic Supply Co., 207 Main St., Worcester, Mass.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.

PH Recorders

see PH Meters

Recording Blanks

see Discs

Records

PHONOGRAPH RECORDS

Audio Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Carillitone Corp., 30 N. Penn St., York, Pa.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Classic Record Co., 2 West 46th St., New York, N. Y.
Columbia Recording Corp., 1473 Barnum Ave., Bridgeport, Conn.
Decca Records, Inc., 50 West 57th St., New York, N. Y.
Poinsetta, Inc., 95 Cedar Ave., Pitman, N. J.
Radio Corp. of America, Camden, N. J.
Riggs & Jeffreys, Inc., 73 Winthrop St., Newark 4, N. J.
Robinson Recording Laboratories, 35 S. Ninth St., Philadelphia, Pa.
Sonart Record Corp., 251 West 42nd St., New York 18, N. Y.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Stark Sound Engrg. Corp., P. O. 493, Fort Wayne 1, Ind.
Talking Devices Co., 4451 W. Irving Park Rd., Chicago, Ill.
World Broadcasting System, 711 Fifth Ave., New York 22, N. Y.

Rectifiers

see also Tubes

DRY DISC RECTIFIERS

American Battery Co., 17 S. Jefferson St., Chicago, Ill.
American Television & Radio Co., 300 E. Fourth St., St. Paul, Minn.
American Transformer Co., 178 Emmet St., Newark, N. J.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Benwood Linze Co., 1815 Locust St., St. Louis, Mo.
Bradley Labs., Inc., 82 Meadow St., New Haven, Conn.
Conant Electrical Labs, Lincoln, Nebr.
Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.
Electrcoil Transformer Co., 421 Canal St., New York, N. Y.
Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill.
Electron Equipment Corp., 917 Meridian Ave., S. Pasadena, Calif.
Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
General Electric Co., Bridgeport, Conn.
General Radio Co., 30 State St., Cambridge 39, Mass.
Good-All Electric, 320 N. Spruce St., Ogalala, Nebr.
Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.
Green Electric Co., Inc., W., 130 Cedar St., New York 6, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
McColpin-Christie Corp., Ltd., 4922 S. Fiqueroa St., Los Angeles 37, Calif.
McInerney Plastics Co., 655 Godfrey Ave. S. W., Grand Rapids, Mich.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Schauer Machine Co., 2060 Reading Rd., Cincinnati 2, Ohio
Selenium Corp. of America, 1719 W. Pico Blvd., Los Angeles 15, Calif.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Freylinghuysen Ave., Newark 5, N. J.

Rectifiers, Tube

Allis Chalmers Mfg. Co., Milwaukee, Wisc.
American Battery Co., 17 S. Jefferson St., Chicago, Ill.
American Transformer Co., 178 Emmet St., Newark, N. J.
Arpin Mfg. Co., 422 Alden St., Orange, N. J.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Baldor Electric Co., 4353 Duncan Ave., St. Louis, Mo.
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Continental Electric Co., 903 Merchandise Mart, Chicago 56, Ill.
Eitel-McCullough, Inc., San Bruno, Calif.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Electro Product Laboratories, 549 W. Randolph St., Chicago, Ill.
Electron Equipment Corp., 917 Meridian Ave., South Pasadena, Calif.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
Electrons, Inc., 127 Sussex Ave., Newark, N. J.
Eureka X-Ray Tube Corp., 3250 N. Kilpatrick Ave., Chicago, Ill.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
France Mfg. Co., 10325 Berea Rd., Cleveland, Ohio
General Electric Co., Bridgeport, Conn.
Green Electric Co., Inc., W., 130 Cedar St., New York 6, N. Y.
Hytron Corp., 76 Lafayette St., Salem, Mass.
Kalb Electric Co., 2711 Big Bend Blvd., St. Louis, Mo.
Lewis Electronics, Inc., Los Gatos, Calif.
McColpin-Christie Corp., Ltd., 4922 S. Figueroa St., Los Angeles 37, Calif.
Master Electric Co., 126 Davis Ave., Dayton, Ohio
Mellaphone Corp., 65 Atlantic Ave., Rochester, N. Y.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Richardson-Allen Corp., 15 W. 20th St., New York, N. Y.
Sohuttig & Co., 9th & Kearney Sts. N. E., Washington, D. C.
Selenium Corp. of America, 1800 West Pico Blvd., Los Angeles, Calif.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York, N. Y.
Weltronic Co., 20735 Grand River Ave., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Regulators

see also Transformers
also Tubes

VOLTAGE REGULATORS and STABILIZERS

Acme Electric & Mfg. Co., 31 Water St., Cuba, N. Y.
Aerolux Light Corp., 653 Eleventh Ave., New York, N. Y.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Avia Products Co., 749 N. Highland, Los Angeles, Cal.
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn 1, N. Y.
Control Corp., 600 Stinson Blvd., Minneapolis, Minn.
Eclipse Aviation Div. of Bendix Aviation Corp., Bendix, N. J.
Electric Auto-Lite Co., Toledo, Ohio
Electric Sorting Machine Co., 802 Michigan Trust Bldg., Grand Rapids, Mich.
Electron Equipment Corp., 917 Meridian Ave., S. Pasadena, Calif.
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Products Co., 19 North First St., Geneva, Ill.
Ferranti Electric, 30 Rockefeller Plaza, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Hytron Corp., 76 Lafayette St., Salem, Mass.
International Transformer Co., 396 Broadway, New York, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Kurman Electric Co., 3030 Northern Blvd., Long Island City, N. Y.
Leland Electric Co., 1501 Webster St., Dayton, Ohio
Philadelphia Thermometer Co., 6th & Cayuga Sts., Philadelphia, Pa.
Radio Corp. of America, Camden, N. J.
Radionic Controls, 3758 Belmont Ave., Chicago 18, Ill.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Richardson-Allen Corp., 15 W. 20th St., New York, N. Y.
Skaggs Transformer Co., 5894 Broadway, Los Angeles, Cal.
Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
Sundt Engrg. Co., 4757 Ravenswood Ave., Chicago, Ill.
Superior Electric Co., 83 Laurel St., Bristol, Conn.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York, N. Y.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
United Transformer Co., 150 Varick St., New York, N. Y.
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Webster Products, 3825 Armitage Ave., Chicago 47, Ill.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.
Wirt Co., 5221 Greene St., Philadelphia, Pa.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

Relays

CAPACITY OPERATED RELAYS

Auth Electrical Specialty Co., Inc., 422 E. 53 St., New York 22, N. Y.
Browning Labs., Inc., 750 Main St., Winchester, Mass.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Price Bros. Co., Frederick, Md.
Radio Corp. of America, Camden, N. J.
Sorensen & Co., 1 Grove St., Stamford, Conn.

HEAVY DUTY RELAYS

Adams & Westlake Co., Michigan St., Elkhart, Ind.
Advance Electric Co., 1260 W. 2nd St., Los Angeles, Calif.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
American Instrument Co., 8010 Georgia Ave., Silver Spring, Md.
Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Mfg. Co., 10 State St., Mankato, Minn.
Automatic Switch Co., 41 East 11th St., New York, N. Y.
Bendix Aviation Corp., Bendix, N. J.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
General Controls Co., 801 Allen Ave., Glendale, Cal.
General Electric Co., Schenectady, N. Y.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
H-B Electric Co., 6122 North 21st St., Philadelphia, Pa.

ELECTRONIC and ALLIED PRODUCTS

Johnson Corp., E. F., Waseca, Minn.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Kurman Electric Co., 35-18 37th St., Long Island City, N. Y.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.
Minneapolis-Honeywell Reg. Co., 2753 Fourth Ave., S., Minneapolis, Minn.
Monitor Controller Co., 51 S. Gay St., Baltimore 2, Md.
Penn Electric Switch Co., Goshen, Ind.
Price Bros. Co., Frederick, Md.
Philadelphia Thermometer Co., 6th & Cayuga Sts., Philadelphia, Pa.
Signal Engineering & Mfg. Co., 154 W. 14th St., New York, N. Y.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Struthers-Dunn, Inc., 1321 Arch St., Phila., Pa.
Tork Clock Co., 1 Grove St., Mt. Vernon, N. Y.
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

MERCURY RELAYS

Adams & Westlake, Michigan St., Elkhart, Ind.
American Instrument Co., 8010 Georgia Ave., Silver Spring, Md.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.
Brown Instrument Co., 4428 Wayne Ave., Philadelphia, Pa.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
General Electric Co., Schenectady, N. Y.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
H-B Electric Co., Inc., 6122 N. 21st St., Philadelphia, Pa.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford 2, Conn.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Philadelphia Thermometer Co., 6th & Cayuga Sts., Philadelphia, Pa.
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.

PHOTOELECTRIC RELAYS

Advance Electric Co., 1260 W. Second St., Los Angeles, Calif.
Aerolux Light Corp., 653 11 Avenue, New York, N. Y.
Allied Control Co., Inc., 2 East End Avenue, New York, N. Y.
American Instrument Co., 8010 Georgia Ave., Silver Spring, Md.
Audio Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Auth Electrical Specialty Co., Inc., 422 East 53rd St., New York 22, N. Y.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Eby Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
Electronic Control Corp., 625 Harper Ave., Detroit, Mich.
Electronic Laboratory, 306 S. Edinburgh Ave., Los Angeles, Cal.
Electronic Products Co., 19 N. First St., Geneva, Ill.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Good All Electric, 320 N. Spruce St., Ogala, Neb.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Cal.
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Parker Engineering Pdts. Co., 16 W. 22nd St., New York, N. Y.
Phil-American, Inc., 528 East 72nd St., New York 21, N. Y.
Photobell Corp., 116 Nassau St., New York 7, N. Y.
Photoswitch, Inc., 77 Broadway, Cambridge, Mass.
Radio Corp. of America, Camden, N. J.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
White Research, 899 Boylston St., Boston, Mass.
Worner Electronic Devices, Inc., 848 N. Noble Ave., Chicago, Ill.

PHOTOTUBE RELAYS

Advance Electric Co., 1260 W. Second St., Los Angeles, Calif.
Allied Control Co., Inc., 2 East End Avenue, New York 10, N. Y.
Auth Electrical Specialty Co., Inc. 422 E. 53 St., New York 22, N. Y.
Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Aerolux Light Corp., 653 11th Ave., New York, N. Y.
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Electronic Control Corp., 1573 Forest St., Detroit, Mich.
Electronic Products Co., 19 N. First St., Geneva, Ill.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago, Ill.
General Control Co., 1200 Soldiers Field Rd., Cambridge 2, Mass.
General Electric Co., Schenectady, N. Y.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Cal.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Parker Engineering Pdts. Co., 16 W. 22nd St., New York 10, N. Y.
Potter & Brumfield Mfg. Co., 617-621 No. Gibson St., Princeton, Indiana
Radio Corp. of America, Camden, N. J.
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
White Research, 899 Boylston St., Boston, Mass.

POLARIZED RELAYS

Allied Control Co., Inc., 2 East End Ave. New York, N. Y.
Auth Electrical Specialty Co., Inc., 422 East 53 St., New York 22, N. Y.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Barber-Colman Co., Rockford, Ill.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
L A B Corp., Summit, N. J.
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.
Signal Engrg. & Mfg. Co., 154 W. 14th St., New York, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SENSITIVE CONTROL RELAYS

Adams & Westlake Co., Michigan St., Elkhart, Ind.
Advance Electric Co., 1260 W. Second St., Los Angeles, Cal.
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
American Instrument Co., Silver Spring, Md.
Arrow-Hart & Hageman Elec. Co., Hartford, Conn.
Auth Electrical Specialty Co., Inc., 422 E. 53rd St., New York 22, N. Y.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Automatic Electric & Mfg. Co., 10 State St., Mankato, Minn.
Automatic Temperature Co., Inc., 34 E. Logan St., Philadelphia, Pa.
Bank's Mfg. Co., 1105 W. Lawrence Ave., Chicago, Ill.
Barber-Colman Co., Rockford, Ill.
Bendix Aircraft Corp., Bendix, N. Y.
Birtcher Corp., 5087 Huntington Drive, Los Angeles, Cal.
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Colt's Patent Fire Arms Mfg. Co., 1429 Park St., Hartford, Conn.
Control Corp., 600 Stinson Blvd., Minneapolis, Minn.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Dayton Acme Co., 930 York St., Cincinnati, Ohio
Eastern Air Devices, Inc., 585 Dean St., Brooklyn, N. Y.
Eitel-McCullough, Inc., San Bruno, Calif.
Electric Auto-Lite Co., Toledo 1, Ohio
Electlical Products Supply Co., 1140 Venice Blvd., Los Angeles 15, Calif.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago, Ill.
General Controls Co., 801 Allen Ave., Glendale, Calif.
General Electic Co., Schenectady, New York.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
H-B Electric Co. Inc., 6122 North 21st St., Philadelphia, Pa.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford, Conn.
Haydon Mfg. Co., Inc., Forestville, Conn.
Heyer Products Co., Inc., 481 Cortlandt St., Belleville 9, N. J.
Holtzer-Cabot, Signal Division, 400 Stuart St., Boston 17, Mass.
Jennings Radio Mfg. Co., San Jose, Cal.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Kurman Electric Co., 35-18 37th St., New York, N. Y.
Leach Relay Company, 5915 Avalon Blvd., Los Angeles, Calif.
Lewis Electronics, Inc., Los Gatos, Calif.
Magnetic Devices, Inc., Frederick, Md.
Mossman, Inc., Donald P., 6133 Northwest Highway, Chicago 31, Ill.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
North Electric Mfg. Co., 501 S. Market St., Galion, Ill.
Parker Engrg. Products Co., 16 West 22nd St., New York 10, N. Y.
Potter & Brumfield Mfg. Co., Princeton, Ind.
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.
Price Bros. Co., Frederick, Md.
R. B. M. Mfg. Co., Div. of Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Radionic Controls, 3758 Belmont Ave., Chicago 18, Ill.
Remler Corp., 2101 Bryant St., San Francisco 10, Calif.
Sigma Instruments, Inc., 70 Ceylon St., Boston 21, Mass.
Signal Engrg. & Mfg. Co., 154 W. 14th St., New York, N. Y.
Smith Mfg. Co., Inc., Nathan R., 105 Pasadena Ave., Pasadena, Cal.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Thordarson Electric & Mfg. Co., 500 W. Huron St., Chicago, Ill.
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.

United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Wallace & Tiernan Products, Inc., Belleville, N. J.
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.
Warrick, Chas. F., 16251 Hamilton Ave., Detroit 3, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Feylinghuysen Ave., Newark 5, N. J.

STEPPING RELAYS

Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Guardian Electic Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 30, Ill.
North Electric Mfg. Co., 501 S. Market St., Galion, Ill.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Signal Engrg. & Mfg. Co., 154 West 14th St., New York, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.

TELEPHONE RELAYS

Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
Auth Electrical Specialty Co., Inc., 422 East 53rd St., New York 32, N. Y.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago, Ill.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford 2, Conn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kurman Electric Co., 35-18 37th St., Long Island City, N. Y.
Lake Mfg. Co., 2323 Chestnut St., Oakland, Calif.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.
Leich Electric Co., 565 W. Washington Blvd., Chicago 6, Ill.
Miles Reproducer Co., Inc., 812 Broadway New York, N. Y.
North Electric Mfg. Co., 501 S. Market St., Galion, Ill.
Parker Engineering Products Co., 16 West 22nd St., New York 10, N. Y.
Potter & Brumfield Mfg. Co., Princeton, Ind.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Radionic Controls, 3758 Belmont Ave., Chicago 18, Ill.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Signal Engrg. & Mfg. Co., 154 West 14th St., New York, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Western Electro-Mechanical Co., Inc., 300 Broadway, Oakland, Calif.

TIME DELAY RELAYS

Adams & Westlake Co., Michigan St., Elkhart, Ind.
Advance Electric Co., 1260 W. Second St., Los Angeles, Calif.
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Allied Contol Co., Inc., 2 East End Ave., New York, N. Y.
American Gas Accumulator Co., 1029 Newark Ave., Elizabeth, N. J.
Amperite Co., 561 Broadway, New York, N. Y.
Auth Electrical Specialty Co., Inc., 422 E. 53rd St., New York 22, N. Y.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Clark Controller Co., 1146 E. 152nd St., Cleveland, Ohio
Controls, Inc., Towaco, N. J.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Cramer Co., R. W., Centerbrook, Conn.
Curtis Development & Mfg. Co., 1 N. Crawford Ave., Chicago 24, Ill.
Dayton Acme Co., 930 York St., Cincinnati, Ohio
Eagle Signal Corp., Moline, Ill.
Edison, Inc., Thomas A., Instrument Div., 51 Lakeside Ave., West Orange, N. J.
Electronic Products Co., 19 North First St., Geneva, Ill.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago 32, Ill.
General Electric Co., Schenectady, N. Y.
Gibbs & Co., Thomas B., Div. of George W. Borg Corp., 814 Michigan St., Delavan, Wisc.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
H-B Electric Co., 6122 N. 21st St., Philadelphia, Pa.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford 2, Conn.
Hatton Co., Arthur T., 410 Asylum St., Hartford, Conn.
Haydon Mfg. Co., Forestville, Conn.
Holtzer-Cabot Signal Division, 400 Stuart St., Boston 17, Mass.
Industrial Timer Corp., 117 Edison Pl., Newark 5, New Jersey
Kurman Electric Co., 35-18 37th St., Long Island City, N. Y.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Magnetic Devices, Inc., Frederick, Md.
Magnetic Gauge Co., 60 E. Bartges St., Akron, Ohio
Monitor Controller Co., 51 S. Gay St., Baltimore 2, Md.
New Haven Clock Co., New Haven 4, Conn.
North Electric Mfg. Co., 501 S. Market St., Galion, Illinois
Paragon Eectric Co., 37 W. Van Buren St., Chicago, Ill.
Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Photobell Corp., 116 Nassau St., New York 7, N. Y.
Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.
Photovolt, 95 Madison Ave., New York, N. Y.
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Price Bros. Co., Frederick, Md.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.
Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford, Conn.
Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Sigma Instruments, Inc., 70 Ceylon St., Boston 21, Mass.
Signal Engrg. & Mfg. Co., 154 W. 14th St., New York, N. Y.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
Square D Co., 6060 Rivard St., Detroit, Mich.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
United Cinephone Corp., 65 New Litchfield, Torrington, Conn.
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
White-Rodgers Electric Co., 1209 Cass Ave., St. Louis, Mo.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

VACUUM CONTACT RELAYS

Edison, Inc., Thomas A., Instrument Div., 51 Lakeside Ave., W. Orange, N. J.
Eitel-McCullough, Inc., San Bruno, Calif.
General Electric Co., Schenectady, N. Y.
H-B Electric Co., 6122 N. 21st St., Philadelphia, Pa.
Industrial & Commercial Electronics, Belmont, Calif.
Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, N. Hollywood, Calif.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.

Repairs, Tube

see Tube Repairs

Resistors

COMPOSITION FIXED RESISTORS

Acme Electric Heating Co., 1217 Washington St., Boston, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Atlas Resistor Co., 423 Broome St., New York, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Cinema Engineering Co., 1508 W. Verdugo Ave, Burbank, Calif.
Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn 1, N. Y.
Continental Carbon Inc., 13900 Lorain Ave., Cleveland, Ohio
Cutler-Hammer, Inc., 1401 W. St. Paul Ave., Milwaukee, Wisc.
Daven Co., 191 Central Ave., Newark 4, N.J.
Erie Resistor Corp., 540 W. 12 St., Erie, Pa.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Globar Div. Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Haines Mfg. Co., 248 McKibben St., Brooklyn, N. Y.
Hardwick Hindle Inc., 40 Hermon St., Newark, N. J.
Industrial Instruments, Inc., 156 Culver St., Jersey City 5, N. J.
Instrument Resistors Co., Little Falls, N. J.
International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Madison Electrical Prods. Corp., Madison, N. J.
Mallory & Co., Inc., P. R., 3029 E. Washington St., Philadelphia, Pa.
Monitor Controller Co., 51 S. Gay St., Baltimore 2, Md.
Muter Co., 1255 S. Michigan St., Chicago, Ill.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Ohmite Manufacturing Co., 4835 W. Flournoy St., Chicago, Ill.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Precision Resistor Co., 334 Badger Ave., Newark, N. J.
Rex Rheostat Co., 3 Foxhurst Rd., Baldwin, N. Y.
Schaefer Bros. Co., 1059 W. 11th St., Chicago, Ill.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Speer Resistor Corp., St. Mary's, Pa.
Sprague Electric Co., North Adams, Mass.
Stackpole Carbon Co., Tannery St., St. Mary's, Pa.
States Co., 19 New Park Ave., Hartford 2, Conn.
Tuttle & Co., H. W., 261 W. Maumee St., Adrian, Mich.
Variaten Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.
White Dental Manufacturing Co., S. S. (Industrial Div.) 10 E. 40th St., New York, N. Y.
Wirt Co., 5221 Greene St., Philadelphia, Pa.
Wright Resistors, 7 West 30th St., New York 1, N. Y.

ELECTRONIC and ALLIED PRODUCTS

VARIABLE RESISTORS

Potentiometers and Rheostats

A. B. C. Products, Inc., 11952 Montana Ave., W. Los Angeles, Calif.
Acme Electric Heating Co., 1217 Washington St., Boston, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wis.
American Instrument Co., 8030 Georgia Ave., Silver Springs, Md.
Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland, Ohio
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Bristol Co., Waterbury 91, Conn.
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wisc.
Central Scientific Co., 1700 Irving Park Rd., Chicago, Ill.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Chicago Telephone Supply Co., 1142 W. Beardsley Ave., Elkhart, Ind.
Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn, N. Y.
Curtis Development & Mfg. Co., 1 N. Crawford Ave., Chicago 24, Ill.
DeJur-Amsco Corp., 6 Bridge St., Shelton, Conn.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eastern Specialty Co., 3619 N. Eighth St., Philadelphia, Pa.
Electronic Products Co., 19 N. First St., Geneva, Ill.
Foxboro Co., Neponset Ave., Foxboro, Mass.
Gamma Instruments Co., Inc., 95 Madison Ave., New York 16, N. Y.
General Electric Co., Schenectady, New York
General Radio Co., 30 State St., Cambridge 39, Mass.
Gray Instrument Co., 64½ W. Johnson St., Philadelphia, Pa.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y
Hardwick, Hindle, Inc., 40 Hermon St., Newark, N. J.
International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Lewis Engineering Co., Naugatuck, Conn.
Madison Electrical Prods. Corp., Madison, N. J.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Mossman, Inc., Donald P., 6133 Northwest Highway, Chicago, Ill.
National Electric Controller Co., 5307 Ravenswood Ave., Chicago, Ill.
National Technical Laboratories, 820 Mission St., South Pasadena, Calif.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Ohmite Manufacturing Co., 4835 W. Flournoy St., Chicago, Ill.
Rex Rheostat Co., 3 Foxboro Rd., Baldwin, N. Y.
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago 39, Ill.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Schaefer Bros. Co., 1059 W. 11th St., Chicago, Ill.
Shallcross Mfg., Co., 10 Jackson Ave., Collingdale, Pa.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Sticht Co., Inc., Herman H., 27 Park Place, New York, N. Y.
Tagliabue Mfg. Co., C. J., 540 Park Ave., Brooklyn 5, N. Y.
Tech Laboratories, 7 Lincoln St., Jersey City, N. J.
Thwing-Albert Instrument Co., Penn St., & Pulaski Ave., Philadelphia 4, Pa.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Variaten Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Wheelco Instruments Co., 847 W. Harrison St., Chicago, Ill.
Wirt Co., 5221 Greene St., Philadelphia, Pa.
Wright Machine Tool Corp., 7 West 30th St., New York, N. Y.

WIRE WOUND RESISTORS

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.
Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Clarostat Mfg. Co., 130 Clinton St., Brooklyn, N. Y.
Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio
Cutler-Hammer, Inc., 1401 W. St. Paul Ave., Milwaukee, Wisc.
Daven Co., 191 Central Ave., Newark 4, N. J.
DeJur Amsco Corp., 6 Bridge St., Shelton, Conn.
Eagle Electric Mfg. Co., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Elco Resistors Co., 112 W. 18th St., New York, N. Y.
Electrical Reactance Corp., Franklinville, N. Y.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge 39, Mass.
Groves Corporation, Cape Girardeau, Mo.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hardwick Hindle, Inc., 40 Hermon St., Newark, N. J.
Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, Calif.
Industrial Instruments Inc., 156 Culver Ave., Jersey City 5, N. J.
Instrument Resistors, Inc., 25 Amity St., Little Falls, N. J.
International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Lectrohm, Inc., 5125 W. 25th Pl. Cicero, Ill.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Madison Electrical Products Corp., Madison, N. J.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Marion Instrument Co., Manchester, N. H.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn 6, N. Y.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
National Electric Controller Co., 5307 Ravenswood Ave., Chicago, Ill.
Nilsson Electrical Laboratory, Inc., 103 Lafayette St., New York 13, N. Y.
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago, Ill.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Precision Resistor Co., 334 Badger Ave., Newark, N. J.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Reimers Electric Co., Inc., 596-56th St., West New York, N. J.
Rex Rheostat Co., 3 Foxhurst Rd., Baldwin, N. Y.
Schaefer Bros. Co., 1059 W. 11th St., Chicago, Ill.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Sprague Electric Co., North Adams, Mass.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Variaten Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wirt Co., 5221 Greene St., Philadelphia, Pa.
Wright Machine & Tool Corp., 7 W. 30th St., New York, N. Y.

Rheostats

see Variable Resistors

Rings, Oil Sealing

Sealol Corp., 45 Willard St., Providence, R. I.

Rivets

American Brass Co., Waterbury, Conn.
Atlas Tack Corp., Pleasant St., Fairhaven, Mass.
Blake & Johnson Co., 1495 Thomaston Ave., Waterville, Conn.
Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn.
Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif.
Chicago Rivet & Machine Co., 9600 W. Jackson Blvd., (Bellwood) Chicago, Ill.
Clark Bros. Bolt Co., Milldale, Conn.
Clendenin Bros., 108 South St., Baltimore, Md.
Cobb & Drew, Kingston St., Plymouth, Mass.
Harper Co., H. M., 2630 Fletcher St., Chicago, Ill.
Hassal, Inc., John, Clay & Oakland Sts., Brooklyn, N. Y.
Manufacturer's Belt Hook Co., 1321 W. Congress St., Chicago, Ill.
Manufacturers' Screw Products, 216 W. Hubbard St., Chicago, Ill.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 470 Bank St., Waterbury, Conn.
Progressive Mfg. Co., 52 Norwood St., Torrington, Conn.
Reed & Prince Mfg. Co., Duncan Ave., Worcester, Mass.
Scovill Mfg. Co., 99 Mill St., Waterbury, Conn.
Stimpson Co., Edwin B., 74 Franklin Ave., Brooklyn, N. Y.
Tubular Rivet & Stud Co., Wollaston, Mass.

Saws Crystal

see Crystal Finishing Equipment

Scales

DIAL SCALES

see also Dials

also Escutcheons

American Emblem Co., Utica., N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Austin Co., O., 42 Greene St., New York, N. Y.
Barker & Williamson, Upper Darby, Pa.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cardy-Lundmark Co., 1801 W. Byron St., Chicago 13, Ill.
Chatillion & Sons, John, 85–93 Cliff St., New York, N. Y.
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Etched Products Corp., 3901 Queens Blvd., Long Island City, N. Y.
Emeloid Co., Inc., 287 Laurel Ave., Arlington, N. J.
Felsenthal & Sons, G., 4122 W. Grand St., Chicago 49, Ill.
Gemloid Corp., 79–10 Albion Ave., Elmhurst, N. Y.
General Electric Co., Schenectady, N. Y.
Grammes & Sons., Inc., L. F., 366 Union St., Allentown 2, Pa.
Hopp Press, Inc., 460 West 34th St., New York, N. Y.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
Parisian Novelty Co., 3510 S. Western Ave., Chicago 9, Ill.
Syracuse Ornamental Co., 581 So. Clinton St., Syracuse, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.

Screws

RECESSED HEAD SCREWS

Allen Mfg. Co., Hartford, Conn.
American Screw Co., 21 Stevens St., Providence, R. I.

Atlantic Screw Works, Hartford, Conn.
Bristol Co., Waterbury 91, Conn.
Central Screw Co., 3511 Shields Ave., Chicago, Ill.
Chandler Products Co., 1475 Chardon Rd., Cleveland, Ohio
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., High, Myrtle & Grove Sts., New Britain, Conn.
Federal Screw Products Co., 224 W. Huron St., Chicago 17, Ill.
General Screw & Mfg. Co., 1234 W. Monroe St., Chicago, Ill.
Harper Co., H. M., 2620 Fletcher St., Chicago, Ill.
Hartford Machine Screw Co., Hartford, Conn.
Industrial Screw & Supply Co., 713 W. Lake St., Chicago 25, Ill.
International Screw Co., 9444 Roselawn Ave., Detroit, Mich.
Lamson & Sessions Co., 1971 W. 85th St., Cleveland, Ohio
Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.
Milford Rivet & Machine Co., Milford, Conn.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, Ohio
New England Screw Co., 109 Emerald St., Keene, N. H.
Parker Co., Chas., Meriden, Conn.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago 50, Ill.
Progressive Mfg. Co., Torrington, Conn.
Reading Screw Co., Norristown, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Midland Ave., Port Chester, N. Y.
Scovill Mfg. Co., 99 Mill St., Waterville 91, Conn.
Shakeproof, Inc., 2501 N. Keeler Ave., Chicago 39, Ill.
Southington Hdwe. Mfg. Co., Southington, Conn.
Sterling Bolt Co., 209 W. Jackson Blvd., Chicago, Ill.
United Screw & Bolt Corp., 2513 W. Cullerton St., Chicago, Ill.
Whitney Screw Co., Nashua, N. H.

SET and CAP SCREWS

Allen Mfg. Co., Hartford, Conn.
Bristol Co., Waterbury 91, Conn.
Chandler Products Corp., 1475 Chardon Rd., Cleveland, Ohio
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., High, Myrtle & Grove Sts., New Britain, Conn.
Federal Screw Products Co., 224 W. Huron St., Chicago 17, Ill.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
Harper Co., H. M., 2620 Fletcher St., Chicago, Ill.
Hartford Machine Screw Co., Hartford, Conn.
Hassall, Inc., John, Clay & Oakland Sts., Brooklyn 22, N. Y.
Industrial Screw & Supply Co., 713 W. Lake St., Chicago 25, Ill.
Lamson & Sessions Co., 1971 W. 85th St., Cleveland, Ohio
Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland 4, Ohio
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago 50, Ill.
Progressive Mfg. Co., Torrington, Conn.
Republic Steel Corp., Republic Bldg. Cleveland, Ohio
Russell, Burdsall & Ward Bolt & Nut Co Midland Ave., Port Chester, N. Y.
Shakeproof, Inc., 2501 N. Keelor Ave., Chicago 39, Ill.
Standard Pressed Steel Co., Jenkintown, Pa.
Sterling Bolt Co., 209 W. Jackson Blvd., Chicago, Ill.

Seals, Hermetic

Federal Electric Co., Inc., 8700 S. State St., Chicago 19, Ill.
Sperti, Inc., Beach & Kenilworth Aves., Cincinnati 12, Ohio

Selsyms

Bendix Aviation Corp., Bendix, N. J.
Control Instrument Co., Inc., 67 35th St., Brooklyn, N. Y.
Delco Products Div., Dayton, Ohio
Diehl Mfg. Co., Somerville, N. J.
Electric Engineering & Mfg. Co., Los Angeles, Calif.
Electric Specialty Co., Stamford, Conn.
Electrical Engineering & Mfg. Corp., 4606 W. Jefferson Blvd., Los Angeles 16, Calif.
Electrolux Corp., Old Greenwich, Conn.
Electromatic Typewriters, Inc., Rochester, N. Y.
General Electric Co., Fort Wayne, Ind.
Hobart Mfg. Co., Troy, Ohio
Packard-Electric Div., General Motors Corp., Warren, Ohio

Shafts

FLEXIBLE SHAFTS

Breeze Corp., 41 S. Sixth St., Newark, N. J.
Chicago Flexible Shaft Co., 5600 Roosevelt Rd., Chicago, Ill.
Coates Clipper & Mfg. Co., 237 Chandler St., Worcester, Mass.
Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, Ill.
Foredom Electric Co., 27 Park Place, New York 7, N. Y. (flexible shaft grinders)
Haskins Co., R. G., 615 S. California St., Chicago, Ill.
Invincible Tool Co., 611 Empire, Pittsburgh 22, Pa.
J. F. D. Mfg. Co., 4111 Ft. Hamilton Pkwy., Brooklyn, N. Y.
Lear Avia, Inc., 1718 Broadway, Piqua, Ohio
Linick & Co., Leslie L., 29 E. Madison St., Chicago, Ill.
Martindale Electric Co., 1371 Hird Ave., Cleveland, Ohio
Stewart Mfg. Corp., F. W., 4311 Ravenswood Ave., Chicago, Ill.
Stow Mfg. Co., 445 State St., Binghamton, N. Y.
Walker-Turner Co., 1463 Berckman St., Plainfield, N. J.
White Dental Mfg. Co., S. S. (Industrial Div.), 10 E. 40th St., New York, N. Y.

Shields

TUBE SHIELDS

Aluminum Goods Mfg. Co., Manitowoc, Wisc.
American Brass Co., Waterbury, Conn.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway, S., Mt. Vernon, N. Y.
Bud Radio, Inc., 2118 East 55th St., Cleveland, Ohio
Erie Can Co., 816 W. Erie St., Chicago, Ill.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn, N. Y.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Guthman & Co., Edwin I., 15 S. Throop St., Chicago, Ill.
Hegeler Zinc Co., Danville, Ill.
J. F. D. Mfg. Co., 4111 Ft. Hamilton Parkway, Brooklyn, N. Y.
National Co., 61 Sherman St., Malden, Mass.
Paul & Beekman, 18th & Cortland Sts., Philadelphia, Pa.
Rice's Sons, Inc., Bernard, 325 Fifth Avenue, New York 16, N. Y.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Union Aircraft Products Corp., 380 Second Ave., New York, N. Y.

Shunts

AMMETER SHUNTS

Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.
Avia Products Co., 749 N. Highland, Los Angeles, Calif.
Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
Federal Instrument Co., 3931 Fourth Ave., Long Island City 4, N. Y.
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Instrument Resistors, Inc., 25 Amity St., Little Falls, N. J.
International Resistance Co., 401 N. Broad St., Philadelphia 44, Pa.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia, Pa.
Marion Electric Instrument Co., Manchester, N. H.
Norton Electrical Instrument Co., 79 Hilliard St., Manchester, Conn.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago, Ill.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Freylinghuysen Ave., Newark 5, N. J.

Sleeves and Tubes, Cathode

General Plate Co., Attleboro, Mass. (seamless tubing)
Precision Co., Irvington, N. J. (lockseam type)
Radio Corp. of America, Camden, N. J. (lockseam type)
Superior Tube Co., Norristown, Pa. (lapseam, lockseam, seamless type)

Sockets

DIAL LIGHT SOCKETS

Alden Products Co., 117 Main St., Brockton, Mass.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Dial Light Co. of America, 900 Broadway, New York 3, N. Y.
Drake Mfg. Co., 1713 Hubbard St., Chicago, Ill.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Franklin Mfg. Co., A. W., 175 Varick St., New York, N. Y.
General Electric Co., Bridgeport, Conn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., 30 South St., Mt. Vernon, N. Y.
National Fabricated Products, 2650 Belden Ave., Chicago 4, Ill.
Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.
Ucinite Co., 459 Watertown St., Newtonville, Mass.
United-Carr Fastener Corp., 31 Ames St., Cambridge 42, Mass.

TUBE SOCKETS

Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Alden Products Co., 117 Main St., Brockton, Mass.
American Brass Co., Waterbury, Conn.
American Metal Products Co., 315 Berry St., Brooklyn, N. Y.
American Phenolic Corp., 1830 S. 54th Ave., Chicago, Ill.
American Radio Hardware Co., Inc., 152 MacQuesten Pkway, S., Mt. Vernon, N. Y.

Astatic Corp., 830 Market St., Youngstown, Ohio
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cinch Mfg. Co., 2335 W. Van Buren St., Chicago, Ill.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Eby, Inc., H. H., 18 W. Chelton Ave., Philadelphia 13, Penn.
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
Electronic Products Co., North First St., Geneva, Ill.
Federal Manufacturing & Engrg. Corp., 199 Steuben St., Brooklyn, N. Y.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Hammarlund Mfg. Co., 460 West 34th St., New York, N. Y.
Hubbell, Inc., Harvey, Bridgeport 2, Conn.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Micarta Fabricators, Inc., 4619 Ravenswood Ave., Chicago, Ill.
Millen Mfg. Co., James, 150 Exchange St. Malden, Mass.
Mykroy, Inc., 1917 N. Springfield Ave., Chicago 47, Ill.
National Co., 61 Sherman St., Malden, Mass.
National Fabricated Products, 2650 Belden Ave., Chicago 47, Ill.
National Tile Co., Anderson, Ind.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Precision Specialties, 220 No. Western Ave., Los Angeles, Calif.
Remler Co., 2101 Bryant St., San Francisco 10, Cal.
Standard Winding Corp., 2-4 Johnes St., Newburgh, N. Y.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Ucinite Co., 459 Watertown St., Newtonville, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Solder

Allen Co., Inc., L. B., 6730 Bryn Mawr Ave., Chicago 31, Ill.
Alpha Metal & Rolling Mills, Inc., 363 Hudson Ave., Brooklyn, N. Y.
American Brass Co., Waterbury, Conn.
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.
Chase Brass & Copper Co., Waterbury 91, Conn.
Division Lead Co., 836 W. Kinzie St., Chicago, Ill.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Eutetic Welding Alloys Co., 40 Worth St., New York, N. Y.
Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, Ill.
General Electric Co., Bridgeport, Conn.
General Plate Div., Metals & Control Corp., 34 Forest St., Attleboro, Mass.
Glaser Lead Co., 31 Wycoff Ave., Brooklyn, N. Y.
Goldsmith Bros. Smelting & Refining Co., Washington St., Chicago, Ill.
Handy & Harman, 82 Fulton St., New York, N. Y.
Industrial Screw & Supply Co., 745 W. Lake St., Chicago 25, Ill.
Kester Solder Co., 4212 Wrightwood Ave., Chicago, Ill.
Lenk Mfg. Co., Newton Lower Falls, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
New York Solder Co., 15 Crosby St., New York, N. Y.
Ruby Chemical Co., 68 McDowell St., Columbus 1, Ohio

Solenoids

Allen-Bradley Co., 136 W. Greenfield, Milwaukee, Wisc.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Comar Electric Co., 3150 N. Washtenaw Ave., Chicago, Ill.
Cutler-Hammer, Inc., 1341 W. St. Paul Ave., Milwaukee, Wisc.
Davis & Co. Inc., Dean W., 549 Fulton St., Chicago, Ill.
Davis & Davis, 137 Cannon St., Bridgeport, Conn.
Electric Controller & Mfg. Co., 2694 E. 79th St., Cleveland, Ohio
Electrical Coil Winding Co., 2733 Saunders St., Camden, N. J.
General Electric Co., Schenectady, N. Y.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill.
Jefferson Electric Co., Bellwood, Ill.
Kingsbury Machine Tool Corp., Keene, N. H.
Milwaukee Manufacturing Co., 218-23rd Ave., Milwaukee, Wisc.
National Acme Co., The, 180 E. 131st St., Cleveland, Ohio
Naxon Utilities Corp., 2101-11 W. Walnut St., Chicago, Ill.
New York Transformer Co., 22 Waverly Place, New York, N. Y.
Precision Machine Works, Inc., 14 South 9th St., Minneapolis, Minn.
Roebling's and Sons Co., John A., Trenton, N. J.
Soreng-Manegold Co., 1901 Clybourn Ave., Chicago, Ill.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Supreme Electric Products Corp., 194 Vassar St., Rochester, N. Y.
Trombetta Solenoid Co., 419 E. Clybourn Ave., Milwaukee, Wisc.
Wellman Mfg. Co., 7122 Melrose Ave., Los Angeles, Calif.
Western Electro-Chemical Co., Oakland, Calif.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Zenith Electric Co., 159 W. Walton St., Chicago, Ill.

Sound

COMPLETE SOUND SYSTEMS

Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Cal.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Atlas Sound Corp., 1443 39th St., Brooklyn, N. Y.
Banks Mfg. Co., 1105 W. Lawrence Ave., Chicago 40, Ill.
Bell Sound Systems, Inc., 1183 Essex Ave., Columbus, Ohio
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Bogen Co., David, 663 Broadway, New York 16, N. Y.
Bond Products Co., 13139 Hamilton Ave., Detroit, Mich.
Boom Electric Amplifier Corp, 1227 W. Washington Blvd., Chicago, Ill.
Carillitone Mfg. Corp., 30 N. Penn St., York, Pa.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati, Ohio
Dilks, Inc., Norwalk, Conn.
Eastern Amplifier Corp, 794 East 140th St., Bronx, N. Y.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Executone, Inc., 415 Lexington Ave., New York, N. Y.
Federal Instrument Co., 3931 Fourth Ave., Long Island City, N. Y.
Forest Electronic Co., 320 E. 65th St., New York, N. Y.
Gates Radio Co., 220 Hampshire St., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
Gibson, Inc., 225 Parsons St., Kalamazoo, Mich.
Globe Phone Mfg. Corp., 2 Linden St., Reading, Mass.
Godfrey Mfg. Corp., 171 S. 2nd St., Milwaukee 4, Wisc.
Good All Electric, 320 N. Spruce St., Ogalala, Neb.
Guided Radio Corp., 161 Sixth Ave., New York 13, N. Y.
Halstead Traffic Communications Corp., 155 East 44th St., New York, N. Y.
Harris Mfg. Co., 2422 W. 7th St., Los Angeles, Calif.
Herbach & Rademan, 522 Market St., Philadelphia, Pa.
Hofmann Corp., C. L., 436 Boulevard of the Allies, Pittsburgh, Pa.
Holtzer-Cabot Signal Div., 400 Stuart St., Boston 17, Mass.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Industrial Sound Products Co., 3597 Mission St., San Francisco, Calif.
Knickerbocker Development Corp., 116 Little St., Bellevillie 9, N. J.
Langevin Co., Inc., 37 W. 65th St., New York, N. Y.
Laurehk Radio Mfg. Co., 3931 Monroe Ave., Wayne, Mich.
Lincrophone Co., 1661 Howard Ave., Utica, N. Y.
Meck Industries, John, Liberty St., Plymouth, Ind.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
National Inter-Communicating Systems, 2434 Montrose Ave., Chicago, Ill.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles 18, Calif.
Operadio Mfg. Co., St. Charles, Ill.
Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif.
Philco Corp., Philadelphia, Pa.
Powers Electronic & Communication Co., Inc., Glen Cove, N. Y.
Racon Electric Co., Inc., 52 E. 19th St., New York 3, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.
Radio Receptor Co., 251 West 19th St., New York, N. Y.
Radiotone Div., Robinson Houchin Co., Columbus, Ohio
Radolek Co., 601 W. Randolph St., Chicago 6, Ill.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Record-O-Vox, Inc., 1379 E. 8th St., Brooklyn, N. Y.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Riggs & Jeffreys, Inc., 73 Winthrop St., Newark 4, N. J.
Ruby Electric Co., 729 Seventh Ave., New York, N. Y.
S.O.S. Cinema Supply Corp., 449 West 42nd St., New York, N. Y.
Schulmerich Electronics, Inc., Sellersville, Pa.
Setchell Carlson, Inc., 2233 University Ave., St. Paul 4, Minn.
Sheridan Electro Corp., 2850 S. Michigan Ave., Chicago, Ill.
Simpson Mfg. Co., Inc., Mark, 188 W. Fourth St., New York, N. Y.
Sound Equipment Corp. of California, 6245 Lexington Ave., Hollywood, Calif.
Stark Sound Engrg. Corp., Box 493, Fort Wayne 1, Ind.
Stromberg-Carlson Telephone Mfg. Co., 100 Carlson Rd., Rochester, N. Y.
United Sound Engrg. Co., 6642 Santa Monica Blvd., Hollywood, Calif.
Victory Radio Corp., 155 West 72nd St., New York, N. Y.
Webster Electric Co., 1900 Clark St., Racine, Wisc.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Western Sound & Electric Laboratories, Inc., 3512 W. St. Paul Ave., Milwaukee, Wisc.

Sound Recorders

see Recorders, Sound

Speakers

see Loudspeakers

Springs

Accurate Spring Mfg. Co., 3811 W. Lake St., Chicago, Ill.
All-Weather Springs, 140 Cedar St., New York, N. Y.
American Coil Spring Co., 2034 Keating Ave., Muskegon, Mich.
American Spiral Spring & Mfg. Co., 5528 Harrison St., Pittsburgh, Pa.
American Spring & Wire Specialty Co., 816 N. Spaulding St., Chicago, Ill.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Barnes Co., Wallace, Div. of Associated Spring Corp., Bristol, Conn.
Barnes-Gibson-Raymond Div. of Associated Spring Corp., 6400 Miller Ave., Detroit 11, Mich.

Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chatillion & Sons, John, 85-93 Cliff St., New York 7, N. Y.
Cleveland Wire Spring Co., Cuyahoga Heights. Cleveland, Ohio
Cuyahoga Spring Co., 10272 Berea Rd., Cleveland, Ohio
Dunbar Bros. Co., Div. of Associated Spring Corp., 76 South St., Bristol, Conn.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
Gibson Co., Wm. D., Div. of Associated Spring Corp., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Central Ave., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Instrument Specialties Co., 246 Bergen Blvd., Little Falls, N. J.
Jones Spring Co., W. B., 124 E. Seventh St., Cincinnati, Ohio
Lee Spring Co., 30 Main St., Brooklyn, N. Y.
Manross & Sons, F. N. Div. of Associated Spring Corp., Bristol, Conn.
Mid-West Spring Mfg. Co., 4634 S. Western Ave., Chicago, Ill.
Muelhausen Spring Corp., 255 Michigan Ave., Logansport, Ind.
Newcomb Spring Corp., 238 40th St., Brooklyn 32, N. Y.
Peck Spring Co., Plainville, Conn.
Precision Products Co., 26 Bedford St., Waltham, Mass.
Raymond Mfg. Co., Div. of Associated Spring Corp., 226 S. Center St., Corry, Pa.
Reliable Spring & Wire Forms Co., 3167 Fulton Rd., Cleveland, Ohio
Tuck Mfg. Co., Brockton, Mass.
Union Spring & Mfg. Co., New Kensington, Pa.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York, N. Y.

Stabilizers

VOLTAGE STABILIZERS

see Regulators

Stampings

METAL STAMPINGS, Small

Ace Manufacturing Co., 1255 East Erie Ave., Philadelphia, Pa.
American Emblem Co., Utica, N. Y.
Banks Mfg. Co., 1105 W. Lawrence Ave., Chicago 40, Ill.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Barnes-Gibson-Raymond Div. of Associated Spring Corp., 6400 Miller Ave., Detroit 11, Mich.
Belmont Smelting & Refining Works, Inc., 330 Belmont Ave., Brooklyn 7, N. Y.
Chase Brass & Copper Co., Waterbury 91, Conn.
Cole Steel Equipment, 349 Broadway, New York 13, N. Y.
Corry—Jamestown Manufacturing Corp., Corry, Pa.
Crowe Name Plate & Mfg. Co., 1752 Waverly Ave., Chicago, Ill.
Dahlstrom Metallic Door Co., Buffalo St., Jamestown, N. Y.
Diebel Die & Mfg. Co., 3654 N. Lincoln Ave., Chicago, Ill.
Electric Auto-Lite Co., Toledo 1, Ohio
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
Garrett Co., George K., D & Tioga Sts., Philadelphia, Pa.
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn, N. Y.
Grammes & Sons, L. F., 344 Union St., Allentown 2, Pa.
Heyman Mfg. Co., Kenilworth, N. J.
Hubbard Spring Co., M. D., 573 Central Ave., Pontiac, Michigan
Hunter Pressed Steel Co., Lansdale, Pa.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
Kent Metal Mfg. Co., Inc., Porter Ave. at Johnson Ave., Brooklyn 6, N. Y.
King Laboratories, Inc., 205 Oneida St., Syracuse 4, N. Y.
Manufacturers Screw Products Co., 216 W. Hubbard St., Chicago, Ill.
Metallic Arts Co., 243 Broadway, Cambridge, Mass.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
O'Neil-Irwin Mfg. Co., 316 8th Ave. S., Minneapolis, Minn.
Patton-MacGuyer Co., 17 Virginia Ave., Providence 5, R. I.
Precision Fabricators, Inc., 120 N. Fitzhugh St., Rochester, N. Y.
Premax Products Div., Chisholm-Ryder Co., Niagara Falls 2, N. Y.
Scovill Mfg. Co., 99 Mill St., Waterbury, Conn.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
Smith Mfg. Co., Nathan R., 105 Pasadena Ave., S. Pasadena, Calif.
Standard Pressed Steel Co., Jenkintown, Pa.
Stewart Stamping Corp., 621 East 216th St., Bronx, N. Y.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Thomas & Skinner Steel Prod. Co., 1120 E. 23rd St., Indianapolis, Ind.
United-Carr Fastener Corp., Cambridge, Mass.
Webster-Chicago Corp., 5622 Bloomingdale Ave., Chicago, Ill.
Willor Mfg. Co., 794 East 140th St., New York 54, N. Y.
Worcester Pressed Steel Co., 100 Barber Ave., Worcester, Mass.
Zell Co., 538 Broadway, New York 12, N. Y.
Zierick Mfg. Corp., 385 Gerard Ave., New York, N. Y.

NON-METALLIC STAMPINGS, Small

Aircraft Products Co., 3502 E. Pontiac St., Fort Wayne 1, Ind.
Auburn Mfg. Co., 110 Stack St., Middletown, Conn.
Baer Co., N. S., 9 Montgomery St., Hillside, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Continental Diamond Fibre Co., 16 Chapel St., Newark, Del.
Electric Auto Lite Co., Toledo 1, Ohio
Franklin Fibre-Lamitex Corp., Wilmington, Del.
Franklin Manufacturing Corp., A. W., 175 Varick St., New York, N. Y.
General Electric Co., Plastics Dept., Pittsfield, Mass.
Insulation Mfgrs. Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Mica Insulator Co., 196 Varick St., New York, N. Y.
Munsell & Co., Eugene, 200 Varick St., New York, N. Y.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
Premax Products Div., Chisholm-Ryder Co., Niagara Falls 2, N. Y.
Richardson Co., Lockland, Ohio.
Synthane Corp., Oaks, Pa.
Taylor Fibre Co., Norristown, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Willor Mfg. Co., 794 East 140th St., New York 54, N. Y.
Zierick Mfg. Corp., 385 Gerard Ave., New York, N. Y.

Standards

CAPACITANCE STANDARDS

Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Industrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
White Research, 899 Boylston St., Boston, Mass.
Winslow Co., 9 Liberty St., Newark, N. J.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Michigan

FREQUENCY STANDARDS

Aero Communications, Inc., 231 Main St., Hempstead, Long Island, N. Y.
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kansas
Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
American Time Products, Inc., 580 5th Ave., New York 19, N. Y.
Bendix Radio, Div. Bendix Aviation Corp., Baltimore, Md.
Browning Labs., Inc., 750 Main St., Winchester, Mass.
Burnett Radio Lab., Wm. W. L., 4814 Idaho St., San Diego, Calif.
Conn, Ltd., C. G., Elkhart, Ind.
Crystal Research Lab., Inc., 29 Allyn St., Hartford, Conn.
Eidson's, 1309 N. Second St., Temple, Texas
Electro Products Labs., 549 W. Randolph St., Chicago, Ill.
Erco Radio Labs., Inc., Fenimore Ave., Hempstead, N. Y.
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Ferris Instrument Co., 110-112 Cornelia St., Boonton, N. J.
General Communication Co., 681 Beacon St., Boston 3, Mass.
General Crystal Corp., 1775 Foster Ave., Schenectady, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Gibbs & Co., Thomas B., Division of George W. Borg Corp., 814 Michigan St., Delavan, Wisc.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
Hearing Aid Labs., 1404 Franklin St., Michigan City, Ind.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, L. I., N. Y.
Knights Co., James, 131 S. Wells St., Sandwich, Ill.
Lavoie Laboratories, Morganville, N. J.
Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Radio Corp. of America, Camden, N. J.
Rieber, Inc., Frank, 11916 W. Pico Blvd., Los Angeles, Calif.
Rosen & Co., Raymond, 32nd & Walnut St., Philadelphia 11, Pa.
White Research, 899 Boylston St., Boston, Mass.

INDUCTANCE STANDARDS

Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
United Transformer Co., 150 Varick St., New York 13, N. Y.
White Research, 899 Boylston St., Boston, Mass.

RESISTANCE STANDARDS

General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Haines Mfg. Co., 248 McKibben St., Brooklyn 6, N. Y.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Industrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Instrument Resistors, Inc., 25 Amity St., Little Falls, N. J.
International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
White Research, 899 Boylston St., Boston, Mass.

Stands

MICROPHONE STANDS

American Microphone Co., 1915 S. Western Ave., Los Angeles, Cal.
Amperite Co., 561 Broadway, New York, N. Y.
Art Specialty Co., 3245 Lake St., Chicago, Ill.

Astatic Corp., 830 Market St., Youngstown, Ohio
Atlas Sound Corp., 1443 39th St., Brooklyn, N. Y.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Eastern Mike-Stand Co., 56 Christopher Ave., Brooklyn 12, N. Y.
Electro Voice Mfg. Co., South Bend, Ind.
General Electric Co., Schenectady, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Lifetime Sound Equipment Co., 1101 Adams St., Toledo, Ohio
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles 18, Cal.
Oleson Illuminating Co., Ltd., Otto, 1560 Vine St., Hollywood, Calif.
Racon Electric Co., Inc., 52 East 19th St., New York 3, N. Y.
Radio Corp. of America, Camden, N. J.
Radolek Co., 601 W. Randolph St., Chicago 6, Ill.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Shure Bros., 225 W. Huron St., Chicago, Ill.
Simpson Mfg. Co., Mark, 188 W. Fourth St., New York, N. Y.
Turner Co., Cedar Rapids, Iowa
Universal Microphone Co., 424 Warren Lane, Inglewood, Cal.

SPEAKER STANDS

Art Specialty Co., 3245 Lake St., Chicago, Ill.
Atlas Sound Corp., 1443 39th St., Brooklyn, N. Y.
Bell & Howell Co., 1801 Larchmont Ave., Chicago 13, Ill.
Bud Radio, Inc., 2118 East 55th St., Cleveland, Ohio
Erwood Co., 223 W. Erie St., Chicago, Ill.
Racon Electric Co., Inc., 52 E. 19th St., New York 3, N. Y.
Radio Corp. of America, Camden, N. J.
Simpson Mfg. Co., Inc., 188 W. Fourth St., New York, N. Y.
Vac-O-Grip Co., 2025 Detroit Ave., Toledo 6, Ohio

Steel

ELECTRICAL STEEL

see **Metals**

Strain Gauges

see **Gauges, Strain**

Strips

TERMINAL STRIPS

see **Posts**

Stroboscopes

Aerolux Light Corp., 653 11th Ave., New York, N. Y.
American Time Products, Inc., 580 5th Ave., New York, N. Y.
Communication Measurements Lab., 120 Greenwich St., New York, N. Y.
Conn, Ltd., C. G., Elkhart, Ind.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
J. F. D. Mfg. Co., 4111 Fort Hamilton Parkway, Brooklyn, N. Y.
Pioneer Instrument Div. of Bendix Aviation, Bendix, N. J.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.

Switches

LIMIT SWITCHES

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wis.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Burling Instrument Co., 253 Springfield Ave., Newark, N. J.
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Electronic Control Corp., 1573 E. Forest St., Detroit, Mich.
General Electric Co., Schenectady, N. Y.
Hetherington & Son, Inc., Robt., Sharon Hill, Pa.
Master Electric Co., 126 Davis Ave., Dayton, Ohio
Mercoid Corp., 4201 Belmont Ave., Chicago 41, Ill.
Micro Switch Corp., 7 Spring St., Freeport, Ill.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. S., Minneapolis, Minn.
Photoswitch, Inc., 77 Broadway, Cambridge, Mass.
Titan Valve & Mfg. Co., 9913 Elk Ave., Cleveland, Ohio
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.
Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MERCURY SWITCHES

Adams & Westlake Co., Michigan St., Elkhart, Ind.
Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford, Conn.
Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland, Ohio
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Cole-Hersee, 54 Old Colony Ave., Boston 27, Mass.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
Electric Switch Corp., 14th at Union St., Columbus, Ind.
General Electric Co., Bridgeport, Conn.
H. B. Electric Co., Inc., 6122 North 21st St., Philadelphia, Pa.
Jefferson Electric Co., Bellwood, Ill.
Littelfuse, Inc., 4753 Ravenswood Ave., Chicago, Ill.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., S., Minneapolis, Minn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PRECISION SNAP ACTION SPRING

Acro Electric Co., 3167 Fulton Rd., Cleveland, Ohio
Cole-Hersee Co., 54 Old Colony Ave., Boston 24, Mass.
Electrical Products Supply Co., 1140 Venice Blvd., Los Angeles 15, Calif.
General Control Co., 1200 Soldiers Field Rd., Cambridge 2, Mass.
General Electric Co., Schenectady, N. Y.
Micro Switch Corp., 7 W. Spring St., Freeport, Ill.
Mu-Switch Corp., 38 Pequit St., Canton, Mass.

ROTARY and BAND CHANGE SWITCHES

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Autocall Co., 1142 Tucker Ave., Shelby, Ohio
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bristol Co., Waterbury 91, Conn.
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Centralab, 900 E. Keefe Ave., Milwaukee 1, Wisc.
Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn 1, N. Y.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Daven Co., 191 Central Ave., Newark 4, N. J.
Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.
Franklin Mfg. Corp., A. W., 175 Varick St., New York, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Control Co., 1200 Soldiers Field Rd., Cambridge 2, Mass.
General Electric Co., Bridgeport, Conn.
JBL Instrument Co., 420 E. Providence Rd., Aldan, Pa.
J. B. T. Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Metallic Arts Co., 243 Broadway, Cambridge, Mass.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. S., Minneapolis, Minn.
Mossman, Inc., Donald P., 6133 Northwest Highway, Chicago 31, Ill.
North Electric Mfg. Co., 501 S. Market St., Galion, Ill.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago 11, Ill.
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago, Ill.
Peerless Labs, 115 East 23rd St., New York 10, N. Y.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Shallcross Mfg. Co., 10 Jackson Ave., Collingdale, Pa.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Tech Laboratories, 7 Lincoln St., Jersey City, N. J.
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 4, Pa.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio.
Variaten Cinema Engineering Co., 1508 W. Verdugo Ave., Burbank, Calif.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Winslow Co., 9 Liberty St., New York, N. Y.
Wirt Co., 5221 Greene St., Philadelphia, Pa.

TIME SWITCHES

Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
American Time Products, Inc., 580-5th Ave., New York, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Automatic Electric Mfg. Co., 10 State St., Mankato, Minn.
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.
Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland, Ohio
Cleveland Time Clock & Service Co., Superior Ave. at E. 27th St., Cleveland, Ohio
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Cramer Co., R. W., Centerbrook, Conn.
Eagle Signal Corp., Moline, Ill.
Edison, Inc., Thomas A., Instrument Div., 51 Lakeside Ave., West Orange, N. J.
Electric Controls Corp., 68 Murray St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Haydon Mfg. Co., Forestville, Conn.
Industrial Timer Corp., 117 Edison Pl., Newark 5, N. J.
Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.
Leich Electric Co., 565 W. Washington Blvd., Chicago 6, Ill.
Lektra Laboratories, Inc., 30 E. 10th St., New York, N. Y.
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., S. Minneapolis, Minn.
New Haven Clock Co., New Haven 4, Conn.
Northwestern Clock Co., 514-15 Brown Bldg., Omaha, Neb.
Paragon Electric Co., 37 W. Van Buren St., Chicago, Ill.
Penn Electric Switch Co., Goshen, Ind.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Reliance Automatic Lighting Co., 1927 Mead St., Racine, Wis.
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.

Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford, Conn.
Richardson-Allen Corp., 15 West 20th St., New York 11, N. Y.
Sangamo Electric Co., Springfield, Ill.
Schaar & Co., 754 W. Lexington St., Chicago, Ill.
States Co., 19 New Park Ave., Hartford 2, Conn.
Thompson Clock Co., H. C., 38 Federal St., Bristol, Conn.
Tork Clock Co., 1 Grove St., Mount Vernon, N. Y.
Ulanet Co., George, 88 E. Kinney St., Newark 5, N. J. (thermal time delay)
Wadsworth Electric Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.
Walser Automatic Timer Co., 420 Lexington Ave., New York, N. Y.
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheelco Instruments Corp., 847 W. Harrison St., Chicago, Ill.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

TOGGLE and PUSHBUTTON SWITCHES

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn.
Atlas Products Corp., 30 Rockefeller Plaza, New York 20, N. Y.
Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Aviometer Corp., 370 West 35th St., New York 1, N. Y.
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Bud Radio, Inc., 2118 E. 55th St., Cleveland, Ohio
Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif.
Clare & Co., C. P., 4719 Sunnyside Ave., Chicago 30, Ill.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Electronic Control Corp., 1573 E. Forest St., Detroit, Mich.
Electronic Products Mfg. Co., 7300 Huron River Drive, Dexter, Mich.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Control Co., Cambridge 2, Mass.
General Electric Co., Bridgeport, Conn.
Gits Molding Corp., 4600 Huron St., Chicago, Ill.
Hart Mfg. Co., 110 Bartholomew Ave., Hartford 2, Conn.
Hetherington & Son, Robt., Inc., Sharon Hill, Pa.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
J. F. D. Mfg. Co., 4111 Fort Hamilton Parkway, Brooklyn, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kulka Electric Mfg. Co., Inc., 30 South St., Mt. Vernon, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Metallic Arts Co., 243 Broadway, Cambridge, Mass.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., S. Minneapolis, Minn.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
Oak Mfg. Co., 1260 Clybourn Ave., Chicago, Ill.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Stackpole Carbon Co., Tannery St., St. Mary's, Pa.
Ucinite Co., 459 Watertown Ave., Newtonville, Mass.
Warrick, Chas. F., 16251 Hamilton Ave., Detroit 3, Mich.
Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.
Wirt Co., 5221 Greene St., Philadelphia, Pa.

Tape

CELLULOSE and THERMOPLASTIC TAPE

Acadia Synthetic Products Div., Western Felt Works, 4035 Ogden Ave., Chicago 23, Ill.
Dobeckman Co., 3300 Monroe Ave., Cleveland, Ohio
General Electric Co., Schenectady, N. Y.
Industrial Tape Corp., New Brunswick, N. J.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul, Minn.
Plax Corp., 133 Walnut St., Hartford, Conn.
Wright & Sons Co., Wm. E., West Warren, Mass.

COTTON or SILK TAPE

Carolina Narrow Fabric Co., 1036 N. Chestnut St., Winston-Salem, N. C.
Elizabeth Webbing Mills, Pawtucket, R. I.
General Electric Co., Bridgeport, Conn.
Goldmark Wire Co., James, 116 West St., New York, N. Y.
Hope Webbing Co., Providence, R. I.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Linton & Bro., Horace, 3081 Ruth St., Philadelphia, Pa.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
Priscilla Braid Co., 1461 High St., Central Falls, R. I.
Sidebotham, Inc., John, 4317 Griscom St., Philadelphia, Pa.
Sullivan & Sons Mfg. Co., Inc., J., 2224 N. Ninth St., Philadelphia 33, Pa.
Wright & Sons Co., Wm. E., West Warren, Mass.

VARNISHED TAPE

B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Electro-Technical Products, Inc., Nutley, N. J.
Endurette Corp. of America, Cliffwood, N. J.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Mica Insulator Co., 200 Varick St., New York, N. Y.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
New Jersey Wood Finishing Co., Electrical Insulation Dept., Woodbridge, N. J.
Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, Ohio
Respro, Inc., Wellington Ave., Cranston, R. I.
Standard Insulation Co., 74 Paterson Ave., East Rutherford, N. J.

TAPES, TELEGRAPH

Paper Manufacturers Co., Philadelphia 23, Pa.

Television Mirrors

see Mirrors, Television

Terminal Plugs

see Plugs

Terminal Strips

see Posts, Binding

Terminals and Lugs

see Lugs

Testers

BATTERY TESTERS

Chaslyn Co., 1906 Irving Park Rd., Chicago, Ill.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Franklin Transformer, 607-22nd Ave. N. E., Minneapolis, Minn.
General Electric Co., Bridgeport, Conn.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hoyt Electrical Instrument Works, Boston, Mass.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
McColpin-Christie Corp., Ltd., 4922 S. Figueroa St., Los Angeles 37, Calif.
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.
Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.
Sterling Mfg. Co., 9205 Detroit Ave., Cleveland, Ohio
Sun Mfg. Co., 6323 Avondale Ave., Chicago, Ill.
Supreme Instruments Corp., Greenwood, Miss.
Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CAPACITOR TESTERS

Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Clough-Brengle Co., 5501 Broadway, Chicago 22, Ill.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J.
Deutschmann Corp., Tobe, Canton, Mass.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Espey Mfg. Co., Inc., 305 E. 63rd St., New York, N. Y.
Federal Instrument Co., 3931-47th Ave., Long Island City 4, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge, Mass.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Industrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Jackson Electrical Instrument Co., 131 Wayne Ave., Dayton, Ohio
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Meck Industries, John, Plymouth, Ind.
Music Master Mfg. Co., 542 S. Dearborn St., Chicago, Ill.
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Radio Corp. of America, Camden, N. J.
Radio Design Co., 1353 Sterling Place, Brooklyn, N. Y.
Solar Mfg. Corp., 285 Madison Ave., New York, N. Y.
Sprague Electric Co., North Adams, Mass.
States Co., 19 New Park Ave., Hartford 2, Conn.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio

ELECTRICAL METER TESTERS

Aerolux Light Corp., 653-11th Ave., New York, N. Y.
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eastern Specialty Co., 3619 N. Eighth St., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
McFarlin Co., 29 W. Marion Ave., Youngstown, Ohio
Radio Corp. of America, Camden, N. J.

Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
States Co., 19 New Park Ave., Hartford 2, Conn.
Superior Instruments Co., 227 Fulton St., New York, N. Y.
Supreme Instruments Corp., Greenwood, Miss.

INSULATION TESTERS

Acme Electric & Mfg. Co., Cuba, New York
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Communication Measurements Laboratory, 120 Greenwich St., New York, N. Y.
Electric Service Mfg. Co., 17th & Cambria Sts., Philadelphia, Pa.
Federal Instrument Co., 3931-47th Ave., Long Island City 4, N. Y.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Heyer Products Co., Inc., 481 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Holtzer Cabot, Signal Division, 400 Stuart St., Boston, Mass.
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Indutrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Miller Co., B. F., Trenton, N. J.
Radio Corp. of America, Camden, N. J.
Radio Frequency Laboratories, Inc., Boonton, N. J.
Routh Co., T. R., 1045 Bryant St., San Francisco, Calif.
Rubicon Co., 3751 Ridge Ave., Philadelphia, Pa.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
Sticht Co., Herman, 27 Park Place, New York 7, N. Y.
Superior Instruments Co., 227 Fulton St., New York, N. Y.
Tech Laboratories, 7 Lincoln St., Jersey City, N. J.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
U. S. Television Manufacturing Corp., 106 Seventh Ave., New York 11, N. Y.
United Transformer Co., 150 Varick St., New York 13, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Winslow Co., 9 Liberty St., Newark, N. J.

TUBE TESTERS

Clough-Brengle Co., 5501 N. Broadway, Chicago 22, Ill.
Dayco Radio Corp., 915 Valley St., Dayton 4, Ohio
Dayton Acme Co., 930 York St., Cincinnati, Ohio
Espey Mfg. Co., Inc., 305 East 63rd St., New York, N. Y.
General Communications Co., 681 Beacon St., Boston 3, Mass.
General Electric Co., Schenectady, N. Y.
Hearing Aid Labs, 1404 Franklin St., Michigan City, Ind.
Heyer Products Co., Inc., 471 Cortland St., Belleville 9, N. J.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Jackson Electrical Instrument Co., 131 Wayne Ave., Dayton, Ohio
Meck Industries, John, Plymouth, Ind.
Philco Corp., Tioga & C Sts., Philadelphia, Pa.
Phil-American, Inc., 528 East 72nd St., New York, N. Y.
Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, N. Y.
Radio City Products Co., 127 W. 26th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.
Readrite Meter Works, College Ave., Bluffton, Ohio
Simpson Electric Co., 5200-16 W. Kinzie St., Chicago, Ill.
Superior Instruments Co., 227 Fulton St., New York, N. Y.
Supreme Instruments Corp., Greenwood, Miss.
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.
Technical Devices Corp., Bloomfield, N. J.
Triplett Electrical Instrument Co., 286 Harmon Rd., Bluffton, Ohio
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

VIBRATION TESTERS

All American Tool & Mfg. Co., 1014 W. Fullerton St. Chicago 14, Ill.
Commercial Research Labs., Detroit, Mich.
L. A. B. Corp., Summit, N. J.
Offner Electronics Inc., 5320 N. Kedzie Ave., Chicago, Ill.

VOLTAGE TESTERS

Aerolux Light Corp., 653 Eleventh Ave., New York, N. Y.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.
Electro Products Laboratories, 549 Randolph St., Chicago, Ill.
Espey Mfg. Co., 305 East 63rd St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland. Ohio
Ideal Commutator Dresser Co., 1631 Park Ave., Sycamore, Ill.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Miller Co., B. F., Trenton, N. J.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Waltham, Mass.
Roller-Smith Co., Bethlehem, Pa.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Springfield Sound Co., 12 Cass St., Springfield, Mass.
States Co., 19 New Park Ave., Hartford 2, Conn.
Takk Corporation, Newark, Ohio
Technical Apparatus Co., 1171 Tremont St., Boston, Mass.

Thermocouple Meters

see Meters

Thermocouples

VACUUM THERMOCOUPLES

Aerolux Light Corp., 653-11th Ave., New York, N. Y.
American Thermo-Electric Co., 67 East 8th St., New York, N. Y.
Bristol Co., Waterbury 91, Conn.
Engelhard, Charles, 233 N. J. R. R. Ave., Newark, N. J.
Eppley Laboratory, Inc., Newport, R. I.
Field Electric Instrument Co., 1 East Fordham Rd., New York, N. Y.
Fredericks Co., Geo. E., Bethayres, Pa.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago, Ill.
Rawson Electrical Instrument Co., 102 Potter St., Cambridge, Mass.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Sundt Engineering Co., 4757 Ravenswood Ave., Chicago, Ill.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheelco Instruments Corp., 847 W. Harrison St., Chicago, Ill.
Xervac Instrument Co., 101 Vine St., Hartford 5, Conn.

Timers

AUTOMATIC CYCLE TIMERS

American Time Products, Inc., 580-5th Ave., New York, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Auth Electrical Specialty Co., Inc., 422 E. 53rd St., New York 22, N. Y.
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.
Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., 4428 Wayne Ave., Philadelphia 44, Pa.
Cole-Hersee Co., 54 Old Colony Ave., Boston 27, Mass.
Controls, Inc., Towaco, N. J.
Cramer Co., R. W., Centerbrook, Conn.
Cyclotron Specialties Co., Moraga, Calif.
Eagle Signal Corp., Moline, Ill.
Electric Switch Corp., 14th at Union St., Columbus, Ind.
Foxboro Co., Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Haydon Mfg. Co., Forestville, Conn.
Holtzer-Cabot Signal Division, 400 Stuart St., Boston 17, Mass.
Industrial Timer Corp., 117 Edison Pl., Newark 5, N. J.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Michigan
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Paragon Electric Co., 37 W. Van Buren St., Chicago, Ill.
Penn Electric Switch Co., Goshen, Ind.
Photoswitch, Inc., 77 Broadway, Cambridge, Mass.
Reynolds Electric Co., 2650 W. Congress St., Chicago, Ill.
Richardson-Allen Corp., 15 W. 20th St., New York, N. Y.
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Rd., Chicago 39, Ill.
Sangamo Electric Co., Springfield 39, Ill.
Seely Instrument Co., Inc., 2249 14th St., S. W., North Bergen, N. J.
Stromberg Time Corp., 109 Lafayette St., New York, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Tagliabue Mfg. Co., C. J., 540 Park Ave., Brooklyn 5, N. Y.
Thompson Clock Co., H. C., 38 Federal St., Bristol, Conn.
Tork Clock Co., 1 Grove St., Mt. Vernon, N. Y.
Wallace & Tiernan Products, Inc., Belleville, N. J.
Walser Automatic Timer Co., 420 Lexington Ave., New York, N. Y.
Warren Telechron Co., Ashland, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

AUTOMATIC INTERVAL TIMERS

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 2, Wisc.
Allied Control Co., Inc., 2 East End Ave., New York, N. Y.
American Time Products, Inc., 580-5th Ave., New York 19, N. Y.
Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Automatic Electric Mfg. Co., 10 State St., Mankato, Minn.
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.
Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland, Ohio
Bristol Co., Waterbury 91, Conn.
Controls, Inc., Towaco, N. J.
Cyclotron Specialties Co., Moraga, Calif.
Cramer Co., R. W., Centerbrook, Conn.
Eagle Signal Corp., Moline, Ill.
Eastman Kodak Co., Rochester 4, N. Y.
Edison, Inc., Thomas A., Instrument Div., 51 Lakeside Ave., West Orange, N. J.
Electric Switch Corp., 14th at Union St., Columbus, Ind.
Electronic Control Corp., 1573 E. Forest St., Detroit, Mich.
Forest Electronic Co., 320 E. 65th St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago, Ill.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.

Hatton Co., Arthur T., 410 Asylum St., Hartford, Conn.
Haydon Mfg. Co., Forestville, Conn.
Holtzer-Cabot Signal Division, 400 Stuart St., Boston 17, Mass.
Industrial Engineering Corp., Rea Building, Terre Haute, Ind.
Industrial Timer Corp., 117 Edison Pl., Newark 5, N. J.
Lektra Laboratories, Inc., 30 E. Tenth St., New York, N. Y.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Michigan
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. S., Minneapolis, Minn.
National Electric Mfg. Co., 103 E. Ferry St., Berrien Springs, Michigan
Northwestern Clock Co., 514-15 Brown Bldg., Omaha, Neb.
Paragon Electric Co., 37 W. Van Buren St., Chicago, Ill.
Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.
Photovolt Corp., 95 Madison Ave., New York, N. Y.
Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Reliance Automatic Lighting Co., 1927 Mead St., Racine, Wisc.
Reynolds Electric Co., 2650 W. Congress St., Chicago 12, Ill.
Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Rowe Radio Research Laboratory, 2422 N. Pulaski Rd., Chicago 29, Ill.
Sangamo Electric Co., Springfield, Ill
Schaar & Co., 754 W. Lexington St., Chicago, Ill.
Seth Thomas Clock, Div. of General Time Instrument Corp., Thomaston, Conn.
Signal Engineering & Manufacturing Co., 154 W. 14th St., New York, N. Y.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Electric Time Co., 89 Logan St., Springfield, Mass.
Stromberg Time Corp., 109 Lafayette St., New York, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Thompson Clock Co., H. C., 38 Federal St., Bristol, Conn.
Tork Clock Co., 1 Grove St., Mt. Vernon, N. Y.
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.
Wallace & Tiernan Products, Inc., Belleville, N. J.
Walser Automatic Timer Co., 420 Lexington Ave., New York, N. Y.
Warren Telechron Co., Ashland, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

AUTOMATIC RESET TIMERS

Ansonia Clock Co., Inc., 103 Lafayette St., New York, N. Y.
Automatic Electric Mfg. Co., 10 State St., Mankato, Minn.
Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.
Bristol Co., Waterbury, 91 Conn.
Cramer Co., R. W., Centerbrook, Conn.
Eagle Signal Corp., Moline, Ill.
Haydon Mfg. Co., Forestville, Conn.
Holtzer-Cabot Signal Div., 400 Stuart St., Boston 17, Mass.
Industrial Timer Corp., 117 Edison Pl., Newark 5, N. J.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Michigan
Lumenite Electric Co., 407 S. Dearborn St., Chicago, Ill.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
National Electric Mfg. Co., 103 E Ferry St., Berrien Springs, Michigan
Paragon Electric Co., 37 W. Van Buren St., Chicago, Ill.
Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Photovolt Corp., 95 Madison Ave., New York, N. Y.
Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Sangamo Electric Co., Springfield, Ill.
Schaar & Co., 754 W. Lexington St., Chicago, Ill.
Self Winding Clock Co., 205 Willoughby Avenue, Brooklyn 5, N. Y.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Electric Time Co., 89 Logan St., Springfield, Mass.
Stromberg Time Corp., 109 Lafayette St., New York, N. Y.
Struthers-Dunn, Inc., 1321 Arch St., Philadelphia 15, Pa.
Tagliabue Mfg. Co., C. J., 540 Park Ave., Brooklyn 5, N. Y.
Tork Clock Co., 1 Grove St., Mt. Vernon, N. Y.
Warren Telechron Co., Ashland, Mass.
Westinghouse Electric Mfg. Co., East Pittsburg, Pa.
Zenith Electric Co., 152 W. Walton St., Chicago, Ill.

PHOTO-ELECTRIC TIMERS

R. W. Cramer Co., Centerbrook, Conn.
Electronic Products Co., 19 North First St., Geneva, Ill.
General Control Co., 1200 Soldiers Field Rd., Cambridge 2, Mass.
General Electric Co., Schenectady, N. Y.
National Electric Mfg. Co., 103 E. Ferry St., Berrien Springs, Mich.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Schaar & Co., 754 W. Lexington St., Chicago, Ill.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Electric Time Co., 89 Logan St., Springfield, Mass.
United Cinephone Corp., 65 New Litchfield St., Torrington, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Tools

SCREWDRIVERS and SMALL INSULATED TOOLS

Bonney Forge & Tool Works, Allentown, Pa.
Bridgeport Hardware Mfg. Corp., Iranistan Ave., Brilgeport, Conn.
Burndy Engrg. Co., Inc., 107 Eastern Blvd., New York 54, N. Y.
Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, Mich. (Power Screw Driver)
Eastern Specialty Co., 3617-19 N. Eighth St., Philadelphia, Pa.
General Cement Mfg. Co., 919 Taylor, Rockford, Ill.
Invincible Tool Co., 611 Empire Bldg., Pittsburgh 22, Pa.
Linick & Co., Leslie L., 29 E. Madison St., Chicago, Ill.
O'Neil-Irwin Mfg. Co., 316 Eighth Ave., So. Minneapolis, Minn.
Park Metalware Co., 28 Bank St., Orchard Park, N. Y.
Stanley Works, New Britain, Conn.
Stevens Walden, Inc., 459 Schrewsbury St., Worcester, Mass.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Utica Drop Forge & Tool Corp., 2800 Whitesboro St., Utica, N. Y.
Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.
Willor Mfg. Co., 794 East 140th St., New York 54, N. Y.

Transformers

AUDIO & POWER TRANSFORMERS

Acme Electric & Mfg. Co., 31 Water St., Cuba, N. Y.
Advance Transformer Co., 14 N. May St., Chicago, Ill.
Airdesign & Fabrication, Inc., 241 Fairfield Ave., Upper Darby, Pa.
Allis Chalmers Mfg. Co., Milwaukee, Wisc.
Altec Lansing Corp., 1680 N. Vine St., Los Angeles 10, Calif.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Audio Development Co., 2833 13th Ave. S., Minneapolis, Minn.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Bendix Radio Div., Bendix Aviation Corp., Baltimore, Md.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Chicago Transformer Corp., 3501 W. Addison St., Chicago, Ill.
Cole Radio Works, 86 Westville Ave., Caldwell, N. J.
Consolidated Radio Products Co., 350 W. Erie St., Chicago, Ill.
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Dinion Coil Co., Inc., 1 North St., Caledonia, N. Y.
Dongan Electric Mfg. Co., 2987 Franklin St., Detroit, Mich.
Doyle, Inc., James W., 2734 N. Pulaski Rd., Chicago 39, Ill.
Electric Heat Control Co., 9123 Inman Ave., Cleveland 5, Ohio
Electric Power Construction, Inc., 569 S. Main St., Akron, Ohio
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Transformer Co., 207 W. 25th St., New York, N. Y.
Erie Electric Co., 120 Church St., Buffalo, N. Y.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Foster Co., A. P., 719 Wyoming Ave., Lockland 15, Ohio
France Mfg. Co., 10325 Berea Rd., Cleveland, Ohio
Freed Transformer Co., 72 Spring St., New York, N. Y.
Gardner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
General Transformer Corp., 1250 W. Van Buren St., Chicago 24, Ill.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Good All Electric, 320 N. Spruce St., Ogalala, Nebr.
Hadley Co., Robert M., 711 E. 61st St., Los Angeles, Calif.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 1, N. Y.
Heyer Producst Co., Inc., 471 Cortland St., Belleville 9, N. J.
Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles 36, Calif.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
International Transformer Co., 396 Broadway, New York, N. Y.
Jefferson Electric Co., Bellwood, Ill.
Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago, Ill.
Kenyon Transformer Co., 840 Barry St., New York, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Langevin Co., Inc., 37 West 65th St., New York, N. Y.
Magnetic Windings Co., Div. of Essex Wire Corp., 16th & Butler Sts., Easton, Pa.
Merit Coil & Transformer Corp., 311 N. Desplaines St., Chicago, Ill.
Moloney Electric Co., 5390 Bircher Blvd., St. Louis 20, Mo.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles 18, Calif.
Peerless Electrical Products Co., 6920 McKinley Ave., Los Angeles, Calif.
Peerless Laboratories, 115 E. 23rd St., New York 10, N. Y.
Permoflux Corp., 4916 W. Grand Ave., Chicago, Ill.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radionic Controls, 3758 Belmont Ave., Chicago 18, Ill.
Radionic Transformer Co., 411 S. Sangamon St., Chicago, Ill.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Rola Co., Inc., 2530 Superior Ave., Cleveland, Ohio
Skaggs Transformer Co., 5894 Broadway, Los Angeles, Calif.
Smith Mfg. Co., Nathan R., 105 Pasadena Ave., S. Pasadena, Calif.
Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
States Co., 19 New Park Ave., Hartford 2, Conn.

Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Superior Electric Co., 83 Laurel St., Bristol, Conn.
Telex Products Co., Telex Park, Minneapolis 1, Minn.
Thermador Electric Mfg. Co., 5119 S. Riverside Drive, Los Angeles, Calif.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
United Transformer Co., 150 Varick St., New York 13, N. Y.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Walsh Engineering Co., 34 DeHart Place, Elizabeth, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.
Whisk Laboratories, 145 West 45th St., New York, N. Y.

CURRENT TRANSFORMERS

Advance Transformer Co., 14 N. May St., Chicago, Ill.
Airdesign & Fabrication, Inc., 241 Fairfield Ave., Upper Darby, Pa.
Allis Chalmers Mfg. Co., Milwaukee, Wis.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Annis Co., R. B., 1101 N. Delaware St., Indianapolis 2, Ind.
Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.
Burlington Instrument Corp., 316 Valley St., Burlington, Iowa
Chicago Transformer Corp., 3501 W. Addison St., Chicago, Ill.
Davis & Co., Dean W., 549 W. Fulton St., Chicago, Ill.
Dinion Coil Co., Inc., North St., Caledonia, N. Y.
Eastern Specialty Co., 3619 N. Eighth St., Philadelphia, Pa.
Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.
Electricoil Transformer Co., 421 Canal St., New York, N. Y.
Electron Equipment Corp., 917 Meridian Ave., S. Pasadena, Calif.
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Transformer Co., 207 W. 25th St., New York, N. Y.
Esterline Angus Co., P. O. Box 596, Indianapolis, Ind.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Freed Transformer Co., 72 Spring St., New York, N. Y.
General Controls Co., 801 Allen Ave., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State St., Cambridge 39, Mass.
General Transformer Corp., 1250 W. Van Buren St., Chicago 24, Ill.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Hadley Co., Robert M., 711 E. 61 St., Los Angeles, Calif.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 1, N. Y.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Jefferson Electric Co., Bellwood, Ill.
Johnson, E. F., Co., Waseca, Minn.
Langevin Co., Inc., 37 West 65th St., New York, N. Y.
Magnetic Windings Co., Div. of Essex Wire Corp., 16th & Butler Sts., Easton, Pa.
Moloney Electric Co., 5390 Bircher Blvd., St. Louis 20, Mo.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.
Niagara Electric Improvement Corp., 51 East 42nd St., New York, N. Y.
Northelfer Winding Labs., 111 Albermarle Ave., Trenton, N. J.
Oxford Tartak Radio Corp., 3911 S. Michigan Ave., Chicago, Ill.
Peerless Electrical Products Co., 6920 McKinley Ave., Los Angeles, Calif.
Peerless Laboratories, 115 E. 23rd St., New York, N. Y.
Presto Electric Corp., 4511 New York Ave., Union City, N. J.
Radionic Transformer Co., 411 S. Sangamo St., Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Superior Electric Co., 83 Laurel St., Bristol, Conn.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
United Transformer Co., 150 Varick St., New York, N. Y.
Uptegraff Mfg. Co., R. E., Scottdale, Pa.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Walsh Engineering Co., 34 Dehart Place, Elizabeth, N. J.
Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 54, Ill.
Western Electro-Mechanical Co., 300 Broadway, Oakland, Calif.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5 N. J.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

INSTRUMENT TRANSFORMERS

Allis Chalmers Mfg. Co., Milwaukee, Wis.
American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Associated Research, Inc., 231 S. Green St., Chicago, Ill.
Automatic Winding Co., 900 Passaic Ave., E. Newark, N. J.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Boes Co., W. W., 3001 Salem Ave., Dayton 3, Ohio.
Burlington Instrument Corp., 316 Valley St., Burlington, Ia.
Cambridge Thermionic Corp., 455 Concord Ave., Cambridge, Mass.
Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Dinion Coil Co. Inc., 1 North St., Caledonia, N. Y.
Electrical Facilities, Inc., 4224 Holden St., Oakland 8, Calif.
Electronic Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electronic Transformer Co., 207 West 25th St., New York, N. Y.
Erie Electric Co., 120 Church St., Buffalo, N. Y.
Esterline-Angus Co., P. O. Box 596, Indianapolis, Ind.
Ferranti Electric Inc., 30 Rockefeller Plaza, New York, N. Y.
General Electric Co., Schenectady, N. Y.
General Transformer Corp., 1250 W. Van Buren St., Chicago 24, Ill.
Guthman & Co., E. I., 15 S. Throop St., Chicago, Ill.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Hollywood Transformer Co., 645 N. Martel Ave., Los Angeles, 36, Calif.
International Transformer Co., 396 Broadway, New York, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
National Co., 61 Sherman St., Malden, Mass.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Newark Transformer Co., 17 Frelinghuysen Ave., Newark, N. J.
Niagara Electric Improvement Corp., 51 East 42nd St., New York, N. Y.
Peerless Electrical Products Co., 6920 McKinley Ave., Los Angeles, Calif.
Presto Electric Co., 4511 New York Ave., Union City, N. J.
Radio Corp. of America, Camden, N. J.
Radionic Transformer Co., 411 S. Sangamon St., Chicago, Ill.
Red Arrow Electric Corp., 100 Coit St., Irvington, N. J.
Roller-Smith Co., Bethlehem, Pa.
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Sparkes Mfg. Co., 318 Jefferson St., Newark, N. J.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
United Transformer Co., 150 Varick St., New York 13, N. Y.
Uptegraff Mfg. Co., R. E., Scottdale, Pa.
Walsh Engineering Co., 34 De Hart Place, Elizabeth, N. J.
Webber Co., Earl, 1313 W. Randolph St., Chicago 7, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

RF AND IF TRANSFORMERS

Aladdin Radio Industries, Inc., 501 W. 35th St., Chicago, Ill.
Automatic Windings Co., 900 Passaic Ave., East Passaic, N. J.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Best Mfg. Co., Inc., 1200 Grove St., Irvington, N. J.
Cambridge Thermionic Corp., Cambridge, Mass.
Carron Mfg. Co., 415 S. Aberdeen St., Chicago, Ill.
Dinion Coil Co. Inc., 1 North St., Caledonia, N. Y.
D-X Crystal Co., 1841 W. Carroll Ave., Chicago, Ill.
Electronic Transformer Co., 207 W. 25th St., Newark, N. J.
Electronic Winding Co., 6227 Broadway, Chicago 40, Ill.
Essex Electronics 1060 Broad St., Newark 2, N. J.
Federal Instrument Co., 3931 47th Ave., Long Island City 4, N. Y.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Franklin Transformer Mfg. Co., 65 22nd Ave., N. E., Minneapolis, Minn.
General Electric Co., Schenectady, N. Y.
General Winding Co., 420 West 45th St., New York, N. Y.
Guthman & Co., E. I., 15 S. Throop St., Chicago, Ill.
Hammarlund Mfg. Co., 460 W. 34th St., New York, N. Y.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn, N. Y.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
Knickerbocker Development Corp., 116 Little St., Belleville 9, N. J.
Lawton Products Co., Inc., 624 Madison Ave., New York 22, N. Y.
Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
National Co., 61 Sherman St., Malden, Mass.
New England Radiocrafters, 1156 Commonwealth Ave., Boston 34, Mass.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Radio Corp. of America, Camden, N. J.
S-W Inductor Co., 1056 N. Wood St., Chicago, Ill.
Sickles Co., F. W., 165 Front St., Chicopee, Mass.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Sound Equipment Corp. of California, 6245 Lexington Ave., Hollywood, Calif.
Standard Coil Products Co., 2329 N. Pulaski Rd., Chicago, Ill.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Teleradio Engineering Corp., 484 Broome St., New York, N. Y.

TRANSMITTER TRANSFORMERS

Advance Transformer Co., 14 N. May St., Chicago, Ill.
Airdesign & Fabrication, Inc., 241 Fairfield Ave., Upper Darby, Pa.
American Transformer Co., 178 Emmet St., Newark, N. J.
Audio Development Co., 2833-13th Ave. S., Minneapolis, Minn.
Bendix Radio Div., Bendix Aviation Corp., Baltimore, Md.
Chicago Transformer Corp., 3501 W. Addison St., Chicago, Ill.
Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Doyle, Inc., James W., 2734 N. Pulaski Rd., Chicago 39, Ill.
Electrical Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electricoil Transformer Co., 421 Canal St., New York, N. Y.
Electronic Transformer Co., 207 W. 25th St., New York, N. Y.

Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Foster Co., A. P., 719 Wyoming Ave., Lockland 15, Ohio
Freed Transformer Co., 72 Spring St., New York, N. Y.
Gardner Electric Mfg. Co., 4227 Hollis St., Emeryville 8, Calif.
General Electric Co., Schenectady, N. Y.
Glenn Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.
Hadley Co., Robert M., 711 E. 61st St., Los Angeles, Calif.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 1, N. Y.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
International Transformer Co., 396 Broadway, New York, N. Y.
Jefferson Electric Co., Bellwood, Ill.
Kenyon Transformer Co., 840 Barry St., New York, N. Y.
Langevin Co., Inc., 37 West 65th St., New York, N. Y.
Magnetic Windings Co., Div. of Essex Wire Corp., 16th & Butler Sts., Easton, Pa.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
New York Transformer Co., 26 Waverly Place, New York, N. Y.
Newark Transformer Co., 17 Freylinghuysen Ave., Newark, N. J.
Northeifer Winding Labs., Albermarle Ave., Trenton, N. J.
Peerless Electrical Products Co., 6920 McKinley Ave., Los Angeles, Calif.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Rola Co., Inc., 2530 Superior Ave., Cleveland, Ohio
Skaggs Transformer Co., 5894 Broadway, Los Angeles, Calif.
Sola Electric Co., 2525 Clybourn Ave., Chicago, Ill.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
Super Electric Products Corp., 1057 Summit Ave., Jersey City, N. J.
Thermador Elec. Mfg. Co., 5119 S. Riverside Drive, Los Angeles, Calif.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products, Inc., 143 W. 51st St., New York, N. Y.
United Transformer Co., 150 Varick St., New York, N. Y.
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

VOLTAGE REGULATING TRANSFORMERS

American Transformer Co., 178 Emmet St., Newark, N. J.
Amplifier Co. of America, 396 Broadway, New York, N. Y.
Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Electrical Engineering Co., 735 W. Ohio St., Chicago, Ill.
Electron Equipment Corp., 917 Meridian Ave., S. Pasadena, Calif.
Electronic Transformer Co., 207 W. 25th St., New York, N. Y.
Ferranti Electric Co., 30 Rockefeller Plaza, New York, N. Y.
Freed Transformer Co., 72 Spring St., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Halldorson Company, The, 4500 Ravenswood Ave., Chicago 28, Ill.
Industrial Transformer Corp., 2540 Belmont Ave., New York, N. Y.
International Transformer Co., 396 Broadway, New York, N. Y.
National Mineral Co., 2628 N. Pulaski Rd., Chicago, Ill.
Peerless Electrical Products Co., 6920 McKinley Ave., Los Angeles, Calif.
Radio Corp. of America, Camden, N. J.
Radionic Transformer Co., 411 S. Sangamon St., Chicago, Il.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Skaggs Tlansformer Co., 5894 Broadway, Los Angeles, Cal.
Sola Electric Co., 2525 Clybourn Ave., Chicago, Ill.
Sorensen & Co., 1 Grove St., Stamford, Conn.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
Superior Electric Co., 83 Laurel St., Bristol, Conn.
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformer Products Inc., 143 W. 51st St., New York, N. Y.
United Transformer Co., 150 Varick St., New York, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

Transmitters

Abbott Instrument Inc., 8 W. 18th St., New York, N. Y.
Aero Communications, Inc., 231 Main St., Hempstead, L. I., N. Y.
Air Associates, Inc., 5827 W. Century Blvd., Los Angeles, Calif.
Air Communications, Inc., 2233 Grand Ave., Kansas City, Mo.
Air King Products Co., Inc., 1523 63rd St., Brooklyn, N. Y.
Airadio, Inc., Melrose Ave. & Battery Pl., Stamford, Conn.
Aircraft Accessories Corp., Fairfax & Funston Rds., Kansas City, Kansas
Aircraft Radio Corp., Boonton, N. J.
Airplane & Marine Instruments Inc., Clearfield, Pa.
Arnessen Electric Co., 116 Broad St., New York, N. Y.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bassett, Inc., Rex., 500 S. E. Second St., Ft. Lauderdale, Fla.
Belmont Radio Corp., 5921 W. Dickens Ave., Chicago, Ill.
Bendix Radio, Div. of Bendix Aviation Corp., Baltimore, Md.
Boehme, Inc., H. O., 915 Broadway, New York City
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Collins Radio Co., 855-35th St. N. E., Cedar Rapids, Iowa
Colonial Radio Corp., 254 Rano St., Buffalo, N. Y.
Communications Co., Inc., Coral Gables, Fla.
Communication Measurement Laboratory, 120 Greenwich St., New York, N. Y.
Communications Equipment Co., 134 West Colorado St., Pasadena 2, Calif.
Crosley Corp., 1329 Arlington St., Cincinnati 3, Ohio
Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago, Ill.
Du Mont Laboratories, Inc., Allen B., 2 Main Ave., Passaic, N. J.
Eckstein Radio & Television Co., 1400 Harmon Place, Minneapolis, Minn.
Electronic Corp. of America, 45 East 18th St., New York, N. Y.
Electronic Specialty Co., 3456 Glendale Blvd., Los Angeles, Calif.
Erco Radio Labs, Inc., Fenimore Ave., Hempstead, N. Y.
Fada Radio & Electric Co., Inc., 30-20 Thomson Ave., Long Island City, N. Y.
Farnsworth Television & Radio Corp., 3700 Pontiac St., Fort Wayne, Ind.
Federal Radio & Television Mfg. Co., 700 E. Florence Blvd., Los Angeles 1, Calif.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
Foote Pierson & Co., Inc., 75 Hudson St., Newark 4, N. J.
Freed Radio Corp., 200 Hudson St., New York, N. Y.
Galvin Mfg. Corp., 4545 Augusta Blvd., Chicago 51, Ill.
Gates Radio Co., 220 Hampshire St., Quincy, Ill.
General Communications Co, 681 Beacon St., Boston 3, Mass.
General Electric Co., 1 River Rd., Schenectady, New York
Grady Instrument Co., 11 Bailey Ave., Watertown 72, Mass.
Gray Radio Co., 730 Okeeshobee Rd., West Palm Beach, Fla.
Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
Halstead Traffic Communications Corp., 155 E. 44 St., New York, N. Y.
Hamilton Radio Corp., 510 Sixth Ave., New York, N. Y.
Hammarlund Mfg. Co., Inc., 460 W. 34 St., New York, N. Y.
Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Harvey-Wells Communications, Inc., North St., Southbridge, Mass.
Hazeltine Electronics Corp., 1775 Broadway, New York, N. Y.
Heath Co., Benton Harbor, Mich.
Herbach & Rademan, 522 Market St., Philadelphia, Pa.
Higgins Industries, Inc., 2221 Warwick Ave., Santa Monica, Calif.
Howard Radio Co., 1735 Belmont Ave., Chicago, Ill.
Hudson American Corp., 25 W. 43rd St., New York, N. Y.
Islip Radio Mfg. Corp., Foot of Beech St., Islip, New York
Jefferson, Inc., Ray, 40 E. Merrick Rd., Freeport, Long Island, N. Y.
Jefferson-Travis Radio Mfg. Corp., 245 East 23rd Street, New York, N. Y.
Jennings Radio Mfg. Co., R 3 Box 22, San Jose, Calif.
Johnson, E. F., Co., Waseca, Minn.
Kaar Engineering Co., 619 Emerson St., Palo Alto, Calif.
Karadio Corp., 2233 University Ave., St. Paul, Minn.
Lear-Avia, Inc., 1718 Broadway, Piqua, Ohio
Link, Fred M., 125 W. 17th St., New York, N. Y.
Majestic Radio & Television Corp., 2600 W. 50th Street, Chicago, Ill.
Meck Industries, John, Plymouth, Ind.
Megard Corp., 1601 S. Burlington, Los Angeles 6, Calif.
Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Co., James, 150 Exchange St., Malden, Mass.
Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif.
Pacific Electronics, Sprague at Jefferson, Spokane, Wash.
Packard Bell Co., 1115 So. Hope St., Los Angeles, Calif.
Philharmonic Radio Corp., 528 East 72nd St., New York 21, N. Y.
Press Wireless Inc., Hicksville, L. I., N. Y.
Radio Corp. of America, Camden, N. J.
Radio Craftsmen, 1341 S. Michigan Ave., Chicago, Ill.
Radio Engineering Laboratories, Inc., 35-54 36th St., Long Island City, N. Y.
Radio Laboratories, Inc., 2701 California Ave., Seattle 6, Wash.
Radio Mfg. Engineers, Inc., 304 First Ave., Peoria, Ill.
Radio Navigational Instrument Corp., 500 Fifth Avenue, New York, N. Y.
Radio Receptor Co., 251 W. 19th St., New York, N. Y.
Radio Transceiver Laboratories, 8627 115th St., Richmond Hill, N. Y.
Radiomarine Corp. of America, 75 Varick St., New York, N. Y.
Richardson-Allen Corp., 15 West 20th St., New York, N. Y.
Sheridan Electro Corp., 2850 S. Michigan Ave., Chicago, Ill.
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Sparks-Withington Co., North St., Jackson, Mich.
Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
Tay Bern Equipment Co., Inc., 120 Greenwich St., New York 6, N. Y.
Technical Devices Corp., Bloomfield, N. J.
Technical Radio Co., 279 Ninth St., San Francisco, Calif.
Telephonics Corp., 350 West 31st St., New York 1, N. Y.
Televiso Products Co., 6533 N. Olmsted Ave., Chicago, Ill.
Templetone Radio Co., Mystic, Conn.
Transmitter Equipment Co., 345 Hudson St., New York, N. Y.
U. S. Television Manufacturing Corp., 106 Seventh Ave., New York 11, N. Y.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., Radio & X-Ray Division, Baltimore, Md.
Wilcox Electric Co., 1400 Chestnut St., Kansas City, Mo.
Wilcox Gay Corp., Charlotte, Mich.
Winters & Crampton Corp., 150 Wilson Ave., Grandville, Mich.

ELECTRONIC and ALLIED PRODUCTS

FACSIMILE TRANSMITTERS

Alden Products Co., 117 Main St., Brockton, Mass.
Barker & Williamson, 235 Fairfield Ave., Upper Darby, Pa.
Bunnell & Co., J. H., 215 Fulton St., New York, N. Y.
Finch Telecommunications, Inc., Passaic, N. J.
General Electric Co., Schenectady, N. Y.
Press Wireless, Inc., Hicksville, L. I., N. Y.
Radio Corp. of America, Camden, N. J.
Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York, N. Y.
Wilcox-Gay Corp., Charlotte, Mich.

Tubes

CATHODE RAY TUBES

Du Mont Laboratories, Inc., Allen B., 2 Main Ave., Passaic, N. J.
Electronic Tube Corp., 1200 E. Mermaid Ave., Chestnut Hill, Philadelphia, Pa.
General Electric Co., Schenectady, New York
Ken-Rad Tube & Lamp Corp., 227 E. 9th St., Owensboro, Ky.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
North American Philips Co., 100 East 42nd St., New York 17, N. Y.
Northern Mfg. Co., Inc., 36 Spring St., Newark, N. J.
Radio Corp. of America, Camden, N. J.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.

CURRENT REGULATING TUBES (Ballast)

Amperite Co., 561 Broadway, New York, N. Y.
Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn 1, N. Y.
Continental Electric Co., 903 Merchandise Mart, Chicago 56, Ill.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Hytron Corp., 76 Lafayette St., Salem, Mass.
J.F.D. Mfg. Co., 4111 Fort Hamilton Pkwy., Brooklyn, N. Y.
Muter Co., 1255 S. Michigan Ave., Chicago, Ill.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Westinghouse Lamp Div., Westinghouse Elec. & Mfg. Co., Bloomfield, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

GEIGER-MUELLER TUBES and EQUIPMENT

Cyclotron Specialties Co., Moraga, Calif.
Distillation Products Co., Rochester, N. Y.
Herbach & Rademan Co., 522 Market St., Philadelphia, Pa.
North American Philips Co., 100 East 42nd St., New York 17, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

HEARING AID TUBES

Hytron Corp., 76 Lafayette St., Salem, Mass.
Ken-Rad Tube & Lamp Corp., 227 E. 9th St., Owensboro, Ky.
Myers & Sons, E. A., Radioear Bldg., Mt. Lebanon, Pittsburgh, Pa.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Radio Corp. of America, Camden, N. J.
Sonotone Corp., P. O. Box 200, Saw Mill River Rd., Elmsford, N. Y.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

INDUSTRIAL TUBES

Aerolux Light Co., 653 Eleventh Ave., New York, N. Y.
Amperex Electronic Products, 79 Washington St., Brooklyn, N. Y.
Arpin Mfg. Co., 422 Alden St., Orange, N. J.
Continental Electric Co., 903 Merchandise Mart, Chicago 56, Ill.
Eitel-McCullough, Inc., San Bruno, Calif.
Electron Equipment Corp., S. Pasadena, Calif.
Electronic Enterprises, Inc., 65-67 Seventh Ave., Newark 4, N. J.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
Electrons, Inc., 127 Sussex Ave., Newark, N. J.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
Fredericks Co., Geo. E., Bethayres, Pa.
General Electric Co., Schenectady, N. Y.
Hanovia Chemical & Mfg. Co., 233 N. J. R. R. Ave., Newark, N. J.
Heintz & Kaufman, Ltd., South San Francisco, Calif.
Hytron Corp., 76 Lafayette St., Salem, Mass.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
Machlett Laboratories, Springdale, Conn.
North American Philips Co., 100 E. 42nd St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Slater Elec. & Mfg. Co., Inc., 728 Atlantic Ave., Brooklyn 17, N. Y.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Taylor Tubes, Inc., 2312-18 Wabansia Ave., Chicago, Ill.
United Electronics Co., 42 Spring St., Newark 2, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

PHOTOTUBES

Bradley Laboratories, 82 Meadow St., New Haven, Conn.
Continental Electric Co., 903 Merchandise Mart, Chicago 56, Ill.
DeJur Amsco Corp., 6 Bridge St., Shelton, Conn.
Eby, Inc., Hugh H., 18 W. Chelton Ave., Philadelphia 13, Pa.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago 32, Ill.
General Electric Co., Schenectady, New York
General Scientific Corp., 4829 S. Kedzie Ave., Chicago, Ill.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago, Ill.
Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio
Miles Reproducer Co., Inc., 812 Broadway, New York, N. Y.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
Photobell Corp., 116 Nassau St., New York, N. Y.
Photovolt Corp., 95 Madison Ave., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Rauland Corp., 4245 N. Knox Ave., Chicago, Ill.
Rehtron Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Selenium Corp. of America, 1719 W. Pico Blvd., Los Angeles 15, Calif.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

RECEIVING TUBES

Admiral Corp., 444 Lake Shore Drive, Chicago 11, Ill.
Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, N. Y.
General Electric Co., Schenectady, New York
Hytron Corp., 76 Lafayette St., Salem, Mass.
Ken-Rad Tube & Lamp Corp., 227 E. Ninth St., Owensboro, Ky.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
North American Philips Co., 100 East 42nd St., New York 17, N. Y.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Slater Electric & Mfg. Co., Inc., 728 Atlantic Ave., Brooklyn 17, N. Y.
Sonora Radio & Television Corp., 2626 W. Washington St., Chicago 28, Ill.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Tung-Sol Lamp Works Inc., 95 Eighth Ave., Newark, N. J.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.

RECTIFYING TUBES

Aerolux Light Corp., 653 Eleventh Ave., New York, N. Y.
Amperex Electronic Products, 79 Washington St., Brooklyn, N. Y.
Arpin Mfg. Co., 422 Alden St., Orange, N. J.
Continental Electric Co., 903 Merchandise Mart, Chicago 56, Ill.
Eitel-McCullough, Inc., San Bruno, Calif.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
Electrons, Inc., 127 Sussex Ave., Newark, N. J.
Federal Engineering Co., 37 Murray St., New York, N. Y.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
General Electric Co., Schenectady, N. Y.
General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago, Ill.
General Electronics, Inc., 101 Hazel St., Paterson, N. J.
Heintz & Kaufman, Ltd., South San Francisco, Calif.
Hytron Corp., 76 Lafayette St., Salem, Mass.
Jennings Radio Mfg. Co., R3, Box 22, San Jose, Calif.
Lewis Electronics, Inc., Los Gatos, Calif.
Machlett Laboratories, Springdale, Conn.
National Co., Inc., 61 Sherman St., Malden, Mass.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
North American Philips Co., 100 East 42nd St., New York 17, N. Y.
Radio Corp. of America, Camden, N. J.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Taylor Tubes, Inc., 2312 Wabansia Ave., Chicago, Ill.
Translite, Inc., 647 Kent Ave., Brooklyn, N. Y.
United Electronics Co., 42 Spring St., Newark 2, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westinghouse Lamp Div. Westinghouse Elec. & Mfg. Co., Bloomfield, N. J.

TRANSMITTING and POWER TUBES

Amperex Electronic Products, 79 Washington St., Brooklyn, N. Y.
Arpin Mfg. Co., 422 Alden St., Orange, N. J.
de Forest Laboratories, Lee, 5106 Wilshire Blvd., Los Angeles, Calif.
Eitel-McCullough, Inc., San Bruno, Cal.
Electronic Enterprises, Inc., 65-67 Seventh Ave., Newark 4, N. J.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
Electronic Tube Corp., 1200 E. Mermaid Ave., Chestnut Hill, Philadelphia, Pa.
Federal Engineering Co., 37 Murray St., New York, N. Y.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
General Electric Co., Schenectady, New York

General Electronics, Inc., 101 Hazel St., Paterson, N. J.
Heintz & Kaufman, Ltd., South San Francisco, Calif.
Hytron Corp., 76 Lafayette St., Salem, Mass.
Industrial & Commercial Electronics, Belmont, Calif.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
Lewis Electronics, Inc., Los Gatos, Calif.
Machlett Laboratories, Springdale, Conn.
National Union Radio Corp., 15 Washington St., Newark 2, N. J.
North American Philips Co., Inc., 100 East 42nd St., New York 17, N. Y.
Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.
Radio Corp. of America, Camden, N. J.
Slater Electric & Mfg. Co., Inc., 728 Atlantic Ave., Brooklyn 17, N. Y.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Standard Arcturus Corp., 30 Court St., Newark 2, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Taylor Tubes, Inc., 2312 Wabansia Ave., Chicago, Ill.
Tung-Sol Lamp Works, Inc., 95 Eighth Ave., Newark, N. J.
United Electronics Co., 42 Spring St., Newark 2, N. J.
Western Electric Co., Inc., 195 Broadway, New York, N. Y.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

VOLTAGE REGULATING TUBES

see Rectifying Tubes

X-RAY TUBES and EQUIPMENT

Eureka X-Ray Corp., 3250 N. Kilpatrick St., Chicago, Ill.
Fischer & Co., H. G., 2323 Wabansia Ave., Chicago, Ill.
Franklin X-Ray Co., 2100 Arch St., Philadelphia 3, Pa.
General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago, Ill.
Machlett Laboratories, Springdale, Conn.
Newman X-Ray Corp., Aurora, Ill.
North American Philips Co., Inc., Metallix Div., 100 East 42nd St., New York, N. Y.
Peerless Laboratories, 115 E. 23rd St., New York, N. Y.
Picker X-Ray Corp., 300 Fourth Ave., New York 2, N. Y.
St. John X-Ray Service Co., 30-20 Thomson Ave., Long Island City, N. Y.
Standard X-Ray Co., 1930 N. Burling St., Chicago, Ill.
Universal X-Ray Products, Inc., 1800 N. Francisco Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Radio & X-Ray Div., Baltimore, Md.

Tube Parts

Admak Manufacturing Co., 46 Cordier St., Irvington, N. J.
American Brass Co., Waterbury, Conn.
Arpin Mfg. Co., 422 Alden St., Orange, N. J.
Bead Chain Mfg. Co., 110 Mt. Grove St., Bridgeport, Conn.
Birtcher Corp., 5087 Huntington Drive, Los Angeles, Calif.
Callite Tungsten Corp., 544 39th St., Union City, N. J.
Electronic Manufacturing Co., 20 Orange St., Newark 21, N. J.
Electronic Products Co., 111 E. Third St., Mt. Vernon, N. Y.
Engineering Co., 27 Wright St., Newark, N. J.
Fansteel Metallurgical Corp., 2200 Sheridan Road, No. Chicago, Ill.
Ford Radio & Mica Corp., 538 63rd St., Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn, N. Y.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
Huse Liberty Mica Co., 171 Camden St., Boston, Mass.
King Laboratories, Inc., 205 Oneida Street, Syracuse 4, N. Y.
Lewis Electronics Inc., Rte. 3, Los Gatos, Calif.
Mica Products Mfg. Co., 69 Wooster St., New York, N. Y.
Munsell & Co., Eugene, 200 Varick St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Rice's Sons, Inc., Bernard, 325 Fifth Ave., New York, N. Y.
Superior Tube Co., Norristown, Pa.
United-Carr Fastener Corp., 31 Ames St., Cambridge, Mass.
Worcester Pressed Steel Co., 100 Barber Ave., Worcester, Mass.

Tube Repairs

Arpin Mfg. Co., 422 Alden St., Orange, N. J.
Electronic Products Co., 111 E. Third St., Mr. Vernon, N. Y.
Lewis Electronics, Inc., Los Gatos, Calif.
Freeland & Olschner Products, Inc., 611 Baronne St., New Orleans 13, La.
Radio Corp. of America, Camden, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
West Shore Laboratories, Box 117, Marblehead, Mass.

Tubing

BRASS and COPPER TUBING

American Brass Co., Waterbury, Conn.
Bridgeport Brass Co., E. Main St., Bridge-Port, Conn.
Chase Brass & Copper Co., Waterbury 91, Conn.
Edwards, Inc., T. J., 121 Beach St., Boston 5, Mass.
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Scovill Mfg. Co., 99 Mill St., Waterbury 91, Conn.
United States Rubber Co., 1234 Sixth Ave., New York 20., N. Y.
Wolverine Tube Co., 1411 Central Ave., Detroit, Mich.

CERAMIC TUBING

see Insulation

FABRIC TUBES and TUBING

Alpha Wire Corp., 50 Howard St., New York, N. Y.
Anchor Webbing Co., 1005 Main St., Pawtucket, R. I.
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Brand & Co., William, 276 Fourth Ave., New York, N. Y.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Bridgeport, Conn.
Hope Webbing Co., Providence, Rhode Island.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
McInerny Plastics Co., 655 Godfrey Ave., S. W., Grand Rapids 1, Mich.
Mica Insulator Co., 200 Varick St., New York, N. Y.
Mitchell-Rand Insulation Co., 54 Murray St., New York 7, N. Y.
National Varnished Products Corp., 211 Randolph Ave., Woodbridge, N. J.
Penn Fibre & Specialty Co., 2030 E. Westmoreland St., Phila. 34, Pa.
Surprenant Electrical Insulation Co., 84 Purchase St., Boston, Mass.
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.
Varflex Corp., Cor. N. Jay St., Rome, N. Y.

FIBRE TUBING

see Insulation

GLASS TUBES and TUBING

Alpha Wire Corp., 50 Howard St., New York, N. Y.
B & C Insulation Products, Inc., 261 Fifth Ave., New York, N. Y.
Bentley, Harris Mfg. Co., Hector & Lime Sts., Conshohocken, Pa.
Corning Glass Works, Corning, N. Y.
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Libbey Glass Co., Ohio Bldg., Toledo, Ohio
Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, Ohio
Semon Bache & Co., 636 Greenwich St., New York, N. Y.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.

KNITTED WIRE TUBES and TUBING

Alden Products Co., 117 Main St., Brockton, Mass.
Alpha Wire Corp., 50 Howard St., New York, N. Y.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Chicago Metal Hose Corp., 1315 S. 3rd Ave., Maywood, Ill.
Electric Auto-Lite Co., Toledo 1, Ohio
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y.

METAL and ALLOY TUBING

General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
International Nickel Co., 67 Wall St., New York 5, N. Y.
National Lead Co., 111 Broadway, New York, N. Y.
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Summerill Tubing Co., Bridgeport, Pa.
Superior Tube Co., Norristown, Pa.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.

PAPER TUBES and TUBING

American Paper Tube Co., Hazel St., Woonsocket, R. I.
B & C Insulation Products Inc., 261 Fifth Ave., New York, N. Y.
Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y.
Cross Paper Products Corp., 2595 Third Ave., New York, N. Y.
Franklin Fibre-Lamitex Corp., 12th & French Sts., Wilmington, Del.
General Electric Co., Bridgeport, Conn.
General Paper Tube Co., 430 E. Chelton Ave., Philadelphia, Pa.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Mica Insulator Co., 200 Varick St., New York, N. Y.
New England Radiocrafters, 115 Commonwealth Ave., Boston 34, Mass.
Paramount Paper Tube Co., 801 Glasgow Ave., Fort Wayne, Ind.
Precision Paper Tube Co., 2033 W. Charleston St., Chicago, Ill.
Tingstol Corp., 1461 W. Grand Ave., Chicago, Ill.

PLASTIC TUBING

see Insulation

Turntables

PHONOGRAPH and TRANSCRIPTION TURNTABLES

Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio
Allied Recording Products Co., 21-09 43rd Ave., Long Island City, N. Y.
Chicago Sound Systems Co., 2124 S. Michigan Ave., Chicago, Ill.
Electro Acoustic Co., 2131 Bueter Rd., Fort Wayne, Ind.
Gates Radio Co., 200 Hampshire St., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
General Industries Co., Taylor & Olive St., Elyria, Ohio
Halstead Traffic Communication Corp., 155 E. 44th St., New York, N. Y.
Harris Mfg. Co., 2422 W. Seventh St., Los Angeles, Calif.
Merkle-Korff Gear Co., 213 N. Morgan St., Chicago 7, Ill.
Newcomb Audio Products Co., 2815 S. Hill St., Los Angeles, Calif.

Pacific Sound Equipment Co., 1534 Cahuenga Blvd., Hollywood, Calif.
Presto Recording Corp., 242 W. 55th St., New York, N. Y.
Proctor Co., B. A., 2 W. 45th St., New York, N. Y.
Radio Corp. of America, Camden, N. J.
Radio Engineering Laboratories, Inc., 35-54 36th St., Long Island City, N. Y.
Rek-O-Kut Co., 173 Lafayette St., New York 13, N. Y.
Robinson Recording Laboratories, 35 S. Ninth St., Philadelphia, Pa.
Talking Devices Co., 4447 W. Irving Park Rd., Chicago, Ill.
Waters-Conley Co. Rochester, Minn.
Webster Products, 3825 Armitage Ave., Chicago, Ill.

Varnish

see Finishes

Vibration Insulating Mountings

see Mountings

Vibrator Testers

see Testers, Vibration

Vibrators

American Television & Radio Corp., 300 E. 4th St., St. Paul, Minn.
Electronic Laboratories, Inc., Indianapolis, Ind.
Kurman Electric Co., 35-18 37th St., Long Island City, N. Y.
Mallory & Co., P. R., 3029 E. Washington St., Indianapolis, Ind.
Oak Mfg. Co., 1260 Clayhourn Ave., Chicago, Ill.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Radiart Corp., 3571 W. 62 St., Cleveland, Ohio
Utah Radio Products Co., 820 Orleans St., Chicago, Ill.
Vibrapower Co., James, 1551 Thomas St., Chicago, Ill.

Voltage Dividers

see Dividers

Voltage Regulators

see Regulators

Voltmeter Multipliers

see Multipliers

Voltmeters

see Meters

Volume Controls

see Controls

Washers

LOCK WASHERS

American Nut & Bolt Fastener Co., 2045 Doerr St., Pittsburgh, Pa.
Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn.
Clark Bros. Bolt Co., Milldale, Conn.
Federal Screw Products Co., 224 W. Huron St., Chicago 17, Ill.
Garrett Co., Geo. K., D & Tioga Sts., Philadelphia, Pa.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
Harper Co., H. M., 2620 Fletcher St., Chicago 18, Ill.
Hartford Machine Screw Co. Hartford, Conn.
Industrial Screw & Supply Co., 713 W. Lake St., Chicago 25, Ill.
Insuline Corp of America, 36-02 35th Ave., Long Island City, N. Y.
Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.
Palnut Co., 61 Cordier St., Irvington, N. J.
Penn Fibre & Specialty Co., 2030 E. Moreland St., Philadelphia 34, Pa.
Philadelphia Steel & Wire Corp., Penn St. & Belfield Ave., Philadelphia, Pa.
Positive Lock Washer Co., 181 Miller St., Newark, N. J.
Printloid, Inc., 95 Mercer St., New York 12, N. Y.
Shakeproof, Inc., 2501 N. Keeler Ave., Chicago 39, Ill.
St. Louis Screw & Bolt Co., 6900 N. B'way, St. Louis, Mo.
Standard Locknut & Lockwasher Inc., Indianapolis, Ind.
Sterling Bolt Co., 209 W. Jackson Blvd., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Worcester Pressed Steel Co., 100 Barber Ave., Worcester, Mass.
Wrought Washer Mfg. Co., 2237 S. Bay St., Milwaukee 7, Wis.

Wattmeters

see Meters

Waxes

WAXES and COMPOUNDS

American Products Mfg. Co., 8127 Oleander St., New Orleans, La.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Bakelite Corp., 30 E. 42nd St., New York 17, N. Y.
Biddle Co., James G., 1213 Arch St., Philadelphia, Pa.
Biwax Corp., 3445 Howard St., Skokie, Ill.
Cantol Wax Co., 211 N. Washington St., Bloomington, Ind.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J.
Dolph Co., John C., 168 Emmett St., Newark, N. J.
Federal Telephone and Radio Corp., 591 Broad St., Newark, N. J.
General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Glyco Products Co., Inc., 26 Court St., Brooklyn, N. Y.
Halowax Products Div., Union Carbide & Carbon Corp., 30 East 42nd St., New York, N. Y.
Insl-X Co., Inc., 857 Meeker Ave., Brooklyn, N. Y.
Insulatine Co., 1 Broadway, New York, N. Y.
Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.
Irvington Varnish & Insulator Co., 10 Argyle Terrace, Irvington, N. J.
Johns-Manville, 22 E. 40th St., New York, N. Y.
Johnson & Co., S. C., Industrial Div., Racine 2, Wisc.
Minerallac Electric Co., 25 N. Peoria St., Chicago, Ill.
Mitchell-Rand Insulation Co., 51 Murray St., New York 7, N. Y.
Paisley Products, Inc., 1770 Canalport Ave., Chicago 16, Ill.
Petroleum Specialties, Inc., 400 Madison Ave., New York, N. Y.
Production Engrg. Corp. 666 Van Houten Ave., Clifton, N. J. (service)
Roebling's Sons Co., John A., 640 S. Broad St., Trenton 2, N. J.
Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago, Ill.
Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y.
Sterling Varnish Co., Haysville, Pa.
Witco Chemical Co., 295 Madison Ave., New York 17, N. Y.
Zophar Mills, Inc., 112-26th St., Brooklyn 32, N. Y.

Winders

COIL WINDERS

see Machines

WINDINGS

see Coils

Wire

ANTENNA WIRE

Alpha Wire Corp., 50 Howard St., New York, N. Y.
American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Ansonia Electrical Co., Ansonia, Conn.
Bassett, Inc., Rex, 500 S. E. Second St., Ft. Lauderdale, Fla.
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 55, Ill.
Boston Insulated Wire & Cable Co., 65 Bay St. (Dorchester), Boston, Mass.
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Crescent Insulated Wire & Cable Co., N. Olden Ave., Trenton, N. J.
Diamond Wire & Cable Co., 128 E. 16th St., Chicago Heights, Ill.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Electric Auto-Lite Co., Toledo 1, Ohio
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Fleron & Son, Inc., M. M., 113 N. Broad St., Trenton, N. J.
Flexo Wire Co., 638 W. Genessee St., Syracuse, N. Y.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Johnson Co., E. F., Waseca, Minn.
New England Electrical Wks., Inc., 365 Main St., Lisbon, N. H.
Paranite Wire & Cable Corp., Div. of Essex Corp., 1601 Wall St., Fort Wayne, Ind.
Premax Products Div., Chisholm Ryder Co., College & Highland Aves., Niagara Falls, N. Y.
Roebling's Sons Co., John A., 640 S. Broad St., Trenton 2, N. J.
Schott Co., Walter L., 9306 Santa Monica Blvd., Beverly Hills, Calif.
Uniform Tubes, Shurs Lane & Lauriston St., Roxborough, Philadelphia, Pa.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Utilities Service Co., 1 Pine St., Allentown, Pa.
Western Insulated Wire, Inc., 1001 E. 62nd St., Los Angeles, Calif.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

HIGH VOLTAGE WIRE

Acorn Insulated Wire Co., 225 King St., Brooklyn, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
Alpha Wire Corp., 50 Howard St., New York, N. Y.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Boston Insulated Wire & Cable Co., 65 Bay St., (Dorchester), Boston, Mass.
Crescent Co., Front & Central Ave., Pawtucket, R. I.
Crescent Insulated Wire & Cable Co., N. Olden Ave., Trenton, N. J.
Diamond Wire & Cable Co., 128 E. 16th St., Chicago Heights, Ill.
Driver Co., Wilbur B., Riverside Ave., Newark, N. J.
Electric Auto-Lite Co., Toledo 1, Ohio
Electric Auto-Lite Co., Wire Div., Port Huron, Mich.
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Flexo Wire Co., 638 W. Genessee St., Syracuse, N. Y.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Bridgeport, Conn.
Goldmark Wire Co., James, 116 West St., New York, N. Y.
Jelliff Mfg. Corp., C. O., 200 Pequot Ave., Southport, Conn.
National Electric Products Corp., Fulton Bldg., Pittsburgh, Pa.
Okonite Co., Canal St., Passaic, N. J.

Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Providence, R. I.
Roebling's Sons Co., John A., 640 S. Broad St., Trenton 2, N. J.
Rome Cable Corp., 330 Ridge St., Rome, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Western Insulated Wire, Inc., 1001 East 62nd St., Los Angeles, Calif.
York Insulated Wire Works Div., General Electric Co., York, Pa.

HOOKUP WIRE

Aircraft-Marine Products, Inc., 1523 N. 4th St., Harrisburg, Pa.
Acorn Insulated Wire Co., 225 King St., Brooklyn, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
Alpha Wire Corp., 50 Howard St., New York, N. Y.
American Electric Cable Co., Holyoke, Mass.
Ansonia Electrical Co., Ansonia, Conn.
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 55, Ill.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Boston Insulated Wire & Cable Co., 65 Bay St., (Dorchester), Boston, Mass.
Consolidated Wire & Associated Corps., Peoria & Harrison Sts., Chicago, Ill.
Cornish Wire Co., 15 Park Row, New York, N. Y.
Crescent Co., Front & Central Ave., Pawtucket, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
Diamond Wire & Cable Co., 128 East 16th St., Chicago Heights, Ill.
Electric Auto-Lite Co., Toledo 1, Ohio
Electric Switch Corp., 14th at Union St., Columbus, Ind.
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Flexo Wire Co., 638 W. Genesee St., Syracuse, N. Y.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Bridgeport, Conn.
General Insulated Wire Works, Providence, R. I.
J. F. D. Mfg. Co., 4111 Ft. Hamilton Parkway, Brooklyn, N. Y
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Lenz Electric Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Lowell Insulated Wire Co., 171 Lincoln St., Lowell, Mass.
Metroloy Co., 57 E. Alpine St., Newark, N. J.
Nonotuck Mfg. Co., Holyoke, Mass.
Packard Electric Div., General Motors Corp., Warren, Ohio
Paranite Wire & Cable Corp., Div. Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y.
Philmore Mfg. Co., 113 University Pl., New York, N. Y.
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.
Rhode Island Insulated Wire Co., Providence, R. I.
Rockbestos Products Corp., 308 Nicoll St., New Haven 4, Conn.
Roebling's Sons Co., John A., 640 Broad St., Trenton 2, N. J.
Rome Cable Corp., 330 Ridge St., Rome, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York, N. Y.
Western Insulated Wire, Inc., 1001 East 62nd St., Los Angeles, Calif.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

MAGNET WIRE

Alpha Wire Corp., 50 Howard St., New York, N. Y.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Ansonia Electrical Co., Ansonia, Conn.
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 55, Ill.
Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn.
Electric Auto-Lite Co., Toledo 1, Ohio
Eraser Co., Inc., 231 W. Water St., Syracuse 2, N. Y.
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Bridgeport, Conn.
Goldmark Wire Co., James, 116 West St., New York, N. Y.
Guthman & Co., Edwin I., 15 S. Throop St., Chicago, Ill.
Hudson Wire Co., Winsted Div., Winsted, Conn.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Knickerbocker Anunciator Co., 116 West St., New York, N. Y.
Meissner Mfg. Co., Mt. Carmel, Ill.
Metroloy Co., 57 E. Alpine St., Newark, N. J.
New England Electrical Wks., Inc., Lisbon, N. H.
North-American Phillips Co., 100 East 42nd St., New York 17, N. Y.
Paranite Wire & Cable Corp., Div., Essex Wire Co., 1601 Wall St., Fort Wayne, Ind.
Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y.
Philadelphia Insulated Wire Co., 200 N. Third St., Philadelphia, Pa.
Rea Magnet Wire Co., Inc., E. Pontiac St., Fort Wayne, Ind.
Rockbestos Products Corp., 308 Nicoll St., New Haven 4, Conn.
Roebling's Sons Co., John A., 640 S. Broad St., Trenton 2, N. J.
Rome Cable Corp., 330 Ridge St., Rome, N. Y.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

POWER CORDS

Aircraft Products Co., 3502 E. Pontiac St., Indianapolis, Ind.
Alden Products Co., 117 Main St., Brockton, Mass.
Alpha Wire Corp., 50 Howard St., New York, N. Y.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Ansonia Electrical Co., Ansonia, Conn.
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 55, Ill.
Birnbach Radio Co., 145 Hudson St., New York, N. Y.
Boston Insulated Wire & Cable Co., 65 Bay St., (Dorchester), Boston, Mass.
Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn, N. Y.
Consolidated Wire & Associated Corps., Peoria & Harrison Sts., Chicago, Ill.
Cornish Wire Co., 15 Park Row, New York, N. Y.
Crescent Co., Front & Central Ave., Pawtucket, R. I.
Crescent Insulated Wire & Cable Co., N. Olden Ave., Trenton, N. J.
Diamond Wire & Cable Co., 128 East 16th St., Chicago Heights, Ill.
Electric Auto-Lite Co., Toledo 1, Ohio
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Bridgeport, Conn.
General Insulated Wire Works, Inc., 69 Gordon Ave., Providence 5, R. I.
Guthman Co., Edwin I., 15 S. Throop, Chicago, Ill.
Haines Mfg. Co., 248 McKibben Ave., Brooklyn 6, N. Y.
Hazard Insulated Wire Works, Div. of The Okonite Co., Wilkes-Barre, Pa.
Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.
J. F. D. Mfg. Co., 4111 Fort Hamilton Parkway, Brooklyn, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38, Ill.
Kerite Insulated Wire & Cable Co., 30 Church St., New York 7, N. Y.
Lenz Electric Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Lowell Insulated Wire Co., 171 Lincoln St., Lowell, Mass.
National Electric Products Corp., Fulton Bldg., Pittsburgh, Pa.
Okonite Co., Passaic, N. J.
Paranite Wire & Cable Div., Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Phelps Dodge Copper Products Corp., American Copper Products Div., 40 Wall St., New York, N. Y.
Philmore Mfg. Co., 113 University Place, New York, N. Y.
Roebling's Sons Co., John A., 640 S. Broad St., Trenton 2, N. J.
Rome Cable Corp., 330 Ridge St., Rome, N. Y.
Runzel Cord & Wire Co., 4731 W. Montrose Ave., Chicago, Ill.
Simplex Wire & Cable Corp., 79 Sidney St., Cambridge 39, Mass.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Western Insulated Wire, Inc., 1001 East 62nd St., Los Angeles, Calif.
York Insulated Wire Works Div. of General Electric Co., York, Pa.

RESISTANCE and FILAMENT WIRE

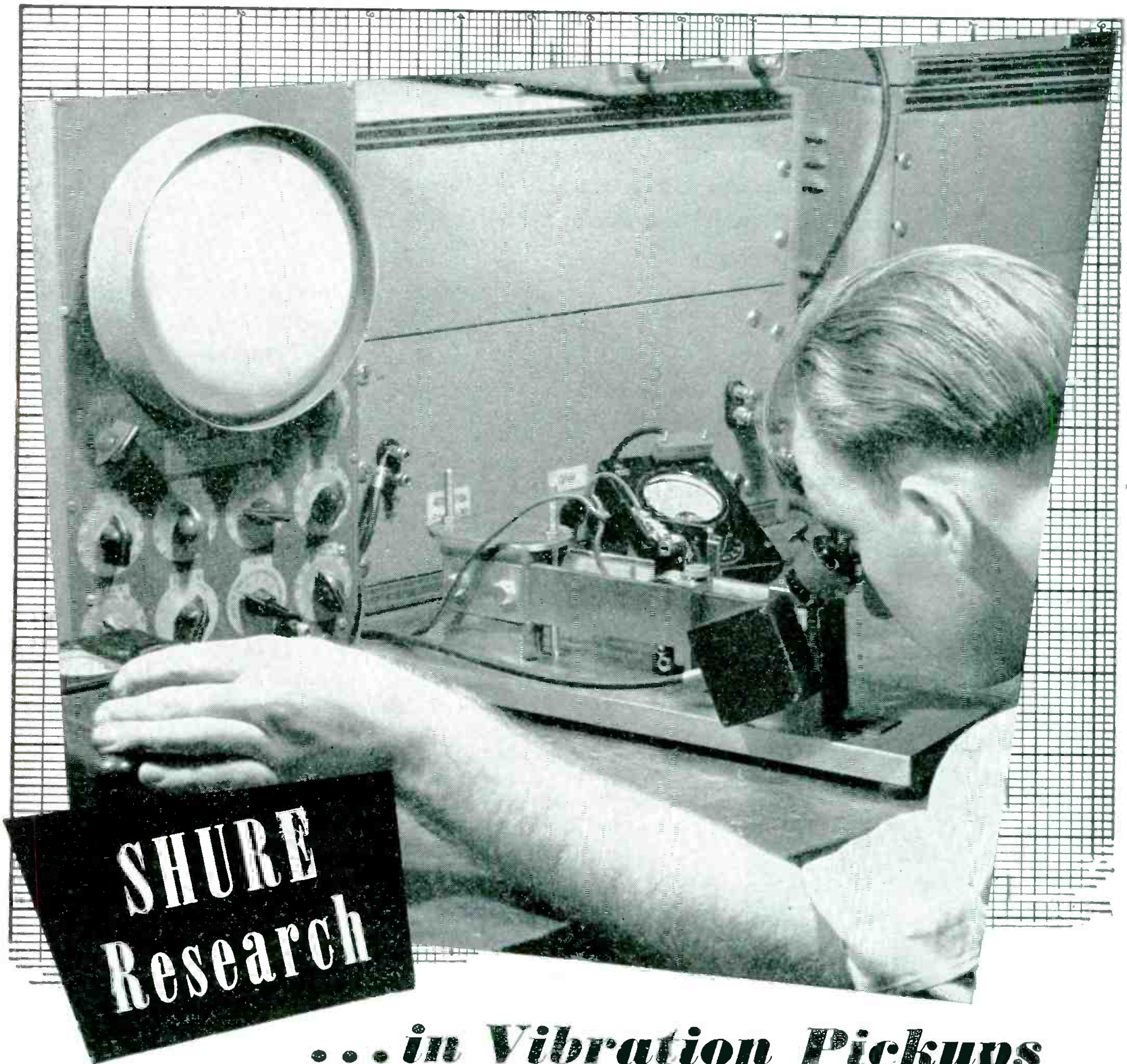
Alloy Metal Wire Co., Prospect Park, Pa.
American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Callite Tungsten Corp., 544 39th St., Union City, N. J.
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Cohn & Co., Sigmund, 44 Gold St., New York, N. Y.
Driver Co., Wilbur B., 150 Riverside Ave., Newark, N. J.
Driver-Harris Co., 201 Middlesex St., Harrison, N. J.
Electric Auto-Lite Co., Toledo 1, Ohio
Eraser Co. Inc., 231 W. Water St., Syracuse 2, N. Y.
General Electric Co., Bridgeport, Conn.
General Insulated Wire Works, Inc., 69 Gordon Ave., Providence, R. I.
Gibbs & Co., Thomas B., Div. of George W. Borg Corp., 814 Michigan St., Delavan, Wisc.
Goldmark Wire Co., James, 116 West St., New York, N. Y.
Haydu Bros., Mt. Bethel Rd., Plainfield, N. J.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8, Mich.
Jelliff Mfg. Corp., C. O., 200 Pequot Ave., Southport, Conn.
North American Phillips Co., 100 East 42nd St., New York 17, N. Y.
Northern Mfg. Co., Inc., 36 Spring St., Newark, N. J.
Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Westinghouse Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

SHIELDED WIRE

Acorn Insulated Wire Co., 225 King St., Brooklyn, N. Y.
Alden Products Co., 117 Main St., Brockton, Mass.
Alpha Wire Corp., 50 Howard St., New York, N. Y.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Ansonia Electrical Co., Ansonia, Conn.
Belden Mfg. Co., 4673 W. Van Buren St., Chicago 55, Ill.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Boston, Mass.
Cornish Wire Co. Inc., 15 Park Row, New York, N. Y.
Crescent Ins. Wire & Cable Co., N. Olden Ave., Trenton, N. J.
Diamond Wire & Cable Co., 128 E. 16th St., Chicago Heights, Ill.
Electric Auto-Lite Co., Toledo 1, Ohio
Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind.
Flexo Wire Co., 638 W. Genesee St., Syracuse, N. Y.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
General Electric Co., Bridgeport, Conn.
Packard Electric Div., General Motors Corp., Warren, Ohio
Precision Tube Co., 3828 Terrace St., Philadelphia, Pa.
Roebling's Sons Co., John A., 640 Broad St., Trenton 2, N. J.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge 39, Mass.
Uniform Tubes, Shurs Lane & Lauriston St., Roxborough, Philadelphia, Pa.
United States Rubber Co., 1234 Sixth Ave., New York 20, N. Y.
Western Insulated Wire, Inc., 1001 East 62nd St., Los Angeles, Calif.

X-ray Tubes & Equipment

see Tubes



...in Vibration Pickups

Shure research has pioneered in the development of vibration measuring instruments. These instruments are important in the determination of leakages in water pipes, the vibration of machinery, buildings, electrical appliances. Among its many uses, vibration pickups have been successfully used in locating termite infested wooden members. Shure engineers have devised special vibration actuators and special standard pickups capable of measuring vibration accurately throughout the greater part of the audio frequency range. Another significant contribution is the development of integrating networks which permit the measurement of either acceleration, velocity or displacement with a single Vibration Pickup.

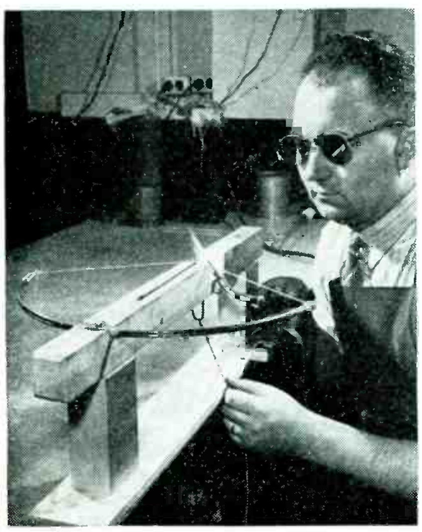
SHURE BROTHERS, 225 West Huron Street, Chicago
Designers and Manufacturers of Microphones and Acoustic Devices

ARMY E NAVY
SHURE
MICROPHONES

TUBES AT WORK

Cross-Bow Shoots Quartz Filaments

MEASURING THE MAGNIFYING power of the electron microscope requires a quartz filament having a diameter of 1/30,000th of an inch. To make such a very delicate thread requires a high initial burst of speed that stretches the quartz while it is in a hot, fluid state and before it has a chance to cool and harden. For this purpose, engineers in the Westinghouse Research Laboratories use an old fashioned cross-bow, since it has been found the simplest and most efficient device.



This cross-bow shoots an arrow that stretches hot quartz into thin filaments for calibrating electron microscopes

The cross-bow, shown in the photograph, is fashioned from tough, flexible steel and mounted on a wooden stock. A small cylindrical piece of quartz is attached to the end of the arrow and heated with an oxy-hydrogen torch until the quartz is just about ready to melt. When the trigger is pulled, the arrow darts from the bow at high speed, trailing behind it gossamer-like threads of quartz. Unbroken pieces up to 20 feeet in length are not unusual, but more often the filaments are dispersed in smaller sections throughout the route the arrow takes. They are extremely flexible and can be wound like thread.

The quartz filament is first put under the electron microscope and gaged by comparison with other standards. Once its diameter has been fixed accurately, it becomes a standard for determining the magnifying power of electron microscopes.

Some of the filaments drawn by the bow are so delicate that they are invisible to the naked eye when viewed under direct light. A strong light source, however, glances off the shiny filament and scatters its rays in different directions and makes the filament appear larger than it actually is. Sixty of the filaments are required to equal the thickness of a human hair.

Electron Microscopes for Production, Research and Analysis

TWO NEW MODELS of electron microscopes have been announced by RCA that provide flexibility and simplicity, both electrically and mechanically, and may be operated by relatively unskilled personnel. One model, shown in the photograph, has been built into a console cabinet the size of an ordinary office desk. This is a smaller, less expensive version of the standard RCA electron microscope and it is intended for use in factories as a process control instrument, in chemical industries for routine analysis, and in schools, hospitals and small laboratories.

Fixed magnification is provided at 5,000 X in the regular operating

The console model of the RCA electron microscope was demonstrated at the wartime conference of the Society of American Bacteriologists by Dr. V. K. Zworykin (seated left), Dr. James Hillier, and Perry C. Smith (standing). The electronic optical system in this model is mounted horizontally, and the picture projected to the vertical screen. Movement of the stage, focus, and control of brilliance are provided by the controls. The pumps, power supply and electrical circuits are all contained in the desk, making the unit completely self-contained and capable of operation from the light socket

IRC WILL BE READY

with SEALED PRECISION VOLTMETER MULTIPLIERS

When "that day" arrives, I R C will be able to supply not only voltmeter multipliers but *all* types of resistances, to meet industry's peacetime needs.

There will be no lag because of reconversion. Instead, the vast quantities of resistors being turned out for the Armed Services can be immediately diverted to civilian goods channels at prices consistent with the mass production methods now in effect.

Meanwhile, members of our engineering staff will be glad to consult with any manufacturers whose post-war plans involve resistance units. There is no obligation, and of course you can be certain all information will be held in confidence.

FEATURES OF SEALED PRECISION VOLTMETER MULTIPLIERS

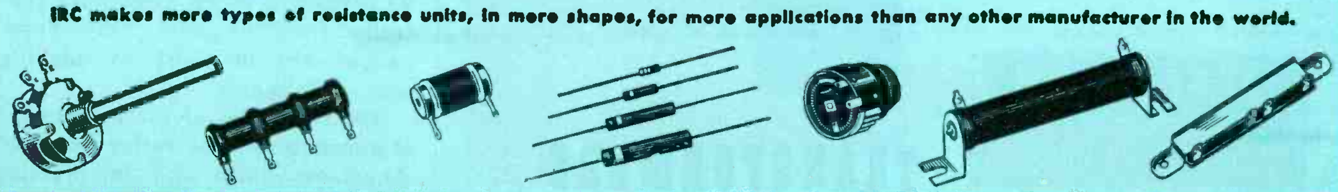
1. *Meet all test requirements of A.S.A. Standard C-75.5—1943.*
2. *Space and layer wound with enamelled wire and with silver soldered connections.*
3. *Sealed to withstand all salt atmospheric and tropical conditions.*
4. *Non-inductively wound to one half of one percent.*
5. *Extra safety factor through the use of large diameter wire and special insulation against voltage breakdown.*

PREFERRED FOR PERFORMANCE · IRC · FIXED & VARIABLE RESISTORS

INTERNATIONAL RESISTANCE CO.

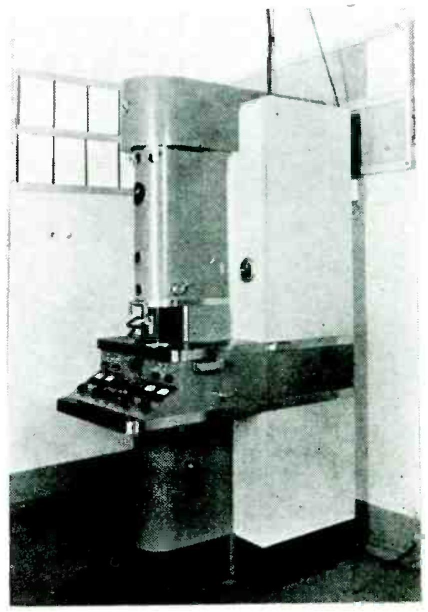
401 N. Broad St. Philadelphia 8, Pa.

IRC makes more types of resistance units, in more shapes, for more applications than any other manufacturer in the world.



position or 500 X with one lens removed. The higher magnification is most satisfactory for photographic purposes and is satisfactory for 90 percent of all direct viewing requirements. Resolution of the console model is comparable to that of the larger models and the depth of focus is the same, 10 to 25 microns. The penetrating power is not as great, since an anode voltage of 30 kv is used as against 50 kv in the larger model.

For use in research laboratories and for other applications requiring a maximum of flexibility, a



Refinements in the universal model of the electron microscope include meters at the left of the operating panel which are "coarse" and "fine" ionization gages and meters at the right which are used for maintenance checking. The image is viewed through the glass ports just above the control board. A sliding shield covers these ports for photography. This instrument contains the electron diffration camera

universal instrument, type EMU, is available. This is mounted in an upright housing that contains the microscope column, the oil-diffusion pump, and a 50-kv power supply. A voltage regulator and mechanical first-stage pump are separate.

Magnifications from 100 X to 20,000 X are obtainable and the most used range, 7500 X to 20,000 X, is covered in ten fixed steps controlled from the panel. Three lower ranges are provided by making lens adjustments.

The resolution of the instrument is guaranteed to be better than 100 Angstrom units and in practice

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resolution two or three times better than this has been obtained. Thus, particles less than a millionth of an inch in size (about six atoms wide) can be easily seen. The depth of focus is the same as the console model, 10 to 25 microns.

The universal instrument also contains an electron diffraction attachment that permits diffraction patterns to be made without any additional equipment. Since the spacing of the circles in these patterns bears a direct relation to the arrangement of atoms in the molecule, the patterns can be used in the study of molecular structures, in determining unknown materials by comparison with known patterns, and in detecting the presence of impurities by the presence of extra lines. This feature presents the possibility of new techniques in production control processes as well as in research and development.

Stereo Microphotos

Both the universal and the console model provide a rather great depth of focus which tends to give a third dimensional effect to direct viewing. Stereoscopic microphoto graphs can also be made with both models. A tilting mechanism built into the specimen holder allows the specimen to be tilted at a slight angle to the normal in either direction without breaking the vacuum. Photographs taken at different tilts can be paired and examined under a stereoscopic viewer to give a pronounced depth to the picture. They may also be made into slides by the vectorgraph method and, when projected on a screen, viewed through polarized glasses.

Bacteriology Applications

In a review of recent developments in electron microscopy, presented before the Society of American Bacteriologists in New York City May 5, Dr. V. K. Zworykin and Dr. James Hillier of RCA Laboratories displayed the new models and disclosed important new applications in bacteriology, including study of the effects of penicillin and sulfanilamide. Excerpts from the joint paper are presented here.

The resolving power or the maximum useful magnification of any microscope is limited by the wavelength of the radiation used and by

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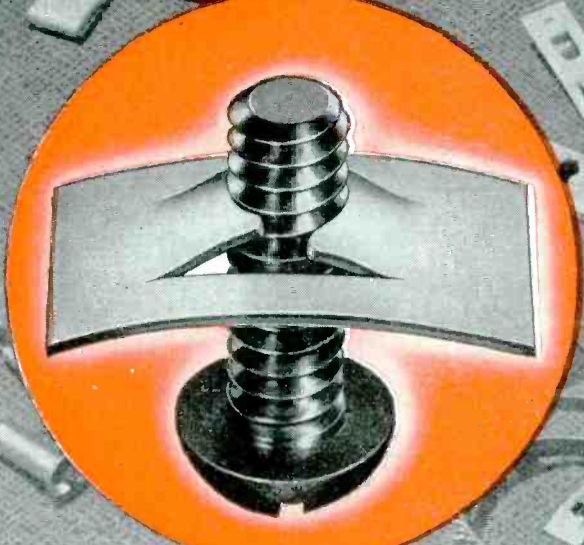

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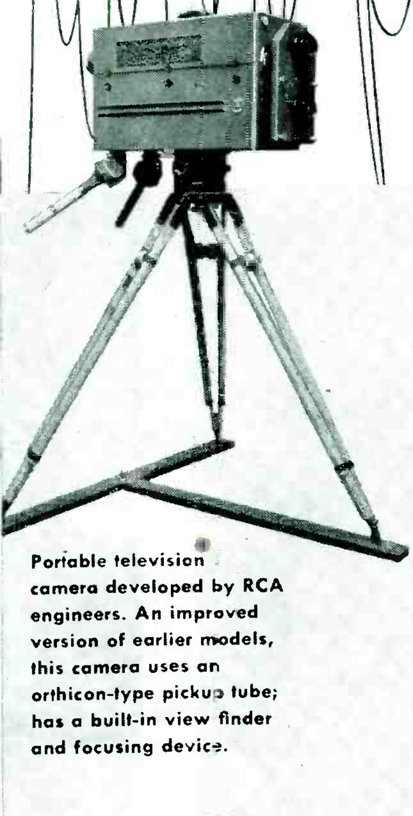
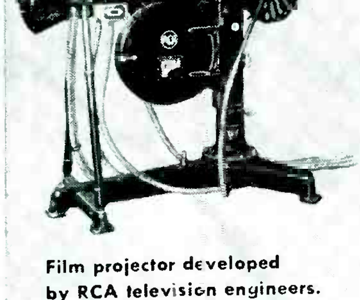


Portable television camera developed by RCA engineers. An improved version of earlier models, this camera uses an orthicon-type pickup tube; has a built-in view finder and focusing device.



Film projector developed by RCA television engineers. Special construction allows regular movie fi m (24 frames per second) to be used with 30-frame-interlaced system of television broadcasting now in use.

RCA engineers developed and first constructed nearly all of the major equipment units used in the present method of television broadcasting.

RCA engineers produced the first all-electronic synchronizing generator, the iconoscope which was the first successful studio pickup tube, the orthicon which, with its higher sensitivity, made outside pickups practical and the film projector which makes possible the use of standard movie films.

RCA engineers designed the first "broadcast type" television field pickup equipment. They established the video equipment system which is used today in a number of stations. They set up and placed in operation the first successful combination of all of these units. In short, they produced the electronic system of television as we know it today.

The experience in television broadcasting which these achievements represent goes back over fifteen years. All of these developments were "before the war." They are the things we can talk about now. They are the "pattern of the past" on which the future can be predicted.

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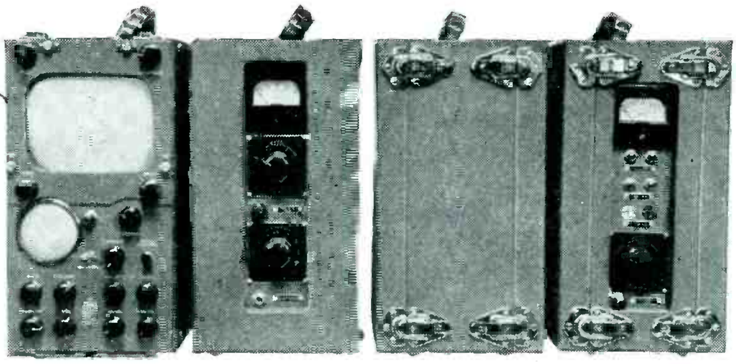


Remote television pickup equipment developed by RCA. Units of this type are presently used by NBC in regular broadcasts from Madison Square Garden — broadcasts which are picked up and rebroadcast by stations in the Philadelphia and Albany-Schenectady areas.

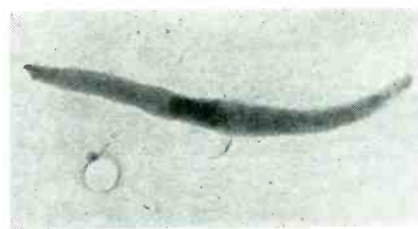
AFTER THE WAR THERE WILL BE MANY IMPROVEMENTS In video equipment one of these will be a new high-sensitivity pickup. Another will be widespread use of the RCA-developed 6AC7 tube which makes possible 6 mc. band-width amplifiers with a gain of 20 per stage. There will be new cameras, new synchronizing generators, new control layouts — new equipment throughout that is simpler, more convenient and more efficient.

BUY MORE WAR BONDS

Telecasting a miniature set. De luxe studio cameras of the type shown here were built by RCA for NBC, CBS and others. These cameras use an iconoscope for pickup. Postwar cameras will use improved pickup tubes — will be smaller, lighter, less expensive.

the aberrations of the lens system. In the light microscope the technical improvement of the lenses has reached a point where the latter factor can almost be disregarded. However, such instruments use ordinary light with wavelengths in the range of 400 to 500 millimicrons. Since a microscope cannot resolve details which lie in size below approximately one-half the wavelength of the illumination used, it is obvious that there are many entities in nature which cannot be resolved by the light microscope.

By the use of electrons which have associated with them a wavelength 100,000 times smaller than



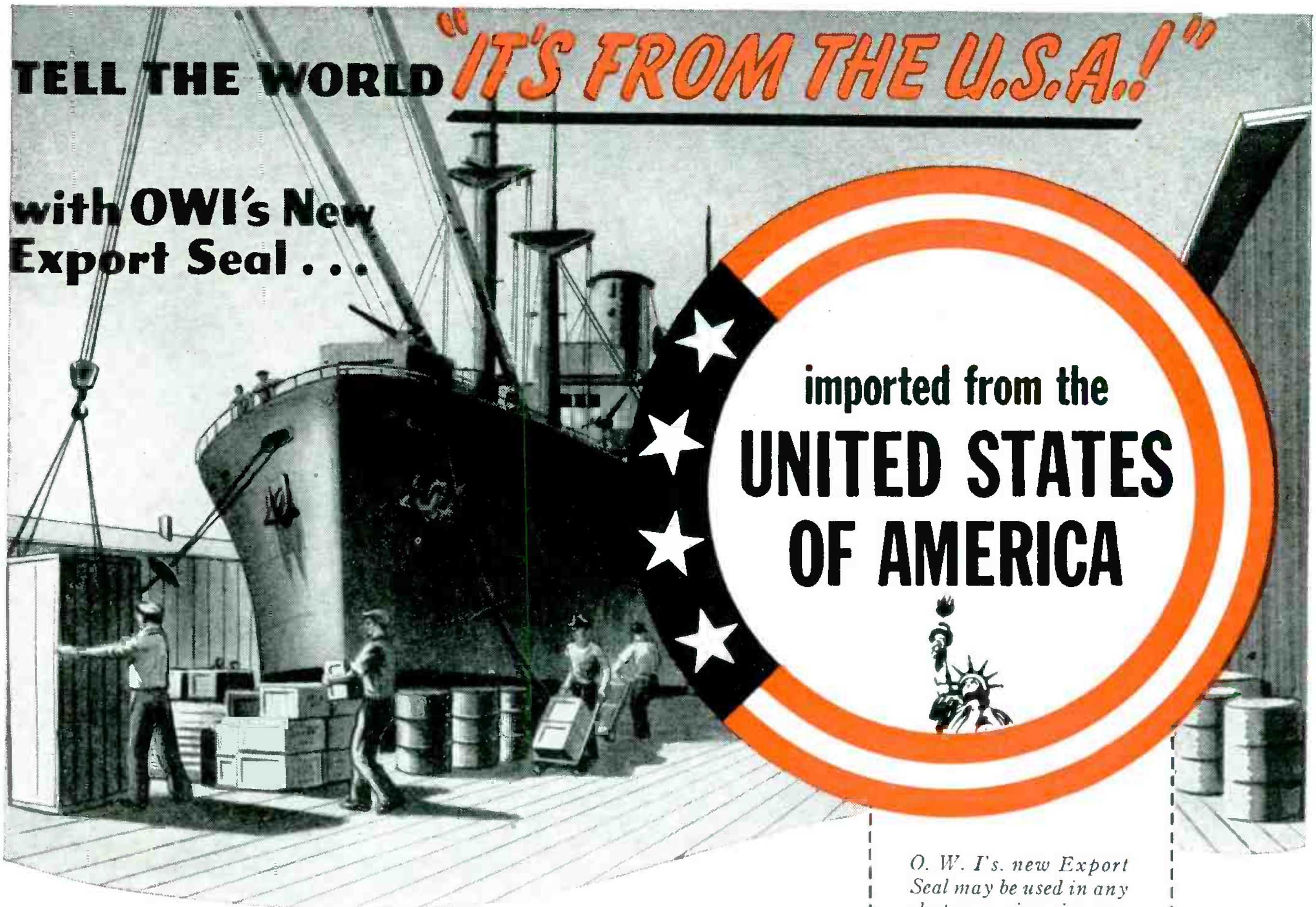
Electron micrograph of the malarial sporozoite which the malaria-carrying mosquito injects into its victim

that of visible light, we have the possibility of observing everything in nature, even down to the structure of the atoms themselves. In the electron microscope at its present stage of development, the lens aberrations prevents us from achieving this terrific resolution. We are, however, able to extend our vision to objects 100 times smaller than is possible with the light microscope.

In applying the electron microscope to bacteriology, we must of course be certain that the size, shape and structures we observe are real. In other words, we want to know how much of the structure observed in the electron microscope image is artifact—introduced by the washing, drying, introduction into a vacuum and bombardment by the electron beam.

Preparation of Specimens

The technique of preparing bacteria and viruses for observation in the electron microscope is fairly simple. The essential factors in the work are those of cleanliness and control; that is, the suspension of bacteria used must be free from all except the smallest traces of the



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culture medium and must be free from inorganic salts—otherwise the final image will be obscured by meaningless structures. There are many techniques of preparation, all of which aim towards obtaining a fairly good dispersion of bacteria or viruses on an extremely thin structureless membrane which provides the support in the microscope. One technique which is particularly good is as follows: Suppose we have bacteria growing on an agar slant. A wire loop is placed in sterile distilled water and removed so that a drop adheres to the loop. A sterile needle is then used to pick up a small quantity of bacteria from the surface of the culture. Care is taken to make sure that none of the culture medium is removed at the same time. This needle with the bacteria is passed through the drop of distilled water on the loop two or three times. As a result of this, a number of the bacteria become detached from the needle and are held in suspension in the drop. The loop is now passed over a two-hundred mesh wire screen which has suspended across its openings the thin supporting membrane. This screen is placed on a pedestal to facilitate dropping the loop over it. The small drop of water which is thus transferred from the loop to the wire screen dries and leaves the bacteria adhering to the collodion membrane. This is then placed in the electron microscope for observation.

Effect of Vacuum on Specimens

We have found that a great many bacteriologists rebel at the idea of examining the bacteria while they are in a vacuum. We, ourselves, do not feel that the vacuum has any affect on the organisms if they were properly dried in the first place. To prove this, two light microscope pictures of some large organisms (B. subtilis) were made one by the usual smear and staining techniques, while the other was subjected to a vacuum between the smearing and staining. The two micrographs were identical.

Effect of Electrons on Specimen

The second factor to be considered in the interpretation of an electron microscope image is the effect on the specimen of the electron bombardment. If you study

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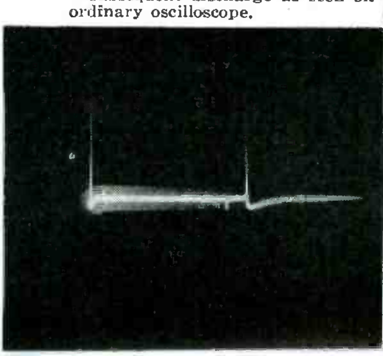
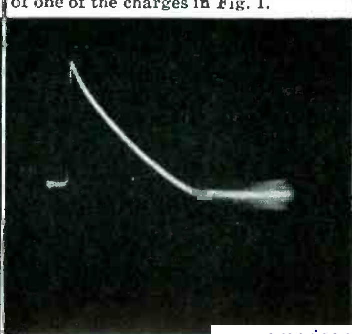
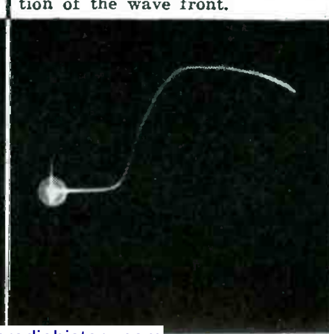
1 Sudden condenser charge and subsequent discharge as seen on ordinary oscilloscope.



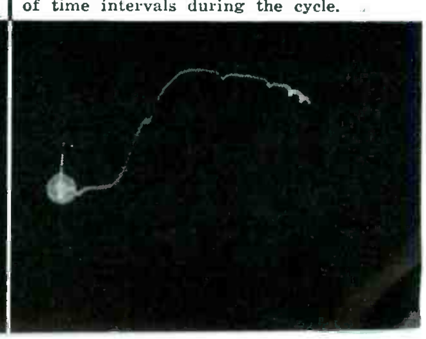
2 Externally synchronized and expanded 50 times, revealing the true form of one of the charges in Fig. 1.

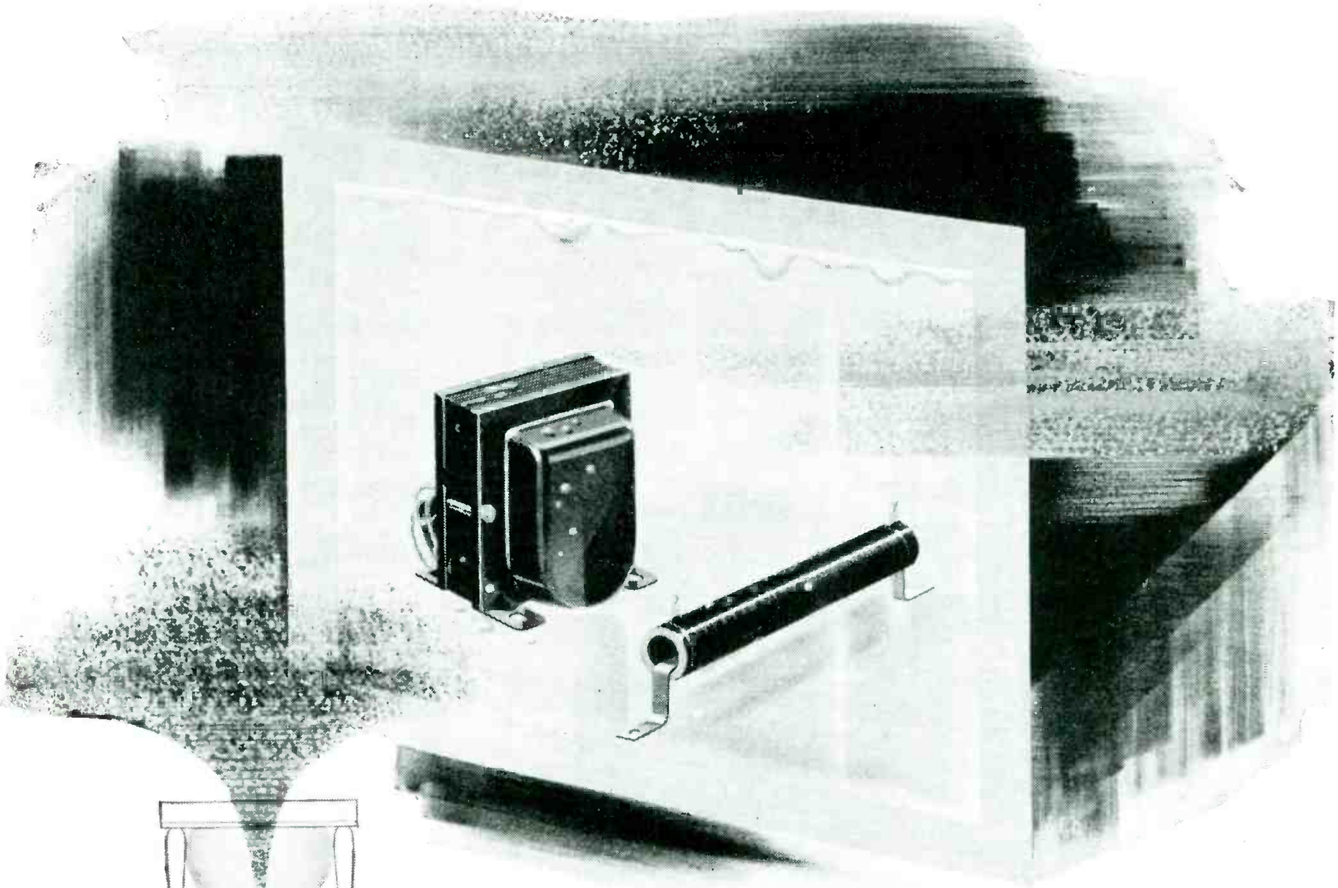


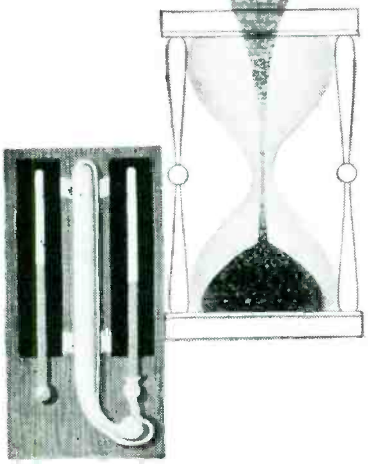
3 The same charge, expanded 1000 times, permits detailed observation of the wave front.



4 Applying a one-microsecond time-base marker allows determination of time intervals during the cycle.







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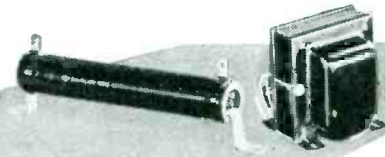

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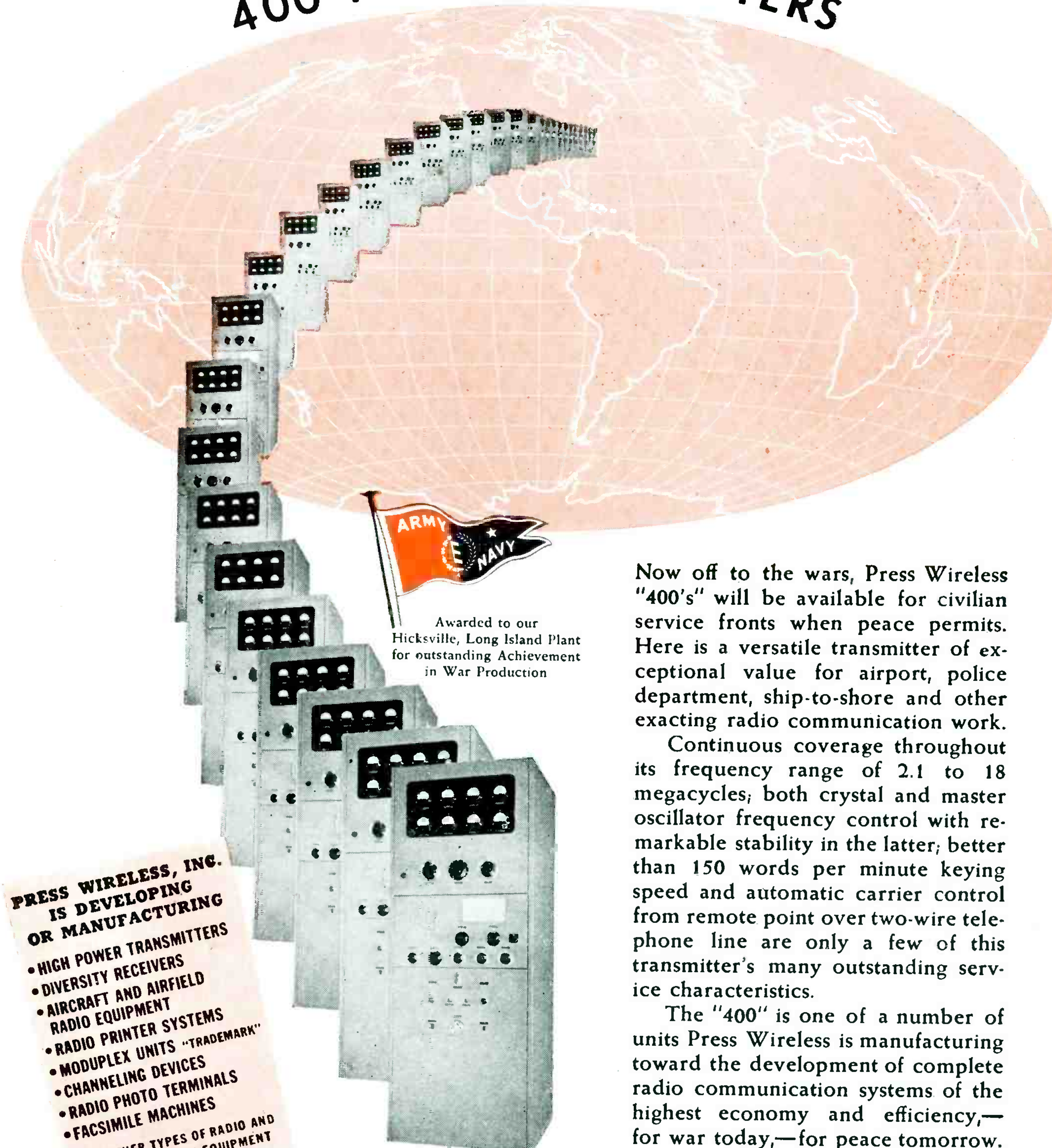

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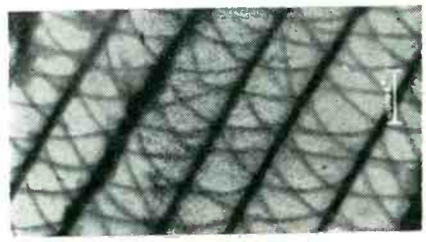
RIO DE JANEIRO · MONTEVIDEO · BERNE · SANTIAGO DE CHILE · NEW YORK · CHICAGO · LOS ANGELES · LONDON · HAVANA the electron microscope you find that the power incident on the area of the specimen being examined may be as high as 10 kw per square mm. Such concentrations of energy are almost astronomical in proportion to those encountered in everyday experiments and one might expect some effect on an organism as delicate as a bacterium. However, there is another side to the question. An electron beam loses—on the average—only one-half of its



Scales of a malarial mosquito's wing, magnified by the RCA electron microscope

energy on passing through an organic layer 50 microns thick. But the total thickness of a bacterium after it has been dried is very seldom more than a quarter of a micron. It is obvious that on passing through a bacterium the beam loses a negligible amount of energy. Since it is only the energy that is absorbed that is going to cause destruction of the specimen, it appears likely that there will be no effect on suitable specimens.

Experimentally it can be easily demonstrated that the electron beam has no effect on the appearance of the organisms. A specimen was introduced in a microscope which had been previously adjusted and focused and the image was recorded as soon as possible after the first turning on of the electron beam. The instrument was then allowed to run for two hours and the second exposure was made. The two images were identical, showing that the electron beam has no effect on normal, thin specimens.

Another question which the bacteriologists often ask is, "Does the electron beam kill the organism?" The answer is, of course, "Yes; definitely." It is well known that organisms subjected to electron bombardment of the intensity used in the electron microscope will not reproduce when placed on a culture media. This, however, does not constitute a difficulty in the electron

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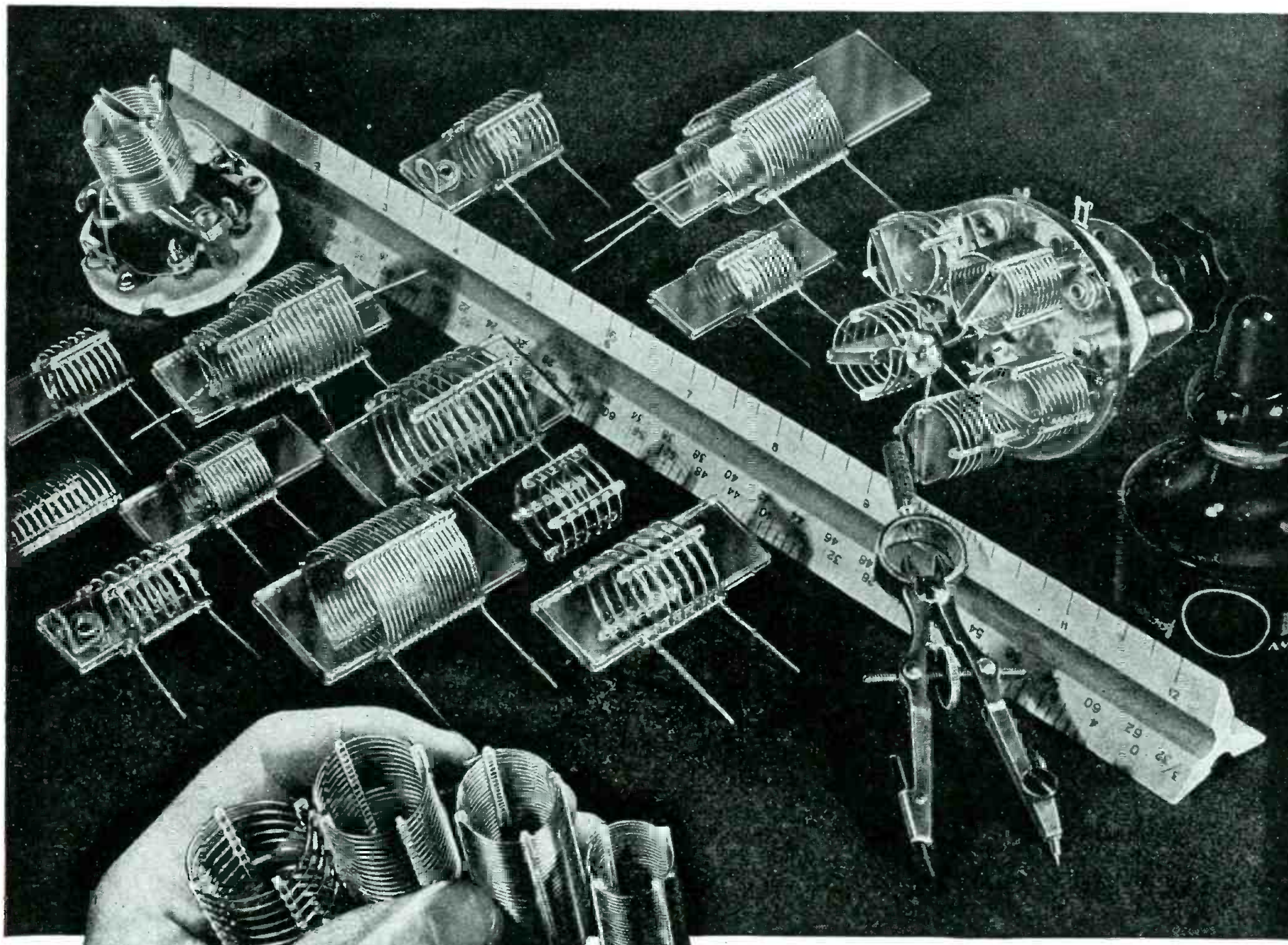

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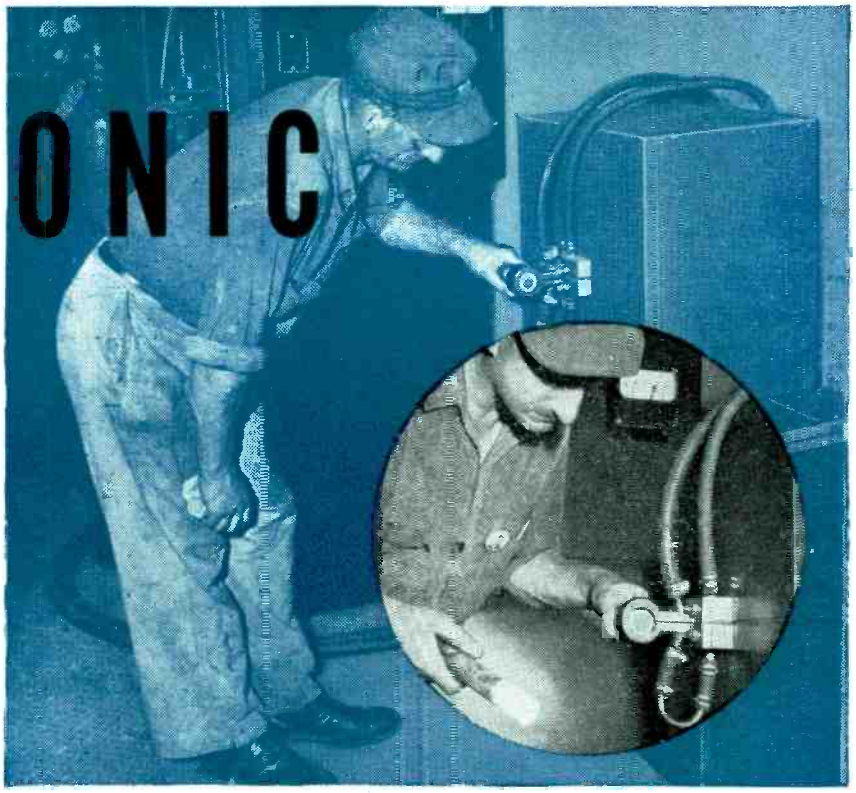

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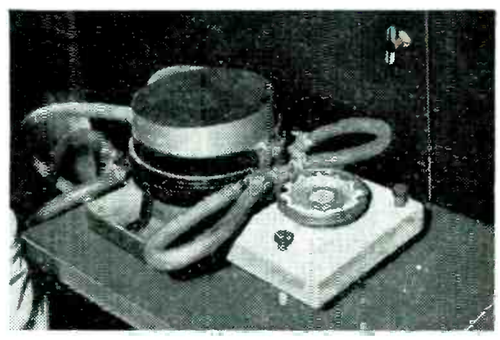

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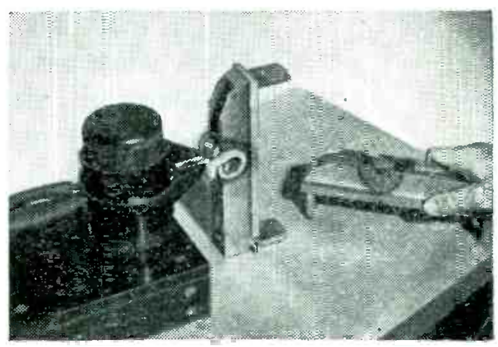

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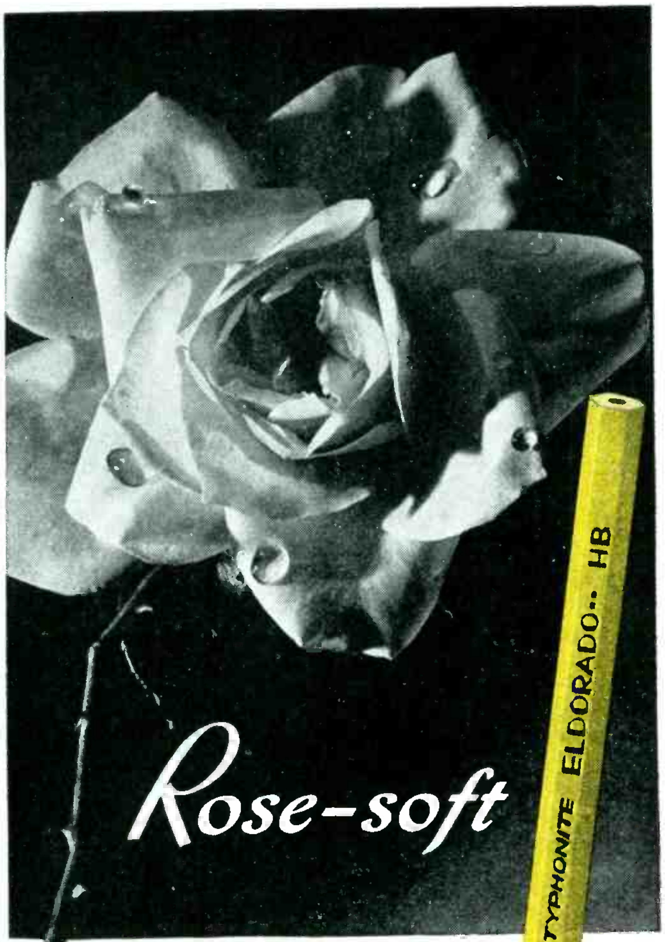

microscope technique, since studies involving a change of morphology with time or environment can be carried out by the normal sampling method. Even in light microscopy this method must be used if high magnifications are desired.

Staining of Organisms

Another aspect of the preparation of bacteriological specimens is the question of staining. In order to differentiate the morphology of an organism so that it can be observed with the high-power oil immersion microscope, it has been common practice to stain the organisms with appropriate dyes. In the electron microscope this is not necessary—the structure of the organism is shown up in the electron image by the differences in density which correspond to that structure. In fact, the electron microscope can be used to show that organisms which have been stained are sometimes quite different in appearance from those which have not. However, staining still has its uses in electron microscopy. It is possible to use the principle of selective staining to determine the chemical composition of the various parts of an organism. The stains used normally for such a purpose contain some heavy elements so that a strong differentiation is obtained in the electronic image.

Examples of Applications

In the investigation of bacterial morphology, various types of bacteria have been reexamined with the extra resolving power afforded by the electron microscope, such as the organism that grows on the walls of pipes carrying gasoline.

Another logical study is the investigation of the effect on bacteria of various germicidal chemicals. Many electron micrographs showing the effects of penicillin on staphylycoccus aureus have been taken. The technique used for obtaining these pictures fitted in with the test for the potency of penicillin. A small cylinder of penicillin is placed on an agar plate culture of staphylococcus. This causes a circular area of the growth to be inhibited. Samples of the surface of the agar plate were picked up from points outside and inside this inhibited area.

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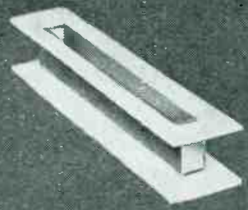
Electroneering is our business

THE RAULAND CORPORATION • CHICAGO 41, ILLINOIS

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



INJECTION

COMPRESSION

FABRICATION

HEAT FORMING

COMPONENT MOLDING

Our reputation was earned by doing difficult close tolerance plastic molding and fabricating.

Please don't insist on us doing the ordinary type of "loose" tolerance, long run work, as our entire facilities are devoted to the production of precision parts.

Your unique plastics problems will receive prompt attention.

ARNOLD Brilhart LTD.

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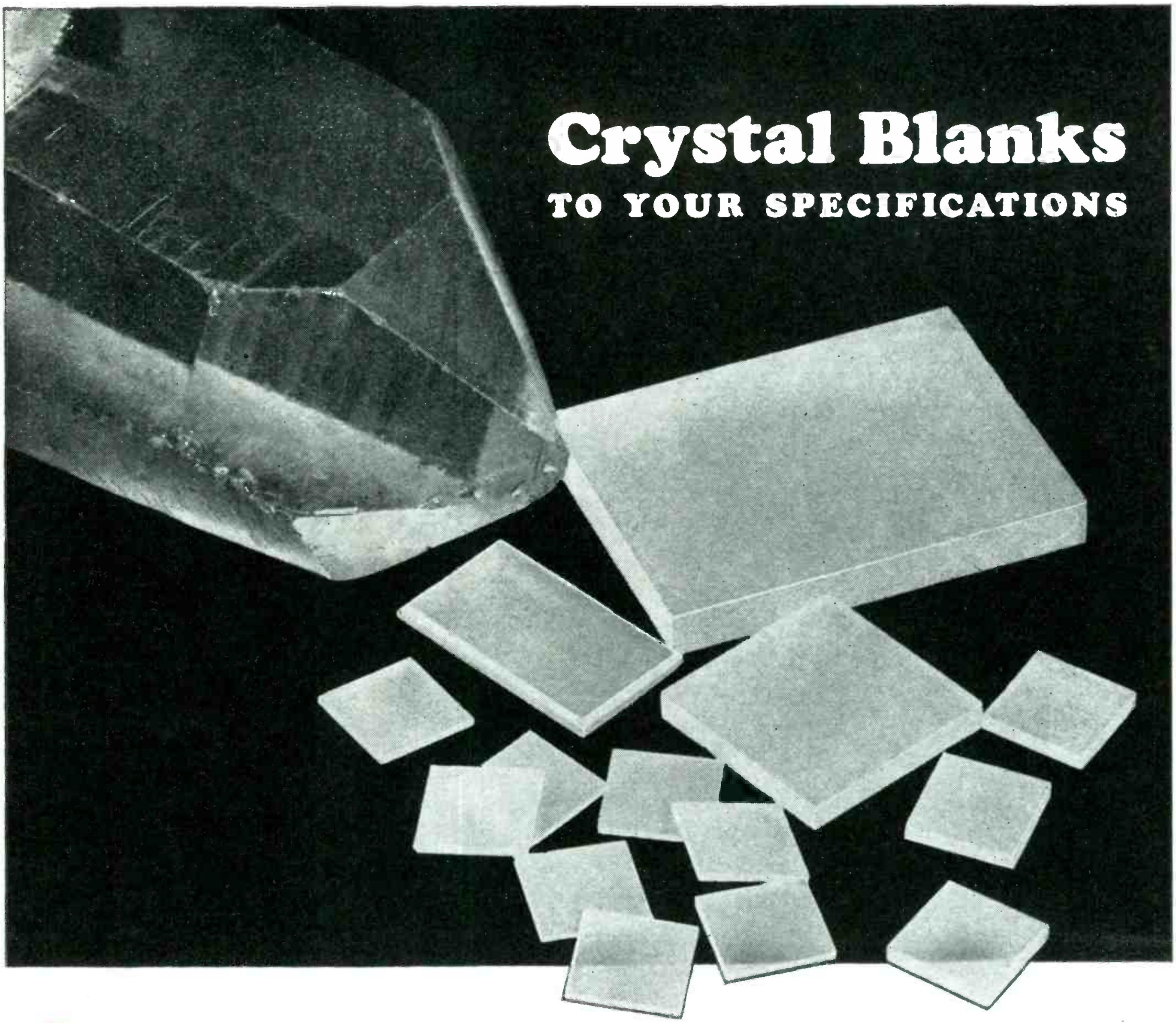


Crystal Products Company can supply Quartz Crystal blanks in any of the three stages of manufacture: (1) "rough-sawed" blanks, (2) "semi-finished" blanks, and (3) "electrically finished" blanks.

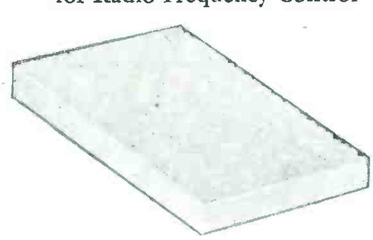
"Rough-sawed" blanks are cut to the specified angles and roughly sawed to dimensions.

"Semi-finished" blanks are blanks which have been brought to approximate dimensions by machine lapping, allowance being made for final hand finishing.

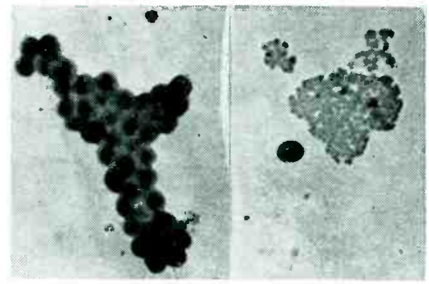
"Electrically-finished" blanks are finished by hand to the frequency desired and electrically tested.

All crystal blanks are cut to specifications from selected Brazilian quartz and guaranteed free from all impurities such as optical twinning, electrical twinning, bubbles, fractures, scratches, mineral inclusions, and other mechanical and electrical imperfections. Dimensions, temperature coefficients, and frequencies are guaranteed within specifications listed. **Send us your holders for replacement of crystal blanks to exact specifications.**

Crystal PRODUCTS COMPANY
1519 McGee Street, Kansas City, Mo.
Producers of Approved Precision Crystals for Radio Frequency Control



added to the membrane on which some unknown bacteria from stagnant water had been dried previously, the penicillin completely clouded the picture in the vicinity of the bacteria, yet some apparently inorganic particles on the same membrane showed just as sharp and clear as they did if no penicillin were present. When the same experiment was tried with influenza virus, the penicillin did not appear to affect the virus in any way. Similar experiments were carried out in an attempt to see the effect on pneumococcus (Type I) of sulfanilamide, and there was no apparent visible effect.



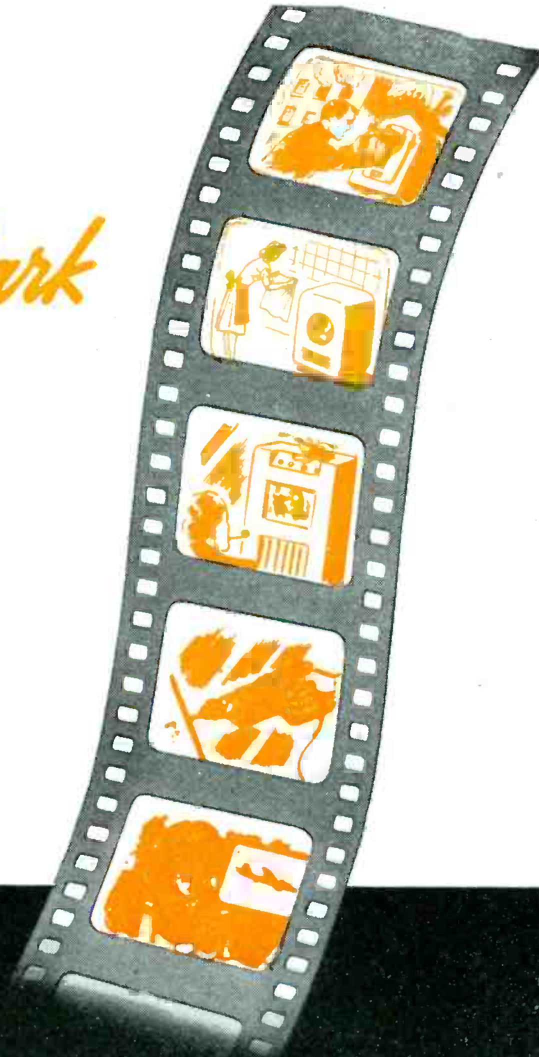
The grape-like cluster at the left is a disease-causing bacteria before penicillin is applied. The effect of penicillin is shown at the right

One of the most spectacular achievements of the electron microscope in biology is to be found in the micrographs of the previously sub-microscopic viruses. For instance, elementary bodies of vaccinia are no longer diffuse points of light as observed in the light microscope, but have real form and show a definite internal structure. If we go still smaller we come into the range of the plant viruses and the bacterial viruses or bacteriophage. Bacterial virus are only about 80 to 100 millimicrons in total length or about 500 atoms long, yet they can be seen to have a heavy head with dense regions, plus a very fine short tail.

By means of electron microscopy it has been possible to observe for the first time some of the actual processes which occur when bacteria are lysed by the bacteriophage particles. The specimens were obtained by the sampling method, i.e., a small drop of a suspension of bacteriophage particles was added to a small drop of a suspension of E. coli on the supporting screen. This was left for various lengths of time

WORTHY OF

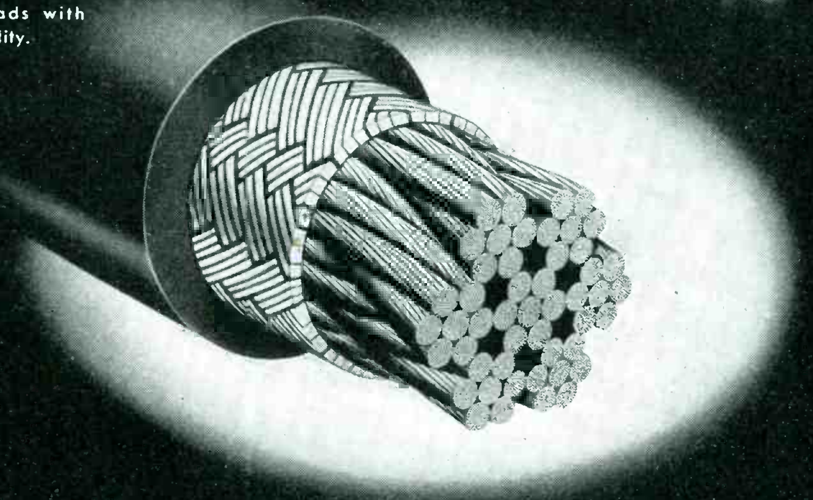
Your Own Trade Mark



The wires and cables you incorporate in your products must be every bit as dependable as the components you produce yourself. To back up our fighters today, and to back up your trade-mark in the peacetime battle of tomorrow, you can count on Roebling Electrical Wires and Cables. The conductors are drawn and stranded and laid with all the skill of years of wire specialization. Metal selection, insulation, finish are supervised with highest integrity.

You can put your trade-mark, without hesitation, on any electrical product you make in which Roebling Wires or Cables carry the loads.

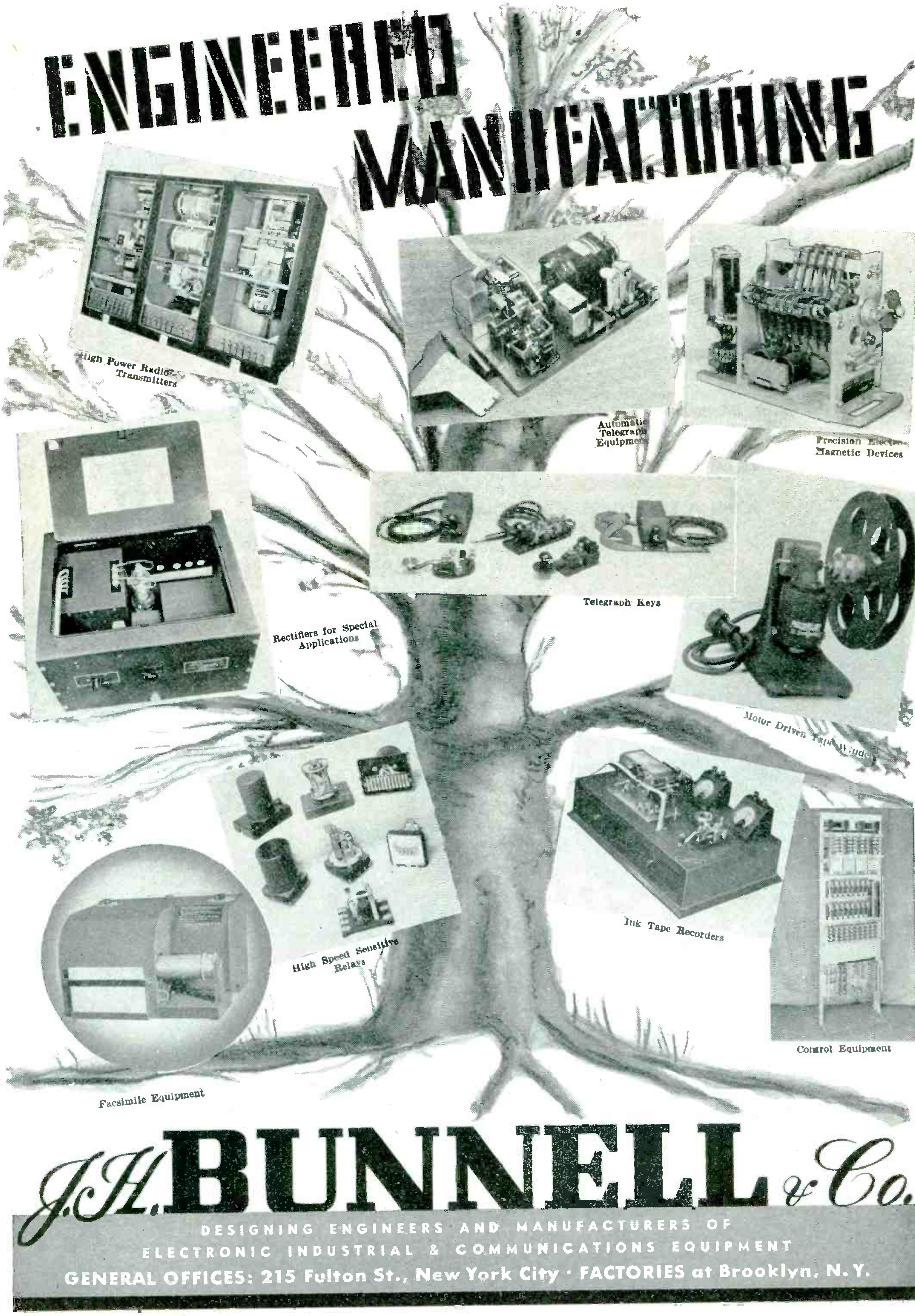
JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities



WELDING ELECTRODE CABLE, embodying thousands of separate wires made by Roebling to carry heavy electrical loads with extreme flexibility.

ROEBLING — *PACEMAKER IN WIRE PRODUCTS*

WIRE ROPE AND STRAND • FITTINGS • AERIAL WIRE ROPE SYSTEMS • COLD ROLLED STRIP • ROUND AND SHAPED WIRE
AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • SUSPENSION BRIDGES AND CABLES • ELECTRICAL WIRES AND CABLES
WIRE CLOTH AND NETTING • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS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Automatic Telegraph Equipment
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DESIGNING ENGINEERS AND MANUFACTURERS OF
ELECTRONIC INDUSTRIAL & COMMUNICATIONS EQUIPMENT
GENERAL OFFICES: 215 Fulton St., New York City · FACTORIES at Brooklyn, N. Y.

DR8008 A NEW IMPROVED RECTIFIER . . .

TO REPLACE THE 872 A . . WITH ONLY A CHANGE IN SOCKET . .

GENERAL ELECTRONICS INC.

DR8008, with Longer Pins, Wider Base

provides better filament contact and insures longer tube life. The longer pins and wider base of the DR8008 give positive filament contact and eliminate almost all pin resistance heretofore encountered with the 872A.

Other notable improvements such as dome type anode, glass boot, filament with large emission surface and bottom closed shield plate combine to give greater durability and performance, as well as longer tube life.

SPECIFICATION: 10,000 volt inverse peak. Extensively used for power supplies from 1,000 to 5,000 volt output. Current output: 2 tubes, 2½ amperes.

CHICAGO 47, 1917 NO. SPRINGFIELD AVE. • 101 HAZEL STREET, PATERSON 3, N. J. • EXPORT DEPT., 85 BROAD STREET, NEW YORK 4, N. Y.

and then the action was stopped. The pictures showed very clearly how one or more phage particles become attached and possibly enter the bacterium, whereupon they multiply by what is still some unknown process. The final result is that the cell membrane of the bacterium becomes weakened and destoyed until finally it bursts, throwing out the cell contents including around 150 newly formed bacteriophage particles.

One of the more important applications of the light microscope to biology is in the study of tissues by ordinary histological techniques. Up to the present we have not found a completely satisfactory method by means of which the electron microscope can be applied to this problem. Drying a cut-section almost completely destroys the finer details. Sections cannot be cut thin enough to provide sufficiently thin specimens for electron microscope observation. This, at present, is a major challenge to electron microscopy but we do not know when a solution will be forthcoming.

The information provided by the electron microscope can be summed up by three words: size, shape and structure. In addition, the electron beam itself can be used to provide additional information through the techniques of electron diffraction.

• • •

Electronic Gyro-Compass in Invasion

FOR LANDING CRAFT, the Navy required a lightweight compass that had to be non-magnetic and unaffected by electrical machinery, ship's structure, or by cargoes of tanks, guns, trucks and jeeps.

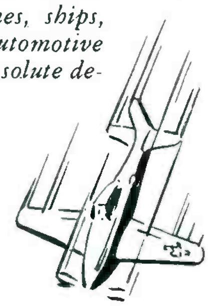
Since 1921, engineers have been conducting experiments with smaller gyro-compass designs for small coastal boats. The problem was complicated by the assumption that there was a minimum limit beyond which the size of a gyro-compass rotor could not go because of the mass necessary to be sensitive to the earth's gravitational force and the difficulty of building up a sufficient directive force (to overcome the friction of the vertical guide and other bearings) with a small rotor.

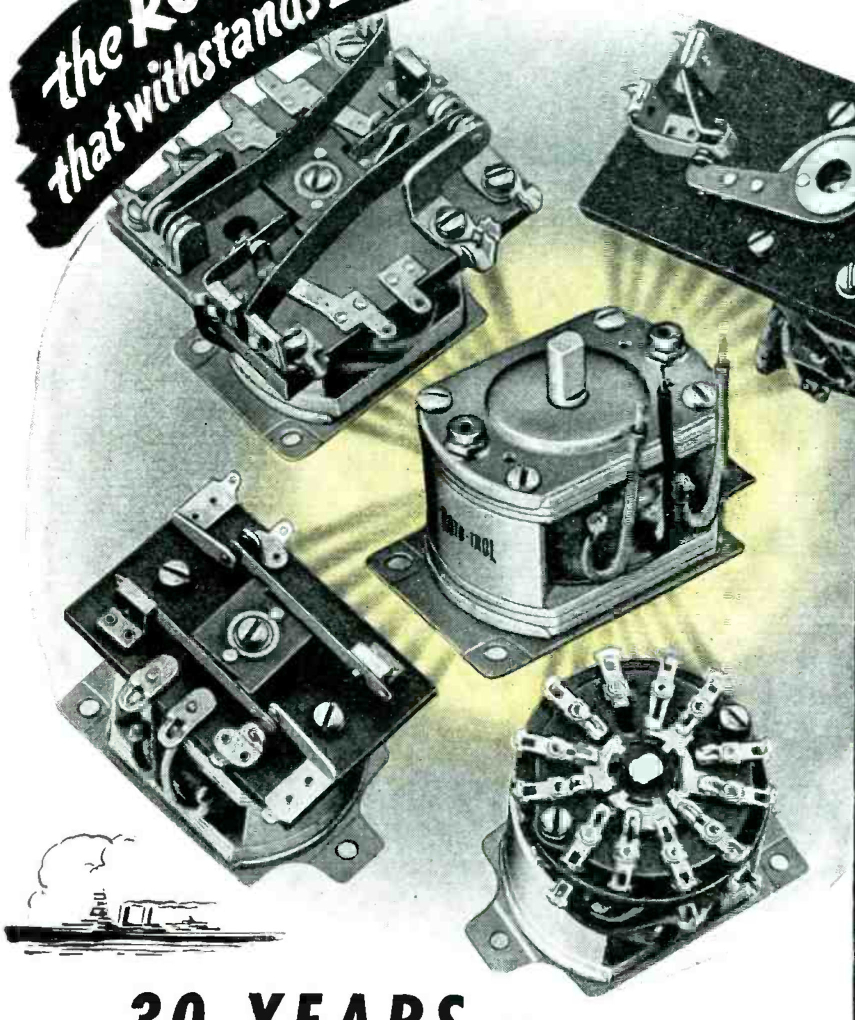
Sperry engineers started with a small compass that had been built

AT LAST...
we can tell about it!

the ROTARY RELAY that withstands BATTLE VIBRATION

SENSITIVE EQUIPMENT, in Modern Vehicles of War, takes a terrific beating from shock and vibration. ROTO-TROL, designed for just such conditions, has served thousands of planes, ships, tanks and other automotive equipment with absolute dependability.





ROTO·TROL

A NEW *Basic* UNIT DESIGN

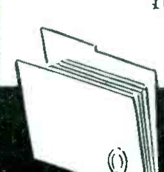
Operating on a rotating balanced principle, instead of the conventional method, ROTO-TROL assures dependability under the most severe operating conditions.

WIDE ADAPTABILITY
The basic unit (center of photo above) is adaptable to an infinite variety of wafer and multiple contact arrangements, some of which are shown here also.

VIBRATION & SHOCK-PROOF
Its rotating balanced feature makes it impervious to vibration and shock. For aviation, automotive and marine application it assures dependability under adverse conditions.

RUGGED & COMPACT
The basic ROTO-TROL unit measures only 2½"x1½"x 1¾". Made of finest materials, accurately machined. Cotton interwoven coils, impregnated and vacuum sealed. Each part proportioned in size for its specific function . . . a powerful, rugged, space-saving device.

Write for **FILE RE-46.**



GET USEFUL DATA FILE

30 YEARS OF SPECIALIZATION

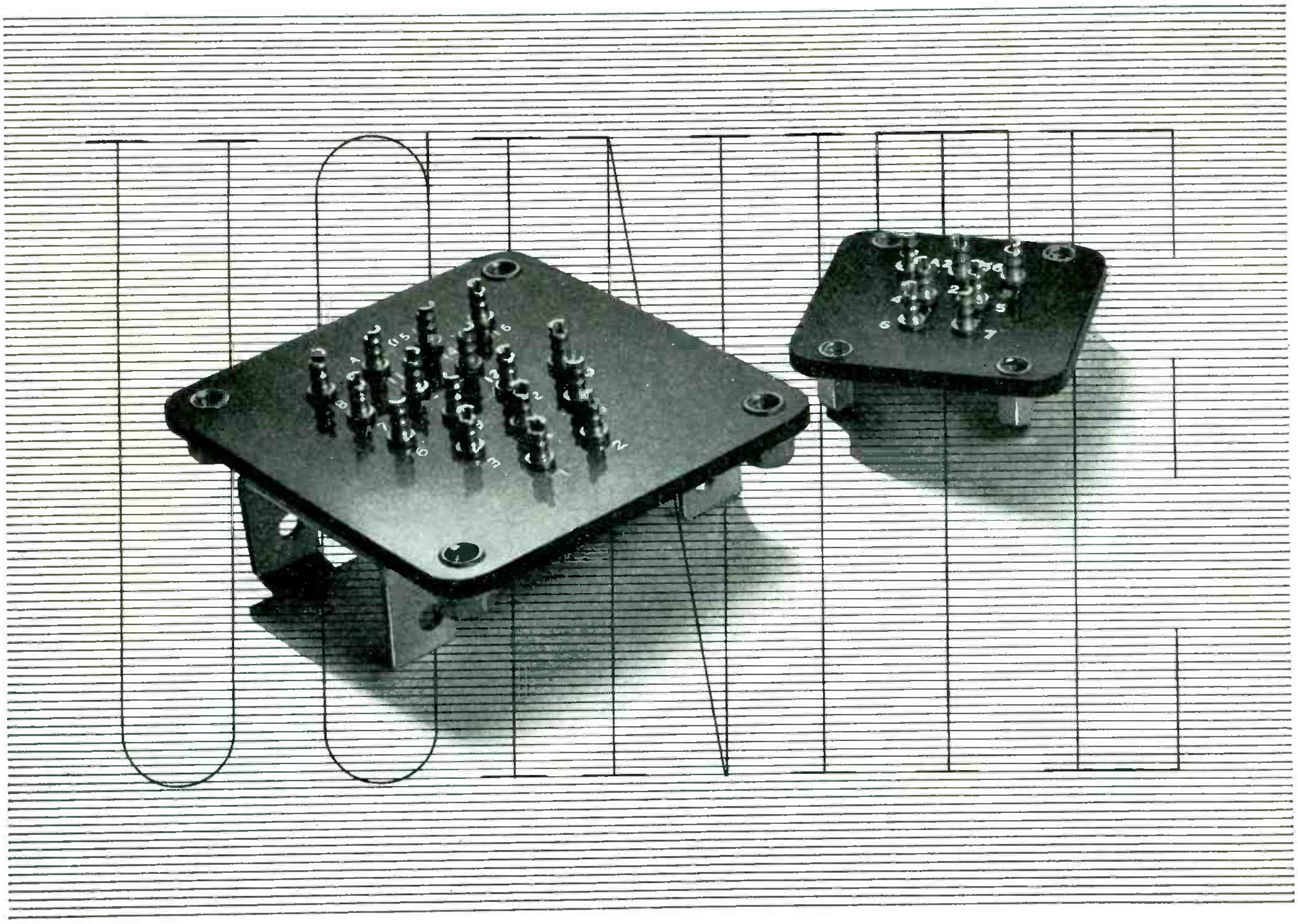
Through two wars and a quarter century of peace, we have designed and manufactured RELAYS and CONTROLS for U. S. Navy, Signal Corps, Coast Guard and leading radio equipment manufacturers . . . ranging from thumbnail-size relays to 50,000 watt motor driven rephasing units. Give us a "try" at your relay problems.

PRICE BROTHERS CO. ★ RELAYS CONTROLS
HUSKY

PRICE Brothers Co.

FREDERICK, MARYLAND

RELAYS, CONTROLS, AND MAGNETIC DEVICES FOR ELECTRONIC & INDUSTRIAL APPLICATION



No trouble at all

One of our customers wasn't satisfied with the way his terminal panels were coming through. Could we combine metal parts with bakelite to eliminate surface cracks? Could we guarantee a good sharp lettering job on the panels? Of course we could—this kind of work is right up our alley, one of our specialties.

Metal and bakelite assemblies like these go through like clockwork at Ucinite. Our one-plant production helps customers to meet jacked-up delivery dates; often turns single orders into regular business. And that, of course, is what we are after.

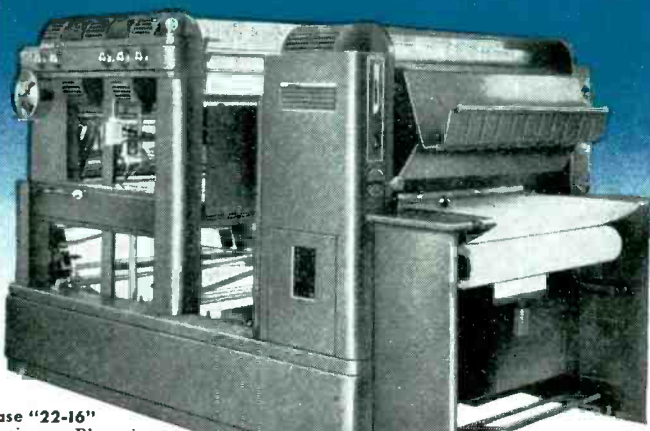
The UCINITE CO.

Newtonville 60, Mass.

Division of United-Carr Fastener Corp.

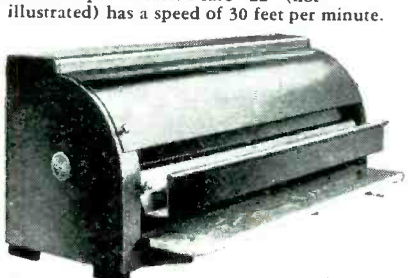
Specialists in **RADIO & ELECTRONICS**
LAMINATED BAKELITE ASSEMBLIES
CERAMIC SOCKETS • BANANA PINS & JACKS • PLUGS • CONNECTORS • ETC.

Printmaking Adaptability



ALL TYPES OF PRINTS WITH PEASE BLUE-PRINTING EQUIPMENT

Pease "22-16" Continuous Blueprinting and Processing Machine has an actual production speed of 20 feet per minute. Pease "22" (not illustrated) has a speed of 30 feet per minute.



Pease "700" Continuous Whiteprint (Dry Direct Process) Developing Machine only.

Pease "K" Continuous Wet Direct Process Developing Attachment for complete Continuous Blueprinting and Processing Machines.

SPECIAL FEATURES FOUND ONLY ON PEASE BLUEPRINTING MACHINES

Sliding "Vacuum-like" Contact smooths tracings, prevents errors in printing • **Three Speed Lamp Control** provides operation at 10, 15, or 20 amperes, minimizes running speed and drier heat changes • **Actinic "No-Break" Arc Lamps** burn 45 minutes without breaking arc, resume instantaneously • **Horizontal "Floating" Water Wash** floats prints free from tension, prevents wrinkles, stains, bleeding • **Quick Change Chemical Applicator System** economically allows change from Blueprints to Negatives in 30 seconds • **Eight-inch Diameter Drying Drums,** thermostatically controlled, heated by gas or electricity, dry prints "flat as hung wallpaper."

PEASE Continuous Blueprinting and Processing Machines can easily be adapted to meet any printmaking requirements. Using a Pease "22-16" Continuous Blueprinting Machine as basic equipment, you can have a complete printmaking department capable of producing any kind of tracing reproductions by simply using the Pease "700" Multazo Whiteprint (Dry Direct Process) Developing Machine in conjunction with the printer only, or by adding the Pease "K" Continuous Wet Direct Process Developing Attachment to the equipment.

PEASE "22-16" Continuous Blueprinting and Processing Machine is fast, economical and easy to operate . . . makes sharp, clear, contrasty Blueprints, Blueline Prints, Brownprints (Negatives) and Brownline Prints.

PEASE "700" Continuous Multazo Whiteprint (Dry Direct Process) Developing Machine is a table model developer. Prints can be easily and quickly developed on it, after exposure on the Pease "22" Printer or any other printer.

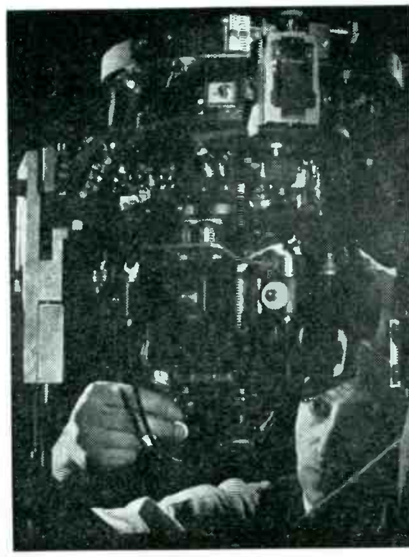
PEASE "K" Continuous Wet Direct Process Developing Attachment, consisting of a developer tank, tray and rolls, is bolted directly to the printer to make Wet Direct Process Prints. The prints are dried and delivered in the same manner as blueprints.

PEASE SENSITIZED PAPERS, made of carefully selected No. 1 paper stock uniformly coated, assure you of sharp line Blueprints, Blueline Prints, Brownprints (Negatives), Brownline Prints and Multazo Whiteprints (Dry Direct Process). For your protection, every roll is wrapped in moisture-proof and light-proof jacket with rip-cord.

Write for Literature and Prices . . .
No obligation, of course.

THE C. F. PEASE COMPANY
2639 WEST IRVING PARK ROAD • CHICAGO 18, ILLINOIS

Pease Blueprinting Machines for all kinds of Tracing Reproductions



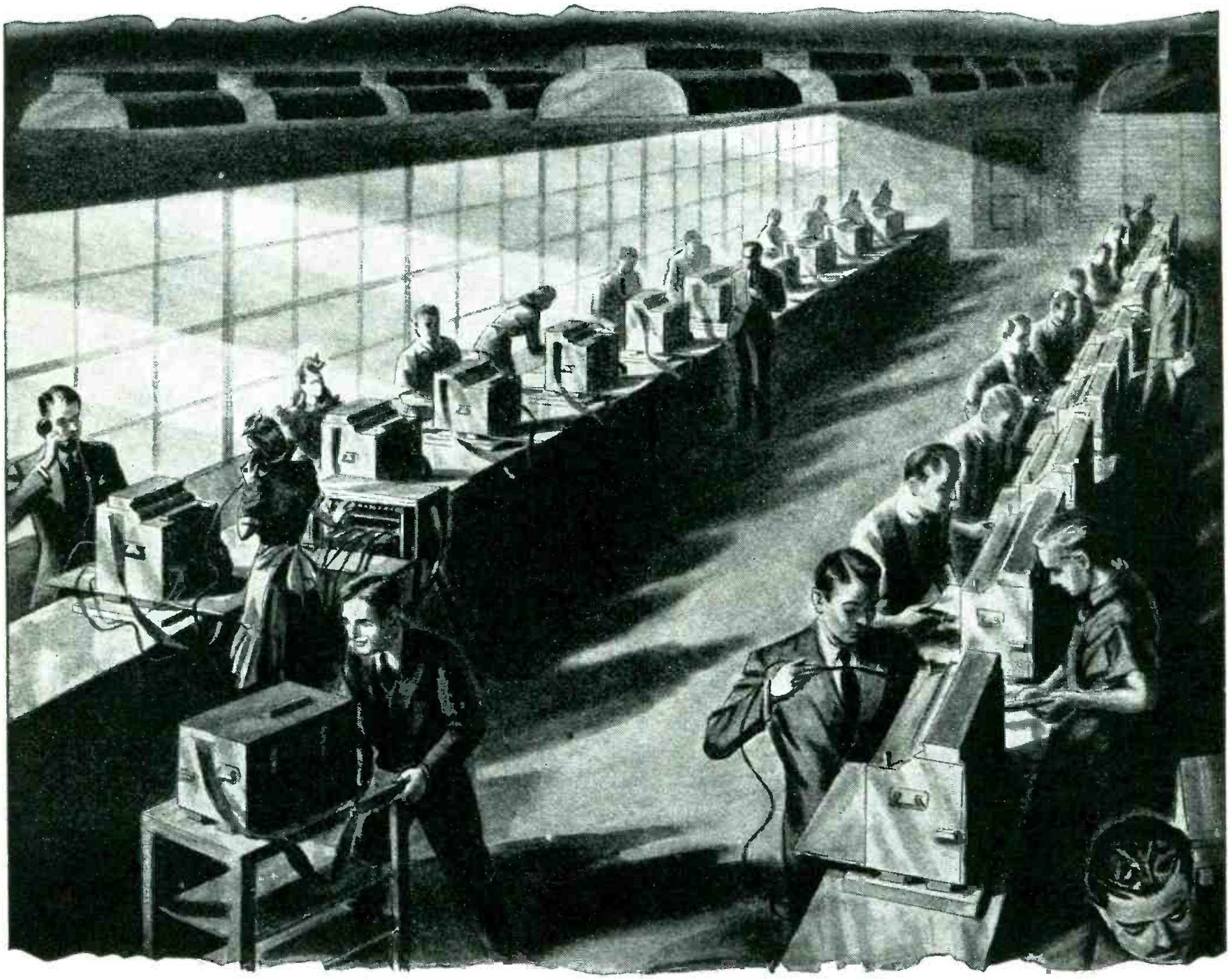
A technician adjusts a device locking the vertical ring to a "phantom ring" on the Sperry non-magnetic electronic gyro-compass. All the mechanism shows in this photograph except the voltage regulator

and tested under the supervision of Eric C. Sparling and William H. Hight in 1921. This experimental compass was modified with respect to an improved mercury ballistic and the substitution of an electronic follow-up system for the old trolley-contactor system originally used. The result of tedious designing, building sample models, testing them on "torture machines" on shore and putting them through elaborate tests at sea is the Sperry Mark XVIII shown in the photographs.

The new compass stands at normal height but is only 19 inches in diameter. Except for the voltage

The lightweight electronic gyro-compass is fitted into its binnacle

Meeting the CALL for MORE and still MORE



This year our armed forces need thirty-five per cent more communications equipment than in 1943. The men and women of this division are tackling their share of this biggest assignment yet, with the same enthusiasm they have shown from the start . . . and with three years' practical experience behind them.

They have good reason to be enthusiastic, for pictures, news stories, and soldiers returning from all over the world, tell of the heroic use that is being made of the equipment we turn out.

Here is a group of skilled engineers, designers and production people who are proving their ability to handle a big and difficult assignment. We tell about it here because we think that is the kind of organization you will want to have working on *your* postwar needs, such as:

COMMUNICATIONS SYSTEMS • SIGNALING EQUIPMENT
PRODUCTION CONTROL EQUIPMENT AND INSTRUMENTS
HOSPITAL SYSTEMS • ELECTRONIC EQUIPMENT • PRECISION
ELECTRICAL MANUFACTURING • IGNITION SYSTEMS

CONNECTICUT TELEPHONE & ELECTRIC DIVISION

GREAT AMERICAN INDUSTRIES, INC.

Meriden, Connecticut

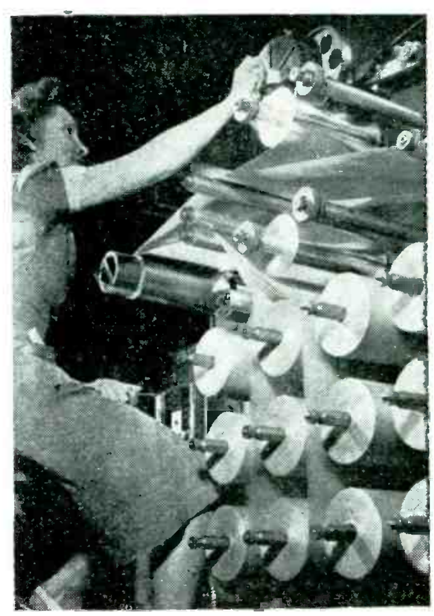
regulator and the repeaters, all items of equipment, including the control panel, amplifier panel and motor generator, are contained within the binnacle. The repeater system employs the same repeaters as the Sperry Mark XIV merchant marine type gyro-compass.

When installed on smaller vessels with extreme space limitations, the binnacle is split into upper and lower halves and placed in different locations on the ship. The top half with the sensitive element, the rotor and mechanism that actually do the job, may be installed at the steering station where it can be seen by the helmsman. The bottom half, with the control panel, amplifier panel, filter and motor generator can be located some distance away where more space is available.

The new Sperry Mark XVIII gyro-compasses are in use today in various types of landing craft and submarine chasers. Some are also being used on merchant vessels.

• • •

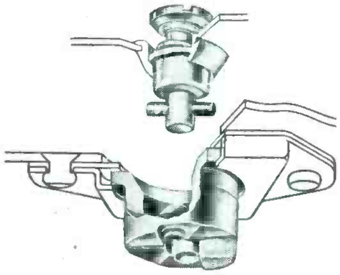
ELECTRONIC CAPACITOR WINDING MACHINE



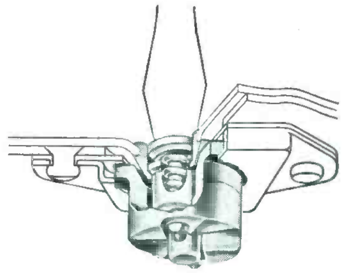
Even when operated by a beginner, this machine produces as many capacitors in one day as 24 operators would make by hand wound methods. Spoilage of critical metal foil has decreased and production increased at Westinghouse since electronic control was applied to the machine

WARPAGE?

Warpage presents no problem to the many aircraft manufacturers who secure their doors and access panels with Camloc High Speed Fasteners. Camloc's patented stud assembly with its permanent cross pin is securely retained in the removable panel. Yet it can be quickly installed or removed as a unit. This permits individual selection for size at time of final assembly. Camloc's unique spring construction allows the stud an unusual range, giving complete coverage of grip thicknesses with a minimum number of stud lengths. When the needs of war no longer demand our entire production, an ever increasing list of industries will use Camloc fasteners. Write for catalog.



Camloc Fasteners are comprised of three units, Stud Assembly, Grommet and Cam Collar. They are four to ten times faster in installation than similar devices.



Camloc High Speed Fasteners operate with a quarter turn of the screw driver. They secure doors and access panels in metal, plastic and plywood.

CAMLOC *high-speed* **FASTENERS**

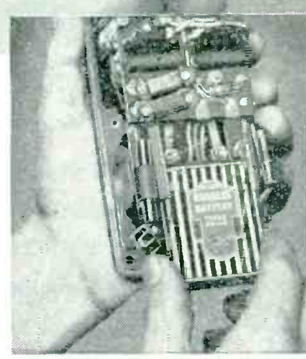
CAMLOC FASTENER CORPORATION, 420 Lexington Ave., New York 17 — 5410 Wilshire Blvd., Los Angeles 36

All-Purpose Pocket Size Volt-Ohm-Milliammeter

A new modernistic styled, compact unit that provides an answer to all Volt-Ohm-Milliammeter requirements. Incorporates all the testing facilities of larger, more costly equipment. A.C. and D.C. Volts 0–2.5–10–50–250–1000–5000 (D.C. at 10,000 ohms per volt; A.C. 1000 ohms per volt); 0–.1–1–10–100–1000 D.C. Milliamperes, at 100 millivolts; 0–10 D.C. amperes at 100 millivolts; Resistance 0–400 Ohms (10 ohm center scale); 0–40,000 ohms (500 ohms center scale) 0–4 Megohms (50,000 ohm center scale). Self contained batteries. Selector switch control for all ranges.

Completely insulated black molded case and panel, attractive streamlined design. (Leather carrying case also available to hold tester and accessories.)

The Triplett Line—more comprehensive than ever—goes today for war needs but its exacting services in war assure you the final answer for post-war equipment requirements.



Battery slides into place, Easily inserted or removed.

Twenty position selector switch control for all ranges.

Triplett

ELECTRICAL STANDARDS ARE SET BY TRIPLETT **INSTRUMENT CO.**

BLUFFTON OHIO ★ ★ ★

WHEN YOU AND FORMICA ARE HONORABLY DISCHARGED

YOU'LL WANT THIS VETERAN IN YOUR PEACETIME PRODUCT

Formica laminated plastic is 30 years young, but a veteran with a long bright future before it helping you make better products for a better world. It passed the most rigid "physical" when it entered the armed services. It is serving in every branch on land, sea and in the air. It went through all the hells on all the fronts as parts of vehicles, planes, tanks, ships and communications equipment. It is coming back to you laden with stripes.

It has met the severest tests in the most gruelling combat to which men and materials have ever been subjected.

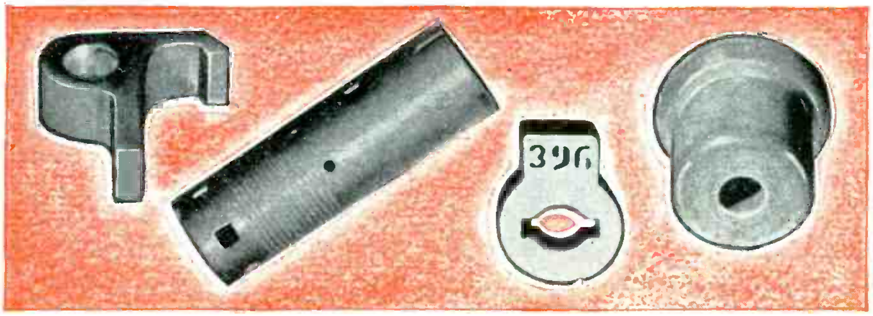
It is light for its great strength, non absorbent, acid resistant, and has good dielectric properties, machinability, and comes in many grades with special properties. Why not investigate its applicability to your post war product now.

"The Formica Story" is a moving picture in color showing the qualities of Formica, how it is made, how it is used. Available for meetings of engineers and executives.

THE FORMICA INSULATION COMPANY, 4661 SPRING GROVE AVENUE, CINCINNATI 32, OHIO

ARMY E NAVY

FORMICA



Fungus-Proofing

(*Continued from page* 93)

ing values well under 15-minutes. Of the 39 vehicles tested, all but 15 had the desired drying rate.

(d) *Satisfactory Dielectric Strength.*

Of the systems studied, only four had wet dielectric strength under 1000 volts-per-mil, and even these ranged from 700 to 900 volts-per-mil, which are considered good values.

(e) *Availability.*

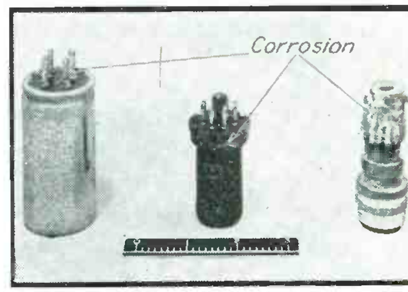
Three vehicles proved better than the rest of the field, but unfortunately the raw materials were unavailable in the required quantity.

Fungicides

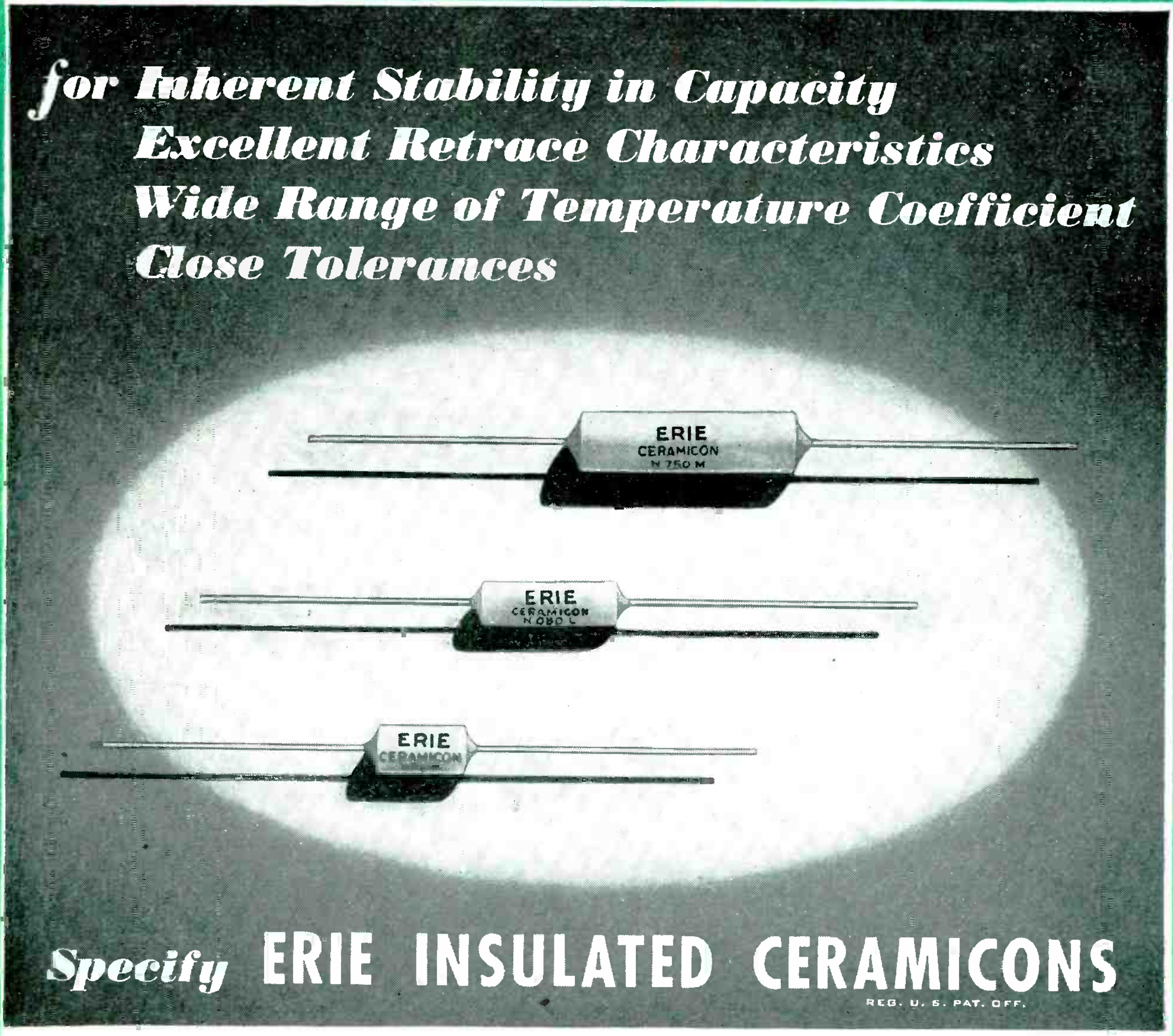
Fungicides were tested for corrosive effect in aqueous and lacquer mediums, for heat stability, for wet and dry dielectric strength, and for fungicidal activity.

One must realize that there are hundreds of thousands of fungus and mold species and that many become acclimatized to various types of poison, so that in time they actually thrive on what would ordinarily be a lethal dose. Also, unless a fungicide is selected that is effective on all commonly encountered types, certain groups may increase more than is customary due to a lessened fight for survival against other groups.

Another consideration in selecting a toxicant is the choice of one that kills before the mold commences to propagate. Mold between electrical contacts may, under operating conditions of a radio set, form a serious conductive path due to the high concentration of water in the cells of the fungi. Even after death the carbohydrates contained in mold structure have a tendency to form



A vibrator, tube and cable-connector, illustrating how corrosion attacks in the tropics when such parts are untreated



OVER eight years ago Erie Ceramicons brought new standards of stability to pre-war broadcast receivers. For war-time military communications equipment these compact, sturdy silver-ceramic capacitors have been rendering excellent service in many critical applications that call for performance standards undreamed of when push-button tuning was in its infancy.

Today Erie insulated Ceramicons are available with basic characteristics that are essential for high frequency, F.M. and television applications.

1. **Inherent Capacity Stability:** Silver electrodes are in intimate contact with ceramic dielectric, eliminating any possibility of air or wax filled pockets between the two.

2. **Excellent Retrace Characteristics:** Since the temperature coefficient is a function of the molecular structure of the ceramic dielectric, change in capacity of Ceramicons with respect to temperature is definite and reproducable under normal operating conditions.

3. **Wide Range of Temperature Coefficient:** Erie Ceramicons are available in 10 standard temperature coefficients from +100 P/M/°C to —750 P/M/°C. Standard tolerance is ±60 P/M/°C, or ±15% whichever is the greater, as determined by measurement at +25°C and 85°C. Erie Ceramicons can be individually checked in production quantities for temperature coefficient to much closer limits.

4. **Close Tolerances:** Standard commercial capacity tolerance is ±.25 MMF or ±1%, whichever is greater. Ceramicons are now being produced in large quantities having capacity tolerances as close as ±0.1 MMF.

The Erie Engineering Department is continually working to further refine the characteristics of Erie Ceramicons. We will be glad to work with you on Ceramicons for commercial or special applications.

ARMY E NAVY
FOR HIGH ACHIEVEMENT IN WAR PRODUCTION

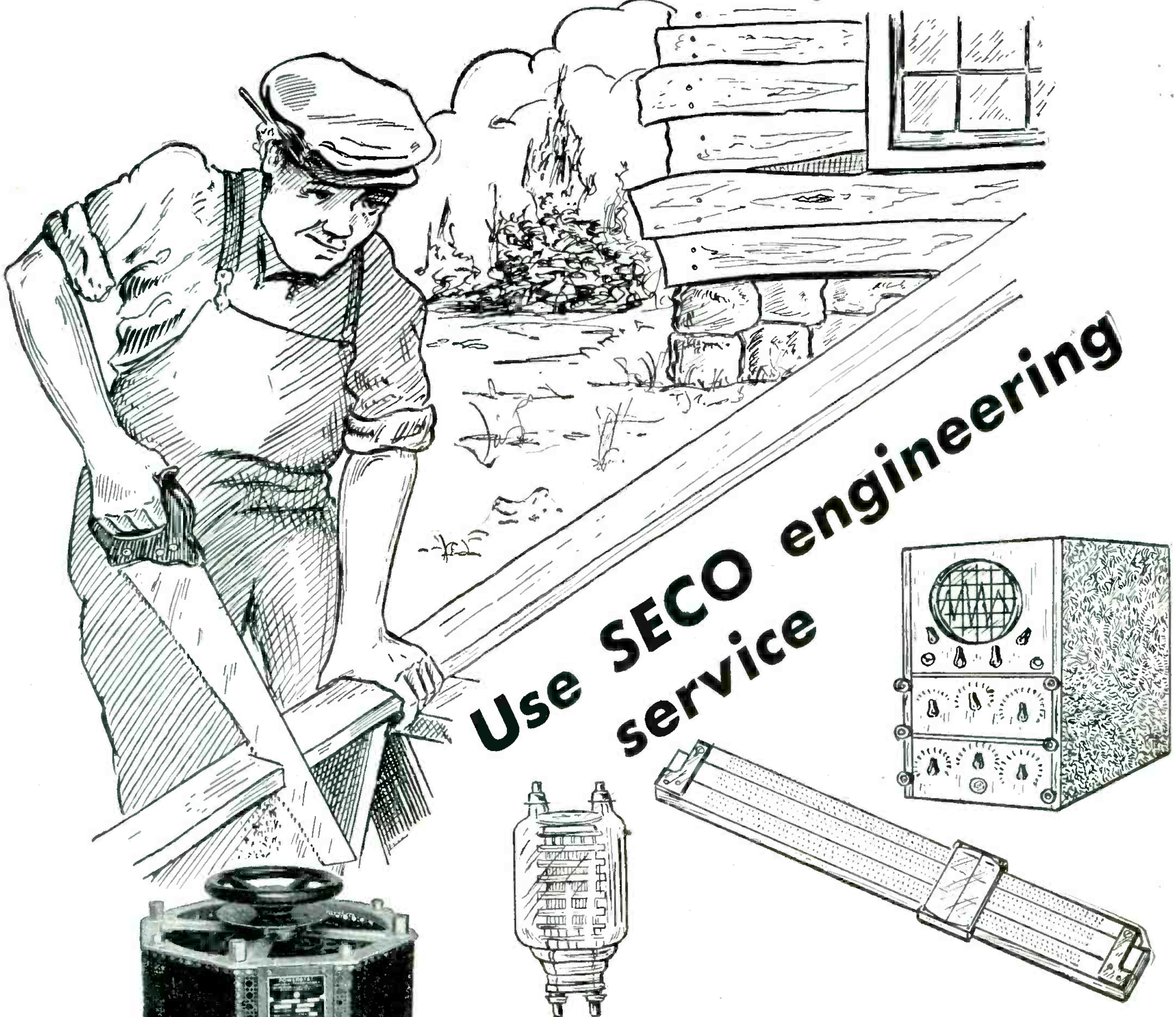
Electronics Division

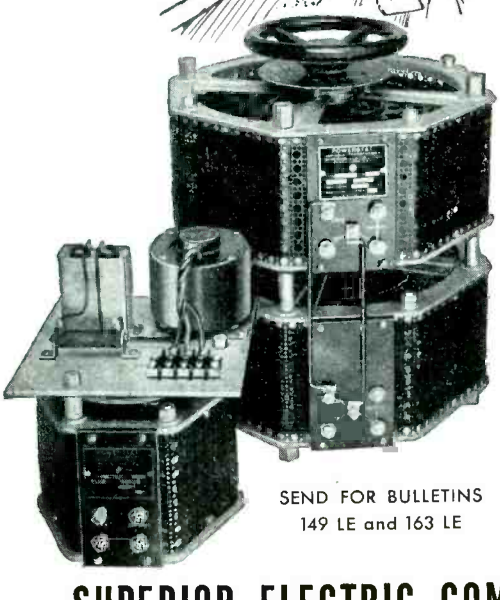
ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND • • TORONTO, CANADA

★ ★ ★ *Let's All Back The Attack—Buy EXTRA War Bonds* ★ ★ ★

Don't cut and try . . .





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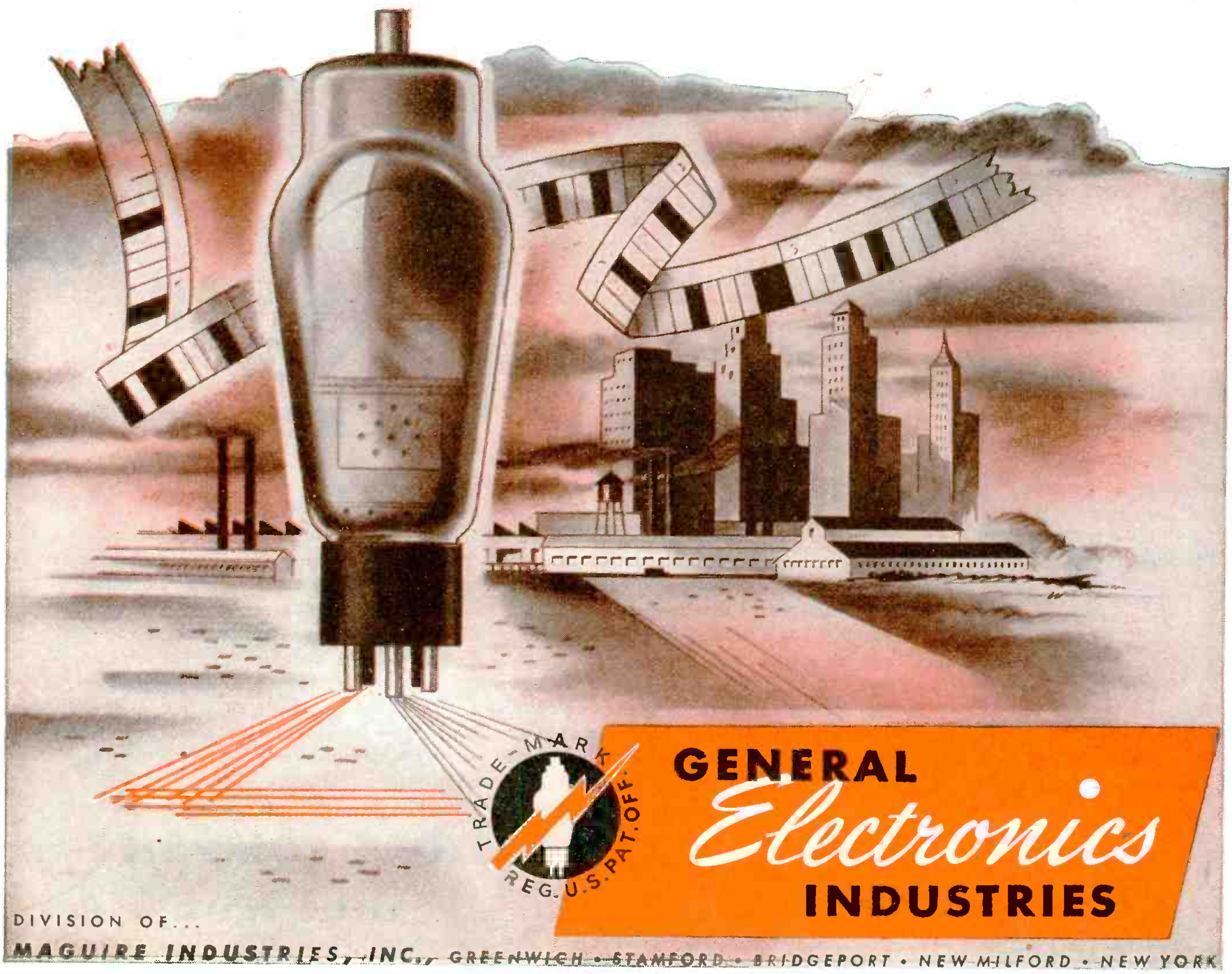

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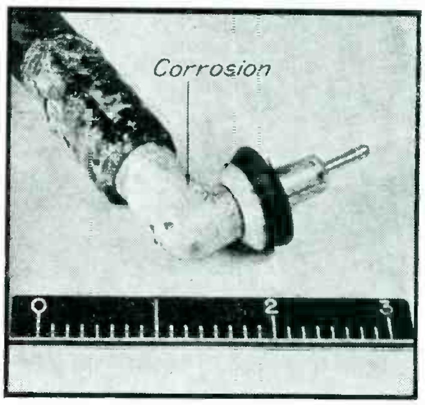
a carbon path for electrical current.

It was also necessary to consider toxic effects on humans, both during and after application, as many toxicants are apt to cause serious difficulties in industrial plants. As many applications may also be made in the field by men whose skin is especially sensitive from long exposure in the tropics, and men having skin infections, minor wounds and abrasions, a toxicant with germicidal effect is particularly desirable.

Mercury-Salt Tests

Of the fungicides tested, an organic mercury salt appeared to be most satisfactory, based on a balanced evaluation of all properties. Medical reports give the compound a clean bill of health regarding danger from dermatitis.



Another example of corrosion of a metal part, coupled with fungus growth on insulation

For determining corrosive effects small panels were prepared and each was immersed in a saturated solution of the toxicants selected for test. The panels were of copper, low-carbon steel, cadmium-plated steel, silver-plated steel and two aluminum alloys. Tests were also made on rubber, neoprene and other materials going into completed communications equipment.

The selected mercury salt showed high bactericidal value, non-reactive tendencies on parts, and in general the best average behavior. Satisfactory results were achieved when the mercury was incorporated in organic vehicles, other than the selected lacquer. It also exhibited good thermal characteristics, and thermal stability is greatly to be desired as at high operating temperatures certain fungicides

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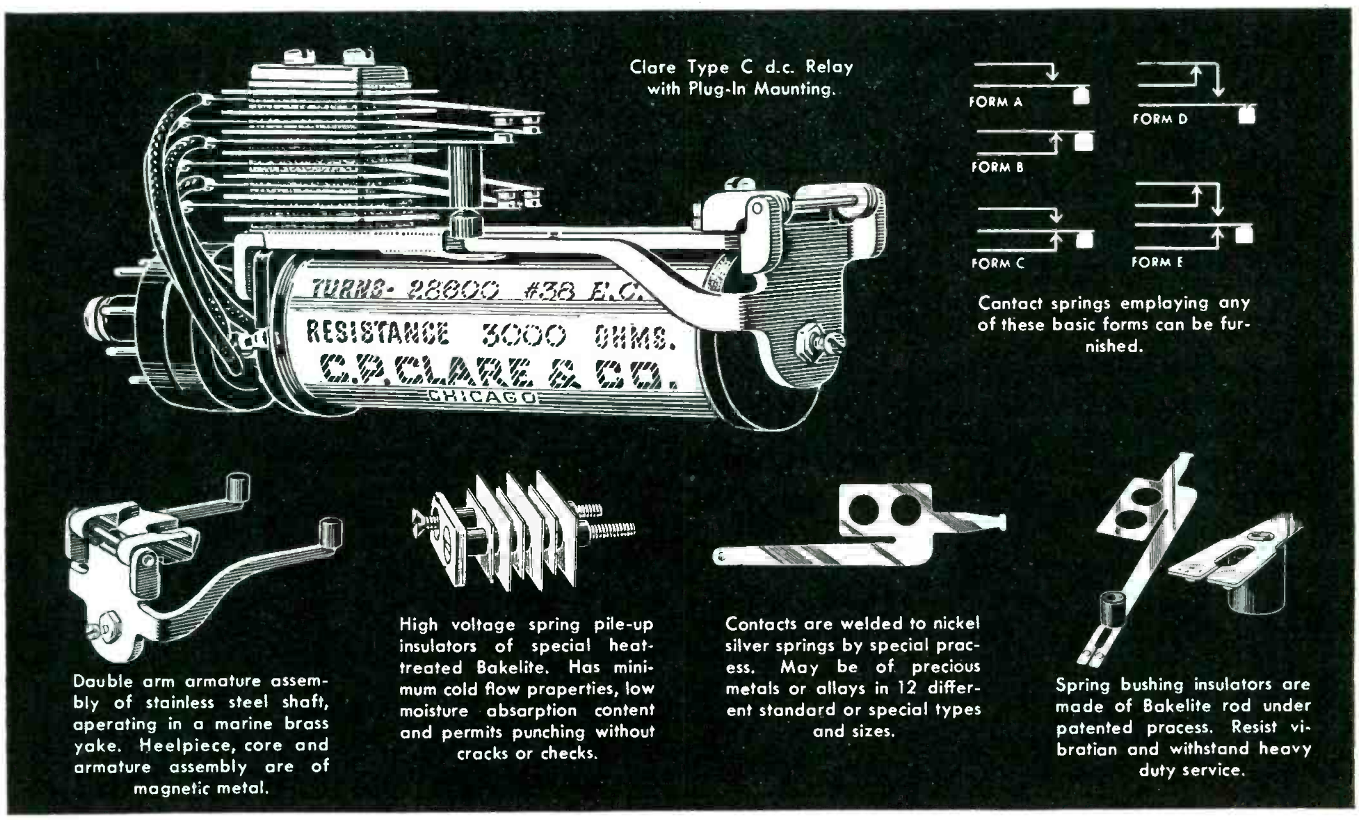

The Clare Type "C" Relay shown here may be "Custom-Built" to provide exactly the contact arrangements, the spring assemblies, or the type and size of contacts your special application calls for.

This flexibility of Clare Type "C" Relays permits any combination of five basic contact forms; provides twelve different standard, or other special, types and sizes of contacts.

Electrical and Production engineers have found this rugged, multiple contact relay of exceptional value in such operations as sequence control of machine tools, for counting equipment, in electric eye controls, in radio and radar and in the operation of many other electronic devices.

All Clare relays are carefully designed, well manufactured from best materials and precisely adjusted. These factors result in a relay which reduces overall relay cost, simplifies installation and insures better and more dependable performance.

Clare engineers are ready at all times to assist you in developing a relay specifically "custom-built" to meet your requirements. Send for the Clare catalog and data book. C. P. Clare & Company, 4719 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

tend to become inert, to vaporize, or to become corrosive.

Protection of Parts

Certain component parts are frequently subjected to unusual conditions before being placed in equipment. It was determined that such parts should, where possible, have special treatment during manufacture or, if this proves impractical, before being placed in storage in tropical climates.

The requirements on thermal range, water resistance, solvent resistance, dielectric strength, power factor, dielectric constant and fungicidity were established and three experimental hot-melt compounds were developed. One proved to have excellent all-round characteristics.

Coatings of the type referred to are of particular value for capacitors. Where leads are apt to cut through standard coatings, the hot-melt is sufficiently flexible so that it bends without cutting or rupturing. It contains a toxicant that is not affected by heat and has no tendency to vaporize or cause dermatitis.

Tests were made on vinylite-molded silvered-mica capacitors of from 800 to 1400 $\mu\mu$f. Half of the samples were heavily varnished and baked for moisture-protection before molding in vinylite; the balance were untreated before molding.

One special study involved the moisture-proofing of molded or laminated phenolic parts. A specification is now being written recommending a special type of baking varnish as a moisture-proofing fungicidal coating having the high degree of adhesion required to protect phenolic parts from reactions mentioned previously. After phenolic pieces have been cut to size and punched this coating is applied by dipping or spraying and seals the edges and punch-holes. The hardware is then attached.

The testing of protective methods other than the use of organic coatings is now proceeding under actual tropical operating conditions. Several types of volatile fungicidal salts and dessicants have been placed in sets, but it is still too early to have any definite opinions regarding their value.

WHEREVER WIRING APPLICATIONS are exposed to conditions which ordinarily cause electro-chemical corrosion, Lumarith (cellulose acetate) insulation is particularly desirable. Guarded by Lumarith even hair-like copper wire shows no more corrosion than when suspended in free air.

Lumarith has excellent dielectric strength. A new development—a special matte-finish—needs no lubrication and allows more elongation, a big plus in winding production.

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THE ELECTRON ART

Fields of Air-Core Coils and Applications to R-F Heating

By George H. Brown
RCA Laboratories
Princeton, N. J.

The writer was asked to abstract the most important parts of Kirkpatrick's paper* for the readers of Electronics. In performing this task, some change has been made in the notation of the original paper, and the expressions set forth will show the magnetic intensity expressed in ampere-turns per centimeter rather than the flux density in gauss. The expressions given by Kirkpatrick have been altered in form. The writer believes that the equations may prove more generally useful with this modification.

In the practice of induction heating, the coils which are used to induce currents in the work are in general small compared to the wavelength. In this restricted case, it is then possible to neglect the radiation term in the magnetic field distribution. That is, in formulating the magnetic field intensity from the well-known vector potential, it is not necessary to retard the potential; the phase delay due to the finite velocity of propagation of the waves may be neglected. Then the magnetic field intensity distribution expressions are independent of frequency. Kirkpatrick has made use of this fact to develop expressions for the magnetic field intensities along the axis of a number of coils which are of interest in induction heating of vacuum tube parts.

First consider the circular helix of Fig. 1. On the axis of the coil, at the point O, the strongest component of magnetic intensity is along

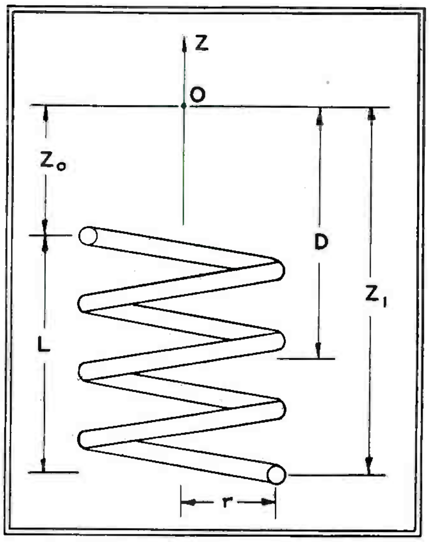


Fig. 1—Helical heating coil

the axis. This component of magnetic intensity is along the axis. This component is

$$H_z \text{ (ampers turns per cm)} = \frac{nI}{2}\left[\frac{Z_1}{\sqrt{Z_1^2 + r^2}} - \frac{Z_o}{\sqrt{Z_o^2 + r^2}}\right] \quad (1)$$

where n = pitch of the coil in turns per cm, N = total number of turns on coil, L = length of coil (cm), $N = nL$, r = radius of coil (cm), Z_o = distance from near end of coil to point O (cm), Z_1 = distance from far end of coil to point O (cm), and I = current in coil (amperes).

(It should be noted that Z_o should be regarded algebraically. When the point O moves into the coil, Z_o becomes negative.) If we measure distance from the center of the coil to point O and call this distance D, Eq. (1) may be rewritten in a more useful form

$$H_z = \frac{nI}{2}\left[\frac{(D + L/2)}{\sqrt{(D+L/2)^2 + r^2}} - \frac{(D - L/2)}{\sqrt{(D-L/2)^2 + r^2}}\right]$$

$$= \frac{NI}{2L} \times \left[\frac{D + L/2}{\sqrt{(D + L/2)^2 + r^2}} - \frac{(D - L/2)}{\sqrt{(D - L/2)^2 + r^2}}\right] \quad (2)$$

The product NI has been introduced because of the fact that, with loose coupling to the load, the total ampere-turns in the coil are determined by the particular vacuum tubes used in the oscillator. That is, the current in the primary tank circuit of the oscillator depends on tube characteristics, but this current may be stepped up in the work coil by means of suitably designed transformers.

The magnetic intensity at the exact center of the helix may be determined from Eq. (2) by setting D equal to zero. Then

$$H_z = \frac{NI}{\sqrt{L^2 + 4r^2}} \quad (3)$$

To examine the variation of magnetic intensity as we move along the axis, we need only investigate the behavior of a factor, M, where

$$H_z = M \times NI/L \quad (4)$$

and

$$M = \frac{1}{2}\left[\frac{\left(\frac{D}{L}+\frac{1}{2}\right)}{\sqrt{\left(\frac{D}{L}+\frac{1}{2}\right)^2+\left(\frac{r}{L}\right)^2}} - \frac{\left(\frac{D}{L}-\frac{1}{2}\right)}{\sqrt{\left(\frac{D}{L}-\frac{1}{2}\right)^2+\left(\frac{r}{L}\right)^2}}\right] \quad (5)$$

The variation with M as a function of D/L is shown in Fig. 2, for a number of values of r/L. We see from these curves that a large coil radius results in low values of magnetic intensity within the coil, with a slow falling off as we move away from the coil, while a coil of small radius yields high intensities within the coil with a sharp decline as we move out of the coil.

It is interesting to examine Eq. (5) to determine an optimum value

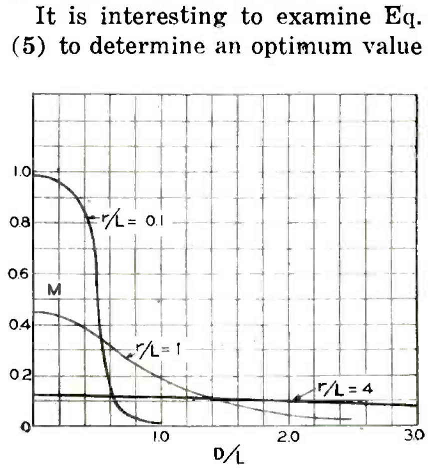
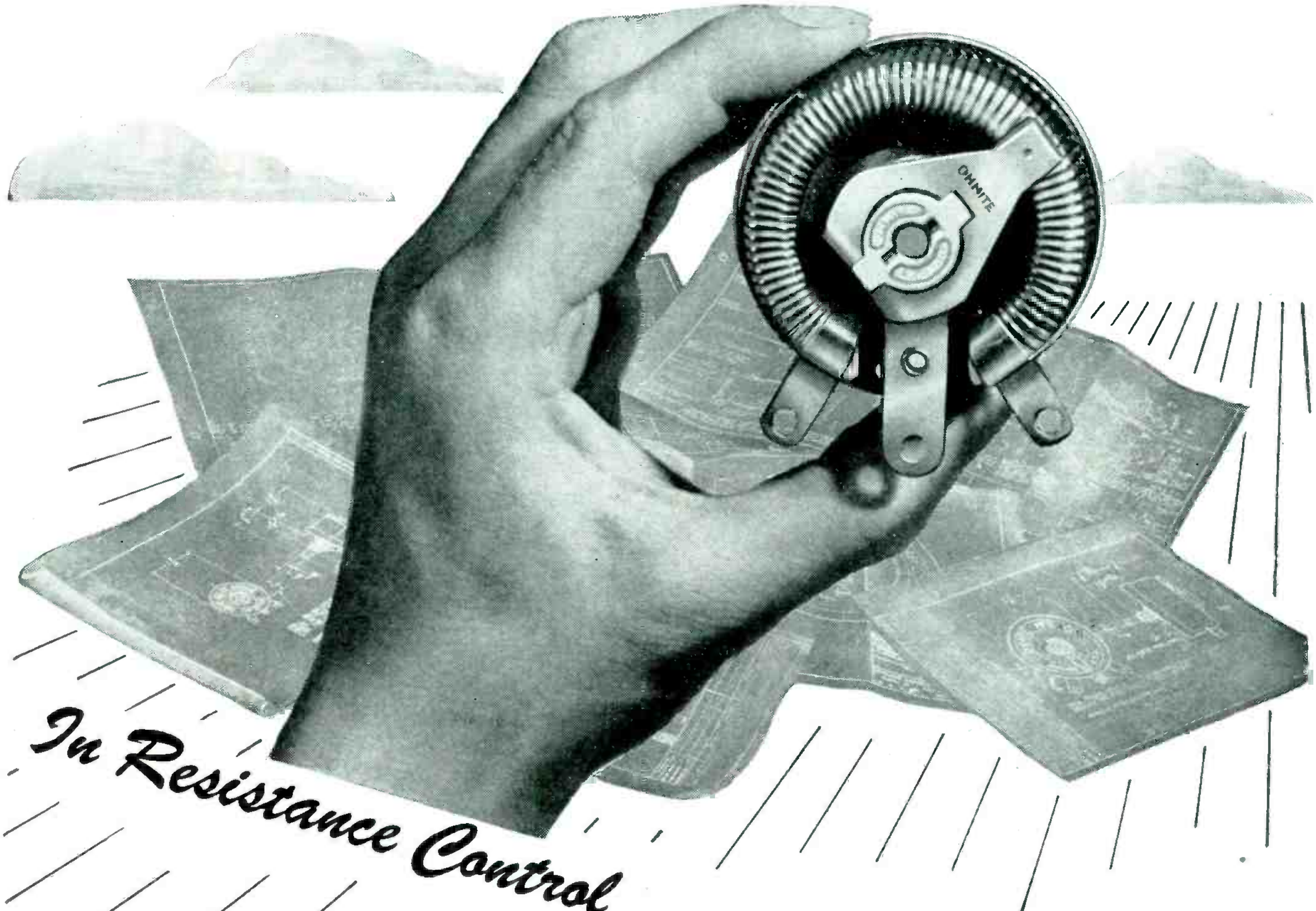


Fig. 2—Variation of the factor M, given in Eq. (5)

* Kirkpatrick, C. B. The Magnetic Induction Field of Air Core Coils and Its Application to High-Frequency Heating in Valve Manufacture, *A.W.A. Technical Review* (Australia), 5, No. 6, Dec., 1941. p. 229-250. Reprinted in *Wireless Engineer*, Aug., 1943, p. 372-382.



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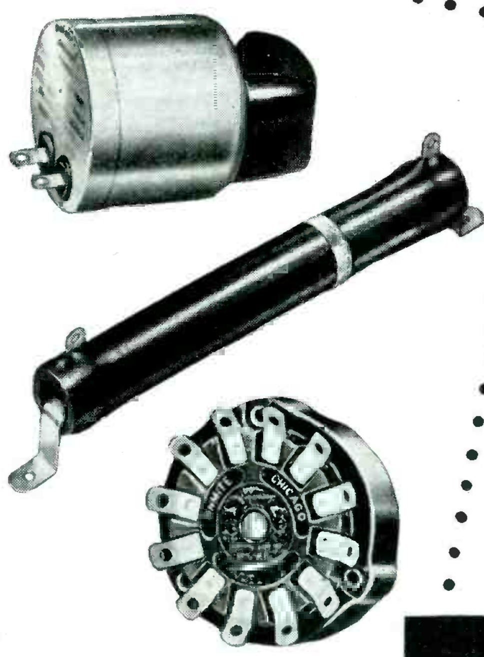

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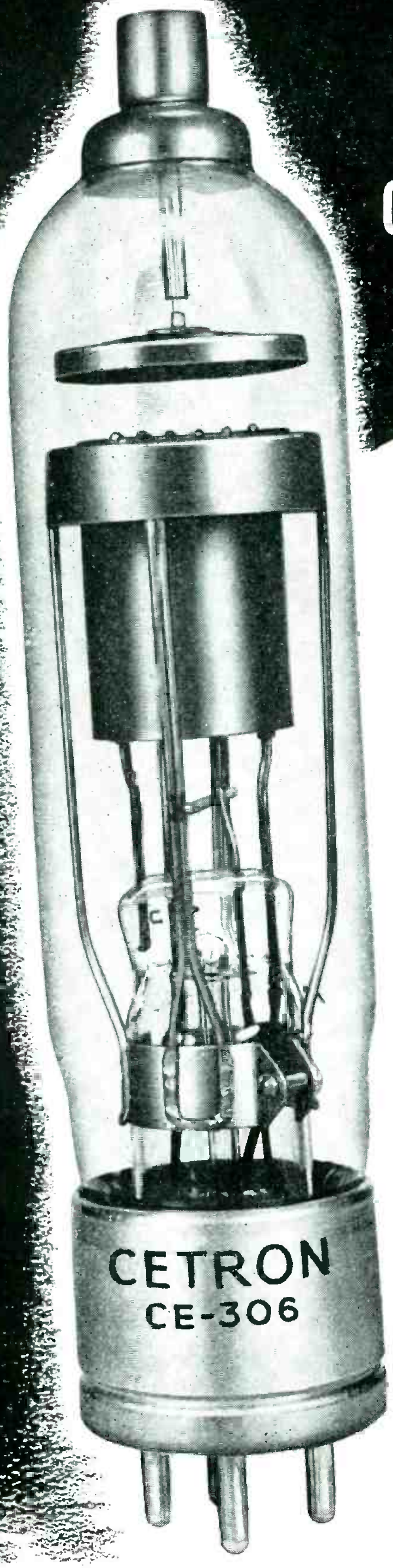

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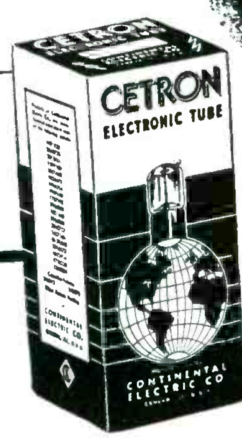

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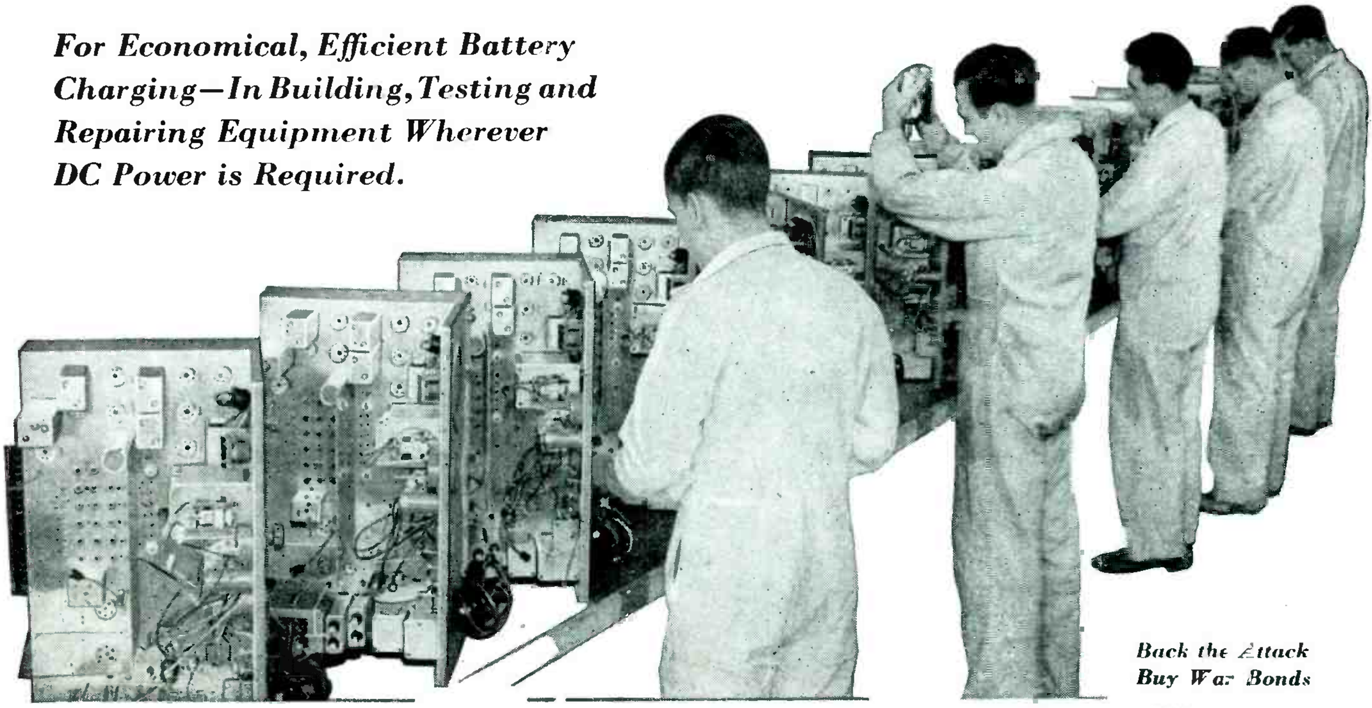

Back the Attack
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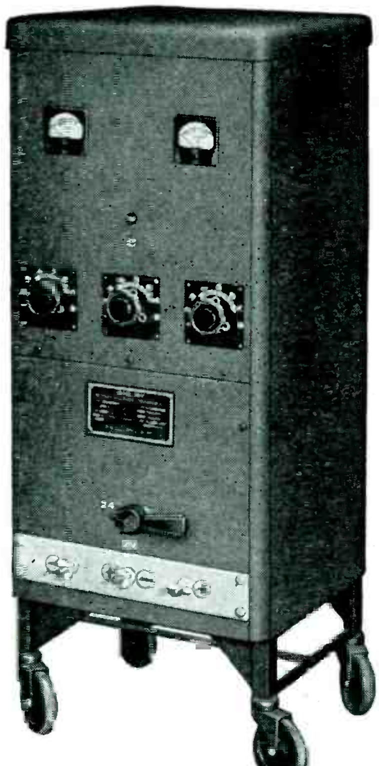
High Current Low Voltage Mallory General Utility DC Power Supply



This General Utility DC Power Supply is designed to replace batteries, battery carts and motor generators on assembly lines, in laboratories, maintenance departments, or wherever DC power is required. Though built for heavy duty, it requires no foundations for installation—you merely roll it to the desired location, and plug into a 230 volt 3 phase AC outlet (460 volt models available on special quotation).

The General Utility unit provides adequate, dependable DC power for manufacturing, testing and repairing electrical communications and electronic equipment in aircraft and other mobile units employing 12 or 24 volt systems. In fact, circuits are arranged to deliver 12 and 24 volts simultaneously.

Mallory "Time-Tried and Proven" magnesium copper sulphide rectifiers provide noiseless operation with no moving parts. For further information, see your Mallory distributor or write direct.

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of the radius, r, when the distance, D, is fixed. Equation (5) is then differentiated with respect to r and the result set equal to zero. This yields the optimum value of r:

$$\frac{r}{L}\,opt = \left[\left(\frac{D}{L}-\frac{1}{2}\right)\left(\frac{D}{L}+\frac{1}{2}\right)\right]^{1/3} \left[\left(\frac{D}{L}-\frac{1}{2}\right)^{2/3}+\left(\frac{D}{L}+\frac{1}{2}\right)^{2/3}\right]^{\frac{1}{2}} \quad (6)$$

The optimum value of r/L as a function of D/L is shown in Fig. 3. It is seen that for values of D/L greater than 2, the optimum value of r/L is

$$r/L = \sqrt{2}\;D/L \quad (7)$$

Figure 4 shows the maximum values of M that may be obtained, when the conditions of Eq. (6) prevail.

At times, when a metal part inside a vacuum tube is to be heated, the limiting factor in coil spacing

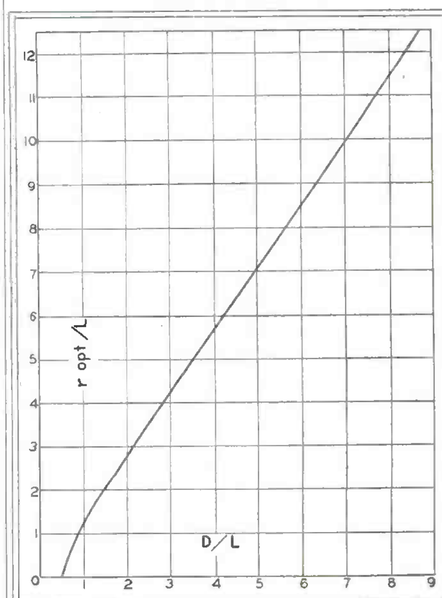

Fig. 3—This diagram shows the optimum value of the radius of a helical coil as a function of the dimension D, with the coil length fixed

is determined by the location of the metal part in the glass envelope. This fixes the dimension, Z_o, in Fig. 1. Then we may rewrite Eq. (4) as

$$H_z = (NI/Z_o)\,(Z_o/L)\,M \quad (8)$$

Remembering that Z_o/L equals $(D/L) - 0.5$ and making use of the maximum value of M shown in Fig. 4, Fig. 5 was constructed, which shows the maximum value of the factor $(Z_o/L)\,M$ where the radius has been made to be optimum in accordance with Fig. 3. This curve shows that the maximum intensity

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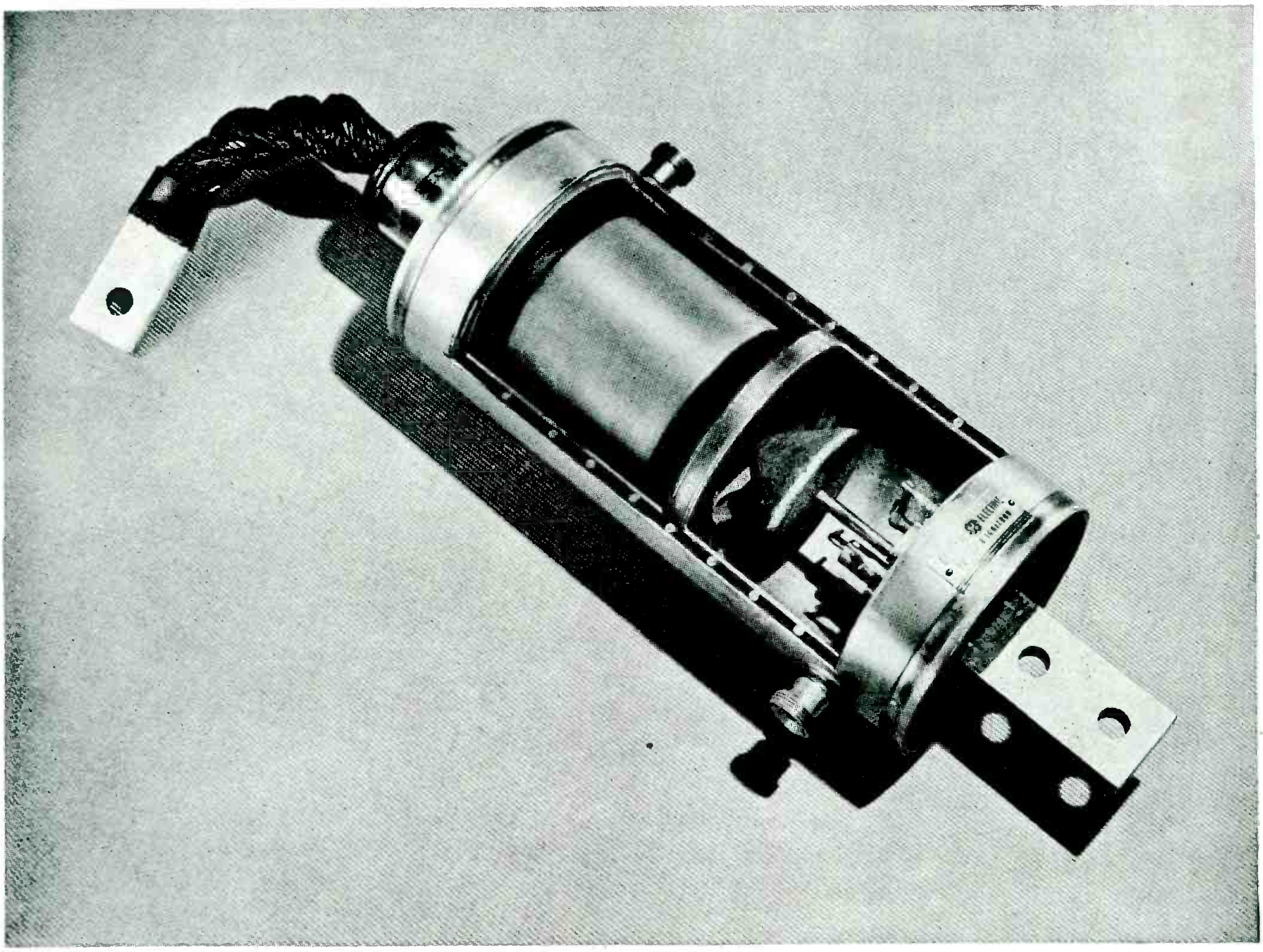

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IN VITAL INDUSTRIES all over the United States, electronic tubes like this are doing heavy duty. They supply the high currents used in spot or seam welding of aluminum alloys, stainless steel and many other types of metal. In many installations they have replaced rotating machinery for rectifying alternating current into direct current.

With a tube carrying such heavy current there is danger of plate overheating. This is just one of the reasons why "National" graphite anodes are installed. They are made to ***highest standards of purity***—giving nearly perfect heat radiation plus minimum arc-back.

"National" graphite elements do not fuse, soften or warp. Low operating temperature reflects less heat to the filament and reduces warpage of other tube parts. And the graphite itself helps keep the interior of both vacuum and gas-filled tubes uncontaminated.

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What cannot be shown is the knowledge behind each product — the continuous and expanding research aimed at product improvement and development of new materials to meet the changing needs of industry.

Irvington products — and the recommendations of Irvington technicians—have supplied the answer to many insulation problems. Enlist the assistance of both, today. Write *Irvington Varnish & Insulator Co.*, Irvington, New Jersey, Dept. 106.

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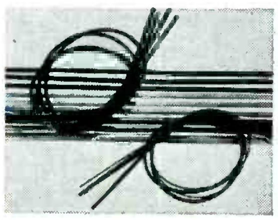

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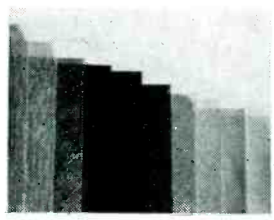

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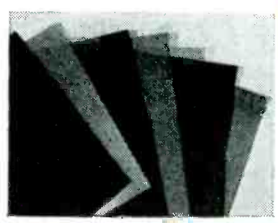

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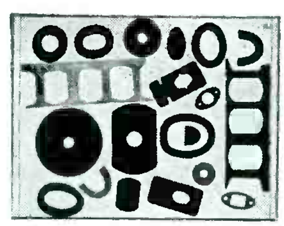

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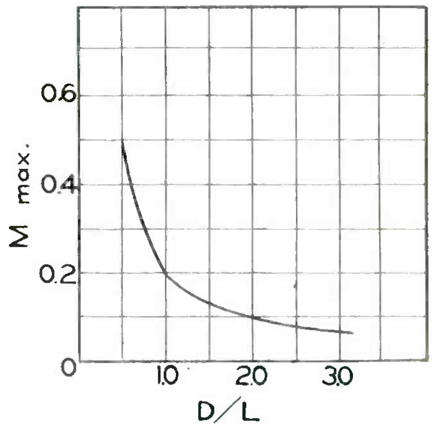

Fig. 4—Maximum values of the factor M, when the optimum radii shown in Fig. 3 are used

is obtained by making Z_o/L as large as possible. Since Z_o is fixed, we must make L very small. This indicates that a single-turn coil with a radius equal to $\sqrt{2}\ Z_o$ is the proper choice for maximum intensity. In this limiting case, the magnetic intensity is

$$H_z = 0.1925\ I/Z_o \qquad (9)$$

The action of a single-turn coil may be studied by setting N equal to unity in Eq. (2) and placing L equal to zero in the same equation. This makes the equation indeterminate, but differentiating numerator and denominator results in the following expression:

$$H_z = \frac{I}{2D} \frac{(r/D)^2}{\left[1 + \left(\frac{r}{D}\right)^2\right]^{3/2}} \qquad (10)$$

We have seen that the single-turn coil may be useful for getting close to the work. There are, however, applications in which the field should be spread over a surface where the single turn may afford too much concentration. Also, where adequate transformers are not available, it may be desirable to use a flat multi-turn coil to provide the necessary number of ampere-turns. A coil of this type which lends itself to analysis is the Equidistant Spiral or the Spiral of Archimedes. Here a point moving on the coil travels so that the radial

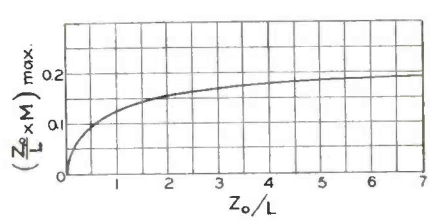

Fig. 5—Maximum field factor when spacing to work is fixed

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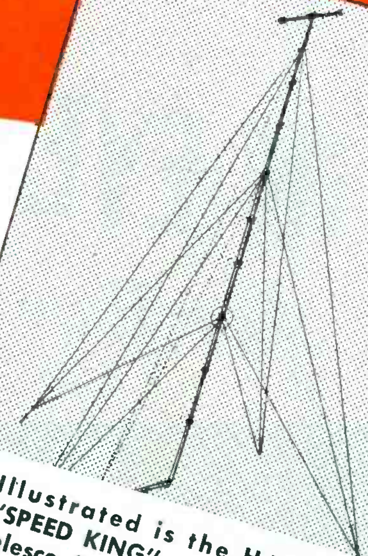

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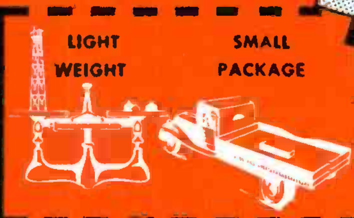
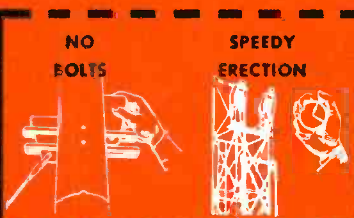


2 MINIMUM ERECTION COST



3 Can be erected with INEXPERIENCED LABOR

4 Can be erected under ADVERSE CONDITIONS

Whatever your Radio Mast and Tower problems may be . . . HARCO can solve them with a variety of designs or can build to meet your exact engineering specifications or needs. These Masts or Towers . . . of triangular or square construction . . . may be obtained with or without guys. They may be straight or tapered . . . with or without telescopic design, and may be arranged for ground assembly, if desired.

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B-L SELENIUM RECTIFIER PLATES are made in diameters from ¾ inch to 4⅜ inches. B-L Copper Sulphide Junctions are made from ½ inch to 1¾ inch.

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BL

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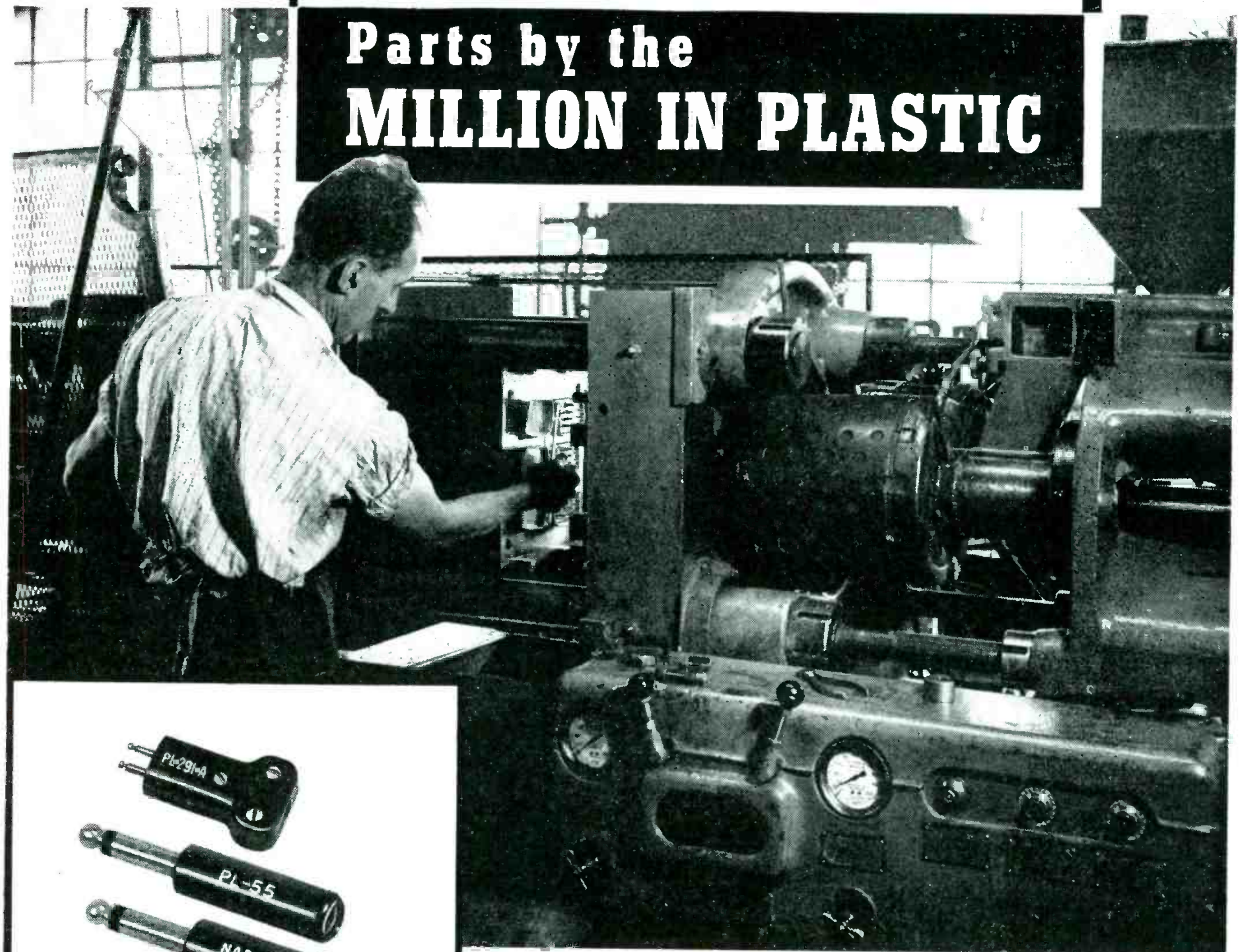

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54	62	76	119	159	
55	63	77	120	160	1136-1
56	64	104	124	291-A	
58	65	108	125	354	No.
59	67	109	127		212938-1
60	68	112	149		

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			

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REMLER PIONEERED custom molding in the West and the electronic experience of this organization goes back to 1918 and ship wireless. Today Remler manufactures complete sound transmitting systems, radio . . . plugs and connectors. Complete facilities frequently permit quotations at lower prices. ● Other manufacturers with war assignments beyond their capacity are invited to entrust part of the work to Remler. Phone or wire if we can be of assistance.

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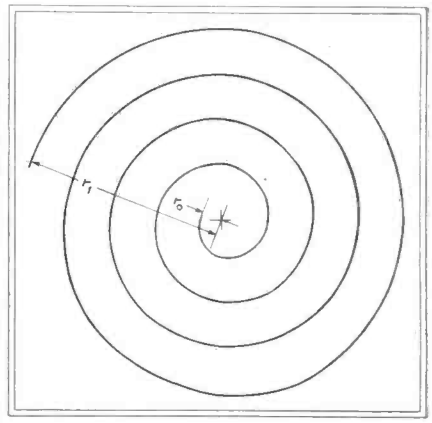


Fig. 6—An Equidistant Spiral, sometimes called the Spiral of Archimedes, for the special case r_0/r_1 equal to 0.1 and N equal to 4

distance to the point is linearly proportional to the angle of rotation.

Let r_1 = maximum radius of outer turn, r_0 = minimum radius of inner turn, N = total number of turns, and r = radius at angle θ where θ is measured in radians. Then

$$r/r_1 = \frac{\theta}{2\pi N}\left[1 - \frac{r_0}{r_1}\right] \qquad (11)$$

Figure 6 shows a Spiral of Archimedes where $r_0/r_1 = 0.1$ and $N = 4$. The magnetic intensity in the Z direction on the Z axis is given by:

$$H_z = \frac{NI}{r_1}\,\frac{1}{2\left(1 - \frac{r_0}{r_1}\right)} \times$$

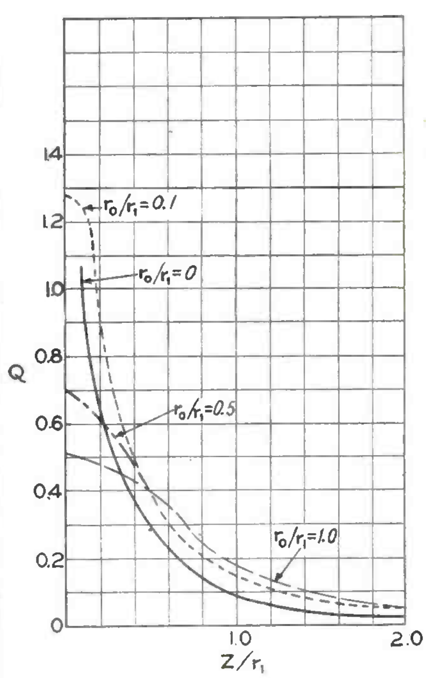
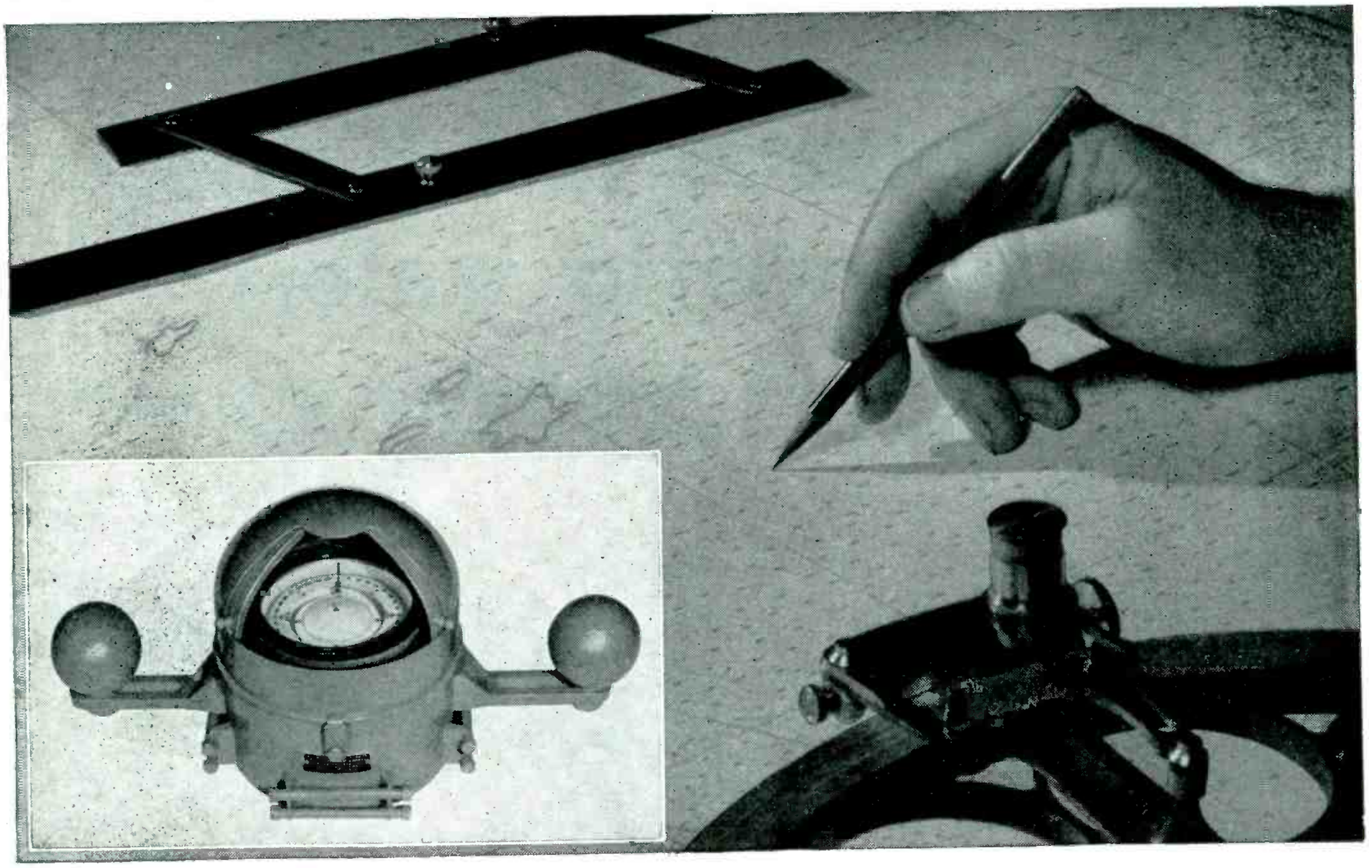


Fig. 7—Variation of the factor Q of an Archimedes Spiral as a function of Z/r_1 for a number of values of r_0/r_1

PERMANENT MAGNETS MAY DO IT BETTER



Rendezvous on a "Fly-Speck"

A PRECISION instrument used for guiding both large and small ships to their destinations is the magnetic compass, such as the one illustrated above. Unprecedented quantities are required for marine service. Many magnetic compasses are also used in planes and tanks.

Modern compasses are versions of the earliest known application of permanent magnets. Today the hundreds of uses for permanent magnets are widely diversified and are expanding rapidly through aggressive engineering and research.

34 years of specialized experience in this field have enabled us to play a leading role in developing these new uses. Our large, modern plant is one of the nation's vital sources of supply.

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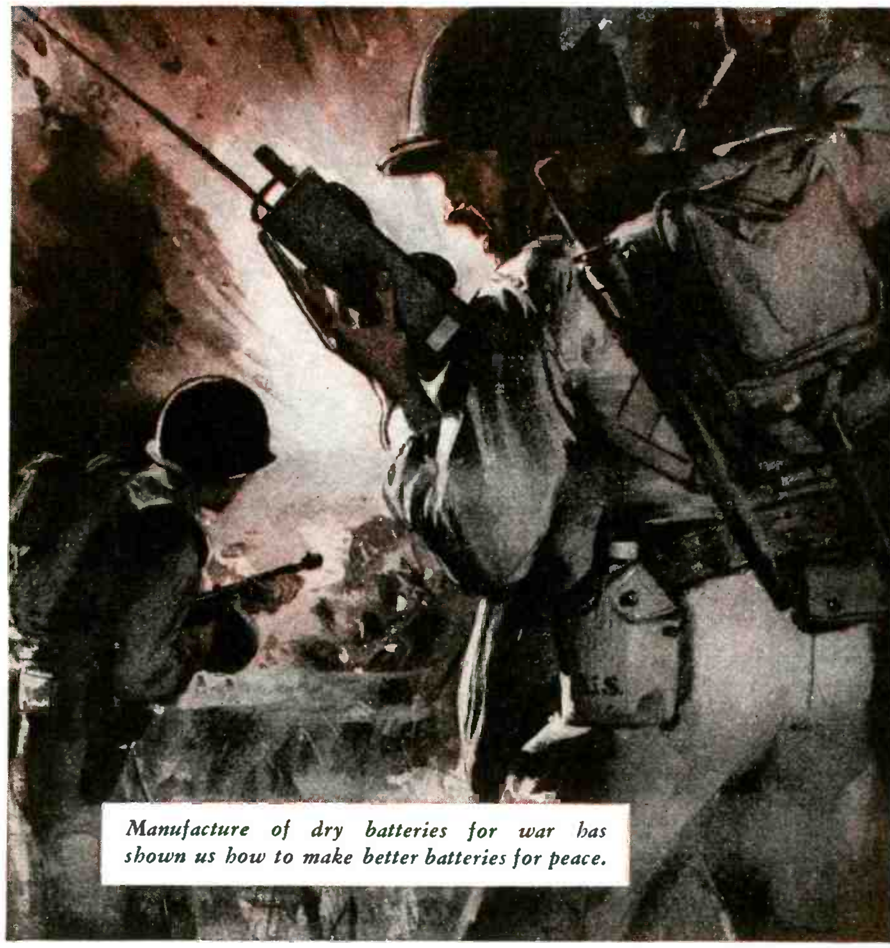
What we had to learn to help him



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. . . the "know how" we gained furnishing dry batteries in ever-increasing millions to our armed forces will help you if batteries are used in your post war products.

Before you *freeze* your post war designs check with Ray-O-Vac . . . for one thing, the space you provide for batteries. Be sure your post war products provide the advantages of the batteries of the future. Write Dept. 2, Ray-O-Vac Company, Madison 4, Wisconsin.

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$$\left[\log_\epsilon\left\{\frac{1+\sqrt{1+\left(\frac{Z}{r_1}\right)^2}}{\frac{r_o}{r_1}+\sqrt{\left(\frac{Z}{r_1}\right)^2+\left(\frac{r_o}{r_1}\right)^2}}\right\}-\frac{1}{\sqrt{1+\left(\frac{Z}{r_1}\right)^2}}+\frac{r_o/r_1}{\sqrt{\left(\frac{r_o}{r_1}\right)^2+\left(\frac{Z}{r_1}\right)^2}}\right] \quad (12)$$

When r_o/r_1 is not zero, and Z is equal to zero,

$$H_z = \frac{NI}{r_1}\,\frac{1}{2\left(1-\frac{r_o}{r_1}\right)}\log_\epsilon\left(\frac{r_1}{r_o}\right) \quad (13)$$

When r_o is zero, but Z is not equal to zero,

$$H_z = \frac{NI}{r_1}\times\frac{1}{2}\left[\log_\epsilon\left\{\frac{1+\sqrt{1+\left(\frac{Z}{r_1}\right)^2}}{(Z/r_1)}\right\}-\frac{1}{\sqrt{1+\left(\frac{Z}{r_1}\right)^2}}\right] \quad (14)$$

It is convenient to write Eq. (12):

$$H_z = Q\times NI/r_1 \quad (15)$$

where

$$Q = \frac{1}{2\left(1-\frac{r_o}{r_1}\right)}\left[\log_\epsilon - \left\{\frac{1+\sqrt{1+\left(\frac{Z}{r_1}\right)^2}}{\frac{r_o}{r_1}+\sqrt{\left(\frac{Z}{r_1}\right)^2+\left(\frac{r_o}{r_1}\right)^2}}\right\}-\frac{1}{\sqrt{1+\left(\frac{Z}{r_1}\right)^2}}+\frac{r_o/r_1}{\sqrt{\left(\frac{r_o}{r_1}\right)^2+\left(\frac{Z}{r_1}\right)^2}}\right] \quad (16)$$

The variation of Q as a function of Z/r_1 for a number of values of r_o/r_1 is shown in Fig. 7. It should be noted that setting r_o/r_1 equal to

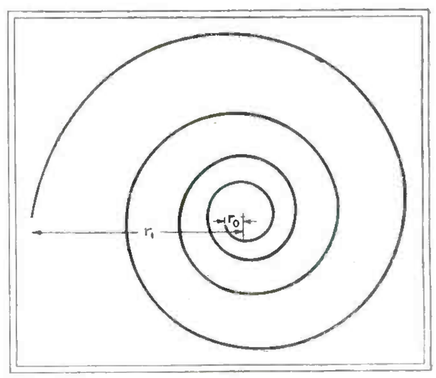


Fig. 8—An Equiangular Spiral for the special case r_o/r_1 equal to 0.1 and N equal to 4

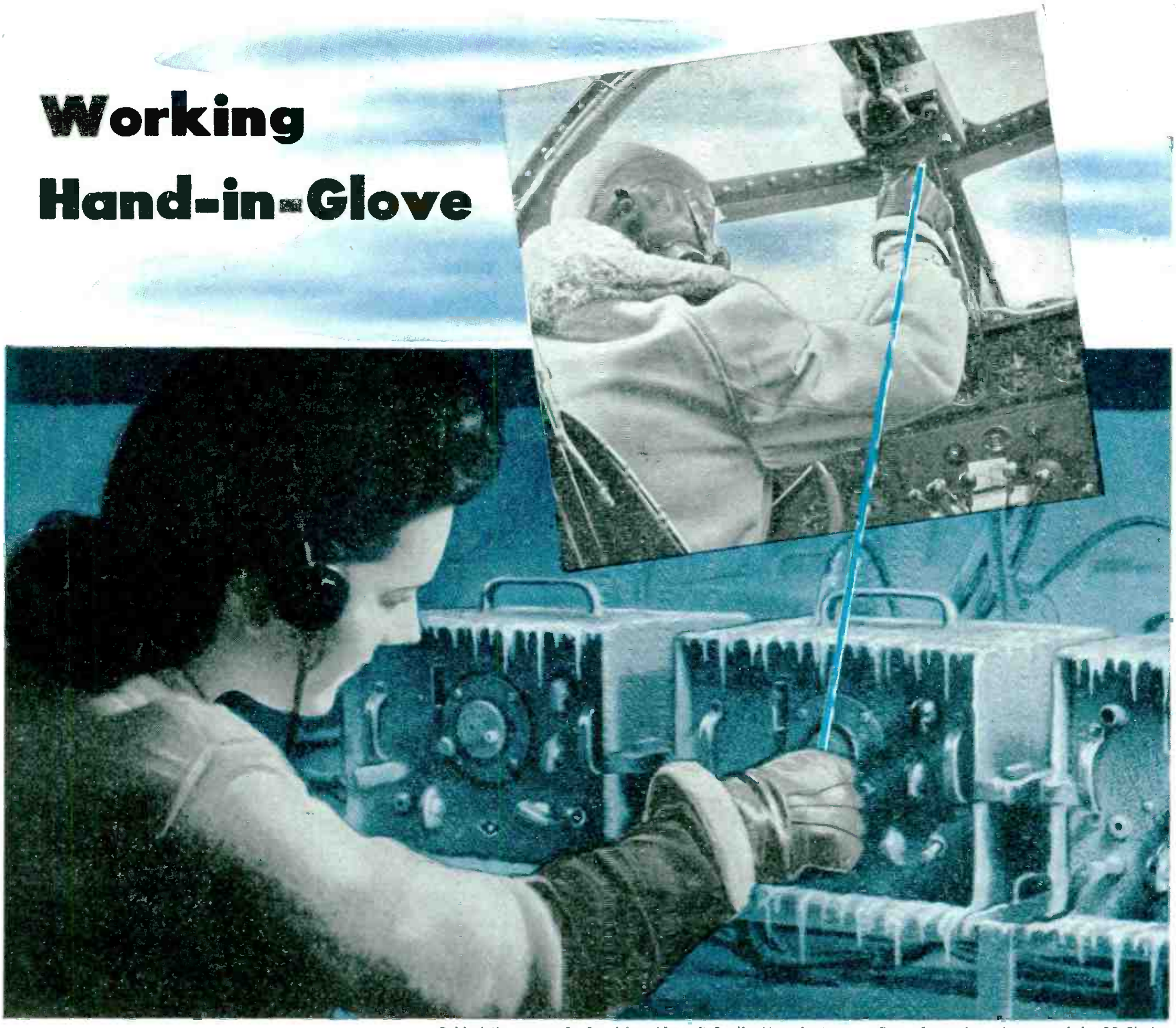
unity is the equivalent of a single closed turn of constant radius.

The Equiangular Spiral is a flat coil so wound that the conductor at any point makes a constant angle β with the radius vector. Under this condition,

$$r d\theta/dr = \tan\beta \quad (17)$$

where θ is the reference angle. In-

Working Hand-in-Glove



Behind the scenes in Precision Aircraft Radio Manufacture . . . One of a series, photograph by BR Photo

"CALLING D FOR DORIS . . . CALLING D FOR DORIS . . ." Somewhere up in the stratosphere, a flier's gloved hand flicks on a Bendix* Aircraft Radio and the voice of the squadron leader comes in clear and crisp, unblurred by the biting cold. The operating frequency is correct . . . set by means of a frequency standard which a girl's gloved hand tested here in the Bendix "cold box," where 40-below temperatures duplicate conditions of altitude flying.

Bendix Radio employees thus literally work hand-in-glove with our fliers . . . testing aircraft radio equipment for its ability to function not only in the bleak cold of the upper air, but in the blistering heat of the tropics . . . in desert dryness and jungle humidity . . . for its ability to stand up under combat strains and landing shock.

Bendix engineers have devised more than a thousand such tests and inspections covering every stage of production, from single parts and sub-assemblies to the compact, finished radio.

Maintenance of the highest standards of quality and precision in manufacture, plus exhaustive pre-flight testing, assure dependable performance even under the most extreme conditions . . . have earned for Bendix Radio equipment the deserved confidence of our fliers in the armed forces, and the pilots of our commercial airlines.

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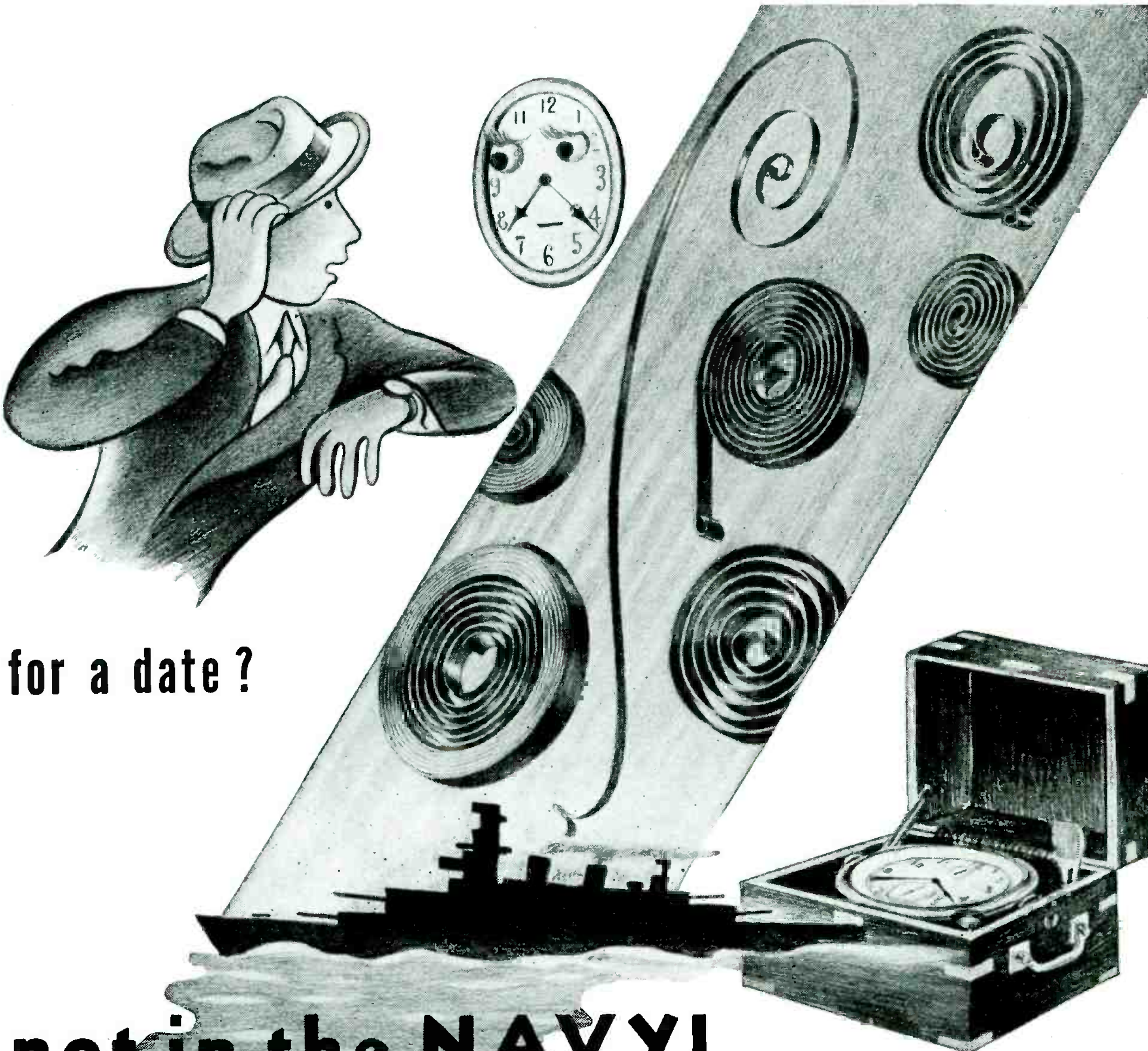

late for a date?

... not in the NAVY!

★ You may be late for a train . . . or a conference . . . even late for work (although "tardy-ism" doesn't help the war effort) ★ but if you're in the Navy . . . on patrol duty . . . convoy duty . . . or in an invasion force ★ punctuality is not only a tradition but a matter of success or failure ★ Navy chronometers are delicate yet dependable mechanisms, timing with split-second accuracy the operation of every objective (not more than 3/100's of a second loss in 24 hours is the requirement of these timepieces) ★ Helping American watchmakers to achieve this accuracy are Barnes-made springs ★ made of Barnes-made spring steel so finely processed that it has surpassed all others in quality and performance for the purpose ★ This same steel will be available for the new applications of civilian developments to come.

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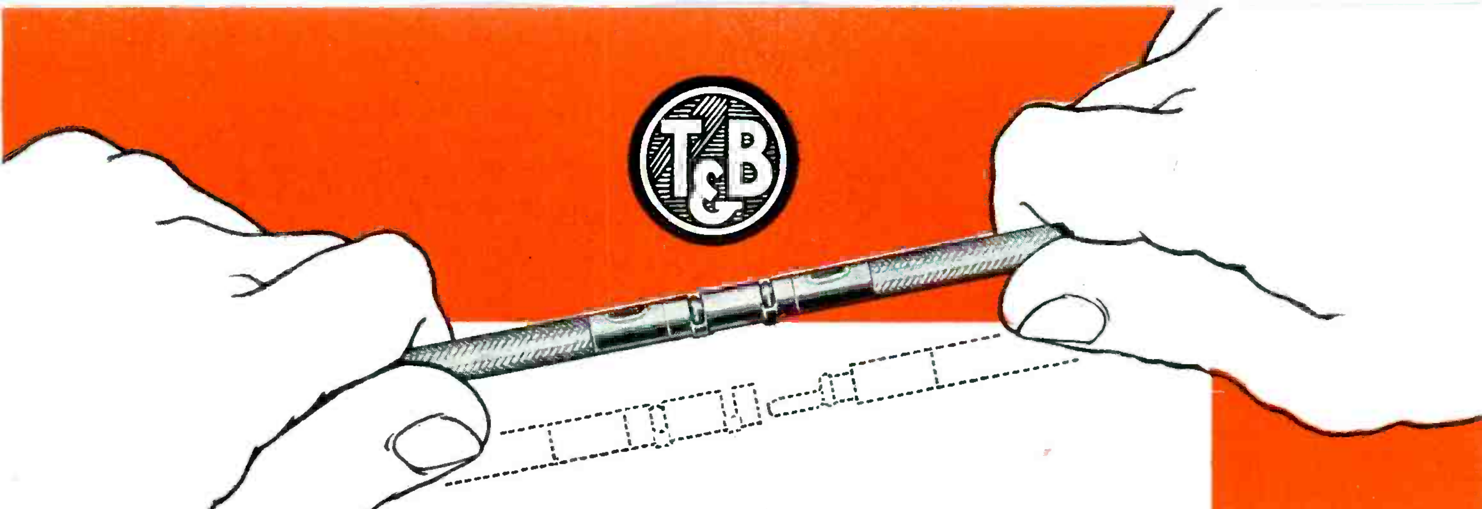
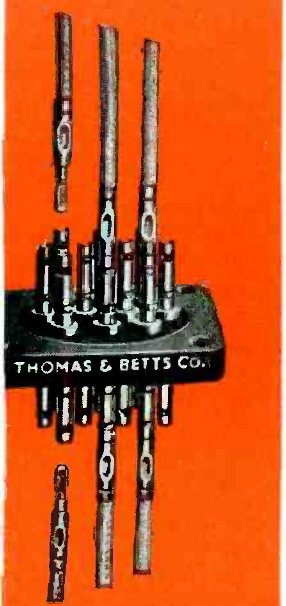
ENGINEERED PEP AND POWER

WALLACE BARNES COMPANY DIVISION OF ASSOCIATED SPRING CORPORATION BRISTOL, CONNECTICUT, U.S.A.

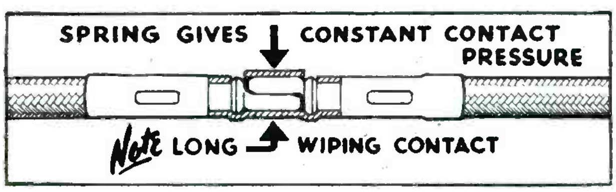


STA-KON
STRAIGHT PULL
DISCONNECT* WAY OF WIRING



The Sta-Kon Disconnect Way of Wiring marks a new development in the technique of connecting all small electrical wires No. 22 through No. 10. T&B straight pull Disconnects are engineered to provide infinite combinations and arrangements of unit and multiple assemblies that can be connected, disconnected and reconnected *at will.*

This straight pull method of disconnecting speeds mounting and demounting, and maintenance and repair of electrical equipment. Because these devices are designed to disconnect at a predetermined pull, they act as "mechanical circuit breakers"—disconnecting and breaking the circuit should the wiring be subjected to accidental external strain. T&B Disconnects are rounded and streamlined to the diameter of the cable to make insulating quick and easy.



The entire T&B Disconnect system centers around two identical Sta-Kon (solderless) Tips which, when connected, are held firmly together by a strong Beryllium copper spring coupler. Under the constant pressure of the coupler, the tips are maintained in direct, long-wiping contact with each other.

T&B Approved Disconnects are members of the familiar Sta-Kon family of Pressure (solderless) Connectors, and are easily installed with standard Sta-Kon Pressure tools, manual or power.

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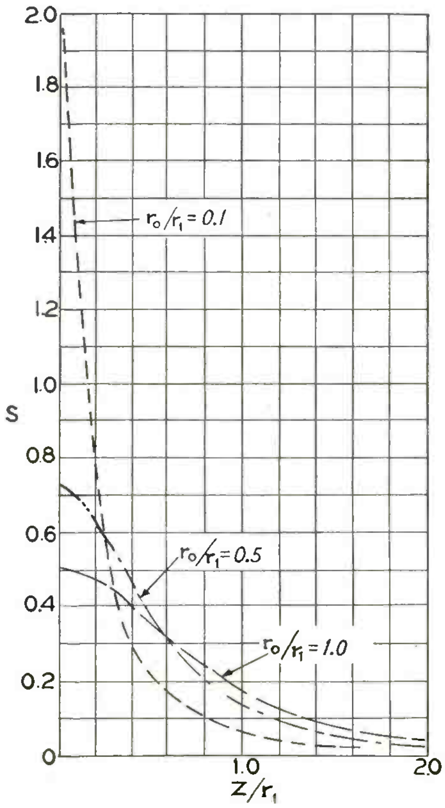


Fig. 9—Variation of the factor S of an Equiangular Spiral as a function of Z/r_1 for a number of values of r_o/r_1

tegration of Eq. (17) yields

$$r = K \epsilon^{\theta \cot \beta} \quad (18)$$

At $\theta = 0$, the start of the coil, $r = r_o$, where r_o is the minimum radius of the inner turn.

Therefore

$$K = r_o \text{ and } r = r_o \epsilon^{\theta \cot \beta} \quad (19)$$

The greatest value of θ is at the outer end of the coil. Here $\theta = 2 \pi N$, where N is the total number of turns on the coil. At this point $r = r_1$.

Then Eq. (19) becomes $r_1 = r_o \epsilon^{2\pi N \cot \beta}$ (20)

and

$$\cot \beta = \frac{1}{2\pi N} \log_\epsilon \frac{r_1}{r_o} \quad (21)$$

Under these boundary conditions, Eq. (18) becomes

$$\frac{r}{r_1} = \frac{r_o}{r_1} \epsilon^{\frac{\theta}{2\pi N} \log_\epsilon \frac{r_1}{r_o}} \quad (22)$$

or

$$\frac{r}{r_1} = \frac{r_o}{r_1} \left[\frac{r_1}{r_o}\right]^{\frac{\theta}{2\pi N}} \quad (23)$$

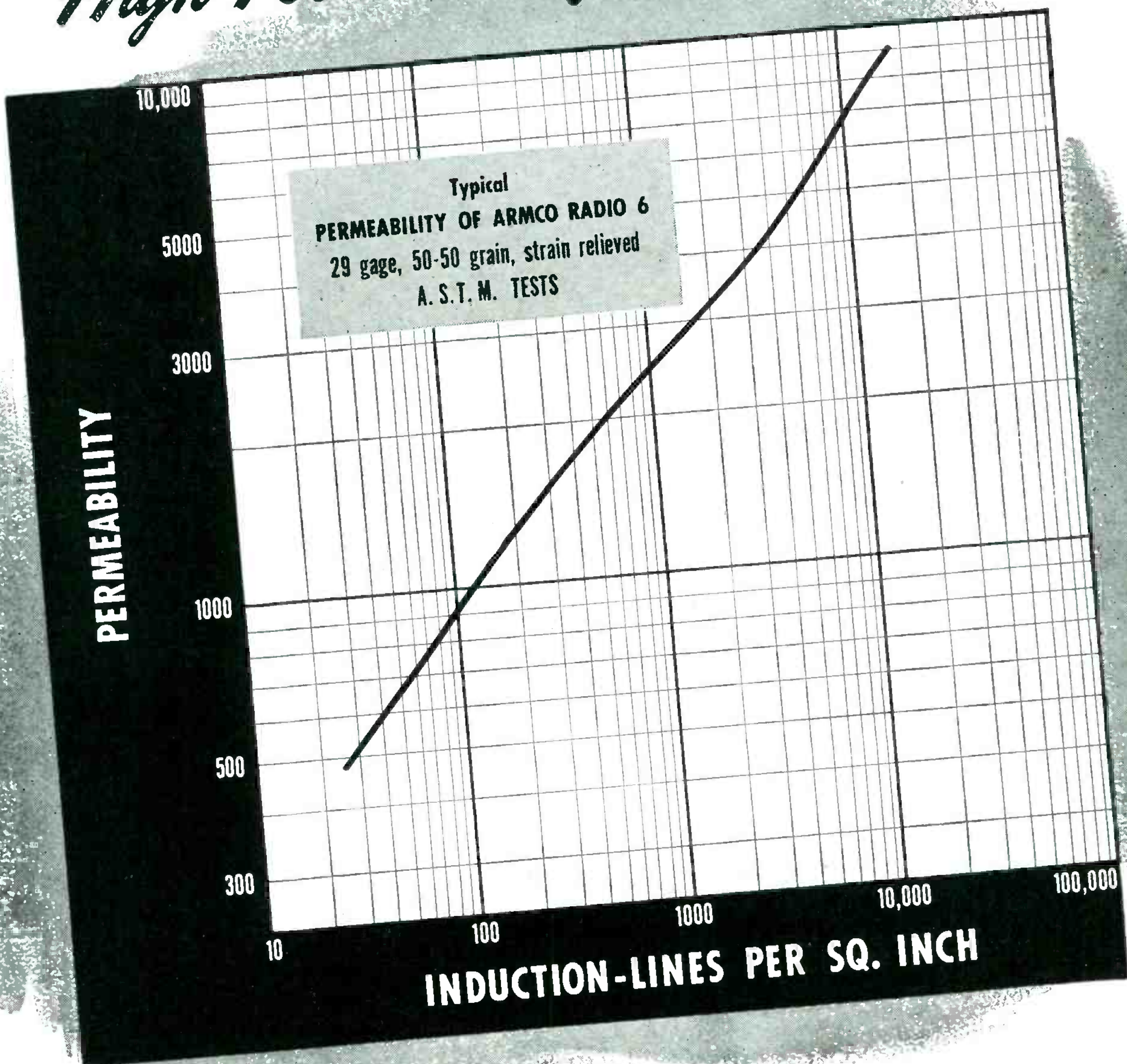
A spiral of this type, with $r_o/r_1 = 0.1$ and $N = 4$, is shown in Fig. 8.

Then the magnetic intensity on the Z axis is

$$H_z = S \times N I/r_1 \quad (24)$$

where

Here is your Steel for High Permeability at Low Induction



Typical high permeability of ARMCO "Radio 6" at various inductions is shown on the curve reproduced here. This grade of electrical steel was created for use in audio transformers, but it is also excellent for the cores of other electromagnetic apparatus. Its primary purpose is to provide superior magnetic qualities at the lower inductions.

All ARMCO "Radio 6" is tested under A.S.T.M. standards at exceptionally low induction. If it fails to meet high permeability requirements the steel is rejected at the mill.

Most transformers operated at low inductions have a core constructed of punchings, in which the steel is used at various angles to the rolling direction. Good permeability in *all* directions is a characteristic of "Radio 6." It is free from strongly oriented properties.

Notwithstanding its superior magnetic qualities, "Radio 6" is readily fabricated. Most cores for low-induction transformers are made of small laminations punched instead of sheared; so good ductility is essential.

ARMCO "Radio 6" is supplied in sheets or welded coils. Welds are of the same thickness as the sheets. Even if an experimental core were built with a weld in every lamination magnetic quality would remain constant.

Write for data on electrical steels for specific jobs. We'll be glad to supply you with tests similar to the chart on this page. Just address The American Rolling Mill Company, 1951 Curtis St., Middletown, Ohio.

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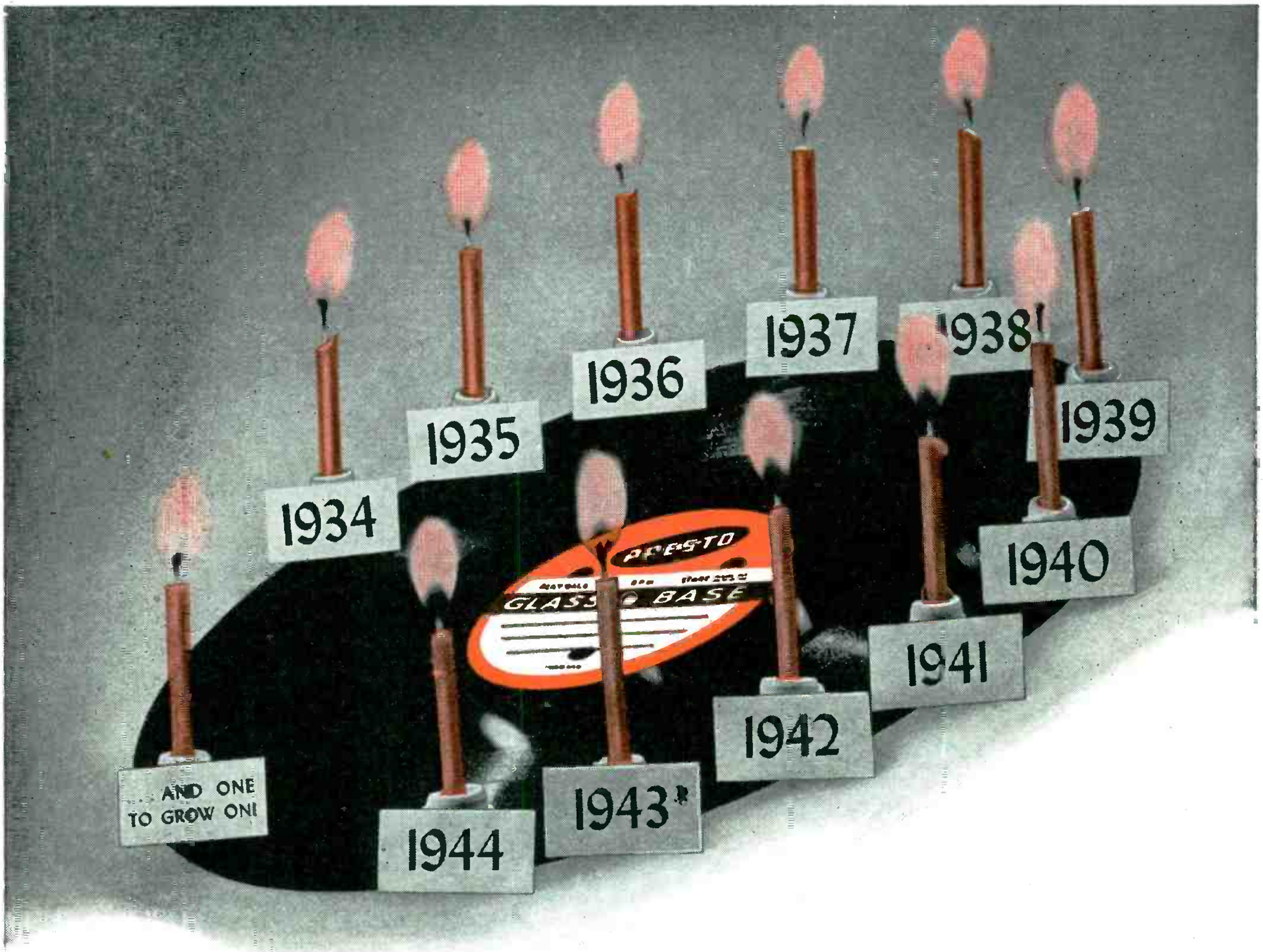


PRESTO IS 10 YEARS OLD

In 1934 Presto made the first commercial cellulose coated recording disc. At the time there were perhaps 3 or 4 instantaneous recording studios in New York making recordings on plain aluminum. We sent these studios samples of our new coated disc and a steel needle to cut them.

They were amazed. Never had they heard a record with so little surface noise . . . such perfect musical response.

Presently we received an order for 100 discs and the entire plant personnel (all 5 of us) worked a week to fill the order.

Already we had made a few recording turntables which we offered, among others, to broadcasting stations and schools. Often as not they asked, "What use would we have for those things?"

Today thousands upon thousands of Presto recorders are in daily service all over the world. On this, our 10th birthday, we want to thank you for having helped us to grow and to assure you that we will continue to do our darndest to give you the best recording equipment we know how to build.

Buy more Bonds during the 5th War Loan — *Double* what you did before.

Presto Recording Corporation, New York 19, N. Y., U. S. A.

World's Largest Manufacturers of Instantaneous Sound Recording Equipment and Discs

$$S = \frac{1}{2\log_\epsilon\left(\frac{r_1}{r_o}\right)} \left[\frac{1}{\sqrt{\left(\frac{Z}{r_1}\right)^2+\left(\frac{r_o}{r_1}\right)^2}} - \frac{1}{\sqrt{\left(\frac{Z}{r_1}\right)^2+1}}\right] \quad (25)$$

When $Z = 0$, Eq. (25) becomes

$$S = \frac{1}{2\log_\epsilon\left(\frac{r_1}{r_o}\right)}\left[\frac{r_1}{r_o} - 1\right] \quad (26)$$

For large values of Z, a good approximation for Eq. (25) is

$$S = \frac{1-\left(\frac{r_o}{r_1}\right)^2}{4\log_\epsilon\left(\frac{r_1}{r_o}\right)}\left(\frac{r_1}{Z}\right)^2 \quad (27)$$

When $r_o/r_1 = 1$, the spiral becomes a single-turn coil of constant radius, and Eq. (25) reduces to Eq. (10).

The variation of S, in Eq. (25), as a function of Z/r_1 is shown in Fig. 9. Comparison with Fig. 7 shows that there is no striking difference between the field from an Archimedes Spiral and an Equiangular Spiral. Both of these figures show that if high field concentration is desired on the axis close to the plane of the coil, small values of r_o/r_1 should be used, while values of r_o/r_1 close to unity give the greatest field at large distances from the plane of the coil. Actually in practice, a spiral coil would not be used unless it could be placed close to the work.

• • •

Visualizing Centimeter Waves

By W. BACON
Yorkshire, England

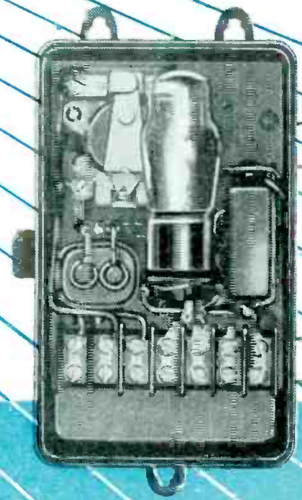
SO LONG AS an idea remains purely mathematical, it is unlikely to appeal to the less highly trained workers who ultimately make its operation possible. It might therefore be shown that engineering progress, to a very real degree, depends on the replacement of abstract theory by practical conceptions which can be visualized.

Centimeter wavelengths are rapidly becoming of extreme importance, especially those of the lower orders. In their use, important techniques involve the use of wave guides instead of lines for the transmission of power and the use of cavity resonators and horns for propagation.

A rough idea as to the behaviour of any wave guide or other appar-

STOP! says the mighty 3 Millionths of an ampere

AND BIG MACHINES OBEY AN *Electronic* COMMAND!



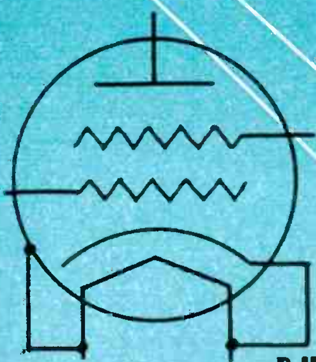
It's like using the minute antenna of an insect for a task demanding the driving force of an elephant . . . yet it's being done — *electronically* — with Photoswitch Pilot Relay.

Wherever an electrical circuit is to be controlled by a delicate actuating medium not capable of functioning directly, the Pilot Relay acts as intermediary . . . permits three millionths of an ampere to control *any* electrical load.

Diverse in application — adaptable to countless industrial processes, Photoswitch Pilot Relay is used for break-detection stop-motion control on textile looms, warpers and winders . . . paper processing equipment . . . wire stranding machines. It monitors feed and keeps production count on automatic punch presses . . . serves as a limit switch on machine tools . . . automatically regulates liquid levels . . . increases life of meter relays. Why not put it to work to solve your own control problem?

Write for Bulletin 900-A.

R-1



PHOTOSWITCH ELECTRONIC PILOT RELAY

TEXTILES . . . Where stop-motion control is normally provided on thread break by light pins dropping on copper electrode beds, Photoswitch Pilot Relay is used intermediate between this circuit and the machine control for positive operation, to prevent arcing and chattering of contacts.

WIRE . . . on wire stranding machines, the wire itself serves as the actuating control in detecting breaks.

PAPER . . . in processing operations, Photoswitch Pilot Relay detects tears through light feelers riding on the paper.

☆ ☆ ☆

Photoswitch Incorporated manufactures Photoelectric and Electronic Equipment for all industrial purposes. Write for information on Electronic Timers designed for unlimited-life accuracy.

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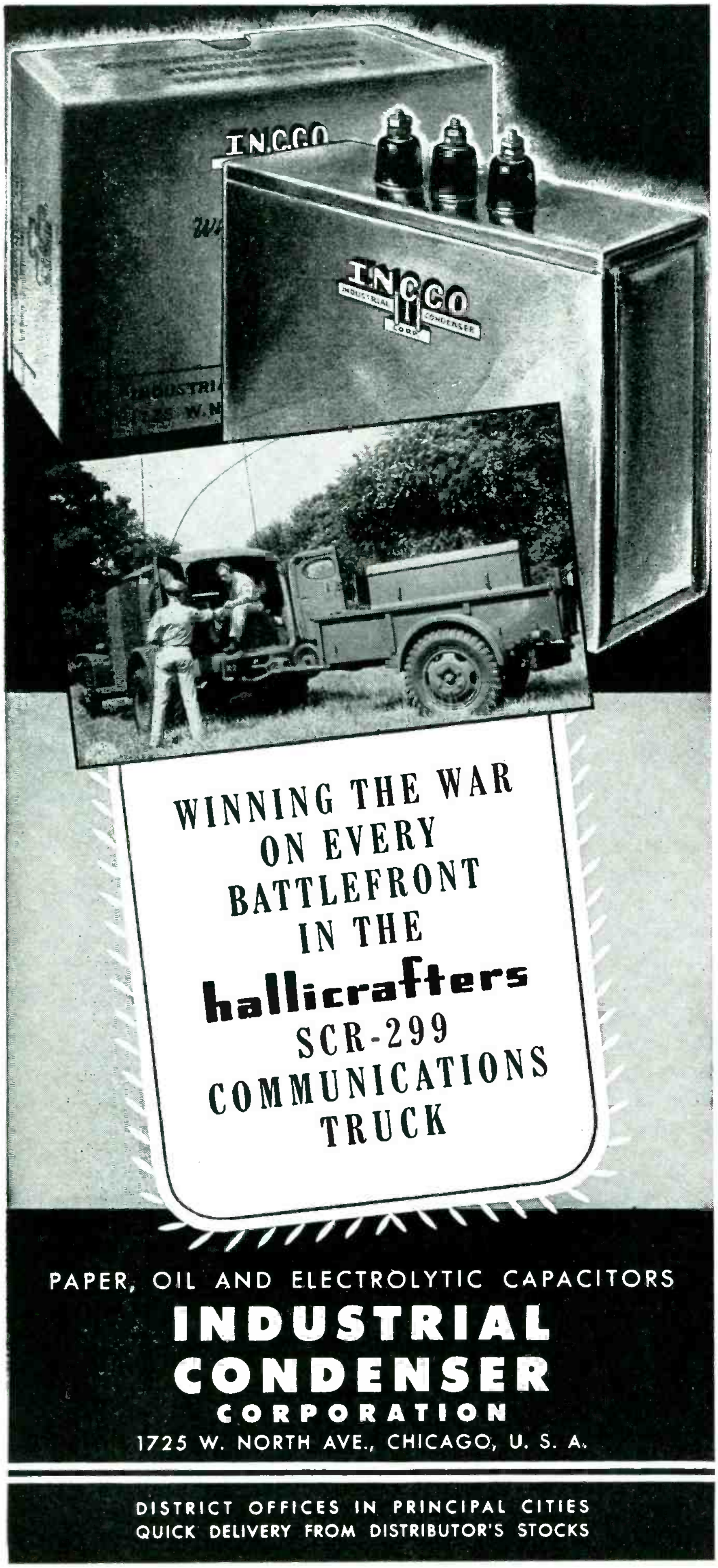
PHOTOELECTRIC AND ELECTRONIC CONTROLS FOR EVERY INDUSTRIAL PURPOSE



atus may be obtained by considering what would happen if a sound wave were travelling along it. This analogy becomes of some significance when the following relationship is considered.

Since the velocity of an electromagnetic wave in free space $= 3 \times 10^{10}$ cm per second and velocity $= f\lambda$ in appropriate units, therefore, the wavelength λ of an electromagnetic wave in cm $= 3 \times 10^{10}/f$ (cps).

If f is expressed in Mc, λ of an electromagnetic wave in cm $= 3 \times 10^{4}/f$ (Mc). Now, velocity of sound in air in cm $= 3.3 \times 10^{4}$ cm per second, therefore λ of sound wave in air in cm $= 3.3 \times 10^{4}/f$ (cps).

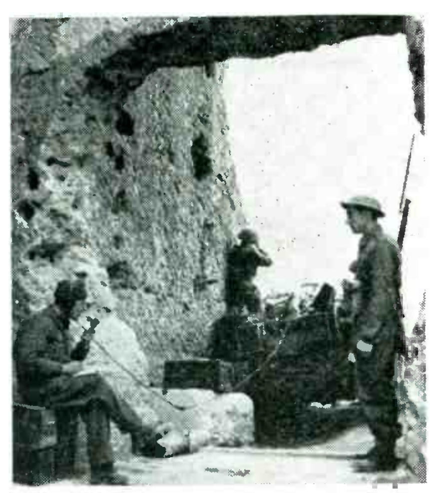
Thus, as an example, the wavelength of a sound wave having a frequency of 128 cycles in air is approximately equal to the wavelength of a radio wave whose frequency is 128 Mc. Since the behaviour of sound waves is fairly well visualized, this gives a means of visualizing the behaviour of radio waves. The table below illustrates these relationships.

Frequency cps (sound) ; Mc (radio)	Wavelength (sound)	Wavelength (radio)
10,000	3.3 cm	3.0 cm
1,000	33 cm	30 cm
100	330 cm	300 cm

The audio range of sound waves thus corresponds to a radio frequency range of three cm to 300 cm. An object affecting both may therefore be expected to exercise a similar effect. The most common example is a metallic horn. If this is a good radiator of sound waves, it is a good radiator of electromagnetic waves.

• • •

RADIO IN ITALY



In a Roman amphitheater, a British radio operator communicates with other units while a rifleman keeps watch for roving German patrols

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Write today for your Free Card of Varnished Tubing with samples ranging from size 0 to 20 to fit wires from .032 to .325 inches . . . other valuable aids, are the M-R Guide Book of Electrical Insulation . . . the Wall Chart with reference tables, electrical symbols, allowable capacities of conductors, dielectric averages, thicknesses of insulating materials and tap drill sizes . . . and the M-R Wax and Compound Guide Book . . . they are full of valuable information . . . write for them on your letterhead.

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Asbestos Sleeving and Tape
Extruded Plastic Tubing
Varnished Cambric Cloth and Tape
Mica Plate, Tape, Paper, Cloth and Tubing

Post-War F-M

(*Continued from page* 99)

it cannot be done but the set will sound at least as good as the $9.95 a-m set, in all probability better, and it will have the noise-reducing feature of f-m which a-m sets do not have, and, so far as we know today, cannot have.

Finally, there is an important listener consideration which is that if people find satisfaction in listening to a-m broadcasting on $9.95 receivers, they will also have satisfaction in listening to f-m on $9.95 receivers, even though the tone quality is not greatly better.

The reasoning given above has, again, been based on pre-war ideas and practices; it has failed to take into account the impact of the war on the design and manufacture of f-m receivers.

Much work has been done to improve the sensitivity, the selectivity, and stability of f-m receivers and new and improved limiters have been evolved. Certainly the knowledge which has been gained through war research will be directly useful in engineering and manufacturing post-war civilian radio equipment.

The author wishes to acknowledge and express his appreciation for the material prepared for this article by Mr. J. W. Sharp and Mr. W. E. Phillips of the Zenith Engineering Department.

• • •

ELECTRONIC BUGLE

Bugle calls are sent out over the ship's public address system to reach all parts of a new light crusier. Official U. S. Navy photograph

Mathematically, here's the inside story

THE FORMULA in the picture above is an expression of *bunching* as it takes place in the Klystron tube.

This Sperry tube converts DC energy into radio frequency energy by allowing an electron beam to become bunched, or pulsating, between spaced grids.

▶ The ultra-high-frequency micro-waves thus generated can be concentrated into a narrow beam and directed with great accuracy.

Various other forms of the Klystron have been developed by Sperry to aid in the amplification and reception of ultra-high-frequency waves. Today they are vital parts of many a device used by our Armed Forces.

The name "KLYSTRON" is a registered trade-mark of the Sperry Gyroscope Company, Inc. Like other Sperry devices, Klystrons are also being made during the emergency by other companies.

▶ Klystrons are now being produced in quantities, and certain types are available. Write us for information.

Sperry Gyroscope Company INC.

GREAT NECK, N. Y. • DIVISION OF THE SPERRY CORPORATION

GYROSCOPICS • ELECTRONICS • AUTOMATIC COMPUTATION • SERVO-MECHANISMS

NEWS OF THE INDUSTRY

Industry conferences for October; Dr. Taylor receives Medal of Merit; quartz crystal and variable resistor standards; Army broadcasts on Guadalcanal; FCC film premiere by television; London news letter

Amphibious Radios in Invasion

IN AN INVASION OPERATION, from the time a landing craft leaves its task force to hit the beach and become established as a unit on enemy territory, it must depend constantly on its radio. Its transmitting and receiving gear become an integral part of the nerve network embracing the communications of all participating land, sea and air groups. This web of amphibious communications provides vital control by the assault force command, contact with the ground troops, with the scout planes spotting and directing fire, and with the warships supporting the landing with their big rifles. A serious breakdown of communications would foredoom an invasion operation to failure.

Sea-borne invasion on a large scale has necessitated many changes in design, manufacture, installation and maintenance of communications equipment.

The radio which goes into the Navy's amphibian tractor is a good example. The equipment used in these LVT's was originally developed for use in tanks. For this application, it was of course necessary to solve such difficulties as noise suppression, resistance to battle shock and control of dust and dirt. When this radio was adapted from a land type vehicle to a seagoing type, a new set of factors had to be faced.

A watertight compartment had to be devised in the armored hull of the LVT, for the amphibian tractor may ship lots of water. The radio itself had to be made resistant to salt water and the tiny plant growths or fungi, which multiply at a terrific rate in the hot and humid climates.

Since many fungi in the tropics reproduce from spores in the air, ordinary precautions of keeping equipment under canvas do not suffice. New chemicals have had to be perfected to defeat the plant pests. This problem has been successfully met by specialists of the Army, Navy and Marine Corps working in cooperation with research experts of the radio industry.

Certain types of head phones were equipped with rubber ear plugs which were particularly subject to fungus growths. The design was revamped to afford light, watertight and fungus-proof ear pieces—the entire harness fitting easily within the regulation steel helmet and doing away with the need of the cumbersome coal-scuttle head covering formerly used. Moreover, the harness can be used just as readily in conjunction with a gas mask.

The special requirements for seaborne invasion have similarly necessitated that the pack set, or walkie-talkie radio, be re-designed so that it can stand a sudden dunking in sea water and yet be thoroughly operative as soon as the person carrying it hits the beach.

Electronic Industry Conference

THE ELECTRONIC PARTS and Equipment Industry Conference will be held at the Edgewater Beach Hotel, Chicago, October 6th to 9th inclusive in order to be assured of adequate hotel accommodations and more favorable transportation conditions than would be available in June. The Sales Managers Club (Eastern Group), the Association of Electronic Parts and Equipment Manufacturers (Western Group), the Representatives Club, and the National Electronic Distributors Association and other parts distributors will attend.

Herb Clough of Belden Mfg. Co., has been elected chairman of the Conference, heading the Conference Committee as follows: Robert P. Almy of Sylvania, Charles Golenpaul of Aerovox, Harry Kalker of Sprague, Roy S. Laird of Ohmite, A. E. Schaar of Talk-a-Phone, Jack Berman of Shure Brothers, A. H. Petersen of Amphenol, A. E. Akeroyd of Raytheon, and Jesse Fishel of the Federal Mfg. Co.

Satellites for Television

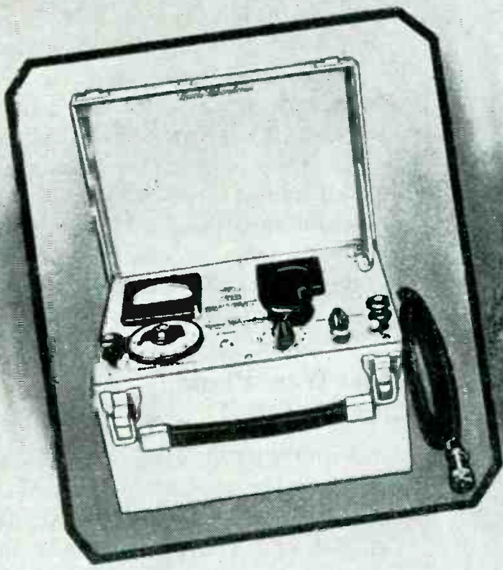
JAMES D. MCLEAN, General Electric commercial engineer, stated that 93 percent of the population of New York State can be covered by master television stations in five cities and "satellite" stations in 11 others, when speaking before newspaper and magazine writers recently in New York City.

He revealed that a revolutionary electronic tube developed by G-E engineers, widely used in war applications, will make this relaying possible. Five years after the war, he predicted, there will be at least one hundred active master television stations in the country, and within their service areas will live 67,000,000 people—over half the population of the United States.

Radio and Radar for Trains

A PROGRAM OF STUDY and experimentation in the use of radar and other electronic devices for train communication and control has been inaugurated on the Chicago, Rock Island and Pacific Railway, with announcement of the appointment of Ernest A. Dahl, electronic engineer, who will direct the investigations into the application of high-frequency radio communication for practical use on the railroad.

The plan is to develop a radio communications system in the micro-wave region for use between the front and rear end of trains, in yards (between yard offices and switching crews), and ultimately



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UHF PRECISION FREQUENCY METER

Recommended for:

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Accuracy 0.1%

Models available from 100 to 2000 megacycles with 2 to 1 frequency coverage on each model.

· *Available Only on High Priority While Our Nation Is At War*

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RADIO ENGINEERS AND MANUFACTURERS
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Specialists in the Development of UHF Equipment

between dispatchers and crews of trains enroute.

Dahl will also direct experimentation on the Rock Island in the use of radar, particularly in safety applications. It is thought that the use of these basic radar principles, so well known as a result of their wide and successful use during the war, may have far reaching practical applications in the safe and efficient operation of trains.

Post-War Plans For A T & T

IN A STATEMENT given at the annual meeting of stockholders, Walter S. Gifford, president of American Tel. and Tel. Co., reviewed the part the company has played in the war effort and mentioned the company's post-war plans.

"We look forward to a record post-war construction program and we have many new things we expect to do. We expect to provide intercity networks—ultimately nation-wide in extent—for television. We plan to try out short wave radio relay systems for long distance telephone service and for television. We know that coaxial cable systems—cables which are capable of carrying several hundred telephone conversations simultaneously in two metal tubes a little larger than a lead pencil with a copper wire inside each extending along its axis—work very satisfactorily but we do not know whether or not radio relay systems will work better or prove more economical. We are in the communications business and we intend to use the best and most economical means whether wire or radio.

"We expect to extend overseas radio telephone service and to reduce its cost. We were the first to establish overseas telephone service and the United States leads the world in the extent of its world-wide international radio telephone service just as it does in its telephone service here at home. Incidentally, if an overseas submarine telephone cable should prove better or more economical than radio, we shall use it just as we intend to use the best and most economical means of telephone communications on land, whether it be wire or radio."

In this connection, it is interest-

ing to note that AT & T has applied to the FCC for approval to proceed on a trial of a new type of intercity communications facility as rapidly as the war situation permits. The new system will be operated by radio relays of a type which was under development by Bell Telephone Labs prior to the war. This system applies to radio communication many of the techniques which have played an important part in the development of long distance wire telephone circuits.

To Use VHF

In the suggested system, directed radio beams at ultrahigh frequencies will be relayed at stations spaced about 30 miles apart. These will operate simultaneously in both directions. Ultimately, each beam is expected to carry a large number of communications channels.

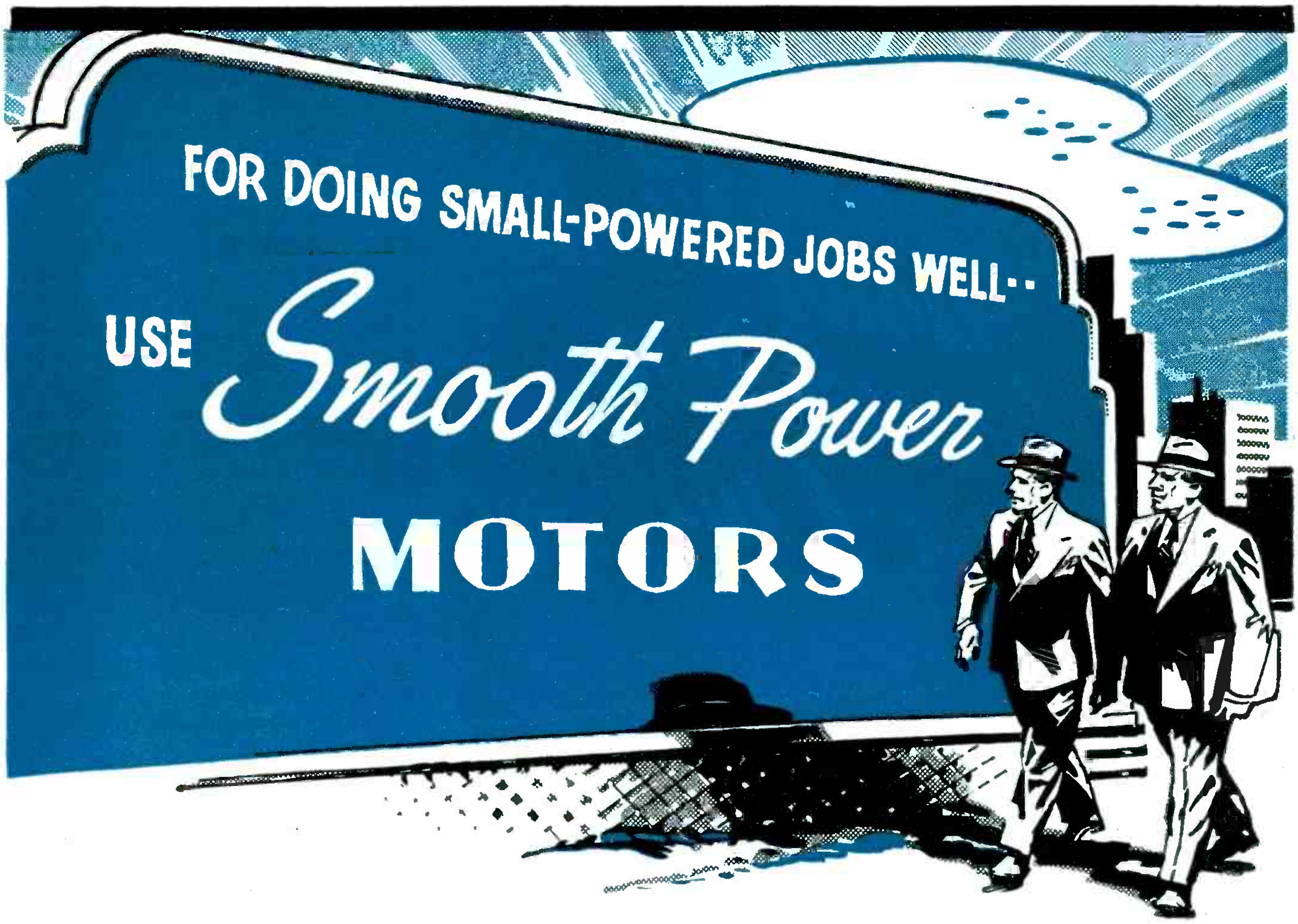
Using waves two or three meters long, radiotelephone service was established just before the war across Chesapeake Bay between Norfolk and Cape Charles, across Massachusetts Bay between Boston and Provincetown, and between the mainland and Smith and Tangier Islands in Chesapeake Bay. The new project proposes to use microwaves which are shorter than have heretofore been used for commercial telephony.

The principal purpose of the trial

• • •

ELECTRONIC VISUAL AID

To make precision bombing fully effective, the pilots, crews and maintenance personnel of the Air Forces must be familiar with the intricacies of the electronic autopilot. Working under the direction of Minneapolis-Honeywell engineers, Walt Disney Studios produced eleven training films that start out with a simplified explanation of electricity and end up with a confidential film showing the full bombing procedure. Shown above is a still from the elementary film depicting EMF forcing Current through a circuit



What does "Smooth Power" mean?

Referring to small motors, "*Smooth Power*" means instant starting, quick pick-up and smooth-as-silk operation. Dependable power, when and as you want it.

"*Smooth Power*" motors are versatile, too. They run such widely differing devices as record changers, tape recorders and intricate control mechanisms. If one of our standard models won't meet your needs, we're adept at designing specials.

Priorities are needed for current delivery, but our engineers have time available for planning your future needs. They'd like to work with you.

THE GENERAL INDUSTRIES COMPANY
ELYRIA, OHIO

THE GENERAL INDUSTRIES COMPANY

Smooth Power

is to determine by practical operation in commercial service the relative advantages and disadvantages of radio relay in transmission of long distance messages and television programs compared with transmission by the familiar wires and cables and recently-developed coaxial cables. Relative costs represent only one of the factors to be determined; others include the relative quality of transmission, flexibility under actual operating conditions and dependability.

Postwar plans were recently announced for a country-wide extension by the Bell System, by about 7,000 miles, of its coaxial cables suitable for telephone service and the transmission of television programs. According to telephone officials, it is hoped that the new radio system will prove to be valuable as an additional means of meeting the nation's telephone and television communications requirements.

Women Attracted To Electronics

To SECURE ADDITIONAL employees, the equipment used in several important tube manufacturing operations was installed in the show windows of a building on the main street of Geneva, Illinois, by Continental Electric Co., manufacturer of electronic tubes. The display attracted many people and resulted in the employment of a substantial number of women.

One of the reasons why the dis-

This window display of a woman performing a typical tube manufacturing operation attracted other women to the payroll of Continental Electric Co.

WELDING CAPACITORS

for capacitor discharge-type equipment

- ***Uniform voltage stress***
- ***Low max. voltage gradient***
- ***Contacts SOLDERED to foil — internal arcs avoided***

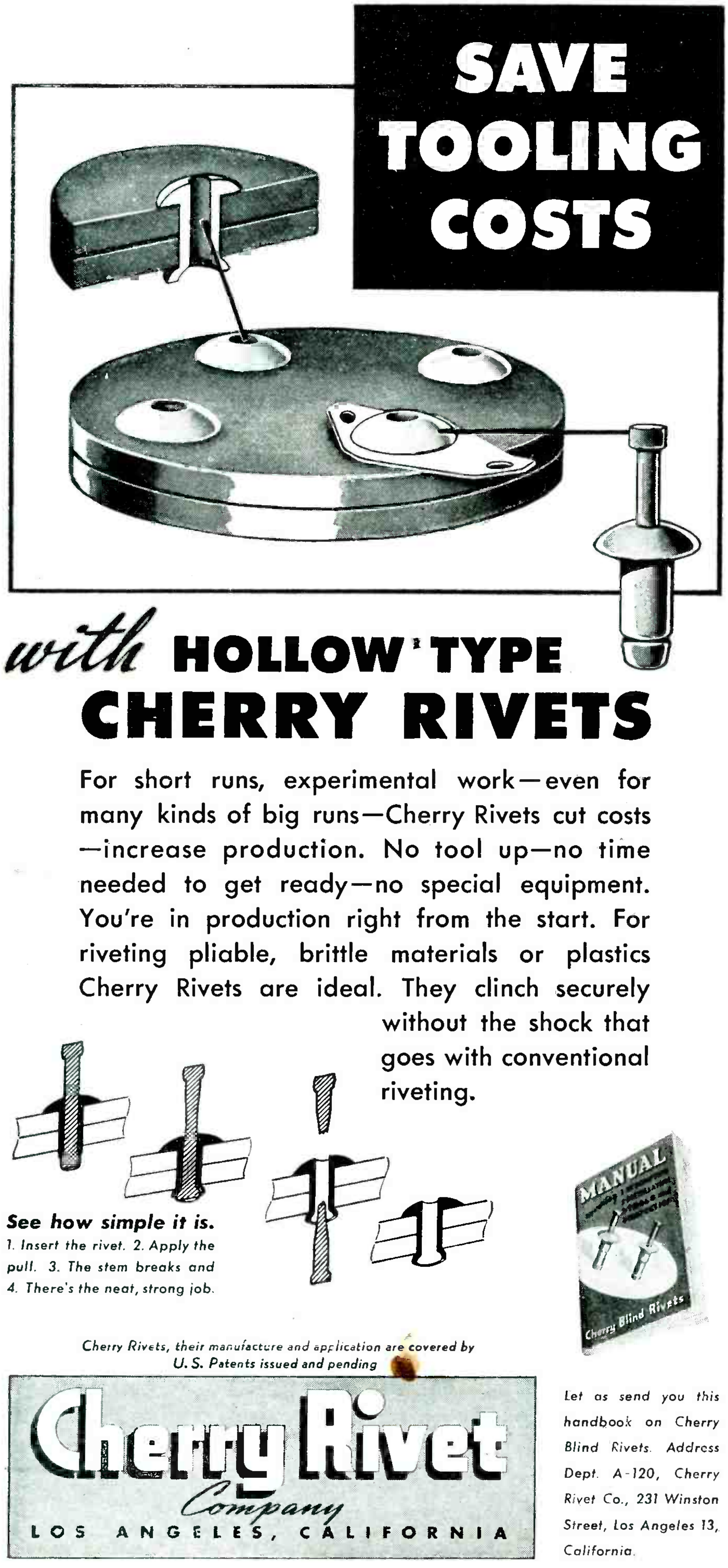
Working closely with leading welding equipment manufacturers in the rapid development of Capacitor-Discharge units, Sprague has produced a line of specially-designed capacitors that have proved eminently successful in this exacting application. The dielectric of these Sprague Welding Capacitors is a high-quality paper impregnated with an oil specially processed to assure a more nearly uniform stress throughout the units and a lower maximum voltage gradient. Longer life is the natural result. A special construction feature wherein contacts are painstakingly *soldered* to the foil minimizes danger of internal arcs with consequent gaseous discharges that might eventually ruin the capacitors.

For the latest developments in this field—whether for original capacitor-discharge welding equipment or replacement purposes—*write Sprague.*

SPRAGUE ELECTRIC CO., North Adams, Mass.
(Formerly Sprague Specialties Co.)

SPRAGUE

CAPACITORS · KOOLOHM RESISTORS



play was successful is attributed to the fact that it convinced prospective women employees that work in the plant was easy and pleasant in clean, airy surroundings. The company has widely advertised the plant to prospective employees as a 'woman's plant' and the display helped clinch this claim.

Medal of Merit to Dr. Taylor

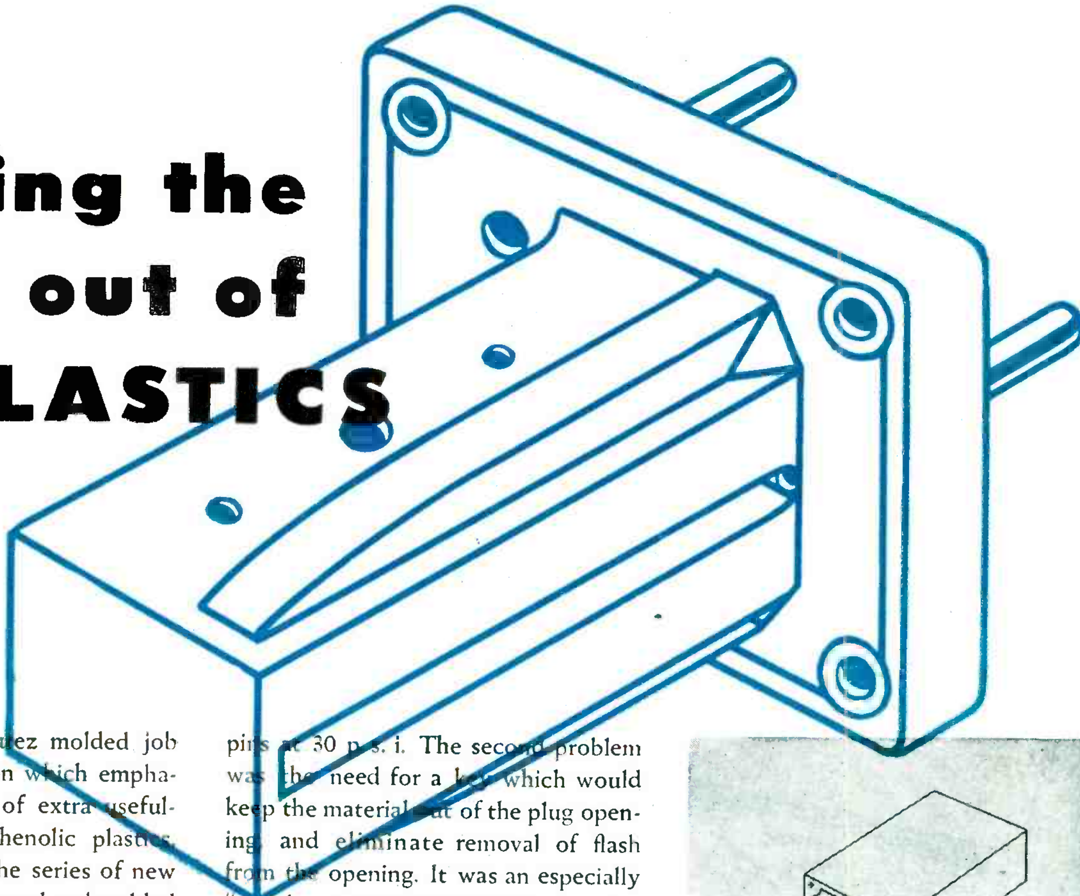
Dr. A. Hoyt Taylor, head physicist at Naval Research Laboratories, has received the Medal of Merit from Secretary of State Cordell Hull. The citation which accompanies the award reads, "For exceptional meritorious conduct in the performance of outstanding services in the line of his profession as a member of the staff of Naval Research Laboratory. Undiscouraged by frequent handicaps, Dr. Taylor labored tirelessly in a course of intensive research and experimentation which eventually resulted in the discovery and development of radar. His foresight, technical skill and steadfast perseverance contributed in large measure to the timely introduction of a scientific device which has yielded the United States Navy a definite advantage over her enemies during the present war."

The medal is awarded by the President of the United States on recommendation of the Secretary of State and is given to civilians of this country and Allies who distinguish themselves by exceptionally meritorious conduct in the performance of outstanding services. Dr. Taylor also holds the IRE Medal of Honor and the John Scott Medal which is given for outstanding service to country or humanity.

National Electronics Conference

A meeting was held at the University Club, Chicago on April 1, 1944, to originate and formulate a National Conference on engineering electronics. Those attending were: P. G. Andres, Illinois Inst. of Technology; R. E. Beam, Northwestern University; W. M. Ballenger, General Electric Co.; A. B. Bronwell, Northwestern University; B. Dudley, western editor of Elec-

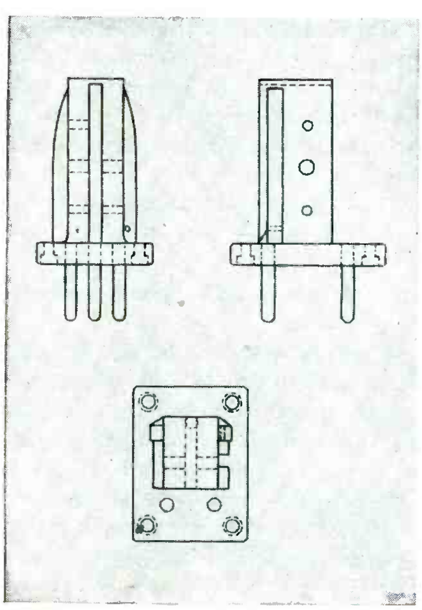
Getting the most out of PLASTICS



Every so often a Durez molded job comes to our attention which emphasizes the storehouse of extra usefulness which lies in phenolic plastics. Such an example is the series of new crystal holders, re-designed and molded by RCA. They give as much as 50% savings in quartz crystal.

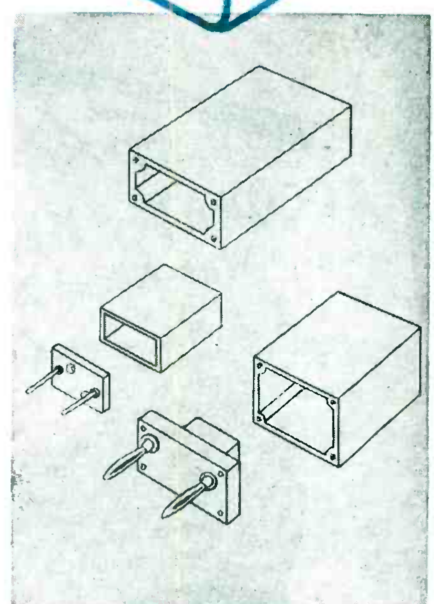
This is another instance of how ingenuity, engineering skill, and the *selection of the right material* paid a substantial dividend.

In designing the molds two major problems became evident. RCA engineers wanted a water-tight seal around the pins at 30 p. s. i. The second problem was the need for a key which would keep the material out of the plug opening and eliminate removal of flash from the opening. It was an especially "tough nut to crack" because the plug opens directly into a slot which is bridged at the end.



Because a direct draw could not be used, the side-action key fixture was designed in two parts. The upper part is removed by a straight sideway motion, and the lower half is removed by a slightly upward and then sideway motion.

This molding achievement has been accomplished with a Durez phenolic plastic—added evidence of the outstanding moldability of Durez, and added proof of the familiar Durez line "Plastics That Fit the Job." In the production of hundreds of current items, it has been found that the moldability and versatility of Durez compounds contained the ideal answer.



We welcome the chance to discuss the advantages of Durez plastics for your needs. As one of the oldest and most experienced producers of phenolics, our laboratories and technical staffs are often able to make valuable suggestions.

Durez Plastics & Chemicals, Inc., 86 Walck Road, North Tonawanda, New York.

DUREZ

PHENOLIC MOLDING COMPOUNDS AND RESINS

PLASTICS THAT FIT THE JOB

TRONICS; L. T. Hearson, AT&T Co.; J. E. Hobson, and C. S. Roys, Illinois Inst. of Technology; W. O. Swinyard, Hazeltine Electronics Corp.; S. E. Winston, Armour Research Foundation.

At the meeting, the needs for wider dissemination of information on the broad field of communication, industrial, scientific, medical, and measurement applications of electronics were reaffirmed. It was felt that this might best be served by a two or three day conference on a wide range of electronic topics on which emphasis would be placed on the application of the principles of electronics and in which the tone of the conference would be definitely engineering.

It was decided to originate, organize, and hold a conference having national interests and scope in which emphasis would be placed on practical utilization of electronics. While it is planned that the meetings will be high caliber with engineering interests predominately represented, it is planned to have programs of the more elementary and instructional nature for those having a specialized application interest in electronics only.

The National Electronics Conference is planned as a "national forum on electronics development and their applications". It is anticipated that the conference will be held annually with the programs for each year aimed to meet current needs. Administration of the National Electronics Conference will be carried out jointly by representatives of the Illinois Institute of Technology, Northwestern University, the Chicago section of the Institute of Radio Engineers, and the Chicago section of the American Institute of Electrical Engineers.

Those in attendance at the April 1 meeting will constitute the Executive Committee of the conference although additional members may be added.

A second meeting of the Executive Committee of the National Electronics Conference was held at the University Club on April 11, at which C. A. Crowley and R. H. Herrick were new members of the Executive Committee representing the Chicago Technical Societies Council.

For the benefit of the new mem-

bers, Dr. Hobson reviewed events leading to the formation of the National Electronics Conference and summarized the progress which had been made at the first meeting of the Executive Committee on April 1, 1944. Dr. Hobson appointed Mr. B. Dudley secretary of the National Electronics Conference.

The function of the Executive Committee of the National Electronics Conference was stated as "to decide general policies and to act as a steering committee for the National Electronics Conference". It will be the purpose of the Executive Committee to review, and if necessary, to stimulate and correlate the activities of the four working committees.

As a result of a survey of dates and places for holding the National Electronics Conference, Professor Andres was instructed to make reservations for October 5 and 6, with an option for October 7, for the National Electronics Conference to be held at the Medinah Club, Chicago.

The Executive Committee named the following operating committees: *Program Committee*—Dr. A. B. Bronwell, chairman; *Arrangements Committee*—Professor P. G. Andres, chairman; *Publications and Publicity Committee*—Mr. B. Dudley, chairman; *Budget and Finance Committee*—Drs. J. E. Hobson and A. B. Bronwell, Co-chairmen.

Engineering Degree in 2½ Years

THE ACCELERATED PROGRAM adopted soon after Pearl Harbor by New York University College of Engineering will continue and will start new terms beginning every twelfth week to accommodate discharged veterans and other students who wish to begin, continue or complete their studies.

"High school graduates who meet admission requirements and returning veterans can register for the new term and, by attending ten twelve week terms consecutively, complete courses for a degree in two and one-half years," Dr. Saville, dean of the college, said. "Discharged veterans who have studied engineering, either before they went into service or in the Army Specialized Training Program

a new HIGH...

The war's end will bring the day when scientific expeditions may verify a new high on the world's roof. When that time comes, the world will also know a new high in the quality of electronic products . . . through radio and other electronic devices built by

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Buy More Than Before

DETROLA RADIO

DIVISION OF INTERNATIONAL DETROLA CORPORATION • BEARD AT CHATFIELD, DETROIT 9, MICH.

C. RUSSELL FELDMANN dr PRESIDENT

(ASTP), can receive credit for the completed work and register with advanced standing."

The twelve-week term corresponds closely to the ASTP training period and students under 18 can complete a course comparable to the basic AST program in 36 weeks. Those who have engineering training already may go into advanced work.

From the standpoint of the veteran, the program will enable him to pick up readily where he left off, especially if he has had ASTP or accelerated civilian college training.

"The content and quality of the courses are the same as in the prewar period," Dr. Saville said. "In normal times, it took eight sixteen-week semesters stretched over four years, to receive a degree. Now we are working all the year round, and the full course consists of ten terms of twelve weeks duration." The courses offered are in administrative, aeronautical, civil, chemical, electrical, mechanical and mining engineering.

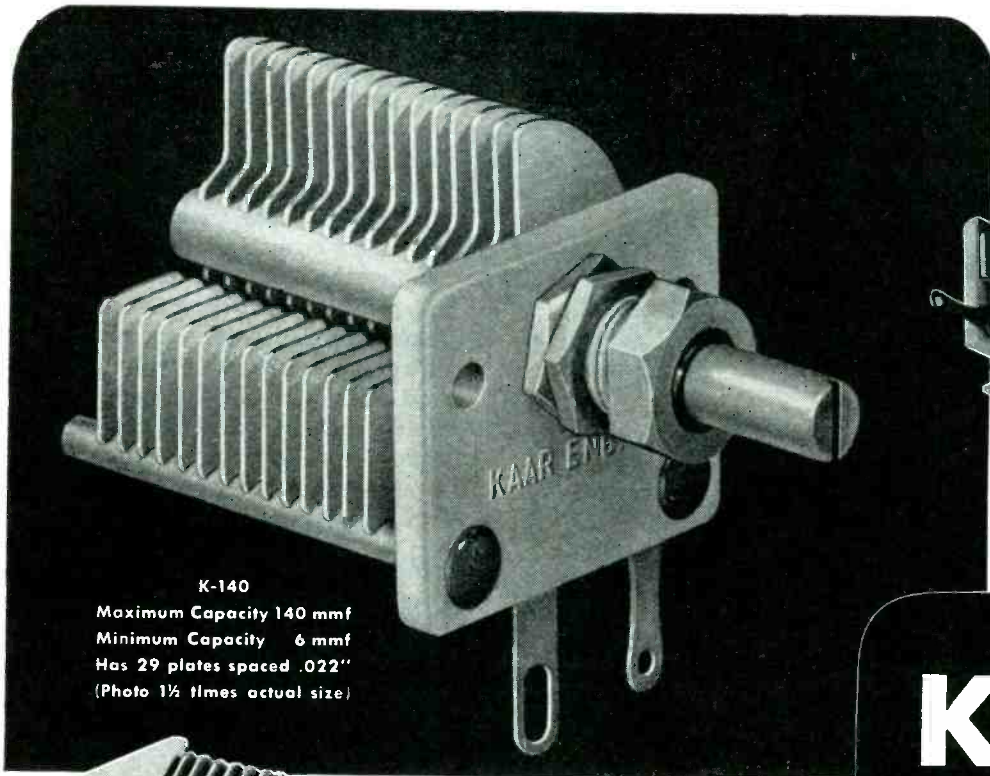
New Short-Wave Station For West Coast

CONSTRUCTION OF a new $1,000,000 short-wave broadcasting plant to serve the Far East, the Pacific area and Latin America, will be made in San Francisco under supervision of National Broadcasting Co.

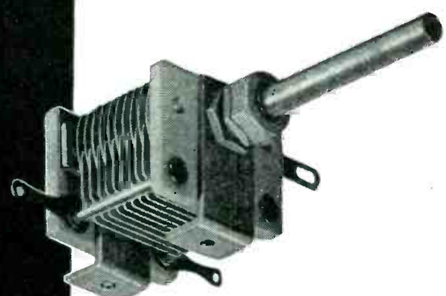
The short-wave plant is expected to be in operation by next fall, it was announced by John W. Elwood, manager of NBC station KPO in San Francisco. It will be designed and built by NBC for and in collaboration with OWI and the Defense Plant Corp. With its completion, San Francisco will become one of the largest short-wave distributing centers in the world.

Plans for installation of a television transmitter and frequency modulation transmitter in San Francisco immediately after the war have also been made.

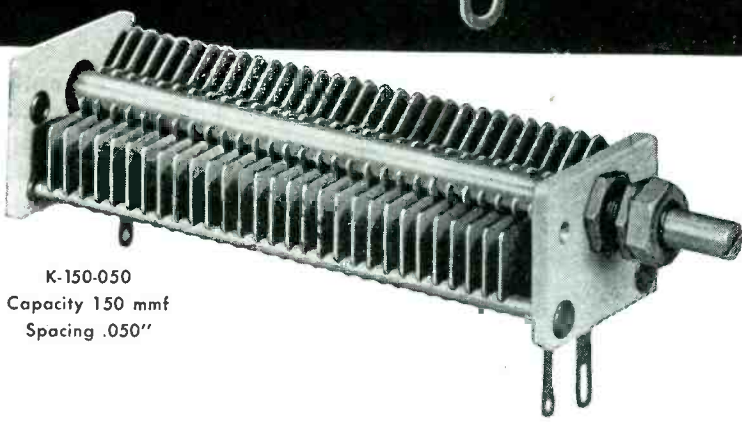
The short-wave plant will be operated technically by NBC, San Francisco, for the Overseas Branch of OWI, which will program the stations for the duration of the war. The initial installation will consist of four 50-kw transmitters tied together as two dual transmitters. In the near future, the power



K-140
Maximum Capacity 140 mmf
Minimum Capacity 6 mmf
Has 29 plates spaced .022"
(Photo 1½ times actual size)



K-100-2B
Capacity 100 mmf
Spacing .022"



K-150-050
Capacity 150 mmf
Spacing .050"

KAAR
VARIABLE AIR CONDENSERS
FOR TANK CIRCUIT AND ANTENNA TUNING

Use this reliable West Coast source for Variable Air Condensers

Kaar Engineering Company now offers prompt delivery of standard and special types of variable air condensers suitable for many applications in radio transmitters and receivers. They are particularly useful as tank and antenna tuning capacitors in low and medium power transmitters.

The small cross-section of Kaar condensers allows a number of them to be assembled in multi-channel radio equipment in a minimum amount of space. Every Kaar capacitor is substantially constructed with soldered and plated brass rotor and stator plates. Shafts can be furnished slotted for screwdriver adjustment, and tapered lock nuts and split bushings assure positive locking without disturbing the adjustment.

Special types are available with very wide air gaps, double rotors and stators, high maximum capacities or special mounting brackets. Further information will be gladly furnished upon request.

KAAR
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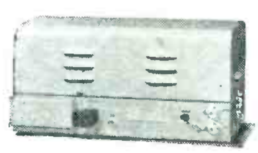
MOBILE RECEIVERS — Crystal controlled superheterodynes for medium and high frequencies. Easy to service.

CRYSTALS — Low-drift quartz plates. Fundamental and harmonic types available in various holders.

TRANSMITTERS — Mobile, marine, and central station transmitters for medium and high frequencies. Instant heating, quickly serviced.



MICROPHONES — Type 4-C single button carbon. Superb voice quality, high output, moisture-resistant.

POWER PACKS — Heavy duty vibrators and power supplies for transmitters, receivers. 6, 12, 32 volts DC.

of two of these transmitters may be stepped up to 200 kw. This will be the highest power yet used by any American short-wave facilities, and will ensure improved broadcasting service to American forces in distant battle zones, as well as to enemy countries and to those occupied by the enemy. The four transmitters will provide separate channels over which four programs may be broadcast simultaneously.

Call letters KNBI and KNBC have been allocated tentatively to two of the four transmitters.

Standard for Quartz Crystals

A NEW STANDARD for quartz crystals which, for the first time, coordinates British, Canadian and American practice in the manufacture of aircraft crystal units, has been approved by the American Standards Association.

The standard was prepared through the joint efforts of industry and the Armed Forces at the request of the War Production Board in order to facilitate the production of these widely used crystal units. The standard has already been adopted by the Signal Corps Standards Agency and the Bureau of Ships. It covers performance requirements and test methods that come up to the high quality of crystal unit needed by the Armed Forces. It will also serve as a guide in the design of new equipment.

The American War Standard for Crystal Unit CR-1()/AR (C75.11-1944) may be obtained for 25 cents from the American Standards Association, 29 West 39th Street, New York 18, N. Y., and without charge from the government agency concerned, for procurement purposes only.

WPB Modifies Parts Ratings

CAPACITORS, microphones and loudspeakers, resistors, transformers, and tubes have been made available to repairmen and retailers on a prorata basis without the use of ratings, and a repairman does not need a rating to get his fair share, according to the Radio and Radar Division of WPB.

Shipments of radio receiving

OUR POSITION ON TELEVISION AND RADIO AS IT AFFECTS YOUR FUTURE...AND OURS

When this war is won, Stromberg-Carlson believes that television will face a future of great promise. As evidence of our conviction, we have applied for a license to operate our own television broadcasting station.

Our confidence in the eventual success of television is founded on long experience. We produced television receiving sets commercially as early as 1938. However, we feel it important for both you and us to consider the future of television and radio from the point of view of business common sense.

HERE'S OUR THINKING ON TELEVISION:

1 Television has a *great* future.

2 There is tremendous public interest in television. It will be several years after the war before enough television broadcasting stations can be built to provide full national coverage.

3 As television broadcasting facilities develop—territory by territory—good business opportunities will be presented to you—and to us.

When television broadcasting develops so *you* can make money out of it, Stromberg-Carlson will have a full line of television receiving sets which will bring to this rich field the 50-year-old fact: "There is nothing finer than a Stromberg-Carlson!"

AND HERE'S OUR THINKING ON RADIO:

1 There always has been—always will be—a profitable demand for a good radio and radio phonograph—*a fine musical instrument.*

2 For the immediate post-war years, the expanding market for FM receivers and phonograph combinations will provide your greatest profit opportunity.

3 We believe that such instruments must have superlative tone quality and an appearance in keeping with the best in furniture design.

And here's our Post-war Pledge to get you back into the Radio Business:

1 *We will have—soon after Victory—a fine line of Stromberg-Carlson FM and AM radios, phonograph combinations and television receivers in an attractive range of prices.*

2 *We will have a policy of distribution planned to give every Authorized Dealer a good profit opportunity on the Stromberg-Carlson line.*

3 *And the Stromberg-Carlson name will be even more widely and more favorably known than ever before.*

STROMBERG-CARLSON

ROCHESTER 3, NEW YORK

★

RADIOS,
TELEVISION, TELEPHONES,
AND SOUND EQUIPMENT

tubes to civilian channels in the first quarter of 1944, when production of civilian tubes was scheduled for the first time, totalled more than 4,000,000. This was slightly under scheduled civilian tube production for the quarter, but second quarter shipments probably will be higher as the result of carry-overs of tubes, WPB representatives indicated. Civilian tube production in the first quarter of 1944 approximately equalled the output for civilians in the last quarter of 1943. However, the 1944 production schedule stressed the critical or "hard-to-get" tubes.

Municipal Signal Conference

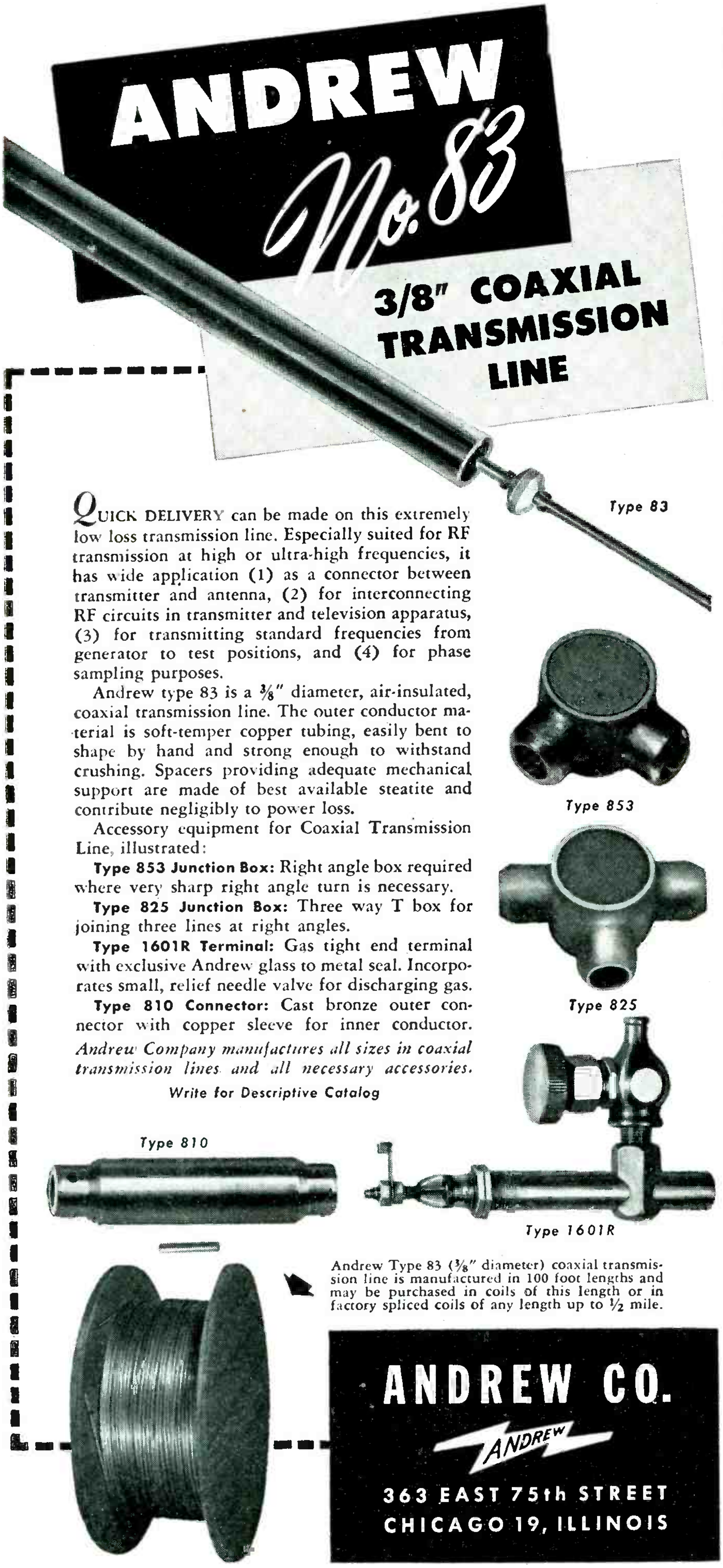
THE 49TH ANNUAL MEETING of the International Municipal Signal Assn., Inc., will be held at Hotel Statler, Boston, Mass., October 2–3–4–5, 1944. The theme of the meeting will be "Today's Work—Tomorrow's Plans" and outstanding authorities will deliver papers on all phases of municipal signaling work—fire alarm, police telegraph, radio communication (for both fire and police depts.), traffic signals, etc. There will also be open forums participated in by members of the Association for discussion of various divisions of the work. It is expected that leading manufacturers in this field will have displays and demonstrations of equipment.

Army Broadcasts on Guadalcanal

The following story was written by Sergeant Alvin M. Josephy, Jr., Washington, D. C., a Marine Corps Combat Correspondent.

Guadalcanal — (Delayed) — Morale zoomed upward with the opening of this island's first American Expeditionary radio station. After months of fiddling with short wave dials for United States or even Japanese transmissions, soldiers, sailors, and Marines here have finally all the trimmings of a regular local station, "just like home."

The new studios and transmitter, set up under direction of the Armed Forces Radio Branch of the Morale Services Division of the War Department, are housed in a typical muddy grove of coconut trees in a



central section of the island. The studio, a 20- by 40-foot board shack, is the last word in Guadalcanal luxury. Consisting at present of two rooms, a combination office and control room and the studio, its immediate plans call for soft-color decorations, involving a mosquito motif, in keeping with the "Mosquito Network", name adopted by the station.

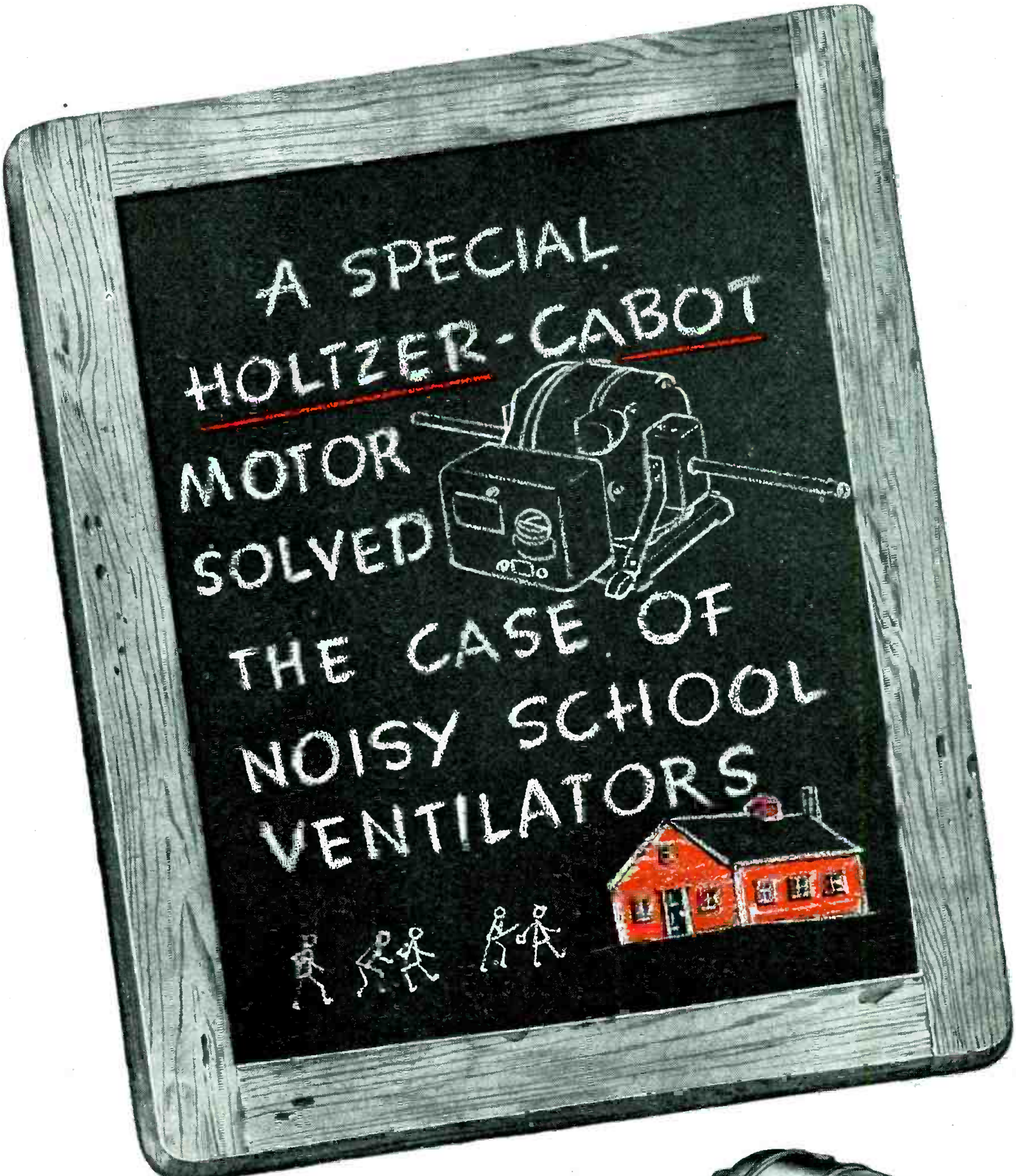
Broadcasts are regularly scheduled each day at times most suited for listening by the troops. The programs, under direction of Captain Spencer M. Allen, U.S.A., formerly with WGN, Chicago, Ill., include news, entertainment and spiritual talks by chaplains, as well as recorded music and variety shows shipped in two weeks' time from the United States. Local special events, band concerts, religious ceremonies, and descriptions of prize fights are also presented. In addition, the station is equipped with the NBC Thesaurus.

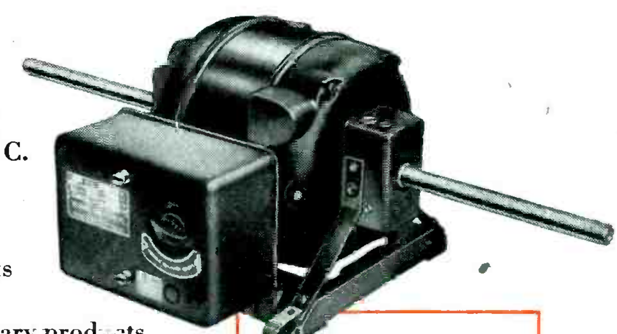
Station

All equipment, including a horizontal Marconi antenna, strung between two 60-foot coconut trees, was installed by Army engineers and signalmen under supervision of Captain Wilford H. Kennedy, U.S.A., formerly with WKRC, Cincinnati, Ohio. Inside units include a Rosen console, two Audax turntables, two RCA ribbon velocity and two Astatic dynamic microphones. All equipment is impregnated with a special compound against the island's excessive humidity.

The transmitter, an RCA 1-kw unit, powered by a Signal Corps 7½ KVA generator run by a jeep motor, radiates a strong signal from 35 to 50 miles. Reception at night under favorable conditions, however, extends several hundred miles. The assigned carrier frequency is 730 kc.

Operated by the Army, the station serves all branches of the armed forces here. A half hour each night is set aside for participation of different units on the island; and a dedicatory program, March 22, featured brief addresses by Admiral William F. Halsey, U.S.N., Commander in Chief, South Pacific; Lieutenant General Millard H. Harmon, U.S.A., Commanding General, South Pacific; and





Not too long ago — school ventilators were powered with D. C. motors because everyone thought that an A. C. motor couldn't be built that would operate *quietly*.

Holtzer-Cabot motor development engineers dispelled this bug-a-boo by designing a special fractional H. P. motor that exactly met all the performance requirements including *extreme silent* operation.

Today, Holtzer-Cabot is building special motors for military products exclusively. However, if you're planning or working on products for post-war, our engineers—backed by over 50 years of experience in designing and building motors to fit specific applications such as instrument, aircraft, machine tools, business machines, etc.—would like to talk with you on your motor problems.

Special Motors Designed To Fit The Application

The HOLTZER-CABOT ELECTRIC COMPANY

Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

125 Amory Street, Boston 19, Mass.; Chicago, Illinois; New York, N. Y.; Philadelphia, Pa.

Major General Roy S. Geiger, Commanding General, First Marine Amphibious Corps.

The Guadalcanal station is the second of its kind in the South Pacific. Another, in Noumea, New Caledonia, has been in operation several months. Prior to its present operations, the new station conducted field strength tests one hour each night for a week.

Reaction of troops to the new station has been enthusiastic. Typical of the first week's fan mail was a letter from a Seabee: "Your announcement has instilled a joy in

Nestled in a muddy coconut grove on Guadalcanal, this station serves troops in the Solomon Islands. Ready to go on the air are Army Corp. Allen C. Botzer (right), formerly with KNX, Hollywood, Cal., PFC Ivan Saddler (left), of WRR, Dallas, Tex., and Staff Sergeant George Dvorak (center), formerly with KFI, Los Angeles, Cal. Official U. S. Marine Corps photo

our hearts that cannot be expressed in words. Practically isolated on this island, we welcome this contact with the memories of our life left behind."

Many letters asked for plenty of news programs. These will be scheduled about four times a day with news picked up from the United States by the station's Scott Marine receiver.

Besides Captains Allen and Kennedy, the personnel includes Staff Sergeant George Dvorak, U.S.A., formerly with KFI, Los Angeles, Cal.; Corporal Allen C. Botzer, U.S.A., once with KNX, Hollywood, Cal. T/5 Rudolph Rubin, U.S.A., and Private First Class Ivan Sad-

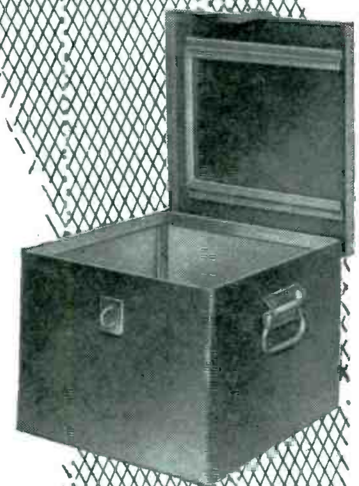
KARP

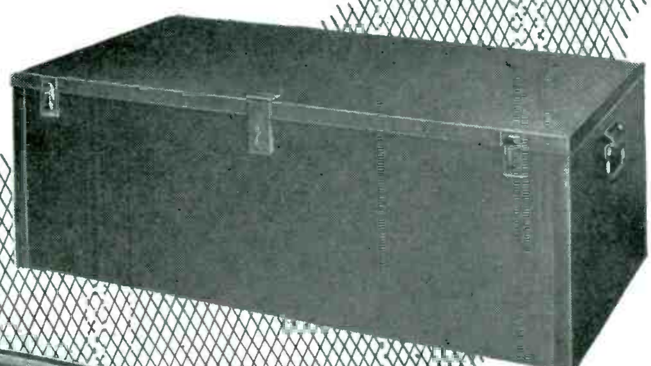
SPARE PARTS BOXES

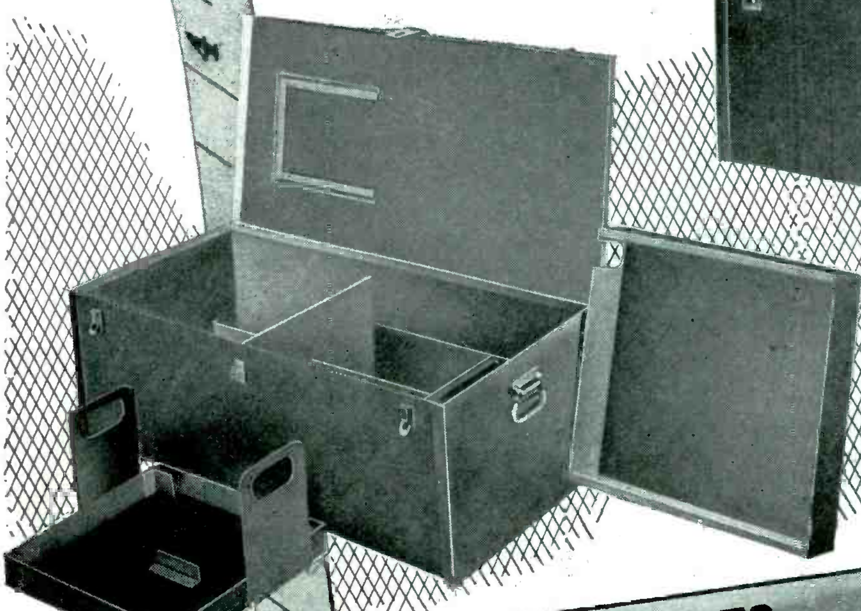
Made-to-order at no extra cost

For the many years that sheet steel has been designated for spare parts boxes, Karp has been a major national supplier. Vast experiences, coupled with unusual production facilities, permit us to lay out and design boxes to *individual order* . . . at no extra cost. Each is built in accordance with U. S. Navy specifications. Tightly welded seams are vermin-proof. Special corrosion resisting paint is applied. Partitions, fittings, supports and trays are added as the case demands. Sizes range from 12" x 6" x 6" (and smaller where special existing conditions require) to boxes of sufficient length to house long motor shafts. *Rapid deliveries, too.*

Artisans in sheet metal, Karp craftsmen produce a varied line of products . . . from a chassis small enough to be handled by two fingers to a heavy rack which requires a crane to lift. We save you time, cost and manpower. A Karp engineer will gladly consult with you.





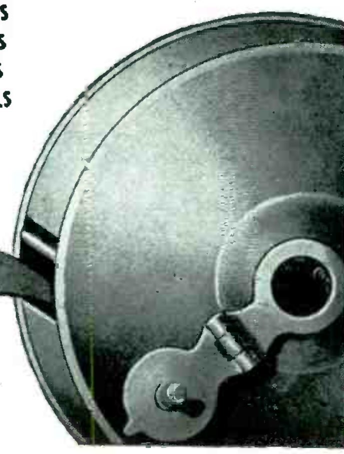


ARTISANS IN SHEET METAL

KARP METAL PRODUCTS CO., INC.
124 30th STREET • BROOKLYN 31, N. Y.

CABINETS
CHASSIS
RACKS
PANELS

HELP SHORTEN THE WAR . . . BUY MORE WAR BONDS



dler, U.S.A., both once with WRR, Dallas, Texas; Private First Class Rudolph Luukinen, U.S.A., formerly with WDSM, Duluth, Minn.; Corporal Alfred E. Taylor, U.S.A., and Private First Class Stephen L. Johnston, U.S.A., formerly with WRDW, Augusta, Ga., and T/5 Hyman J. Averback, U.S.A., former program director of KMPC, Beverly Hills, Cal.

Permanent Offices For WCEMA

THE EXECUTIVE COUNCIL of both the Southern California and Northern California areas of the West Coast Electronic Manufacturers Association met recently and elected the following permanent officers: H. L. Hoffman, president; Jack Kaufman, vice-president; Herb Becker, secretary; Howard Thomas, treasurer.

The Executive Committee also adopted an Association insignia for use by the membership in their own advertisements.

Forty-five electronic manufacturers are represented by the Association and these comprise producers of virtually all types of electronic equipments and components.

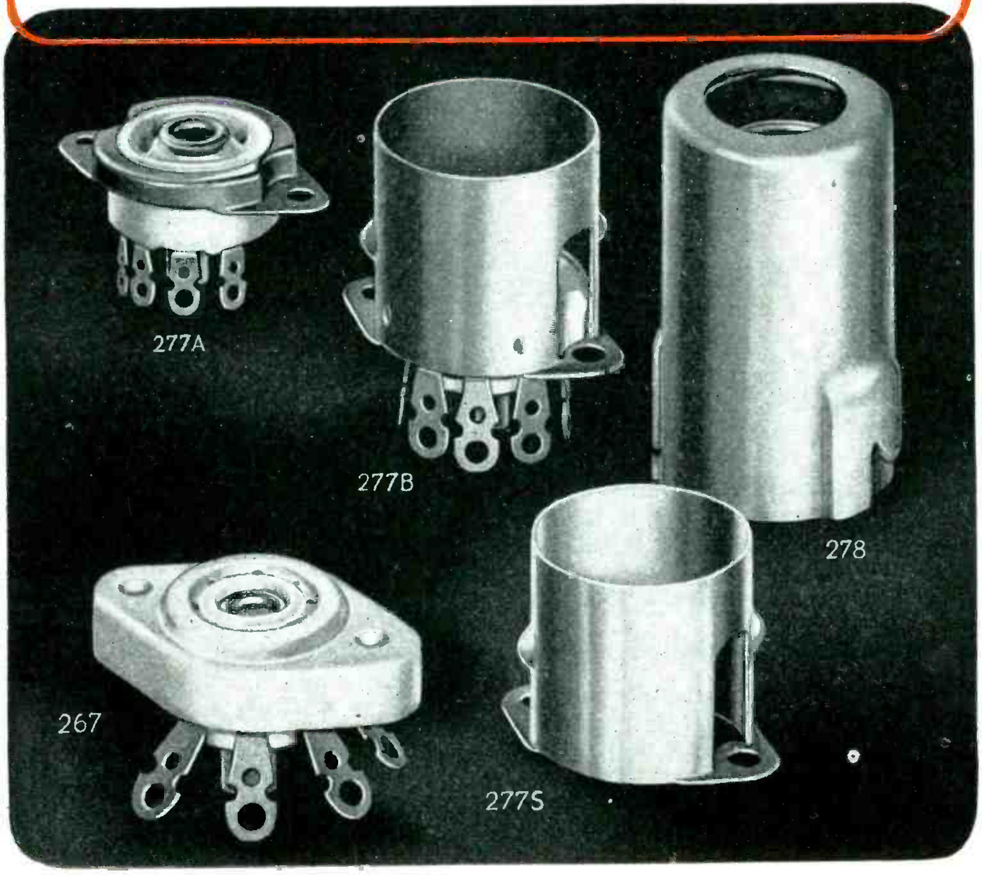
According to the Association, there is no shortage of "woman power" on the Coast. Inasmuch as approximately 60 percent of the total employees of Association members are women, and because these women in the main have preferred work in the electronic industry to jobs in shipbuilding or aircraft, Association members have experienced no difficulty in recruiting necessary production personnel.

Jobs for Veterans

A PLAN TO PROVIDE war veterans with employment opportunities, almost upon the heels of their discharge from military service, has been initiated by Brown Instrument Co. Since veterans must report to their draft boards after discharge, the plan includes cooperation with boards within a 35-mile radius of the company's plant.

The company, a division of Minneapolis-Honeywell Regulator Co., provides each board with a weekly list of jobs open at the plant, the type of men required and what experience, if any, is needed. In addition, the company offers the vet-

JOHNSON MINIATURE SOCKETS



Pre-eminent in the ceramic socket field, it was to be expected that Johnson was asked in 1941 to develop the first miniature ceramic socket (No. 267), or that it was quickly approved and widely adopted a year or more ahead of the field, and today is going into critical equipments by the hundreds of thousands.

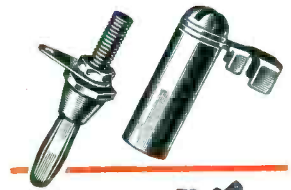
The same Johnson skill in engineering both ceramics and metal has gone into the No. 277, and the associated shields and shield base (usable with other sockets as well). These Johnson sockets not only meet standards (developed jointly by us, the W. P. B. Socket Sub-committee, Signal Corps, Navy and private laboratories); in each of them you may count on that EXTRA value that's typical of products bearing the Viking mark. High grade steatite insulation with long creepage and arcing paths and low inter-contact capacity; accurately formed and processed contacts of silver plated beryllium copper or phosphor bronze, freely floating and with just the right tension, feature this series of sockets.

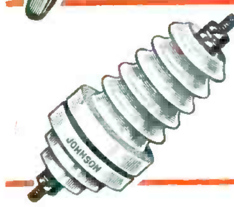
If you have a socket problem, whether it's engineering, design, substitution, or delivery, first try Johnson.

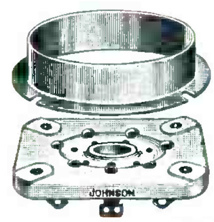
Ask for NEW catalog 968D

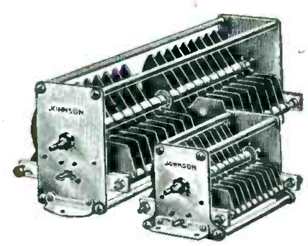
JOHNSON
a famous name in Radio

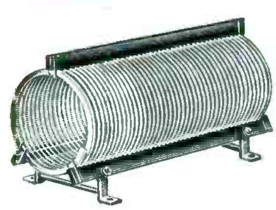
JOHNSON *Made*
PLUGS and JACKS
INSULATORS
SOCKETS
CONDENSERS
INDUCTORS
BROADCAST CABINETS

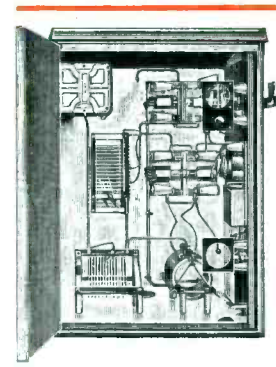












E. F. JOHNSON COMPANY • WASECA • MINNESOTA erans instruction at the Brown school, when they are qualified by experience or education to receive additional knowledge in the servicing, operation and maintenance of industrial instruments.

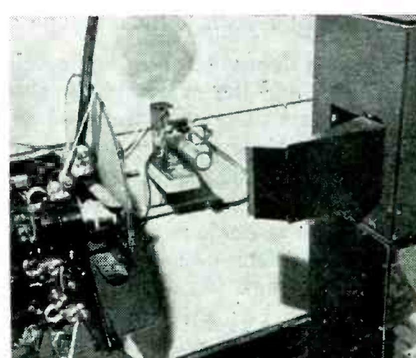
E. B. Evleth, vice-president of the company and author of the plan, pointed out the results will be advantageous to the veteran, to the continued production of war goods and to the company. Long periods of waiting and the veteran's indecision as to where to find work are overcome and red tape is reduced to a minimum. Readjustment to civilian life is more rapid for the veteran and his outlook is brighter.

The only requirement which the veterans must meet to fill the positions, other than their ability and knowledge of the work, is that they shall be considerably physically and mentally recovered from their disability to permit them to work.

Film Premiere By Television

THE FIRST FILM PREMIERE presented by television took place in April when the new M-G-M short feature "Patrolling the Ether" was telecast by NBC station WNBT. James Lawrence Fly, chairman of FCC, was televised as he introduced the film which was produced with the cooperation of the FCC.

The film is the dramatized story of the Radio Intelligence Division of the FCC, a group of trained radio men who are assigned to de-



The two-reel movie "Patrolling the Ether," produced by MGM and sponsored by FCC, was broadcast with this equipment. At the left is the projector for the 16-mm film whose image was projected onto an iconoscope in the transmitter at the right. Slides can be projected into the transmitter by the machine in the center, while printed titles can be combined with projected slide backgrounds in the mechanical device at the lower right

tect and run down illegal transmitting stations, especially those used for subversive purposes. Some of the novel methods and apparatus utilized in these searches are revealed in the film.

In addition to the film presentation over WNBT, station WRGB, Schenectady, and WPTZ, Philadelphia, picked up the signals from New York and re-telecast them over their respective areas. In Chicago and Los Angeles, local television stations transmitted the same film during evening hours.

Wickenden's "Second Mile"

THE FAMOUS ADDRESS before the Engineering Institute of Canada in 1941 by William E. Wickenden, president of Case School of Applied Science. "The Second Mile" has been reissued by the Engineers' Council for Professional Development under the title, "The Second Mile—A Re-survey, 1944".

This new material is very pertinent to all engineers in the present confusion as to professional status, when it is even being asked "Will post-war engineering be Labor or a Profession?"

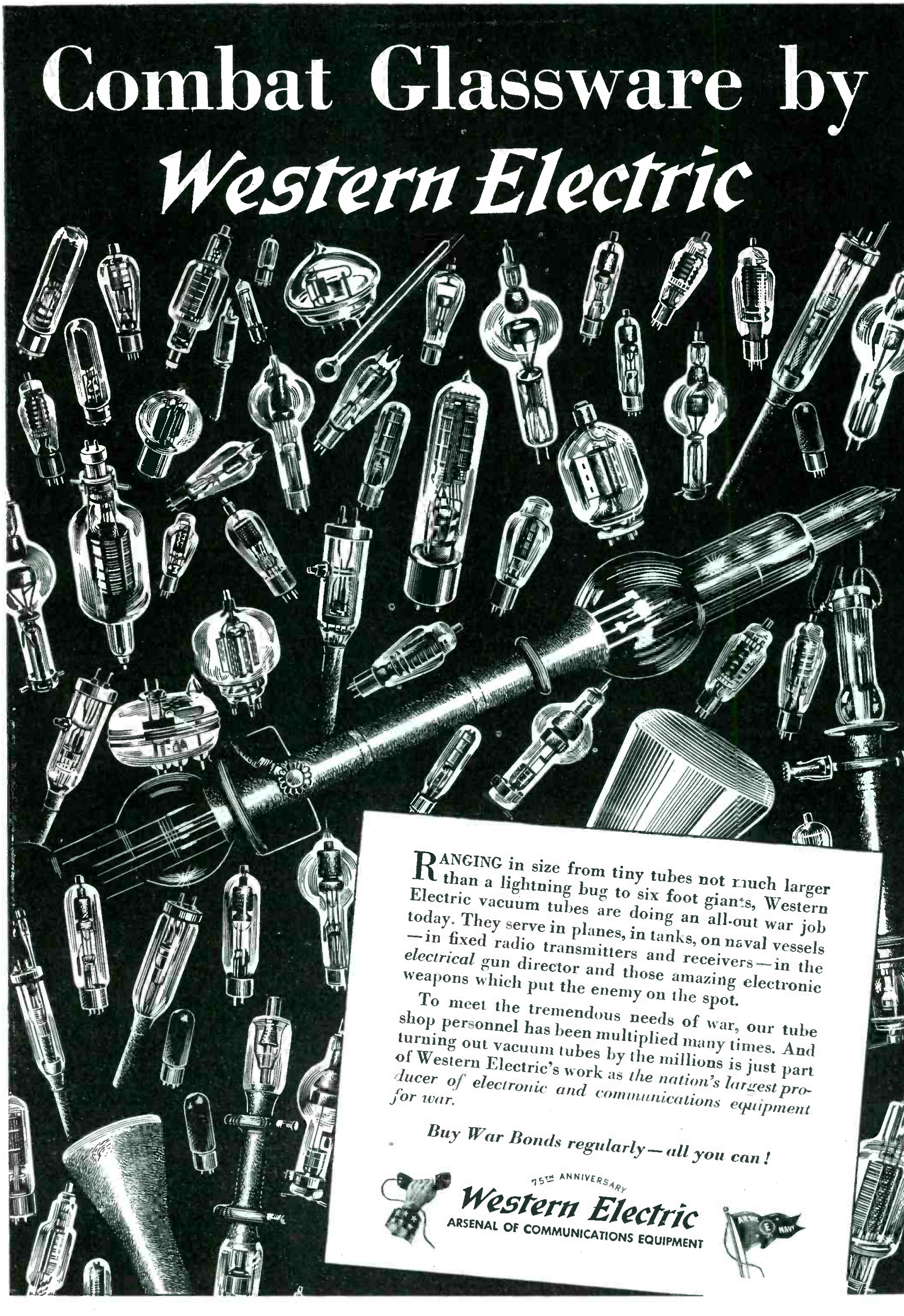
Copies of the new edition may be obtained from Engineer's Council for Professional Development, 29 West 39th Street, New York 18, N.Y. The price is $3 per hundred; 5 cents a copy in small lots; and 10 cents for single copies.

War Standards for Rheostats and Variable Resistors

AMERICAN STANDARDS ASSOCIATION has announced completion of two new American War Standards in the radio and electronic field—Power-Type Wire-Wound Rheostats and Variable Wire-Wound Resistors.

Complete with outline drawings, the two standards cover the performance requirements, test methods, standard dimensions, and standard resistance values of the quality required by the Armed Forces. Both standards include applicable specifications and drawings; classification; materials and workmanship; general and detailed requirements; methods of sampling, inspection and tests; and packaging, packing and marking for shipment.

The main difference between


Combat Glassware by
Western Electric
RANGING in size from tiny tubes not much larger than a lightning bug to six foot giants, Western Electric vacuum tubes are doing an all-out war job today. They serve in planes, in tanks, on naval vessels—in fixed radio transmitters and receivers—in the *electrical* gun director and those amazing electronic weapons which put the enemy on the spot.
To meet the tremendous needs of war, our tube shop personnel has been multiplied many times. And turning out vacuum tubes by the millions is just part of Western Electric's work as *the nation's largest producer of electronic and communications equipment for war.*
Buy War Bonds regularly—all you can!
75TH ANNIVERSARY
Western Electric
ARSENAL OF COMMUNICATIONS EQUIPMENT

these two standards is that the power-type wound rheostat can dissipate greater power in a given physical size because of a higher operating temperature.

The two standards were set up by a combined committee of representatives of the radio industry and the Armed Forces, and have already been adopted by the U. S. Navy Department, Bureau of Ships, and the Signal Corps Standards Agency of the U. S. Army.

American War Standard Power-Type Wire - Wound Rheostats (075.9-1944) may be had for 50 cents a copy, and the American War Standard Variable Wire-Wound Resistors (C75.10-1944) for 40 cents a copy from the American Standards Association, 29 West 39th Street, New York 18, N. Y. It is available without charge from the government agencies concerned, for procurement purposes only.

Table 9 Revised

REVISION OF TABLE 9, the Radio and Radar Division table of General Scheduling Order M-293, has been made to bring it into conformity with previous amendments, WPB has announced.

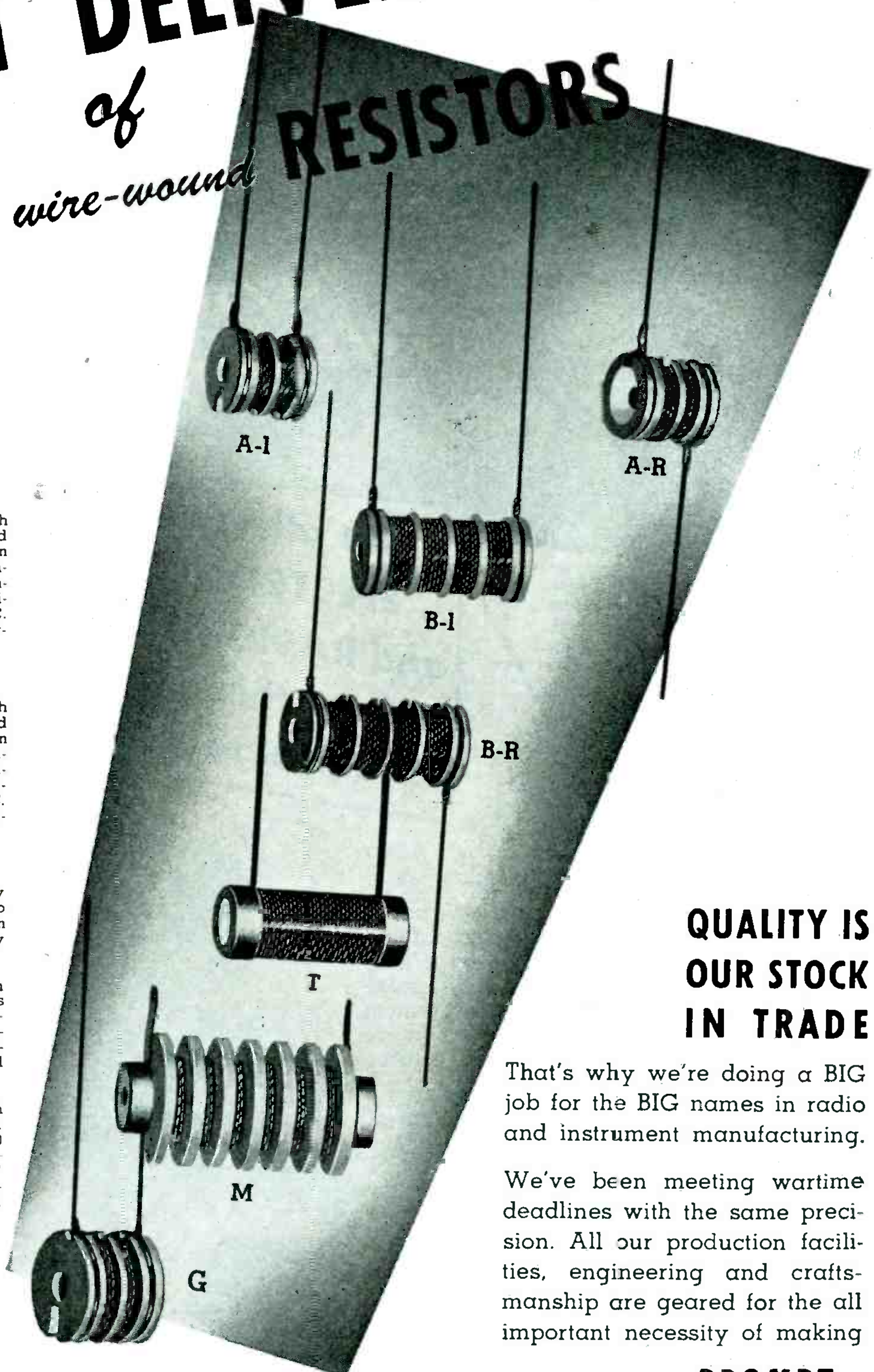
The revision of the table adds some electronic equipment items as "undesignated products", those for which a producer must submit his operational report only. WPB may request submission of order boards by producers of undesignated products if production scheduling need arises. Some of the products on the Radio and Radar table have been retained under new product descriptions and classifications.

Vacuum tube production machinery is added to the list as an X product, which requires that the manufacturer must submit an operational report and order board to WPB. A frozen period of three months on shipping schedules is listed.

Industrial and mechanical instruments are listed in detail as undesignated products, with a four-month frozen period for shipping schedules.

Transformers, electronic vibropacks and vibrators, microphones and loud-speakers, and radio and radar switches are listed as un-

PROMPT DELIVERIES *of* PRECISION *wire-wound* RESISTORS



SPECIFICATIONS:

"A-1"—15/32 long x ½" dia.—Mountable with 6-32 flat or filester screw. No. 21 tinned copper wire leads. 1 to 300,000 ohm value—½% standard accuracy—non inductive pie wound—½ watt, 30° C. temperature rise in free air—100° C. maximum operating temperature—200 D. C. maximum operating voltage. Baked varnish finish.

"A-R"—Same as A-1, with leads reversed.

"B-1"—15/16 long x ½" dia.—Mountable with 6-32 flat or filester screw. No. 21 tinned copper wire leads. 1 to 500,000 ohm value—½% standard accuracy—non inductive pie wound—1 watt, 30° C. temperature rise in free air—100° C. maximum operating temperature—300 D. C. maximum operating voltage. Baked varnish finish.

"B-R"—Same as B-1, with leads reversed.

"T"—1-1/32 long x 7/16" dia.—Inductively wound—⅛ x .015 strap terminals—35 to 35,000 ohms—2 watts, 100° C. maximum operating temperature—normal accuracy 1%. Baked varnish finish.

"M"—1-13/32 long x ¾" dia.—Mountable with 6-32 screw—⅛ x .015 thick strap terminals—non inductive wound—1 meg ohm maximum resistance—600 volts maximum operating voltage—100° C. maximum operating temperature—1.5 watts—1% normal accuracy. Baked varnish finish.

"G"—15/32 long x ½" dia.—Mountable with 6-32 flat or filester head screw. No. 21 tinned copper wire leads. 1 to 500,000 ohm value. ½% standard accuracy—non inductive pie wound .8 watts, 30° temperature rise in free air. 100° C. maximum operating temperature. 200 D. C. maximum operating voltage. Baked varnish finish.

QUALITY IS OUR STOCK IN TRADE

That's why we're doing a BIG job for the BIG names in radio and instrument manufacturing.

We've been meeting wartime deadlines with the same precision. All our production facilities, engineering and craftsmanship are geared for the all important necessity of making

PROMPT DELIVERIES!

Get to know **ELCO RESISTORS COMPANY**

114 West 18th Street, New York, N. Y.

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designated products, with a two month frozen period.

Panel Instruments

Purchase orders for panel indicating instruments may be placed without prior approval from WPB on Form WPB-1682. There are two exceptions: (1) any order for 500 or more identical panel indicating instruments, (2) an order for any type of panel instrument having a full scale deflection resulting from a current of 150 micro-amperes or less. These two exceptions are treated as Y products and require WPB authorization on Form WPB-1682.

Panel indicating instruments are no longer required to meet American War Standards C 39.2 1943 in ranges and dimensions in order to have automatic approval without the filing of Form WPB-1682.

London News Letter

By JOHN H. JUPE
London Correspondent

Phototube Steering Gear. A recent British patent (No. 556,175) describes a new and comparatively simple type of photoelectric steering control applicable to aircraft or ships.

A magnet, free to swing in one plane, is immersed in a clear damping fluid, such as kerosene, and has a small mirror mounted on it. Close to the magnet are two inductors of high-permeability material for the purpose of concentrating the earth's magnetic field.

The mirror normally reflects light onto a phototube which is in turn coupled to a gas-filled relay. The whole unit is mounted on a rotatable platform so that the inductors can be set at right angles to the earth's field when the craft is following a set course.

A change of course will cause the magnet to swing and reduce the amount of light falling on the phototube. Relays can be used to correct the steering or a direct reading meter can indicate the change. For aircraft use, two such mechanisms, mounted at right angles, can be used to control or indicate the vertical as well as horizontal variations.

Jet-Propelled Aircraft. It has now been disclosed that the Brit-

ish Thomson-Houston Co., which has strong American connections, has been foremost in aiding the development of this new type of aircraft.

In view of the experience which the B.T.H. Co. gained in the manufacture and operation of the 10,000-kw steam turbo-alternator supplied to the Detroit Edison Co. (turbine initial temperature 1,000 deg F) they decided to collaborate with Group Captain Whittle in the design and manufacture of a jet propulsion engine.

Now it seems to me that if this jet propulsion is all that is claimed for it, there will be a great scope for new electronic devices. New air designs require new instruments and it is here that the experience of U. S. electronic engineers can be very valuable.

A common grouse among aircraft electrical engineers over here is that they have to put their gear into any odd corners available after the rest of the machine has been designed.

I have a feeling that it would do a lot of good if somebody would step out boldly and show what a real partnership between electronics and mechanics could do for the airplane. Jet propulsion offers the chance; who's going to take it?

Black Light Beats Blackout. One of the big British railroad companies is experimenting in London with ultraviolet light, in conjunction with fluorescent paints, on station signs, in order to determine whether it is possible to make signs which are clearly visible in the dark but which do not infringe the blackout regulations.

Electronic-Minded Britain. It is suprising how the war has made many British firms electronic minded. Take dielectric heating for example. Many firms are considering this quite favorably yet in normal times they would not have looked at it for another twenty years. As for cathode-ray tubes—well, we are making them in very large numbers over here and are using them in ways which will have a bad effect on the Nazis' health. Unfortunately the interesting stories will have to wait in cold storage for a while.

TRANSFORMERS

of Quality...

When our transformer plant was organized 22 months ago, four *MUST* rules were laid down. In order, they were:—

1. **Make the best product possible.**
2. **Buy only the finest in raw materials.**
3. **Use a polymerization vacuum-varnish impregnation process combined with pressure.**
4. **Guarantee unconditionally every unit manufactured.**

Today, when you have a Langevin Transformer, you have all these *plus* rigid manufacturing control and inspection. Your inquiries for quality transformer products are solicited. Capacity to 5 KVA.

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., 38

Radio Business News

SPRAGUE ELECTRIC CO. is the new name of Sprague Specialties Co.

ALLEN-BRADLEY CO. has moved the New York office to 155 East 44th St., New York 17, N. Y.

FM CONSTRUCTION PERMITS have been sought by 120 applicants as of April 1. This is double the number on file five months previous.

THE BLUE NETWORK now has its own communications department. Facilities were previously leased from NBC.

THE AMERICAN NETWORK, INC., will build and operate its own stations in New York, Chicago, Washington and Los Angeles. A transmitter site has been purchased in Washington and a lease approved for the roof of the La Salle-Wacker Building in Chicago.

INDUSTRIAL CONDENSER CORP. expects to finish construction of a new factory in July. Located in Chicago, the new plant is expected to double the present output of capacitors and will house a million-volt research laboratory.

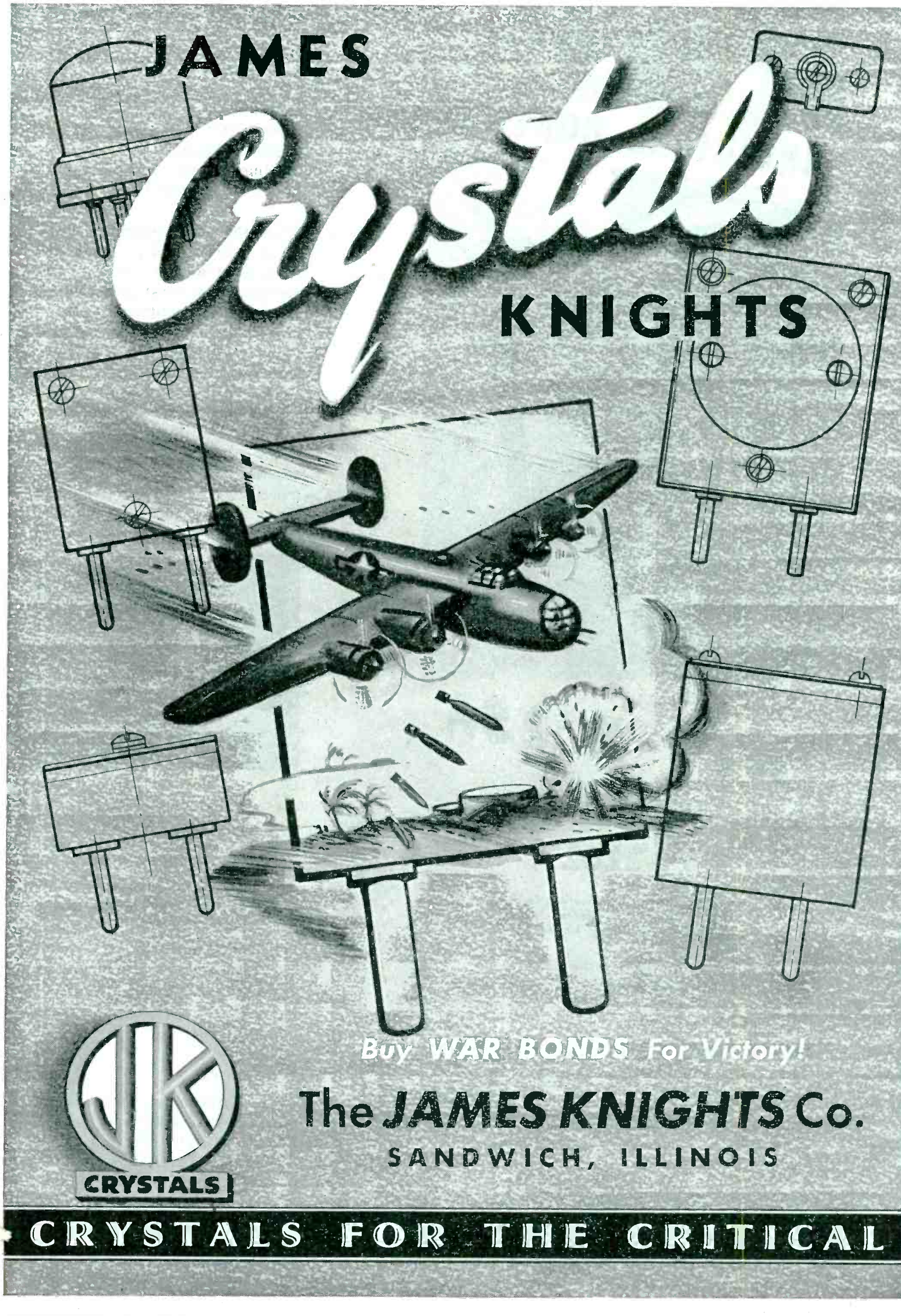
WGNC, Gastonia, N. C., has never broadcast a commercial program on Sunday because of convictions of owner F. C. Todd about Sabbath observance. A Methodist, he says he believes firmly in the admonition of John Wesley: "Make all you can; save all you can; give all you can."

CROSLEY CORP. employees are being advised by two leading agriculturists in tending 1,600 Victory Gardens.

ATLAS SOUND CORP. has taken over the entire building in which the plant is located in Brooklyn, N. Y.

WGN, INC., has announced a $10,000 prize contest for architectural plans for a radio studio seating 2,000 persons. The theater will be the heart of a new building to be erected as soon as materials are available. A separate competition for the building will be announced later.

FM APPLICANTS can obtain maps for use in preparing station license applications from J. Walter Thompson Company (Retail Shopping Areas), 420 Lexington Avenue,


JAMES
Crystals
KNIGHTS
Buy WAR BONDS For Victory!
JK
CRYSTALS
The JAMES KNIGHTS Co.
SANDWICH, ILLINOIS
CRYSTALS FOR THE CRITICAL

New York City; Rand McNally Map Company, Inc. (Trading Areas), National Press Building, Washington, D. C.; Hagstrom Map Company, Inc. (Four-Color Retail Trading Area Maps), 20 Vesey Street, New York City, and International Magazine, Inc. (Consumer Trading Areas), 8th and 57th Streets, New York City.

STANDARD TRANSFORMER CORP. set up assembly line in a store near the main plant so that passersby could see employees working on field communications equipment for the armed forces. In three weeks, the stunt brought in enough applicants for jobs to make it a success, even though other contractors offered higher wage-rates.

JOHN MECK INDUSTRIES of Plymouth, Indiana, has purchased a monocoupe airplane to speed delivery of crystals. In the photo

above, William W. Montgomery, Meck executive engineer, is ready to take off with a girl pilot to make an emergency crystal delivery.

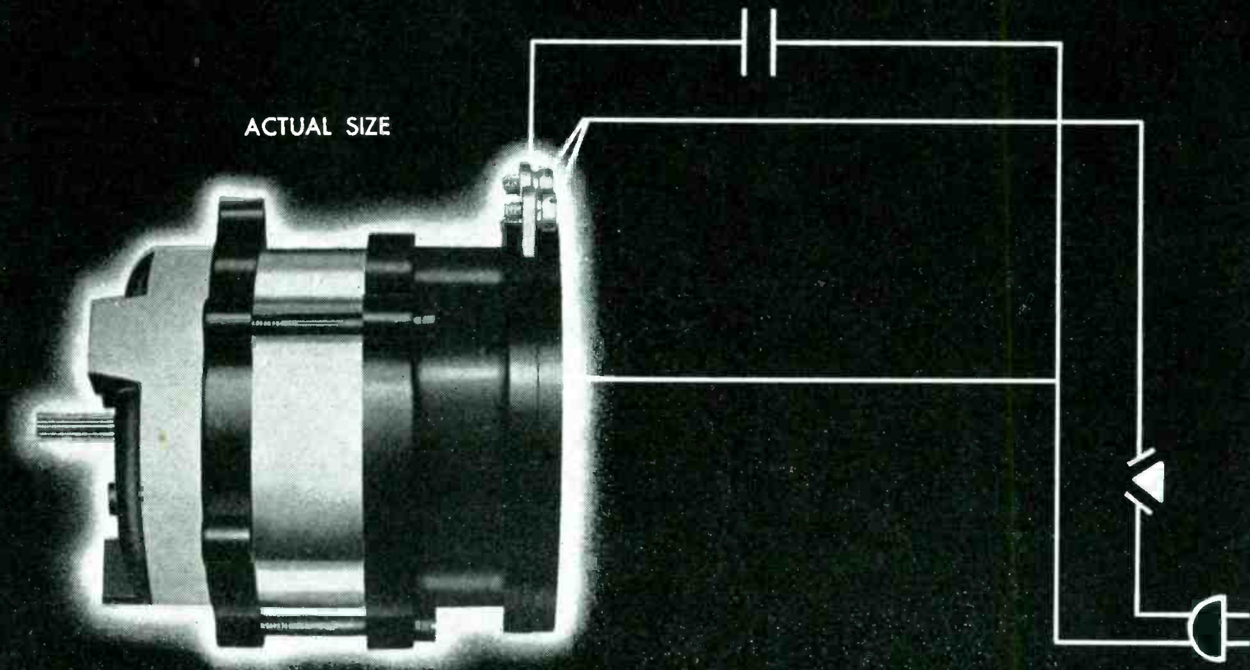
URUGUAY has granted the first experimental television license to Marion Giampietro. Tests will be conducted under government supervision on 52 Mc.

Personnel

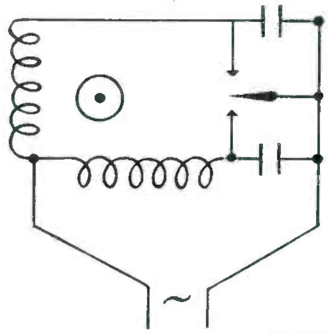
J. E. Tweeddale, until recently on leave of absence from Bell Telephone Labs to Columbia U. War Research Division, has taken over coordination and production programming of thermistors, varistors, glass-sealed switches and carbon-deposited resistors in the Radio Division of Western Electric Co.

Design Engineers! ... **KOLLSMAN NOW OFFERS**

many new types of low-inertia Drag Cup Motors including an adaptable 115 volt 60 cycle unit



DRAG CUP MOTOR SIMPLE REVERSING CIRCUIT



Design Engineers requiring a low-inertia, quick-reversing unit will be interested in the many new types of Kollsman Drag Cup Motors—particularly the new 115 volt 60 cycle units which can be run directly from a regular single-phase outlet with the addition of a capacitor as shown in the main illustration.

The low-inertia, quick reversing characteristics are obtained by a special light aluminum cup, used in place of the usual solid metal rotor. Speed of rotation is varied by controlling voltage input to one or both windings or by varying one phase angle. Direction of rotation may be changed by reversing the leads or phase of either winding.

Where additional torque is needed, and a slight increase in inertia is not undesirable, copper cups may be substituted for aluminum cups.

In addition to applications as motors, Kollsman Drag Cup Units are sometimes used as induction generators.

OPERATING CHARACTERISTICS—115 VOLT 60 CYCLE DRAG CUP MOTORS

Type	Rotor	Speed	Reversing Time	Stopping Time	Stall Torque
776-05	Aluminum	2930 RPM	.12 sec.	.2 sec.	.50 in/oz.
776-015	Copper	2930 RPM	.20 sec.	.4 sec.	.656 in/oz.

For latest information about Kollsman Drag Cup Motors write to Kollsman Instrument Division of Square D Company, 80-10 45th Avenue, Elmhurst, New York.

ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

ELMHURST, NEW YORK • GLENDALE, CALIFORNIA tube for radio uses that speeded up the sawing operation from 2,200 to about 15,000 units per day.

Robert S. Peare and **H. V. Erben** are new vice-presidents of General Electric Co.

Frank R. Deakins has been named president of RCA Victor Co., Ltd., of Canada, a wholly owned subsidiary of RCA.

J. K. Gannett, vice president of The Austin Co., engineers and builders, has been appointed director of engineernig, in charge of engineering and research.

J. W. Dietz, industrial relations manager of the Western Electric Co. Manufacturing Department, at present on leave for service with the Government, has been awarded an honorary degree of doctor of engineering by Purdee University, from which he graduated in 1902. He entered the company 42 years ago as an engineer.

Walter H. Lynch, chief engineer of Arpin Mfg. Co., has been elected vice-president in charge of engineering, general manager, and director of the company. He will direct research in industrial electronic tube development.

Joseph K. Fabel has been elected a vice-president of Allen D. Cardwell Mfg. Corp.

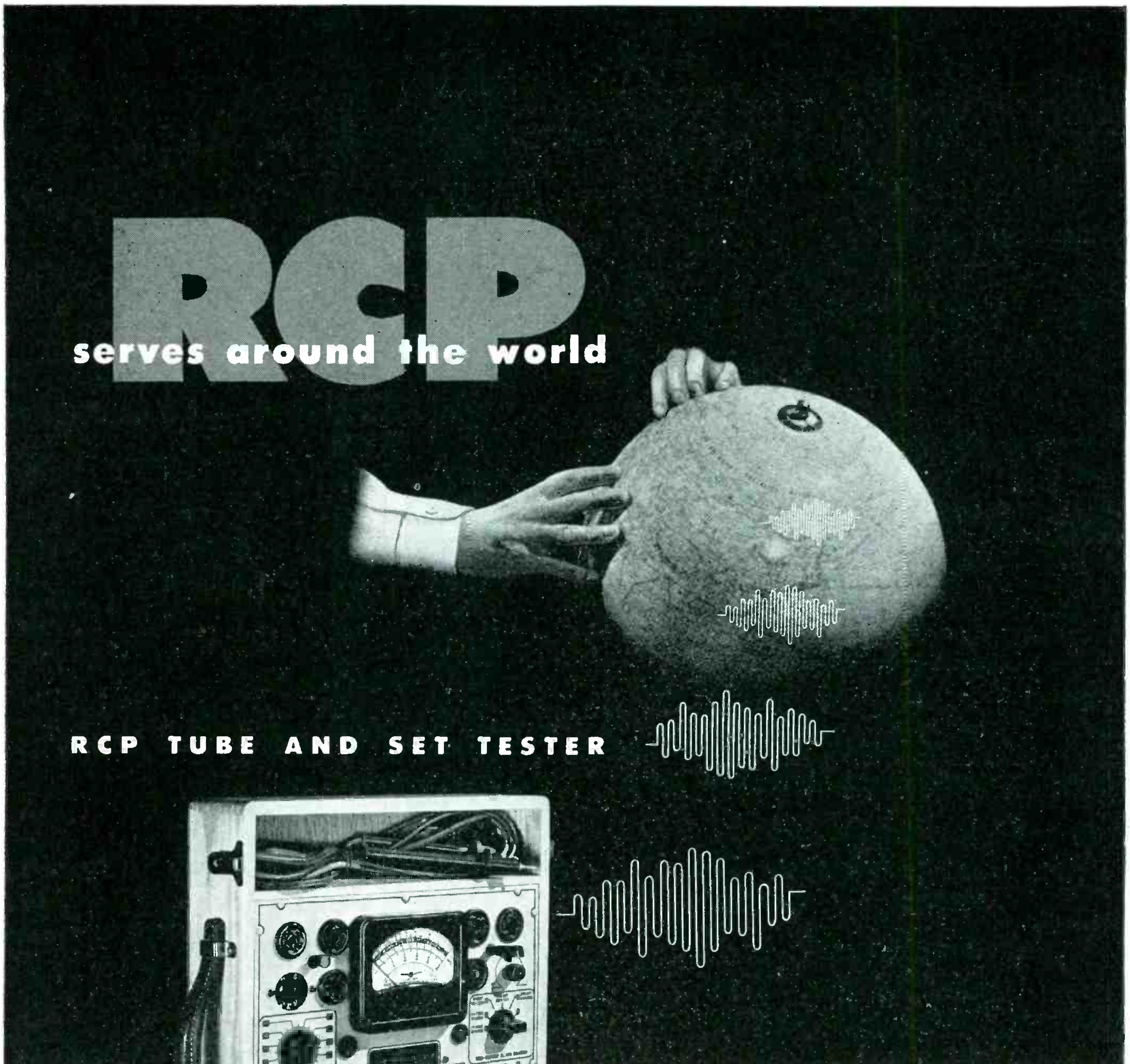
Ricardo Muniz, formerly plant manager of Radio Navigational Instrument Corp., has joined the staff of Espey Mfg. Co., of New York as staff director of engineering.

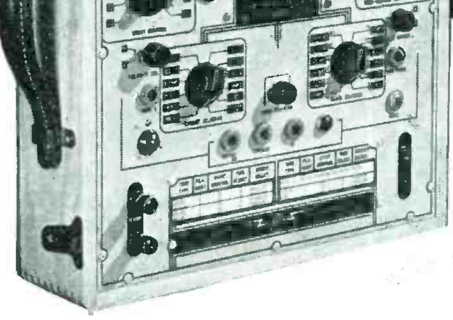
Ralph P. Glover, has resigned from Webster Products Co., to become a consulting engineer with offices at 1024 Superior Street, Oak Park, Illinois.

Elmer R. Crane has been appointed general manager of the Radio Division of Lear Avia Inc.

Dr. Willard Henry Dow, president of the Dow Chemical Company, Midland, Michigan, received the Gold Medal Award of the American Institute of Chemists for 1944.

Colonel C.R.H. Firth is in charge of procurement, research and development of all types of radio and communications equipment





MODEL
804

A portable tube, battery and set tester equipped for direct testing of all old and new types of receiving tubes, rectifiers, etc. Features: ★ Famous Dynoptimum test circuit ★ Double line fuses ★ All filament voltages ★ Tests all ballast tubes ★ Tests condenser leakage at rated voltage ★ Hot inter-element short and leak tests of individual elements ★ Separate test for noise, hum, intermittents ★ Tests batteries under load.

Ranges: D.C. voltmeter: 0-2.5-10-50-250-1,000-5,000 volts • A.C. voltmeter: 0-10-50-250-1,000-5,000 volts • Output voltmeter: 0-10-50-250-1,000 volts • D.C. milliammeter: 0-1-10-100-1,000 milliamperes • D.C. ammeter: 0-10 amperes • Ohmmeter: 0-250-2,500-25,000-0-2.5-25 megohms • Decibel meter: -8 to 15, 15 to 29, 29 to 49, 32 to 55

Radio City Products manufactures a line of testing instruments that serve wherever radio is used. These testing devices perform with the speed, accuracy and efficiency that make them first choice for important wartime needs—in field and factory, in lab and shop.

The Signal Corps uses RCP testing instruments in large quantities, selected from the complete line we manufacture. All models are illustrated and described in our Catalog 128 which should be in your files. Will you ask us to send a copy?

Our engineers will be glad to advise on the selection of models, or to cooperate with you on testing problems.

RADIO CITY PRODUCTS
127 WEST 26th STREET • NEW YORK CITY 1. N. Y.
MANUFACTURERS OF PRECISION ELECTRONIC LIMIT BRIDGES—VACUUM TUBE VOLTMETERS — VOLT-OHM-MILLIAMMETERS — SIGNAL GENERATORS — ANALYZER UNITS — TUBE TESTERS — MULTITESTERS — APPLIANCE TESTERS — AND SPECIAL INSTRUMENTS BUILT TO SPECIFICATIONS.

and small power units, in Supply Directorate IX of the British Supply Mission, Washington. On his staff are: R. P. Ross, dealing with research and development; Lt. Col. R. V. Coles, handling procurement; and A. E. Barrett of British Broadcasting Corp.

Dr. Herbert A. Clark, founder of the standards laboratory of the Taylor Instrument Co., died recently.

Errol H. Locke, former vice-president of General Radio Co., Cambridge, Mass., has become president of the company. Arthur E. Thiessen has become vice-president in charge of sales.

Alfred N. Goldsmith has announced the new location of his office as 597 Fifth Ave., New York 17, N. Y.

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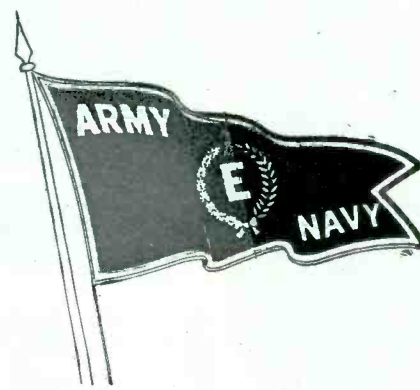


THE BALDWIN LOCOMOTIVE WORKS
The Whitcomb Locomotive Co., Rochelle, Ill.

THE BEAD CHAIN MFG. CO.
Bridgeport, Conn.

BENDIX AVIATION CORPORATION
Scintilla Magneto Div., Sidney, N. Y.

BRYANT ELECTRIC CO.
(Subsidiary of Westinghouse Elec. & Mfg. Co.)
Wiring Device Div., and Plastic Div., Bridgeport, Conn.

CROWE NAME PLATE & MFG. CO.
Chicago, Ill.

DOUGLAS AIRCRAFT CO., INC.
Santa Monica Plant, Santa Monica, Calif.

GLOBE-UNION, INC.
Milwaukee, Wisconsin

LEWYT CORPORATION
Brooklyn, N. Y.

LITTELFUSE, INC.
Chicago, Illinois

Found a "Fool-proof" Fastening Method *and* Hundreds of Work-hours Once *Lost* in Tapping

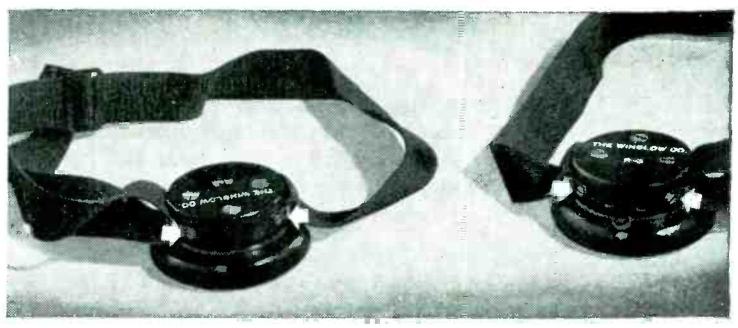
"We had to find a 'fool-proof' fastening method on our head phone assemblies," said engineers of the Winslow Company, of Newark, N. J., makers of electrical apparatus for the armed forces. And the simpler P-K Self-tapping Screw method proved the answer.

Fastenings were originally made with machine screws. The holes were small, and drilling and tapping were unusually difficult operations for inexperienced workers. Even when holes were properly drilled and tapped, "green" assemblers often stripped the threads in driving the machine screws. Spoilage of parts ran prohibitively high . . . hundreds of work-hours were lost.

By switching to P-K Self-tapping Screws for this ticklish job, tapping and thread-stripping were eliminated. Spoilage virtually disappeared. Production picked up immediately. Fastenings were stronger than ever.

Question Every Fastening! – on the drafting board, and in production! Ask for a P-K Assembly Engineer to point out all metal and plastic assemblies on which Self-tapping Screws will end trouble, speed work, save money. Or mail assembly details for recommendations. Parker-Kalon Corporation, 190-200D Varick St., New York 14.

EVERY WORKER A "SKILLED" WORKER! No special training or skill is required for this simpler fastening method. At the Winslow Co., inexperienced girls drive P-K Screws in tiny holes, and equal the work of veterans. You can change to Self-tapping Screws overnight!



MADE FAST – HOLD FAST! Four Type "Z" P-K Self-tapping Screws fasten two metal strap-retaining clips to plastic telegraph receivers. They form their own strong threads as they are driven, stay tight under severe stresses. The Winslow Co. also uses P-K Type "Z" Screws to fasten plastic sub-panels and ground wires to transformer cases of an ignition testing set.

TYPE "Z" THREAD-FORMING SCREWS

All purpose, *form* their own threads in the material. For fastening to cellulose acetate and nitrate compounds, methyl methacrylate resins, polystyrenes, laminated phenolics, and metal.

TYPE "F" THREAD CUTTING SCREWS

Expressly developed for use in crumbly and friable materials, such as phenolic and urea base compounds, cold mold compositions, and hard rubber. Also for metals. *Cuts* a thread like a tap.

TYPE "U" – FOR PERMANENT FASTENINGS

For use in all kinds of plastics and metals. Hammered or otherwise forced into the material, it forms its own thread. Cannot be removed.

OTHER TYPES OF P-K SCREWS ARE AVAILABLE

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

Give the Green Light to War Assemblies

A TYPE FOR EVERY METAL OR PLASTIC ASSEMBLY

METAPLAST CORPORATION
New York, N. Y.
NATIONAL UNION RADIO CORP.
Lansdale Plant,
Lansdale, Pennsylvania
NOBLITT-SPARKS INDUSTRIES, INC.
Columbus, Indiana
PHILCO CORPORATION
Storage Battery Div.,
Trenton, N. J.
RADIO CORPORATION OF AMERICA
RCA Victor Division,
Lancaster, Pa.
RAY-O-VAC COMPANY
Blake Mfg. Co.,
Clinton, Mass.
ST. REGIS PAPER CO.
Panelyte Div.,
Trenton, N. J.
STACKPOLE CARBON COMPANY
Carbon Division,
St. Marys, Pa.
SUPERIOR TUBE CO.
Norristown, Pa.
WELLS-GARDNER & CO.
Chicago, Illinois
TELETYPE CORPORATION
(Div. of Western Electric Co.),
Chicago, Ill.
S. B. WHISTLER & SONS CO., INC.
Buffalo, N. Y.
WINTER BROTHERS STAMPING CO.
Detroit, Michigan

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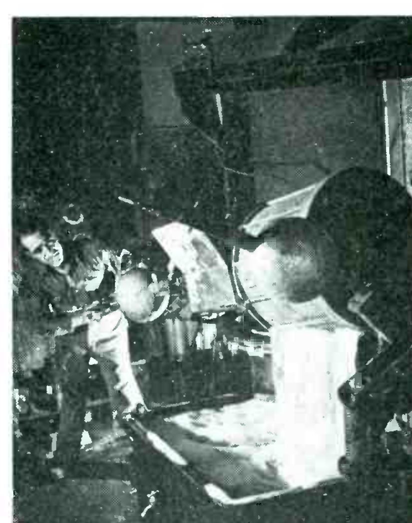
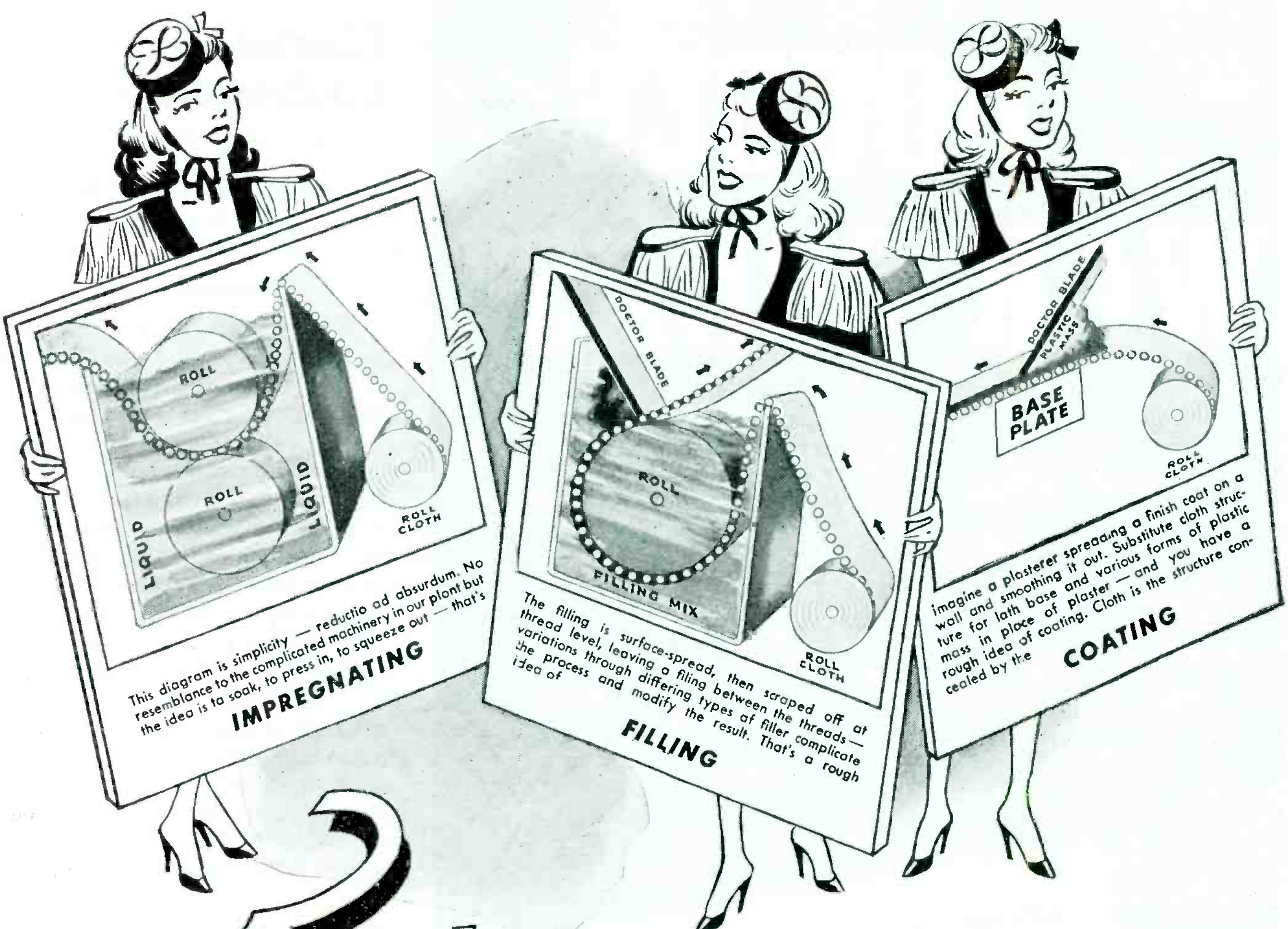
HIGH-CONDUCTIVITY PLATING



A new plating, developed by Westinghouse, is superior to nickel in conductivity for h-f applications and in corrosion resistance. Standard plating practice, as shown above, is used with special anodes made of an alloy of copper, tin and zinc



3 steps to broader fields of usefulness

For many of the established uses of cloth find, if you can, an adequate substitute. There is none because only a woven fabric drapes, folds, creases, holds stitching or adhesives and conforms to contour with a comparable degree of elastic tensile strength. Cloth is a structure distinctive in nature and when processed to special use, serves that use as can nothing else. Processing to purpose brings woven cloth in the forefront of postwar production materials.

COATING

Coating means using the woven fabric as a structural base and covering and concealing the texture with a heavy bodied flexible substance spread on much as plaster is spread on lath. Coating materials are varied to secure differing appearances and properties. Many of these coatings fall in the plastic group. New coating treatments are being devised and greatly varied properties secured. Coating may be preceded by impregnating or filling.

CURRENT HOLLISTON PRODUCTION includes COATED AND IMPREGNATED FABRICS . . . INSULATING CLOTH BASE . . . SEPARATOR CLOTHS rubber, starch-filled, glazed. TRACING AND BLUE PRINT CLOTHS white and blue, ink or pencil. MAP CLOTH, PHOTO CLOTH, self-adhesive. REINFORCING FABRICS. SIGN, LABEL AND TAG CLOTHS, waterproof to take any ink, meet any inking problem. BOOK-BINDING CLOTHS. SHADE CLOTH, impregnated waterproof, opaque, translucent or light proof.

We urge you to consider CLOTH, and invite you to consult with us concerning possibilities and developments for your specific requirements.

The Holliston Mills, Inc.
PROCESSORS OF CLOTHS FOR SPECIAL PURPOSES
NORWOOD, MASSACHUSETTS
Sales Agents in Principal Cities

Electronic Tachometer

(Continued from page 104)

celerating. Therefore the coast-time reading is a measure of the rate of deceleration.

Vibration Circuit

The signal produced by the phonograph-type crystal pickup placed on the gyro frame is introduced on the grid of V_8, operating as a conventional Class A voltage amplifier. The output of this amplifier divides into two branches. One branch drives a conventional power amplifier, V_9, which operates a speaker to give audible indications of vibration present in the gyro rotor.

The second branch is used to provide visual indication when vibration of the gyro rotor exceeds a specified amount. Output from the voltage amplifier V_8 is fed into the input stage of the peak-discharge circuit employing a gas tetrode, V_{10}. When the grid of the gas discharge tube exceeds a stipulated value, the tube breaks down and illuminates the indicator lamp, V_{11}. In this way, excess vibration of the gyro rotor is converted into a visual warning.

Power Supply, Electrical Specifications

Two rectifier-filter type voltage supplies are provided for operating the unit. One is a negative supply for bias purposes while the other is a high-voltage supply for all plate voltages.

The voltage of the bias supply is controlled by a regulator tube V_{14} while critical plate voltages are regulated by two tubes V_{15} and V_{16} in series.

The gyro test unit operates from a 115 v, 60 cps line and consumes 110 watts. An input signal of 2 millivolts or more is required for satisfactory operation. Most gyro units produce a voltage of at least 5 millivolts with the probe designed for this purpose. With the range switch adjusted to the low scale, rotational speeds of 400 to 1,000 rpm for a rotor having 24 buckets may be read on the meter whereas on the high scale, rotational speeds of from 5,000 to 15,000 rpm for a rotor having 24 buckets may be read. With the range switch on position C for measuring coast-time, nega-

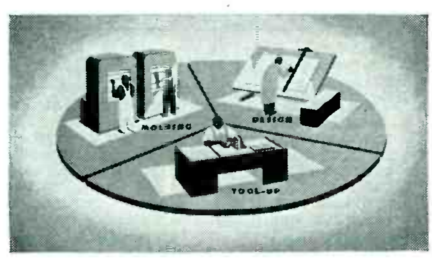
Your Plastics Molder can help you Catch Business by **DESIGN!**

There's plenty of sales appeal in up-to-date, streamlined styling of plastic parts.

But unless Design sleeps right in the same bed with Engineering, there are plenty of headaches. Both these functions have to be on the job at once to combine styling with proper handling of wall sections, inserts, undercuts, bosses, fillets and plenty of et ceteras.

But that's only the start of the story, here at Kurz-Kasch. In growing up with the plastics industry, we've found that experts on Moldmaking, Molding and Finishing ought to be consulted, too, while products are still plans.

So we bring them all together here at the Plastics Round Table. Your engineers are invited to discuss your plastics problems here, with men representing a generation of molding experience. Behind them are the resources of one of the largest and best-equipped exclusive molding plants in the country.



PLANNING *always* brings home the bacon! If your post-war plans include plastics, let us urge that you consult your molder early. His assistance now on design and material specifications can be doubly valuable.

KURZ-KASCH

For over 25 years Planners and Molders in Plastics

Kurz-Kasch, Inc., 1421 South Broadway, Dayton 1, Ohio
Branch Sales Offices: New York • Chicago • Detroit • Indianapolis • Los Angeles • Dallas
St. Louis • Toronto, Canada. *Export Offices:* 89 Broad Street, New York City

tive acceleration from approximately 1.6 to 3.2 cps per second is read on the indicating meter. Extensive tests have shown that the test unit is accurate to within 3 percent when measuring rotational speed, whereas a precision to within about 5 percent is obtained when measuring coast-time.

Significance of Electronic Equipment

By means of direct-reading electronic equipment of this type it has been possible to greatly increase the speed with which satisfactory tests may be made. This is particularly true as regards the coast-time of gyro rotor.

Normally, specifications call for bringing the gyro rotor up to full speed (10,500 or 12,500 rpm) and noting the time required for the rotor to come to a standstill. This coast-time is in the neighborhood of 10 minutes. If the coast time is less than 8½ minutes the gyro bearings are too tight and should be loosened, whereas if the coast time exceeds 11 minutes, the bearings must be tightened. Thus, the normal procedure consumes about 10 minutes for each adjustment and several adjustments may be required before a single gyro rotor is properly adjusted. By means of the electronic accelerometer, the coast-time can be determined from the deceleration reading in a matter of a few seconds, and the necessary adjustment on the gyro bearings can be made immediately, even with the rotor turning. Thus, the test unit has been able to effect considerable savings in time.

The vibration channel likewise has been found to be extremely valuable in making it possible to eliminate dynamic unbalance in gyro rotors. After a rotor has been properly balanced and adjusted by means of the electronic test unit, it is virtually impossible to ascertain by touching or listening to the unit whether it is stationary or revolving.—B.D.

ENOUGH COPPER for more than 1,200,000,000 machine gun cartridges has been returned to the national stockpile from the telephone plant of the Bell System, according to Western Electric.

the 11th hour... 11th day... 11th month...

1918 Armistice WAS SIGNED!

November 10th, 1918 . . . 1,081 men were killed, captured, and wounded! That ***extra*** day may mean ***your*** boy's life! . . . Those ***extra*** bonds, scrap, pints of blood . . . will mean ***Victory*** sooner! . . . Are ***you*** making the most of your weapons?

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 our armed forces 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

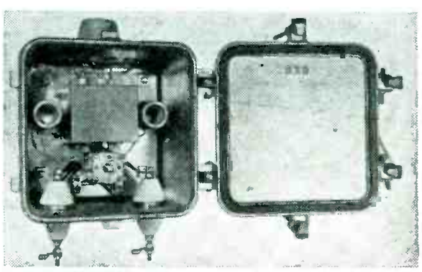
KENYON TRANSFORMER CO., Inc. 840 BARRY STREET NEW YORK, U. S. A.

NEW PRODUCTS

Month after month, manufacturers develop new materials, new components, new assemblies, new measuring equipment; issue new technical bulletins, and new catalogs

Rhombic Antenna Transformer

THIS NEW RHOMBIC receiving antennal coaxial cable coupling transformer, designed for out-of-doors installation) provides an impedance match for 70-ohm cable to 700-ohm antenna terminals with less than 1 db loss over range of from 4 to 22 Mc. The circuit design provides simple d-c continuity checking



throughout the whole length of the antenna from the coaxiable cable input terminal position. Close coupling and powdered iron transformer cores of high permeability are used to achieve a broad frequency response. The unit is housed in a weather-proof cabinet with a water-tight cover.

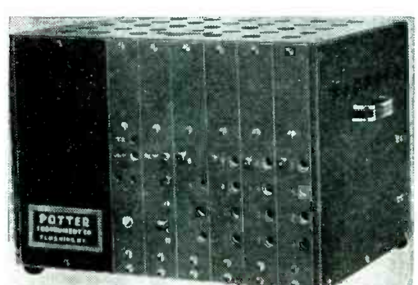
Andrew Co., 363 East 75th St., Chicago 19, Ill.

Interval Timer

THIS INSTRUMENT IS called a "Counter Chronograph Interval Timer" (patent applied for) and is developed for direct-reading instruments. It uses an electronic counter in the timer, and a 100-kc crystal-controlled oscillator to generate the initial counting rate. An electronic switch (or gate) is first actuated by a pulse from the initiation of the time interval. The cycles of the 100-kc frequency are then counted by four decades. The pulse generated by the termination of the time interval turns the electronic gate off, leaving a count on the panel indicator. The resulting count is the number of cycles of the 100-kc source that have elapsed in that time interval. Since each cycle has a duration of 0.00001 second, the reading is hundred-thousandths of a second and the full capacity reading of the panel is 0.09999 second. The counter can then repeat, if desired.

Four tubes are used in the electronic counter decades for counting and indicating a scale of ten. The answers are indicated for each decade on four neon lamps designated 1, 2, 4, 8. Combinations of these lamps indicate 0 to 9. For example: $1 = 1$, $2 = 2$, $2 + 1 = 3$, $4 = 4$, $4 + 1 = 5$, $4 + 2 = 6$, $4 + 2 + 1 = 7$, $8 = 8$, $8 + 1 = 9$.

The instrument operates from a line voltage of 100-125 volts, 60 cps, a.c. The tube complement is 27.



Plug-in construction of various connected units is used throughout. The timer measures 15 x 10 x 10 inches, and weighs approximately 30 lb.

Potter Instrument Co., 136–56 Roosevelt Ave., Flushing, N. Y.

Midget Transformer

THIS TRANSFORMER COMES in an aluminum case and measures 1 inch in diameter and 1 7/16 inches overall height. It weighs approximately 2 ounces. It is rated at 1.4 henries at 0.025 amps d.c., and has a resistance value of 100 ohms. It is for use in electronic applications.

Acme Electric & Mfg. Co., Cuba, N. Y.

"Salad Bowl" Horn

THIS LOUDSPEAKER was designed primarily for the Navy. It is a high-powered unit and has passed Navy tests. Called "Salad-Bowl" horn because of its shape, it is designed for speech reproduction. The speaker has an outside diameter of 12½ inches and weighs approximately 25 pounds. The unit is composed of three principal sections: the base, which provides space for a transformer, and a terminal strip, and provisions for the lead-in cable; the horn, which is of the folded expotential type; and the magnetic unit which is fitted with a two-piece permanent magnet, and diaphragm. The loudspeaker is constructed principally from formed sheet steel and moulded plastic.

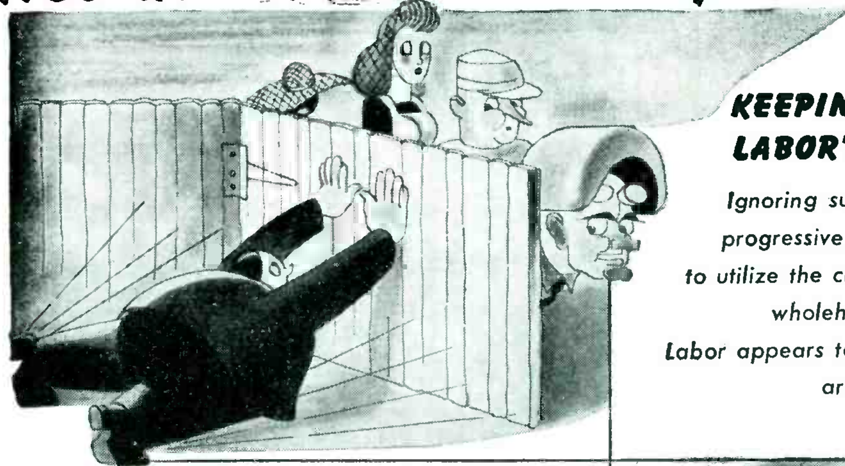
The voice coil impedance of the unit is approximately 7.5 ohms. The speaker develops the high

sound pressure of 50 dynes per sq cm when operated at the rated electrical input and measured at 10 feet from the speaker on the sound axis in open air.

Other features of this loud speaker are that it is resistant to shock, vibration, salt spray, gun blast, and is readily accessible for servicing.

The speaker was designed by Bell Telephone Laboratories and is now being produced by Western Electric Co., 195 Broadway, New York, N. Y.

Three attitudes that hamper war production

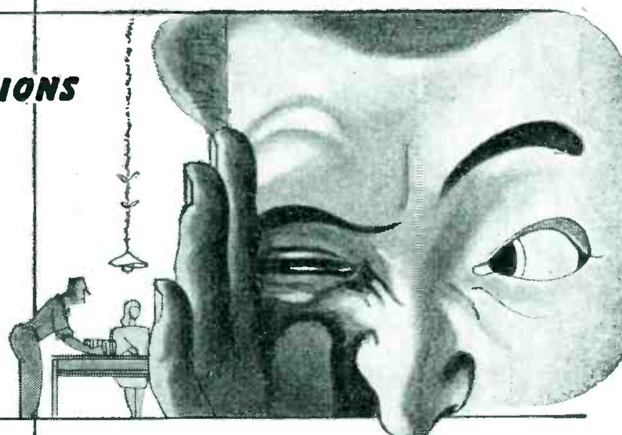


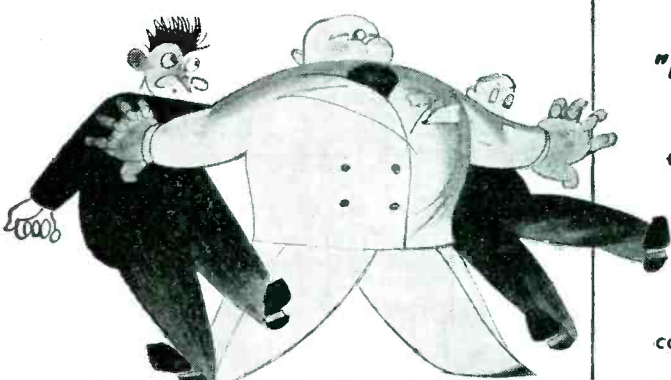
KEEPING LABOR ON LABOR'S SIDE OF THE FENCE

Ignoring successful examples of many progressive plants, some executives still choose to utilize the craftsmanship but not the wholehearted cooperation of labor. Labor appears to be non-essential around the conference table.

ONE EYE SHUT TO WORKING CONDITIONS

A healthy and contented worker is a good worker — but, unfortunately, some men close one eye to this well-established fact. Provisions for maintaining general comfort and morale on the production line are shrugged aside, and then there's wonderment if output lags.





"I'M BETTER THAN HE IS"

While boys of different colors and races and religions fight and die side-by-side, here at home there are those who practice an un-American form of discrimination. Overlooked is the actuality that harmonious relationships of all peoples can, and must, be achieved.

THERE IS NO PLACE IN THIS COUNTRY FOR SUCH ATTITUDES

At ECA, even as in your plant, we have questioned these three attitudes . . . experimented . . . eliminated them. Carrying the fundamental principles of the American dream into our organization, management and labor function as a single democratic unit. Periodic meetings have been established . . . ideas of benefit to both groups are exchanged. Here we gather suggestions for economy and efficiency. Here originate recreational facilities, group insurance and medicine plans, our extensive home front activities. Here developments are born whose value to the country have been effectively demonstrated. Here our policy of assigning jobs on the basis of merit rather than heritage is reaffirmed. *Has our plan worked?* Efficiency steadily increases and production, for example, today is six times greater than it was twelve months ago. This record gives added support to our proposition that, regardless of color or creed, to advance is the common birthright of all men . . . and that mutual cooperation between the man-in-the-front-office and the man-who-puts-things-together is not only highly desirable but highly essential.

eca

ELECTRONIC CORP. OF AMERICA

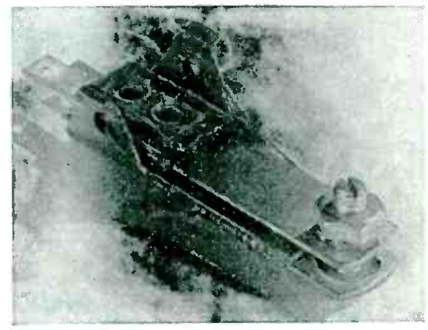
45 WEST 18th STREET • NEW YORK 11, N. Y. WATKINS 9-1870

REPRINTS OF THIS ADVERTISEMENT AVAILABLE

SHAPPE-WILKES INC.

Time Delay Switch

THIS RUGGEDLY constructed ambient compensated time delay switch has contact capacity of 1500 watts. 115–230 volts a.c. The heater windings are wound for 6 to 230 volts. Heavy duty electrolytic silver contacts are available normally open or normally closed. The unit weighs



$\frac{3}{4}$ ounces. Overall dimensions are $2\frac{3}{4} \times \frac{3}{4} \times \frac{5}{8}$ inches. The switch is conveniently mounted with two 6/32 inch screws through eyelets having $\frac{5}{16}$ inch centers. The manufacturer will build the switch to individual specifications.

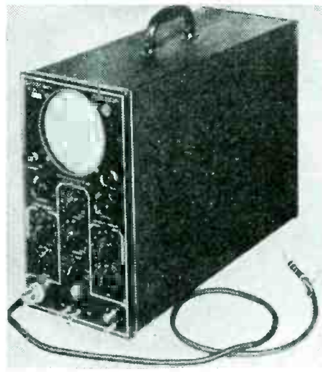
George Ulanet Co., 88 East Kinney St., Newark 5, N. J.

Cathode Ray Oscilloscope

STUDIES OF SQUARE WAVES and pulses in television, and the study and measurement of intermediate frequency phenomena such as wave forms and transients up to 1 Mc may be made on Model 550-A, which is an 5-inch oscilloscope of the wide range type. Square wave signals from 40 cps to 50 kc per second can be accurately reproduced. The vertical amplifier of the instrument has a sine wave frequency response of 50 kc per second, plus or minus 1 db. The gain of the vertical amplifier is high enough to be used for low level frequency audio measurement. The voltage gain is 625. The instrument is equipped with a detachable coaxial cable which has a rated input capacity of $8\mu\mu f$. A special compensated 4-step attenuator permits observation of voltages up to 175 volts, with a variable gain control on the second stage providing continuous variation of gain, without changing frequency characteristic.


rods
tubes
shapes
tapes
RIGID...to FLEXIBLE...
Compounders and Extruders of Specific Materials for Specific Uses
Synflex Compounds as developed in our own laboratories are produced only in the form of rods, tubes, shapes, tapes and elastics. These distinguished materials meet and surpass the most exacting requirements of the electrical and aviation industries. Many formulations are available, each for a specific job.
Synflex FT 10 is used for the lowest temperature applications, retaining its flexibility to —85°F. * * Synflex FT 11, a transparent material, is effective in a wide range of working temperatures from —60°F. to 188°F. * * Synflex FT 22 has a high dielectric strength and for many applications supplants varnished tubing and sleeving.
Synflex rubber-like Tubings are in continuous lengths from B. & S. #24 (.021 I.D.) to 2.000" I.D. Special sizes and shapes upon request.
Inquiries invited. We will gladly submit complete test methods, data and samples.
SYNFLEX
INDUSTRIAL SYNTHETICS CORPORATION
60 WOOLSEY STREET, IRVINGTON, NEW JERSEY

Positive locking (up to 500 kc) of the image on the screen is achieved by synchronizing the horizontal linear time base with the signal of



the vertical amplifier. A switch controls this synchronization at either negative or positive peak. A power interlocking switch, on the chassis, affords protection from high voltage when the unit is removed from its case. The case and panel are of metal. The unit is priced at $187.50 complete with tubes and a 4-foot coaxial cable.

Reiner Electronics Co., 152 West 25th St., New York 1, N. Y.

Instrument Mounting Speed Nut

BULLETIN NO. 179 DESCRIBES instrument mounting speed nuts (A6939) for front mounting of aircraft instruments. The speed nuts are approved by U. S. Army Air Forces. They are made of non-magnetic material and may be installed in standard 0.171 inch clearance holes, and will fit panel thicknesses from 0.062 inches. No special tools are required to install the nuts and they hold firm against the force of inserting the screw and against screw-tightening torque. The nuts may be used with standard brass machine screws.

No. A5939 speed nuts are also described in the bulletin and are for use where non-magnetic qualities are unnecessary. These nuts are made of spring steel and use standard AN530 thread system sheet metal screws.

Tinnerman Products, Inc., 2038 Fulton Road, Cleveland 13, Ohio.

D-C Instruments

A COMPLETE LINE of rugged "Dale" electrical voltmeters, ammeters, microammeters, and milliammeters are available in standard 2 and 3-inch AWS case construction. A solid Bakelite bridge forms the body of the movement. Soft iron pole pieces assure a uniform scale distribution and a special type of balance system is used to give a good balance for all positions of mounting.

Electronic Development Co., 2055 Harney St., Omaha 2, Neb.

Inlaid Characters for Panels

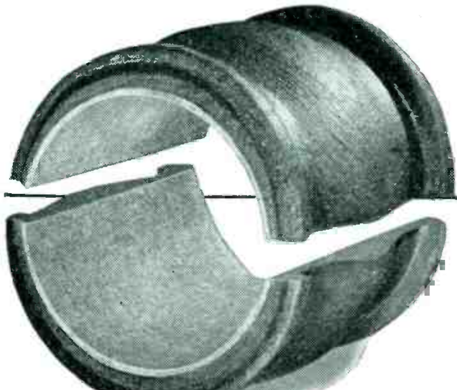
AN "INLAY PROCESS" for placing durable characters on metal panels, chassis, etc. eliminates the use of name plates on front panels. The process is perfected in either a flat or a wrinkled background, on finished metal or on metal in its bare state. Backgrounds can be black, olive drab, brown, or any shade desired. Characters (inlay-baked) may be any color. The background finish protects the inlaid characters and makes them resistant to abrasions and salt spray. (The characters are guaranteed by the manufacturer to pass a 50 hour salt spray test.)

Screenmakers, 64 Fulton St., New York 7, N. Y.

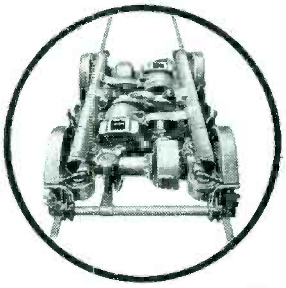
Electronic Drives for Standard D-C Motors

A LINE OF SELF-CONTAINED, adjustable speed, electronic motor drives, which provide d-c motor performance from a-c power, may be used with any machine which is driven by a d-c shunt motor. These drives eliminate the need for specially designed motors. Electronic rectifier tubes are used to convert alternating to direct current. The tubes also supply separate power to the d-c motor armature and field circuits. Each circuit is individually controlled through other electronic tubes to provide speed adjustment and current regulation.

The method used to control armature current prevents excessive current ripples. Full field strength of the motor and limited armature current is utilized in starting so that



There are many grades and types of INSUROK, one or more of which will meet practically every mechanical, electrical and chemical requirement.



INSUROK brake beam bearings, four in a series, are used on each truck.

"THANKS FOR THE SMOOTHER RIDE"

INSUROK bearings are now used on the Chicago Surface Lines' newest street cars.

Bearings by The Richardson Company are made of a combination of molded soft rubber and Laminated INSUROK. INSUROK forms the bearing surface and because this particular grade of INSUROK has a high graphite content, friction is reduced to a minimum—thus permitting smoother starting, travel and stopping. They also eliminate the noise that resulted from the bearings made of other materials, formerly used. And they last ten times longer, thus reducing maintenance and replacement costs.

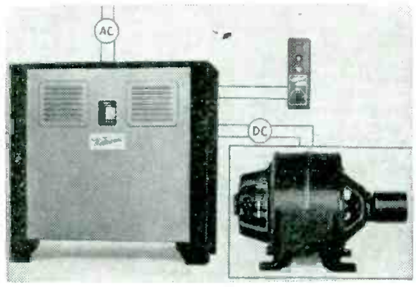
INSUROK, both Molded and Laminated, as well as combinations, is being used for parts and complete products by practically every industry. If you have a problem that INSUROK might solve, why not let an experienced Richardson Plastician help you? Just write for complete information.

INSUROK *Precision Plastics*

The RICHARDSON COMPANY

MELROSE PARK, ILL. NEW BRUNSWICK, N. J. FOUNDED 1868 INDIANAPOLIS 1, IND. LOCKLAND, CINCINNATI 15, OHIO
DETROIT OFFICE: 6-252 G. M. BUILDING, DETROIT 2, MICHIGAN NEW YORK OFFICE: 75 WEST STREET, NEW YORK 6, N. Y.

maximum torque may be had without causing excessive power line surges and interference with other equipment drawing power from the same current source. Full torque is provided at low speeds so that it is possible to vary the speed of a machine without sacrificing torque.



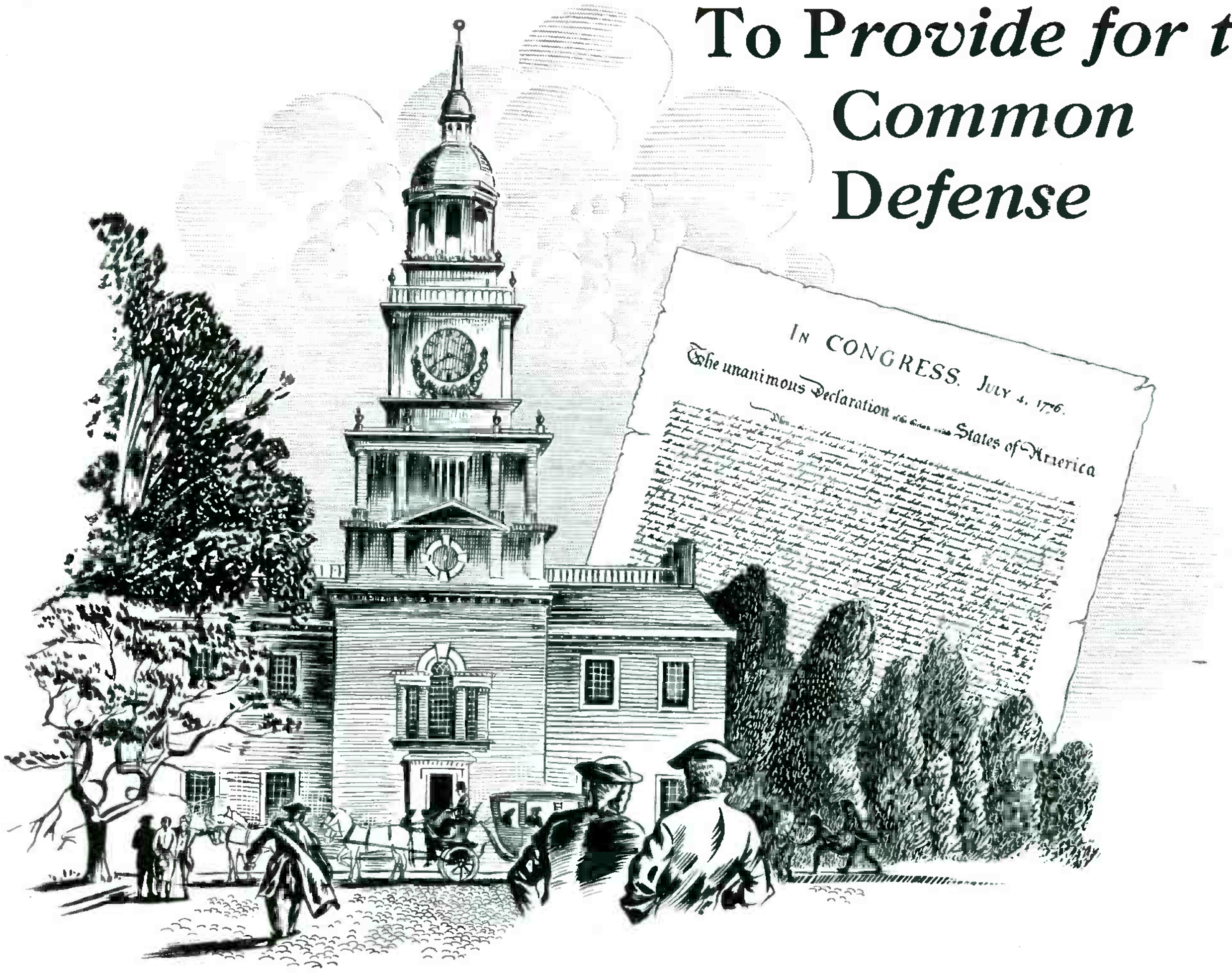
If the motor stalls because the machine is overloaded, the controls automatically limit the current drawn and provide full protection for the equipment. Standard units have start, stop and speed controls, but reverse controls (with or without an independent reverse speed selection control) can be supplied. Capacities in standard equipment are available from ½ to 3 hp, single phase; and from 5 to 10 hp, three phase. Other sizes or special designs for specific applications are also available. Standard voltages are 220–440 at 60 cps (550 volt and 25 or 50 cps machines can be supplied). Units may be wall or floor mounted, and are easy to install.

Weltronic Co., 20735 Grand River, Detroit 19, Mich.

Multi-Range Electronic Comparator

INSPECTION OF FINISHED parts on the production line, and measurements of mechanical dimensions of the work, may be rapidly made on this unit which is now in production by the manufacturer. The comparator consists of a rigid stand which carries an anvil, a gage head, and the indicating instrument. The work to be measured is placed on the anvil and moved under a spindle. The pressure of the spindle is instantly adjustable from zero to 20 ounces. Deviations from normal to the precise degree are recorded on a dial. Electrical zero and magnification adjustments are made by means of convenient controls. Gaging is available from

To Provide for the Common Defense



In 1787, early in May a century and a half ago, distinguished visitors began to appear in the city of Philadelphia. Eventually, on the 25th of May, 55 delegates from twelve States met in formal body and the Constitutional Convention opened.

Throughout the summer these men, "clear-headed, moderate men, with positive views of their own and firm purpose, but with a willingness to compromise," labored soberly to provide their loved country with a means of securing its growth, its safety and the liberty of its people forever.

These men were realists. In the very first Article of the Constitution they provided for an army and navy "for the common defense."

The freedoms, the decency, the justice, the very dignity of man which the Constitution establishes and defends are today being attacked by Japan and Germany. We who draw breath under the Constitution have been forced to create an army and navy to protect it and ourselves. We must continue to build, to increase our own attacking power. It takes work and sacrifice, and it takes money—

"For the Common Defense". . . . Buy War Bonds!

ARMY E NAVY

AWARDED TO THE J. P. SEEBURG CORPORATION FOR OUTSTANDING PRODUCTION OF WAR MATERIALS IN EACH OF ITS FOUR PLANTS

Seeburg

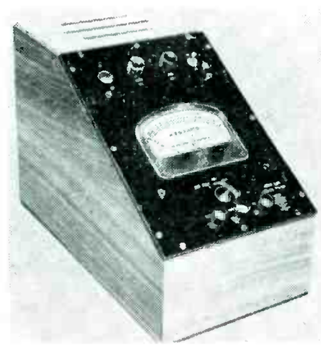
FINE MUSICAL INSTRUMENTS SINCE 1902

J. P. SEEBURG CORPORATION • CHICAGO, ILLINOIS millionths of an inch to ten thousandths, or to thousandths. The instrument operates on 115-volts, 60 cps. It is easy to operate and is particularly adaptable for use in multiple-gage fixtures where any number of important dimensions may be measured simultaneously.

Hathaway Instrument Co., 1315 S. Clarkson St., Denver 10, Colo.

Megohm Meter

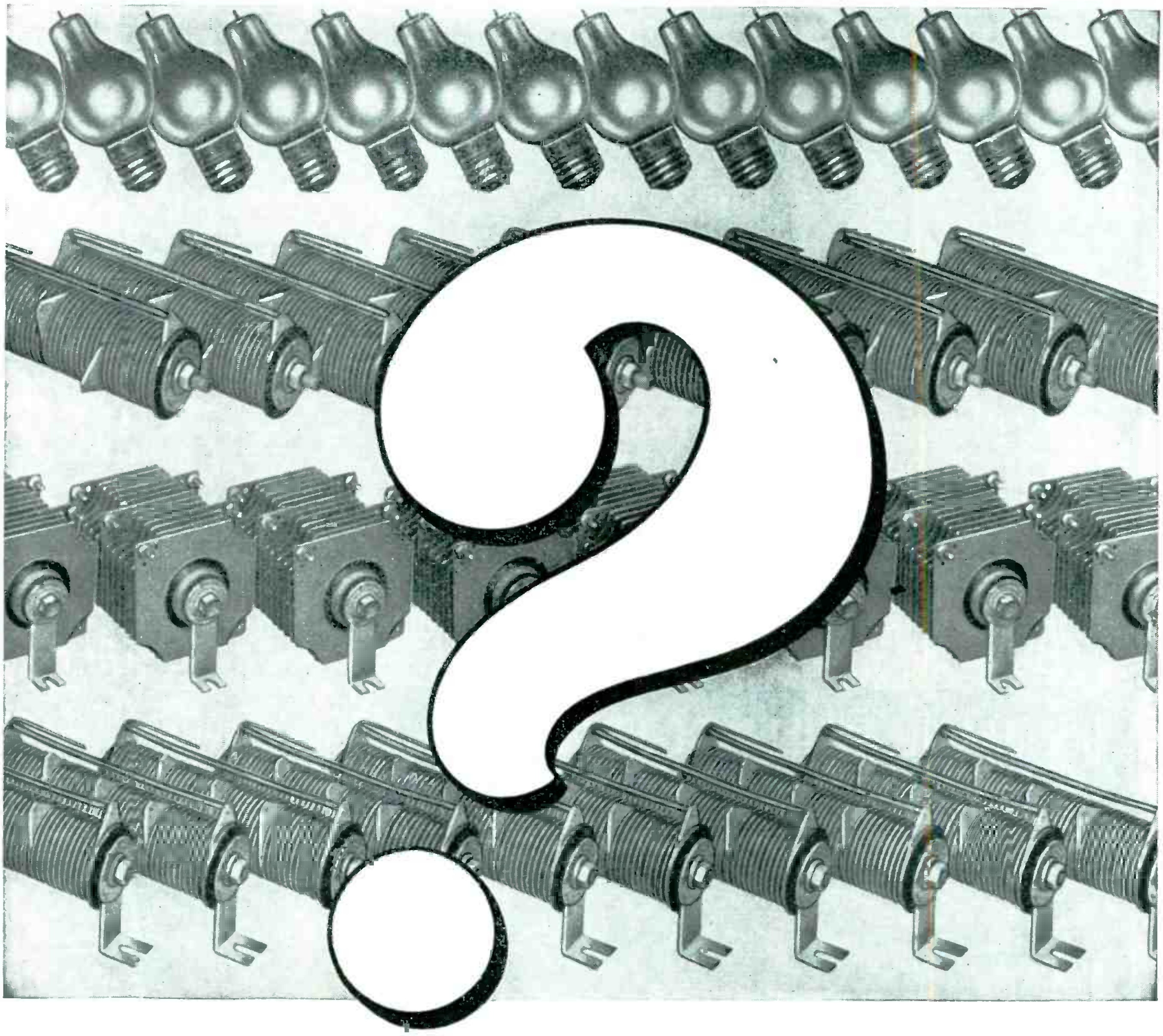
THIS METER IS essentially a direct-reading ohmmeter but a vacuum-tube voltmeter is incorporated in the instrument (Model L-2) to cover high resistance values. The instrument may be used to check leakage resistance of cables and insulting materials, or to locate defective insulation in equipment, to measure carbon resistors, or for production testing of radio capacitors. It is self-contained and operates on 110-volts, 60 cps, a.c. Internal resistance standards enable an operator to check calibration and to make compensating adjustments when necessary. The scale measures 3¼ inches. The internal voltage supply is rated 200 volts and the maximum range extends from 1 megohm to 100,000 megohms in four overlapping ranges but can be extended to 500,000 megohms with an external 1000-volt supply. Maximum resistance in series with a capacitor or insulation under test is rated 1 megohm. The instrument measures 10 x 8 x 15 inches, and weighs 10 lbs.



Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.

Fungus-Resistant Lacquer

A LACQUER which resists moisture and fungi and which has high dielectric strength is available for communications equipment. The



Are You Keeping Up-to-Date

ON LOW-VOLTAGE RECTIFIERS?

1. Name the three most commonly used types of low-voltage rectifiers.

2. In what respects do they differ?

3. What is the best way to decide which type to use for a specific job?

4. Name the only designer-manufacturer of all three types.

5. What engineering-service benefit does the rectifier user get when he consults a company that offers him all three types of rectifiers?

(Turn to page 449 for the answers.)

GENERAL ELECTRIC

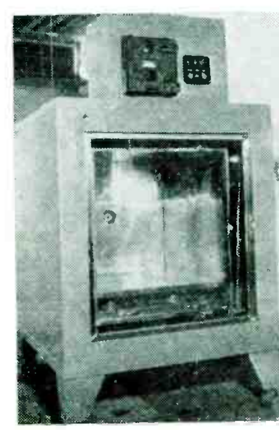
new lacquer is designated as Dulac Fungus-Resistant, No. 86 and it complies with Signal Corps Specifications. It is a clear, quick-drying lacquer that may be applied by spraying, brushing or dipping.

Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.

Constant Humidity Test Cell

THE EQUIPMENT IS primarily designed for studying effects of microscopic layers of moisture (not to be confused with condensate) which sometimes forms on surfaces of radio and electronic equipment.

The unit consists of an outer chamber with insulated walls and a stainless steel inner chamber. Electric heaters and blowers circulate the air around the outside of the inner chamber. The electronic potentiometer pyrometer indicator controller mounted at the top is utilized to control this temperature to ¼ of 1 deg C. The inner chamber has an independent circulating blower which passes the air over a stainless steel tray in which water, lead nitrate or other salt solution is



placed. The air in the inner chamber can be maintained at any point between 30 and 60 deg C, and the relative humidity after temperature stabilization will approach saturation and remain constant indefinitely. By varying the salt solution several relative humidity percentages may be achieved and held to plus or minus 1 percent. Inside dimensions are 36 x 30 x 36 for Model NL-B-4-15 and 24 x 24 x 24 inside for Model NL-B-4-16. The instrument may also be equipped with a recording controller.

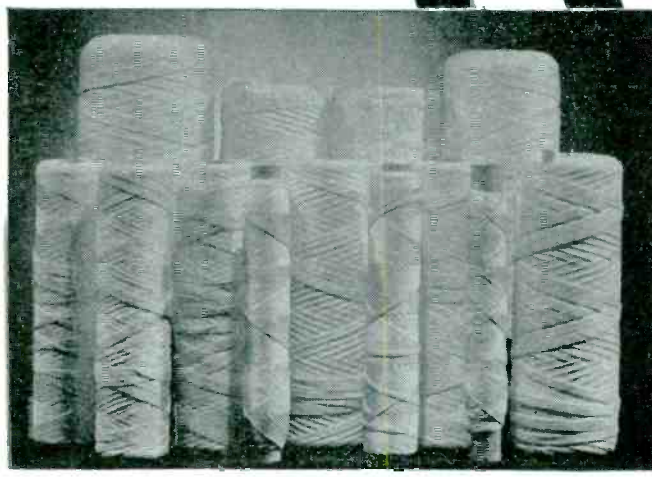
Northern Laboratories Ltd., 50 Church St., New York 7. N. Y.

IMMEDIATE DELIVERY

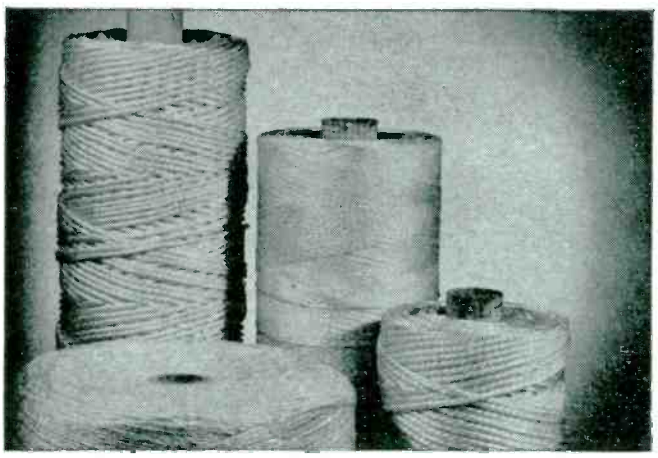
FIBERGLAS
T M Reg U S Pat Office
ELECTRICAL INSULATION

ELECTRICAL IMC INSULATION

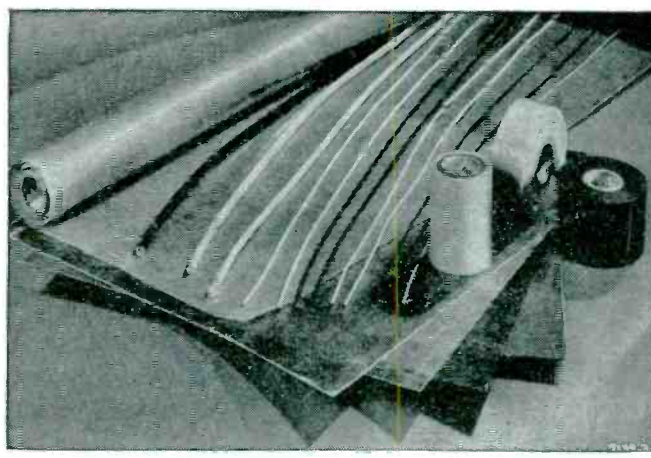
Fiberglas Tapes are available in all standard widths and thicknesses.



Fiberglas Braided Sleevings



Fiberglas Tying Cords both treated and untreated.



A few of the many types of Fiberglas fabricated materials, including varnished Fiberglas cloths and tapes, and varnished and saturated tubings; Fiberglas-mica combinations and Fiberglas laminated sheets.

OTHER IMC PRODUCTS

Macallen Mica Products—Vartex Varnished Cloth and Tapes—Varslot Combination Slot Insulation—Varnished Silk and Paper—Fiberglas Electrical Insulation—Manning Insulating Papers and Press Boards—Pedigree Varnishes—Dieflex Varnished Tubings and Saturated Sleevings of Cotton and Fiberglas—National Hard Fibre and Fishpaper—Phenolite Bakelite—Adhesive Tapes—Asbestos Woven Tapes and Sleevings—Cotton Tapes, Webbings, and Sleevings—Wood Slot Wedges.

WHEN IN NEED CALL FOR THE IMC ENGINEER

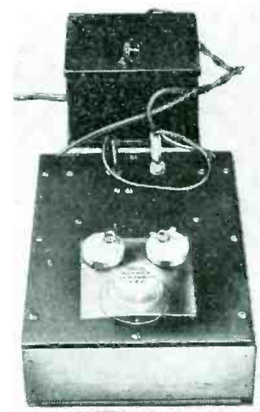
INSULATION MANUFACTURERS CORPORATION

★ CHICAGO 6 • 565 West Washington Blvd.
★ CLEVELAND 14 • 1005 Leader Building

Representatives in
MILWAUKEE: 312 East Wisconsin Avenue
DETROIT: 11341 Woodward Avenue
MINNEAPOLIS: 316 Fourth Ave., South
PEORIA: 101 Heinz Court

Metal Etcher

THIS ETCHER MEASURES 2 x 6 x 9 inches and uses a 110 volt a-c transformer. It is called "Met-L-Etch" and makes from 1,200 to 1,500 impressions per hour. Names, numbers, trade marks, inspection symbols and other data are quickly and permanently etched on smooth metal surfaces without the use of acids. The parts to be marked do



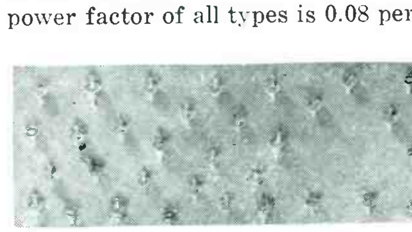
not need any special preparation, nor do they require cleaning or neutralizing after being marked. Two models are available. The first model is for marking flat surfaces, and the other model is for marking the periphery of round parts.

Acme Marking Equipment Co., 2222 W. Fort St., Detroit 16, Mich.

Silver Mica Capacitors

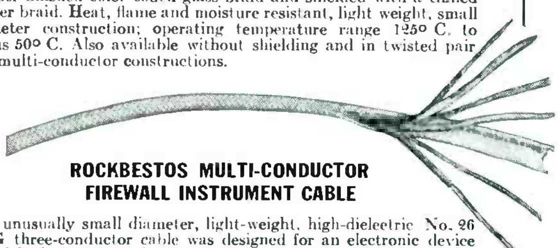
A CAPACITY RANGE of from 6 to 2000 $\mu\mu$f, measured at 1 Mc, is now available in silver mica capacitors whose basic construction consists of stacked mica discs which are individually silvered and vacuum impregnated in transil oil after assembly. Several new types with many terminal arrangements have also been added to the 830 and 831 types described in January ELECTRONICS. These capacitors are especially for use in high frequency applications.

Capacity ranges are from 6 to 650 $\mu\mu$f for types 830, A831, B831 and 833. Type 832 capacity ranges from 650 $\mu\mu$f to 2000 $\mu\mu$f. The power factor of all types is 0.08 per-



SHIELDED ROCKBESTOS FIREWALL RADIO HOOKUP WIRE

Sizes No. 22 to No. 4 AWG stranded tinned copper conductors insulated with synthetic tapes and felted asbestos, covered with lacquer-finished color coded glass braid and shielded with a tinned copper braid. Heat, flame and moisture resistant, light weight, small diameter construction; operating temperature range 125° C. to minus 50° C. Also available without shielding and in twisted pair and multi-conductor constructions.



ROCKBESTOS MULTI-CONDUCTOR FIREWALL INSTRUMENT CABLE

This unusually small diameter, light-weight, high-dielectric No. 26 AWG three-conductor cable was designed for an electronic device in which three No. 22 AWG single conductor aircraft circuit wires previously used had proved too bulky. It is made to a nominal diameter of .125" (smaller than a No. 14 AWG single conductor 1000 volt Rockbestos Firewall Radio Hookup Wire). Also in 4 and 5 conductor constructions.

ROCKBESTOS ASBESTOS INSULATED LEAD WIRE

Sizes No. 22 to 4 AWG solid or stranded copper, monel or nickel conductors insulated with .031" or .040" of impregnated felted asbestos in black, white or colors.

Heatproof and flame-resistant, this lead wire will not bake brittle and crack under vibration, won't rot, swell or flow when in contact with oil or grease, and has ample moisture resistance for most applications.

ROCKBESTOS ASBESTOS INSULATED MAGNET WIRE

Round, square and rectangular asbestos insulated conductors finished to meet varying winding conditions and coil treatment requirements.

Designed for Class B windings and also suitable for use as insulated bus wire where high-dielectric strength is not required. The insulation is non-checking and is unaffected by heat or aging.

A few of the 122 different wires, cables and cords designed for severe operating conditions by Rockbestos.

Investigate Permanently Insulated Rockbestos Wires, Cables and Cords

Gone are the days of "by guess and by gosh" in wire selection for electrical equipment and apparatus. Today, product designers *either* figure out in advance such factors as operating conditions, dielectric strength, voltages, diameters, probable ambients, etc., . . . *or else* they supply a wire manufacturer with the complete facts and follow his recommendations. Experience proves that wire-planning in design stages assures dependable, trouble-free wire performance when the equipment is in service.

If you are solving your own wire problems, then investigate Rockbestos *permanently insulated* wires, cables and cords. 122 standard constructions are available. Each with a permanent asbestos insulation that resists heat, flame, moisture, cold, oil, grease and other severe conditions.

If you need wire-engineering assistance on your prototype requirements . . . for either complete solution of your wire needs or the answer to some specific wire question . . . Rockbestos Research will gladly help you. There is no obligation. Simply write nearest branch office or:

Rockbestos Products Corporation
412 Nicoll St., New Haven 4, Conn.

ROCKBESTOS RESEARCH

Solves Difficult Wiring Problems

NEW YORK, BUFFALO, CLEVELAND, CHICAGO, PITTSBURGH, ST. LOUIS, LOS ANGELES, SAN FRANCISCO, SEATTLE, PORTLAND, ORE.

INVEST IN WAR BONDS • MAKE EVERY PAYDAY A LAY-AWAY DAY

cent for resonant circuit applications, and 0.12 percent for by-pass or blocking use. Leakage resistance is 10,000 megohms.

Literature on these silver mica capacitors is available from the manufacturer, Centralab, Division of Globe-Union Inc., 900 E. Keefe Ave., Milwaukee, Wis.

Static Bars

METAL ENCASED, fibre-covered midget static bars are available to assist in the elimination of dangerous positive charges of electricity where materials such as wool, nylon, rayon and certain other kinds of transparent films are used. The bar consists of a charged inner bar which has a brass casing surrounding it. There are holes spaced equally throughout the length of the bar so that each point of the inner bar comes in the center of the hole of the brass casing. The inner bar

is held in position in the brass casing by insulating bearings. The brass casing is insulated from the ground by the fibre casing and is charged by induction from the inner bar and ground. The potential of the brass casing is adjustable so that the casing voltage may be fixed at the most efficient point for eliminating a particular kind of charge.

The Simco Co., 4929 York Road, Philadelphia 41, Pa.

Alternate for Varnished Silk

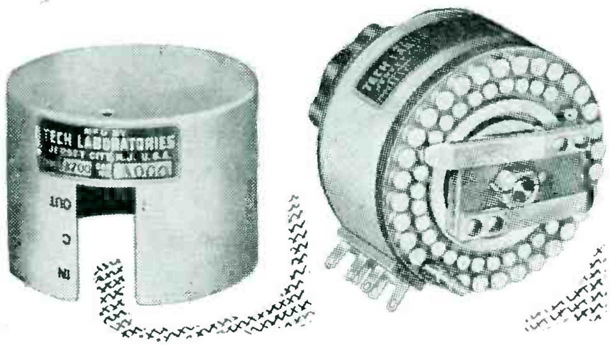
THIN COTTON CLOTH varnished to specified thicknesses is available as an alternate for varnished silk. It is obtainable in continuous length rolls of 36 or 72 yards. The material has been introduced to eliminate the need for splicing 51-inch bias cut strips, and it permits uniformly tight, compact taping since it is free from seams or splices. It may be had in either a slightly tacky or in mica-dusted finish. The dielectric strength is rated 1200 vmp, and tensile strength as 42 lb per 1-inch width.

Irvington Varnish and Insulator Co., Irvington 11, N. J.

To meet your most exacting requirements . . .

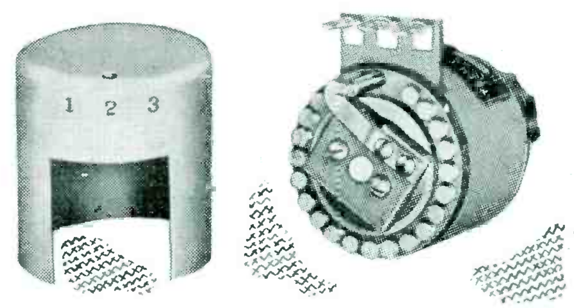
ATTENUATORS *by* TECH LABS . . .

T-PAD ATTENUATORS



TYPE 700 Attenuators embody all improvements made during the war on our former Type 95 units. These improvements include silver contacts; improved die cast detent housing and detent gear which will stand up for a half million revolutions and more; special wiper springs of stainless silver which keep contacts clean and eliminate the necessity of periodic cleaning, and also greatly improves the noise level. In addition, the rotor hub is pinned to the shaft, preventing unauthorized tampering and keeping the wiper springs in perfect adjustment. Write for Bulletin No. 431.

MIDGET ATTENUATORS



TYPE 600 Midget Attenuators represent a crystallization of all the improvements and experiments made during the war. These units also have silver contacts and special silver alloy wiping springs which stay bright and clean and reduce maintenance and noise level. The hubs are also pinned to the shaft and all other parts are as rugged and mechanically perfect as is possible in this small size. Write for Bulletin No. 431.

These units can also be furnished as Ladders, Potentiometers, Dual Potentiometers and Tandem units.

CONSULTATION SERVICE . . .

You are invited to consult with our Engineering Department on your "special design" problems.

PATS. APP. FOR

TECH LAB. MICROHMMETER . . .

gives direct and instantaneous readings of resistance values down to 5 microhms and up to 1,000,000 megohms. Furnished in two models. Accuracy in all measurements to better than 2%. Entirely AC operated. Write for Bulletin No. 432.

TECH LABORATORIES

7 LINCOLN STREET, JERSEY CITY 7, N. J.

MANUFACTURERS OF PRECISION ELECTRICAL RESISTANCE INSTRUMENTS

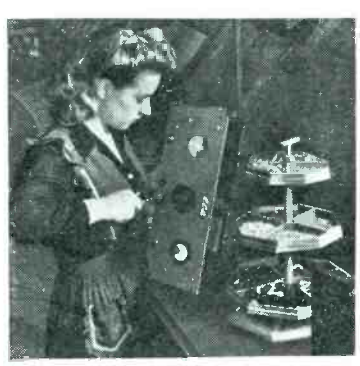
Oscillograph for Recurrent and Transient Studies

TYPE 247 OSCILLOGRAPH may be used to facilitate investigation of transients, as well as recurrent phenomena, over a wide frequency range. The instrument uses the Army-Navy preferred Type 5CP1 cathode-ray tube with an intensifier electrode, operated at an overall accelerating potential of 3000 v. High-intensity patterns are obtained on a 5-inch diameter screen. Standard screens are medium-persistence green. If a permanent record of transient phenomena is required, the instrument can be supplied with a short-persistence blue screen for high-speed photographic recording, or with a long-persistence green screen for visual observation of low-speed phenomena. The sweep frequency range of the instrument extends down to ½ cps. The instrument measures 14 x 19 x 26 inches and weighs 130 lbs.

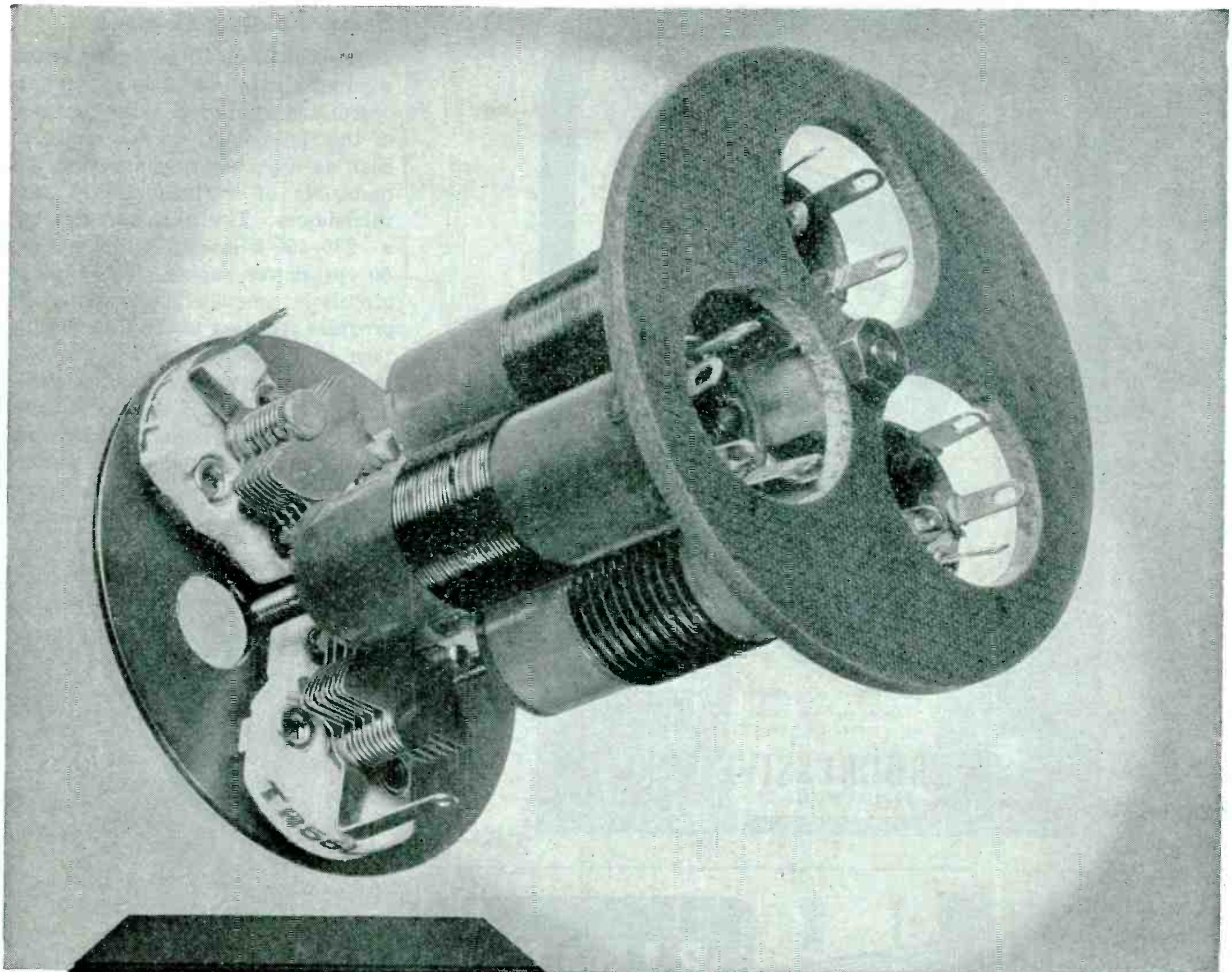
Allen B. DuMont Laboratories Inc., 2 Main Ave., Passaic, N. J.

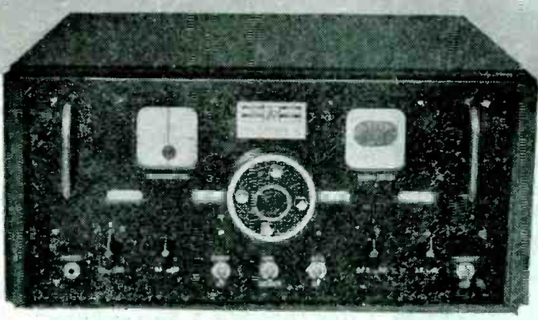
Handy Tray for Assembly Line

SMALL COMPONENT PARTS can be accommodated in this tray ("Handi-Tray") which is 17 inches high and 20 inches square and has three tiers of shelves with four trays on each shelf. The trays are removable and may be inter-changed. The whole unit revolves about a central pivot to facilitate the selection of a part. The tray has a handle on the top so the unit can be placed wherever it is needed. A heavy base prevents tipping.



Handi-Equipment Co., 105-20 New York Blvd., Jamaica 5, N. Y.

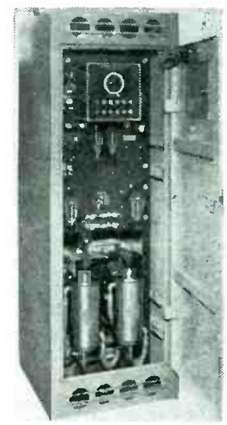




LRR4 (APPROVED FOR LOW RADIATION)

Seam-Welding Control

TYPE CR7503-B110 IS a new seam welding control which is useful for operations where frequency changes of the timing pattern are required such as when welding a variety of materials of various shapes and thicknesses. The unit operates on a 230–460–575-volt, single-phase, 60 cps power supply. The timing circuit is completely electronic. It provides accuracy of the timing pattern of the weld regardless of normal, instantaneous, or gradual line-voltage variation. The control consists of a timing panel, a firing and a heat control panel, and a power panel, any of which can be separately disconnected and removed to



facilitate inspection or servicing. A phase-shift method provides smooth heat control. Snap switches provide adjustment of the "heat" and "cool" time in one cycle steps from 1 to 30 cps. All the switches are conveniently located on a compact panel which is readily accessible through a flap opening. A row of indicating lights on the front door of the instrument show instantly whether the water flow is adequate, power has been applied, and the time-delay has timed out.

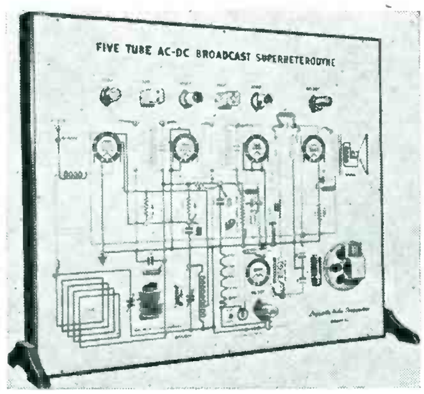
General Electric Co., Industrial Control Division, Schenectady, N. Y.

Broadcast Receiver Demonstrator

TO SIMPLIFY INSTRUCTION in theory and radio circuit design, operation and servicing for workers' training programs and school curricula, a new 5-tube superheterodyne broadcast receiver (panel-type) which actually operates is available. The unit is assembled on a 30 x 36-inch


Type ER Series. Ambient Compensated Time Delayed Relays.
Type B-3120 Thermostat and Heater. Crystal Dew Point Control.
Type C-4351 Thermostat. Used for Tube Warming, Tube Cooling, High Limit Controls, etc.
For Control Security
Type RT Thermostat. Adjustable Crystal Temp. Oven Control.
Type C-2851 Thermostat. For such use as Roughing Controls on Outer Crystal Ovens.
USE KLIXON SNAP-ACTING CONTROLS...
ON
OFF
Type C-6363. Switch Circuit Breaker.
No complicated operating mechanisms such as relays, toggles, magnets, springs or other fussy parts—nothing to get out of adjustment—that's why Klixon disc-operated controls provide complete security and protection.
What actuates Klixon controls? A simple scientifically calibrated Spencer thermostatic disc that snaps to a quick, clean break or a solid make. And because this disc does away with complicated parts, Klixon Controls are highly resistant to shock, motion, vibration, and altitude.
Klixon snap-acting controls are small, compact, and light in weight. They are available in a wide range of types for such applications as motor and transformer overheat protection, electrical circuit overload protection, thermal time delays or temperature control for radio equipment. Write for complete information.
Type PM (NAF-1131) Circuit Breaker.
ARMY E NAVY
KLIXON
TRADE MARK REG. U.S. PAT. OFF.
SPENCER THERMOSTAT COMPANY, ATTLEBORO, MASS.

imprinted panel and mounted in a reinforced hardwood framed 3-inches deep. It may be set up on a table or blackboard or it may be placed on a wall for vertical observation. The tubes are of high voltage filament types and the circuit is wired for operation on 110 volts,



a.c. or d.c. All parts, except the loop, are mounted in plain view adjacent to their schematic position on the panel which is printed in four colors. The colors coincide with RMA standards with grid circuits in green, plate circuits in blue, positive potential (B plus) lead in red, and the balance of the circuit in black. Multiple snap connectors are provided to demonstrate trouble shooting.

Lafayette Radio Corp., 901 W. Jackson Blvd., Chicago 7, Ill.

Fractional HP Motors

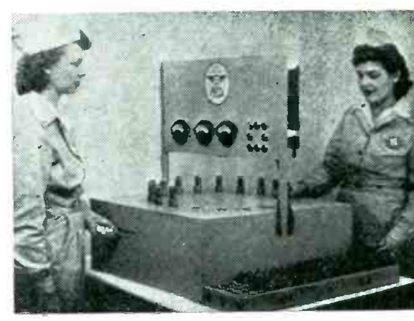
THESE FRACTIONAL HP motors (designated as SM-2) measure 2 x 3¼ inches (plus shaft extension) and weigh 22½ ounces. They are built to special order for such uses as cooling fans and blowers, vacuum pumps, remote control of radio and instruments, band switching and other airplane applications. The motors are completely enclosed and have aluminum ends, ball bearings and stainless steel shafts. They are reversible, with high starting torque and low current draw, and can be wound for voltages from 6 to 230. The winding of the motors are of magnet wire, impregnated with varnish. Mica-insulated commutators, and laminated field and armature cores are used. Flange, clamp, base or integral mountings are furnished for operating in any required mounting position. Speeds are from 2000 to 20,000 rpm on alternating or direct current or both.

The motors are corrosion proof and pass the 200-hour, 20 percent, salt spray tests.

Small Motors, Inc., 1308 Elston Ave., Chicago 22, Ill.

Tube Checker for Production Lines

In order to facilitate the testing of faulty tubes a precision tube checker is available which may be operated by a group of people to check a number of tubes at one time. The manufacturer of this checker claims that tube checking is speeded up 3000 percent over the one-man tube-checkers. The machine illustrated takes two (unexperienced) persons to operate it. One person puts the tubes in one side while the other employee manipulates the turntable through a slide lever. As the table turns, preheating starts, and glow lamps indicate shorts. In the last operation, prior to tube removal, three meters indicate a good or a bad tube. Errors due to haste, mishandling and wrong instrument setting are eliminated and all electrical checks are carried on efficiently and speedily.



Pacific Electronics, Sprague and Jefferson Sts., Spokane 5, Wash.

Mold and Fungi-Resistant Insulating Material

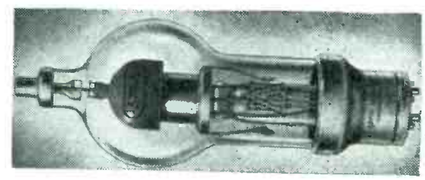
"Pemque" is a new type of pyroplastic which is described in March Electronics. This new type material is an inorganic material which is used for insulating purposes in electronic equipment used in the tropics. The material is highly resistant to mold and fungi growth and is impervious to moisture. In the molding of this material a pyrowelding process is used which permits the components of the mate-

rial to be welded to such density that machining to tolerances of 5 mils is practical.

International Products Corp., 2554 Greenmount Ave., Baltimore 18, Md.

Rectifier

TYPE 575-A is a half-wave mercury-vapor rectifier for use in suitable high-voltage d-c power supply devices operating from an a-c line. Full-wave rectification can be obtained in single phase circuits by using two of these rectifiers. An edgewise wound ribbon filament (made of a new alloy material) provides a cathode of large emission reserve and is designed to give longer life. Two of these rectifiers operating in a full-wave rectifier are capable of delivering to a



choke input filter a rectified voltage of 5000, at 3 amps, with good regulation.

Characteristics of the tube are as follows: Filament voltage (a.c.) 5.0 volts; filament current 10 amps; peak inverse voltage 15,000 volts with a condensed mercury temperature of 20 to 50 deg and 10,000 volts with a condensed mercury temperature of 20 to 60 deg; peak plate current 6.0 amps; average plate current 1.5 amps; tube voltage drop, approximately 7.5 volts.

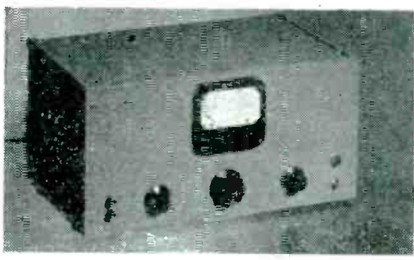
Arpin Mfg. Co., 422 Alden St., Orange, N. J.

Portable D-C Power Supply

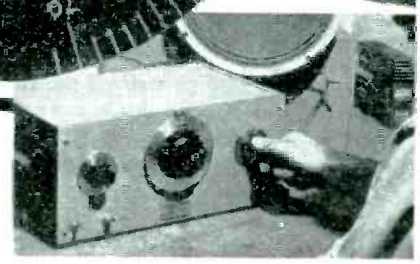
THIS PORTABLE d-c power supply is for use on assembly lines. It provides power for manufacturing, testing and operating electrical and electronic equipment in aircraft and other units which use 12 or 24-volt systems. The unit may also be used to taper charge batteries or battery carts of similar voltages. It operates from three phase a-c lines of 208 and 230 volts. Three models are available. The first is No. VA1500, which has a d-c output of 10 to 16 volts at 100 amps, or

INSTRUMENTS COVER A WIDE RANGE OF USES

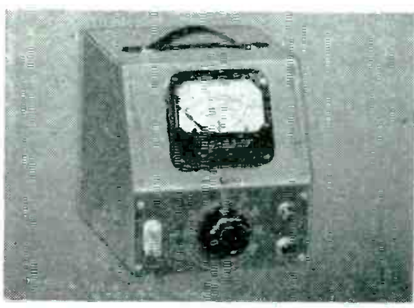
Simplicity of operation combined with extreme accuracy makes for greater speed in measuring and testing AF apparatus. These fundamental characteristics are basically what makes *-hp-* Instruments outstanding in the field. The variety of instruments available and the range of tests and measurements they accomplish is comprehensive. The following is a partial listing of standard *-hp-* instruments available at this time:



Audio frequency oscillators of the resistance-tuned type. Excellent frequency stability and freedom from wave form distortion. Model 200B Resistance-Tuned Oscillator illustrated.

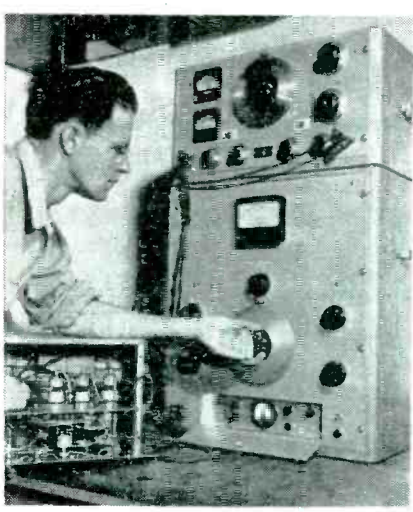


Instruments for measuring frequency including secondary frequency standard and electronic frequency meters. Model 500A Electronic Frequency Meter illustrated.

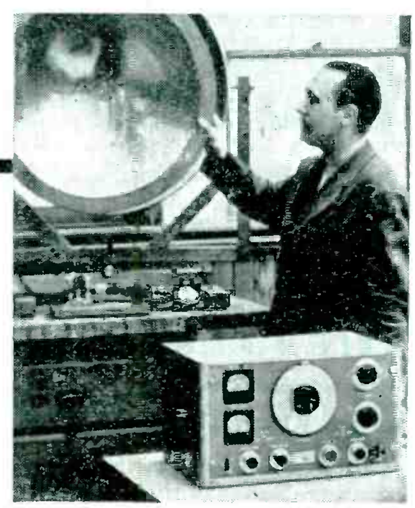


Instruments for measuring voltage in the audio and high frequency range. Model 400A Vacuum Tube Voltmeter illustrated.

Instruments for making over all measurements on audio equipment including total harmonic distortion, frequency response, and hum level. Model 325B Distortion Analyser illustrated.



Harmonic wave analysers with many new features including variable band width. Model 300A Wave Analyser illustrated.



Audio signal generators providing standardized voltage throughout the audio frequency range. Model 250AG Audio Signal Generator illustrated.

If you have a special problem *-hp-* Engineers will gladly cooperate without cost or obligation. Ask for Catalog number 17A and enter your name for regular receipt of technical bulletin.

HEWLETT-PACKARD COMPANY

Box 876A • Station A • Palo Alto, California

876

20 to 32 volts at 50 amps; Unit No. VA3000 has a d-c output of 10 to 16 volts at 200 amps or 20 to 32 volts at 100 amps; and the third

model is No. VA4500 which has a d-c output of 10 to 16 at 300 amps or 20 to 32 volts at 150 amps. Models are also available with similar d-c outputs but for operation on 460 volts a.c. Rectification is provided by the manufacturer's magnesium-copper sulphide dry disc rectifiers.

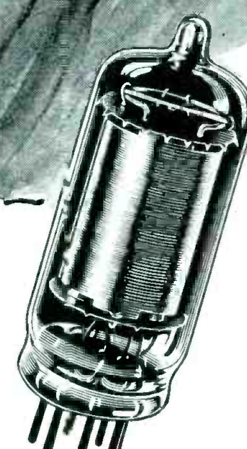
P. R. Mallory & Co., Inc., Indianapolis, Ind.

Portable Insulation-Resistance Meter

THIS METER MEASURES the resistance of insulation in apparatus during the manufacturing process and reveals imperfections. It may also be used to check the condition of insulation of apparatus which is in service, or for rapidly testing a wide range of production or experi-

mental samples of insulating material. The instrument consists of an electronic rectifier, a Thyrite bridge circuit, and an electronic-tube voltmeter. It is available in two types. One type has a scale calibrated from 1 to 50 megohms and measures resistance at 500

YOU CAN'T BUY A NEW TUBE IN A FOX HOLE



When a signal corpsman goes into action, the tubes his unit must depend upon for communications are the tubes that were issued to him back at the base. They have been jerked on trains, handled in and out of ships and tumbled in trucks before they even get to him. Then he gives them a long rough ride in the set on his back. Tubes have to be good to stand up under this kind of treatment.

Little did TUNG-SOL Engineers realize that the many design and construction features they incorporated in TUNG-SOL Tubes long before there was any thought of war, would assume a new importance in our nation's battles. Then TUNG-SOL Tubes were built to withstand the synthetic abuse we called "Vibration-Testing". Now they are called upon and do withstand the real thing.

Manufacturers and users of radio and other electronic devices and controls may be assured that the TUNG-SOL Tubes they buy for initial equipment and replacement have been "War-Tested" far beyond any requirement of civilian use. TUNG-SOL Research and Development Division will be glad to assist manufacturers in planning circuits and selecting TUNG-SOL Electronic Tubes for present and future devices.

THE SPRING DAMPER BAR developed by TUNG-SOL

The TUNG-SOL Damper Bar construction is positioned to hold the filament tension spring to one side, thus taking the whip out of the filament above the mica disc. This whip would allow the filament to vibrate, the cause of low frequency pitch known as "howl".

TUNG-SOL

vibration-tested

ELECTRONIC TUBES

ARMY E NAVY

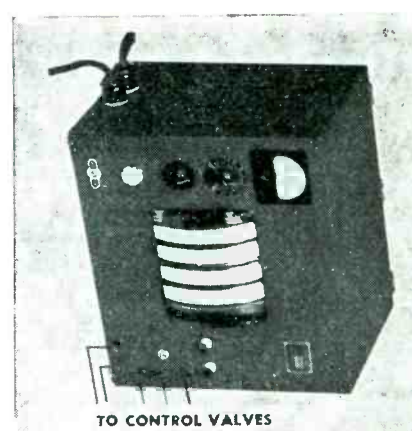
TUNG-SOL LAMP WORKS INC., NEWARK 4, NEW JERSEY

ALSO MANUFACTURERS OF MINIATURE INCANDESCENT LAMPS, ALL-GLASS SEALED BEAM HEADLIGHT LAMPS AND CURRENT INTERMITTORS volts d.c., and the other type has a zero to 20,000 megohm total range and measures resistance over four different resistance intervals (from 0 to 5 megohms at 0-250 volts d.c., and 5-200, 50-2000 and 500-20,000 megohms at 500 volts d.c.) Any range may be selected by a panel-mounted rotary switch. The unit operates on 115 volts, 60 cps.

Special Products Div., General Electric Co., Schenectady, N. Y.

Electric Manometer

THIS UNIT IS DESIGNED to change minute pressures, which might be expressed in inches and tenths of inches of water, into electrical readings. This is done by a sensitive pressure measuring device which operates on a no-point principle utilizing a Wheatstone bridge circuit. The pressures are converted into actual inches and tenths readings which are on a drum indicating unit. This instrument has a range of 0 to 100 inches of water



with a sensitivity of ¼ of 1/10 of 1 inch, with an accuracy of plus or minus one tenth of 1 percent. The unit also is available in ranges of 0 to 5; 0 to 30; and 0 to 50 inches, having correspondingly better degrees of sensitivity with the same percentage of accuracy.

Trimount Instrument Company, 37 W. Van Buren St., Chicago 5, Ill.

Volt-Ohm-Milliammeter

MODEL 710 METER comes complete with cover, self-contained batteries, test leads and instructions. The instrument measures 6 x 10 x 10 inches and weighs 11 lb. It uses a 4½-inch square, rugged 0-400

SUPPLEMENTAL "DIRECTORY" INFORMATION

for Electronic Engineers

You will find S. S. White listed in this directory issue under these headings — Flexible Shafts — Fixed Resistors — Molders of Plastics. The following elaboration should be helpful to Electronic Engineers.

FLEXIBLE SHAFTS

S. S. White offers the widest selection of flexible shafts for power transmission and for remote control, each type specially engineered and constructed for its particular function.

POWER DRIVE SHAFTS range in diameter from .095" to .750" with a selection of different characteristics of torsional strength, torsional deflection, transverse flexibility, etc., in each diameter. Engineering data on these shafts given in *BULLETIN 1238*.

REMOTE CONTROL SHAFTS come in diameters from .130" to .437"; also in a wide selection of characteristics. *BULLETIN 38-42* covers these shafts.

FLEXIBLE CASINGS — A wide range of Metallic, Fabric and Rubber Covered Casings for light and heavy duty use with flexible shafts. Details are included in the bulletins mentioned.

END FITTINGS for shafts and casings in a comprehensive selection of designs. Illustrations with dimensions in *BULLETIN 43*.

Copies of the Bulletins will be mailed to you on request.

FIXED RESISTORS

Information about these Resistors will be found in another ad in this issue which you can locate by referring to the Advertiser's Index.

MOLDERS OF PLASTICS

S. S. White offers a complete line of plastic dummy shipping plugs and caps designed to provide inexpensive protection for products with threaded openings during shipment. Full details in *BULLETIN P-4305*—copy on request.

S. S. White also offers a complete plastics molding service equipped to provide the best in molding in any thermoplastic or thermosetting material to your specifications. Quotations on your requirements furnished on request.

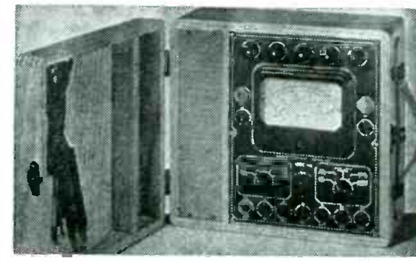
The name "S. S. White" on any product is your guarantee of highest standards of engineering, material quality and craftsmanship.

S.S.WHITE INDUSTRIAL DIVISION

THE S. S. WHITE DENTAL MFG. CO.

DEPT. E. 10 EAST 40th ST., NEW YORK 16, N. Y.

FLEXIBLE SHAFTS — AIRCRAFT ACCESSORIES — MOLDED PLASTICS — MOLDED RESISTORS — FLEXIBLE SHAFT TOOLS microamp meter. All the calibrations are printed directly on the meter scale in large easy-to-read type. The meter has 6 d-c voltage ranges and 6 a-c voltage ranges up



to 1500 volts, 7 direct current ranges up to 30 amp, 1 alternating current range up to 3 amp and 5 resistance ranges up to 10 megohms. Sensitivity of the meter is rated 1,000 ohms per volt on both a.c. and d.c.

Superior Instrument Co., Dept. W, 227 Fulton St., New York 7, N. Y.

Portable Cord Receptacle

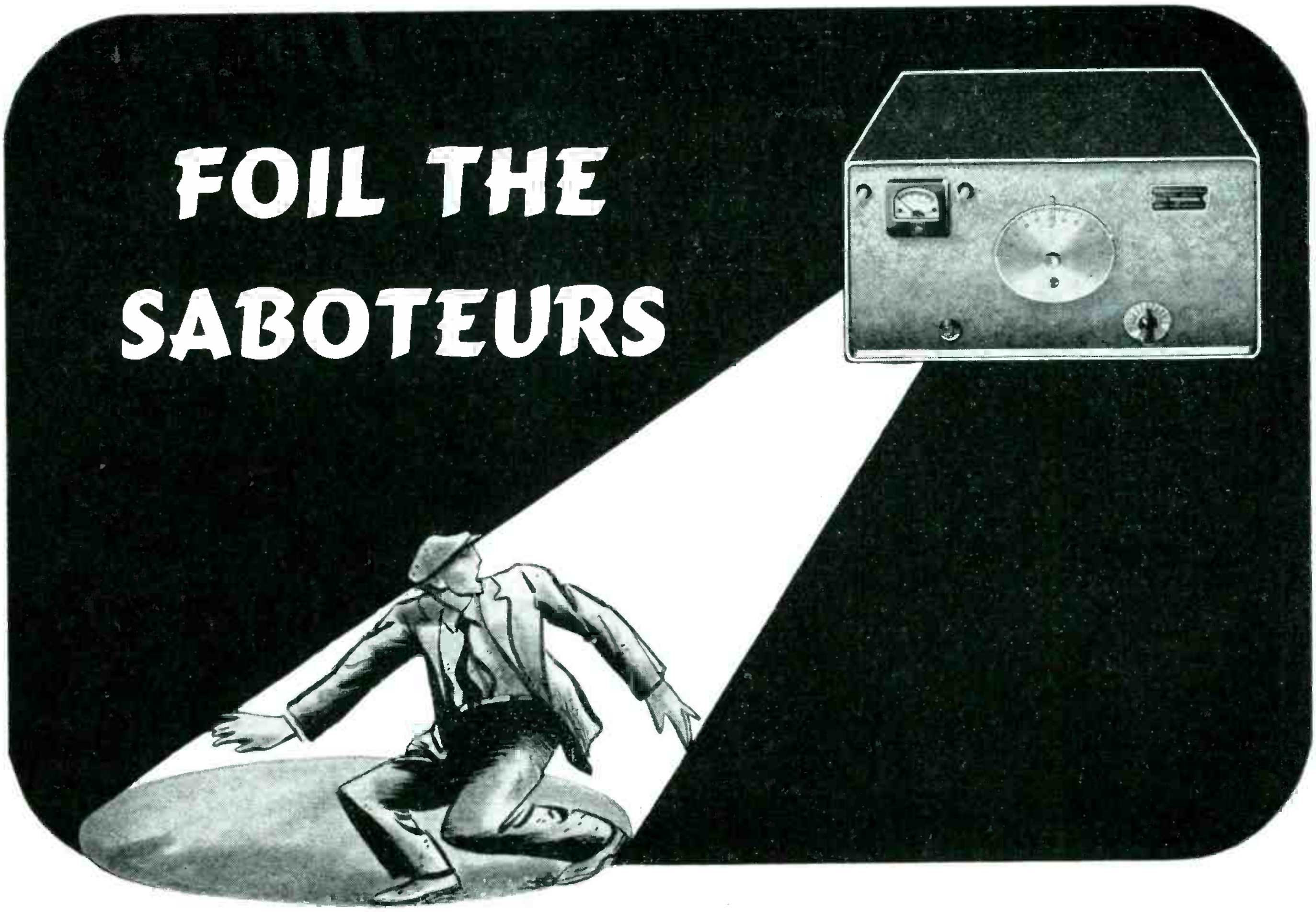
BULLETIN AB3101 CONTAINS information on Type AN3101 electrical connector whose general appearance is that of a plug but it has a male coupling thread similar to the manufacturer's types AN3100 and AN3102 and is therefore designated as a receptacle. It is a mating cord for types AN3106 and AN3108 but it has no mounting facliities and may be used in place of types AN3100 and AN3102 connectors when regular mounting is not necessary. The receptacle may also be used with an extension cord. It is available in sizes 8s to 16s, and 12 to 36 inclusive.

Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Cal.

Duo-Directional Sound Reproducer

MODEL HI-8 sound reproducer has an 8-inch permanent magnet speaker (with a 6 ohm voice coil) and is designed to operate in conjunction with the manufacturer's music and voice-paging systems, in industrial plant-broadcasting of any size area where up to medium noise conditions exist and wide angle distribution of voice and sound is desired.

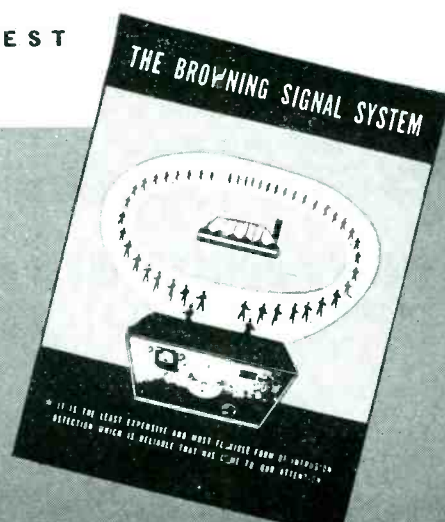
Executone Inc., 415 Lexington Ave., New York, N. Y.



Give critical plants the protection of Browning Signal System with its balanced-capacitance electronic circuit, which saturates vulnerable areas and releases guards for productive duty. Pre-Pearl Harbor installations have proved efficient, dependable, economical.

Browning Frequency Meters are accurate to .005%. Pre-check public utility and other emergency radio systems. Assure signal clarity.

ILLUSTRATED LITERATURE UPON REQUEST



BROWNING

LABORATORIES, INCORPORATED
WINCHESTER, MASSACHUSETTS

Literature

Buyers' Guide. The Buyers' Guide section published in this issue will be available as a separate reprint. Prospective purchasers can obtain a copy by enclosing fifty cents with their order and addressing it to Electronics Editorial, 330 West 42nd St., New York 18, N. Y.

Tube List. A 4-page folder contains prices and a listing of such tubes as transmitting (air and water-cooled), rectifying, special-purpose tubes, and water jackets and accessories. Rating for the various tubes are given. Federal Telephone and Radio Corp., Newark, N. J.

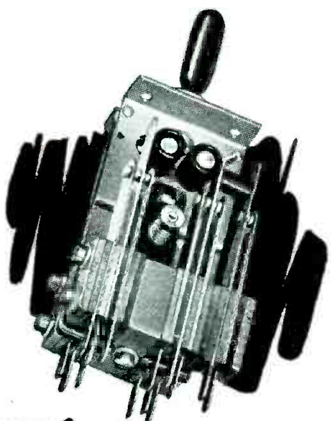
Voltage Stabilizers. Bulletin No. DL48–537 contains eight pages of data on three standard designs (cased, uncased and endbell) of voltage stabilizers which deliver output voltages to ± one-half percent over their full rating. The units are entirely automatic and require no adjustments or maintenance. Raytheon Manufacturing Co., 190 Willow St., Waltham, Mass.

Welder Control. Technical bulletin No. 75–51–50 contains specifications and functions of a synchronous resistance-welder control (Model No. 75–51–50) which is fully automatic, precisely synchronous, and continuously adjustable. The control is designed to permit complete control of operations on spot welders using air or hydraulically actuated electrodes, with solenoid-operated valves. The four functions of sequence timing, synchronous timing, heat control and electronic contacting which are performed by this unit are described in detail in the bulletin. Weltronic Co., 20735 Grand River Ave., Detroit 19, Mich.

Electronics and Metals. A booklet (Form F-342) called "Electronics Begins in Metals" goes briefly into the history of electronics and tells about the importance of refractory metals (such as tantalum, molybdenum and tungsten) in the manufacture of electronic tubes. Characteristics of these metals are described and the manufacturer's method of making these metals are briefly described. Fansteel Metallurgical Corp., North Chicago, Ill.

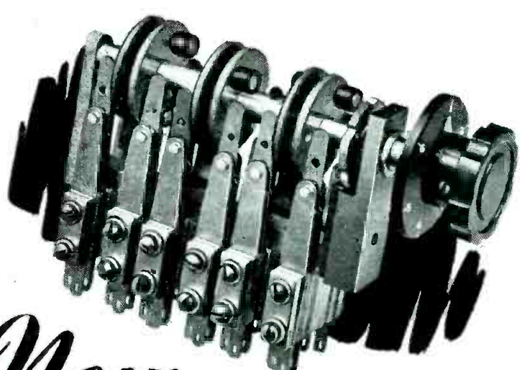
two new Master

GENERAL CONTROL COMPANY CAM LEVER SWITCHES



General Control Company, the original cam lever switch specialists, are pleased to announce two new cam lever switches. The new Model MCL-CS is similar in design to the well-known Model MCL-FS, except that coil springs are used instead of flat springs to assure longer life and equalized pressure on both sides of the cam, regardless of the number or arrangement of contacts on each side of the switch. Also it can be supplied with either light or stiff action on the control knob to suit your requirements. This model is rated at 10 amperes, 125 volts A.C. and is outstanding for long life and dependability.

New MODEL MCL-CS



The new Model MR Rotary Cam Lever Switch is designed for one to six index positions. It fills a definite gap, and a definite need, in the multiple contact switch field. With the new Rotary, any combination of contact arrangements can be used in each of the six positions. It is adaptable to actuate practically any number of circuits in sequence (or repeat) with the convenience of a single control knob. Its unique construction provides such features as circular cams for locating from one to five low-friction, roller spring actuators on each cam. A single hole only is required for mounting, and contacts in any section can be removed from frame by removing a single bolt. This switch can be easily rearranged. The Rotary is rated at 10 amperes, 125 volts A.C.

New MODEL MR ROTARY

OTHER GENERAL CONTROL COMPANY PRODUCTS

MODEL MCL-FS

Same construction as MCL-CS except with flat springs for pressure on cams. Contact possibilities are unlimited.

MODEL MCL-MT

Now under development for aircraft and other light duty applications. The lightest switch of its type in the field.

MC

MI

MH

MANUALLY OPERATED (FOOT) SWITCHES

These switches relieve the machine operator, prevent fatigue, increase production and safety. The 32 types cover every application. Send for catalog No. 44 1.

GAGE-O-MATIC

Special electric gaging machines for fast, accurate checking of all dimensions on production parts.

GENERAL CONTROL COMPANY

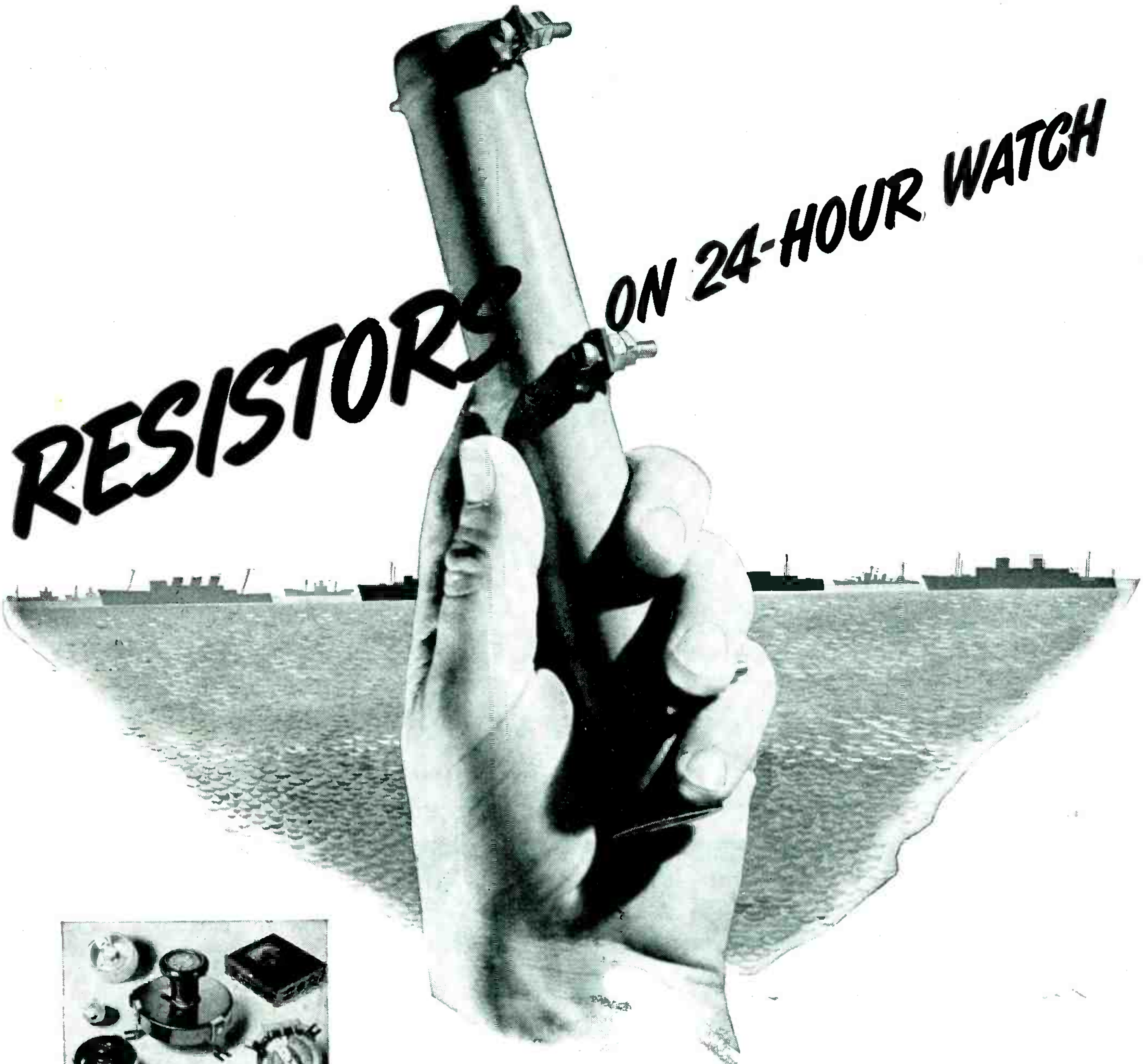
1202 SOLDIERS FIELD ROAD, BOSTON 34, MASS.

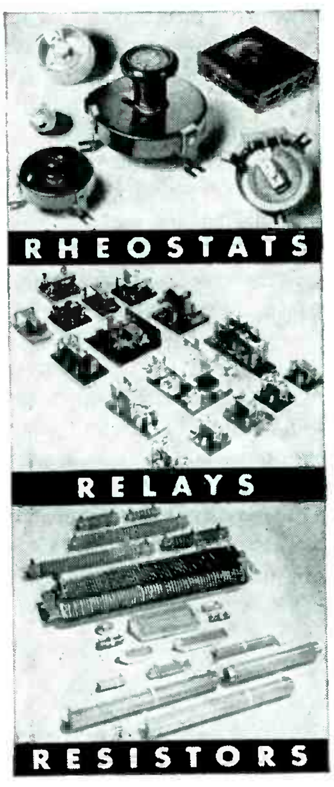
Engineering Data Sheets. Electrical characteristics, dimensional and structural data on radio parts such as switches, capacitors, vibrators, relays and mechanical tuning devices are assembled in a handy 60-page book. The purpose of the book is to make it easy to specify the manufacturer's products and to lay out panels and chassis. Oak Mfg. Co., 1260 Clybourn Ave., Chicago 10, Ill.

Regulated Power Supply. Bulletin No. H1-5M-44 describes and illustrates Model 106 PA regulated power supply which is a precision instrument designed to supply a regulated d-c voltage of between 200 to 300 volts. It is controllable to within 1 percent and may be used for pulse generators, amplifiers, measurement equipment, constant-frequency oscillators and other equipment. Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge 38, Mass.

Aerovox Research Worker Articles. In May ELECTRONICS, Part 1 of a series of articles on "H. F. Frequency Measurements" was announced as having appeared in *The Aerovox Research Worker*. Now Parts II, III, IV and V are also available. Part V is actually a comprehensive bibliography on the subject and contains reference data on: 1. General Theory U.H.F. Measurements, 2. Methods U.H.F. Measurements, 3. Oscillators, Generators, etc., 4. Monitors, etc., 5. Wavemeters, Frequency Meters, and Lines, 6. Tubes, 7. Miscellaneous. Also available, in other issues of this same publication, are two articles entitled "Paper Capacitors As Mica Capacitor Substitutes" and "An Audio Amplifier Testing Unit." Aerovox Corp., New Bedford, Mass.

Capacitors. "Solar Capacitors" is the name of a booklet which provides the layman with an elementary explanation of capacitors. It gives the whys and wherefores of electrical capacitors, is written in a manner similar to Government instruction books, and contains actual Army Signal Corps photographs. A description is also given of the manufacturer's products in the various phases of war service. Solar Mfg. Corp., 285 Madison Ave., New York 17, N. Y.





Electrical equipment aboard ship has no off-duty time. Radio, inter-communication, air conditioning, ventilation, refrigeration, deck machinery, gun operation and innumerable other vital services employ resistors in their control circuits. These resistors must be dependable to function at all times. Ward Leonard Vitrohm Resistors have measured up to their responsibilities. Their ability to withstand moisture, temperature change, shock and vibration makes them particularly well fitted for sea duty. Resistors with the same ruggedness as those used by the Navy and Merchant Marine are available to all industry engaged in victory production. Send for data sheets.

ARMY E NAVY

WARD LEONARD

Electric control (WL) devices since 1892.

WARD LEONARD ELECTRIC COMPANY, 32 SOUTH STREET, MOUNT VERNON, NEW YORK

Plating on Plastics. In December 1943 ELECTRONICS the Metaplast Process was described. There is now available a booklet which is called "The Metaplast Process and Licensee Plan" which describes the process, gives general properties, preparation for plating, surfaces that can be Metaplated, applications of the process, equipment necessary to Metaplate, and other data such as Guild membership which might be of interest to persons seriously considering entering this field. Metaplast Co., 205 West 19th St., New York 11, N. Y.

Disconnect Electrical Fittings. Engineering details on the T&B Sta-Kon disconnect way of wiring are given in Bulletin 522. Devices such as disconnectable two-way splices, three and four way splices, disconnect terminals, disconnect strips, blocks and others are pictured and described in this booklet. Thomas & Betts Co., Inc., 36 Butler St., Elizabeth 1, N. J.

Classified Directory. The Association of Consulting Chemists and Chemical Engineers, Inc., (a membership corporation chartered under the laws of New York State and a clearing house for consultants) has recently published its eighth edition, 1944, issue of Classified Directory. This directory is divided into three sections. The first section consists of "Key Sheets" comprising a record of the various services performed by the members listed. The second section contains "Scope Sheets" which are one-page statements from each member, descriptive of his and his organizations' qualifications, scope, functions and activities. The third section contains the "Index" which is in alphabetical order and contains the membership list, company affiliations of members, and the geographical location of members. Write to Executive Secretary, Association of Consulting Chemists and Chemical Engineers, Inc., 50 East 41st St., New York 17, N. Y.

Rectifiers. Rexselen Rectifiers, used for a wide variety of applications, utilize the selenium rectifier stack and are suited to the job of converting a.c. to d.c. in rectification problems. Catalog Sec. E,

PyroFerric IRON CORES

... an Art Developed by Years of Research and Experiment

The past six years saw the Pyroferric art of moulding powder metal components gain full recognition and become established with foremost manufacturers of coils for dependable powder iron cores to meet close tolerances and rigid specifications demanded by communication equipment required for critical war use.

The reputation of Pyroferric as the dependable manufacturer of powder iron components is the result of long years of research and experiment coupled with six years of steady production for critical use.

It is this background of experience which enables Pyroferric to produce specification powder iron components for desired permeability, frequency, "Q", resistance, great physical strength and to fit any circuit.

Permeability	*High*	Frequency	*High*
"Q"	*as desired*		*Medium*
Resistance	*Low*		*Low*

Pyroferric, with its background of research and experience, will gladly consult with you on your Powder Metallurgy requirements.

PYROFERRIC CO.

175 VARICK ST. NEW YORK 14, N. Y.

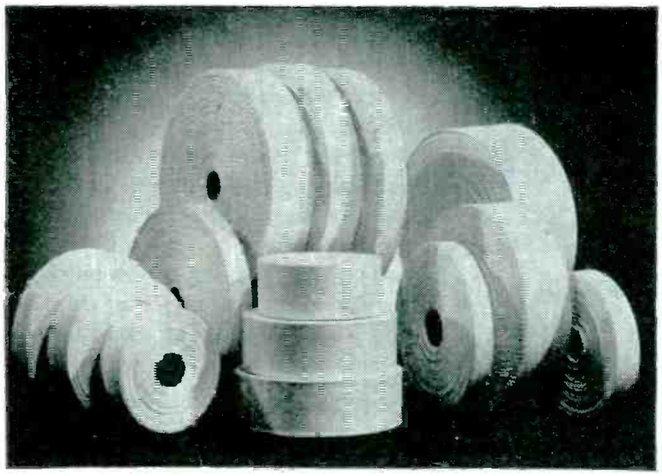
Bulletin No. 500 illustrates and describes these Rexselen rectifiers. Tables are given which list standard single-phase selenium rectifier stacks grouped under output voltages and currents for various applications. Overall dimensions and mounting details, as well as the number of stacks necessary to assemble each rectifier, are included in the bulletin. Electrical Facilities Inc., Oakland, Cal.

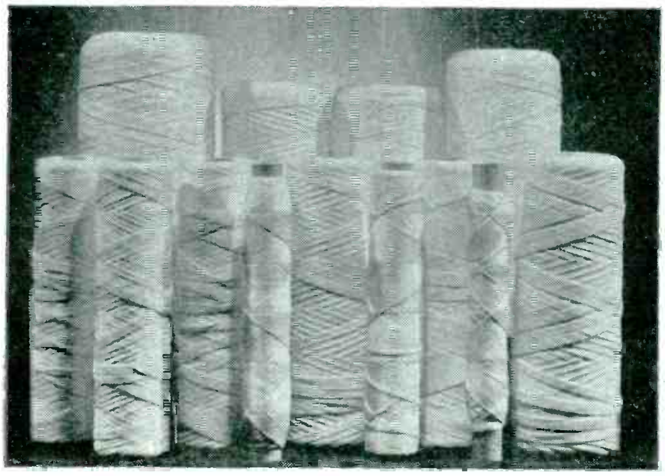
Mica Capacitors. This catalog was compiled to assist prospective buyers in placing orders for the manufacturer's El Menco capacitors. The various types of capacitors available are illustrated and color codes as well as characteristics are included. The Electro Motive Manufacturing Co., Willimantic, Conn.

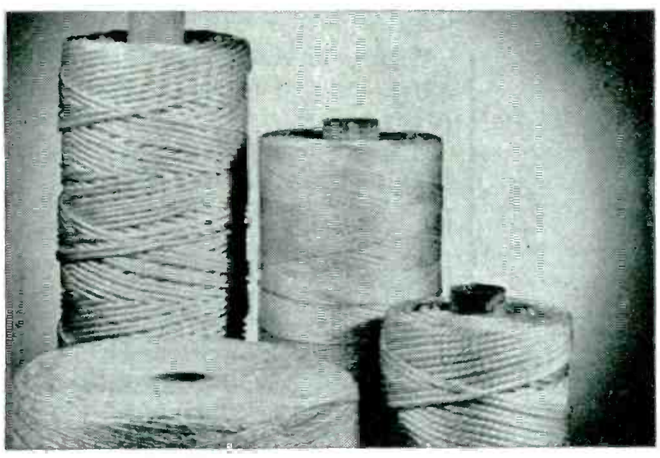
Motors and Generators. D-C units, a-c units and self-synchronous motors are described, and characteristic curves for them are given in loose-leaf sheets which are bound in an expanding cover. There are drawings in the back of the book for each of the motor types available. Electric Indicator Co., Stamford, Conn.

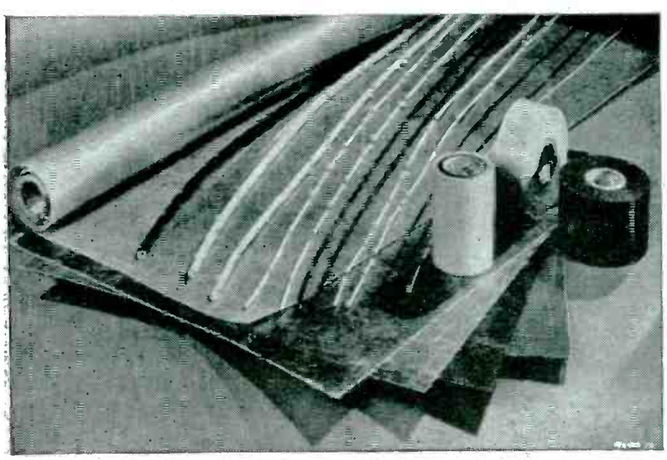
Thermocouples. This 32-page Bulletin S2-4 is a new edition of the manufacturer's booklet called "Thermocouple Data Book and Catalog" which gives data on selection of thermocouples, lead wire, protecting tubes, heads and insulators. Suggestions are given for substitute materials. Also included in the bulletin are temperature conversion tables, millivolt tables, and tables on pipe and wire sizes, decimal equivalents and wire resistances. Instructions are given on checking thermocouples and pyrometers, and on construction of thermocouples. Wheelco Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill.

Testing Instruments Catalog. Various types of multitesters, vacuum-tube testers, insulation testers, electronic voltmeters, limit bridges for precision resistance testing, combination tube, battery and set testers with plug-in analyzer units, volt-ohm-milliammeters, signal generators, and push-button analyzers are described in Catalog No. 128. Radio City Products Co., Inc., 127 West 26th St., New York 1, N. Y.









Fiberglas* properties

—helpful in solving problems in electrical insulation

Fiberglas is glass. It will of itself withstand temperatures far in excess of any requirements of an electrical insulation. But high heat resistance is only one of its many basic properties.

Low space factor (thinness) combined with high tensile strength make Fiberglas highly desirable in many applications in which its high-temperature characteristic has value only as a safety factor . . . In textile form, Fiberglas is available in thicknesses down to 2 mils (.0020″).

Fiberglas is resistant to moisture, most acids, oils, corrosive vapors. Again, these properties make it highly desirable for electrical use where high heat resistance is important only as a safety factor.

In textile form, Fiberglas is a good conductor of heat. This property also permits its use in many electrical applications.

And, of course, Fiberglas is permanent. It does not deteriorate with age.

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Untreated Fiberglas is available as cloth, tapes, sleeving, and cord.

In treated forms, Fiberglas is available as varnished cloth and tapes; combination Fiberglas-and-mica sheets and tapes; pressure-sensitive tapes; single, double, and triple saturated sleeving; varnished tubing; and laminated Fiberglas sheets, sticks, or wedges.

Fiberglas-covered magnet wire, lead wire, and other wires are obtainable from leading wire manufacturers.

Fiberglas is now available for immediate delivery. Increased production facilities make this possible. Consult your electrical distributor. *Owens-Corning Fiberglas Corporation, Toledo 1, Ohio, Fiberglas Canada, Ltd., Oshawa, Ont.*

FIBERGLAS

*T. M. Reg. U. S. Pat. Off.

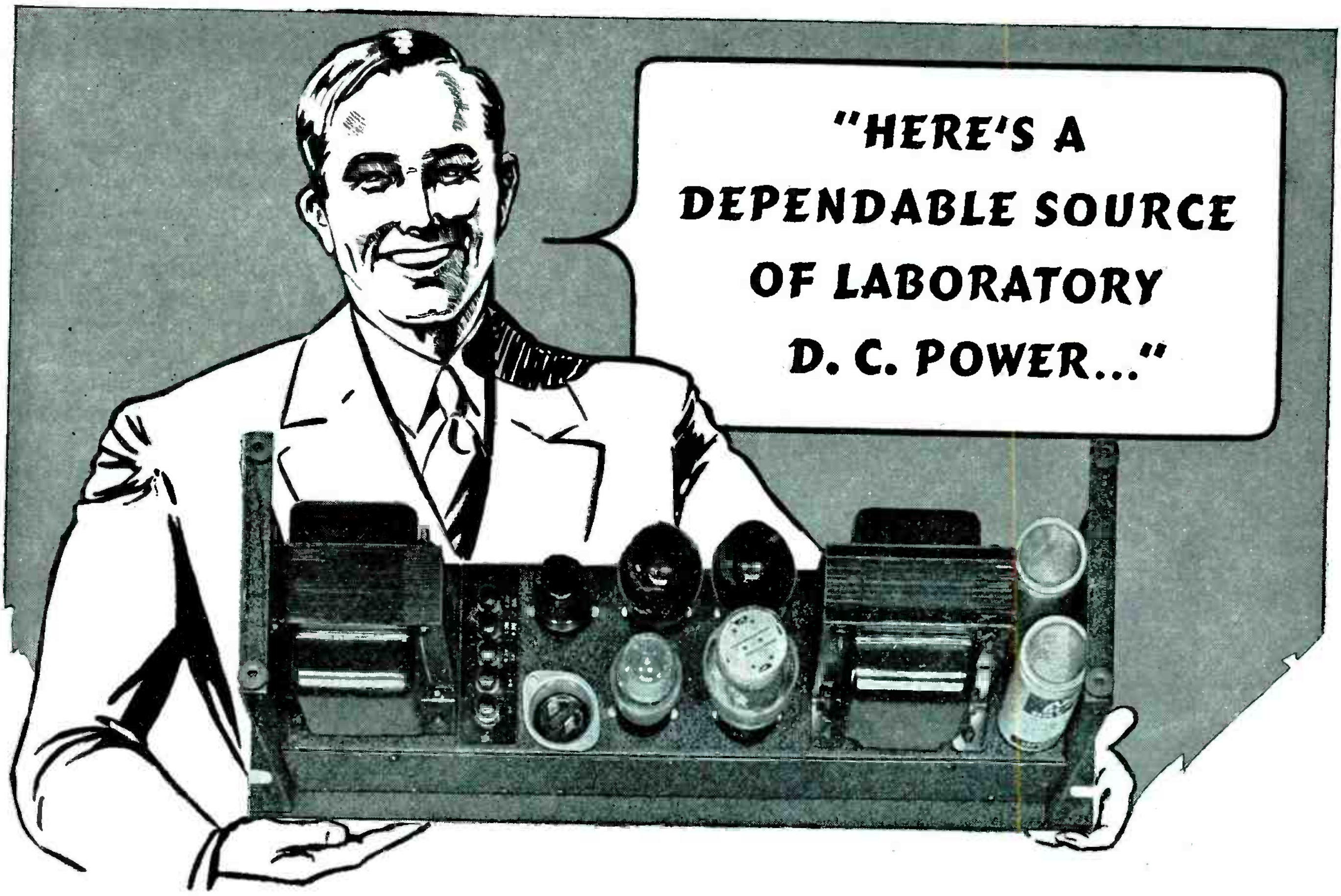
YARNS • TAPES • CORD • SLEEVING
CLOTH and OTHER FORMS

Packing War Material. Literature on the packing of war material has been condensed into a handy manual which includes a section on protection against corrosion. Material which is digested from literature issued by the various branches of the armed services, many illustrations on how to make packaging folds for different types of materials, and samples of packaging available from this manufacturer are also included. Sherman Paper Products Corp., Newton Upper Falls 64, Mass.

Handbook of Tube Operation. This 68-page handbook is a reprint of the more important issues of the manufacturer's publication *Tubes*. The purpose of *Tubes* is to develop a broader technical understanding of transmitting and rectifying tubes—their characteristics, functions and applications, and therefore the handbook is designed to assist those who wish to become acquainted with the varied problems related to efficient operation of tubes in service. Included in the handbook are diagrams, charts and bibliographies. Federal Telephone and Radio Corp., Newark, N. J.

Wiring Instruction Manual. "OK Methods". (Volume 1, No. 1) is the name of a 24-page booklet which is designed as a means of exchanging methods for more efficient and speedier wiring connectors. The booklet is a composite of the better methods used in some aviation and radio plants plus the experience of the manufacturer's engineers and cable assembly division. The booklet is profusely illustrated with pictures that show the proper way of handling wires and tools, and many suggestions are given for applications, as well as the do and don'ts in various operations. American Phenolic Corp., 1830 South 54th Ave., Chicago 50, Ill.

Electronic Progress. A 60-page lithographed booklet called "Electronic Telesis" tells about the progress of electronics and the manufacturer's tubes. Some of the subjects include FM, electronic heating, instrument landing, television, facsimile radio, police radio, and radio diathermy. Eitel-McCullough, Inc., San Bruno, Cal.



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You'll find it ideal for operation with pulse generators, measurement equipment, constant frequency applicators, amplifiers and any other equipment requiring a constant flow of D. C. voltage.

Designed to operate from 115 volts A. C., the HARVEY 106 PA has a D. C. voltage output variable from between 200 to 300 volts and accurately controllable *to within one per cent.* A model of efficiency and convenience, it has separate fuses on each transformer primary as well as the D. C. output circuit: pilot lights on each switch; a D. C. voltmeter for measuring output voltage and a handy two-prong plug or binding posts to permit easy hook-up.

For complete information on this precision-built, thoroughly dependable source of constant voltage, write for the new HARVEY Regulated Power Supply bulletin. Address your requests for this useful new bulletin to

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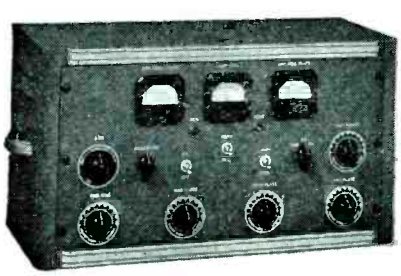

HARVEY UHX-25

A 25-Watt General Purpose Radio Telephone Transmitter

Available for operation between 1.5 M.C. and 30 M.C.

HARVEY "AMPLI-STRIP"

FOR I-F AND AUDIO AMPLIFICATION

Counter Decade

(*Continued from page* 113)

counter may be useful. For example, an accumulated count may be used with fewer decades to indicate if a watch is fast or slow, from the 5-cycle on and off beats of a watch. A predetermined number of beats can be used to switch the counter on and off, giving an accumulated reading that would average out any errors caused by irregularities of the watch rate.

A camera shutter or exposure timer can readily be built using a counter, to indicate the accuracy of timing of the spring movement.

The counter used as a chronograph can be applied in practically all cases that at present use some graphic recorder for recording a time interval against a time base, with the advantage that the time interval will be directly and immediately indicated on the panel of the counters.

Frequency Divider. An interesting use of counters, as a by-product of their use as interval timers, is as a frequency divider having the property of stopping in the event the control frequency stops, a feature only recently incorporated in frequency standards. In addition, the input controlled frequency may be varied from 100 kc to frequencies as low as 1 cps and the same division ratio maintained. This feature is one that is unique only in this type counter divider.

Radiation Counter. Most counters used as scaling circuits in radiation counters up to the present have not had a resolution time comparable to the resolution time of the counter tube. The counter described in this article has a resolution of 0.00001 second and can readily be made to have a resolution of 0.000002 second if desired. Counters with considerably higher resolutions are possible and have already been manufactured.

Electronic Calculator. The basic part of most calculators is a mechanical counter decade. Substitution of an electronic decade should give much greater speed and may result in a less expensive method of adding, subtracting, dividing and multiplying, especially in business uses.

Selector Applications. The elec-

America's NEW Frontier

• IN AMERICA'S EARLY DAYS of growth, opportunities for progress lay in the ever widening frontiers. In the fertile lands of the great plains . . . in the timber of our forests . . . in the metal of our mines.

Today, we have reached the limit of our physical frontiers. But new frontiers lie before us—new opportunities for exploration—in our research laboratories. Here in the multiple world of the electron tube are being born the scientific advances that will make our world immeasurably safer and happier.

Pioneering on this new frontier of research are RCA Laboratories in Princeton, New Jersey. Today RCA Laboratories are devoted to providing the fighting forces of the United Nations with the best radio and electronic equipment available. Tomorrow, this same skill will continue to serve America in creating new and finer peacetime products.

RADIO CORPORATION OF AMERICA

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tronic counter offers a method of increasing the rate of circuit selection, now generally done by stepping relays as in dial-telephone operation. A series of rapid pulses may be transmitted over a line for almost instantaneous selection of a desired circuit.

Industrial Counters. Will provide an accurate count when objects are moving through the light beam of a phototube system at rates higher than can be handled by a mechanical counter. Electronic counters can handle any counting rates encountered in industry, even up to a million objects per second.

Business Machine Sorters. As a means of increasing the operation speed of such equipment as card-counting sorters, now limited by the speed of mechanical counters.

Counting Instead of Weighing. Many industries use the technique of ratio-weighing. A very fast counter used with a sorter and photoelectric pickup would give greater accuracy, especially in instances where a variation occurs in the density of the material in the article being sorted.

It has been the purpose of this article to point out what is believed to be a new electronic tool for use in many fields. This new tool may stimulate thinking directed to a mulitude of additional uses.

• • •

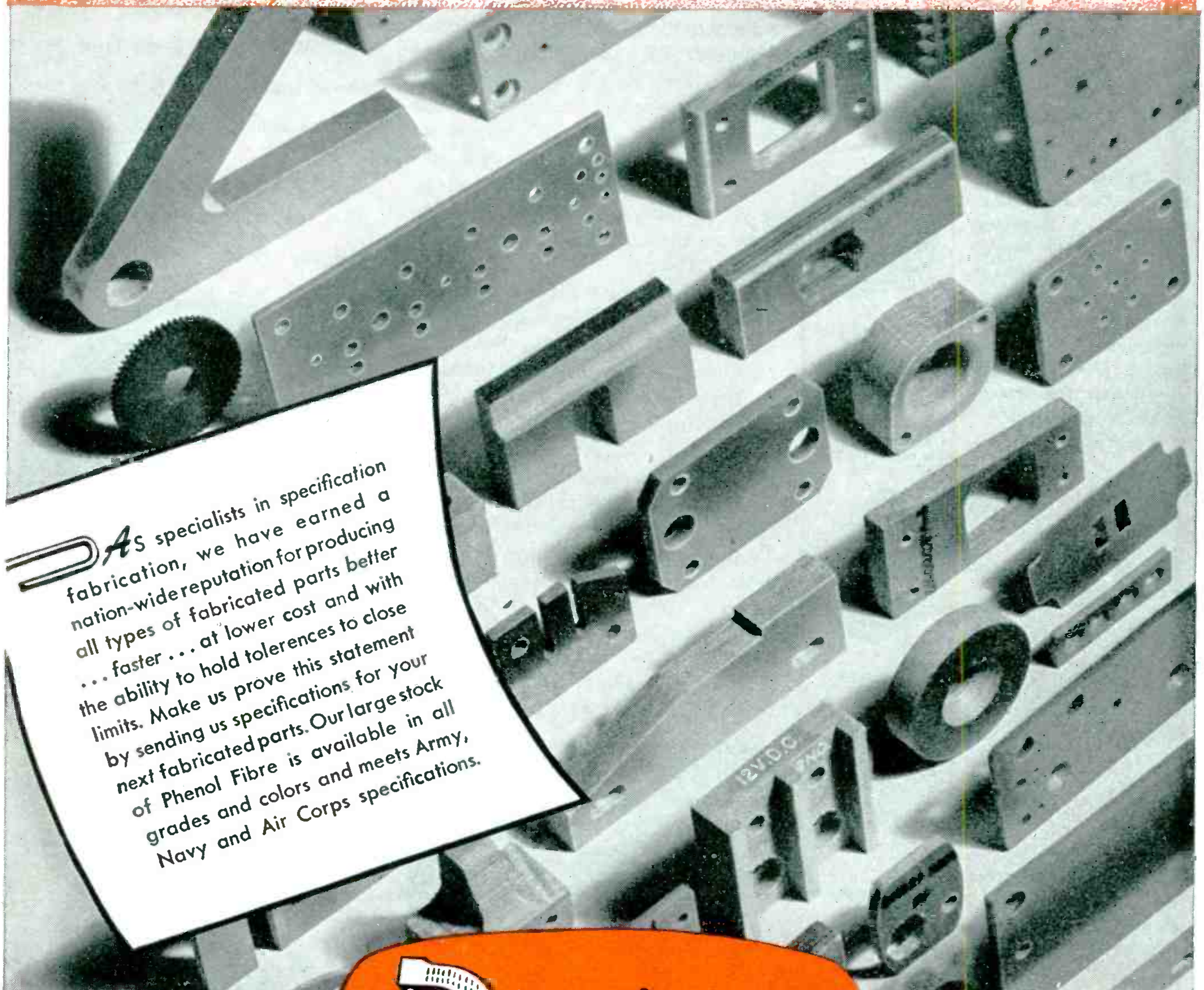
ELECTRONIC MEGAPHONE IN TRAFALGAR SQUARE

To cut down traffic accidents, British police use this portable electronic megaphone at crossings to direct pedestrian traffic. Tubes and batteries hang from the tripod assembly

PHENOLIC *Laminated*

MACHINED PARTS

MILLED, DRILLED, LATHED TURNED
SAWED, GROUND, SHAPED AND PUNCHED
FROM SHEET, ROD AND TUBING



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Thermal Behavior

(*Continued from page* 119)

The cathode-ray oscilloscope is set for a sweep frequency of 60 cycles and is connected across the capacitor in section L of Fig. 2. This indicates the length of the period of the day during which the house temperature is below 70° F.

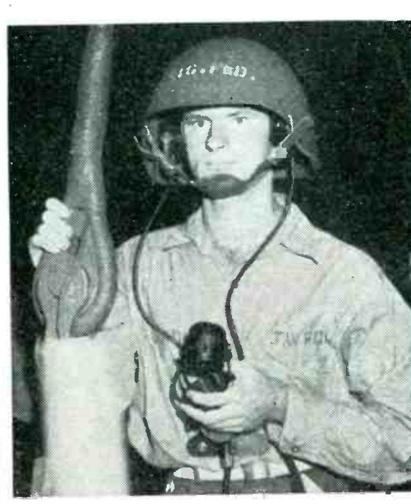
With switch SW in section S of Fig. 2 open, the "house" voltage is continually maintained at a value corresponding to 70°F. Then R in section M, Fig. 2, is varied until A_2, a sensitive ammeter, reads zero. Ammeter A_1 then indicates the steady heat flow for the outside conditions applied. As SW, section S, Fig. 2, is closed the cycle of off-on operation proceeds and ammeter A_2 indicates the saving in heat current which results from turning the thermostat down for a part of the day.

The circuit thus gives a complete answer to the problems of constant heat current, saving in heat current, and temperature as a function of time in a single operation for any setting of outside temperature.

This article is based upon a bachelor's thesis submitted to the Department of Electrical Engineering of Massachusetts Institute of Technology. The authors wish to acknowledge the generous assistance of Professor R. H. Frazier, who supervised the thesis.

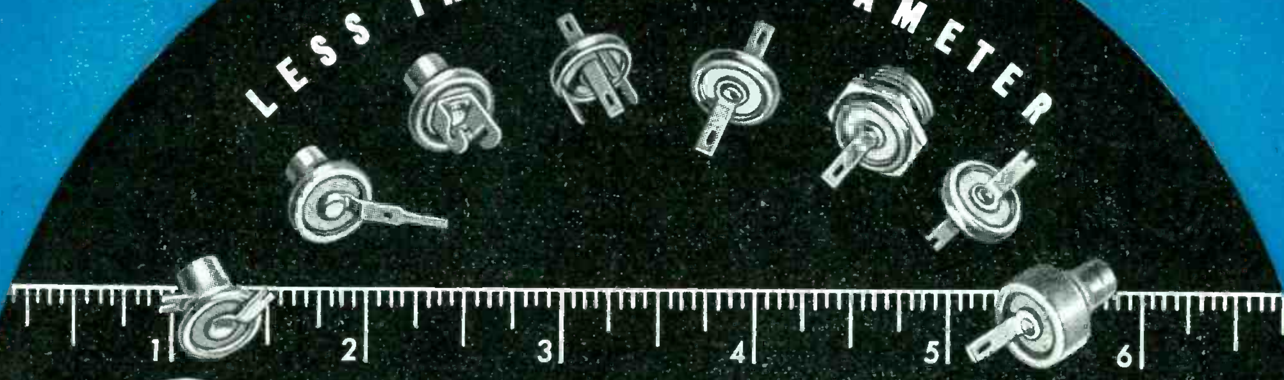
• • •

COMMUNICATIONS HELMET



The observer on the signal bridge of a new light cruiser wears the new Navy helmet issued to all men using earphones and microphones. Official U. S. Navy photograph

LESS THAN ½" IN DIAMETER



Silver Mica CAPACITORS

Capacities from 6 to 2000 MMF

Less than one half inch in diameter . . . capacities from 6 MMF to 2000 MMF . . . ideal for numerous UHF and VHF applications.

Mica discs of the highest grade, individually silvered for maximum stability and stacked to eliminate any book effect. The assembly is vacuum impregnated. Available in a variety of terminals. All units are color coded.

Form 586 is available for additional information on these CENTRALAB Silver Mica Capacitors.

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CRL

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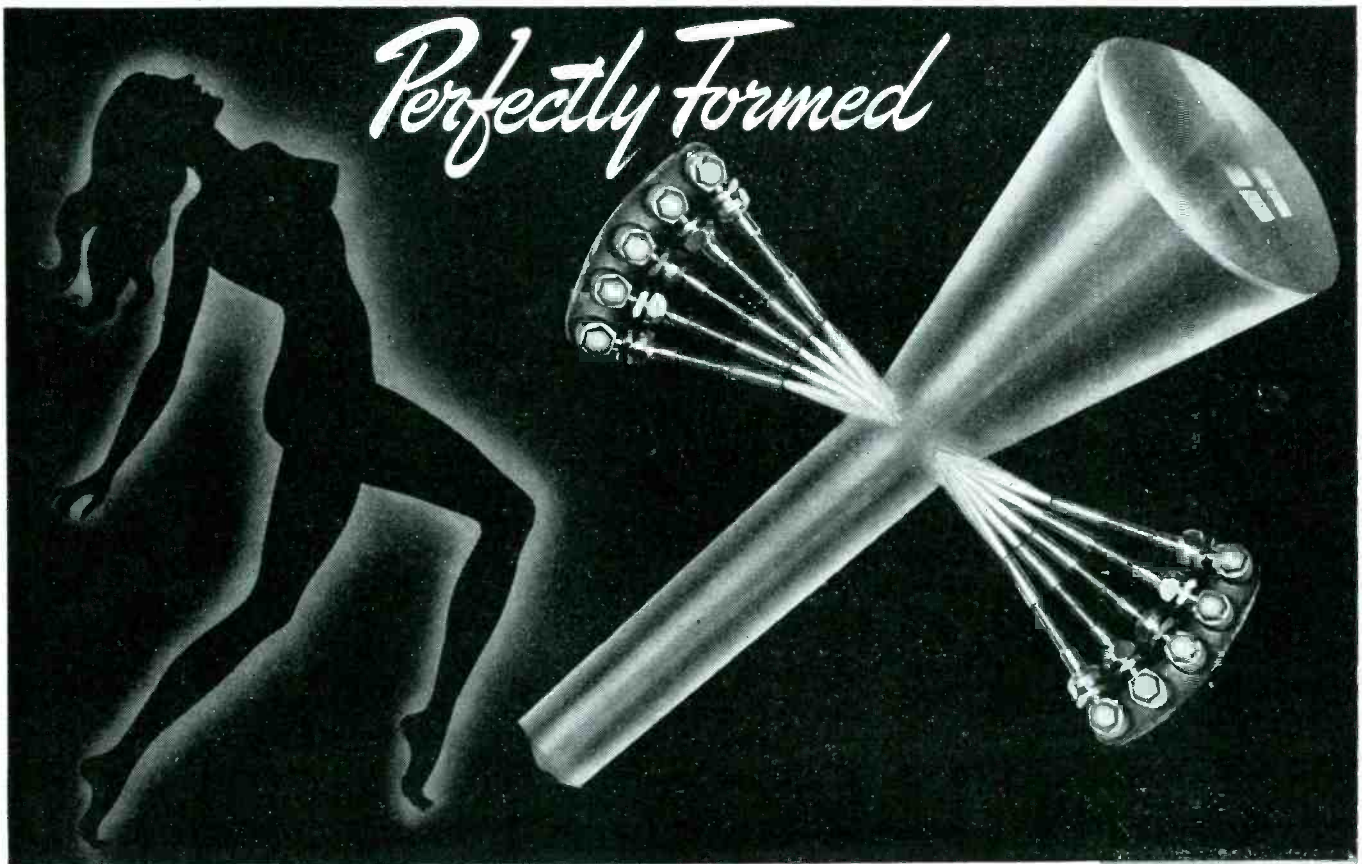
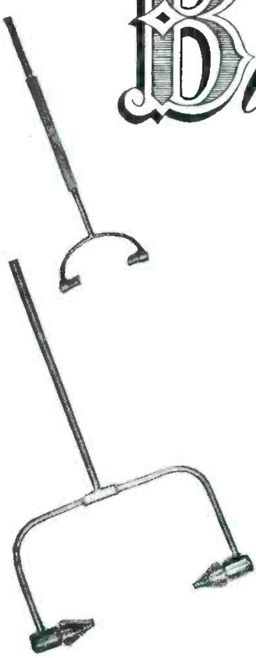


HAYDU BROS

Burner equipment



PERFECT FORM—both in manufacture and performance, is more essential now than ever, if you are driven by war time speed, and the constantly growing need for greater production.

The traditionally dependable performance of Haydu Bros. Burner equipment, has been an assurance of uninterrupted economical production.

Today, thousands of Haydu Bros. Burners, in many styles and sizes, for Gas, Air and Oxygen, are used in plants of the general glass working industry from coast to coast, helping to speed those essential orders.

Specially designed Burners, Torches, Cross-fires and Mixers to meet your requirements.

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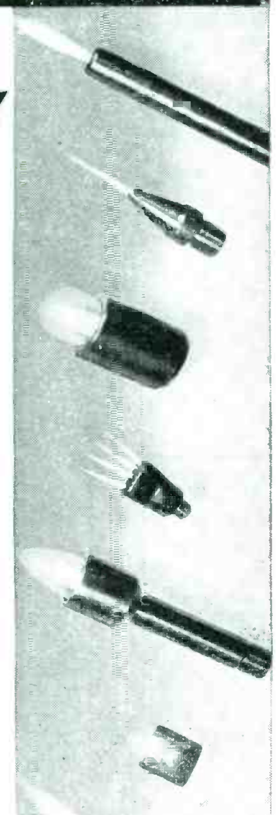
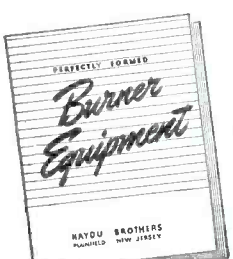
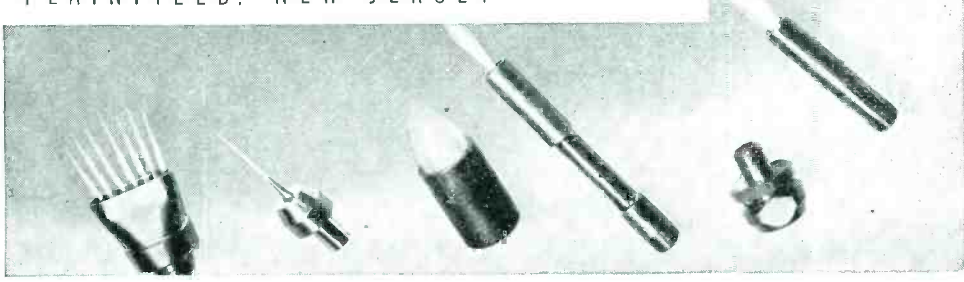




WRITE FOR LATEST BULLETIN



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Single Terminal Kovar-glass lead-through readily soldered to apparatus.

Through the use of Kovar and glass your product can be sealed hermetically against all Tropical elements—extreme heat, excessive humidity, myriads of insects and strange fungus growths.

Kovar is an alloy of cobalt, nickel and iron. A seal between Kovar and glass is produced by forming a chemical bond, through heating, in which the oxide of Kovar is dissolved into the glass. Kovar has the unique property of matching the expansion factor of hard or thermal shock resistant type glass—is readily formed by machining or deep drawing.

Stupakoff supplies Kovar in sheet, rod, wire, tubing or fabricated as eyelets, cups, flanges, etc., also Kovar-glass seals complete, ready for soldering, welding or brazing to metal containers.

Kovar IS the answer to permanent vacuum or pressure tight sealing. For further information on your specific problem, write Stupakoff today.

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Built with greatest precision and "know how" for ***low ripple—high efficiency—low drain*** and ***a minimum of commutation transients.*** High production here retains to the highest degree all the "criticals" which are so important in airborne power sources.

ALLIANCE D. C. MOTORS

Incorporate precision tolerances throughout. Light weight—high efficiency—compactness. An achievement in small size and in power-to-weight ratio. Careful attention has been given to distribution of losses as well as their reduction to a minimum.

Remember Alliance!
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4000 VOLT *Dielectric* TEST SET

- Continuously variable to 4000 volts D.C.
- Control by G. R. Variac.
- Not harmed by momentary short circuits on output.
- High voltage cables plug into safety connectors.
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THERE'S A DRAKE SOLDERING IRON FOR EVERY TYPE OF ELECTRONIC WORK

From that mighty mite

the Drake No. 400 to the high-speed production "honey"

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Drake Heat Controls and the Drake "Magic Cup" Stand are important soldering aids.

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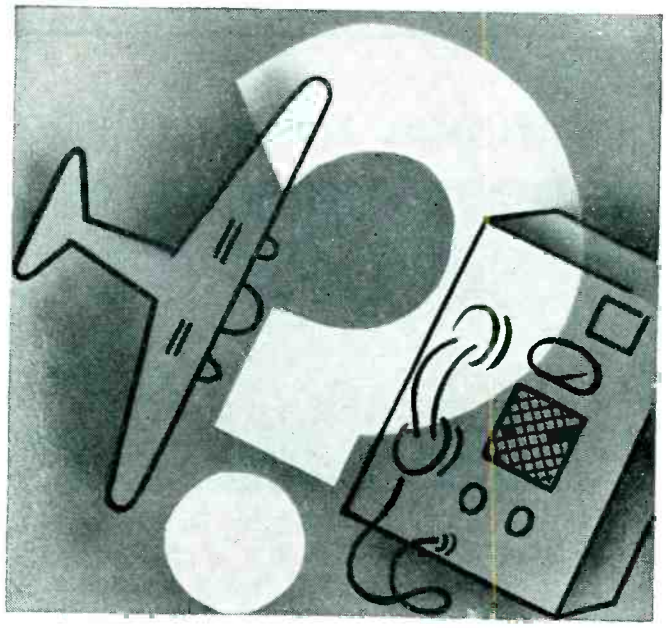
Ideas and Inventions For Postwar Products

Automatic Electric Company, originator of the dial telephone and leading manufacturer in the field of communication and electrical remote control, seeks to make contact with inventors and others who may have patentable ideas or inventions for sale or license. Objective is the acquisition of newly invented or improved products which have peacetime application, which will make use of the company's expanded productive capacity, and which will help to maintain employment for its engineering, production and sales personnel during the postwar period.

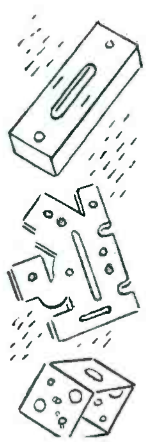
Inventions should relate to wire communication, point-to-point radio, electrical remote control, or to mechanical, electrical or electronic devices used in such systems, and replies should be addressed to Mr. C. S. Cadwell, vice-president. All ideas submitted will be given careful consideration and treated with the utmost confidence.

AUTOMATIC ELECTRIC COMPANY

1033 West Van Buren Street
Chicago 7, Illinois



METAL FABRICATING *Problems*



We have ample facilities to produce FAST, sheet metal work, stamping, fabricating, metal boxes and cases from 1″ to 20′ high, cabinets, chassis, shelves, odd shaped flat pieces, strips, panels, housings, etc. Can do precision work to extremely close tolerances.

When peace comes — we will be back again in ARCHITECTURAL LIGHTING, where we have done very close precision work. We will also continue to do metal fabricating; work for industries such as radio, aircraft and many others. Send us your specifications now for any post war products on which we might help you.

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490 Johnson Avenue, Brooklyn 6, N. Y.

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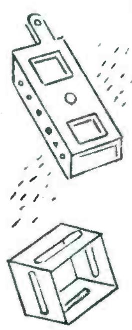

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YES, I would like further information . . .

1. At the present time we are most interested in ....
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We are enclosing specifications.

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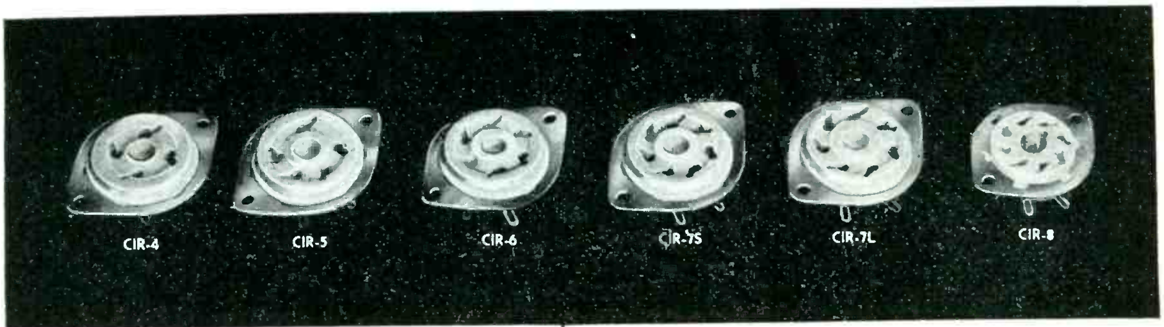

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Any Type **List $ .45**

Type CIR Sockets feature low-loss isolantite or steatite insulation, a contact that grips the tube prong for its entire length, and ... ring for six position mo... supplied with two met...

AA-3 List $ .60
A low-loss steatite spreader for 6 inch line spacing. (600 ohms impedance with No. 12 wire.)

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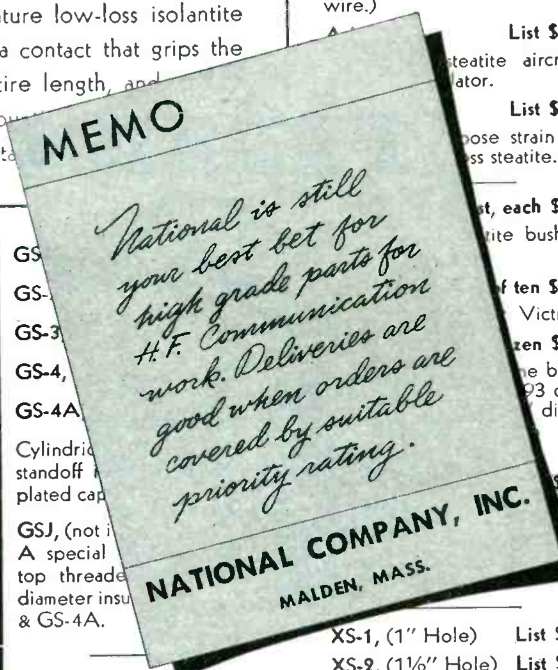

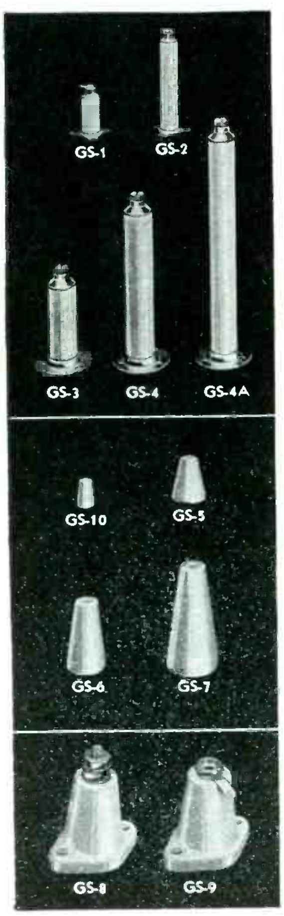

GS...
GS-...
GS-3...
GS-4, ...
GS-4A...

Cylindri... standoff ... plated cap...

GSJ, (not i... A special ... top threade... diameter insu... & GS-4A.

GS-5, 1¼" **List, each $ .40**
GS-6, 2" **List, each $ .70**
GS-7, 3" **List, each $ 1.25**
GS-10, ¾", package of 10 **List $ .12**

These cone type standoff insulators are of low-loss steatite. They have a tapped hole at each end for mounting.

GS-8, with terminal **List $ .90**
GS-9, with Jack **List $ 1.25**

These low-loss steatite stand-off insulators are also useful as lead-through bushings.

XS-1, (1" Hole) **List $ 1.20**
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Prices listed are per pair, including metal fittings. Insulation steatite.

XS-3, (2¾" Hole) **List $ 6.00**
XS-4, (3¾" Hole) **List $ 7.25**

Prices are per pair, including metal fittings. These low-loss steatite bowls are ideal for lead-in purposes at high voltages.

XS-5, Without Fittings
List, each $ 8.25

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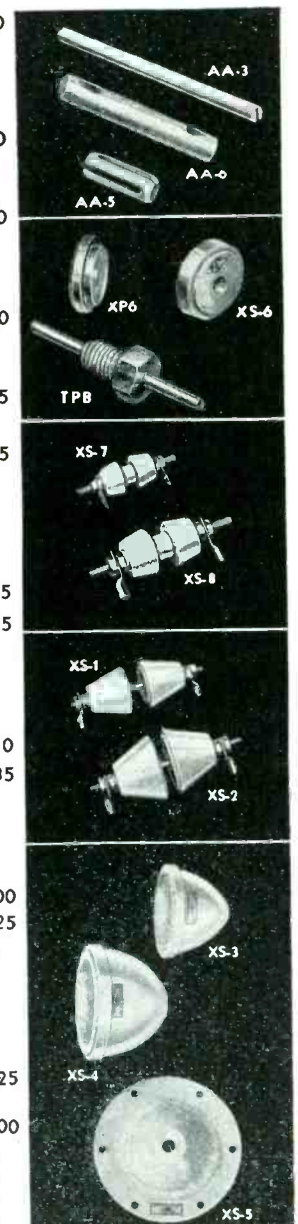
List, per pair $17.00

These big low-loss bowls have an extremely long leakage path and a 5¼" flange for bolting in place. Insulation steatite.

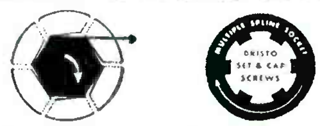


The screw that's Built like a Gear

A sound engineering principle makes Bristo Multiple-Spline Socket Set Screws your safest recommendation for protection against vibration.

This screw can be set up tighter than any other . . . for the spline design *pulls* the wrenching force *inward*, not outward. It can be turned far beyond the point where an ordinary screw would burst or at least round out to stop effective wrenching. Yet a flick of the key will loosen it for quick removal!

Any assembly man will thank you for specifying Bristo. Assembly is easier, faster, especially when the fastening point is hard to reach—the splines in the screw cling to the splines on the wrench.



Hex: key exerts outward pressure against socket wall; screw will round out or break.

Bristo: key exerts *inward* pressure; no danger of rounding out or breaking socket wall.

And the man who buys and uses your product will be grateful for the stronger fastening. Because Bristos — no matter how small (even down to the No. 4 wire size) —have greater strength, will hold more tightly, than other screws of comparable size.

TYPICAL APPLICATIONS

- cameras
- radio assemblies
- computing machines
- electric shavers
- scientific instruments
- x-ray machinery
- electric refrigerators
- motor assemblies
- vacuum cleaners
- domestic appliances

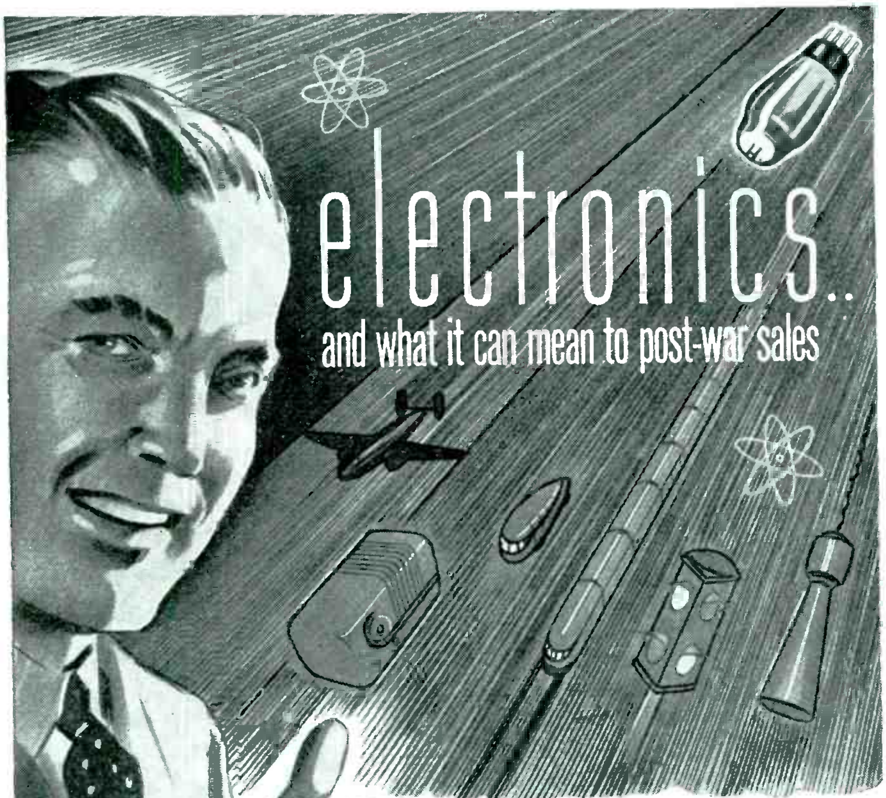
See THOMAS' REGISTER for more facts, list of product applications. Remember Bristo for vibration conditions.

The BRISTOL Company
MILL SUPPLY DIVISION

BRISTO MULTIPLE SPLINE SOCKET SET SCREWS

Geared to the Key—for faster, easier, tighter setting

THE BRISTOL COMPANY, 154 BRISTOL ROAD, WATERBURY 91, CONNECTICUT



Look ahead . . . Prepare your Salesmen For the Peacetime Electronic Era to Come!

● Where will you fit in the fiercely competitive markets that will come with the war's end? Your position can be determined *now*, by the methods you employ *now*, in the design and engineering of your post-war products. Right now, with the aid of seasoned electronic and mechanical engineers, your peacetime items can be started toward top-rank positions in their respective fields.

Alert manufacturers, with a view toward post-war sales and quick acceptance of their products, are urged to consult with National engineers now, on matters electronic, electrical or mechanical. Write today — Your inquiry will receive prompt attention.

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Our engineers and crystallographers are ready and willing to help you on the following items:

Radio Receivers	Crystal Oscillators	Supersonic Devices
Television Receivers	Filters	Control Devices
F-M Receivers	Stabilizers	Diathermic Devices
Transmitters	Timing Equipment	Induction Heating
H. F. Inter-Communications	Police Transmitters	Frequency Standards

Address your inquiry to — **Crystal Division**

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NATIONAL SCIENTIFIC PRODUCTS COMPANY

Designers and Manufacturers of Electrical and Mechanical Devices

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PERMANENT MAGNETS

A Word about Our Production Facilities

We can handle and are handling big orders for permanent magnets . . . handling orders from many exacting manufacturers of electronics equipment including Sperry, Philco, Galvin Motorola, Raytheon, Scintilla (Bendix), and others.

We have the skilled workmen and the manufacturing facilities . . . and the experienced engineers to help you design the best type of permanent magnet for your equipment.

* * * * *

Among the steels going into our magnets are ALNICO and NIPERMAG, two metals of exceptionally high energy product.

6-CC-1

CINAUDAGRAPH CORPORATION

STAMFORD, CONNECTICUT

1 SAVES COST OF METAL DIES

Compound curvatures and fairly sharp bends without any inside radius are produced in PANELYTE #906 parts by inexpensive forming dies of Kirksite, cast phenolic, laminated phenolic or hardwood.

2 SIMPLIFIES AND SPEEDS PROCESSING PANELYTE

#906 can be stamped, bent or drawn in process similar to—but much simpler than metal stamping. No need for hot molds. Material is merely heated to temperatures higher than those used in manufacture, molded, and left for very short period in mold for partial cooling.

3 ELIMINATES NEED FOR HEAVY EQUIPMENT OR HIGH PRESSURES

The fast and economical forming of PANELYTE #906 is accomplished with small air cylinders — and, in some cases, hand presses can be efficiently used.

If you manufacture or use laminated phenolic parts of complex design, Grade 906 PANELYTE may save you time — and money. This fully cured thermosetting sheet plastic opens entirely new fields in plastic fabrication. Write for Engineering Bulletins on Grade 906 . . . and samples.

PANELYTE *the structural plastic*

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ST. REGIS PAPER COMPANY
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NEW YORK 17, N. Y.

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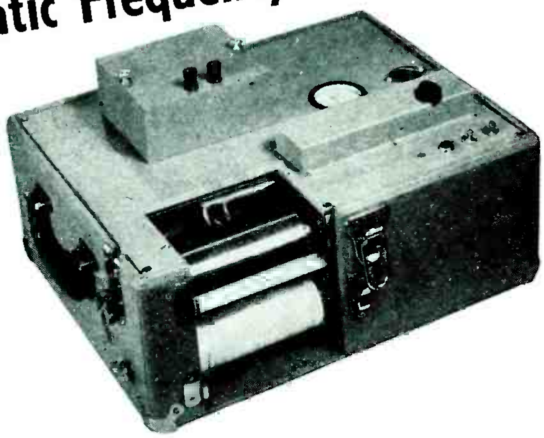
Help Solve your Manpower Shortage Problems with the SOUND APPARATUS Automatic Frequency Response Recorder



Provides, automatically, frequency response characteristics of all kinds of communication apparatus on standard charts.

Throughout laboratories, manufacturing plants, and along America's war production lines, these dependable Recorders are at work saving thousands of manhours . . . giving quick, continuous, accurate records of electrical measurements.

The most cumbersome measurements can be made in the shortest time, by inexperienced operators, such as microphone and loudspeaker measurements where the characteristics with respect to frequencies change rapidly. Likewise, all other apparatus and components can be measured and recorded as effectively, for example: filters, equalizers, amplifiers, photo-electric cells, transmission lines, etc.

The FR Recorder provides a record either on a logarithmic (db) or linear scale.

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Contains information describing our Graphic Recorders, and other data of vital importance to every electrical engineer interested in the application and advancement of automatic measurements.

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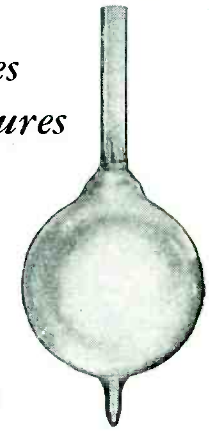

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Airco Rare Gases are pure and free of active gases. Mixtures are blended uniformly and accurately. They are available in lead glass or PYREX containers.

The individual gases as well as many standard mixtures are available both for production and experimental use. Special mixtures can be supplied to meet any need.

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Sheet, Wire, Brazing Alloys

APW

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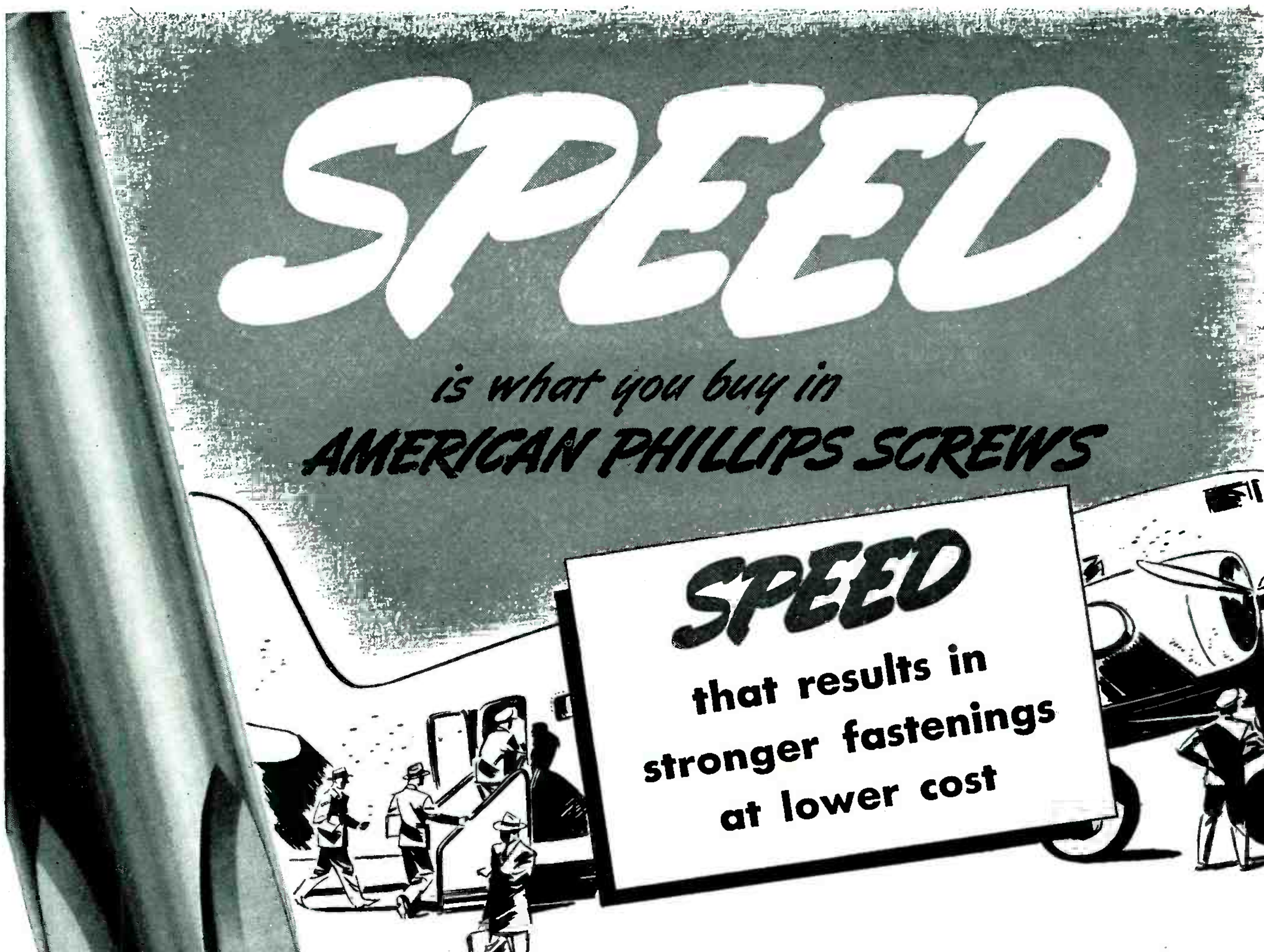
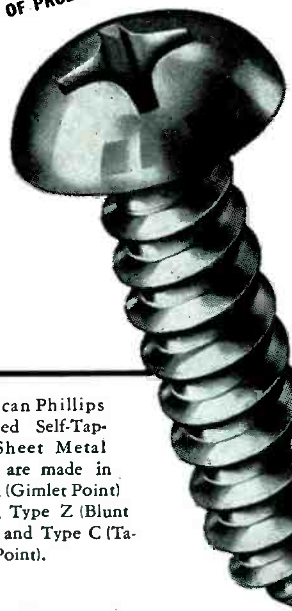


High-geared war plants are finding that they get faster and better fastenings at lower cost when using American Phillips Screws. This modern method of screw driving is faster because it's easier . . . because it permits use of power drivers on almost every type of assembly. There is no time lost in fumbled starts and dropped screws. The self-aligning fit of the 4-winged driver in the recessed screwhead makes it easy to drive this screw straight . . . straight to a tight, clean fastening without marring the work surface. Better work can be done even with unskilled labor *right from the start.*

And when you specify the American Phillips Screws, you also get the extra values of American's high quality and service . . . as well as the help of American engineers on any special fastening problem.

WORLD'S EASIEST, FASTEST, MOST ACCURATE METHOD OF PRODUCTION SCREW DRIVING

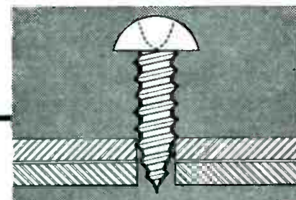


American Phillips Hardened Self-Tapping Sheet Metal Screws are made in Type A (Gimlet Point) shown, Type Z (Blunt Point), and Type C (Tapered Point).

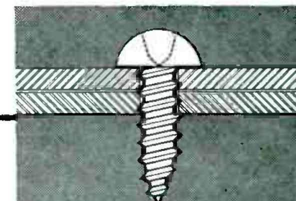
AMERICAN SCREW COMPANY

Providence 1, Rhode Island

Chicago 11, 589 East Illinois Street **Detroit 2, 502 Stephenson Building**

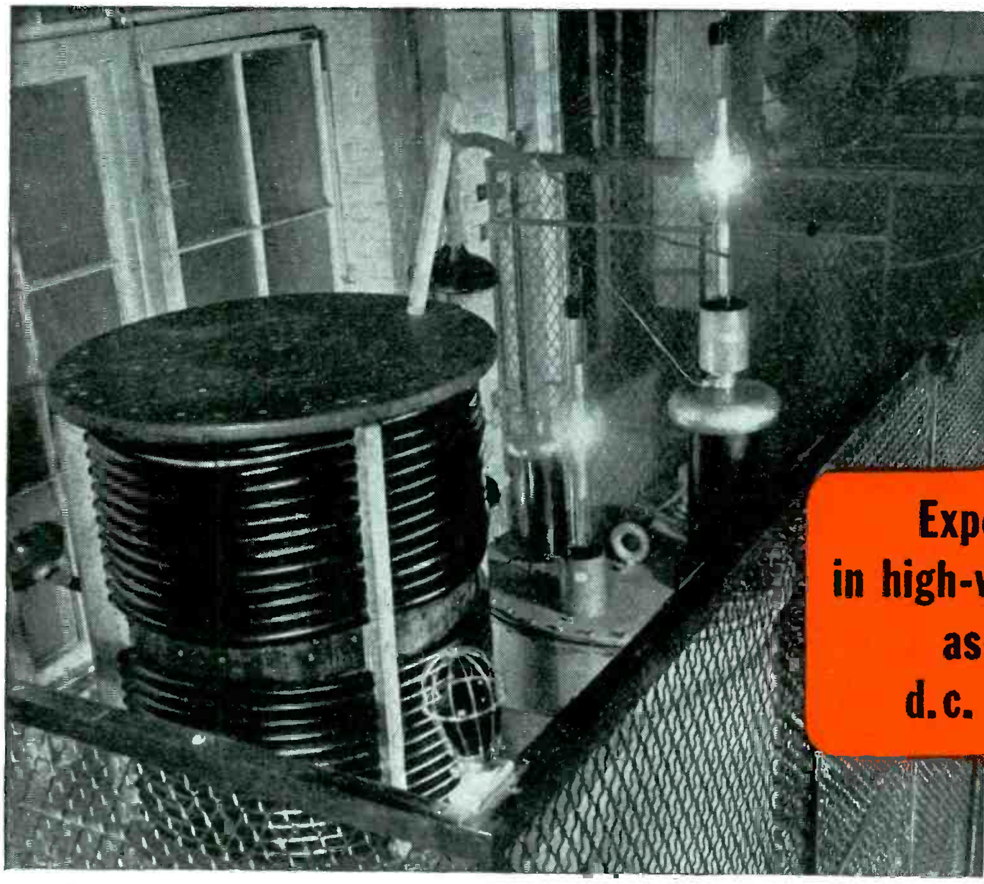


American Phillips Driver and Screw form a single, straight-line driving unit . . and stay that way until screw is completely driven in.



American Phillips Hardened Self-Tapping Sheet Metal Screw sets up tight and straight in drilled or clean-punched holes.

PUT THE SCREWS ON THE AXIS . . . BUY BONDS!



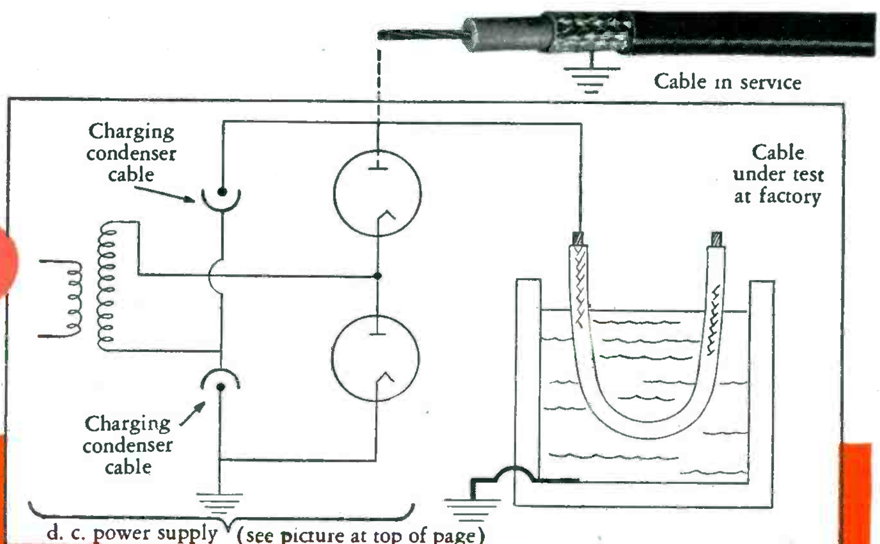
Okonite high voltage cables must pass super-voltage tests made with this d. c. kenotron set.

Experience gained in high-voltage d.c. testing assures reliable d.c. Cable Operation

For over 5 years all Okonite high voltage wires and cables have had to pass our self-imposed factory d. c. tests at voltages of 4 to 5 times those required in standard a. c. high voltage tests. This procedure was adopted in order to eliminate possible defects that a.c. testing could not always locate.

Though not required by purchasers, this extra precaution has led not only to the production of better cables but has also resulted in obtaining cables that are more reliable for the high voltage d. c. applications brought about by new electronic developments.

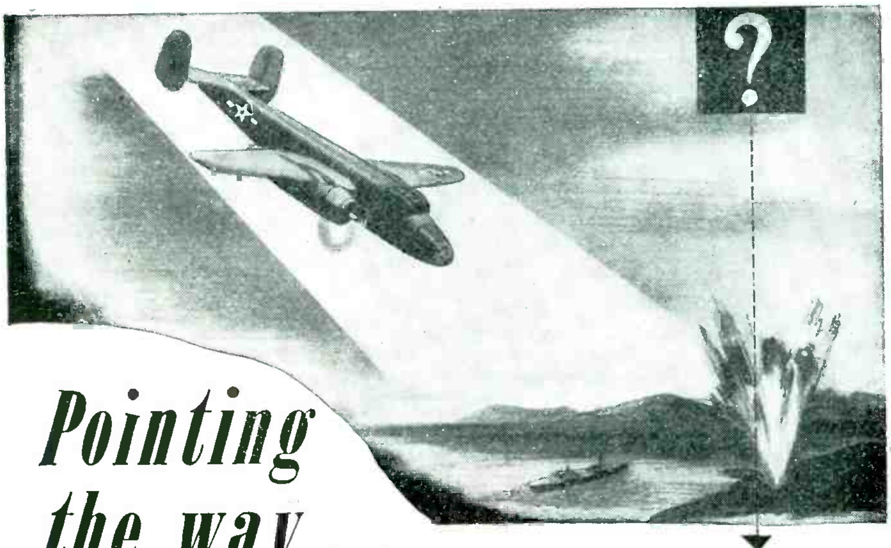
Our extensive experience with d. c. testing and d. c. applications through x-ray, co-axial and other high voltage cables for electronic uses can perhaps prove of value to you. Why not outline your problem and requirements and let Okonite's Engineering Department cooperate with you in obtaining a solution? Please write to The Okonite Company, Passaic, New Jersey.



Careful d. c. testing in the factory assures better cable performance in service.

OKONITE INSULATED WIRES AND CABLES

3654



Pointing the way....

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Today, as a result of American engineering skill ingeniously applying amplification principles to highly specialized instruments, thousands of amplifiers by "Eastern" help to guide our army and navy bombers with unerring accuracy in successfully completing their vital missions.

Our engineering staff invites your inquiry—large and small production runs, even single units, receive our usual prompt attention. *Write for Bulletin 100.*

BACK THE ATTACK ★ ★ *BUY WAR BONDS* ★

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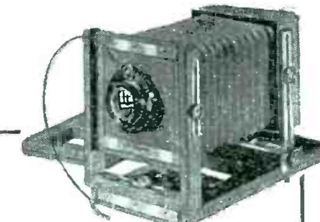

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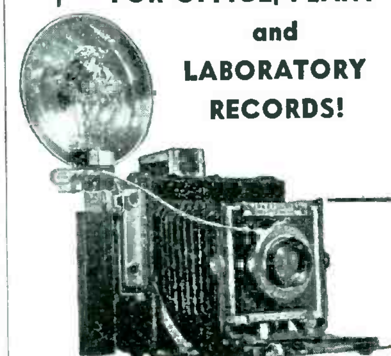

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Medium power triode for use as audio-frequency amplifier or modulator and radio-frequency oscillator or amplifier at medium frequencies.

A-F Power Amplifier and Modulator—Class B

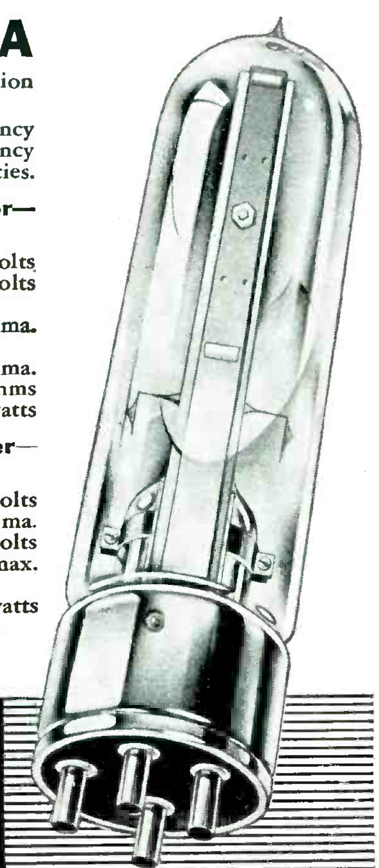
D-C Plate Voltage	2000 volts
D-C Grid Voltage	-105 volts
Zero-signal D-C Plate Current per tube .	40 ma.
Max.-signal D-C Plate Current per tube .	300 ma.
Load resistance plate-to-plate .	8000 ohms
Power Output (2 tubes) . .	650 watts

Plate-Modulated R-F Power Amplifier—Class C Telephony

D-C Plate Voltage	1500 volts
D-C Plate Current	300 ma.
D-C Grid Voltage	-200 volts
D-C Grid Current	75 ma. max.
Carrier output for mod. factor of 1.0	300 watts

Makers of high-quality Transmitting and Receiving Tubes since 1926.

IN-2-44



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NOTHING LIKE REAL DIAMONDS

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Metal Bonded DIAMOND HAND HONE
Only $15.

Coarse Grit magnified 100X

WON'T CHIP SCORE OR GROOVE!

Made in Coarse (100 grit) Medium (220 grit) Fine (320 grit)

Saves valuable toolmaker's time. Saves set-up man's time. This amazing hone keeps cutting edges keen on high speed steel or hardest grades cemented carbides . . . Prompt delivery with priority.

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In just 5 minutes . . .

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PRODUCES A DEEP, LASTING BLACK OXIDE FINISH FOR IRONS AND STEELS!

BEFORE Alrose research chemists developed the Jetal Process back in 1932, lengthy "blueing" and "browning" methods were the only means of producing protective finishes for irons and steels. Now, with practically every finishing operation a race against time, the value of the Jetal 5 Minute Process is increased many-fold.

By immersion in an aqueous solution this process produces a tough, long lasting black oxide finish. The finish is adaptable to practically all cold and hot rolled steels, as well as most forged steels and cast irons. A Jetal coating will not chip, peel, crack, crumble or dust off even if bent or cut.

Longer tool life and added economy of operation also result from application of the Jetal finish. This is due to the increased toughness Jetal gives all types of cutting and lathe tools. In addition, the Jetal Process prevents corrosion and wear.

Let the Alrose Advisory Service help you to apply Jetal to YOUR black oxide finishing assignment. Drop them a line today, no obligation . . . address Dept. B

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FOR MAGNET WIRE THAT MUST MEET SPECIFICATIONS ALL THE WAY—

WINCO

● When you specify WINCO magnet wire, there's one thing of which you can be certain:

Every inch of the delivered product will be found uniformly accurate and free from variation. It will have the required electrical properties, flexibility, tensile strength, laying speed, etc.

Modern wire making methods, mercury process tests and exacting WINCO supervision, guarantee that any order for magnet wire products, whether it be for a single spool or a million pounds, must meet specifications all the way.

If you have a magnet wire probem of any nature our engineers and complete facilities are at your disposal. Send product blue prints or specifications for our recommendations. Or if you wish samples for test, we will be glad to cooperate.

ENAMELED COPPER
ENAMELED IRON
ENAMELED ALLOY
ENAMELED ALUMINUM
TWISTED MULTIPLES
PARALLEL MULTIPLES
SILK COVERED
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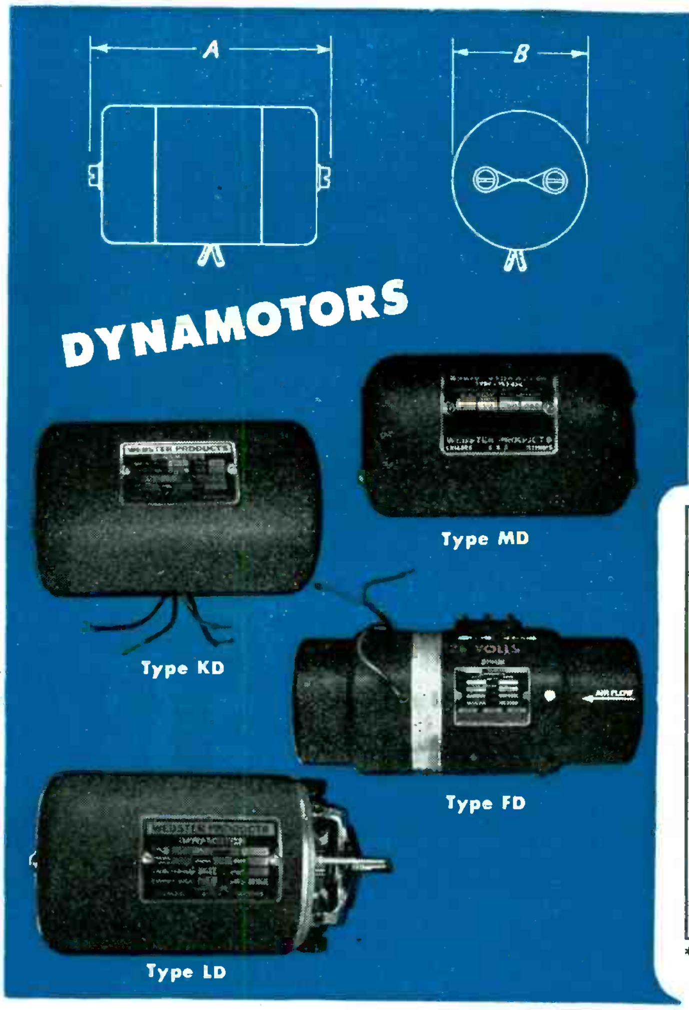
SPECIALS TO ORDER

WINSTED DIVISION

WINSTED HUDSON WIRE COMPANY **CONNECTICUT**

WEBSTER PRODUCTS



Dealing with VOLTAGE and VOLTAGE REGULATION

...*with outstanding performance advantages*

The Webster dynamotors listed here are our standard large-scale production models. The outstanding performance records they have set reflect the care with which parts are machined and inspected before assembly to assure good balance, minimum vibration and maximum durability. You can have more complete details than space permits giving here by just writing for them.

Wattage	Webster Model Number	Input		Output*		Net Wt. Lbs.	Dimensions	
		Volts	Max. Amp.	Volts	Amp.		A	B
10 to 15	MD-1020	14	2.4	250	.060	2 9/16	4 13/16	2 3/4
	MD-1021	28	1.15	250	.060	2 9/16	4 13/16	2 3/4
	MD-1022	28	1.15	250	.060	4 1/4	4 13/16	2 3/4
	MD-1024	27	1.15	250	.060	2 9/16	4 13/16	2 3/4
15 to 20	KD-1000	14	2.8	220	.080	5	5 5/8	3 7/16
	KD-1001	12	3.8	220	.100	5 1/4	5 5/8	3 7/16
	KD-1002	13.8	2.5	230	.070	4 7/16	5 5/8	3 7/16
	KD-1004	27.9	1.25	230	.070	4 7/16	5 5/8	3 7/16
20 to 30	LD-1010	12.2	3.3	230	.090	5 3/8	5 29/32	3 7/16
	LD-1011	28	1.6	230	.100	5	5 29/32	3 7/16
	LD-1012	9	6.4	450	.060	5 3/4	6 7/16	3 7/16
	LD-1013	18	3.3	450	.060	5 3/4	6 7/16	3 7/16
	LD-1014	18.5	3.3	400	.080	5 3/4	6 7/16	3 7/16
150	FD-1060	28	10.5	High 300 Med. 150 Low 14.5	.260 .010 4.9	21	12 1/16	5 11/32

*Ratings shown are for continuous duty with temperature rise and secondary ripple voltage well within the limits of Government Specifications. Models listed are also available with mounting brackets or filters when required.

VOLTAGE REGULATORS

VR-2000—Performance when carbon pile is shunted with 4-ohm resistor

Input Voltage	Pile Drop	Pile Current	Pile Resistance (Ohms)	Regulated Output Voltage	Max. Load (Amperes)	Wt. (Lbs.)	O.D. (Inches)	Height (Inches)
21.0	2.2 V.	4.5 A.	.49	18.8	5.0	2 1/4	2 13/16	4 7/16
30.0	11.0 V.	2.4 A.	4.68	19.0				

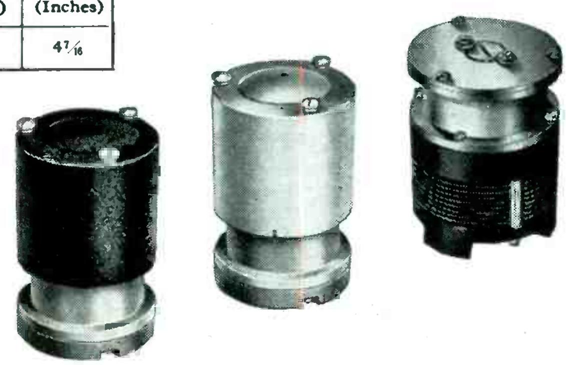
VR-2001—Performance when used in series with regulating field of dynamotor

Input Voltage	Pile Drop	Pile Current	Pile Resistance (Ohms)	Regulating Field		Regulated Output Voltage	Wt. (Lbs.)	O.D. (Inches)	Height (Inches)
				Volt.	Amp.				
21.6	6.8 V.	1.4 A.	4.85	14.8	1.2	13.1	2 1/4	2 13/16	4 7/16
29.0	25.0 V.	.34 A.	73.5	4.0	1.2	13.2			

Webster Carbon Pile Voltage Regulators are sturdy, compact, reliable—withstanding vibration, shock, moisture and salt spray. Maximum pile resistances from approximately 1½ ohm to 100 ohms are available. Compensation for wide temperature ranges is provided. Typical performance of two models under specific operating conditions is indicated in the tables at left. Our engineers will be glad to study your application to see if a Webster Regulator will do the job best. Please include complete circuit data and operating specifications with your inquiry.

BUY MORE WAR BONDS NOW!

LOOK TO WEBSTER PRODUCTS
TODAY
Dynamotors and Voltage Regulators
TOMORROW
World-Acclaimed Record Changers



WEBSTER PRODUCTS

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THE NEWCOMB
Model 146-S
Portable
SOUND SYSTEM

THIS powerful sound system complete . . . 39½ pounds . . . ready for immediate action. Users report successful audibility on land up to ½ mile, (dependent on terrain and noise level) and at sea up to 2 miles.

FEATURES:

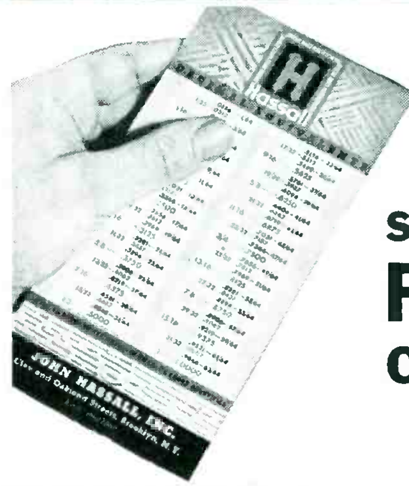
- Designed for high acoustic output (approximately 95 db. at 100 ft.) . . . low battery consumption (STAND-BY: 1.65 amps.—ON: 10.5 amps.)
- A press-to-talk switch closes circuit on integral vibrator power supply only for duration of speech.
- Audio output 14 watts.
- Ideal for ship-to-ship or ship-to-shore communication.
- Especially valuable where radio use is restricted.
- Widely used by armed forces in landing operations. Also for cadet training, prisoner control and similar activities.
- In addition to remarkable volume and compact size, low cost makes it widely practical.

Investigate today the advantages this portable sound system offers you.

COMPLETE UNIT INCLUDES:
- Microphone
- Amplifier
- Power supply
- Loudspeaker

Expansion into eastern market now opens territories for new distributors. Write for more information on all Newcomb products.

NEWCOMB
AUDIO PRODUCTS CO.
(Complete Sound Systems)
2815 S. HILL ST., LOS ANGELES 7, CALIFORNIA



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Decimal Equivalents. Accurate to four places. Signaled in three colors for maximum speed in locating decimal equivalent of fraction. Saves time and avoids errors. Yours at no cost or obligation. Just send us your name, title and address.

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Specialists in Cold-Forging Since 1850
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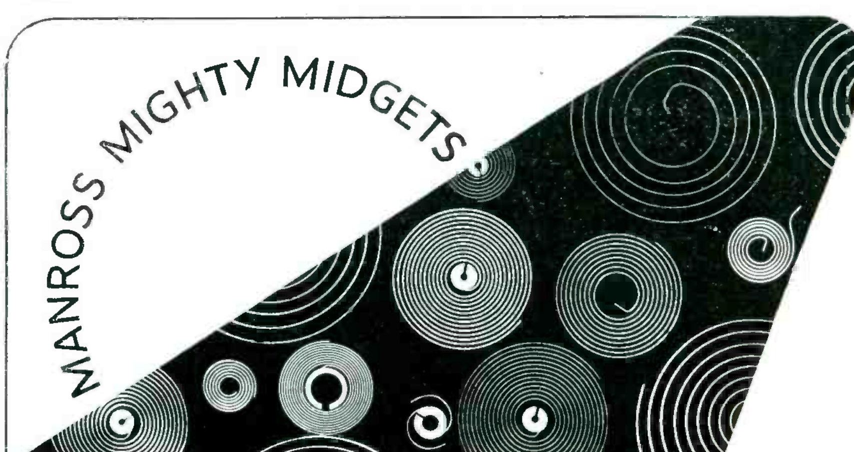
SPECIAL NAILS RIVETS SCREWS
Hassall



The Standard for Accuracy and Performance

For instruments, indicators, relays, switches—there are no finer springs than Manross hairsprings. Get the benefits of sound experience in design and modern research in materials.

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F. N. MANROSS & SONS
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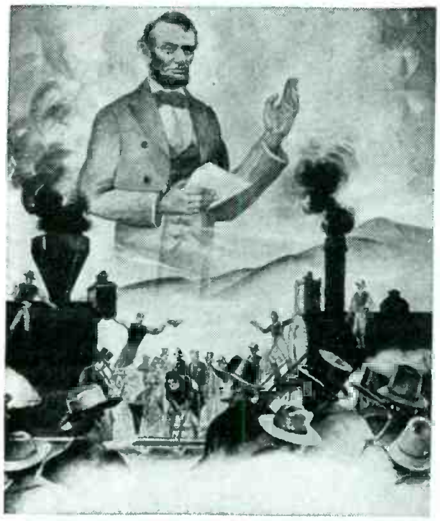


LINCOLN'S VISION

is today's reality!

STEEL RAILS connecting coast with coast. Railroad trains speeding goods and people to and from the country's farthest outposts. That was the national development Abraham Lincoln, with sure vision, foresaw when he signed the Pacific Railway Bill, July 1, 1862. In 1869, four years after his death, the Golden Spike was driven in Utah which united the first transcontinental tracks. There, the fast, personalized shipping service initiated in New England in 1839 became a national reality by railroad.

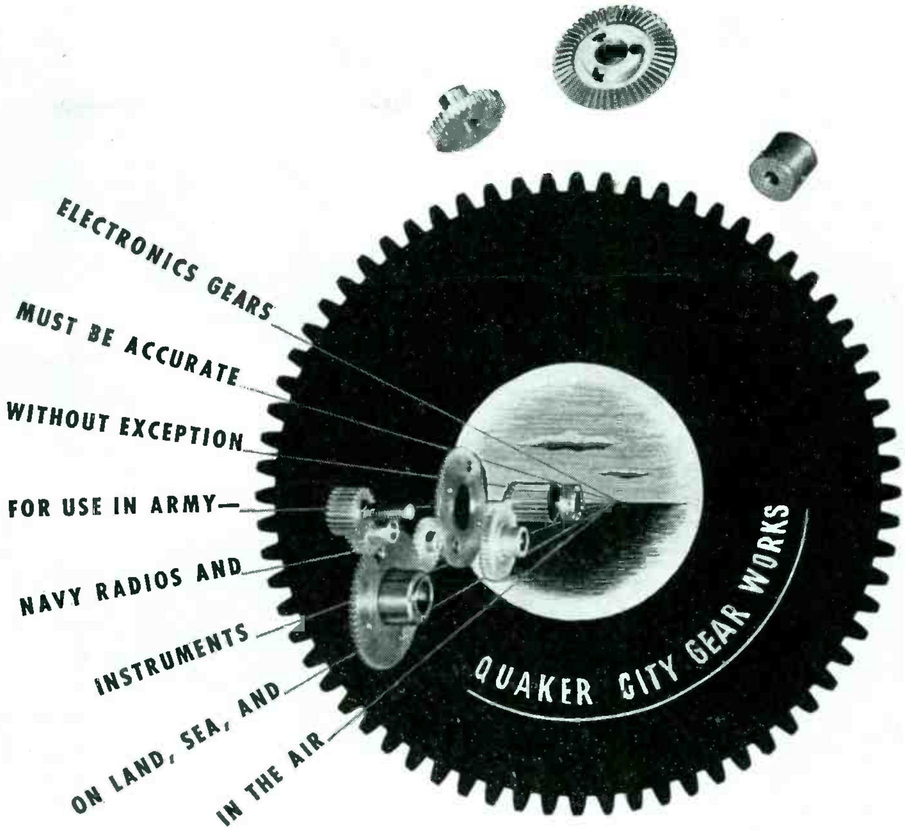
Today, Railway Express is serving the country's shipping needs via 230,000 miles of railroads plus motor lines, waterways and the nation's commercial airlines. The goods now are mostly war materiel. In peace time they will again encompass every conceivable personal item as well as the products of industry and agriculture.

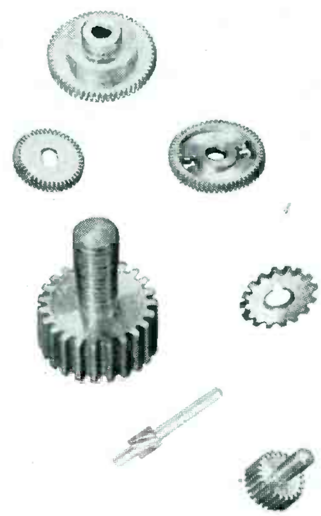
You can help us carry our share of America's war time shipping load and serve you better by doing two simple things: Pack your shipments securely . . . address them clearly. Our century of experience proves that "a shipment started right is half-way there!"

BUY MORE THAN BEFORE — IN THE 5th WAR LOAN

RAILWAY EXPRESS AGENCY

NATION-WIDE RAIL-AIR SERVICE





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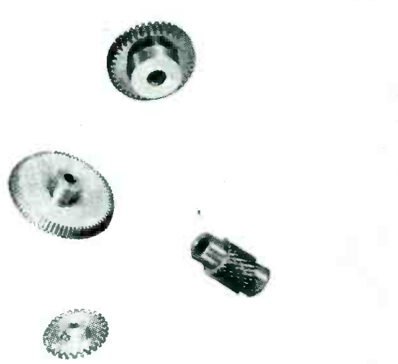

Quaker City Gear Works

INCORPORATED

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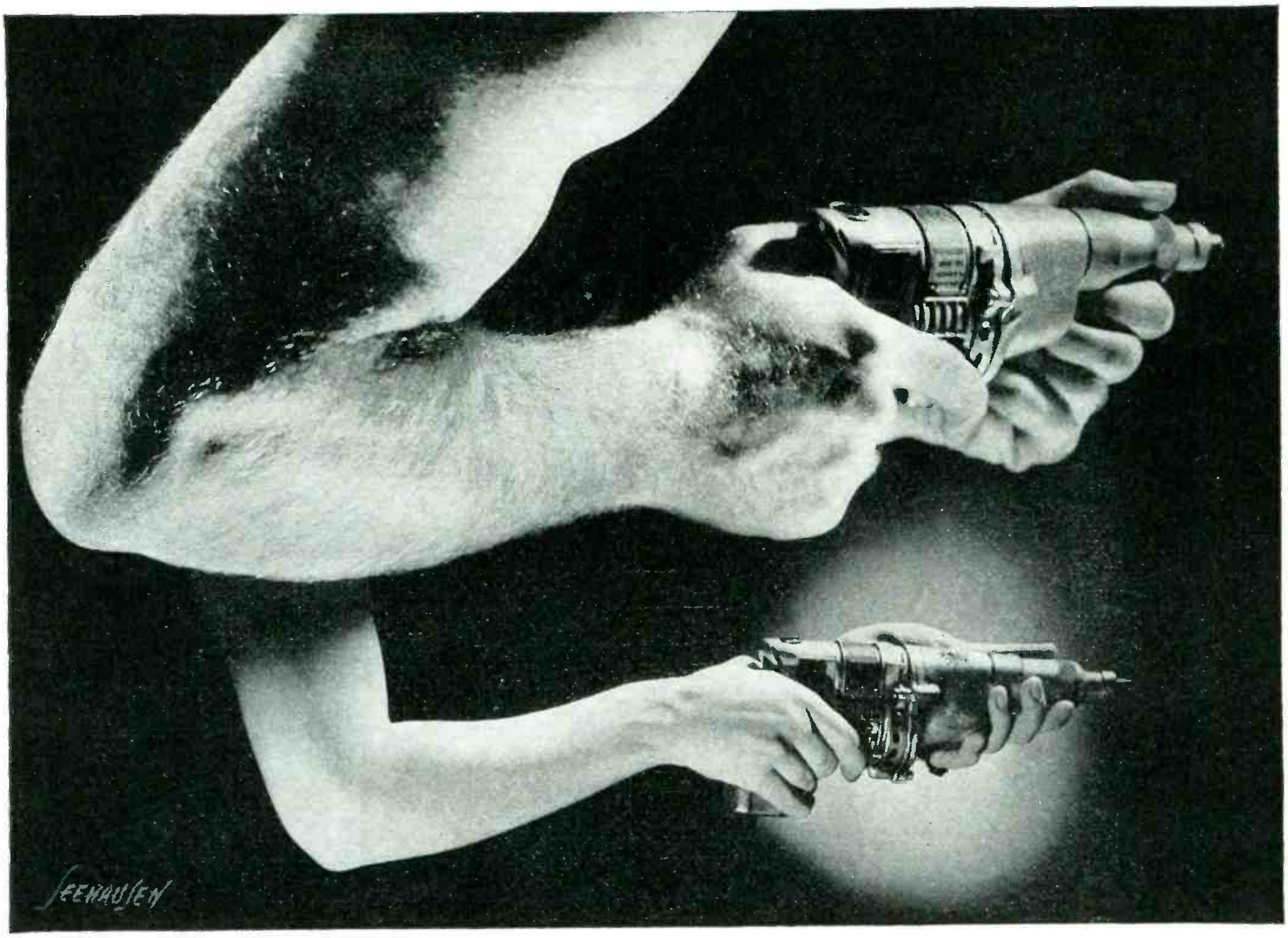

Compare The Effortless Ease

with which CLUTCH HEAD Screws are driven home . . . *employing the substitution of method for muscle* . . . with definite output gain at the end of the day. The explanation is simple. With the straight-walled Clutch recess, matched by the straight sides of the Type "A" Bit, there is no "ride-out" tendency and, therefore, no need for strenuous end pressure. This exclusive CLUTCH HEAD feature eliminates the fatigue factor set up by end pressure. In addition, the wide Clutch of this modern screw develops speed and confidence in line assembly work by presenting a safe, easy-to-hit target.

CLUTCH HEAD *contributes so many outstanding exclusive advantages for faster, better, safer, and lower cost production that it has come to be accepted as* "The Screw That Sells Itself." *You may demonstrate this to your own satisfaction by asking us* to mail you *package assortment of* CLUTCH HEAD *Screws and sample of the Type "A" Bit.*

The fact that CLUTCH HEAD Screws operate with the ordinary type screwdriver simplifies problems of field service. This feature has proved its value in many phases of the war effort. This modern screw is available in Standard and Thread-forming types for every purpose.

CLUTCH HEAD SCREWS

This rugged Type "A" Bit delivers long uninterrupted service. A brief application of the end surface to a grinding wheel restores original efficiency. No delay, and no "back-to-the-factory" shipment for reconditioning.

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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.

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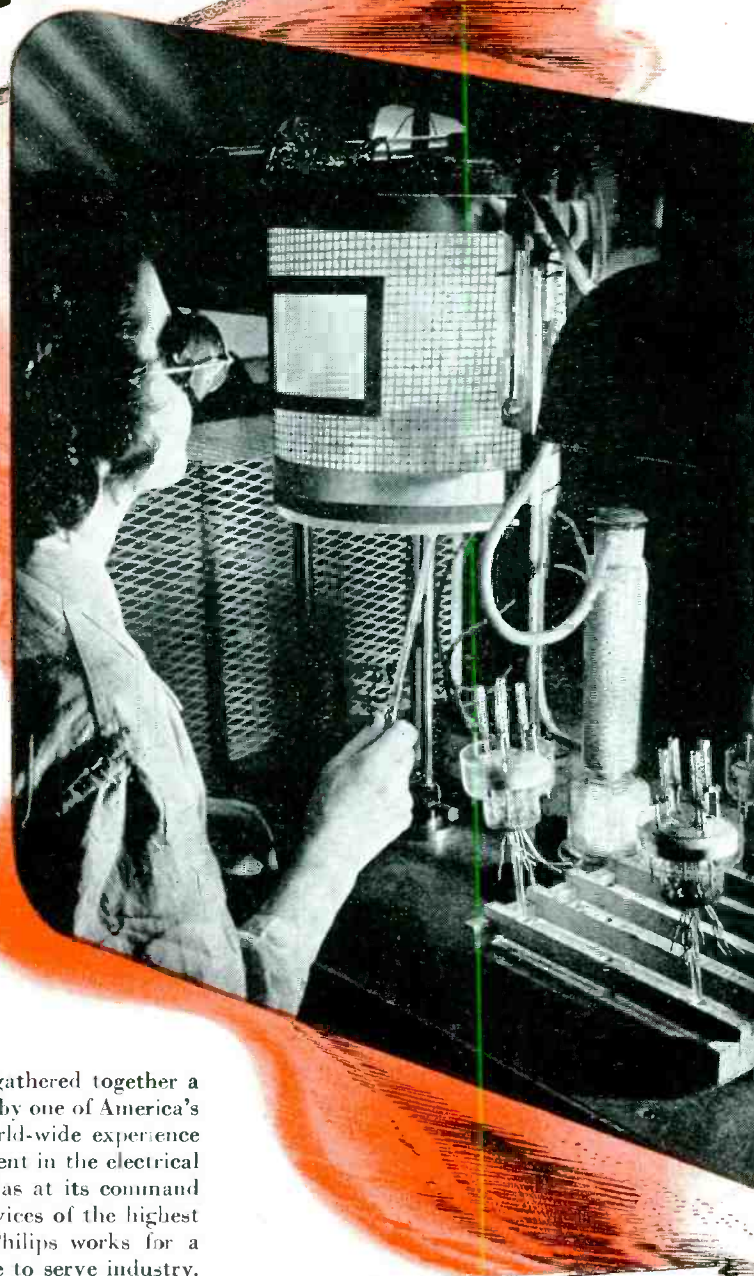
PRECISION MANUFACTURERS AND ENGINEERS OF RADIO AND ELECTRICAL EQUIPMENT

FLASHING LONG LIFE INTO POWER TUBES



IN transmitting tubes operating in military communications at ultra high frequencies, long life and uniform electron emission are imperative requirements. The photograph illustrates one interesting tube manufacturing operation with the tungsten filaments being "flashed" in a hydrogen atmosphere as a protection against oxidation.

North American Philips engineers build long life expectancy, optimum electron emission and all-round satisfactory performance into every NORELCO tube they manufacture.

Although all the tubes we produce now go to the armed forces, we invite inquiries from prospective users. A list of tube types we are especially equipped to produce will be sent on request.

In the North American Philips Company, there is gathered together a team of outstanding electronic engineers, captained by one of America's leading physicists, and coached by a group with world-wide experience resulting from fifty years of research and development in the electrical field. This new combination of technical talent has at its command many exclusive processes that insure electronic devices of the highest precision and quality. Today, North American Philips works for a United Nations' Victory; tomorrow, its aim will be to serve industry.

Norelco ELECTRONIC PRODUCTS by

NORTH AMERICAN PHILIPS COMPANY, INC.

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

NORELCO PRODUCTS: Quartz Oscillator Plates; Amplifier, Transmitting, Rectifier and Cathode Ray Tubes; Searchray (X-ray) Apparatus, X-ray Diffraction Apparatus; Medical X-ray Equipment, Tubes and Accessories; Electronic Measuring Instruments; Direct Reading Frequency Meters; High Frequency Heating Equipment; Tungsten and Molybdenum products; Fine Wire; Diamond Dies. When in New York, be sure to visit our *Industrial Electronics Showroom.*

"BUFFALO CALLING FLIGHT 37...."

A typical Corry-Jamestown installation! This equipment, installed at a ground station for air-borne radio, includes transmitter, rectifier, and modulator units by one of the largest manufacturers of radio equipment housed in Corry-Jamestown cabinets.

If your requirements include chassis, chassis mounting or shelf assemblies, panels, housings or cabinets, our ability to build them of steel, stainless steel or aluminum should interest you.

So should our reputation for fair prices and quality equipment.

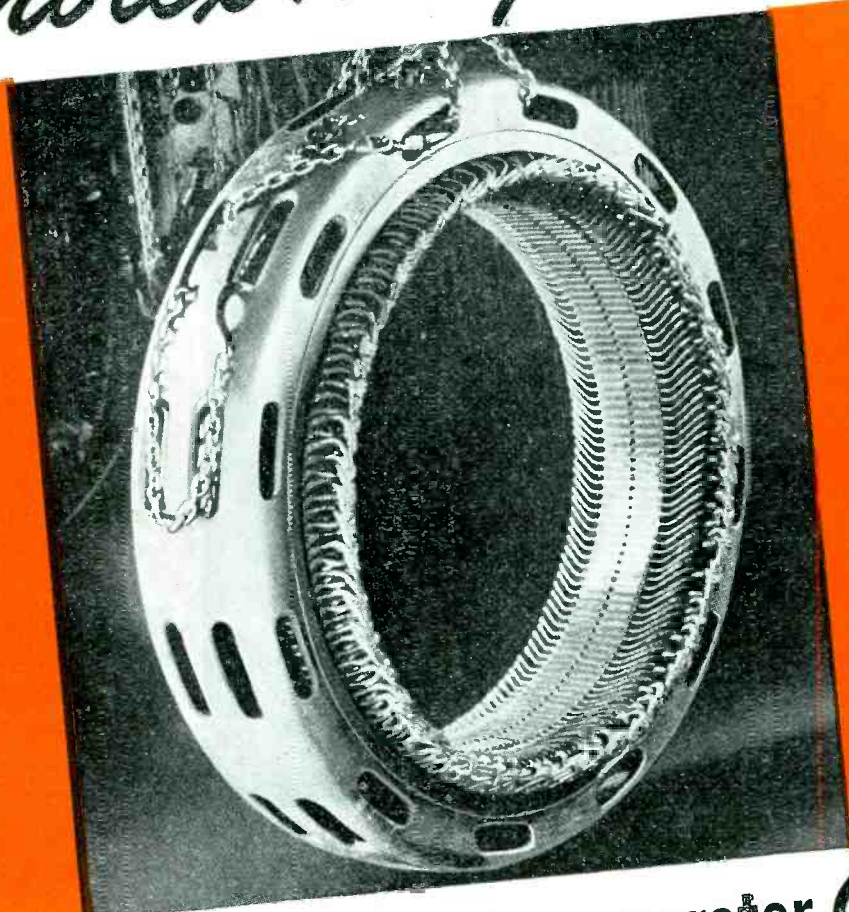
We invite you to send us your specifications.

Steel Age

CORRY - JAMESTOWN

MANUFACTURING CORPORATION ★ CORRY, PENNA.

Vitrotex Magnet Wire



upped the capacity of this generator *20%*

IT'S A TYPICAL EXAMPLE of results from Vitrotex. When this generator—which was connected to a water wheel of larger capacity—began to overheat, it was rewound with Vitrotex. Result: capacity was increased from 75 KW to 85-90 KW.

Vitrotex pure spun-glass insulation is fire-resistant . . . moisture-proof . . . highly resistant to corrosion. Anaconda Vitrotex Magnet Wires retain sufficiently high dielectric strength to operate satisfactorily at temperatures considerably above the destruction point of cotton, silk, paper and similar insulation.

Excellent space factors, too

And with all their exceptional thermal and dielectric properties—Vitrotex Magnet Wires possess excellent space factors. The design advantages are obvious.

Especially at high operating temperatures, use of Vitrotex wire permits reduction in size of the device in which the wire is used, without danger of failure due to heat. In the same size, Vitrotex can replace other insulations and thereby increase output.

The Vitrotex covering is *bonded* to the wire (either bare or enameled) resulting in a smooth surface resistant to abrasion. The covering is extremely flexible and compares favorably with steel in tensile strength.

Vitrotex Magnet Wires are one of the many fine *engineered* products of Anaconda. Any of our sales offices will be glad to supply additional data. 44286

magnet wire and coils

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from our Research Laboratory . . .
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Scientific Radio Products Company proudly presents two newly designed crystal units, adaptable to a multitude of uses. Made with the same careful precision as the thousands we produce for the armed forces, these crystals are now available on priority order.

Type SR1-V, at left, is continuously variable over a range of 12 Kc. at 3 Mc. It may be controlled from the front panel of the transmitter by attaching a flexible shaft to the 1/4 inch adjusting shaft at top of holder. Available in the frequency range from 1600 to 4000 kc. 2 cy/mc/deg. C. or less.

Type SR2-V, at right, consists of a precision ground low drift crystal in adjustable ceramic holder designed to fit a five-pin socket. Available for any frequency from 200 kc. to 8500 kc. temperature coefficient of 1 cy/mc/deg. C., or 2 cy/mc/deg. C.

For prices and full particulars, write.

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Would you like to read the interesting story of the development of the American crystal industry? Send for your copy of our new brochure. It's as interesting as a tour through our plant. Yours for the asking.

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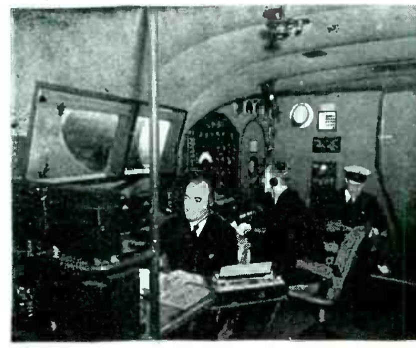

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Where action is the hardest . . . where the PTs and the Flat-tops move in, Premax Antennas are doing their job in maintaining communications that are vital to Victory.

When this is over, Premax will have an outstanding line of antennas for commercial installations.

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The New Model 710

VOLT — OHM — MILLIAMMETER

NOW AVAILABLE FOR PROMPT DELIVERY ON PRIORITY OF AA3 OR BETTER!!

Sensitivity—

1,000 OHMS PER VOLT

ON BOTH A.C. AND D.C.!!

Measures:—

A.C. AND D.C. VOLTAGES UP TO —

1500 VOLTS

A.C. CURRENT UP TO —

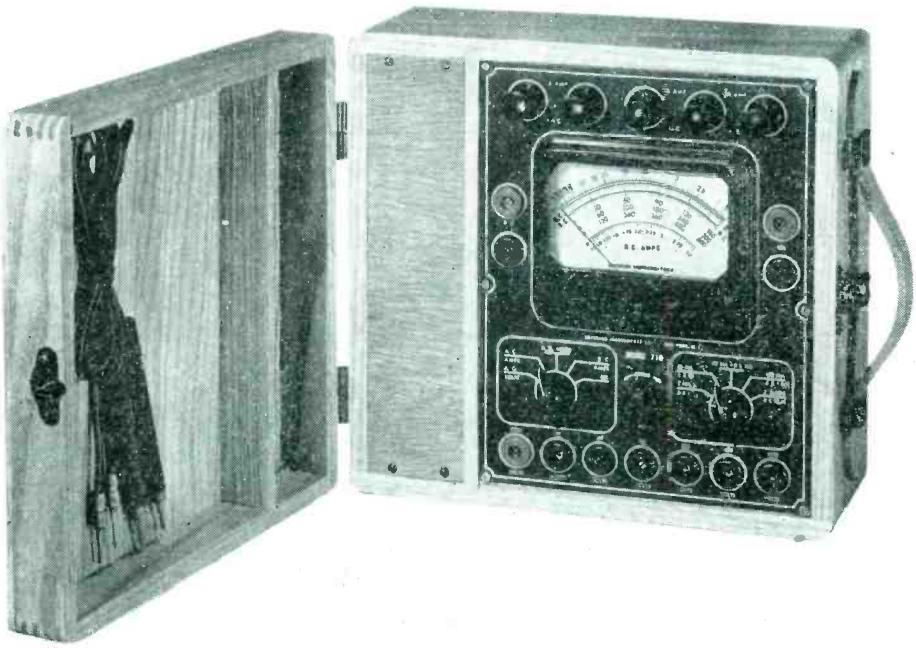
3 AMPERES

D.C. CURRENT UP TO —

30 AMPERES

RESISTANCE UP TO —

10 MEGOHMS



Features:—

*Uses New 4½" Square Rugged 0-400 Microampere Meter.

*Direct Reading—All Calibrations Printed Directly on Meter Scale in Large Easy-to-Read Type.

*Housed in Rugged Heavy Duty Portable Oak Cabinet.

*Completely self-contained—No External Source of Current Required.

A 400 Microampere meter movement is shunted to provide a sensitivity of 1,000 Ohms Per Volt on both A.C. and D.C. This method—using a 400 Microampere meter instead of a 1 Milliampere meter—affords improved damping because the meter is at all times shunted by a resistance. An Ayrton universal shunt is used for all current and resistance ranges. Paired multipliers insure accuracy of all voltage ranges and in addition two individual master calibrating adjusters enable precise calibration of all A.C. and D.C. Voltage Ranges. An almost perfectly linear A.C. scale is provided by using a special copper oxide rectifier unit which has an inverse to forward "a" resistance ratio of better than 400 to 1. Although the current carrying capacity of this rectifier is 15 ma., a maximum of 1 Milliampere is permitted to pass through the unit. This insures minimum heating in the rectifier unit guaranteeing high stability of all A.C. calibrations.

Specifications:—

6 D.C. VOLTAGE RANGES (1000 OHMS PER VOLT)
0 to 15/60/150/300/600/1500 Volts.

6 A.C. VOLTAGE RANGES (1000 OHMS PER VOLT)
0 to 15/60/150/300/600/1500 Volts.

7 D.C. CURRENT RANGES:
0 to 3/15/60/150 Milliamperes   0 to 3/15/30 Amperes.

A.C. CURRENT RANGE:
0 to 3 Amperes.

5 RESISTANCE RANGES:
0 to 1,000/10,000/100,000 Ohms.   0 to 1 Megohm   0 to 10 Megohms.

The MODEL 710 comes complete with cover, self-contained batteries, test leads and instructions. Size 6" x 10" x 10". Net weight 11 pounds. Price **$34.50**

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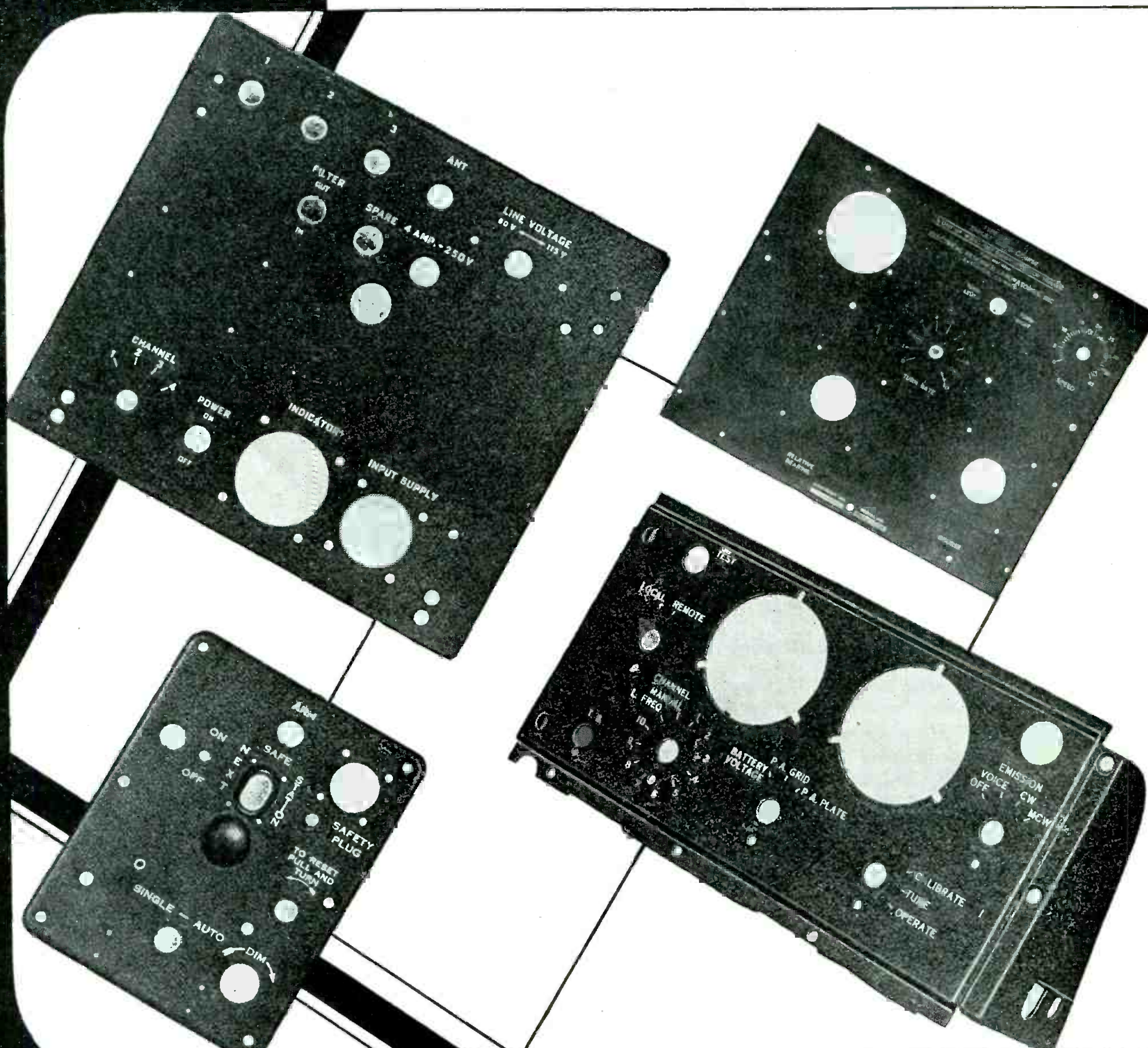

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T-30


T-45

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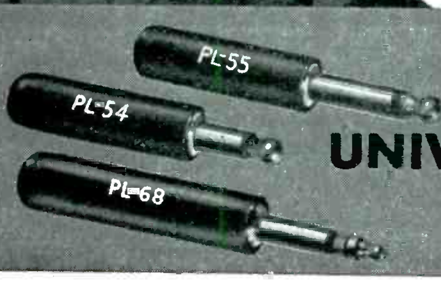
T-17

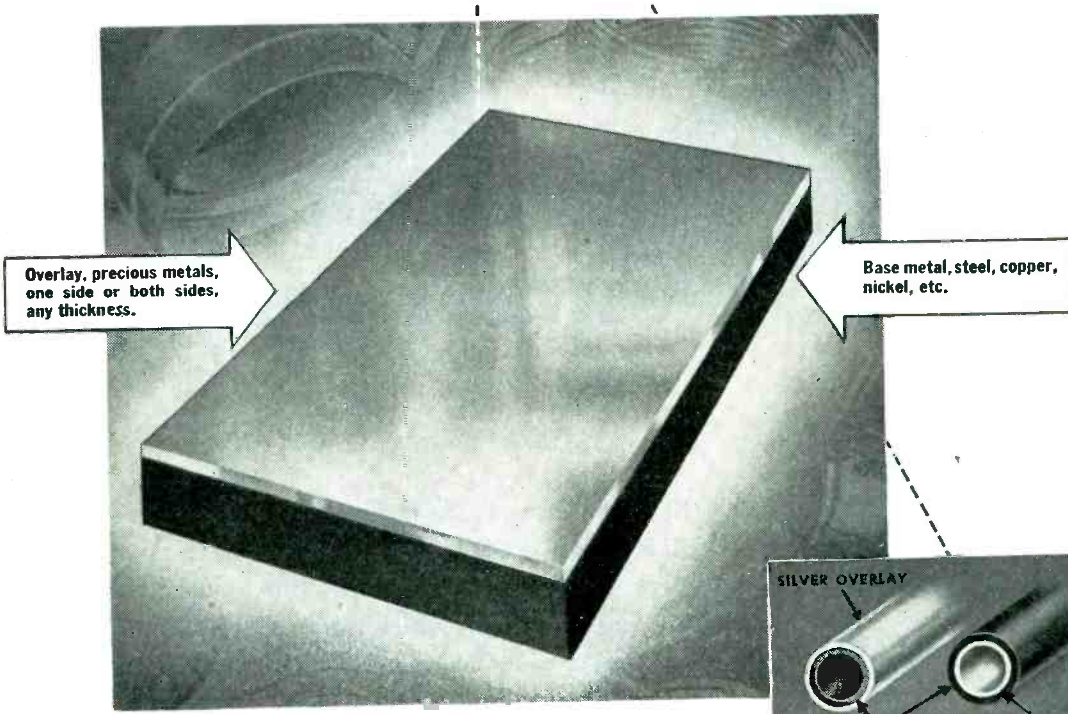
Universal takes pride in producing these three types of Microphones at the request of the U. S. Army Signal Corps. These units represent but a small part of the skill and experience which has produced over 250 different types and models made available to our customers. From Submarine Detectors to High Altitude Acoustic units, Universal's Engineering experience has covered World War II.

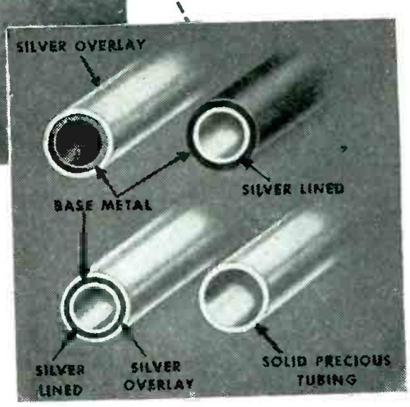
These Microphones built without peace time glamour have every essential of military utility. When peace comes, Universal Microphones, with many innovations of design and accoutrements, will enter upon the post-war scene. Universal includes among its electronic communication components, in addition to microphones: Plugs, Jacks, Switches, and Cord Assemblies.



UNIVERSAL MICROPHONE COMPANY
INGLEWOOD, CALIFORNIA

AN OPEN EYE ON POST WAR PLANNING





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SHEET • TUBE • WIRE

The post-war parade has started and General Plate Laminated Metals (sheet, wire and tube) are already being incorporated into the designs of many contemplated peace-time products such as chemical equipment, electronic devices, signal control apparatus, instruments, radios, electrical equipment, etc.

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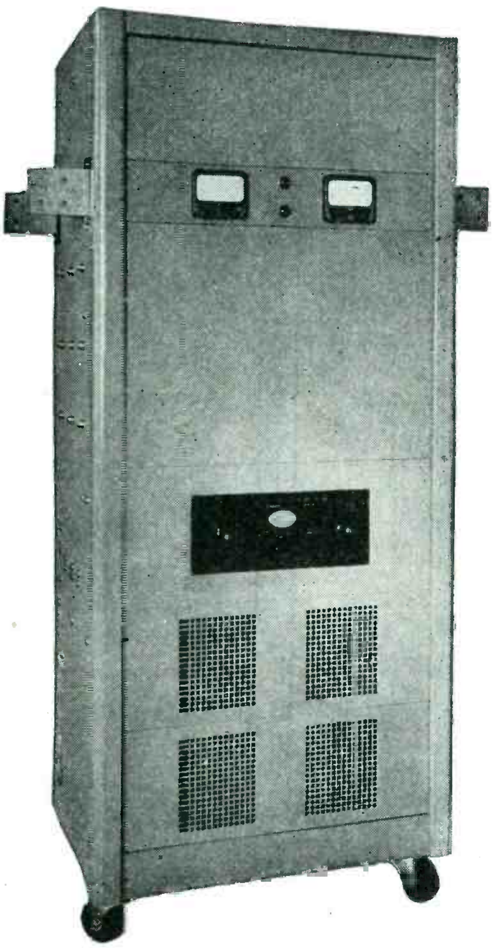

42" wide, 24" deep
Approx. 81" Tall
Capacity up to 5000 amps.
at 6 volts

Complete in ONE Cabinet with Built-in Meters and Controls

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6 Volts—25—50—75—100—300
500—1000—1500—2000
3000—4000—5000 amps.

8 Volts—300—600—900—1200
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3600 amps.

12 Volts—600—1200—1800—2400
3000 amps.

16 Volts—300—600—900—1200
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24 Volts—300—600—900—1200
amps.

48 Volts—300—600 amps.

Special requirements incorporating either selenium or rectifier tubes are met by engineering to individual needs.

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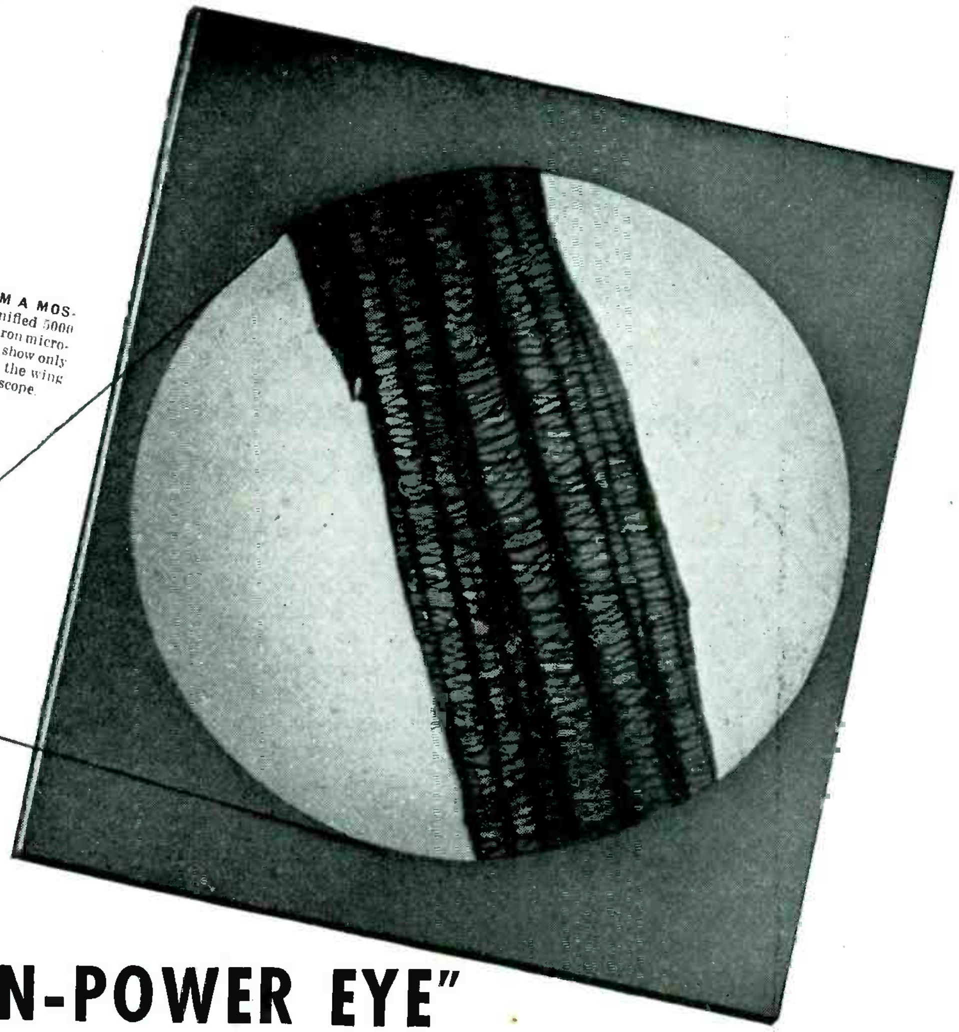
RECTIFIER ENGINEERS
EST. 1892

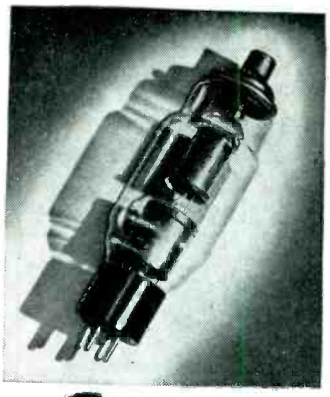
"FEATHER" FROM A MOSQUITO WING, magnified 5000 times by the G. E. electron microscope. The "feathers" show only as a fringy edge along the wing through a light microscope.



They wanted a

"100,000 MAN-POWER EYE"

...and its power to see begins with Nickel



NEW, COMPACT, G.E. ELECTRON MICROSCOPE distinguishes objects as small as 1,000,000th of an inch...magnifies them directly to 5,000 or 10,000 times actual size. If photographic enlargements are wanted, blow-ups can be made to show objects at 100,000 times their true size. Can be plugged into a regular 110-volt A.C. line.

POWER CONVERTOR TUBE (above) used in G.E. microscope converts 110-volt A.C. to 30,000 volts D.C. Vital elements of tube are made of Nickel.

You're looking at a single feather from a mosquito's wing through the new G. E. electron microscope.

Even with a fine optical microscope which can see objects as small as 1/84,000 of an inch long and magnify them 2,000 times, you could only make out the feathers as a fringy edge along the wing.

But with an electron microscope you can look at submicroscopic objects 1/1,000,000 of an inch long and reproduce them by photographic blow-up at 100,000 times their true size.

The first electron microscope was taller than a man, powered by some four dozen tubes. Now General Electric Company has simplified it into a compact instrument for general use which plugs into a regular 110-volt A.C. outlet. A 2-tube power unit converts the A.C. into 30,000 volt D.C. for the electron gun. And in both these tubes, the vital elements are nickel—because nickel combines all these advantages:

- High strength, at regular and elevated temperatures.
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- Freedom from rust . . . high corrosion resistance.
- High stiffness and damping capacity to lessen vibration.
- Ability to take strong spot welds . . . resist oxidation.
- Ability to give off absorbed gases readily.
- High electron emissivity . . . minimum back emission.

And nickel may be the answer to *your* problems, too. Write:

THE INTERNATIONAL NICKEL COMPANY, INC.
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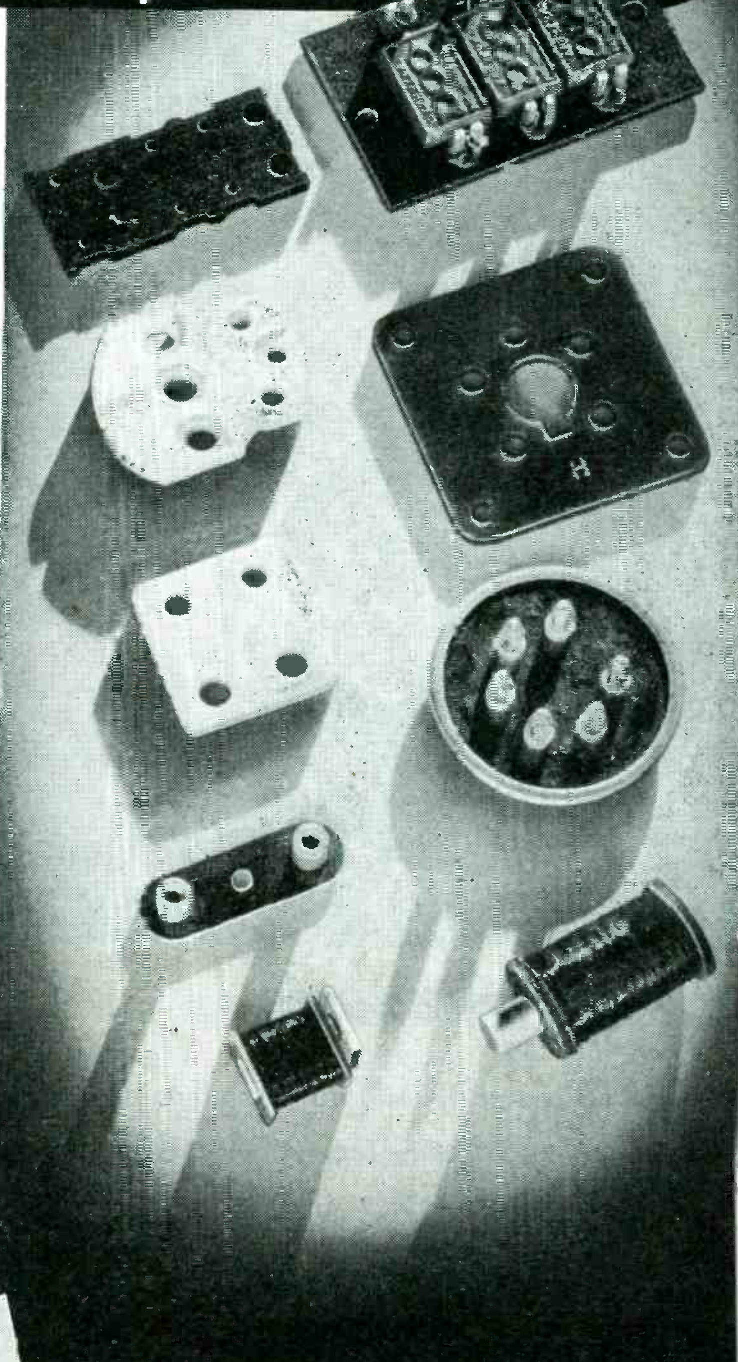
INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

a complete *Moisture Proofing* service for small parts



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Excellent Regulation and Stability
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Single knob control with range-changing switch.

Some special models to meet individual specifications are in production. The basic circuit is adaptable to meet a wide variety or voltage and current requirements.

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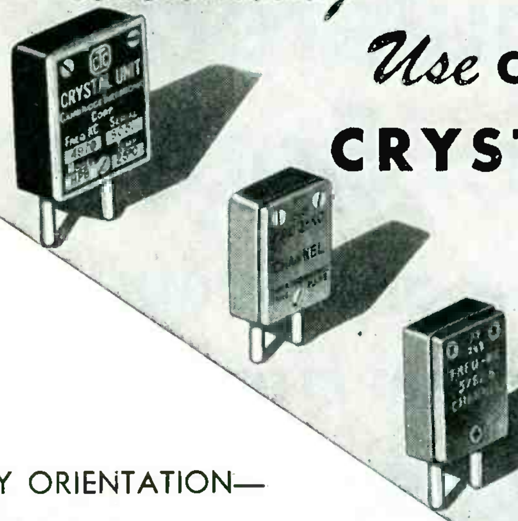

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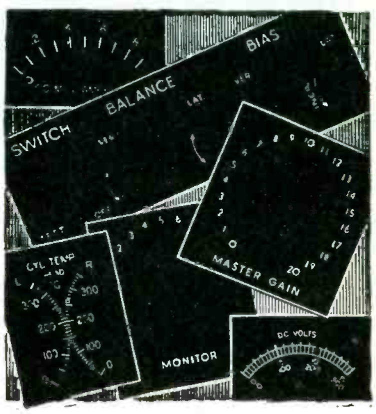

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DULAC FUNGUS RESISTANT LACQUER #86-A

Contains non-mercury bearing Fungicide. High Solids and good moisture resistance.

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Contains mercury bearing Fungicide. High solids and good moisture resistance.

Two high grade moisture and Fungus Resistant coatings made to meet Signal Corps Specification #71-2202-A dated April 12, 1944, the fungicides meeting the requirements of the Signal Corps and the Navy.

Fungus Resistant Varnishes available on request.

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Accuracy: 10 parts in 1,000,000
Output: 30 volts at 500,000 ohms
Input: 105-125V, 50-60c, 40 watts
Weight: 50 pounds

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This Multi-frequency generator furnishes the frequencies shown above at the turn of a switch. All frequencies are obtained from a temperature-compensated tuning fork and voltage-stabilized circuit.

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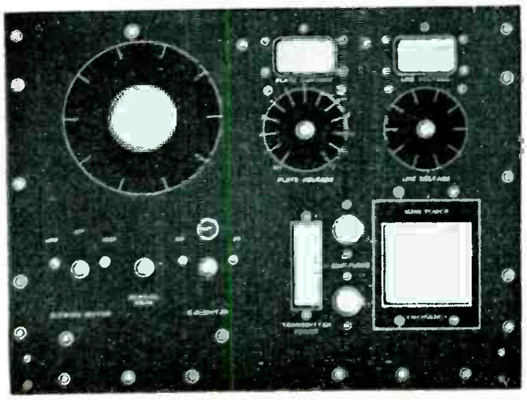
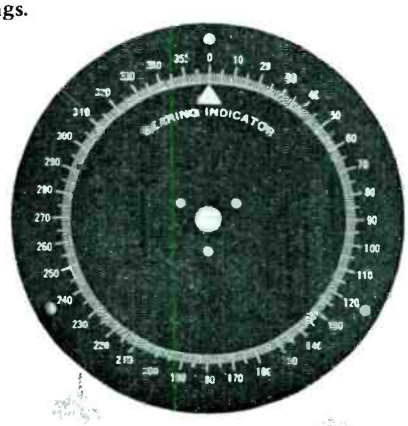
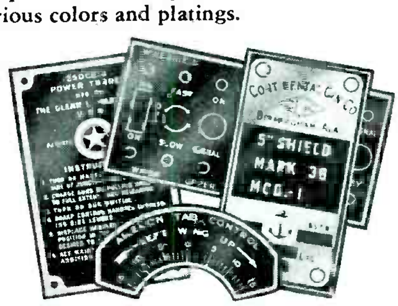


PANELS for all kinds of instruments. Made of various types of metal up to 9/64" thick. Holes punched to close tolerances. Finished in various colors and platings.

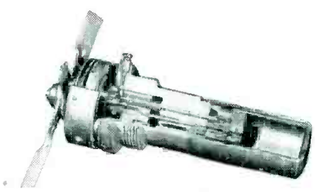


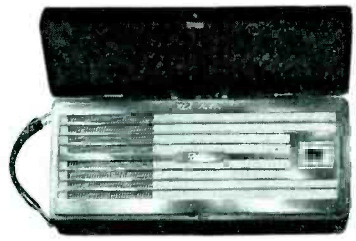
DIALS for various types of airplane instruments. Made of different types of metal up to 9/64" thick. Holes punched within precision tolerances. Finished in various colors and platings.



INSTRUCTION PLATES used on airplanes. Made in various sizes, shapes, and types of metal up to 9/64" thick. Finished in different colors and platings. Holes punched to close tolerances.

SCALES for different types of gauges and instruments. Made of various types of metal up to 9/64" thick. Markings printed and holes punched within close tolerances. Finished in various colors and platings.





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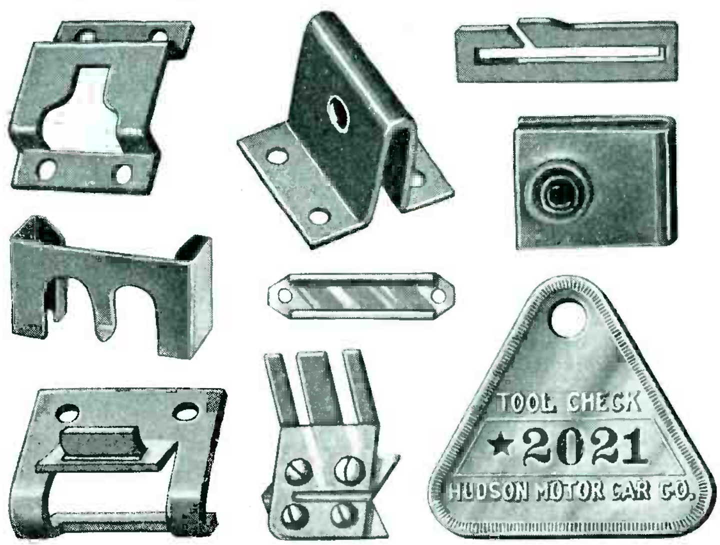

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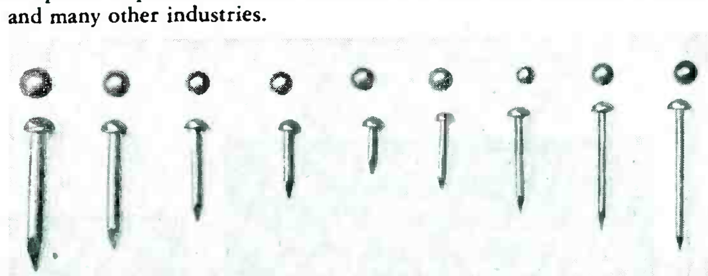

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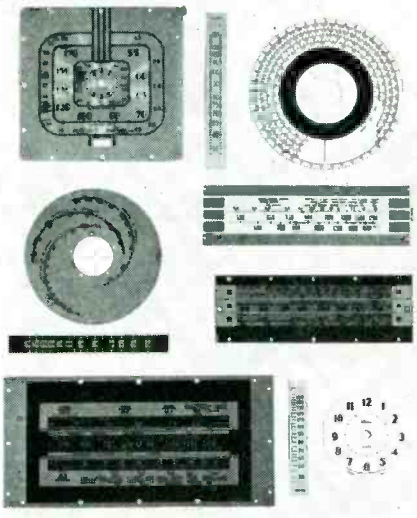

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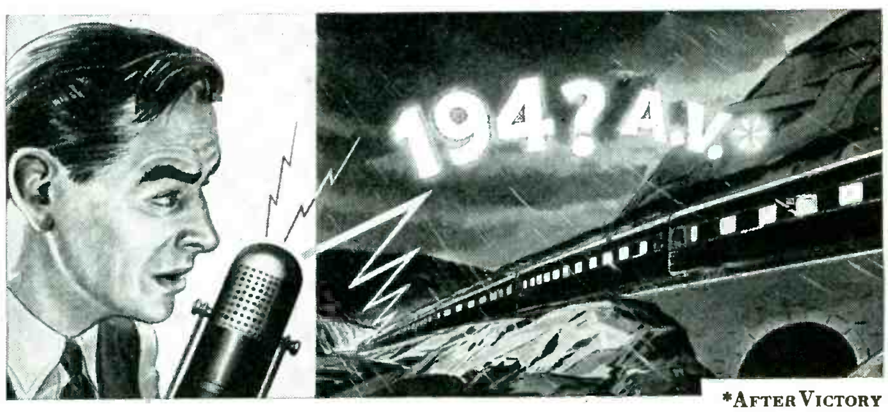

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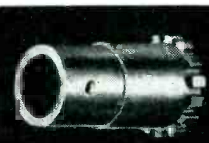

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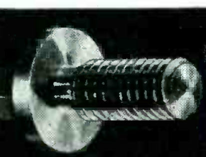

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Today, behind closed doors, I. C. E. strives for perfection in the rush schedules of war . . . tomorrow, when the fruits of our labors have helped to win the peace, you can look to the precision engineering skill of I. C. E. to help mold your drafting-board dreams into reality. ☆ Perfected in the merciless crucible of war . . . I. C. E. will have the key to many of your post-war radio-application problems.

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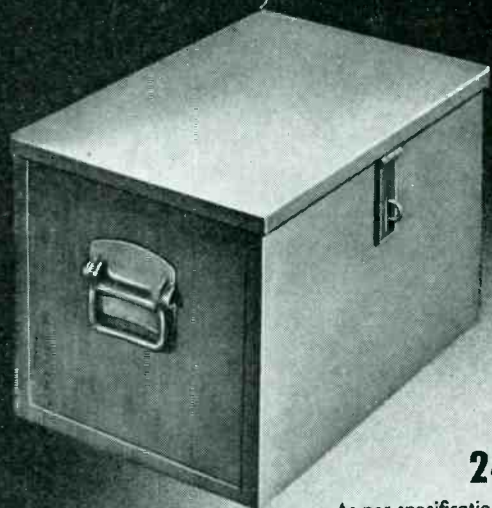
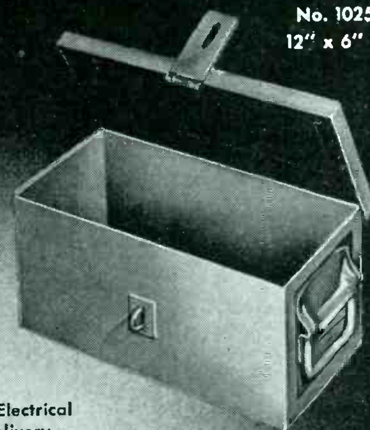


No. 1025—6
18" x 9" x 9"



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1025- 2	12	9	6	1025-15	24	15	12
1025- 3	12	12	6	1025-16	24	15	15
1025- 4	12	9	9	1025-17	24	18	12
1025- 5	18	9	6	1025-18	24	18	15
1025- 6	18	9	9	1025-19	24	18	18
1025- 7	18	12	9	1025-20	24	12	9
1025- 8	18	6	6	1025-23	30	15	9
1025- 9	18	15	9	1025-14	30	15	12
1025-10	18	12	6	1025-22	36	12	9
1025-11	18	15	12	1025-21	42	9	9
1025-12	18	12	12	1025-24	42	12	9

No. 1025—14
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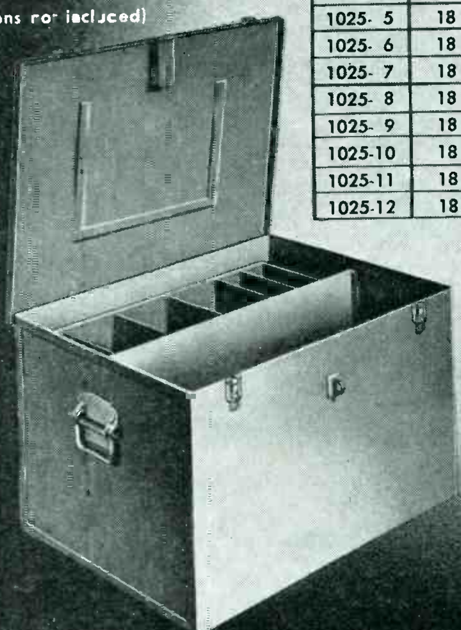

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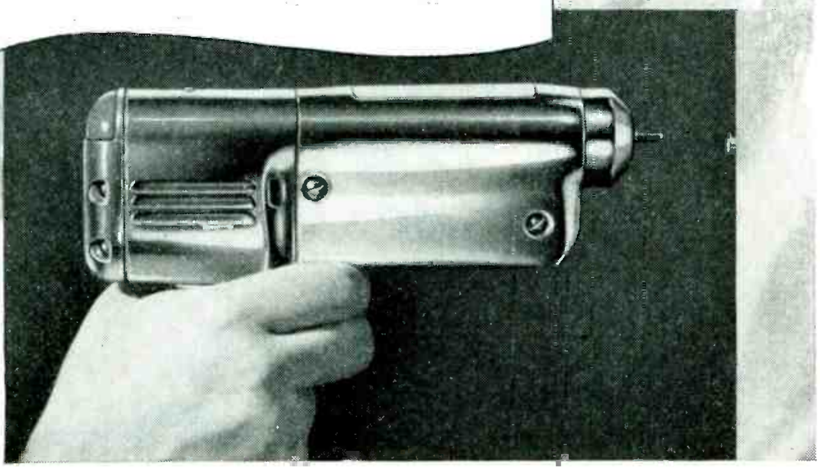

New Air Tool Drives "blind" Rivets Accurately . . . Automatically

Installing "blind" RIVNUTS quickly with precise, positive upset while working entirely from one side is now possible with the recently developed Auto RIV-Driver. Completely automatic, the tool runs a threaded mandrel into a Rivnut, upsets it, backs the mandrel out and stops the tool. Operators simply press a throttle; make no manual adjustments for any operation. Rivnuts are installed 6 to 8 times faster than formerly; rejects are almost completely eliminated.

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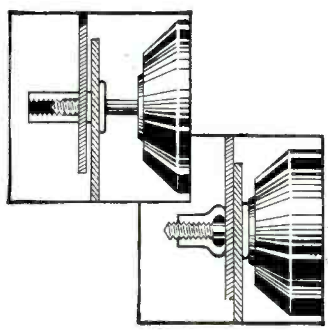

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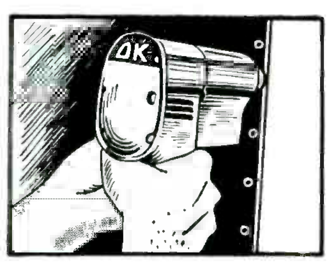

Automatic action, positive depth control and visual indicator assure correct and uniform installation of rivnuts with new Auto RIV-Driver.

Y-119

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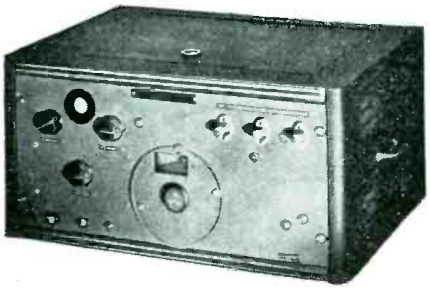

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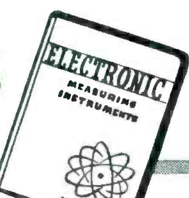

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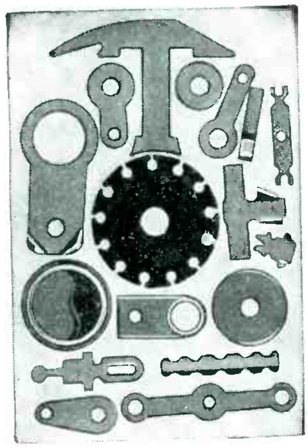

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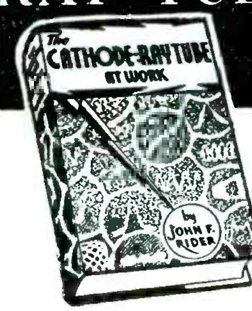

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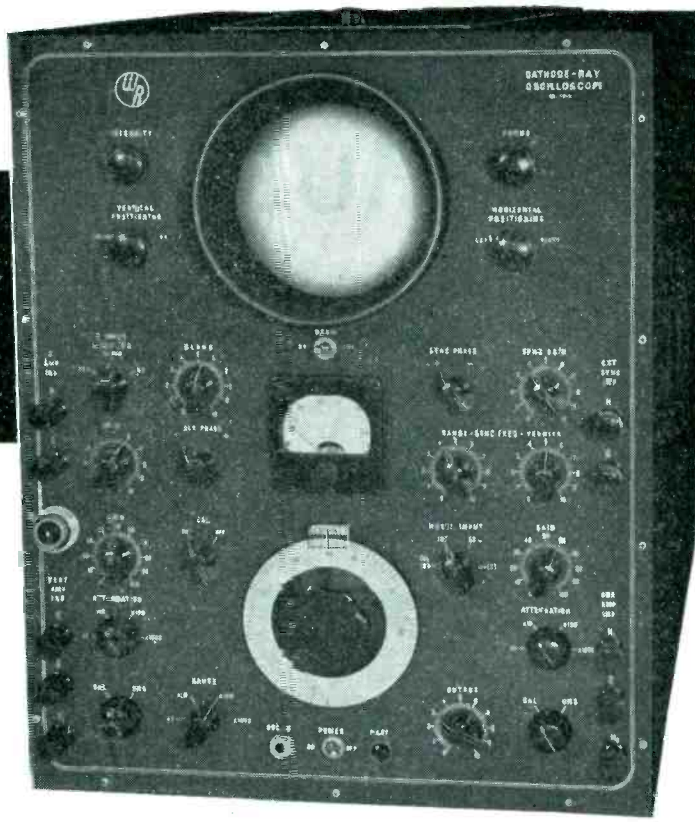

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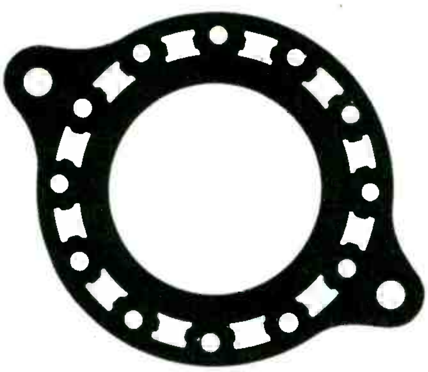

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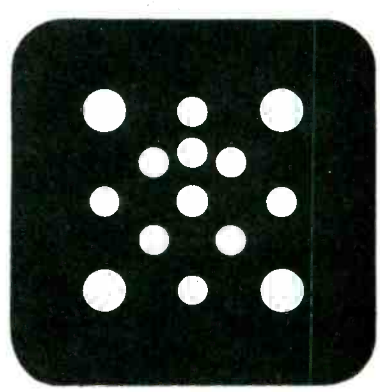

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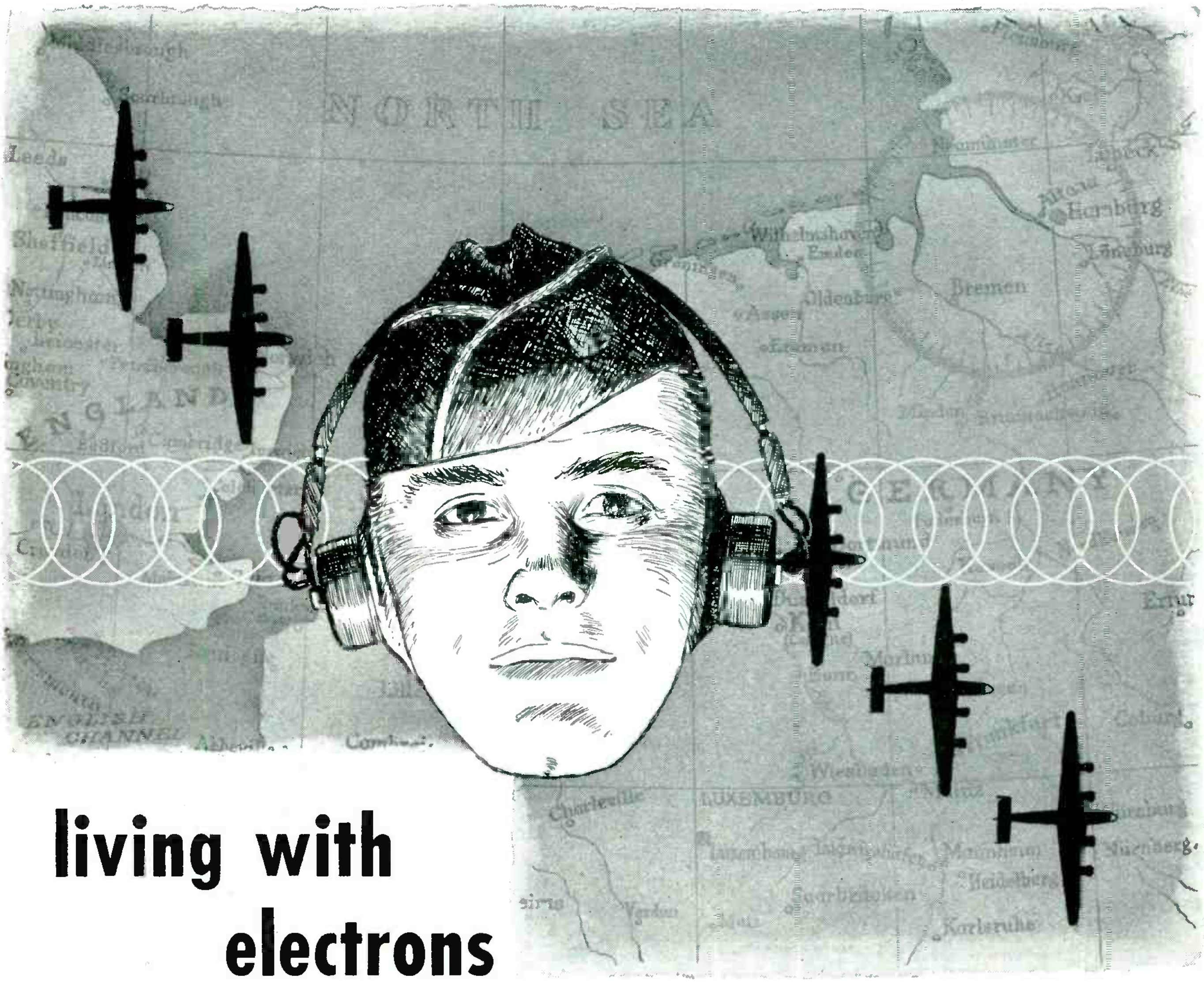

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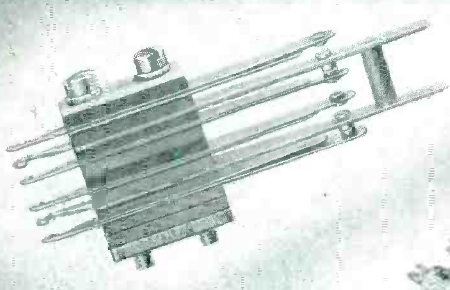

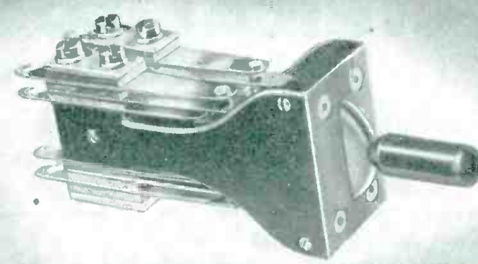

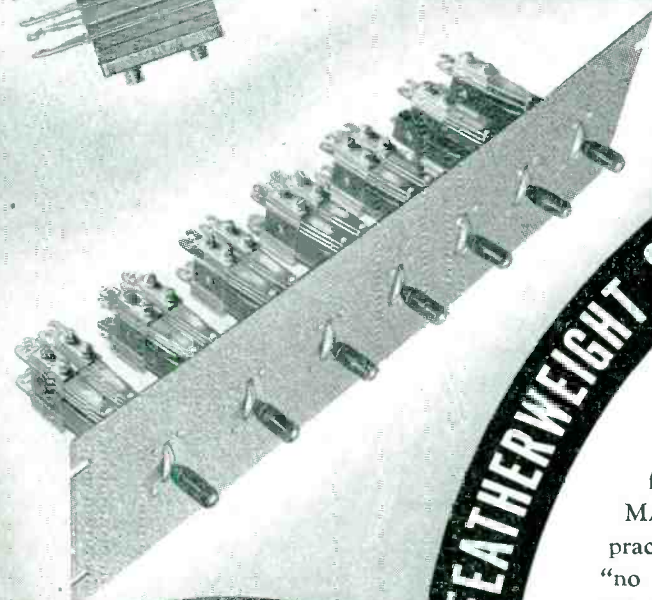

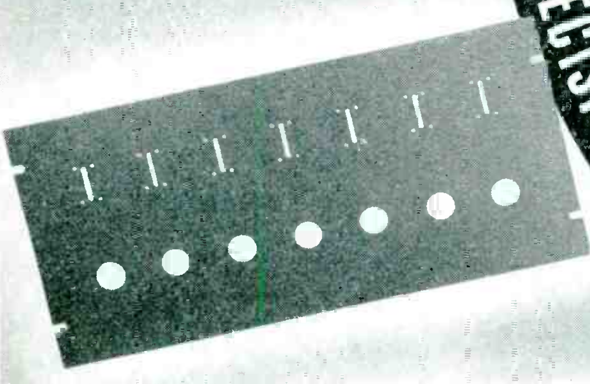

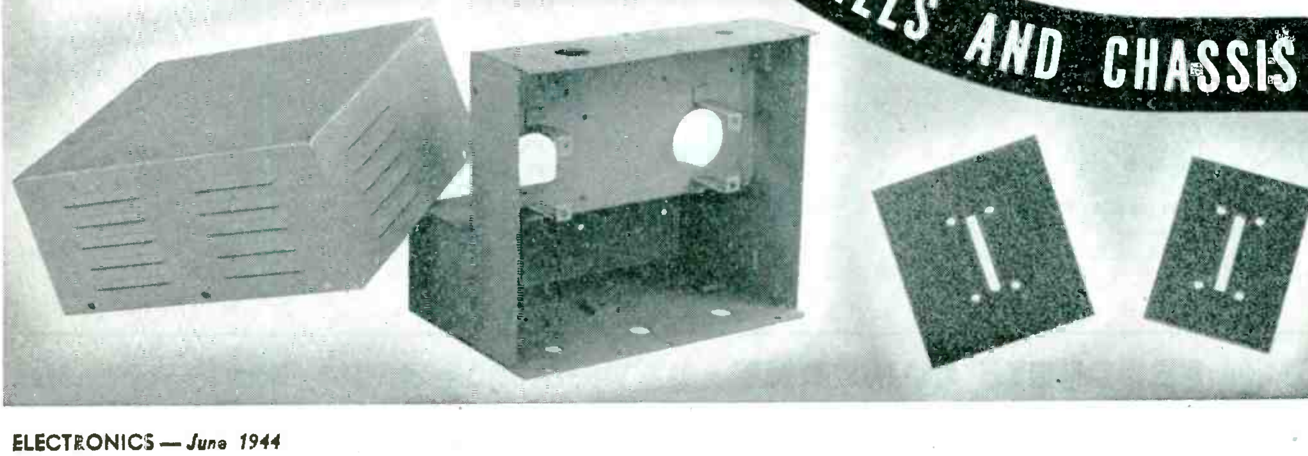

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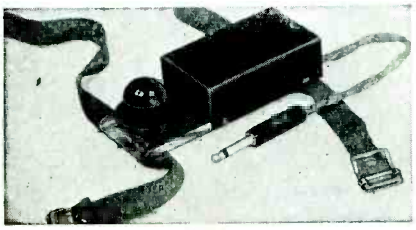

B-19

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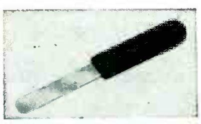
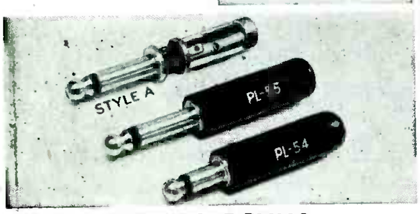
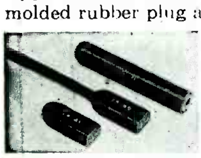




TELEPHONE PLUGS

Signal Corps Types Style A, PL-55 (Navy Type NAF-310572) and PL-54. Style A for molded rubber plug assemblies.



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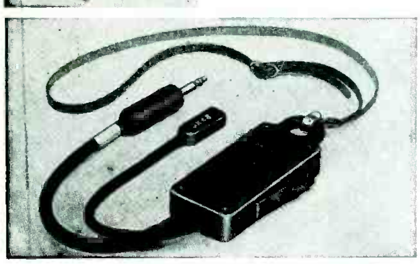
JK-26 and JK-48. Supplied with cords attached if desired.



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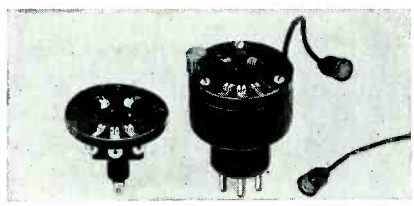
The same skills and ingenuity demonstrated by Alden in the last 25 years now are applied to the entire field of Facsimile. Present products include: tape recorders, photographic transreceivers, Teledotos reporting, continuous recorders of various widths and speeds not only for the communications field but for recording and analyzing all kinds of impulses.

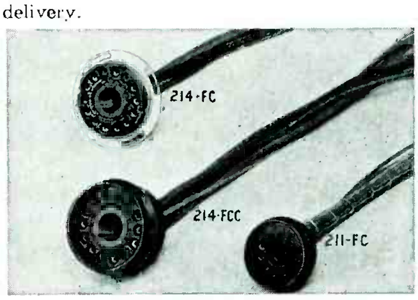


ACORN SOCKETS and ADAPTORS

Socket 455-V2 and Adaptor 966. Quality designed to handle the variations in these tubes. New contact tooling assures prompt delivery.

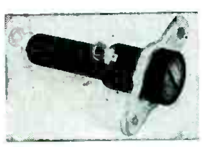
ANALYZER and ADAPTOR KITS

for all Government Test Sets. Prompt delivery.



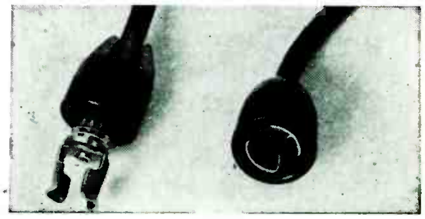
CATHODE RAY CONNECTORS and SOCKETS

A magnal type socket assembly with leads prepared to your specifications. Two new di-heptal connectors for panel mounting or for straight connector use. All sockets have individually insulated terminals and leads, providing a large safety factor at high altitudes and over a wide temperature range. Magnal 211-FC; Di-heptals 214-FC and 214-FCC.



FUSE HOLDER

designed to rivet direct to the panel to preclude any loosening under vibration. Made with ejector spring.



92-RL

TUBE CAP CONNECTORS

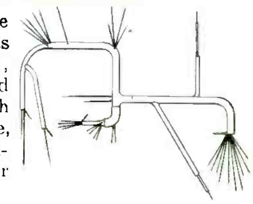
furnished with leads attached for every possible application from receiving tubes to high current radio frequency applications.

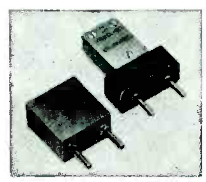
SPECIAL MOLDINGS

Knobs, condenser and relay bases, commutator and brush assemblies for RADAR applications. Special magazine method of phenolic molding for both large and small quantities. A single mold starts your order, additional molds step up production to any daily requirements. This method also permits any required changes and is particularly well-suited for government requirements.

CABLE ASSEMBLIES

Any type of cable assembly such as formed, laced, braided or shielded to your print, with wire of your choice, can be handled efficiently in large or small quantities.





CRYSTAL HOLDERS and ADAPTORS

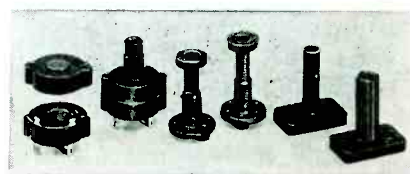
made to government specifications and to meet special requirements.

SPECIAL QUALITY WIRE

Immediately available capacity for serving, braiding, lacquering and shielding.

MULTI-WIRE CONNECTORS

for every purpose from miniature hearing aids up. Particular attention given to compactness and complete insulation around each lead. Government and commercial types.



COIL FORMS, HOUSINGS and CASINGS

RF coil forms for iron core tuning. Molded from low loss material. Available in plain, ribbed, molded thread types.

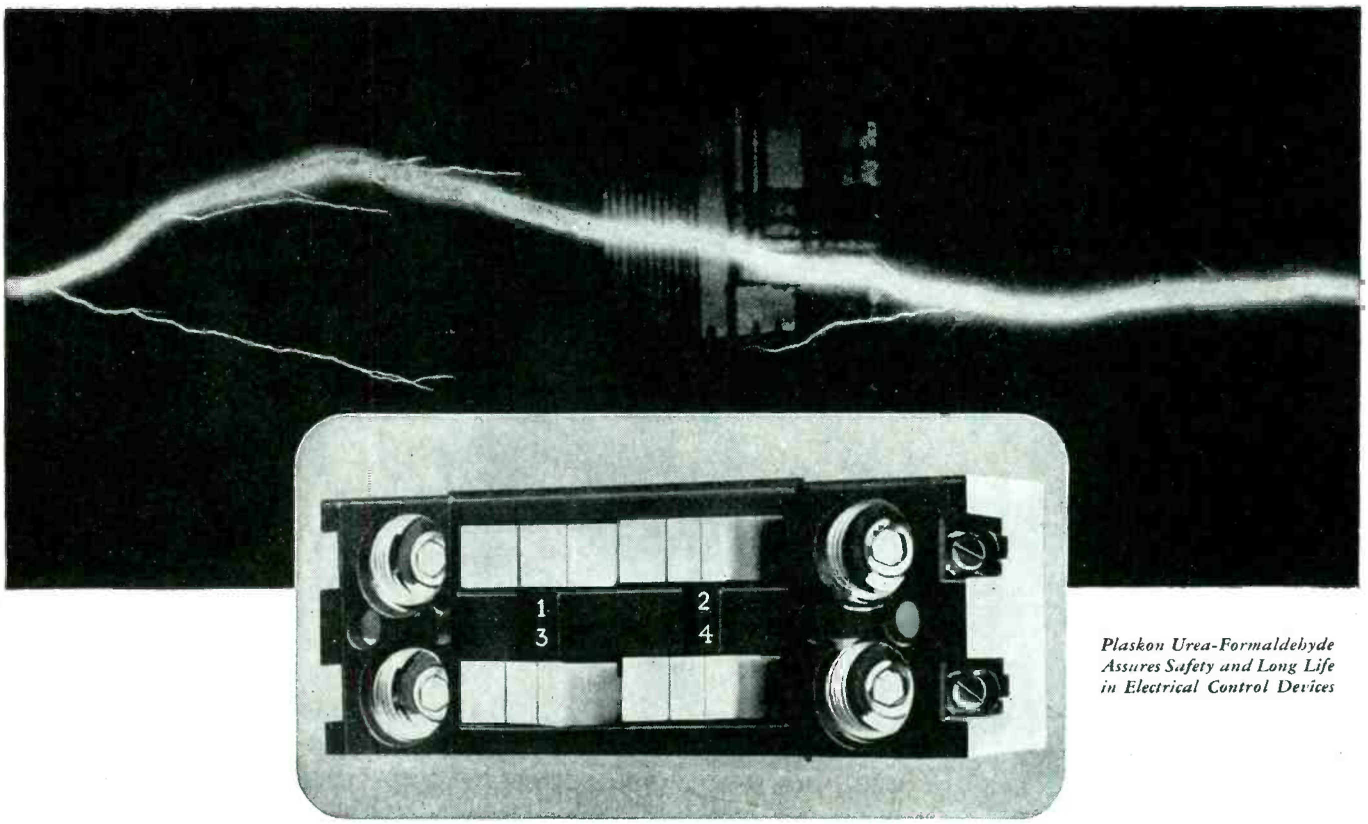
Coil housings for iron pot and core applications designed for positive hermetical sealing.

Plug-in coil cases for moistureproof sealing of small transformers.

SPECIAL ASSEMBLIES

Facsimile and picture transmission equipment.

ALDEN PRODUCTS COMPANY • 117 North Main Street, Brockton, Mass.



Plaskon Urea-Formaldehyde Assures Safety and Long Life in Electrical Control Devices

High Resistance to High Voltages

...that's why Plaskon was chosen for this special job!

Of primary importance to the electrical engineer, and certainly the most unusual electrical property of Plaskon urea-formaldehyde, is its resistance to arcing. Most molded plastic insulators form a conducting carbon path which allows a continuance of the circuit when subjected repeatedly to the impingement of an electrical arc.

Molded Plaskon urea-formaldehyde insulators, however, maintain their excellent dielectric properties when subjected to such electrical arcs, due to the formation on the surface of the Plaskon insulator of extremely condensed chemical residues, high in their insulation value. Even long exposure to high humidities, and immersion in salt solution for 24 hours, fail to destroy the resistance of Plaskon to arcing.

Because of this unique combination of electrical properties, plus the range of colors in which it is available, Plaskon urea-formaldehyde is suitable not only for color-coded electrical switches, high and low tension circuit breakers and fuse blocks, but for heavy duty switchboards and line connectors and plugs as well.

These are the advantages of Plaskon Materials for Electrical Designing:

Plaskon Urea-Formaldehyde Compound

1. Wide range of lightfast hues, from translucent natural and pure white to jet black.
2. Smooth surface, eye-catching, warm to touch.
3. Completely resistant to common organic solvents, impervious to oils and grease.
4. Possesses extremely high flexural, impact and tensile strength.
5. Highly resistant to arcing and tracking under high voltages and high frequencies.

Plaskon Grade 2 Compound

1. A Plaskon urea-formaldehyde of good quality, lower in price than regular Plaskon, and adaptable to economy production requirements.
2. High resistance *to*, and retains lustre, surface and color *in*, presence of water, common organic solvents, soaps, etc.
3. Identical unusual dielectric strength and freedom from arcing and tracking as regular Plaskon. Furnished in one shade of black and brown only.

Plaskon Melamine Compound

1. Assures ample protection where water or high humidity prevent the use of urea compounds.
2. Exceptional resistance to acids and alkalies. Non-porous, non-corrodible.
3. Under extreme conditions of heat and humidity, is non-tracking, highly resistant to arcing, and has high dielectric strength.
4. Highest heat resistance of all light-colored plastics.

Plaskon Resin Glue

1. Materials bonded by Plaskon Resin Glue cannot be separated at glue line—the material fails first.
2. Plaskon glue line is completely moisture-resistant, cannot be weakened by mold or fungi.
3. Maintains its tenacious grip in heavy-duty service for years, under water, on land, in the air.

PLASKON DIVISION, LIBBEY • OWENS • FORD GLASS COMPANY
2136 SYLVAN AVENUE • TOLEDO 6, OHIO

Write for this Manual

The properties and characteristics of Plaskon in molded form, and the proper methods of fabrication, are discussed in detail in this valuable Plaskon handbook. Its contents will be of interest to engineers and fabricators alike.

PLASKON

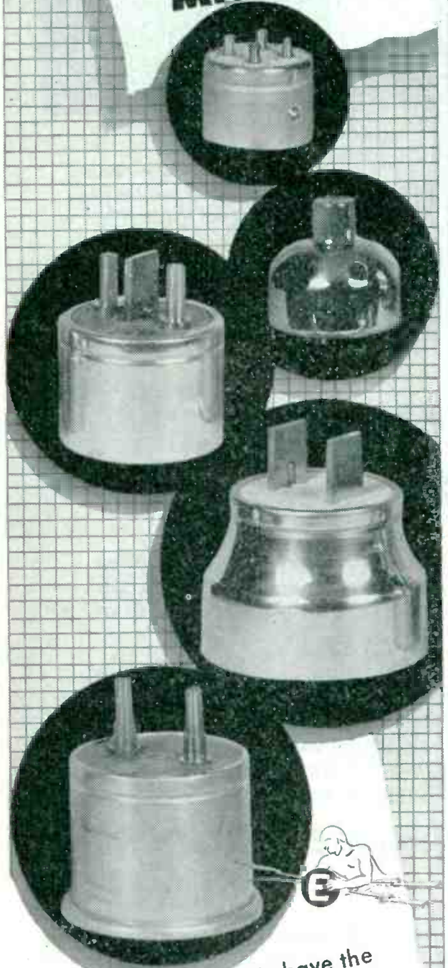
TRADE MARK REGISTERED

★ ★ MATERIALS ★ ★

Manufacturers of Electronic Tube

BASES . . CAPS TUNGSTEN LEADS and

Vacuum Tube **MACHINERY**

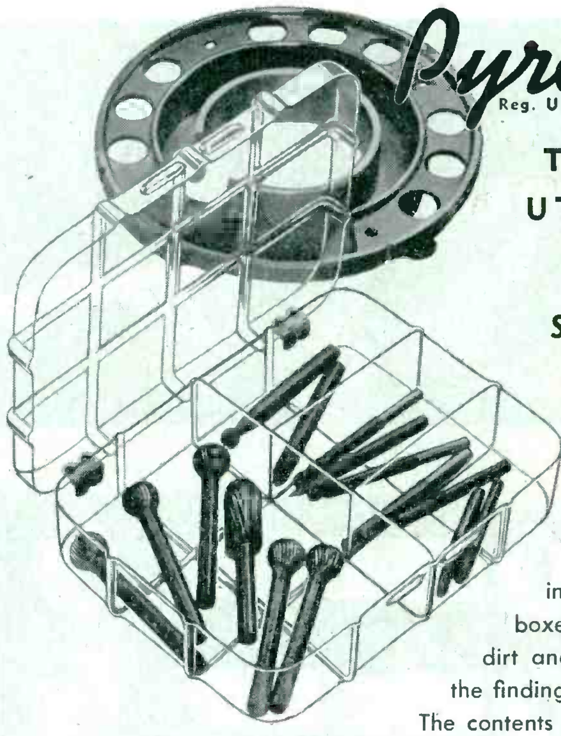


We have the engineering background and modern production facilities for the precision manufacture of Electronic Tube Bases, Caps, Tungsten Leads and Glass Working Lathes up to 6" for transmitting tubes. Consult our Engineering Department on your "special design" problems.

ELECTRONIC MANUFACTURING COMPANY
20 ORANGE STREET
NEWARK 2, N. J.

Pyra-Shell

Reg. U.S. Pat. Off.



TRANSPARENT UTILITY BOXES

Light in Weight Sturdy and Strong

Keep vital small parts in Pyra-Shell transparent boxes for protection against dirt and grit, and to speed up the finding of any needed parts. The contents of Pyra-Shell boxes—like the burring tools shown above—can be seen through the box, preventing delay in locating any required tool or part. Many standard styles, sizes and compartment arrangements are available.

Write for illustrated folder.

SHOE FORM CO. Inc. *Utility Box Dept. R* **AUBURN, N. Y.**

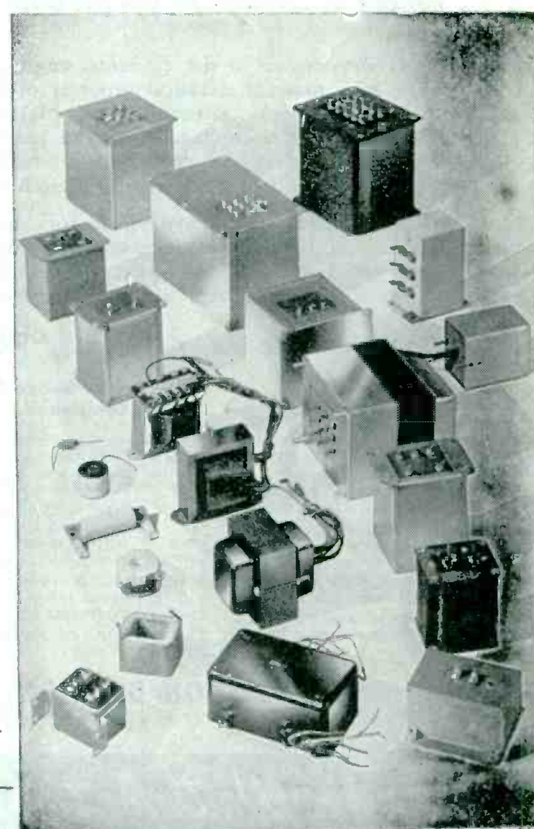
Products of **"MERIT"** *means Fine Radio Parts*

. . . PARTS manufactured exactly to the most precise specifications.

Long manufacturers of component radio parts, MERIT entered the war program as a complete, co-ordinated manufacturing unit of skilled radio engineers, experienced precision workmen and skilled operators with the most modern equipment.

MERIT quickly established its ability to understand difficult requirements, quote intelligently and produce in quantity to the most exacting specifications.

Transformers—Coils—Reactors—Electrical Windings of All Types for the Radio and Radar Trade and other Electronic Applications.



Since 1924

MERIT COIL & TRANSFORMER CORP.
311 North Desplaines St. • CHICAGO 6, ILL.

—the Password is "PRECISION"

We carry hundreds of items in stock to meet practically every installation requirement.

Odd shaped pieces stamped and formed from strip or wire on high speed machines.

Our Tool Room is equipped to make dies for your special needs.

HOT TINNING.

NICKEL, CADMIUM, SILVER AND ZINC PLATING.

All pieces can be furnished in any desired finish.

IT is a part of our obligation to customers to see that every metal stamping sold under the name of "Stewart" measures up to the highest standards of Precision. This means—uniform gauge of metal, correct angle of bend, and openings placed in their true position, according to blue print.

Every Stewart Stamping, small or large, must conform to specifications. Badly formed, out-of-true, defective stampings simply can't get by. Under our rigorous system of constant checking, the password is "Precision."

Send for samples and quotations. Let us have your blue prints and specifications. Quick response to inquiries

STEWART STAMPING COMPANY

621 East 216th Street New York 67, N. Y.

STEWART

METAL STAMPINGS

TERMINALS LUGS BRACKETS CLIPS

ADECO

A DEPENDABLE SOURCE FOR POST-WAR PRECISION PARTS

If your post-war plans call for precision parts and assemblies, it will pay you to consult the Adeco organization. These specialists in precision offer you the experience and facilities for all types of close-tolerance production on a contract basis . . . provide a dependable source of supply for your most exacting requirements.

New illustrated booklet tells the complete Adeco story. Write for free copy today.

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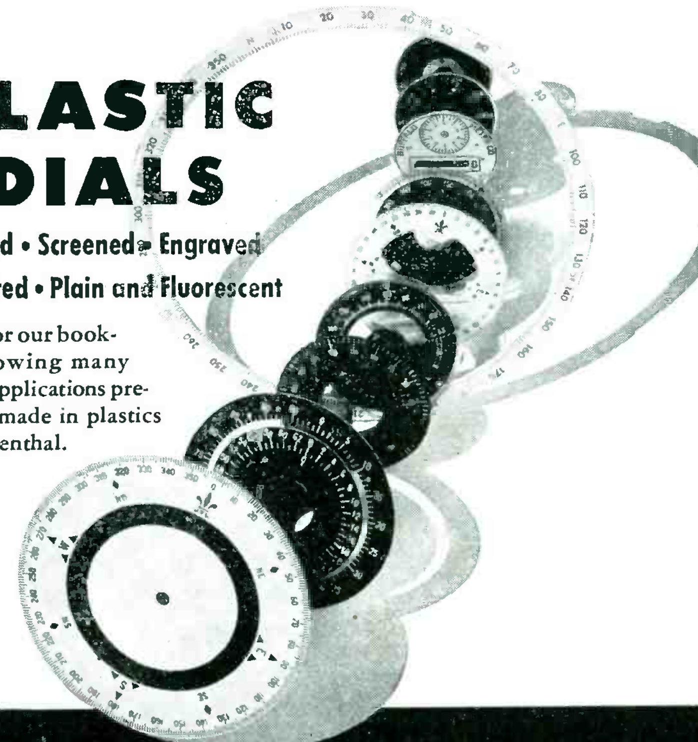
"Your Partners in Precision"

PLASTIC DIALS

Printed • Screened • Engraved

Laminated • Plain and Fluorescent

Send for our booklet showing many other applications precision made in plastics by Felsenthal.



Also Name Plates, Crystals, Computers and other items to specifications

G. FELSENTHAL & SONS

Manufacturers Since 1899

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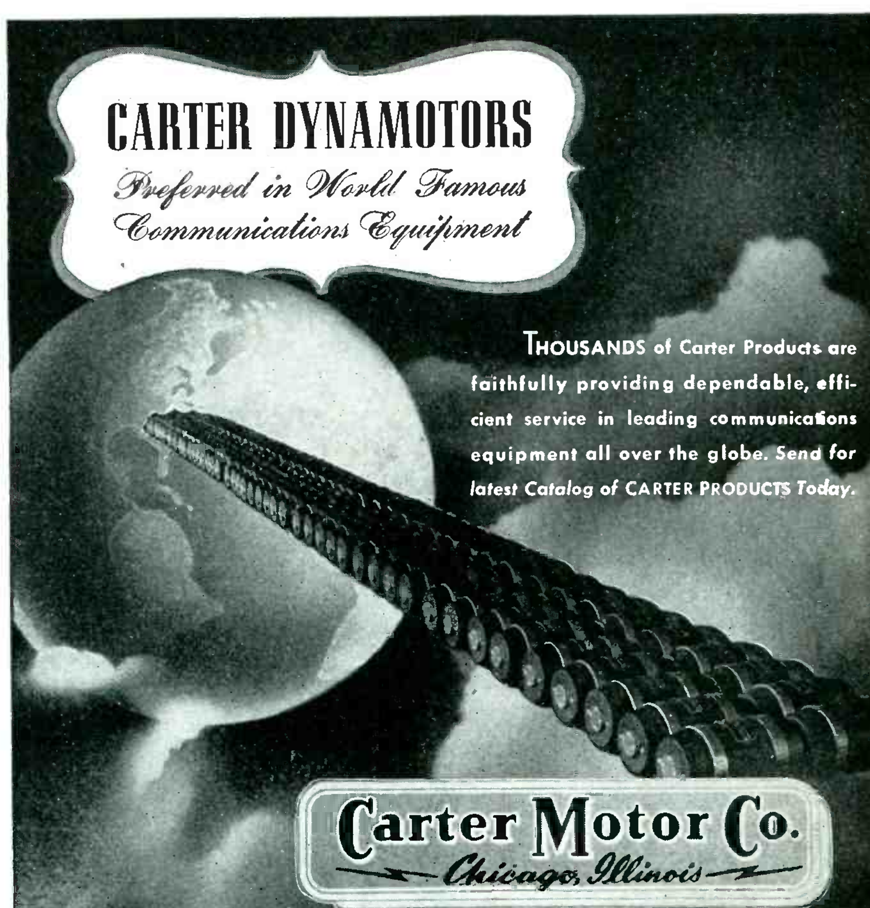
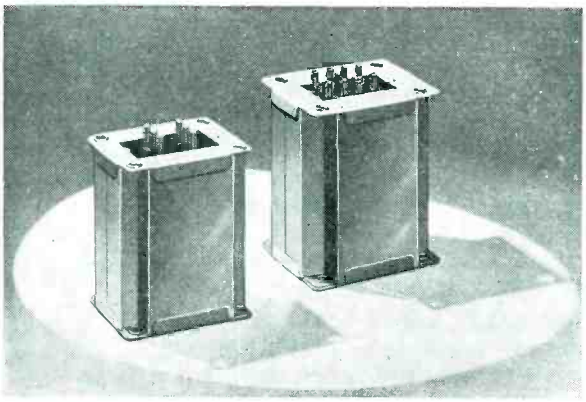


1606 MILWAUKEE AVE. CABLE: GENEMOTOR

CARTER, a well known name in radio for over twenty years.

OPEN NOW



TRANSFORMER MANUFACTURING FACILITIES
at Glenn-Roberts . . .

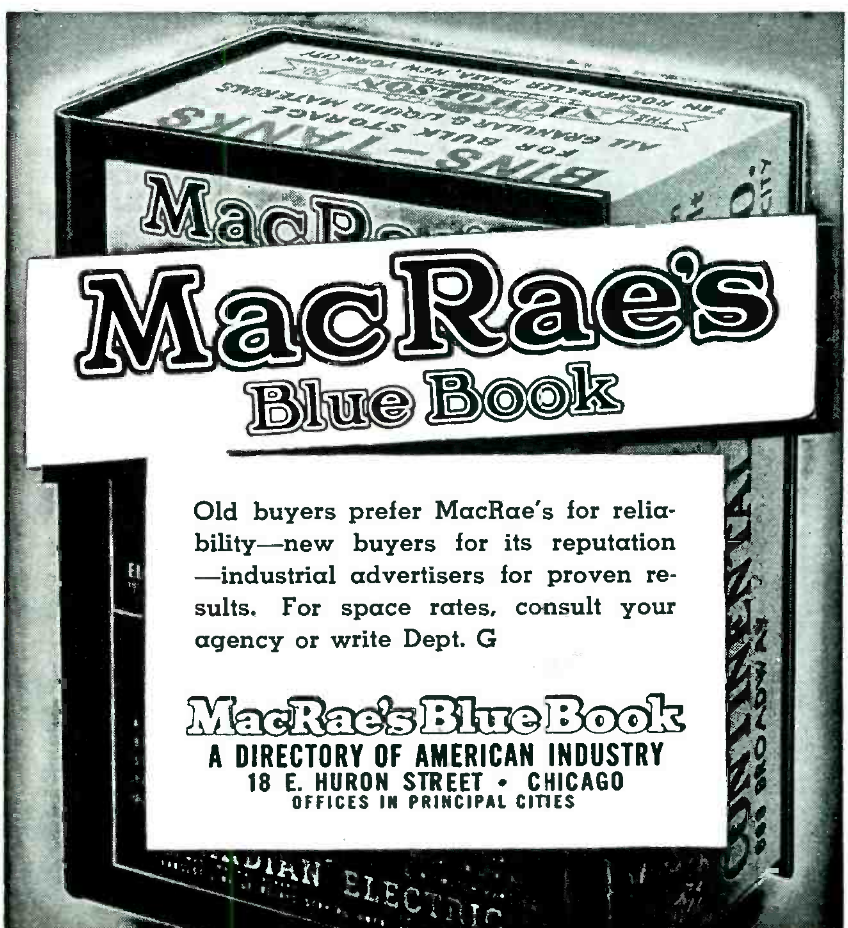
MAJOR ADDITIONS to Glenn-Roberts transformer design, manufacture, test and inspection facilities have recently been completed. The resulting increase in capacity permits the acceptance of additional orders for radio or communications transformers and chokes of all types. Quotations will be furnished promptly; please address inquiries to Electronics Division.

Export Agents: FRAZAR & HANSEN, 301 CLAY STREET, SAN FRANCISCO, CALIFORNIA

GLENN-ROBERTS COMPANY

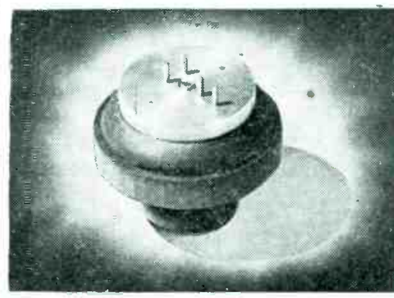
1009 FRUITVALE AVENUE
OAKLAND, CALIFORNIA

2107 ADAMS STREET
INDIANAPOLIS, INDIANA



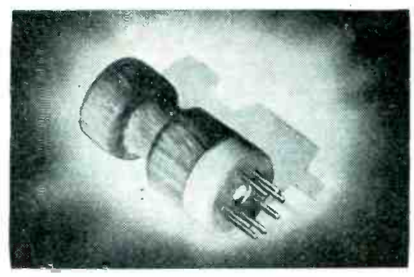
Radio Manufacturers Speed Production

And cut rejections and costs with STEDMAN precision-made dummy tubes, tube-pin straighteners, etc.



ECONOMICAL—EFFICIENT

This special device was designed to aid a manufacturer in accurate alignment of chassis with panel opening and contact points. We will aid you in developing a similar item designed for your particular need. Send us your specifications. Permit us to submit sample.



DUMMY MINIATURE TUBE

Precision made. Stainless Steel Pins. Used to hold socket clips in correct alignment during wiring.

Meets requirements of WPB subcommittee on miniature tubes.

MINIATURE TUBE PIN STRAIGHTENER

Used with hardened tool steel insert for factory use. Also stainless steel insert when resistance to corrosion is desired. Precision made. Body and posts cadmium plated. Inserts replaceable.

Illustrated above are a few of the products we are now delivering to leading equipment manufacturers. Standard items available. Special items to fit your particular requirements.

Your Inquiry Will Receive Our Prompt Attention.

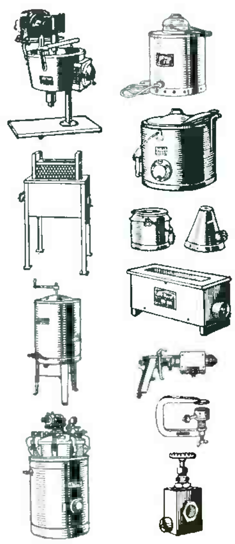
ROBERT L. STEDMAN MACHINE WORKS

Oyster Bay, N. Y. Tel. 1532

IN YOUR

POST-WAR PRODUCTION PLANNING

. . . *any compound heating problems?*



● If so, you will find specialists on the engineering staff at Sta-Warm Electric Co. with broad experience in designing and specifying tanks, kettles or pots for electrically heating compounds, chemicals, soft metals, wax, glue, thermoplastic resins, and similar materials.

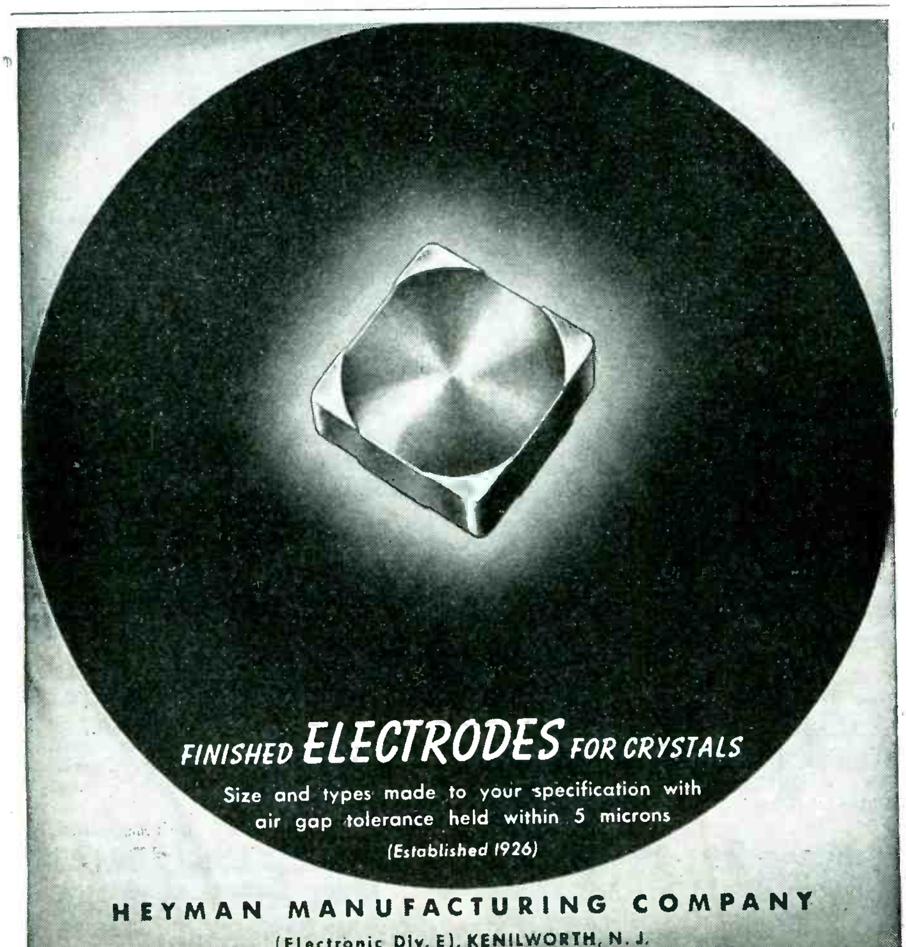
Sta-Warm engineering service may be just what you require to take certain snags out of the post-war production line you are now planning. There's no obligation in briefly outlining compound heating problems you face now or anticipate in the near future.

If the standard line of Sta-Warm electrically heated tanks, kettles, pots, hose, gate valves and other specialties won't fit your needs, their engineers will gladly submit sound, economical and practical recommendations for specially tailored heating equipment.

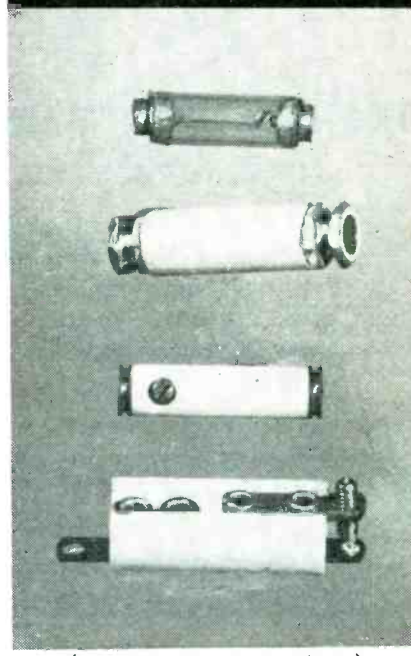
Why not inquire today?

Have you seen the new Sta-Warm Bulletin 036? Just out

STA-WARM ELECTRIC CO.
1000 N. CHESTNUT ST. • RAVENNA, OHIO



MINIATURE THERMOSTATS DESIGNED & FABRICATED



(Actual Size Unretouched Photo)

☆ The illustrated thermostats are but a few of those we have designed and fabricated for nationally known manufacturers. If you have any thermostat problems, involving either miniature thermostats or thermostats for building-in of any size, we have the solution. Let our engineers solve your next thermostatic control problem.

RATINGS

Recommended electrical rating 50W, 115-230 volts ac non-inductive load. Temperature differential 1°F. Maximum temperature ranges 300°, 450° and 700° F.

MANUFACTURERS OF TIME DELAY SWITCHES, MANUAL RESET TEMPERATURE LIMIT SWITCHES, HEAVY DUTY AUTOMATIC RESET THERMOSTATS.

Send for Illustrated Bulletins

GEORGE ULANET COMPANY

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Plastics from VICTORY*

FOR *Victory!*

We Are Molding Millions of Precision Parts Now Being Supplied by Prime Contractors to the Armed Forces

Our craftsmen's skill . . . the result of intensive study and wide experience . . . is still further improved by the strict attention to detail required to meet Army and Navy specifications.

Victory's staff can do a *better* molding job for you. If your plastic product will help win the war, we are ready to work with you at once . . . we have facilities to handle a limited number of new contracts. If your product must wait, our engineers are ready now to plan with you for leadership in the post-war market. Write us today and let us know your problems.

Member: Society of the Plastics Industry

Automatic Injection Molding

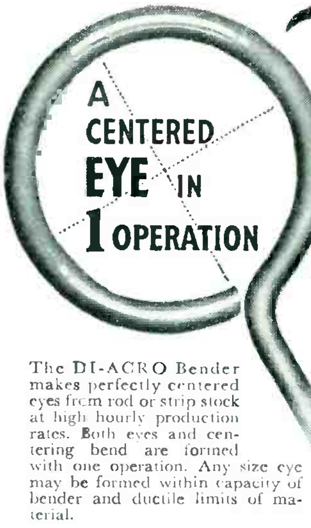
Small and large parts

UP TO 17-OZ. SHOTS

Lumarith, Tenite, Fibestos, Plastacelle, Crystallite, Lucite, Ethyl Cellulose, Polystrene, Lustron, Styron, Vinylite, Loalin, Cellulose Acetate and others . . . all molded to your exacting specifications.

***VICTORY MANUFACTURING COMPANY**

1724 W. Arcade Place, Chicago 12, Ill.
ESTABLISHED 1930

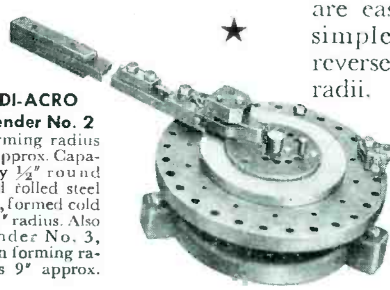


Precision CENTERED EYE *Bending*

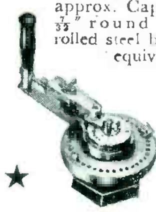
With DI-ACRO Benders

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eyes and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

DI-ACRO Precision Bending is accurate to .001″ for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.



DI-ACRO Bender No. 2
Forming radius 6″ approx. Capacity ½″ round cold rolled steel bar, formed cold to 1″ radius. Also Bender No. 3, with forming radius 9″ approx.



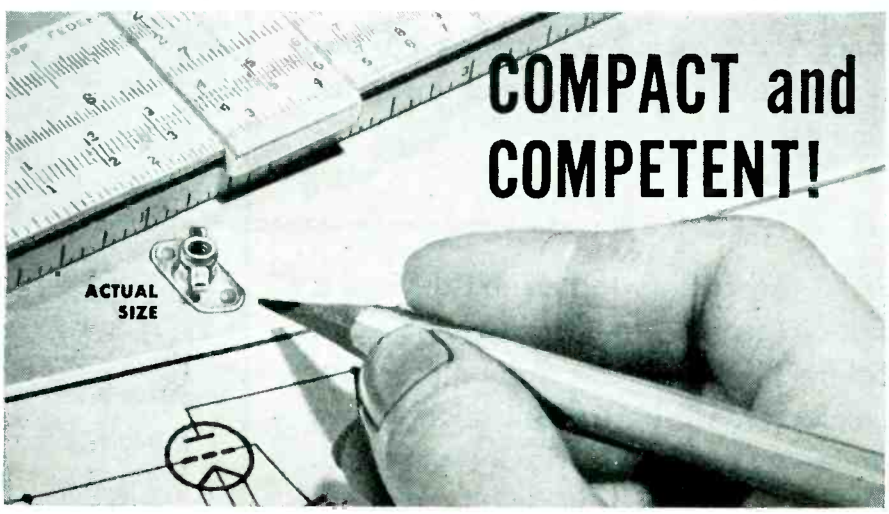
DI-ACRO Bender No. 1
Forming radius 2″ approx. Capacity $\frac{7}{32}$″ round cold rolled steel bar or equivalent.

Send for CATALOG
"DIE-LESS" DUPLICATING showing many kinds of "dieless" duplicating produced with DI-ARCO Benders, Brakes and Shears.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

321 EIGHTH AVENUE SOUTH • MINNEAPOLIS 15, MINN.



Specially designed for Radio and Electronic products—
The BOOTS SELF-LOCKING RADIO ANCHOR NUT Size No. 6

All-metal, with built-in locking device—vibration-proof—not affected by temperature changes—resists corrosion—can be re-used, again and again.

5 Other Important Advantages For You:

- Exceptionally small, with thin base—permits compactness and good lines on a product.
- Will not turn.
- More easily applied than a clinch nut.
- Threads are never distorted since no punch is required.
- Allows flush surface on opposite side without chamfering.

Our engineering department is at your service on all fastening problems.

BOOTS

SELF-LOCKING NUTS

"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corporation
General Offices · New Canaan, Conn.

BOTTLENECK BUSTERS

No. 2 of a Series

Salt-Air Tempest in a "Teapot"

BOTTLENECK:

Navy specifications required that all communications parts be tested under conditions that would reveal their resistance to corrosion after exposure to sea air and salt spray for a period of several months.

HOW BROKEN:

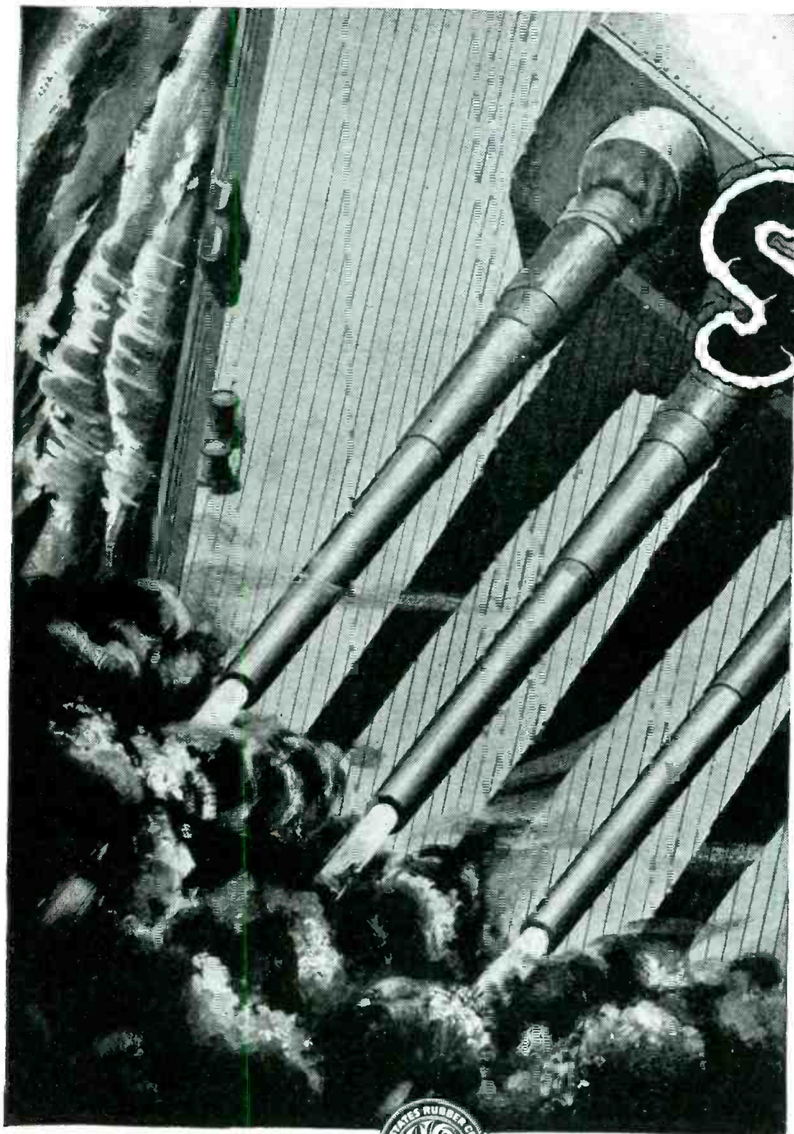
Sickles laboratory technicians devised a salt-air "teapot"—a small insulated metal cabinet, in which temperature, pressure, humidity, and the concentration of salt in the air, could all be rigidly controlled. Sickles parts receive, in a matter of days, tests that equal in effect, several months of salt-air exposure.

The ingenuity of our "bottleneck busters" has been challenged often. So far, it has been equal to all emergencies.

For delivery of condensers, choke coils and other electronic specialties, where speed and quality are of equal importance, specify Sickles.

THE F. W. SICKLES COMPANY
CHICOPEE, MASSACHUSETTS

SICKLES *Electronic Specialties*



SHOCK

CUSHIONED TO SMOOTHNESS

Every time a broadside is fired—it creates a minor earthquake. What stands between this impact and the ship's sensitive instruments?

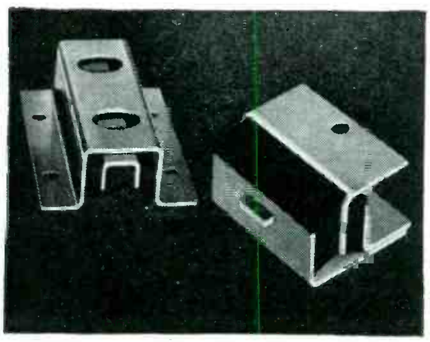
Through the new science of smoothness—rubber mountings have been engineered into equipment. These rubber springs give effective insulation against the impact of gunfire, the vibration of engines, even the shock of nearby explosions.

The use of rubber mountings to cushion vibration, noise and shock has moved ahead at lightning speed during the war.

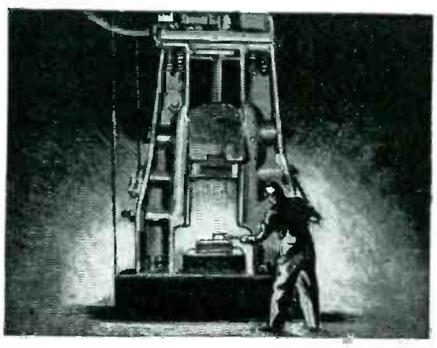
Engineered rubber mountings have become a new machine-design tool for the designers of tomorrow's peacetime products.

These mountings—developed largely by the scientists and engineers of United States Rubber Company—have important benefits to offer makers of delicate instruments, electronic apparatus, machinery, automobiles, buses, trucks and railroad and street cars.

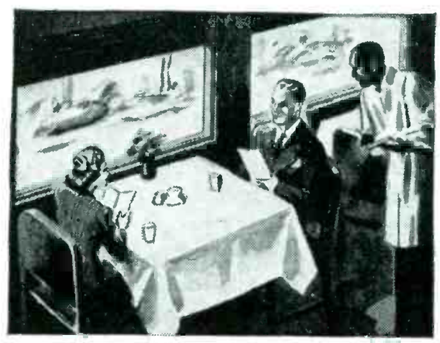
SERVING THROUGH SCIENCE



RUBBER TECHNOLOGY—U. S. Rubber Company scientists engineer rubber just as steel is engineered. New developments and processing have made it possible to unite rubber and metal in an enduring bond, as shown in these mountings.



SOFT-PEDALING SHOCKS—Rubber mountings, specially designed and engineered for this huge drop forge, prevent transmission of shock from heavy hammer-blows that would otherwise shake entire buildings and shorten the life of the machine.



TRAVEL COMFORT—A new era of riding-smoothness began with the application of rubber mountings on railway cars. U. S. Rubber Company experts have worked hand-and-glove with transportation engineers to reduce jolt and vibration for travelers.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE · ROCKEFELLER CENTER · NEW YORK 20, N. Y. · *In Canada:* DOMINION RUBBER CO., LTD.

KELNOR *Electric* SOLDERING IRONS

REG. U. S. PAT. OFF.

THE FEATHERWEIGHT IRON THAT CAN DO A HEAVYWEIGHT'S WORK!

Many of America's most important firms in Radio, Electronics, Aircraft, Telephone, Communications fields are included among KELNOR'S **SATISFIED USERS**

Difficult Places Easy to Solder with specially designed . . . light but strong, welded construction, precision built KELNOR! "Barrel" of KELNOR 3½" long, ⅝" diameter. 10" overall length. Each of three KELNOR models...65 watts, 100 watts, 125 watts...

WEIGHS ONLY 8 OUNCES

PATENTS APPLIED FOR

Advantages of KELNOR *in* ELECTRONIC AND RADIO REPAIR FIELDS

MIDGET RADIOS: In cramped space KELNOR effectively reaches condensers and wiring without danger of burning insulation. Connections at bottom of coils can be soldered from the top, eliminating possibility of melting wax, especially important in the case of oscillator coil.

CHASSIS WORK: KELNOR can be dipped into chassis and turned up at any angle, making those awkward connections without striking edge of chassis. No need to remove top wiring or condensers.

RELAY RACKS: Joints can be soldered from side or back without loosening mounting bolts. KELNOR can reach over top of relay.

Special **KELNOR** *Alloy Extendable, Corrosive-Resistant Tip*

runs completely through center of barrel. Tip can be extended 3½" to reach out-of-the-way places.

PENCIL TIP (3/16"x 5¼") for Wire Soldering

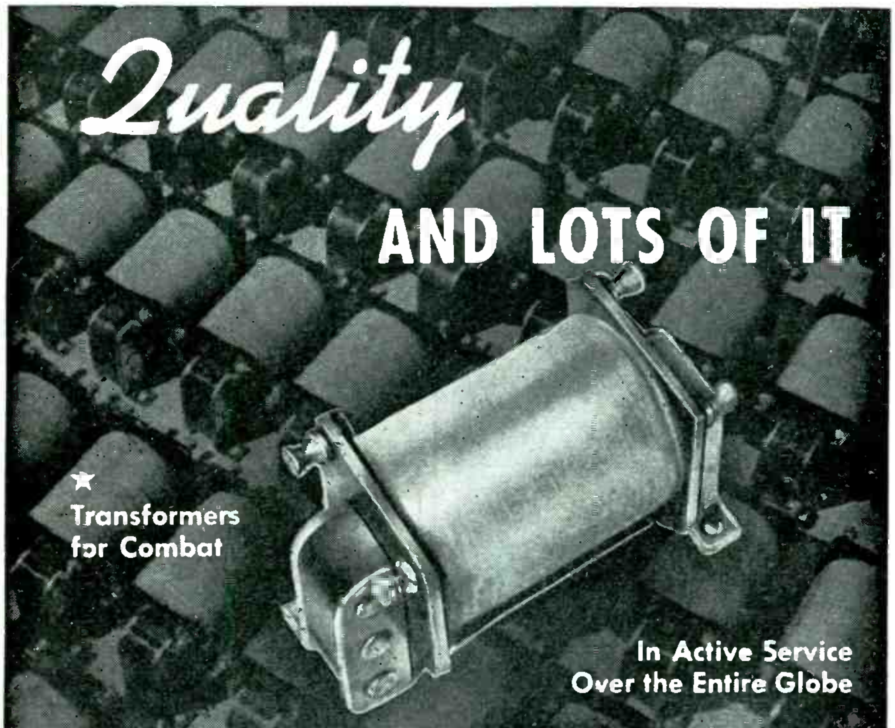
PYRAMID TIP (½" dia. head) for Plate Soldering

APPROVED BY UNDERWRITERS LABORATORIES

Order from your JOBBER. For more facts, prices, write Nat'l Sales Agent, Wm. Weston & Co., 550 Page, San Francisco 17

OR

KELNOR MANUFACTURING COMPANY GENERAL OFFICES: **CENTRAL TOWER, SAN FRANCISCO 3**

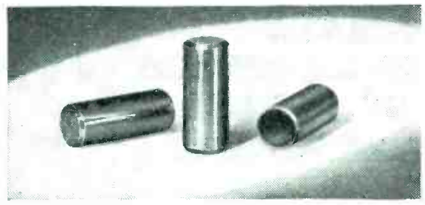


DINION COIL COMPANY

CALEDONIA, N. Y.

PRECISION PARTS

WEASELS and DIESELS



Small but vital . . .

Out in the vast Pacific, there is an extermination job to be done. Each Jap-infested island must be cleaned up as we go. Diesel-driven equipment plays an important part in each operation, and these little by-pass valves turned out by Ace are an important part of the Diesel engines.

Starting from bar-stock, they are machined, heat-treated, centerless ground on the outside diameter, and cylindrical ground on the angles. They are typical of Ace mass-production facilities, all located here under one roof.

Ace offers manufacturers the modern equipment and the engineering ingenuity to turn out small parts and assemblies calling for stamping, machining, heat-treating, or grinding—and to turn them out quickly and accurately. Send blueprints, samples, or sketches for quotations.

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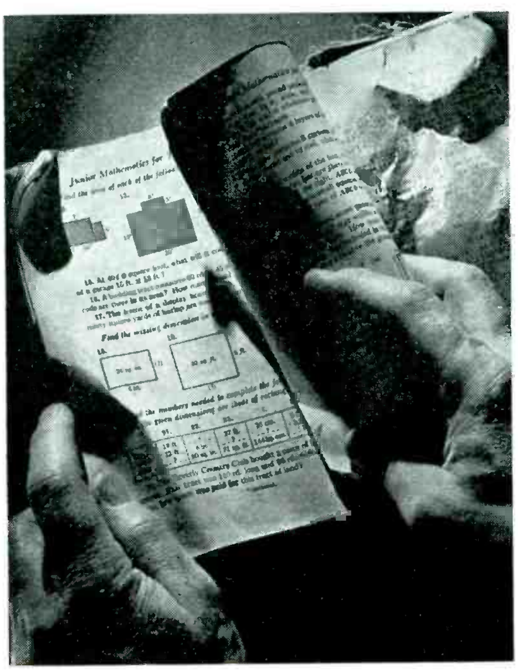
The only pre-war manufacturer of Home Radios in the New York Metropolitan area to earn both these awards.



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Here at Auburn, during sixty-eight years, we have acquired a lot of "back of the book" answers of our own. These answers, which are the result of actual experience by a seasoned organization in a complete molding plant, can be the means for providing a solution for you, even though your problem involves new designs, new materials, and new methods.

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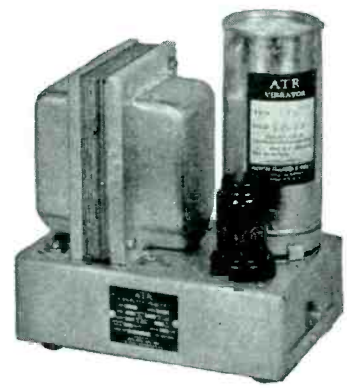

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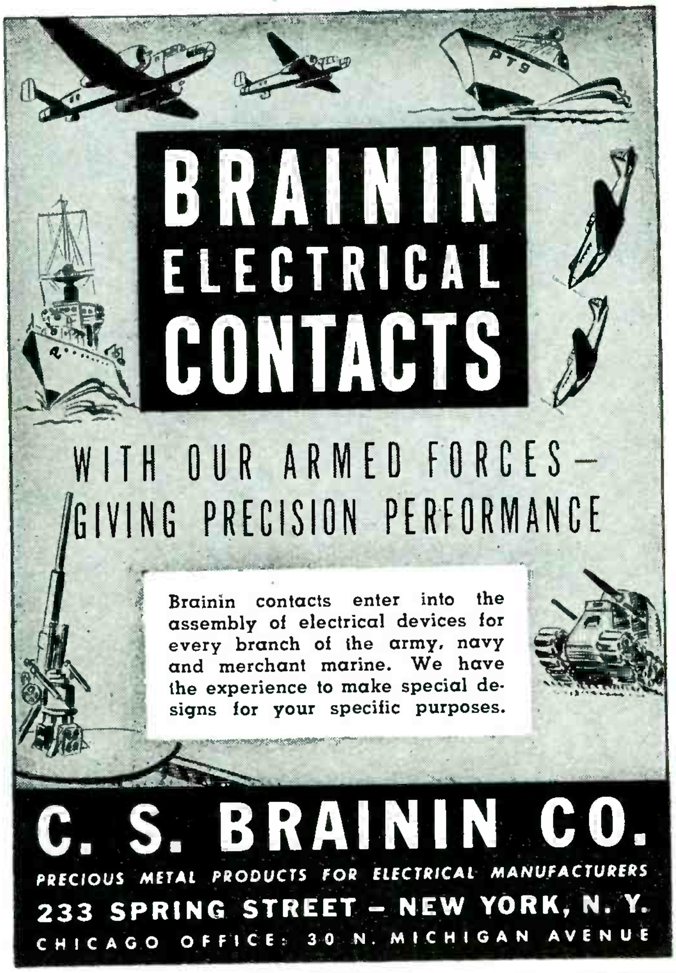
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This direct reading instrument permits rapid measurement of capacities down to 0.001 mmfd. with accuracy of 5% or better. It is furnished with a completely shielded measuring circuit, making it necessary only to insert the tube in the shielded socket and read the interelectrode capacity directly on the meter.
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Engineering data on the design and use of the instrument will be furnished on request and appointment for demonstration may be arranged.
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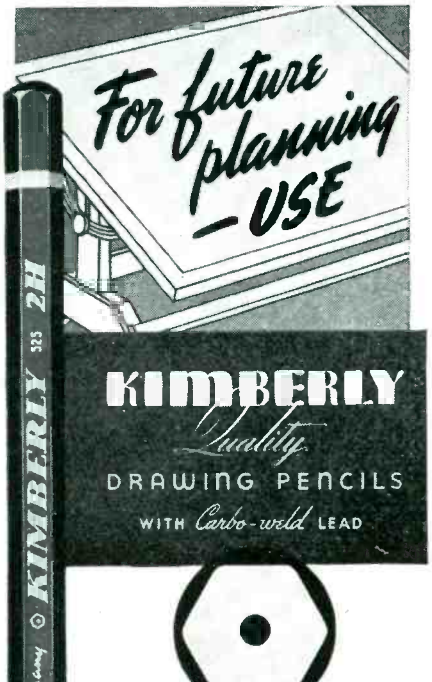

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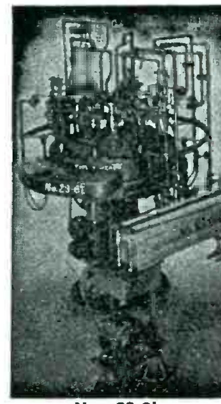

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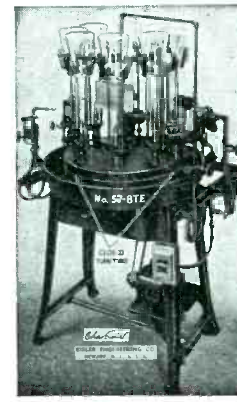

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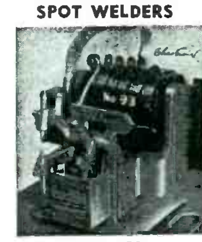

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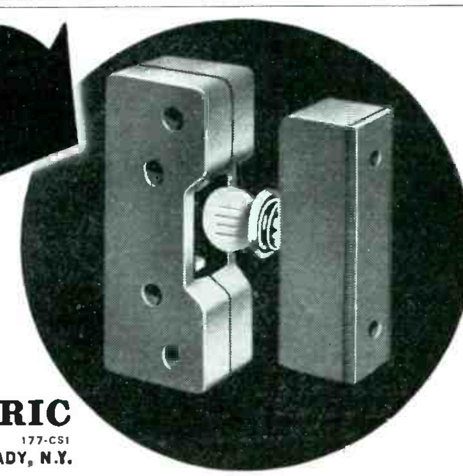

OPEN the door and the power's off! Prevents accidents, protects equipment. Will not fail mechanically. For complete details, write:

GENERAL ELECTRIC

177-CSI

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WILL IT NEED A TRANSFORMER?

If your post-war product will require the use of a transformer, it is only good business to get the details worked out early. Our engineering staff will be glad to co-operate with you in every way, drawing upon our 35 years of experience in the designing and building of transformers for a great variety of applications.

Send Your Specifications for a Quotation

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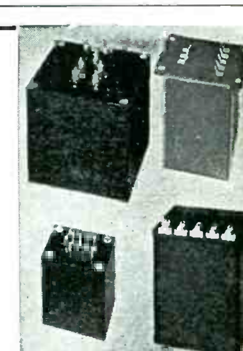
2977 Franklin **Detroit 7, Mich.**

"The Dongan Line Since 1909"



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for Additional Business

If you need extruded plastics in tubing, rods or special shapes, you'll be interested to know that we have some machine time now open and can take care of your requirements promptly and satisfactorily.

This applies, of course, only to war orders and uses approved by WPB.

Let us discuss your extrusion problems with you.

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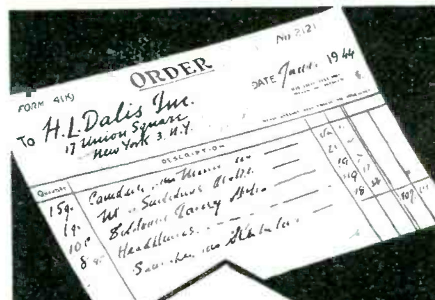
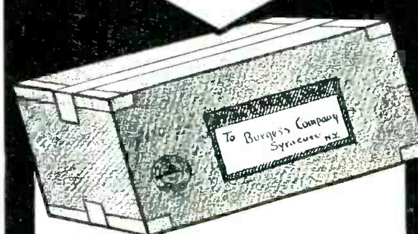


FAST WORK ON YOUR WAR ORDERS

● If your needs are urgent, take advantage of our exceptionally large and complete stock of radio-electronic supplies and parts. Most orders can be filled immediately from stock, and shipped the same day received.

And to help you order just what you need, we have the big Dalis catalog which is yours for the asking. Write on your business letterhead for your copy.

● *Try Dalis—just wire, 'phone or write . . .*



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Communications
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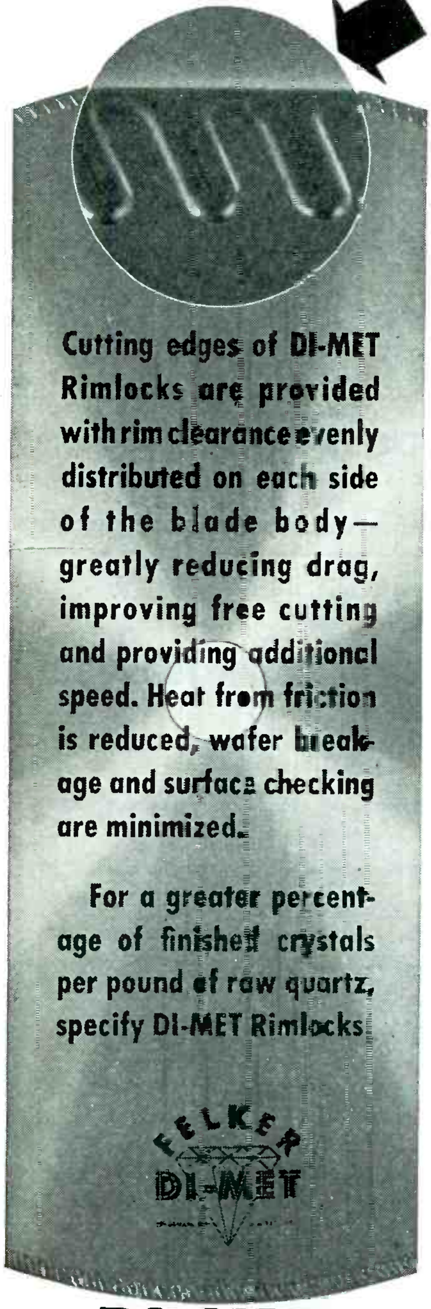

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Manufacturers of
DIAMOND ABRASIVE WHEELS

ANSWERS TO QUESTIONS PAGE 325

Are You Keeping Up-to-date ON LOW-VOLTAGE RECTIFIERS?

1. The three most commonly used types of low-voltage rectifiers are Selenium, Copper-Oxide and Tungar.
2. They differ in characteristics, basic materials and construction.
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4. The only designer-manufacturer of all three types is General Electric Co. (Tungar and Metallic Rectifier Division, Bridgeport, Conn.)
5. When the rectifier user consults General Electric, the only designer-manufacturer of all three standard types of low-voltage rectifiers, he can be assured of impartial engineering advice on which type will meet his needs most economically and efficiently.

For complete details write: Section A648-119, Tungar and Metallic Rectifier Division, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

THE ENGINEERING CO.
27 WRIGHT STREET, NEWARK, 5, NEW JERSEY
DKE

POSITIONS VACANT

ELECTRONIC ENGINEERS wanted for new department in old company with outstanding reputation. Development or production abilities sought in field of electronic instruments and control devices. Advancement should be rapid. Write stating experience, education, salary expected, draft status and availability if now engaged in essential war work. P-637, Electronics, 330 W. 42nd St., New York 18, N. Y.

GRADUATE ELECTRICAL engineers or men with equivalent industrial experience, for the development and design of pocket size radio and audio frequency equipment. We are especially interested in qualified engineers looking to the post war period who, at present, are not being used in their highest skill or capacity. The company is well established in the electronic field, located in the suburbs of a large metropolitan city in New England. P-679, Electronics, 330 W. 42nd St., New York 18, N. Y.

ELECTRICAL ENGINEER with electronic design experience wanted for research laboratory of precision instrument manufacturer, now engaged 100% in war work. Excellent postwar opportunities. Location in Denver, Colorado, near Rocky Mountains. Give complete details of education, training and experience. Include salary expected. Applicants must have statement of availability. Please address replies to P-680. Electronics, 520 N. Michigan Ave., Chicago 11, Ill.

OUTSTANDING PHYSICIST: wanted. To take charge of laboratory, exceptional opportunity in the development of aircraft instruments and products with post-war future. Simmonds Aerocessories, Inc., 30 Rockefeller Plaza, New York, New York.

EXECUTIVE ENGINEER—New York City medium sized Radio Communications Equipment Manufacturer, presently wholly engaged in War Production, with excellent post-war prospects, offers attractive and important opportunity to applicant whose experience must include executive management of all phases of Transmitter and Receiver manufacturing from design, development, through production. Write fully qualifications, salary desired. All correspondence confidential. Box 137 Cromwell Advertising Agency, 122 East 42nd Street, New York 17, N. Y.

ENGINEER CAPACITOR laboratory. Electrolytic or paper design. Not just war job. Salary commensurate with experience, ability. WMC Rules. Micamold Radio, 1087 Flushing Ave., Brooklyn. St. 2-9827, Ext. 43.

PRODUCTION ENGINEER. Familiar with developing and manufacturing wiring devices. One capable of developing a complete line and taking full charge of post-war planning. He should have knowledge of plastic molding, metal stamping, methods of assembling, etc. In answering this advertisement, please give complete details as to background and experience. Address M. A. Wachstein, Jr. (Personal) Hatfield Wire & Cable Company, Hillside, New Jersey.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 34 years' recognized standing negotiates for high salaried supervisory technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission's. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 278 Delward Bldg., Buffalo, N. Y.

EMPLOYMENT AGENCY

ELECTRONICS—More positions are coming in daily for well qualified men in Electronics. Our service is Nation wide and covers all branches of Engineering. More than 51 years at the same address. The Engineering Agency, Inc., 53 W. Jackson Blvd., Chicago 4, Illinois.

POSITION WANTED

ENGINEER - PHYSICIST — Good theoretical background plus ten years of excellent developmental experience. Desires executive or supervisory position in small or medium Midwest organization directing research or development. Protestant; age 35 years. Describe position completely and state salary in first letter. PW-678, Electronics, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED

ANYTHING within reason that is wanted in the field served by Electronics can be quickly located through bringing it to the attention of thousands of men whose interest is assured besause this is the business paper they read.

(Additional Wanted Ad on page 451)

AVAILABLE

Leon L. Adelman

MANUFACTURERS' REPRESENTATIVE

Can add several prominent lines in radio and electronics field for distribution by wide jobber following in the Eastern territory. Over 20 years of highly successful associations.

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FREELAND & OLSCHNER PRODUCTS, INC.

REBUILDERS OF RADIO TRANSMITTING TUBES

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BEST QUALITY, USED ELECTRON TUBE MACHINERY

Equipment for the manufacture of all kinds of electron tubes, radio tubes, incandescent lamps, neon tubes, photo electric cells, X-ray tubes, etc.

AMERICAN ELECTRICAL SALES CO., INC.

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WANTED

SURPLUS RADIO & ELECTRONIC PARTS and EQUIPMENT

of every description

Screws—Nuts—Bolts—Washers & Lockwashers—Solder Lugs—Rubber Grommets, Bushings & Feet—Solder Lug & Screw Terminal Strips—Fibre & Bakelite Washers—Push on & Set Screw Knobs—Push Button Switches & Knobs—Iron Cores—Momentary & Toggle Switches—Steel, Brass & Bakelite Spacers—Leather Handles & Loops—Slide Lever Hinges—Expansion & Compression, Etc. Springs Of Every Description—Connection Wire—Battery, Speaker Plugs & Receptacles—Magnet Wire—Tubular & Mica Condensers—Resistors—Short Lengths Fibre Glass Wire (all gauges)—Bakelite Handles—Flexible Shaft Cables—and 1001 other items.

Mr. Manufacturer: What are your Buying requirements?

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50 West Broadway, New York 7, N. Y.

"In Radio Since 1921"

Your Invitation

When in Boston (Beantown) let us know— We will be glad to acquaint you with the places to go, and see, including our new 4 story display storage and office building at 885 Boylston Street.

ANOTHER SOURCE OF SUPPLY

Send your name to us and get on our mailing list. We distribute standard brand lines, and have available choice items in electrical and radio specialties. Let us know your wants.

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Let Us Design Your Products

Do you need Engineers to design or redesign your products?

Far-sighted Manufacturers are now planning for post war business.

Will your product meet the market in the changes taking place in design?

Our Product Design Department specializes in creative design of new products and the modernizing of old.

Whether your Engineering or Designing problems are large or small, allow us to submit a proposal.

H. L. YOH COMPANY

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AMERICAN MANUFACTURERS *of* ELECTRICAL *and* ELECTRONIC INSTRUMENTS

which they desire to introduce to the British Market are invited to send particulars of their products to —

THE ELECTRICAL APPARATUS CO., LTD.

ST. ALBANS, ENGLAND

Additional Employment Ads On Pages 375, 396, 451, 452 and 453

HERE TODAY . . . . AND HERE TOMORROW, TOO!

Allen B. DuMont Laboratories, Inc., Pioneers in Television and Precision Electronics, has immediate employment openings for:

• ENGINEERS

Research and Development
Design (Electrical and Mechanical)
Quality Control (Oscillograph Experience)
Metallurgical
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Also

Laboratory Assistants
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• SUPERVISORS

Hams and Service-men are needed as Supervisors in Production and other Departments. Experience in Cathode-Ray Tubes and Equipment, and VHF Receivers and Transmitters advantageous.

Allen B. DuMont Laboratories, Inc.
2 Main Avenue **Passaic, N. J.**

Statement of Availability required.

CHIEF MECHANICAL ENGINEER

Aggressive midwest radio-electronics manufacturer has immediate position open. Excellent postwar future for engineer experienced with small parts or radio development laboratory. Salary open. Premium for unusual man. Confidence respected. Write

P-671, Electronics
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

(Continued from page 450)

WANTED

RCA Type 1899 monoscope or 1848, 1849 inconoscope.

CAN SUPPLY PRIORITY.
W-676, Electronics
330 W. 42nd St., New York 18, N. Y.

WAR WORK AT ITS BEST

High priority War Industry operating in the vicinity of Knoxville, Tennessee, has immediate need of experienced men in the following Technical Fields:

Electrical Design Engineers	**Mechanical Engineers**
Mechanical Design Engineers	**Chemical Engineers**
Physicists	**Mechanical Draftsmen**
Electrical Engineers	**Electrical Draftsmen**

Adequate living conditions for men and women on Project.

State age, education, experience, salary record, references, and when available under present War Manpower Commission regulations.

TENNESSEE EASTMAN CORPORATION

Post Office Box 628 **Knoxville 5, Tennessee**

WANTED

ELECTRONIC ENGINEERS

A well established company of excellent reputation located in the east, offers permanent position to a few engineers who have educational training and background in Electronic engineering or Physics. Unusual opportunities offered men who possess originality and initiative in connection with research and developments relating to television, radio, sound reproduction and other applications. Write full particulars relative to education and experience.

P. 635, Electronics, 330 West 42nd St., New York 18, N. Y.

WANTED

ELECTRONIC ENGINEER

to work 100% on the job—rather than 25% actual work and 75% "holding the job."

The Engineer we need must have substantial experience and demonstrated initiative in design, research and development.

The position offers an excellent opportunity with a well-established company in western New England, employing over 100 personnel. This company's 5 years pre-war industrial background assures a continued program of post-war advancement.

P-662 Electronics
330 West 42nd St., New York, N. Y.

SENIOR RADIO ENGINEERS

Top bracket midwest radio-electronics manufacturer has present and postwar positions for one chief mechanical engineer, two research, three development, two production, one specifications and standards. Salaries open. Confidential inquiries respected. Write

P-672, Electronics
520 N. Michigan Ave., Chicago 11, Ill.

Permanent Positions

Available with national manufacturer in essential X-Ray industry. Experienced Field Service and Sales Engineers will be placed in branch offices immediately. Factory training courses available for man with technical background. Excellent opportunity for Electrical Engineers. Work is interesting and under pleasant conditions. Ample opportunities for advancement.

Write the Supervisor
Technical Employment

Union Bank Building
Pittsburgh 22, Pennsylvania

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

WANTED

ELECTRONICS ENGINEERS

100% war work; splendid post war opportunity; capable men; E. E. degree at least 4 years practical engineering exp., knowledge of one of the following required; Test equipment audio amplifiers, recording equipment, photo electric devices, magnetic materials, lab. exp., with knowledge of modern electronic equipment necessary. If you feel you are competent of filling such a position,

Phone CI 6-2230, Extension 3 for appt. or write

AMERTYPE RECORDGRAPH CORP.
333 West 52nd St. New York City

WANTED

Electronic Engineer

Electronic Engineer for Development Department of large industrial instrument company. Post War Position. Thorough design knowledge of tube circuits, oscillators, filters, modulators required. Experienced with servo mechanisms desirable. Location New England. Write detailed experience, draft status, availability.

P-669, Electronics
520 North Michigan Ave., Chicago 11, Ill.

WANTED

Senior and Design Draftsmen

A Cedar Rapids, Iowa manufacturer engaged totally in critical war production of small intricate mechanical and electrical mechanisms is interested in employing several men or women with at least three years of practical mechanical design and drafting experience. Must be able to make neat, accurate parts drawings with complete specifications, assembly drawings and layouts; assume responsibility, and have knowledge of general standard shop and field practices. Write fully stating age, education, experience, draft status, and compensation required. Must comply with W.M.C. regulations.

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

WANTED

Loud Speaker Engineer

Experienced in loud speaker design and accoustics, plus knowledge audio amplifier design and construction.

We are a medium sized manufacturing organization based on a concrete financial foundation, have been successful in manufacturing identical pre-war equipment that we are now producing for the war effort. We shall continue, without interruption, upon the resumption of post-war activities.

If interested in a permanent position with an excellent future, write and include full details. Laboratory and plant located in Brooklyn, New York.

P-674, Electronics
330 W. 42nd St., New York 18, N. Y.

WANTED

ENGINEERS

By leading television and electronics organization in Manhattan a number of first class engineers specialized in Electronics, Circuits, Optical Precision Instrument and High-vacuum Technique, for research and development mainly on most important post-war products. Give full details of experience and salary. Replies held in strictest confidence.

P-665, Electronics
330 W. 42nd St., New York 18, N. Y.

PHYSICISTS and ELECTRICAL ENGINEERS

Needed in connection with the manufacture of a wide variety of new and advanced types of communications equipment and special electronic products. Apply or write, giving full qualifications, to:

D. L. R.
Employment Dept.
WESTERN ELECTRIC COMPANY
Hawthorne Station, Chicago 23, Ill.

New "SEARCHLIGHT" Advertisements

received by June 12th will appear in the July issue subject to limitations of space available.

Address copy to Departmental Staff

ELECTRONICS
330 West 42nd St. New York 18, N. Y.

INDEX TO ADVERTISERS

(*Continued on page 456*)

Professional Services

(Continued on page 458)

· CONTACTS ·

FOR THE FIELD OF ELECTRONICS

Make it a HABIT . . . to check this page—EACH ISSUE

THIS CONTACTS SECTION supplements other advertising in this issue with these additional announcements of products and services essential to efficient and economical operation in the field of ELECTRONICS

Announcement of importance to the Electrical Industry

Geon

Vinyl Resins & Plastics

Versatile synthetic materials offered for

INSULATION AND SHEATHING OF ELECTRICAL WIRE AND CABLE

FROM GEON resins may be made a wide variety of thermoplastic elastomers, possessing unusual electrical and mechanical properties. These materials can be extruded, pressure or injection molded, calendered, or cast into sheet and film.

Here are the specifications and properties of a representative formulation of GEON for cable insulation, in this instance, GEON 2046:

Dielectric strength	800 volts per mil
Insulation resistance	6.0×10^{15} ohm-cm @ 15.5° C.
Dielectric constant	6.0 @ 15.5° C.
Power factor	.09 @ 15.5° C.
Chemical resistance	Outstanding
Flame resistance	Will not support combustion
Abrasion resistance	Excellent
Air and ozone resistance	Excellent
Moisture absorption	Comparable to best grades of rubber
Tensile strength	2500 p.s.i.
Elongation	300%
Oil resistance	Excellent
Aging and light resistance	Excellent
Color range	14 Standard NEMA colors

GEON insulation and sheathing can be extruded directly onto the wire or formed into slip-on tubing. GEON film or GEON-treated materials can be made into tape for very fine insulation. GEON can be molded into plugs, connectors, etc.

By varying the type of GEON resins and plasticizers a great number of different combinations of properties may be obtained. Or, GEON, properly blended with certain synthetic rubbers, will impart to the rubber characteristics otherwise unobtainable.

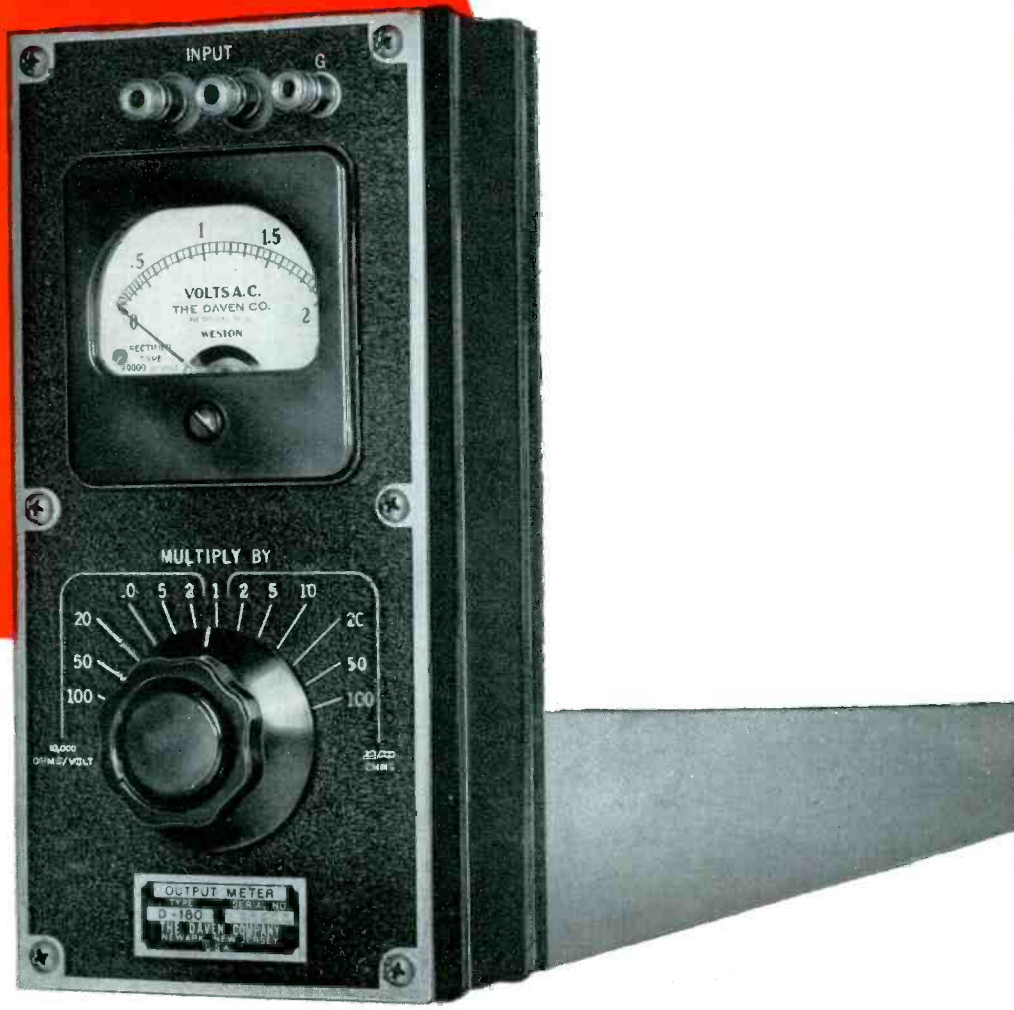
The complete GEON story cannot be told in this limited space. But our research staff and laboratory facilities are available to help you work out any special problems or applications. Chemical Division, The B. F. Goodrich Company, Rose Building, Cleveland, Ohio.

★ ★ ★

For an informative folder which further describes GEON'S properties and suggests many applications, or for answers to your questions, write Dept. F-1, Chemical Division, Rose Building, Cleveland 15, Ohio.

GEON is available to industrial users subject to allocation under General Preference Order M-10. Limited quantities can be had for experiment.

FOR ACCURATE MEASUREMENT OF AUDIO FREQUENCY VOLTAGE



RANGE: indicating meter is calibrated at 2 volts full scale. Multiplier extends this range by 1, 2, 5, 10, 20, 50 and 100 times full scale.

INPUT IMPEDANCE on constant impedance scale — 20,000 ohms. on constant ohms per volt scale—20,000, 40,000, 100,000, 400,000 ohms, 1 megohm and 2 megohm.

ACCURACY: plus or minus 5% of full scale over the range of 30 to 5000 cycles. A correction of approximately 3% per kc. may be applied above 5000 cycles.

The **DAVEN D-180 Output Meter** is a combination of a high impedance voltmeter and a constant impedance output meter. The high impedance voltmeter range is particularly convenient when measuring transformer secondary voltages and as a bridging indicator where a high impedance is required. The constant impedance range serves as a null detector and as a beat indicator in the comparison of two frequencies.

The indicating element of the **DAVEN D-180 Output** Meter is a copper oxide rectifying voltmeter calibrated to read directly in volts. Multiplier network provides a meter range of 1, 2, 5, 10, 20, 50, and 100 times meter scale reading. On the left of the vertical center line, the multiplier changes the input impedance to keep resistance equal to 10,000 ohms per volt. On the right of the vertical center line, the impedance remains constant at 20,000 ohms. When measuring between 50 and 200 volts, the ability to increase the input impedance is particularly desirable.

Regular Purchases of War Bonds Aid the Fight Against Inflation

THE **DAVEN** COMPANY

191 CENTRAL AVENUE
NEWARK 4, NEW JERSEY

407 - unknown Army set

In the interests of those concerned with the design and manufacture of Army or Navy equipment, RCA reprints this latest

ARMY-NAVY PREFERRED LIST

OF RADIO ELECTRON TUBES

15 FEBRUARY 1944

RECEIVING										
FILAMENT VOLTAGE	DIODES	DIODE TRIODES	TRIODES	TWIN TRIODES	PENTODES REMOTE	PENTODES SHARP	CON-VERTERS	POWER OUTPUT	INDICA-TORS	RECTI-FIERS
1.4	_1A3_	1LH4	1LE3	_3A5_ 3B7/1291	_1T4_	_1L4_ 1LN5 _1S5_	1LC6 _1R5_	_3A4_ 3D6/1299 _3S4_		
5.0										5U4G 5Y3GT
6.3	_6AL5_ 6H6* 559 _9006_	_6AQ6_ 6SQ7* 6SR7*	2C22 _6C4_ _6J4_ 6J5* 7E5/1201 446A _9002_	_6J6_ 6SL7GT 6SN7GT	6SG7* 6SK7* _9003_	6AC7* _6AG5_ 6AG7* _6AK5_ 6SH7* 6SJ7* 7W7 _9001_	6SA7*	6G6G 6L6GA 6N7GT/G 6V6GT/G 6Y6G	6E5	6X5GT/G 1005
12.6	12H6*	12SQ7* 12SR7*	12J5GT	12SL7GT 12SN7GT	12SG7* 12SK7*	12SH7* 12SJ7*	12SA7*	12A6*	1629	
25 and above								25L6GT/G 28D7	991	25Z6GT/G

MISCELLANEOUS	
CATHODE RAY	CRYSTALS
2AP1 3BP1 3DP1 3FP7 5CP1 5CP7 5FP7 5JP1 7BP7 12DP7 12GP7	1N21B 1N23 1N27 **PHOTOTUBES** 918 927 **VOLTAGE REGULATORS** 0B3/VR-90 0C3/VR-105 0D3/VR-150

TRANSMITTING									MISCELLANEOUS	
TRIODES		TETRODES	TWIN TETRODES	PENTODES	RECTIFIERS VACUUM	RECTIFIERS GAS	RECTIFIERS GRID CONTROL		CLIPPER TUBES	GAS SWITCHING
2C26 2C44 6C21 15E VT127A 327B 434A 527 530	801A 809 811 826 833A 838 1626 8005 8014A 8025	5D21 715B 807 813 814 1625	3E29 815 829B 832A	2E22 803 837	2X2 3B24 5R4GY 371B 705A 836 1616 8016 8020	4B25 83 856A/866 872A/872	3C23 3C31/C1B C5B 884 2050		73 719A	1B32/532A 471A 532

*Where direct interchangeability is assured "GT" and "L" counterparts of the preferred metal tubes may be used.

Miniature tubes (shown in Italics) shall be used only when essential to Service requirements.

NOTE: THIS PREFERRED LIST SUPERSEDES THE ARMY-NAVY PREFERRED LIST OF VACUUM TUBES, DATED MARCH 1, 1943.

1. The above Army-Navy Preferred List of Radio Electron Tubes sets up a group of unclassified general purpose tubes selected jointly by the Signal Corps and the Bureau of Ships. The purpose of this list is to effect an eventual reduction in the variety of tubes used in Service equipment.

2. IT IS MANDATORY THAT ALL UNCLASSIFIED TUBES TO BE USED IN ALL FUTURE DESIGNS OF NEW EQUIPMENTS UNDER THE JURISDICTION OF THE SIGNAL CORPS LABORATORIES OR THE RADIO DIVISION OF THE BUREAU OF SHIPS BE CHOSEN FROM THIS LIST. EXCEPTIONS TO THIS RULE ARE HEREINAFTER NOTED.

3. The term "new equipments," as mentioned in Paragraph 2 above, is taken to include:

a. Equipments basically new in electrical design, with no similar prototypes.
b. Equipments having a similar prototype but completely redesigned as to electrical characteristics.
c. New test equipment for operational field use.

4. The term "new equipments," as mentioned in Paragraph 2 above, *does not* include:

a. Equipments either basically new or redesigned, that are likely to be manufactured in very small quantity, such as laboratory measuring instruments.
b. Equipments that are solely mechanical redesigns of existing prototypes.
c. Equipments that are reorders without change of existing models.
d. Equipments in the design stage before the effective date of adoption of this Preferred List.

Note: The foregoing statements in Paragraphs 3 and 4 above are explanatory in nature and are not intended to be all-inclusive.

5. In the event that it is believed that a tube other than one of those included in this Preferred List should be used in the design of new equipments for either the Signal Corps or Navy, specific approval of the Service concerned must be obtained. Such approval, when Signal Corps equipment is concerned, is to be requested from the Signal Corps Laboratory concerned with such equipment; the said Laboratory will then make known its recommendations in the matter to the Signal Corps Standards Agency where the final decision will be made and returned to the laboratory for transmittal to the party requesting the exception. When Navy equipment is concerned, the request for exception shall be addressed to the Radio Division, Bureau of Ships, Code 930-A, Navy Department.

6. The publication of this list is in no way intended to hamper or restrict development work in the field of radio electron tubes or radio electron tube applications.

7. This list is to take effect immediately.

The Chief of the Bureau of Ships
Navy Department

Office of the Chief Signal Officer
Headquarters, Army Service Forces,
War Department