

RADIO



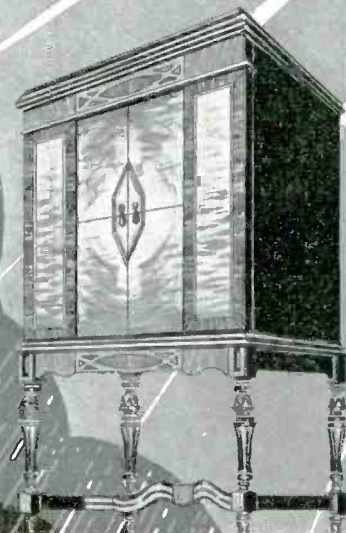
APRIL
1930

RAIN OR SHINE

What an amazing difference **four-**
screen grid tubes make!

Brunswick's 1930 models delight with
the same rich, full tone . . . the same
marvelous clarity . . . and the same
power to bring in far distant stations,
anytime, anywhere, under any weather
conditions.

Brunswick dealers welcome performance
comparisons. Such tests have
sold many instruments.



Brunswick

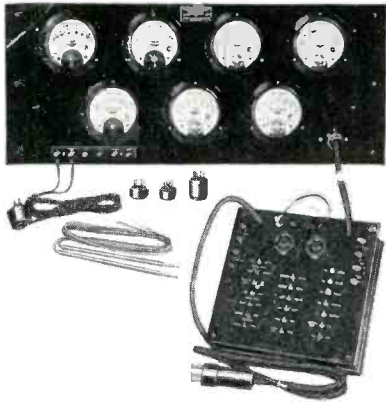
Radio — Panatropes with Radio — Records

The Brunswick-Balke-Collender Co., New York, Chicago, Toronto
Branches in All Principal Cities

JEWELL SET ANALYZERS

Pave the Way to Service Profits

**No. 579 Service Test Panel
with Remote Control Box**



Another outstanding achievement by Jewell — an instrument unequalled in speed, accuracy, and convenience for radio service testing. Read these features:

Remote control box with push button switches makes for rapid, convenient testing and easy reading of instruments. Control box is connected to panel with flexible cable and plug.

Seven large 5½ inch instruments with long legible scales.

Capacity readings of .1 to 15 microfarads on 1.5 and 15 microfarad scales.

Readings of plate current, as well as plate, grid, and filament voltages simultaneously. Provides tests for all tubes, including screen grid under actual operating conditions. Continuity tests are read on a double range ohmmeter.

Mail coupon for complete description of the Pattern 579.

No. 199 Set Analyzer



The Jewell Pattern 199 Set Analyzer is the most popular set analyzer on the market because it —

Makes every practical radio field service test, including screen grid sets.

Is simple to operate — does not require a radio engineer to use it.

Is built to the highest standards throughout, and can be relied upon for accuracy as well as ability to stand the hard usage incurred in radio field service.

Is endorsed by leading radio engineers.

Is built throughout by manufacturers whose only business is the manufacture of precision instruments. Has push button switches that select desired scales in test service, eliminating troublesome rotary switches.

Is backed by a complete radio data service.

Is the lowest priced complete set analyzer on the market.

List price \$97.50
Dealers' price 73.12

No. 41 Ohmmeter



Here is an instrument that makes it easy to check radio resistors quickly and accurately. The Jewell Pattern 41 Ohmmeter is a high grade D. C. instrument with a sub-base carrying a three-cell battery. Current drawn from the battery is very low and with ordinary use the battery lasts several months. It can be replaced conveniently.

A knurled knob provides adjustment for battery voltage variation through a magnetic shunt. In service the binding posts are short circuited before using and the pointer adjusted to the top of the scale. This corrects the instrument to the exact battery voltage, and resistance placed across the binding posts is accurately indicated in ohms direct on the scale. Construction of the Pattern 41 is rugged; the movement is of proven reliability and accuracy; it is an instrument that every service man should have.

Write for bulletin.

Jewell Set Analyzers quickly pay for themselves. Service men who do not have good instruments pay for them over and over again in wasted time, costly service and loss of business. For sale by leading radio jobbers.



30 YEARS MAKING GOOD INSTRUMENTS
JEWELL
SET ANALYZERS

Jewell Electrical Instrument Company
1642-1 Walnut Street, Chicago

Please send by return mail your booklet "Instructions for Servicing Radio Receivers" and the new Jewell bulletin on Radio Service Instruments.

Name
Address

OPERADIO

PUBLIC ADDRESS SYSTEMS

OPERADIO has developed and has in service specific equipment for specific jobs. We do not attempt to adopt a standard unit to *any* sort of use; for example,—we have equipment *designed especially for Airport use*, which is a self-contained unit, comprising microphone and phonograph and radio input connections, an amplifier with high output, and a control panel for "mixing" the entire system.

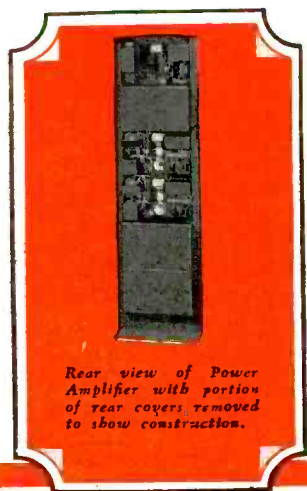
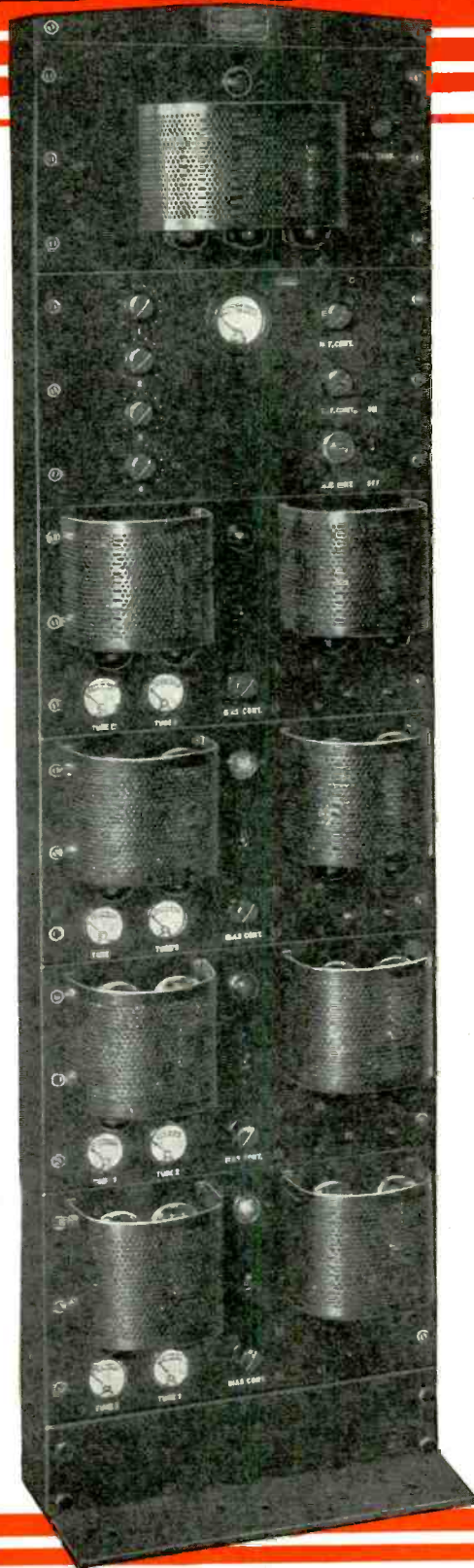
The Operadio UNI-DIRECTIONAL Bowl Speaker is *designed particularly* for Theatre and outdoor use.

Another complete system has been developed for overflow church meetings and church lectures. It is a "far cry" from the Airport to the Church and their problems are vastly different. Operadio has standard equipment for these and many other problems in the many complex ramifications of Public Address work. *This special equipment, however, is standard, and no matter what the size of the job may be, it will fit in one of the classifications already taken care of by Operadio engineers.*

Operadio equipment is soundly engineered, well built and beautiful in appearance. Operadio offers the most comprehensive line of sound equipment in the country and at prices in reach of all. Write for technical bulletins of complete apparatus available for sound equipment.

Operadio Mfg. Co.

St. Charles, Ill.



Rear view of Power Amplifier with portion of rear covers removed to show construction.

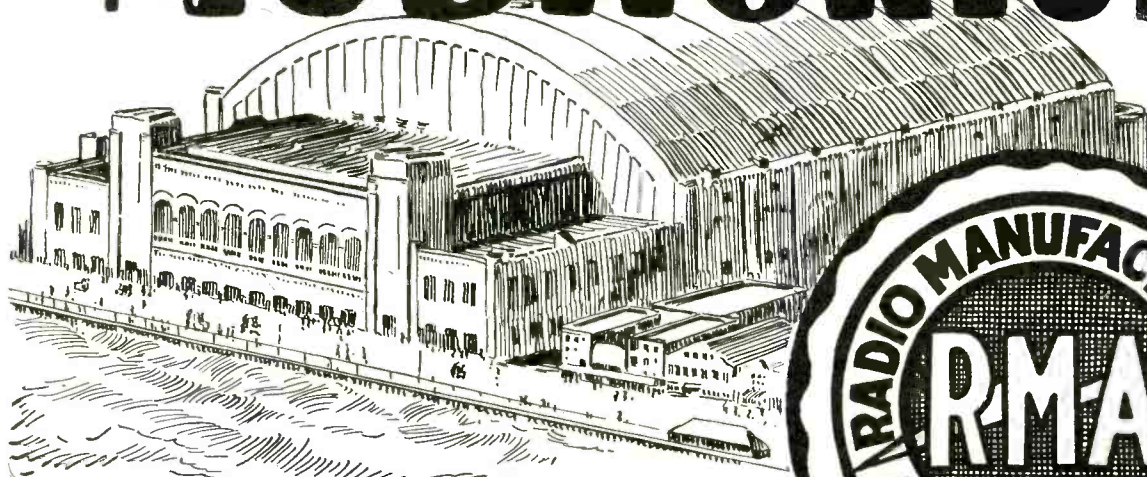
At Right—

A typical rack of amplifiers in which one Low Stage Amplifier works into four High Stage Amplifiers, with the necessary Control Panel. Equipment illustrated is capable of operating 2,000 head phones, 600 Magnetic Cone Speakers or 60 Electrodynamic speakers.

4th RMA Trade Show

ATLANTIC CITY

AUDITORIUM



JUNE 2 to 6th

ALL indications are that the 4th Annual R. M. A. Trade Show to be held in Atlantic City June 2nd to 6th will be the largest as well as the most important Trade Show in the industry's history.

In addition to the latest receiving set models and accessories, which will be exhibited and demonstrated in the Atlantic City Auditorium, many important subjects of interest to everyone in the industry, from dealer to manufacturer, will be discussed.

During the same week as the Trade Show, the Sixth Annual R. M. A. Convention, the National Federation of Radio Associations, the Radio Wholesalers Association, and the Institute of Radio Engineers will convene in Atlantic City.

Atlantic City abounds in first class hotels. The visitors to the Trade Show can be assured that an average of \$10.00 per day will well cover all expenses except transportation. For your information, we give the round trip railroad rates to Atlantic City from the principal cities.

The Radio Trade Show immediately follows the opening on Decoration Day of Atlantic City as the "Playground of the World." All of the attractions of Atlantic City, piers, golf courses, bathing, fishing, etc., will be in full swing, affording you an ideal opportunity to combine business with pleasure.

Make your hotel reservations through the Atlantic City Convention Bureau, Atlantic City, N. J. Invitation credentials for the Trade Show will be mailed to the trade about May 1st.

Radio Manufacturers' Association Trade Show

ROOM 1904, TIMES BUILDING

NEW YORK

Under Direction of U. J. Hermann and G. Clayton Irwin, Jr.

Round Trip Railroad Rates to Atlantic City

All railroads are offering special fare and one-half rates for the round trip to Atlantic City. Following are the round trip rates from the cities indicated:

Pittsburgh	\$22.50
Cleveland	29.06
Toledo	34.83
Detroit	37.94
Columbus	32.28
Dayton	36.09
Cincinnati	38.75
Louisville	45.21
Indianapolis	42.03
Chicago	47.28
Milwaukee	51.87
St. Louis	55.32
Kansas City	70.38
Minneapolis	69.27
Omaha	74.18
Denver	103.20
Los Angeles	162.89
San Francisco	162.89
Portland and Seattle	163.10

REVOLUTIONARY!«

IN CONSTRUCTION AND PERFORMANCE

EVEREADY RAYTHEON 4-PILLAR TUBES

NOW you can sell your customers something really new . . . Eveready Raytheon Tubes! Let them hear the rich, full-voiced tone, the breath-taking realism of Eveready Raytheon reception. Demonstrate it, in their own radio sets . . . then tell them reception will *always* be better if they put a new Eveready Raytheon in each socket *whenever the tone begins to sound fuzzy*.

You can HEAR the difference and SEE the reason

Look at the illustration on this page, showing Eveready Raytheon's 4-Pillar construction . . . a sound improvement. See the solid, four-cornered glass stem, with the four rigid pillars imbedded in it, anchoring the elements. No other tube is permitted to use this construction, for it is patented and exclusive with Eveready

Raytheon.

Before the day of dynamic speakers and screen grid circuits, the old, flimsy, "gas-mantle" construction may have been satisfactory. But present-day radios need tubes with 4-pillar rigidity.

No legal entanglements!

Eveready Raytheons are licensed tubes. They come in all types, and fit the sockets in every standard A.C. and battery-operated receiver now in use. Ask your jobber, or write us now for the names of jobbers near you.

★ ★ ★

The Eveready Hour, radio's oldest commercial feature, is broadcast every Tuesday evening at nine (New York time) from WEAJ over a nation-wide N. B. C. network of 30 stations.

NATIONAL CARBON COMPANY, INC.

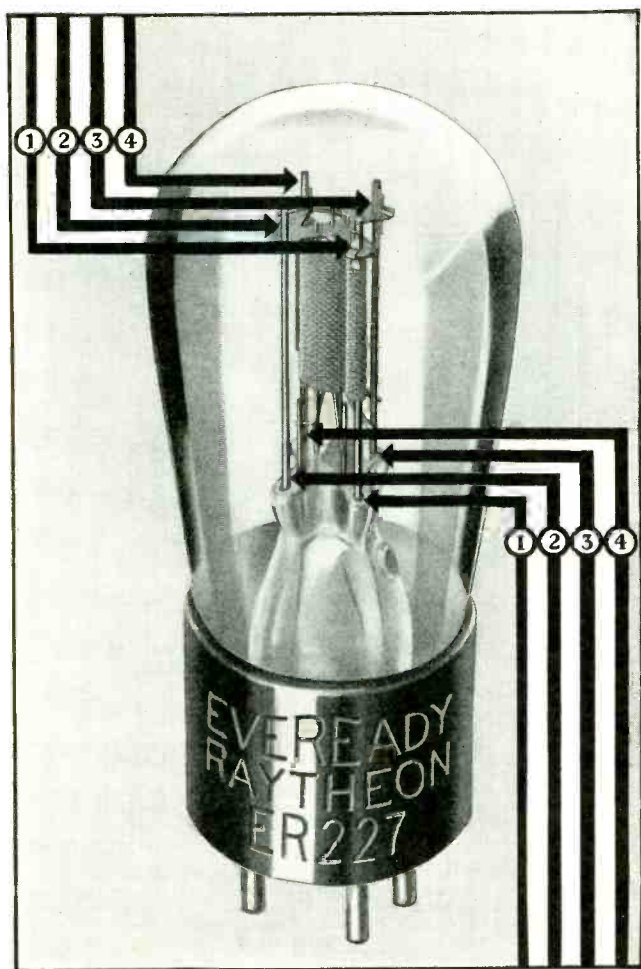
General Offices: New York, N. Y.

Branches: Chicago Kansas City New York San Francisco

Unit of Union Carbide  and Carbon Corporation

EVEREADY RAYTHEON

Trade-marks



Tell them you saw it in RADIO

CONDENSER LEAKAGE TESTER

FOR RADIO *and* AUTOMOBILE SERVICE

The one sensitive instrument that tells the exact health of paper dielectrics in condensers.

This is the pioneer and first instrument of its kind—no transformers—no chance to injure the highest class meter obtainable—so sensitive the finger will deflect the needle full scale, but a dead short circuit cannot injure the instrument. Plugs directly into light socket—no external batteries or equipment necessary. A needed instrument marketed by pioneers in the service instrument field.

Radio Condenser Testing

Condensers that leak current across the dielectric cause complete loss of tone in radios. These condensers are quickly located by this instrument. It is not necessary to use breakdown tests. Shorted condensers give full scale deflection. LEAKY CONDENSERS register on meter with dead beat constant reading, giving full extent of the leakage. Meter is also calibrated to read capacities of by-pass condensers from .1 to 4. microfarads. No radio service job can be properly handled without reading condensers for leakage. This is the first instrument giving accurate readings.

Automobile Condenser Testing

The PRAP No. 1 Condenser Tester has brought a new era to the servicing of auto ignition troubles. The old method of flipping a wire, which is in series with a lamp, across the condenser terminals is gone. It could not advise if the condenser leaked, thereby causing lag in spark and slow pitting of points. It was a case of hit or miss service. Today you have an instrument that tells exactly what the internal condition of the condenser is. No guesswork—quick and efficient. Automobiles are rapidly being equipped with radio, necessitating another by-pass condenser across the generator. Unless you have an instrument to detect leakage in these condensers, noise cannot be eliminated and no service job can be properly handled.

Continuity Testing

The PRAP No. 1 Condenser Tester has been equipped with two binding posts on the touch plates so probe leads can be fastened for continuity work. A closed circuit will deflect the needle full scale. This instrument will also give the most decisive readings between primary and secondary windings of transformers, besides reading their continuity. Also, any leakage from primary to secondary or to the case or core is indicated. Reads condition of spark coils, etc. The sensitive meter is peculiarly adapted to reading continuity of circuits through high resistances, giving a reading through resistances of millions of ohms, such as grid leaks.

A condenser will take a charge of electricity to its capacity limit if the current is flowing in one direction. After the condenser has received its full charge no further immediate action takes place except when the dielectric of the condenser is in an impaired condition, then a further action takes place due to the leakage of the charged current from one plate to the other. However, the current leakage would dissipate and no prolonged indication would take place sufficient for working an indicating meter unless a proper electrical arrangement were made. This is accomplished in the PRAP No. 1 Condenser Tester, giving a dead beat continuous reading on the meter, and when there is any impairment to the dielectric of the condenser under test, the special pulsating current arrangement flows through this impairment of dielectric and deflects the needle of the indicating meter in direct proportion to the amount of impairment or increase in dielectric leakage.

Pats. App. For

ONE-HALF
ACTUAL
SIZE



List Price, \$32.50—Less 199 Type Tube
105-125 V., 25 to 133 Cycle

PRAP NO. 1 CONDENSER TESTER

Made for radio and automobile by-pass condenser testing, for leakage across dielectrics, and sensitive continuity testing. Equipped with Jewell Pattern 88, bakelite case, 3 3/8" precision meter, calibrated to read capacities from .1 to 4. microfarads.

Uses 199 type tube inserted in bottom of aluminum casting. Plugs in light socket—no batteries or external equipment used. Fits in pocket or tool kit. Dimensions 2 1/8 x 3 3/8 x 7 inches. Weight complete, 2 pounds. Furnished with cord and plug. Shipped in single cartons or in standard package of 12 single cartons.

PRECISION RADIO PRODUCTS CORP.
Little Rock, Ark.

Ship immediately via express one PRAP No. 1 Condenser Tester.

I/we agree to deposit with the express agent \$24.37, which is my net price, and it is understood that I/we may return the instrument in good condition to the express agent any time within six days and receive the deposit less the small transportation return charges.

Address.....

Firm.....

By.....

Attach this coupon to your letterhead or card.

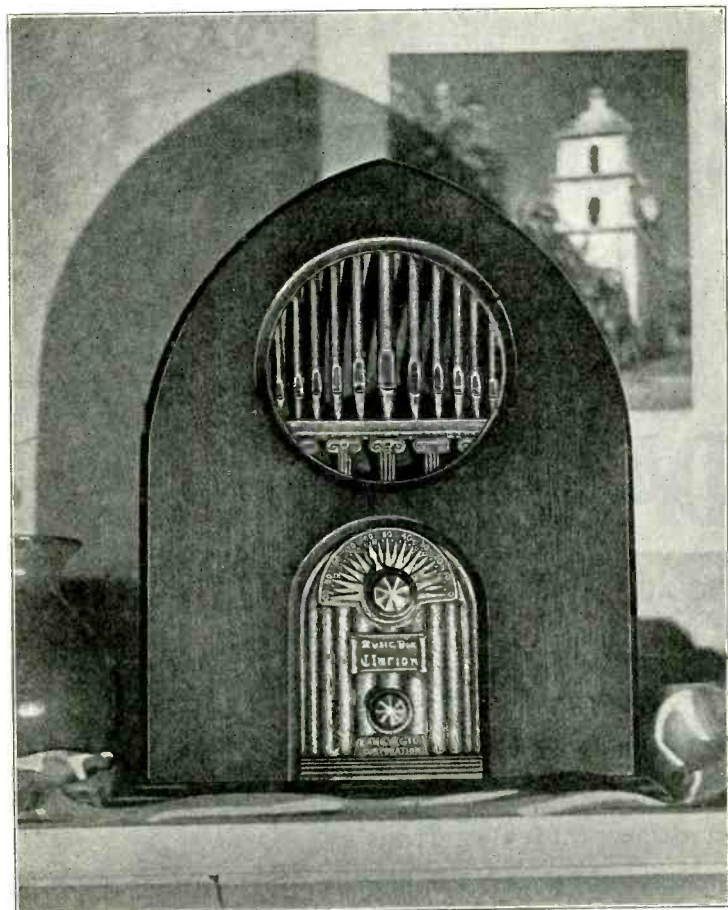
If C.O.D. purchases are against your policy, order through your jobber, or advise us to ship through your jobber.

A 1930 SENSATION

MEETING AN ECONOMIC RADIO DEMAND

THE MUSIC BOX "CLARION"

The Mighty Midget of Radio



Actual Size 12" x 18" x 7"

SCREEN GRID
245 Output

Features:

CABINET of mahogany with heavy baffling. Bronze finished grill and escutcheon.

CHASSIS of die cast duraluminum, small, compact. Thoroughly shielded, easily removable, sturdy for shipping. 3 gang condenser 100% adjustable.

CIRCUIT: A new revolutionary hook-up, exclusive to the *Music Box*, fool proof—long life—quiet, and extremely simple; 40% less parts to service. The tubes used are one 224 as detector, two 227's, one 280 full wave rectifier, and a 245 on the amplification output.

SPEAKER: Nationally known matched unit—beautiful tone—auditorium volume.

SELECTIVITY: By National Test. No set at any price has greater sharpness—even with long aerial.

DISTANCE: Never before mentioned in low priced sets, one of our greatest boasts; remarkable DX in good locations.

Price! 59⁵⁰

COMPLETE WITH TUBES

Here Are Your Sales Talks

SCREEN GRID!

245 OUTPUT!

AUDITORIUM VOLUME!

EYE APPEAL ✓ **SALES APPEAL** ✓ **TONE APPEAL**
EASY TO SELL ✓ **STAYS SOLD**

FRANCHISES NOW AVAILABLE ✓ **ATTRACTIVE DISCOUNTS**

Get Rid of That Summer Slump ✓ **Feature What the Public Want and Can Afford!**

ZANEY-GILL CORPORATION

5914 SOUTH WESTERN AVENUE
LOS ANGELES, CALIFORNIA

To
Think of

T TRANSFORMERS

is to
Think of

THORDARSON

TRANSFORMER SPECIALISTS • Since 1895

Microphone Transformers • Line to Tube, Tube
to Line, Line to Line • Mixing Transformers •
Coupling Reactors • Filter Chokes • Audio
Transformers • Impedance Matching Trans
formers • Power Compacts • Speaker Coupling
Transformers • Complete Amplifiers

**THORDARSON ELECTRIC
MANUFACTURING CO.**

Huron, Kingsbury and Larrabee Sts.
Chicago, Illinois, U. S. A.

Wright-DeCoster Model A

Phonograph and Power Radio Speaker

Used in the Lobbies of Some of the Largest and Most Beautiful Theatres—

Notably, *Publix Theatres*



Its Performance

Before you could fully understand the wonderful ability of this Model to truly reproduce everything from the talking voice to a symphony orchestra, you would have to HEAR it. If you have ever heard a Wright-DeCoster Reproducer, however, you have a general idea of its excellence. It embodies the capacity of our new speaker, supplemented by an amplifier and magnetic pick-up, which are nationally recognized as the finest instruments of their kind in the world. This phonograph and radio speaker also has a modulator control, which reduces or increases the bass tones to suit the ear of the operator.

Among the many outstanding features of the new Model "A," three major points engaged the concentrated attention of the designers—

*Performance—
Attractiveness—
Size*



The Speaker of the Year

Its Size

In Model "A" we have confined within a remarkably small space an electric instrument, hitherto looked upon as necessarily unwieldy, all of the essentials of a pro-modern instrument. The cabinet is small enough to be agreeably accommodated in any home. Its character adds to the appearance of any room in which it is installed. Height, 34½ inches; width, 24 inches; depth, 16¾ inches.



Its Attractiveness

The cabinet, of Old English type, is made of selected walnut, with matched doors and top of highly figured grain. The handsomely carved grill has a background of metal silver cloth, through which a number of colored electric lights cast their glow. These lights are controlled by switches, making it possible to select one of the eight shades which will harmonize, in the opinion of the operator, with the music of the record which is being played, or the radio program which is being received. This enables a person in his or her own home to also use colored lighting effects. The cabinet has a compartment for records and a jack at the side for making radio connections.

Write for Complete Details and



Address of Nearest Sales Office

WRIGHT-DECOSTER, INC., 2217 University Ave., St. Paul, Minn
Export Department: M. SIMONS & SON CO., 220 Broadway, New York City Cable Address: "SIMONTRICE," New York



The Road to Radio Profit

THIS year is full of golden opportunity for the distributor and dealer who takes the Right Road to Radio Profit. Now is the time for you to look over the Landmarks and determine if you are on that Road.

The Distributor and Dealer of Today is interested in Stability, Financial Resources, Engineering Ability, Manufacturing Capacity, Sales and Merchandising Cooperation, and *what the Manufacturer will do for him*. For that reason, you should give serious consideration to Kennedy, not only for 1930, but for the ultimate security of your business in the years to come.

Consider a product which, in design, performance and beauty, has never been surpassed for quality, and is backed by a pioneer manufacturer whose integrity of purpose and reserve resources are unquestioned and unshakable.

Consider a program of cooperative merchandising and selling, designed to crush sales resistance and build up a permanent volume of profitable business, created by an organization of men who have never known failure in their many years of business experience.

There are many other advantageous features offered by Kennedy which afford the progressive distributor and dealer an opportunity to travel greater distances along the Road to Radio Profit.

Colin B. Kennedy Corporation, South Bend, Indiana.

Investigate Kennedy! Get the facts! Get first hand information on why the Kennedy Exclusive Sales Franchise is so desirable! But do it Now! A letter, wire or 'phone call puts you under no obligation.

KENNEDY

The Royalty of Radio

1911



1930

COVER

BOTH

TRADE SHOWS FOR
THE PRICE OF

ONE

... get double value for your money

IT'S an altogether different story this year. **TWO** trade shows will be staged in June. One at Atlantic City . . . June 2-6 . . . by the R. M. A. . . . and another on the Pacific Coast . . . June 25, 26 and 27, by the Pacific Radio Trade Association in San Francisco. In line with the economy program for trade show advertising the publishers of "RADIO" announce that the June Trade Show Issue will cover **BOTH** shows for the advertiser . . . giving you the greatest national radio trade circulation . . . assurance of complete coverage of **BOTH** shows. Only "RADIO" gives you this vast national trade coverage in June. By far the greatest circulation of any radio trade magazine and at the lowest cost per thousand circulation. Buy wisely . . . conservatively . . . get double value for your money. Cover both shows for the price of one. Use the June Trade Show Issue of "RADIO." 50,000 copies.

PUBLISHERS

OF

RADIO

THE NATIONAL TRADE MAGAZINE

NEW YORK
415 Lexington Ave.

CHICAGO
307 No. Michigan Ave.

BOSTON
86 St. Botolph St.

SAN FRANCISCO
Pacific Building

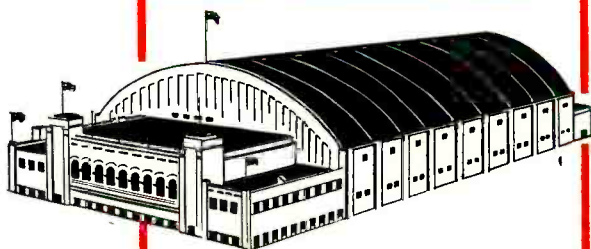
MAKE YOUR RESERVATIONS

NOW ~

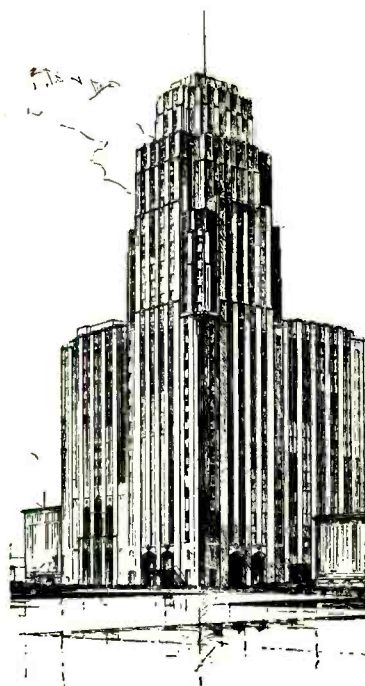
SOME preferred advertising positions are still available. Write or wire for rates for 8, 16 or 32 page inserts.

Large inserts can be accepted as late as May 25th, if these inserts are

printed by the advertiser and sent to the publisher ready for inserting into the magazine. Other advertising copy for the run of the magazine should be in the hands of the publisher not later than May 20th.



*Atlantic City Auditorium.
Scene of the RMA TRADE
SHOW. June 2-6.*

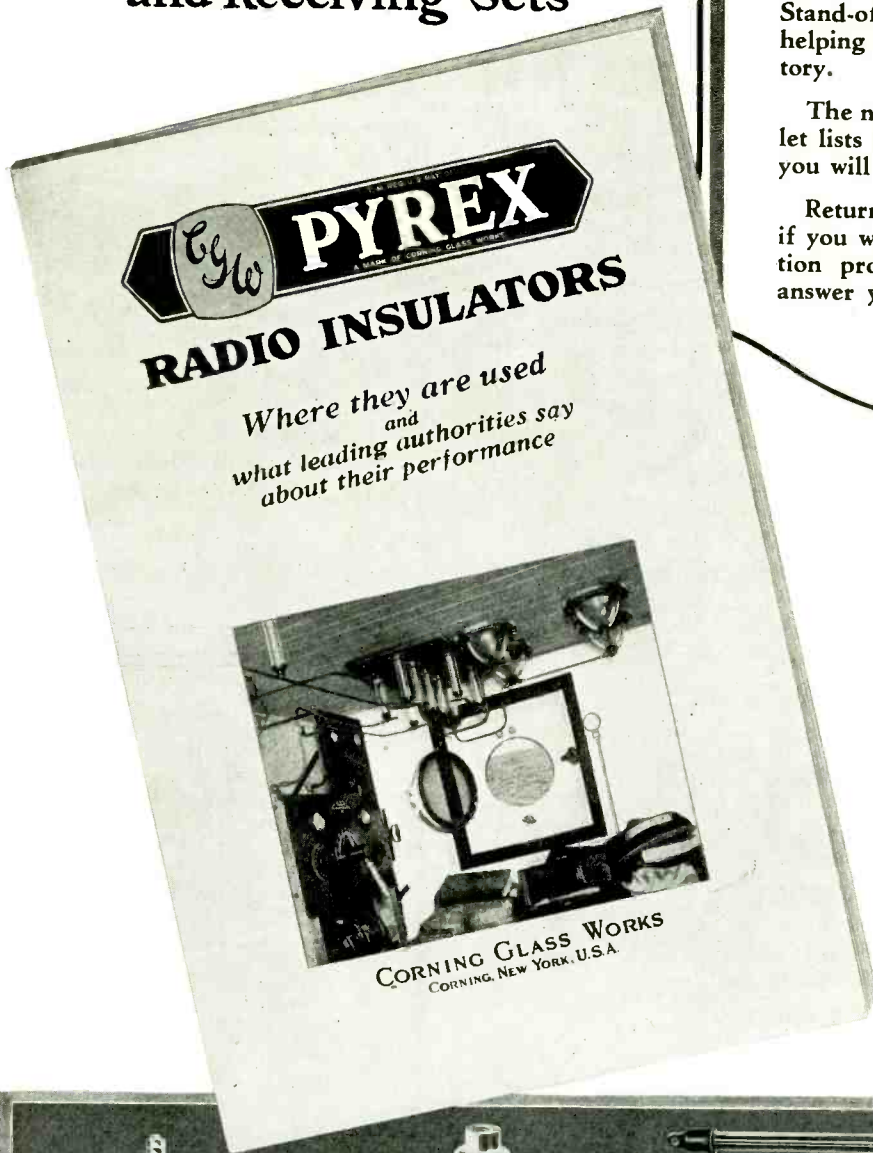


*William Taylor Hotel, San Francisco.
Scene of the First Annual
Pacific Radio Trade Show.
June 25, 26, 27.*

Tell them you saw it in RADIO

A SAFE GUIDE

in the selection
of insulation for
Radio Transmitting
and Receiving Sets



OVER 300 broadcasting stations, leading radio telegraph systems, the United States Army, Navy, Air Mail, Coast Guard and Ice Patrol Services, explorers like Commander Byrd, and exacting amateurs everywhere have utilized PYREX Insulators in many spectacular achievements.

Regardless of whether you are sending or receiving—on land, sea or airplane—you should be thoroughly familiar with the PYREX Antenna, Strain, Entering, Stand-off and Bus-bar Insulators that are helping these leaders to make radio history.

The new PYREX Radio Insulator booklet lists all types and sizes with data that you will want for ready reference.

Return the coupon for your copy, and if you want further advice on any insulation problem, our Technical Staff will answer your questions promptly.

SEND
THE COUPON
FOR YOUR COPY

Corning Glass Works,
Corning, N. Y.

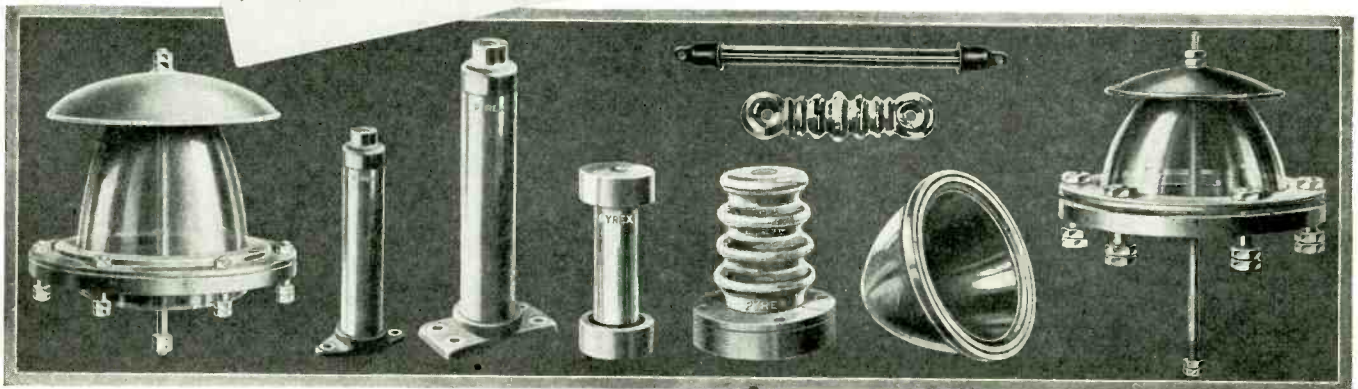
Gentlemen:

Please send me copy of your
new bulletin on Radio Insu-
lators.

NAME

ADDRESS

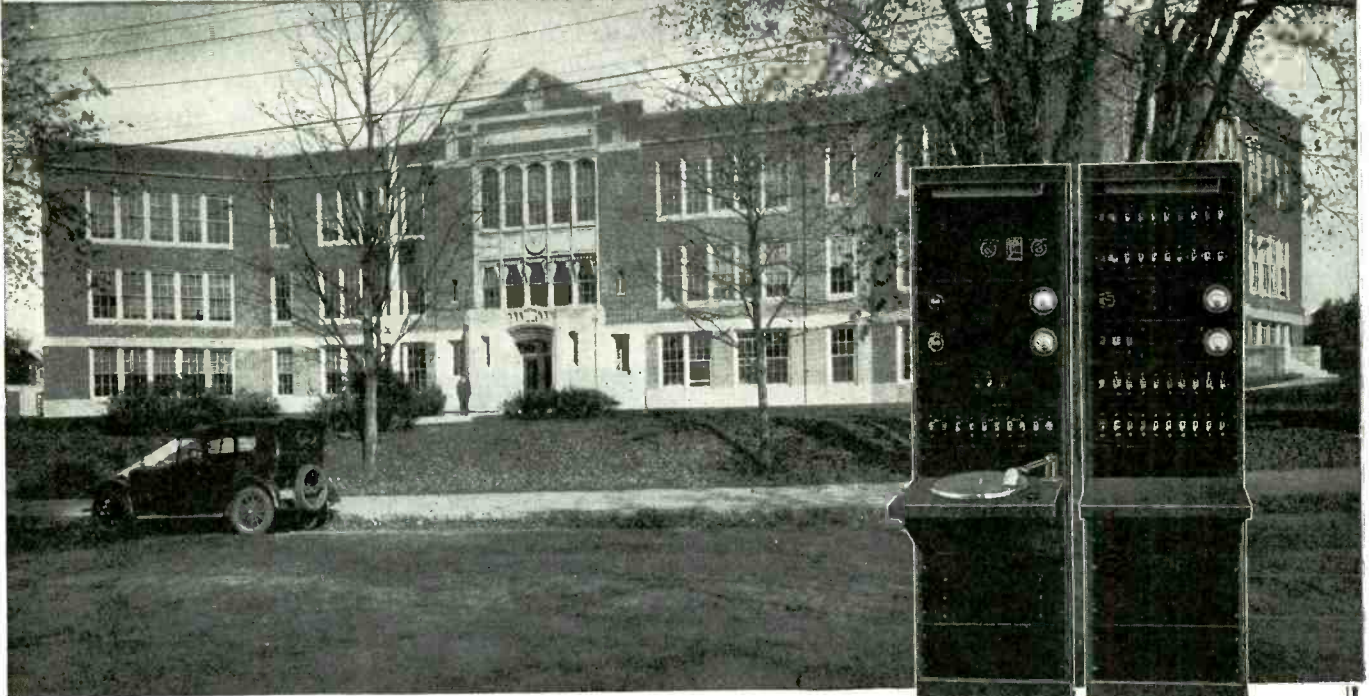
RAD. 4-30



PAMS ARE MADE ONLY BY SAMSON

PAM

REG. U.S. PAT. OFF.
SOUND AMPLIFIER



PAM Equipped F. A. Day Junior High School, Newtonville, Mass.

PMR 40

PAM, the new faculty member

With a PAM school amplifying system important lectures, talks, educational radio programs or phonograph records can be reproduced for the pupils in any or all rooms simultaneously.

This system is one which has been designed from information as to educational needs supplied us in a national survey by school boards, superintendents, principals and teachers. It is not a system adapted from other systems to partially fill the wants of the school.

The lecturer can be in the principal's office, the school auditorium or at any point properly connected with the amplifier system, and his voice is instantly brought to the pupils and teachers.

The distribution of reproduction in the PAM system is at the finger tips of the operator. Volume of the programme is both visual and aural, assuring the correct level in each room. Whether one loud speaker or all are in service, no variation in volume is experienced.

The PAM system is also a group address equipment for the auditorium, allowing the weaker-voiced to be heard distinctly. It may serve as an accompaniment to motion pictures or entertainments.

The PAM school amplifying system also distributes music for setting-up exercises, luncheon, dancing, gymnastic instructions, and the school's social functions.

The finest recordings on phonograph records of music, drama, elocution and language are made available for any or all classes by a PAM school amplifier system.

PAM equipment operates from the electric light socket, entirely eliminating batteries and other attendant care. It is made in accordance with Underwriters' requirements.

The PAM amplifier system is made by the manufacturer of Samson fire alarm and telegraph systems, which have been used in schools for the last thirty-five or forty years.

Our 36-page bulletin, "PAM, The New Voice in Education," describes the position of radio programs in schools' curricula and other uses of PAM school equipment and installations. This bulletin should be of great value to the electrical contractor or radio dealer interested in the sale and installation of this type of equipment. Write on your letterhead, enclosing 25 cents in stamps, and we will send it promptly.

Main Office:
Canton, Mass.

Samson Electric Co.
MEMBER
RMA

Factories at Canton and
Watertown, Mass.

Manufacturers Since 1882

PACIFIC COAST OFFICES:

327 Tilden Sales Bldg.
SAN FRANCISCO, CALIF.

324 North San Pedro Street
LOS ANGELES, CALIF.

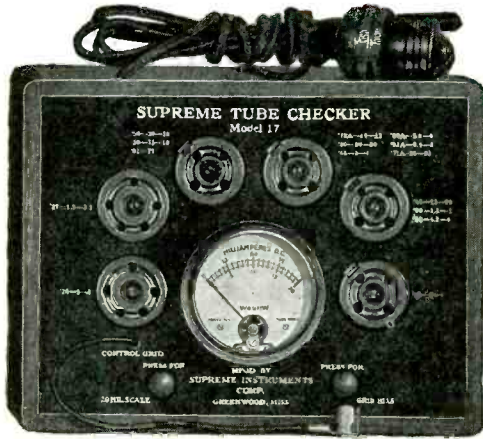
2607-11 Second Avenue
SEATTLE, WASH.

221 S. W. Temple Street
SALT LAKE CITY, UTAH

637 East Broadway
PORTLAND, ORE.

Tell them you saw it in RADIO

"SUPREME BY A Watch Word



SUPREME TUBE CHECKER, MODEL 17 Dealer's Net Price **\$21.75**

Size, 3-3/16 x 7-5/16 x 5-9/16"
Shipping weight, 4 3/4 pounds

Extreme simplicity, accuracy and efficiency. Its rugged construction and protective measures make it practically foolproof. Tests all tubes, including screen-grid. Each type of tube has its own testing socket—no switches to operate. All readings for tubes plainly marked on panel beside each testing socket. Weston meter, 2 scale 100/20/0. Operates from any 60-cycle A-C line. Exceptional value—"Supreme" quality. A tube checker that no dealer handling tubes can afford to be without and comparable with instruments selling for twice as much.



SUPREME OHMMETER Model 10
Dealer's Net Price **\$18.50**

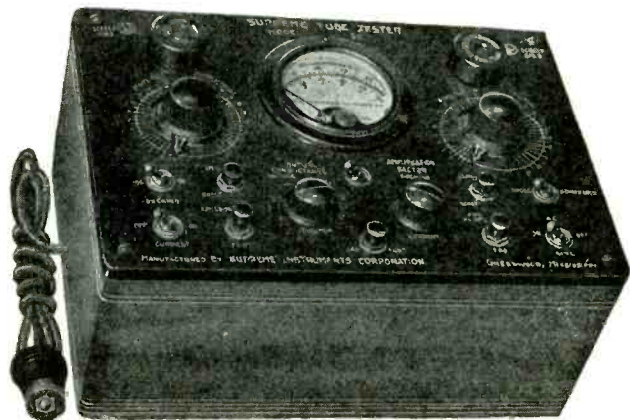
Embodying most advanced features in Ohmmeter design. Last word in simplicity. Designed for rapid and direct indication of resistances, etc., measures 10 to 10,000 ohms. Built to stand rough usage. Can be carried in pocket.

Size, 2 x 2-5/16 x 4 3/4". Shipping weight, 12 oz.

SUPREME MEGOHMMETER MODEL 80 Dealer's Net Price **\$23.75**

See illustration of Ohmmeter for design and appearance. Reads from 10,000 ohms to 4 meg-ohms. Like the ohmmeter gives maximum features in minimum, pocket size. Measures high resistances, leakage of condensers and approximate capacity of condensers.

RANK imposes obligation—*Noblesse Oblige*—as the French put it. So in sponsoring a complete line of testing instruments "Supreme" is keenly conscious of the standards established by the Supreme Diagnometer throughout the world, and confidently offers "Supreme Testing Instruments" shown on this page, and subsequent supplements, as embodying characteristic advances and advantages, in their respective fields of service. The motto "Supreme by Comparison" is both a watchword and a pledge!



SUPREME TUBE TESTER Model 50 Dealer's Net Price **\$98.50**

Size, 7-5/16 x 10-9/16 x 5 1/8". Shipping Weight, 11 3/4 pounds.

Equipped with automatic voltage regulator, manufactured under license from **WARD-LEONARD ELECTRIC CO.** Gives direct reading of amplification factor, mutual conductance, emission, normal plate current, both plates of full-wave rectifier and gives meter indication of the presence of gas. A particularly high-grade instrument intended for the more advanced radioman; invaluable for the use in public address systems, sound picture equipment, testing laboratories and wherever a thorough and complete analysis of tubes is desired.

Distributors in All Principal Cities

Service Depots in New York, Philadelphia, Pittsburgh, Chicago, Kansas City, Seattle, San Francisco, Toronto

COMPARISON" and a Pledge!

"SUPREME" Features

The SUPREME oscillation test gives the only, easily made, dependable test on tubes; tubes tested under radio frequency dynamic operating conditions.

Tests all types of tubes, including screen-grid and overhead heater types.

Affords a mutual conductance test of tubes.

Tests both plates of '80 type full-wave rectifier tubes.

All tubes tested independent of radio.

Locates unbalanced transformer secondaries.

Reads either positive or negative cathode bias.

Furnishes modulated signal for testing, synchronizing, neutralizing, etc.

Provides means for aligning of condensers by Thermo-couple meter or A-C meter.

Neutralizing with tubes used in the set; only accurate method.

Tests gain of audio amplifiers.

Provides D-C continuity tests without batteries.

Indicate resistances, without the use of batteries, in four ranges, .1 to 25 ohms; 10 to 200 ohms, 150 to 30,000 ohms (calibration curve furnished) 5000 ohms to 5 megohms.

High resistance continuity for checking voltage dividers, insulation leakages, by-pass and filter condenser leakages, bias resistors, grid leaks, etc.

Low resistance continuity for checking rosin joints, shorted variable condensers (without disconnecting R-F Coll), center tapped filament resistors, etc.

Three precision meters; one four-scale D-C voltmeter, 0/750/250/100/10 volts, resistance 1000 ohms per volt. One four-scale A-C voltmeter 0/750/150/16/4 volts. One three-scale mill-ammeter 0/125/25 mls. 0/2-1/2 amps.

External connections: to all apparatus.

Universal analyzer plug.

Screen-grid socket analysis.

Makes all analysis readings. Provides simultaneous plate current and plate voltage readings and the customary readings of A-C and D-C filament voltage, grid voltage, cathode bias, screen-grid voltage, line voltage, etc.

Measures capacity of condensers from .1 mfd. to 9. mfd.

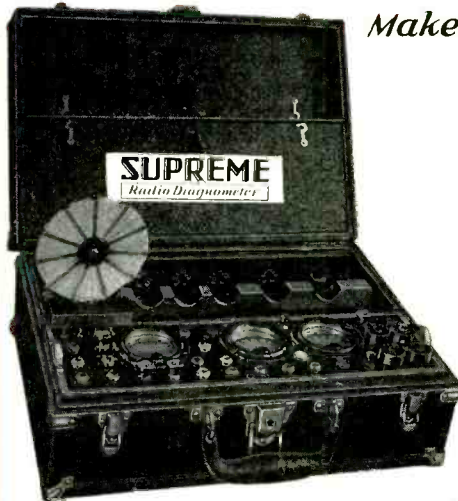
Tests trickle charger by meter.

Bridges open stages of audio for testing.

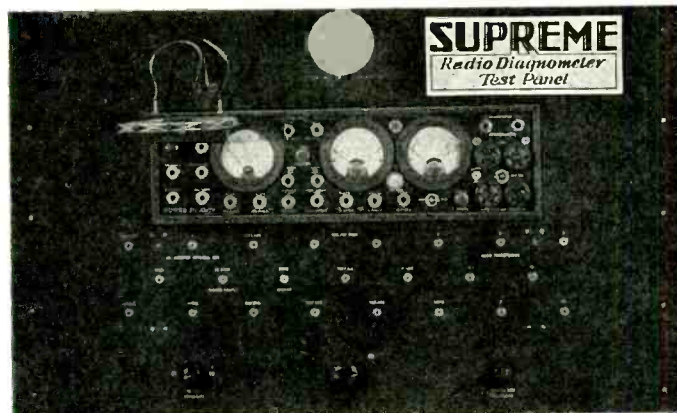
Contains 500,000-ohm variable resistor, 30-ohm rheostat and .001 mfd., .002 mfd. and 1 mfd. condensers for testing.

The laboratory test panel is equipped with a variable condenser for controlling the frequency of the oscillator.

Provides many other tests, readings and functions.



Dealer's Net Price f.o.b. **\$139.50**
Greenwood
Size 7½ x 12 x 16½



SUPREME LABORATORY TEST PANEL

Makes your Diagonometer a dual purpose instrument—shop or portable service. Fastens to back of work bench. Staunch, good looking, reinforced bakelite. Saves lost motion in shop. Dealers net price, fo.b. Greenwood, \$50.00.

Makes every ^{conceivable} test on any Radio Set-

So far-reaching now is the use of the SUPREME DIAGNOMETER among radiomen striving to give a complete and higher type of service, that it is hardly necessary to recount its many remarkable features. It is "Supremely" alone in the realm of corrective work, affording a multiplicity of functions approached by no other one instrument. By far the cheapest in price, when measured by results.

Also available in smaller case for radioman who does not care to carry spare parts, tubes, etc., in same unit.

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GREENWOOD, MISSISSIPPI

SUPREME INSTRUMENTS
CORP., 360 Supreme Bldg.,
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Without obligation, please send me information on _____
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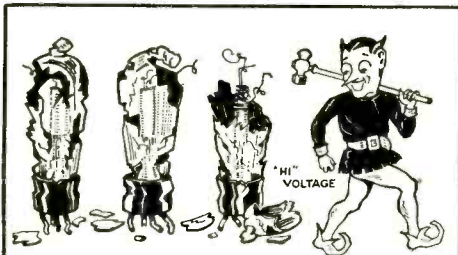
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at City _____
State _____
(Signed) _____
Street Address _____
City _____
State _____

Harmful "Hi!"

You know what happens when high ("Hi") voltage hits radio sets and tubes. Everybody knows.

To end these troubles, we make the Wirt Voltage Regulator—a variable voltage control that is attached between the convenience outlet and the radio set. It effectively controls constantly high voltages to a safe maximum.

The Wirt Voltage Regulator is a profitable item to handle. Hundreds of thousands in use. Fully guaranteed. Two sizes—now read the advertisement that appears in Collier's Weekly, April 12th, to tell 2,220,000 people how they can get more satisfaction from their AC radio sets:

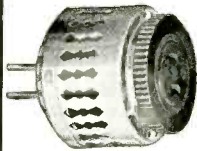


"Hi" Voltage ruins radio tubes

HIGH voltage, prevalent everywhere, burns out your radio tubes long before they would normally be used up. There is one safe remedy, recommended by a number of the best set manufacturers and radio dealers everywhere—

Wirt Voltage Regulator

Easily, instantly installed in any socket or base receptacle. Holds line voltages down to safe maximum. Tends to eliminate line noises. Improves local and DX reception. Fully guaranteed. Hundreds of thousands now in use.



Two sizes—211-B (\$3.25) for sets with dynamic speaker and sets with seven or more tubes; 211 (\$2.25) for sets with less than seven tubes and sets without dynamic speaker. See your radio dealer now.

WIRT COMPANY
PHILADELPHIA PENNSYLVANIA

THIS PUBLICITY WILL INCREASE YOUR PROFITS.
ORDER THROUGH YOUR JOBBER

WIRT COMPANY
PHILADELPHIA PENNSYLVANIA

No Reason for This!



Here's the Remedy

THE Dubilier Light Socket Aerial connects into the electric light socket, affording to the user all his house-wiring system, and the wires of the light company, for an aerial.

Works with all makes of receiving sets.

Consumes no current whatever. Needs no attention.

Nine years' record in commercial use.

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Dubilier LIGHT SOCKET AERIAL

DUBILIER CONDENSER CORPORATION
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TYPE 360 TEST OSCILLATOR



ONE of the new test oscillators for the radio service laboratory is now ready. It will deliver a modulated radio-frequency voltage at any point in the broadcast band (500 to 1500 kilocycles) and at 175 and 180 kilocycles. The tuning control is calibrated with an accuracy of 2 per cent.

The Type 360 Test Oscillator is intended to be used for neutralizing, ganging, and tuning of the radio-frequency stages in a receiver, and it is fitted with an output voltmeter for indicating the best adjustment.

Price
\$110.00

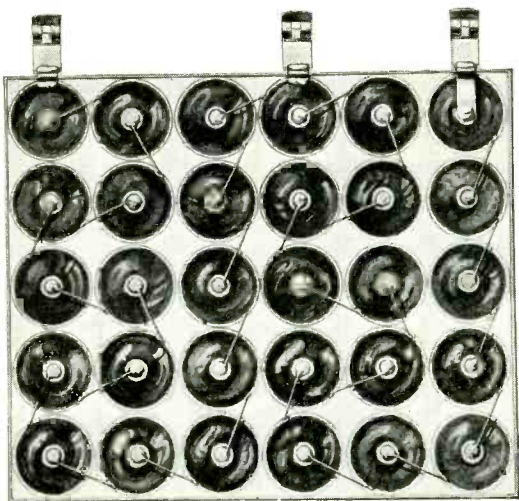
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THESE "B's"—

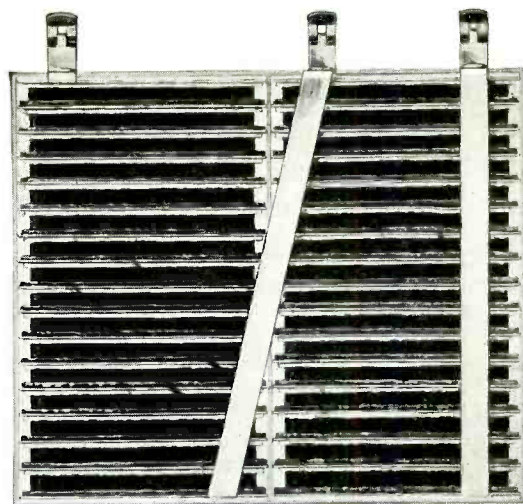
Eveready Layerbilt

"B" BATTERIES



CYLINDRICAL CELL CONSTRUCTION

This is a typical cylindrical cell "B" battery. Note the 29 fine wires and 60 solderings—89 chances for trouble. See also the large amount of waste space.



LAYERBILT CONSTRUCTION

Here is the exclusive Eveready Layerbilt construction. Only five solderings, and two broad connecting bands, all other connections being made automatically. Waste space eliminated. Layerbilt construction is a patented Eveready feature. Only Eveready makes Layerbilt Batteries.

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Here's why: The Eveready Layerbilt trade-mark has been impressed upon the public consciousness as representing the best in "B" batteries. The two famous diagrams reproduced on this page are appearing in leading magazines and farm papers throughout the country, informing "B" battery users how waste has been eliminated in the patented Eveready Layerbilt, and how chances for trouble are avoided. And Eveready Layerbilt advertisements are backed up by a quality product! The public is proving that. Millions of satisfied users of Eveready Layerbilt "B" Batteries are coming back insisting on the Eveready Layerbilt label. Add to them the thousands of new consumers reached by Eveready Layerbilt advertising, and you know why Eveready Layerbilts are the best selling of all "B" batteries.

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Unit of Union Carbide  and Carbon Corporation

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EVEREADY Radio Batteries

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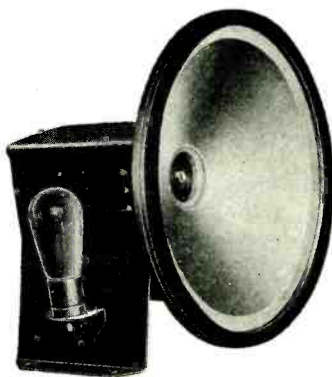
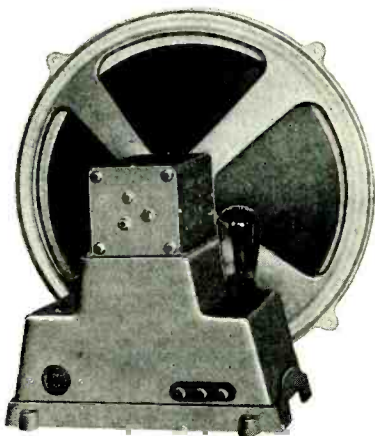
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16" cone (inside)—(19" outside).
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Net weight complete with input and rectifying transformers, 38 lbs. Neutralizing coils and filters are not used on Victory Speakers.

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(Less Rectifier Tube)

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A NEW VICTORY SPEAKER, with a **TWELVE-INCH CONE**, using the same superior constructional features as the famous **VICTORY GIANT**. The new speaker is the **Model 70**. It uses a type '80 tube for a rectifier. A new material for the cone is an exclusive **VICTORY** feature. This speaker is ideal for public address systems—for use in theaters—and for outdoors. It will stand maximum volume without blasting . . . without rattle . . . without breaking down. It is an addition to the superior line of **VICTORY SPEAKERS**. Write for complete information, trade prices and distribution territory. List price, **Model 70** . . . \$85.00
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"Your Engineers Have Perfected



A RADIO TUBE MIRACLE

... we want these
tubes for our set!"

That's what the U. S. Radio and Television Corporation said, when they selected the New National Union Radio Tube as the exclusive matched tube equipment for the New APEX Unified Radio

Long and exhaustive tests in the research laboratories of the United States Radio and Television Corporation singled out the New National Union Radio Tube as a worthy companion to the set. Closely matched to the operation of the receiver, these tubes will make possible a new, thrilling clarity of tone, and a new sense of power.

The striking uniformity of characteristics, the superb design and construction which the United States Radio has found in National Union tubes, brought forth the strongest of praise. United States Radio engineers did not hesitate to call the New National Union tube a radio tube miracle. In its rigid adherence to the highest quality standards in the industry, it is just that. Interested manufacturers are invited to write. Dealers and jobbers are urged to ask for the New National Union 1930 Proposition.



THE United States Radio and Television Corporation have created a new standard of radio value in the NEW APEX UNIFIED RADIO.

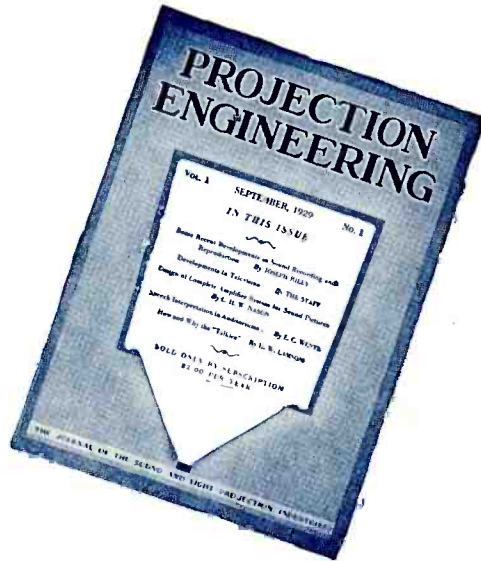
This new radio presents a highly developed co-ordination of set and tubes. Through our close co-operation, it has been made possible to offer this screen-grid receiver, complete with dynamic speaker, in a beautiful console at the unchallenged price of \$101, *with tubes!*



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400 Madison Avenue
New York City

The
NEW
**NATIONAL
UNION
RADIO TUBE**

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5,000

Radio Service Men *Needed Now!*

The replacing of the old battery operated receivers with all-electric Radios has created a tremendous country-wide demand for expert Radio Service Men. Thousands of trained men are needed *quick!*



30 Days of R.T.A. Home Training

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We furnish you with all the equipment you need to become a Radio Service Man!

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Cash in on Radio's latest opportunity! Enroll in the Association. For a limited time we will give to the ambitious man a No-Cost Membership which need not . . . should not . . . cost you a cent. But you must act quickly. Filling out coupon can enable you to cash in on Radio within 30 days, lift you out of the small-pay, no-opportunity rut, into a field where phenomenal earnings await the ambitious. You owe it to yourself to investigate. Fill out coupon NOW for details of No-Cost Membership.

The Radio Training Association of America
4513 Ravenswood Ave. Dept. R-4 Chicago, Ill.

THE RADIO TRAINING ASSOCIATION OF AMERICA
4513 Ravenswood Ave., Dept. R-4, Chicago, Ill.

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Address.....

City..... State.....

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TONE!

- ... SUCH AS ONLY A 3 STAGE PUSH-PULL AMPLIFIER CAN DELIVER!
- ... SUCH AS ONLY AN AMPLIFIER WITH IMPEDANCE MATCHING CONTROL CAN DELIVER.
- ... SUCH AS ONLY THE NEW BARRETT AMPLIFIER CAN DELIVER.



Illustrated
THE
PA-250
 Super Power
 8-Tube
 Amplifier . . .
 Suitable for
 ANY use . . .
 Supplies its own
 Microphone
 Current
15 WATTS
OUTPUT

List Price
\$220

CONSIDER THESE EXCLUSIVE IMPROVEMENTS BEFORE YOU BUY

THERE is but one amplifier on the market which MATCHES its output to any speaker or group of speakers. It is the new Barrett PA-250 Amplifier . . . the 8-tube, three-stage push-pull super power model . . . with built-in noiseless volume control and still another control for the supply of microphone current, doing away with the necessity for batteries or a separate

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Why Pay More For Less Than Barrett PERFORMANCE?

Other Models of Barrett Amplifiers

Model PA-245. A smaller amplifier. 5 watts output. Push-pull throughout, with '27 tubes in first stage, '45 tubes in last stages. Supplies field current

for speaker . . . also A and B current for a radio frequency tuner. Ideal for home or small theater use.
 List Price\$99.50

Model PA-866. A 10-tube giant amplifier. 30 watts output. Four '50 tubes in push-pull. Same exclusive features of PA-250.
 List Price\$297.50

THE BARRETT MANUFACTURING COMPANY
 3714 San Pablo Avenue Emeryville, California

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**WIRE . . .
 WRITE . . .**

for the whole story on why you too should profit from our line.

Some Territory Still Available

Tell them you saw it in RADIO

..the name

A nation's confidence in the name Cunningham has been built and maintained on the dependability of its product. From the earliest days of radio manufacture the name Cunningham on a radio tube has stood for in-built integrity.



Cunningham
RADIO TUBES
Standard Since 1915

..... the tube

Name prestige is a rigorous task-master but consumer confidence expressed in an ever-increasing demand with millions of set owners, combined with dealer good-will, amply repays us for the exacting performance we demand of every tube that leaves the factory.



the carton . . .

The familiar Cunningham slogan "Look for the Orange and Blue Carton" has been so extensively advertised that it has become a symbol of tube quality with the radio-buying public. Dealers who display these cartons on their shelves and counters identify themselves with quality merchandise.



the market

Concentrating our entire time and energy as we do to supplying a single nation, we have built up a distributing organization that leads the field in rapid and efficient delivery and replacement service.

E. T. CUNNINGHAM, INC.

NEW YORK

ATLANTA

CHICAGO

SAN FRANCISCO
DALLAS



JOTTINGS

THE Capper-Kelly fair trade bill may be passed during the present session of Congress. It provides that the manufacturers of a trade-marked article can stipulate the re-sale price in a contract with the seller. Such contract must give the same terms to all retailers in the same city or town. It does not apply to discontinued lines of a seasonal nature, to damaged goods, nor to bankrupt sales under court orders. Nor does it legalize any agreement between producers or between wholesalers or between dealers as to price maintenance.

THE Federal Radio Commission's new plan for allocating broadcast frequencies, according to unconfirmable reports, provides that one-fourth of the facilities be divided equally between the several states, and the District of Columbia, each being allocated one-forty-ninth of the number. Another fourth is to be divided among the states in proportion to their area. The remaining half is to be assigned in proportion to population. This plan would supersede the present system of zone allocation on the basis of population.

THE results of a nationwide survey conducted by the General Electric Co. show a 95 per cent preference for the continuance of cleared channels and 100 per cent for more cleared channels, as compared with regional and local channels. Of those signing the questionnaire, mostly in the rural sections, 80½ per cent favored increase in power.

ANOTHER solution to the radio trade-in problem may some day be found in a plan similar to that used by Ford in the vicinity of Detroit. He pays \$20 for each junked Ford delivered to him, up to the number of new cars bought by the dealer who makes the delivery. All parts possible are salvaged for re-use and the rest are thrown in the melting pot.

RADIO

Established 1917

Reg. U. S. Pat. Office

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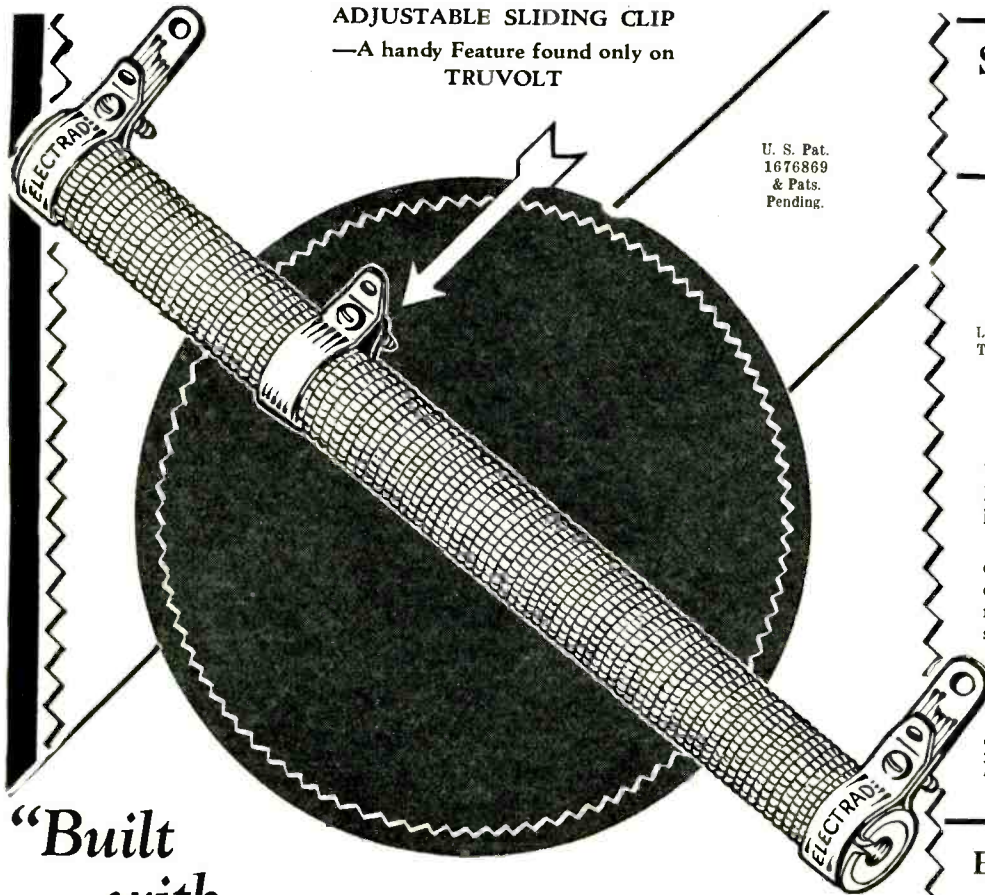
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A Suggestion to the Reader:

After reading this April number of RADIO give it to some one else in the trade who might be interested in it. Even if he is your competitor, remember that the safest competitor is an educated one. RADIO is teaching better sales and service methods. But if you want to keep this number yourself, send the name of the man whom you think it would help and the publishers will send him a free sample copy.



ADJUSTABLE SLIDING CLIP
—A handy Feature found only on
TRUVOLT

U. S. Pat.
1676869
& Pats.
Pending.

“Built
with
ELECTRAD Resistances”

means

Built to PERFORM!

SINCE the birth of the radio industry, the ELECTRAD organization has built radio resistances of superior engineering refinement, quality manufacture and perfect adaptability to existing radio requirements.

The success of this policy is shown by the universal use and endorsement of ELECTRAD Resistances by radio experts all over the world.

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175 Varick St., New York, N.Y.

ELECTRAD
INC.

Super-TONATROL Heavy Duty Volume Control



U. S. Pats.
1034103-
1034104.

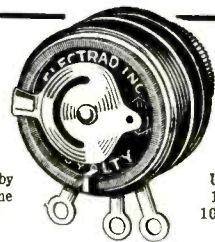
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Corp.

The Super-TONATROL combines smooth, accurate control of high voltages with unusually long life. Safely dissipates 5-watts.

The specially designed resistance element is *permanently* fused to an enameled metal plate. Rotor, with multiple floating contact of pure silver provides stepless variation with a freedom from noise that is revolutionary.

Shielded metal construction aids rapid heat dissipation. 7 types, for all usual requirements, List Price, \$2.40 to \$3.50.

ELECTRAD ROYALTY The Universal Variable High Resistance



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Corp.

U. S. Pats.
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The ELECTRAD Royalty has won wide acclaim from radio experts due to its low self-inductance, and long-wearing qualities. Due to its *patented* construction, the resistance element is *not impaired* by operation.

Quality-built throughout of finest available materials—compact—easy to install.

11 types. Potentiometer, \$2.00.
Other types,
\$1.50.

ELECTRAD, INC., Dept. PR4, 175 Varick Street, New York, N. Y.
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 TRUVOLTS; Super-TONATROL; ROYALTY; ALL PRODUCTS
Name _____
Address _____

RADIO

the national trade magazine

VOL. XII

APRIL, 1930

No. 4

Radiotorial Comment

By the Editor

TELEVISION continues to loom too large in the public picture of radio as it is. Like prohibition, it is a wonderful experiment but not yet a practical service. Or, to put it differently, television is still

An Experiment Which Will Succeed

in the pre-natal stage. It is being carefully nurtured in the laboratory from which it will some day come forth as a partially perfected instru-

mentality for viewing moving pictures whose film is being unreeled at a point relatively distant from the observer. Then it will gradually develop from babyhood to manhood and eventually become, like its big brother radio, a popular means for home entertainment. But there is a wise old saw that says something about not enumerating poultry before they have passed through the process of incubation.

ALTHOUGH the market for radio accessories has gradually dwindled with the increased sale of complete a-c receivers which require no batteries or loudspeakers, it is far from dead. There is still a very

Radio Accessories

large demand for batteries, which can be capitalized by a few dealers in each locality where the majority do not seek this class of business.

An extra loudspeaker ought to be sold with every radio set and also enough spare tubes to replace at least one of each type in a receiver. Other accessories which are not included as a part of the complete equipment of many sets are the devices for minimizing noise and regulating voltage supply. Another accessory whose value is not fully realized is the fine furniture which is available for housing a standard chassis.

ONE of the evils of the radio business is the ease of entry. Frequently the dealer's ante is less than a thousand dollars. The rest of the necessary capital is furnished by the jobber and the finance com-

Radio Business Should Have a Bigger Ante

pany. In fact they seem to own nearly ninety per cent of the retail stores. This easy credit allows two new stores to spring up wherever one store fails be-

cause of trying to do business on a shoe-string. While this evil is by no means peculiar to radio, there is no good reason why it should be allowed to continue.

Statistics show that eighty per cent of the retail sales are made by twenty per cent of the stores. This is only another way of stating that eighty per cent of the stores do only twenty per cent of the business. Obviously some of these stores are run at a loss and many of them are barely breaking even. The primary cause, as ably developed by Volney G. Mathison in this issue, is lack of capital.

The jobber, theoretically, discourages a prospective dealer who proposes to start business with insufficient capital. But as he figures that some other jobber will take the business if he does not, he puts one of his salesmen on the trail to get what he can, and then stands ready to close up the store if things go wrong.

Until recently the paper finance companies did likewise. Since they have tightened as regards their requirements, many legitimate dealers have been inconvenienced. And all on account of the bad name that has been acquired by those who should not have become retailers originally. Conservative practice dictates that a dealer should not "sell" more than one-

third of his "paper," and should carry two-thirds of it himself.

This calls for plenty of invested capital. If he lacks it, the wise man will work for a big firm until he can get the right kind of backing, thereby actually earning more money for himself and not muddying the water for the others. The entire radio industry would be helped if it were harder to enter.

WHILE a radio salesman talks about the good points of the set that he is selling and about the fine programs that are being broadcast, he seldom thinks about the merits of the station transmitter which is also responsible for the present excellent rendition of radio music. Yet he knows that to a discriminating ear some stations sound better than others, having less noise in the background, more uniform intensity for the different musical notes, and less distortion of sound. These differences are largely due to recent betterments in the engineering design of transmitters.

Why Radio Reception Is Better

A transmitter's frequency characteristic, for example, has an important effect on a receiver's tone quality. A poor characteristic emphasizes some notes and subordinates others. A perfect characteristic is represented by a horizontal line on the chart of tone fidelity. One of the modern transmitters, such as installed in the new 50,000-watt stations, gives a straight line for all frequencies between 300 and 5000 cycles; the curve shows a slight rise for the low notes between 50 and 300 cycles, and a slight drop from 50 to 30 cycles. This curve refutes the oft-made statement that no station broadcasts notes whose frequency is below 100 cycles.

A higher degree of modulation is another recent achievement of the radio engineer. In the earlier forms of transmitters the sound became distorted if the carrier wave was modulated with (had superimposed upon it) audio frequency current which made the maximum amplitude of the modulated wave more than 1.5 times that of the carrier. This is known as 50 per cent modulation. Now, 100 per cent modulation, where the amplitude of the modulated wave is twice that of the carrier, is accomplished without causing appreciable distortion. This gives louder signals over a wider area, which doubles the range of a station without having to increase the amount of power radiated. This increased coverage is thus accomplished without causing any more interference to other stations on the same channel.

While these semi-technical accounts of recent progress are somewhat dry reading and beyond the understanding of the layman prospect, they will give the salesman a good picture of what the radio transmitting engineer has done to improve broadcasting. They might be summarized by saying that the modern transmitter has improved the tone quality and reduced the noise level in radio reception.

THE importance of the service man as a factor in selling radio sets is frequently overlooked. After the regular salesman demonstrates the set and takes the order, the service man really clinches the sale by furnishing the satisfactory installation and service which is promised by the salesman. Unless he does this his employer not only has dissatisfied customers on his hands,

Importance of the Service Man

but also faces the loss of many other sales because of the "black eye" which these customers give him. Furthermore, this train of dissatisfaction often reaches back and adversely affects the sales of the manufacturer and jobber of the model which causes it.

On the other hand, if the service man understands the psychology of selling and is imbued with the fact that he is a salesman as well as a service man, and that service is a commodity that should be sold as any other commodity, he will appreciate his responsibility and do his utmost to satisfy the customer. Thus he will, in addition to giving his best, create unlimited good-will for the dealer as well as indirectly create additional sales.

Until recently, many dealers have not fully understood how the service man fits into the merchandising plan. They considered the service department as entirely separate from the sales department. Such a dealer thought that the sale was completed after the set had been sold and delivered, and that the installation and servicing was just another of those necessary evils which cut the profits in the radio business.

But now the wide-awake retailer is training his service men in the art of selling as carefully as he trains his salesmen. The service man generally knows more about a set than does the salesman, but seldom uses his knowledge as readily and intelligently when it comes to meeting objections and turning complaints into compliments.

No amount of industry and technical ability will compensate for a lack of courtesy, tact and diplomacy. Courtesy covers many blunders, while tact and diplomacy iron out many of the complaints which are the bane of the successful salesman. The service man comes into more intimate contact with the customer than does the salesman, and during his work in the home he learns many of the purchaser's idiosyncrasies which the salesman never discovers. He learns what the purchaser really wants and can show how his line satisfies that want. Furthermore, he can pick up many live sales prospects, for a satisfied customer is quick to recommend those who made this satisfaction possible.

The average person thinks that a service man takes too much time to remedy trouble in a set so as to "run up a large bill." The service man, who is also a salesman, can correct this wrong impression and thus hold customers for the dealer. As he realizes that he is a vital part of the sales scheme, and not merely an adjunct, he can increase his value to his employer and thus become a really successful service man.

\$150,000 a Year —And Broke

By VOLNEY G. MATHISON

A startling confession of how and why a radio retailer failed in business,—handled without gloves.

SIX men, five of them representing distributors of successful and widely advertised makes of radio receivers, sat glumly in their chairs in the offices of an attorney who specialized in attachments on retail stores of every kind, and the collection, by fair means or otherwise, of bad jobber accounts.

"How much are you in for, Baker?" queried one plump, youngish man in a gray suit, of his elderly neighbor, who was moodily staring into space, as if in sour introspection over the vicissitudes of the radio business.

"Twenty-eight hundred dollars," said the older man, stiffly chopping off his words. The other laughed mirthlessly. "You're not holding the biggest sack, then, by a long ways. We are forty-five hundred in the red. Farnsworth, here, is in for eleven thousand."

"Whew! And everybody thought this dealer, Gray, was doing such a whale of a business. Jobbers' trucks used to unload ten or fifteen sets on the sidewalks in front of the Gray Radio Company's stores almost every day. And he used to discount his bills as regularly as clockwork. He was supposed to be selling more radios than any other dozen dealers in Redbank."

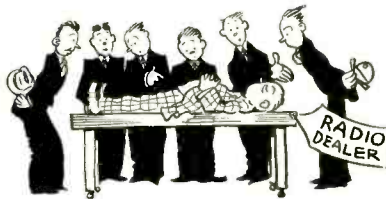
"He was, too," observed another jobber's representative. "He is the biggest and liveliest dealer in the place. He's just putting over a fast one. They say in Redbank that he has cleared out of town with fifty thousand dollars—"

"I beg your pardon," a voice spoke up acridly. "I think you are mistaken. I haven't cleared out of town just yet."

The speaker was a tall young man with angry eyes. "I am Gray."

There was an astonished and embarrassed silence. The jobbers were large ones and the particular attorneys they had sent to this meeting were all men who had never personally met the insolvent young Mr. Gray.

"Ough!" muttered one. "Stimpson never told us you were going to be here. What has happened down there in Redbank?"



At this juncture the collection attorney, a bustling, bespectacled little man, came hurrying in, lugging an armful of briefs and documents.

"Troubles galore!" he puffed, seating himself on a cushion in his big chair, facing the gathering, and stacking his papers about him. "Radio dealers and jobbers are catching the devil, too, these days, eh? Umph. Close the door. I'll see no one and take no telephone calls for half an hour. Now then, Mr. Gray, have you a list of all your creditors?"

"I have."

"What is the total amount of money you owe?"

"Twenty-two thousand dollars."

The five jobbers' agents looked at Mr. Gray, aghast.

"Um! Twenty-two thousand dollars," said the collection attorney. "What do you owe the money for?"

"A good many things," replied Mr. Gray. "Invoices for radio receivers from the five wholesalers here total about seventeen thousand dollars. Unpaid notes due my bank run over twelve hundred dollars. Installments on electric Neon signs and cash register, and rent due are others. Advertising bills of newspapers and billboard companies total about two thousand dollars."

"I see. Have you a list of your assets?"

"Yes. The assets are about fourteen thousand dollars."

"What do they consist of?"

"Mostly new radio receivers—about seventy sets altogether. Also four delivery trucks, one service car, equities in cash registers and electric signs, desks

and filing equipment, and fixtures. Also about six thousand dollars' worth of unsold time-payment contracts—accounts receivable."

"How much gross business did you do in the last twelve months?"

"One hundred and fifty thousand dollars, roughly."

"Great Scott! One hundred and fifty thousand dollars worth of business in a year, in three small radio stores—and broke!! How come?"

"Too much finance," answered Gray. "I was using a lot of finance company money to work with, and it's too costly. That was the main cause. There are a lot of other contributing causes."

Most anybody, most any radio dealer, at any rate, would be astonished at this situation—a concern with a volume of \$152,000 on its books in one year, and insolvent. The case of the Gray Radio Company, which is an absolutely genuine one, and one that has caused widespread comment in the vicinity where it operated, is a case that urgently merits the thoughtful consideration of every dealer, large or small, who is selling radio receivers on time payments.

The dangers of installment radio selling are greatly underestimated. I say "dangers of selling," and I mean just that. These dangers are real and menacing; they develop so slowly and insidiously that the dealer is liable to be overwhelmed before he comes to a belated realization of his condition—especially inasmuch as his books may show a good fat potential profit right up to the point of the big crash.

Herein I shall show accurately just what caused the busiest radio dealer who was operating three stores in a town of a quarter-million population to suddenly topple at the peak of his business volume. The analysis is somewhat elaborate, because of the unique situation involved, but it will pay any dealer to study it closely until he thoroughly understands

it. That the statements herein are based on first-hand, accurate knowledge the reader will, I think, be fully convinced, if he reads on.

Too much finance was, in a nutshell, the fatal factor in the business of this prosperous radio company. Practically every radio dealer today makes use of borrowed capital with which to finance his time-payment sales of radio receivers. The borrowing is almost invariably done by "discounting" contracts with finance companies. The dealer who does not discount contracts either has a very small volume of business or else a large amount of working capital—such dealers are rare indeed, particularly in the radio business.

There are two systems by which radio dealers are financed through commercial credit companies—the "direct" and the "indirect" system. It is necessary here that we review the procedure under both of these systems so that the reader will clearly understand just what I am talking about.

The indirect system is one wherein the dealer collects monthly payments himself from the purchaser and remits the collections in a lump sum once a month to the finance company. For instance, the dealer sells a radio set for \$140, with \$20 down. The balance of \$120 is to be paid at the rate of \$10 a month for twelve months. He delivers the contract which calls for a potential face value of \$120 to a finance company. The finance company at once advances the dealer about \$87.60 in cash. This amount is arrived at by a deduction of twenty per cent from the unpaid balance of the contract, which is called a contingent reserve (for the benefit of the finance company only, not the dealer, remember), and then a further flat deduction of usually seven per cent of the value of the contract, which is called the discounting or "carrying charge." It is really a pure interest charge, and the amount, as can easily be shown, is usurious. In the case of the above example, the finance company will deduct \$24 as a contingent reserve and

\$8.40 carrying charge, total deduction \$32.40, total cash to dealer \$87.60.

It is important here to consider the great danger to the dealer in the above mentioned "contingent reserve." The finance company does not actually hold back the contingent reserve. Rather, the finance company simply does not take over the contract at its face value. Just as the pawnbroker will loan you only thirty dollars on your sixty-dollar watch, so the finance company will not loan you more than eighty, or in certain cases ninety dollars, on your hundred-dollar radio contract.

Now this does not appear to be such a life-and-death matter on the face of it, yet it may be. Owing to the fact that the finance company does not purchase a radio contract at its face value, the net result is that the finance company assumes a certain portion of the dealer's credit business and the dealer assumes the rest himself. The more business the dealer does, the bigger a banker he must be on his own account. If he has not the capital to match his business, he had better reduce his business to safer limits.

Many dealers realize this point, but labor under the futile delusion that the profits of their business are so great that they can afford to operate without the aid of the ten or twenty per cent reserve tied up in the unsold portions of their installment contracts. They think their business is making a profit so big that they can regard the contingent reserve as a future melon they will cut when the contract pays up in full. The melon is there all right, but it is irremovably frozen in ice until the customer pays up. It is profit the dealer may put in his book if he likes, but not in his pocket—he can't pay any bills with it.

Under the indirect system of finance, the dealer is supposed to collect the monthly installments from the purchaser and remit to the finance company. In the above example, the dealer is expected to collect ten dollars a month from the purchaser and remit eight dollars a month thereof to the financing concern. In this way, the dealer, at the end of a year, will have collected \$120 from the purchaser and remitted \$96 to the finance company. This would mean a collection of \$24 for the dealer's own benefit—here is his "contingent reserve," which he has now obtained in full. This twenty-four dollars, plus the original \$87.60 paid the dealer by the finance company, will make a total of \$111.60 received in cash, plus the original twenty-dollar down payment, or \$131.60 in all, which the dealer has received for his radio receiver.

There is a shortage here of \$8.40. This is the finance charge and is sup-

posed to have been added onto the contract and paid for by the customer. But just try nowadays and make the customer pay this amount of carrying charge in the face of department store and furniture companies' full page newspaper ads every week announcing "no carrying charge." They are willing to take the finance cost out of their own profit and can afford to do so, as they are using their own capital. The dealer, in order to compete, is more or less forced to do likewise, whether he wants to or not. He may by good salesmanship get down payments of \$25 in the face of the furniture stores' offer of five dollars down or nothing down, but no amount of salesmanship that I ever heard of will consistently put over a carrying charge on customers who know they don't have to pay such a charge for the very same radio in some other establishment.

Under the direct collection system, the dealer in sending in the above described contract will usually have a smaller deduction made under the heading of contingent reserve; the average being ten per cent, or twelve dollars in this case, but the discount will be almost double, about thirteen dollars. This higher discount charge is made because under the direct system the finance company does its own collecting from the purchaser and claims a larger charge to cover the expense of such collection. The dealer, after a deduction of twelve dollars for reserve and thirteen dollars for finance charge on his \$120 contract will receive \$95 in cash at once and will receive twelve dollars more from the finance company when the purchaser finally pays up the account in full—if he ever does. The dealer thus gets a sum of \$107 in cash from the finance company plus the original down payment of \$20, total \$127. The thirteen dollars he is short of his original sale price of \$140 is again supposed to have been charged against the purchaser in the first place.

UNDER the indirect system, the finance company inexorably collects the installments due every month from the dealer on the exact date due, whether



the dealer has collected the said money from the customer or not. If the customer hasn't paid, the dealer must pay for him and act as a banker for the benefit of the customer—without thanks and without interest.

Under the direct system, the finance company has to wait itself for slow-paying customers to come across. But the finance companies don't wait very long before they toss the contract back into the dealer's lap and yell for their money back, or for a good new contract to replace it. Now, a lot of dealers have never sat down and figured out just what all these finance facts mean to them. One dealer remarked to me that he had started to dope it out once, and the process made him sick. I don't doubt it.

One important question, one that some of the highest courts in the United States have shown conflicting opinions about, is this: When the dealer "sells" contracts to a finance company, does he really sell anything at all or does he merely get a loan, surrendering the customer's account and the radio receiver or other object in question as security for that loan? The answer is definitely that to all purposes and by any view of the net result, the dealer is getting a loan—he is not selling anything at all, he is borrowing money. If the dealer sold the contract outright, and was forever through with it and forever through with the radio receiver specified therein, without any comeback of any kind from anybody, then he would be really making a sale of the said contract. But the arrangement the finance company makes with the dealer unmistakably specifies in ironclad words that if the customer doesn't make his payments, the dealer must repurchase the contract immediately or replace it with another good contract. The dealer guarantees that the customer will do what he is supposed to do. This arrangement is the same, whether the system used is direct or indirect.

Under the direct system, the finance company obviously knows when an account is delinquent; under the indirect system the finance company sends auditors every thirty days to root high and low through the dealer's files and see just how all the customers' accounts stand. Accounts that are found delin-

quent the dealer must at once replace with a fresh and good contract.

Now this is a funny kind of sale. You sell and you don't sell. You sell, but you have to buy back if the purchaser doesn't like his purchase at any time. In other words, the whole arrangement is an elaborate device for getting around the usury laws of these various states in which they operate. It is unlawful to charge more than eight percentum per annum in most states. How much do the commercial finance companies charge?

UNDER the indirect system outlined above, and taking the case of the contract having a \$120 unpaid balance, there is a flat charge of 7 per cent—seven dollars for every hundred dollars of "paper" offered. But first of all, the finance company buys only eighty per cent of the face value of the paper and then holds back the finance charge itself, so that they actually loan \$87.60 in cash at a charge of \$8.40.

Now this loan (and here is a simple point that many dealers strangely enough overlook) is not made for a year, but for an average length of six months. Get this straight: The dealer has the use of part of the money for a year, but not of all of it. At the end of six months he has already repaid the finance company \$43.80, or half of the loan; at the end of the year he has paid it all back. He has had the use of \$87.60 for an average period of roughly six months. Stating it differently, he has had an actual average loan of only \$43.80 for a period of one year, at a cost to him of \$8.40. Under the direct system, the dealer does not actually repay the loan; his retail customer pays it for him, but the dealer is out the finance charge just the same—the finance charge represents money he would have gotten for himself if he had not sold the contract.

The dealer, as I have shown in the above example, pays \$8.40 for the use of \$43.80 for one year. And a straight loan of \$100 for a period of one full year costs him over \$17.50! (This figure is not exactly accurate, but it is fairly close. Finance rates vary. Don't write the editor and tell him I am all wet and that the exact figure should be \$17.287643 plus). In other words, the dealer is paying about 17 per cent interest on the capital he employs on account of making time-payment sales of radio. Do you see danger here? No? Wake up! Do you realize that there are lots of big and successful businesses that don't earn as much as ten or even seven per cent per annum on their investment? Well, there are! Before the radio dealer can make a dime out of the time-selling part of his business, he

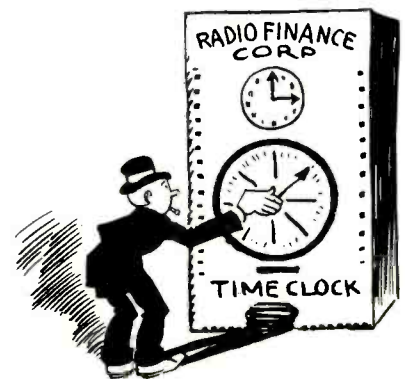
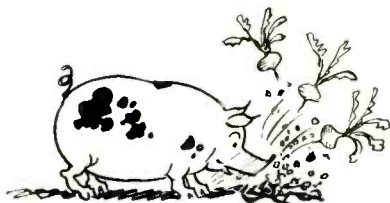
must earn the finance company's profit of seventeen or fifteen per cent per annum. A lot of dealers are only working for finance companies and may not know it.

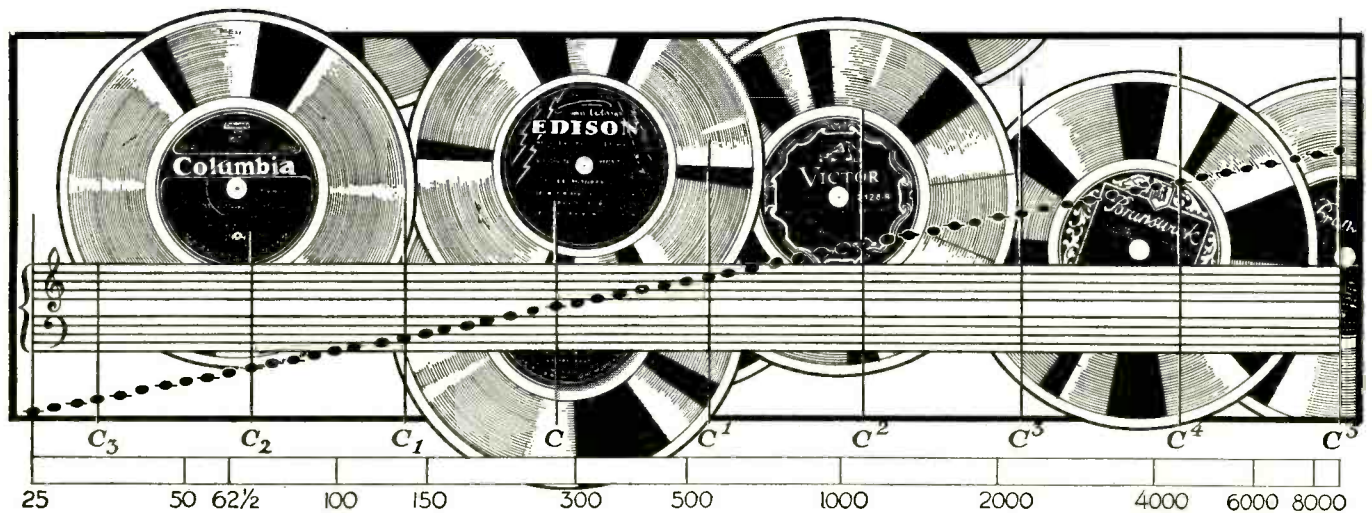
Under the direct collection system, the dealer pays an interest rate that runs as high as 30 per cent per annum. Now most any finance company representative on reading this will immediately yell that I am allowing nothing for the cost the finance company is put to to operate and to collect. So far as the expense of operating is concerned, banks which charge only seven or eight per cent interest, have similar costs of operating to face, yet they manage to keep their heads quite visibly above water.

As for the expense of collections from purchasers, that is a serious item, if well done, but no finance company does it well at all. This is just another serious danger the dealer is confronted with.

I may as well confess right here that I was the operator of the Gray Radio Company, inasmuch as I wish to impress on every dealer who reads this that I have dealt on a big scale with five of the largest finance companies in the United States, and I am thoroughly familiar with the collection methods of all of them. The average finance company system of collection is merely a series of mailed duns, essentially reading like this: "Your bill will be due—your bill's due—your bill's 'way past due—you dirty name, if you don't pay your bill we're going to blah-blah-blah. . ." You'd think somebody was sure going to get it in the neck; somebody does, too—the dealer; he is ordered to replace the bad contract at once. My experience has been this—that the five largest finance companies in the country collect installments on radios at a cost of not over twenty cents a month more than it costs them to collect indirectly through the dealer. Another thing: Finance companies collect accounts that are easy to collect, accounts that are virtually self-collecting, in other words. The dealer gets the others back to collect for himself.

(To be continued)





Selling Radio by Recorded Music

ONE of the most popular folksongs, played on one of the most popular of musical instruments, the pipe organ, is the Hawaiian air, Aloha Oe. The authorship of this song is ascribed to Queen Liliuokalani, whose death occurred in 1917. The music was finished and harmonized by the famous violinist, Fritz Kreisler.

Among the several recordings of Aloha Oe, the pipe organ solo by Edwin H. Lemare (Victor No. 21121) is perhaps the most popular. Certainly it is one of the outstanding records for the demonstration of the bass frequencies, for the recorders have gone to a special effort in order to reproduce notes down to 50 cycles on this record without allowing the needle to jump out of its groove. On both this and Chant de Bonheur on the reverse side, the low notes are down where the average sense of sound turns into a sense of feeling. The listener must be very attentive to perceive the lowest of them, even if the receiving set plays them faithfully, although it should be remembered that to enjoy the reproduction as a whole, the bass notes must be considered merely as a background for the melody.

THE Brunswick record No. 20096, with the St. Louis Blues on one side and Beale Street Blues on the other, is an interesting novelty number. The first few measures of the former, starting off with the rolling of kettle drums and giving way to the clarion blare of the trumpets, nicely demonstrates both bass reproduction and brilliance before the orchestra gets properly wound up. In fact, the salesman could call a halt after the first few revolutions of the record, and say, "How's that for reproducing the top and bottom?" The first impression of the brilliant trumpet work, of course, is that it is almost as high as

the ear can detect, whereas the truth of the matter is that the highest note the trumpet can take is D above, slightly less than 1500 cycles per second. The high notes are there, however, in the harmonics of the trumpet tones, so the salesman will be telling the truth even though he cannot point out the proof.

The sudden changes in time and the typical "blue" voice of Louis Katzman, who sings the chorus, are very amusing. And it never hurts to make a prospect smile.

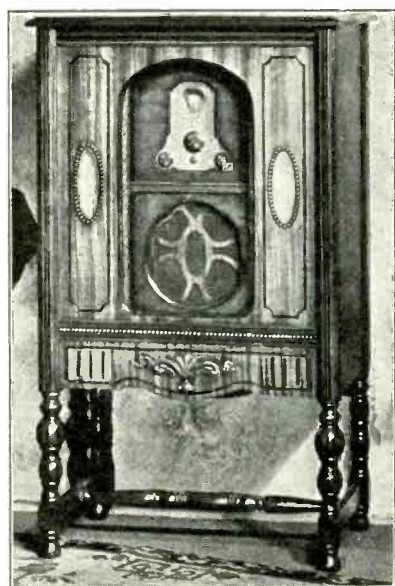
FOR those who get disgusted and feel like feeding canary seed to imitators of our various feathered musicians, the Brunswick No. 4489 is as good as a walk in the woods on a spring day. Entitled The Golden Bird, this record contains two solos actually sung by a well-fed canary who shows no shyness of the microphone, but opens up and sings at the fullest capacity of its lungs. An orchestral accompaniment is provided, probably in order to kid the little soprano along, or possibly to provide continuity for those moments when it decides to take a rest or to look around and see if it is getting over all right. It is refreshing to hear a "whistling" solo in which the artist keeps on pitch. This record is of value in demonstrating radio sets; those, at least, that are capable of reproducing the high notes; because the fundamental notes of the canary's song are reputed to be of frequencies higher than 5000 cycles, or the limits to which manufacturers of radio receivers aspire.

THE reproduction of a vocal chorus is usually a pretty difficult proposition, either in the broadcast studio or the recording studio. This one, in which the Metropolitan Opera Chorus assists Ezio Pinza to sing a selection from

Faust, and one from Norma (Victor No. 3053), is as realistic as the actual performance itself. In it the fine harmony of many voices, hundreds of fundamental tones and harmonics, all of which are necessary to obtain this naturalness, are gathered together in one small wax disc. The bass voice of Ezio Pinza, young Italian opera star, is also well worthy of comment.

IN THE Victor record No. 6695, Jascha Heifetz shows the violin at its best. In the Hebrew Melody, on one side, the resonance of the lower strings shows the vibrant depth of the instrument. Here Heifetz' skill is shown in the purity of his tones. In the Spanish Dance, on the opposite side, Zapateado, the artist goes to the other extreme, his masterful technique predominating. Most of his work in this number is done in the higher positions, fundamental notes reaching the maximum obtainable on the violin, or frequencies of around 3600 cycles per second. And in addition to these, Heifetz plays harmonics in these positions, by lightly touching the string at a point usually used for the fundamental, so that harmonics of double or quadruple the frequency are actually heard without the fundamental. This is a trick of the master violinist, and taxes the receiving set to the maximum. It is not possible, of course, for any present day receiver to reproduce the highest of these harmonics; neither is it possible for the average human ear to hear them. If the salesman should study this violin number, realizing that he is hearing the actual harmonics *about* which he hears so much, stripped of the fundamentals which usually hide them from detection, he could make excellent use of it in demonstrating his wares, provided his wares are able to reproduce them.

The Eye Appeal of Some New Sets



Oxford Hepplewhite, No. 41, Model of Stewart-Warner Radio

The new models of Stewart-Warner radio receivers are featured in cabinets of Early English period design. The Oxford No. 41, illustrated herewith, is an adaptation of an original Hepplewhite design and relies for its charm upon the exquisite graining of the woods used and the simple conventional ornamentation. It stands 43 inches high and retails at \$150, less tubes. Other models in the 1930 series whose fine cabinet work was produced by the Louis Hanson Co. of Chicago are the Woodstock, which expresses the hardy craftsmanship of Early England, the Tremont console cabinet which is characteristic of early Colonial furniture, and a seventeenth-century English console.



Fada Model 40

This new a-c screen-grid receiver with electro-dynamic speaker is encased in a Gothic walnut console of the French Renaissance period. The pilasters and the inside of the quarter French doors are lined with matched but walnut and the overlays are of burl maple. The station-finder and indicator is automatically illuminated as the tuning dial is turned to show the call letters of logged stations. Tone character is adjustable to suit individual taste.



Gulbranson Model 9950

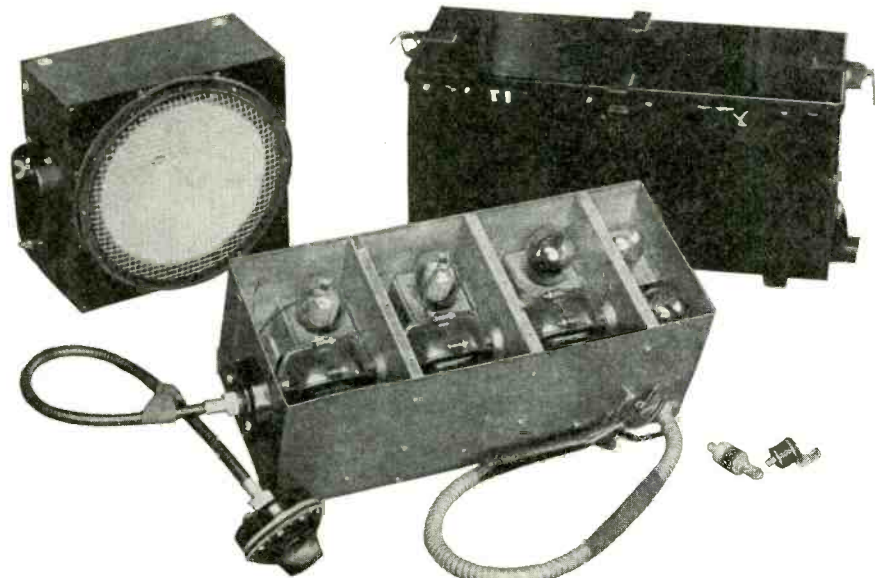
The eye appeal of this set is enhanced by a pocketbook appeal of \$99.50 for a lowboy cabinet 36 inches high which houses a nine-tube chassis and electro-dynamic speaker whose sound is delivered from the bottom of the cabinet. The chassis has screen-grid tubes in the r-f stages, power detection, and push-pull audio.



Silver Model 60 B Lowboy

This open-face cabinet houses one of six new moderately priced models whose appeal is primarily to the ear rather than the eye, though the latter is not lacking. They are designed to have great sensitivity and selectivity with a short aerial.

The eye appeal of the Delco automotive radio depends upon the fact that the set is concealed beneath the car's cowl, the batteries in a metal box under the floor-boards, and the antenna in the top of the car, so that the tuning dial, volume control and key switch on the instrument board are the only radio devices in sight. Even the cone speaker is mounted on the dash, out of sight, as are likewise the resistors and condensers that prevent interference from the ignition system.



Delco Automotive Radio Ready for Installation



Cadillac Instrument Panel With Radio Control at Right

A Leaf from the Diary of Keyhole George

EXTRY! Dealers Discover a Mare's Nest! Radio trade robbed right and left by newspapers. "We spend as much on advertising as the automobile men—why don't we get the same break?" Echo—"Why?"

It all started when the trade association statistician got busy with his pencil and figured the boys were getting a raw deal on "publicity." A hectic half-hour and advertising committee formed. Purpose—find out why and how the radio trade gets gypped. Great excitement—radio editors flayed—ad men crucified—what about a radio section? Great idea. Let's have a section. Loud cheers. A few pages of ads and lots of free publicity space. Oh, everybody'll read it, of course—wonderful scheme. Let's get the editors up here and tell 'em what we want and make sure we get it. We spend as much as—here, wait a minute, who says? A-ha! Why not get the facts first. Call in an expert. Maybe we'd better.

Storm subsides somewhat. Perhaps it **WOULD** be better to make sure of the facts before starting a war. Special meeting. Facts and figures—reams of them. What's this—radio advertising expenditures about one-third of automotive. Impossible! But there are the figures. Oh, well, maybe we won't be quite so severe with the boys, but still, we want a lot more than we're getting. What **DO** we want? More publicity per inch of space! Good, but what are you going to use the space for? Oh, this and that! Usual stuff. "Local distributor goes fishing"—"Prominent manufacturer buys a hog ranch"—how many sets will that stuff sell? Big jobber displays a stack of factory-made publicity he has ditched.

What we want is to make better use of publicity space we have. Much brightening

of countenances. Now we're getting somewhere. Everybody write their factory—give us dope with news value. Carried. What about a section? Expert frowns. That's out. Nobody reads 'em. Do you? Who the dickens wants to have his little ad crowded out by sixteen others on the same page. Get it somewhere in the sheet by itself. Maybe it's a good idea for the other fellow, but none for mine. I'm different.

But think of the prestige it would give the industry to have a section! Loud guffaws from the skeptics. They think of everything but getting the buyer into the dealer's store.

What we **DO** want is more advertising about radio and less about sets. Put over the idea of radio. Talk up programs—tie in with forthcoming events—forget the screen-grids for a while—cut out the bull—less ballyhoo and more sincerity. Now, that sounds like an idea—everyone hopes the other fellow will do it too. Maybe he will himself—maybe.

Another optimist suggests association get advertising expert to teach retailers fundamentals of ad copy writing. Most of the amateur advertisers think it's the space and not the copy that gets the business. Most of them say too much anyway. Suggestion dies a natural death. So did the advertising committee.

Local newspaper offered to print eight-page association news-sheet once a month gratis. This red herring made a hit. Gave the big boys a chance to get into print. Most of the jobbers now amateur authors, writers and journalists. Names on the mast-head—editorial advisers and what-not. First edition went over big, everybody having an axe to grind. Sheet promises to be a real safety valve and may do a lot of good. Meanwhile dealer advertising can take care of itself. Who cares, anyway?

Planning a Public Address System

By JOSEPH DOUGLAS

OF EQUAL importance with the circuits and equipment to be used in a public address system is a preliminary survey of the location where the installation is to be made. This survey involves a consideration of the purpose of the system and the size and surroundings of the proposed location.

Is the system to serve small or large groups of people, inside or outside of a building? If outside, is it to be used for a purpose like sidewalk advertising or is it to serve a throng of seventy thousand or more, such as listened to Herbert Hoover's official acceptance of the nomination for President at the Stanford stadium on August 11, 1928? Each requires a different type of installation.

A large audience necessitates the use of extra large horns, reproducers, and special design of equipment to carry the sound from the microphone to the ear of each spectator. If there is a likelihood of cheering, clapping of hands, etc., it is necessary that the amplifiers be designed to give additional gain over the normal requirement. It is also necessary to have the "singing" point of the system high enough to care for this additional gain.

When the horns are placed in front of the microphone, as shown in Fig. 1, the sound will travel from the horns to

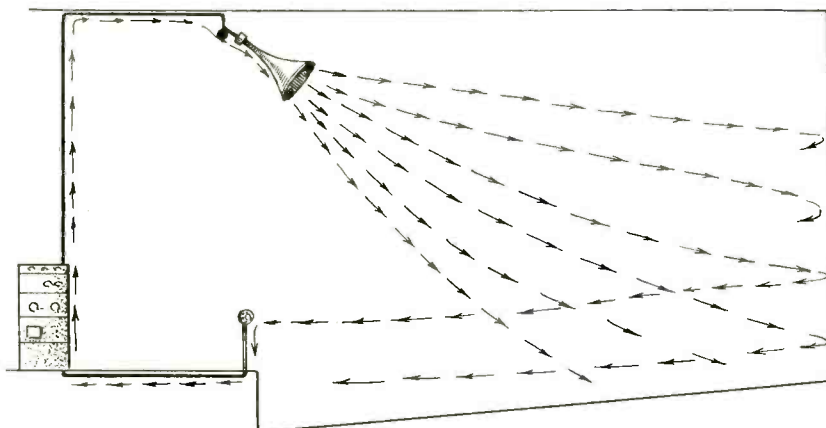


Fig. 1. Sound Path That Causes "Singing"

the flat wall surface and then be reflected back, so that the reduced volume will be picked up by the microphone and passed through the amplifying equipment out through the horns again. In

other words, a circuit is built up partly of sound waves and partly of electrical waves, and in the electrical path a great deal of amplification is obtained. This circuit continues to build up until it develops a "sing" or "howl." The point where the equipment starts to sing is called the "singing point," and is the measure of the maximum amount of amplification which can be used under these conditions.

By referring to Fig. 2, which shows another inside installation, it will be noted that it is nearly impossible to place the horns so that they will not have a direct throw at the edge of the

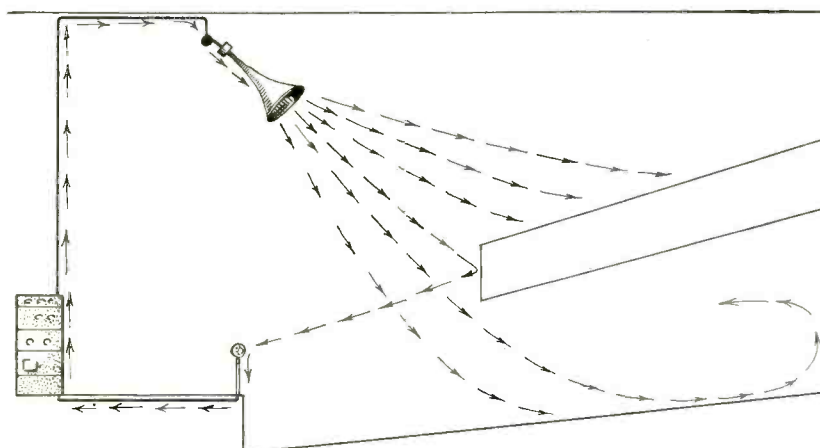


Fig. 2. Effect of Balcony in Causing "Singing"

balcony. This sound path is much shorter than that in Fig. 1. Therefore, if the horns are placed so that a direct path or short sound wave circuit is built up to the microphone, it will be neces-



Public Address Installation for President Hoover's Acceptance Speech at Stanford Bowl

sary to reduce the gain of the amplifying equipment. Under the circumstances, the longer the sound path, the greater

the gain on the horns without the tendency to sing. This will explain the advisability of draping the walls for an inside installation. For the same reason it is also wise to drape the outside of buildings, bill boards, etc., on outside installation as well.

In an outside installation, consideration must be given to weather conditions to determine, if possible, which direction the wind may be blowing during the operation. It is also wise to determine as nearly as possible the amount of outside noises that must be contended with, such as aeroplanes, trains, etc., allowing for the equipment necessary to overcome these obstacles. Arrange to place the horns as closely as possible to the group making the largest amount of noise. In this way the greater number will be able to hear the system.

On inside installation the problem of determining the size of the audience is not so important as the necessity of arranging for equipment which will be able to cover the hall with considerable margin. Of course, it is understood that when the tests are being made, the singing point of the system will be much lower than when the building is full of people, as the wearing apparel of the audience tends to absorb the sound and reduce the singing path of the system back to the microphone. Along these lines much may be determined at the time of the testing by just clapping the hands together and listening to the sound reverberate around the hall. This simple test will give a quick picture of the amount of wall draping that is necessary.

If the installation is to be made in the open, remember that uneven ground, near-by buildings or trees cast sound shadows and are likely to cause considerable reverberation. In the case of an indoor installation, acoustic conditions are more difficult to meet, due mainly to echo. In order to alleviate this condition, in many instances it is necessary to drape the bare walls with monk's cloth. If there is a balcony in the building where the Public Address System is to be used, oftentimes the desired results are obtained by draping merely the edges of the balcony. If the building is a temporary structure, alterations might be made in the plans to avoid excessive overhang of the balcony.

The usual location for the horns or speakers is either over the microphone or directly in front of it; however, it has been proven that on outdoor installation the best results are obtained by mounting the horns about 20 ft. above the speaker's platform. If the outside installation is to be used for announcements only, arrangements should be made to place the announcer in a sound-proof booth where he can get a good view of his topic. The horns can then be placed where they will be directed toward the audience.

In the installing of inside equipment it is usually possible to suspend the horns from the ceiling, high enough so they will not obstruct the audience's view of the speaker. In some instances it is advisable to suspend the horns from the ceiling in front of the speaker. Under these circumstances care should be taken to see that one of the units is directed so that the audience located below the units will receive a sufficient amount of volume. Such arrangements are usually necessary to obtain maximum efficiency.

The amplifying equipment should be located as closely as possible to the horns and the microphones. In some instances the equipment may be placed in a truck beside the speaker's stand, or, even better, under or in back of the stand. These points should be gone into at the time of the field survey, giving particular attention to the following: How far will it be necessary to run the power leads? What type of power supply is available? Is it suitable for the neces-

sary requirements? Will it be necessary for the power company to make rearrangements? In case of a power failure in the network, will an emergency power supply be available and how much time will be required to make the switch if such action is required?

In the average system it is advisable to have several telephone lines from the controls to various points in the audience, placing a man at each of these points where he will be able to inform the operator of the working condition of the system, the quality reproduced, and the difference in level; that is, if the level of the system is above that of the crowd. The observer may also advise the operator in the event the system should sound hollow or be on the verge of singing. The observer is of particular importance to the successful operation of the system, and a great deal depends upon his judgment.

Thought should be given at this time to the method which will be used to control the output of the horns and the type of horns that will be used. In selecting the panel for handling the horns it is necessary to give special consideration to the flexibility of this panel and the speed at which it can be operated to care for the variation in level required to give satisfactory volume at all times.

The engineering methods to be used in setting up and testing the equipment will be described in a future article in these columns.

The Spirit of the Wayside Radio

By EARLE ENNIS

YOU, who seek the finer cadences of life, who in the thrall of music, the hue of rare old wine, the motif of an aged tapestry, or the benedictions of a secret pigment, encounter the wider horizons of understanding—have you met, these days, the Spirit of the Wayside Radio, in his harlequin garb of mountain-mist and valley sunshine, tramping staff-in-hand along the highway with his gift for the tired traveler?

The Spirit of the Wayside Radio is no man's slave—or master. He is as free as a ray of light, and as easily diverted to the cause of happiness. He is, in truth, the genii of a tiny button, no bigger than the eye of a dragon-fly—a button that, once pressed, summons him from across the world, light-footing through the glades to bring his bag of wastrel pleasures. But he comes only for the motorist who carries on his dashboard the magic box of Pandora, beneath whose loose-locked lid lies all the sorcery of science.

Travel time is here—the fragrant days of shimmering woodland pools, of forest lure, of pine and balsam incense, of the vast witchery of growing things. We shake the dust of cities from our tired wheels, and seek the peace of green and distant trails. A shadowed glade, a cloistered pool—and we have found our goal. The rhythm of running water casts its benediction from afar, and beneath its spell, we lie and doze within the sun-splotched courtyard of pagan Pan.

Then dim the coals to crimson glow. We touch the button

of the magic box, and winging from afar, the Spirit of the Wayside Radio obeys our call—and casts a spell beside our embers. An organ's somber notes chant softly through the solemn trees. The swelling theme of rare symphonic thought wafts gently on the evening air. A voice is raised in song—a voice from somewhere down the star-lanes where the shadows fall, where man can never go until he dies. The pipes of Pan are silent as the Great God listens . . .

Well, this—the gift of the Spirit of the Wayside Radio, that tiny little thing that rides in the box of magic on the traveler's dashboard. He may thrill to the marvel of science at his own fireside as kings and emperors speak from distant spots into his very ear. But in the heart of the woods, where simple things seem great, and great ones small, the soft cadence of a flute wafted down the air-lanes to his box of magic brings something new.

If there came no other perfection of the year than this—the magic dashboard box, with its little button that summons, at will, the Spirit of the Wayside Radio—we should still be fortunate beyond our age and time. For this wanderer of the ether, this hobo of the outer spaces, whose footprints belt the globe, has brought us in the allopathic guise of science, the greater gift of understanding. One can never again be the same if one has communed with the Spirit of the Wayside Radio beside a camp fire in the fragrant gloaming of the Spring.

Preparation and Use of a Standard Sales Talk

By HECKERT L. PARKER

This series of articles, of which this is the fifth, deals with the human side of selling and is intended to help those who have some technical knowledge of radio but lack practical sales experience. It is to be followed by simple explanations of broadcasting and of types of receivers which are intended to assist those who lack technical knowledge. In conclusion there will be a discussion of commercial and economic phases of radio which can be used by the salesman to establish a prospect's interest and confidence.

THE purpose of the standard sales talk is to close more sales in less time than can be done by the usual hit-or-miss effort. It has become particularly necessary in radio with the recent change from a seller's to a buyer's market. No longer are radio sets literally taken away from the shop. No longer can the man behind the counter act merely as an order-taker. He must sell radio. To do so, he must adopt the kind of methods that have proven successful in selling other specialties in a highly competitive field.

The experienced salesman can get better results if he has such a talk well in mind, although he may change it to meet a new situation. The inexperienced salesman will find it to be the best and easiest way to make profits. For any salesman it is assurance against loss of poise, or against confusion due to objections and interruptions.

Too much emphasis cannot be placed upon the necessity for the salesman's training to include the learning of a detailed sales talk which covers every point regarding the maker, the set he sells, and the firm selling. Frequently two receivers are so nearly alike in performance that the appearance of one, or the reputation of its maker, is the only argument which will induce the prospect to buy one in preference to the other. Only the salesman who is trained to use this information can hope to succeed.

The sales talk, however, should not be given until the salesman has learned all facts possible about the prospect: family social habits, financial standing, likelihood of request for trade-in, buying motives most likely to appeal to the individual, etc., suggestions for securing which will be given later. With these points in mind, the type and price of receiver upon which to concentrate can be determined and an appointment made for a demonstration or sales presentation of a model which is deemed suitable for that particular prospect.

The first objective in the talk should be to create a favorable impression about the manufacturer and his product. As a receiver is first seen, and then heard, the next objective is to build up a satisfaction with the appearance of the cabinet. Then comes the demonstration

SALES SYNOPSIS FOR AN A-C RECEIVER

A—The Manufacturer:

1. General: age, size, financial standing.
2. Personnel: executive, engineering.
3. Production: quantity, processes, warranties.
4. Products other than radio receivers.
5. Reputation of receivers. Performance record, testimonials.
6. Special features.

B—The Cabinet:

1. General appearance: high-boy, low-boy, etc., design details, color, finish, speaker opening, switch and controls.
2. Materials, construction, workmanship, body, veneers, doors, hardware, joints, back, leg solidity, etc.
3. Acoustic properties.

C—Sound:

1. Tone quality at normal, low and loud volume. Distortion.
2. Range of compass. Upper, lower and middle register (frequencies).
3. Volume control, manual or automatic. Smoothness, ruggedness, sensitivity.
4. Quietness. A-C hum, extraneous electrical disturbances.

D—Tuning Control:

1. Station selector; local, remote. Dial marking, visibility.
2. Sensitivity. Selectivity.

E—Tubes:

1. Types: radio frequency, detector, audio frequency, rectifying, others.
2. Make, life, guarantee, replacement.

F—Circuit:

1. Type: tuned r-f, neutrodyne, superheterodyne.
2. Antenna requirements.
3. Radio frequency stages, stability. Kind of detector rectification. Type of audio system coupling.

G—Chassis Construction:

1. Ruggedness, permanence, shielding.
2. Ease of tube replacement. Accessibility.
3. Facilities for phonograph pick-up. Ease of outside speaker connection.

H—Speaker:

1. Maker. Type, dimensions, volume capacity, durability.

I—Power Unit:

1. Current consumption, watts. Voltage regulation. Capacity (milliamperes).
2. Heating in use, fire hazard safety. Condenser and transformer life. Accessibility of parts for test and replacement.

J—The Retail Establishment:

1. General: age, size, financial standing.
2. Reputation. Technical ability to choose dependable lines. Fair dealing, service facilities and attention to customers.
3. Price of receiver. Cash, time payment, trade-in. Installation and demonstration policy.
4. Special features not possessed by other retail establishments.

and talk about the sound from the receiver. After this, such details as tuning control, tubes, circuit, chassis construction, speaker and power unit may be discussed. This is followed by an outline of the retailer's qualifications to establish confidence, and finally the matter of price is brought up.

The general procedure here outlined is given in more detail in the accompanying sales synopsis for an a-c receiver. To one having a full knowledge of receivers, it makes no difference which part is discussed first. But to the layman, uninformed about radio, it is important that the sales talk follow some logical plan and not skip about, back and forth, between cabinet, the manufacturer, tubes, service, price, etc., and create confusion in the mind of the prospect instead of developing an easily followed process of thought.

The information regarding a given brand of radio set is to be found in the sales promotion material which the manufacturer furnishes the dealer and may be supplemented by additional facts from the factory representative. From the same source, the facts for Part A are secured. The dealer himself should provide the facts for Part J. These two parts should be used in every talk so as to establish confidence. The other parts, B to I, must be varied for different models.

A complete talk must be long enough to cover every part fully. This may occupy 40 to 50 minutes, of which about 30 minutes is taken up by talking and the remainder of the time with action by the salesman and prospect. As an average person can understand and assimilate the meaning of a talk which is given at the rate of 100 words per minute, a 30-minute talk requires about 3000 words. In the above synopsis alone, 242 words are used.

THE best way to prepare the talk is to write it out in complete detail as indicated in the synopsis and then boil it down to the required number of words. For a talk using 3000 words, Parts A and J together should take about 900 words; Parts B, C and D

about 1500; and Parts E, F, G, H and I about 600 words. If more or less words are used they should be divided among the different parts of the synopsis in about these proportions. Use common words that are easy to pronounce, and describe new things in terms of old familiar things. When technical words or phrases cannot be avoided they may be accompanied by a brief explanation. Write one part at a time, including every available fact; then revise and condense it to the minimum number of words which will clearly express the idea. Cut out all superlatives like "clearest," "best," "finest," "purest," etc., which mean nothing if you wish to gain the prospect's confidence. Whenever any action is necessary, as described later, insert the directions (in parenthesis) for action in the appropriate place in the talk.

Even when the prospect's time is limited, some reference should be made to the technical details in Parts E to I. For instance, the most essential facts might be stated for a typical set in 184 words as follows:

"Seven receiving and two rectifying tubes are used. Each set is equipped throughout with the well known tubes which have long life and are guaranteed by the tube maker for hours." (Part E, 32 words.)

"This receiver uses the standard type of tuned radio frequency circuit, with power detection and a push-pull audio system whose power tubes give the absence of distortion which was explained when we were discussing tone." (Part F, 36 words.)

"Note the provision for connection of a phonograph pick-up device, which enables you to play phonograph records through this receiver. Also, the provision for attaching another speaker for use in some other part of your home." (Part G, 38 words.)

"The speaker unit in this model is the latest type of speaker made under specifications which specially adapt it to this receiver." (Part H, 24 words.)

"The power consumed is 100 watts of electricity per hour, which is about one-sixth as much as used by an electric flat-iron. When it is installed, it is adjusted to the voltage of the electrical supply in your home, thereby insuring that excess voltage will not shorten the life of the tubes." (Part I, 54 words.)

This condensed description, which is ample for many prospects, can be given in 2 to 4 minutes, depending upon the time required to point out each part as it is talked about. On the other hand, 200 words about the power unit alone might interest a prospect and should be held in readiness for use. Only by a carefully organized talk can the salesman be prepared to condense the talk to fit the time available at a presentation, but still cover all points without omitting some vital point.

Suppose, as the short form of description is being given, that the salesman notes some expression or movement by the prospect when the record-playing possibilities are mentioned. A couple of questions may bring out the fact that the prospect has some treasured records that

he would like to hear. A demonstration with a pick-up unit might close the sale then and there. If not, the sales talk could be resumed from the point of interruption.

NO SALES talk is interesting without some gestures and action to indicate what is being talked about. Consequently, an action synopsis should be prepared for each part of the talk. For instance, Part A should include the showing of inside action pictures in the factory and testimonials and photographs of prominent users.

Face the prospect while Part B is being given, keeping your hand on the cabinet or pointing out each detail as it is talked about. (While discussing other appearance details, the salesman should turn on the set so as to heat the tubes). Perhaps ask the prospect to run his hand over the finish.

Seat the prospect comfortably as Part C is started, also being sure that the set is tuned to a good local station where there will be a program to please him. Vary the volume control while proceeding, but don't fish for other stations at this point of the talk.

While describing sensitivity and selectivity in Part D, demonstrate with other local stations and have the prospect handle the tuning selector, volume control and switch.

When stating the number of tubes in Part E, count on the fingers. Pick up a spare tube and hand it to the prospect, pointing out the maker's label. During the balance of the description, to and including Part I, turn the receiver so that the prospect can see inside, pointing out the parts described and possibly removing one tube shield.

When Part J is started, turn the receiver front to the prospect and again seat him comfortably. Show testimonials, pictures of service facilities, etc., as well as pictures of the homes of typical local installations. Have the order (already filled out as far as possible) and pen ready to put into the hand of the prospect.

After these various actions have been inserted in the proper place, the entire talk and action should be learned and rehearsed. Note particularly when to get enthusiastic or serious, the place to raise or to lower the voice, when to bring a point home with a fist in the palm, where to keep quiet, and where to stop. The talk can be made impressive, and hence convincing, when the salesman puts his feeling and personality into it.

The first rehearsal might be made in front of a mirror, imagining that a prospect sees you as you see yourself. Next get a friend to criticize your whole performance as you present the talk and demonstration. Then you are ready to consider such matters as keeping the

prospect's attention, in spite of interruptions, meeting objections, keeping the lead in the conversation, etc., as will be developed in the next lessons.

HOW WE SELL THOSE USED SETS

By W. C. NORRIS

IT HAS been the misfortune of the radio dealer to be bothered with getting rid of the used set. We have studied the conditions that exist and have worked out a plan whereby we could realize the full allowed trade-in price. This year and last year, from October on, we have sold practically every one of our trade-ins at the allowed value. Besides this we believe that we could have realized the sales of twice as many.

The main object of our sales methods was in gaining the confidence of the buyer. There is a good market as yet if just the confidence of the prospect can be obtained. The poorer classes are hot for good values, and there are thousands of farm homes that are good prospects for battery sets.

Our trade-ins accumulated at about the rate of two a day. We fixed up a room to be used solely for the demonstration of used machines. We select the best sets and polish them up and check them over. Then we have them all put in our demonstration room. Of all our used sets we hook up just two at a time for demonstration. The idea is that out of twenty or thirty sets that we have just hooked up, two give the prospect something to think about. We tell the buyer that these two sets that are hooked up are good sets and in A-1 shape, and we know that they will give good service. But the price of those two sets has been raised over the machines that are not hooked up. We tell the prospect that the sets not hooked up are for sale at most any price, but we will not guarantee that they will work. You might get one that works and you might not. Even if they take us up on a set that is not hooked up, we are getting as much as most dealers get, and it is surprising how rare it is they do. Then we place a thirty-day conditional guarantee on either one of the two sets. But in order for this guarantee to hold we must hook the set up in the prospect's home ourselves. We make the customary charge for this service. Our guarantee is safe also. If a set is put in right, nothing will ever go wrong in thirty days. We don't get two calls a month on used set sales.

As I mentioned before, we keep our used set lines sold. However, occasionally we get sets that it would not do to sell, and we are using these for making up a part of interference filters we put on all the sets we take out. These are line filters and very often mean a sale where our machine is not so noisy as A's machine.

Antennas and Sales

By J. EDWARD JONES

WHAT bearing do antennas have on red ink? Does the dealer scorn the idea that antennas span the ledger from red to black? Well, they do, and installation and service are the buttresses.

The stringing of an antenna or pick-up system is the greatest portion of the installation of a modern all-electric set. Every phase of installation is extremely important and should be correct in every way so that the set will operate at its maximum efficiency.

Let us trace a receiving set from factory to the consumer, taking for granted the months upon months of laboratory experiment. Let it suffice that a working model is produced, complete tests are made—sensitivity, selectivity, tone, cabinet design, price—in fact, everything meets with full approval of every department of the manufacturer. The factory goes into production. Each individual part must come up to specification; all must pass exhaustive tests individually first and then in completed sets.

The advertising and publicity departments also have entered the fray. Space is employed in periodicals and newspapers. Broadsides and circulars are used profusely to popularize the product. Certain dealers, chosen for their dependability and ability to render proper service, are appointed in each locality, who in turn advertise locally, hook up with national advertising, use elaborate window displays, and, in fact, use every possible means to get the prospects into their places of business.

Here the retail salesman unlimbers his guns. Every known and unknown argument is used, from screen grid to push-pull amplification, from power detection to cabinet design. Tone, sensitivity and selectivity are discussed with all their merits. Finally a demonstration is arranged and a nice commission mentally spent.

There we have a fine logical sequence from the designer to the demonstrator. Everything as it should be. Qualities are over-emphasized perhaps, but a little over-zealousness is excusable.

Now—installation—and here the sequence strikes a snag. *Three out of ten possible sales are lost because of improper installation.* The efforts of designer, manufacturer, dealer and sales-

man are nullified. Therefore we repeat—antenna equals installation, equals red or black, plus or minus.

I AM Mr. Average Citizen. Various circumstances have created a desire to own a radio. Through advertising, etc., I have about decided that one particular make will fill the bill. The manufacturer behind it is reliable, strong financially, and is not likely to go out of business tomorrow. I find many perfect sets advertised. In fact, some are even improvements on perfect sets, but anyway this particular one appeals to my good judgment as being a real factor in the field.

My next step is to find a dealer just as reliable, one with a reputation for good, dependable service. Several friends recommend a dealer who has given them satisfactory service, with men who know their business. The store's appearance is excellent. Everything is quiet and restful, extremely businesslike.

A neat, polite salesman steps forward. I make my wants known. I mention the name of the manufacturer in whose product I am interested, and am politely ushered into one of the various demonstration rooms. The homelike atmosphere of the furnishings agreeably surprise me. I settle comfortably in an easy chair and survey the various models of the same manufacturer. My salesman steps over to a beautiful model. He tells me in simple language its many fine points, dwelling on its marvelously faithful reproduction. He points out that a radio receiver is a musical instrument. Of course its design must harmonize with its surroundings. It must be able to tune in various stations to the exclusion of all others, and at times I might wish to listen to a program emanating from a station a few hundred miles away. Nevertheless, whatever station, near or far, reproduction was the true requisite.

No apparent high-pressure salesmanship here, but the feeling was instilled in me that he knew what he was talking about and had confidence in his goods. He had subtly flattered me by basing his general sales talk on the highest priced instrument in the room. I liked him for it and determined to help him sell me the particular priced instrument I could afford, making a mental note

Not only is the case proved against the poor antenna as a killer of sales, but also is the remedy here provided.

to send in to see him a couple of friends who had also been talking radio.

We switch to the particular model that will nicely fit my home surroundings as well as my pocketbook. Again I am impressed. Nothing that was said of the high priced model detracted in any way from the one I intended to buy. The merits and distinctions of both were ably and honestly pointed out. My model salesman had really sold me the higher priced set and yet had not unsold me on the set I could afford.

My request to hear the set brought forth the first sign of reluctance, the first apparent lack of enthusiasm. The music was all that had been claimed. Deep, sonorous notes of the bass viol, rich high notes of the violin, while the perfect natural tones of the piano evidenced the reproduction of the overtones, but what an accompaniment—crackles, scratches, hisses, pops, bangs, and a conglomeration of other noises. Apologetically the salesman informs me it is location, electric signs near by, a dentist overhead, street cars passing by, and many other excuses. I am disappointed and disgusted. I walk out. I want to buy a musical instrument, not a barn yard. *Two out of ten possible sales are lost on the dealer's floor.*

TO SUMMARIZE, we have three possible sales lost because of poor installation, and two out of ten lost because of poor demonstration possibilities in the dealer's store. Five out of ten—startling, to say the least, but as near to fact as it is possible to arrive. These figures were arrived at through observations, conversations and investigations, in both rural and metropolitan areas over a period of four years.

One instance, indicative of many: A dealer's store is a terribly noisy location. He was smart, however. He convinced prospective customers that the noise was only his location, but eight out of ten walked out without signing on the dotted line. Then this particular dealer woke up—a few dollars spent, a few hours' labor, a few filters and a real shielded antenna system—now it is a pleasure to listen to a program in his demonstrating rooms. Incidentally, further survey showed the average was six out of ten now instead of eight, with a

goodly portion of that amount coming back.

Another instance, indicative of many. A dealer had used considerable time and effort running down a particular prospect. Finally the prospect agreed upon a demonstration in the home. A salesman went out to demonstrate. Set would not work. Service man went out next day. Discovered apparent defect in power pack. Took power pack to own shop. Could find no trouble, so took power pack to distributor with no information. Next morning power pack returned to dealer—tested O. K. Different service man sent to install power pack, who, after considerable fussing around, found shorted tube in chassis. Set works, but no distance. Customer had been sold on distance idea. Reason—no antenna, temporary installation. Next day, consultation. Rough antenna installed, for convenience of the building and with no thought of the set. The antenna is too long, therefore set too broad, and the dealer receives the request to pick up the unsatisfactory set.

This is an instance chosen at random from a startling number of similar cases in widely separated locations. What is the average dealer's idea of being in business? One would think that prospects would pay his rent, salaries, etc. He works hard for his prospects, but sales, if they are made, have to just about make themselves. No other business could tolerate such slipshod methods of placing its wares in the hands of the consumer, and those surprisingly few dealers who are waking up to that fact will reap their just rewards.

IT IS possible to give a good demonstration on any standard radio set in any dealer's store in the country. It is possible to so install any standard radio set in any home anywhere so that it will operate in accordance with the specifications of the manufacturer. The devices that create the electrical disturbances called "man made" static are increasing rapidly. This is the electrical age, and the noise caused by this ever increasing number of devices must be combated and eliminated, not excused.

If a good portable radio set is taken to a so-called noisy block and carried

from the ground floor to the top of the highest building, it will be found that the noise diminishes with each mounting floor up to the roof, where all noises will be practically gone. In other words, the greatest density of "man made" static is at ground level, and this amount constantly decreases up to some indefinite point above all floor levels where there is none. This effect would be far more pronounced were it not for the fact that the radiating energy is picked up by the wiring system and all metallic structures in the building and re-radiated therefrom.

In the average installation the lead-in from the antenna, if there is one, is

lead is shielded in the same manner from the set to the ground. The lead sheath in turn is grounded to the water pipe system of the building, to which practically all other electrical devices in the building are grounded.

This will eliminate all disturbances from the pick-up system. These disturbances, however, can be fed directly into the receiver over the a-c line. This must be eliminated by line filters. A pair of condensers in series across the line with center grounded to building water pipe system will help in some cases, but they merely provide an additional path to ground. Radio frequency chokes of proper dimensions in each line

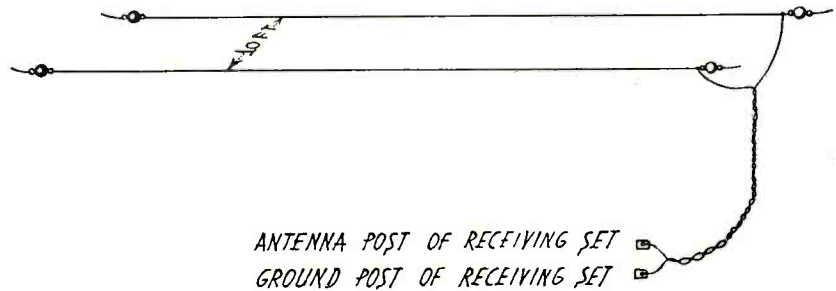


Fig. 2. Double Antenna for Eliminating Interference

brought down through this jungle, picking up the radiations from the various conductors it must parallel, thereby feeding them to the set. If the sole antenna is a wire around the room, it of course is entirely within the field of these radiations. The solution is to limit all pick-up to the flat top of the antenna which can be placed in the clear zone beyond the range of the said radiations. Fig. 1 shows how this can be done. The lead-in is shielded by a lead sheath from the flat top to the set, and the ground

in conjunction with the bypass condensers are the real remedy.

In cases where near-by high tension lines are as high as the flat top, the shielded lead-in system will not eliminate any disturbance created thereby. In this case a double antenna, as in Fig. 2, with the two lead-ins twisted together, one being taken to the antenna post and one to the ground post of the set, will nearly always eliminate the difficulty. With this type of antenna no ground whatsoever is used.

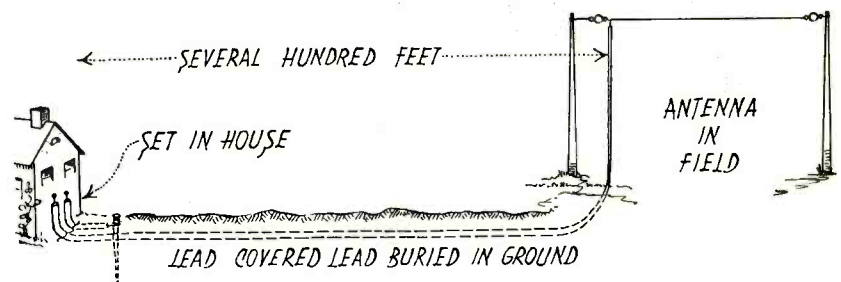


Fig. 3. Distant Antenna With Shielded Lead

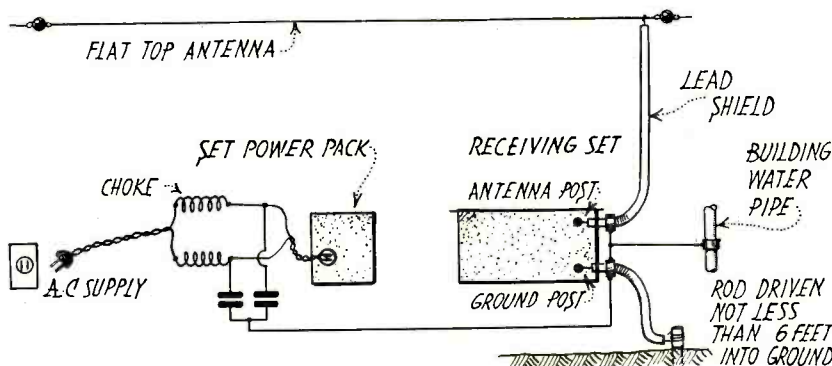


Fig. 1. Antenna With Shielded Lead-in and Ground

Where space will permit, an antenna can be erected several hundred feet from the high tension wires and a shielded lead brought to the set, as in Fig. 3. The capacity effect of the shielded lead can be overcome by a slightly longer flat top, and in many cases the signal strength can be brought up by the insertion of a .00025 mfd. condenser in series with the lead-in. Well insulated wire could be run in conduit, but lead-covered wire should never be run in conduit. Also, in all installations using lead-covered wire, care should be taken to prevent the lead covering from touch-

(Continued on Page 44)

Prices and Specifications of Radio Receivers

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rct.			East	West
ACME							
88	3-24	'27	1-27, 2-45	'80	Yes	90	135.00 135.00
88	3-24	'37	1-27, 2-45	'80	Yes	90	155.00 155.00

ALL-AMERICAN LYRIC							
94-T10	4-27	'27	2-27, 2-45	'80	Yes	..	148.00 158.00
95-T10	4-27	'27	2-27, 2-45	'80	Yes	..	175.00 190.50
96-T10	4-27	'27	2-27, 2-45	'80	Yes	..	147.00 160.00
94-SG	3-24	'27	1-27, 2-45	'80	Yes	..	156.00 166.00
95-SG	3-24	'27	1-27, 2-45	'80	Yes	..	183.00 198.50
96-SG	3-24	'27	1-27, 2-45	'80	Yes	..	155.00 168.00

AMRAD							
Aria	3-24	'27	1-27, 2-45	'80	Yes	100	198.00 213.00
Serenata	3-24	'27	1-27, 2-45	'80	Yes	100	245.00 260.00
Symphony	3-24	'27	1-27, 2-45	'80	Yes	100	295.00 310.00
*Duet (Comb)	3-24	'27	1-27, 2-45	'80	..	140	495.00 520.00
Minuet	3-24	'27	1-27, 2-45	'80	Yes	100	158.00 163.00

ANDREA FADA							
22 (Bat.)	3-12A	'12A	1-12A, 2-71A	..	Yes	..	55.00 57.50
25	2-27	'27	1-27, 2-45	'80	Yes	100	165.00 172.00
25Z	2-27	'27	1-27, 2-45	'80	Yes	100	170.50 177.50
35	2-24	'27	1-27, 2-45	'81	Yes	115	245.00 255.00
35Z	2-24	'27	1-27, 2-45	'80	Yes	100	250.00 260.00
35B	3-24	'27	1-27, 2-45	'81	Yes	125	255.00 265.00
35C	2-27	'27	1-27, 2-45	'80	Yes	100	220.00 230.00
36 (DC)	3-24	'27	1-27, 2-45	..	Yes	200	175.00 185.00
75	3-24	'27	1-27, 2-10	'81	Yes	150	360.00 370.00
*77	3-24	'27	1-27, 2-10	'81	..	150	675.00 695.00

*Phonograph Combination

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rct.			East	West
APEX (With Tubes)							
10	2-24	'27	1-27, 2-45	'80	No	75	101.00 110.50
10A (25 cyc.)	2-24	'27	1-27, 2-45	'80	No	75	105.00 114.50
11	3-24	'27	1-27, 2-45	'80	No	75	130.00 139.50
11A (25 Cyc.)	3-24	'27	1-27, 2-45	'80	No	75	134.50 143.50
14	3-24	'27	1-27, 2-45	'80	No	75	155.00 164.50
14A (25 cyc.)	3-24	'27	1-27, 2-45	'80	No	75	159.00 168.50
54 (Bat.)	2-24	'26	1-01A, 1-71A	..	No	..	95.00 104.50
55 (Bat.)	2-24	'26	1-01A, 1-71A	..	No	..	58.00 67.50

ATWATER KENT							
55 Chassis	2-24	'27	1-27, 2-45	'80	No	90	64.00 67.00
55 Table	2-24	'27	1-27, 2-45	'80	No	90	68.00 71.00
55 Console	2-24	'27	1-27, 2-45	'80	No	90	109.00 113.00
60 Chassis	3-24	'27	1-27, 2-45	'80	No	105	76.00 81.00
60 Table	3-24	'27	1-27, 2-45	'80	No	105	80.00 84.00
60 Console	3-24	'27	1-27, 2-45	'80	No	105	121.00 126.00
61 Chas. (DC)	3-22	'12A	1-12A, 2-71A	..	No	..	76.00 81.00
61 Table (DC)	3-22	'12A	1-12A, 2-71A	..	No	..	80.00 84.00
61 Con. (DC)	3-22	'12A	1-12A, 2-71A	..	No	..	121.00 126.00
66 Console	3-24	'27	1-27, 2-50, 2-81	..	No	195	155.00 161.00
67 Chas. (BL)	3-22	'12A	1-12A, 2-71A	..	No	..	58.00 61.00
67 Table (BL)	3-22	'12A	1-12A, 2-71A	..	No	..	62.00 65.00
67 Con. (BL)	3-22	'12A	1-12A, 2-71A	..	No	..	103.00 107.00

AUDIOLA							
7330 (Chas.)	2-24	'27	1-27, 2-45	'80	No	105	80.00 80.00
8430 (Chas.)	3-27	'27	1-27, 2-45	'80	No	110	95.00 95.00

AUTOMATIC TOM THUMB							
B	1-22	'99	2-99	..	No	..	57.50 60.00
De Luxe	1-22	'99	1-99, 1-20	..	No	..	55.00 67.50
DC	1-22	'01A	2-01A	..	No	..	87.50 90.00
AC	1-24	'27	1-26, 1-71A	'80	No	15	95.00 99.00

Prices and Specifications of Radio Receivers

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rct.			East	West
BOSCH							
48-17	3-24	'27	2-45	'80	No	110	230.00 237.00
48-18	3-24	'27	2-45	'80	No	110	240.00 248.00
48-19	3-24	'27	2-45	'80	No	110	280.00 290.00
48	3-24	'27	2-45	'80	No	110	119.50 122.50
48A	3-24	'27	2-45	'80	No	110	125.50 129.50
48C	3-24	'27	2-45	'80	No	110	155.00 159.00
48H	3-24	'27	2-45	'80	No	110	198.50 205.00
48J	3-24	'27	2-45	'80	No	110	240.00 248.00
48L	3-24	'27	2-45	'80	No	110	230.00 239.00
48K	3-24	'27	2-45	'80	No	110	280.00 290.00
49 (25 Cycle)	3-24	'27	2-45	'80	No	105	119.50 122.50
49A (25 Cyc.)	3-24	'27	2-45	'80	No	105	168.50 172.50
54AD (DC)	3-24	'27	1-27, 2-71A	..	No	185	168.50 172.50
56 (Bat.)	3-22	'01A	1-01A, 2-71A	..	No	..	95.00 97.50
56AB (Bat.)	3-22	'01A	1-01A, 2-71A	..	No	..	133.50 137.50

Western Consoles							
140	3-24	'27	2-45	'80	No	110	174.50
141	3-24	'27	2-45	'80	No	110	154.50
149	3-24	'27	2-45	'80	No	110	194.50
163	3-24	'27	2-45	'80	No	110	125.00
*Comb.	3-24	'27	2-45	'80	..	110	225.00

BROWNING-DRAKE							
53	2-24	'27	1-27, 2-45	'80	Yes	95	102.50 109.50
54	2-24	'27	1-27, 2-45	'80	Yes	95	142.50 154.50
57	2-24	'27	1-27, 2-45	'80	Yes	95	188.50 188.50
83 (Bat.)	3-22	'01A	1-01A, 2-12A	..	No	..	75.00 81.00
84 (Bat.)	3-22	'01A	1-01A, 2-12A	..	No	..	119.50 129.50

BRUNSWICK							
S-14	3-24	'24	1-27, 2-45	'80	Yes	125	129.00 129.00
S-21	3-24	'24	1-27, 2-45	'80	Yes	125	154.00 154.00
*S-31	3-24	'24	1-27, 2-45	'80	..	130	249.00 249.00

*Phonograph Combination.

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rct.			East	West
COLONIAL							
Cavalier, AC	3-24	'24	1-27, 2-45	'80	Yes	90	175.00 175.00
Picadilly, AC	3-24	'24	1-27, 2-45	'80	Yes	90	175.00 175.00
Modern, AC	3-24	'24	1-27, 2-45	'80	Yes	90	235.00 235.00
Cavalier, DC	3-24	'24	1-27, 2-45	..	Yes	170	175.00 175.00
Picadilly, DC	3-24	'24	1-27, 2-45	..	Yes	170	175.00 175.00
Modern, DC	3-24	'24	1-27, 2-45	..	Yes	170	235.00 235.00

CONTINENTAL "Star Raider"							
R-20	6-484	484	2-50	2-81	Yes	200	435.00 435.00
R-25	6-484	484	2-50	2-81	Yes	200	475.00 475.00
R-30	6-484	484	2-50	2-81	Yes	200	525.00 525.00
*R-105	6-484	484	2-50	2-81	Yes	240	1000.00 1000.00

CROSLLEY							
30-S	2-24	'27	1-27, 2-45	'80	Yes	100	62.00
31-S	2-24	'27	1-27, 2-45	'80	Yes	100	91.00 94.00
33-S (Chas.)	2-24	'27	1-27, 2-45	'80	Yes	100	108.50
34-S	2-24	'27	1-27, 2-45	'80	Yes	100	116.00 119.50
40-S	3-24	'27	1-27, 2-45	'80	Yes	105	80.00
41-S	3-24	'27	1-27, 2-45	'80	Yes	105	103.50 106.50
42-S	3-24	'27	1-27, 2-45	'80	Yes	105	126.00 129.50
82-S	3-24	'27	1-27, 2-45	'80	Yes	105	145.00 149.50
Buddy	2-24	'27	2-71A	'80	No	65	55.00 57.50
Chum	2-24	'27	2-71A	'80	Yes	65	75.00 78.00
Playmate	2-24	'27	1-27, 2-45	'80	Yes	100	90.00 93.50
Comrade	3-24	'27	1-27, 2-45	'80	Yes	105	105.00 108.75
Crony	3-24	'27	1-27, 2-45	'80	Yes	105	115.50 115.50
Partner	3-24	'27	1-27, 2-45	'80	Yes	105	121.50 121.50

MURDO SILVER

SILVER-MARSHALL INC 641 WEST 65 ST,

PHILIP S. RAND
NORTH PALMOUTH
MASSACHUSETTS

LAYED TWELVE WEST COAST STATIONS SUNDAY MORNING FROM
EATTLE TO SANDIEGO INCLUDING SOME TWO HUNDRED FIFTY

Dec. 26, 1929

ATT STATIONS FOR THE MORE POWERFUL SIGNALS CAME IN
LIKE LOG

CLARITY AND VOLUME STOP PERFORMANCE SUCH AS THIS IS NOT
UNUSUAL FOR THE S LOCALITY

SILVER-MARSHALL

PATRONS REQUESTED BY AND SUGGESTION CONCERN

JAMES E. ...
6401 West 65th Street
Chicago, Illinois

Attention: McMurdo Silver
Your acknowledgement card was received so promptly
that it was put aside and only today has it been possible
to let you know what a truly wonderful set the "Silver"
really is. The tone is marvelous. The selectivity
almost uncanny.
So far as distance is concerned it is all that anyone
could desire. Even at this time of the year I have
been able to pick up KGO California. This, of course,
time. All in all during the twenty-two days I have
been operating this during the twilight set the "Silver"
from coast to coast and from Chicago to Havana to various
median stations.

out antenna or ground, I received New York stations,
yined to a football game at night over WFL at New
York, received WOC at Davenport and numerous Chicago
stations.

is a marvelous set, and I have been fortunate
to have owned various sets in the last six years
only consisted of factory built sets, but
ants as well, and I can truthfully say that
radio. In my mind, is the peer of them all.

Very truly yours,
Philip S. Rand

6401-64th West 65th St
Chicago, Ill.
I have heard but not logged, due to the fact that I only
recently started to log them. There are also great
many stations by broadcast that are quite
common but I have not had time to pick
up yet. I have had the set about a month, and
I have been awfully good of the

There are a great many stations I
I have heard but not logged, due to the fact that I only
recently started to log them. There are also great
many stations by broadcast that are quite
common but I have not had time to pick
up yet. I have had the set about a month, and
I have been awfully good of the

I am using a one hundred foot aerial
running east and west. The east end is 40 feet high,
while the lead-in end is 30 feet high. A cold water
pipe is used for a ground.

Needless to say, I am very much pleased
with the set, and have never seen a set before that
would equal its performance. Four California stations
the same night, KIX, KFI, KGO, KRLD, and one of them
only using 500 watts (KMIC).

Sincerely yours,

Philip S. Rand

P.S. I have just ordered a Silver-Marshall short-wave
"Round the World Six".

CHICAGO, NOV 30
DEAR MR. SILVER.

LYA. NEW ZEALAND
Nov. 30, 1:45 A.M. 900 K.
PROGRAM
ORGAN.
VIOLIN SOLO, ORGAN ACC
ORGAN

ALSO A "DOGGONE" LOCAL
K.T.M. LOS ANGELES.

You couldn't buy my
Silver for 1000 if I
couldn't get another one
Ipaternaley
All Pirelo.

3540 PIERCE AVE

Mr. McMurdo
Silver-Mar
6401 W. 65th
Chicago,

Sir:

NOV 15 1929

Dear Mr. Silver:
I received your letter of the 16th at
the same time that letter and at
you may care to do so.
this one if you care to do so.
On last Friday night or rather
early sat. A.M. March 1st at my wife
tuned in the following stations, together
with many others:
KTM Los Angeles Cal.
KFI Los Angeles Cal.
KHT San Diego Cal.
K7SD Hollywood Cal.
KXX San Francisco Cal.
K7RC San Francisco Cal.
U.S. Louisiana, N.Y. N.Y.
K7RC Louisiana, N.Y. N.Y.
U.S. Louisiana, N.Y. N.Y.
K7RC Louisiana, N.Y. N.Y.
U.S. Louisiana, N.Y. N.Y.
K7RC Louisiana, N.Y. N.Y.

Dear Sir - I wanted to
say you set me up
with Silver
I have enjoyed many
entertainment
I have had the
set for a long
time and I have
been awfully
good of the

Dear Sir - I wanted to
say you set me up
with Silver
I have enjoyed many
entertainment
I have had the
set for a long
time and I have
been awfully
good of the

THERE IS NO SUBSTITUTE FOR
SILVER-MARSHALL, Inc. 6441 W. 65th St., Chicago

CHICAGO ILL OCT 31 1929
MARSHALL INC
ST CHICAGO ILL

WORKING THE NEW MODEL SIXTY QUADRUPLE SCREEN GRID
TICKED UP LOS AT BUENOSAIRES ON TWO FIFTEEN AM SEPTEMBER NINETEENTH
METERS STOP STATIC BAD BUT GOT GOOD RECEPTION
TOP CONGRATULATIONS FOR

Tell them you saw it in RADIO

Shub, Michigan
 Detroit
 McMurdo Dillon,
 Dillon Marshall Inc.,
 Chicago, Ill.

H. Mammouth,
 New Jersey
 Nov. 20, 29

VERNON IAD DEC 17 200P '29
 KFI ON SILVER RADIO TWELVE O'CLOCK NOON WHE
 AND NASHVILLE WSM WERE GOING FUR
 TEST= 650
 DONALD SCHE

RADIO EXTRAORDINARY

Stations - are brought in
 Metropolitan Area with a minimum
 of interference. Nightly Cuba may
 be tuned in with no interference
 and Canadian stations are also usu-
 ally loud and clear.

Grand
 People in
 at the distant
 with such gra
 I put
 C.M.C
 without ground
 also CNRM of
 K.F.I. of California. I also
 of Cuba + K.F.X. of
 These are just a few

Yours truly,
 710 Madison St. Co. Wash.
 Wash. D.C. Equal Opp.

101 Woodside Road
 Maplewood, N. J.
 October 18, 1929.

This radio
 stations of Mexico
 - and K.G.V. 3 times - OAX
 being for 15 minutes with remarkable
 4 Volume - using 70 feet outside
 = 2 low built mast of the Radio
 against stout ribs and sound around 15.
 word makes - the Silver outperformer than all
 Your Truly, Ben B. Ingram 378 N. Denver Ave
 Chicago.

and he
 I also heard
 early one morn
 my friends are all buy
 I told the
 distributor about this
 in St. Louis.
 FEB 18
 Your former we
 Silver. Olive Belmont
 3939 Tolson
 St. Louis 8

Silver,
 all, Inc.,
 St.,
 L.

an the proud possessor of a Silver Radio
 te cannot speak too highly of it. Friends
 ed me a visit are also greatly unappreciated
 el I can safely say, without fear of
 elation, that I will be instrumental
 ers.

ing to any great extent as yet.
 ulling in Cleveland, Chicago.
 ne reception, may I
 etter results with an
 ones. At present I am
 ne on my set.
 ver Radio is the World's
 Very truly yours,
 Niagare, N.Y.
 April 14, 1929
 To let you
 Silver Radio
 wish to
 of all

S. Coast Guard Station
 Head, N. J.
 umber 16, 1929.

I think you have produced a receiving set of
 the very highest class and will take pleasure in recommend-
 ing it to my friends.

Very truly yours,
 C.M. Falconer
 C.M. Falconer,
 209 Highfield Road,
 Guilford,
 Baltimore, Md.

CUSTOMER SATISFACTION
 Distributors in all Principal Marketing Centers

WESTERN UNION

SIGNS	
DL	- Day Letter
NM	- Night Message
NI	- Night Letter
LD	- Deferred Cable
CL	- Cable Letter
WT	- Week-End Letter

I think the crew of this unit has been very successful
 in obtaining one of your "SILVER RADIOS", out of the score of
 demonstrations of other radios the "SILVER" was selected as the
 best for the money involved. Due to its clarity of tone and
 reception, you can simply get pleasure anywhere on the dial, and
 any one wishing to install a radio will not go wrong in selecting
 a "SILVER".

Received at
 64 26 N.W. GREENSBORO NCAR JAN 9 1930
 GURDO SILVER#
 6401 WEST 65 ST-1

IN TRYING OUR NEW SILVER RADIO TONIGHT AT NINE FIVE EAST
 STANDARD TIME WITHOUT AERIAL CLEARLY RECEIVED PROGRAM F
 KFI LOSANGELES NO INTERFERENCE FROM NASHVILLE STATION=

Tell them you saw it in RADIO

Prices and Specifications of Radio Receivers

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
EDISON							
R-4	3-27	'27	1-27, 2-45	'80	Yes	100	197.50 223.00
R-5	3-27	'27	1-27, 2-45	'80	Yes	100	167.50 177.00
*C-4	3-27	'27	1-27, 2-45	'80	..	140	295.00 336.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
GRAYBAR							
330	5-27	'27	1-27, 1-71A	'80	Yes	90	98.00 98.00
330-F-45	5-27	'27	1-27, 1-71A	'80	Yes	90	156.25 156.25
500 Table	2-24	'24	1-45	'80	Yes	90	75.00 75.00
550	2-24	'24	1-45	'80	Yes	90	130.00 130.00
600	2-27	'27	1-45	'80	Yes	110	175.00 175.00
*600-S	5-27	'27	1-45	'80	..	150	225.00 225.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
GREBE							
21950-A	3-24	'27	2-45	'80	Yes	125	219.50 223.50
270-C	3-24	'27	2-45	'80	Yes	125	270.00 274.00
285	3-24	'27	2-45	'80	Yes	125	285.00 292.00
*450	3-24	'27	2-45	'80	..	160	450.00 465.00

Note—All models made for 110 v. DC also.

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
GULBRANSON							
291	4-26	'24	1-26, 2-45	'80	Yes	85	139.50 149.50
292	4-26	'24	1-26, 2-45	'80	Yes	85	149.50 159.50
9950	4-26	'24	1-26, 2-45	'80	Yes	85	235.00 245.00
*200	4-26	'24	1-26, 2-45	'80	..	120	99.50 104.50

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
HOWARD							
Consolette	3-24	'27	2-45	'80	No	90	185.00 195.00
Puritan	3-24	'27	2-45	'80	No	90	165.00 175.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
JACKSON							
NJ-30 (Chas.)	2-24	'27	1-24, 1-45	'80	Yes	60	77.50 77.50

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
KELLOGG							
523	3-K-24	K-27	1-K-27, 2-45	'80	Yes	110	175.00 190.00
524	3-K-24	K-27	1-K-27, 2-50	'81	Yes	195	225.00 240.00
*525	3-K-24	K-27	1-K-27, 2-50	'81	..	215	395.00 415.00

Note—25-cycle models \$10 more in each case.
*Phonograph Combination.

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
KENNEDY							
220	3-24	'27	1-27, 2-45	'80	Yes	100	159.00 159.00
320	3-24	'27	1-27, 2-45	'80	Yes	100	189.00 189.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
KYLECTRON							
K-71	3-24	'24	1-27, 2-45	'80	Yes	120	149.50 159.50
K-72	3-24	'24	1-27, 2-45	'80	Yes	120	169.50 179.50

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
LEUTZ							
Seven Seas	3-24	'27	1-27, 2-50	2-81	Yes	200	295.00 295.00
"	3-24	'27	1-27, 2-50	2-81	Yes	200	295.00 295.00
"	3-24	'27	1-27, 2-50	2-81	Yes	200	610.00 610.00
*Do (Comb.)	3-24	'27	1-27, 2-50	2-81	..	200	395.00 395.00
Silver Ghost	4-24	'27	2-27, 2-50	2-81	Yes	250	2400.00 2400.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
MAJESTIC							
90	4-G27	G27	2-G45	'80	No	105	95.00 95.00
91	4-G27	G27	2-G45	'80	No	105	116.00 116.00
92	4-G27	G27	2-G45	'80	No	105	146.00 146.00
93	4-G27	G27	2-G45	'80	No	105	146.00 146.00
*102	4-G27	G27	2-G45	'80	..	105	184.00 184.00
*103	4-G27	G27	2-G45	'80	..	105	203.50 203.50
*181	4-G27	G27	2-G45	'80	..	105	265.00 265.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
NORDEN-HAUCK							
Super DX5							
(Short Wave)	1-Pen.	'27	1-27, 2-45	'80	No	80	150.00 150.00
Admiralty	6-24	2-27	2-50	2-81	Yes	200	350.00 350.00
Admiralty	6-24	2-27	2-50	2-81	Yes	200	450.00 450.00
RM-4 (Bat.)	4				..		125.00 125.00

†Has extra 484 tube for phonograph.

Prices and Specifications of Radio Receivers

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
PHILCO							
76	2-24	'24	1-27, 2-45	'80	No	105	67.00 72.00
78	2-24	'24	1-27, 2-45	'80	No	105	112.00 119.50
76	2-24	'24	1-27, 2-45	'80	No	105	119.50 129.50
76	2-24	'24	1-27, 2-45	'80	No	105	139.50 149.50
76	2-24	'24	1-27, 2-45	'80	No	105	195.00 205.00
87	3-26	'27	1-26, 2-45	'80	No	95	129.50 139.50
87	3-26	'27	1-26, 2-45	'80	No	95	149.50 159.50
87	3-26	'27	1-26, 2-45	'80	No	95	205.00 215.00
95	3-24	2-27	1-27, 2-45	'80	No	115	97.00 102.00
95	3-24	2-27	1-27, 2-45	'80	No	115	149.50 159.50
95	3-24	2-27	1-27, 2-45	'80	No	115	169.50 179.50
95	3-24	2-27	1-27, 2-45	'80	No	115	225.00 235.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
RCA							
21 (Bat.)	2-22	'12A	2-12A	..	No	..	69.50 69.50
22 (Bat.)	2-22	'12A	2-12A	..	No	..	135.00 135.00
33 (with legs)	3-26	'27	1-26, 1-71A	'80	No	..	54.00 54.00
33 (DC)	3-12A	'12A	1-12A, 1-71A	..	No	..	64.00 64.00
44	2-24	'24	1-45	'80	No	..	75.00 75.00
46	2-24	'24	1-45	'80	No	..	130.00 130.00
*47	2-24	'24	1-45	'80	No	..	195.00 195.00
60	6-27	'27	1-71A	'80	No	..	98.00 98.00
66	5-27	'27	1-45	'80	No	..	175.00 175.00
*67	6-27	'27	1-50	2-81	No	..	690.00 690.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
SILVER							
60	3-24	'24	1-27, 2-45	'80	Yes	95	160.00 170.00
Concert Grand	3-24	'24	1-27, 2-45	'80	Yes	95	173.00 183.00
95	3-24	'24	1-27, 2-45	'80	Yes	95	195.00 210.00
60-B	2-24	'24	1-27, 2-45	'80	Yes	90	145.00 155.00
75-B	2-24	'24	1-27, 2-45	'80	Yes	90	158.00 168.00
95-B	2-24	'24	1-27, 2-45	'80	Yes	90	145.00 155.00

*Phonograph Combination.

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
SPARTON							
49 (Bat.)	6-686	201A	1-201A, 1-171A	..	Yes	..	76.00 89.00
*†101	5-484	484	2-226, 2-250	2-281	..	145	795.00 845.00
110	5-484	484	2-226, 2-250	2-281	Yes	125	395.00 395.00
111	5-484	484	2-226, 2-250	2-281	Yes	125	395.00 395.00
301	5-484	484	2-250	2-281	Yes	105	284.50 294.50
589	6-484	484	2-182B	280	Yes	87	164.85 174.85
931	5-484	484	2-182B	280	Yes	85	179.50 189.50

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
STEWART-WARNER							
21	3-24	'27	1-27, 2-45	'80	Yes	130	130.00 134.00
31	3-24	'27	1-27, 2-45	'80	Yes	130	140.00 145.00
41	3-24	'27	1-27, 2-45	'80	Yes	130	150.00 159.25
47	3-24	'27	1-27, 2-45	'80	Yes	130	157.50 162.50
*78	3-24	'27	1-27, 2-45	'80	Yes	130	235.75 246.50

Note—All models may be had for 110 v. DC or battery operation.

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
STERLING							
Troubadour	3-24	'27	1-27, 2-45	'80	Yes	75	129.50 139.50
Serenader	3-24	'27	1-27, 2-45	'80	Yes	75	149.50 165.00
Imperial	3-24	'27	1-27, 2-45	'80	Yes	75	187.50 201.00

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
STROMBERG-CARLSON							
641	3-24	'27	'45	'80	Yes	90	155.00 165.00
642	3-24	'27	'45	'80	Yes	90	259.00 277.00
652	3-24	'27	'45	'80	Yes	90	239.00 257.00
654	3-24	'27	'45	'80	Yes	120	369.00 387.00
846	3-24	'27	†1-27, 2-45	2-80	Yes	160	347.50 377.50

†27 tube as automatic volume control.

MAKE	TUBES			Phono Jack	Power Used	PRICE	
	RF	Det.	AF Rect.			East	West
ZENITH							
60	2-24	'24	3-27, 2-45	'80	Yes	110	145.00 188.00
61	2-24	'24	3-27, 2-				

A Two-Tube Super Adaptor for Short Wave Reception

By R. WILLIAM TANNER

How to capitalize the demand for a cheap, high frequency receiver of the superheterodyne type.

MANY a penny may be turned by the enterprising dealer or service man who can build a cheap a-c short-wave adapter that is selective, ultra-sensitive and capable of utilizing the broadcast receiver to the utmost advantage without making it necessary to pull out a tube and plug in a gadget on the end of a dust-collecting cord. Heretofore high-frequency adapters have been designed to plug into the detector socket of the radio set and use the audio frequency stages only. The adapter herein described is connected, through a switch on the adapter panel, to the antenna post of the receiver, requiring no change in the set-up of the latter, which functions as the intermediate and audio frequency amplifier of a super-heterodyne. The adapter provides the first detector and oscillator. The intermediate frequency is equal to the minimum frequency possible in the broadcast set, or between 550 and 500 kc.

To operate the adapter, the receiving set is turned on and the dial set at the minimum frequency, say 530 kc. Then the first detector in the adapter is tuned to any frequency from 1500 kc to 20,000 kc and the oscillator is tuned to a frequency 530 kc above or below the detector. A "beat-note" of 530 kc is generated between these two circuits and applied to the antenna post of the receiver. As this is the exact frequency of the receiver's r-f amplifier and detector circuits this beat-note is amplified and rectified by the detector (now the "second detector" of the super). And of course the job is then finished off by a little a-f amplification.

The total cost of the parts for an a-c kit should not be over \$20 complete with tubes, cabinet, metal panel, eight plug-in coils, filament transformer, etc. The professional radio man can charge \$35 for an installation and make a neat profit. Once sold this little adapter stays sold, and, best of all, each sale means many more. The customer does not have to strain his ears, and possibly his imagination, to hear foreign stations as he would with a regenerative or a two-tube r-f adapter. Signals pound in like the proverbial "ton of brick."

For the benefit of the custom set builder a few details will be given. Due

to the great difference in sizes and shapes of existing radio parts, no exact dimensions will be stated. The location of the sockets, coils, condensers, etc., should be arranged in such a manner that the grid and plate leads are fairly short.

To cover the most interesting portion of a short-wave spectrum, 15 to 200 meters, a set of four plug-in coils is required for both the detector and oscillator. Winding details are given in the accompanying table. The forms are Silver-Marshall type 130P midgets, although there is no reason why Pilot or

all-electric type, the circuit is arranged for the use of a-c '27 heater tubes. The plate voltage is taken from the power supply unit in the main receiver. Although 45 volts is specified, anything up to 135 may be used. The C bias is obtained from resistors in the cathode leads. These are bypassed with .1 μ f condensers. A separate transformer is employed to heat the filaments, the 2.5 volt winding being the only one used. A 60-ohm resistor is connected across the filament and the center-tap is grounded in order to eliminate as much

PLUG-IN COIL TABLE

Frequency Band (kc)	L	L ₁	L ₂	L ₃	L ₄
15000	2 No. 22	6 No. 22	3 No. 28	7 No. 22	5 No. 28
7500	4 No. 22	13 No. 22	5 No. 28	15 No. 22	7 No. 28
3750	7 No. 22	25 No. 28	10 No. 28	31 No. 28	10 No. 28
1875	12 No. 22	45 No. 28	18 No. 28	60 No. 30	15 No. 28

Enameled wire is used in each case.

other types cannot be used. Five-prong UY tube sockets are employed as mounting bases. The antenna coils L are wound in the slots. Plate coils L_4 are wound close to the filament end of L_3 and the oscillator coupling coils L_2 at the grid end of L_3 for 7500 and 15,000 kc. For the 1800 and 3750 kc bands, coils L_2 should be wound over the grid end of L_3 . Details of connections are shown in Fig. 1. The turns in L_2 are subject to modification. Some tubes give greater output than others so it would be well to increase the number, and, after placing the adapter into operation, remove a turn at a time until best operation is secured.

The complete schematic circuit is depicted in Fig. 2. As nearly all of the present-day broadcast receivers are of the

of the 60-cycle a-c hum as possible.

The tuning condensers C_1 and C_2 are both of the same capacity, .00014 μ f. Those having soldered or welded plates and pigtail connections to the rotors are to be preferred. The oscillator blocking condenser C_3 has a capacity of .0005 to .001 μ f.

The radio frequency choke RFC in the plate circuit of the oscillator *must* be a good one, capable of functioning efficiently throughout the entire tuning range. If a poor one is used, "dead spots" will undoubtedly develop, and no signals will be heard due to the absence of oscillations.

It will be noticed by referring to Fig. 2 that a tuned circuit C_4-L_5 is placed in the plate circuit of the detector. This is necessary in order that the adapter

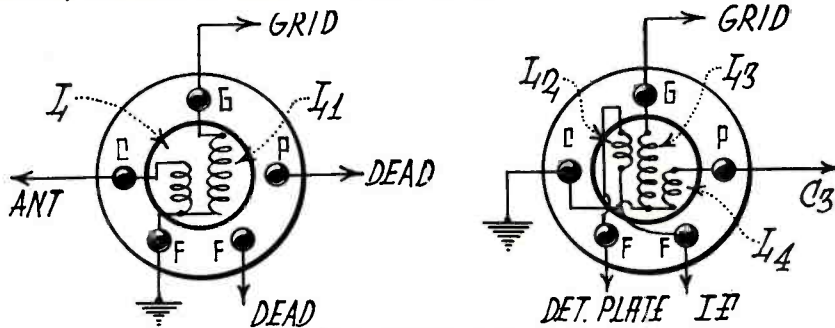


Fig. 1. Coil Connections

may be used with all types of broadcast receivers regardless of whether a ballast or tuned input r-f stage is employed. The circuit C_4-L_5 is peaked at the same frequency as the i-f amplifier (broadcast receiver), and once adjusted, does not have to be touched again. The tuning is not at all critical. C_4 is a Muter or Pilot semi-variable condenser with a capacity of .0005 μf maximum and L_5 consists of 85 turns of No. 30 D. C. C. or enameled wire wound on a bakelite or cardboard tube $1\frac{1}{2}$ in. in diameter by $2\frac{1}{2}$ in. long. The condenser C_4 also functions as a by-pass for the signal and oscillator currents. If this were omitted the effect would be negligible upon the i-f end of the set; however, no signals would be received due to the fact that L_5 would act as an r.f. choke, tending to block the oscillator energy.

The i-f currents are fed to the broadcast receiver through a coupling condenser C_5 having a capacity of .0001 μf . It might be stated that the use of the additional tuned circuit results in a considerably higher degree of selectivity than that afforded by the broadcast receiver alone.

A wooden baseboard 18 in. long, 8 in. wide and $\frac{1}{2}$ in. thick will easily accommodate all of the parts without overcrowding. The bias by-pass condensers may be placed underneath the baseboard, which should be supported approximately 1 or 2 in. above the bottom of the cabinet on two sub-panel brackets. This allows the running of the heater and low potential wires in a location where they are not seen. The panel should be a metal one to prevent capacity effects of the hands while tuning. Many of these are available on the market at a reasonable price.

The 2.5-volt filament circuit is wired with No. 14 twisted pair cable. It is well to keep these wires as far as possible from other wires and from the component parts in order to reduce the hum level to a minimum.

The matter of placing this adapter into operation is a problem for each individual set constructor. If the first r-f stage in the broadcast receiver is tuned it is only necessary to connect the lead from the condenser C_5 to the antenna post (two posts are generally provided and are marked "long" and "short." Use the one marked "short.")

If the first stage is of the ballast type, employing a resistor or r-f choke to couple the antenna to the grid circuit, the lead from the adapter should be connected to the grid of the second r-f tube. In this case greater selectivity can be had by reducing C_5 to approximately .00005 μf , or even lower.

The initial adjustments are comparatively simple. The antenna is disconnected from the broadcast set and fastened to the antenna post on the adapter. Then, with the broadcast dial set at maximum, a weak short-wave station should be tuned in and the condenser C_4 adjusted for highest signal strength. This setting will be at nearly full capacity. After this is done the slider on the detector bias resistor should be varied until best results are secured. The center of the resistor will be about right.

ANTENNAS AND SALES

(Continued from Page 38)

ing any other metallic structure other than its own grounding clamp.

It is ideal to eliminate disturbances at their source, and this should be done in every possible case. However, the growing number renders the ideal highly improbable. Therefore, as a part and parcel of installation, a survey should be made by the dealer at his prospect's home and then and there the shielded antenna and necessary filters written into the contract.

In large apartment houses the antenna system for multiple receivers, as

described in a previous issue of RADIO, is the only solution to date. It is ideal up to 80 receivers working on one antenna at greater efficiency than on the usual makeshift arrangement. This system is a growing necessity for the large apartment house, and dealers who demonstrate several sets would do well to investigate this for their own stores.

The radio business demands the elimination of alibed store demonstrations and makeshift home installations. A good rule to follow—be sure that every set played wherever a possible buyer may hear it is operating at the efficiency for which it was designed.

REPLACEMENT OF FILTER CONDENSERS

By H. W. HOUCK

Dubilier Condenser Corp.

The testing and replacement of condenser blocks is the most delicate operation in the servicing of a power pack, and should not be undertaken unless the smallest of soldering irons and the steadiest of hands are possessed. Faulty soldering will destroy or at least weaken a paper condenser quicker than any other factor, aside from excessive voltage or electrical strain.

For the soldering of condenser sections, small soldering irons should be used and these must be kept clean and bright. Rosin should be used to clean the parts and just enough heat applied to do the job in a minimum of time; for, if the soldering iron is applied for too long a time, the heat causes the impregnating compound of the condenser to melt. The solder may even work its way down into the tightly wrapped paper and tinfoil, causing a short-circuit or weak spot. Acid soldering flux or paste should never be used, for while it is easier to apply and solder, the slightest trace of acid may result in chemical action, deterioration, weak spots, and even an open connection chewed away by the acid.

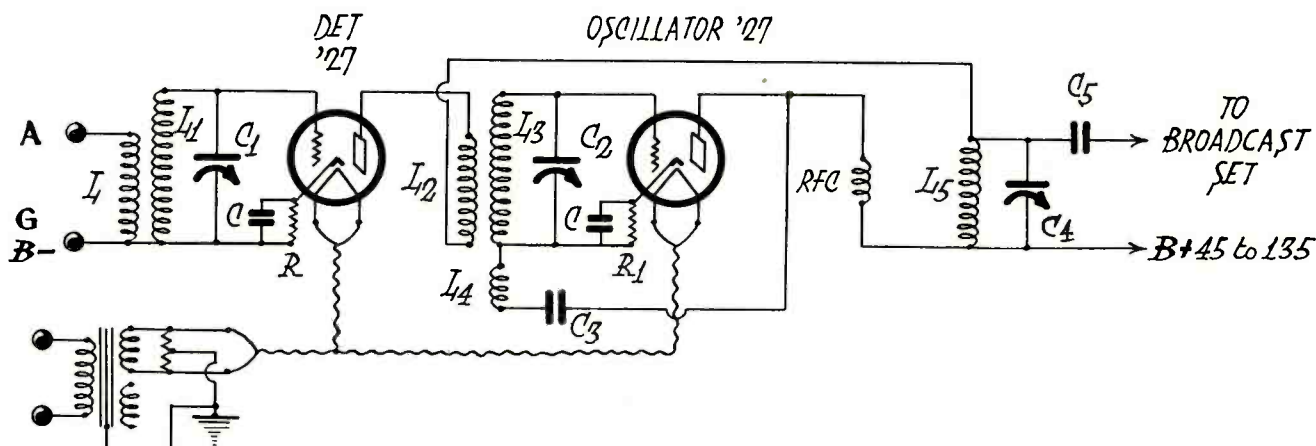


Fig. 2. Circuit Diagram of High Frequency Adapter

L_1, L_2 —1st. Det. Coils.
 L_3, L_4, L_5 —Oscillator Coils.
 RFC—R-F Choke.
 T—Filament Transformer.

R—50,000-ohm Variable Resistor.
 R_1 —1500-ohm Resistor.
 R_2 —60-ohm Resistor.
 C_1, C_2 —0.00014 μf Tuning Condensers.
 C_3 —0.005 μf .
 C_4 —0.0005 μf Semi-variable Condenser.
 C_5 —0.0005 to .0001 μf Condenser.

Circuit Analysis of Sparton 589 Receiver

THIS is a nine-tube receiver in which one Cardon 484 tube is used preceding the selector unit, five are used as r-f amplifiers, and one as a detector, while two 182B's are used in the single a-f stage and a 280 is employed as a rectifier. The same principle is employed as that used in the Sparton 301 and similar models, but the selector circuit and the a-f system have undergone several important changes.

The first and most vital change in the circuit is the addition of a 484 tube (which corresponds to the '27) in the antenna circuit. The antenna goes to the grid of this tube through a series trimmer, screw driver control, and the grid is returned to ground through the antenna coil. A .006 μ f condenser between the ground and one side of the a-c 110 volt line serves to minimize any a-c hum that might be picked up by this circuit. Grid bias is supplied from the drop through the 110 ohm resistor in the power pack that supplies all the r-f grids, and an r-f choke and by-pass condenser are connected in series with the cathode and its connection to the r-f amplifier unit in order to keep the r-f current in its prescribed path. The plate is fed from the same d-c line that feeds

the amplifier plates, a choke and by-pass condenser being located in this lead also.

While this circuit is one of the four tuned circuits which make up the selector unit, it gives this receiver the advantage over the preceding model in that it steps up the antenna signal current before passing it along to the next three selector circuits which are not able to amplify. This additional gain is the underlying cause of the increased sensitivity of the receiver as shown in the comparison of the accompanying sensitivity curve with that of the Model 301 which appeared in the September 1929 issue of RADIO.

There is another advantage in having a little amplification before passing the current along to the rest of the selector circuits. Whereas in the old method it was necessary to couple the latter conductively in order to maintain all possible signal strength, it is now permissible to sacrifice a little of it by employing inductive coupling as shown in the diagram. Without a doubt this is the means that has enabled the Sparton engineers to get the improved selectivity shown. Compare these curves also.

The r-f amplifier unit is identical with that described in the analysis of the

Model 301; however, for those who have not been able to obtain copies of the above mentioned issue, a brief description will be given here.

There are six tubes in the unit; five r-f amplifiers and detector. All stages are untuned and are coupled as tightly as possible for maximum gain without regard to selectivity, this feature having been taken care of in the selector circuits. In the coupling transformers the primary and secondary wires have been laid alongside of each other and wound together, each secondary turn paralleling one primary turn. Direction reversals have been made in all but that in the third stage, these appearing as separate series coils in individual slots.

All the r-f grids are returned to ground, getting their bias voltage from the 110-ohm resistor in the power unit between terminals 5 and 7. In series with this resistor is a 15,000-ohm variable resistor which serves as a volume control, adding to the cathode voltage (or negative grid bias) and blocking the tubes. Plate supply for all six r-f tubes is taken from terminal 6, which is in turn supplied direct from the low voltage end of the speaker field winding.

(Continued in First Column Below)

(Continued from Third Column Above)

The detector operates on the plate rectification principle, the grid being biased with the voltage drop through a 20,000-ohm resistor between the detector cathode, terminal 2, and the detector grid return lead, terminal 8. When the phonograph switch is thrown, a 1000-ohm resistor is substituted for the 20,-

000-ohm unit and the detector tube becomes an amplifier for the phonograph pick-up. The detector plate is supplied through an r-f choke from terminal 1, which receives the voltage through the primary of the a-f transformer from the high voltage line.

Three primary taps are provided at the power transformer for voltage

variation. There are four secondaries on the transformer, one for the heaters of all the 484 tubes, one for the filaments of the power tubes, one for the rectifier filament and one for high voltage. The filter system consists of one section in which the speaker field winding is the a-f choke. Plate voltage for the power

(Continued on Next Page)

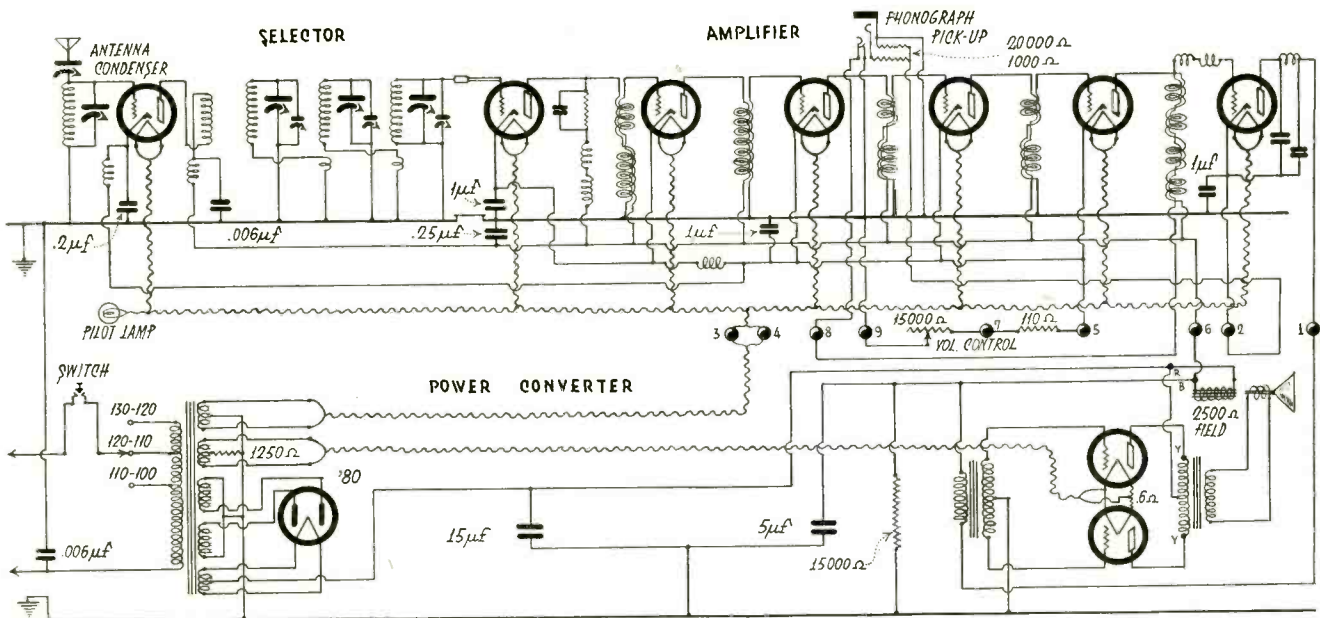


Fig. 1. Circuit Diagram of Sparton 589 Receiver

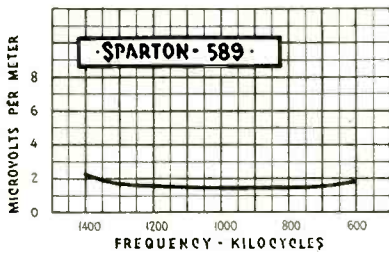
Performance Curves of Sparton 589 Receiver

(Continued from Preceding Page)

tubes is supplied from the high potential end of the speaker field winding. A 1250-ohm resistor between filament secondary center-tap and ground supplies grid bias to the power tubes. In order to equalize the two power tubes, a .6-ohm resistor has been connected in series with the two filaments, voltage being fed to the variable center-tap.

VOLTAGE READINGS OF SPARTON 589

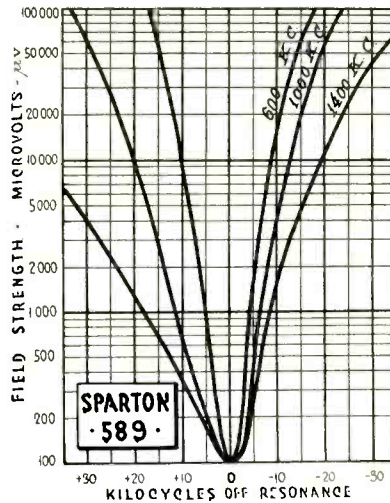
Tube	Heater or Filament	Cathode or Grid Bias	Plate
R-F	2.97	4.5	145
DET.	2.97	12.	140
A-F	4.75	40.	250



Sparton Sensitivity Curve

The sensitivity of the Sparton receiver is almost equal over the entire frequency spectrum. And at its poorest it is capable of

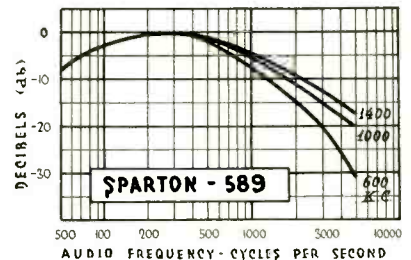
picking up practically any radio frequency oscillation "in sight." Such excellent sensitivity cannot often be used due to the fact that at the 2 microvolt per meter level there is usually more man-made and nature-made static than broadcast program.



Sparton Selectivity Curves

These curves taken on the Sparton 589 receiver indicate unusual selectivity for a set with four tuned stages. And the fact that the three of them follow each other so closely indicates that selectivity on the higher frequencies is approaching more and more that

on the lows. Some day the three may coincide. It will be noted that at its poorest the 1400 kc curve shows that the receiver requires a field strength from a station 30 kc away equal to 40 times that of the station tuned in, in order to cause complete interference. On the other side the curve indicates that a station on 1400 kc minus 30, or 1370 kc, would have about one chance in 440 of breaking up the desired program. This is excellent selectivity for the high frequency end of the spectrum.



Sparton Fidelity Curves

The fidelity curves of the Sparton 589 show an attenuation or loss of only about 7 decibels at 50 cycles. The high notes, at 1400 kc, drop about 7 db at 5000 cycles. Some of this is due to the peak of the selectivity curve (the cutting of side-bands), while a portion of it is probably due to losses in the audio system. The 1000 and 600 kc curves drop a little more, of course, due to greater slicing of the side-bands.

A Non-Synchronous Movie Installation

By B. FOX

THE enterprising service-man or dealer can offer a good non-synchronous outfit to small movie-houses that cannot afford a synchronous installation. The outfit includes two electric turntables and pick-up units with fader, a switch for connection to the output of a radio set, a power amplifier and a speaker.

Either one or both turntables may be operated at the same time, as each has a separate pick-up. The fader consists of a center-tapped 25,000 ohm potentiometer. It enables the operator to smoothly and noiselessly fade the amplifier unit from one pick-up to the other. Either pick-up may be brought into play by bringing the slider past the center-tap.

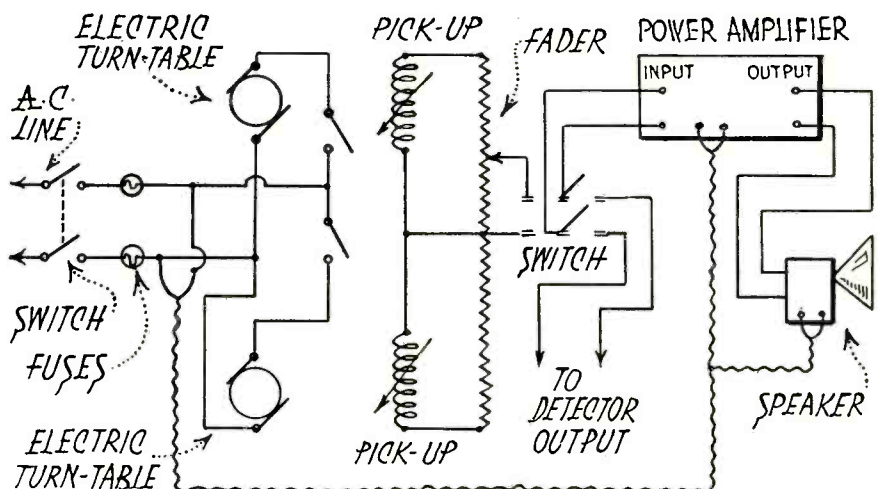
The amplifier may be any one of the standard two- or three-stage outfits which are now furnished by different manufacturers. A two-stage outfit with '45 tubes in push-pull is sufficient for a 500-seat theater. Larger houses will require a three-stage outfit with '50 tubes in push-pull.

The speaker should be of the best type available and preferably of the exponential air-column type. It is important that the primary impedance of the speaker input transformer matches the

output impedance of the amplifier. Otherwise, distortion will result; especially on vocal selections. The switch *S* is provided so that the detector output of a radio set can be utilized for special occasions, such as broadcasts of election returns, football and baseball games, etc.

To operate the outfit, a suitable record is placed on one turntable and started. When it is desired to change to another selection, another record is placed upon

the second turntable, which is started and the pick-up placed in position. At a suitable, predetermined moment the slider is brought, quickly and steadily, past the center tap, to a corresponding position on the resistance so that the volume level from one record is the same as the other. The first turntable is now stopped. The process is repeated whenever a change of record is necessary. Record companies furnish complete record albums and cueing service for each picture.



A Non-synchronous Movie Installation

Circuit Analysis of Apex Screen-Grid Receiver

THE Apex screen-grid receiver is a six-tube set using '24 tubes in the two screen-grid stages, '27s in the detector and first a-f stage and a pair of '45s in push-pull in the power stage.

The plates of the two r-f tubes are supplied from the main positive line at the low potential side of the a-f choke, through a 4100-ohm resistor. The first plate lead is bypassed through a .1 μ f condenser and the second through a 1 μ f condenser. Screen grids are fed from a tap in the voltage divider which is connected across the low potential side of the speaker field winding, which acts as the second choke, and ground. This common supply lead is by-passed through a .4 μ f condenser. A negative bias is supplied to the control grids of these tubes from the movable tap in a 400-ohm potentiometer which forms a section of the same voltage divider. In actuality this potentiometer puts a positive potential on the cathodes with respect to ground, but as the grids are connected to ground this voltage is spoken of as a grid bias, negative with respect to the cathodes. Variation of the potentiometer controls the volume of the receiver. A .4 μ f condenser bypasses the cathode lead to ground.

The detector employs the grid recti-

fication principle, using the usual .00025 μ f condenser and 2 megohm grid-leak system. The plate voltage is received from the low potential end of the speaker field winding through a 25,000-ohm resistor. This lead is bypassed via a 2 μ f condenser. A .001 μ f condenser in the output circuit of the detector bypasses the r-f to ground before they get into the transformer primary.

An 1800-ohm resistor between cathode and ground in the first audio stage provides the grid bias for this tube, the 50,000-ohm resistor between grid and ground serving as an r-f filter only, as there is no current flowing through it, hence can be no voltage drop. The .02 μ f condenser between the cathode and the junction between the transformer secondary and the 50,000-ohm resistor serves as a part of this r-f filtering system.

The second audio stage is also trans-

former coupled, the grid return, or secondary center-tap, being grounded. Grid bias for these two tubes is supplied from the drop across a 1600-ohm resistor between the filament center-tap and ground. The resistor is located in the power supply unit. An unusual a-f filter arrangement is connected in the output circuit of this stage in order to absorb all frequencies above 5000 cycles. Although the theory is a good one, it seems strange that the two plate circuits should be thrown out of phase in order to accomplish this ideal.

The power transformer has secondaries for the heaters of the '24s and '27s, for the '45 filaments, the rectifier tube filament and one for high voltage. An '80 rectifier tube is used, and the output is filtered through one choke and the speaker field winding, a 1 μ f, a 1.5 μ f and another 1 μ f condenser completing the filter system.

VOLTAGES WITH VOLUME CONTROL AT MAXIMUM

Type of Tube	Position of Tube	"A" Volts	"B" Volts	Cont. Grid "C" Volts	Screen Volts	Screen Current	Plate MA
'24	1st R-F	2.36	173	2.72	86	.87	3.0
'24	2nd R-F	2.31	173	2.72	86	.21	3.0
'27	Det.	2.28	38	0			2.8
'27	1st A-F	2.28	100	6.1			3.25
'45	2nd R-F	2.29	169	38			11.3
'45	2nd R-F	2.29	169	38			11.3
'80	Rec.	4.61					34.5

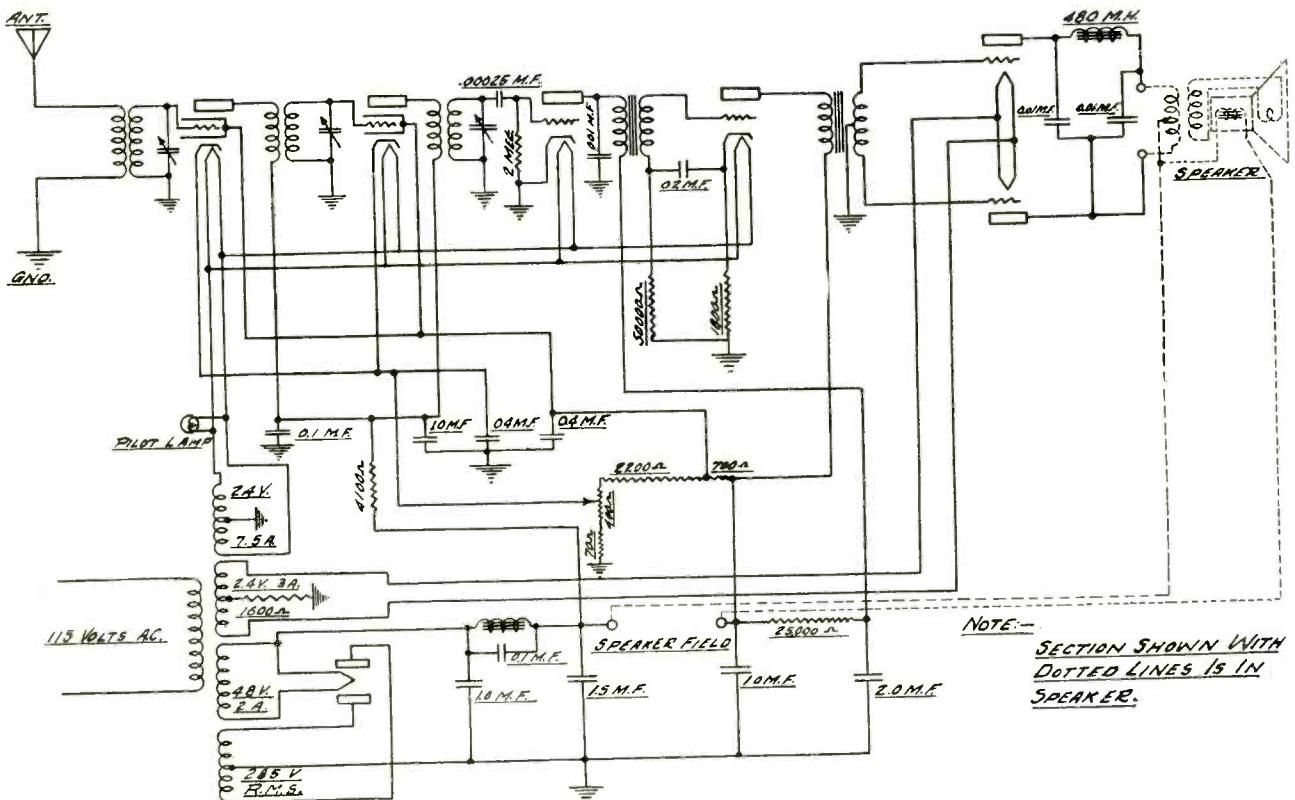


Fig. 1. Circuit Diagram of Apex Screen-Grid Receiver

Circuit Analysis of Radiola 21 and 22 Receivers

THE chassis used in these receivers is battery operated, having five d-c tubes. The two tuned r-f stages employ UX 222s, the detector and first a-f stage use UX 112-As, and the last audio stage employs either a UX 112-A or a UX 171-A, depending upon the volume requirements and the amount of B battery available.

The local distance switch in the antenna circuit merely disconnects the antenna for local reception and shunts a .00023 μ f condenser across the coil. The secondary circuits of the two r-f tubes and the detector are identical with the exception of the grid leak and condenser in the detector grid circuit. Grid bias for the two screen grid tubes is supplied from the voltage drop through the 6.5 ohm filament resistor, while the screen grid potential is obtained from the movable arm of a 50,000 ohm potentiometer across the 67 volt positive terminal and ground. This potentiometer serves as the volume control.

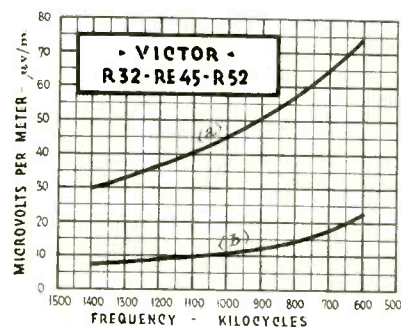
Each screen grid lead, negative filament lead and plate lead in the two r-f circuits is by-passed to ground through a .1 μ f condenser. The second plate lead

is by-passed again via a 1 μ f condenser, as is the detector plate lead.

Fixed regeneration is employed in the detector circuit; a feedback coil, part of which is shunted with a fixed condenser, being used to accomplish this purpose. A 30,000 ohm resistor in the plate circuit of this tube reduces the voltage from 135 to 45 volts. Both a-f stages are transformer coupled, bias being supplied to the two grids from C batteries. An output choke is used to feed the plate of the last tube, coupling to the speaker being made through a .5 μ f condenser in order to isolate the direct current from the speaker winding. A 1.95 ohm resistor in the positive filament lead of the detector and first audio tube reduces the 6 volt A supply to 5 volts, while a 1.55 ohm resistor in the positive filament lead to the two r-f tubes and the second audio tube performs the same operation for these tubes. The 6.5 ohm resistor in the negative r-f filament lead reduces this 5 volts to the required 3.2, supplying the grids with the drop. The operating switch opens the B battery circuit as well as the A battery lead.

VICTOR CORRECTION

The upper curve shows the performance when the variable resistor, which is connected in series with a fixed condenser across the secondary of the second a-f transformer, is not adjusted to give maximum sensitivity.



Sensitivity Curves of Victor Chassis in R-32, RE-45 and R-52 Models

The lower curve shows the performance when the resistor is properly adjusted. Since the upper was that published in November, 1929, RADIO, as the purported performance of this Victor set, it seriously misrepresented the actually excellent sensitivity of this receiver. The correct curve, as measured in RADIO's laboratory, is consequently here published, together with an apology to the Victor Corporation for the erroneous impression that was created by the original publication. These curves, like those for all other receivers, are taken from a model which happens to be in local stock, and while typical, represent neither maximum nor minimum possible performance.

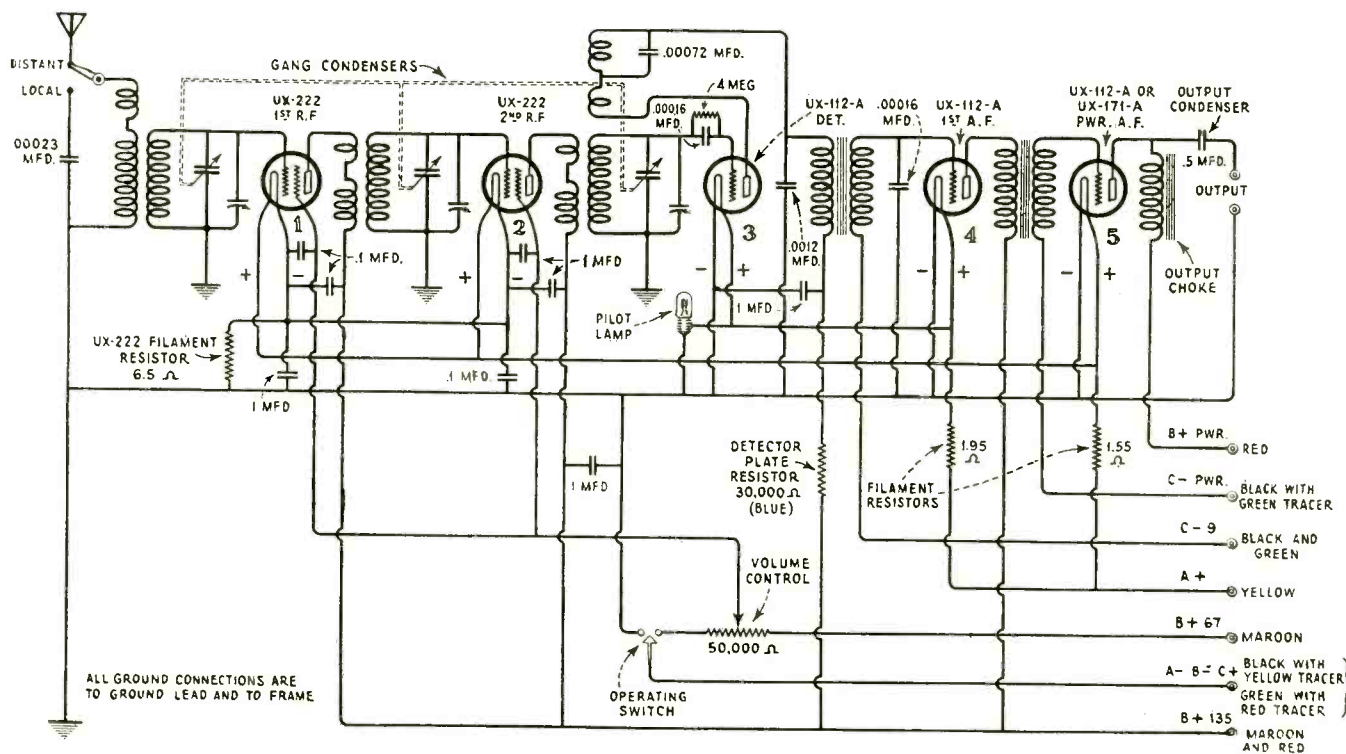


Fig. 1. Circuit Diagram of Radiola 21 Battery Operated Receiver

Radio Pickups

Items of trade interest from here, there and everywhere, concentrated for the hurried reader.

DE FOREST CUTS TUBE PRICES

Due to the use of new automatic high-speed production machines, De Forest Radio Company has made a radical downward revision of tube prices. The new prices are: \$3.00 for the 424, \$4.00 for the 420, \$2.00 for the 427, \$2.50 for the 445, \$8.00 for the 410, \$10.00 for the 450, \$2.50 for the 480, and \$6.50 for the 481.

COLONIAL AND VALLEY COMBINE

The interests of the Colonial Radio Corporation of Long Island City have been combined with those of Valley Appliances, Inc., of Rochester, N. Y. Each division will be operated as an independent unit, the Colonial making receivers and the Valley making speakers.

NEW RCA LICENSES

Cable Radio Tube Corporation and Perryman Electric Co. have been licensed for the production of radio tubes under RCA patents. The Radio Corporation of America has also granted tuned r-f and electric phonograph licenses to Transformer Corporation of America and to Story & Clark Radio Corporation, while canceling those of Walbert Radio Corporation.

PHOTO-ELECTRIC CELL AND AMPLIFIER UNIT

Westinghouse E. & M. Company is selling a unit that operates a relay when light falls on the caesium-coated photo-electric cell



which, together with an amplifier tube, is mounted on the top. The necessary coupling devices and wiring are concealed in an aluminum box below. It has a response of less than .001 second. It may be applied to many tasks which otherwise require tiresome watching by the human eye. These include rapid counting or sorting of objects whose shadow crosses the cell, automatic alarms wherever a change in light intensity is involved, measuring the intensity of light, etc. Detailed description is given in Leaflet 20456. Recent spectacular demonstrations of such a device include the control of an automobile in New York City by means of words telephoned from Pittsburgh. The sound impulses, transformed into light waves through a Neon tube, affected a photo-electric cell in the car so that through suitable relays the car was started, stopped, and reversed. Another application is the lighting of an unattended airport by means of a siren on an approaching plane. It has also been applied, in model form, to traffic control, the appearance of a car on a side street flashing a "stop" sign on an arterial.

STEINITE REORGANIZED

Steinite Radio Co. has been reorganized with John C. Tully of Chicago as president, and Arthur T. Haugh of Rochester, N. Y., as vice-president. It is stated that quality radio sets are to be produced in the new factory at Fort Wayne, Ind.

RADIO TRADEMARKS

As certain trademarks are used to designate various prices of radio equipment, some interest and value is found in a statement from the Association of the Bar in New York City that "the first person to use a trademark on merchandise acquires title thereto in the territory where his goods are marketed." Registration in the U. S. Patent Office or in various states is not essential for protection of vested rights, although registration in the Patent Office is advisable because it gives the right to bring suit in the federal courts and the right to advertise such registration.

Remler Division of Gray & Danielson Mfg. Company is making deliveries on variable condensers, drum dials, sockets, Infrazyne kits and audio transformers from the new factory at 2101 Bryant Street, San Francisco.

Assets of the Temple Corporation of Chicago have been purchased by L. C. Wellington, president of the K. W. Radio Company, of New York, who announces that the Temple set will be continued in production.

MAGNAVOX EXPANDS

The Magnavox Company of Oakland, California, which was incorporated under the laws of Arizona in 1917, has been re-incorporated under the laws of Delaware as the Magnavox Company, Ltd., preceding the establishment of an eastern factory, in addition to the present Chicago assembly plant. The new legal structure also permits possible merger, although the company denies the rumor of a contemplated merger with Grigsby-Grunow Company. A new patent has been secured to cover the use of loudspeakers in radio-phonograph combinations.

AMPERIAN AUTOMATIC PHONO-RADIO

The Amperian line, which the Capehart Corporation of Fort Wayne, Ind., has recently added to its Orchestrascoper line, includes many models of automatic phonographs and phono-radio combinations for both home and commercial use. The phonograph is equipped with an automatic record changing mechanism which has an operating capacity for from 10 to 18 double-faced records.

Model 110, which is illustrated herewith, is designed for commercial use where both automatic phonograph and radio are desired. The top compartment contains a screen-grid radio set, the second compartment an automatic phonograph, and the lower compartment an electro-dynamic speaker. The lower center knob on the radio panel changes from radio to phonograph, both operating from one coin mechanism which allows for five minutes of music from any station selected or the playing of one phonograph record. Record magazines are placed on either side of the speaker compartment.



Model 110 Capehart Amperian



N. F. R. A. 1930 Agenda

In the course of his presidential address at the Cleveland convention, Michael Ert gave an interesting summary of the Association's immediate intentions and aspirations. First among these is the protection of the retailer and distributor by means of a close study of the potential market for radio. He suggests regulation of the sale of discontinued and distress lines, education on limiting the allowance on trade-ins, and less direct advertising in the broadcasting. With regards to radio advertising in newspapers, he urges the preparation and adoption of a standard advertising code. Local associations are urged to get behind the serial number ordinance.



J. N. Blackman, President, National Federation of Radio Associations

The convention approved abolition of the zone system of allocating wavelengths, condemned premature publicity on new developments, and indorsed the plan for a National Radio Week during September. Newly elected officers of the Association are J. N. Blackman, president; Henry Alter, H. M. Steussy, and Fred Wiebe, vice-presidents; Robt. Himmel, treasurer; and Harry Cory, secretary. H. G. Erstrom, former executive secretary-treasurer, is now executive vice-president.

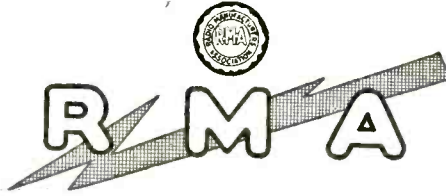
Ward Leonard Adaptoron

This device consists of a motor-driven commutator and four brushes which reverse the flow of d-c current 120 times a second so that, through a suitable transformer, a 110-volt a-c receiver may be operated from a 32, 110 or 220 volt d-c supply. The input and output are filtered and the device is shielded. It is claimed to have an electrical efficiency of 80 per cent. The standard model is rated at 125 kva, which is equivalent to a 120 watt receiver.

Remote control of a radio set whose sound interferes with a telephone call can be accomplished by means of a unit which is made by the SCO Electrical Products, Inc., of Jackson, Mich. An "on-and-off" switch on the telephone instrument is connected by 25 ft. of cord to a relay switch at the radio set, which is thus shut off or turned on at will.

Robbins & Myers Rotary Converter

Robbins & Myers, Inc., are making a 100-watt rotary converter for operating a-c radio sets from a d-c supply of 32, 110 or 230 volts. Each unit is supplied with a filter for removing commutator ripple.



A new book of revised standards for the radio industry will be issued during May by R. M. A., under the direction of Ray H. Manson. Included in its recommendations will be requirements for television equipment.

At a joint meeting of the receiving set and tube committees on March 6, evidence was introduced to show that pentode sets will not be presented this season by the larger set manufacturers who have completed their plans for 1930. The reason is lack of sufficient technical information. This is to be corrected by a committee of ten members who were appointed to collect and study data on the tube and to determine those characteristics which are possible and wanted by the set makers.

In connection with the publication of advance information concerning new developments, such as the pentodes, President H. B. Richmond said:

"Never let there be any withholding of technical information. Neither let there be any premature consumer announcements of a nature tending ultimately to destroy consumer confidence. Our first problem seems to be one of getting the component suppliers to announce their new devices and improvements as soon as they are ready, but first to the set manufacturer, then to the consumer. Our second problem is to get the set manufacturer to feel that it is not necessary for the whole industry to stay in line in lock-step fashion, but that each manufacturer can have his product individualistic, incorporating in it those advances in the art which he feels are desirable and sufficiently reliable to pass on to the public."

At the RMA board meeting on March 21, plans were discussed for the sixth annual convention and trade show at Atlantic City, during the week of June 2. Reservations have already been made for over 30,000 ft. of floor space. Special trains are to be run to Atlantic City from various points throughout the country and rates of one and one-half fares secured for the round trip. Elaborate entertainment programs are included in the plans.



Kylelectron radio sets, Models K-71 and K-72, made by the United Reproducers Corporation, are equipped with Kylelectron condenser-type speakers whose reproducing surfaces cover the entire face of the cabinets.

RADIO FOR APRIL, 1930



R. W. A. Plans

Following the discussion on various reports presented at the Cleveland convention, the Association went on record as favoring a plan for gathering and compiling monthly statistics which cover sales and inventory, both in dollars and number of units, together with forecasts for the following three months. Thus it is hoped to curb over-production. Members are to be provided with a monthly summary of these statistics as a guide for future commitments and as a comparative indication of sales in their several territories.

The Association endorsed the Capper-Kelley bill to protect the resale value of



Henry Alter, President, Radio Wholesalers Association, and Vice-President, National Federation of Radio Associations

merchandise. It was suggested that special attention be given to the sale of extra loud speakers, portable radios and other radio accessories.

Newly elected officers of the Association are Henry Alter, president; J. N. Blackman, Fred Wiebe, Ray Thomas and James Aitken, vice-presidents; H. J. Shartle, secretary, and Robert Himmel, treasurer.

NEW RADIO CATALOGS

Ohmite Manufacturing Company of Chicago has issued a 16-page catalog, 8½ by 11 inches, on Ohmite vitreous enameled resistance units. These are made in about thirty different sizes with six different types of terminals which are fully illustrated and described.

Under the title of "Fixed Resistor Replacement Problems," the International Resistance Company of Philadelphia has published an interesting booklet on the resistor requirements of modern broadcast receivers. The text covers the importance of good resistors, their power carrying capacity, the noise factor, and how to determine the necessary resistance and current handling capacity required.

The RCA Radiotron Company of Harrison, N. J., manufacturers of vacuum tubes, are supplying radio dealers and jobbers with a monthly publication entitled "Good News." The first issue was out March 1. It contains information about selling radio tubes.

The January and February issues of the *Research Worker*, published by Aerovox Wireless Corporation, Brooklyn, N. Y., are devoted to the use of resistor multipliers to increase the range of milliammeters and voltmeters.



Letters to the Editor

Service an Asset or Liability?

Sir: We notice in your March issue some comments on the dealer service situation which we consider very apt. It seems to us that very few of the smaller dealers can really afford to maintain even a moderately efficient service department. It is also our observation that very few of them do.

As the whole attitude of the radio buyer toward radio depends largely on the trouble-free operation of the set he buys—that is, freedom from mental irritation as well as mechanical breakdown—it seems to us that the service factor is of increasingly great importance in the radio business.

For this reason it is becoming more and more essential that the best of service be available at all times, not only in the way of efficient personnel, but in a service policy that will ensure the radio owner having the fullest uninterrupted use of his set at a minimum of maintenance cost.

No ill-equipped dealer can do this. The small retailer can not afford to maintain a service department; he cannot employ a really good service man nor provide the proper test and repair equipment. That some manufacturers realize this is evident when they are proposing to take care of their own service.

The only way in which the small dealer can insure customer satisfaction then, is to either pay some real service organization a retaining fee, or give them all aerial installation work and service jobs at a fixed scale of charges covering both his "free" service and post-guarantee work. Perhaps a better way would be for several dealers to combine to support a service organization to confine themselves to the work of those dealers.

Whatever plan is adopted, the dealer in the future must come to realize that sales depend upon service as much as good merchandising methods. Word of mouth advertising is a very important factor in radio sales, and buyers talk a lot more about their troubles with their dealers than they do about the little services he does them.

Competition is becoming keener and profits smaller as time goes on and no dealer who knows his vegetables will jeopardize his future business by offering less than the best in service after sales.

GORDON B. BRAUN, *Pres.*,
Oakland, California. BRAUN & KING.

Modernizing Jewell 133A Analyzer

Sir: In re the article by B. E. Estes in December 1929 RADIO, describing a test kit, would say that the writer has used the basic principle described in modernizing an old Jewell 133A d-c analyzer.

There are no doubt many service men who have one of these kits on hand and who cannot afford to lay out money for one of the new type a-c d-c set testers. The cost involved in this work being approximately twenty-five dollars, it may readily be seen that the outfit about to be described was well worth the work and resultant saving.

The entire d-c volt and milliammeter section of Mr. Estes' kit was omitted, as all necessary d-c readings were obtainable from the Jewell analyzer. Also the four-prong socket for tube testing and filament reversing

switch, as these were also available in the said analyzer. The voltage bridging arrangement was connected to the external binding posts of the analyzer, as were the leads to the milliammeter plug. As there was only a 100 ma scale available at the external posts, it was necessary to make a slight wiring change in the analyzer to be able to obtain a 10 ma reading. The readings then obtainable were 0-100-500 d-c volts and 0-10-100 ma.

The eliminator tester and ohmmeter were built as specified, as was the oscillator, although there appears to be an error in the published diagram as it was found that no voltmeter reading was obtained when plugging into the tip jacks a-c vm. This was overcome by connecting the lead from the one tip jack run direct to the filament.

In place of the a-c voltmeter arrangement in the published description, a Jewell 0-3-15-150 a-c Model No. 78, was substituted with a SPDT toggle switch to switch from 15 to 3 volts, and all three voltages brought out to tip jacks. The latter gives more satisfactory readings than a single scale voltmeter used with external multipliers, as well as provision for measuring line voltages.

A very satisfactory bridging plug for the d-c voltages is the General Radio 274M used with G. R. 274J jacks. It was also found that a small bushing the size of a control grid cap screwed on the plug insert and screen grid lead from cable thereto, was more satisfactory than a clip hanging loose, and also aided in extracting the insert from tight sockets.

A toy transformer (Thordarson) was used to supply filament voltage to the oscillator tube, instead of the bell-ringing device specified, as the former can also be used for rejuvenating thoriated filament tubes and for a-c continuity testing with a lamp (75 watt) in series with the secondary voltage used.

The writer believes the foregoing may be useful to those who are building or who contemplate building the test kit, and it is with this thought that the above information is submitted. Very truly yours,

BERT R. BLACKMAR,
2026 Muliner Avenue, New York City.

Adapting Anderson's Tester to Screen-Grid Tubes

Sir: Shortly after your October 1928 issue arrived, I assembled the a-c d-c set tester described therein by H. W. Anderson. Outside of sending the Jewell 0-1 milliammeter to the factory to make the multipliers and match to meter, and using a 4½ volt C battery for tube testing in grid shift, it's identical to diagram. And do she work? I'll say she do. I figured I had about the last thing in set testers, when along comes the screen grid tube to get my goat. Somehow the tester "as was" would not test the dinged things. I bought an adaptor that was to fix this all up in good shape, but it was a nuisance to carry along, and found some sets that were next to impossible to get adaptor into.

First, I mounted four small pin jacks just above the a-c meter (only place I had room left) with centers ⅝ in. apart. Reading from

left to right, they are numbered 1, 2, 3, and 4. Turning tester panel up, I located the wire from tester cable that ordinarily went direct to grid shift switch and multipliers, and cut it off right under panel, soldering the wire from cable to pin jack No. 1. The end left after cutting grid wire and soldering to pin jack No. 1, was soldered to pin jack No. 2. Now by soldering about 1½ in. of wire to two pin plugs (such as are used on loudspeaker cords, etc.) and shunting pin jacks 1 and 2, we have exactly the same as before, but with a method of opening the wire (grid) from tester cable into set tester. Next unsolder the wire connected to the grid connection of tester socket and solder this to pin jack No. 4. Then run a wire between pin jack No. 3 and grid connection of socket. Then make up another short shunt wire, with two pin plugs and about 1½ in. wire and shunt pin jacks Nos. 3 and 4.

This done we have exactly the same set tester as before we started, but with provision for opening two of the wires therein by removing the two shunts. Next get two pieces of ordinary flexible wire and on one end of each solder a pin plug, and on the other end of each a small battery clip.

To test a screen grid tube in its set, remove tube from radio, plug it into set tester, plug set tester into radio. Remove shunts between pin jacks 1 and 2 and between pin jacks 3 and 4, and place one of the shunt wires between pin jacks 1 and 3, thus routing the voltage for screen grid direct to tube. Place long single wire pin plug in pin jack No. 2, and other end on grid clip in radio, which ordinarily goes to top of tube. Place short single wire pin plug into jack No. 4, and clamp other end on grid connection on top of screen grid tube, and proceed to test in regular manner. Nothing to it, and it works.

By placing four pin jacks in plain sight on set tester panel, we have not only adapted it to testing screen grid tubes and sets, but makes it easy to use set tester for a simple output voltmeter, as follows. Leave shunt on between jacks 3 and 4, and remove shunt between 1 and 2. Plug set tester into output tube, or in place of one of the output tubes, if in push pull, and place the tube removed from radio into tester. Set milliammeter for reading on the 10 ma scale. Attach to aerial post a good oscillator capable of putting out a steady signal, and enough C battery added between jacks 1 and 2 to pull hand on meter about to center of scale, and we are all set to either synchronize or to neutralize. If followed according to this lineup, the plus post of additional C battery goes to jack No. 1 and neg (usually about 22½ volts) to jack No. 2. In synchronizing an increase in reading on milliammeter shows better alignment, and any decrease shows not so good. In neutralizing, plug dummy tube in first unit in radio to be balanced, and adjust neutralizing condenser for minimum reading, proceeding through other stages in this manner.

This was all worked out for adaption to Mr. Anderson's set tester, but can see no reason why not adaptable to any set tester bought before the screen grid tube became a menace. Yours truly,
Carrington, N. D. GEO. OLSON.

TOBE Filterette

APRIL, 1930

TOBE ENGINEERING SERVICE MEETS WIDESPREAD APPROVAL

Rush Engineer to Cover Chicago

NEWs that Tobe engineers are available for cities and towns has resulted in a flood of inquiries from real estate operators, Rotary Clubs, Kiwanis, and leading citizens of communities everywhere.

One of the first to apply for the services of an engineer was Louis M. Strauss, of Newark Electric Company, Chicago, who, the moment he heard of this announcement, made a personal trip to Canton, Mass., headquarters of the Tobe Deutschmann Corporation, in order to make certain that he would obtain first call on the services of a Tobe engineer.

As a result of this visit, in which, incidentally, Mr. Strauss, long a Tobe booster, was given renewed enthusiasm by a trip around the grounds and plant, he secured the services of the same engineer whose excellent work in Springfield, Vermont, will be remembered by our readers.

It was originally planned to send the Tobe engineer who was working in Negaunee, Michigan, from there to Chicago, but a call for his services from Houghton, Michigan, disrupted this plan and Mr. Strauss, so anxious was he, brought his own engineer back with him.

We know that our readers will be as interested as we were in the photographs which are reproduced herewith. It is significant that despite the inclement weather so convincingly shown in the photographs, the Tobe engineer and his loyal co-workers carried on just the same.

We wonder whether our readers ever stopped to picture to themselves the actual scene of such a town which has

(Continued on Page 56)



GEORGE E. PALMER

Mr. Palmer, who was formerly general sales manager for the Dubilier Condenser Corporation, is vice-president of the Tobe-Deutschmann Corporation and general manager of the Condenser Division.

EXCLUSIVE DEALER FRANCHISE

In order to furnish to the fullest extent selling and installation cooperation for the local dealers of Tobe Filterettes our company is establishing direct exclusive Tobe franchises for dealers.

These franchises will prove extremely profitable in view of the tremendous field, practically untouched, in radio interference prevention devices, of which we are the pioneers and the largest manufacturers in the world.

Dealers who wish to receive all possible assistance from the advertising and extensive educational campaigns on Radio Interference Elimination Devices now being instituted by our corporation, and who desire to obtain exclusive franchise for their territory should fill out the coupon on page 56 and mail it at once, as preference to territory will be allotted in rotation of applications received.

IOWA-NEBRASKA LIGHT AND POWER COMPANY IN OFFICIAL BULLETIN SPEAKS HIGHLY OF FILTERETTE

Finds High Percentage of Line Noise

Those of our readers who have been wondering just what percentage of the radio noises which they receive are coming over the line will be interested in the bulletin reprinted below, which was sent out by the Iowa-Nebraska Light and Power Company, under the direction of its engineer, Mr. B. E. Ellsworth.

Mr. Ellsworth reports elimination or great reduction of interference in 60 per cent of radio sets, even when the Filterette Senior was installed on the set itself, a type of installation in which Tobe has not guaranteed the Senior to work to fullest efficiency. We take this opportunity of heartily endorsing his other recommendations as well, and are reproducing them here for the benefit of interested readers.

RADIO BULLETIN NO. 17

The Use of Filters to Eliminate Radio Interference

March 6, 1930

Since the last superintendents' meeting at Lincoln there have been many requests for copies of the Tobe Filterette Manual, entitled "Radio Noises and Their Cure." Manuals have been ordered for everyone on the mailing list for these bulletins. We are advised by the publishers that these books have been temporarily exhausted, but a new publication will be off the press within a week.

We do not wish to recommend the Tobe filter to the exclusion of all other makes. However, we know it will do the work, it is convenient to handle, is mounted in fireproof case and is easily installed, it has a pleasing appearance, and is reasonable in cost. The Senior type P. O. filter will be found the best one to use for general work.

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Laboratory Filtering Methods

A Glimpse at the Actual Process of Designing a Specific Filterette
From Start to Finish

By R. L. HASKINS, Engineer, in Charge of Laboratory, and
JAMES H. S. MOYNAHAN, Filterette Editor

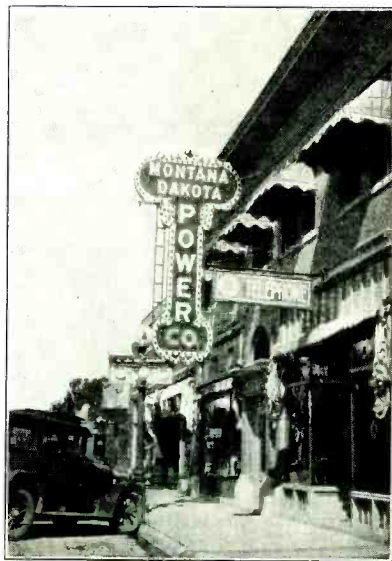
WITH the tremendous interest manifested everywhere in the process of filtering, some word on the actual laboratory methods employed is sure to be received with interest by all radio engineers. We shall attempt, therefore, to outline, so far as space permits, the steps through which the apparatus to be filtered must pass before the assignment is declared to be satisfactorily completed.

Word is received at the laboratory that a crate containing a piece of electrical apparatus, the product of a well-known manufacturer, has been received for filtering. Under the supervision of the engineer assigned to the task, the crate is unpacked, manufacturer's directions studied, and the apparatus set up.

Before any attempt is made to study interference characteristics, one essential feature of the installation must be satisfactorily reproduced. This is the actual field operating conditions under which the apparatus would be installed. It is useless to design a Filterette under any but actual field operating conditions. Therefore, the engineer must take under advisement several modifying factors. Let us instance a few of these, in order to demonstrate. How long will the lead wires be—half a mile, perhaps, as in a traffic control signal, or a foot or two, as in an oil burner? There is also the question of a ground, one of the most important of all factors in a successful filterette. Will the apparatus be installed where a good ground is accessible, as in the case of an oil burner in the cellar, or will it be remote, as in the case of an elevator motor, necessitating a long ground wire from the pent-house, through the building, or as in the case of some flashing signs?

But this is not all. There is still the question of the type of wiring which will be encountered in actual field installation. And, of course, the engineer must assume the worst. Despite the fact that nine out of ten installations might have wiring run in conduit, he must design his filterette so that it will work just as efficiently in the single instance where the wiring is open.

Still, it is not all so bad as this. Occasionally he strikes a set of conditions



SIGNS LIKE THIS CAUSE RADIO INTERFERENCE

The Tobe Filterette N. Y. L. No. 4 is particularly adapted to quell radio interference from signs such as the above. Have you any flashing signs in your town which need filtering?

which permit him somewhat more latitude. Let us explain further.

The primary purpose of filterettes is to prevent interference with radio set reception. Instances arise where the appliance is not of the type which will be installed in close proximity to a radio set. The engineer who is designing a filterette for household appliances, since they are sure to be used in the home, and since their field of radiation almost invariably extends to the antenna of the set, cannot be content with a filterette which is anything less than 100 per cent efficient.

Occasionally, however, the engineer finds that he can reduce the interference from some apparatus to a negligible amount at a moderate cost, whereas to eliminate it completely would add perhaps 50 or even 100 per cent to the cost of the filterette. Provided that the apparatus is not likely to be used in close proximity to radio sets, it is usually deemed unwise to go to the extra expense of laboratory-perfect filtering, which in this case would be wholly unnecessary.

WE COME now to the examination and calibration of the interference itself. Different types of interference, as the reader probably knows, have different characteristics, which we can identify best for laboratory measurement by the band of frequencies which they cover. One type of interference, for example, may be heard only on low frequencies, and give no appreciable trouble above a certain wavelength. Another may be just the opposite, and be heard only on the high wavelengths.

For the engineer, however, such approximate measurements as may be made by the human ear, which is, to say the least, a highly imperfect and fallible instrument, are wholly inadequate. The use of delicate meters for determining exactly the range of the interference are absolutely necessary if correct, accurate and efficient filtering is to be accomplished. Imagine an engineer in a laboratory bending with his ear to the speaker to determine whether "the noise has stopped yet." Such antiquated methods are all very well for service men, who cannot afford the expense of special laboratory measuring instruments, but in a laboratory which examines unnumbered pieces of electrical apparatus in a year such methods would result in a needless and expensive waste of high-priced engineers' time.

The measurements, accordingly, are made by such instruments as oscillators, vacuum tube voltmeters, wavemeters and oscillographs, which indicate decisively the exact characteristics of the interference. Of what sort is it? What band of frequencies does it cover? How far is its field of radiation, and in what proportion does it decrease? At what frequencies is the interference peaked? How does the interference travel—is it carried by the power lines or is it radiated directly through the air to the antenna? The acquisition of this and similar information is essential to the engineer before he can even begin to plan for the construction of the filterette which is to eliminate the interference.

In addition to the delicate measuring instruments mentioned above, the laboratory has a number of different radio sets, each of a type which has been carefully selected for certain known charac-

teristics. These characteristics and their uses are given below.

The first set is an electrically operated set with a tuned r-f circuit which is more sensitive on the lower wavelengths; the type of set, in fact, approximating most closely the average set which is in use in nine out of ten homes which have radios today. This is for the purpose of estimating the radio interference on an average set, as shown in Fig. 1.

The second is a loop-operated battery set, extremely sensitive, and with a uniform amplification over the entire broadcast waveband. This set is fully as sensitive as a modern a-c receiver, but since

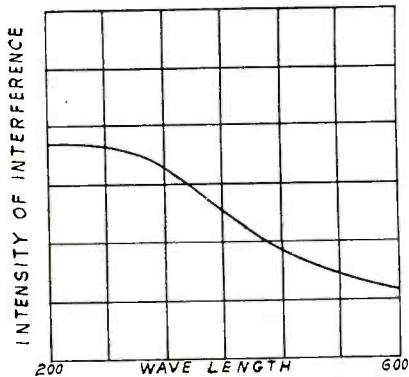


Fig. 1. Interference Response on Set Which Is More Sensitive on Lower Wavelengths.

it is not coupled to the a-c mains, it gives a method of measuring purely radiated interference on an accurate scale (on account of its uniform amplification), as shown in Fig. 2, and without the necessity of taking into account the factor of the receiver's being coupled to the a-c mains.

The third is a modern a-c set, with uniform amplification over the entire broadcast band. This set gives the engi-

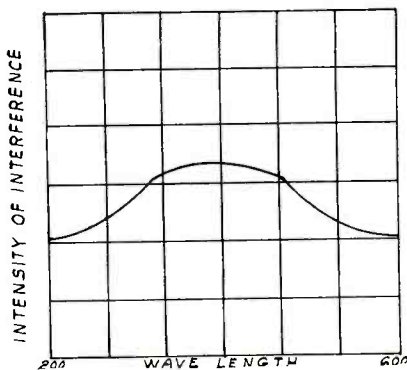


Fig. 2. Interference Response on Set With Uniform Amplification, Showing True Peak of Interference.

neer a chance to estimate the effect of the interference on a receiver which is coupled to the power line, since such factors as the wiring of the individual house, etc., enter into the amount of interference which will be encountered in each instance.

Fourth and last there is a portable set, with uniform amplification over all the broadcast band, and, of course, battery operated. This is used to measure the

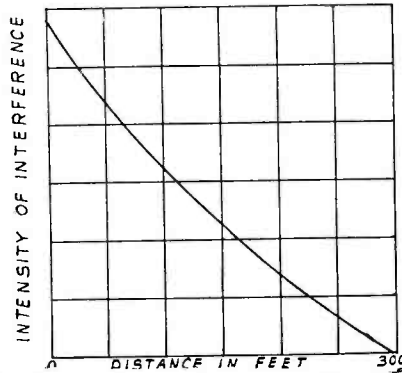


Fig. 3. Interference Response on Portable Set Uniformly Receding from Source of Interference.

relation between distance from the source and field strength of the interference, shown in Fig. 3. A visual output meter gives accurate readings.

A feature of radio interference which makes it extremely difficult to calibrate with any known degree of accuracy is its irregularity. For interference, as a rule, is erratic. It may be loud one minute, and soft the next. It may be high one second and low the next. But with the assistance of this portable set and the aforesaid meters the engineer makes a charted curve of the characteristics, and the relation of distance to field strength.

The above curves vary, of course, with each distinct type of apparatus. They are chosen not as typical of all interference, but as examples of the curve of a specific apparatus, arbitrarily chosen.

(To be continued)

Effect of Heat Upon Condensers

RECENT tests have proven two interesting facts regarding the effect of heat upon fixed paper condensers such as are used in power units. First, when the condenser has been thoroughly heated to a temperature of 130 deg. F. it will stand a 25 per cent greater voltage test than the same condenser maintained at room temperature. Second, the paraffin with which the container is filled will soon become soft and will settle to the bottom, leaving the top portion of the condenser more liable to puncture.

It is important, then, since long life of the condenser is the main consideration, that all condenser blocks be placed as far as possible from the power transformer, the rectifier tube and other apparatus that is subject to heating, and that the best ventilation be provided. Partitions are very effective and are often the only means available for minimizing the heat. They should be made of copper or other good heat-conducting material.

A temperature of 110 deg. F. should be considered a fair maximum temperature if long life is to be assured, and the service man would do well to become familiar with temperatures in general, making a few tests at different points in a housed power unit.

(Continued from Page 53)

A few remarks as to what may be expected from this filter:

1. Don't expect the filter to eliminate static, because it won't do it. Any noise coming to the radio set via the aerial will not be changed by the addition of this filter. If the aerial is close to the electric wires (as an aerial in an attic), then the aerial usually picks up any noise which may be on the light wires. In such cases the filter installed at the entrance switch should be more effective than one installed at the radio set.

2. Don't try to install the filter in a line requiring a capacity of over 5 amperes.

3. Don't install a filter and then expect to use the light wires for an aerial. Reception will "not be so good."

You can expect this filter to stop very nearly all the noise reaching the radio set through the 110-volt supply. The filter has been found to eliminate or greatly reduce interference on approximately 60 per cent of the sets on which it was tried here in Lincoln. The other 40 per cent were receiving most of the interference over the aerial.

A great many of the radio sets being bothered by interference have a poor ground. In cities the set should be grounded to the water pipe on the street side of the water meter. The four-foot iron rod used for ground rods by many radio dealers is very inadequate. A ten-foot galvanized pipe or copperweld rod should be used. These filters will not do much good if the ground is poor. Radio set ground and ground wire from filter may be fastened to same ground rod. All ground rods should be over two feet from building foundations if a good ground is to be secured.

In cases where only one appliance is bothering a given neighborhood, the owner of said appliance should be induced or otherwise persuaded to install a filter on this appliance. Most of this type of work should be done through the radio dealers. If they can be convinced of the value of these filters and will handle them a good work will be started. They can be secured from the Westinghouse Electric Supply Company of Omaha, or direct from Canton, Mass.

The Senior filterette has been found to reduce noise due to 33,000-volt transmission lines to about one-half or one-quarter of its former value. Where our lines give trouble which cannot be eliminated we have offered to purchase the filter for the customer and sell it to him at wholesale if he is interested enough to purchase it at that price (\$4.50). We have been installing the filters for these customers. There will be another bulletin soon relative to this trouble along 33 KV lines.

This filter should use no power and should not turn the meter. The spark which appears when disconnecting the device is caused by condenser changing current which is 90 degrees out of phase with the voltage, thus the "big spark and no power." The more of these filters on the system the better the power factor secured.

Yours very truly,
IOWA-NEBRASKA LIGHT & POWER CO.
By B. E. Ellsworth,
Assistant Engineer.

TOBE INTERFERENCE MANUAL SELL-OUT

The first edition of the Tobe Manual, "Radio Noises and Their Cure" is already exhausted. The second edition, greatly enlarged, is now available. Twenty-five cents, prepaid.



NOTHING CAN STOP THEM!

Ice and snow hold no perils for Tobe interference engineers. Picture shows M. E. Simmons, of the Tobe staff, on a field trip in Negaunee, Michigan. We assume from the photo that they must have had a snowstorm up there. But the work of interference location goes on, no matter what the weather.

TOBE ENGINEERING SERVICE MEETS WIDESPREAD APPROVAL

(Continued from Page 53)

been promised that radio interference, from which it has been suffering helplessly for years, is shortly to be alleviated.

Perhaps, you, the reader, live in such a town. If so, have you ever stopped to imagine how you would feel under those conditions?

Word is received a week or so beforehand that the engineer is on his way. In no time homes are buzzing with talk about the relief which is in sight. Commuters on trains and housewives in stores vie with each other in recounting the intensity of their interference. "Why, when the noise starts, I just have to turn the set off; it's impossible to hear a

thing." "Well, I really think my noise is even worse, because it isn't on all the time, and I just begin to get hope when in it blasts just in time to spoil the best program of the evening."

When the engineer arrives a committee is on hand to greet him. Who can blame them if the individual members exaggerate their own woes a little in the hope that *their* home may be chosen as a center from which to clear up the town?

The aid of local trouble-shooters is enlisted. The Tobe engineer is bombarded with professional questions, "How sensitive do you think a good interference set ought to be?" "Do you follow the power lines or do you track it by its intensity in the open?" "What kind of trouble-shooter do you use?" "How do you filter a diathermy machine?"

The engineer sets about making a general survey of the possible interference causes. Sometimes, for these citizens are wary birds, they may try to trip him up with a sudden test. Who can blame them if they are from Missouri? One plant owner, skeptical of the trouble-finding set which the engineer was using, confronted him with some six motors, all running. "Which one of these is causing the noise?" he asked. The engineer ran his antenna-wand over the fields of the motors. "These three," he said, "are sparking, the others are not." Sure enough the others were of the repulsion-starting induction-running type, and in good condition, so that they caused no interference. The wily citizen had wondered whether the Tobe engineer would pick out only one motor, although he knew that three of the motors were sparking.

After a while the main sources of potential trouble are located. Perhaps certain apparatus is shut down. Listeners tuned to local stations whose sets barely ride above the noise level suddenly hear the noise stop and the signal come in full and clear. "Why," they say, incredulously, "it's stopped!" Who could



SHE'S GETTIN' HOTTER!

You radio listeners sitting comfortably at home in your warm living rooms, give a thought to the radio service men and trouble-shooters who must brave the snow and drifts to hunt down interference in order that you may have clear, untroubled reception. The picture was taken in Negaunee, Michigan, where the trouble-shooter shown is working with M. E. Simmons, Tobe engineer, in filtering the entire community.

have told that the set sounded so fine? Why, when the noise was cut out, you'd almost swear the singer was right in the same room.

Of course there are always a few oil burners which radiate for a considerable distance. Certain types with steady spark ignition cause real trouble to near-by listeners. Perhaps some citizen is surprised to be told that his trouble lies in his own cellar. When he learns that his burner is the cause not only of his own difficulties, but of his neighbor's as well, he inquires the cost of a Filterette to stop the noise. What, only fifteen dollars? Why, this set cost me many times that, and I might as well not have it. If the Filterette will allow me to use my set, it's more than worth the money, really, for it protects my investment. Insurance, you might call it.

In a short while the engineer's report is completed. Much of the trouble has been due to old, worn equipment, which, having been replaced, no longer causes trouble. The local service men and trouble-shooters have picked up the latest tricks and now speak confidently of "intensity," "wave fluctuation" and "inductive-capacitive" filters.

An amusing case was recorded where the engineer found radio interference being caused by the operation of a still in the neighborhood. We gave him our word we wouldn't tell what happened after that.

Is *your* town suffering from radio interference? It doesn't cost much to engage an expert. Twenty dollars per day will bring a Tobe engineer to almost any community on the eastern seaboard. And, believe us, you have never heard that radio set of yours do its stuff until the noise level in your town has been reduced sharply by modern, efficient methods of radio interference elimination—Tobe methods!

COUPON

TOBE DEUTSCHMANN CORPORATION,
Filterette Division, Canton, Mass.

I herewith apply for exclusive franchise for the following territory on your complete line of Tobe Filterettes. Kindly furnish me promptly full details of cooperation furnished such dealers.

Electrical dealer?

Radio dealer?

Other business?

Name

Address

City and State.....

Who Makes It

Classified Index of Radio Equipment and Its Manufacturers Corrected Monthly

Key to Letters and Numbers

- A-1 The Abox Co., 215 N. Michigan Avenue, Chicago, Ill.
A-2 The A-C Dayton Co., 300 E. First St., Dayton, Ohio.
A-3 Accusti-Cone Laboratories, 1 N. Seventh, Philadelphia, Pa.
A-4 Acme Apparatus Corp., 37 Osborn St., Cambridge, Mass.
A-5 The Acme Elec. & Mfg. Co., 1444 Hamilton Ave., Cleveland, Ohio.
A-6 Acme Products Co., 22 Elkins St., South Boston, Mass.
A-7 The Acme Wire Co., New Haven, Conn.
A-8 The Actron Corp., 123 N. Sangamon St., Chicago, Ill.
A-9 Adler Mfg. Co., 29th and Chestnut Sts., Louisville, Ky.
A-10 Adrola Corp., Fort Jefferson, N. Y.
A-11 Advance Electric Co., 1260 W. 2nd St., Los Angeles, Calif.
A-12 Aerial Insulator Co., Inc., 429 N. Washington St., Green Bay, Wis.
A-13 Aero Products, Inc., 4611 E. Ravenswood Ave., Chicago, Ill.
A-14 Aerovox Wireless Corp., 70 Washington St., Brooklyn, N. Y.
A-15 Ajax Electric Specialty Co., 1926 Chestnut, St. Louis, Mo.
A-16 Akron Porcelain Co., Akron, Ohio.
A-17 Alden Mfg. Co., Brockton, Mass.
A-18 Aladdin Mfg. Co., 602 E. 18th St., Muncie, Ind.
A-19 All-American Mohawk Corp., 4201 Belmont Ave., Chicago, Ill.
A-20 Allan Mfg. Co., 102 N. Fifth St., Harrison, N. J.
A-21 Allen-Bradley Co., 494 Reed St., Milwaukee, Wis.
A-22 Allen-Hough-Carryola Co., 279 Walker St., Milwaukee, Wis.
A-23 Aluminum Co. of America, 2400 Oliver Bldg., Pittsburgh, Pa.
A-24 American Bosch Magneto Corp., Springfield, Mass.
A-25 American Electric Co., 64th and State St., Chicago, Ill.
A-26 American Hard Rubber Co., 11 Mercer St., New York City.
A-27 American Lava Corp., 29 William St., Chattanooga, Tenn.
A-28 American Porcelain Co., Akron, Ohio.
A-29 American Radio Hardware Co., 135 Grand, New York City.
A-30 American Reproducer Corp., 1200 Summit St., Jersey City, N. J.
A-31 American Transformer Co., 178 Emmet St., Newark, N. J.
A-32 Amoroso Mfg. Co., 60 India St., Boston, Mass.
A-33 Amplex Instrument Labs., 132 W. 21st St., New York City.
A-34 Amplicon Corp. of America, 133 W. 21st St., New York City.
A-35 The Amrad Corp., 205 College Ave., Medford, Mass.
A-36 Anaconda Wire & Cable Co., 111 W. Washington St., Chicago, Ill.
A-37 F. A. D. Andrea, Inc., Jackson, Orchard and Queen Sts., Long Island City, New York.
A-38 Anylite Electric Co., Fort Wayne, Ind.
A-39 Arc-Aerial Inc., Green Bay, Wis.
A-40 Arco Electrical Corp., 207 E. Columbia St., Fort Wayne, Ind.
A-41 Arcturus Radio Tube Co., 260 Sherman Ave., Newark, N. J.
A-42 Argon Tube Corp., 102 Livingston, Newark, New Jersey.
A-43 Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
A-44 Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa.
A-45 Arnold Electric Co., Racine, Wis.
A-46 Aston Cabinet Mfrs., 1223 W. Lake St., Chicago, Ill.
A-47 Atlantic Electric Lamp Co., Salem, Mass.
A-48 Atlas Radio Corp., Peabody, Mass.
A-49 Atwater Kent Mfg. Co., 4700 Wissahickon Ave., Philadelphia, Pa.
A-50 Auburn Button Wks., Inc., Auburn, N. Y.
A-51 Audak Co., 565 Fifth Ave., New York City.
A-52 Audiola Radio Corp., 430 S. Green, Chicago, Ill.
A-53 The D. L. Auld Co., 5th Ave. and 5th St., Columbus, Ohio.
A-54 Automatic Radio Mfg. Co., 112 Canal St., Boston, Mass.
A-55 Automobile Radio Corp., 1475 E. Grand Blvd., Detroit, Mich.

- A-56 American Battery Corp., 2053 N. Racine Ave., Chicago, Ill.
A-57 American Apparatus Co., Richmond, Ind.
A-58 American Storage Battery Co., 128 Dartmouth, Boston, Mass.
A-59 American Piezo Supply Co., 1101 Huron Bldg., Kansas City, Mo.
A-60 Amperite Corp., 561 Broadway, New York City.
A-61 Alpha Wire Corp., 520 Broadway, N. Y. C.
A-62 Bailey-Cole Electrical Co., 1341 Flatbush Ave., Brooklyn, N. Y.
A-63 Baldor Radio Corp., 80 4th Ave., N. Y. C.
A-64 Nathaniel Baldwin, Inc., 3474 S. 23rd St., E., Salt Lake City, Utah.
B-1 Balkei Radio Co., North Chicago, Ill.
B-2 Barkelew Electric Mfg. Co., Middletown, Ohio.
B-3 The Wallace Barnes Co., Box 506, Bristol, Conn.
B-4 Bassett Metal Goods Co., Derby, Conn.
B-5 Bastian Bros. Co., 1600 Clinton Ave. N., Rochester, N. Y.
B-6 Batteryless Radio Corp., 116 W. 65th St., New York City.
B-7 Beaver Manufacturing Co., 625 N. 3rd St., Newark, N. J.
B-8 Belden Mfg. Co., 2300 S. Western Ave., Chicago, Ill.
B-9 Benjamin Electric Mfg. Co., Des Plaines, Ill.
B-10 Benwood-Linze Co., 19th and Washington Ave., St. Louis, Mo.
B-11 Best Mfg. Co., 1200 Grove St., Irvington, N. J.
B-12 Birnbach Radio Co., 254 W. 31st St., N. Y. C.
B-13 Bisby Mfg. Co., 59 Warren, New York City.
B-14 Bodine Electric Co., 2254 W. Ohio St., Chicago, Ill.
B-15 Bond Electric Corp., Jersey City, N. J.
B-16 Bosworth Electric Mfg. Co., Main and Lexington Ave., Norwood, Cincinnati, Ohio.
B-17 L. S. Brach Mfg. Corp., 127 Sussex Ave., Newark, N. J.
B-18 The Brandes Corp., 200 Mt. Pleasant Ave., Newark, N. J.
B-19 Braun Co. W. C., 551 Randolph, Chicago, Ill.
B-20 Bremer-Tully Mfg. Co., 656 Washington Blvd., Chicago, Ill.
B-21 Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
B-22 Browne & Caine, Inc., 2317 Calumet Ave., Chicago, Ill.
B-23 Browning-Drake Corp., Calvary St., Waltham, Mass.
B-24 Brunswick-Balke-Collender Co., 623 S. Wabash Ave., Chicago, Ill.
B-25 Buckeye Electric Mfrs., Gladwin, Mich.
B-26 The Buckingham Radio Corp., 440 W. Superior St., Chicago, Ill.
B-27 Bud Radio, Inc., 2744 Cedar, Cleveland, O.
B-28 Burgess Battery Co., Harris Trust Bldg., Chicago, Ill.
B-29 Bush & Lane Piano Co., Holland, Mich.
B-30 Boudette Mfg. Co., 67 Crescent Ave., Chelsea, Mass.
B-31 Bright Star Battery Co., Hoboken, N. J.
B-32 Borden Electric Co., 480 Broad, Newark, N. J.
B-33 Bernard Electrical Mfg. Co., 36 Flatbush Ave., Brooklyn, N. Y.
B-34 Broadcaster's Service Bureau, San Jose, Cal.
B-35 Baritone Mfg. Co., 844 W. Jackson, Chicago.
B-36 Bethesda Crystal Lab., Bethesda, Md.
B-37 Barrett Mfg. Co., 3712 San Pablo Ave., Oakland, Calif.
C-1 Cable Radio Tube Corp., 84 N. Ninth St., Brooklyn, N. Y.
C-2 Candy & Co., Inc., 2515 W. 35th St., Chicago.
C-3 Cannon & Miller Co., Inc., Springwater, N. Y.
C-4 The Capehart Corp., Fort Wayne, Ind.
C-5 Carborundum Co., Niagara Falls, N. Y.
C-6 Cardwell Mfg. Corp., 81 Prospect St., Brooklyn, New York.
C-7 Carter Radio Co., 407 S. Aberdeen St., Chicago, Ill.
C-8 The Caswell-Runyan Co., Huntington, Ind.
C-9 CeCo Mfg. Co., Inc., 702 Eddy St., Providence, Rhode Island.
C-10 Central Radio Corp., Beloit, Wis.
C-11 Central Radio Labs., 16 Keefe Ave., Milwaukee, Wis.
C-12 Champion Radio Works, Inc., 140 Pine St., Danvers, Mass.
C-13 Chicago Transformer Corp., 4541 Ravenswood Ave., Chicago, Ill.
C-14 Chillocothe Furniture Co., 1 Cherry St., Chillocothe, Mo.
C-15 Circle F. Mfg. Co., Trenton, N. J.
C-16 Clarostat Mfg. Co., Inc., 285 N. Sixth St., Brooklyn, N. Y.

Items

- ADAPTERS, Tube**
A-17, C-7, C-33, F-21, G-9, I-4, L-10, M-5, P-1, R-11, R-17, S-22, W-25.
- AERIAL EQUIPMENT, Leads, Lightning Arresters, Leptins, Mastarms, Plugs, Poles**
A-15, A-30, A-33, A-40, A-46, B-7, B-11, B-16, B-17, B-20, B-32, C-15, C-16, C-30, D-8, D-14, D-15, E-1, E-20, F-11, F-14, G-1, G-9, G-21, G-25, H-13, H-24, I-4, L-9, M-14, M-17, N-5, S-11, S-14, S-22, S-42, T-17, T-18, U-6, W-13, W-19, Y-1.
- AERIAL INSULATORS**
A-12, A-15, A-16, A-26, A-27, A-29, A-46, B-5, B-20, C-27, C-29, F-13, F-15, G-9, H-6, H-13, I-3, I-4, J-3, K-13, L-9, M-8, P-8, P-18, P-23, R-31, S-22, S-27, T-15, U-4, U-5, W-19.
- ALUMINUM, Sheet, rod & tube**
A-23.
- AMPLIFIERS, Audio**
A-1, A-17, A-41, A-56, B-21, B-43, C-19, F-2, F-6, G-7, G-14, G-19, K-2, K-16, L-10, M-4, M-15, N-3, O-3, O-4, P-1, P-13, P-20, R-3, R-12, R-32, S-1, S-15, S-16, S-21, S-31, T-7, W-8.
- BATTERIES, Dry**
B-1, B-18, B-34, B-37, D-7, F-18, G-4, N-2, S-17, S-44.
- BATTERIES, Storage**
A-58, B-30, E-12, G-13, G-18, G-27, P-7, S-17, S-44, U-15, W-15.
- BATTERY CHARGERS**
A-19, A-41, A-58, C-19, D-16, E-11, E-15, E-24, G-6, G-15, K-15, K-19, P-7, S-45, S-47, T-9, T-12, U-16, W-2, W-11, W-24.
- BATTERY CHARGING RELAYS**
A-19, A-41, C-37, C-40, E-25, F-23, H-6, H-13, L-11, R-26, T-5, U-5, W-2, Y-2.
- BATTERY ELIMINATORS (For Plate Current Supply)**
A-19, A-40, A-60, A-61, B-13, B-18, B-21, B-39, C-33, C-39, D-5, E-10, E-15, E-25, F-2, F-16, F-23, G-7, G-22, G-29, K-15, K-16, K-19, K-20, M-19, N-3, P-1, P-7, P-13, P-20, P-22, P-29, S-15, S-17, S-35, S-47, T-9, T-13, W-7, W-15.
- BATTERY POWER UNITS, Combination**
A-41, A-61, C-41, D-13, D-16, E-11, F-23, G-7, G-18, G-23, H-7, K-10, K-19, P-7, R-8, S-17, S-46, S-47, T-10, V-6, W-15, W-24.
- BINDING POSTS**
A-3, A-15, A-23, A-52, B-6, C-16, E-4, E-10, F-1, F-7, G-9, G-14, I-4, K-4, P-13, P-30, R-14, S-22, W-5, X-1.
- BRACKETS, Sub Panel**
A-13, B-12, E-8, E-10, F-21, I-4, K-2, P-13, S-15, S-22.
- BROADCASTING EQUIPMENT**
B-40, B-43, E-26, E-28, F-6, F-21, G-6, G-9, G-20, H-14, K-3, L-3, R-13, R-29, S-1, S-17, T-7, W-11.
- CABINETS**
A-9, A-48, A-55, B-21, B-29, B-31, B-35, C-8, C-14, C-21, C-43, D-17, E-3, E-17, E-21, E-22, F-5, F-9, F-17, G-24, H-2, H-20, K-14, K-16, L-6, L-7, M-9, N-3, P-12, P-15, P-17, R-5, R-6, R-10, R-18, S-13, S-19, S-26, S-30, S-33, S-34, S-38, U-1, W-4, W-6, W-23, W-26.

Tell them you saw it in RADIO

- J-17 Colonial Radio Corp., 25 Wilbur Ave., Long Island City, N. Y.
- J-18 Columbia Phonograph Co., Inc., 1819 Broadway, New York City.
- C-19 Columbia Radio Corp., 711 W. Lake St., Chicago, Ill.
- C-19A Condenser Corporation of America, 259 Cornellson Ave., Jersey City, N. J.
- C-21 The Conner Furniture Co., 5th and Oak St., New Albany, Ind.
- C-22 Consolidated Elec. Lamp Co., 88 Holten, Danvers, Mass.
- C-23 Consolidated Vacuum Tube Corp., 22 East 21st Street, New York City.
- C-24 Continental-Diamond Fibre Co., 1150 W. 3rd St., Cleveland, Ohio.
- C-25 Continental Electric and Mfg. Co., 1890 East Fortieth, Cleveland, Ohio.
- C-26 Continental Radio Corp., Fort Wayne, Ind.
- C-27 Cook Porcelain Ins. Corp., Cambridge, Ohio.
- C-28 Cornell Elec. Mfg. Co., Rawson St. and Anable Ave., Long Island City, N. Y.
- C-29 Corning Glass Wks., Corning, N. Y.
- C-30 Cornish Wire Co., Inc., 30 Church St., N. Y. C.
- C-31 Crescent Braid Co., Providence, R. I.
- C-32 Cresradio Corp., 166 Jamaica Ave., Jamaica, New York.
- C-33 Crosley Radio Corp., 3401 Colerain Ave., Cincinnati, Ohio.
- C-34 Crowe Name Plate & Mfg. Co., 1749 Grace St., Chicago, Ill.
- C-35 E. T. Cunningham, Inc., 370 Seventh Ave., New York City.
- C-36 The Cutler-Hammer Mfg. Co., 12th and St. Paul Ave., Milwaukee, Wis.
- C-37 Connecticut Electric Mfg. Co., Bridgeport, Conn.
- C-38 Crouse-Hind Co., Syracuse, N. Y.
- C-39 Cole Sales Co., 36 Pearl, Hartford, Conn.
- C-40 Connecticut Telephone & Electric Co., Meriden, Conn.
- C-41 Cooper Corp., 8th and Main Sts., Cincinnati, O.
- C-42 Condenser Corp. of America, 259 Cornellson Ave., Jersey City, N. J.
- C-43 Cary Cabinet Corp., 1427 N. 15th St., St. Louis, Mo.
- C-44 Concourse Elec. Co., 294 E. 137th St., N. Y. C.
- D-2 Day-Fan Electric Co., 1320 Wisconsin Blvd., Dayton, Ohio.
- D-3 De Forest Radio Co., Central and Franklin Sts., Jersey City, N. J.
- D-4 Dejur-Amsco Corp., 418 Broome St., N. Y. C.
- D-5 Demco Products Co., 1521 Market St., Wheeling, W. Va.
- D-6 Diamond Appliance Co., South Bend, Ind.
- D-7 Diamond Electric Corp., 780 Frelinghuysen Ave., Newark, N. J.
- D-9 Diamond Vacuum Products Co., 4049 Diversey Ave., Chicago, Ill.
- D-10 Diehl Mfg. Co., Elizabethport, N. J.
- D-11 Dongan Electric Mfg. Co., 3001 Franklin St., Detroit, Mich.
- D-12 Donle-Bristol Corp., Meriden, Conn.
- D-13 Dooley Rectifier Co., Wheeling, W. Va.
- D-14 Dubilier Condenser Corp., 342 Madison Ave., New York City.
- D-15 Dudlo Mfg. Co., Fort Wayne, Ind.
- D-16 D. A. Radio Co., 30 Hollister St., Buffalo, N. Y.
- D-17 Davis Industries, Inc., 314 W. 43rd St., Chicago, Ill.
- D-18 Duovac Radio Tube Corp., 360 Furman, Brooklyn, N. Y.
- D-19 Dilco Electric Corp., Harrison, N. J.
- E-1 Eagle Electric Mfg. Co., 59 Hall St., Brooklyn, N. Y.
- E-2 Easton Coil Co., Keplers, Pa.
- E-3 Ebert Furniture Co., Red Lion, Pa.
- E-4 The H. H. Eby Mfg. Co., Inc., 4710 Stenton Ave., Philadelphia, Pa.
- E-5 Thomas A. Edison, Inc., Orange, N. J.
- E-7 The Ekko Co., 111 W. Monroe St., Chicago, Ill.
- E-8 Electrad, Inc., 175 Varick St., New York City.
- E-9 Electrical Products Mfg. Co., Providence, R. I.
- E-10 Electrical Research Labs., Inc., 1731 W. 22nd St., Chicago, Ill.
- E-11 Electric Autolite Co., Toledo, Ohio.
- E-12 Electric Storage Battery Co., Philadelphia, Pa.
- E-13 Electron Relay Co., 83 Fourth Ave., N. Y. C.
- E-14 Elgin Cabinet Corp., Union and W. Chicago Sts., Elgin, Ill.
- E-15 Elkon, Inc., 200 Fox Island Road, Port Chester, New York.
- E-16 Emerson Radio & Phonograph Corp., 635 Sixth Ave., New York City.
- E-17 The Empire, Ltd., 11th and Harrison, Rockford, Ill.
- E-18 Empire Steel Corp., Mansfield, Ohio.
- E-20 Essensee Radio Devices Co., 2016 W. Lake St., Chicago, Ill.
- E-21 Eureka Talking Machine Corp., 5939 S. Lowe Ave., Chicago, Ill.
- E-22 Excello Products Corp., 4820 W. 16th St., Cicero, Ill.
- E-23 Electrical Specialty Co., 211 South St., Stamford, Conn.
- E-24 Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, Ohio.
- E-25 C. A. Earl, 122 E. 42nd St., New York City.
- E-26 Electro Acoustics Products Co., 55 E. Wacker Drive, Chicago, Ill.
- E-27 Eastern Coil Co., 56 Christopher Ave., Brooklyn, N. Y.
- E-28 Ellis Electrical Lab., 333 W. Madison St., Chicago, Ill.
- F-1 Fahnestock Electric Co., East Ave. and 8th St., Long Island City, N. Y.
- F-2 Farrand Mfg. Co., Inc., Metropolitan Bldg., Long Island City, N. Y.
- F-3 John E. Fast & Co., 3982 Barry Ave., Chicago, Ill.
- F-5 Federal Wood Products Corp., 206 Lexington Ave., New York City.
- F-6 Ferranti, Inc., 130 W. 42nd St., New York City.
- F-7 Fibroc Insulation Co., Valparaiso, Ind.
- F-8 Fidelity Radio Corp., Walker Bank Bldg., Salt Lake City, Utah.
- F-9 Robert Findlay Mfg. Co., Inc., 1027 Metropolitan Ave., Brooklyn, N. Y.
- F-10 Flisch Radio Co., 1283 Hoe Ave., New York City.
- F-11 Fishwick Radio Co., 133 Central Parkway, Cincinnati, Ohio.
- F-12 A. M. Flechtheim & Co., Inc., 136 Liberty St., New York City.
- F-13 M. M. Fleron & Son, Trenton, N. J.
- F-14 Foote-Pierson & Co., 75 Hudson, Newark, N. J.
- F-15 The Formica Insulation Co., Cincinnati, Ohio.
- F-16 Freed-Eisemann Radio Corp., Junius St. and Liberty Ave., Brooklyn, N. Y.
- F-17 Jesse French & Sons Piano Co., New Castle, Ind.
- F-18 French Battery Co., 30 N. Michigan Ave., Chicago, Ill.
- F-20 S. Freshman Co., 225 N. Michigan Ave., Chicago, Ill.
- F-21 Herbert H. Frost, Inc., 1124 W. Beardsley Ave., Elkhart, Ind.
- F-22 Fairmount Electric & Mfg. Co., 59th and Woodland Ave., Philadelphia, Pa.
- F-23 France Mfg. Co., 10325 Berea Rd., Cleveland, Ohio.
- F-24 Fansteel Radio Co., No. Chicago, Ill.
- G-1 Gardner & Hepburn, Philadelphia, Pa.
- G-2 Gardner Electric Mfg. Co., Oakland, Calif.
- G-3 Gearhart Radio Co., Fresno, Calif.
- G-4 General Dry Batteries, Inc., 13100 Athens Ave., Cleveland, Ohio.
- G-5 General Coil Co., Weymouth, Mass.
- G-6 General Electric Co., Schenectady, N. Y.
- G-7 General Instrument Corp., 225 Varick St., New York City.
- G-8 General Plastics, Inc., Walck Road, North Tonawanda, N. Y.
- G-9 General Radio Co., 30 State St., Cambridge, Mass.
- G-10 General Transformer Corp., 910 W. Jackson Blvd., Chicago, Ill.
- G-11 Gilby Wire Co., 150 Riverside Ave., Newark, New Jersey.
- G-12 Gilfillan Radio Corp., 1815 Venice Blvd., Los Angeles, Calif.
- G-13 Globe Union Mfg. Co., 14 Keefe Ave., Milwaukee, Wisconsin.
- G-14 Globe Technolean Corp., Reading, Mass.
- G-15 Gold Seal Electrical Co., Inc., 250 Park Ave., New York City.
- G-16 The L. S. Gordon Co., 1800 Montrose Ave., Chicago, Ill.
- G-17 Gossard Radio & Wire Co., Belvidere, Ill.
- G-18 Gould Storage Battery Co., 250 Park Ave., New York City.
- G-19 Gray & Danielson Mfg. Co., 260 First St., San Francisco, Calif.
- G-20 Graybar Electric Co., Lexington Ave. and 43rd St., New York City.
- G-21 Gray Products, Inc., Poughkeepsie, N. Y.
- G-22 A. H. Grebe & Co., Inc., 109 W. 57th St., New York City.
- G-23 Grigsby-Grunow Co., 5891 W. Dickens Ave., Chicago, Ill.
- G-24 Gulbrandsen Co., 3232 W. Chicago Ave., Chicago, Ill.
- G-25 Gustin-Baker Mfg. Co., Kansas City, Mo.
- G-26 Guthrie Co., Elyria, Ohio.
- G-27 General Lead Battery Co., 1 Lister Ave., Newark, N. J.
- G-28 Gillette-Vibber Co., New London, Conn.
- G-29 General Engineering Corp., Charlotte, Mich.
- G-30 Frank Greben, 1927 So. Peoria St., Chicago, Ill.
- G-31 Gibraltar Radio Supply Co., 5 Union Square, N. Y. C.
- H-1 Halldorson Co., 4500 Ravenswood Ave., Chicago, Ill.
- H-2 Hamilton Mfg. Co., Two Rivers, Wis.
- H-3 Hammarlund Mfg. Co., Inc., 424 W. 33rd St., New York City.
- H-4 Hardwick, Hindle, Inc., 215 Emmet St., Newark, N. J.
- H-5 Kenneth Harkness, Inc., 72 Cortlandt, New York City.
- H-6 Hart & Hegemann, Hartford, Conn.
- H-7 Hartford Battery Mfg. Co., 47 W. 63rd St., New York City.
- H-8 Hartford Metal Products Co., Hartford, Conn.
- H-9 Hartman Electrical Mfg. Co., 31 E. 5th St., Mansfield, Ohio.
- H-10 Harvey Hubbell Co., Bridgeport, Conn.
- H-12 Herald Electric Co., 35 East End Ave., New York City.
- H-13 Heinemann Electric Co., Trenton, N. J.
- H-14 Heintz & Kaufman, 219 Natoma St., San Francisco, Calif.
- H-15 Hickok Electrical Instrument Co., 10514 Dupont, Cleveland, Ohio.
- H-16 High Frequency Labs., 28 N. Sheldon St., Chicago, Ill.
- H-17 The Holyoke Co., Inc., 621 Broadway, N. Y. C.
- H-18 Howard Radio Co., South Haven, Mich.
- H-19 Hoyt Electrical Instrument Works, 857 Boylston St., Boston, Mass.
- CABLE, CABLES AND CONNECTING WIRE**
A-7, A-37, A-64, B-11, B-15, R-20, C-19, C-30, C-31, D-15, E-1, G-11, G-17, H-17, I-4, I-6, K-3, N-9, P-2, P-16, R-25.
- CLAMPS, Ground**
A-46, A-59, B-6, B-11, B-20, B-38, C-16, C-37, C-38, E-1, E-7, F-1, F-21, F-22, G-28, H-6, H-13, I-4, M-14, M-17, M-23, R-23, T-22, Y-1.
- CLIPS**
A-15, A-17, B-6, F-1, K-15, L-10, M-14, M-17, M-23, N-3, P-8, W-5.
- COILS, A-F Choke**
A-4, A-7, A-41, C-7, C-13, C-44, D-11, D-15, E-2, E-15, F-6, F-23, G-3, G-5, G-7, G-9, G-10, G-19, H-1, J-2, K-9, M-17, N-3, P-13, P-16, P-22, P-24, R-3, R-19, R-20, S-1, S-4, S-15, T-13.
- COILS, R-F Choke**
A-4, A-13, C-44, D-15, E-2, E-10, F-23, G-5, G-9, G-19, H-3, H-5, K-2, M-17, N-3, P-13, P-24, R-3, R-19, R-20, S-1, S-15, S-50, T-24.
- COILS, R-F**
A-4, A-5, A-6, A-13, B-12, B-15, B-17, B-23, B-30, C-10, C-19, C-44, E-2, E-10, E-27, F-23, G-3, G-9, G-19, H-3, H-5, K-2, K-9, M-4, N-3, P-1, P-13, P-21, P-24, R-14, R-20, R-29, S-5, S-15, S-50, T-21, T-24, V-5.
- COIL WINDING MACHINES**
B-11, H-1, M-14.
- CONDENSERS, Fixed Mica**
A-14, A-34, C-33, C-42, D-14, E-8, E-10, F-21, M-10, M-17, P-13, P-16, P-19, S-2, W-17, X-1.
- CONDENSERS, Fixed Paper**
A-7, A-14, B-26, C-28, C-30, C-42, C-44, D-14, E-8, F-3, F-6, F-12, G-9, I-2, K-3, K-15, L-10, M-10, M-17, F-13, P-16, P-19, P-20, R-4, S-23, T-9, W-17.
- CONDENSERS, Electrolytic**
A-14, A-36, C-33, D-14, E-15, I-1, M-24, P-19, P-22.
- CONDENSERS, Variable**
A-13, C-6, C-33, D-4, E-10, G-1, G-3, G-7, G-9, G-19, H-3, H-14, K-2, L-3, M-17, N-3, P-1, P-8, P-13, P-21, P-24, R-7, R-14, R-29, S-6, S-15, U-11.
- CONDENSER SHAFTS AND COUPLERS**
H-3, N-3, P-13, P-21, S-6.
- CRYSTALS, PIEZOELECTRIC**
A-62, B-42, R-28.
- DIALS**
A-17, A-26, A-52, B-24, C-33, C-34, D-4, E-10, G-9, G-19, H-3, I-4, K-2, K-17, M-5, N-3, N-13, P-1, P-8, P-13, P-14, P-21, P-24, R-2, R-14, S-6, S-15, S-22, T-21, W-5.
- DIAL LIGHTS**
B-10, M-5, M-21, N-2, N-3, P-13, P-24, Y-2.
- FIBRE, Vulcanized sheet, rod & tube**
C-24, I-4, N-6, P-13, S-21.
- FILAMENT BALLASTS**
A-6, L-10, M-17, P-13, R-2.
- GRID LEAKS, Fixed**
A-14, A-21, C-5, D-14, E-1, E-8, H-4, I-5, L-10, M-10, M-17, N-3, P-1, P-8, P-13, P-16, S-48, W-2.
- GRID LEAKS, Variable**
A-21, A-34, C-11, C-16, C-36, E-1, E-8, G-1, H-4, M-17, R-9, W-2.
- GRID LEAK HOLDERS (See MOUNTINGS, Resistor)**
- HEADSETS**
A-15, A-31, B-3, B-21, C-3, F-10, F-21, G-20, K-16, P-1, P-8, T-12.
- INSULATION, Composition**
A-7, A-17, A-26, B-31, C-2, C-24, F-15, G-8, I-1, I-4, K-17, L-9, M-11, N-6, P-14, S-7, S-22, W-5.
- INSULATORS (See AERIAL INSULATORS)**



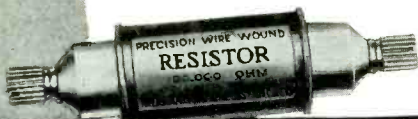
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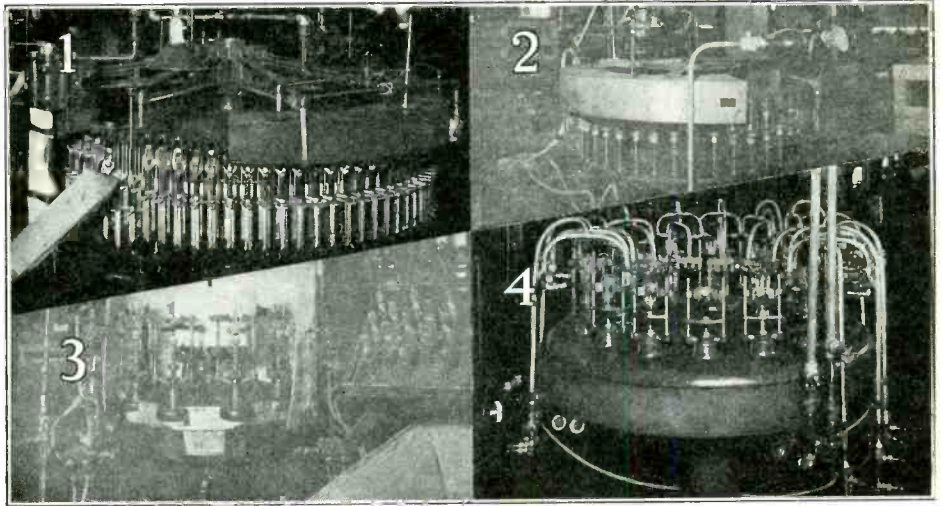


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2. Old basing machine—capacity 300 tubes an hour.
3. Old sealing machine—capacity 300 tubes an hour.
4. New sealing machine—capacity 2,000 tubes an hour.

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The above illustrations show only two of the several new automatic high-speed machines developed and patented by the De Forest Radio Company.

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Your customers will appreciate this saving and when they equip their set completely with the De Forest perfected Audions, they will note the difference right from the start.

Type	Purpose	Old Price	New Price
410	Power Amplifier	\$9.00	\$8.00
422	D. C. Screen Grid Amp.	4.50	4.00
424	A. C. Screen Grid Amp.	4.00	3.00
427	A. C. Detector Amplifier	2.50	2.00
445	A. C. Power Amplifier	3.50	2.50
480	Full-Wave Rectifier	3.00	2.50
481	Half-Wave Rectifier	7.25	6.50
450	Power Amplifier	11.00	10.00

de Forest
AUDIONS

De Forest Radio Company
Passaic, New Jersey

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- H-20** H. L. Hubbell, 59 Market Ave., N. W., Grand Rapids, Mich.
- H-21** Hyatt Electric Corp., 836 N. Wells St., Chicago, Ill.
- H-22** Hygrade Lamp Co., 60 Boston, Salem, Mass.
- H-23** Hytron Corp., Salem, Mass.
- H-24** Hope Webbing Co., Providence, R. I.
- H-25** Hilet Eng. Co., Orange, N. J.
- I-1** Imperial Molded Products Corp., 2925 W. Harrison St., Chicago, Ill.
- I-2** Igrad Condenser & Mfg. Co., 4322 Lake Ave., Rochester, N. Y.
- I-3** Insulation Mfg. Co., Herkimer & N. Y. Aves., Brooklyn, N. Y.
- I-4** Insuline Corp. of America, 78 Cortlandt St., New York City.
- I-5** International Resistance Co., 2006 Chestnut St., Philadelphia, Pa.
- I-6** Inca Mfg. Co., Fort Wayne, Ind.
- J-1** Jaeger Research Labs., 270 Park Ave., Weehawken, N. J.
- J-2** Jefferson Electric Co., 1500 S. Lavin St., Chicago, Ill.
- J-3** Jenkins Glass Co., Kokomo, Ind.
- J-4** Jenkins Television Corp., 346 Claremont Ave., Jersey City, N. Y.
- J-5** Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago, Ill.
- J-6** Jewell Electrical Instrument Co., 1640 Walnut St., Chicago, Ill.
- J-7** Howard B. Jones, 2300 Wabansia Ave., Chicago, Ill.
- J-8** Jones-Motrola Sales Co., 370 Gerard Ave., New York City.
- J-9** Jenkins & Adair, Inc., 3333 Belmont Ave., Chicago, Ill.
- K-1** F. Kallus Mfg. Co., 104 Court St., Hoboken, N. J.
- K-2** Karas Electric Co., 4040 N. Rockwell St., Chicago, Ill.
- K-3** Kellogg Switchboard & Supply Co., 1066 W. Adams St., Chicago, Ill.
- K-4** Kendrick & Davis Co., Lebanon, N. H.
- K-5** Colin B. Kennedy Corp., 212 W. Ewing Ave., South Bend, Ind.
- K-6** The Ken-Rad Corp., Owensboro, Ky.
- K-7** Kersten Radio Equipment, Inc., 1415 Fulford St., Kalamazoo, Mich.
- K-8** Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.
- K-9** Keystone Radio Labs., Inc., 129 N. Jefferson St., Chicago, Ill.
- K-10** Kimley Electric Co., 2665 Main St., Buffalo, N. Y.
- K-11** King Mfg. Corp., 254 Rano St., Buffalo, N. Y.
- K-13** Knox Porcelain Corp., Knoxville, Tenn.
- K-14** The Knoxville Table & Chair Co., P. O. Box 1087, Knoxville, Tenn.
- K-15** The Kodel Electric & Mfg. Co., 507 E. Pearl St., Cincinnati, Ohio.
- K-16** Kolster Radio Corp., 200 Mt. Pleasant Ave., Newark, N. J.
- K-17** The Kurz Kasch Co., 1415 S. Broadway, Dayton, Ohio.
- K-18** Kwik Test Radio Labs., 4464 Cass Ave., Detroit, Mich.
- K-19** Kato Co., 727 So. Front, Mankato, Minn.
- K-20** Knapp Electric, Inc., Port Chester, N. Y.
- K-22** K. & H. Electric Corp., 68 Springfield Ave., Newark, N. J.
- L-1** Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
- L-2** La Salle Radio Corp., 143 W. Austin Ave., Chicago, Ill.
- L-3** C. R. Leutz, Inc., 195 Park Place, Long Island City, N. Y.
- L-4** Liberty Electric Corp., of New York, 342 Madison Ave., New York City.
- L-5** Liberty Radio Corp., 123 N. Sangamon, Chicago, Ill.
- L-6** The Logan Mfg. Co., 338 E. Front St., Logan, Ohio.
- L-7** I. A. Lund Corp., 1018 S. Wabash Ave., Chicago, Ill.
- L-8** Lundquist Tool & Mfg. Co., Worcester, Mass.
- L-9** Luzerne Rubber Co., Muirhead Ave., Trenton, New Jersey.
- L-10** Lynch Mfg. Co., Inc., 1775 Broadway, New York City.
- L-11** Liberty Bell Mfg. Co., Minerva, Ohio.
- L-12** Lincoln Radio Corp., 329 So. Wood St., Chicago, Ill.
- M-1** Magnatron Corp., 406 Jefferson, Hoboken, N. J.
- M-2** The Magnavox Co., 1315 S. Michigan Ave., Chicago, Ill.
- M-3** Markel Electric Products, Inc., 145 E. Seneca St., Buffalo, N. Y.
- M-4** Marti Radio Corp., 18th and Springdale Ave., East, Orange, N. J.
- M-5** Martin-Copeland Co., Providence, R. I.
- M-6** Marvin Radio Tube Corp., Irvington, N. J.
- M-7** Master Engineering Co., 122 So. Michigan Ave., Chicago, Ill.
- M-8** McKee Glass Co., Jeannette, Pa.
- M-9** McMillan Radio Corp., 1421 S. Michigan Ave., Chicago, Ill.
- M-10** Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y.
- M-11** Micarta Fabricators, Ind., 500 S. Peoria St., Chicago, Ill.
- M-12** Midwest Radio Corp., 410 E. 8th St., Cincinnati, Ohio.
- M-13** Minerva Radio Co., 154 E. Erie St., Chicago, Ill.
- M-14** Morris Register Co., Council Bluffs, Iowa.
- M-15** C. E. Mountford, 105 Sixth Ave., N. Y. C.
- M-16** Munder Electrical Co., 97 Orleans, Springfield, Mass.
- M-17** Leslie F. Muter Co., 8440 S. Chicago Ave., Chicago, Ill.
- M-18** Mutual Phone Parts Mfg. Corp., 610 Broadway, New York City.
- M-19** Modern Electric Mfg. Co., 312 Mulberry, Toledo, Ohio.
- M-20** Murdock, Wm. J., Chelsea, Mass.
- M-21** Matchless Electric, 1500 N. Ogden Ave., Chicago, Ill.
- M-22** L. C. McIntosh, 4163 Budlong Ave., Los Angeles, Cal.
- M-23** Mueller Elec. Co., 1583 E. 31st St., Cleveland, Ohio.
- M-24** Mayo Laboratories, Inc., 281 E. 137th St., New York City.
- N-1** Nassau Radio Co., 60 Court St., Brooklyn, N. Y.
- N-2** National Carbon Co., Inc., 30 E. 42nd St., New York City.
- N-3** National Co., Inc., 61 Sherman St., Malden, Mass.
- N-4** National Electrical Products Co., 10 E. Kinzie St., Chicago, Ill.
- N-5** National Electric Specialty Co., 314 N. St. Clair, Toledo, Ohio.
- N-6** National Vulcanized Fibre Co., Maryland Ave. and Beech St., Wilmington, Del.
- N-7** Neonlite Corp. of America, 500 Chancellor Ave., Irvington, N. J.
- N-8** Neutrowound Radio Mfg. Co., 3409 W. Madison St., Chicago, Ill.
- N-9** New England Electrical Works, Lisbon, N. H.
- N-11** Northern Mfg. Co., 371 Ogden St., Newark, N. J.
- N-12** The Northwestern Cooperage & Lbr. Co., Gladstone, Mich.
- N-13** Norton Labs., Lockport, N. Y.
- N-14** National Radio Tube Co., 3420 18th St., San Francisco, Calif.
- N-15** National Union Radio Corp., 400 Madison Ave., New York City.
- N-16** National Radio Corp., 680 Beacon St., Boston, Mass.
- O-1** Old Masters Paper & Pulp Corp., 154 Nassau St., New York City.
- O-2** O'Neil Mfg. Corp., 715 Palisade Ave., West New York, N. J.
- O-3** Operadio Mfg. Co., St. Charles, Ill.
- O-4** Oxford Radio Corp., 3200 Carroll Ave., Chicago, Ill.
- O-5** Ohmite Mfg. Co., 613 N. Albany Ave., Chicago, Ill.
- P-1** Pacent Electric Co., Inc., 91 7th Ave., N. Y. C.
- P-2** Packard Electric Co., Warren, Ohio.
- P-4** R. M. Peffer, Harrisburg, Pa.
- P-5** Perryman Electric Co., 33 W. 60th St., N. Y. C.
- P-6** Pfantstiel Radio Co., 10 E. Kinzie, Chicago, Ill.
- P-7** Philadelphia Storage Battery Co., Ontario and C Sts., Philadelphia, Pa.
- P-8** Philmore Mfg. Co., 106 7th Ave., N. Y. C.
- P-9** Phono-Link Co., 490 Broome, N. Y. C.
- P-10** Phonomotor Co., 121 West Ave., Rochester, N. Y.
- P-11** Pierce-Airo, Inc., 119 Fourth Ave., N. Y. C.
- P-12** The Pierson Co., Cedar and Pleasant Sts., Rockford, Ill.
- P-13** Pilot Electric Mfg. Co., 323 Berry St., Brooklyn, N. Y.
- P-14** Pioneer Radio Corp., Plano, Ill.
- P-15** Platter Cabinet Co., Madison Ave., North Vernon, Ind.
- P-16** Polymet Mfg. Corp., 829 E. 134th St., N. Y. C.
- P-17** The Pooley Co., 1600 Indiana Ave., Philadelphia, Pa.
- P-18** Porcelain Products, Inc., Findlay, Ohio.
- P-19** The Potter Co., 1950 Sheridan Rd., North Chicago, Ill.
- P-20** Powrad, Inc., 121 Ingraham Ave., Brooklyn, N. Y.
- P-21** Precise Products, Inc., 254 Mill St., Rochester, N. Y.
- P-22** Precision Mfg. Co., 1020 Santa Fe Ave., Los Angeles, Calif.
- P-23** Premax Products, Inc., Niagara Falls, N. Y.
- P-24** Premier Electric Co., Grace and Ravenswood Aves., Chicago, Ill.
- P-25** Premier Radio Corp., Defiance, Ohio.
- P-26** Presto Machine Products Co., Inc., 70 Washington St., Brooklyn, N. Y.
- P-27** Prime Mfg. Co., 653 Clinton, Milwaukee, Wis.
- P-28** M. Propp Co., 524 Broadway, New York City.
- P-29** Harold J. Power, 5 High St., Medford Hillside, Mass.
- P-30** J. L. Polk, 41 Belle Ave., Troy, N. Y.
- Q-1** QRS-DeVry Corp., 1111 Center St., Chicago, Ill.
- Q-2** Quam Radio Products Co., 9705 Cottage Grove Ave., Chicago, Ill.
- Q-3** Quinn Tube, 1890 E. 40th, Cleveland, Ohio.
- R-1** Racon Electric Co., Inc., 18 Washington Place, New York City.
- R-2** Radiall Co., 50 Franklin St., N. Y. C.
- R-3** Radiart Corp., Inc., 13229 Shaw Ave., East Cleveland, Ohio.
- R-4** Radio Appliance Corp., Springfield, Mass.
- R-5** Radio Cabinet Co., 818 Butterworth St., Grand Rapids, Mich.
- R-6** Radio Cabinet Co., Seminary St., Rockford, Ill.
- R-7** Radio Condenser Co., Copewood and Davis Sts., Camden, N. J.
- R-8** Radio Corp. of America, 233 Broadway, New York City.
- R-9** Radio Foundation, Inc., 1 Park Place, New York City.
- INTERFERENCE ELIMINATORS**
A-14, T-9.
- JACKS**
A-3, A-17, B-6, B-24, B-32, C-7, D-4, E-4, E-8, F-21, G-9, K-3, P-1, P-8, P-13, P-24, S-22, Y-2.
- KEYS, SOUNDERS AND BUZZERS**
K-3, M-22, S-14, S-22, T-23, V-7.
- LOUDSPEAKERS**
A-3, A-15, A-18, A-19, A-24, A-31, A-35, A-38, A-39, A-51, A-55, B-3, B-14, B-21, B-23, B-27, B-29, B-30, B-36, B-41, C-3, C-27, C-33, E-15, F-2, F-8, F-10, F-16, G-20, G-23, H-12, J-5, K-5, K-7, M-2, M-17, M-20, N-2, O-2, O-3, O-4, P-1, P-7, P-12, P-15, P-17, P-26, Q-2, R-1, R-8, R-9, R-13, R-22, S-15, S-16, S-19, S-24, S-29, S-31, S-32, S-35, T-4, T-12, T-19, U-3, U-7, U-9, U-10, U-12, U-14, V-2, W-14, W-21, W-23.
- LUGS, Soldering**
A-17, B-5, B-15, K-3, L-5, S-6, W-5, Y-2.
- MARKERS, Metal Cable**
C-34, W-5, Y-2.
- METERS, Ammeters & Voltmeters**
D-11, F-6, G-6, H-15, H-19, J-6, R-11, R-17, S-29, S-40, W-11, W-12.
- MOTORS, Phonograph**
A-22, A-47, B-17, B-29, D-10, G-6, G-16, J-8, K-4, L-4, P-1, P-10, P-27, S-14, S-19, S-31, S-36, U-7, U-14, W-11.
- MOUNTINGS, Resistor**
A-14, C-16, D-4, E-1, E-8, I-5, K-3, L-10, N-3, M-15, M-17, P-13, P-16.
- OUTLETS, Convenience Wall**
B-10, B-32, C-7, E-1, F-21, H-10, R-21, S-42, Y-2.
- PANELS, Composition**
A-26, F-7, F-13, F-15, F-21, I-4, L-9, N-10, P-13, P-22, R-14.
- PANELS, Metal**
A-23, A-55, B-8, B-30, C-10, C-24, C-33, C-34, N-3, P-13, R-12, R-14, S-6, S-29, U-5, V-3.
- PICK-UPS, Phonograph**
A-17, A-22, A-24, A-25, A-35, A-36, A-51, A-53, B-21, B-31, C-3, C-20, C-33, C-37, E-10, G-16, H-4, K-16, M-18, P-1, P-9, P-26, R-3, S-14, S-31, S-35, S-36, T-11, T-19, U-2, U-7, U-14, W-8.
- PLATES, Name**
A-15, A-55, B-6, C-7, C-34, S-6, W-11.
- PLUGS, Phone & Multiple Connector**
B-10, B-20, D-4, E-1, F-21, G-9, H-10, M-5, M-17, N-3, P-13, P-16, S-22, Y-2.
- REACTIVATORS, Tube**
I-5, J-2, S-29.
- RECEIVING SETS**
A-2, A-5, A-11, A-19, A-24, A-34, A-36, A-38, A-51, A-54, A-56, A-57, B-2, B-4, B-9, B-19, B-21, B-23, B-27, B-29, B-30, B-31, B-35, C-17, C-18, C-19, C-26, C-33, D-2, D-5, D-17, E-5, E-9, E-10, E-16, E-25, F-16, F-17, F-24, G-12, G-19, G-20, G-22, G-23, G-24, G-26, H-9, H-18, K-3, K-5, K-9, K-11, K-16, L-1, L-3, L-5, M-4, M-9, M-12, M-13, M-17, N-1, N-2, N-3, N-4, N-8, N-16, P-6, P-7, P-8, P-11, P-12, P-14, P-24, P-25, Q-1, R-8, R-11, R-13, R-24, S-5, S-9, S-10, S-11, S-12, S-13, S-14, S-15, S-16, S-19, S-20, S-28, S-29, S-32, S-34, S-35, T-4, T-6, T-8, T-14, T-20, U-7, U-9, U-11, U-12, V-1, W-1, W-3, W-4, W-9, W-14, W-20, W-22, W-25, Z-1.
- RECEIVING SET KITS OR CHASSES**
A-13, B-27, E-1, G-19, G-22, H-3, H-5, H-16, K-2, L-3, L-12, N-3, P-13, P-24, R-20, R-29, S-9, S-15, S-49, T-21, V-5.
- RECTIFIER UNITS**
A-1, A-41, A-42, B-4, D-5, E-15, F-2, F-23, G-7, G-23, K-15, K-20, N-3, P-7, R-12, S-16, T-12, W-8.



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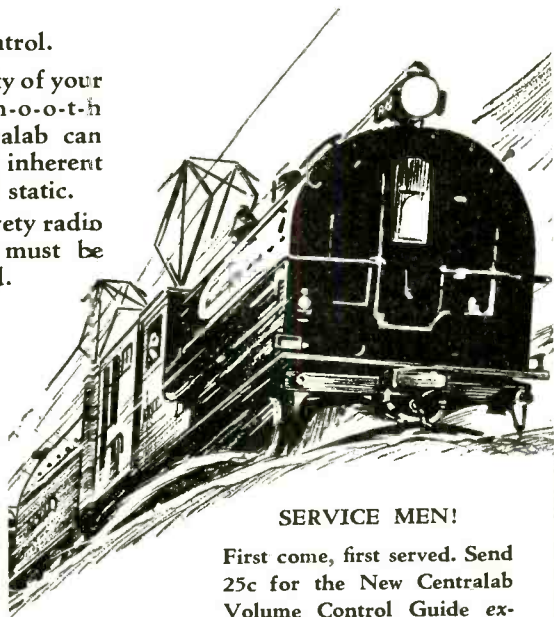
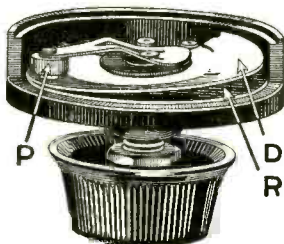
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R-11 The Radio Products Co., Fifth and Norwood Sts., Dayton, Ohio.
R-12 Radio Receptor Co., 106 7th Ave., N. Y. C.
R-13 Radio-Victor Corp. of America, 233 Broadway, New York City.
R-14 Ranger Coil Co., W. Davenport, N. Y.
R-16 R. B. Mfg. Co., Logansport, Ind.
R-17 Readrite Meter Works, 15 College Ave., Bluffton, Ohio.
R-18 Red Lion Cabinet Co., Red Lion, Pa.
R-19 A. E. Rittenhouse Co., Honeyoe Falls, N. Y.
R-20 Robertson-Davis Co., 361 W. Superior St., Chicago, Ill.
R-21 Rodale Mfg. Co., 200 Hudson, N. Y. C.
R-22 The Rola Co., 4250 Hollis St., Oakland, Calif.
R-23 Rosenbeck & Sons, Torrington, Conn.
R-24 Roth-Downs Mfg. Co., 2512 University Ave., St. Paul, Minn.
R-25 Runzel-Lenz Electric Mfg. Co., 1751 N. Weston Ave., Chicago, Ill.
R-26 Reliable Parts Mfg. Co., Wellington, Ohio.
R-27 Rival Radio & Battery Co., 180 E. 123rd St., New York City.
R-28 J. T. Rooney, 4 Calumet Bldg., Buffalo, N. Y.
R-29 Radio Engineering Labs., 100 Wilbur Ave., Long Island City, N. Y.
R-30 Radio Utilities Corp., 67 Winthrop, Newark, New Jersey.
R-31 Radio Insulation, Parkersburg, W. Va.
R-32 The Rauland Corp., 3341 Belmont Ave., Chicago, Ill.
R-33 Radio Wire Corp., 6629 Central Park Ave., Chicago, Ill.
S-1 Samson Electric Co., 227 Washington St., Canton, Mass.
S-2 Sangamo Electric Co., Springfield, Ill.
S-3 Saturn Mfg. & Sales Co., 48 Beekman St., New York City.
S-4 Scanlon Electric Mfg. Co., 1113 N. Franklin St., Chicago, Ill.
S-5 Scott Transformer Co., 4450 Ravenswood Ave., Chicago, Ill.
S-6 Scovill Mfg. Co., 99 Mill St., Waterbury, Conn.
S-7 Scranton Button Co., Scranton, Pa.
S-9 Shamrock Mfg. Co., 196 Waverly Ave., Newark, N. J.
S-10 Shelby Co., 10 Prince, Trenton, N. J.
S-11 Shinn Mfg. Co., N. Racine Ave., Chicago, Ill.
S-12 Shortwave & Television Lab., 104 Brooklyn Ave., Boston, Mass.
S-13 Showers Brothers Co., 10th and Morton Sts., Bloomington, Ind.
S-14 Signal Electric Mfg. Co., Menominee, Mich.
S-15 Silver-Marshall, Inc., 6401 W. 65th St., Chicago, Ill.
S-16 Simplex Radio Co., Sandusky, Ohio.
S-17 B. H. Smith, Danbury, Conn.
S-18 Sonatron Tube Co., 1020 S. Central Park Ave., Chicago, Ill.
S-19 Sonora Phonograph Co., Inc., 50 West 57th St., New York City.
S-20 The Sparks-Withington Co., Jackson, Mich.
S-21 Spaulding Fibre Co., Inc., 484 Broome St., New York City.
S-22 Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
S-23 Sprague Specialties Co., 1511 Hancock St., Quincy, Mass.
S-24 Standard Radio Corp., 41 Jackson St., Worcester, Mass.
S-25 Standard Transformer Co., Warren, Ohio.
S-26 The Starr Piano Co., S. 1st and A, B, C and D Sts., Richmond, Ind.
S-27 Starr Porcelain Co., Trenton, N. J.
S-28 Steinite Radio Co., Fort Wayne, Ind.
S-29 The Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
S-30 Stettner Phonograph Corp., 310 E. 75th St., New York City.
S-31 Stevens Mfg. Corp., 46 Spring St., Newark, N. J.
S-32 Stewart-Warner Speedometer Corp., 1826 Diversey Parkway, Chicago, Ill.
S-33 St. Johns Table Co., Cadillac, Mich.
S-34 Story & Clark Piano Co., 173 No. Michigan Ave., Chicago, Ill.
S-35 Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
S-36 Studner Bros., 67 W. 44th St., N. Y. C.
S-37 Sunlight Lamp Co., 76 Colt, Irvington, N. J.
S-38 Superior Cabinet Corp., 206 Broadway, N. Y. C.
S-39 Supertron Mfg. Co., Hoboken, N. J.
S-40 Supreme Instruments Corp., Bright Bldg., Greenwood, Miss.
S-41 Swaboda Co., 612 E. Pike St., Seattle, Wash.
S-42 Swan-Haverstick, Inc., Trenton, N. J.
S-43 Sylvania Products Co., Emporium, Pa.
S-44 Sturges Multiple Battery Corp., Jamaica, N. Y.
S-45 Sarras Electric Co., 67 Park Place, N. Y. C.
S-46 See Jay Battery Co., 915 Brook Ave., N. Y. C.
S-47 A. R. Spartana, 806 N. Gay, Baltimore, Md.
S-48 Shallcross Mfg. Co., 700 Parker Ave., Collingdale, Pa.
S-49 Scott Transformer Co., 4450 Ravenswood Ave., Chicago.
S-50 The F. W. Sickles Co., 191 Chestnut St., Springfield, Mass.
T-1 Taylor Electric Co., Madison, Wis.
T-2 Tectron Radio Corp., 1270 Broadway, N. Y. C.
T-3 Televocal Corp., 588 12th St., West New York, N. J.
T-4 Temple Corp., 5253 W. 65th St., Chicago, Ill.
T-5 Therm-A-Trol Mfg. Co., 52 Willow, Springfield, Mass.
T-6 Thompson Radio Co., 25 Church, N. Y. C.
T-7 Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
T-8 Tilman Radio Corp., Lagro, Ind.
T-9 Tobe Deutschmann Co., 136 Liberty St., New York City.
T-10 Todd Electric Co., 42 Vesey, N. Y. C.
T-11 Toman & Co., 2621 W. 21st St., Chicago, Ill.
T-12 Tower Mfg. Corp., 124 Brookline Ave., Boston, Mass.
T-13 Transformer Corp. of America, 2301 S. Keeler Ave., Chicago, Ill.
T-14 Trav-Ler Mfg. Corp., 1818 Washington Ave., St. Louis, Mo.
T-15 Trenle Porcelain Co., East Liverpool, Ohio.
T-16 Triad Mfg. Co., Inc., Fountain and Blackstone Sts., Pawtucket, R. I.
T-17 Tri-Boro Radio Mfg. Corp., 62 W. 21st St., New York City.
T-18 Trico Products Corp., 817 Washington, Buffalo, N. Y.
T-19 Trimm Radio Mfg. Co., 847 W. Harrison, Chicago, Ill.
T-20 Trutone Radio Sales Co., 114 Worth, N. Y. C.
T-21 Tyrman Electric Corp., 314 W. Superior St., Chicago, Ill.
T-22 Thomas & Betts Co., 15 Park Place, N. Y. C.
T-23 Teleplex Co., 76 Cortlandt, N. Y. C.
T-24 Teleradio Engineering Corp., 484 Broome St., New York City.
U-1 The Udell Works, 1202 W. 28th St., Indianapolis, Ind.
U-2 Ultraphonic Products Corp., 270 Lafayette, New York City.
U-3 Ultratone Mfg. Co., 1046 W. Van Buren St., Chicago, Ill.
U-4 Union Electrical Porcelain Works, Muirhead Ave., Trenton, N. J.
U-5 Union Insulating Co., 296 Broadway, N. Y. C.
U-6 Union Metal Products Co., 2938 Pillsbury Ave., Minneapolis, Minn.
U-7 United Air Cleaner Co., 9705 Cottage Grove Ave., Chicago, Ill.
U-8 United Radio & Electric Corp., 500 Chancellor Ave., Irvington, N. J.
U-9 United Reproducers Corp., Springfield, Ohio.
U-10 United Research Labs., Inc., 864 W. North Ave., Chicago, Ill.
U-11 United Scientific Lab., Inc., 113 Fourth Ave., New York City.
U-12 U. S. Radio & Television Corp., Marion, Ind.
U-13 Universal Electric Lamp Co., Newark, N. J.
U-14 The Utah Radio Products Co., 1737 S. Michigan Ave., Chicago, Ill.
U-15 Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
U-16 Universal Electro Chemical Corp., 30 W. 15th St., New York City.
V-1 Vaga Mfg. Co., 720 Atlantic Ave., Brooklyn, N. Y.
V-2 Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
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V-4 Van Horne Tube Co., 280 Center St., Franklin, Ohio.
V-5 Victoreen Radio Co., 2825 Chester Ave., Cleveland, Ohio.
V-6 Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.
V-7 Vibroplex Co., 825 Broadway, N. Y. C.
W-1 Walbert Radio Corp., 1000 Fullerton Ave., Chicago, Ill.
W-2 Ward Leonard Electric Co., Mt. Vernon, N. Y.
W-3 Ware Mfg. Corp., Broad St. Bank Bldg., Trenton, N. J.
W-4 Wasmuth-Goodrich Co., Peru, Ind.
W-5 Waterbury Button Co., Waterbury, Conn.
W-6 Watsontown Table & Furniture Co., Watsontown, Pa.
W-7 The Webster Co., 850 Blackhawk St., Chicago, Ill.
W-8 Webster Electric Co., Racine, Wis.
W-9 Wells Gardner & Co., 816 N. Kenzie Avenue, Chicago, Ill.
W-10 Western Felt Works, 4029 Ogden Ave., Chicago, Ill.
W-11 Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
W-12 Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.
W-13 T. C. Wheaton Co., Millville, N. J.
W-14 Wilcox Labs., Charlotte, Mich.
W-15 Willard Storage Battery Co., 346 E. 131st St., Cleveland, Ohio.
W-16 Wireless Corp. of America, 1744 N. Robey, Chicago, Ill.
W-17 Wireless Specialty Appliance Co., 76 Ather-ton St., Jamaica Plain, Mass.
W-18 Wise-McClurg Corp., New Philadelphia, Ohio.
W-19 Wirt Co., 5221 Greene (Germantown), Philadelphia, Pa.
W-20 Wiz Mfg. Co., 225 Sixth Ave., N. Y. C.
W-21 J. W. & W. L. Woolf, 133 W. 21st St., N. Y. C.
W-22 World Electric Co., San Dimas, Calif.
W-23 Wright-DeCoster, Inc., 2233 University Ave., St. Paul, Minn.
W-24 Wuhco Battery Corp., Swissvale Sta., Pittsburgh, Pa.
W-25 Workrite Radio Corp., 1838 E. 30th St., Cleveland, Ohio.
W-26 Winnebago Mfg. Co., Rockford, Ill.
W-27 Wireless Egert Eng., Inc., 179 Greenwich St., N. Y. C.
X-1 X-L Radio Labs., 1224 Belmont Ave., Chicago, Ill.
Y-1 Yahr-Lang, Inc., 207 E. Water, Milwaukee, Wis.
Y-2 Yaxley Mfg. Co., 1528 West Adams, Chicago, Ill.
Z-1 Zenith Radio Corp., 3620 Iron St., Chicago, Ill.
- RESISTORS, Fixed Carbon**
A-21, C-11, C-16, H-4, I-5, M-10, M-15, P-16.
- RESISTORS, Fixed Processed**
A-14, C-5, C-7, C-16, C-32, E-8, H-4, I-5, L-10, M-10, M-15, N-3, P-13, P-16, R-2, W-19.
- RESISTORS, Fixed Wire Wound**
A-14, A-32, C-7, C-16, C-32, D-4, F-6, E-8, E-10, F-6, F-21, G-6, G-9, K-18, L-3, M-10, M-15, M-17, M-24, N-3, O-5, P-1, P-13, P-16, R-17, R-20, S-48, W-2, W-19, Y-2.
- RESISTORS, Variable Carbon**
A-21, B-24, C-7, C-16, E-8, F-21, K-3, P-13, P-16.
- RESISTORS, Variable Wire Wound**
C-7, C-16, C-36, D-4, E-8, E-10, F-21, G-7, G-9, H-4, K-18, M-15, M-17, N-3, P-1, P-8, P-13, P-16, R-14, U-11, V-5, W-2, W-19, Y-2.
- SHIELDS**
A-23, C-7, C-10, C-33, G-19, L-3, N-3, P-13, S-15.
- SOCKETS, Tube**
A-17, A-26, A-52, B-12, C-10, C-36, D-4, E-4, E-10, F-21, G-9, G-19, I-1, I-4, K-3, K-15, K-18, N-3, N-13, P-1, P-8, P-13, P-14, P-24, R-14, S-3, S-9, S-15, U-5.
- SOLDER, Self-Fluxing**
K-8.
- SWITCHES & SWITCH CONTACTS**
A-15, B-5, B-10, B-24, C-7, C-11, C-36, E-10, F-1, F-10, F-21, G-9, G-14, H-10, H-13, H-16, K-3, K-19, M-17, P-1, P-8, P-13, P-21, R-14, R-31, S-3, U-5, W-17, Y-2.
- TESTING EQUIPMENT, Tube and Set**
E-24, F-6, F-10, G-9, H-14, H-15, H-19, J-2, J-6, K-18, L-3, L-8, N-3, P-4, P-28, R-11, R-17, R-29, S-14, S-29, S-40, T-1, T-19, W-2, W-12.
- TRANSFORMERS, Audio**
A-4, A-13, A-32, A-34, B-43, C-7, C-13, C-19, C-44, D-15, F-3, F-6, F-13, G-2, G-3, G-7, G-9, G-10, G-17, G-19, H-1, H-3, H-5, J-2, K-2, K-3, L-5, M-17, N-3, N-13, P-1, P-13, P-21, P-24, R-14, R-19, R-20, R-32, S-1, S-2, S-3, S-4, S-15, S-25, T-7, T-13, V-3, V-5, W-8.
- TRANSFORMERS, Power**
A-4, A-6, A-13, A-32, A-41, B-19, B-24, B-43, C-7, C-13, C-44, D-11, D-15, E-15, E-24, F-1, F-6, F-7, F-23, G-3, G-5, G-7, G-9, G-10, G-17, G-19, H-1, H-14, J-2, K-2, K-3, K-9, K-10, K-15, K-18, L-3, M-17, M-24, N-3, N-9, P-13, R-2, R-3, R-9, R-19, S-1, S-9, S-15, S-17, S-25, T-7, T-21, U-5, V-5, W-7, W-17.
- TRANSFORMERS, R-F (See COILS, R-F)**
- TRANSMITTING APPARATUS**
A-4, A-13, A-62, C-6, E-23, F-21, G-9, G-30, H-14, H-25, K-3, L-3, N-3, N-14, R-13, R-29, S-2, S-17, T-7, T-9, W-27.
- TUBING, Spaghetti**
A-7, A-15, I-4, P-8.
- UNITS, Loudspeaker & Phonograph**
A-3, A-13, A-22, B-3, B-14, B-41, C-18, E-7, E-10, E-15, F-8, F-10, H-16, M-17, P-8, R-22, S-19, S-41, T-12.
- VACUUM TUBES**
A-8, A-20, A-24, A-42, A-43, A-45, A-49, A-50, B-18, B-22, C-1, C-9, C-12, C-22, C-23, C-25, C-35, D-3, D-7, D-9, D-12, D-18, D-19, E-13, E-19, F-18, G-15, G-23, G-31, H-22, H-23, J-1, K-3, K-6, K-22, L-2, M-1, M-6, M-16, M-21, N-2, N-7, N-11, N-15, P-5, P-13, Q-3, R-13, R-30, S-9, S-18, S-37, S-39, S-43, T-2, T-3, T-16, U-7, U-8, U-13, V-4, W-11, W-16.
- VARIOMETERS & VARIO COUPLERS (See COILS, R-F)**
- VOLTAGE REGULATORS**
A-4, A-63, C-16, E-1, G-1, I-4, M-7, N-3, R-17, W-2, W-19, X-1.
- WIRE (See CABLE)**

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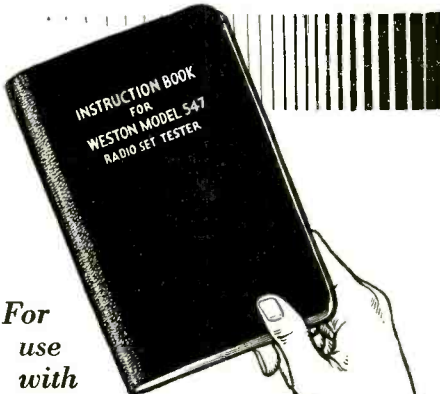
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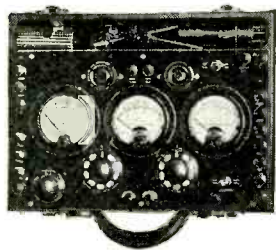
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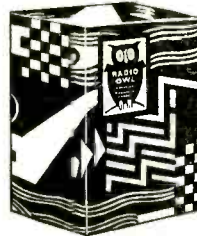


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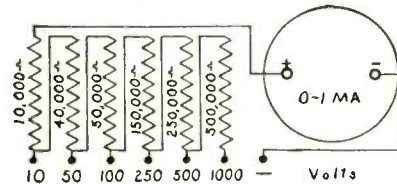
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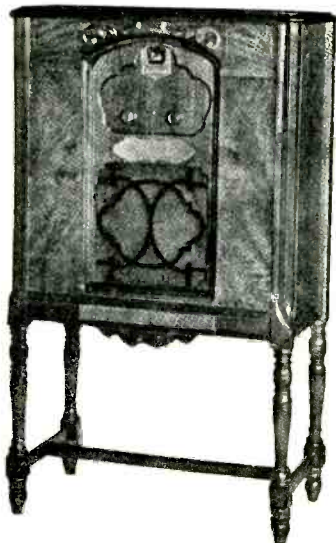
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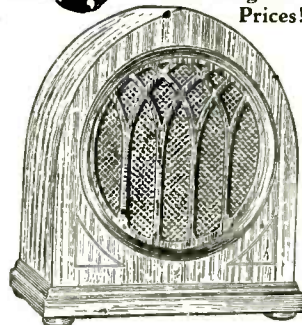
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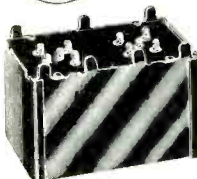


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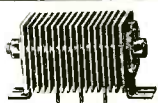
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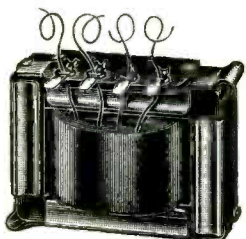
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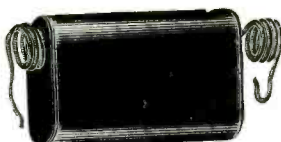
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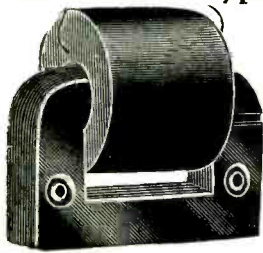
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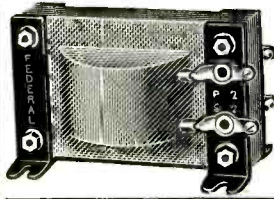
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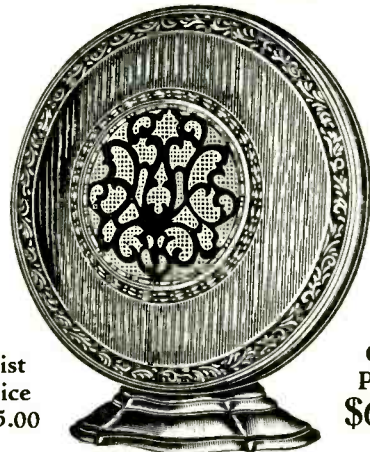
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Our Price
\$6.75

Erla Audio Transformer

Fully Shielded
Price
\$1.10
\$12.50 Per Dozen



Ratios: 3½ to 1
5 to 1



Federal Silk Super Cables

5 Wire — 6 ft. 15c
6 Wire — 6 ft. 16c
7 Wire — 6 ft. 17c
9 Wire — 6 ft. 19c

Heavy Duty 6 Wire Power Cable, 17c

Dubilier Buffer Condenser



Ratheon Type used on Federal Power Pack
Ratheon type 2 taps 1/10 mfd. each.
425 volts each
55 cents

Used on Federal Power Pack

Sprague Replacement Block

4½ mfd. .400 volt



Small, compact for combinations to replace any block or fit any newhook up.

Length, 5 in.
Width, 1¼ in.
Height, 3½ in. comb.

2 mfd. 400 volt
2 mfd. 200 volt
½ mfd. 200 volt

85 cts.

Can be installed alongside your blownout blocks to replace bad section.

Teletone Horn

Built Like a Violin



List
\$22.50

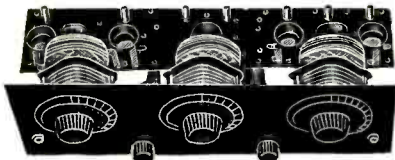
Our Price
\$3.25

Exponential Horn made of specially treated ply wood and fitted with a Baldwin Unit.

Complete 5-Tube T. R. F. Kit—All Parts Complete

READY TO ASSEMBLE

ALL PARTS COMPLETE TO THE LAST NUT AS FOLLOWS:



- 1 7x18 Bakelite Front Panel, drilled and engraved.
- 1 Stewart-Warner 5 socket sub-panel.
- 3 Pilot Lowloss Variable Condensers.
- 3 Genuine Freshman Coils and mts.
- 2 Franklin Transformers. 2 Kellogg Rheostats.
- 3 Erla Fixed Condensers, sizes .0025 with clips .002 and .006.
- 1 Electrad Grid Leak 2 meg.
- 3 Kellogg 4 in. Bakelite Dials.
- 1 Filament Switch, 2 Jacks.
- 1 Coil Hookup Wire and Spaghetti.

Our Price **\$4.95** Complete Kit

Dubilier Grid Leaks



¼, ½, ¾, 1, 2, 4, 5, and 10 Megs.
List 40c

Our Price 9c Each

Cunningham Grid Leaks

2 Meg.

Dozen 40c; Each 4c

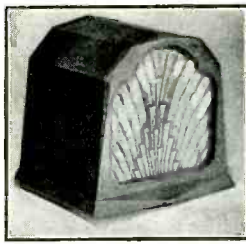
Special Sale Combination

This Highly Advertised Set—Perfect Speaker and Set of Licensed Tubes at Special Price of \$37.50



This Earl A.C. Set alone
\$27.50

NOTICE THIS COMBINATION
Earl A.C. Set—in metal cabinet
Earl Cabinet Speaker (S.W. Chassis)
3—226 Colonial Tubes
2—227 Colonial Tubes
2—171 Colonial Tubes
1—280 Colonial Tube
Complete Aerial Kit
\$37.50



This Earl Cabinet Speaker with S.W. Chassis alone
\$5.75

These are real buys. We are not mentioning any fancy list prices to make this sound good. Our sales of these sets and speakers to the Radio dumping ground, Cortlandt Street, N. Y., proves this. Subject to Previous Sale

Dubilier Condensers

at 70% Off

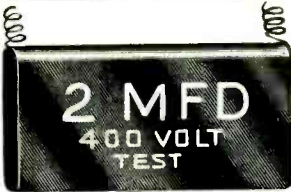


Type 907
By-Pass Test 200 Volts

Capacity	List	Net
.1	\$0.85	\$0.24
.25	.95	.29
.5	1.00	.30
1.0	1.25	.35
2.0	2.00	.60

Mark Simpson Distributing Co.
20-22 HUDSON STREET, NEW YORK CITY

TERMS:—20% with order, balance C. O. D. 2% discount allowed for full remittance with order only.



Here is a complete line of impregnated condensers. A size and rating suitable for any and all repair jobs.

Size	Rating	Dim.	Price
2	400 V.	2 1/2 x 7/8 x 1/4	45c
2	200 V.	2 x 1/2 x 1/4	25c
1	400 V.	2 x 1/2 x 1/4	25c
1	200 V.	2 x 3/8 x 1/4	18c
5	200 V.	2 x 3/4 x 1	15c

REPLACEMENT "A, B, C" Power Trans.

Audio Trans. For Kolster Sets



Special at 77c



Supplies—
Two 227's, (2 1/2 v.)
Five 226's (1 1/2 v.)
Two 171's (5 v.)
Also 250 volts at 35 mils for B and C.
Price \$1.85

***NATIONALLY KNOWN**

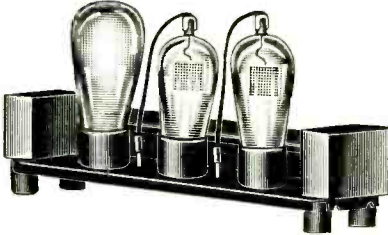
OUR PRICE \$3.00



DIA. 9"
This is an exact reproduction of the chassis. Includes 8 ft. cord with gold plated tips.

*We have been asked not to divulge the manufacturer's name

Direct Coupled Amplifier Kit



Price \$4.95

We offer the following equipment in a kit we have assembled—metal chassis (mfrs' type), subpanel, sockets, steel trough with cover (to hold all the resistances) two Grebe one mfd. condensers, tip jacks, two screen grid tube connectors with clips, potentiometer, all hardware, rubber feet, etc.

To complete the job all you need is a soldering-iron.

AIREX UNIVERSAL AUDIO TRANSFORMER



We secured the materials for these transformers from prominent manufacturers. Hence the low price. Comes with long colored leads, and in a handsomely finished tubular case.

Ratios 3:1
5:1

90c

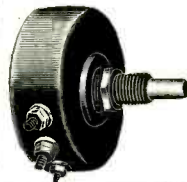
ALSO IN PUSH-PULL

Input, Ratio 3 1/2 to 1
Output, Ratio 1 to 1

MISCELLANEOUS

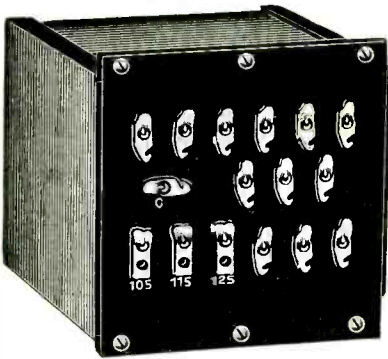
Kolster twin audios	\$1.50
Carborundum Resistors with clips (60,000 ohms)	.16
Bradleyohms 5,000 to 500,000	.25
Weston 0-7 voltmeter (125 ohms per volt)	
Freed Eisemann type	1.35
Temple Magnetic Chassis	3.50
Grimes Unshielded Audio	.60
Airex Shielded Trans.	.66
Electrad 3 meg. Grid Leaks	.07
Airex "B" Supply (180 volts)	5.25
Eagle "B" Supply Raytheon Replacement Transformer	1.75
Splitdorf Audio 3 1/2 to 1	.90
Majestic "B" Replacement Condenser Block	3.90
Airex Push-Pull (unshielded) Transformers, per pair	1.90
RCA Rectron (U.V. 196) for replacement in Super-Ducon "B" Eliminators	.85
Freshman Output, Ratio 1-1	.60
4-gang .0004 mfd. with individual trimmers made by Thompson Levering	1.65
Type 280 Rectifier tubes	.90
Type 245 Power tubes	.90
Pair of matched 245 tubes	1.80
Eby binding post, marked Long Ant., Short Ant., Gnd.	.05
Polymet .00025 Moulded	.19
Toggle Switches (Bryant)	.16
Toggle Sw. (single pole, double throw)	.20
Replacement Trans. for Atwater Kent Sets	1.50
Potentiometer (1000-ohm Clarostat)	.25

SEND FOR OUR COMPLETE CATALOG



FROST Variable Resistors
25c Ea.
10,000 ohms
30,000 ohms

"A, B, C" POWER TRANSFORMER
For 105-115-125 Volts
50-60 Cycle, A-C Current



Delivers 350 Volts, 150 Mils.

Supplies the following voltages:
2 1/2 V. (C.T.) for 2-245 Tubes.
2 1/2 V. for 4-227 Tubes or 224's.
2 1/2 V. for 1-227 (Separate Detector) or 224 Screen-Grid.
5 V. for 1-280 Tube.
"B" and "C" voltages for all the above tubes—including the 2-245's. Size 4"x4 1/2"x5" high. Weight 12 pounds.
60 cycle 110 volt.
PRICE \$2.75
25 cycle 110 volt, \$3.00.

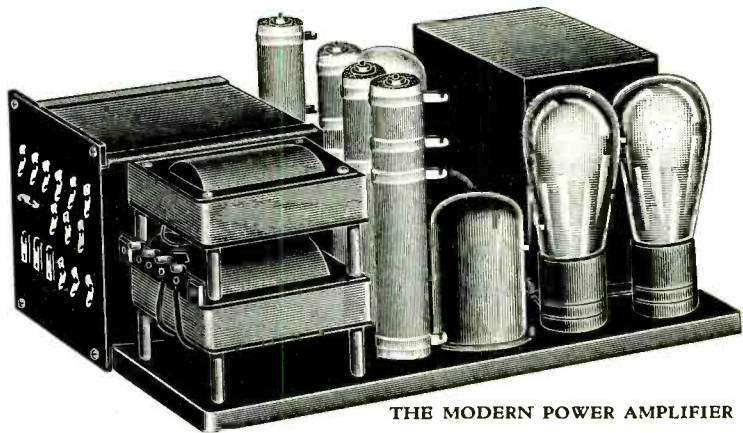
OUR SPECIAL TYPE 245 PUSH-PULL KIT

With "A, B, C" Power Supply (As Described at Left)

NET PRICE \$11.50

COMPLETE KIT WITH DIAGRAM

For two 245's and one 280 Tubes Add \$2.85 to the Above Price



THE MODERN POWER AMPLIFIER

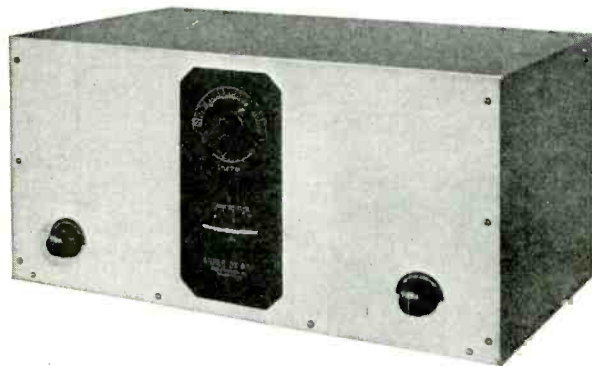
Consist of	Value
1 Special 245 Power Transformer	\$2.75
1 Condenser Block 10 mfd. (800, 600, 400, 200 volts, Tests)	2.25
1 Splitdorf Choke	1.40
1 Eagle Choke	1.00
1 Pair Push-Pull Airex Audio Transformers	3.00
4 Baked Porcelain Wire Wound Resistors	1.00
1 Bradleyohm (Detector Control)	.25
1 Metal Baseboard, Rubber Feet	1.00

Total Value \$12.75

Mail Orders Direct to: **AIREX CO.**
67 CORTLANDT STREET, NEW YORK, N. Y.

TERMS:—20% with order, balance C. O. D. 2% discount allowed for full remittance with order only.

WORLD-WIDE
RECEPTION
WITH THE NEW
NORDEN-HAUCK
SHORT-WAVE
SUPER DX-5



Size: 9 x 19 x 10 inches. Weight: 30 pounds

ENTIRELY NEW
ADVANCED DESIGN
NEW PENTODE TUBE
SENSATIONAL DISTANCE
RANGE 11½ TO 205
METERS
RELIABLE PERFORMANCE
A-C AND D-C MODELS
ADAPTABLE FOR LONG
WAVES

Write, telephone or cable TODAY for
Complete Information

NORDEN-HAUCK, INC.
ENGINEERS

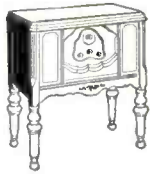
1-9 South Street

PHILADELPHIA, PA., U. S. A.

New

Screen Grid Neutrodyne Power Speaker Radio In the Popular Newly Designed Low Utility Consoles!

Look at the pictures of the new Crosley "Companionship" Series shown in this advertisement—read the descriptions of chassis and cabinets, note the low prices—then determine for yourself whether or not they represent the most amazing radio values ever offered. These "Companionship" Series models, with their unusual features and unexcelled performance, will readily become true companions in millions of homes!



The CHUM

This model is a useful inconspicuous, low 3 and 5-ply walnut veneer cabinet for use anywhere. An improved Dynacone moving armature electro-magnetic power speaker is concealed in the cabinet. Uses six tubes—two Screen Grid No. -24, one No. -27 as a bias-type power detector feeding into two No. -71-As connected push-pull, and a No. -80 rectifier tube. Has built-in power supply incorporating

genuine trouble-free Mershon condenser. Dimensions: 28½" high x 27" long x 14¾" deep. Amazingly low priced at only

\$75

Less Tubes

The PLAYMATE

This beautiful wood model is built of two-tone walnut veneer. The set incorporates the seven-tube refined Crosley Monotrad chassis. It uses two Screen Grid tubes No. -24, one No. -27 tube as a bias-type detector, one No. -27 as a resistance coupled first audio, two No. -45 tubes in push-pull, and one rectifier No. -80. The latest refined Crosley Type "M" Dynacoil power speaker is concealed in the cabinet. Dimensions: 29¾" high x 28¾" long x 16¾" deep. No radio value ever approached this model at only



\$90

Less Tubes



The COMRADE

This set is enclosed in the same cabinet as the "Playmate" but incorporates the refined Crosley Unitrad eight-tube chassis, giving somewhat greater sensitivity and performance due to the use of three Screen Grid tubes instead of two. You've never seen so much value in radio for only

\$105

Less Tubes

For those of your customers who still wish to purchase radio sets housed in the higher cabinets, Crosley offers the two models shown below.

The CRONY

An early American design console of 3 and 5-ply walnut veneer having center panel of rich golden maple with recessed dial panel. Heavy top and molding. Incorporates the refined Crosley eight-tube Unitrad chassis and improved Crosley Type "M" Dynacoil power speaker the same as in the "Comrade". Dimensions: 42" high x 27" wide x 14¾" deep. No such value in radio has ever been offered at the sensationally low price of

\$112

Less Tubes



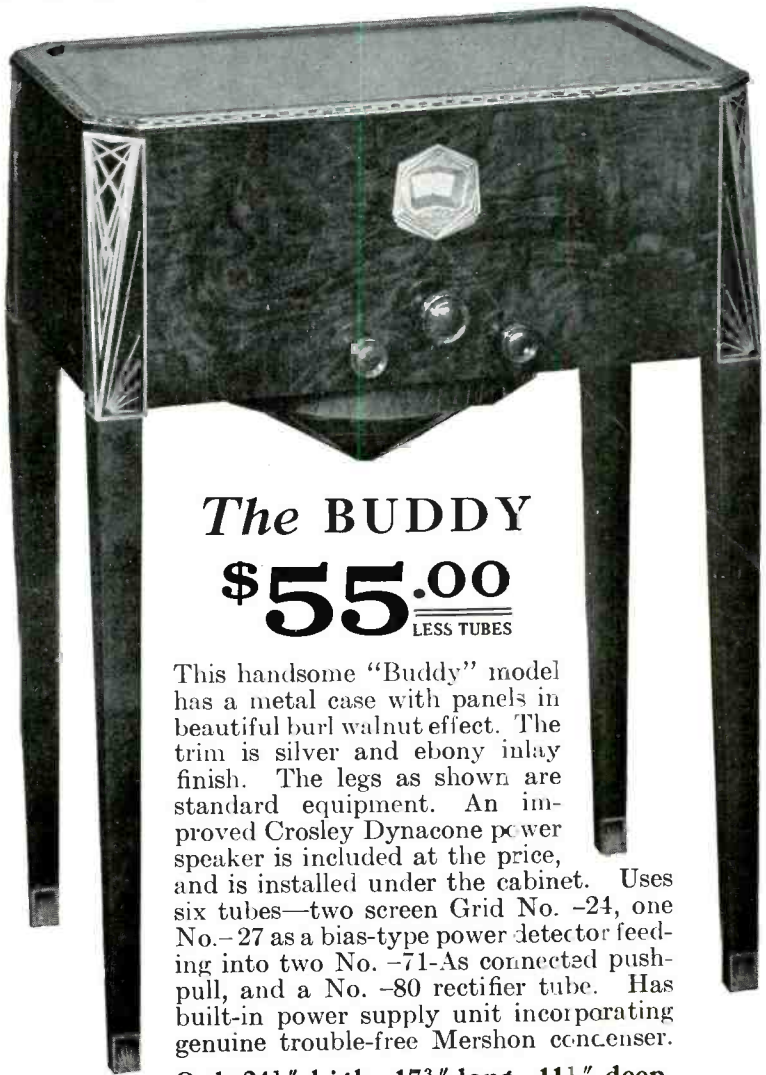
The PARTNER

This handsome cabinet, after the French manner, is built of two-tone walnut veneer with double doors of diamond matched panels which open to disclose the instrument panel and the speaker grille. The Crosley "Partner" incorporates the refined Crosley eight-tube Unitrad chassis and the improved Crosley Type "M" Dynacoil power speaker the same as in the "Comrade" and "Crony". Dimensions: 40" high x 28¾" long x 16¾" deep. An astonishing radio value for only

\$118

Less Tubes

With the presentation of the new Crosley "Companionship" Series there is ushered in a new era in the development of radio receiving sets for the home. It is now possible to obtain radio sets—complete in beautiful low console utility models—with improved power speakers built in—using Screen Grid tubes, with Neutrodyne circuits, operating from electric light sockets—at prices so low that everyone can afford to own one! Get in touch with your Crosley distributor today—get your share of the profitable business being created by this amazing new Crosley "Companionship" Series.



The BUDDY

\$55.00
LESS TUBES

This handsome "Buddy" model has a metal case with panels in beautiful burl walnut effect. The trim is silver and ebony inlay finish. The legs as shown are standard equipment. An improved Crosley Dynacone power speaker is included at the price, and is installed under the cabinet. Uses six tubes—two screen Grid No. -24, one No. -27 as a bias-type power detector feeding into two No. -71-As connected push-pull, and a No. -80 rectifier tube. Has built-in power supply unit incorporating genuine trouble-free Mershon condenser. Only 24¼" high, 17¾" long, 11¼" deep.

Western prices slightly higher

THE CROSLEY RADIO CORPORATION

POWEL CROSLEY, Jr., President

CINCINNATI, OHIO

HOME OF WLW — "The Nation's Station"

You're *THERE* with a Crosley

CROSLEY RADIO



YOU NEED SELF-EVIDENT
QUALITY TO SATISFY YOUR
CUSTOMERS

Today's critical buyers want the facts before they buy. Show them, with these simple tests, that Arcturus Blue Tubes give exceptional service in every radio set . . .

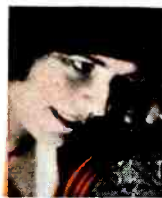


*they're
 blue!*

HERE are three tests that accurately measure the merit of any tube. You can easily make these tests, in a few minutes, in your own store. When you do, you definitely answer three questions about tubes that your customers are asking:

"How quick do they act?"

Ask your customer to hold a watch on any set equipped with Arcturus Tubes. There's the program in 7 seconds.



Clear, pure tone, free from hum, is a certainty when sets are equipped with Arcturus Tubes.

"How clear is the tone?"

Let your customer listen to the clear, pure tone that is characteristic of Arcturus Blue Tubes. There's no annoying



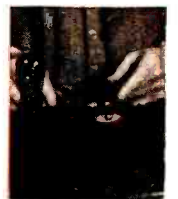
7 seconds by your customers' watch! That's how fast programs come in when Arcturus Tubes are used.

hum, no outside noise, to mar the smooth reception of any station.

"How long do they last?"

Show your customer, on the meter, that Arcturus Tubes withstand exceptional overloads. This kind of stamina has given Arcturus the world's record for long life.

These three Arcturus tests convincingly prove Arcturus' superiority. Thousands of Arcturus dealers and hundreds of thousands of Arcturus users know by actual comparison that Arcturus performance is unmatched by any other tube on the market today. If you have not checked Arcturus quality ask your jobber for a demonstration. See why Arcturus is now the fastest growing tube in the radio industry.



Exceptional ability to withstand overloads, easily proved on your meter, explains the long life of Arcturus Tubes.

ARCTURUS RADIO TUBE COMPANY
 NEWARK, N. J.

ARCTURUS

this means programs in 7 seconds Quick-Acting

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