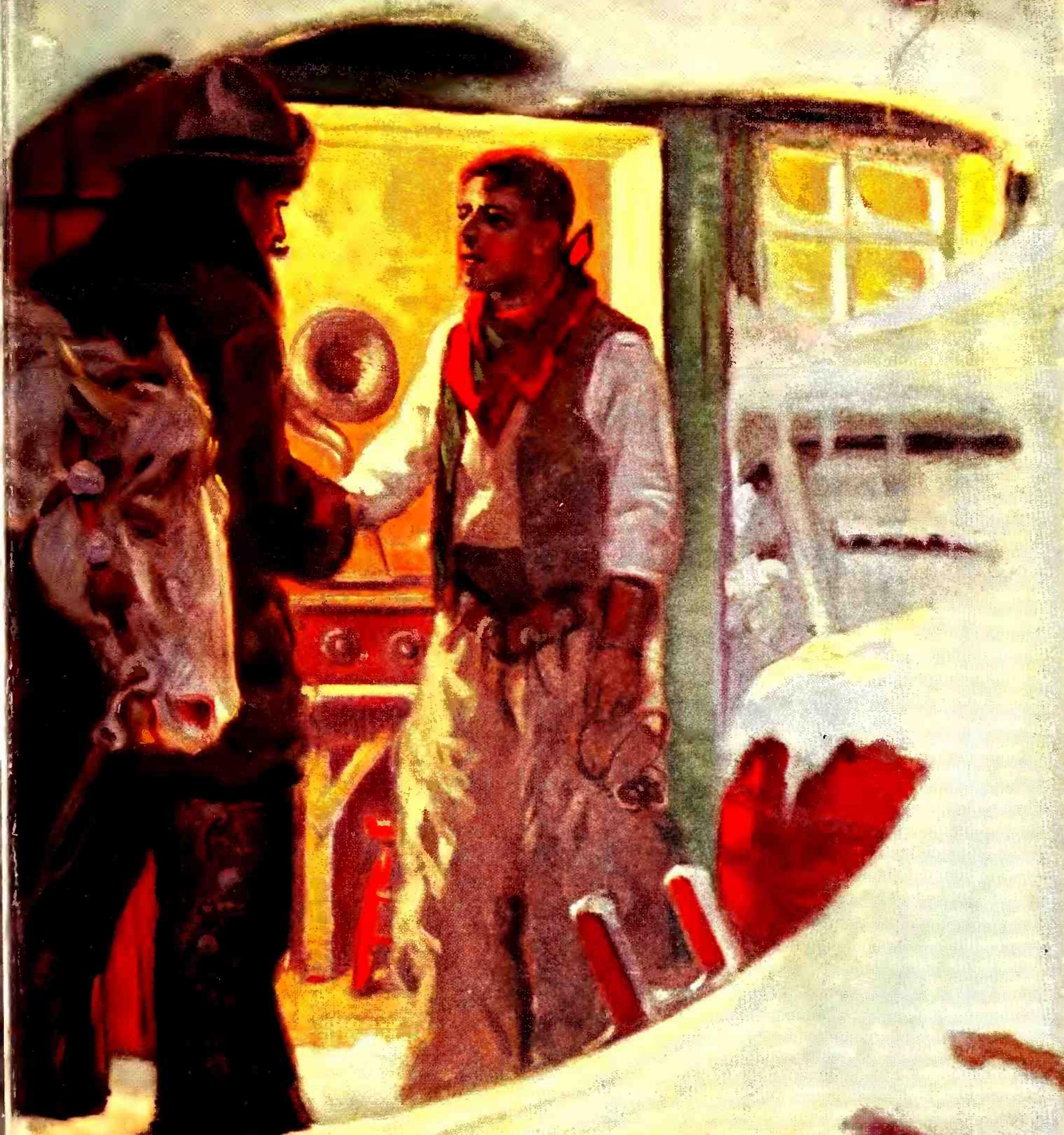


JAN. 1925 35 CENTS

RADIO BROADCAST





Hear Him
by RADIO
in your home

Funny? He's a Riot, a Laugh Factory, A Fifth Alarm!!! The whole nation knows his name and fame. But how few can actually see him in person!!! Radio leaps the Barriers of Time and Distance. Listen-in when next he's on the air. Cunningham Radio Tubes make Clear Reception a Certainty. Why gamble on sub-standard equipment for the nerve-center of your set? More than ever — Quality Counts.



Quality Plus Service
Since 1915

Price the same on all Five Types
C-301A, C-299, C-300, C-11, C-12

Patent Notice: Cunningham Tubes are covered by patents dated 2-18-08, 2-18-12, 12-30-13, 10-23-17, 10-23-17, and others issued and pending. Licensed only for amateur experimental and entertainment use in radio communication. Any other use will be an infringement.

Cunningham 40-page Data Book fully explaining care and operation of Radio Tubes now available by sending 10c in stamps to San Francisco Office.

Cunningham

RADIO TUBES



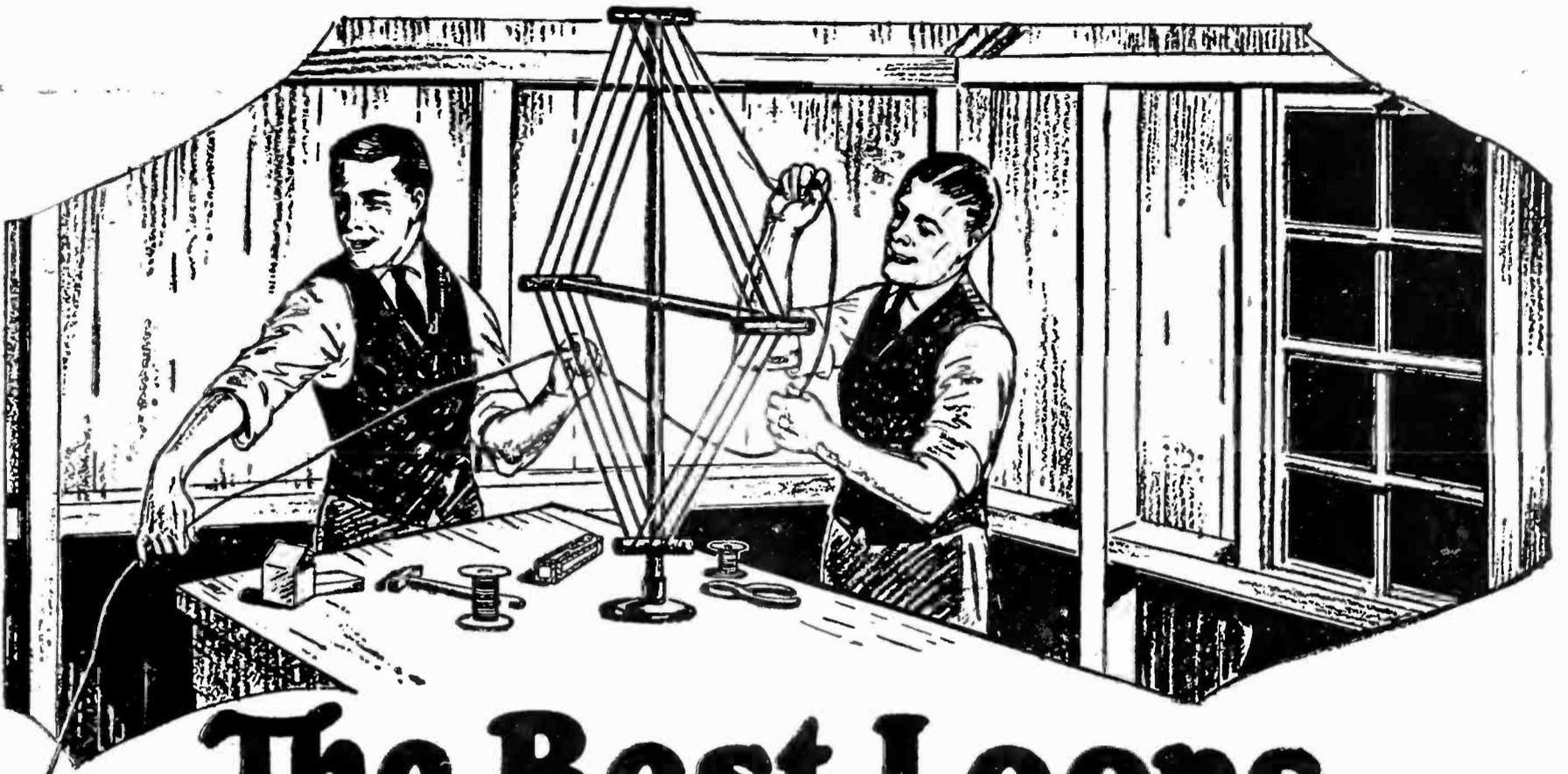
H. J. Cunningham Inc.

Branch
CHICAGO

HOME OFFICE
182 Second Street
SAN FRANCISCO

Branch
NEW YORK

★ Tested and approved by RADIO BROADCAST ★



The Best Loops are wound with *Special* wire

A good loop antenna must fulfill two requirements; it must be electrically efficient, and it must be mechanically satisfactory. To combine both requirements is difficult unless a special wire, made especially for loops, is used.

Belden Loop Wire is made of sixty exceedingly fine strands of copper wire twisted with five strands of phosphor bronze wire, enclosed in an insulating covering. The sixty copper strands afford a low resistance circuit for the radio-frequency oscillations of the loop; the

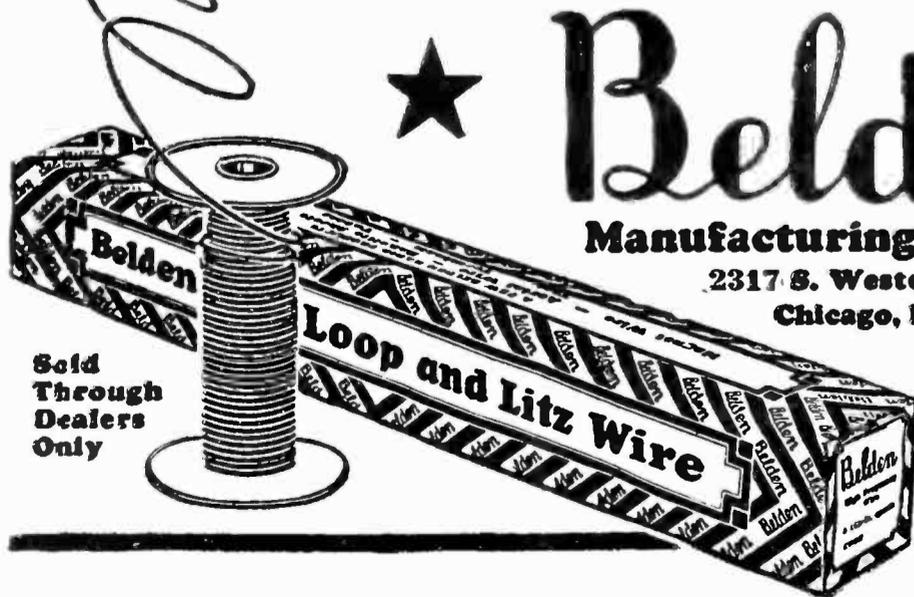
phosphor bronze strands provide the tensile strength that makes Belden Loop Wire non-stretching and non-sagging. Ideal for collapsible loops.

When you build a loop, make one that will give maximum signal strength and still keep snug and tight, after long usage. For special work, use Belden Litz Wire. Our new booklet, "Helpful Hints for Radio Fans," has a lot of good ideas that will help you. Send for it. It's free. Use the handy coupon.

OTHER BELDEN RADIO PRODUCTS

Ask your dealer to show you Belden hook-up wire, enameled aerial wire, terminals, battery cords, and a dozen other Belden items, sold in distinctive Belden cartons. Build Belden Quality into your radio set.

Free Booklet!



Sold Through Dealers Only

★ **Belden**
Manufacturing Company
2317 S. Western Avenue
Chicago, Illinois

DEALERS! Attach the coupon to your business letterhead for complete dealer information on the Belden Line of Radio Products.

Belden Manufacturing Company
2317 S. Western Ave., Chicago, Ill.
I would like to know more about good loops. Send me your latest booklet—Helpful Hints for Radio Fans. Be sure to explain Litz Wire, too.

Name _____

Address _____

★ Tested and approved by RADIO BROADCAST ★

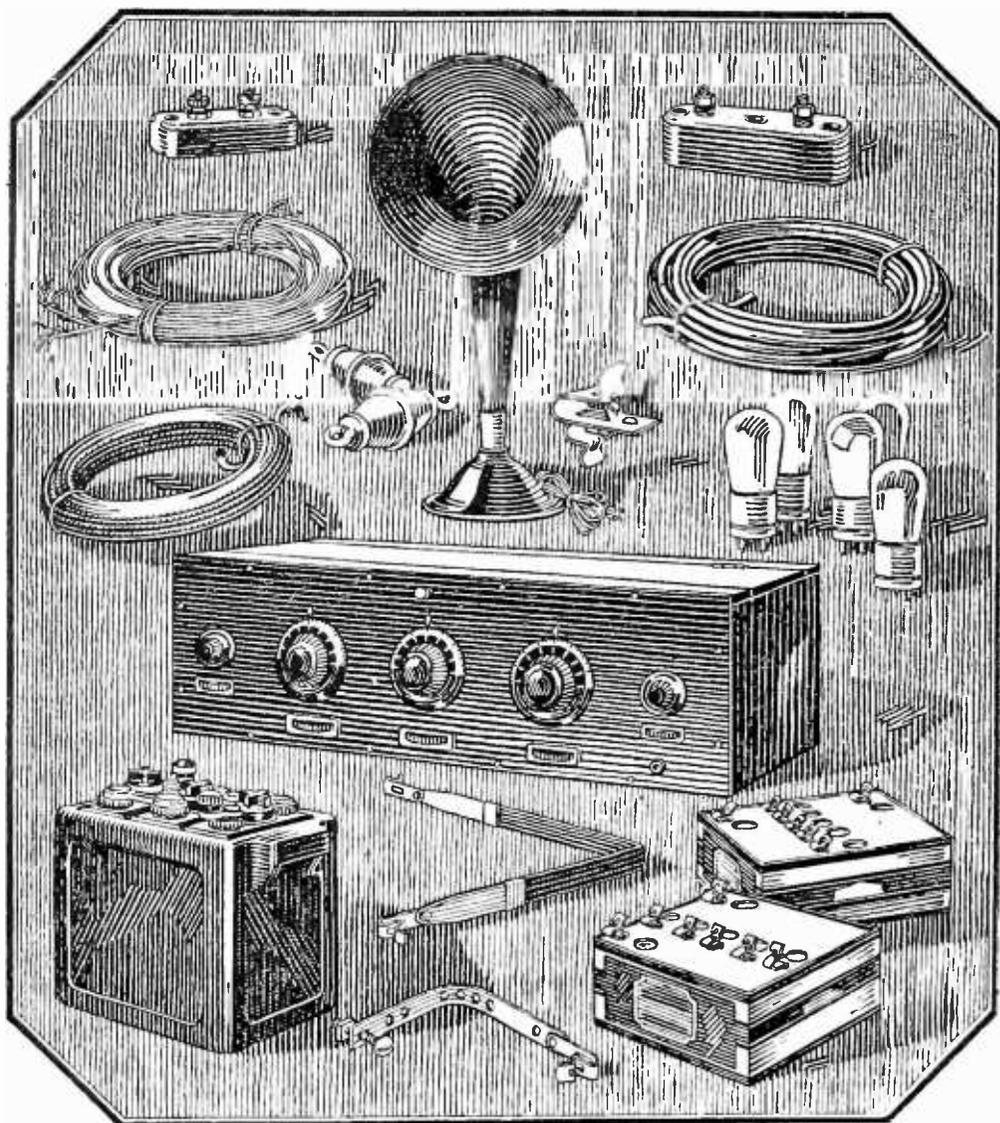
Which would

"WITHOUT ACCESSORIES"

This →

Radio instrument	Loud speaker	Ground clamp
Antenna wire	Window lead in	Antenna spring
Connection wires	Mechanic's labor	Hammer
Clips	Storage battery	Nails
Lightning arrester	"B" batteries	Screws
Insulators	Tubes	Staples

Separate price for each of these items, plus your time.



What "complete self-contained"

IT is the best of fun, we admit, to hook up a radio set, to string your antenna from tree to house, to connect your ground wire—at least it is fun if you are mechanically minded.

If, however, you want principally to use a radio set, there are two things of primary importance—first, that its tone and quality shall be absolutely pure, non-metallic and accurate; secondly, that it shall be as little

fuss and bother to you as is humanly possible. This means De Forest D-12 Radiophone—the leader in the field—bearing the imprint of Dr. Lee De Forest, the man whose great invention paved the way to radio broadcasting.

As to tone—it is impossible to describe the clean and natural quality which this instrument gives. You simply must hear it

DE FOREST RADIOPHONE

★ Tested and approved by RADIO BROADCAST ★

you choose?

DE FOREST D-12 RADIOPHONE

Complete in one unit, with everything necessary to use it immediately — all at the one initial cost.

Prices according to cabinet finish and batteries.

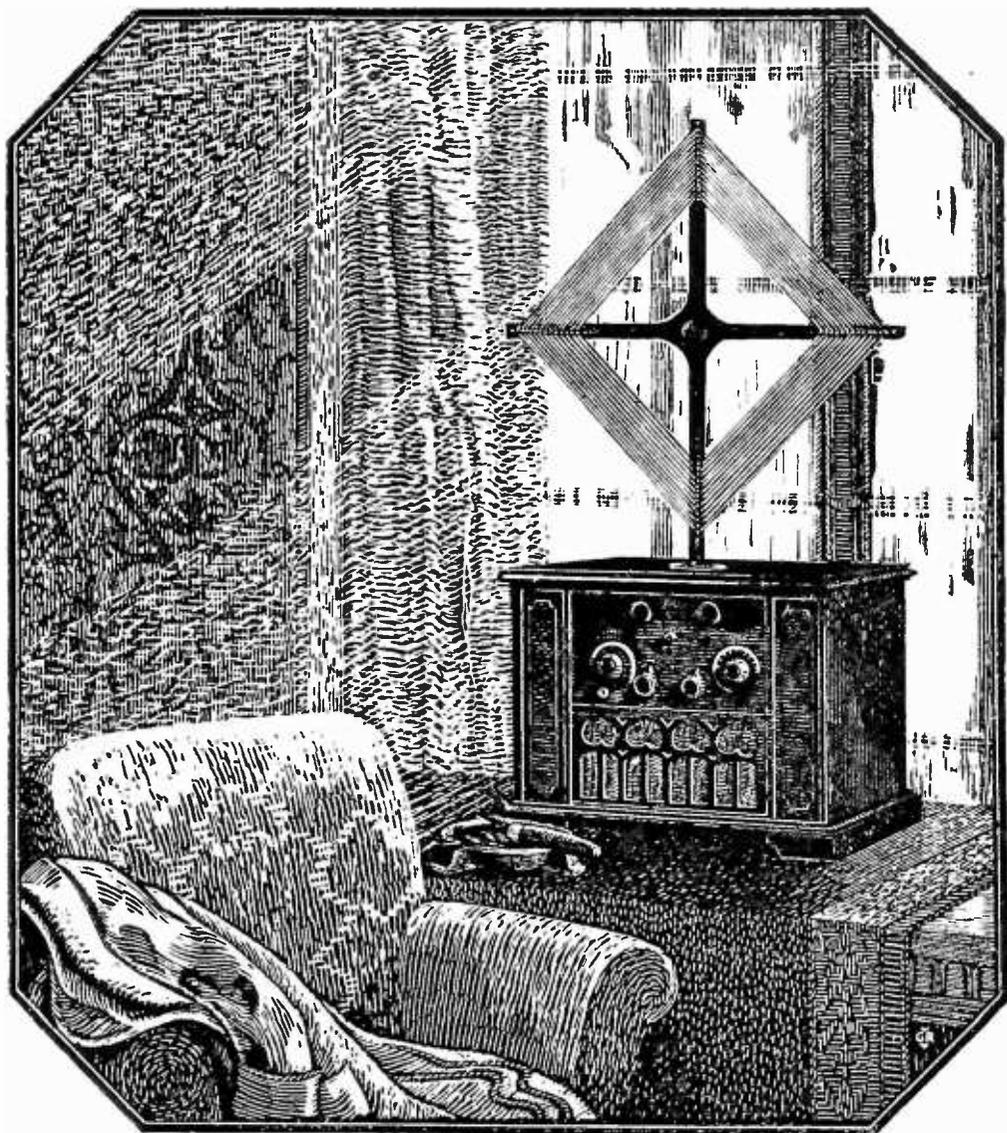
With dry batteries

In Fabrikoid cabinet : : : : : \$161.20
 In Mahogany cabinet : : : : : 176.20

With storage batteries

In Fabrikoid cabinet : : : : : \$180.00
 In Mahogany cabinet : : : : : 195.00

← *or this*



means as in De Forest

and judge for yourself. And as for convenience, remember these important things: it is self-contained and complete in one unit—usable within five minutes after it enters your home—easily movable from room to room because it does not need to be attached to either antenna or ground.

When you find the De Forest agent in your vicinity you find a man who knows

radio—a man who has given us his word that he will see that every instrument he sells is thoroughly inspected and properly serviced after the sale.

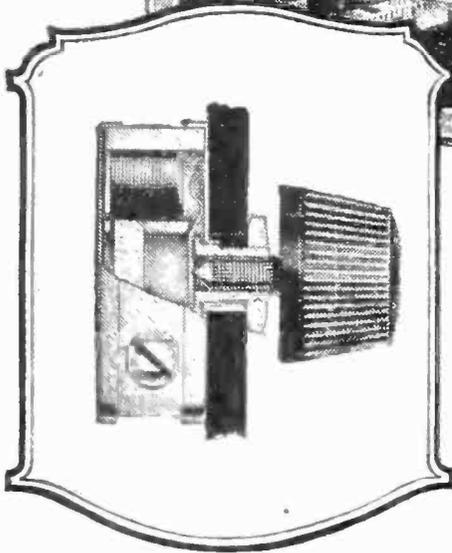
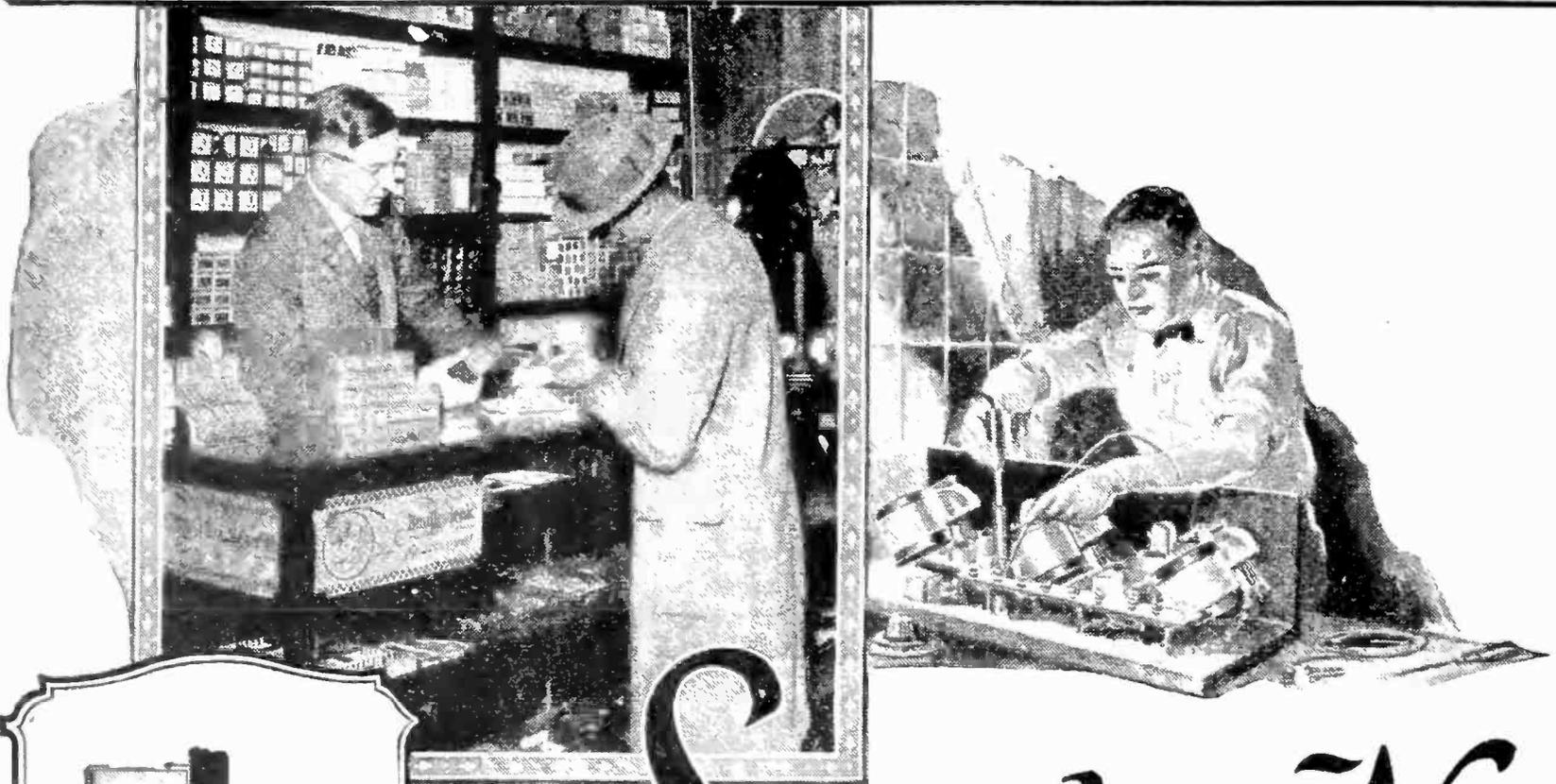
Avail yourself of his help. He desires, as we do, that you should get the fullest enjoyment and satisfaction from your instrument.

DE FOREST RADIO COMPANY, JERSEY CITY, N. J.
 Also makers of De Forest Tubes, The "Magic Lamp" of Radio

DE FOREST RADIOPHONE

★ Tested and approved by RADIO BROADCAST ★

Before You Build Your Radio Set



See the New Allen-Bradley Line

Radio amateurs are building better receiving sets, today! They want greater distance, better selectivity, and clearer reception.

The new Bradleystat, Bradleyleak, Bradleyohm, Bradleyometer and Bradleyswitch have met with instant favor, everywhere. In a super-class, by themselves, they are the exclusive choice of the discriminating amateur who has learned from experience that noiseless, stepless control is essential for perfect radio reception. Your set will work better with Allen-Bradley Radio Devices. For sale by leading dealers.

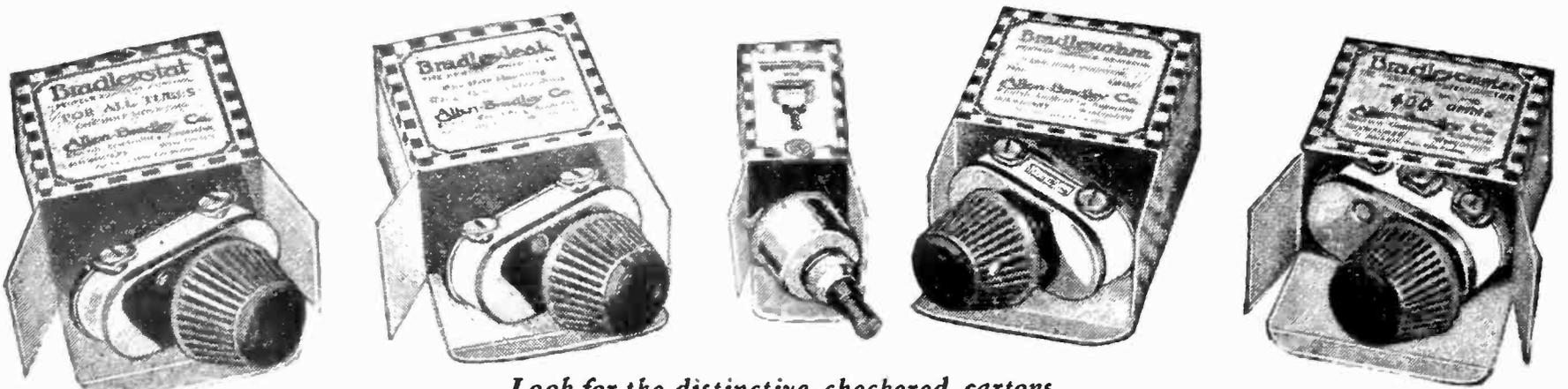
Distinctive Features

- 1—Extremely compact without loss of control.
- 2—One-hole mounting for panels. Table mounting if desired.
- 3—Noiseless, stepless control, due to graphite discs.
- 4—Guaranteed against defects in material and workmanship.
- 5—Sold in distinctive checkered cartons by leading radio dealers.



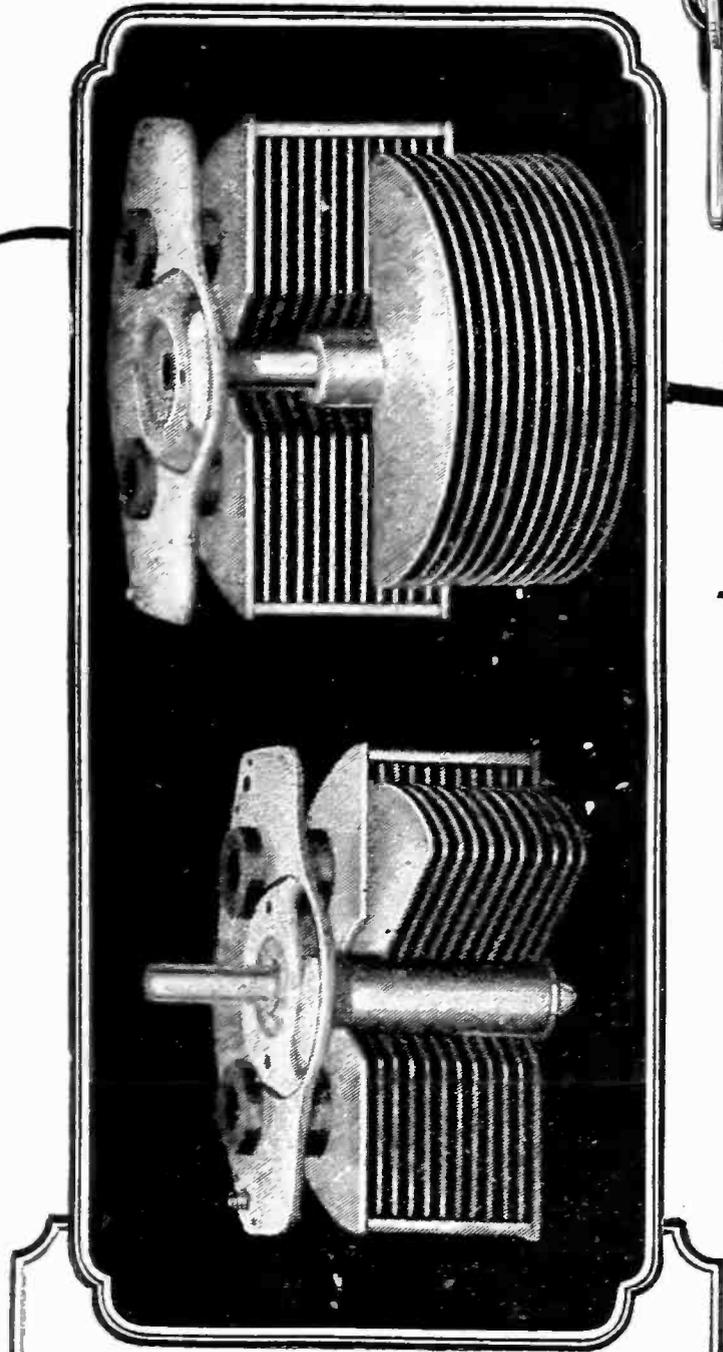
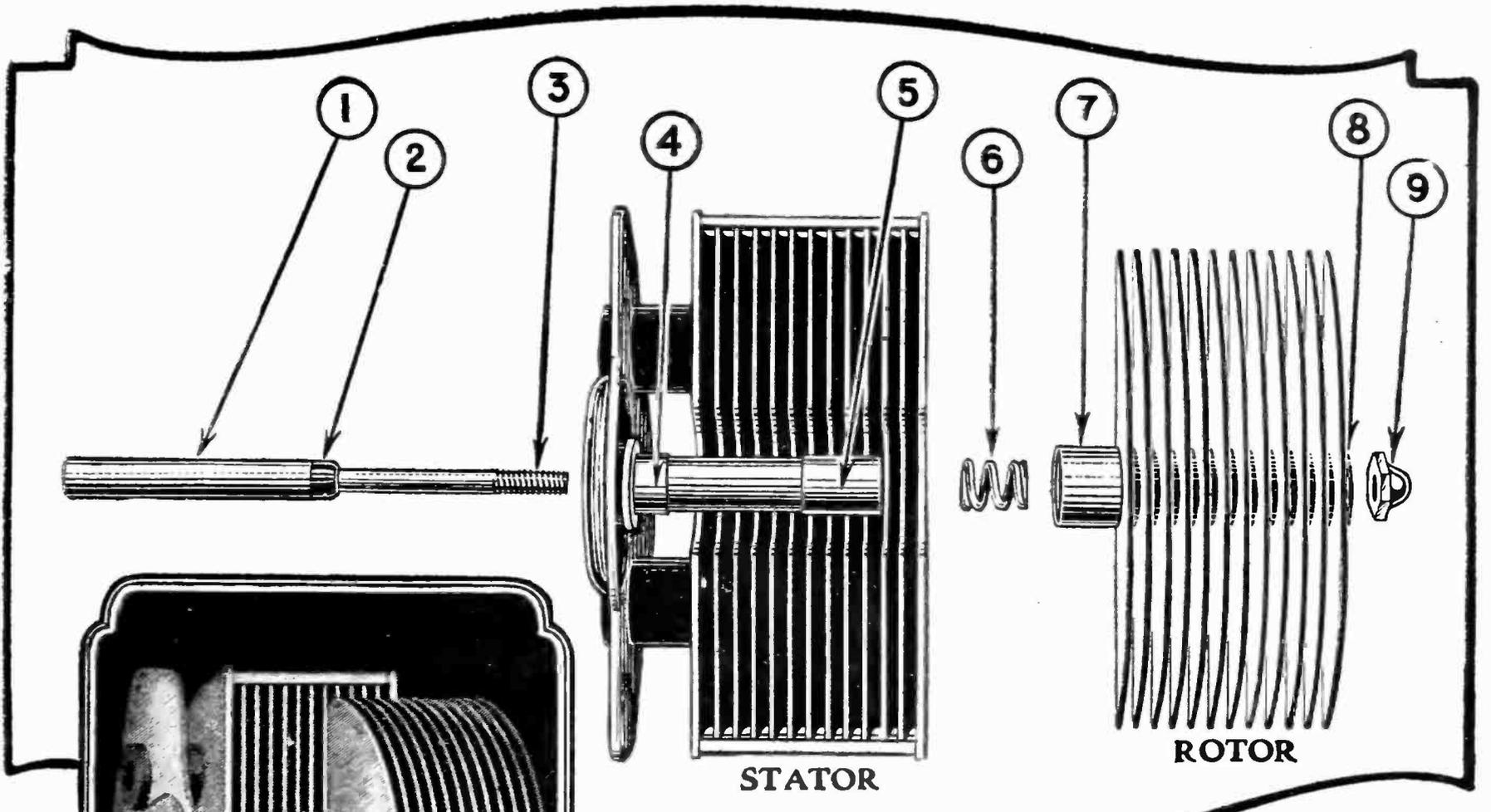
Allen-Bradley Co.
Electric Controlling Apparatus

General Office and Factory: 278 Greenfield Avenue Milwaukee, Wisconsin



Look for the distinctive checkered cartons which identify all Allen-Bradley Radio Devices.

★ Tested and approved by RADIO BROADCAST ★

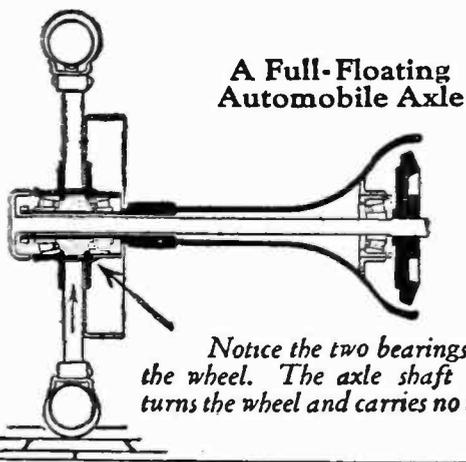


The Condenser with the "full floating axle"

The striking feature of the Bradleydenser is the rigid double bearing, based on the principle of the "full-floating" automobile axle, that eliminates the usual outer pivot-bearing for the rotor shaft, and still provides a non-sagging support that insures perfect alignment of the rotor plates.

The rotor plates, soldered on a long, hollow tube extending from [7] to [8], revolve on a hollow steel stem provided with *two* bearings [4] and [5]. The alignment and support of the rotor is independent of the condenser shaft [1], as shown by the first photograph at the left. The shaft [1] merely turns the rotor. It slips through the hollow steel stem and its threaded end [3] is secured to the rotor at [8] with the nut [9] as shown in the second photograph. The spring [6] prevents end-play.

This design, combined with the use of soldered brass plates, results in a rugged, long-life condenser of extremely high efficiency. For superior service, use the Bradleydenser.



A Full-Floating Automobile Axle

Notice the two bearings for the wheel. The axle shaft only turns the wheel and carries no load.

Allen-Bradley Co.
Electric Controlling Apparatus



General Office and Factory: 278 Greenfield Ave., Milwaukee, Wis.

Bradleydenser

PERFECT VARIABLE CONDENSER

★ Tested and approved by RADIO BROADCAST ★

CONTRACTOR TO BRITISH, FRENCH AND ITALIAN GOVERNMENTS

C. F. Elwell.

MEM. INST. ELEC. ENGINEERS
FELL. INST. RADIO ENGINEERS.
MEM. AM. INST. ELEC. ENGINEERS
MEM. ASS. ELET. ITALIANA

RADIO ENGINEER

DESIGNER & MANUFACTURER
OF ALL KINDS OF
WIRELESS PLANT
AND CONTRACTOR FOR
COMPLETE INSTALLATIONS

SPECIALIST IN ALL SIZES OF
FOULSEN ARC GENERATORS
UP TO 1000 KW

LONDON & PARIS

TELEGRAMS: "ELRADIOENG, WESTCENT, LONDON"
CABLES "ELRADIOENG, LONDON"
WESTERN UNION CODE:
TELEPHONE REGENT 1607

**GRAVEN HOUSE,
KINGSWAY,
LONDON, W C 2**

October 20th, 1924.

General Instrument Corp.,
423 Broome Street,
New York, New York. U. S. A.

Dear Sirs:

By first post and without delay, please ship me six (6) Variable Air Condensers type 56D 500 mmfds maximum capacity, insulated with Isolentite and by the same post six (6) Variable Air Condensers type 51D 500 mmfds maximum capacity, insulated with Pyrex.

It may be of interest to you to know that we have no condenser on this side to equal yours in the matter of phase angle difference. As a matter of fact, in all my many years of radio experience, I have never had an opportunity before to experiment with a Variable Condenser having a phase angle difference of a little over three (3) seconds.

I am using your condensers in a very small set, and can hear your American Stations nightly very clearly and without difficulty.

Yours sincerely,

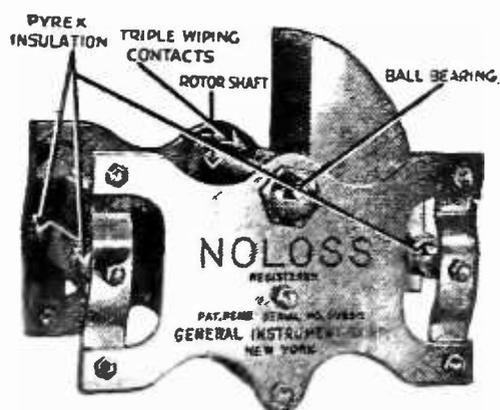
CPE/GG

C. F. Elwell.

From Oversea



NOLOSS
 TRADE MARK
TYPE 51
PYREX INSULATION



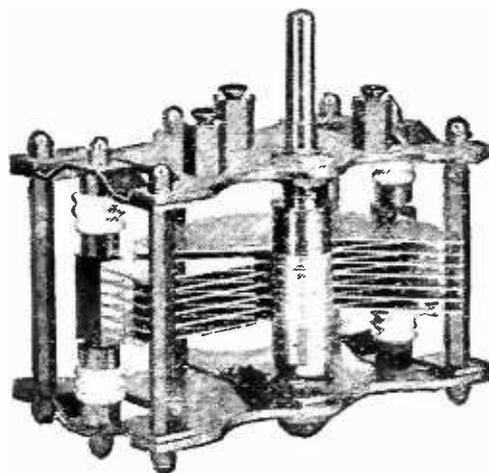
THE unapproached quality of General Instrument NOLOSS, Pyrex and Isolantite Condensers, is acknowledged.

The phase angle difference (measured at 1500 kilocycles) of 3.6 and the power factor of .00175 percent is the result of engineering skill that commands recognition.

NOLOSS Condensers have proved their electrical supremacy, their mechanical superiority. They are ruggedly built with jealous watchfulness to permanently withstand wear and tear—a vital condition in obtaining oversea results.



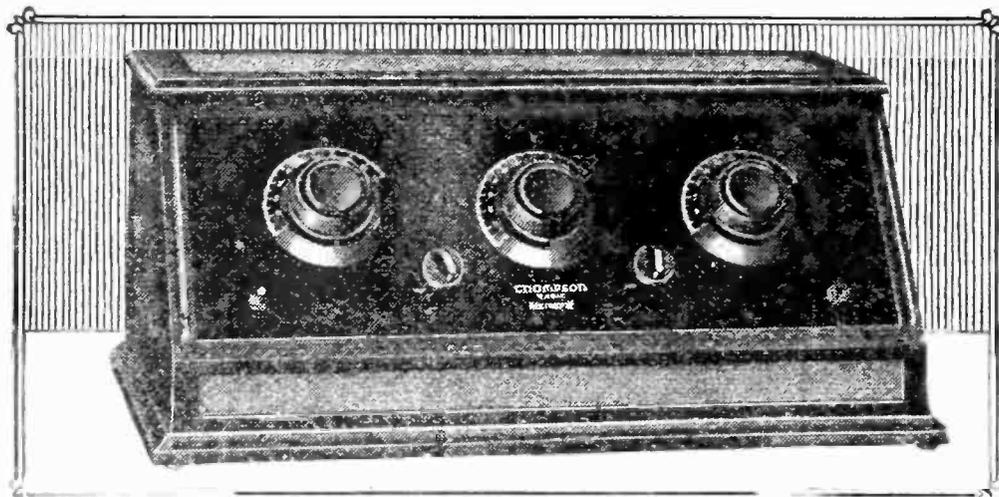
NOLOSS
 TRADE MARK
TYPE 56
ISOLANTITE INSULATION



General Instrument Corporation

Manufacturers of Laboratory Equipment

**423 BROOME STREET
 NEW YORK, U.S.A.**



"Experience is the Vital Factor in Excellence"

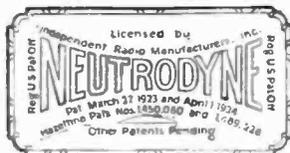
THOMPSON RADIO

THE THOMPSON COMPANY is the only organization that has been manufacturing radio apparatus *exclusively for fifteen years*. During this time its research laboratories have perfected developments which have contributed largely to the advancement of the radio industry.

This wide experience, now available in the Thompson apparatus, means Receiving sets and Speakers that embody the latest and best practice in Radio Engineering.

A critical investigation of each model will disclose outstanding features of genuine effect, in artistic appearance, naturalness of tone, simplicity of operation.

Radio in the home broadens the scope of human happiness. Every day the broadcast program carries something for every member of the family.



The 5-tube GRANDETTE is \$125. The 5-tube PARLOR GRAND, (shown above) is \$145. The 6-tube CONCERT GRAND is \$180. Prices are without tubes or batteries. The Thompson Speaker, with conical diaphragm and other special features, is now \$28.

Write for attractive literature and name of Thompson dealer near you.

R. E. THOMPSON MANUFACTURING CO.
FACTORY: JERSEY CITY, N. J. 30 CHURCH STREET
NEW YORK, N. Y.



CONCERT GRAND

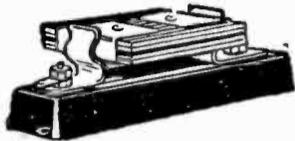
THOMPSON
SPEAKER

GRANDETTE

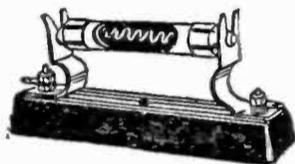
★ Tested and approved by RADIO BROADCAST ★



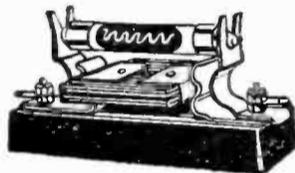
The Super-Amplifier



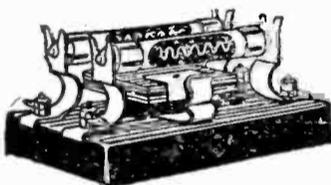
Condenser Mounting



Grid-Leak Mounting



Combination Mounting No. 51



The Resisto-Coupler

Read the "RESISTOR MANUAL." A thirty-two page hand-book on Resistance Coupled Amplification with interesting data and hook-ups

Price 25 cents
At Your Dealers



The DAVEN SUPER AMPLIFIER

To-day, more than ever, the discriminating radio fan is insisting on quality reception—the blatant reception of the past will no longer satisfy. Resistance Coupling is the ultimate method of audio amplification because of its perfect reproduction.

The *Daven Super-Amplifier* is the aristocrat of all amplification devices—it comes ready to install in any set, condensers and resistors included and the complete unit laboratory tested and ready to give an immediate and superior service. It reproduces with fidelity the voice or musical instruments, as if the radio were not, and that the artists themselves were performing in your own home.

Sold at all good Radio Stores

DAVEN AMPLIFIER KITS (without sockets and condensers) for those who build their own.

3-Stages\$ 8.00
4-Stages 10.50

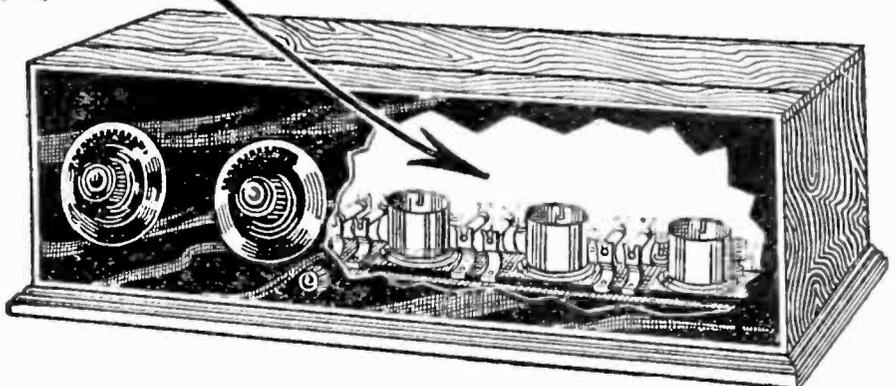
Manufacturers of the Daven Grid Leak Resistors and Mountings

DAVEN RADIO CORP.

"Resistor Specialists"

Newark

New Jersey



★ Tested and approved by RADIO BROADCAST ★

THE NEW SUPER-HETERODYNE MODEL C-7 ★

Important To-day

THE EXPERIMENTERS INFORMATION SERVICE, Inc., has been recommending the Super-Heterodyne method of reception since the early part of 1922. In February, 1923, a Super-Heterodyne of our design was installed on the S.S. *Western World*, pier 1, Hoboken, N. J., in the cabin of Dr. Horatio Belt. On the voyage to Rio de Janeiro, Brazil, at a distance of 3,000 miles, southeast of New York, the entire Gardner fight was received from WJZ, with sufficient audibility for the entire cabin full of passengers to hear the bout, blow by blow, plainly. At 3,300 miles southeast of New York, an entire evening church service was received from Pittsburgh. At that time there was not another single firm advertising the Super-Heterodyne. Since then Mr. A. Ancieux, Engineer, Trariviva Elec de Arequipa, Arequipa, Peru, has reported consistent reception from KDKA, WDAP, WEAF, WGY, and others, a distance of over 5,000 miles, using a Model "C" Super-Heterodyne. The Pratt & Brake Corp., of New York City, sent a Model C to Rio de Janeiro which received American broadcast station at a distance of over 7,000 miles.

Practically all concerns now featuring Super-Heterodyne have copied our original Model C design, and to prove again that we are far in advance of competition, we present this Improved Model C-7 Super-Heterodyne as the *Most Sensitive, Most Selective, and finest* reproducing Broadcast Receiver that can be built.

7 Tubes Give the Results of 10

The Reason:—When regeneration is added to a one tube non-regenerative receiver, tuned radio frequency amplification is about equal to adding two stages of tuned radio frequency amplification. Heretofore it has been impossible to add regeneration in the 1st Detector of a Super-Heterodyne and accordingly this has been a big loss. The new Model C-7 Super-Heterodyne has a special 1st Detector circuit with a split antenna inductance so arranged that normally the detector would oscillate continually. However, in addition, a neutralizing condenser is inserted in the circuit which gives absolute control of the oscillations to such an extent that the circuit can be adjusted to just below the oscillating point, as this adjustment gives the maximum regenerative amplification. The new circuit has a bias potential on the 1st Detector grid, in place of the usual grid leak and condenser, and this allows infinitely weak signals to be regenerated and heterodyned through the radio frequency amplifier, which an ordinary grid leak and condenser would block. On a weak signal the difference in sensitivity is very noticeable. Using a 22-foot indoor antenna in the suburbs of New York loud speaker reception has been obtained from KGO, Oakland, California. A normal range of 2,000 miles is easily obtained on an average small antenna at night under average conditions.

EXPERIMENTERS INFORMATION SERVICE, INC.

476 BROADWAY, NEW YORK CITY

Designers of the Highest Class Radio Apparatus in the World

New Book, "Modern Radio Reception," by Charles R. Leutz, over 250 Pages, over 150 Illustrations, Fully Bound, \$3.00 Postpaid

"The Rolls-Royce of Reception



MODEL C-7 SUPER-HETERODYNE

Wave-length Range, 200 to 575 meters. Dimensions, 40 in. x 8 in. x 8 in.
Tube Arrangement: Regenerative Detector, Oscillator, 2 Stages Radio, Detector, 2 Stages Audio

General Information

ANTENNA: Single wire, 30 to 150 feet long. Provision has been made for use of either a short or long antenna. Indoor antenna works very satisfactorily.

TUBES: 7 Radiotrons UV201A or C201A, requiring one 6 volt storage battery and one 90 volt B Battery either dry or storage.

DRY CELL TUBES: Radiotrons UV199 or C199 may be used if desired, but the results obtained with dry cell tubes are not as satisfactory as with the Radiotrons UV201A or C201A.

LOOP: As a loop takes considerable space and is objectionable looking, and furthermore an inefficient collector, no provision has been made for loop reception. Local reception can be had without antenna or ground. An indoor antenna 30 to 50 feet long is suggested in place of a loop.

SELECTIVITY: The degree of selectivity is so high that distance stations can easily be tuned in through the local stations. For example, with a C-7 located five miles from WJZ operating on 455 meters, WCAE Pittsburgh on 462 meters can be tuned in without interference with WJZ.

TUNING: There are only two tuning adjustments, one for the detector circuit and one for the oscillator. Each station has a definite point on each dial and will always be found at these calibrations. Individual Verniers are provided for each dial. A third Vernier controls the volume.

CONSIDERATIONS: The Second Harmonic feature could be used with a view to eliminating another tube, but we feel that the many advantages of having a separate oscillator more than compensates for the extra tube. For a similar reason we have refrained from Reducing the circuit to reduce the number of tubes.

STANDARDIZATION: All the component parts specified are readily obtainable on the market through high-class dealers.

PARTS: The parts specified in this design are all selected with expert consideration with a view to giving the maximum results obtainable. While it may appear that certain other parts could be used to economize, we strongly recommend that you take advantage of our engineering experience and follow the specifications to the letter.

Original Blue Print showing all data, diagrams, circuits, details, etc.,
\$1.00, postpaid

GOLDEN-LEUTZ
PLIODYNE-6

TRADE MARK REG.

"The Perfect Broadcast Receiver"

\$95.00 COMPLETELY
 CONSTRUCTED
 WITHOUT ACCESSORIES
 Transportation Prepaid

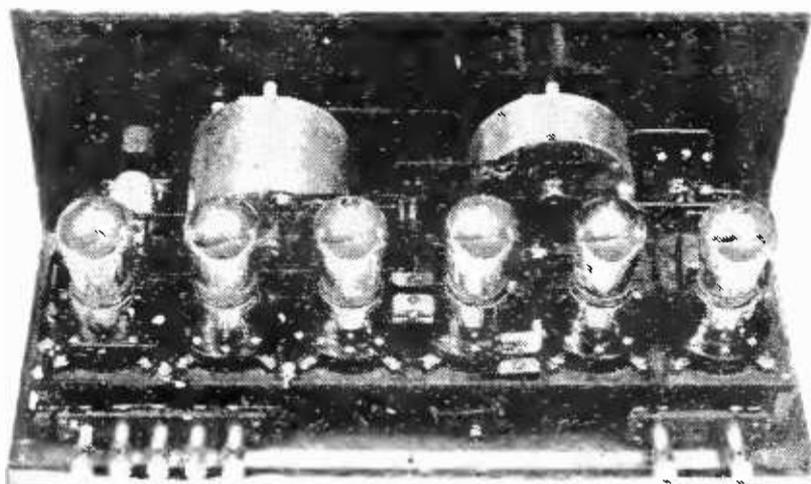
A New Superior Broadcast Receiver ★

SIMPLE—LONG RANGE—HIGHEST QUALITY—NON RADIATING—NON REGENERATIVE

Two Stages Tuned Radio Frequency, Detector and Three Stages of Audio Frequency Amplification



PLIODYNE 6
 Front View Showing Simplicity of Control



PLIODYNE 6
 Interior View Showing Compact and Efficient Design

A New Marketing Plan

Rather than sell this high grade receiver to wholesalers at \$190.00 less 50% discount, we are going to sell it direct to you at wholesale, saving you \$95.00 and at the same time giving you the finest set that can be bought for twice the amount.

Inspect the "PLIODYNE 6" at Our Expense

We will send the "Pliodyne 6" C.O.D. transportation prepaid with privilege of inspection. If it does not appeal to you as the finest medium priced broadcast receiver you ever saw, return it to us at our expense.

Otherwise take advantage of

A Free Trial

Accept the C.O.D. and try the "Pliodyne 6" for five days, if you are not satisfied in every way, return it at our expense and we will return your money.

Our Guarantee

We guarantee every GOLDEN-LEUTZ "Pliodyne 6" to be the finest broadcast receiver that can be manufactured using 6 tubes or less and to be satisfactory to you in every way and to reach you in perfect condition.

You take no risk whatever in sending us your order, for unless you are completely satisfied with the receiver and with your saving you may return the receiver to us and we will refund your money.

GOLDEN-LEUTZ, Inc.

476 BROADWAY

NEW YORK CITY

LICENSED UNDER FARRAND AGREEMENT AND HOGAN PATENT NO. 1,014,002

NOTE:—We reserve the right to withdraw the Free Trial Offer if our Factory Production is exceeded.

GOLDEN-LEUTZ, Inc.

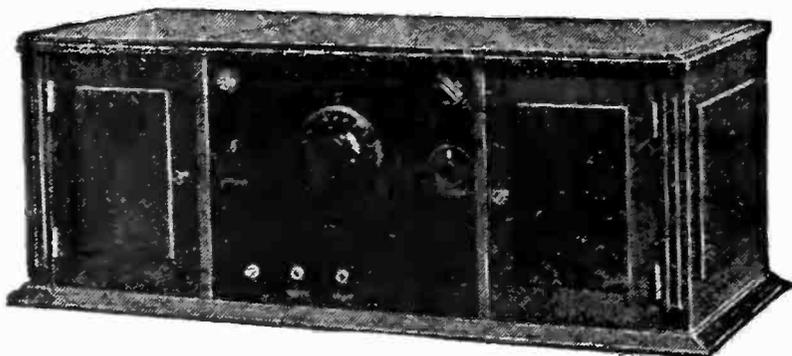
★ Tested and approved by RADIO BROADCAST ★

The Harbinger of Happiness

A radio set in the home is a "Well Spring of Pleasure"—it brings to the family that outside atmosphere for which we crave—music and song with an occasional opera and drama or after dinner speech. When concerts are received with a "Brandola", the joy is even more great, for it reproduces with fidelity the interpretations of the artists performing. You can purchase a "Brandola" in any good Radio Store.

The Brandola

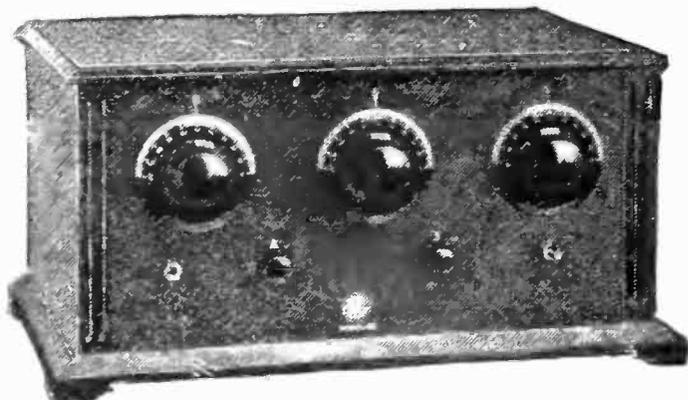
Just one dial to operate six tubes—distance is no barrier to reception with this set. It is very selective and has wonderful volume. By the use of Resistance Coupling for its amplification the tone quality of the Brandola is perfect. Cabinet may be had in American Walnut or Mahogany.



List Price \$125
 West of Rockies . . . 135
 Canada 165



The Brandola III



A Five-Tube Radio Frequency Set that is especially designed to meet the demand for a high-grade receiving set at a medium price. It is very selective and has extraordinary distance range and great volume. Genuine American Walnut Cabinet of pleasing design.

List Price \$ 85.
 West of Rockies 90.
 Canada 115.

The J. F. BRANDEIS CORPORATION, NEWARK, N. J.

★ Tested and approved by RADIO BROADCAST ★



Is AmerTran the best

AmerTran is recommended to you as the "best" audio frequency transformer because:

AmerTran gives the *most* uniform amplification. All tones are amplified nearly alike.

AmerTran insures amplification of the *highest* order with minimum distortion.

AmerTran makes tubes deliver the *utmost* in volume, clarity and tone quality.

Use a pair of AmerTrans and you have *the* combination to get *all* two stages can possibly deliver.

AmerTran is made in two types, one quality — A F 6—Ratio 5:1 and A F 7—Ratio 3½:1. Buy them by the pair!

AMERICAN TRANSFORMER COMPANY

175 EMMET STREET, NEWARK, N. J.

"Transformer builders for over twenty-three years"



Price either model \$7.00 at your dealer's.

AMERTRAN
TRADE MARK REG. U.S. PAT. OFF.

Send for leaflet giving useful amplifier information.

★ Tested and approved by RADIO BROADCAST ★

SPAULDING BAKELITE

Endorsed by

Andrew Radio Co.
C. D. Tuska Co.
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Coto Coil Co.
Rawson Elec'l Instr. Co.
The Framingham Co.
Elec'l Products Mfg. Co.
Forest Electric Co.
American Mechanical
F. A. D. Andrea
Resas, Inc.
Magnus Electric Co.
R. E. Thompson
Dynamotive Radio Corp.
Ware Radio Corp.
Phoenix Radio Corp.
Chicago Radio Laboratories
Operadio Corporation
Howard Radio Co.
H. C. Saal Co.
Krasco Mfg. Co.
Wells Mfg. Co.
Ferro Mfg. Co.
Joy Kelsey Corp.
Clapp Eastnam Co.
De Witt La France Co.
Cutler Hammer Mfg. Co.
Shepard Potter Co.

SPAULDING FIBRE COMPANY, Inc.

Tonawanda New York

Factory: Tonawanda, N. Y.

Sales Offices—Warehouses

484 Broome Street, New York City

141 No. 4th Street, Philadelphia

659 W. Lake Street, Chicago

15 Elkins Street, Boston

310 E. 4th Street, Los Angeles

171 2nd Street, San Francisco

509 First National Bank Building,
Milwaukee

Specially Processed for RADIO

WHEN you consider its source, you can readily understand why Spaulding-Bakelite is demanded by discriminate radio fans and leading manufacturers.

Made in the Spaulding plant, famous for over fifty years of specially processed fibre—accorded the Spaulding limitless facilities for uncommon manufacturing—this bakelite for radio panels and tubes is likewise especially processed and especially dependable.

Beautiful, black, everlasting, high gloss finish. Drills, saws and engraves safely; will not shrink or split. Highest in dielectric strength. Supplied in standard sizes, individually packed in envelope containers—special size to order.

Write nearest office for descriptive circular ★

Spaulding -BAKELITE



★ Tested and approved by RADIO BROADCAST ★



The Strongest Indication

of the real worth of the Newport Radio Receiver is evidenced by the many who have patiently waited up to this time for the models ordered.

This delay in shipping your Newport has been occasioned by the impossibility of keeping pace with the unexpectedly heavy demand. Allow us to thank you for your kindness and forbearance.

Plans are being consummated (5 to 10 days at the most) whereby the Newport production will be large enough to adequately handle the rapidly increasing demand. This larger production will mean the same skillful craftsmanship, the same careful workmanship, and the same rigorous tests that have heretofore characterized this receiver.

This extraordinary and gratifying demand has proven two things: It has proven that the quality of the Newport was instantly recognized; and it has proven that our many friends are willing to deny themselves the pleasure of the ordinary receiver in order that they may know the joy of a Newport.

Such a confidence in this product has doubly intensified our efforts to make the Newport a product that requires no apologies, anywhere, at any time.

*The Newport Is a Good Receiver
Built in a Piece of Fine Furniture*

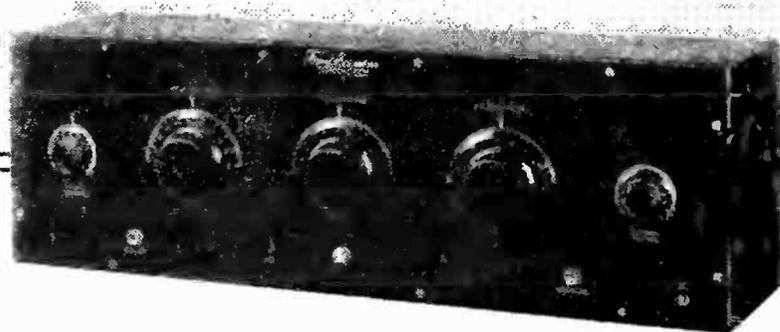
Newport Radio Corp.

*250 West 54th Street,
New York City*



★ Tested and approved by RADIO BROADCAST ★

FREED- EISEMANN



Can you do it?

There are fourteen "locals" in New York City. Can you hear them — *one at a time in full volume*—without overlap?

Then—can you tune them out and get distance without interference? Can you pick up your DX station by the log, without fishing for the squeal?

All this is the every-day performance of the FREED-EISEMANN Radio Receiver. Installed in the same building with a broadcasting station, it has tuned out the station and brought

in other programs from distant cities.

The secret is *finesse*. Each FREED-EISEMANN Receiver is custom-built by trained experts, not mere assemblers. The condensers are specifically designed, as are the matched radio frequency coils. Seventeen separate tests insure the perfection of each FREED-EISEMANN Receiver.

Four-tube and five-tube models. Price \$100 up, slightly higher in Canada and west of the Rockies. Booklet "Buying a Radio" free on request.

Freed-Eisemann Radio Corporation
MANHATTAN BRIDGE PLAZA, BROOKLYN, NEW YORK



★ Tested and approved by RADIO BROADCAST ★



You can make it come in clear

THERE'S a lot of satisfaction and enjoyment in perfect reception.

Yet it does not come merely with having a good loud speaker.

It's the work of Jefferson Transformers to provide full, smooth amplification—furnish the loud speaker with the proper energy so as to assure the greatest volume consistent with purity of tone.

Proper design prevents howling and distortion. You want more than noise from your loud speaker; that's why Jeffersons are made to a ratio which assures clarity.

Even amplification over the entire musical range, perfect reproduction of the voice or instrument—these are some of the reasons why radio authorities and music lovers the world over are recognizing the superiority of Jefferson Transformers.

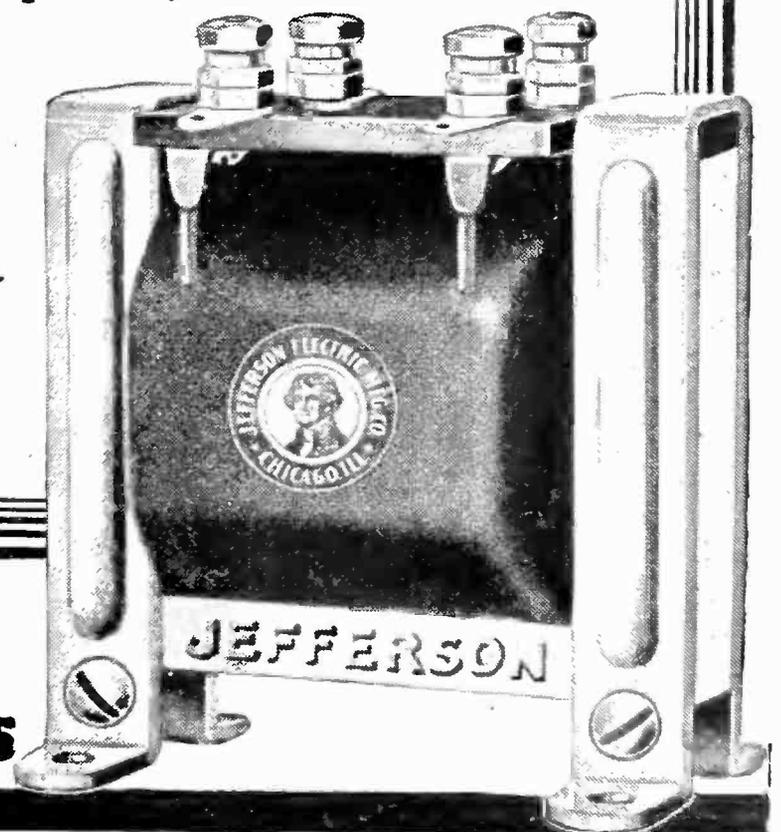
Designed by a concern with over 20 years' experience in the manufacture of high grade transformers of all descriptions. Jefferson Transformers meet matched construction specifications.

Ask for our latest Jefferson circuits including full details for building the Jefferson Baby Grand Superheterodyne (6 tubes). Write today.

Jefferson Electric Mfg. Co.
442 South Green Street, Chicago

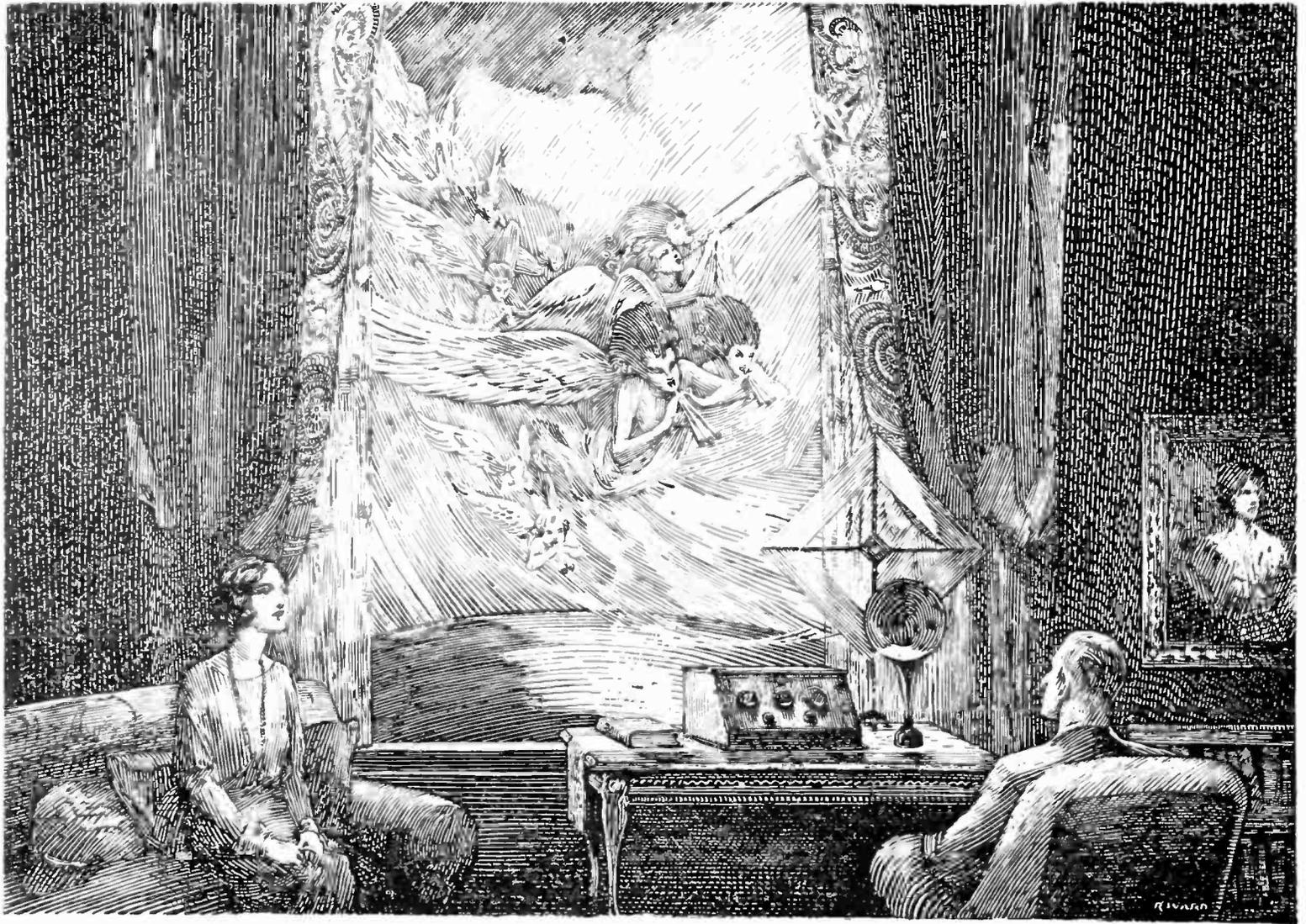
Manufacturers of

Bell Ringing Transformers	Gas, Furnace and Oil
Sign Lighting Transformers	Burner Transformers
Automobile Ignition Coils	and Ignition Equipment
Testing Instruments	Toy Transformers
Jump Spark and Make and	Low Voltage Auto
Break Ignition Coils	Transformers



Jefferson Transformers

★ Tested and approved by RADIO BROADCAST ★



★ The Finest Entertainment Whispers at Your Window

THE *Mercury* Receiver was born at the very moment when its qualities were beginning to be demanded by the public. It is the *perfect* reflex receiver.

Absolute faithfulness of reproduction; all the distance two stages of perfectly engineered tuned radio frequency can provide; simple exactness of tuning which admits but one signal at a time—these are a few of the features which contribute to *Mercury* greatness.

We respectfully suggest critical side-by-side comparison between the *Mercury* and any other set made.

MERCURY RADIO PRODUCTS CO. • 50 CHURCH ST., NEW YORK CITY

Visit your dealer or write direct for *De Luxe Catalog*

TECHNICAL

Highest existing development of Grimes Inverse Duplex System. Four tubes reflexed and equal to six straight (two tuned radio frequency, tube detector and three stabilized audio frequency). Operates from loop (furnished) also indoor or outside antenna *without change* in set. "Last word" low-loss engineering at every point.

MERCURY BROADCAST RECEIVER

Licensed under Grimes Patents—issued and pending
"The STRADIVARIUS of RADIO"



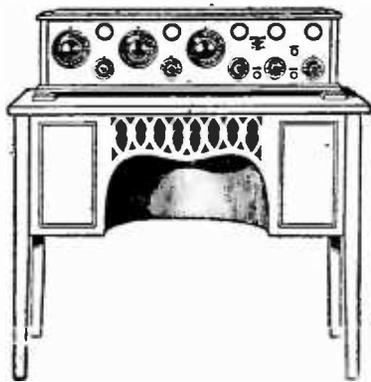
APPEARANCE

Solid American Walnut Cabinet. Hand rubbed *genuine* piano finish. Inclined panel of heavy-gauge, etched ordnance bronze. Set rests on felt protecting buttons. Balanced panel arrangement of controls. All "A" and "B" dry batteries self-contained. Price, with loop; but *without* tubes and batteries, \$165 list.

INVERSE DUPLEX SYSTEM • INSURES NATURAL TONE QUALITY

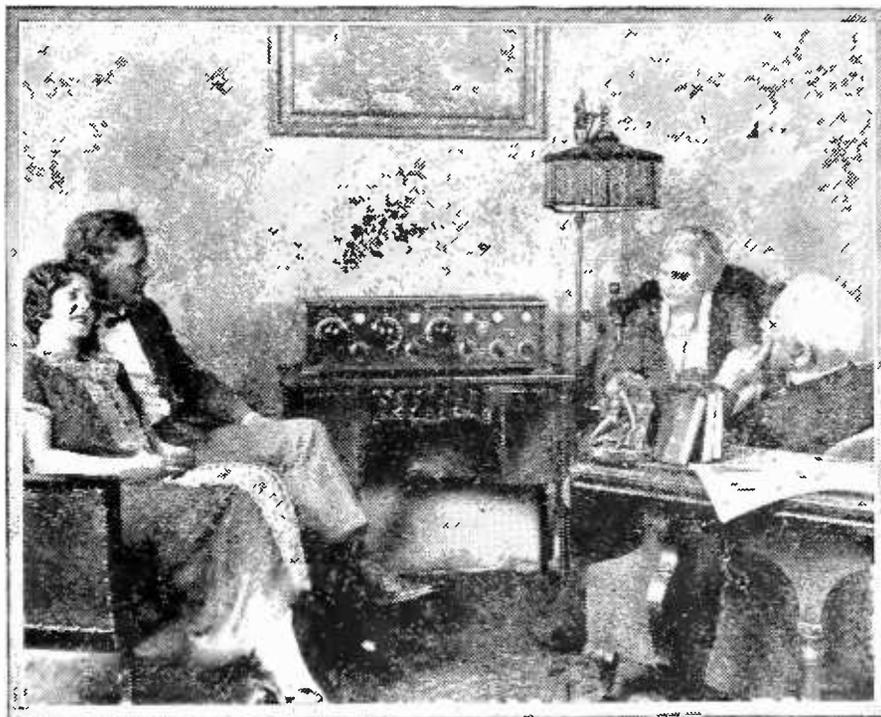
★ Tested and approved by RADIO BROADCAST ★

Radio Without the Horn!



Goodbye to the Old-Fashioned Horn Speaker!

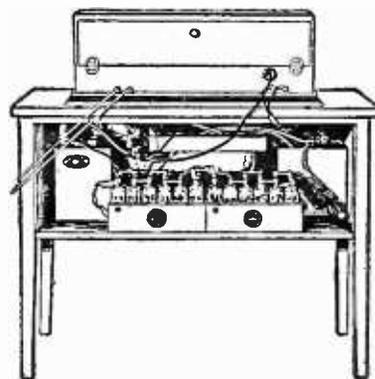
A Vastly Better Reproduction With this New Radio Console!



"Our old horn speaker never gave tones like this! An artistic addition to the living room—everything in its place—it's a joy!"

New Console Has Its Own Perfect Loudspeaker!

Ample Space for All the Rest of Your Outfit!



HERE is something that enables you to enjoy radio in the home without the clutter of unsightly apparatus that plays havoc in the decorative scheme of your living room! The horn speaker is out of date and out of place in radio for the home. This console with its in-built loudspeaker is scientific and sightly.

A Truly Wonderful Tone

It does a better job of reproducing, for it has the best unit of all that have been tried and its sound-box is of resonant wood instead of metal, fibre, or composition.

The appearance of a Windsor loudspeaker console is a delight. Its convenience is a joy. A piece of real living room furniture of pleasing lines and finish—and it accommodates all the miscellany of equipment which hitherto had no place except on table tops, shelves or floor. Ample space on top for any set, with plenty of elbow room in front. Nothing in sight but the dials. Everything else goes inside—from behind—in spaces cleverly designed to hold the largest batteries and outfit—besides the self-contained speaker—all unseen and protected from dust or disturbance.

You Need This Console Whatever Your Present Outfit Is

It makes no difference what kind of radio outfit you have—this console was designed for your use. The graceful exterior of this console gives no hint of its inner utility, for it is a simple and effective piece of furniture in every line. But a glance at the interior reveals a most ingenious arrangement of the in-built loudspeaker with space either side and in front. These spaces are ample for the largest A battery, and the largest wet B batteries and the largest charging outfit. It is 38 in. long, 18 in. deep, and 29 in. high. Notice the artistic grill that conceals sound box, and the provision of "knee room" beneath. Made in mahogany or walnut finish, and the price is only \$40! (West of the Rockies \$42.50.)

Dealers!

The sale of these consoles has already reached extraordinary figures. They are selling in surprising quantities in even smallest stores where there is one in the window or on the floor. It is a convenience and a value not to be duplicated.

Write us for discounts and particulars of big newspaper advertising campaign.

Investigate!

Dealers everywhere are now showing the Windsor loudspeaker console, and have them for immediate delivery to your home. If you haven't already seen this remarkable contribution to

radio enjoyment and convenience, write us now for the name of a nearby store where you may view it. We will also send you complete information. Remember, this console gives you not alone a marvelously faithful reproducing unit and sound-box, but an altogether new beauty and utility in the provision for your entire radio outfit. Mail coupon or postal.



WINDSOR FURNITURE COMPANY (10)
 1422 Carroll Ave., Chicago

Please furnish pictures and full details, also name of nearest dealer who has the new Windsor loudspeaker console.

Name

Address

★ Tested and approved by RADIO BROADCAST ★



No antenna —Just the Ducon



*The Ducon sells
for \$1.50 in all
reliable stores*

No more need to labor and toil over erecting an aerial. No more need to worry about the appearance of a bulky indoor loop in your home. The Ducon saves your time—and solves your problem.

Screw the Ducon into any accessible electric light socket and when you want to hear a program just tune in.

The Ducon brings in the stations clearly. The fact that over 400,000 fans use it is convincing proof.

Try it. You can purchase a Ducon on a five-day trial basis from your radio dealer.

Dubilier[★]

CONDENSER AND RADIO CORPORATION

★ Tested and approved by RADIO BROADCAST ★

ZENITH RADIO

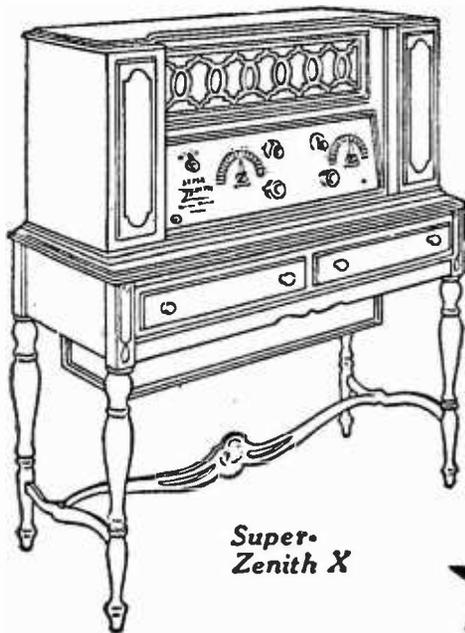
TRADE MARK REG



Super-Zenith VII—
the ideal radio set
for the fine home

They Cost More
But They Do More

Each station comes in at the same point on the dial, *always*



Super-Zenith X



You don't need to be a "radio engineer," and you don't need to have three hands, to operate the new Super-Zenith. Tuning is controlled by *two dials only*—so perfectly adjusted that each station comes in always at the same dial settings. *It never varies.* Powerful locals may be on full blast, yet, if you like, you can tune them out completely, choose the distant station.

Those who know and appreciate truthful tone reproduction find in the new Super-Zenith an unfailing source of delight. Their pleasure is all the greater from the fact that even when silent, the Super-Zenith lends to its surroundings charm and distinction.

Write to us for the name of the nearest dealer from whom you can obtain a demonstration of this outstanding marvel of the radio world.

Dealers and Jobbers: Write or wire for our exclusive territorial franchise

ZENITH RADIO CORPORATION

Executive Offices: 332 South Michigan Ave., Chicago
ZENITH—the exclusive choice of MacMillan for his North Pole Expedition
—Holder of the Berengaria Record.

THE complete Zenith line includes seven models, ranging in price from \$95 to \$550.

With either Zenith 3R or Zenith 4R, satisfactory reception over distances of 2,000 to 3,000 miles is readily accomplished, using *any ordinary loud speaker.* Models 3R and 4R licensed under Armstrong U.S. Pat. No. 1,113,149.

The new Super-Zenith is a six-tube set with a new, unique, and really different patented circuit, controlled exclusively by the Zenith Radio Corporation. It is **NOT** regenerative.

SUPER-ZENITH VII—Six tubes—2 stages tuned frequency amplification—detector and 3 stages audio frequency amplification. Installed in a beautifully finished cabinet of solid mahogany—44 1/2 inches long, 16 1/2 inches wide, 10 1/2 inches high. Compartments at either end for dry batteries. Price (exclusive of tubes and batteries) **\$230**

SUPER-ZENITH VIII—Same as VII except—console type. Price (exclusive of tubes and batteries) **\$250**

SUPER-ZENITH IX—Console model with additional compartments containing built-in Zenith loud speaker and generous storage battery space. Price (exclusive of tubes and batteries) . . . **\$350**

SUPER-ZENITH X—Contains two new features superseding all receivers. 1st—Built in, patented, Super-Zenith Duo-Loud Speakers (harmonically synchronized *twin* speakers and horns). designed to reproduce both high and low pitch tones otherwise

impossible with single-unit speakers. 2nd—Zenith Battery Eliminator, distinctly a Zenith achievement. Requires no A or B batteries. Price (exclusive of tubes) **\$550**
Price (without battery eliminator) **\$450**
All Prices F. O. B. Factory.

Zenith Radio Corporation
Dept. 1D
332 South Michigan Avenue, Chicago, Ill.

Gentlemen: Please send me illustrated literature giving full details of the Super-Zenith.

Name

Address

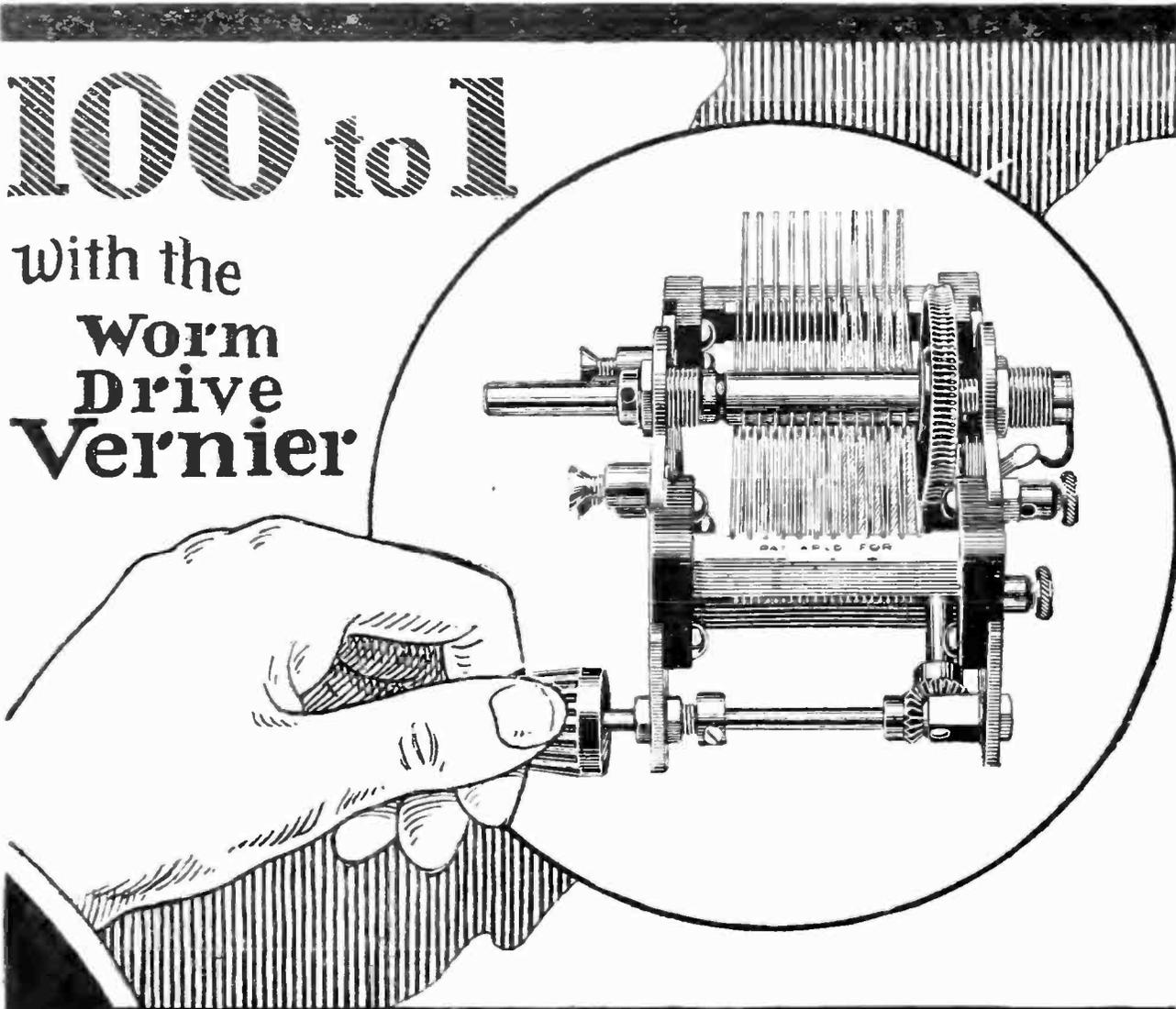
★ Tested and approved by RADIO BROADCAST ★

AMERICAN BRAND CONDENSER

\$5⁰⁰
 IN CANADA \$7.00

100 to 1

With the
Worm Drive Vernier



One of the biggest contributing factors to the growing popularity of Radio reception is this fine tuning condenser.

Made with a geared vernier having a ratio of 100 to 1, American Brand Condensers assure the successful operation of any set—especially when there is more than one broadcasting station in the air. For DX reception American Brand Condensers can't be surpassed.

American Brand Condensers need only to be seen to prove their superior qualities, Ask your dealer to show it to you and to give you a descriptive folder.

Wholesale Distributors everywhere throughout the country are prepared to fill dealer's orders.

Note to Dealers: If your Jobber is out of stock, please write us.

★ **AMERICAN BRAND CORPORATION**
 8 WEST PARK STREET NEWARK, N. J.



Atlas

TRADE MARK

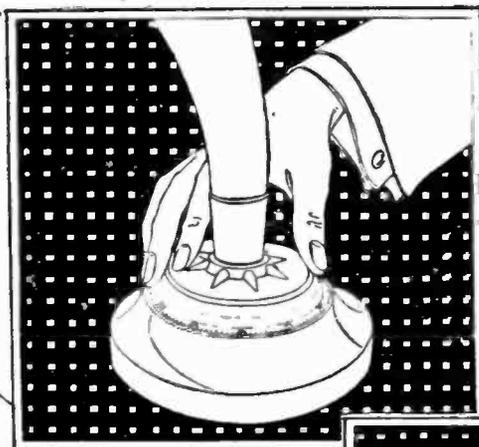
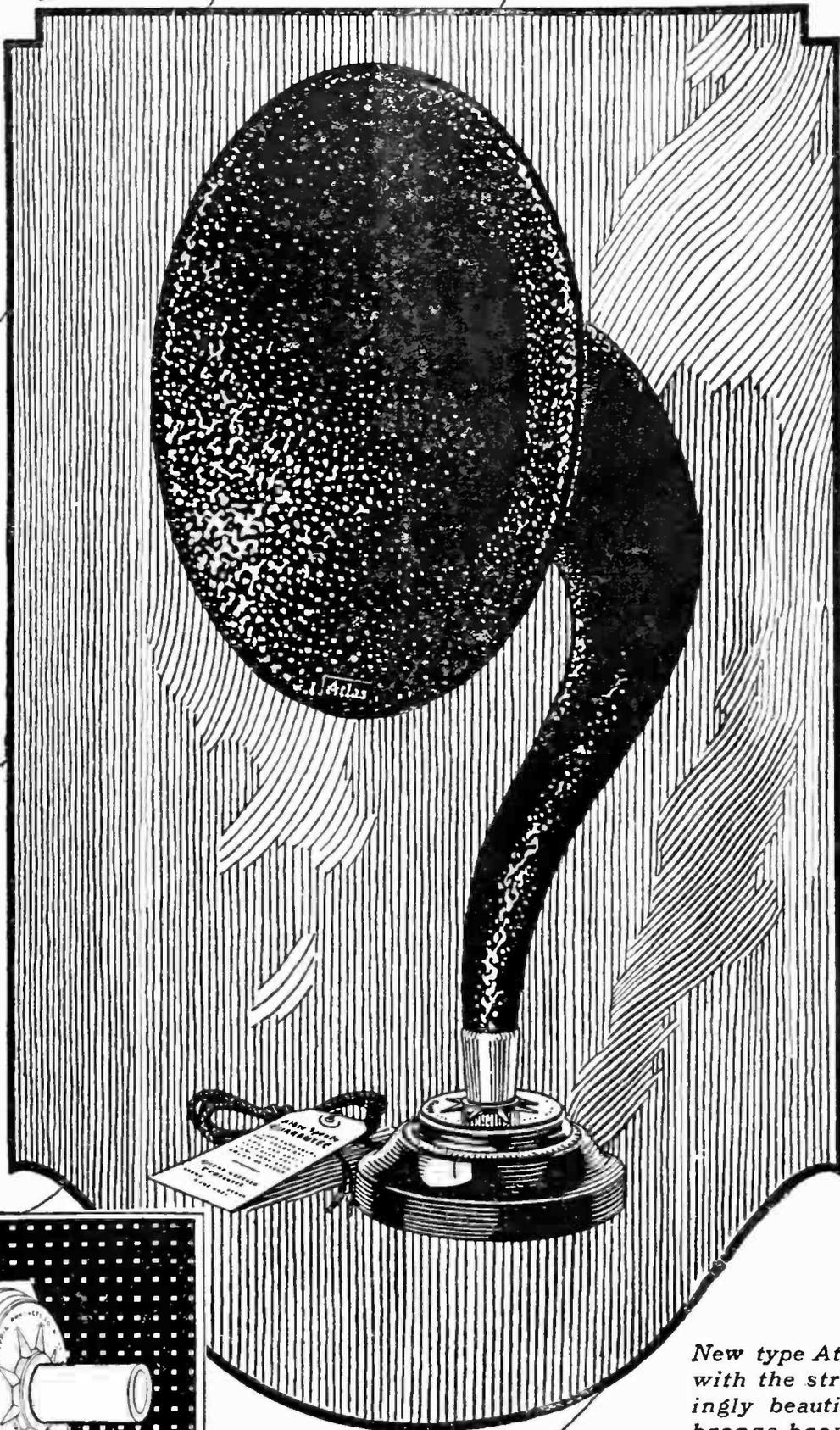
RADIO REPRODUCTION Speaker

ATLAS floods the room with the best that's in your set. Write for the interesting booklet you ought to read before buying any speaker.

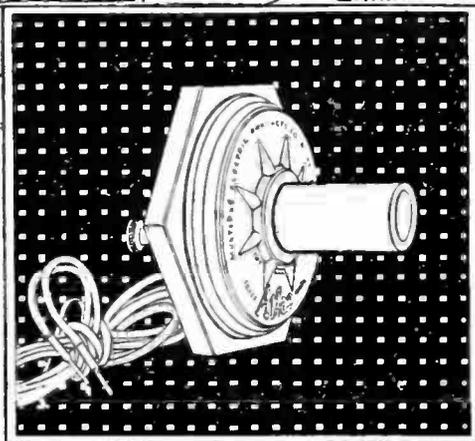


Multiple Electric Products Co., Inc., 365 Ogden Street, Newark, N. J., Dept. W. New York, Boston, Philadelphia, Baltimore, Pittsburgh, Detroit, Chicago, St. Louis, Rialto Building, San Francisco.

Marconi Wireless Telegraph Co. of Canada, Ltd. Sole Canadian Distributors



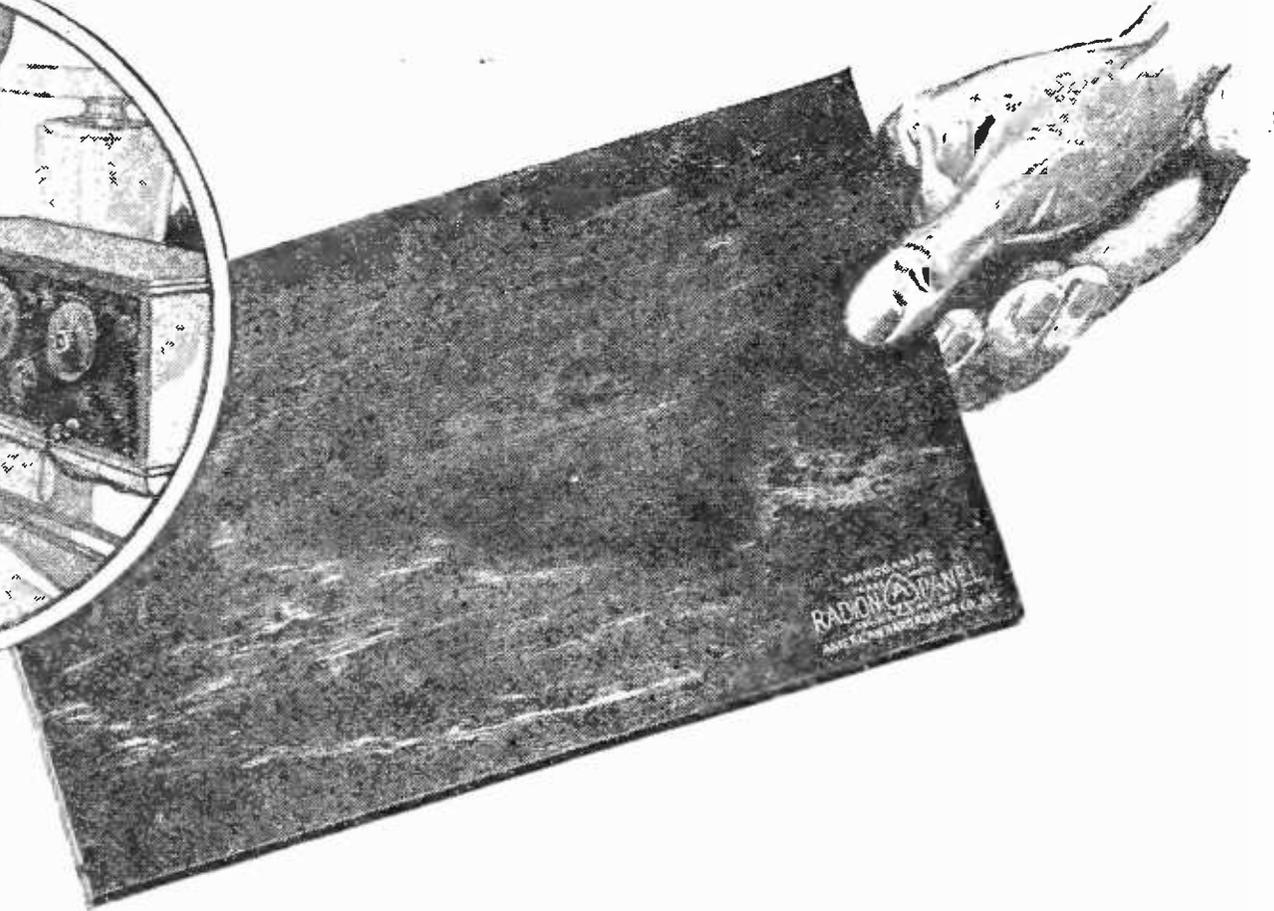
A slight turn of the exclusive Atlas harmonizer (Pat. applied for) — and your speaker is harmonized with the broadcast you are hearing and the set you are using. It gives you radio—as you ought to hear it.



Atlas unit, with attachment couplings to fit all standard phonographs.

New type Atlas with the strikingly beautiful bronze-brown ripple-finish gooseneck horn.

★ Tested and approved by RADIO BROADCAST ★



SEND for booklet, "Some Insulation Stickers Explained." Use the coupon below.

Surface leakage exceptionally low with this panel—*built to order for radio*

THE needs of radio are *special*. Better results have invariably followed the use of apparatus and materials designed for its own unique demands.

Radion is a special material, developed to order by our engineers to meet the needs of radio. For radio-frequency insulation its characteristics are highest as proved conclusively by authoritative laboratory tests. Surface leakage and dielectric absorption are shown to be exceptionally low.

You can see the difference by the finish

YOU can see that Radion is different if you look at the finish. That high-polished, satin-like surface is not only

good-looking but useful as well. Moisture and dirt cannot gather to form leakage paths and cause leakage noise.

Radion is mechanically right, too. It resists warping. No special tools are needed to make a clean-cut workmanlike job. Everybody knows that it is the easiest material to cut, saw or drill. Comes in eighteen stock sizes, two kinds, Black and Mahogany.

Better performance will make it worth your while to ask for Radion by name, and to look for the name on the envelope and the stamp on the panel. Radio dealers have the exact size you want for your set.

Other Radion Products

The same qualities of low-loss insulation and attractive appearance characterize Radion dials (to match panel), binding post panels, insulators, knobs, etc.—also the new Radion Built-in horn.

AMERICAN HARD RUBBER COMPANY, Dept. RB-1, 11 Mercer St., New York City

Chicago Office: Conway Building

Pacific Coast Agent: Goodyear Rubber Co., San Francisco—Portland

RADION ★

The Supreme Insulation

PANELS

Dials, Sockets, Binding Post Panels, etc.

AMERICAN HARD RUBBER COMPANY
Dept. RB-1, 11 Mercer St., New York City

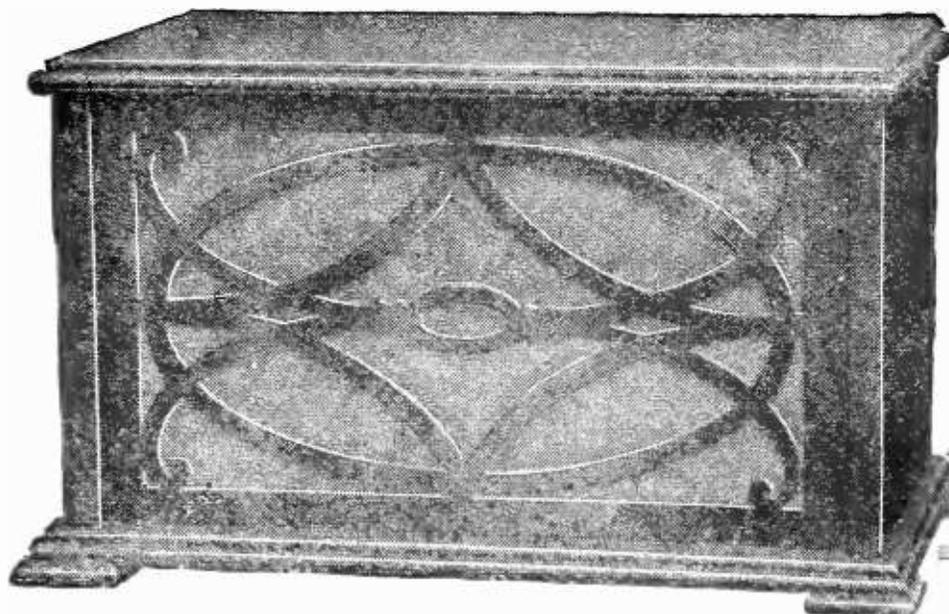
Please send me your booklet, "Some Insulation Stickers Explained," and your complete instructions for building a 2-tone DX Loud-speaker set.

Name.....

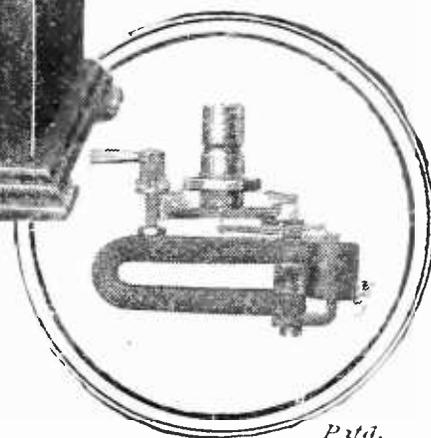
Address.....

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

★ Tested and approved by RADIO BROADCAST ★



MODEL "C"
Cabinet Type
\$30.00



Patd.

*The Voice of the
Audiophone*

The New Cabinet Model

For those who admire the full, round, musical voice of the Audiophone, but prefer a cabinet design, we have brought out this splendid model.

The case is of real mahogany, of a character to give it equal fellowship with your grand piano. The design goes nicely with the most tasteful furnishings. The size, 17x10x10 $\frac{1}{4}$, is just right for the top of your phonograph or your receiving set.

It has the sound mechanism of our Model "S," but its square design gives it a sweetness of its own.

Not a "Phone Unit"

The voice of the Audiophone is not a "phone unit". It is a highly developed, electro-magnetic reproducer. This results in an instrument which reproduces with natural quality in most powerful tones, yet has a sensitiveness equal to any loud speaker developed.

The Bristol line includes five Audiophones priced from \$12.50 to \$30.00. If not at your dealer's write for Bulletin No. AH3022.

THE BRISTOL CO., Waterbury, Conn.



MODEL "S"
Audiophone
\$25.00

Rubber horn 14 $\frac{1}{2}$ inches diameter. Velvet mat finish of mottled bronze and gold; classic base.

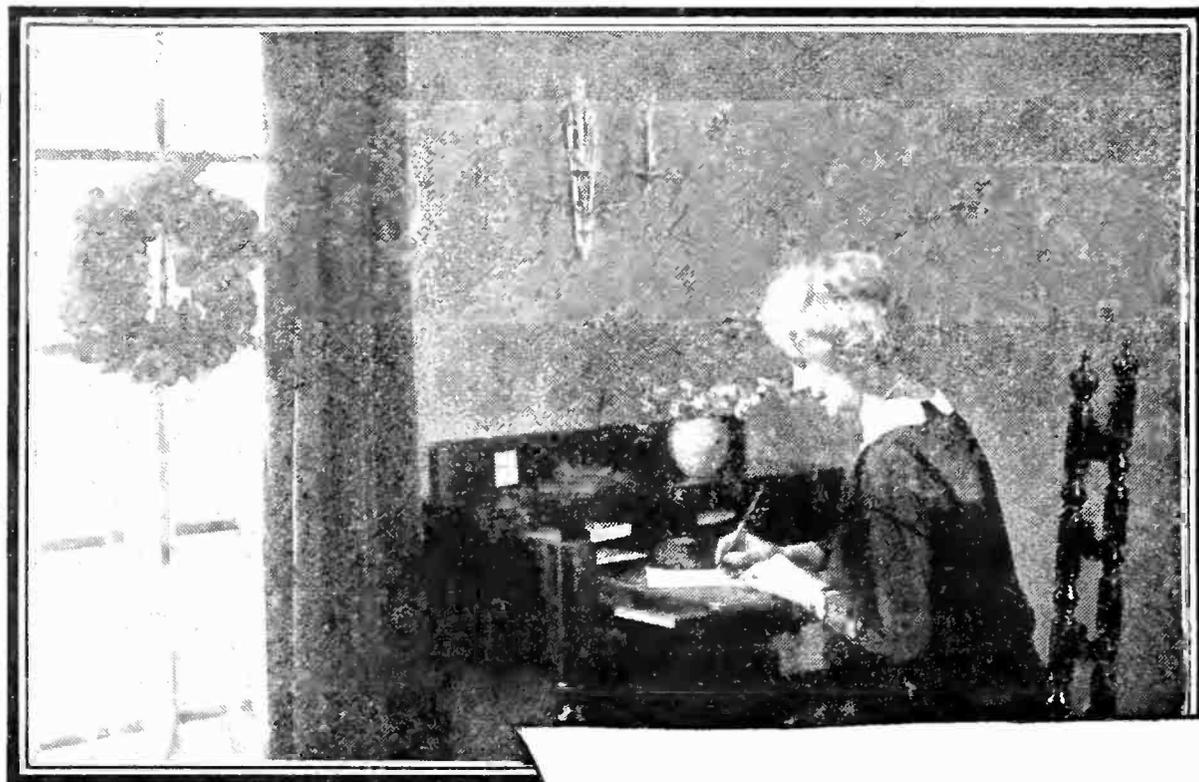


TRADE MARK

Bristol **AUDIOPHONE** LOUD SPEAKER

REG. U. S. PAT. OFFICE

The GREATER Neutrodyne EAGLE ★ Balanced Receiver



New Model B
5 Tubes
\$175

A Happier New Year

Reasons for Buying the New Model B Eagle

GUARANTEE — The warranty that accompanies every Eagle Receiver fully protects you.

Exclusive Eagle Instruments Multiple (filament control) switch, ball-bearing, die-cast condensers, revolving resistor element rheostat—new refinements of the neutrodyne receiver.

BALANCE the perfect balance of tube capacities, which is the secret of neutrodyne efficiency.

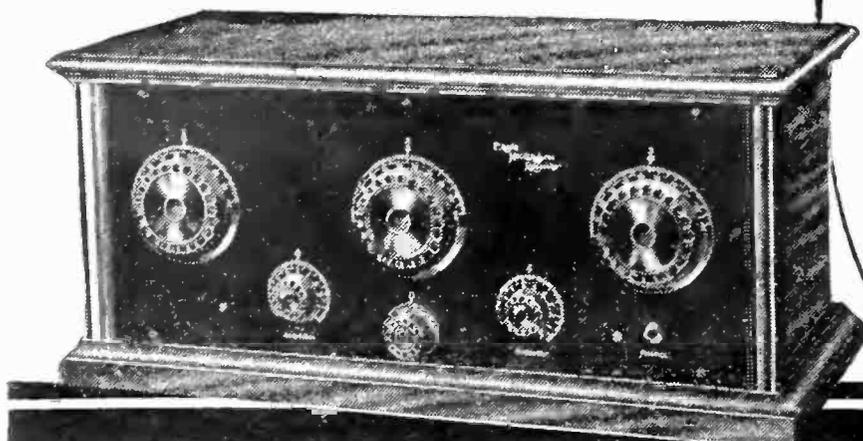


Write for Literature

EAGLE
19 Boyden
Place



RADIO CO.
Newark,
New Jersey



My dear Boy:

Only your wonderful thoughtfulness could have found just the very gift I wanted—the New Eagle Receiver. When folks asked me this year "Was Santa Claus good to you?" I told them I had someone who was better to me than even Santa Claus.

I was a little afraid that radio might prove too complicated for me but the Eagle is as easy to operate as my phonograph. John made up a "log" for me and now all I do is decide on the program I want to hear and turn the dials to the numbers for that station. No more loneliness, long evenings, dull times. My Eagle keeps me entertained.

John says it's the best radio set money could buy, to which I replied, "Of course, didn't Bob select it for me." Now John is going to get a new Model B Eagle. Says it's just the set he's been waiting for.

I appreciate this wonderful gift more than I can tell you.
Your affectionate,
Mother.

★ Tested and approved by RADIO BROADCAST ★

Haynes-Griffin

RADIO SERVICE, Inc. 41 W. 43rd St., New York City
 250 W. 49th St. New York MAIL ORDER DEPARTMENTS 111 S. Clark St. Chicago



A. J. Haynes, Assoc. Inst. Radio Engineers, designer of the "Knock-out" Amplifier.

At Last! True QUALITY

The New "Knockout" Amplifier Gives Absolutely Distortionless Loud Speaker Reproduction

One stage of audio frequency and two stages of resistance coupled amplification—that's the secret of the wonderful tone quality of the "Knockout" Amplifier.

No matter how much or how little loud speaker volume you wish, you always have the same fine tone quality with this remarkable new amplifier—your loud speaker is truly a musical instrument.

The "Knockout" Amplifier is the final answer to the problem of quality in loud speaker reproduction.

Reprint of Zeh Bouck's article on the "Knockout" Amplifier (December "Radio Broadcast") mailed FREE upon request. Use the coupon below.

Parts for the "Knockout" Amplifier

- | | | | |
|---|--------|--|-----------|
| 1 10 ohm rheostat..... | 75c. | 2 .006 mfd. Micadon Condensers | each 75c. |
| 1 20 " " | 75c. | 1 .00025 mfd. Micadon Condenser | 35c. |
| 3 Haynes-Griffin panel mounting sockets...each | \$1.00 | 1 Haynes-Griffin Single open circuit jack | 60c. |
| 1 Haynes-Griffin audio frequency transformer Type 91..... | 5.50 | 1 Haynes-Griffin Double circuit jack | 80c. |
| 2 Resisto Couplers.....each | 1.25 | All necessary tail washers, bus-bar wire, etc..... | 80c. |
| 4 Coupling Resistors as specified | 50c. | 1 7 x 10 Bakelite panel—drilled and engraved..... | \$3.00 |
| 6 Binding Posts.....each | 20c. | | |

All of the above listed parts furnished at a combination price of \$20 per set. 7 x 10 Mahogany cabinet—\$3.25 extra. "Knock-Out" Amplifiers also furnished completely assembled in mahogany cabinet ready for use at \$35 ea.

Don't Miss "Radio Dispatch"

Edited personally by Mr. Haynes to keep you up-to-date in radio. Published every month with new live radio news. And it's absolutely FREE. Simply send in the coupon below.

A One-Stage Resistance Coupled Amplifier

Parts for One-Stage Resistance-Coupled Amplifier

- Haynes-Griffin Socket
- Daven Resisto Coupler
- .1 Meg. Resistance
- .25 Meg. Resistance
- .006 Mfd. Micadon
- 20 Ohm Rheostat
- 4 Binding Posts
- 2 Lengths Bus Bar
- 1 Doz. Lugs
- 2 Lengths Solder
- 7x5 Cabinet
- 7x5 Hard Rubber Panel [Drilled]
- Base Board 4x4½

All of the above parts furnished at a combination price of \$9.25 One stage amplifier, completely assembled in mahogany cabinet \$15

for use with the Haynes Super-Heterodyne

If you want more volume from your Haynes "Super" simply add this new One-Stage Amplifier and note the difference. It gives a marked increase in signal strength, yet retains the fine tone quality of the Haynes Super-Heterodyne.

No changes in the original design necessary.

Those in poor location for loop reception will find this new amplifier the answer to real loud speaker volume on distant stations.

FREE: Booklet giving complete instructions on how to build the New One-Stage Resistance Coupled Amplifier.

HAYNES GRIFFIN RADIO SERVICE, Inc. 250 W. 49th St. New York City. 111 So. Clark St. Chicago

HAYNES-GRIFFIN RADIO SERVICE, Inc.

250 W. 49th Street, N. Y. City
 111 S. Clark Street, Chicago



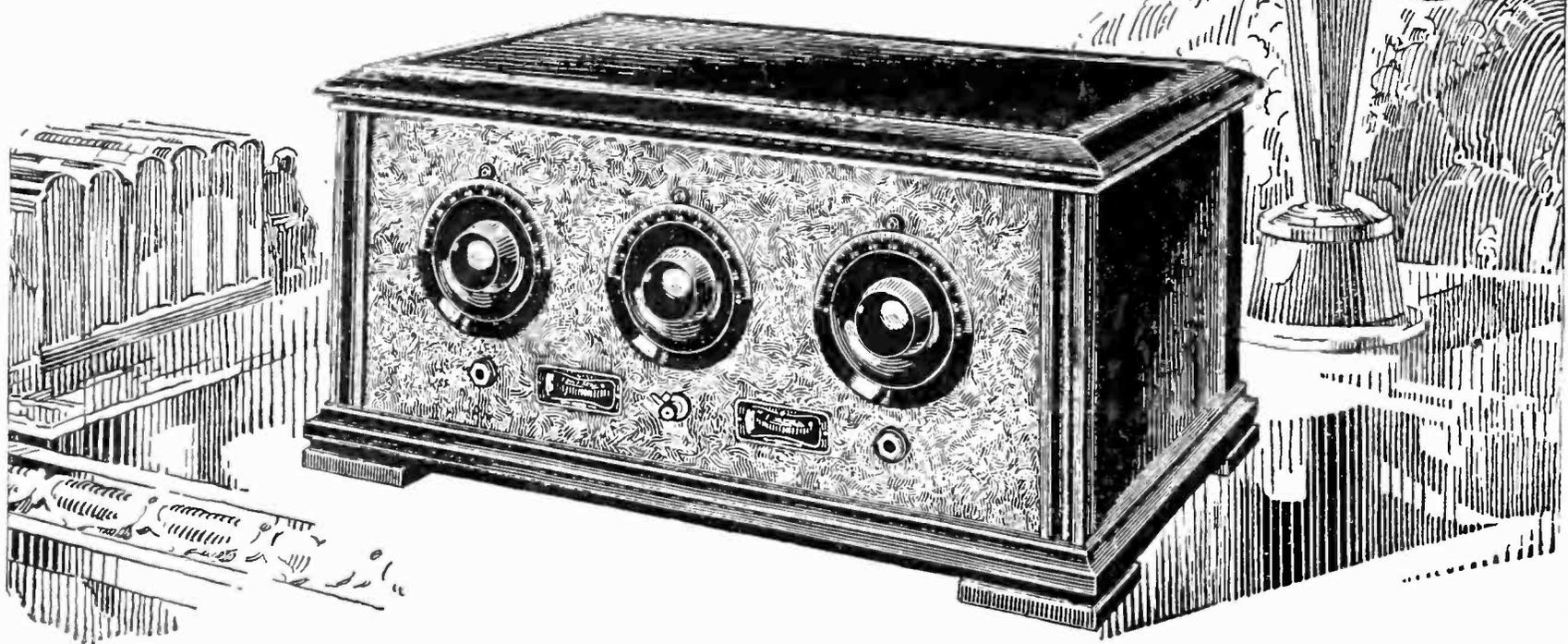
- Send me Radio Dispatch each month.
- Send me booklet on 1-stage Resistance Amplifier.
- Send me reprint of "Knockout" Amplifier Article.

Name

Address

EISEMANN

ELECTRICAL EQUIPMENT



Type 6-D Broadcast Receiver

Non-oscillating ~ Non-radiating

SPECIFICATIONS

Circuit: Two stages of tuned radio frequency amplification, detector and two stages of audio frequency amplification. Non-oscillating. Non-radiating. Astatic transformers used to minimize mutual induction.

Tubes: Five in all. Jacks provided for either five or four tube operation.

Batteries: Either storage or dry cells.

Cables: Complete set supplied for "A" and "B" batteries.

Wave lengths: 200 to 600 meters, with uniform efficiency of reception.

Aerial: 75 to 125 feet, single wire.

Panel: Aluminum, with attractive crystal black finish. A perfect body capacity shield.

Dials: Sunken design. Shaped to fit the hand and permit a natural position in tuning.

Rheostats: Adequate resistance for all standard base commercial tubes.

Condensers: Single bearing, low leakage losses.

Sockets: Suspended on cushion springs which absorb vibrations.

Cabinet: Mahogany, with distinctive lines and high finish. Ample space provided for "B" batteries.

THE real, intrinsic value of the 6-D Receiver can be fully appreciated only by making direct, side-by-side tests with other makes.

Such comparisons need not be confined to sets in the same price-class. The 6-D is the equal, in every detail, of many receivers priced \$25, \$50 and even \$75 higher.

Performance of the highest order, strikingly attractive appearance and moderate price—all these elements of true worth are found in the 6-D.

You will note its clarity and the full, generous volume. You will also observe the unusual sharpness of tuning. And the finely carved, high finish mahogany cabinet will make a strong appeal.

★ **Price \$125.00 without accessories. For sale by reliable dealers.**



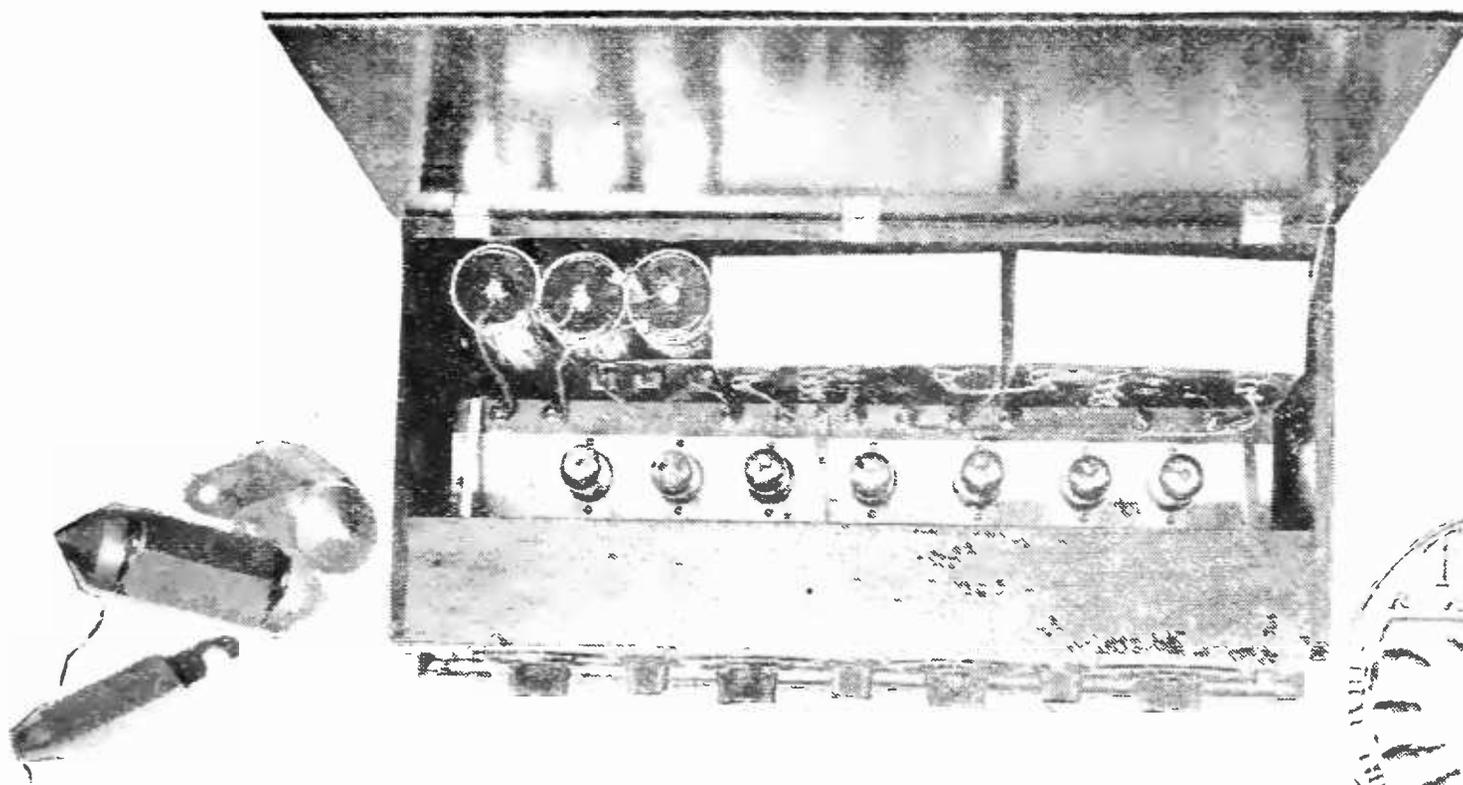
EISEMANN MAGNETO CORPORATION

General Offices: 165 Broadway, New York

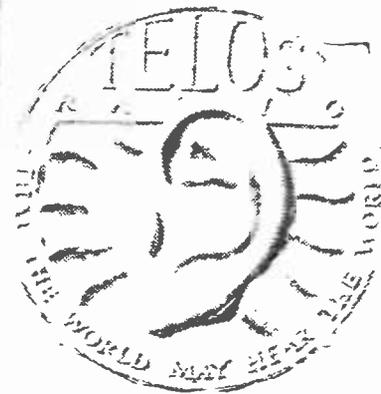
DETROIT

SAN FRANCISCO

CHICAGO



Interior view of a typical set you can build with the new Telos KIT



You can't buy it—

but if you are the least bit handy with tools, you can build this amazing Telos set yourself in a single afternoon.



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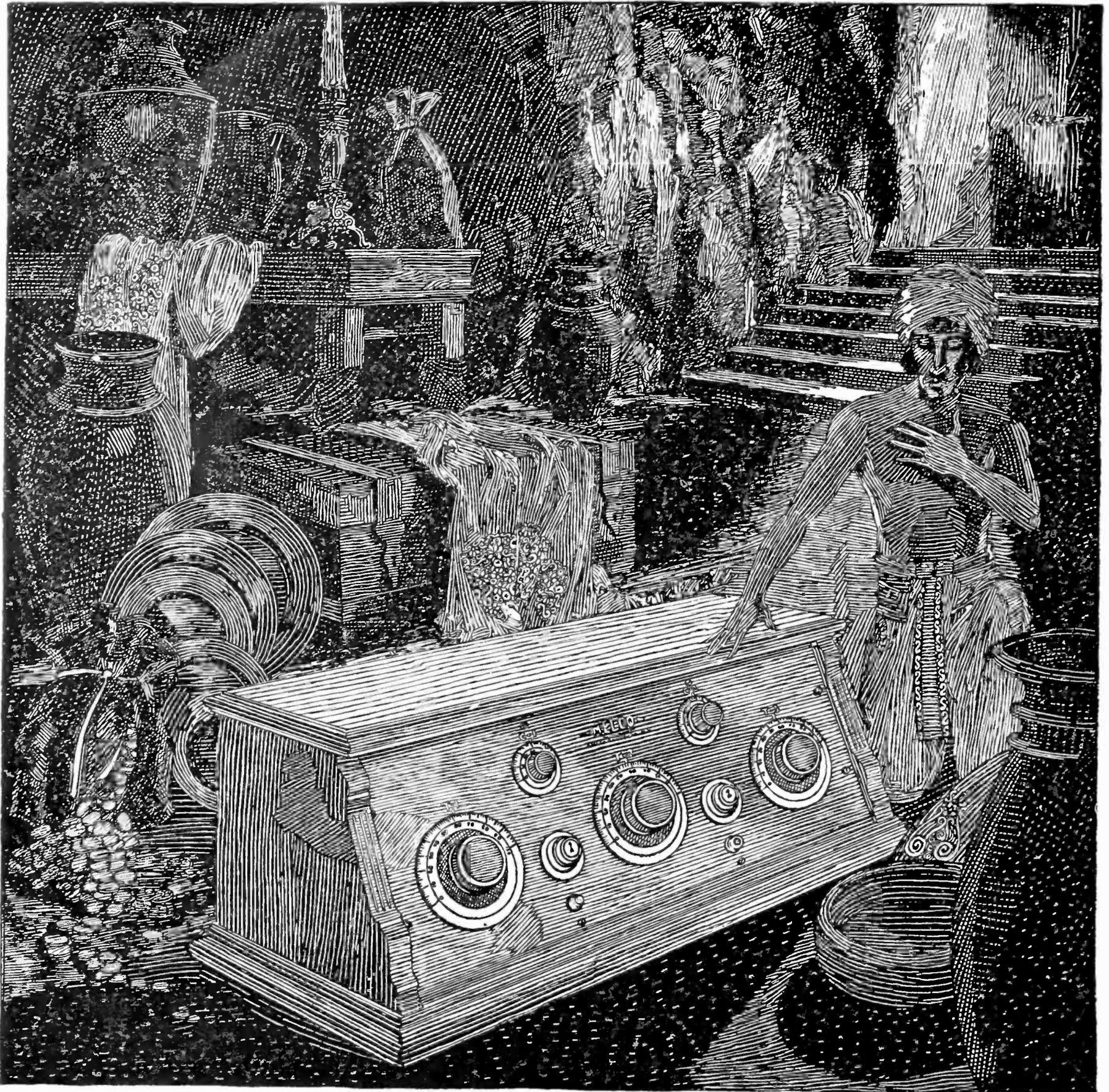
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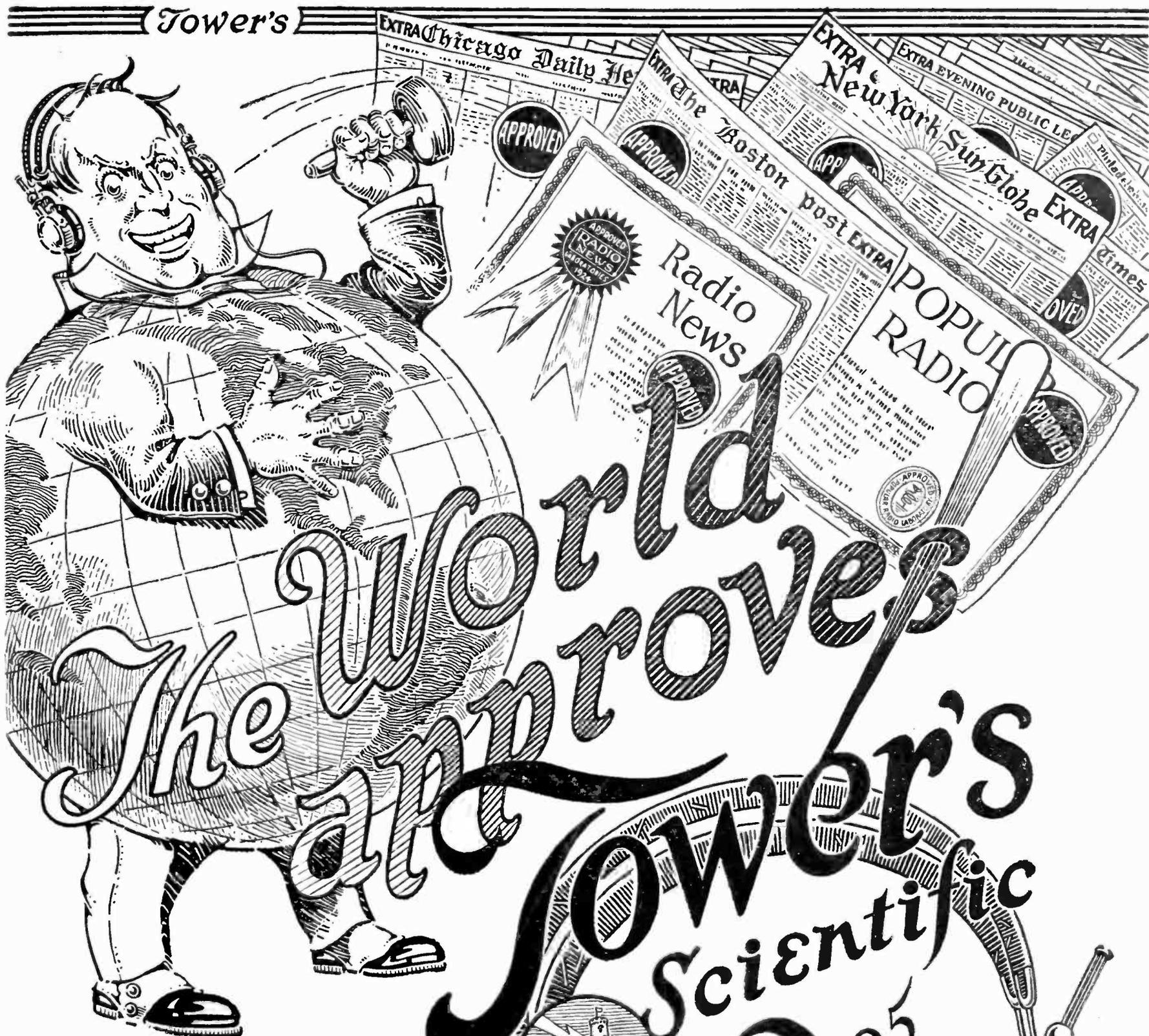
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Radio Broadcast

ARTHUR H. LYNCH, EDITOR

JANUARY, 1925

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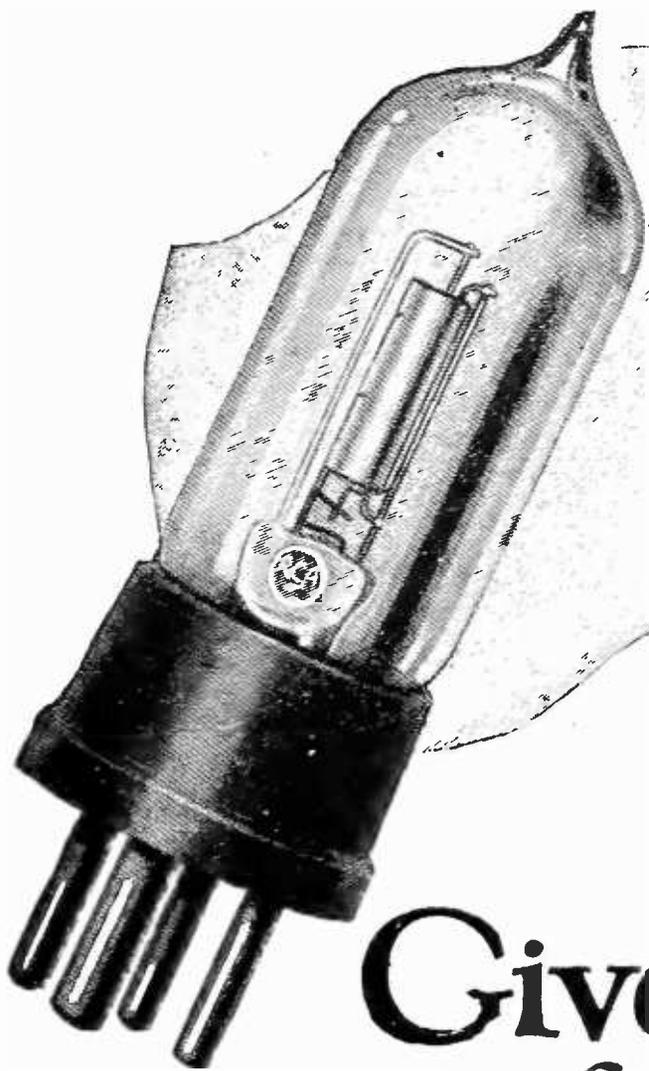
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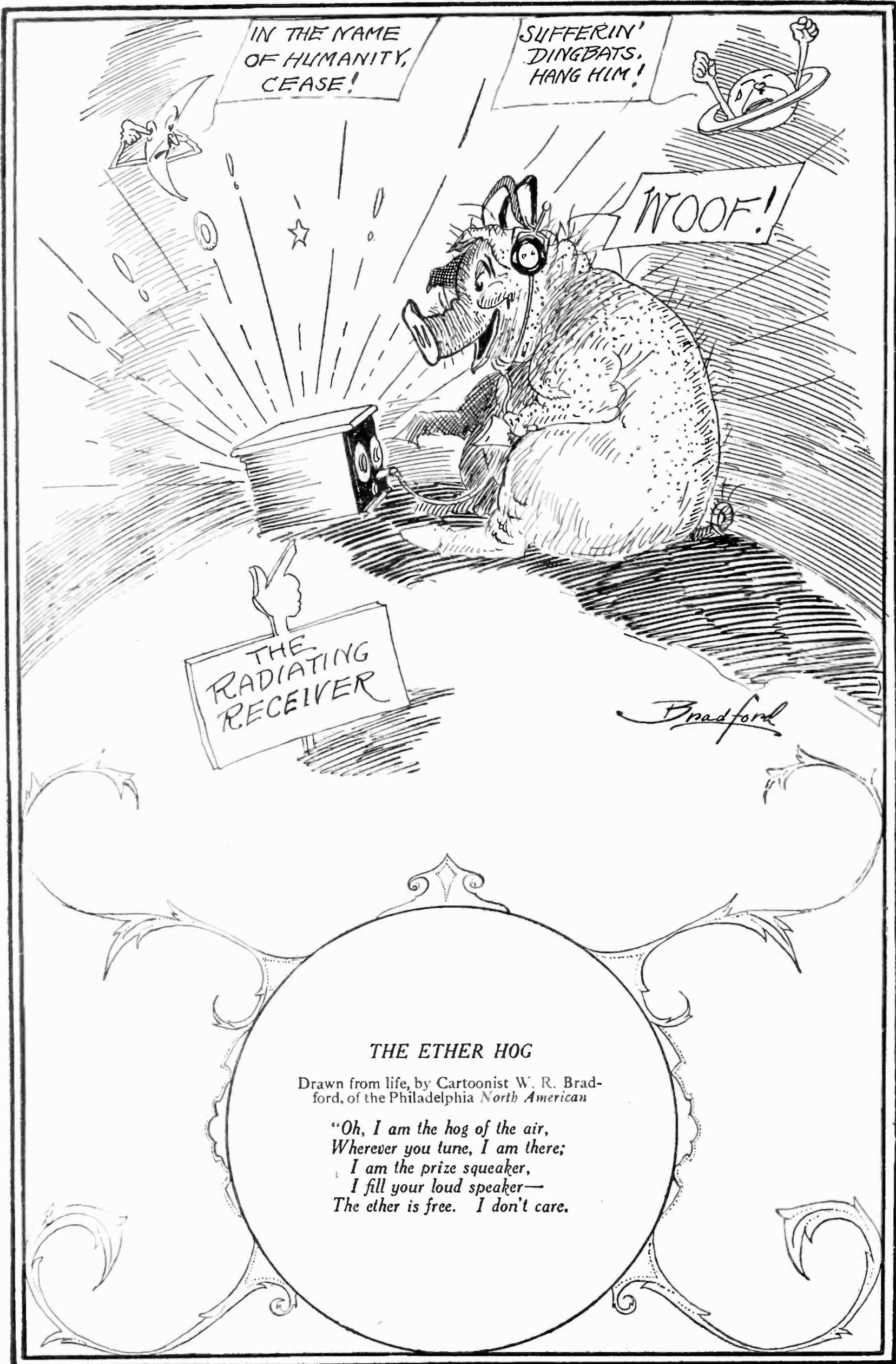
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THE RADIATING RECEIVER

Bradford

THE ETHER HOG

Drawn from life, by Cartoonist W. R. Bradford, of the Philadelphia *North American*

*"Oh, I am the hog of the air,
Wherever you tune, I am there;
I am the prize squeaker,
I fill your loud speaker—
The ether is free. I don't care.*

DEC 26 '24

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RADIO BROADCAST

Vol. 6, No. 3



January, 1925

Sound: First and Last in Radio

The Romance of Radio—Radio the Superlative Degree of Communication—Sound and Radio—Importance of Scientific Knowledge of Sound in Broadcasting—A Discussion for Layman and Technician Alike

BY B. F. MIESSNER

Consulting Engineer, Wired Radio, Inc.

GENII," said Aladdin to the phantom who appeared as he rubbed his wonderful magic lamp, "build me a palace fit to receive my betrothed, the Princess Buddir al Buddoor. Let it be built of porphyry, jasper, agate, lapis lazuli, and the finest marble of various colors and surmounted by a dome of gold and silver. Let there be a spacious garden, a treasure house filled with jewels and precious metals, kitchens and store houses, stables and horses, and a royal staff of servants."

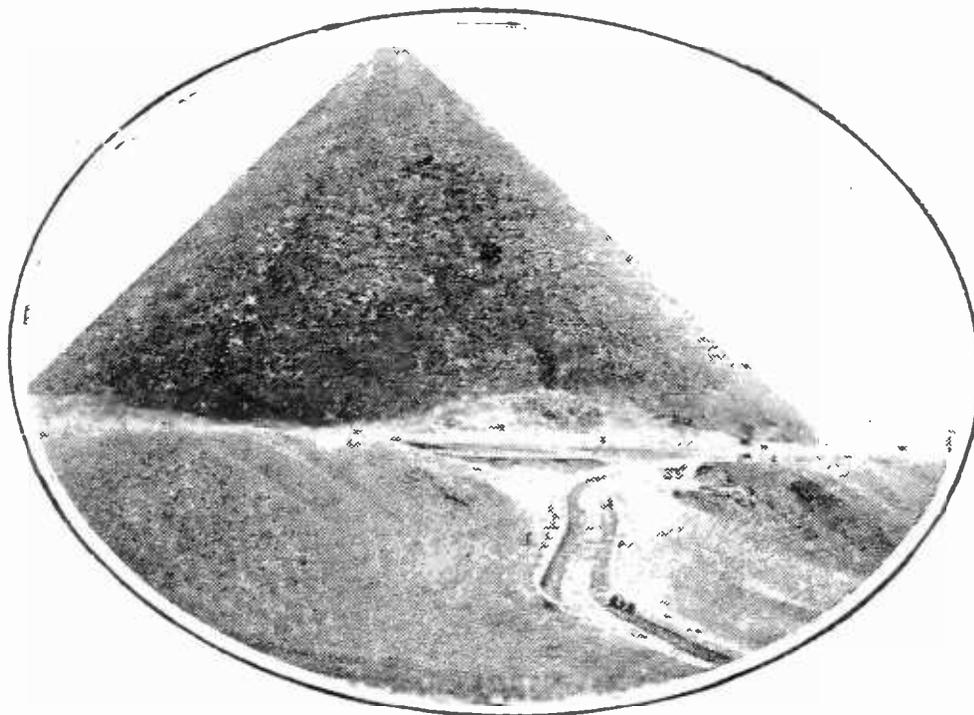
It was about the hour of sunset when Aladdin gave these orders and the next morning before the break of day, the Genii pre-

sented himself saying, "Sir, your palace is finished."

Who among us does not remember with delight this story from the Arabian Nights of the boy Aladdin and his wonderful lamp? He had only to rub his lamp and give his commands to the Genii who immediately ap-

peared to obtain whatsoever his boyish heart desired.

If Aladdin were to come to life to-day he would rub his eyes and not his lamp, for millions of real magic lamps are in actual use in hundreds of thousands of homes. He would find the users of these lamps are not in a fairyland of myths and fables, but in a land just as entrancing and even more won-



THE PYRAMIDS OF CHEOPS

The secret of their building died with the dynasties that built them. Had modern arts of communication then been developed, the constructional marvels in building them would now be known

derful because of its reality. What would he think and feel, and say if you sat him down in your own home before your own magic box with its magic lamps, turned a few knobs and let him listen to the music and voices of half of the world? How could it be possible to hear these wonderful things and still remain at home?

In the twinkling of an eye you can take him on explorations over thousands of miles, from your own cozy fireside to the gay, bustling life of great cities, the shivering blizzards of the North, the languid summers of the South, or the quiet of the great West.

Can there be any among us with imagination so cramped or mind so rigidly harnessed to daily tasks that he cannot see and feel the romance and power of radio?

But now there comes among us a great and wonderful new thing that reaches us, not through the all-seeing eye attributed to God alone, but through an all-hearing ear—radio—which each and every one of us may own. The “Call of the North,” the “Voice of the South,” the “Heart of the West” all are here in the air we breathe, pervading even our very own bodies, wanting only the magic ear to translate their ghostlike presence into the living, breathing voices of song, of eloquence, of entertainment, of instruction or knowledge.

RADIO LENGTHENS OUR EARS

IN RADIO, we are developing a means through which the sense of hearing may come to mean more, perhaps, than vision ever meant. All of the value that sound and the hearing of it ever possessed, is now being multiplied thousands and millions of times by this new and wonderful servant, which finds its way into every nook and cranny of the world with the speed of lightning. This sixth sense reaches out over bounds and barriers and

brings back to our own hearth stones, the voices and sounds of all the world. Radio is to the ear what the telescope is to the eye.

Progress is impossible without some means of communication, and in radio a new means of communication has been given to mankind. It is a far cry from the crude signalling of olden days, by smoke clouds, semaphores, or runners, to the telegraph, telephone and radio of to-day.

When one Indian, craftier than his fellows, discovered a method of chipping flint for his arrow heads, it took thousands of years for that bit of knowledge to spread over a single continent. What has become of the lost arts of the Egyptians in the rearing of the pyramidal tombs of their Pharaohs, in embalming, in glass making? Think of the tempered copper process of the Aztecs now lost to mankind, wiped out together with its creators, for the lack of means to spread their knowledge to the rest of the world.

The progress of the ages from stone, to wood, to iron, to steam and to electricity, is a story interwoven with the development of communication.

WHAT IF WE ONLY HAD SMOKE CLOUDS?

CONSIDER for a moment the effects on you and me, if we still had only the smoke clouds of the Indians, the runners of the ancient Greeks, or even the town criers of our own Colonial days instead of our telegraph, telephone, cables, newspapers and now the radio. What would have become of Watt's steam engine? It would surely have been buried where it was born and the age of steam might never have come over the world. What would have become of Lister's antiseptic, the printing press of the Chinese, Whitney's cotton gin, Dalton's atomic theory, Daguerre's photography, the motion picture, the phonograph, the flying machine, and the

Something About Sound

Most of us have heard a great deal of talk about “distortion” in radio. That unfortunate word is coming in for a rather severe doing by a great many who have no idea what it means. It is running “efficiency” a pretty close race for the title of radio's most over-worked word.

Mr. Miessner, the author of this, the first of a series of articles on the application of acoustics to radio, knows what he is talking about and has that rare ability in an engineer, of making his ideas understandable to others without first insisting upon a thorough discussion of something as remote as the fourth dimension.

Whether you are interested in radio technique or not you will find this accurate statement of fact entertaining and will, we feel sure, when tempted to criticize some flaw in the art, realize that astounding progress has already been made, and marvel with us at the wonderful results now being obtained by the contortions of two little diaphragms.

—THE EDITOR.

other stepping stones of our present existence? Where would we be along the road of progress, if Edison's electric light was still only common knowledge in the little community of West Orange, N. J.? How could our great cities and complicated modern life be possible if all the wisdom that individuals and groups have hewn out for themselves the world over were not made available to each one of us by means of our modern methods of communication?

Radio broadcasting is one of the really great developments of this rapidly moving age.

SOUND WE BROADCAST AND SOUND WE RE- CEIVE

RADIO as we know it to-day is primarily an acoustical instrument. The intelligence we send by radio is the intelligence conveyed by sound. The transmitting and receiving apparatus serve merely to transport sounds from one place to another or to many others. Its intricate electrical factors are merely a part of the whole whose one function is to reproduce *sound*. It is *sound* that we broadcast and *sound* that we receive. From microphone to loud speaker each part serves merely as a link in the chain which connects one place with another by *sound*.

The success of the whole scheme of broadcasting as an instrument of communication depends upon *how accurately* sounds in one place can be reproduced at another. To perfect the instrument then, we must concentrate our attention on this single purpose. We must understand the place of sounds in our own normal existence, know their nature physically, and how the links in the apparatus composing the broadcast chain fit this purpose. We must forget for a while the numberless variations of a few radio circuits, stop talking about batteries, distance, and other incidental matters, and spend some of

our collective energy on the real fundamental thing we are most concerned with—the acoustics of radio.

Sound, though few of us realize it, exerts a tremendous influence in our daily lives. Of all the five senses, seeing, hearing, feeling, tasting, and smelling, hearing is surely one of the most important.

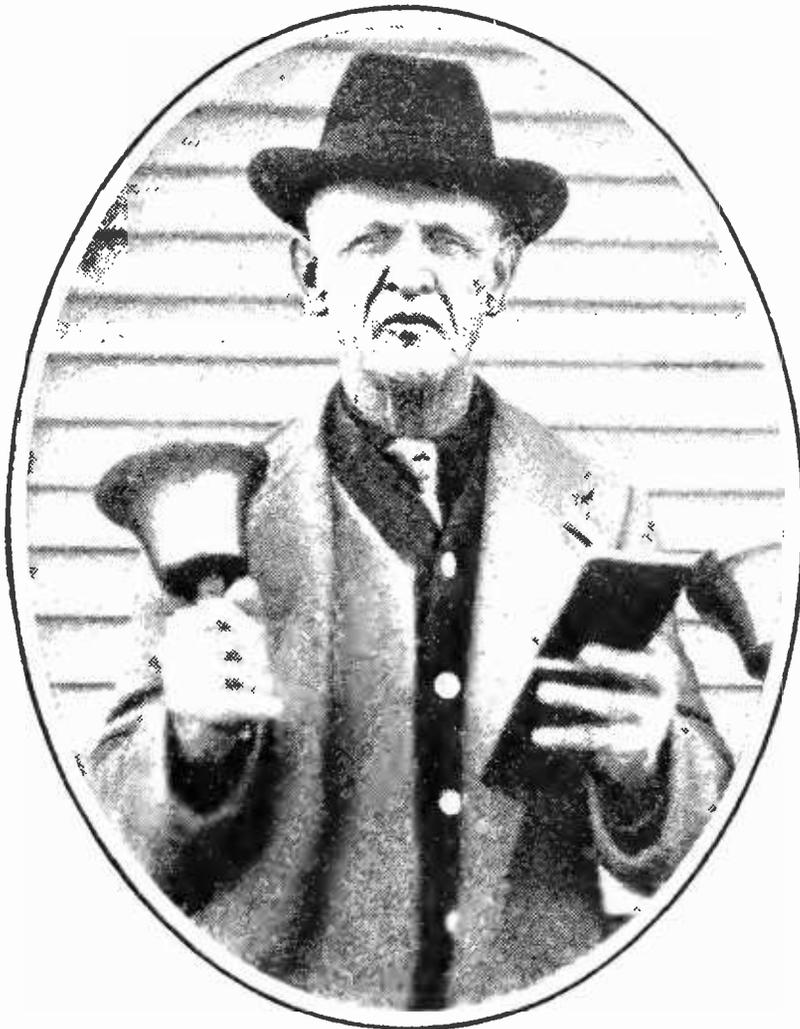
How many of us have ever stopped to think of this world of sound and what it means—how sound can tell us of the myriad things going on about us, the presence of which we might otherwise never know! We are constantly alive to these sounds—hearing them, classifying them—picturing the things producing them—interpreting them and their meanings—all without effort, subconsciously—automatically translating them into whatever meaning they may have for us.

SOUND RULES OUR DAILY LIVES

AS I sit here in my study with all my senses, save hearing, voluntarily cut off from the outside world, I can still retain a remarkable

moving picture of what is going on about me as conveyed to my senses, alone through these subtle influences called sound. Because sound is a result of action, it is action or motion of some kind that we sense when we hear sounds. Every sound we hear is produced by motion of some kind. Nearly all sounds, therefore, are suggestive of action and are so interpreted as we listen.

Through my open window I hear a certain sound that is unmistakably the rustling of the leaves of a tree in the breeze. I hear an intermittent banging which is without question a carpenter hammering on a near-by house. A certain snip-snip tells me my neighbor is trimming his hedge—another whirring rattling noise says another mows his lawn. Shrill, trilling sounds tell of crickets,



©Brown Brothers

THE TOWN CRIER

Was the time-honored method of communication for a long period. He depended on sound, and to-day, we depend on sound, through the radio, the telephone, and the telegraph

other of frogs and birds or other insects, quite as clearly. A continuous characteristic rumbling and heavy bumping tells of an approaching automobile. Without seeing, I know it has stopped before my house, that the driver gets out, walks up to our door, raps on it, that the door is opened, that he asks for information, gets it, and departs! I can tell that it is an electrically driven car and know he goes on and not back.

WE CAN ALMOST SEE BY SOUND

ANOTHER car approaches, getting louder and louder. The motor slows and I hear a slight creak of the brake; now the motor races furiously with a short grinding and whining and the motor again quiets with another brake creak; then another furious racing and grinding for a moment and as the pitch lowers these sounds weaken and disappear amid the other remaining sounds.

How do I know that this was a Ford motor car and that it turned in my driveway, backed out

and around and went back the way it came? That is a difficult question to answer; but I am just as certain as if I had *seen* it with my eyes.

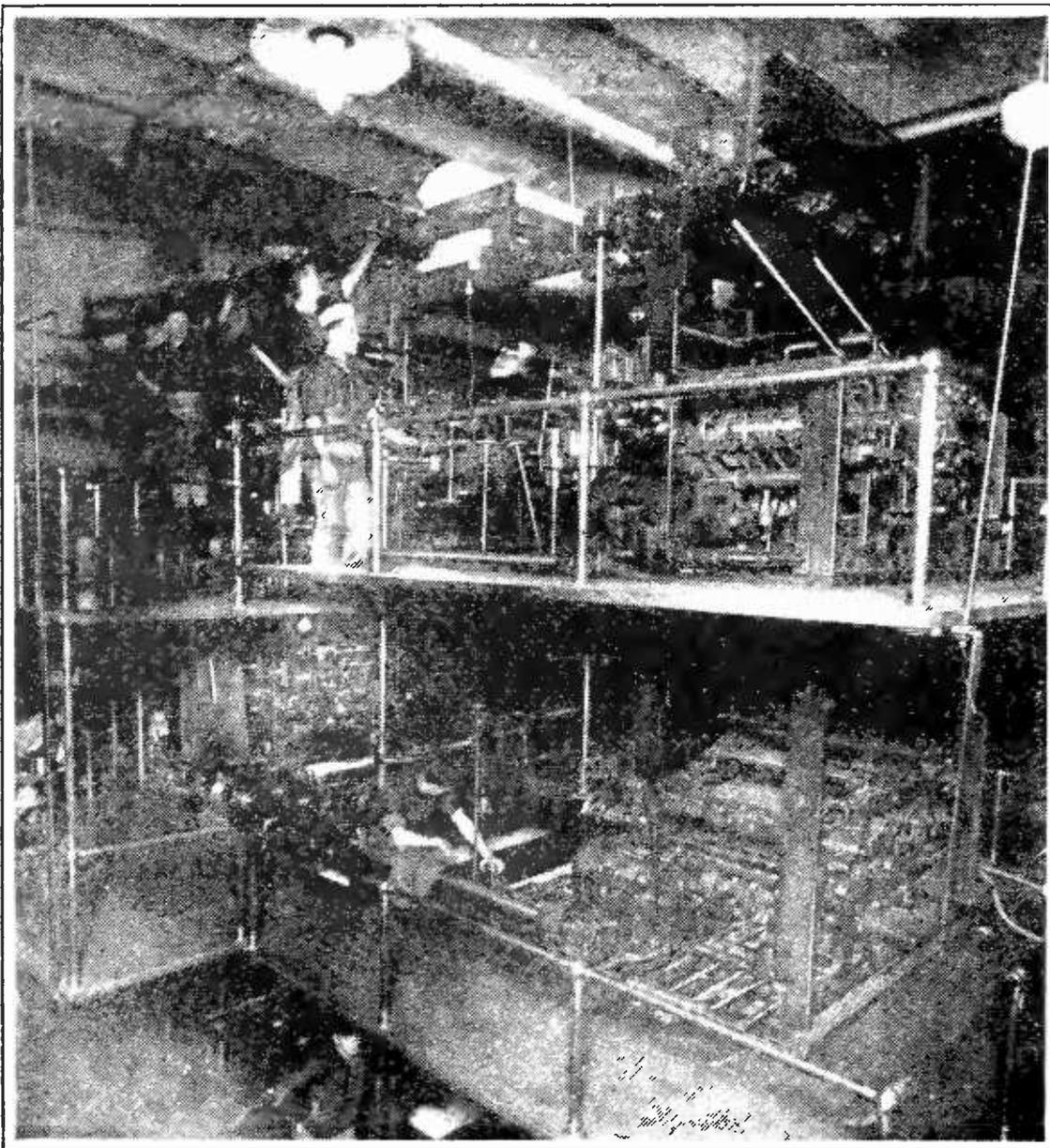
I hear other sounds that I know come from a piano. I know, too, that they come from a house across the street and am sure are produced by a player action and not manually. Only the three first beats are necessary to tell me that the selection is Rachmaninoff's "Prelude in C Sharp Minor."

Our sound memory retains accurate records of literally millions of different sounds just as our visual memory retains pictures of endless kinds and arrangements of visible objects. With vision we classify and distinguish objects by form, position, movement, surroundings, and color. By long accumulated experience we have grown proficient in the art of describing them by words. But with sound it is very much more difficult. We can describe the appearance of a pipe organ unmistakably, but to describe its sound accurately is quite another matter.

We can with relative ease describe a person with whom we are familiar, but are quite completely at a loss in truly picturing the sound of his voice. And so while we live all our lives in this world of sound hardly realizing its presence, it is constantly conveying a remarkably great and accurate knowledge of our surroundings, of the ideas our fellowmen wish to convey to us, and very much more besides by the association of ideas in the realms of the other senses.

Realizing this we become interested in sound objectively. We want to know what it is that we call sound, why sounds differ, and how we hear.

Most of all we are interested in sound because we are interested in radio. We have come to realize what a wonderful, far-reaching influence broadcasting is coming to have, and because we know that broadcasting is the art of instantaneous reproduction of *sound*, we



THE PRINTING PRESS

Of the newspaper and the magazine and the book spread intelligence today in quantity and efficiency undreamed of in earlier days. The knowledge of how to use the press filtered through Europe and America through the aid of greatly developed methods of communication

know that we must understand sound in order to reproduce it accurately.

Radio reproduced sound is *not* the same as the original and the degree of similarity varies with the character of the sound. Some sounds reproduce well enough that our understanding or pleasure in listening is not marred.

HOW RADIO CHANGES SOUND

OTHER sounds reproduce so poorly that we cannot understand or enjoy them. For instance, a banjo or violin, with the best equipment now available, are reproduced with considerable accuracy. The degree of similarity may be as close as that between a man himself and a good photographic likeness. However, in the man himself, many details can be observed which are not shown in the photograph. Likewise with these original sounds and their reproductions. Other instruments like the piano do not reproduce so accurately. Some tone ranges are good, others poor. The upper mid-range reproduces well, but the extreme high and extreme low are poor. The very high notes are far too weak and the extreme low notes are much too thin and lacking in the powerful rounded smoothness produced by the piano tones themselves. Here the likeness may be as close, say, as a pen and ink sketch of the man; it is recognizable, but there is considerable detail missing.

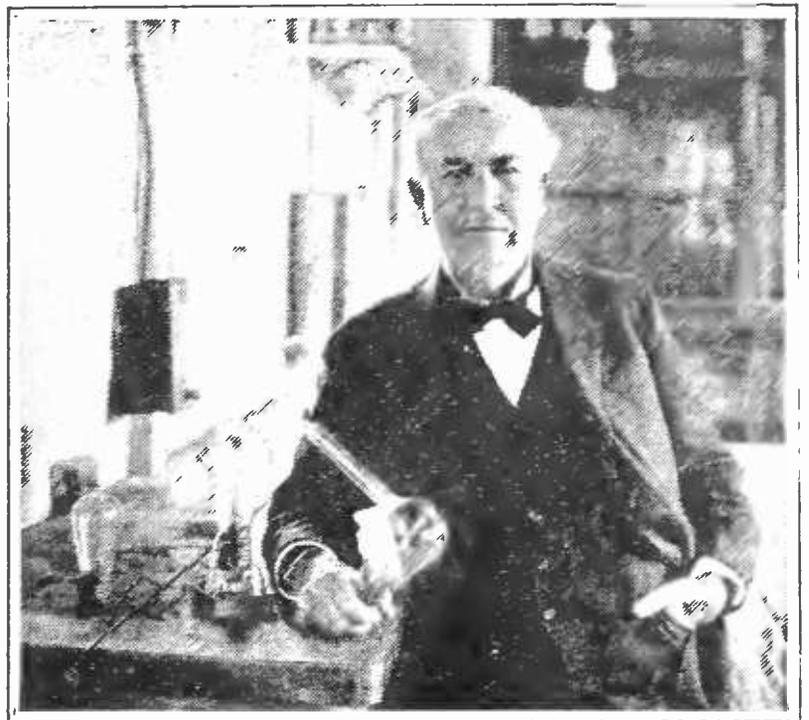
SOUNDS THAT RADIO DOES NOT REPRODUCE WELL

WITH the bass viol, the reproduction amounts to hardly more than a caricature, and it requires considerable imagination to recognize it.

In general, there is a lower level of loudness in the reproduced sounds for high and low pitches, and in somewhat the same manner very weak and very strong sounds are suppressed.

In a broadcasting studio we can easily hear the faint ticking of a clock across the room, but this would never be heard at a reproducing speaker. If a very loud sound like a pistol shot or drum beat were made with almost painful intensity in the studio, the reproduced sound intensity at a receiver would be greatly lacking in volume.

These differences between the reproduced sound and the original are caused by what we call distortions. They are produced in many different ways and cause a wide varia-



IF THOMAS EDISON AND HIS LAMP

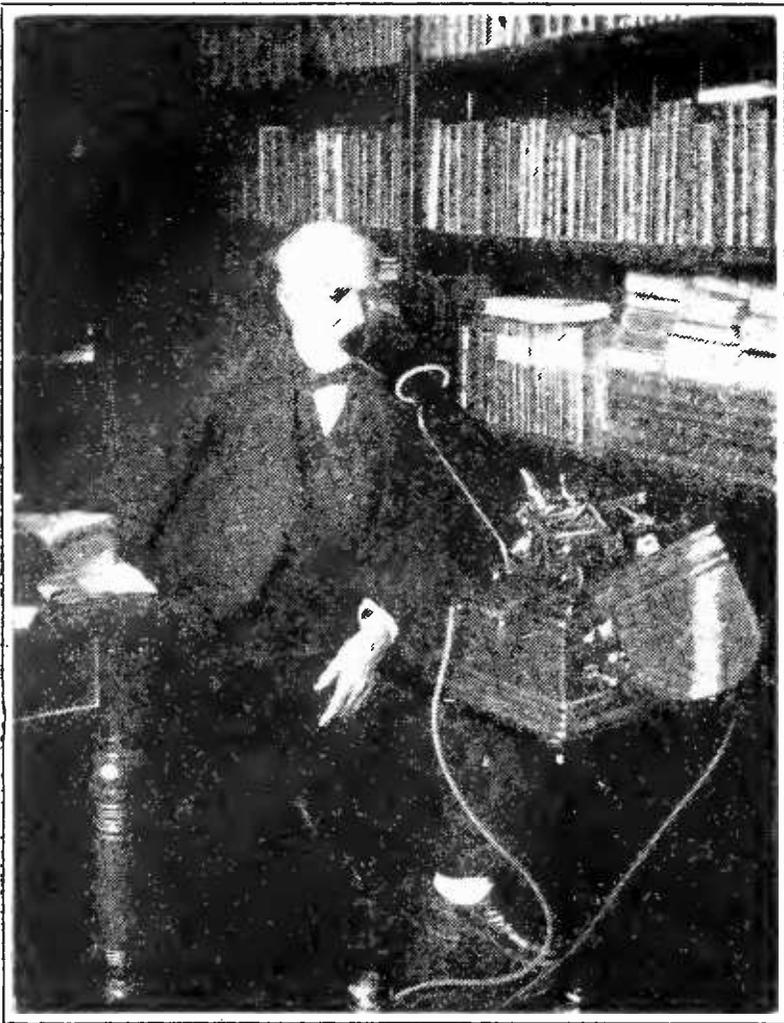
Had been known only in West Orange, the world would still be backward in its development

tion from the ideal true likeness of the reproduction for the original sound.

Who has not viewed himself in a poor mirror or in those of a curved form such as are found in the large amusement parks? Who has not viewed moving pictures from a side seat near the front or looked through improperly fitted eyeglasses? What we see is sometimes a very grotesque and unnatural reproduction of the original which is due to incorrect relation of the various lines and parts one to another. Surely everyone has looked through colored glasses and has seen all colors save one subdued and that one accentuated. A ghastly example of such color distortion occurs in mercury vapor lamp illuminations as used in moving picture studios or factories. Color in Optics, and pitch in Acoustics are very similar, and very similar distortions occur in both.

SOMETHING ABOUT DISTORTION

IF WE take a mixture of all colors such as we have in sunlight or other white light and send them into a room through a colored window glass, the light in the room may be said to be distorted. Objects illuminated by it appear very different than in white light. If the glass be tinted only slightly the distortion may be small, and other colors may pass through in reduced intensity. But if the color be deep, only one color passes through and very great distortion results, such as occurs with the violet mercury vapor lamps. These give out monochromatic or one color light, and only that color in objects illuminated by it is visible.



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THE PHONOGRAPH

Is an excellent example of the development of communication and exchange of ideas by sound

A complex sound like that of an orchestra contains a very wide range of pitch in its tones and is similar therefore to white light in optics. If such a mixture of tones passes through a horn or diaphragm or other acoustic device which possesses a strong tone characteristic, the sound passing through will be distorted. If the tone characteristic is marked as in certain kinds of acoustic windows (glass globes with ear tube and sound opening) called Helmholtz Resonators, practically only one tone will be heard. All others will be suppressed and this one will be accentuated. Obviously, the distortion would be so pronounced that what was heard through the acoustic window would be only a very grotesque acoustic caricature of the actual music of the orchestra.

Horns, diaphragms, and various parts of the electrical equipment in a broadcast system possess this tone color characteristic which greatly influences the final reproduced sound. Furthermore, some sounds entirely absent from the broadcasting studio appear in the reproduction.

NEW SOUNDS IN THE RADIO RECEIVER

HOW serious this distortion is, few fully realize. But if one has things so arranged in a broadcasting studio that he can

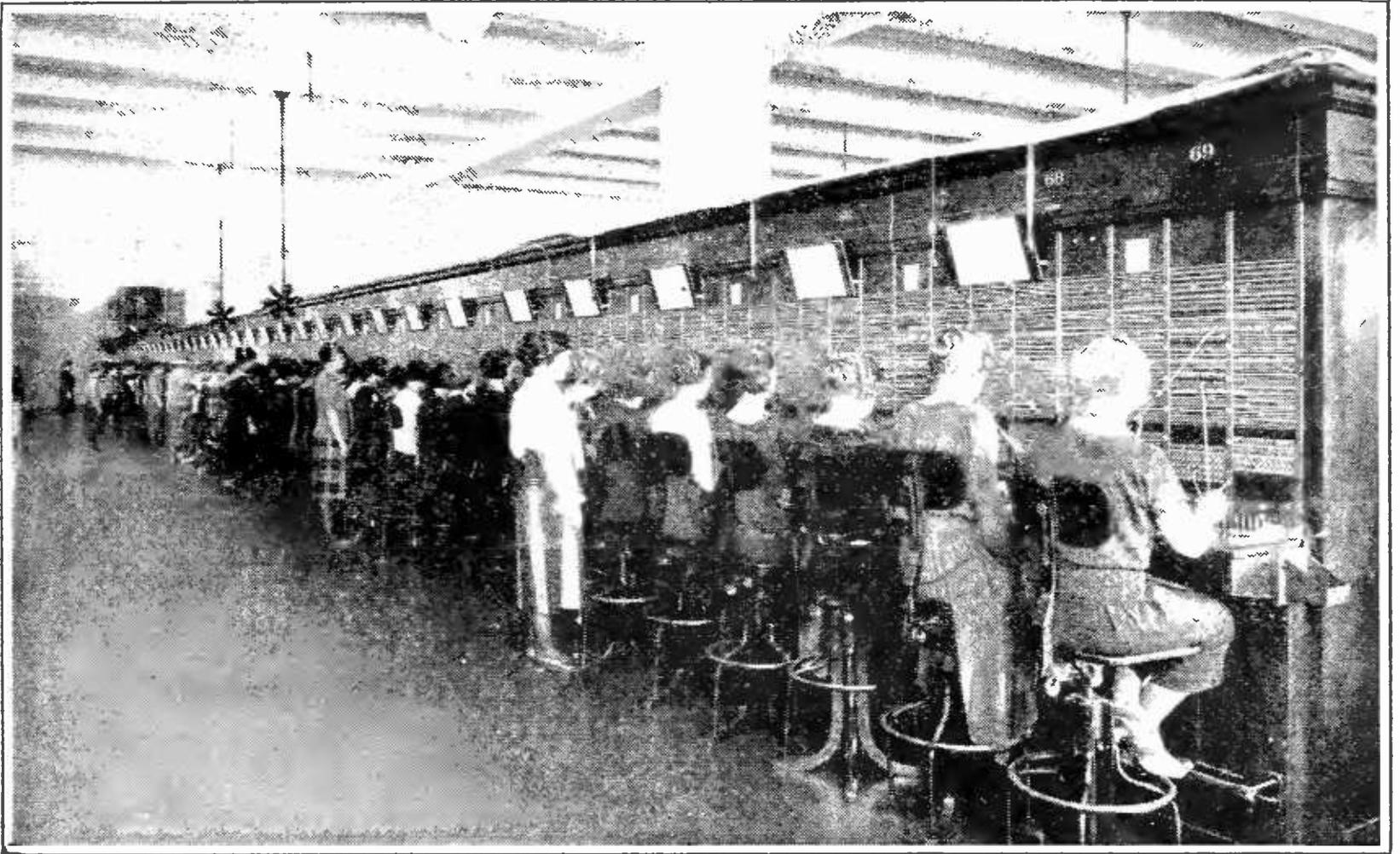
listen to either the original sound in the studio or to its radio reproduction from a loud speaker in an adjoining room merely by the opening and closing of a sound-proof door, a tremendous difference is apparent. Until the reproduction is indistinguishable from the original, the true object of broadcasting cannot be accomplished.

Realizing then that there is room for great improvement in the reproduction of sounds by radio, we must turn our attention first to the physical nature of sound, insofar as it is related to this process of radio reproduction, and then to the various elements of the radio system whose function it is to convert the sound energy into the various other forms necessary in radio and back again into sound. It is here that the inaccuracies and distortions in reproduction creep in. The original sound energy cannot itself be sent to great distances. Radio, a totally different kind of wave energy, is called into play. These radio waves have the peculiarly fitting property of being silent unless properly translated, and they can be sent to an unlimited number of distant localities at once.

Since sound waves cannot be converted directly into radio waves, other conversion steps must intervene. In some of these converting elements of the system, the original sound vibrations exist as physical or mechanical vibrations, in others, as magnetic or electric vibrations. In order to accomplish the final result, many transformations and retranslations of the energy occur.

When one considers the complexity of these processes, it seems remarkable that the final result is so good as it is. Consider for a moment a piece of fine literature of intricate grammatical structure with deep and wide emotional appeal. Let this be translated from, say, the original English first into Chinese, then from Chinese into German, again into Greek, and farther through perhaps a dozen such translations and finally again back into the original English. Would it be surprising if only the crudest outline of the author's meaning appeared in the final retranslation?

And yet, this is what, in effect, is done every day in the process of radio broadcasting and reproduction. The final translation into sound, considering the intricate nature of the process, retains a remarkable likeness to the original. For this degree of perfection thus far attained the major amount of credit must be given to those who have devoted their careful attention and attacked the problem as one of



IN THE TELEPHONE EXCHANGE

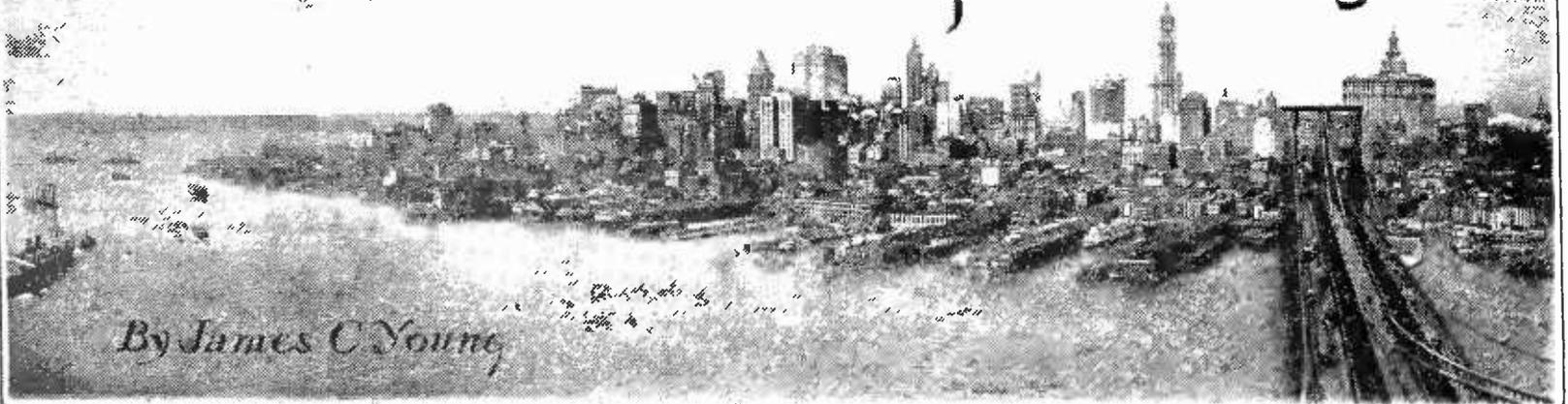
Enormous quantities of communication by sound pass every day. In wire telephony, as in radio telephony, we send out sound and sound we hope to receive at the other end. Too little attention in radio has been paid to the fact that we want perfect sound at both ends of the circuit

acoustics. Improvement in this art will be made only by a deeper study of the nature of sound and its relation to these many trans-

lating devices like the microphone, the amplifier, or the loud speaker which comprise the radio sound reproducing system.

A second article by Mr. Miessner will discuss in a most interesting fashion, the physics of sound. It will appear in an early number of this magazine.

RADIO—the "Voice of the City."



By James C. Young

WHEN WNYC sends out its evening call from the high Gothic tower of the Municipal Building on lower Manhattan Island, it speaks with the voice of the only American city which commands a place "on the air." To put the matter a little differently, this is the single station owned and maintained by an American city. Perhaps it may seem strange that this should be the one truly representative municipal station at a moment when institutions of every sort are turning to radio with a sure instinct for publicity. But plans under way may be expected to result in several new municipal stations. A half-dozen others scattered across the country fall into this classification, although not directly owned by local governments. Thus it may be said that the day of the municipal station has definitely arrived; that the personalities of cities are to be made familiar throughout the ether.

This development brings far-reaching considerations. Some observers affirm that the municipal station will be freer of prejudices and restrictions than any other kind of station possibly could be; but another phase of public opinion holds that the political element is likely to become troublesome. Doubtless, the true estimate lies somewhere between these extremes. It is beyond question that the next year or two will witness the installation of municipal plants in growing numbers.

Long ago a famous poet asked the Roman populace to "lend me your ears." That same request is being made to-day in the name of American cities, anxious to command a hearing from the world, by means of radio. A forcible case in point arose when WLAG shut down in Minneapolis. Instantly the city government, the community's business men, and the community itself, felt the loss of prestige. An old friend had departed. Instead of the fair name

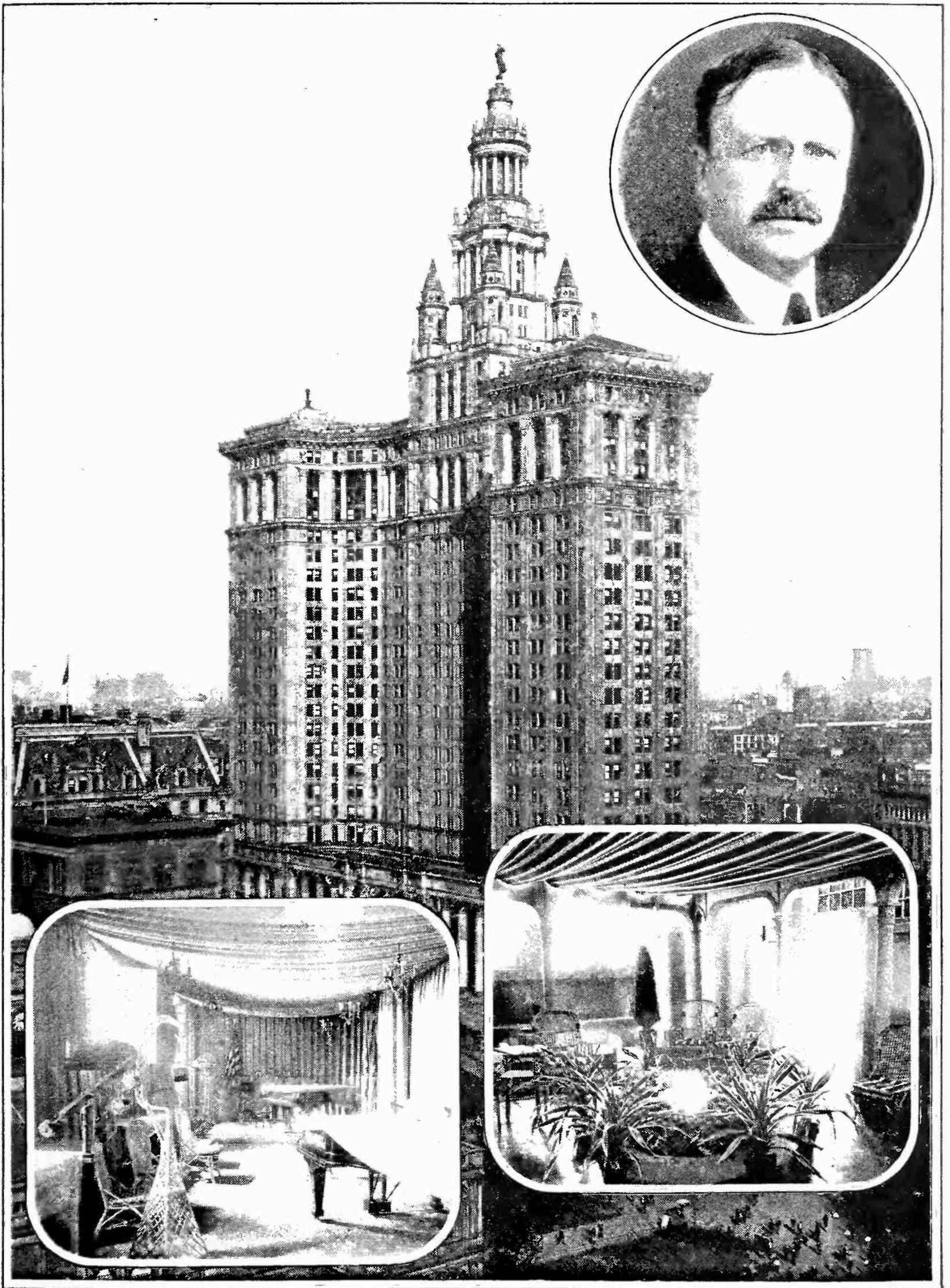
of Minneapolis being wafted around the world every night, the microphone was silent, and Minneapolis suffered.

Such a condition could not be tolerated in a city so fair and hustling. A number of its citizens said that "something should be done about it," and presently something was done. The Washburn-Crosby Company, the big millers, offered to assume all liabilities in addition to half the cost of maintenance for three years, at \$100,000 a year. Ten other business concerns came forward with the necessary \$5,000 each, and now Minneapolis has its station going again, better than ever, perhaps; every night cities throughout the world may listen-in across the reaches of space when their neighbor entertains. Incidentally, St. Paul shares in this glory and the expense. Its quota of the \$50,000 is 40 per cent.

WHERE MATTER DOES MORE THAN SERVE MIND

THE experience of Minneapolis is a typical instance of the associations that gather around a radio station. It is something more than a mere mechanical creation; indeed, this is a place where matter is harnessed in the service of mind. It is a poor sort of station that does not develop a definite identity in the consciousness of a multitude. If we reason upon the matter, we must see that this result cannot be escaped. Even the voices of announcers become so familiar that the absence of one for a night is promptly detected. When the personality of a man is so easily conveyed and understood, how much greater is the opportunity to spread broadcast the civic spirit which distinguishes many cities.

And cities throughout the land are beginning to understand the possibilities which await. Late they may be in starting, but it is likely that their alacrity in catching up will more than offset the delay. Boston is contemplating a station near the Parkman bandstand on



THE VOICE OF NEW YORK CITY

The New York Municipal Building. The top insert (photo © Underwood & Underwood) shows John F. Hylan, Mayor, under whose administration \$50,000 was spent in purchasing the station. The two lower inserts show the elaborate reception room and studio of the station

Boston Common to be connected with all of the sixty-five parks in the city. Many of these parks are provided with stands for music and speakers in the summer months. It has been proposed so to arrange the system that a concert or address in any park could be picked up and radiated from the central station. Or a varied program might be supplied by means of selections from the several parks. At other seasons indoor programs would offer opportunity to let the world know that the spirit which once flared on Boston Common still lives in the breasts of its citizens, but now applied to peaceful pursuits.

Probably no station in the country can offer more of interest than WNYC, New York's own. Situated on the twenty-fifth floor of the Municipal Building tower, it has special advantages of location. At 7:30 P. M., when the station "takes the air," lower New York has fallen into its nightly slumbers, after an intensive day. No place in the country is so much like a deserted village

as is this section at that time. The big pile of the Municipal Building rises up in serried floors, overshadowing City Hall Park and the lesser buildings gathered around.

Away up in the tower, so far up that a man in the street below could not see the light, is WNYC. If a visitor be lucky and runs the gauntlet of elevator men, guards, and other functionaries, he arrives at the studio in time for a pleasant illusion. Stepping through the door of WNYC's own home means going from the marble and glass of an office building into a tented palace that seems to have been created for romance. There is a colorful awning sus-

pended below the ceiling and brilliant cane furniture to match, with a fountain in the center where spraying streams converge over the changing hues of an electric globe.

It required a vision of the first order to conceive this station and carry out its installation. The conception was that of Grover A. Whalen, until recently Commissioner of Plants and Structures, and a prominent figure in the administration of Mayor John F. Hylan. Mr. Whalen suggested the plan early in the year. Mayor Hylan thought well of it. Other officials opposed. It would cost too much money, maybe a prodigious sum. But Mr. Whalen said that he wanted merely \$50,000. But, it was objected, that would not even purchase the plant. "Give it to me," said Mr. Whalen, in effect, "and I will show you."

From that \$50,000 WNYC was installed and developed. Mr. Whalen first cast around for a station. He found that the station used in Rio de Janeiro during

the recent exposition there, would be sold. And he became the buyer, in the city's name. The whole apparatus was shipped to New York and set up again. The plant corresponds exactly to the former WJZ station in Newark, of which it is a copy.

The first program was sent out on July 8, 1924. And from that day, WNYC has held a well-defined place "on the air." By degrees its programs have been turned into a definite direction which differs widely from the average program, intended for entertainment only. It is the announced purpose of WNYC to mix a larger measure of instruction and enlighten-



WNYC

The cage antenna of the New York City municipal radio station atop the Municipal Building. The station first went on the air during the Democratic Convention and since has been the storm center for some acrimonious disputes. Mayor Hylan made an address about the transit situation, in which he attacked the Transit Commission. A member of the Commission demanded the right to reply from the same station, but was unwilling to have his speech censored by the Mayor. This was finally done, however

ment with its entertainment. That effort has been carried forward with a degree of success which raises up many interesting possibilities for other municipal stations.

WHAT CAN BE DONE WITH THE STATION

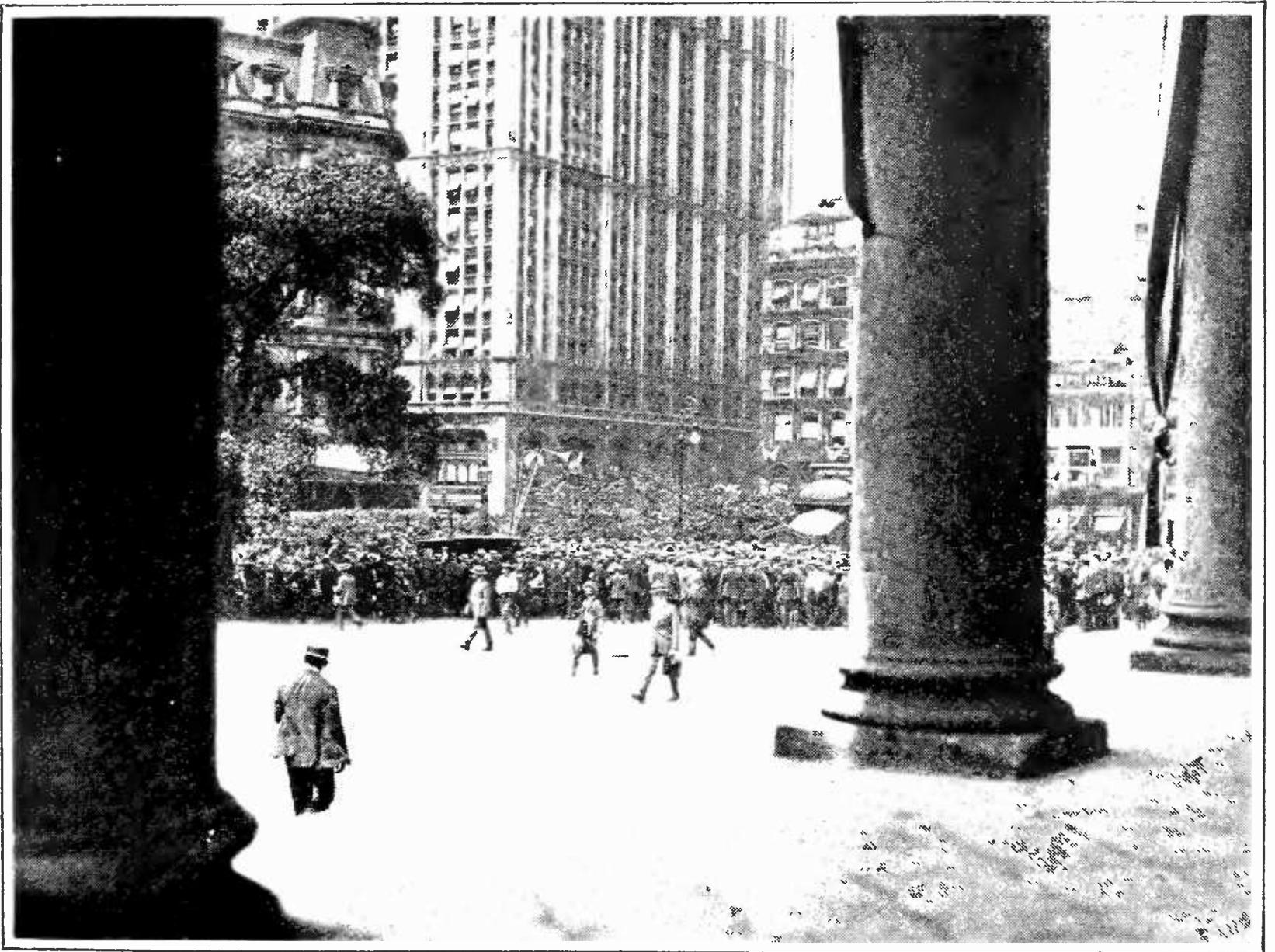
JUST now a plan is under advisement which would link the station with all of New York's 632 schools, scattered through five boroughs, comprehending some 300 square miles of ground. If a lecturer endeavored to visit these schools, one a day for 300 days a year, he could not reach the last in less than two years. Therefore it is impossible for any instructor in the schools to extend his influence beyond a few. By means of WNYC he could achieve the work of two years in a half hour.

That is but one aspect of the station's educational plans. It is expected to open radio extension courses dealing with many themes, along the lines already laid down by a number of colleges. These courses will be devised to reach the adult public sitting by its fire at night. The other educational programs will be broadcast during school hours.

Still another avenue of development has been opened by invitations to workers in almost any field who have substantial achievement to their credit. Not long ago the returning Olympic athletes described from WNYC just how it felt to come back victors from Colombes, after winning from the first athletes of the world. Such a message was largely entertainment, with a dash of instruction. But on the next night, perhaps, speakers from this station discussed such a momentous matter as the future of New York transit, one of the city's most difficult problems. In this case the entertainment was small indeed, but it may be believed that the instruction was not without value.

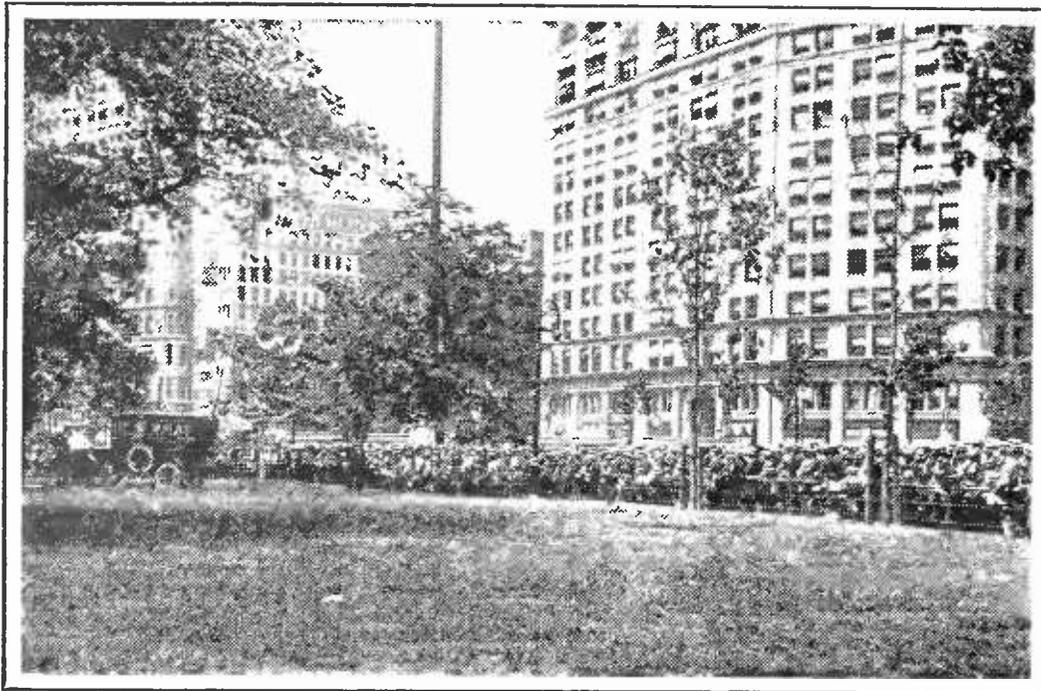
The mission of WNYC is not always entertainment or instruction. It has a grim purpose in part. Every night at 7:30 and 10:30 a man in blue coat and prominent brass buttons sits down at the microphone.

"WNYC broadcasting," he says, "for the New York Police Department. General alarm for Harry Martin, age 30, 5 ft. 6 in. tall, weight about 140 pounds. Dark face, with bold fea-



HOW THE NEWS IS SPREAD

Important events are broadcast from the municipal radio station and others in New York, and picked up by receivers and amplified so that great crowds may hear. The photograph shows crowds in City Hall Park, New York, in the shadow of the Woolworth Building, listening to broadcasting. The city, Mr. Young points out, may accomplish real service, with a properly run broadcasting station



WHEN SOMETHING IS SAID, PEOPLE LISTEN

Digests of the meetings of the Board of Estimate and Apportionment, the Commissioners of the Sinking Fund, and the Board of Aldermen are put on the air from WNYC in New York on the days these meetings occur. Besides the more political elements of the city programs, they also contain the usual musical and oratorical features

tures and frowning eyes. Has a slight limp. Dangerous man. Escaped from Welfare Island early to-day. Believed traveling west."

The listener rather catches his breath at such use of radio. It is an eerie thing—this pursuit of a man by air. An observer wonders what chance there will be of detecting Harry Martin among all the other men in the country of that general appearance. But his speculations are cut short by a new description which the officer is spreading far and wide. This time another man is wanted. And presently it is another, until the department has sent out particulars of some twelve or fifteen men whom the law demands.

A surprising number of these are apprehended, not always directly by the intervention of radio, but its use has become an invaluable part of an intricate whole. In a number of cases radio has made it possible promptly to broadcast descriptions of dangerous persons, with the result that their arrest soon followed. No quicker method is known to criminal procedure, and it has the power of drama as well. Descriptions of missing persons also are sent out, about four a day. Not long ago a stolen automobile was captured by a policeman on Williamsburgh Bridge within twenty minutes after the number had been broadcast from WNYC.

WHAT OTHER CITIES ARE DOING

LEAVING WNYC, busily engaged in its high tower, the next radio plant which the United States Department of Commerce

classifies as a municipal station, will be found at Stevens Point, Wisconsin, using the call signal WLBL, and operated by the Wisconsin Department of Markets.

The West is progressive in the matter of municipal stations, for there is another near by, in Omaha, conducted by the Central High School, and known to many listeners as WNAL. The Boise High School in Boise, Idaho, has a municipal station identified as KFAU. In Dallas, Texas, the Police and Fire Signal Department of the city government operates WRR, while the Detroit Police Department owns and operates station KOP, and there is a sixth station, KFPR, under direction of the Los Angeles County Forestry Department.

These six stations, with WNYC, are commonly classified by the Department under the title of municipal plants. But the New York station has the distinction of being the sole station directly operated by any city government. It is likely that a similar plant soon will "take the air" in San Francisco, where somewhat jealous eyes have been turned toward Los Angeles and its station. The city council and various business organizations there have the details under consideration. If the city does not install a station, it is believed that private enterprise will supply the need.

Municipal radio stations enjoy some peculiar privileges. One of these is the willingness of entertainers to contribute their services. Although many entertainers find radio so rich in prestige that they are willing even to pay for the opportunity of broadcasting, it is one of the unsettled questions confronting the public and the owners of stations, as to how these services shall be compensated. In the case of municipal plants it seems generally agreed that the stations do not yield a profit to anybody concerned, and entertainers more willingly extend their help. This is an important consideration that calls up many other questions which must be answered. As the municipal plants develop and the demand for radio entertainers increases, people will certainly compare the municipal station with the other stations. And so now we have the old question of governmental competition—in a new way.

THE GREAT AND SILENT VOID WAITS

IN SO FAR as the political phase is concerned, there seems little reason to believe that any city administration would overlook such opportunity to sound its praises. That is not in the nature of things—human or radio. But it is just as certain that any fulsome use of radio to spread word of the deeds performed by Mayor What's-his-name would be likely to fall upon a great and silent void. The radio public probably makes up the most sensitive audience which any speaker could be summoned to address. Political propaganda is not wholly unwelcome, as evidenced in the recent campaign for President, where it was tested on a larger scale than ever before. But it soon was learned that the best political speech was the shortest, a policy rigidly followed by speakers of all political shadings.

There is no reason, of course, why a political address should be objectionable. On the contrary, it frequently is enlightening. Few matters have a larger influence on the welfare of the nation than its government, and politics is but another name for government. The political address properly is a part of radio. But when all this has been granted, it is even more certain that the American radio public

would not yield its ears for even five minutes to the man who dispensed bombast about himself. So it may be believed that the good sense of the public will be the surest check on the misuse of municipal stations by spellbinders.

With so many advantages evident to city, nation, and public arising from municipal stations, it requires but one scant glance to perceive that a number of these stations will be added to the radio resources of the United States. Perhaps in time the municipal station will take the place, in some measure, of the numerous stations which have sprung up because there was nothing better in the neighborhood. It is a fair guess that the average municipal plant will draw about it the best to be had in any city, as concerns both entertainers and public confidence. Such stations inevitably will crowd to the wall others of uncertain status that merely fill a gap in the evolution of radio.

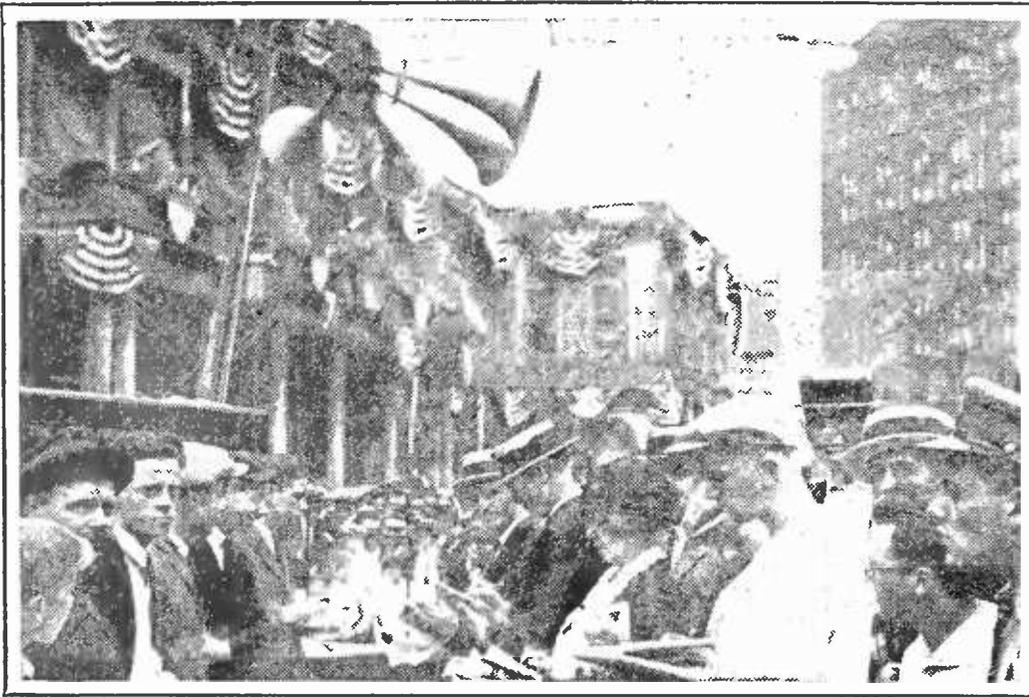
SELLING PRESTIGE

IT IS wholly conceivable, even distinctly probable, that municipal stations will be rapidly financed in some such manner as the Minneapolis station. If a similar proposal should be submitted to the business communi-



ONE OF THE TWIN CITIES

—Minneapolis, Minnesota. When WLAG recently closed, business men of both cities felt that civic pride and actual definite benefits both demanded that the locality continue to have a broadcasting station. They raised sufficient money to operate the station and WCCO is the result. Mr. Young points out that a city broadcasting station can give a very important idea of the character and advantages of the city to listeners in other parts of the nation



LISTENING TO POLITICAL BROADCASTING

Interested politicians during the recent Democratic Convention in New York kept tally cards of the balloting in Madison Square Garden. The municipal service may be extended beyond this, however. New York plans, for example, to broadcast market information daily to New York housewives. At a given hour each morning, housewives who own radio sets may tune-in and learn what foods are cheapest and what in the most abundance, and govern their purchases accordingly

ties of almost any city above 100,000, a plant would be the probable result. Proceeding along a slightly different line, cities may supply plants and call upon organized business to undertake maintenance for the common good. Whatever the method, it cannot be doubted that the municipal station will have a rapid expansion. There are so many evident advantages that it may be wondered why these stations have not come into their own long ago. But it need be only pointed out that the whole radio industry is so new and still in such a highly formative state that many goals are yet to be reached.

There is something of inspiration and much of glory in the thought that before the lapse

of many years municipal stations strung across the country will keep American cities in intimate touch, day or night, through their own plants. The assurance that these will be operated for direct public benefit is one of importance. They never can be accused, as all other stations have been, of fostering private enterprise. Assuredly there is nothing to be censured in this enterprise, considered by itself, but wherever private interests enter, the possibility of criticism also must arise. Municipal stations will have nothing to sell—unless it be the prestige of their cities; and if some candidate occasionally oversteps the bounds of radio, he may depend upon a prompt tuning out, his worst punishment.

The prediction is familiar that the number of commercial stations must decrease rather than expand. But despite the closing of some stations the number has gone steadily upward instead of down. Even with the stations now projected, it is probable that this expansion soon must reach its logical working out. And the moment additional municipal stations are opened, the pressure on weaker commercial plants will be hard to resist. It is likely that municipal enterprise will help to correct a condition that has caused some concern. In any event, an America girded with plants owned by its cities will be a fine evidence of civic spirit; a spirit which well may serve to draw the whole nation closer together by the invisible bonds of the air.

HELP FOR THE EXPERIMENTER

A NEW department will appear in RADIO BROADCAST regularly which contains helpful contributions from readers. We have had many excellent suggestions about little kinks of construction which were proved so helpful that we think all our readers ought to share in them. We invite contributions which must be typewritten and not over three hundred words long. We are not interested in freak ideas but will only consider those which are of decided value. Payment of between \$5 to \$10 will be made for each suggestion accepted.

A Motor-Generator Unit for Radio Battery Charging

How to Assemble a Simple Mechanical Unit, Efficient, and Particularly Low in Upkeep—The Parts are Easy to Secure

BY JAMES MILLEN

IN PRESENTING this construction article on the building of a battery charger, RADIO BROADCAST feels that it is giving to its readers a device of great value and usefulness. While the method here described of charging storage batteries is not by any means new, Mr. Millen has simplified the motor-generator charging method in usable form for the average radio fan. This charger is comparatively cheap in first cost and upkeep, and what is highly important, will charge a set of radio, or any other batteries much more quickly than usual methods at the command of the radio enthusiast.

—THE EDITOR

MANY radio fans have no doubt often desired a more rapid means of recharging their storage A batteries. As, at best, a storage battery delivers only 75 per cent. of the energy fed into it, it will take longer to charge the average battery by means of the ordinary two-ampere charger than it will to discharge the battery when used with some of the modern multi-tube sets. Of course the so-called five-ampere chargers will do the job more quickly, but they are both more noisy and more expensive. The approximate time required to charge a 100 ampere-hour six-volt battery by means of several of the chargers in most general use is given in Table 1.

It is a well known fact that the motor-generator is one of the most efficient and rapid methods of battery charging, but due to the high initial cost of such machines, they have never come into popular use.

The purpose of this paper is, therefore, to describe the construction of a motor-generator type charger which can be made from standard parts which ought to cost no more than the best of the five-

ampere type chargers now on the market. Such a motor-generator will completely charge an empty 100 ampere-hour battery in about twelve hours at a total cost of about twenty-five cents for the current consumed.

In large cities which are usually supplied with direct current, there are only two methods of battery charging. The most convenient of these two methods is the direct use of the house current through a suitable resistance to the battery. The efficiency of such a system is very low, however, due to the high IR drop (about 100 volts) which must take place across the resistances. Thus, when charging a 6-volt battery at a ten ampere rate from a 110 volt d. c. line, the power consumed by the resistances and dissipated as heat is 102 x 10 or 1020 watts, while that consumed by the battery is only 8 x 10 or 80 watts. Thus the efficiency of this method of charging is

only eight per cent. The cost of charging a 100 ampere-hour battery is about ninety cents. The only other method of charging batteries from d. c. is by means of a motor-generator, whose efficiency is much higher. The initial cost and space oc-

TABLE I

TYPE CHARGER	TIME IN HOURS
Two-ampere tube charger	80
Five-ampere tube charger	36
Three-ampere chemical charger	55
Motor generator	12

This table shows the approximate time required to charge a fully discharged 100 ampere-hour 6-volt storage battery by means of several different types of chargers. It costs with generator approximately twenty-five cents to charge completely an entirely discharged 100-a. h. battery, in about twelve hours.

cupied by a motor-generator is generally, however, much greater, so that where considerable use of a single six-volt battery is not to be made, the ultimate value of a motor-generator is questionable.

THE VALUE OF THIS OUTFIT

FOR use on alternating current, though, where some device is necessary to convert the alternating current into at least pulsating direct current, the motor-generator offers many advantages when used with batteries of from 60 to 100 ampere-hour capacity. With larger batteries, the use of the motor-generator becomes almost essential.

The use of a motor-generator charger is not advisable with batteries of less than 60 a. h. capacity. In the recent comparative tests made by the Bureau of Standards at Washington with the different type battery chargers available for radio use, the motor-generator was found to be the most efficient.

Some of the advantages of the motor-generator are:

1. Highest efficiency
2. Quickest method of charging
3. Longest life (no bulbs, etc. to burn out)

The only disadvantages possessed by the motor-generator is its high initial cost. This is true of the complete units available in the electrical market, but it is the purpose of this paper to describe a motor-generator type charger which in many cases can be had for the mere effort of assembling it and in any case for a less financial outlay than is required for the ordinary five-ampere charger.

THE CHARGER COST TWELVE DOLLARS

THE photograph shows an exceedingly well made and efficient charger which cost less than \$12. Of this, \$9.90 was for the motor. It was a new $\frac{1}{6}$ h. p. self-starting split phase General Electric induction motor which turns over at 1725 r. p. m. on 110 volts 60 cycle a. c. The Westinghouse generator was obtained from a wrecked Chalmers which had come into the possession of the local garage. This charger has now been in use for more than a year, and has never had to be adjusted or tinkered with.

Excellent generators may be obtained at junk prices at any of the automobile wrecking yards. The average price is \$5.00 for a guaranteed generator. It is also possible, however, to purchase second hand generators in good condition at a reasonable price at most garages and repair shops. Inquiries made at a number of local garages revealed the fact that it is quite easy to obtain a very satisfactory second hand generator from this source for less than \$10. New generators cost from \$17 up, depending upon the make. The points to watch in buying an old generator are:

- Reason for selling
- Condition of commutator
- Condition of windings
- Condition of bearings
- (most generators have ball bearings, which, if not in good condition, may be readily replaced)

In order that the motor might also be used for other purposes it was mounted as shown in the photograph and connected to the

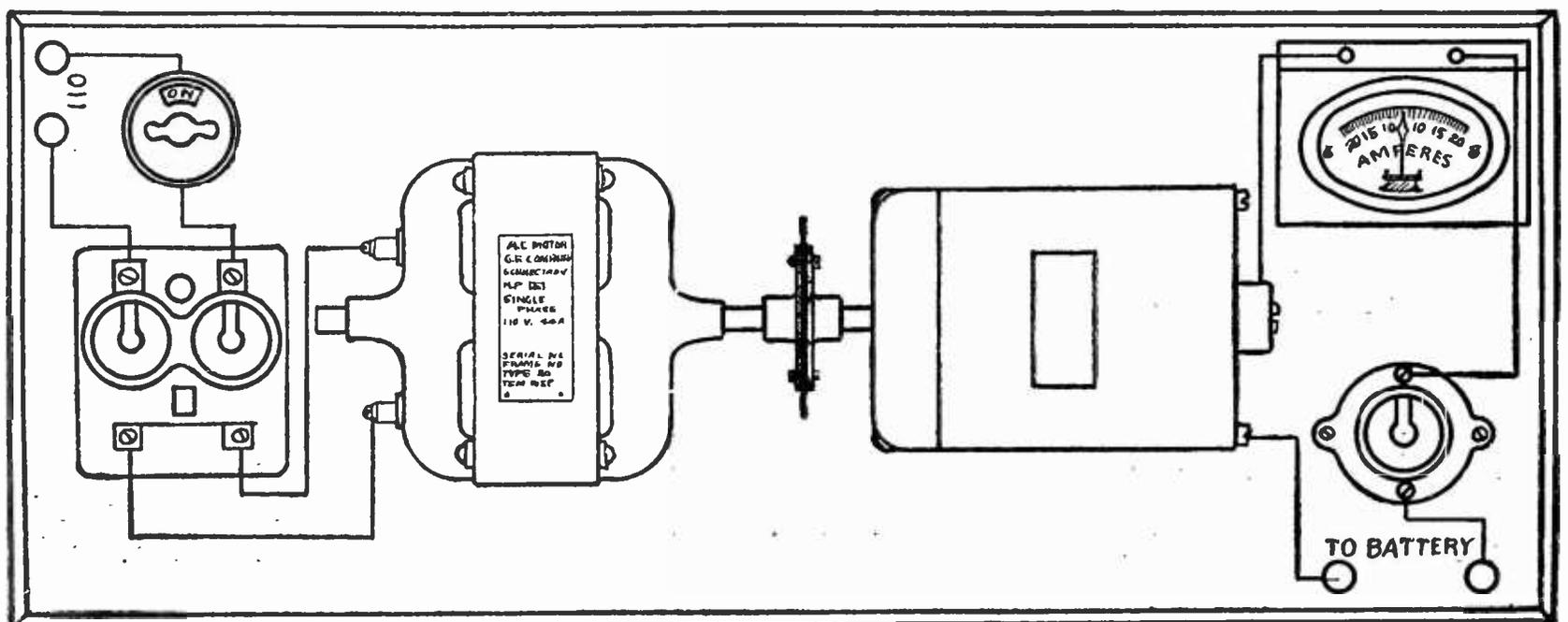


FIG. 1

A picture diagram of the charging layout. The 110-volt line is fused directly after the switch. A single fuse is also included for protection in the charging circuit.

generator by a belt instead of directly with a universal joint. This also makes possible the use of different sized pulleys for obtaining different generator speeds, and thus altering the charging rate. Slots are provided in the base in order that the two shafts may be properly lined up and the belt kept tight. The base was made from a piece of 18" x 10" x 2" oak. The pulleys were home-made, but if a lathe is not obtainable, then they may be purchased from a dealer in second hand machinery, or they may be turned directly on their own shafts as was the case with those shown in the photograph. In order to run the generator as a motor from the storage battery for this purpose, it is merely necessary to press the cut-out contacts together. A one inch single-ply belt was used, although an automobile fan belt is also admirably adapted to the purpose.

In order to eliminate any possibility of belt trouble, especially where the motor is not to be put to any other use, (such as running a small lathe, emery wheel, etc.) the generator may be directly coupled to the motor by means of a universal joint. The universal joint (or coupling) which comes with most generators will prove ideal for this purpose. The shafts of the motor and generator should be carefully lined-up and the two units securely fastened to the base. The universal

is then securely fastened in place by means of the tapered pins and Woodruff key provided for this purpose. Of course a high order of precision is not absolutely essential in this work as the flexible coupling is more than able to take care of a slight inaccuracy in alignment.

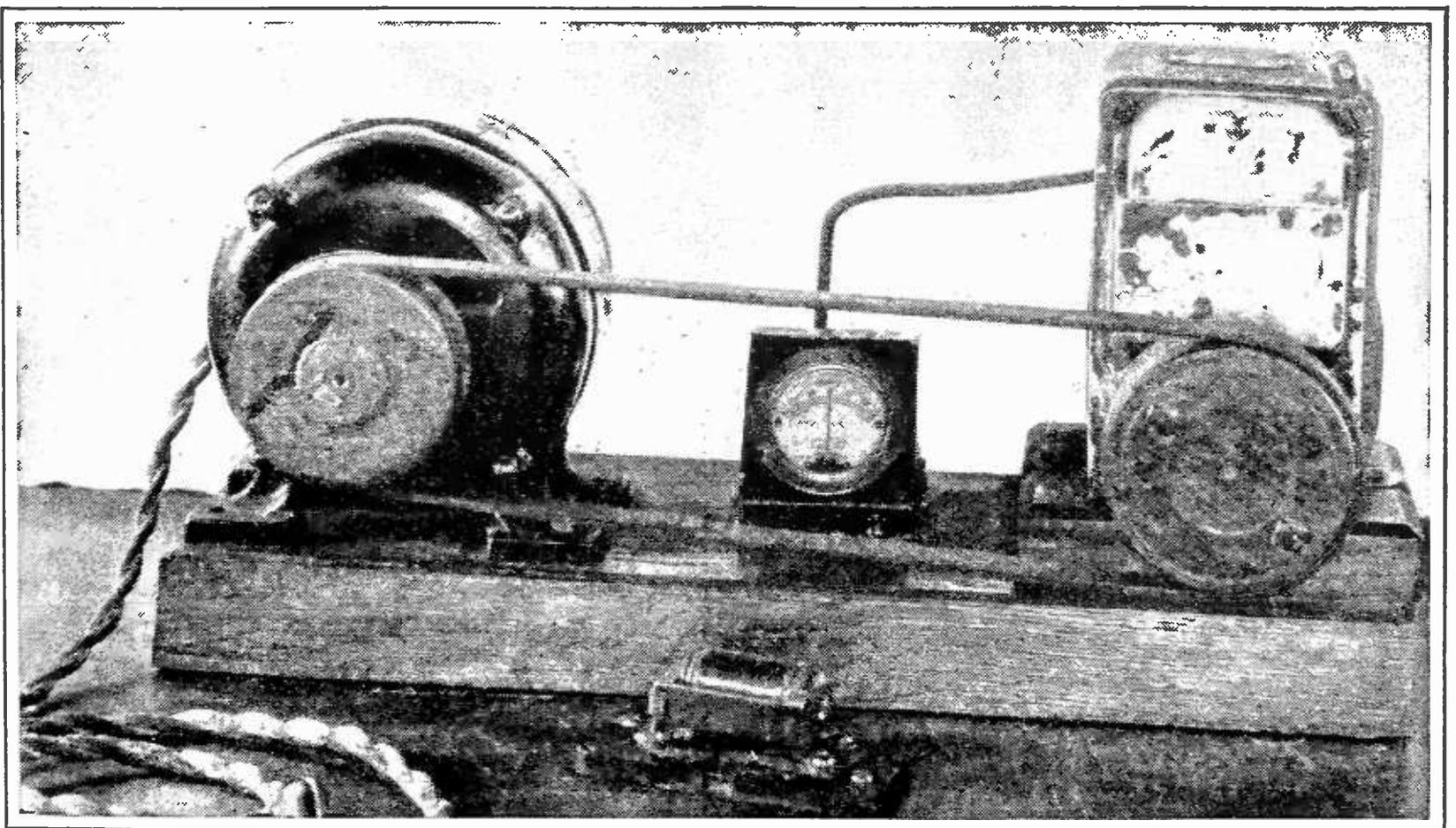
Another substitute for the belt is the chain drive. The average chain drive is slightly more expensive, more noisy, more difficult to install and must be lubricated. It will, however, make a very satisfactory drive where it is not deemed advisable, to use direct coupling.

In order to test out the efficiency of the belt drive, a revolution counter was attached to both the motor and generator and frequent checking showed that the losses due to belt slipping could easily be kept negligible.

THE PARTS AND THEIR COST

A GOOD motor-generator charger can be made entirely from new material for approximately \$29, or about the same price as a five-ampere tube charger. (List price about \$28). The following parts will be required:

New Ford Generator, with cut-out	\$17.00
New $\frac{1}{6}$ H. P. Induction motor	9.90
Wood base	1.50
Ammeter	1.50



—Court Studio

THE COMPLETED UNIT

Containing a $\frac{1}{6}$ horsepower motor, driving an old automobile generator. The motor is at the left and the automobile generator at the right, with an ammeter between. The separate automatic cutout is shown detached. This is merely a rough model. An accompanying drawing shows a suggested base layout

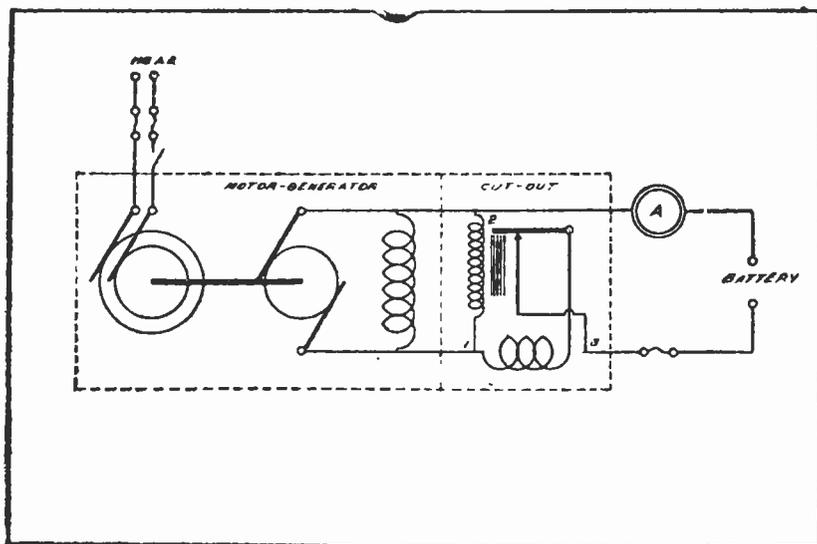


FIG. 2

A complete hook-up, showing the apparatus illustrated in the photograph. 1, 2, and 3 are connections to the cutout device shown as separate in the photograph. A is the ammeter. Note the fuses indicated in the 110-volt alternating current line

Re-built Ford generators sell for \$10 at almost all Ford repair shops.

When a high grade second hand generator of the two brush type, similar to the one shown in the photograph, can be obtained in good condition, its use will result in a more efficient and flexible charger.

Ford generators deliver 11 amperes at 8.5 volts to the average six volt 100 a. h. battery when directly coupled to a 1725 r. p. m. motor. As the voltage of these generators is not readily alterable, it is advisable to use a belt drive where a lower charging rate is desired, as in the case of small capacity batteries. The Ford generator revolves in a counter-clockwise direction when viewed from the commutator end.

CARE OF MOTOR AND GENERATOR

MOST generators are entirely enclosed in metal shells which completely protect them from dust, oil, and water. The only attention they require is a few drops of oil occasionally. If a second hand generator is to be used, then it may be necessary to clean the commutator and possibly to replace the brushes. In order to get at the commutator, remove the steel band that is fastened around one end of the case. If the commutator is found to be corroded or rough, it may be easily cleaned and smoothed with No. 00 sand-paper. Never under any circumstances use emery cloth on the commutator of any motor or generator. All the small particles of copper, carbon and sand dust should then be carefully removed. The commutator should also be examined to see that none of the segments are shorted together. If a small piece of copper from one segment

touches the next, it should be scraped away. Next examine the brushes to see that they make an even contact, but without pressing hard enough on the commutator to cause excessive heating and wear. The pressure on the brushes is controlled by means of small springs. If the brushes are worn to such an extent as to need replacing, then it is advisable to get just the right kind from the maker of the generator. Make-shift brushes are merely a source of continual trouble. In replacing the brushes care should be taken not to crack any of the insulating bushings which support the brush holders, as they must be well insulated from the generator frame. Extreme care must also be exercised to keep all oil and grease from the commutator and brushes.

The third or adjustable brush found on many generators may be shifted in order to change the charging rate of the generator for any given speed. When this brush is displaced in the direction in which the armature turns, the charging rate will be increased, and vice versa. The charging rate of the Westinghouse generator previously referred to (which has only two brushes) is alterable by means of the small adjusting screw on the end of the case. On some generators, such as the Ford, there is no method of altering the charging rate except by changing the speed. Under such conditions it becomes necessary to use a rheostat in the 110-volt line, cone pulleys for changing the generator speed, a rheostat in the battery line, or, best of all, a field rheostat, which may easily be placed in the line leading from one end of the field coil to the third (small) brush.

It is not necessary, however, to change the charging rate by such means every time a battery is charged, as the charge will automatically taper. Thus if charging is started at 16 amperes it will have dropped to 10 by the

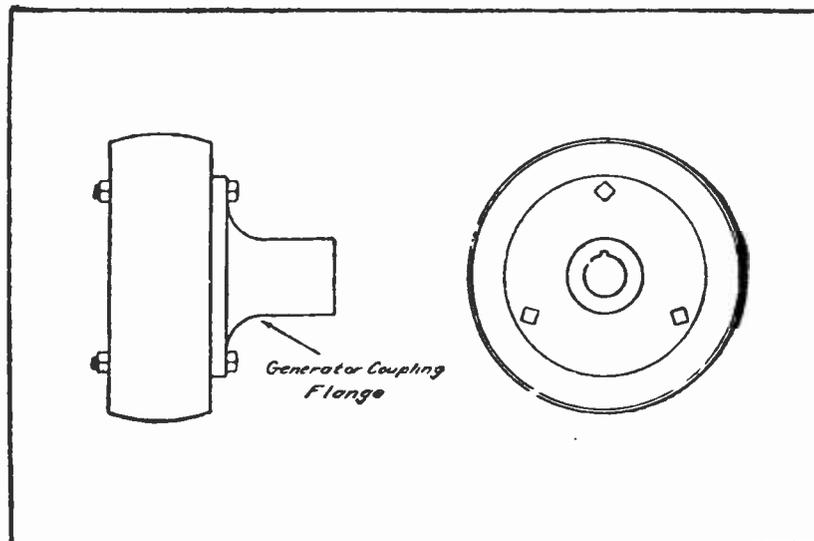


FIG. 3

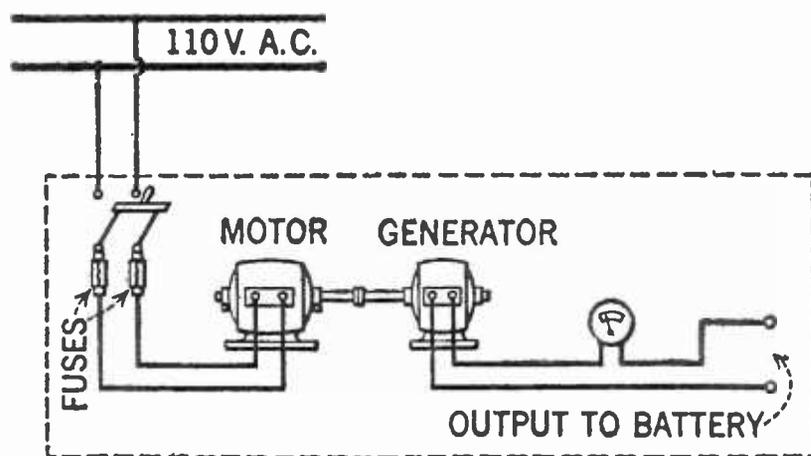
Details of the generator coupling-flange

time the battery has become nearly charged. An initial rate of 8 amperes will taper to about 4 amperes, which is, perhaps, the best all round rate at which to charge a 100 a.h. battery. Under such conditions the time required for a complete charge will be about 20 hours. Some generators will not deliver more than 18 or 20 amperes without danger of burning out the armature. The maximum safe charging rate can be ascertained from the plate on the generator.

The efficiency of the generator whose charging rate could be varied without varying the speed, was found to vary with the charging rate. This is mainly due to the rapid decrease in efficiency of a. c. motors when operated at less than the rated load. With the previously mentioned Westinghouse generator running at a constant speed of 1400 r. p. m., the maximum efficiency (30 per cent.) was obtained at 13 amperes. (Generator efficiency alone was 80 per cent.)

The ammeter shown in the illustrations is a Weston 20-0-20 but a cheaper automobile dash meter, although not necessarily accurate, will serve to show when the battery is properly connected and the approximate charging rate.

Some generators, such as the Westinghouse, have built-in cut-outs, while those that do not will require external ones. The cut-out is necessary in order to prevent the battery from discharging back into the generator in case the



The basic wiring circuit of the motor-generator unit

motor should stop when no-one is around to disconnect the battery. All low voltage wiring should be done with No. 10 or heavier wire.

And now a few words about battery charging. Contrary to general opinion a high initial charging rate is not in any way injurious to a battery as long as the temperature of the electrolyte does not exceed 110° F, and the gassing is not excessive. Excessive gassing tends to loosen the active material in the battery plates, and thus shorten the life of the battery.

Unless a cut-out is being used, it will be necessary to disconnect the battery from the generator when not charging. This may be accomplished by means of a single pole knife switch.

THE FACTS ABOUT REFLEX CIRCUITS

ARE informatively and interestingly told in another article by Julian Kay in his excellent "What's In a Name?" series. Mr. Kay tells what the various types of reflex circuits are, and how they work, in addition to the general radio information which many of our readers have followed in his previous articles with much profit and interest. This article will appear in an early number.



How the Radio Public Should Be Pleased

SOME day large delegations of radio listeners-in are going to march from one broadcasting station to another and the managers of each will be informed with much sternness that their own passionate fondness for the sort of music called jazz is not shared by anything like a majority of the people who buy receiving sets."

This was the opening paragraph of an editorial on radio music that appeared recently in the *New York Times*.

We can easily visualize that procession. Tens of thousands, increased town by town by other tens of thousands, growing and growing, until there are millions of them. This is no exaggeration. Protests against radio musical programs are universal.

Unfortunately, the people who object to having the radio monopolized by jazz are the sort of people who do not voice their objections through letters to broadcast directors. Were it otherwise, many of the stations would be so flooded with mail that all other work than

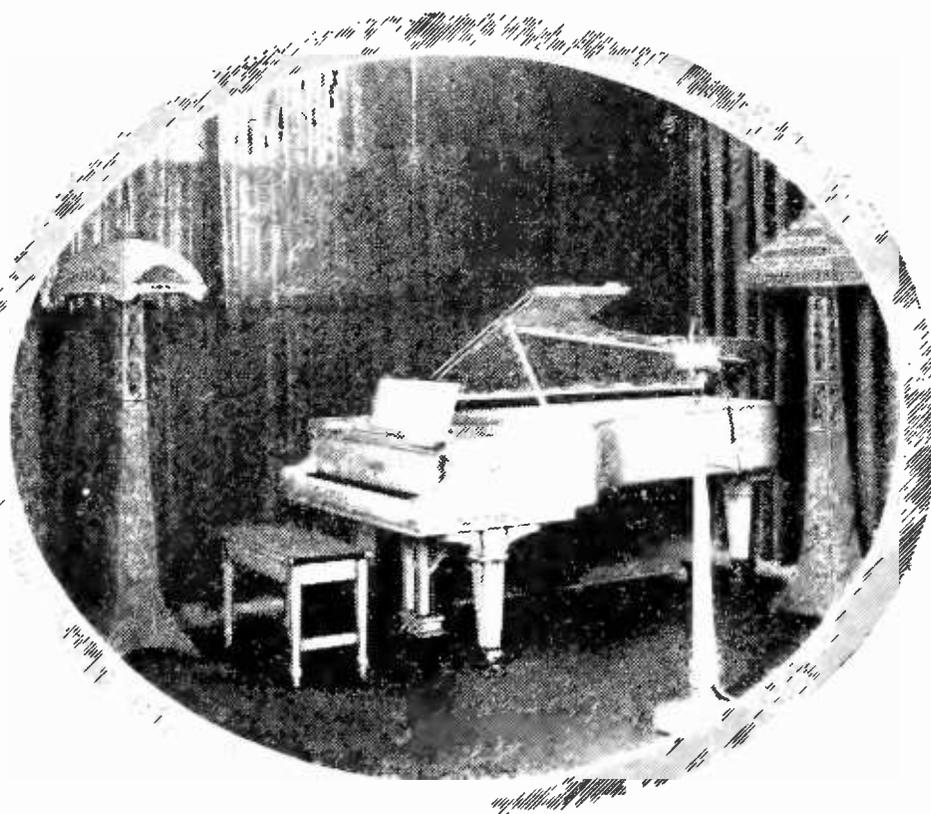
reading it would necessarily cease for the time being, which would be a good thing, for that would mean at least a temporary cessation of jazz.

To make a conservative statement, more than a billion dollars are spent in this country

each year for good music, meaning by this term the greatest music ever composed. This money is spent in patronage of concerts and grand opera, and for music lessons and the buying of music scores. With but few exceptions, the greatest musical artists of Europe find in America's patronage of music their chief source of income. And they are accorded this patronage year after year, from the people of big

cities and of small cities, because the American public knows good music when it hears it and wants to hear as much of it as possible.

These same people are spending millions of dollars each year that their children may have musical instruction. Taking this country as a whole, the standard of such instruction is high. Even in the smallest towns may be



THE GRAND PIANO

Finished in old ivory to correspond with the style of the studio at station CKAC, *La Presse*, Montreal, Canada. In front can be seen the magnetic Marconi type microphone, used exclusively by this station



© Harris & Ewing

MRS. CARL CHINDBLOM
Wife of Representative Chindblom of Illinois and an
outstanding figure in the musical life of Washington

found teachers who are guiding their young pupils toward an appreciation of the best in music. The day when Susie Simpkins of Simpkinsville, as her highest musical ambition, looked forward to the day when she could play "Hearts and Flowers," has long since passed. All the Susies in all the Simpkinsvilles are now playing Haydn, Mozart, Mendelssohn, and Beethoven sonatas, and the simpler pieces of Grieg and Schumann. And they like this music, like it far better than the cheap stuff of which they would grow tired if they practiced it for a week.

In the larger communities the musical instruction of the young people is so advanced, and on so high a plane in every respect, that, nowadays, a student beginning before ten has a well-developed taste for the best music long before he or she is out of the 'teens.

But it costs the parents much money to give their children such musical opportunities, and requires intelligent supervision as well.

Times without number has the editor of this department heard a mother or a father say:

"No, I will not have a radio set in my home. Under no circumstances would I permit the developing musical taste of my children to be influenced by such music as is broadcast night after night."

One man said:

"No one would think of calling me high-

brow if I refused to have a mechanical contrivance in my home that for hours each day talked aloud and murdered the English language with every sentence. Why, then, should I be called highbrow if I refuse to have something in my home that, day after day, distorts and murders music? All I can say is, if this means being a highbrow, then may I live and die one!"

Another man, after hearing a so-called musical program broadcast by a commercial firm, exclaimed:

"I'll never buy one of their products! I'll bet they're just as bad as that music!"

The program had been composed wholly of jazz with numerous unspeakable saxophones predominating.

Fourteen Red Hot Mamas

CAME a woman's voice over the telephone:

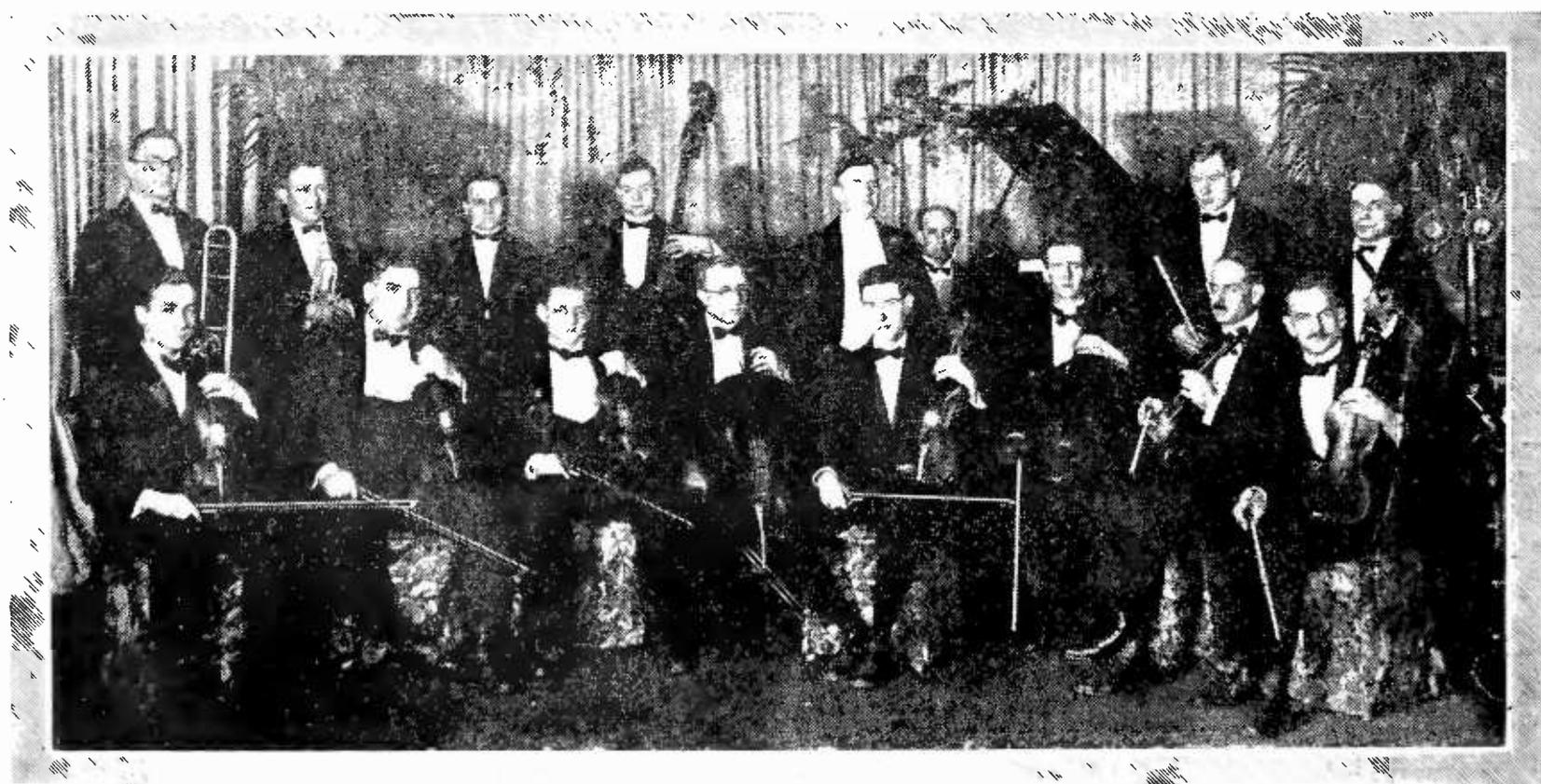
"Are you the one that writes that 'Listeners' Point of View' in RADIO BROADCAST?"

"Yes."

"Well, I want to tell you that we've bought a radio set and it's perfectly awful!"

"What kind of a set have you?"

"Oh, I don't mean the set is awful. It's wonderful. We can get all the stations. But the music! Last night we tuned-in four-



THE KDKA LITTLE SYMPHONY ORCHESTRA

Victor Saudek, Conductor. Seated, left to right: Milton Lomask, Pierre De Backer, Leo Kruczek, violins; Elmer Hennig, 'cello; Raymond Bandi, viola; James Younger, 'cello; Herbert Saylor, viola; Rest Baker, violin. Standing, left to right: Stephen Konvalinka, trombone; John J. Harvey, trumpet; William Nugier, drums; Karl Haney, bass; Victor Saudek, Conductor; Stephen Miller, Jr., piano; Alvin Hauser, flute; S. Sapienza, clarinet



Thomas Coke Knight

HELEN TAYLOR, MILDRED DELNA, AND ANNA PINTO

Who have been heard from wjz. Miss Taylor is a coloratura soprano who recently made her radio debut from this station. Miss Delna, a soprano, has been heard with pleasure by wjz's audience. The tones of Miss Pinto's harp have pleased radio listeners at various times for more than three years.

teen stations and every one announced that the orchestra would now play 'Red Hot Mama'! And everything else was just like that."

She talked for quite a time. She complained justly that she had no guide in the advance programs published in the papers as to where she could get the good music. All that the programs indicated was that at such or such an hour a musical program would be given. "And it's always such rot!" was her wail.

When Good Music Is Broadcast

OF COURSE, it isn't "always such rot." Taking the country by and large, quite a bit of good music is broadcast each week. But it is insignificant in quantity when compared with the cheap and tawdry stuff that is sent out over the air. And it is generally so mixed up on a program that contains the worst as well as the best that many people who might hear it fail to do so because they have tuned-out in disgust.

To quote again from the *Times* editorial:

"Jazz, especially when it depends much on that ghastly instrument, the saxophone, offends people with musical taste already formed, and it prevents the formation of musical taste by others, and even its votaries are cautious enough—have enough respect for their reputations with civilized people to say, 'Oh, we don't ever listen to it. We only dance to it.' But the often mentioned radio audience does not dance, at least while it is justifying its name, and there is no imaginable

excuse for giving it jazz, hour after hour, every evening from nearly all the stations."

From Mr. Gordon Balch Nevin, well-known author of various books on music, a composer and organist of the First Lutheran Church at Johnstown, Pennsylvania, some comments have been received upholding the policy of this department in decrying the hodge-podge musical program so prevalent at present in broadcasting. A portion of Mr. Nevin's letter reads:

I am not one of the class of musicians who dislike popular music, the music of the day, even jazz, for that matter. I do not adopt an up-stage attitude in regard to this class of music. In fact, there are times when, for perhaps half an hour, I find good jazz played by a real orchestra to be a mental tonic. But I do most certainly object to the very thing so often mentioned in "The Listeners' Point of View"—the haphazard and scrambled arrangement of most radio programs.

I wonder if the broadcasters are not missing an opportunity to evolve the novel and unusual type of program. In my own recital work I have found the all Wagner, or American, French, or German type of program, also, to some extent, the historical or chronological type, to be very good and helpful for the listener. At least, there is a certain coordination and continuity that gets somewhere.

I hope to see some competent singers giving programs, each selected from some one composer or nationality. When they do this there will be enough of us who will not spin the dial on them.

Mr. Nevin then goes on to cite an example of the mentality of some listeners-in. He was in a broadcasting station while a Bible lesson was being sent out. The instant this pro-

gram closed, some "half-wit," as he so aptly describes him, telephoned in requesting that "Hot Mama Blues" be played. "Comment is futile," he adds.

The pity of it is that, times without number, program directors accede to such requests. Why do they do it? Do they actually think that the radio audience is wholly composed of morons?

Mrs. Nobody of Podunk is giving a party. She telegraphs to some broadcasting station that they all want to hear such and such numbers. Immediately all the listeners-in, probably tens of thousands of them, are also supposed to want to hear this same trash.

Suppose you had bought a ticket for a public concert. And, suppose, instead of hearing the sort of program you expected to hear when you paid for that ticket, you were obliged either to leave the hall without having had your money's worth, or to sit there and listen to a lot of junk that this, that, or the other person in the audience took it into his head he wanted to hear. What would become of our concert programs if they were conducted in this fashion?

And what is going to become of radio programs if every Tom, Dick, and Harry can telephone or telegraph in and have the numbers he requests played or sung?

"The Public Be Pleased"—How?

BUT we must please the public!" exclaim the broadcast directors.

That is exactly the point we are making. The public is not being pleased with radio musical programs. For the public consists of intelligent people of discriminating taste as well as of those to whom music means only jazz.

Station KSD, which is operated by the St. Louis *Post-Dispatch*, is one of the few broadcasting stations in this country that recognizes the musical cultivation of many among the radio audience. The broadcasting by this station this season of fifteen concerts by the St. Louis Symphony Orchestra is an epoch-making event in radio entertainment. These concerts are not staged simply for the radio. They are the regular subscription programs and are broadcast direct from the Odeon Theater, where all these subscription concerts are given under the direction of Rudolph Ganz.

Five of these programs have already been broadcast, and the remaining ten will be put on the air December 27, January 10, 17, 24; February 7, 14, 21, 28; March 7 and 14. The

dates all come on Saturday evening. The concerts begin at 8 o'clock, Central, and 9 o'clock Eastern Standard Time.

The broadcasting of these programs is not only giving a large public opportunity to hear many among the classical symphonic works, but also to hear new works of important significance, among them Vaughn Williams's "London Symphony," the much talked-of symphony by Hanson, Igor Stravinsky's "Fireworks"—one of the most notable among modern compositions—Ernest Schelling's "Victory Ball," Honegger's "Pacific 231," and Respighi's "Three Old Dances."

One can just hear some people saying, "Oh, the public doesn't care for that highbrow stuff!"

Doesn't it? Why, then, are there now in this country fully fifty symphony orchestras that each season give programs of the best orchestral music? And why is it, then, that other cities and towns are making heroic efforts to have their own orchestras?

Why? Because of the widespread public demand for great music.

Do Listeners Want Their Programs Explained?

MR. JAMES C. MOFFET, of Louisville, Kentucky, has written to this department suggesting that radio announcers in presenting a musical program preface each number with some explanatory remarks, given in non-technical language. He believes this would help to popularize good music, and that this form of musical education can be put out better over the radio than through any other medium. He adds:

"The concentration of mind induced by listening-in on any explanation on the radio, with nothing to distract the attention of the listener, as in a public hall or concert room, would make this form of exposition peculiarly valuable. I know that I remember what I hear over the radio better than what I receive as one of a big audience at a concert or lecture."

Although it would not be advisable to preface each number on each musical program broadcast with explanatory remarks, it would undoubtedly be a constructive plan if this were done at stated intervals. There is an unlimited amount of interesting information from which to draw for such talks and still keep them within the comprehension of the layman.

Explanatory programs have indeed been tried, from time to time, by various stations.

So far as the present writer's knowledge of these experiments goes, the prefatory talks generally sounded as if being given, not by an authority on the subject, but by some one who had crammed for the occasion. The results in such a case, no matter what the subject talked about, are bound to be disappointing, to miss fire.

In order to talk about music or any musical composition in a way to hold the interest of the listener, the speaker must know a great deal more about his subject than simply the phase of which he is at the moment presenting. A broadcasting station can never successfully give educational musical programs until willing to pay some thoroughly competent specialist, who is also a good talker, to give these explanations.

All other subjects than music, when discussed over the radio, are discussed by well-known authorities on these subjects. This is as true of astronomy as it is of pugilism. But, as a rule, when anything is said about music, it seems to be considered that anybody can say it.

At present, the most conspicuous exception to this rule may be found in the series of talks on orchestral instruments being given through station KDKA by Mr. Victor Saudek.

As everybody knows who owns a radio set, Mr. Saudek is director of the KDKA Little Symphony Orchestra. But he is much more than this. His current musical work along various lines and his experiences in the past place him among the leading authorities in the country on orchestral instruments and their use.

Mr. Saudek was for many years a member of the Pittsburgh Symphony Orchestra, playing in that organization first under Victor Herbert, then for six years under Emil Paur. He is at present teacher of orchestration in the combined music departments of the University of Pittsburgh and the Carnegie Institute of Technology. He is also director of the Woodwind Ensemble at the latter institution. He has delivered many lectures on orchestral instruments for the Board of Education of the Pittsburgh public schools, and also for various colleges. In addition to his work as director of the KDKA Little Symphony, he is organizing a light opera company for this station.

In his weekly talks on orchestral instruments which are now being given at KDKA, Mr. Saudek divides the instruments into their four natural groups—the strings, the woodwind, the brass, and the percussion instruments. The history of each instrument, or

co-related instruments, is briefly given, and this is followed by a clear discussion of the chief characteristics of the instrument, after which its qualities are illustrated by the playing of excerpts from that instrument's part in an accredited orchestral work.

The concluding feature of this series of talks which will continue for some twelve weeks from their inception the middle of last November, will be a concert in which the more unusual instruments, such as the woodwind group and the horn, will be used.

A very interesting feature of this concluding concert will be the coöperation of the radio audience. The instruments will be announced not by name but by number, and the audience will be asked to send in the names of the instru-



Francis Brugiere

THE MADONNA

As she appears when taking the place of the absent Nun in the Cathedral, in Morris Gest's production of "The Miracle," staged by Max Reinhardt at the Century Theatre, New York, and broadcast by WGBS (Gimbel's, New York) during this station's opening week. Lady Diana Manners is here seen in this rôle

ment corresponding to each numbered solo, or the names corresponding to the numbers of such ensemble groups as may be used.

Here, in its most instructive and delightful form, is musical education over the radio, given by a professional specialist in the subject treated. Such a broadcasting feature will go far toward wiping out memories of musical disappointments experienced after one has tuned-in.

Mr. Saudek might well make these illustrated talks on orchestral instruments an annual feature at KDKA. For there is absolutely no question as to their success.

In his work with this Little Symphony, Mr. Saudek has brought the organization to a point of excellence where it has no superior among the orchestras regularly associated with broadcasting stations. Many of the sixteen men who make up the orchestra's personnel are virtuosi, with training gained in regular symphony work. Taking the programs in the aggregate, this orchestra broadcasts much good music. One looks forward to the day when they will set aside one hour two evenings a week and give, during that hour, nothing but music worthy of being heard at a public symphony concert. If, let us say, such a program was given every Tuesday and Friday, or Monday and Thursday, or Wednesday and Saturday from eight to nine, and this was continued month after month, the

audiences listening-in would be so large that the other broadcast stations might well rejoice that they could not know how they were being neglected.

Good Music That Is Popular

A PIANIST who knows from experience that radio listeners enjoy good music, is Mrs. Carl Chindblom of Washington, D. C., who has been heard a number of times through station WRC of that city.

Endowed with exceptional musical talent, Mrs. Chindblom from childhood had the advantage of training under the best masters. She is the daughter of Hjalmar Nilsson, who has directed Swedish male choruses in this country for twenty-five years and has received decorations for his musical work from the King of Sweden and the Singers' Union in Sweden, as well as in America. At the age of fourteen, Mrs. Chindblom, then Christine Nilsson—"but no relation to the famous singer," she explains—went to Stockholm where she pursued her piano studies.

Mrs. Chindblom is the wife of Representative Chindblom of Chicago, who, next March, will finish his third term as representative of the Tenth District of Illinois, and who is also a member of the Ways and Means Committee. Although corresponding secretary of the Congressional Club which is composed of wives of the members of Congress, occupied with social duties and the management of a home, Mrs. Chindblom still keeps up her musical work through taking lessons and public playing. Her cosmopolitan life has confirmed her natural faith in the people's love for good music provided they have opportunities to hear it.

"It did not occur to me," she said when speaking of her broadcasting experiences, "to play trashy music. For that matter, I could not have played it, anyway, for I have not concerned myself with such music. Why should one, when so many like to hear the best?"

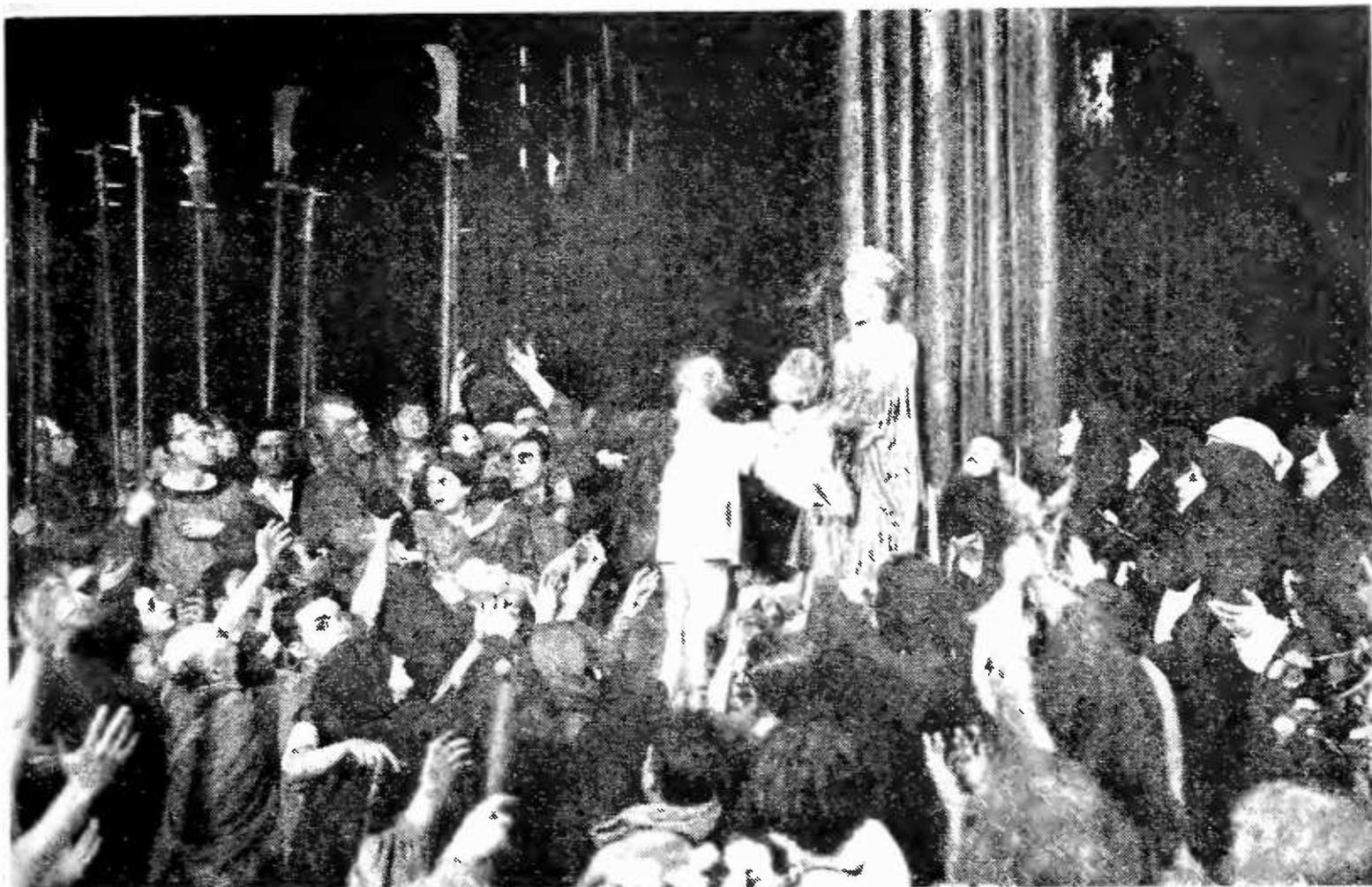
"And why should I think, just because I happened to be playing for an invisible instead of a visible audience,



Waters, San Francisco

COMMITTEE AND READERS

A service that is meeting with far-reaching success is broadcast daily at station KPO, San Francisco, immediately after the Naval Observatory time signals. First, the chimes you see in this picture are played, and, as chimes are always very lovely over the radio, the opening of this service immediately engages attention. There then follows a reading of the scriptures, always from those portions that are not controversial, but of a character to make universal appeal. The director of the station may be seen (in gray suit) standing in front of the chimes



White, New York

THE LAMED PIPER

(Werner Krauss), healed at the foot of the wonder-working statue of the Madonna (Lady Diana Manners) in "The Miracle"

that my listeners would want mawkish or cheap numbers? I cannot understand why any one who is accustomed to playing good music should be willing to play any other kind when broadcasting.

"One of the best received numbers I have broadcast, is the D'Albert *Suite*—the one with the *Allemande*, *Gavotte*, and *Musette*. It is built, you know, on classical lines, very much in the style of Bach, but with the modern touch so characteristic of D'Albert who, noted first as a great pianist, can well lay claim to being, if not equally great as a composer, one that has added much to modern piano literature.

"Another number that has also been much liked by my radio audience is the *Preludium* from Grieg's *Holberger Suite*. Then I have also broadcast a Schumann *Nocturne*, Scarlatti's popular yet very classical *Pastorale*, the Liszt arrangement of Mendelssohn's "On the Wings of Song," and the "Concert Fantasie on Swedish Folk Songs," by Emil Larsen, one of Chicago's leading musicians.

"What are my feelings when playing for an invisible radio audience? Well, it is difficult to describe them because they are not essentially different from my feelings when

playing for a visible audience. But I always have the feeling that there *is* an audience out there beyond—near and far—and the absolute consciousness of this is an inspiration. And I am always on my mettle, for I know that, over the radio, every wrong note, every slightest mistake, stands out with glaring distinctness. I know this from having listened so much to others. When a number is announced with which I am familiar, I listen always in the hope of learning something from the performance, and I very often do learn something, either regarding technical execution, or interpretation, and sometimes both.

"Although I play a good deal in Washington each winter at musicales and concerts, and last winter gave a number of programs with Congressman Woodrum, the 'Singing Congressman' as we call him, the enjoyment was no greater, if as great, as that I experience when playing for radio audiences. I do not know whether this feeling I have about radio listeners is shared by others who broadcast. I only know that it is the way I feel. There is always in my mind the thought that among those listeners I cannot see may be some who are thoroughly competent to criticise, and who will know from my playing just what sort of



Aldene, New York

NATHAN ABAS AND HIS PENNSYLVANIA HOTEL CONCERT ORCHESTRA

Tri-weekly features on WJZ's programs. This is the real thing, and not a jazz orchestra, which may account for the fact that it is one of the most popular organizations now broadcasting regularly. Their Sunday evening concerts, given at 7 o'clock, Eastern standard time, are especially well worth hearing.

musician I am. The result is, that when before the microphone, I feel that I am playing for the most exacting yet appreciative of audiences."

Because she does not use her music as a means of livelihood, Mrs. Chindblom is not personally concerned with the question of payment for broadcasting. But she is completely in accord with the stand taken by professional musicians who depend on their music for their living, that they should be paid for radio appearances,

Praiseworthy Work of a New Broadcaster

UNSTINTED praise is due the management of WGBS [Gimbel Brothers of New York] in that they had the artistic vision to broadcast, during their opening week, Morris Gest's production of "The Miracle," which has had a long run at the Century Theater, New York, and, at this writing, is scheduled for a six weeks' run in Cleveland, Ohio, the only city outside of New York where it will be presented.

It might be thought, upon first consideration, that a performance appealing first of all to the eye could not successfully be broadcast. But "The Miracle" is an exception because the story, drawn from classic legend, is of itself so beautiful and so dramatic, and because it is given a noteworthy musical setting.

During the broadcasting of this production, Mr. Fred Eric, well-known actor and stage director, gave a graphic and sympathetic synopsis of the story as it was revealed on the stage. These descriptions were vivified by Englebert Humperdinck's music for chorus, orchestra, and organ—music of a kind all too seldom heard over the radio. Humperdinck, one of the greatest masters of orchestration among modern composers, a writer of some of the most graceful and lovely music composed during the last quarter of a century, is best known by his two fairy operas, *Hänsel und Gretel*, and *Die Königskinder*. He died a few years ago, suddenly, at Neu-Strelitz, of apoplexy.

He came to this country in 1910 when *Die Königskinder* received its first production on any stage at the Metropolitan Opera house with Geraldine Farrar in the rôle of the Goose Girl. He drew largely on German folk song for the foundation of his works, using them with unexcelled finesse and effectiveness. He was a close and understanding friend of Richard Wagner and assisted him in preparations for the first production of *Parsifal* in 1880 at Bayreuth. Living a simple and unostentatious life, both as artist and as man, Humperdinck nevertheless gained world recognition during his lifetime.

Having set such a standard as the broadcasting of "The Miracle" during their opening week, it is hoped that those who are to guide the work at WGBS will live up to this standard in the future.

FROM Alice L. Nealeans, of Newport, Kentucky, comes the statement, in a letter:

"Your 'scrambled programs' raps will set makers of these 'Air Entertainments' to separating the material and keeping hours for jazz and hours for high grade music, giving certain hours to each, regularly, so that radio fans may know when to tune-in and when to tune-out."

May Miss Nealeans prove a true prophet!

A Kit for the Radio Detective

How to Use a Sensitive, Portable Receiver to Find Interference of All Sorts—Some Radio Tests of Great Value and Interest to the Experimenter

BY

ROBERT H. MARRIOTT

First President Institute of Radio Engineers

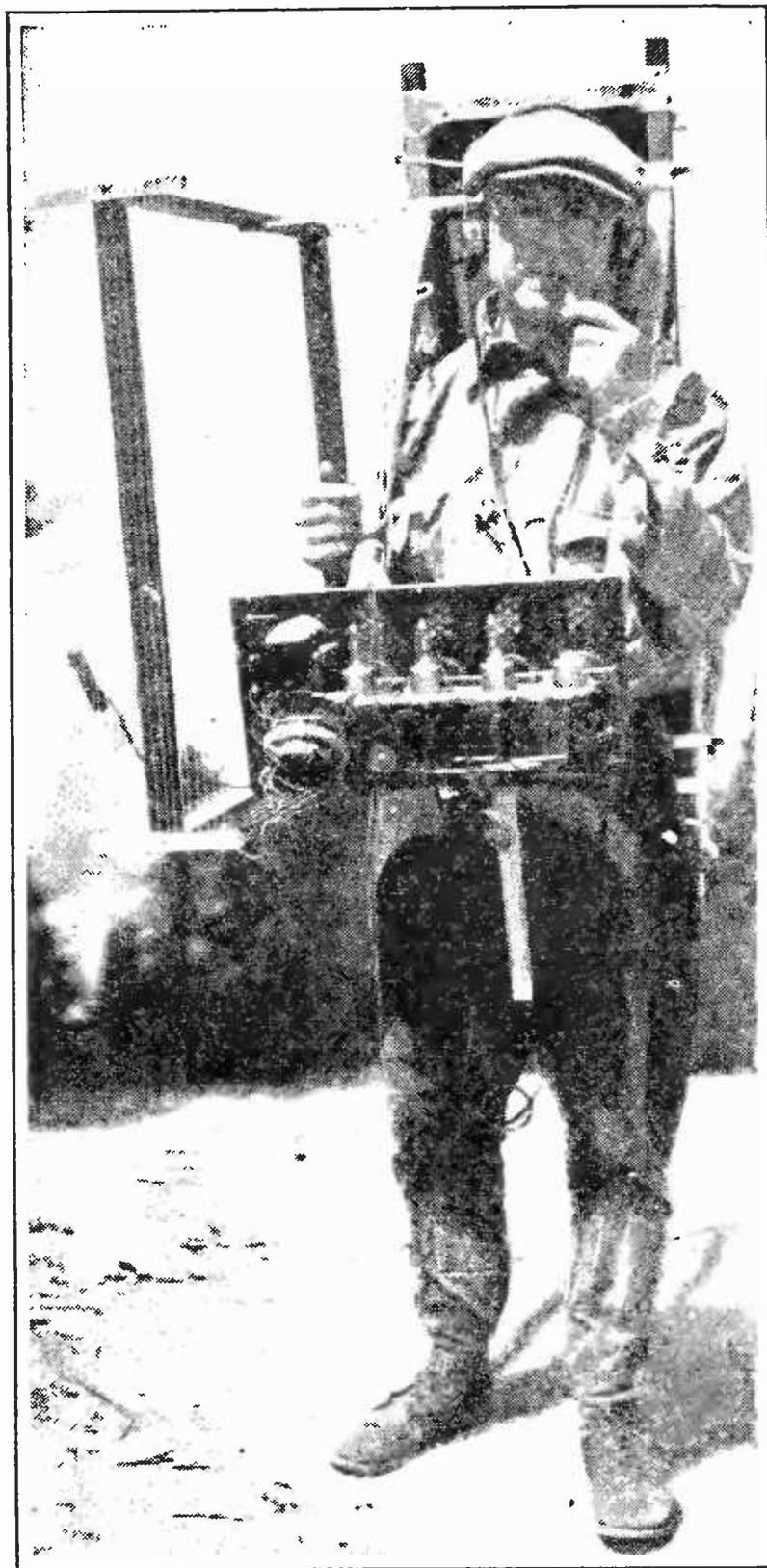
MR. MARRIOTT
With the pack loop receiver described in this article

NOT far from the point at which these paragraphs begin, the observing reader can see several photographs of a radio compass station mounted on the writer on Mount Rainier.

That is the kind of a radio compass station that can travel almost anywhere. That station is not too wide to go through doors nor too heavy for a youth. It is not too heavy for an old chap either, but of course if an old chap carries it in and around public places, it will probably be due to a lack of the dignity that usually comes with age, or due to youthful spirits, or because he wants to learn facts about interferences and the reception of radio to the extent of braving the remarks of others.

The radio compass station operator, in this case, is the means of transportation or beast of burden and, if he travels in public places, he may be referred to as a beast of burden. Somebody will surely say he is an "ass." Also, inexperienced young dogs and snappy dogs may bark at him. The wise humans and dogs will behave quite properly.

That kind of transportation for a compass station does not produce electrical disturbances



to interfere with the compass readings. Also the operator is the pivot. Operator, receiver and coil turn together, which prevents changing tuning because all parts remain relatively the same.

An automobile carrying a loop cannot go up stairs and in narrow places and the ignition has to be shut off to use the radio compass. Also a coasting automobile often moves too fast to detect sources of interferences or variations in receiving ability.

Those of you who go camping in places where human transportation is the only available transportation, will recognize that thing on my back and shoulders as a special form of pack board made with braces over the shoulders instead of straps. This special pack board is just as available to carry fishing gear as to carry scientific instruments. In

another photo you can see my son wearing a regular orthodox Indian style pack board loaded with food and I am behind him with the special pack board loaded with the rest of the camp duffle, ready to go through brush and streams. Both boards are strong enough to carry fifty pounds or more. The Indian type is superior for going through brush, while the brace type can be thrown off quickly if you fall in water over your head or where you want to shed the pack quickly.

THE PACK-BOARD RADIO COMPASS

WHEN using the special pack board for radio compass work, the radio receiver is supported by the braces in front of the operator, where he can see the dials and make adjustments. Almost any kind of sensitive fairly long range receiver will do if the tubes require very little battery. The receiver in the photographs includes a regenerative detector and three stages of audio frequency, using peanut tubes that require about one volt and one fourth of an ampere each. Forty volts were used in the plate battery. That receiver was not built especially for this kind of use. It was chosen because it was convenient and light in weight.

The compass coil, as can be seen, is mounted at one side. It consists of eighteen turns of No. 23 cotton covered wire, about three eighths of an inch apart. The coil frame is of very light spruce and fitted together with screws. A folding coil would do about as well, but it might not be as strong for its weight. A clip is provided so that eight, twelve, or eighteen turns may be used. Also, the little coil in series with the loop that couples to the tickler is tapped, so altogether a range of from 200 to about 1000 meters can be covered in receiving, with the tube oscillating. An oscillating tube is sometimes better for picking up disturbances.

A Radio Set on Your Head

Can easily be very valuable, while at the same time, subjecting its bearer to a certain amount of ridicule. Mr. Marriott's interesting article tells how he built up a simple portable receiver, using dry cell tubes and a loop which he mounted on a pack board and used to trace interference from power lines, radiating receivers, and improperly operating domestic electrical devices. Since this magazine published a series of articles, on "Man-Made Static" by A. F. Van Dyck in March, April, and May, 1924, interest in tracing and reducing unnecessary interference from these sources has grown very greatly. Other radio periodicals have since taken up the cause, and the general receiving situation is sure to be much improved, for power companies and even some of the thoughtless individuals are almost always willing to do all they can to reduce interference of all sorts, when it is brought to their attention. Local dealers can plot radio maps of their territories with a set of this kind, and radio club members wishing to perform public service can well take up this sort of thing themselves.—THE EDITOR.

The batteries are carried on the back on the pack board surface. Other things may be carried on the pack board at the same time. I sometimes carry such things as electrical measuring instruments on it. In another photograph is shown the board and some voltage measuring equipment that I used on Mount Rainier. I used them to find static potentials. They are not part of the compass equipment. In traveling through brush the coil frame and receiver can be removed from the side and from the braces and packed on the back. For carrying the outfit as baggage on an automobile or in a train everything is packed on the front of the board between the braces. Blankets and clothes serve for packing material, and a tarpaulin serves for the cover of the package.

A little khaki cloth cover not shown in the photo, fits over the receiver in front and another piece of khaki over the back for damp weather. All of the wood used,

which was spruce, and the khaki are waterproofed by wetting them with gasoline in which paraffine has been dissolved. The gasoline evaporates and leaves the paraffine in the pores of the wood and cloth. Waterproofing the strips that support the coil wires is necessary. Spruce is one of the best woods because it is strong for its weight, but almost any available wood will do.

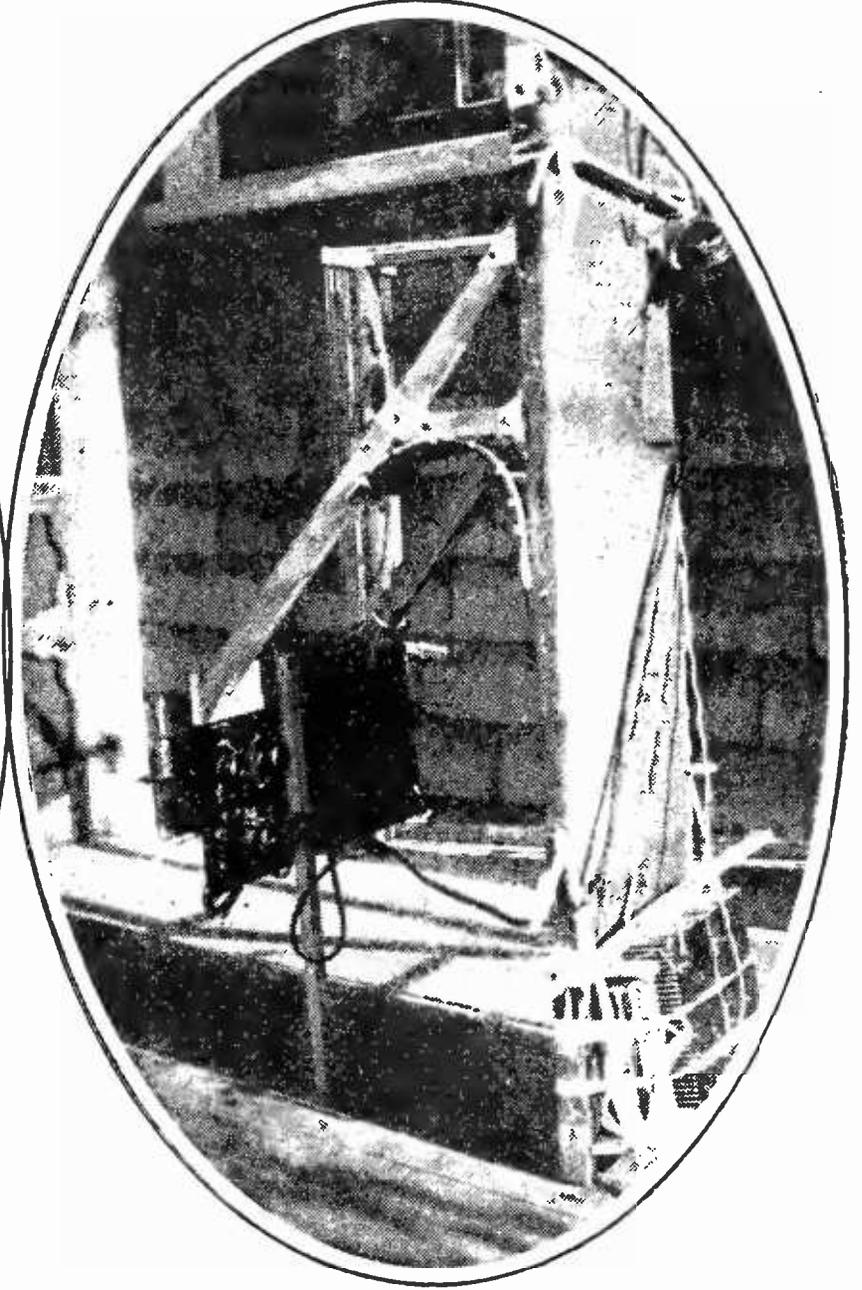
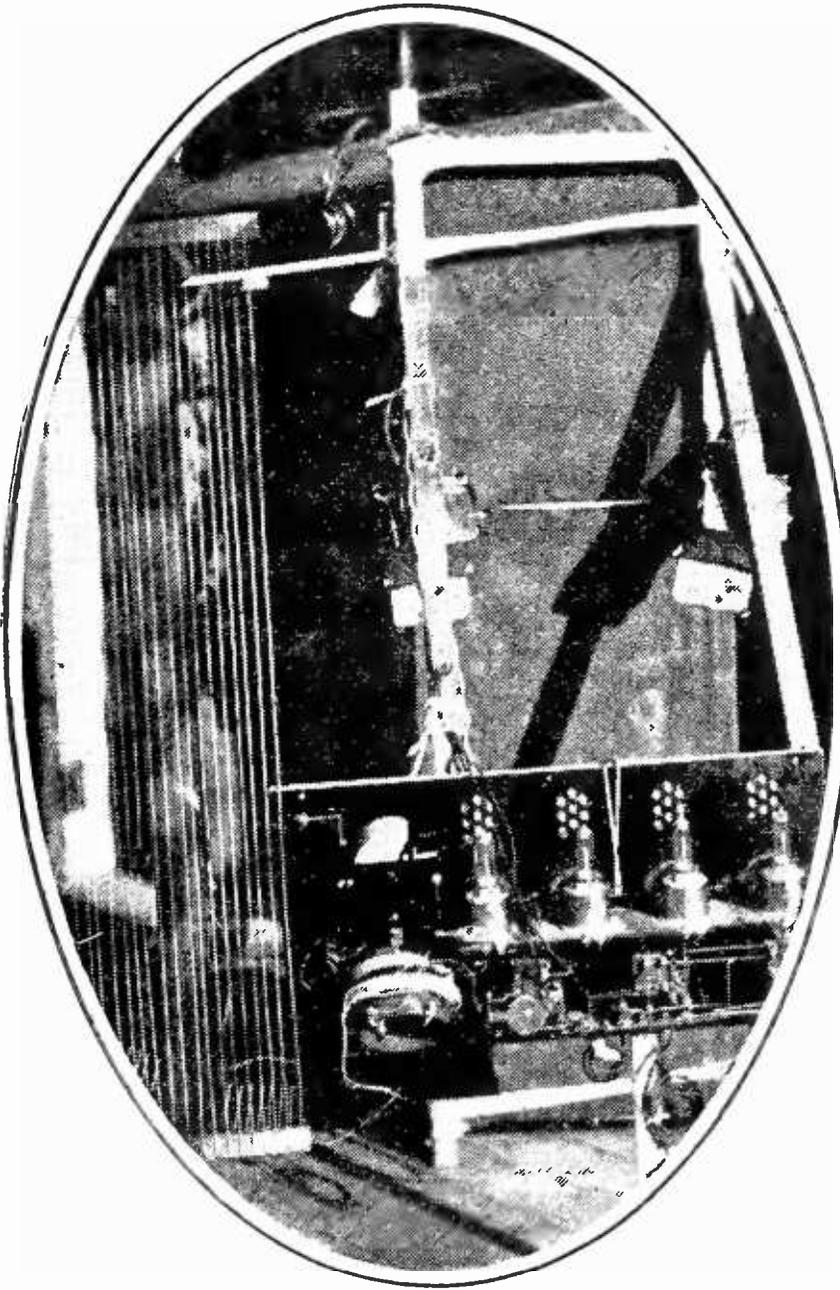
WHAT GOOD SAMARITANS CAN DO WITH THIS SET

WHY have I told you about this and why am I going to say more about it farther along in the article? Because lots of people can build such arrangements as good as this or better and use them to find causes of interference, and otherwise to develop radio. Having found the causes of interference, those causes can be eliminated through the arts of diplomacy and electricity,

and the reception of broadcasts will be improved. Cutting out interference is one of the most important things in improving local receiving. One reason why a lot of interference is not cut out is because enough people do not know what the causes are. With such arrangements as this they can find the causes.

men who would not use glittering words to attract fame or money and who, therefore, attracted little or no attention.

Another way in which radio was advanced by getting more people interested in its development was through the United States amateurs. They made radio an indoor sport.



A CLOSE-UP OF THE RADIO COMPASS RECEIVER

Showing how a simple receiving set, which can be operated on a loop can be mounted on the loop frame, which carries the dry cells to run the set

The advancing of an art and science and the correction of evils depends very largely on how many people learn the facts. For example, the apparatus for radio was invented and the idea of using it for communication was conceived and published long before Marconi made his developments. But Marconi or his associates made a lot of noise about it and that interested a lot of people who investigated the facts and started developing radio.

In their publicity, to advertise Marconi and to raise money, they brought to light information and possibilities that had previously been quietly discussed orally and in print by conservative professors and old

Still another way was the Institute of Radio Engineers which was founded and devoted entirely to disseminating information for the advancement of the radio science and art. Scientific and popular publications played a part in all those ways.

LOCAL RADIO DETECTIVES

NOW that radio receivers are located practically everywhere, there are too many possible sources of interference to cover the interference subject by articles stating where interferences may be found. Another kind of education is necessary. We have got to train a lot of local disturbance finders. Some local radio detectives with radio compasses

are needed to do the finding and spreading of information.

When broadcasting first started, the uninitiated blamed all interference on amateurs and static. Now in the summer time a great deal of interference is blamed on natural static that comes from defective electric lighting and power circuits. Also, winter and summer, some one short range notorious interference is blamed for what other local interferences do. A chap's own bed warmer may be causing the interference that he blames on the Blank electric light company.

To stop interferences, first, find the interference producer; second, use your best influence to have that interference cease. Power companies are glad, usually, to do their share. Individuals are almost always reasonable about such matters, once the true situation has been presented to them.

Those who take the trouble to do this radio investigating will find it decidedly interesting. They will do not a little to advance the radio

art in their locality. Especially will they advance the art, if they tell others how they do it and the results they get.

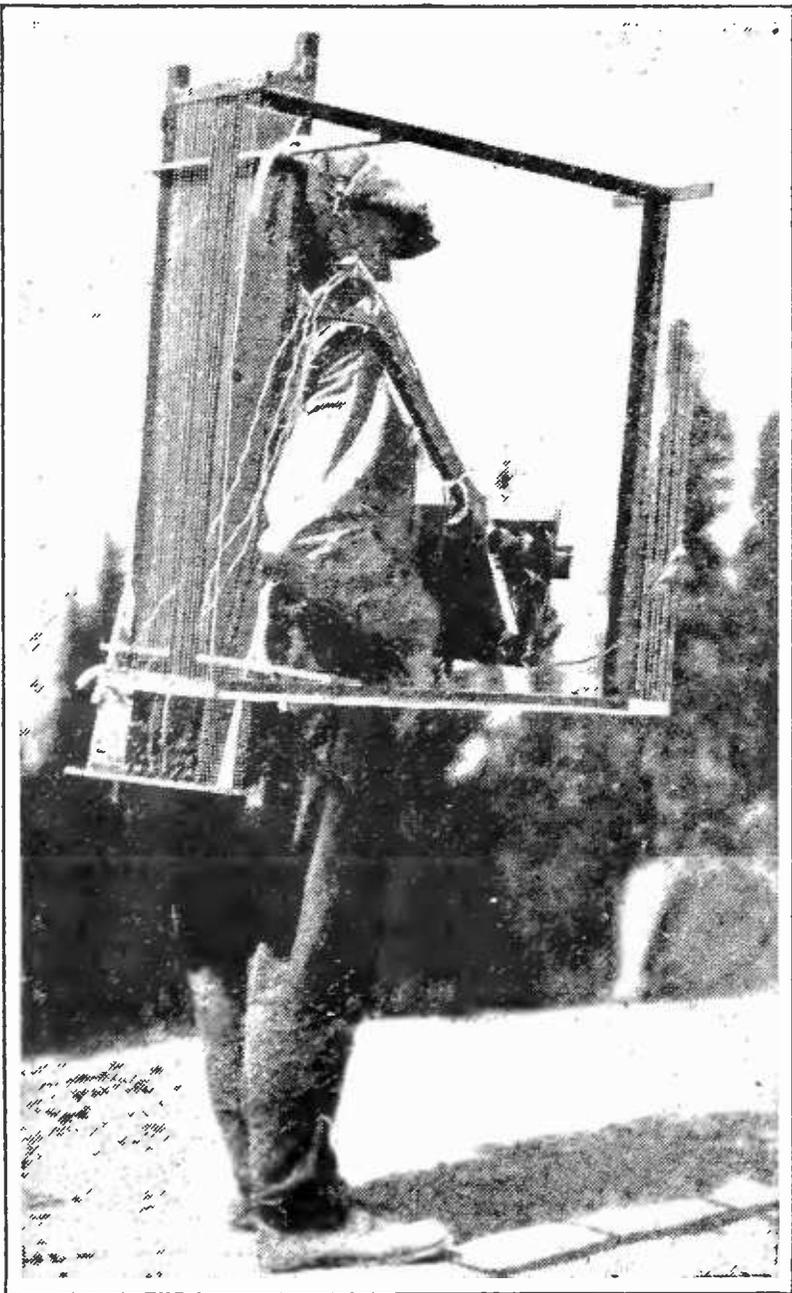
There is a tendency to expect the Radio Inspectors of the Department of Commerce to find all interferences and correct them. The trouble with that idea is that there are not enough such inspectors and no Congress is going to appropriate enough money to get enough inspectors. All of the present inspectors together could not take care of the interferences in New York, and there are a lot of folks and territory west of Hoboken. If you find the interference and it is something the inspectors have jurisdiction over, they will take action.

A radio compass station made up in the form of a pack is much easier to carry than a suit case arrangement, and it leaves the hands free. One can carry about fifty pounds on a pack board as easily as one can carry twenty pounds in a suit case. And a pack board radio compass, as shown in the photos, weighs only about twenty-five pounds. By using a lighter receiver and smaller batteries, that can be reduced to ten pounds. By going to extremes and using radio-frequency amplification only it could be reduced to five pounds or less. Also all the equipment could be included in one package.

HOW THE PORTABLE COMPASS IS MOUNTED

IN THE accompanying photographs you can see the pack board radio compass standing alone. The back frame is of one inch by one inch spruce and consists of two uprights and a cross piece at the top and bottom fastened by dowel pins and stiffened by sheet aluminum bent around the joints and held by screws. Khaki cloth is stretched tightly over the frame and tacked fast. Stiff brass hooks in the frame serve to allow packing cords to be fastened to them. A light stick from the bar holding the receiver serves as a leg so the pack board will stand alone when the receiver is in place. Two pieces of sheet aluminum with felt on the under side are attached to the front braces and back by single screws so the aluminum tilts slightly to conform to the slope of the shoulders.

One way to put on the device is to set the pack board on the edge of a table and duck under one of the shoulder pads and rise up. Another way is to stand to one side of the pack board, say the right side, and place the left hand under the left pad and the right under the right pad and raise the pack up



ON MOUNT RANIER

With the pack set. One attachment for the receiver allows the strength of static discharge to be measured

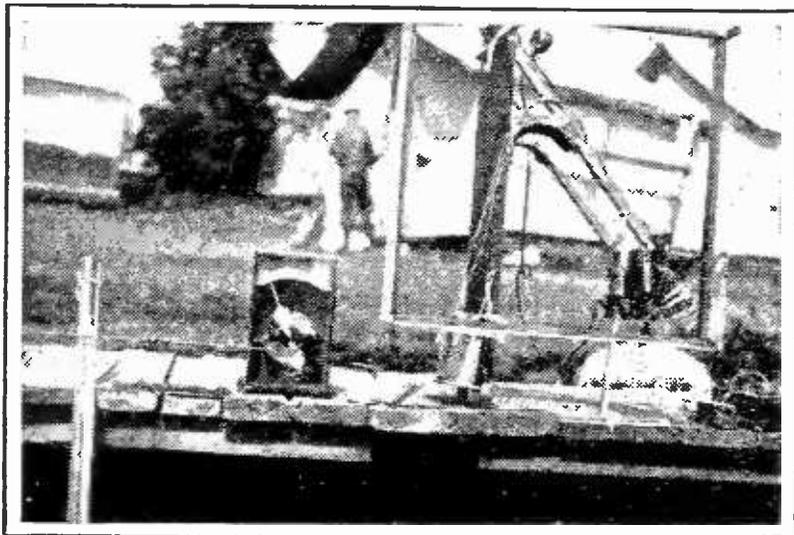
and over the head and then let it down upon the shoulders.

You can probably design a better looking outfit and undoubtedly you can provide a better looking operator, packer, or beast of burden, whatever you want to call this photographed biped.

WAYS AND MEANS OF USING THIS "DETECTOR"

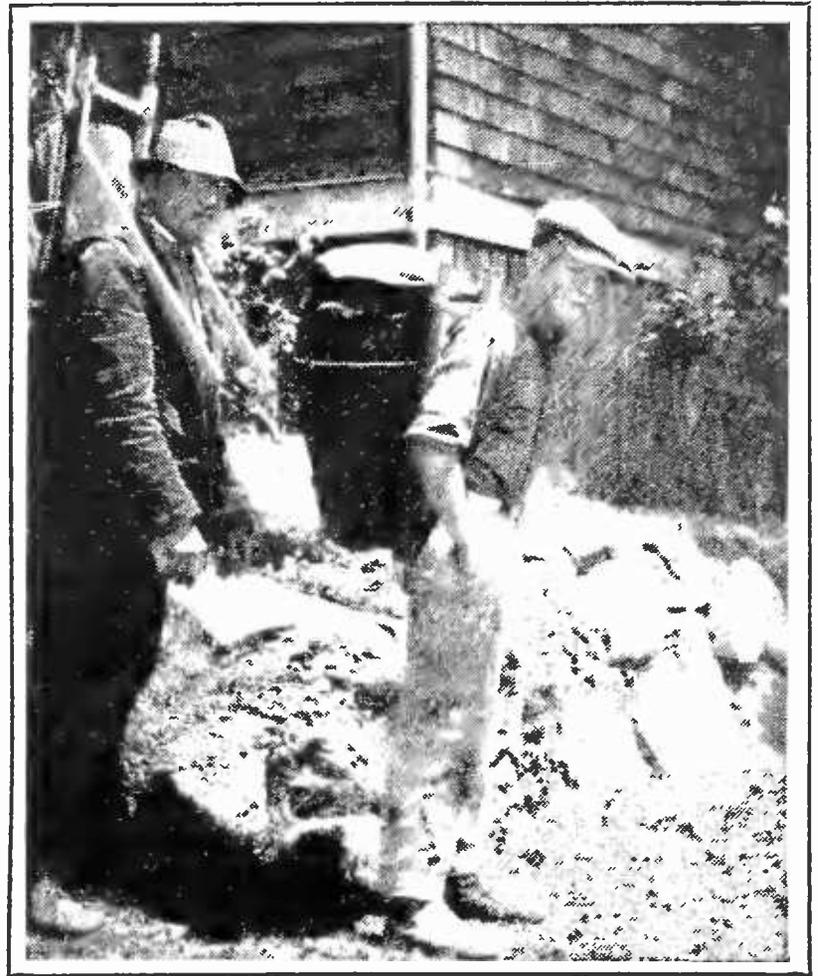
TO FIND the cause of a disturbance, put the pack board compass on, turn on the filament battery and tune-in the disturbance with the detector oscillating, if tuning is necessary. Then turn around until the disturbance is loudest and then till it is weakest or out. Those two positions should be at right angles and the disturbance should be in the direction of the wires in the compass coil when the disturbance is loudest, that is it should be either in front or back of you, providing it is from some place some distance away and there are no conductors in your immediate neighborhood. Then walk forward until the disturbance gets weaker or stronger. If it gets weaker, turn around again and if the direction of the wires is the same for maximum disturbance, walk in the opposite direction. If everything is ideal for compass work, you probably will walk right up to the cause of the disturbance.

If the interference comes from a neighbor with a regenerative detector and you set your radio compass so it oscillates, you probably will be able to follow the squeal right up to the neighbor's house. Then if you "squeal on" or "tell on" him to the other broadcast receiving neighbors they will probably join with you for a persuasive conference with the interfering neighbor. Of course if he is a stubborn Scotchman you may have to call



TO MEASURE STATIC

The pack set is arranged as shown in the photographs. The average experimenter would have no reason to use such a device, but there are some who might be interested in making such measurements



THE RADIO PACK SET READY FOR ACTION

Mr. Marriott and his son, near their home in Bremerton, Washington, ready for a journey of test and experiment with the loop receiver which the author uses for searching out interference from power lines, imperfect household electrical devices, and other sources

on the Presbyterian preacher for aid. If he is a dealer in stubborn water called "Scotch," boycott him. If you have a drop of Scotch in your blood, please forget this. If your drop of Scotch is in a bottle, offer it to your interfering neighbor.

If the disturbance is caused by the lighting or power circuits of the public service company that you all are buying service from, the correction should be easy. Some of the power companies who have high voltage lines want to know when people hear such disturbances on their lines because such noises may mean leaking insulation which will break down some time and shut down their service.

Some of the present interfering apparatus was made or is owned by the General Electric, Westinghouse, Western Electric, and Bell Telephone companies. Those companies are also interested in broadcasting, therefore they should naturally want to prevent interference from their machines and devices, and want to know what you find.

There are a lot of effects that may make the spotting of the source difficult which, if you are not in a hurry to find a particular source, are very interesting.

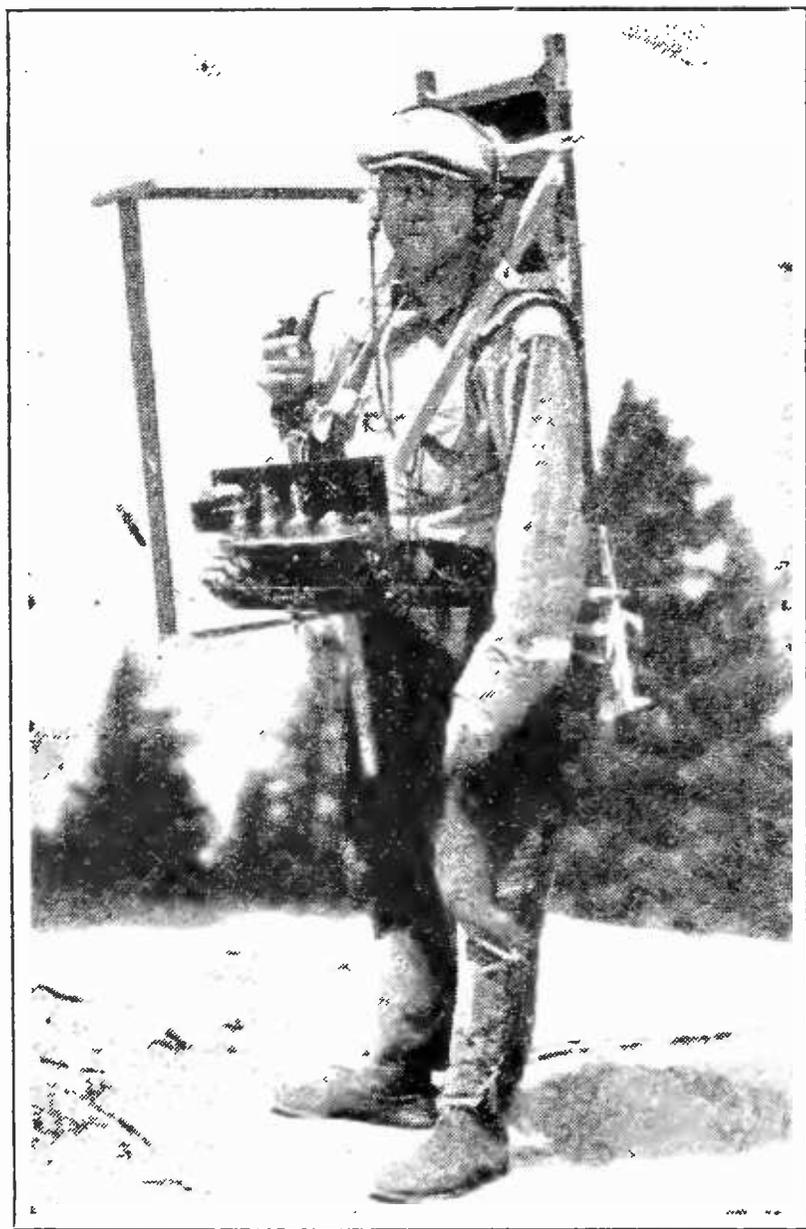
If the disturbance is carried by a wire line

overhead or underground, the disturbance will be loudest when the horizontal wires are parallel to it, and the disturbance may follow the line for a considerable distance.

WHAT TO LOOK FOR IN TESTING

IF YOU have a large mass of metal in the house like a large furnace, all broadcasts and all disturbances may be loudest when the coil is pointing toward the furnace no matter which side of the furnace you may be on. That is providing you are alongside the furnace. You may get the same result from a tall iron structure or a wire coming down a tall pole.

If there are wire lines running along one side of your lot you may get a broadcast station on the other side and not at all or in a different direction on the wire line side. Generally speaking any conductor you pass close to will produce a change in apparent direction or in volume. Another interesting thing is that to get zero sound in finding directions the coil must be tilted sometimes. This is done by leaning over sidewise.



THE TESTER

May use telephones for reception, as Mr. Marriott does here, but one who wished to use a small loud speaker could create considerable interest

If you live in a part of the United States where summer thunder storms are common occurrences, it will be interesting to pick up their directions and follow them around, away, or over. When they are overhead or all of them are far away in several localities, the static will probably seem to come equally strong from all directions.

The pack board radio compass is a good device for comparing the receiving characteristics of different localities because you have the same apparatus to use in all the places instead of a different antenna and different ground connection in each place. For example: I used it at Bremerton, Washington on Puget Sound and then went up on Mount Rainier and concluded that the strength of broadcasts from KGO at Oakland was about five to ten times as strong at Bremerton than I found them in Paradise Valley on Mount Rainier.

Not only is the pack board radio compass useful for broadcast listeners and amateurs to enable them to divest their neighborhoods of interferences and to learn about radio but it is useful for merchants to learn of interferences and to chart their city and sales territory, marking the localities where receiving conditions are good, bad, and indifferent. Also if they want to have some fun and possibly make some sales they can put a light loud speaker on the pack board and tune-in broadcasts, for others to hear in passing.

PERSONAL EXPERIENCE

ONE evening, recently, I was out with the pack set checking up on the absorbing and direction changing effect of some wire lines. Going around the block I live in about dusk, I passed the Kitsap Inn. I noticed a woman on the porch, but not being so young as most radio engineers I was more interested in radio effects and did not pay any attention to her. I do not know whether she was a new comer to the neighborhood or whether she was peeved by my inattention. Anyhow she telephoned in to the Bremerton Police Department that there was a crazy man going around with a radio set on his head.

A few minutes later, a mechanic who was ambitious to become a sleuth, came along and paid attention to the lady on the porch and being informed of my conduct followed me at a safe distance.

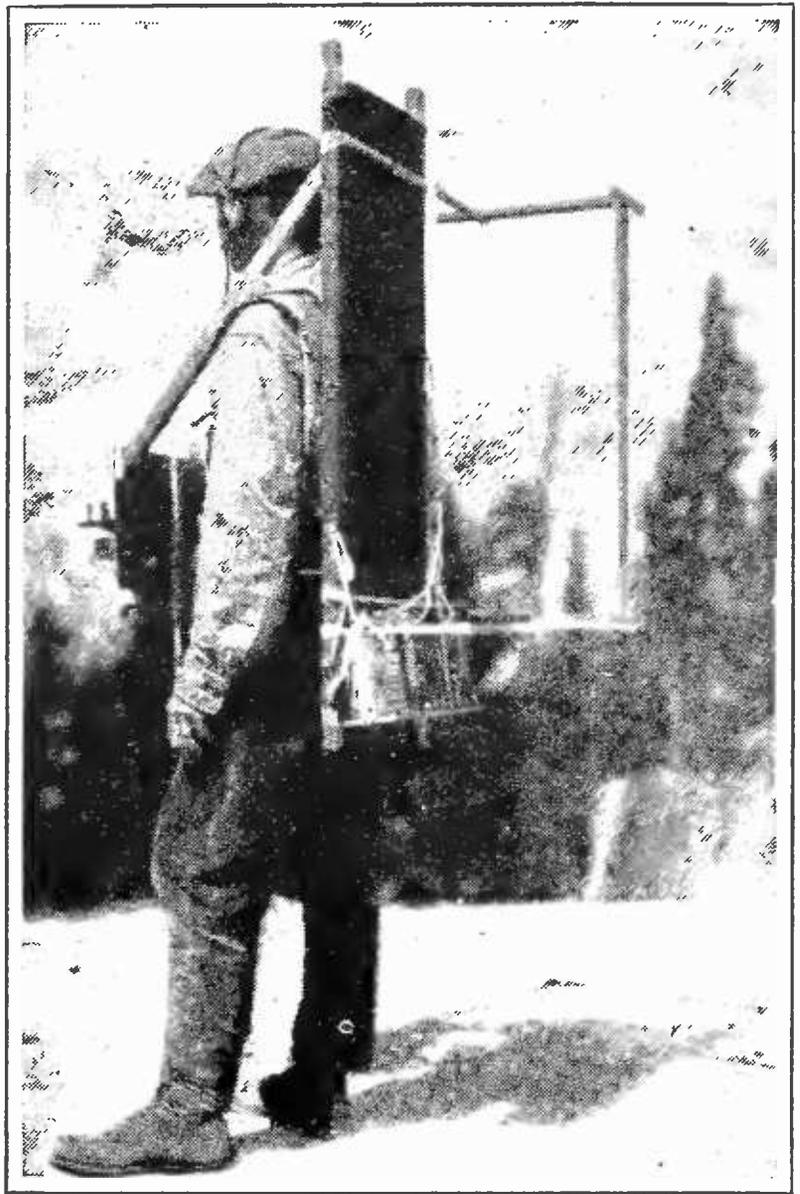
This man with the positive sleuth bias seemed to believe that I was carrying a diabolic ray apparatus which I was trying to train on the Navy Yard which is about a mile

and a quarter long. At any rate, something like that was telephoned to the Bremerton Police about the time I was passing across the street that separates Bremerton from Charleston.

After the first alarm, the Bremerton police came to look for me, after the second alarm a Charleston policeman was added to the posse. Not finding me they called out the sheriff. The neighborhood afterward told me that police were seen searching even behind garbage cans. I don't know whether any of them looked in a garbage can or not. This went on for about two hours and in the meantime I went home and set my pack compass on a table along side of a tuned antenna wire, plugged in the loud speaker and sat down.

A little later an automobile full of men pulled up just below my house on the wrong side of the street and made so much noise that I thought they were full and went out on the porch and sat down on the steps to pet the dog and watch the men. About that time one of them said, "There is a fellow sitting on the porch of that house, maybe he knows something about it." Whereupon he came over and asked me if I had seen a fellow going around with a radio set on his head. I said, No, but that I had been going around with one on my back shortly before. Then he started in to ask questions about like most people ask when they meet me wearing the pack compass.

Others came up until there were eight or nine of them and the questions seemed rather unusual, which caused me to ask why all the delegation and so much interest. I didn't know they were police because they were in plain clothes. Then they told me the whole story and I invited them in and let them



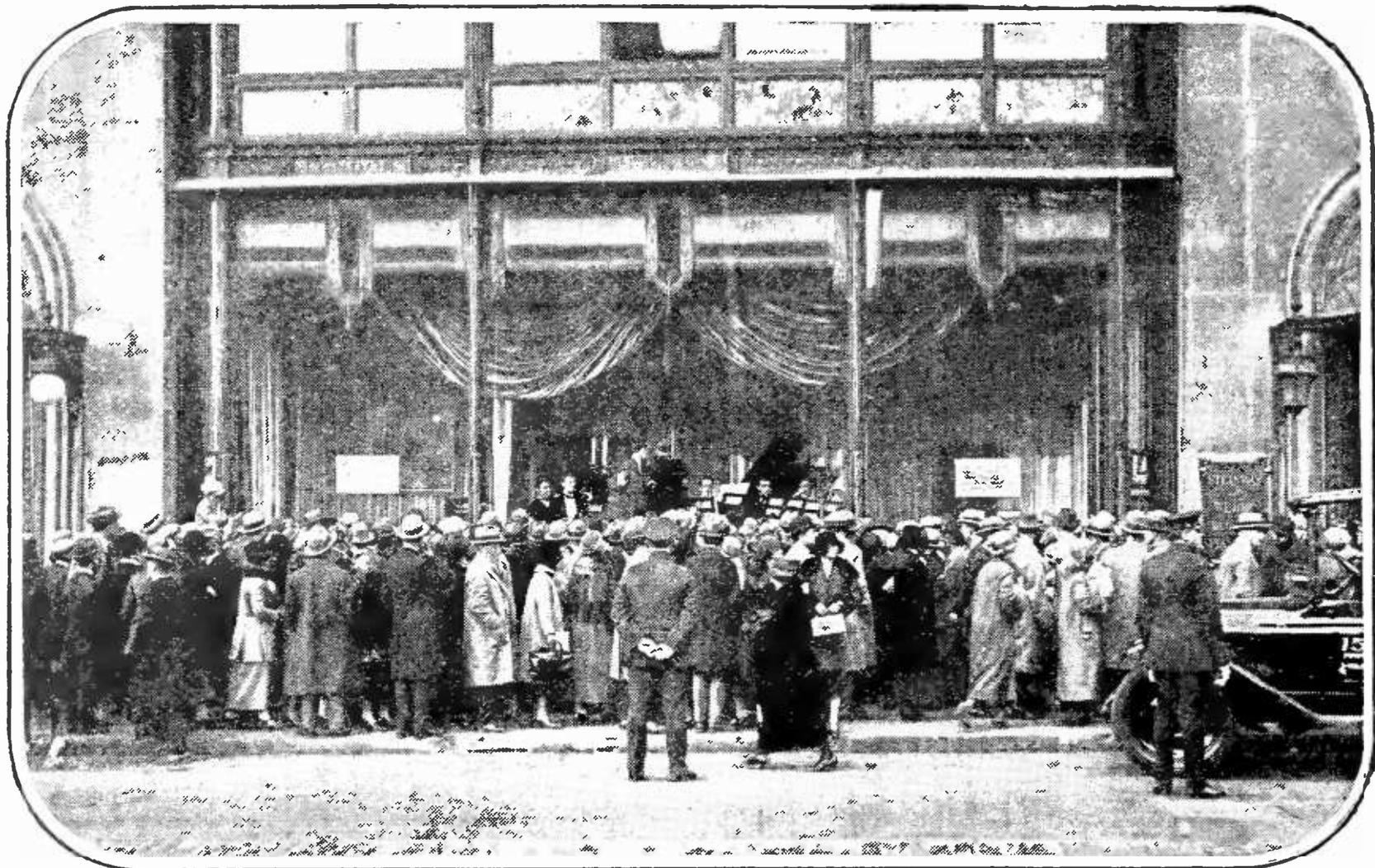
GOOD RECEPTION AREAS

May easily be charted with a device similar to this. Local radio dealers could send several men out with a pack set and quickly make a dependable map of their territory. A direction-finding loop set used in an automobile is not always satisfactory because the interference produced by the ignition is usually quite bothersome

listen to concerts. Altogether we had a very enjoyable evening. They told my friend McCall, the mayor, and Mac told the newspaper reporters and I don't expect ever to hear the last of it.

"THE MAN WHO KNEW ALL ABOUT RADIO"

IS THE title of a quite amusing story by William H. Cary, Jr. Many radio folk will recognize their own portrait, perhaps, in Mr. Cary's word-mirror. It will be a feature of a coming number of RADIO BROADCAST.



© Underwood & Underwood

A BROADCASTING STUDIO WITH A PLATE GLASS WINDOW

The studio of wjz-wjy in New York was recently moved down to the display windows of the Aeolian Building so that passing crowds might see just how broadcasting was carried on. Amplifiers were installed so that the watching crowd could hear as well as see what was going on

THE MARCH OF RADIO

By

J. A. Morecroft
Past President, Institute of Radio Engineers

What Has Happened to Important Radio Patents

RADIO certainly has proved a boon to those who reap their livelihood by getting manufacturers into and out of legal entanglements. Patents, by the thousands, on all phases of the radio art, have been granted or applied for, and it is doubtful that a single piece of radio apparatus could be manufactured in such quantity as to bring in worthwhile returns without some dozen attorneys being able to arrange damage suits on some count or other. Some men whose names stand reasonably high in the estimation of the lay public have adopted what may be termed "steam-roller" methods

of patenting radio devices. Hiring one or more attorneys, they draw up claims for anything they can conceive of whether they have made it work or not. Such men expect to make money on the "nuisance value" of their patents. We recollect seeing one man's name so often in the patent office records that he certainly must have at least 200 patents, possibly more. Such a man is trying to use the radio art purely as a money-making proposition. It is questionable if a single really original valuable contribution will be found in his whole pile of patents.

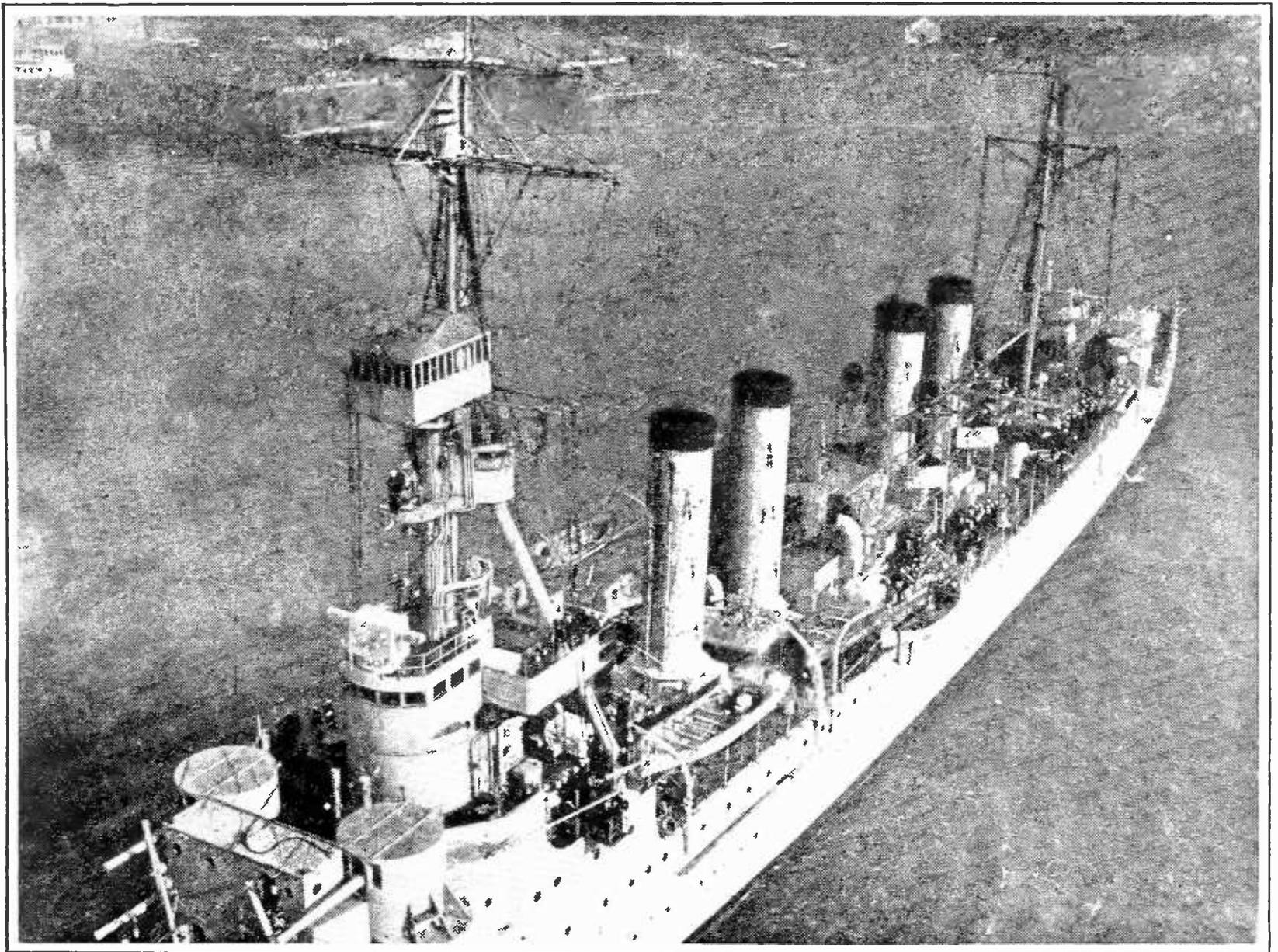
With a few such men in the game, and a

few hundred others who are more conservative in the amount of work they turn in to the patent office clerks, it is small wonder that we continually hear of patent suits. During the past month, several very important suits were either started or decided, temporarily. We say temporarily, because apparently no one but a lawyer, familiar with the various successive processes by which a suit can be continued, knows when a question is decided and when it is not.

Through various transfers of patent rights, some exclusive and some not, the Radio Corporation of America attorneys were of the opinion that they could hold the De Forest Company to carry out sales according to their desires and policies, that is, the R. C. A. could tell the De Forest Company where and how they must stick these little tags we have all seen so many times telling us that these devices are "sold for amateur and experimental use only." Early in 1923 the R. C. A. did obtain an injunction against the De Forest Company under which the selling policies of the De Forest Company were

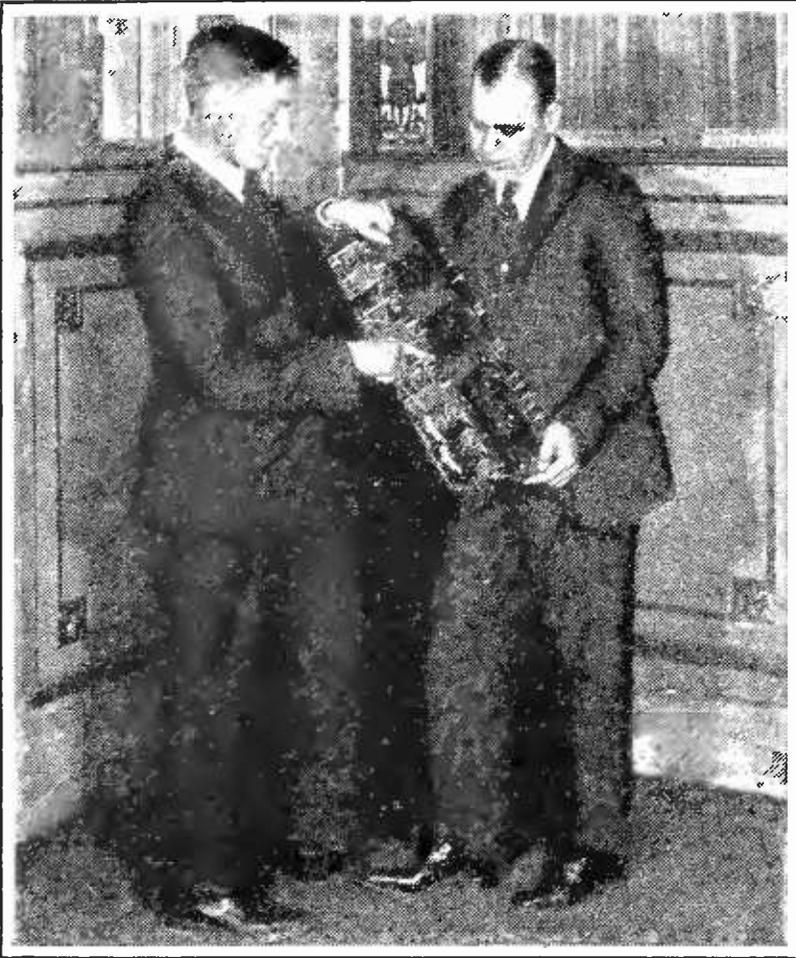
controlled by R. C. A. After thoroughly reviewing the case, vice-chancellor V. M. Lewis of Trenton, New Jersey has just handed down a decision which frees the De Forest Company from the restraining hand of the Radio Corporation. The legal arguments used are too intricate for a layman of our calibre to follow, but agreements between the De Forest Company and Western Electric Company; and then between the latter company and the American Telephone and Telegraph Company; and then with the Radio Corporation sometimes "for pay" and sometimes not, apparently convinced Chancellor Lewis that De Forest should be allowed to be free to compete with the Radio Corporation in the sale of tubes and apparatus.

In another suit, a small firm selling a few parts for a super-heterodyne has been sued by the Radio Corporation for infringement. The expert for the R. C. A. claimed that the five or more pieces collected in a box constituted the makings of a "super," although we had previously been informed that there were more than 4000 parts in the super as



THE NEW U.S.S. "MARBLEHEAD"

The newest of the Navy's cruisers. The extensive use every naval vessel makes of radio is partially shown by the elaborate antenna installation aboard the *Marblehead*. This photograph was taken in the East River, New York



JACK BINNS AND HANS LADWIG

Meeting at New York shortly after the transatlantic flight of the ZR-3 was concluded. Ladwig was radio operator aboard the Zeppelin and Binns is famous as the first wireless operator to take part in a rescue at sea

constructed by the Radio Corporation and that, according to Armstrong himself, even though we were furnished with a diagram of connections and given the actual constants of the various coils, condensers, resistances, and what not, none of us could build a superheterodyne that would work. It seems that one's ideas as to what constitute a superheterodyne depends upon what one wants to prove.

During the War, someone thought of using an antenna under water as a receiver of radio signals. Under-water antennas were used to some extent for reception during the War. The principal use of such a device, however, is evidently on a submarine which needs to get radio signals when she is submerged. Dr. J. H. Rogers applied for a patent on a submerged antenna as did other inventors, some of them in government employ at the Bureau of Standards. The specific type of submarine antenna described by Dr. Rogers in his patent was an insulated wire connected to the bow of the submarine, running to the conning tower, down through the receiving apparatus, back to the conning tower, and thence to the stern of the submarine where it was attached. The hull of the submarine thus constituted a part of a one-turn loop antenna. Messrs.

Willoughby and Lowell of the Bureau of Standards tried to have Dr. Rogers's patent annulled on the ground that they were the real inventors, but the Court of Appeals of the District of Columbia has, after five years litigation, declared Dr. Rogers the real inventor.

The De Forest Company has started suit against the Government to recover damages for the use of three-electrode tubes purchased for the government through the General Electric Company and others. Apparently, the De Forest attorneys think there is a possibility of showing that the General Electric Company had no legal right to sell tubes to the Government. Two million dollars is named by the De Forest Company as its estimate of the damages suffered.

Now, Attorney-General Stone has just handed down a decision which will probably prove to be extremely valuable to some of the American radio manufacturers. Some of the German patents seized by our government during the War may now be leased by the navy to American manufacturers. The Attorney-General held that there appeared to be no inhibition against the issuance of non-exclusive licenses to manufacture under the patent, but that the patent could not be sold. Use of the patents seized by the Government, several hundred in number, has heretofore been denied. Among the patents so leased is one of Schloemilch and Van Bronck covering the reflexing of radio circuits. We shall probably see a lot more reflex sets on the market in the next year or two, unless the alternating current tube should appear on the market within that time. Reflexing is a scheme for saving maintenance cost, but when an alternating current tube is available, the maintenance of a set will fall so low that the use of reflexing will not then be as general as it is now.

Radio Helps the Air Pioneers

LAST month we called attention to the help radio nowadays extends to the Arctic explorer. Now, the explorer, instead of disappearing from the face of the earth for a year or two is in daily communication with those of us who prefer the humdrum life in a more equable climate.

As we read of the transatlantic flight of the ZR-3, we couldn't help but think of how modestly and almost unheeded radio was making possible the record-breaking trip. A dirigible like the ZR-3 hasn't a great deal of fuel reserve and can make only about 70 miles an hour without excessive gasoline

consumption. If she meets a head wind of much strength, she would actually be almost standing still, and a day or two of such standing still with full fuel consumption would probably spell disaster for the trip.

The ZR-3 however, ran no chance of getting into such difficulty; she was constantly in radio touch with one continent or the other, and with dozens of ships in various parts of the ocean, to give her weather reports, and so was able to lay her course to avoid bad weather conditions. This feat without radio, would have been entirely impossible. We can expect radio to play a rôle of ever increasing importance in pioneering of the kind our new dirigible accomplished.

What "Low Loss" Means

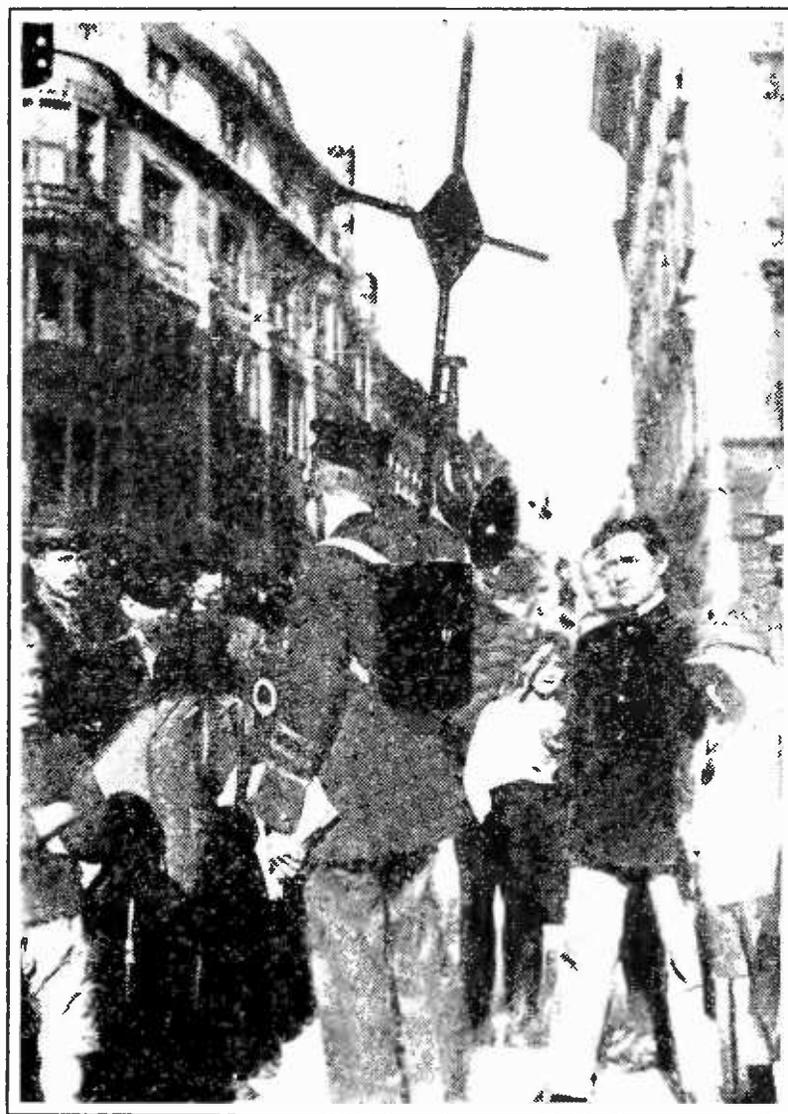
THE progress in any art is necessarily made in a series of steps, an improvement of existing methods here, a new idea and invention there, and perhaps improvement in material and design of apparatus elsewhere. The change of communication scheme from code signals to the spoken word at one step increased the possible users of radio from hundreds to hundreds of thousands. The advent of the inventions of De Forest, Armstrong, Heising and others increased the range of the broadcast channels from tens of miles to thousands of miles. The increase in efficiency of apparatus brought about by the thoroughgoing methods of the research engineers of the large electrical companies, and other smaller ones, such as the General Radio Company, has given us more reliable sets, easier to adjust and operate, consuming less and less battery power.

In the latter class of radio progress we have had such ideas as the unicontrol, the dry battery tube, the non-radiating set, etc., successively holding the stage in technical discussion and advertising. Of late the "Low Loss Condenser" has been the slogan of dozens of manufacturers regardless actually of whether the losses of their condensers were low or not. It seems likely that many of the "Low Loss" advertisements are based on conjecture rather than fact.

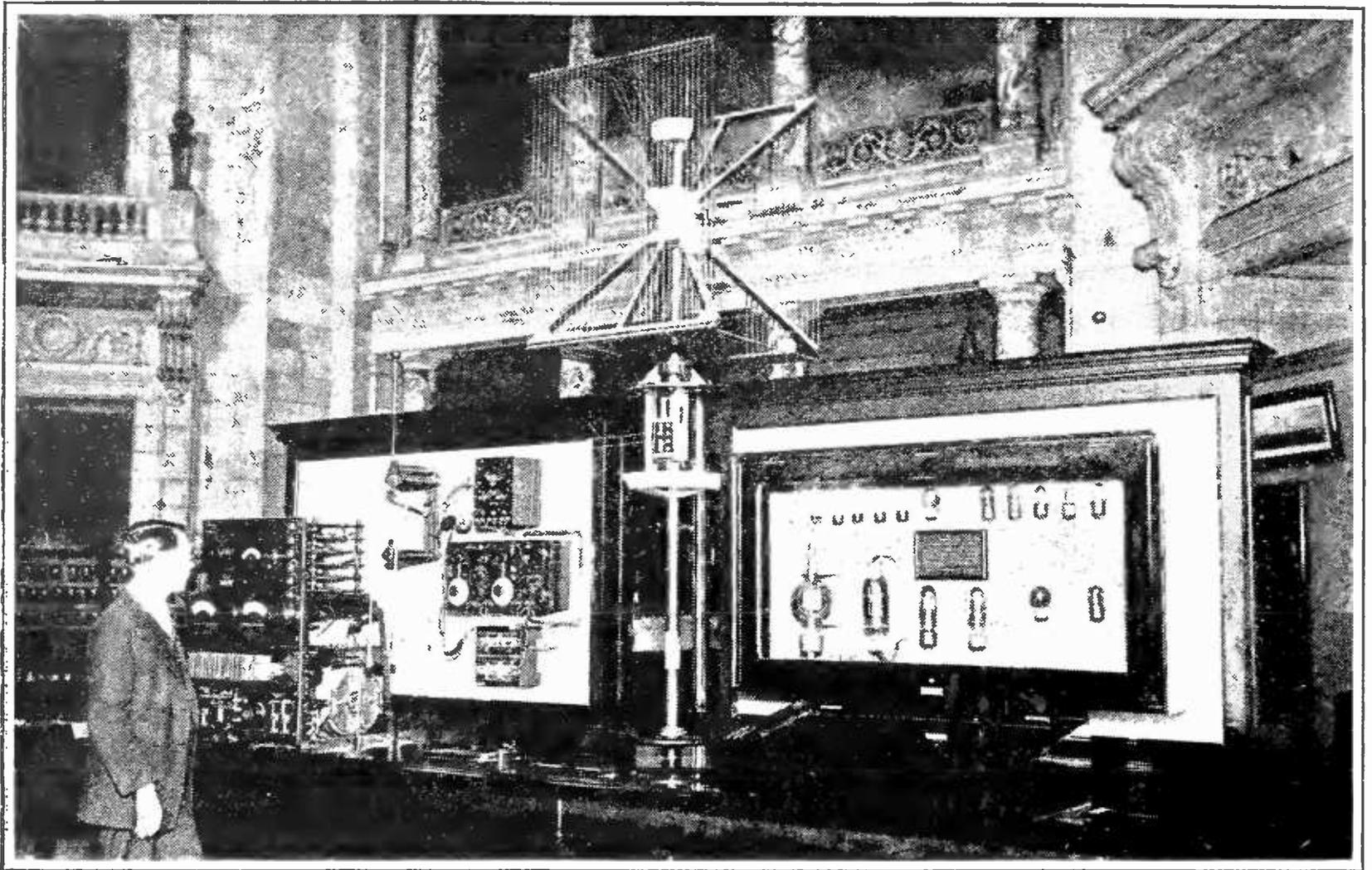
So much has the low loss idea been emphasized lately by radio manufacturers that it is likely the non-technical broadcast listener has, by the sheer repetition of this attractive phrase, become convinced that extremely low losses in a condenser are essential to satisfactory operation of his set. A condenser having a phase angle difference

of one minute is thought to be twice as good as one having two minutes of angle. We have tested many of the better class variable condensers and do find that some of them have only one-half or one-third the losses of others, but this fact, striking as it may seem, should have but little consideration in the choice of a condenser. The operation of a radio set depends on many other items than the tuning condenser. Some of these are the losses in the coil with which a condenser is always associated. Now the losses in the average coil are about fifty times as much as the losses in the average good condenser. So small, in fact, are the condenser losses compared to coil losses that when any one of a dozen of the better class tuning condensers is substituted for another, no appreciable difference in the behavior of the set is discernible, even with reasonably good measuring instruments.

The lower losses a condenser has, the better it is, judged on this item alone, but the questions of permanence of adjustment, reliability of contacts, smoothness of control, etc. should be considered by the condenser pur-



MUCH EASIER THAN ORGAN GRINDING
Is the life of travelling radio music man in Germany. A number of enterprising Teutons have equipped themselves with loop receivers and a loud speaker and go about the cities vending music. The state of the musician's uniform seems to indicate that the business is reasonably profitable



© Harris & Ewing

RADIO IN THE WASHINGTON NATIONAL MUSEUM

A corner of this new museum is devoted to radio. The display at the left has a complete submarine installation. A half-kilowatt quenched spark transmitter, complete with its motor generator is directly in front of the figure. Mounted on the white panel is a lightning switch and a Navy type receiver. The other displays are the standard Navy radio compass loop, and a progressive exhibit of vacuum tubes from the early De Forest audion at the left to the modern transmitting tubes below

chaser of at least as much importance as the losses.

The Meaning of Super-Power

ESPECIALLY since the recent Hoover conference, has there been much talk of super-power broadcasting stations. The word super-power station is not used in the sense that ordinary stations will be blanketed by its outpouring of radio energy, but rather that sufficient power will be sent out from the station so that static and other interfering signals will sink into insignificance when compared with the station's signals. Of course this is true now for even a 500-watt station, in respect to those listeners who are only a few miles distant from it, but evidently those who contemplate super-power stations believe that their signals will be clear and distinct for all listeners within, perhaps, a 300 mile radius. At present, this range is obtained by the present stations only with much extraneous noise. By sending out ten to fifty times as much power, the signals will reach out hundreds of miles before they drop in strength below that of competing electrical disturbances.

Many listeners are opposed to the idea of these high-powered stations, but we believe such stations are destined to come in the normal march of radio. Just as our stations went from 50 watts to 500 watts, they will go from 500 to 10,000 watts, and for the same reason, namely, to give more satisfactory communication to a larger number of people. Those who live near these coming super-power stations will, of course, be subject to more interference than are neighbors of the present stations, but the convenience of the few can never be allowed to impede a movement which is in the interest of the many. To give as little trouble as possible, the high-powered stations must be situated several miles from a large city. They will be controlled from the city studio by wire connection.

Better programs and better technical operation will come with the larger stations, and these spell progress for the broadcast art. The licenses issued to such stations will, of course, be provisional only, so that if a large share of the radio audience find the super-power idea objectionable, a return to the present low-powered stations may be readily brought about.

Antennas Are Not a Lightning Menace

WHEN radio receiving first started on its phenomenal career of popularity, many of the more cautious pseudo-scientists predicted a corresponding increase in the number of fires started by lightning. These bootless prophets averred that the radio antenna would serve as a convenient channel for the lightning bolt to enter the home. We dared to combat this view, for we thought that the increase in lightning hazard would be almost nothing, because of the general disposition of the ordinary receiving antenna.

A recent bulletin of the Bureau of Standards confirms our original opinion. Whereas the radio antenna cannot be regarded as a very efficiently installed lightning rod, it need not be considered as an inviter of lightning, either. The Bureau puts an antenna in the same category, insofar as danger from lightning is concerned, as rain gutters, downleads, wire clothes lines, and metal roofs. This should be useful information for the insurance companies which have frequently in the past regarded the radio receiving set as an increased lightning risk.

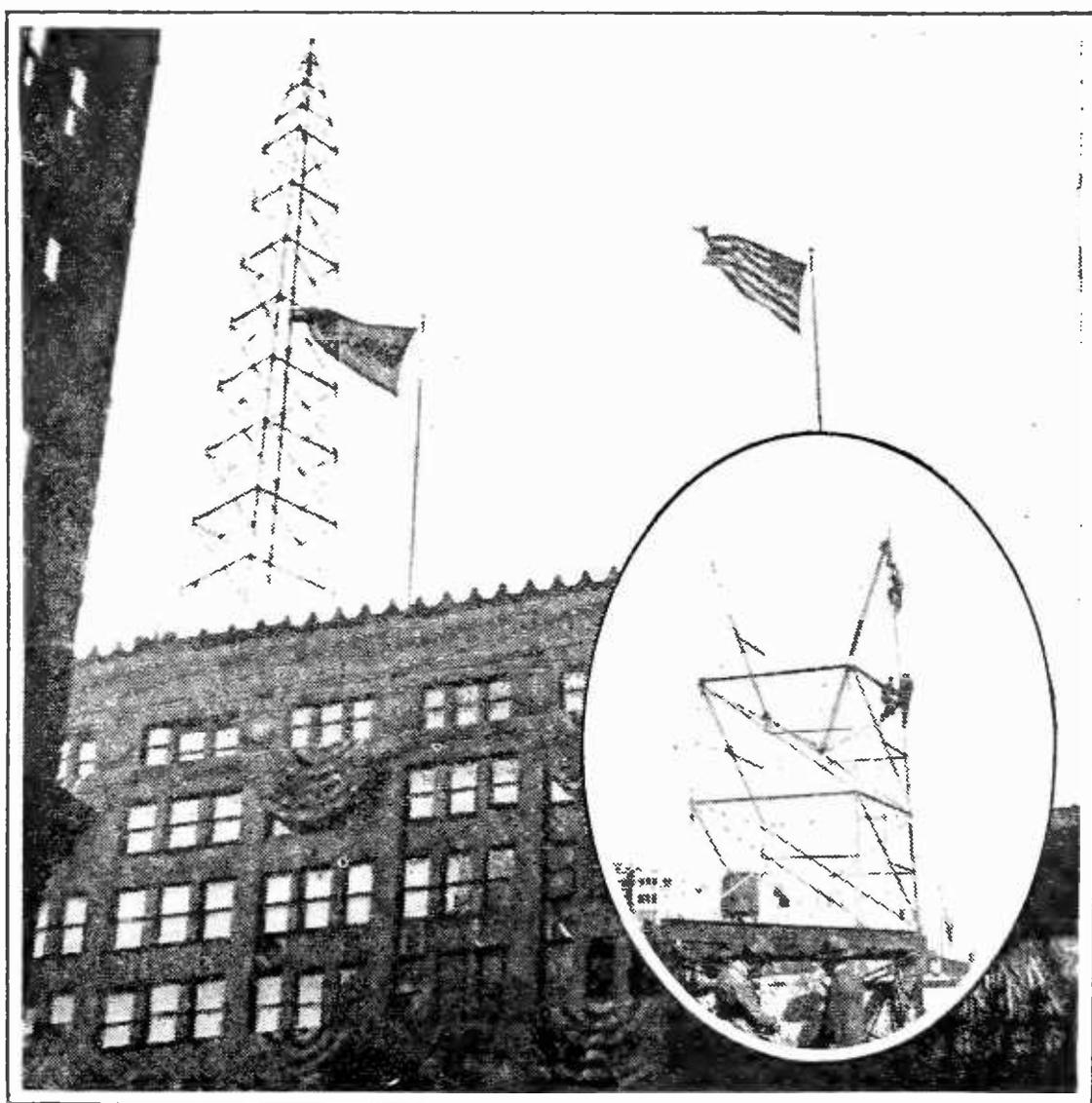
Municipal Broadcasting Stations

A MUNICIPAL station such as WNYC in New York City is a very questionable benefit to those citizens whose tax contributions pay for its erection and maintenance. Especially is this true when the calibre of the municipal office holders is as low as is the case even in many of our largest cities.

Evidently a municipal station must be largely under the thumb of the mayor or his appointees. It may be used for propaganda of the most biased sort, for unanswerable attacks on those servants of the public who happen to be of political faith different from that of the city's temporary ruler. Is this use of a city-owned station to be

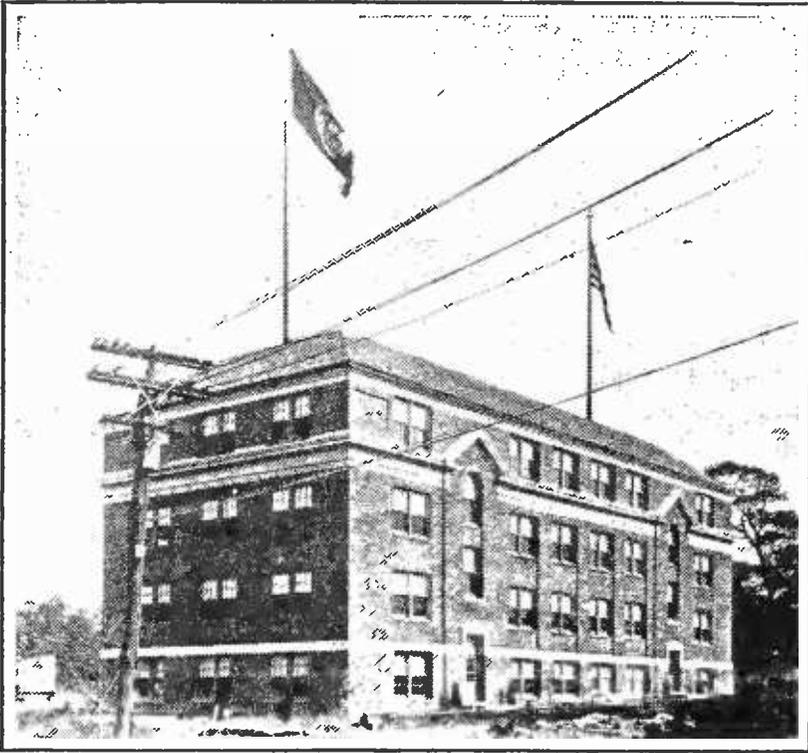
permitted? New York's is probably the most influential municipal station, so that it is worth while to study its operations, with the idea of forming an opinion of their value.

In New York the mayor uses the station whenever he will, speaking on any subject which he cares to select. In case his policies are being attacked, he can at once prepare a brief (or pay someone else to prepare one that he may read) showing that he is "supporting the interests of the people," whereas all others represent the "interests" and are seeking to rob the public. If his opponents want to combat his, perhaps, unreliable statements, they may do so through the city's radio station, but their remarks must be written, they must stick to their written notes, and these must be sent to the mayor's office for censoring before the speech is delivered! Others must stick exactly to the material which has been thus censored, whereas if the mayor himself is scheduled to speak on the city's budget, for example, he may forget all about the budget and spend his time vilifying some public servant who has dared to question the soundness of some of his doctrines. Surely here is a situation in the broadcasting field



STATION WGBS, NEW YORK

Recently put on the air. This station is a companion to WIP, operated by the same firm at Philadelphia. The insert shows one of the towers in the process of construction



FOR RADIO RESEARCH

This entire building, recently erected by the Radio Corporation of America in New York City, houses the technical and test staff of the organization, under the leadership of Dr. Alfred N. Goldsmith, chief broadcast engineer

which should be heralded from the housetops, so that stations of this sort may send out their messages to receivers which are all tuned to some other channel.

Is this condition morally and legally sound? Broadcasting has been put in the same class as newspapers, insofar as responsibility to the public is concerned. Is a mayor privileged to run a paper, of which he is the censor, to espouse the virtues of his régime? Certainly, it is done in many cases. But here is a different question. Is a mayor privileged to spend the city's money, collected equally from his followers and from those differing with his ideas, to purchase a newspaper for his own use? Isn't that what this municipal broadcasting station amounts to?

More ARA Public Service

THE American Radio Association is still carrying on its good work. Instead of making vague complaints about interference and other troubles, it picks out a definite point of attack and makes admirable constructive criticism. Instead of writing reams about the decrements of spark stations and the impossibility of tuning-out such signals, a letter is sent to the Postmaster-General stating that a Postal mail-boat, doing very heavy radio traffic around New York harbor, is using an antiquated spark system which is seriously interfering with broadcasting channels. Their complaint says further, "if the Post Office

Department cannot afford to provide a modern transmitting apparatus for this mail-boat, several broadcast listeners stand ready to contribute to a fund to purchase the equipment and thus save the programs from the bombarding interference caused by this obsolete transmitter."

What is Happening on Short Waves

AS SOON as short-wave channels had been shown feasible for distances much greater than was ordinarily thought possible for them, all the commercial companies started experimentation in this field, and to-day a large number of stations are carrying on such work. The Radio Corporation station at Tuckerton, designed primarily for transatlantic work, with a 15,900 meter wavelength, has had its license changed so that it can use in addition 103, 100, 97, and 93 meters. KDKA is carrying on its pioneer work in this field and WGY has several short waves in use, one as low as 15 meters. POZ in Germany and UFT in France have been talking to Argentina (LPZ) on 77 meters. Two Italian stations, IDO and IHT, have been working with each other on 106 and 117 meters. The Navy reports that successful experiments have been conducted with wavelengths as low as 54 meters. It will be remembered that Marconi recently sent a 92-meter wave from Poldhu, England to Buenos Aires with a small fraction of the power ordinarily used to span a 6000 mile separation. In these tests he used Hertz's scheme of parabolic reflectors.

From the calibre of the experimenters now working in this field we can soon expect to have reliable data on short wave channels, how much fading occurs compared to longer waves, whether short period fading is sufficiently aggravated to make these frequencies of thousands of kilocycles unsuitable for telephone channels or not, and other information of equal importance.

Recent Distance Records

AS THE winter months approached, the distance-breaking contest started in earnest. Not only is the absorption of the radio signal much less in winter time than in summer, but, of far greater importance, the noises from static disturbances are only a small fraction of the summer-time values. The latter effect is undoubtedly the one which accounts for the long-distance communication records in winter time.

We have always thought that airship transmission could only be carried on over short distances. It would be remarkable enough if an airship could keep in touch with its base even by land-station relaying, but if the performance of the *Shenandoah* is to be regarded as other than freak, such relaying may not be necessary. The dirigible, anchored at her mast in San Diego, was using a 50-watt set adjusted to radiate on 90 meters. Her signals were picked up by one of the navy boats while cruising in the Pacific 4400 miles away. At the same time the naval air station near Washington was in almost daily communication with the *Shenandoah*, separated from Washington by the whole span of our continent.

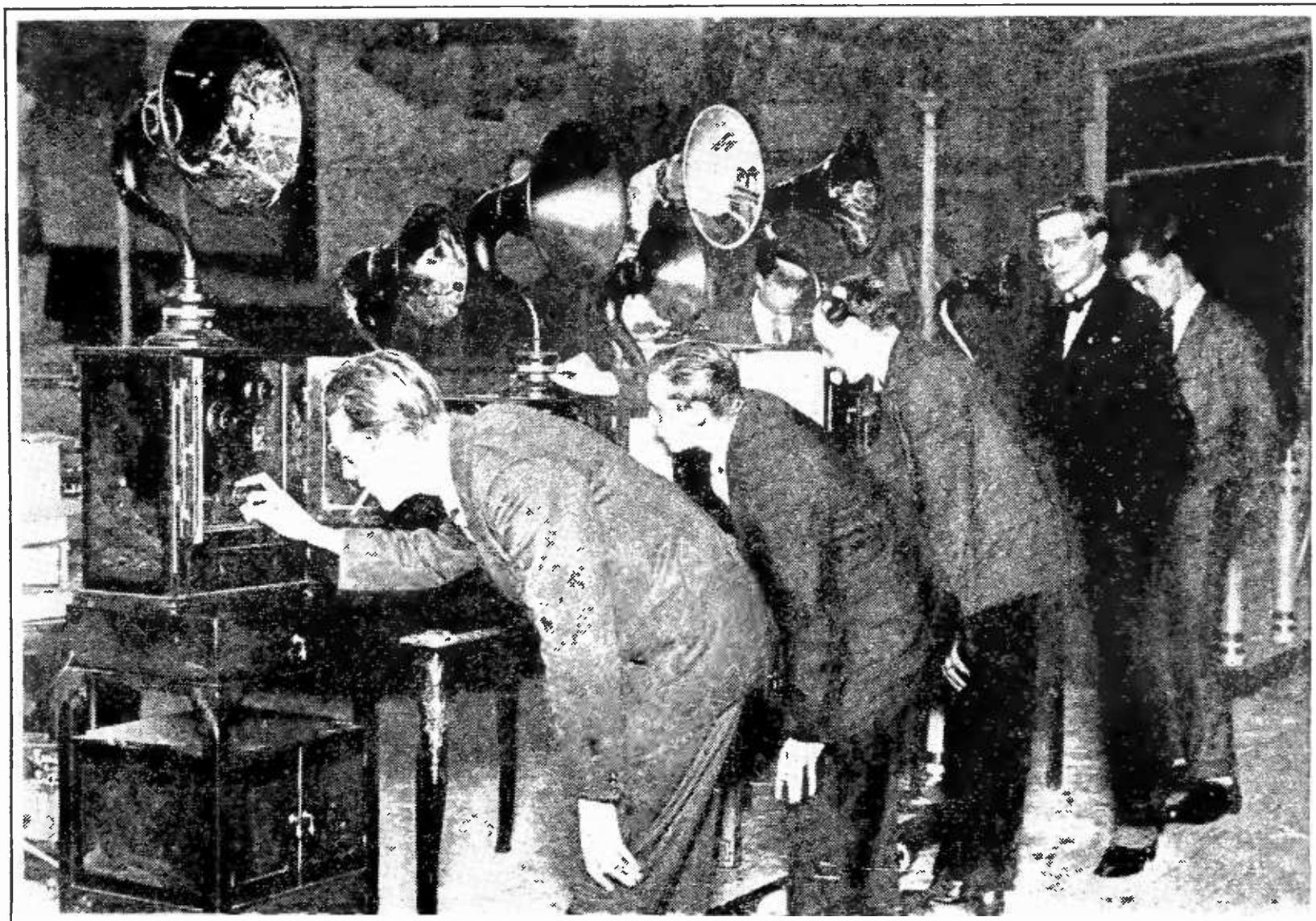
Two British amateurs, one in England and one in New Zealand, with home-made equipment, have been able to communicate with each other, although half the earth's circumference intervened. Remarkable as this may sound, we shall probably hear of such feats more and more regularly. An American amateur, H. Johnson, at Short Beach, Connecticut, reports that he held two-way communication with a New Zealand amateur, the distance between them being 9000 miles.

But all these transmissions must still be regarded as freaks by any honest observer.

The Artist, Not the Broadcaster Must Pay Radio Royalties

A DOUBLE bomb shell landed in the camp of the American Society of Composers, Authors, and Publishers when Federal Judge Knox handed down his remarkable decision recently on the question of royalties and broadcasting. The owner of the copyright of a piece of music had asked the judge to stop the unauthorized broadcasting of the music. The judge's decision if it is allowed to stand as the law, will do much to prevent the coffers of the above-mentioned society from bursting with the radio harvest they had hoped for.

The first part of the judge's decision states that the artist is the one giving out the program, not the broadcasting station. The station, in other words, cannot be held responsible for royalties, no matter what the copyright situation may be. Royalties, if any, must be sought from the one sending out the program, namely, the performer. Secondly,



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A CORNER IN THE LONDON RADIO SHOW

At Albert Hall. Some of the more enthusiastic of the visitors are testing several of the latest models of British receivers at close range. The inlay work in the radio cabinets is quite elaborate



GENERAL JAMES G. HARBORD

New York, President Radio Corporation
of America

"Let me invite your attention to the developments in radio photography. Great strides in this direction have been made in the past year. It is not too much to say that we are in the eve of developments whereby it will be in the realm of possibility to transmit a complete newspaper page from London to New York by means of radio and in a fraction of the time it would take to transmit the entire text of the page either by radio or cable telegraph signals.

"Transoceanic broadcasting for purposes of entertainment is not yet in regular operation, but proposals for increasing the power of sending stations so that the programs from London and Paris and Berlin may be easily heard in America are carefully being considered.

"At present, transoceanic as well as marine radio messages are dispatched by means of telegraph code signals, but the transoceanic radio telephone, now under development through the American Telephone and Telegraph Company and the Radio Corporation, bids us to expect that before many years it will be possible and convenient for any one of us to pick up his telephone and in a short time be connected with his party in Europe, or with his stateroom, on some liner on the ocean."

that the performer, if entitled by license or otherwise to use the copyrighted music at all, can use it for broadcasting without additional payment of royalties. In other words, if the performer has acquired the right to sing to an audience of ten people, he may, at no additional expense, sing it to 10,000 people over the radio channel.

This decision, if allowed to stand as the law of the land, is the most important that has been handed down since broadcasting began,

insofar as the general broadcast listener is concerned. It undoubtedly makes the royalty collecting agencies moan with anguish, but the millions of radio listeners will no doubt agree that it is a wise and proper decision.

Some of the *New York Times* correspondents have been acrimonious about an editorial which appeared in that paper commending Judge Knox's solution of the question: "People who get their music over the radio do not buy it." "Broadcasting is a sort of bonus to promote the sale of radio sets." "This profit is partly due to the fact that the broadcaster steals the music"; After much of such baseless argument, this writer winds up with a statement which shows he is at least as human as the rest of us. "However, it (Judge Knox's decision) will probably not undermine respect for the law except in a comparatively small class of artists. Nearly everybody is in favor of a law which confiscates the other fellow's property."

Interesting Things Interestingly Said

L. A. NIXON (New York; Secretary, Radio Trade Association, in a report on present broadcasting plans): "It seems to this committee that the true regulation of the power of a broadcasting station should be based on the listener; on the ability of the listener to discard the program offered by the high powered station and select another program in its place.

"Restrictions should be placed on the interference caused by the transmitting station in the receiving set, rather than the power generated. By such a plan, it would be possible that a twenty-five kw station located in some places in the country might cause less interference than a fifty-watt station located in densely populated centers and poorly tuned."

JAMES C. EGBERT (New York City; Director, Columbia University Extension Service): "About a thousand persons took the Columbia radio extension courses last year, and a great many more merely listened-in. This use of radio for education is as yet in an uncertain stage, so that it is impossible to say yet just what the results will be. We have had definite courses of instruction and have issued syllabuses which served as guides for the lectures. We shall now issue syllabuses and give opportunity for the radio student to send answers to questions given by the instructor. These will be criticised and returned to the student. In this way, we shall test the efficacy of this new method of popular education."

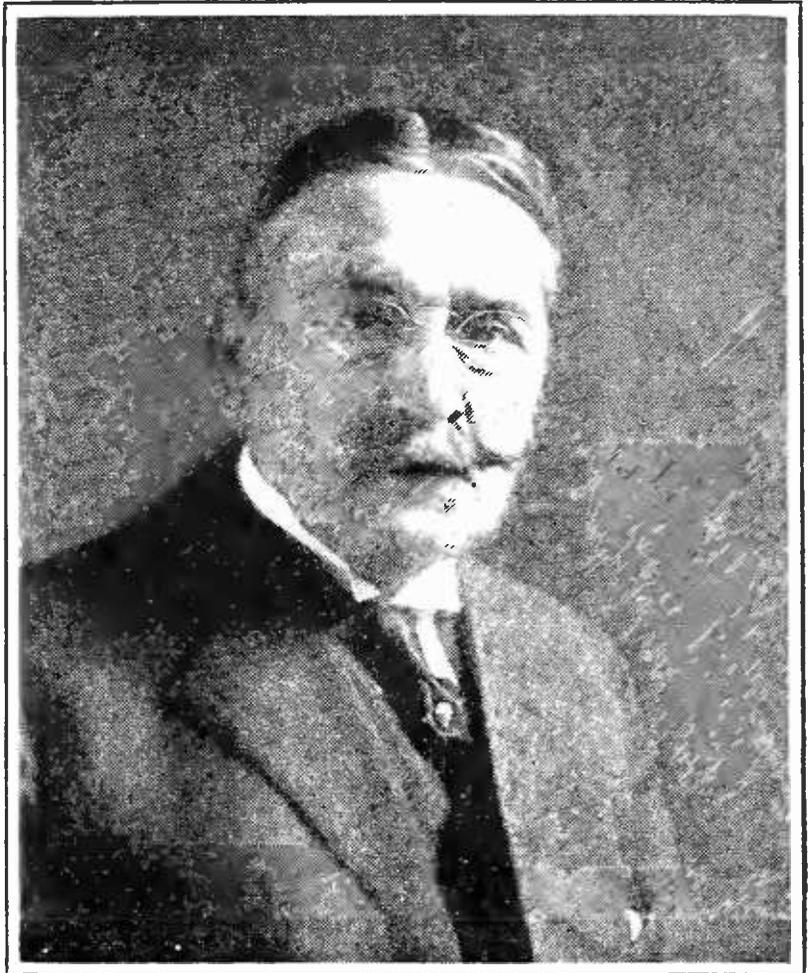
GUGLIELMO MARCONI (London; In a statement opening the New York Radio World's Fair): "Since last year, great strides have been made in the art of broadcasting, both in the United States and England. There have been some important developments in simultaneous broadcasting from several stations, and I believe that on certain occasions in the United States, vast audiences of no fewer than 25,000,000 people have listened to a broadcast address. I anticipate that in the not far distant future, this great achievement will be surpassed and the broadcasting of messages throughout the world will become a matter of everyday occurrence. We on this side of the Atlantic are looking forward to the day when we can listen to American speakers on subjects of common interest."

GIMBEL BROTHERS (New York City; in an advertisement announcing the opening of their new broadcasting station WGBS): "Broadcasting, as we see it, is a limitless force in the hands of a limited number. With some comprehension, we believe, of the invaluable possibilities of radio, and with a deep sense of the responsibility assumed by the broadcasters, WGBS begins its broadcasting experiment with the desire to employ itself in the development of programs in keeping with, and worthy of a force of such power. WGBS wishes to be a public servant in the full sense of the word."

THE NEW YORK SUN (New York; in an editorial about broadcasting and politics): "With the tremendous volume of political talking that has been broadcast, there has necessarily been a great deal of listening. Of course, nobody can measure it. But this is certain: only the listener chronically and bitterly opposed to politics has escaped hearing more about the campaign than he would otherwise have heard. Probably a great number of the voters at the polls this year went because of a quickened interest caused by radio."

"This is as much as any believer in radio could ask. Radio is only a mechanical device. If it gives the politician an opportunity, that is all he can ask of it."

DEPARTMENT OF COMMERCE News Service; Washington: "The activity in amateur radio work and in broadcasting is still greater in the United States than in any other nation, the past year has brought about marked changes in the situation in many foreign countries. Naturally, the development has had its greatest growth in Europe. In the British Isles, France, Germany, Sweden, Switzerland, Holland, Belgium, Denmark, and Czechoslovakia, the broadcasting of programs of entertainment and news is on a regular basis. In Italy, Finland, Spain, and Austria, programs are sent out at irregular periods. There is a decided likelihood of regular schedules being adopted in the near future. In South America, Argentina stands out as having made the greatest progress in the dissemination of music and other entertainment by radio telephony. Chile also maintains a regular broadcasting service."



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PROFESSOR MICHAEL I. PUPIN

Department of Electromechanics Columbia University

"The weakest point in democracy has always been lack of appreciation of expert knowledge. Railroads, telegraphy, telephony, radio broadcasting, electrical lighting, and electrical transmission of power are certainly public utilities, but the intelligent people of the United States will never consent that these things, requiring an enormous amount of intelligent expert knowledge be placed under government ownership. The machinery of our government, or any other government known to man to-day is utterly incapable of handling technical problems which require the highest type of training applied to the highest type of intelligence.

"All of these public utilities are full of complex technical problems which cannot and never were intended to be handled by any government. In Europe, we see where there is government ownership, the utilities are being run at very heavy deficits."

E. F. MC DONALD, JR. (Chicago; President, National Association of Broadcasters): "There is an effort afoot to change the name broadcasting to radiocasting. I wish to go on record as voicing a strenuous objection. Without explanation, ask one hundred people on the street what radiocast means, and the chances are if they answer at all, it will be a guess that the word has something to do with a radio receiving instrument. Ask the same group what broadcasting means, and they will tell you correctly. There is nothing to be gained by making the change. Why have this new word when the vernacular already offers an adequate term?"

For the Love of Mike

BY A. COOPER ALLEN

Drawings by George C. Williamson

IT was the night before Christmas and all through the house there was a subdued air of expectancy. The light from the shaded reading lamp cast its mellow rays upon the big padded arm chair before the cheerful grate fire and crept partially up the four walls, leaving the ceiling in semi-darkness. The atmosphere of the room was warm and redolent of peace and piquant odor of cedar.

Curled in a heap in the deep padding of the big chair was the boy, his eyes glued to the pages of a book. Occasionally he stirred, turned the pages, muttered below his breath and continued to read. The curly haired dog—the boy's sole companion—lay comfortably dreaming on his rug at one end of the davenport, all unconscious of the joyous Christmas-tide.

Over against the wall in the dining room was dimly outlined a long table which gave back a glitter of silver, cut-glass, and the gaudy colors and tinsel of a small ornamented tree. Here and there about the two rooms were wreaths of Oregon grape, holly, and the red, red, berries of the madrone—for this was a home in a little Oregon valley.

The silence was absolute until there suddenly came a half uttered whine from the dog. It ceased almost as quickly as it came. A few more moments of silence then again the half-whining bark. The great chair creaked and the boy looked around at the quivering muscles of the dreaming dog. For a moment he regarded the animal intently as the peculiar barking increased and the dog's legs moved spasmodically as if in a labored run.

"Aw, cut it out!" growled the boy. "If you want to ride that nighthorse, hike into the kitchen."

The dog slowly opened his eyes, blinked a few times and promptly resumed his interrupted nap. With a yawn the boy slumped again into the chair and flipped a page of the book.

Dead silence again. Only the tick-tock of the clock was heard. The boy's head drooped over the pages and then a faint tinkle, tinkle, as of bells came on the air. Santa Claus! The youthful eyes opened, the head raised

and he listened. Plainly it came—tinkle, tinkle, tinkle.

The big chair creaked, the boy slid out and stood listening. Again came the tinkle. The boy moved to the back part of the house and a sleepy voice broke the silence.

"Bobbie, is that you?"

"Yas'm."

"What are you doing?"

"Lookin' for Santa Claus—whadayu s'pose? I heard his bells."

"Bells?" came the female voice with a rising inflection. "What *are* you talking about?"

"Well, I heard sleigh bells out back and came to investigate," retorted Bobbie.

"Find out?"

"Sure."

"Sleigh bells?"

"Yah-h-h," he drawled. "Bunk. It's rainin'—droppin' from the roof on tin cans. Never have snow here. I wish——"

"I've told you to carry those cans away," interrupted the voice, "and you had better—"

"Uh-huh," grunted the boy and the door slammed as he returned to the chair.

Silence again, and then a stealthy noise at the front of the house. The dog pricked up his ears, jerked his tail a couple of times, and closed his eyes again—the figure in the chair did not move.

ASLIGHT scratching at the door then the knob slowly turned and the figure of a man with dripping hat and coat came through the opening. Furtively he looked about then entered bearing a long, oblong, bundle under his arm. Silently he crept across the room toward the Christmas tree on the table.

He was undoubtedly Santa Claus but clothed in the conventional garb of the average business man. The only possible method of identification of the merry elf was his mysterious, stealthy, entrance. It was evident he feared discovery as he cautiously moved across the floor. He passed the high back of the big chair and glanced at the dying embers of the fire. Then he halted suddenly, arrested by a voice from the padded depths of the chair.

"Low Sandy Claus. Whatcha got?"

"Bobbie! What are you doing up, at this time of night?"

"Readin'."

"Reading? What is so interesting to keep you up this late?"

"Gulliver's Travels—book review—school—all bunk," and Bobbie squirmed and yawned.

"Well, you hop to bed—right now. How do you expect Santa Claus to come if you sit up all night? It's Christmas right now."

"All right, Dad—I'm goin'," and Bobbie uncurled his six feet of seventeen year old sinew and sauntered out.

"Merry Christmas, Dad! Call me early!"

Dad grinned and continued his journey across the room, planted the long package carefully upon the table and swept the polished silver tableware ruthlessly to one side. Then he removed his dripping hat and coat, hung them carefully in a pile on the Davenport and again opened the front door. Here he picked up sundry mysterious bundles, placed them on the table by the diminutive tree, muttering to himself "A battery, B's, horn." Seating himself at his desk he sought for and found a card and wrote rapidly upon

it, placed it upon the large package and, snapping out the light, sought his room.

AGAIN the cheerful fire upon the hearth, the peaceful quiet room, now flooded with light. In the big chair was Dad, a brand-new pair of slippers upon his feet, a new smoking-jacket about his shoulders, and a pair of horn rimmed glasses upon his nose. In his hand a magazine, the page before his eyes lined with many names and strange hieroglyphics such as PAQ, KXY, WBG, etc.

On the table in the corner stood an oblong, mysterious looking, box with strange dials on its black face and beside it a queer black horn turned its mouth toward the room. Before this strange box sat Bobbie, the expression on his face denoting highly concentrated thought while his fingers manipulated sundry wires leading in from the window. From back in the kitchen now and then came the rattle of dishes and snatches of song where Ma was busy putting away the remains of the Christmas dinner.

Bobbie tightened a wire to a series of small, red-topped, boxes studded with brass taps, leaned back, and the concentrated attention changed to one of pleased expectancy.



"HE WAS UNDOUBTEDLY SANTA CLAUS
But clothed in the conventional garb of the average business man"

"Got her hooked up," he announced.

Dad grunted and looked around in his chair, his eyes peering over the horn bows. Of course Dad had no great interest in the affair, for he was not very much impressed with radio.

"Turn her on," he suggested after a wait.

"Well, I have, haven't I?" grunted Bobbie.

"Can't hear anything," apologetically.

"Give her time, can't you?"

Dad subsided, but, though the magazine was held before his eyes he saw nothing—but his ears were twisted to the rear like a mule's.

Silence—dead silence. Bobbie turned the dials backward and forward. Silence.

Bobbie lifted the cover. Inside, five tubes glowed with mellow light midst mystic combinations of wire and strange apparatus.

"It says here——" began Dad, but was suddenly stopped.

"I don't care what it says—I'm doing this."

"W-e-l-l," drawled Dad, "you are evidently doing it wrong. I told you——"

"I got it," broke in Bobbie. "Got my A

battery poles reversed. Now"

A slight sound issued from the horn, Bobbie twisted the tails of the dials. The hissing turned to a frying sound.

"You've got the kitchen," ventured Dad facetiously. "I can hear bacon frying."

"For gosh sakes! Can't you keep still? I'm gettin' 'em, if——"

Dad left his chair and stood before the yawning mouth of the horn. Strange murmurs, crackles, and the sound of frying came forth. They listened in strained attention as the dials slowly turned. Suddenly there was a squawk and a whistle—then only buzzing.

"Nearly got 'em that time," Bobbie exulted.

"You bet," Dad agreed heartily. "I heard him whistling for his dog."

BOBBIE'S hands dropped from the dials and he sank back in his chair as his gaze rested upon his father's face in utter disgust. Dad subsided and sought sanctuary in his chair. Bobbie returned to the dials—there were three big ones with some kind of scale marked on them, and there were a couple of other knobs. Bobbie was busy and his neck was stretched to the limit trying to get his ear nearer the horn. Faint sounds as of distant music and voices seemed to come from a hundred miles back in the black throat of the horn. Bobbie strained his ears and Dad held his breath in wrapt attention. Then a door at the back of the house slammed, dishes rattled and a woman's voice rolled through the room warbling snatches of a Christmas carol. A muttered explosion was half smothered in the throat of the boy as he impatiently thrust back his chair and made for the sound—Dad only gasped.

Bobbie returned and left silence behind him—Dad grinned.

Again the slow, deliberate, turning of the dials without result. Then the voice from the chair:

"Jones just turns one dial and gets 'em right away and——"

"Y-a-h-h-h-h!" came scornfully from the young hopeful. "Single-tube regenerative—cheap—this is different. Ah-ha!"

This time it was unmistakable. Far back back in the foothills of the machine could be heard a woman's voice—high soprano. Dad slid out of his chair and stole silently up behind the absorbed operator. Back and forth Bobbie moved the dials and the illusive sound died away or returned, according to the manipulation of the dials. He placed his



"THAT CONTRIVANCE PROMISES TO DRIVE US ALL OUT"

hand upon a knob and began to turn. The volume increased and suddenly burst forth in all its glory and power: "Zitty-zit-zit-zit. Zitty-zit-zit-zit."

Dad snorted. "It's a Zulu lullaby," he laughed.

"For the love of Mike!" shouted Bobby in high dudgeon. "If you can't keep quiet, get out! I was just about to get 'em——"

"Seems to me you got a whole beehive that time."

"Gosh darn it—that's just like you. You don't know the telegraph code when you hear it and—and—oh, heck!" What's the use!" Bobbie threw a switch, the sounds ceased and he pushed back his chair.

Ma, in the kitchen, saw the door open slowly and Dad appear looking over his glasses in a quizzical way.

"What's the matter?" she demanded, realizing there was something in the wind.

"I beat it," explained Dad. "He got a Zulu band or a hive of bees or something buzzing around in the horn and——"

"I suppose you had some smart remarks to make about it?" she broke in accusingly.

"I only joked him a little," he acknowledged and his tones implied guilt.

"Well, you leave the boy alone. I," with emphasis, "think he is doing just fine—it isn't every boy his age, and never having had a radio before, could do as well. He——"

"He hasn't got a thing yet. Cost nearly two hundred bucks—I told him they are just in the experimental stage—never heard anyone get anything but whistles and howls and noise."

"But this is different," Ma stoutly defended her idol, "this is a—a—well, it's some kind of a dyne and it won't make those noises."

"It's already making them. If you don't believe it, go listen to it."

"Then it's all your fault. You allowed yourself to be cheated." positively declared Ma. "You know I told you to be careful."

"I got the one he picked out."

"It was probably a bargain—you always opposed the idea so you just picked any old thing and——"

But Dad had fled. As he wasn't ready to go to bed and he wouldn't go out he could only return to the "studio."

He was completely bluffed so he sneaked in on tip toes, for Bobbie was once more at the machine. He made about four steps when Bobbie whirled.

"For the love of Mike! Can't you keep still? Your shoes squeak so I can't hear a thing."

"I got to move, don't I?" Dad defended himself and sneaked toward his chair. The slippers were new and Dad was not conscious there was a very mild, weak, little squeak in them. He halted with his back to the fire watching his son who had again turned to the dials, then, after several minutes, sat down in his chair, wriggled into a comfortable position and opened the evening paper. Instantly the storm broke.

FOR the love of Mike! Just as I had 'em you——"

"Dad-burn it, do you expect me to sit here and twiddle my thumbs all evening?" Dad began to grow a bit irritable. He had opposed the installation of the "infernal thing" on the grounds of cost. He thought this business too "purely experimental." He had not expected to hear anything very much out of the set and, from self defense, had gone the limit and purchased what they had thought was the best and newest on the market, thereby hoping to get a slight return for his money. He was prepared to swallow his loss and expected failure, but he had not counted upon his peaceful home being rent and turned into a domestic battlefield. The flames of combat began to burn and, as Bobbie had much of his own disposition, the fur promised to fly.



EVERY NOTE CAME THROUGH CLEARLY

"Well, you can listen, can't you? That's what it is for."

A stinging retort was on the tip of his tongue when a movement in the shadows of the next room caught his eye and Ma beckoned to him. He arose and, with bristles standing straight up, stamped into the kitchen.

"Now, Dad," she began when she had closed the door behind him, "remember, this is Christmas and there should be peace——"

"Peace!" he shouted. "Ha, ha, ha! Ever since that blamed thing was turned on there has been nothing but growls and snarls. Why can't you all be good natured and tolerant like I am? This *is* Christmas but, all you two do is to try and brow-beat me and——"

There was a sound at the door and Dad opened it. The dog sneaked into the room with tail between his legs and sought a secluded corner beneath the kitchen table, for he had indulged in an ardent flea scratching bee just when Bobbie had again "nearly got 'em."

"See! See!" Dad exulted. "Even the

dog had to beat it. That contrivance promises to drive us all——"

"Dad! Dad!" came excited cries from the front room and, forgetting all his troubles, Dad answered the call with Ma following close behind. Bobbie was sitting back, his face wreathed in a happy smile, as there came floating from the horn, and filling all the rooms, the clear, sweet, notes of an orchestra. There was no doubt of it, for every note came distinctly and without distortion. Dad and Ma halted on either side of the happy boy—Ma supremely blissful and tears of pride in the eyes of Dad as he rested one hand upon Bobbie's shoulder.

"Who is it?" whispered Dad in awed tones.

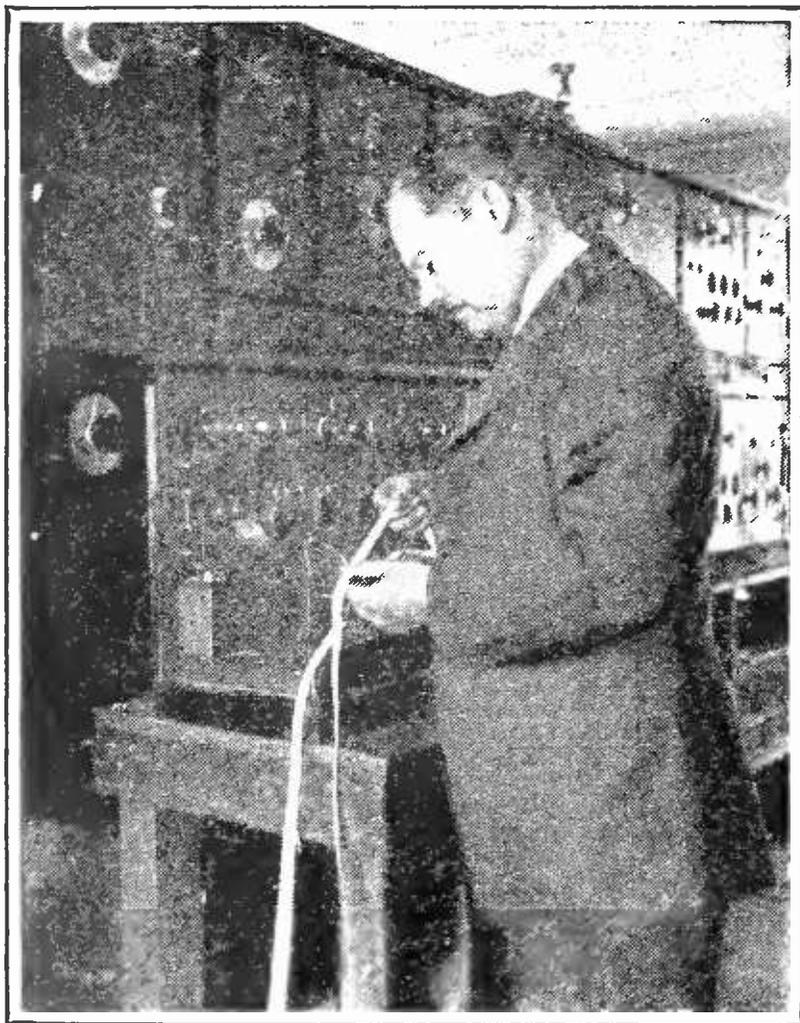
"Don't know yet—listen!"

The sweet strains died away. There followed a moment of silence, then a clear voice distinctly announced the call letters and the name of the city.

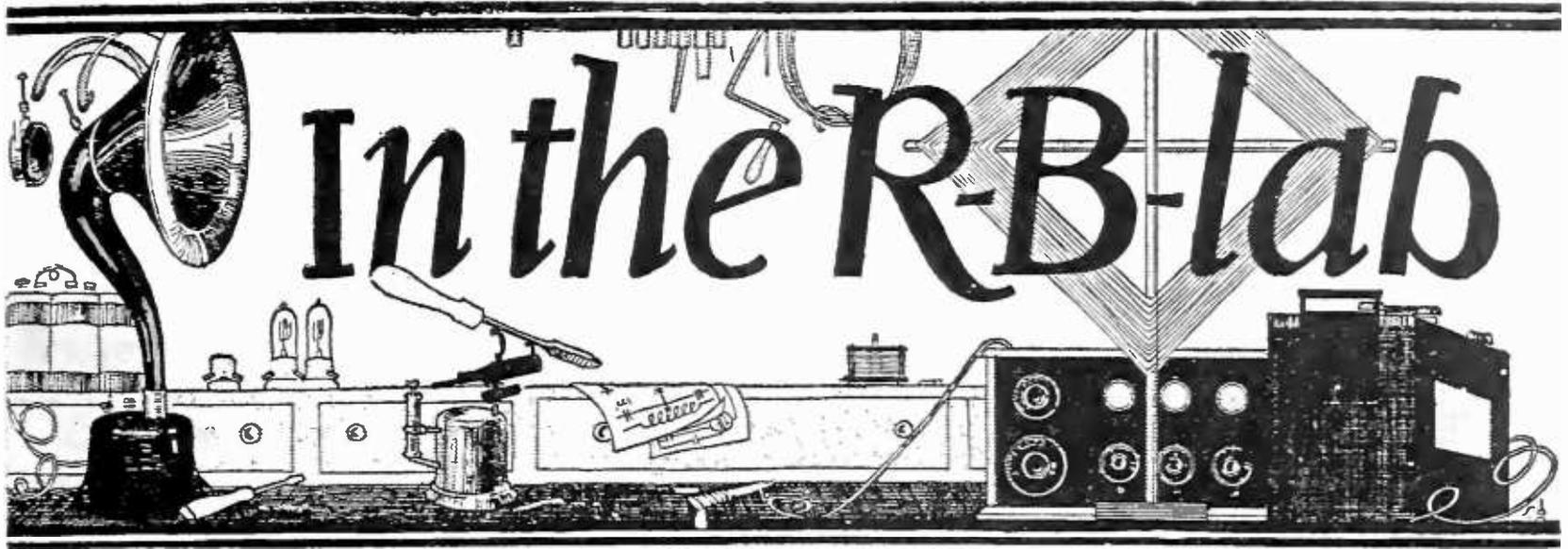
"Pittsburgh!" exulted Bobbie.

"Pittsburg, and this is Oregon!" echoed Ma in an awed whisper.

"Pittsburgh!" proudly exclaimed Dad. "For the love of Mike!"



E. F. W. ALEXANDERSON
Chief consulting engineer of
the Radio Corporation of
America examining the auto-
matic receiving apparatus at
Radio Central, Riverhead,
Long Island



STANDARD THREE-CIRCUIT COILS AND THE ROBERTS RECEIVER

THE principal difficulty encountered in the construction of the several Roberts receivers described in recent issues of RADIO BROADCAST is the obtaining or construction of the designated spider-web coils, and the mechanical arrangement of the variable tickler. Spider-webs have been recommended by the various authors, regardless of the possible inconvenience, probably because such inductances were specified in the original article by Mr. Roberts, and because, as experience has shown, it is not an over easy matter to design other inductances for this receiver.

The spider-web is not a particularly efficient type of inductance (which again dispels one of radio's pet illusions), several engineers having found it inferior to the conventional single layer coil (the solenoid) for a given value of inductance.

After several months of experiment, this department has found the several problems of the Roberts inductances solved for the average builder by adapting the standard three-circuit tuner to the requirements of the more efficient Roberts circuit. These coils are widely purchased under a variety of

trade names—such as "The Ambassador Coil," "The Trans-Continental Tuning Coil," "The Uncle Sam"—etc., all of which are characterized by three windings, primary, (antenna coil), secondary (grid coil) and the rotating tickler (plate coil). There is little electrical difference between the various makes of these coils, and any one of them, with the addition of a few turns of wire, may be substituted for the usual spider-web, radio-frequency transformer and tickler in the Roberts set (T₂, Fig. 2).

First count the number of primary turns—of which there will generally be from fourteen to sixteen. Place a layer of tape over the primary winding, and connect one end of a sufficient length of No. 22 wire to *the binding*

post which represents the primary terminal nearest the end of the tube. Wind over the tape exactly as if you were winding a second layer of the primary over the first layer, winding to one turn less than the original primary. You will now have a *transformer* primary, and a neutralizing coil with one terminal common. In wiring the receiver, the common post leads to the plus B battery, the two remaining terminals running, indiscri-

In the R. B. Lab This Month

SHORT ARTICLES ON—

—*Three-circuit tuner coils for the Roberts set.*

—*A one-stage resistance-coupled power amplifier.*

—*Loop sets on outdoor antennas—Why this is inadvisable and how it should be done when necessary.*

—*A one-tube receiver that works on a loop accomplished by radio frequency and regeneration.*

—*"Building your own lab"—The slide rule and how it can help you in your work.*

—*and short lab notes that may mean a lot to you.*

We are endeavoring to make "In the R. B. Lab" the most valuable single department to you in RADIO BROADCAST. Tell us what you would like to see in it—some particular experiment or test that has been puzzling you.

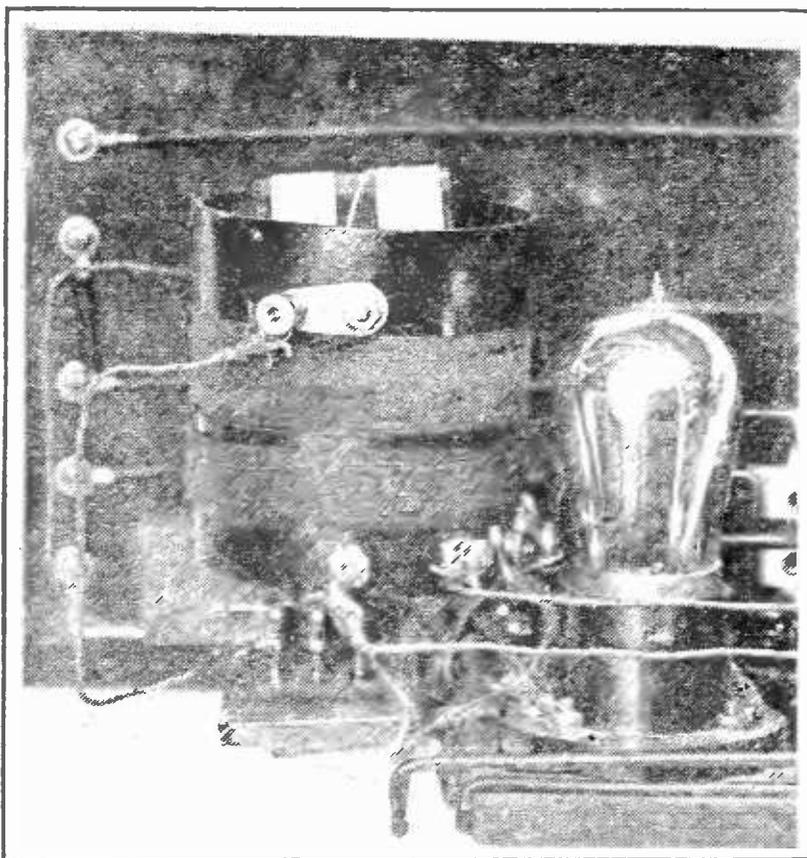


FIG. 1

The three-circuit tuner in an experimental Roberts set. The extra winding can be seen on the lower portion of the coil

minately, to the neutralizing condenser and plate of the radio-frequency tube. (This is exactly as directed in the articles describing in detail the construction of the Roberts receiver). Fig. 1 shows the arrangement connected in the R. B. LAB.

Fig. 2 shows the circuit in which the modified coupler was used as T₂. P₁ and P₂ refer to the primary and neutralizing windings, S to the secondary, and "tickler" to the rotating coil, the last two windings being connected as in the usual three-circuit arrangement. T₁ is the antenna coupler, the secondary of which consists of forty turns of wire on a three-and-a-half-inch form. The primary is wound alongside of the secondary with fourteen turns of wire. This forms a semi-tuned primary, the ground side of which is connected to the filament lighting battery. The usual type of tapped primary can be used if desired.

For further details and operating data, the reader is referred to any one of the numerous articles on the Roberts set appearing in the August, September, and October, 1924, numbers of RADIO BROADCAST.

A ONE-STAGE RESISTANCE-COUPLED POWER AMPLIFIER

AS WAS demonstrated in this department last month, the tendency of a receiving system toward instability increases more or less directly with the num-

ber of tubes. For this reason, the addition to a multi-tube receiver of still more tubes, such as a single stage of power amplification for use on distant stations and dance purposes, must be effected with unusual method and care. In many cases an extra stage of transformer-coupled power amplification to a many tube reflex or super-heterodyne receiver proves to be the straw that breaks the camel's back, precipitating the system into almost incurable oscillations or squeals.

The characteristics of resistance-coupled amplification, which made effective the attempts at stabilizing the three-tube reflex receiver as described in the R. B. LAB. for December, recommend this method of amplification as a final stage of power intensification free from the complications attending a similar step of transformer coupling. (Resistance coupling and its particular qualifications in final amplifying stages, has also been described in greater length in "How To Make A Knock-Out Amplifier" featured in the same issue of RADIO BROADCAST.)

Figs. 3, 4, and 5 are descriptive of a single stage of resistance-coupled power amplification, for use as an external and auxiliary amplifier. Fig. 3 illustrates the amplifier built up on a base board for experimental and lab work, while Fig. 4 suggests a more finished cabinet model, designed to conform in appearance and for use with the Haynes super-heterodyne receivers described in several numbers of RADIO BROADCAST. The circuit is shown in Fig. 5.

The coupling resistor, R₁, is generally a one hundred thousand-ohm resistor, though this value often varies in either direction, following a stage of transformer-coupled intensification. A one hundred thousand-ohm resistor, when using one hundred and fifty volts or less on the plates, may be a Daven special coupling resistance, which will clip into the Daven resisto-coupler shown in the photograph. However, if higher voltages are used on a one hundred thousand ohms or lower resistance, a Crescent Lavite is recommended. On resistances above one hundred thousand, the Daven unit may be employed almost regardless of plate potential.

The coupling condenser, C₁ is a .006 mfd., Micadon.

A power tube, such as the W. E. 216-A is recommended, with a gridleak of 100,000 ohms.

The input of the single stage resistance-coupled amplifier is coupled to the output of the preceding amplifier in the usual manner

—i.e., substituting the input connections for the loud speaker. The lead from the upper end of the resistor, however, must run to the plate of the preceding bulb.

USING LOOP SETS ON ANTENNAS

PROBABLY the best way of disposing of this question would be to state emphatically that it should never be done. There are two excellent reasons why engineers and reputable magazines frown upon this procedure. In the first place the arrangement is deliberately inefficient. Apparatus designed for loop reception is ultra-sensitive—it is made receptive to the comparatively weak impulses supplied to it from the coil antenna by the rather prodigal use of extra radio frequency stages that are not merely unnecessary but actually undesirable on antenna reception. Less theoretically, it is possible to design a three-tube antenna receiver (the Roberts for instance, plus one stage of transformer-coupled audio amplification) that will do everything that a seven-tube super-heterodyne will accomplish working on a loop.

The second consideration dispels the rather prevalent misconception that if a receiver works well on a loop, it must necessarily function many times better on an open antenna. Such is far from being the case, particularly with a receiver primarily designed for loop

reception. Connecting such a set to the antenna merely raises the noise level. There is a more or less definite limit to the strength of the signal which a radio-frequency amplifier can feed to the detector tube—a limit that is occasionally reached in the case of loop reception. Hence it is obvious that on such stations, the use of the antenna will merely bring up the extraneous noises—atmospherics, arc light interference, etc. to this same limit of audibility—i.e. until these undesired sounds are quite as loud as the desired signal! Weaker signals will of course be amplified more than on the loop, but owing to the raising of the noise limit they will be anything but enjoyable if heard at all. (Incidentally, a good loop receiver will bring in most signals above the noise level, at the point of reception—that is, signals that are louder than the undesired but inevitable static and similar disturbances. Thus the effect of operating such a receiver on an antenna would be to lower the signal to the noise level.)

An additional and very weighty argument against antenna operation is found in the case of the super-heterodyne, where a continuously oscillating bulb is coupled into the antenna circuit. Such an arrangement is a radiator—one that will produce a continued squeal on stations slightly above or below the transmitter to which the “super” is tuned. Investigation has shown this receiving system (the “super” closely coupled to the antenna)

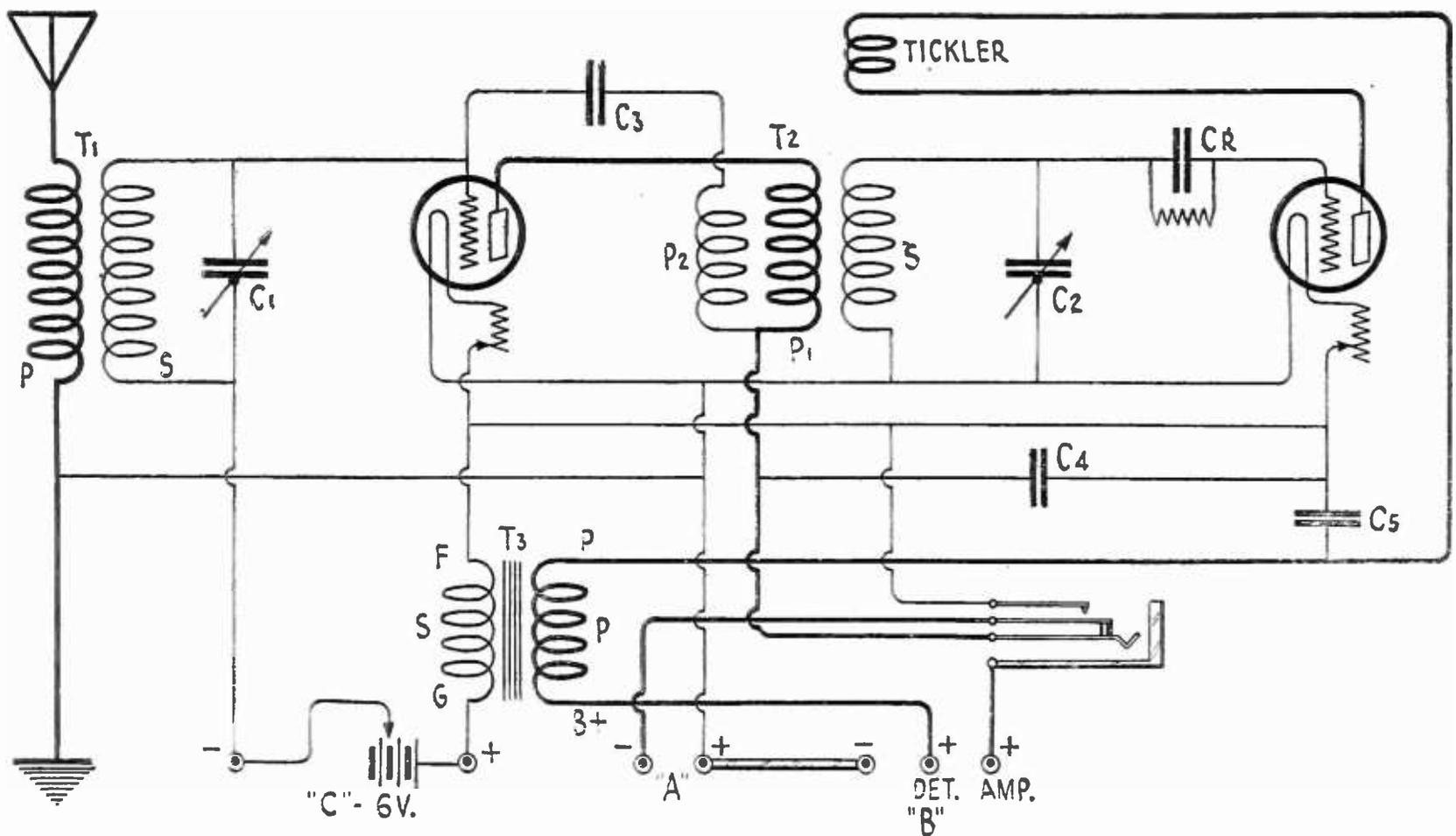


FIG. 2

The standard three-circuit tuner as adapted to the Roberts circuit, in the R. B. LAB. If the reader prefers, T, may be the usual tapped coupler

the source of many squeals usually attributed to a heterodyning distant transmitter.

Unfortunately, advising against this procedure will not solve the problem. Indeed, in some cases, such as in transoceanic reception and similar tests, the *proper* use of a loop receiver on an open antenna may be justified. However, a good bit of the justification lies in the word "proper." Coupling *should never be made* by tapping on to the loop, by the use of a tuning coil or by a standard variocoupler. In all of these cases, the coupling will be considerably too tight. Tight coupling results in two more or less obvious undesirable conditions—the raising of the noise level, and radiation in the case of the "super."

A simple and acceptable manner of experimental coupling, which will determine if yours is one of the few loop receivers that benefit from antenna operation, consists of two turns of No. 18 or any other self-supporting wire, with a diameter of about one foot, suspended a few inches from the loop connected in the usual way. One side of the additional coil is grounded and connected to the minus terminal of the filament lighting battery, the remaining terminal running to the open antenna.

A less experimental type of coupler may be built up in accordance to Figs. 6 and 7. The two coils are wound on a three-and-a-quarter to three-and-a-half-inch tube, with an inch and a half separation between primary and secondary. The ten-turn or pri-

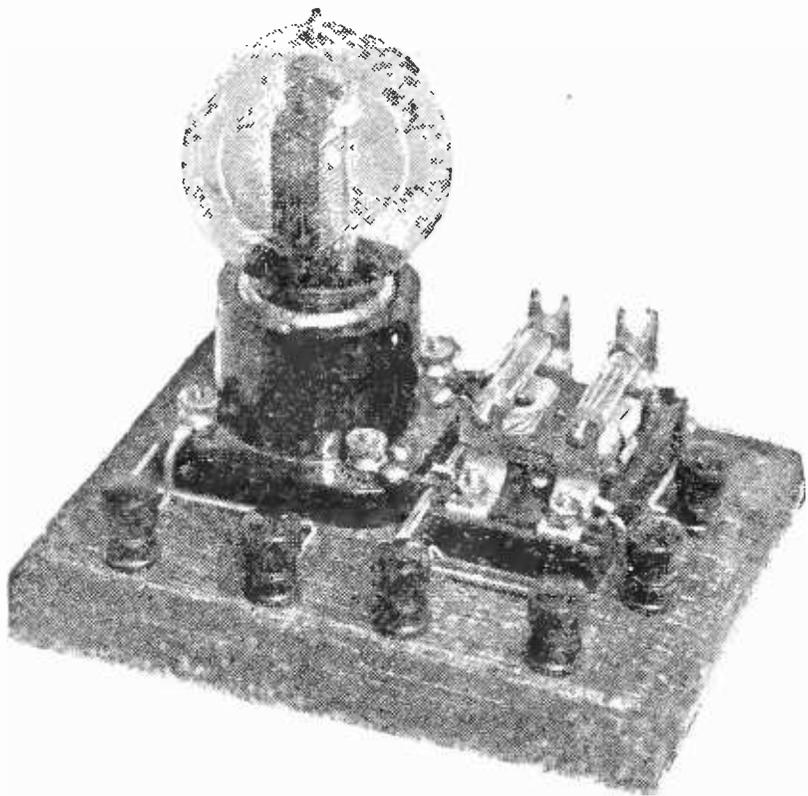


FIG. 3

The one-stage resistance-coupled power amplifier built up on a base board for lab and experimental use. One hundred and forty volts were used on the plate of the W. E. 216-A tube shown in the photograph

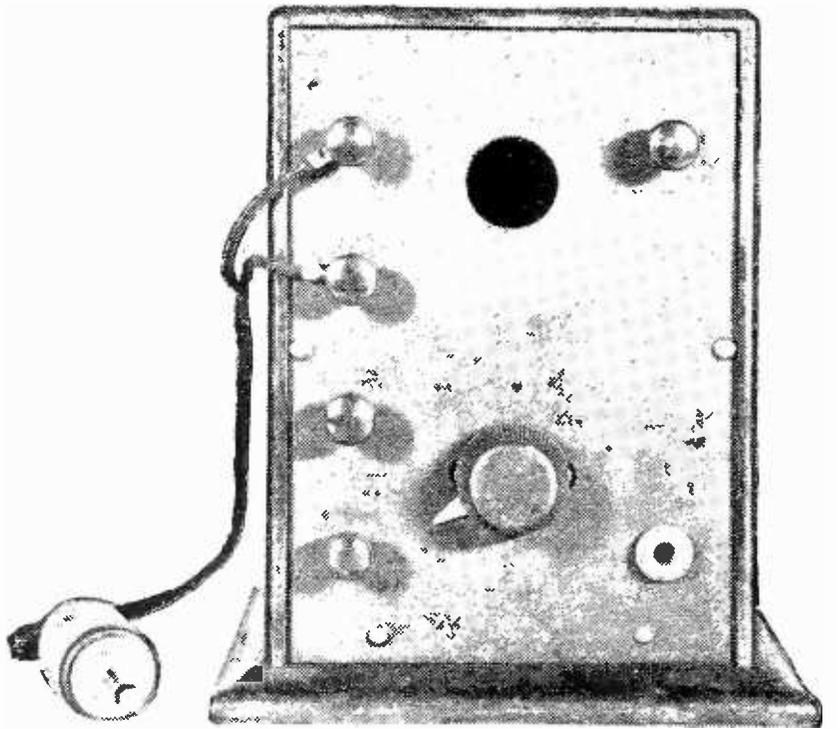


FIG. 4

A more pretentious layout of the power amplifier. It is merely plugged into the output jack of the preceding amplifier or receiving set

mary winding is connected to antenna, ground, and A battery in the manner suggested for the two-turn coil, while the forty-turn inductance or secondary is substituted for the loop. No. 18 annunciator or magnet wire can be used in place of the designated wire. The completed coils are mounted in back of a seven by five inch panel. The coupler photographed has been mechanically designed for use alongside of a RADIO BROADCAST super-heterodyne described by A. J. Haynes in this magazine in January and March, 1924. Electrically, it will give equally good results on the Grimes and similar reflex circuits.

The use of the antenna will seldom increase signal strength on local and semi-local stations, and while better reception of distance may be effected, this can only be accomplished by also bringing up the noise level.

THE ONE-TUBE KNOCKOUT ON A LOOP

IT IS theoretically possible to operate any circuit from a coil antenna, merely by substituting the loop for the customary input coil to the detector or radio-frequency tube. Unfortunately, the effectiveness of a receiving system designed for antenna operation is generally seriously impaired when such a receiver is switched to loop operation. However, in the RADIO BROADCAST Knock-out single-tube receiver, a slight revision of the circuit develops into a receiver that makes loop reception on the head phones quite practical—the usual losses, being somewhat compen-

sated for by the circuit changes. The possibilities of such a receiver were first suggested to this laboratory by a reader, R. S. Ryan, and the resulting circuit is shown in Fig. 8.

Other than the substitution of the coil antenna for the secondary of the usual radio-frequency transformer, T_1 , the changes of the circuit consist of a liberal distribution of bypass condensers and the two hundred-ohm potentiometer, which contribute controlled regeneration that is doubtless responsible for the effectiveness of the single-tube loop receiver.

a ground connection, running to the minus side of the filament lighting battery.

A fixed crystal may be used with this receiver, though an adjustable detector, which can be operated on a comparatively high resistance spot, will permit greater regeneration. Try reversing connections to the crystal. A loop of standard dimensions will operate successfully with the receiver, though as usual signal response will vary directly with the size of the loop.

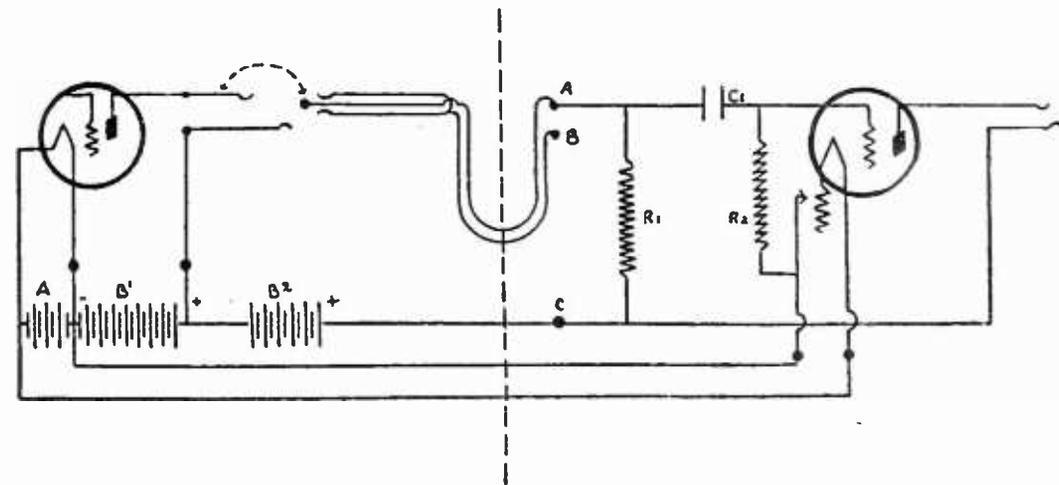


FIG. 5

The circuit, connected to the last tube in the super-heterodyne designed by A. J. Haynes. If the extra battery B2 is not used (when B1 is above 100 volts) B may be connected to C

Though this laboratory has not been able to duplicate Mr. Ryan's reception record of 1000 miles, the results indicate that such a range, while perhaps not consistent, is quite possible. Local stations (within 25 miles) come in with enjoyable ear-phone volume, and when amplified with the Knock-out amplifier, described in the December number of RADIO BROADCAST, gives a signal of splendid volume and quality.

BUILDING YOUR OWN LAB

T_2 corresponds to the original specifications for this transformer, 63 turns being wound on a two and a half inch winding form, functioning as the secondary, followed by a layer or two of paper and the primary of thirty-six turns. Any convenient magnet wire, between No. 22 and No. 26 may be used. In the R. B. LAB. (Fig. 9) the Ballantine Varioformer has been found particularly effective in this one-tube loop receiver, the regeneration that is more or less objectionable when operated on an open antenna, adding considerably to the audibility and range of the loop set. When using the Varioformer, the condenser across the secondary T_2 is, of course, eliminated.

OUR suggestion this month is addressed in particular to the more serious fan—the experimenter—the embryo engineer, whose interest and inclinations prompt him to original and studied design. Our recommendation is a slide rule—preferably a Keuffel and Esser, ten inch polyphase rule. Such a rule, with leather case, retails at eight dollars, and is shown in Fig. 10.

The audio-frequency transformer T_3 may be any reliable make—this laboratory recommending a medium high ratio—such as five to one—in which case the bypass condenser across the secondary is best dispensed with.

Under some conditions, it will be found advisable to use

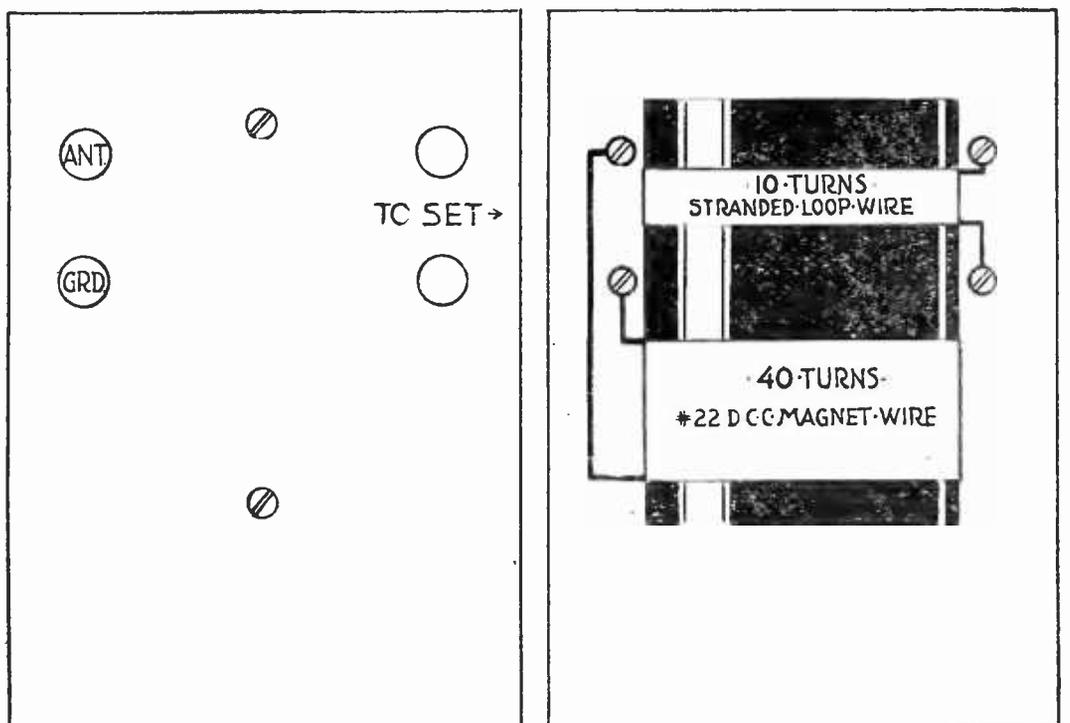


FIG. 6

Suggested layout for the antenna coupler

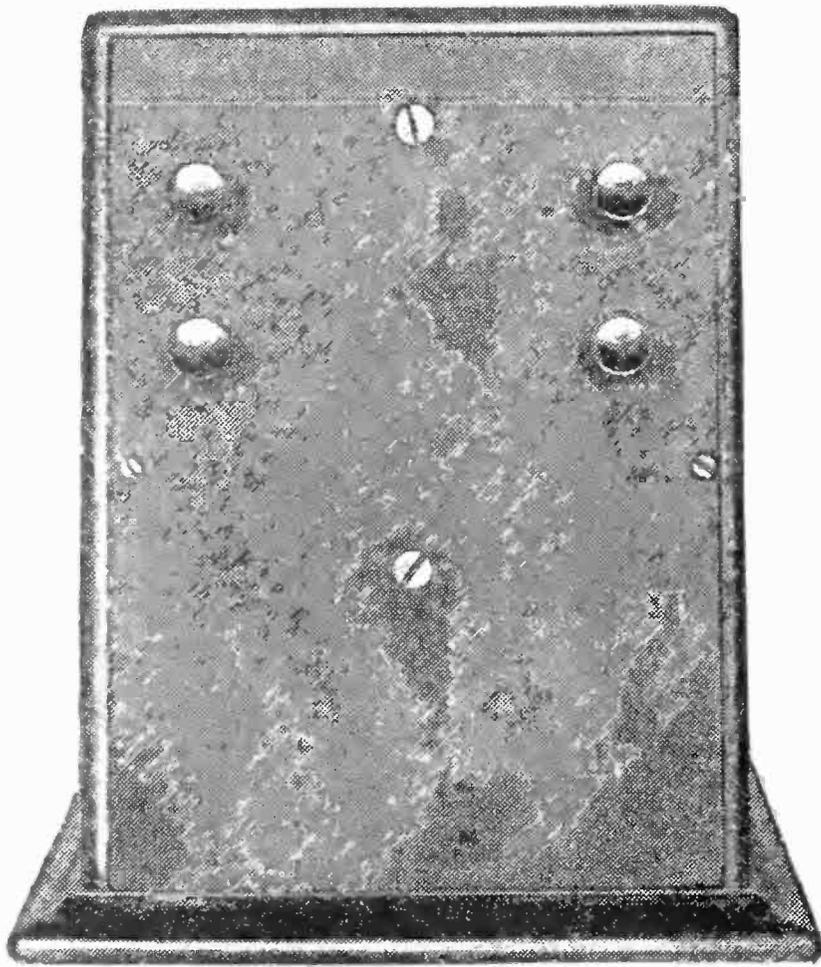


FIG. 7
The finished coupler

This wonderfully ingenious arrangement is equally a most capable assistant at desk and lab bench. The rule consists of a set of scales which, through their logarithmic interrelations make possible multiplication, division, squaring, cubing, the extraction of square and cube roots, the solution of ratios and proportions, the determining of logarithms, and the juggling of trigonometric functions practically without mental effort and in a small fraction of the time required to accomplish the same calculations in the usual way. The radio experimenter will find the slide rule particularly applicable to the solution of problems involving Ohm's law, and to the design of transformers where, given one winding additional voltages and windings are solved almost instantaneously, the changing of wavelengths to kilocycles, and in the thousand and one calculations to which lab work invariably gives rise. Tube curves and similar characteristics may be plotted with the slide rule in a tenth of the time required for arithmetic derivations.

Though the slide rule is generally associated with the more serious experimental endeavors, the fan with only the slightest inclination toward the design and engineering side of electricity and wireless will profit by possession and a working knowledge of the rule. The fascination of its ingenious possibilities is a powerful stimulant leading to a more comprehending appreciation of this science-art of ours.

LABORATORY HINTS

AN INVALUABLE assistant to the lab worker is a good manual of electrical engineering. Such a manual should cost five dollars or more. The experimenter will find arranged in it in a logical system, all the formulas, data and miscellaneous information that he has run across in his more or less haphazard reading and to which it is so often difficult to return.

THE modern vacuum tube (the De Forest DV-2, the Cunningham C-301-A and the Radio Corporation UV-201-A) is not at all critical in respect to detector plate potential, and in many cases requires higher voltage for most efficient operation than the older soft tubes. This is particularly noticeable in the super-heterodyne, when it may be found advisable to increase the detector plate voltage to ninety.

MOST loud speakers must be connected in the right direction in respect to polarity. If the direction of current is reversed the permanent magnets are weakened, and the efficiency of the speaker ultimately impaired. It is often difficult to locate the plus battery lead to a jack or plug. However, in the case of adjustable diaphragm speakers, it is easy to determine when the instrument is connected correctly, by noticing at what adjustment the "rattle-spot" occurs. When the adjuster is turned all the way to one side, the diaphragm of the speaker is generally in contact with

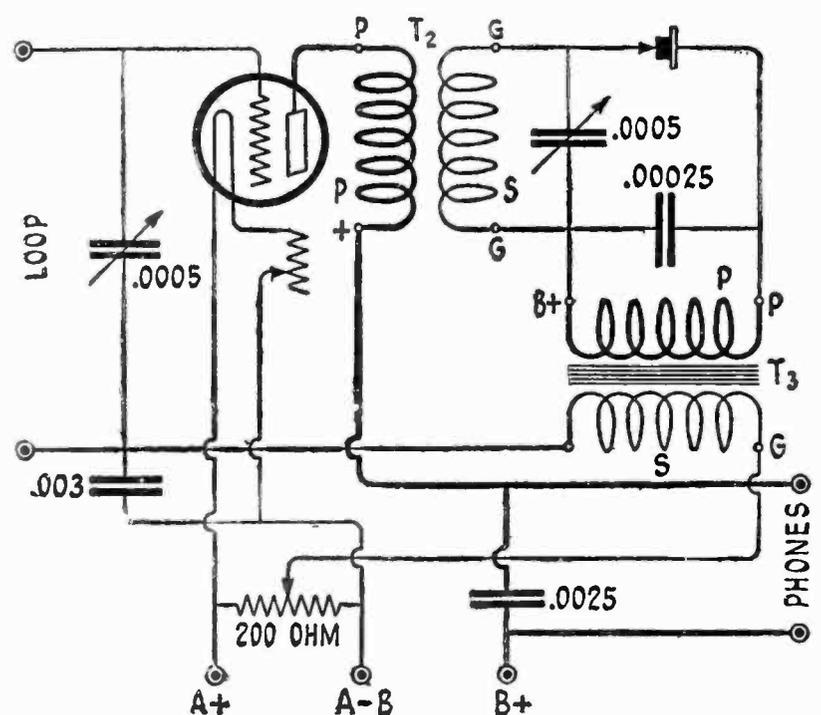


FIG. 8

The one-tube loop hook-up—the first cousin to our old friend the single-tube knock-out. If the Ballantine Varioformer is substituted for T2, the condenser across the secondary is eliminated

the magnets, or so near to it that it rattles badly on a signal. As the adjuster is turned away from this dead or inoperative side, the diaphragm is raised until it generally "plops" free. When the speaker is connected correctly, it will be necessary to turn the adjuster farther than on the incorrect polarity, to free the diaphragm and achieve distortionless reproduction.

NEVER overload your loud speaker. The suspicion of a rattle should be avoided. Even momentary overloads lower the power capacity of the talker (in respect to satisfactory reproduction) and a loud speaker that has been occasionally strained will distort and blast on much lower powers than before the initial stress. This fact was ably demonstrated in a series of amplification ex-

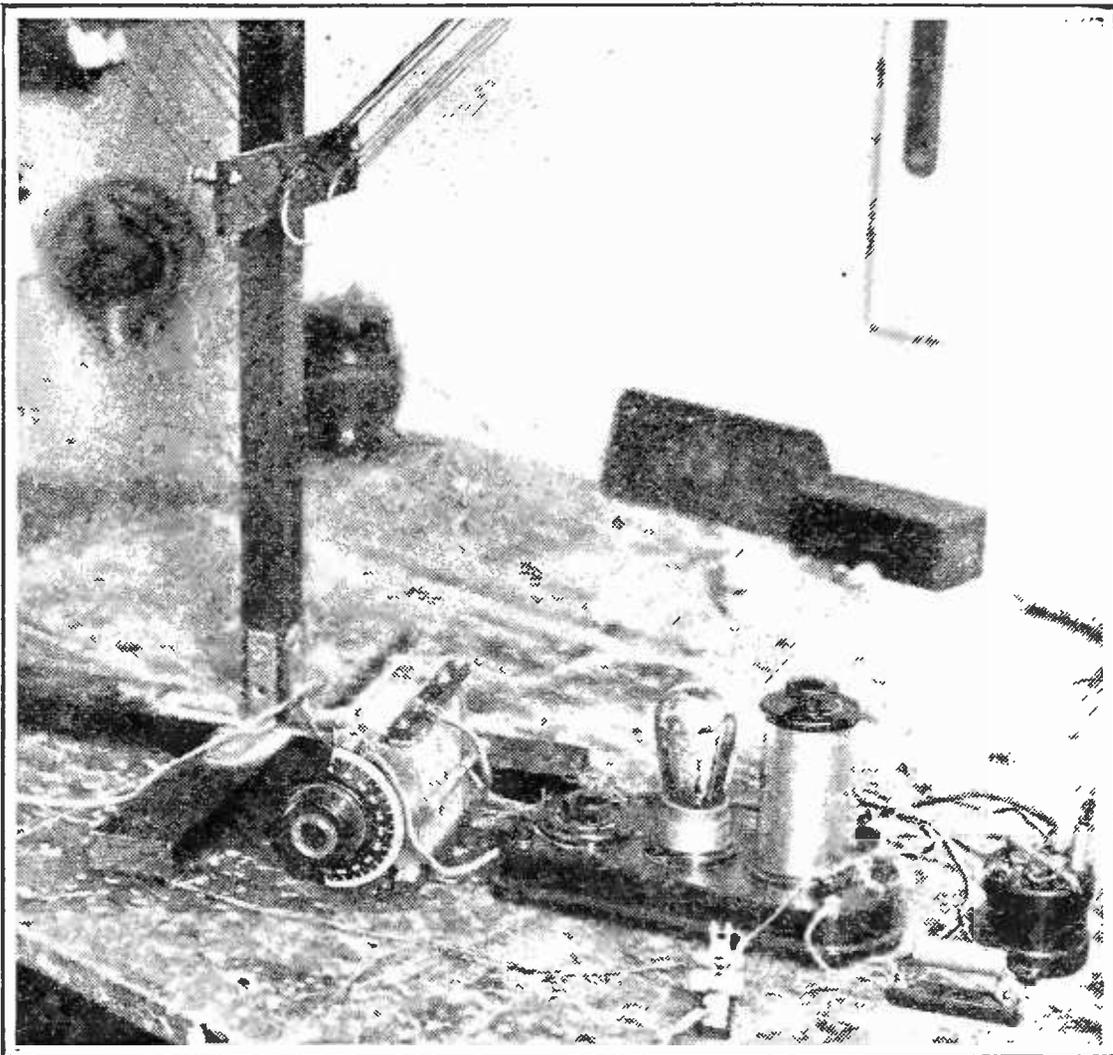


FIG. 9

Testing the one-tube loop receiver in the R. B. Lab. Regeneration is quite pronounced with the Ballantine Varioformer

periments carried on in the R. B. Lab in which volume was a primary consideration.

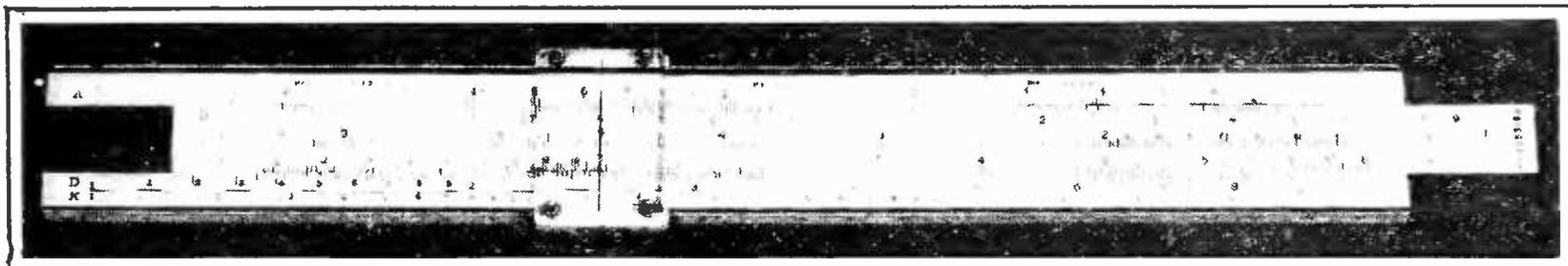


FIG. 10

The ten inch poly-phase slide rule or "slip stick,"—our laboratory suggestion for January

IN THE R. B. LAB SOON

The R. B. LAB is preparing data on low loss coils in the Roberts receiver, in both the broadcast set and the record-making short-wave receiver. This material will appear in an early number.

Pioneering With De Forest in Florida

High Adventure with Temperamental Wireless When Forty Feet of Sand Brought Failure Close—Despair, Expense, Trouble, and Final Success—How the Pensacola and Key West Navy Wireless Stations Were Built

By FRANK E. BUTLER

Former Chief Assistant to Dr. Lee De Forest

THE erection of five high-powered wireless stations in the South guaranteed to give perfect communication over a distance of one thousand miles was the flattering contract offered Dr. Lee De Forest by the United States Government after he had made his sensational success at the St. Louis World's Fair. Naturally, he was elated at such unqualified endorsement of this success coming from so high a source. And I, having worked with him during every hour of that long and desperate struggle, and having shared with him the final triumph, was equally elated.

The stations were to be built at Pensacola and Key West, Florida; at Guantanamo, Cuba; San Juan, Porto Rico; and Colon, Panama.

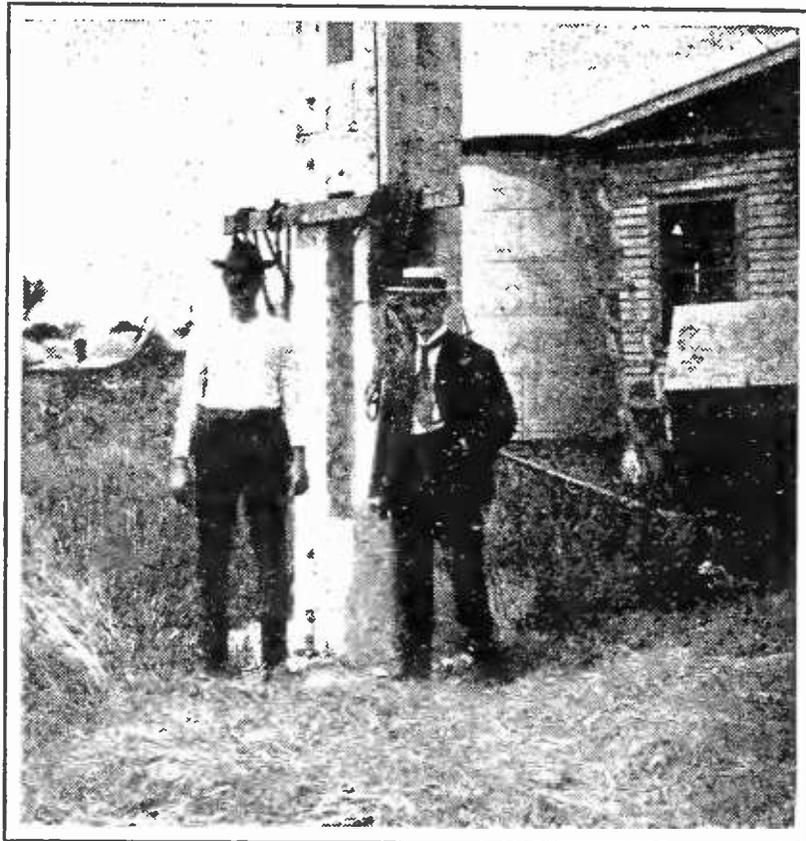
They were to be the first wireless stations ever erected in the tropics. They were to work over a distance two thirds greater than wireless communication had before carried. But what of it? Had we not smashed the world's record at St. Louis? As a preliminary to this stupendous achievement had we not conquered all installation troubles? This Southern job was going to be an easy matter now that we had the St. Louis experience back of us! There was nothing to worry about, even though this time we were working for the Government.

This was the way we felt the day we started for the South. But, alas!

That Southern trip, begun in 1905, lasted close to two years. In the exercise of patience and the development of skill it made those gruelling days at St. Louis seem as no more than a preliminary bout before the battle royal.

It was a battle from the very start. All nature seemed in revolt at our intrusion.

She fought us with static overhead. It was fierce, relentless static such as was never heard before with the crude tuning devices at hand. She baffled us by "ground conditions" underneath that taxed to the utmost our perseverance and ingenuity in the effort to conquer them. She pestered us day and night with insects so vicious we grew to think of the mosquito as a friend. But we stuck. And we stuck until we conquered.



TOWER BASE AT THE PENSACOLA STATION

The masts were two hundred feet high. Each timber in the base is eight by eight

SCENE OF OUR FLORIDA STRUGGLES

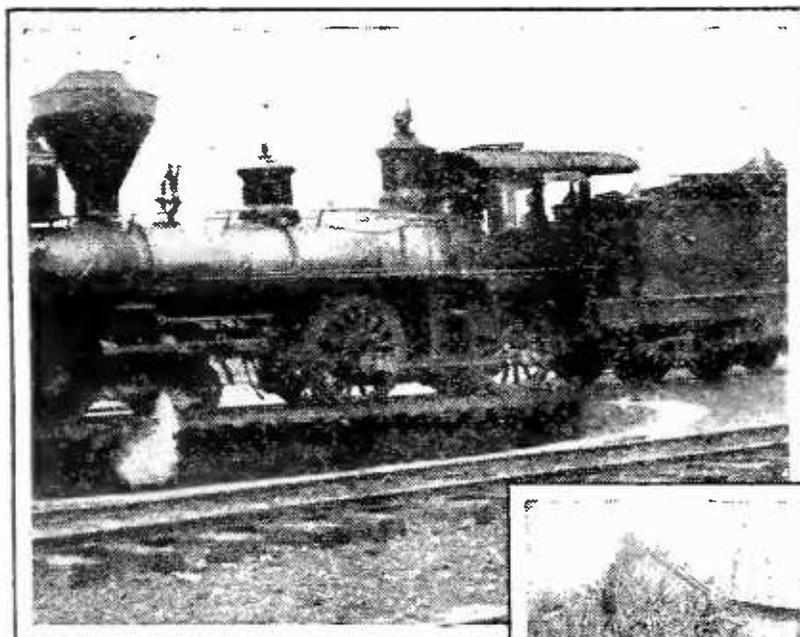
MY FIRST stop was at the Warrington Navy Yard, Pensacola, where I was to have charge of the erection of a two-masted station with a fan antenna. This station was to be of 10 kw capacity, and although very similar to the St. Louis Fair installation, excelled it in refinements of apparatus and wiring. I had a special letter from Mr. Breckenridge Long, then Secretary of the Navy (under

President Roosevelt), requesting all navy officers to assist us as much as possible in our work, but it was not necessary for me to use it because the navy officers at this yard were always exceedingly courteous and helpful to us in every way.

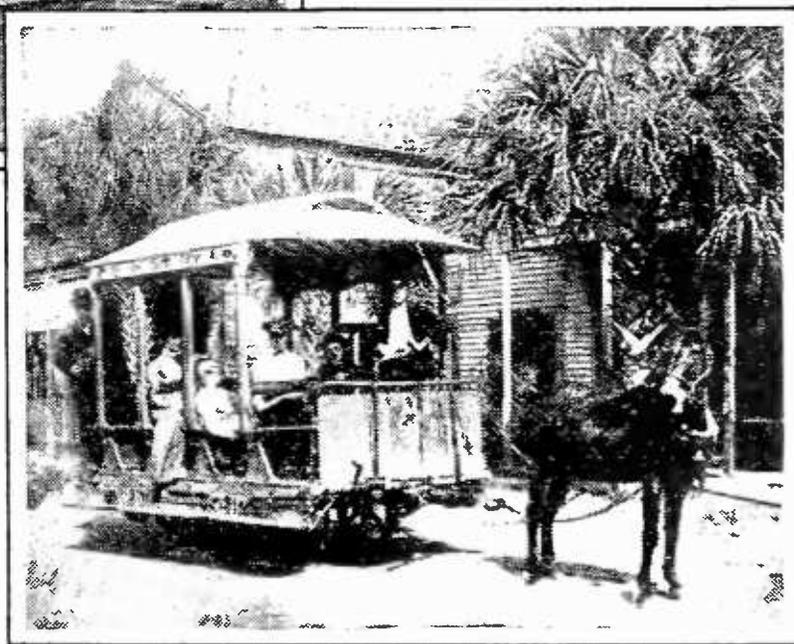
For a time I lived at the hotel in Pensacola. But only for a time. As our troubles multiplied I found it necessary to be right on the spot day and night. So I moved down to the wireless station where I slept on a bunk and ate my meals with the "Jack Tars" in their mess hall. It was here among these happy fellows that I learned many things which have proved most helpful to me ever since. They patiently taught me the knack of tying knots and of rope splicing, accomplishments I afterward found most useful in making proper antenna construction. I was allowed access at all times to their machine shop and electrical department, and I had the advantage of their experience with heavy construction work, wind stresses, mathematical formulas, etc. And so, for weeks, all concerned in the erection of the station worked happily, undaunted by nature's enmity, worked with the persistent energy that comes from a surety of ultimate success.

When the installation was finally completed it had all the aspects of a beautiful job.

As the day arrived for the initial test, the stage was all set to begin the test signals at 8



P.M. Dr. De Forest was located at Key West, about 400 miles distant. He was notified to listen-in at the appointed time when we were to send out the accustomed "D" test signals. All of the reading instruments on the operating table registered perfectly, the



MUNICIPAL PROGRESS AT KEY WEST IN 1905
The lower cut shows the transportation system of the city. One car, one mule, one street. To board car, proceed to center of street. The mule then stops, turns head around, and will not start until passenger is aboard. The conductor at rear of car gives the mule "motorman" the bell twice and on you go until the "motorman" stops of his own accord at the other side of the next street. At the left, the diamond stack wood-burning locomotive that was still in use on the Florida railroads when Mr. Butler went from Pensacola to meet De Forest at Key West in 1905



"WE SHOULD WORRY"

They seem to be saying, even though they are away down in Pensacola. Mr. Butler, third from the left, of this group of "Jolly Tars" is helping the boys form the lucky combination of "four eleven, forty four"

spark across the spark gap was fast and powerful, and there was every indication of a perfect inauguration of service without delay.

IT WOULDN'T WORK

THE battleship *Brooklyn* was anchored in the harbor about two miles distant. The wireless operator aboard had been a daily visitor at the station and was interested in the test, so he planned to listen-in that evening. It seemed ridiculous to us that he should listen in on a 10 kW station located only two miles away, but he did.

As I started the test I was positive of its success. I sent "D's" for hours, waiting

anxiously for a telegram from De Forest at Key West. Nothing came.

However, at eleven o'clock, the *Brooklyn* operator came ashore in a launch and reported at the station. He inquired as to why we had not been sending, and added that he "had not heard a peep" from us.

The following morning a message was received from Dr. De Forest stating that he had not heard our signals.

Every item of the installation was carefully checked over and not a flaw found. A slight change in adjustment was made and the test resumed that evening with the same result. This testing continued week after week with relentless patience and continual changes. Even the large spread fan antenna was taken down, closely inspected and replaced.

What Dr. De Forest Said of the Author

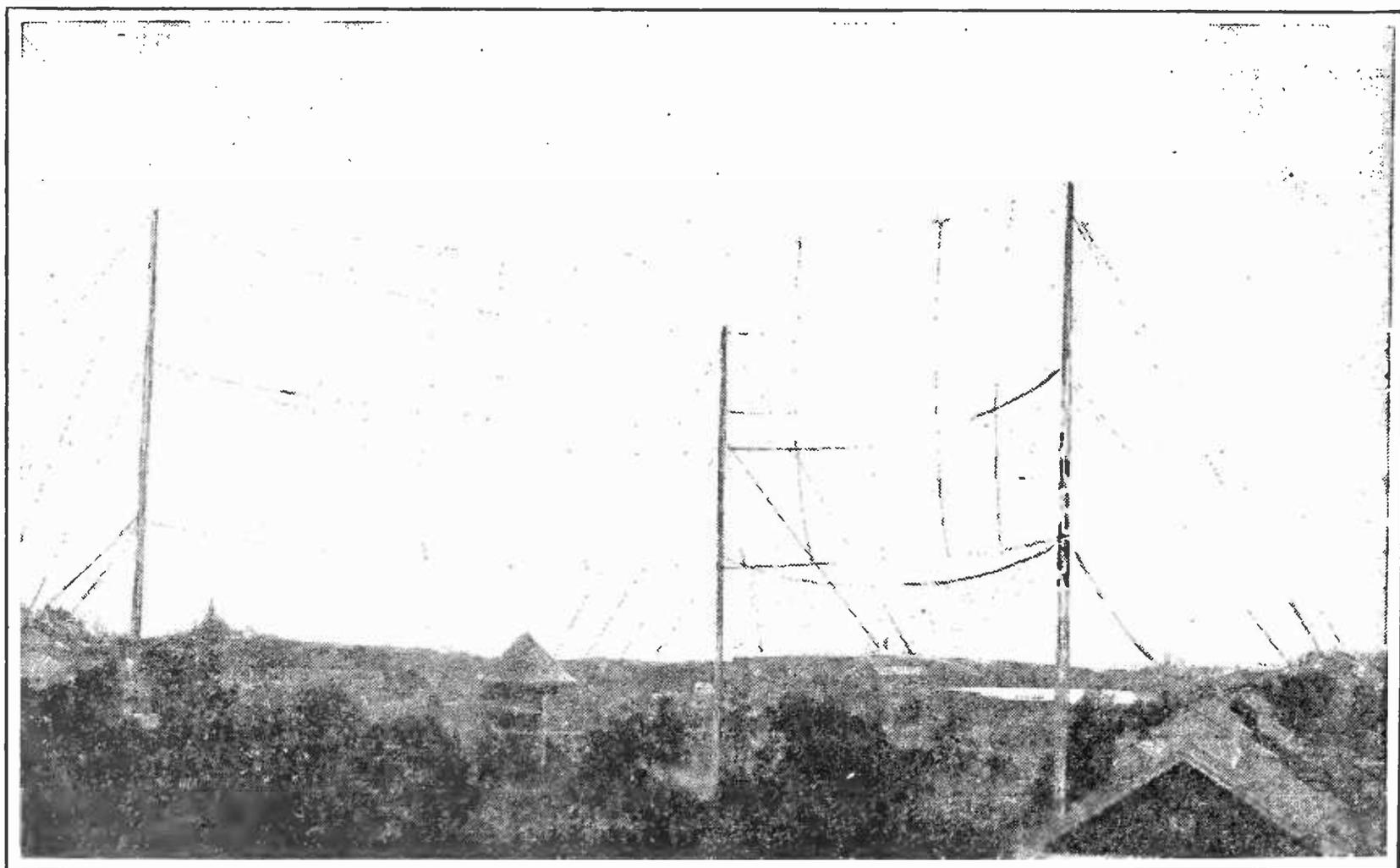
"Mr. Butler, is in fact the only surviving member of the "old guard" who is still interested in wireless and who is in a position to lay before the public, in a graphic and interesting manner, a gripping story of those old days and the subsequent development of radio under the De Forest banner. He has just read me the first three installments of a most graphic story of his early days in wireless, recalling a thousand interesting facts which I had forgotten, and in which every radio fan must be intensely interested."

The "ground" was an item of suspicion.

This "ground" had been considered a good one for the reason that it was made of heavy sheet copper one hundred feet square and buried five feet underground two feet under water, and connected to the spark gap by a four-inch copper bus bar.

To make sure the ground was all right, we dug up the plate and prepared to sink it deeper into the sea water. To do this it was necessary to construct a cofferdam, and while a

force of men shoveled out the sand another crew on each corner operated force pumps to keep out the water so the digging gang could work. It was slow, stubborn work. When a depth of eleven feet had been reached, we were compelled to stop further excavation on account of the increased rush of the incoming



"KW"

The De Forest station at Key West, erected in 1905 for the United States Navy. This spark set had a capacity of twenty kilowatts. The radio scenery at Key West now looks vastly different, what with the tall steel masts of the present modern Navy station now there

water. Then we dropped a new one hundred square feet of copper and buried it, feeling certain it would solve our ground difficulties. That evening we sent "D's" energetically and with renewed confidence in our success.

It was a staggering blow to receive the following morning the old accustomed telegram from Dr. De Forest, "Heard nothing." This was followed by some suggestions of another change and an admonition to keep up courage.

That day, when the clouds of despair were at their darkest, an incident occurred which, trivial in itself, was the turning point in our apparently hopeless battle with an unknown trouble.

It was a drink of water that brought about the idea that solved the Pensacola problem.

A DRINK OF WATER SOLVED THE PROBLEM

WITHIN a few rods of the wireless station was a well from which we obtained our clear, cool drinking water. As I strolled over to the pump to get a drink on this day I met a Navy officer who reached the spot at the same time I did. After the usual greeting, I said:

"This is fine drinking water. Wonder if it's a drilled well."

To which he replied:

"It is. I know because I drilled it."

"How deep?" I asked, and little realized the tremendous importance of the question.

"Fifty feet," came the answer. "But," went on the officer, "if I had stopped at forty feet or gone down to sixty feet, I would have had nothing but salt water."

"How's that?"

"Well, you see it's this way. This white sand around these parts is about forty feet deep, and below that is a stratum of clay and stone twenty feet thick, and beyond that is an indefinite reach of sand."

"Ah, I see," was my rather inane comment. But I was too stunned by the idea that had flashed into my mind to carry on the conversation further.

The idea was that perhaps that white silica sand, the body of which was greater than the thin film

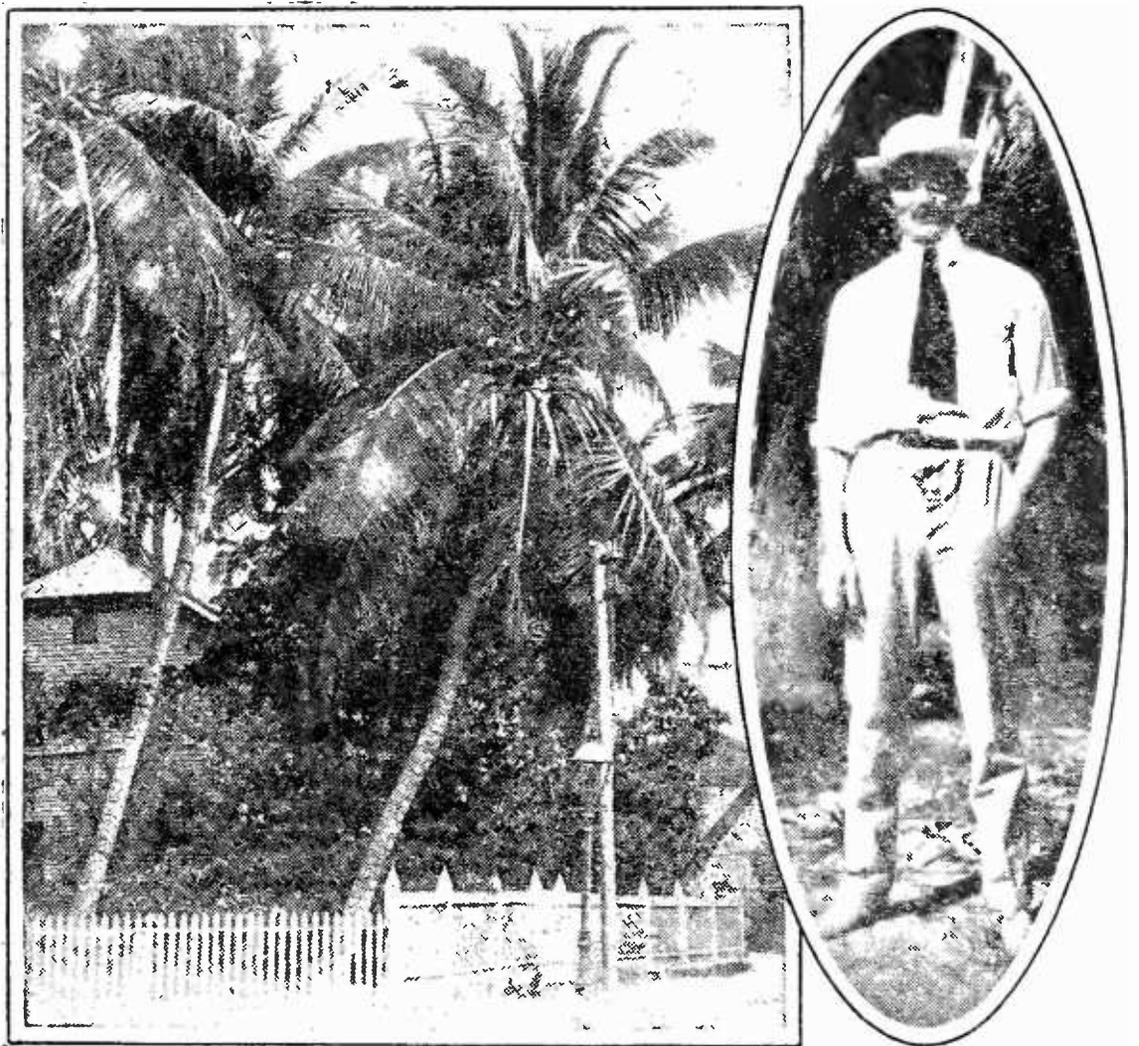
of seawater that seeped around it, offered too much resistance or formed a dielectric which prevented a good ground.

I spent the rest of the day absorbed with this idea. It still had full possession of me when, in the evening, I went to the Western Union office to send a telegram. Before I left I asked the operator what kind of a ground he had. He replied that the ground they used consisted of an iron pipe driven down forty feet, and that using any less than that produced no electrical results whatever.

That settled it. I was sure the solution of our baffling problem was at hand.

The following day I bought about six hundred feet of four-inch pipe and engaged men to drive twelve iron pipes each forty-five feet long into the loose, moist sand. These were grouped in a small circle about two feet apart. The twelve tops were joined together with heavy copper cable and a large bus bar run into the spark-gap.

The evening after this was finished we started sending "D's" promptly at 8 o'clock, and scarcely before I could realize it, the joyful news was received from Dr. De Forest that he had heard the first signals we sent out. To have success so suddenly thrust upon us after weeks of discouraging failures, was indeed a



PALMS AND WIRELESS AT KEY WEST

The palms hid the masts, but the station and its buildings took up an entire block. The insert at the right shows Dr. De Forest as he looked when he was doing the installation at Key West

keen pleasure and relief. You radio fans who enjoy making your own sets and revel in the thrill of "hearing results" for the first time, can perhaps appreciate to a degree the sensation that was ours that evening.

From this time on "PN" worked perfectly, and it was not long before we were heard by distant Northern stations.

KEY WEST GETS A STATION

COURAGE soared. It was time for another "forward march!"

Leaving the Pensacola station in charge of the Navy wireless operators, I departed for Key West, overland, by way of Tampa, and thence by steamer. Even if I had not taken a snapshot of it, I should still be able to visualize the primitive engine that went ambling leisurely from Pensacola to Tampa, an engine of the "diamond stack" wood burning type. About every twenty-five miles cords of three foot stove wood were loaded on the tender, to be consumed during the next twenty-five miles with much belching of smoke that, compared to coal smoke, was a grateful odor.

Arriving at the Tampa docks just before noon, I had lunch, after which I found my finances reduced to exactly five cents. My boat ticket included meals, but the boat was not to leave until evening. There was nothing but a railroad yard at the Tampa docks, and the city itself was ten miles distant. So, with insufficient carfare to "go to town" there was nothing to do during the long afternoon but to watch the fish from the dock. It did not occur to me to mourn over being broke, for, during those early days of wireless, being broke was the usual condition with all of us, and being flush meant knowing where next month's rent

was coming from. And it was worth it, the fight, the privation, the anxiety. And even if any of us had had it in us to weaken, it would have been impossible with De Forest always at the helm, an inspiring leader.

I found him at Key West in his wireless

station set in the midst of a picturesque tropical grove. Coconut, banana, and palm trees completely surrounded the station and the living quarters of the wireless crew. So far as climate and scenery were concerned, this island was an ideal place in which to live. But the restaurants were exceedingly poor. The only appetizing food was rice and hard rolls. Although fish was abundant, no one seemed to know how to cook it. When our work was going fairly well (comparatively speaking) we felt rather disturbed about this inadequate food supply. But when trying to solve seemingly unsolvable problems, we scarcely knew whether we ate or not.

Spread majestically over the trees of the grove that sur-

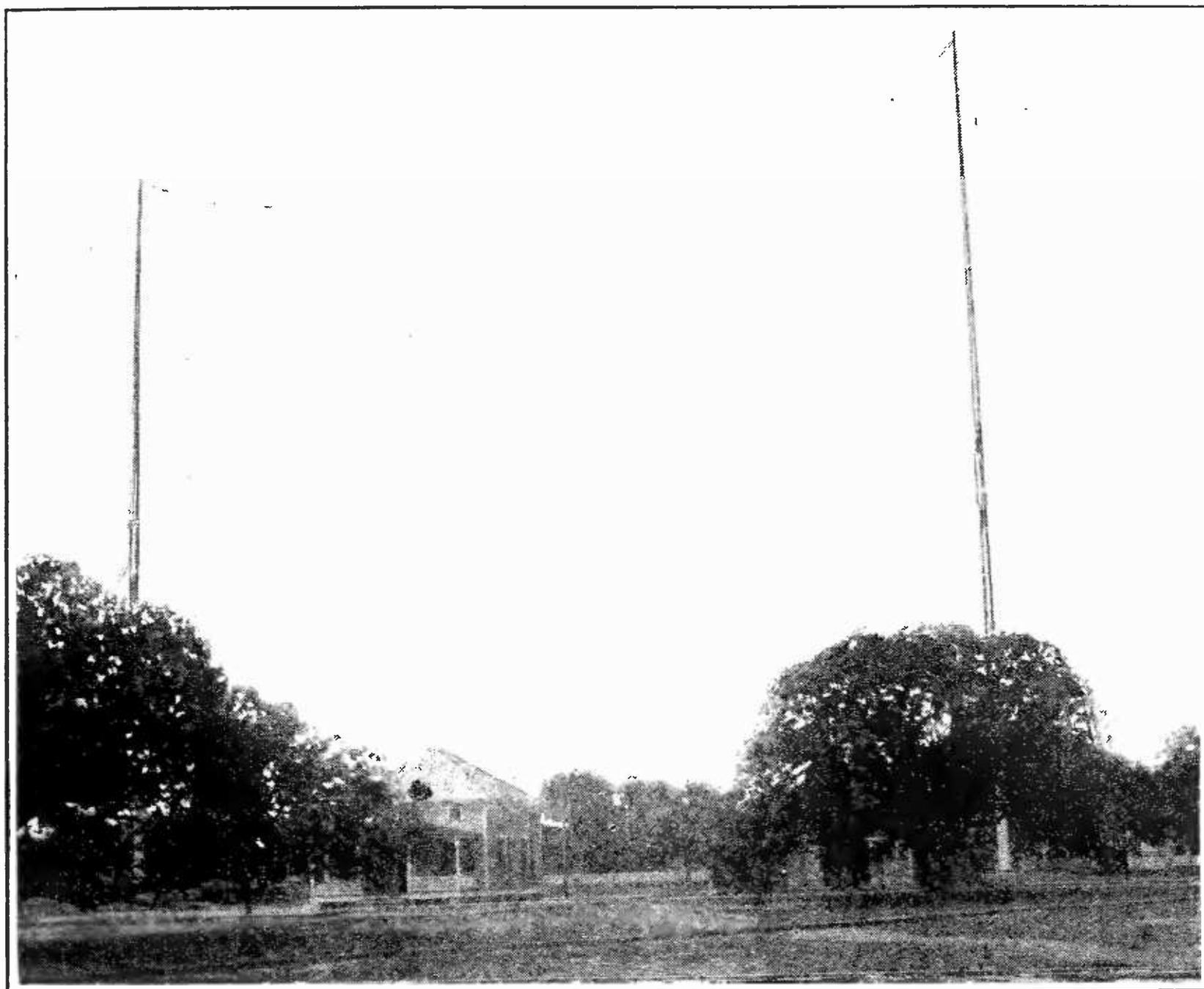
rounded the station was the huge triangular cage antenna consisting of 45,000 feet of wire, suspended from three equi-distant masts, two hundred feet high. The radio fan who has used seven stranded phosphor bronze wire for antenna purposes knows how stubborn and kinky it is and how difficult to handle. Think, then, of the difficulty of this antenna installation owing to the density of the tree foliage and the prevalence of high winds.

Many improvements in the wireless apparatus were noted at this station, and the quality of the spark at "kw" (as it was then called) was better than hitherto heard. Most notable of these changes were new ideas in receiving tuning devices. We made a definite endeavor to overcome the incessant static.



ALL IN THE DAY'S WORK

Here are the laborers pumping out water from the "ground excavation" at Pensacola to enable the diggers to get at their job of making a place for the large copper ground plate and below, the gang of diggers shovelling sand for the "ground" excavation at Pensacola. Some of them had to work waist deep in the cofferdam. The peculiar character of the ground connection here led to some unusual and very discouraging difficulties



STATION PN

The De Forest Station at the Warrington Navy Yard, Pensacola, Florida

In my diary, under date of April 16, 1905, I find a notation of an experiment we carried on at this Key West station with an *incandescent lamp for the purpose of eliminating static*. In these tests we used bulbs of various voltages and watts in conjunction with coils and condensers. The results were unique but not definite.

This was two years *before* the famous "audion" bulb was invented by Dr. De Forest. Little did we know how closely we were stumbling at the door of the "wonder lamp" that was destined to revolutionize wireless and make radio broadcasting possible. Had we gone a degree or two farther we might have a different story to tell here.

Evidently the doctor had become tired of "pump handling" "D" signals as was done

at St. Louis, day after day, because here he had devised a mechanical contrivance operated by clockwork, which sent out the "dash-dot-dot" "D" signals incessantly, without manual effort.

My stay at Key West was short, as it was now time to begin operation at Guantanamo Cuba, where the third station of the group was to be erected. Again, I started forth with high hopes, believing that the worst of my experiences with wireless were behind me. As it turned out I was going straight into a work that called for wholly unforeseen and difficult engineering feats and the most crucial physical endurance test of the entire contract.

How success was finally accomplished after eleven months of hardships and disappointments is a story in itself which will follow.

(The next article in this series will deal with the experience of these radio pioneers in Cuba)

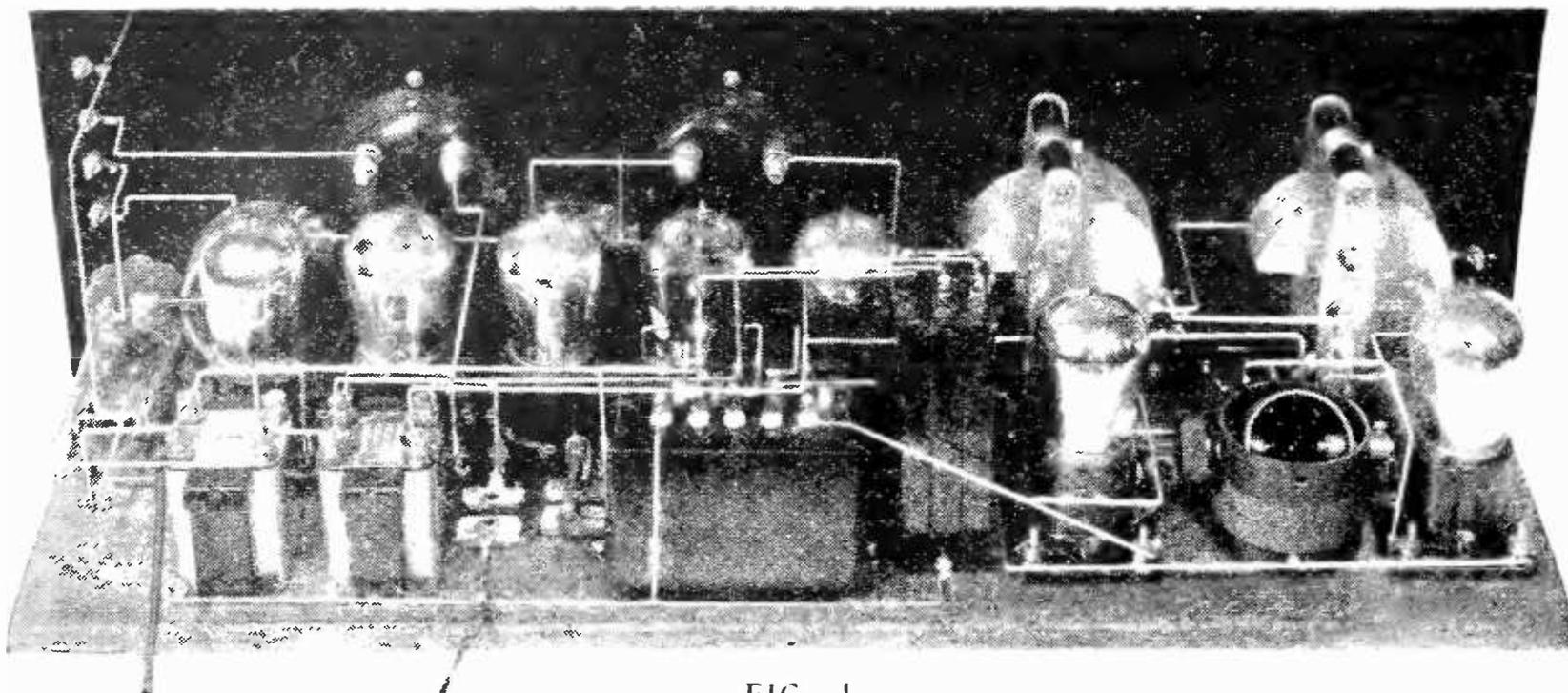


FIG. 1

The rear view of the seven-tube "super". The photograph shows what an excellent layout can be secured using a standard 7 by 24-inch panel. The small balancing condenser is shown between the two variable condensers

Revamping the Silver Super-Heterodyne

Complete Instructions and Discussion on Changes Necessary to Adapt a Dry-Cell Straight "Super" for Storage Battery Tubes—A Complete How-to-Build-it Article Describing a Super-Heterodyne Which Produces Remarkable Results

BY McMURDO SILVER

IN THE October, 1924, RADIO BROADCAST an article appeared by Mr. Silver, describing a super-heterodyne that operated on 199's, had remarkable selectivity, and could be assembled from standard and easily procurable parts. In this article, Mr. Silver has answered a demand for a super-heterodyne of the same qualifications to operate with storage battery tubes. Experienced constructors, and those not so experienced will readily appreciate that this "super" is well worth the time necessary to build it.—THE EDITOR.

SINCE the publication in the October RADIO BROADCAST of the description of the portable super-heterodyne receiver using dry-cell tubes and self-contained batteries, the writer has been swamped with letters from fans asking all manner of questions, and reporting results far in excess of what they had expected from the set.

Reports have come in from all sides, telling of phenomenal DX reception with this set and its exceptional selectivity and quality of reproduction, both from seasoned experimenters and from builders who had no previous constructional experience. One log

made by a man totally unfamiliar with radio who had built the set, listed thirty-three stations heard in one night, with loud speaker volume on an 18-inch loop. This was the second evening he had operated the set in his home, in a thickly populated Chicago residential district, surrounded by steel frame buildings. Another report came from a man who had built seven different super-heterodynes in an endeavor to get selectivity and DX reception in his home, located, within a radius of five miles of a number of powerful broadcasting stations. Suffice to say, that he finally found what he had been hunting

for as he was able to report during the first week of operation three Pacific Coast stations received with loud-speaker volume.

Several of the sets, located within five blocks of WQJ and WEBH in Chicago, have tuned-out these two stations and brought in WGY in Schenectady and WOS in Jefferson City, with loud-speaker volume on a small loop. The separation between WGY and WEBH is ten meters, and between WQJ and WOS, seven meters. It is also possible to work through WLS on 345 meters to WBZ in Springfield on 337 meters. Some builders have reported five Pacific Coast stations in one night, through the locals. An experimenter in Delhi, New York, reported loud-speaker reception from KGO in Oakland, California, several times in one week, as well as stations all over the country.

Last but not least, Captain Irwin of the RADIO BROADCAST COVERED WAGON reported from Las Vegas, New Mexico, hearing both east and west coast stations with loud-speaker volume, operating the set right in the COVERED WAGON. He advised that dead spots did not seem to exist when the set was in operation, and that it was the most selective outfit he had ever operated. This will be realized when it is understood that a one half degree movement of both dials will tune from WSAI, Cincinnati, to KGO, Oakland, with a silent spot between them.

Practically all of the letters received about this set have asked questions which might be summed up as follows:

1. How can storage battery tubes be used?
2. How can the set be enlarged to make an easier wiring and assembly job?
3. Can resistance-coupled audio amplification be used?

4. How can a stage of tuned radio-frequency amplification be placed ahead of the first detector?
5. How can voltmeters be incorporated for A and B battery voltages?

THE NEW MODEL

IN RESPONSE to these many questions a larger model of the portable "super" was designed, which for ease of reference, will be called the laboratory model. This set is 24 inches long and fits in a 7 x 7 inch cabinet. It may be used with any type of tube now on the market, or various combinations of types, and will permit of as many refinements in the way of extra high grade material as the builder may desire to incorporate.

The portable set has already proved to be one of the most thoroughly satisfactory and fool-proof "super" designs ever presented to the public, and the larger laboratory model is even superior to it in the matter of volume when 201-A or DV-2 tubes are employed. This model retains all the desirable features of the portable, but because it is spread out more it is somewhat simpler to construct and is recommended to the fan who is not interested in building a small, self-contained outfit.

The results to be expected will be somewhat better than those experienced with the portable set. In the suburbs of Chicago the laboratory model will bring in the east or west coast broadcasting stations on a small 18-inch loop with slightly greater loud speaker volume than the portable. On locals the use of the larger tubes gives considerably more volume. As for selectivity, stations such as WHN, WGY, WBZ, WFFA, WOAW, KGO, and many others could be brought through while

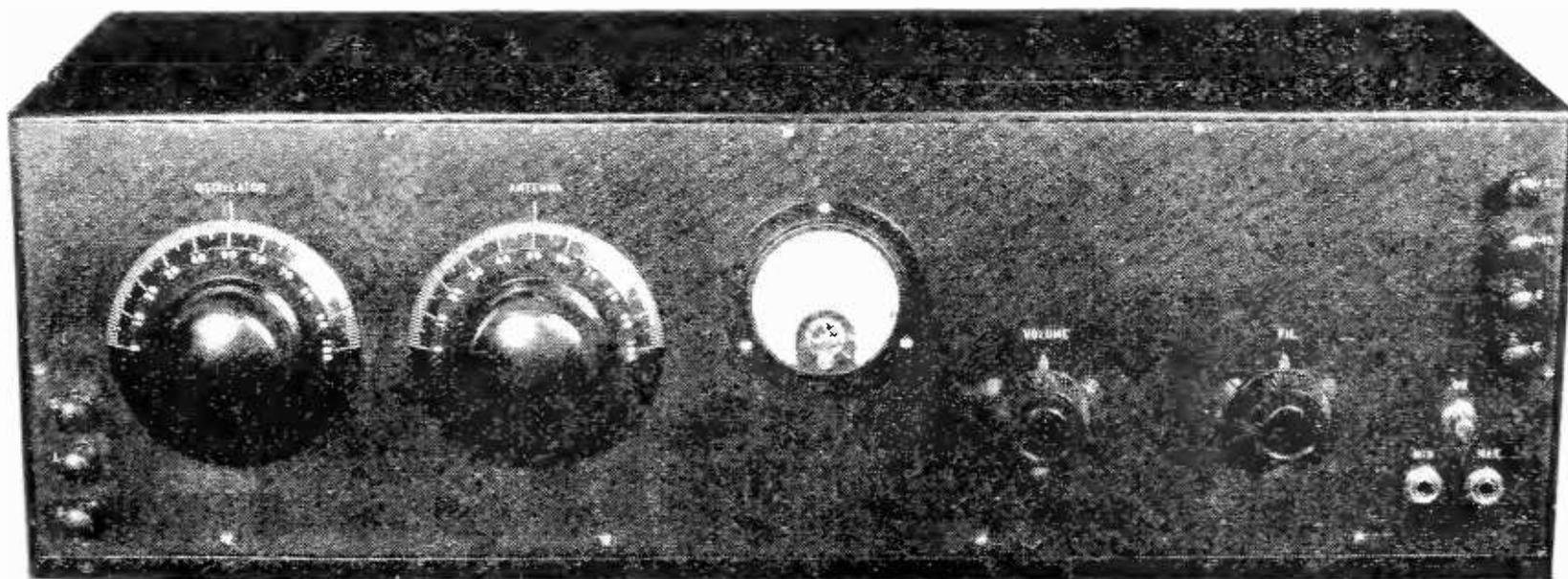


FIG. 2

Shows the front panel view of the storage battery-operated super-heterodyne. The small balancing condenser used in the receiver is not shown in the photograph

If UV-201-A, DV-2, UV-199, or DV-3 tubes are used, the Benjamin spring sockets will work in very nicely. These sockets absorb all vibration and eliminate almost entirely the ringing noise often experienced with such tubes. In addition, these sockets are excellent from an electrical and mechanical standpoint.

If standard 4-inch dials are used on the condensers, they can be tuned satisfactorily either by means of a pencil with an eraser rotated against the edge of the dial and the panel, or by tuning the dial with the fingers on the outside edge instead of on the knob. If vernier dials are used, the Apex, which is geared about 10 to 1, is extremely satisfactory and is to be recommended. The Eztoon is also a good dial, except that the vernier action covers only a few degrees, after which the entire dial must be rotated and the vernier re-adjusted. Any other good standard vernier dial without "back-lash" or play in it will be satisfactory.

Jefferson No. 41 transformers may be used in the set although Thordarson $3\frac{1}{2}$ to 1 transformers seem fully as satisfactory as the Jefferson.

The Thordarsons may be used in either

$3\frac{1}{2}$ to 1 for both stages or if a very great volume is anticipated a $3\frac{1}{2}$ to 1 in the second stage and a 2 to 1 of the new type in the third stage.

For details of the construction of the set, the reader is referred to the unusually complete construction article on the portable set in RADIO BROADCAST for October, 1924. Methods of construction in both sets are quite similar.

HINTS ON ASSEMBLY

ALL PARTS are placed on the base-board and panel, and should be located according to the photographs. After the panel has been prepared, the proper parts should be placed on it and the sub-base screwed in position. The parts to go on the sub-base should be placed in their proper positions, and their locations marked, care being taken to see that they are so situated that the wiring will be easy and that tubes will not strike meters, etc. or the location of any parts on the sub-base conflict with parts on the panel.

All wiring that it is possible to do on the panel should be done before the panel is attached to the sub-base on which the sockets,

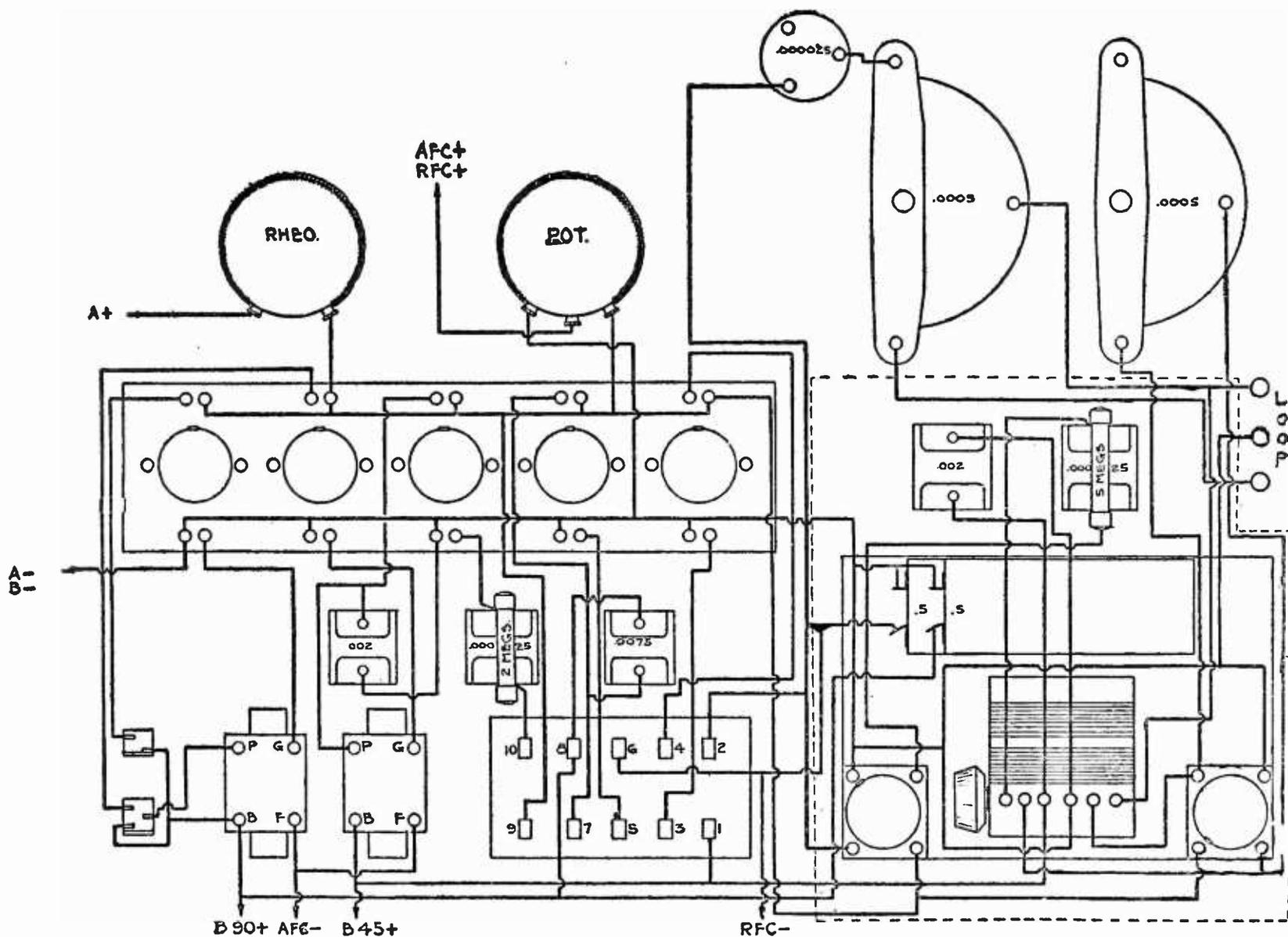


FIG. 4
A placement diagram of the units in the receiver

transformers, etc. have been mounted. Likewise, all possible wiring should be put in place on the sub-base before it is finally screwed to the panel. If this is done, only a few leads will have to be run from the panel to the baseboard and the wiring will be found quite simple and easy. The wiring may be done with bus-bar, straightened, bent at angles and soldered to lugs fastened to the instrument binding posts, or it may be done with flexible magnet wire covered with spaghetti, as described in the October article.

A C battery is used on the intermediate amplifier tubes as well as on the audio amplifier tubes. For UV-201-A's this C battery will vary between 3 and $4\frac{1}{2}$ volts. The same values will hold for UV-199 or DV-3 tubes, while the C battery value for WD-11's, or WD-12's will range from $1\frac{1}{2}$ to $4\frac{1}{2}$ volts. In each case the C battery is connected with its negative terminal to terminal 6 of the radio-frequency transformer unit and its positive lead to the center contact, or arm of the potentiometer. The audio amplifier C battery is connected with its negative lead to the F terminals of the audio transformers and with its positive lead to the minus side of the filament line. The C batteries may be located on the right hand corner of the base board inside the cabinet. If a high value of C battery is used on the intermediate amplifier, the potentiometer will have no effect on the volume of the set and a low enough voltage to permit of the potentiometer volume control should be used.

It will be noticed in Fig. 3 that three bypass condensers are used, each of $\frac{1}{2}$ mfd. One is connected across the 90-volt B battery, one across the 45-volt B battery section and one from terminal 6 of the radio-frequency transformer unit to the minus side of the filament. The cans of these condensers are soldered together, and with the cans of the

audio transformers and the radio frequency transformer unit, are grounded to the negative side of the filament. This is very important; instability of the set may be due to the failure to ground all of these cans.

If meters are to be used in the set, a voltmeter with a maximum scale reading of from 6 to 10 volts may be connected directly across the A battery terminals of the set to indicate the A battery voltage, or across the filament terminals of one of the tube sockets to read the filament operating voltage. This latter is the preferable position as it will permit operating the tubes at their best point, and resetting of the rheostat to the same value each time the set is used. A milliammeter in the plate circuits of the tubes is of little value; a B battery voltmeter would be preferable. The B battery voltmeter may be connected directly across the B battery or it may have its negative terminal connected to the negative B terminal of the set and its positive post brought through the resistor to the center arm of a small single-pole double-throw switch. If one contact of the switch is led to the 45-volt B post and the other contact to the 90-volt B post it will be possible, by means of this switch, to throw the meter across either the 45- or 90-volt battery sections at will. If a double range voltmeter is employed, a small switch can be used to throw it from the A to the B battery. The details of these circuits are given in Fig. 6.

The advantage of bringing out the balancing condenser to the panel is that it permits maximum sensitivity to be obtained at every wavelength. If the balancing condenser is set at one fixed value, it will have to be at a point where the first detector tube will not oscillate at the shortest wavelength to be received. At the longer wavelengths the value of balancing condenser may be increased slightly with resultant strengthening of

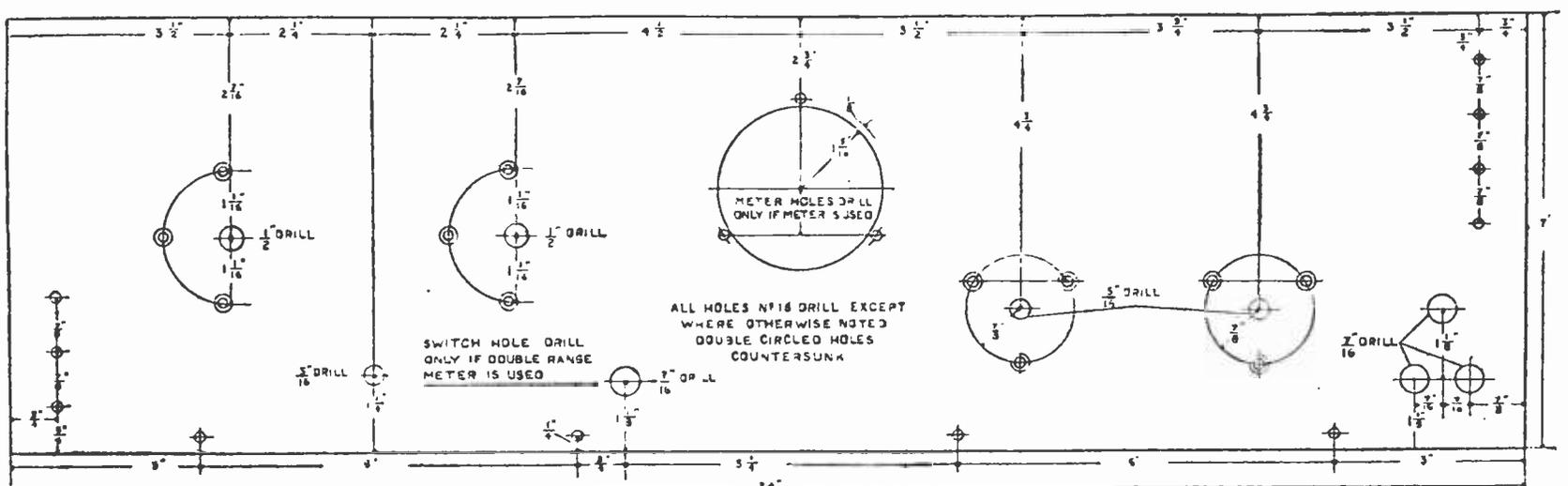


FIG. 5
The panel layout

signals. This control is not critical except that if too high a value of condenser is used the first detector tube will oscillate and become unstable. The condenser may be located above and between the two tuning condensers on the portable model also, if it is desired to take advantage of the full amplification possibilities of the set by means of this one additional, but fairly non-critical adjustment.

Binding posts may be located on small bakelite strips on the sub-base so that they will not appear on the panel. This will add somewhat to the appearance of the set if it is to be used in a permanent installation.

WIDE LATITUDE IN ASSEMBLY

THE assembly can be changed to meet any individual conditions of height, depth, or length, such as might be imposed by a phonograph cabinet. The amplifier assembly should not be changed, but the oscillator coupler and first two tubes may be moved up against the panel between the two condensers, which will have to be located farther apart. The entire amplifier section may then be shifted behind this portion of the set, which will make an assembly 12 to 15 inches long and 8 to 10 inches deep. (See Figs. 6, 7, and 8 of the article on the portable receiver.) It is also possible to locate the amplifier section above the condensers and first two tubes. The size would then be approximately 10 to 11 inches high, 12 to 15 inches long, and 6 to 7 inches deep. These variations are only suggested where the constructor wishes to meet particular space requirements, and feels confident that he will be able to work out the changes satisfactorily.

TESTING AND TROUBLE SHOOTING

Filter Condenser: The value of the condenser across the RF unit terminals 7 and 8 will vary between .0075 and .01. It is best to start with .0075 and then build up to .01 by adding .0005 and .001 condensers in parallel with the .0075 condenser. The best value will be where the oscillator dial reading is sharpest on a comparatively strong local signal. The proper number of condensers may be bolted together with machine screws and nuts and soldered in position on the wiring.

Grid Leaks: For 201-A tubes the grid leaks should be from $\frac{1}{2}$ to 2 megohms for the second detector. One megohm is satisfactory. A grid leak from 2 to 5 megohms should be used

for the first detector. The higher value is preferable. Grid leak values for 199 tubes are given in the October, 1924, article and the same values are correct for DV-3's. For WD-11's or WD-12's they will be approximately the same as for 201-A's.

Filament Returns: In the portable receiver, the first detector grid return, or center tap of the loop is shown going back to the negative side of the filament, and for the second detector, terminal 9 of the can leads to the plus side

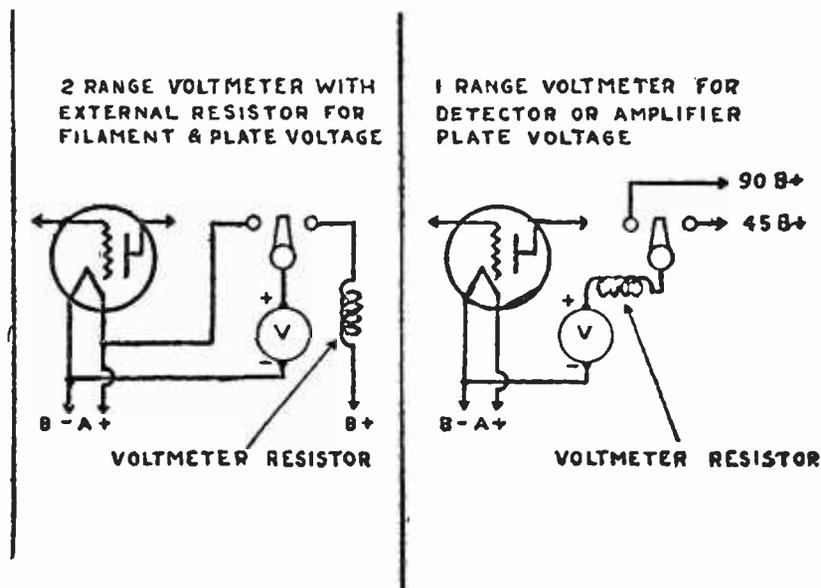


FIG. 6

Wiring details of voltmeter which can be used with advantage in the super-heterodyne

of the filament. In the laboratory model both these returns are shown to the negative side of the filament. It is not of very great importance which connections are followed out, although it would be advisable to keep all returns, including those of by-pass condensers, on the negative side of the filament line.

Overloading: Due to the extreme amplification, about 55 per stage (voltage) with 201-A or DV-2 tubes, developed in the intermediate amplifier it is sometimes possible to overload the set on strong local signals. This may be overcome by some of the suggestions offered in regard to the portable super-heterodyne or by connecting grid leaks of $\frac{1}{10}$ to $\frac{1}{4}$ megohms across the radio-frequency amplifier tubes from grid to plus or minus filament.

Potentiometer Control: In the case of 201-A, DV-2, UV-199, or DV-3 tubes, the potentiometer control will probably be satisfactory in that the volume of stations may be reduced by retarding its arm toward the positive side. If this is not possible, decreasing the value of C battery on the RF tubes will remedy matters. On WD-11's or WD-12's, good control will be difficult to obtain and the C battery will have to be set at the lowest value commensurate with good

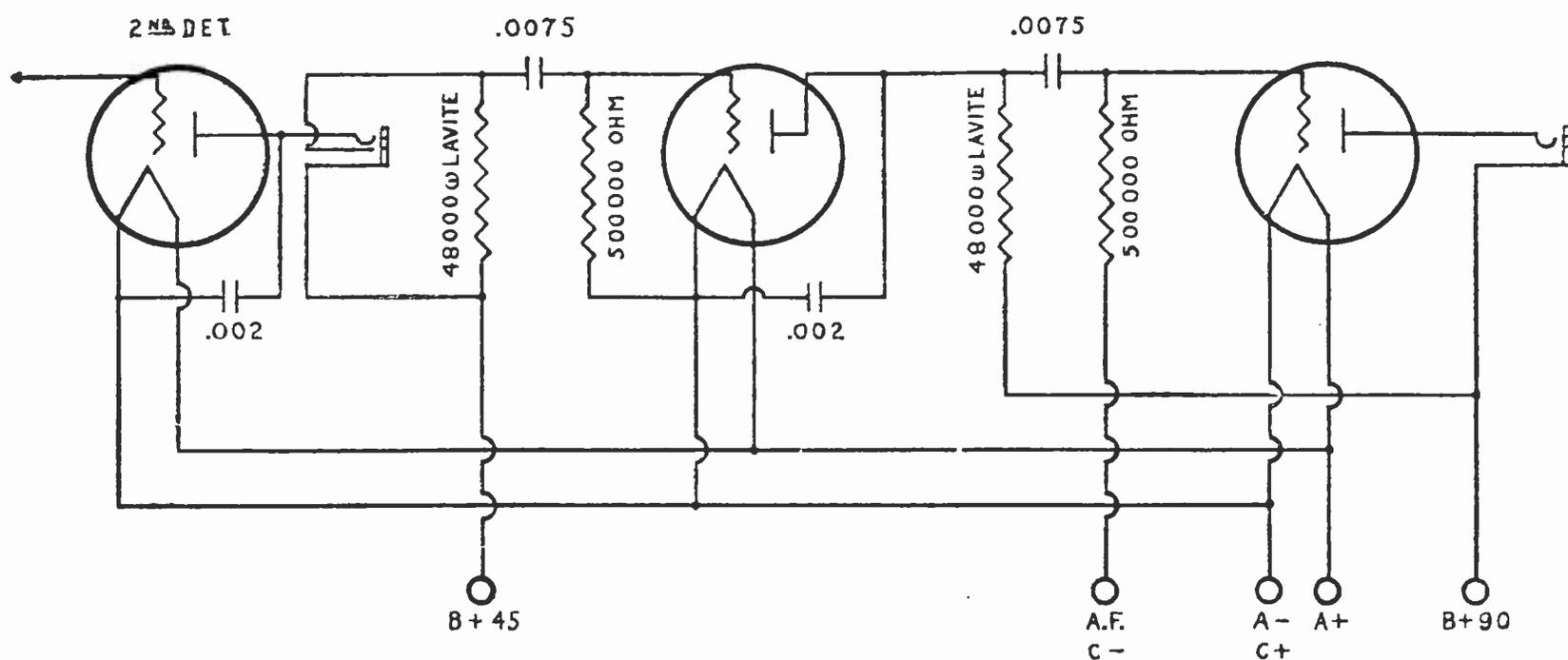


FIG. 8

Two additional stages of resistance-coupled amplification may be connected in place of the ordinary audio-frequency amplifier specified in the circuit

volume of two transformer-coupled stages. This is of no very great importance, however, since the volume obtained from the set is in practically all cases, very much more than will be needed for good loud-speaker operation.

It is suggested that lavite resistances of about 48,000 ohms be used as the plate-coupling resistances with grid leaks of from $\frac{1}{4}$ to 1 megohms. It will be advisable in this case to leave out the jacks in this amplifier and use either the detector output or the full two-stage amplifier output, as is shown in the figure. In this case, a C battery will be necessary only on the last audio stage, where it should be of approximately $4\frac{1}{2}$ volts. This is because the effective plate voltage on the first stage is only about 30 to 40 volts, whereas the effective plate voltage on the last stage is very nearly up to the full 90 of the B battery. This will be made clearer when it is realized that a 48,000 ohm resistance is in the plate circuit of the first audio stage which cuts the B voltage to approximately $\frac{1}{3}$ that of the full plate potential. Only a loud-speaker or a pair of phones is in the plate circuit of the last audio stage with the result that practically all the B battery voltage is applied directly to the tube.

SHORT WAVE RECEPTION

THERE is a growing interest in a really sensitive receiver for operation on the new low broadcasting wavelengths in the neighborhood of 100 meters.

The wavelength range of the oscillator used is about 150 to 550 meters, which is more than ample for the entire broadcasting wavelength band. This oscillator range will per-

mit reception over a range of from slightly below 150 meters to about 600, by using the lower heterodyne point at the upper end of the range, and the upper points at the lower end of the range.

It is also possible to use a harmonic of the oscillator to perform the heterodyne function. If the first harmonic, or half the wavelength of the oscillator is used, it means that the range of the oscillator, using this harmonic, would be from below 75 meters to nearly 300 meters. If it is desired to receive a 100 meter signal, the oscillator dial may be set at either of its points where a 200 meter station may have been heard. Then the harmonic will bear the proper relation to the 100 meter signal to create the necessary beat with it. This, of course, is general, but it indicates how the set would be operated.

The loop circuit would have to be changed for this work, the loop being cut to about four turns. It may be rather difficult to employ the split loop feature at these waves also. If an antenna is used, the coil to replace the loop may consist of about 20 turns of No. 16 or No. 18 DCC wire, on a three or four-inch form. The antenna coil should contain three to eight turns, depending upon individual conditions.

If a set is to be built for short wave work only, the oscillator coils could be wound with fifteen turns each in L₂ and L₃, and about six or seven turns of heavy wire in L₁.

SHORT WAVE R. F. AMPLIFIER

UNDER certain conditions the experienced fan may find it desirable to add additional R. F. amplification to either of the receivers. A condition which would

justify this would be where the atmospheric noise was not very great and where it was desired to obtain the very limit that could be gotten from a receiving system. Or, it might be that the receivers were poorly located, so far as collecting sufficient energy for their operation is concerned, yet the noise level might be very low. In either of these cases it would be possible to add a stage of R. F. amplification before the first detector tube, which would involve but one additional tuning adjustment. This adjustment would be comparatively sharp and the addition of this amplification is not recommended until the builder has operated his set for some time and is entirely familiar with its operating characteristics. This is because with three tuning dials the set would be so sharp that it would be extremely difficult to tune it without knowing where at least two of the dials should be set for a given wavelength.

The circuit for this amplification is given in Fig. 7 and the only additional equipment necessary to construct it would be an oscillator coupler, as described in the previous section, the tube with its socket and rheostat, the tuning condenser, and a balancing condenser.

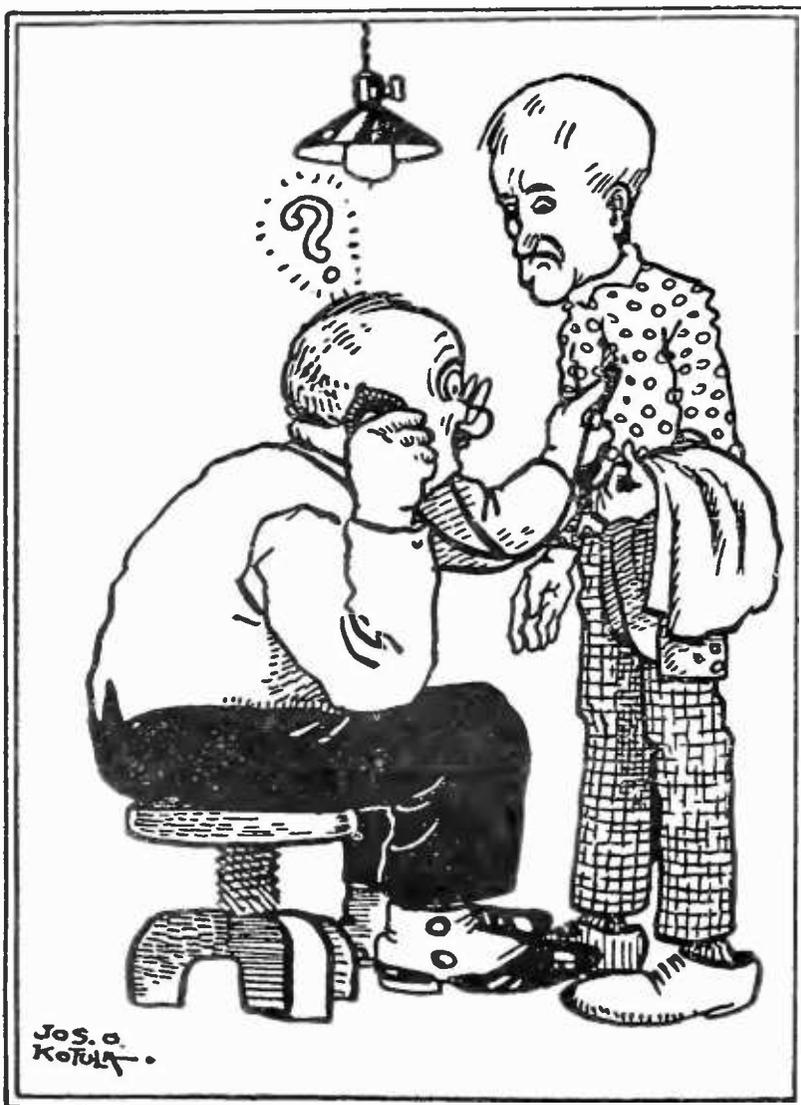
The entire amplifier could be housed in a small box which would go at the loop end of the set with three binding posts to connect it to the set and three binding posts for the

loop. It would also be necessary to bring out posts for the A and B batteries as shown in the drawing.

It will be seen that this circuit is practically the same as that of the first detector, except that the grid condenser and leak and oscillator coupling coil have been omitted.

In the plate circuit of this R. F. tube, the coupling coil of an oscillator coupler is connected. The stator windings of the coupler are brought to three binding posts on the panel of this unit and are in turn connected to the three binding posts intended for the loop on the set itself. The oscillator coupler then performs the function of the R. F. transformer. Its two stator coils with their center leads joined, form the secondary circuit, the coupling coil acting as the primary. The balancing condenser in this case is not critical as in the first detector circuit of the super and may be set practically all the way in without oscillation occurring in the R.F. stage. This condenser acts almost entirely as a neutralizing condenser, its purpose being to sharpen the tuning of the loop connected in the R. F. stage and to prevent oscillation.

The same batteries may be used for this unit as are used for the set itself, and any standard type of tube may be employed in the circuit.



FORCE OF RADIO HABIT

The Doctor: "H'm! that's strange,
Cuba ought to be on now!"

STATIC DAYS AND NIGHTS

THE BOREDOM OF RANCH LIFE IS NOW BROKEN BY RADIO

WORD AND PEN PICTURES OF THE E-BAR RANCH

By Remington Schuyler



STATIC" describes perfectly the evenings on the old ranch in South Dakota. So *static* were our evenings that in desperation we turned in along about nine o'clock of a winter's evening, bored to death with each other.

The same old faces, stories, and magazines grew terribly dog-eared. We knew the magazines from cover to cover. We knew the advertisements with the same close intimacy. We knew every yarn of the other fellow's and every "funny story." Dynamite is "static" till you wallop it. It only needed some slight wallop to start something in the close harmony of our bunk-house. It was a desperate time. You can't forever talk horses, cattle, and women.

Living the same life, doing the same things, day after day atrophied our brains. Our conversation moved sluggishly in deeply worn channels, all too familiar and threadbare.

The nearest ranch, Isaac Battleyoun's, was fifteen miles over across the broken buttes of the Key-a-pa-ha. Ike had a wax cylinder Edison; a Steinway, a pipe organ, and a daughter who could certainly play. At times my bunkie and I would ride over and sit in on some music. It was not often, for by sundown we were dog-tired, and thirty miles, what with the drifts, was no great sport after a fourteen-hour day.

We were building up the E Bar. Our days were long and full of toil. Four a. m., when it was still dark and bitterly cold we "came alive," hustled into our frozen, board-like clothes and got out and going. There were seven of us.

Six cow-hands and Bob Emory, our genial foreman. Into the frosty darkness, one of us would ride over the drifted prairies and round up the pony herd and work horses. By lantern light another chopped wood. A third pumped water for the stock and calves in the pens. The rest busied themselves pitching hay or building the board corral and branding chute. At six o'clock and barely dawn we were heartened by the familiar ring of the lustily beaten frying pan and the welcome whoop, "Come and get it." In a ravening pack we scrambled to be first into the grub house. This nine by nine end of the log cabin was also kitchen and washroom.

Hustling in the door, one slopped a dipper of icy water into the tin basin—hurriedly soaped and washed face and hands and slicked one's hair. Then on to the grabbing match at the oil cloth covered table.

At the round corral a lively scene followed. The pony herd led by the wise old bell mare had been driven in. With saddle rope dragging we stealthily stalked our horse for the day. If you were crafty enough, to mislead the horse you were after into thinking you were after some other one, then a sudden swish of the throw rope and you had your mount for the day.

Saddles were slapped on, latigoes made snug and we were off about our several businesses. Some rounded up and counted the scattered herd and threw them back on the range, then looked for strays or cattle that had "gotten down." Others set out with running gear and teams to haul logs from the "breaks"

of the Little White. The logs were needed for our bunk house which was slowly rising alongside the original ranch-house.

At noon and again at six we went through the same washing rites and ate the same grub. After supper "while we were resting" as Bob used to say, we squared and wrestled into place a few more logs on the bunk-house walls.

During the fall, the tent which "The Kid" and I slept in had been the gathering place. Now that winter was seeping down from Medicine Hat it had grown too frigid to be pleasant for gossiping.

Our new bunk-house was complete, so we gathered the clan there. Pipkin and Ambrose had one room, The Kid and I the other. Our room had more bunks and a stove. The Kid's mother had sent over some curtains and do-dads that added to the coziness.

THERE was Pipkin—an ex-cavalry man, a genial, hard riding good scout. He had come to us in the summer. "Pip" was down on his luck with a badly infected finger and arm, but with a zest for work. After he arrived we had taken turns as surgeons. A liberal use of gauze, bailing wire and tobacco quids had nursed him back to a normal use of his hand and arm, and an intense desire to work. His army stories and ditties had given us quite a few thrills and furnished entertainment. But he was running dry. We knew his Sergeant McGillicuddy tales almost perfectly.

Ambrose, nick-named "Old Nick," was a dirty, unshaven, unbathed rascal. He had a flow of language which was an undammed stream of obscene profanity. He couldn't



even ask for a smoke without G—D—ing it. And yet his folks were sturdy pious New Englanders. The daguerrotypes of his parents and grandparents showed fine stock, dependable citizens. He had slipped from his earlier snubbing post and was a disgusting specimen. A bath with him consisted of squirting water on himself and scrubbing white spots with a sock. If ever his spots seemed in danger of overlapping he would quit disgustedly, muttering he was getting "too ——— particular". Then another month would add its grime and grit unmolested.

"The Kid" was young, handsome, well knit, the son of a teacher in the Indian day schools; raised on the prairies, a good cow hand and rider. But his mind dwelt constantly on new conquests to be made and the remembrance of former ones. A year as a fireman on the Missouri and Elkhorn; another with the Express Company, these were the only times he thought he had really lived. They were his only vivid experiences. He constantly pined for what he longingly called God's City—Chicago.

For my part they knew all I could tell them of my native state, Missouri. My camping experiences down in the Ozarks among the mountain people were the only bits of conversation that got by. So I would plunk my old guitar and sing Negro camp meeting songs and the latest popular hits I had learned before leaving St. Louis. "Goo Goo Eyes" "Under the Bamboo Tree" and such like.

The two Indians were just so much smoky blanketed background. They silently rolled and swiftly smoked cigarettes. Like most Indians who smoke they resembled an engine starting up. A series of short sharp puffs, then a pause. Another series and then that cigarette was about done.

Often I tried to draw them into the conversation. But "The Kid" and Ambrose thought only of them as "damned Injuns," and barely tolerated them in our circle.

Eagle Horn Dog was a noted singer of the Sioux. That is, he made new songs and knew all the old ones. He had a fine voice and loved to sing. Sometimes I could get him to favor us. It was stirring to listen as he thumped the bunk edge with a quirt and sang "Sitting Bull's Defiance" or "Go You to War?" or "Horses I am Seeking." Last year when I broadcast my western experiences from WEA, I sang some of the songs which I had learned from Eagle Horn. Eagle Horn is gone to the Happy Hunting Grounds. Enlisting immediately when we entered the World War, he

went across with the First Division. He was among the first to fall.

Except for an occasional grunt, "Was-Tay" (good), "Waw-wee" (the Hawk) never made himself prominent. He seemed to be glad of the warmth and the company, but otherwise was merely a blur in the smoky background.

Bob, our foreman, was our best entertainer. He had grown up in the saddle. He had known cattle and horses all his life. He had been in on the last of the buffalo running. In his youth he had drifted over many ranges. He told tales of "The Panhandle," Montana, Idaho, and the "Ute" country near Carson Sinks. The Dakotas were as familiar to him as his own quarter sections. His knowledge of cattle ways and pony tricks seemed uncanny.

When the mood was on him he could recount thrilling experiences in a stilted matter-of-fact way. He had been in Spotted Tail's tepee when Crow Dog had ridden up and shot "Old Spot" as a traitor to the tribe's best interests. A moment later, sharp knives were slicing the tepee to ribbons while stone mauls were smashing the poles down about his ears. The uproar and excitement following the slaying, he told of as if he had been but a guest at a tea party. Yet in actual fact, he barely escaped alive by jumping his horse down a cut bank and riding across a narrow swift river on a one log bridge.

SO FOR a month or two we had good entertainment. But as the snow banked up around our log houses, and blizzard and snow storm followed each other in steady procession, sweeping down on us over hundreds of miles of treeless prairie from distant Saskatchewan, we gradually got worn to a frazzle.

We tried by superhuman efforts to hold the herd from drifting too far with the blizzards, then worked them back on to our range with painful effort, almost carrying in the weak-

ened steers. Now and then we rescued some snow-blind, snow-bound freighter. And again when a windless snowfall had buried even the ridges, we fared forth with the pony herd. All day we let them paw through to the grass and then drove them on to another pawing contest. The cattle herd followed, and once having smelled the grass exposed by the ponies they nosed out a meagre meal. At night the tired hungry ponies were given some hay and then set adrift to shift for themselves.

The prairie wind seldom ceased. All day it buffeted one. The drifts in the gullies smothered any one who got off the ridges. It was struggle and fiendish toil. Then an evening as pictured in the beginning—monotonous in its sameness.

But once a month came a rift in our clouded horizons. *The Rosebud*, a four-page newspaper, printed at the Agency School by Indians would arrive by some circuitous hand to hand route. But bedraggled and mussed though it was, it brought news from

the outside world. We had new things to talk about.

In memory I can see Old Bob, leaning back in an old broken backed chair, following the text with one finger and laboriously reading and gloriously mis-pronouncing such interesting items as "John Comes-Out-Holy" has been visiting in Cut Meat with his old friend "Brings-White" or "Bill Bates and Mack Marsten have been out gunning for antelope in the Bad Lands, or "Doug" McChesney, Agency Brand: Inspector, was down near Olaf Nelson's ranch checking up on Olaf's report of too many strays from the settlers down in Nebraska, or perhaps these bits of Agency humor: "The stork has left a new Annuity Baby at Mrs. Chased-by-Bears. Louis Ribideau will have one more papoose by next Annuity Payment Day. Good luck to you Louie. We hope it will be twins."

And so the wonderful news of the outside world dribbled in to us.

Except for *The Rosebud* and an occasional

Where It Drips Boredom

Remington Schuyler, who is well known to readers of this magazine through the many excellent covers he has done for us, spent considerable time among a certain type of real Westerners to whom we all attach a great deal of "romance". And most of us have thought of the life of the cow-puncher and Indian as something resplendently virile and somehow romantic. We think most often of radio in the city or small town and on the farm, but here is a view of what radio is doing in the genuine "open spaces." The sketches accompanying this story were made some years ago by Mr. Schuyler on the ground, and our cover this month shows one of the typical ranch houses in this country with radio holding its new sway.

—THE EDITOR.



"THE KID"

drifting cowboy we had lost contact with the outside. We were thrown so much on each other that it looked like a free for all would be the only safety valve. There was no telephone. "No nawthing" as Bob used to say.

IT IS a winter's night on the old E-Bar in the year 1923. By hard riding I dropped the drifted miles behind and received a rousing welcome as I pulled up at dusk.

The supper is much the same and the old wash basin and dipper still do duty. But the bunch seems changed. Bob is there, grayer and more wrinkled, Pipkin much the same. In old Ambrose there is a marked change. He seems too ungodly meek and thoughtful. He gets through first and disappears toward the bunk house. We follow leisurely and as we come close to the door I notice for the first time a rude antenna on the roof.

"Sh-h" says Bob as I start to congratulate them. "Slip up here and have a look-see at the old cuss."

Through the small window there is Ambrose hunched down in front of a "super-het" set.

Through the thin panels of the door comes a voice familiar through all the country. That tough old ex-service man, McNeary, with his grand voice and wonderful imagination telling bedtime stories—and old hard-boiled Ambrose listening-in on the loud speaker. When WOR has signed off we stomp loudly up to the door and bursting in, find Ambrose trying to get WEA-F.

At last we succeed and coming over the air is Oskenonton, the Mohawk Singer singing an Indian program. His rich voice and the thump of the water drum comes clearly. At the end he sings "Sitting Bull's Defiance" and one of old Eagle Horn's plaintive melodies.

"Jest like old times ain't it Cinchbuckle?" says Bob. "Can't you jest hearn Eagle Horn a-yowling? I'll tell a man we sure got the world by the tail with a down hill pull."

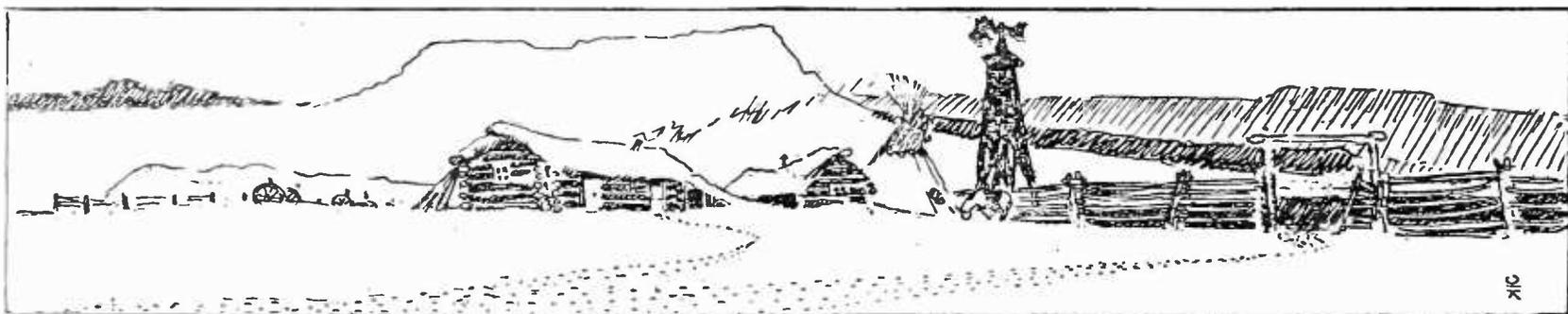
"When these here dinkuses furst came out we didn't put no stock in them," says Pipkin. "But Johnny in at the Agency got one and when we all heered it, why man alive we just cottoned to it."

"We hocked our German silver trappings and we're way behind on the pay, but I'd eat my socks if I had to to jest keep the dinkus in prime shape."

It was funny to hear their remarks about the different performers.

"Why," says Bob, "We nearly bought a vacuum cleaner, after listening to a feller who was 'loco' about it. It do beat all what you can learn."

And so each evening while I was there we had a radio banquet. Gone was the old dismal gloom of snow-bound isolation. A wider world had stalked across the frozen prairies and opened up their lives. They were *living* nowadays and happy. In an old shed they had the wreck of a flivver jacked up. It was Ambrose's job to keep her running enough to store the battery. The three old cronies Bob, Pipkin, and Ambrose still clung to the remnants of the old E Bar doing freight-carrying carrying the mail, and Bob now and then had put in a few years as instructor to the Indians in farming. But the tie that made the old E Bar a rallying point—a home for all of them, was radio.



Notes on Neutralizing the Roberts Circuit

By JOHN B. BRENNAN

RADIO receivers, especially those using the regenerative principle, should not be allowed to radiate energy into space, causing unnecessary interference with other receivers in the vicinity.

In the Roberts circuit, radiation is prevented by the use of the coil N and the condenser connected to the grid of the first tube and the coil N. This coil N, because of its peculiar connection, prevents oscillation in the plate circuit of the first tube, and the condenser, when properly adjusted, should exactly equal the capacity between the grid and plate of the tube. (See Fig. 4). Mr. Roberts describes the theory of this action as follows:

Whatever alternating voltage exists on the plate of the tube must be due to alternating magnetic flux linking P. But the same flux also links the similar winding N, which is connected the other way round, and hence, acting through C, produces an effect on the grid which is equal and opposite to that produced by P acting through the grid-plate capacity of the tube. Thus the net feed back, or tendency to regenerate is completely neutralized or balanced.

Having now determined the necessity for this neutralization, we must know how to

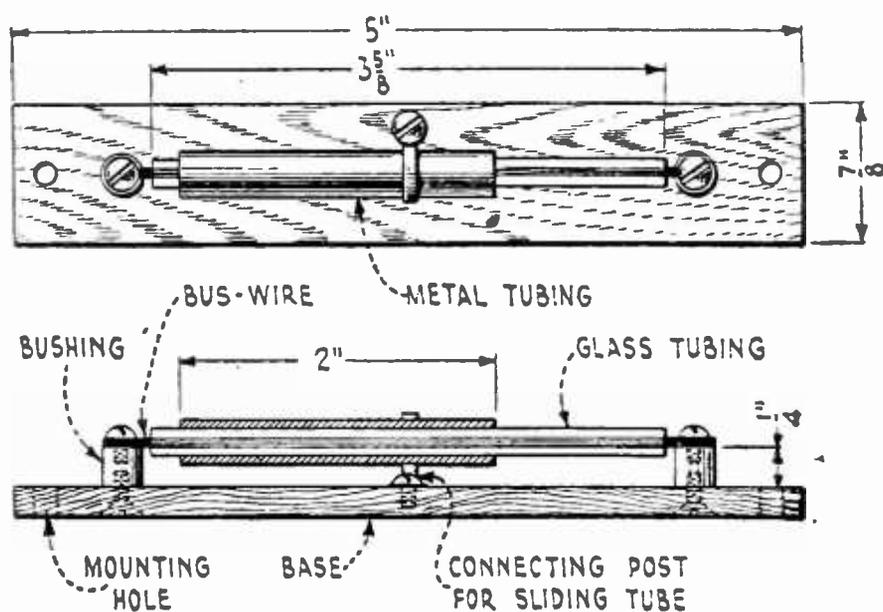


FIG. 1

How to make your own neutralizing condenser. Bakelite or formica may be substituted for the hardwood base. If it is desired, the right side mounting may be eliminated, making it possible to slide the tubing over the end. This will allow a greater range of neutralization

apply this method of neutralization to the receiver.

To do that, one proceeds as follows: turn the tickler control well up against the secondary; light the filaments of the tubes and rotate both dials until the carrier wave or "squeal" of a station is located. Now adjust the dials for maximum signal strength and then lower the tickler coil to loosen the coupling between it and the secondary.

Now, by rotating the left hand dial slowly, the intensity of the squeal will be varied as the dial is moved. The intensity depends on the amount and the direction that the dial is turned.

On another page are shown two curves, which illustrate incorrect and extremes of unbalanced neutralization which are occasionally experienced in the Roberts circuit. To operate this receiver successfully without radiation, the neutralizer must be correctly adjusted. Therefore a bit of instruction on this important feature will not be amiss.

The best home-made type of neutralizer is made from a length of bus bar with spaghetti or glass insulation and a piece of copper gasoline tubing for the sliding member. Fig. 1 gives the dimensions for such a unit.

In determining whether or not your receiver is properly neutralized, one must visualize the rise and fall in squeal intensity.

The curves in the two graphs shown in Figs. 2 and 3 are somewhat exaggerated to make it easier to understand the action of the neutralizer.

HOW TO TEST YOUR SET FOR IMPROPER NEUTRALIZATION

BY ROTATING the dial (Fig. 2) in the direction of the arrow, we find a quiet spot X at the reading 50 and extending one or two degrees either side of it. By continuing slowly to rotate the dial, we immediately reach the full squeal intensity indicated at B. As the dial continues to rotate, the squeal intensity gradually decreases to A. On the other

side of X, rotating the dial in the opposite direction, we immediately reach the full squeal intensity as before at C, but here the decrease in intensity is very rapid ending at D.

In Fig. 3 the action is just the opposite.

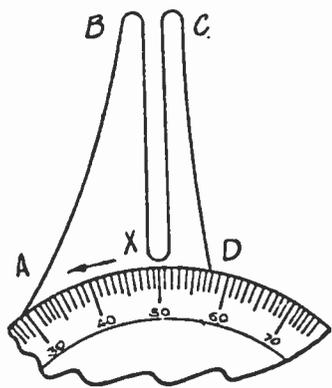


FIG. 2

An example of extremely unbalanced neutralization.

Visualize your own "squeal curve" on condenser C₁ in the Roberts circuit

The quiet point X is found at 50. Rotating the dial in the direction of the arrow, the full squeal intensity is immediately reached at B and then rapidly decreases to A. On the other side of 50 we immediately reach the full squeal intensity at C which gradually diminishes to D.

These two examples of improperly balanced neutralization will suggest to the constructor the proper setting of the

condenser. The graph showing the proper balanced squeal curve appeared in the article on the four-tube receiver.

Obviously, if your receiver produces squeals similar to those indicated in Figs. 2 or 3, the condenser tubing must be shifted until each section on either side of the quiet spot (indicated in the graph,) is equal and balanced.

It is well to remember that the same setting will not always be correct for all tubes. The Roberts receiver will operate equally well on all types of standard tubes. In the first description of the Roberts circuit appearing in the April number, two types of tubes were used, a UV-201-A and a UV-199. The only reason for this arrangement was the saving of .19 ampere in filament consumption. Naturally the neutralizer setting for these tubes would not work out efficiently if WD-12's were substituted.

In determining the location of the squeal, this characteristic noise should not be mistaken for forced or over-regeneration due to the use of high B battery voltage applied to the plate of the detector tube. However, in this operation, the tickler coil should be turned well up

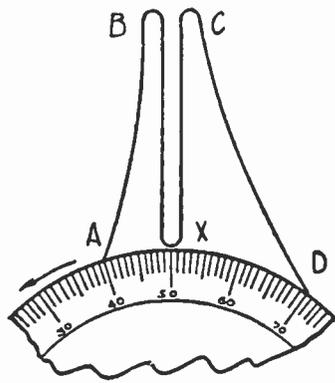


FIG. 3

Showing the other extreme of unbalanced neutralization. The correct "squeal curve" will result from a neutralizer condenser setting equal to the average of the settings in Figs. 2 and 3

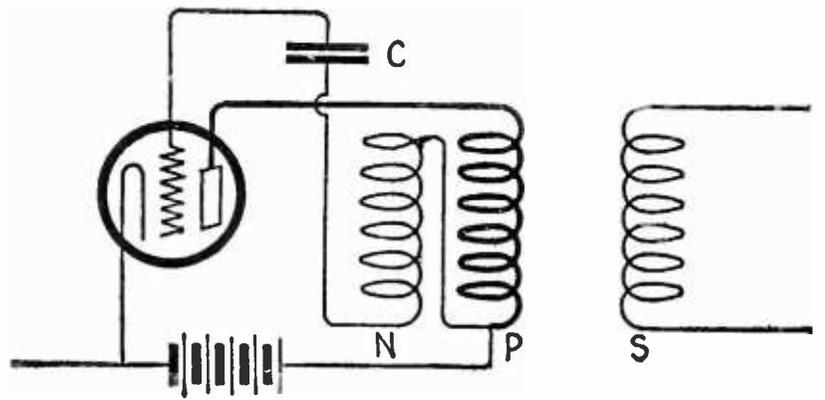


FIG. 4

The heart of the Roberts circuit. Any standard tuned radio-frequency amplifier may be neutralized by using the inductance N and the capacity C. In the Roberts circuit, S is made of 44 turns of No. 22 dcc wire wound on a spiderweb form having 13 teeth. The first turn diameter is $2\frac{1}{8}$ inches. The outside diameter is 5 inches. S is shunted by a .0005 mfd. variable condenser, preferably a vernier. Coil N-P is wound on a similar form. A pair of wires, of different colors for ease in winding and connection, are wound for 20 turns. For this coil, use No. 26 dcc wire. The outside turn of one of the wires is connected to the plate and its other end (inside) is connected to the outside lead of the other wire. From this point, a lead is brought to the B battery or phones. The inside end of the other coil attaches to the neutralizing condenser C which is connected to the grid of the tube.

against the secondary. Once the squeal of a station has been located, the volume may be reduced at will by decreasing the coupling between the tickler and secondary coils.

To adjust the regenerative action so that there is no sudden 'plop' of the regenerative squeal, regulate the detector B voltage to its most effective value for the particular detector tube used.

ANOTHER GOOD TEST

ONE of our readers, Mr. W. A. Golden, Jr., of Santa Ana, Calif., writes us as follows:

A very easy and effective method of determining the point of neutralization can be had by the use of a good crystal detector and a pair of phones connected across the antenna and ground binding posts. First tune-in a strong station in the regular manner, allowing the detector tube to oscillate and form an audible beat note with the carrier wave of the station; then listen to the phones connected in series with the crystal detector between the antenna and ground and, if the set is not neutralized, this beat note will be heard. Now adjust the small neutralizing condenser until this beat note becomes inaudible. It is a good idea when doing this to listen to the phones in the plate circuit of the tube set once in a while so as to be sure that the detector continues to oscillate and form the audible beat note at all times while the neutralizing condenser is being adjusted. When the note can no longer be heard in the phones between the antenna and ground, the set is adjusted properly and should be left permanently in this condition.

I have found this a very simple and efficient means of performing this otherwise rather difficult task.

The coil winding data contained in the May RADIO BROADCAST is herewith reprinted with slight elaborations.

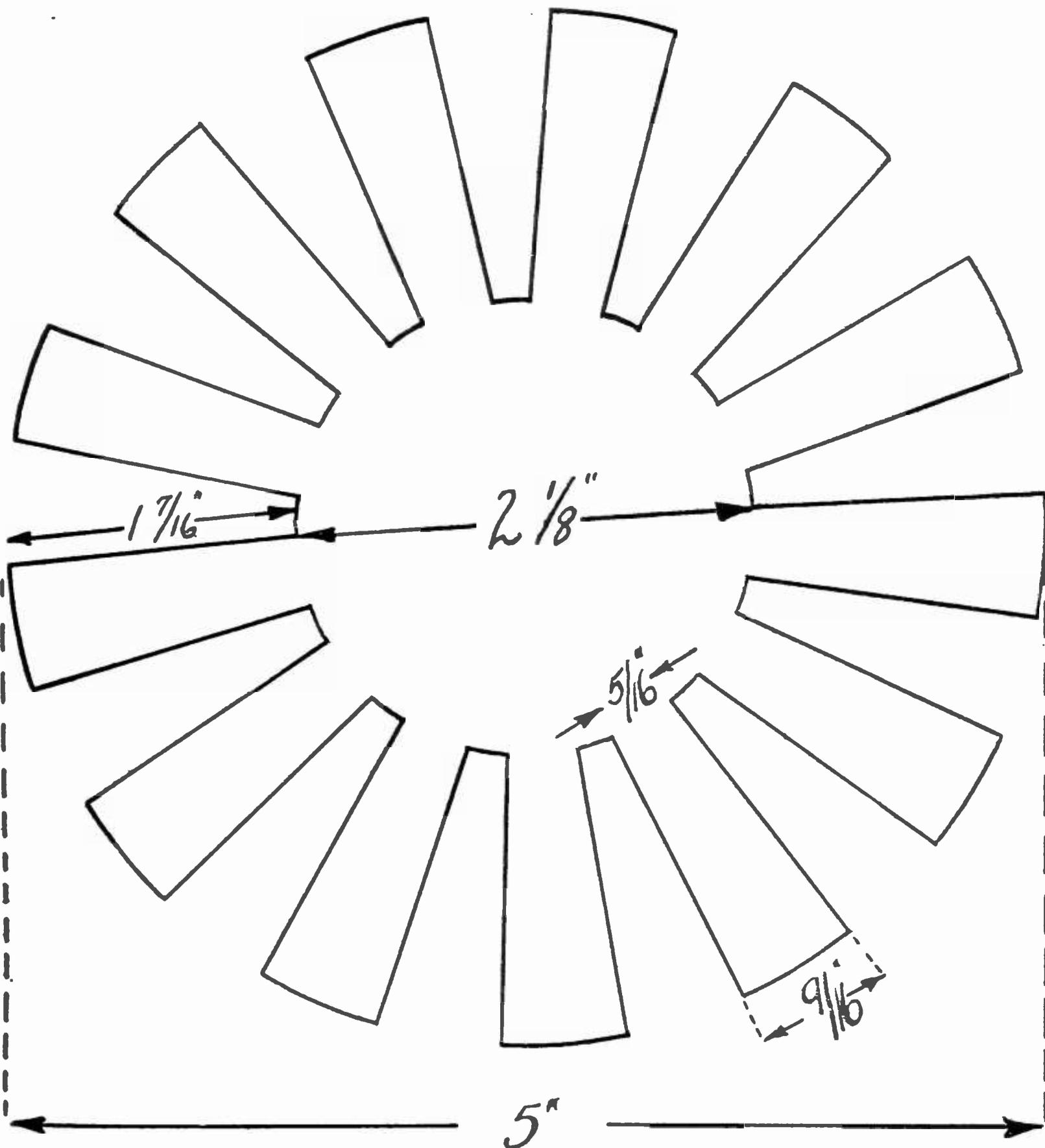
A WINDING FORM FOR THE ROBERTS COILS

IT IS recommended that double cotton covered wire be used instead of silk covered wire as the latter is more apt to wear away

more quickly. Enamel covered wire may be used, providing the builder is sure there are no points at which the insulation has worn away.

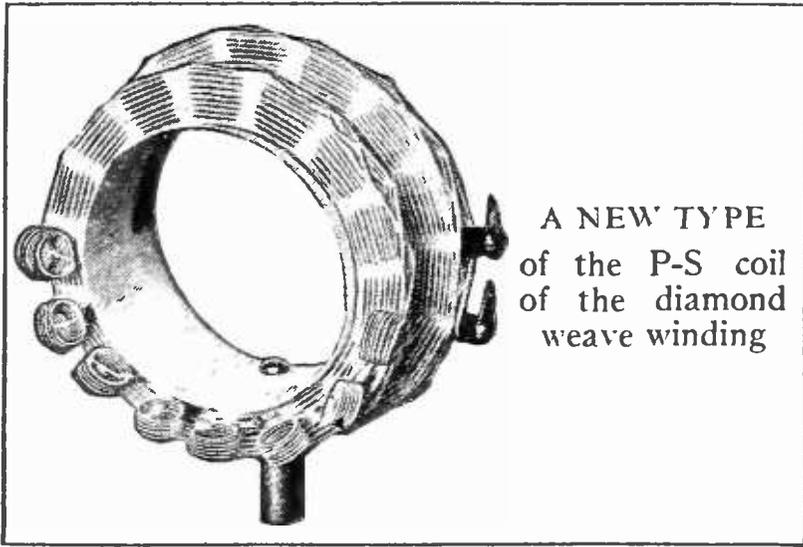
Coils A-S and T are all wound the same way, that is, over two spokes and then under two spokes of the spiderweb form. The coil N-P is wound over one, then under one spoke.

The number of coil turns for the several inductances is listed below the spiderweb template. For those who wish to experiment

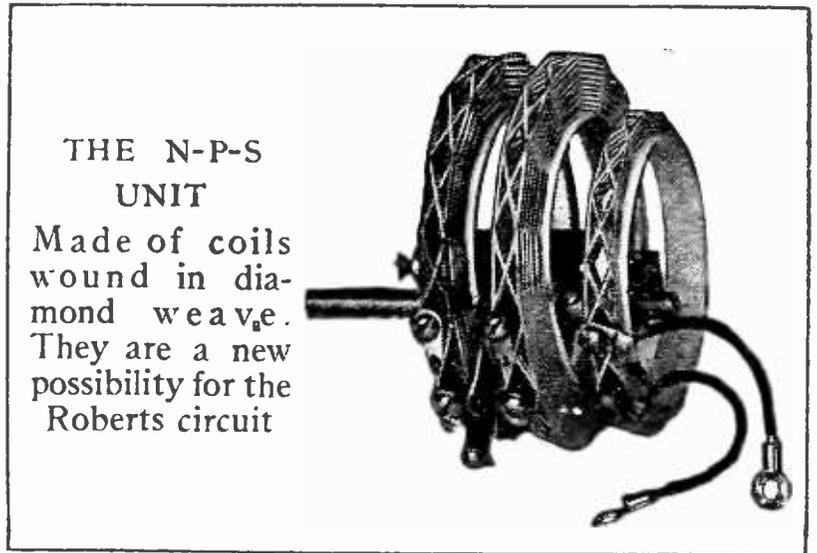


A TEMPLATE FOR THE SPIDER WEB COILS

Exact size. The winding for these coils, as used in various parts of the Roberts circuit and indicated by the letters are as follows: A: 40 turns No. 22 dcc wire tapped 1-2-5-10-20-30-40; S1: 44 turns No. 22 dcc wire; N: 20 turns No. 26 dcc wire; P: 20 turns No. 26 dcc wire (two wires of N and P are wound parallel as a pair); S2: 44 turns No. 22 dcc wire; T: 18 turns No. 22 dcc wire. Coils A, S1, S2 and T are each individually wound under two and over two spokes of the form. The NP coil is wound under one and over one spoke



A NEW TYPE of the P-S coil of the diamond weave winding



THE N-P-S UNIT

Made of coils wound in diamond weave. They are a new possibility for the Roberts circuit

with cylindrical coils, it is suggested that they use the same number of turns as specified for the spiderwebs and then increase or decrease the number of turns, as the case may be, until a satisfactory arrangement is provided.

NEW COILS FOR THE TWO AND FOUR TUBE KNOCKOUT

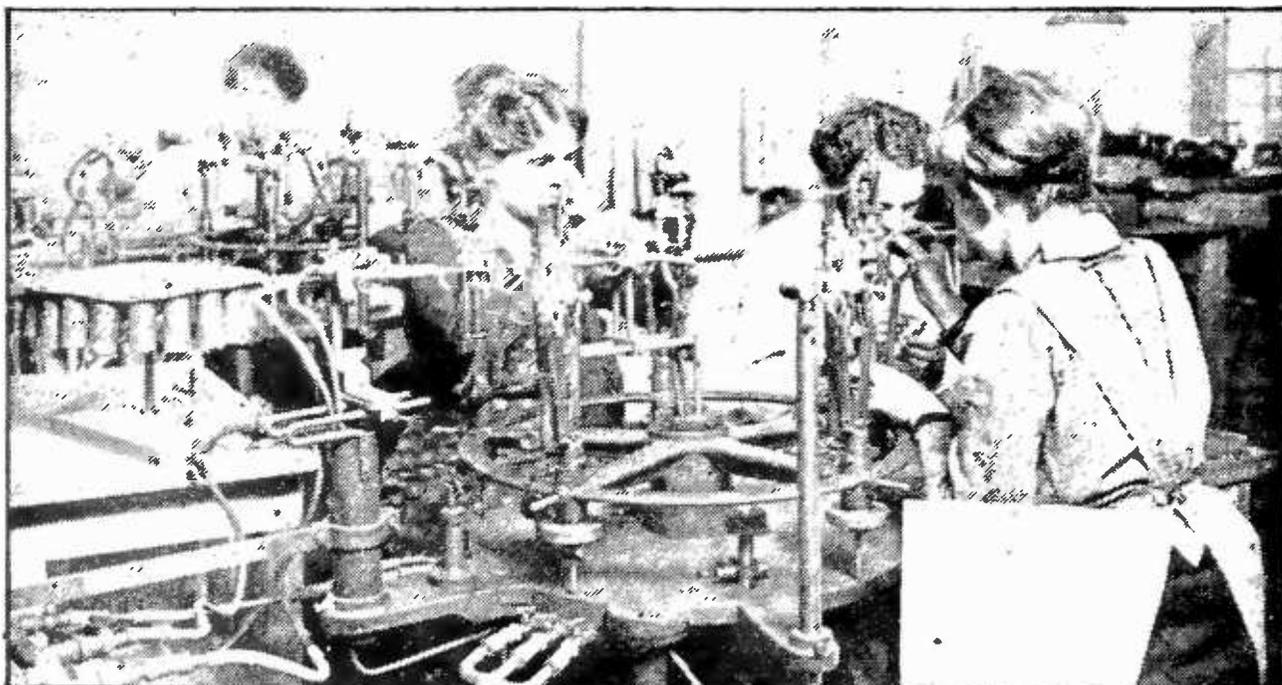
SOME of our readers have reported some difficulties in making the two- and four-tube knockout receivers employing the Roberts circuit perform satisfactorily. We have found that in many instances this difficulty has been caused by faulty manufacture in connection with the spiderweb coils. In some of these units, the coils were wound in the wrong direction, and occasionally turns in one or more of the coils have been short-circuited.

During the past few weeks, we have experimented rather extensively with the coils illustrated here, which are made by the F. W. Sickles Company, of Springfield, Massachusetts, and have found that the difficulties re-

ferred to in the case of the spiderwebs were not encountered. With good condensers we have discovered that these coils will cover a wider band of wavelengths than was possible with the spiderwebs, permitting reception on amateur waves at the lower end and commercial stations at the upper.

The following numbers of RADIO BROADCAST have contained constructional and operating information about the Roberts circuits.

RADIO BROADCAST for April, 1924,	pages	456 to 460
" " " May, "	"	73 to 78
" " " July, "	"	72
" " " August "	"	279 to 285
" " " September	"	and 308 to 314
" " " October	"	379 to 386
" " " November	"	and 438
" " " November	"	490 to 497
" " " November	"	60 to 62
" " " December	"	and 112
" " " December	"	279 to 281



A CORNER IN A GERMAN TUBE FACTORY

The German Radio Patents

The History of Certain Important Patents Seized During the War, and Now Released for General Use

ONE of the outstanding events in the radio patent field took place Oct. 30, 1924, when the Navy Department decided to issue licenses to approximately sixty independent radio manufacturers under 129 German patents seized by the Alien Property Custodian during the World War.

Early in 1923, application for the patents had been filed, but no decisive action was taken by the Washington authorities. The cooperation of Congressman Fred Britten of Chicago, the National Association of Broadcasters, and the Radio Manufacturers' Association was enlisted.

The majority of the patents and applications involved were originally owned by the Telefunken Company, a German corporation. Among their patents is the controlling patent covering tuned radio frequency amplification—the well-known Wilhelm Schloemilch and Otto von Bronk patent. Under a series of contracts, the first dated Feb. 21, 1913, substantial rights in these patents and applications were assigned by the Telefunken Company to the Atlantic Communication Company, a German corporation organized under the laws of the State of New York.

Under the provision of the Trading With the Enemy Act, as amended, the Alien Property Custodian seized all right, title, and interest in and to these letters patent and application, which remained in the Telefunken

Company, and simultaneously took over the Atlantic Communication Company.

Under the provisions of the Trading With the Enemy Act, as amended, the Alien Property Custodian on Feb. 5, 1919, sold to the Secretary of the Navy, representing the United States, all right, title, and interest in and to the said patents, which had been vested in the Atlantic Communication Company and acquired by him from it. Next day the Custodian also sold to the Secretary of the Navy all right, title, and interest in and to the patents and applications which had remained in the Telefunken Company after the assign-

ment to the Atlantic Communication Company, and which had been acquired by the Custodian.

These sales were outright, without any limitations, and covered all the rights acquired by the Government. The sale expressly includes "the sole and exclusive right, license, and authority to manufacture or cause to be manufactured within the United States, its Territories and dependencies, and within the Republic of Cuba, and the right to sell and install, to use and to grant the right to use. . . ."

THE SALE IS LEGAL

THERE is no question about the legality of sales of this nature. Title to property so acquired vests in the United States. The Attorney General has so decided.

It is also established that the grant of a revocable, non-exclusive



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CONGRESSMAN FRED BRITTEN
Of Illinois, in an unconventional attitude. Mr. Britten was influential in having the radio patent situation clarified according to the recent ruling of the Attorney General

license to use patents valuable to the manufacture of radio apparatus is well within the discretion of the Secretary of the Navy.

On Aug. 5, 1920, the Secretary of the Navy granted to the International Radio Telegraph Company a non-exclusive, irrevocable license, without royalty, to make, use, and sell for the purposes and to the extent which the department has a right to do the inventions covered by the patents.

The theory on which the independent manufacturers requested grant of license was that such grant would tend to advance the welfare of the people of the United States and would promote a healthy competition in the manufacture and sale of radio apparatus; that to withhold such license would tend to injure the public welfare by tending to promote monopoly contrary to the policy declared by the Sherman act; that the denial of the license to the applicants would make the International Radio Telegraph Company the only licensee, which would be inconsistent with governmental policy as to monopoly.

As a part consideration for granting the license, the independent radio manufacturers agreed to grant to the United States of America, represented by the Secretary of the Navy, a non-transferable, non-exclusive license under United States letters patent which they now own or may hereafter own during the term of the agreement, to make or have made for it and use for governmental purposes apparatus utilizing or embodying

the inventions of their patents, but not for sale.

It is claimed that this grant of license by the Navy Department to the independent radio manufacturers will completely change the complexion of patent litigation.

One of the chief obstacles to the greatest development of the industry is thus removed. The complexities of the radio patent situation have been minimized.

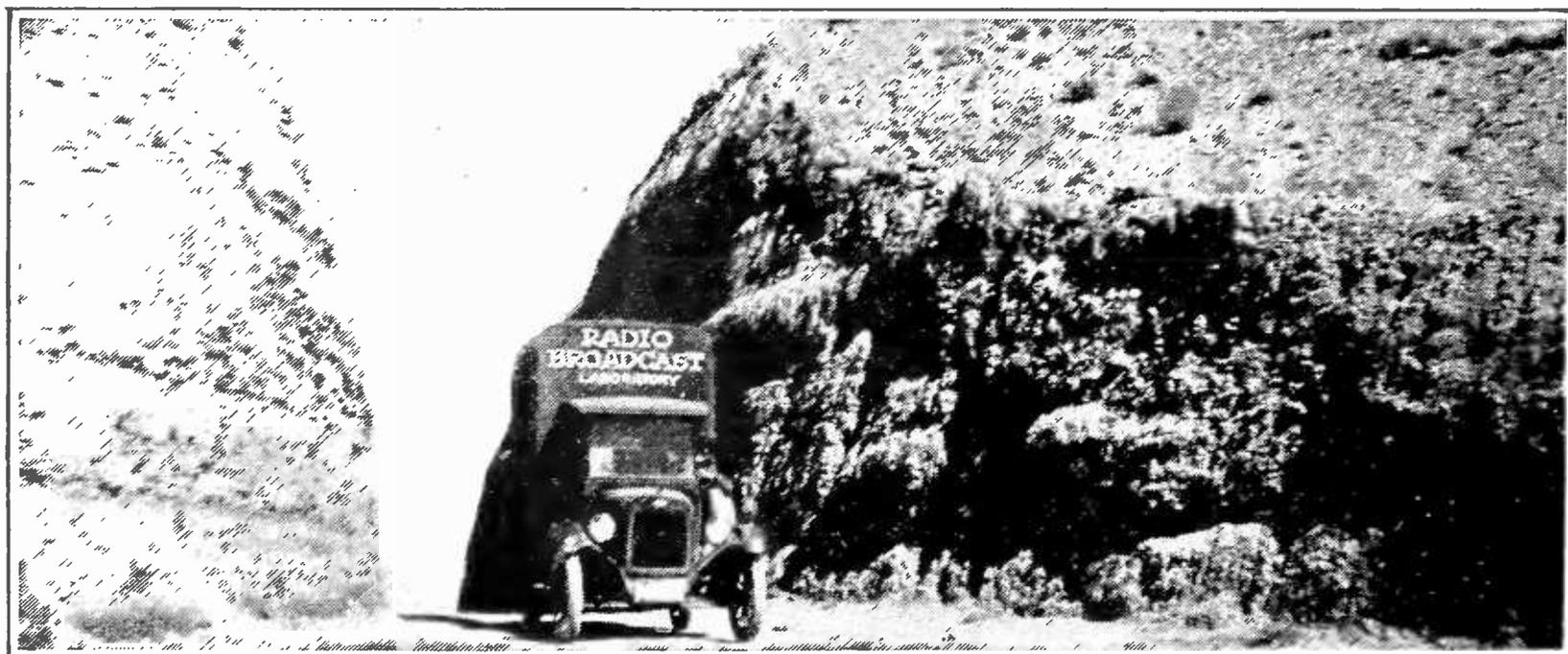
A "muffler" or "blocking" tube is a vacuum tube used in a special circuit to eliminate radiation from a receiving set. The patent which covers this method of preventing radiation is owned by the United States Navy Department. Proposals have been made to release the invention to the public so that American manufacturers can develop a device to stop the interference caused by radiation of receivers.

The patent was originally issued on Feb. 17, 1914, by the United States Patent Office to two Germans, Wilhelm Schloemilch and Otto von Bronk. The patent is 1,087,892 and is titled "Means for Receiving Electrical Oscillations."

Since this patent was finally granted during the World War to citizens of Germany it was seized by the Alien Property Custodian Jan. 28, 1919. It was sold by the Alien Property Custodian on Feb. 6, 1919, to the United States Government as represented by the Secretary of the Navy. The legal title now belongs to the United States Navy Department.—*New York Times*.

THE COVERED WAGON IN NEW MEXICO

Captain Irwin navigating a pass through the mountains in New Mexico on his way to California. He is now in California where great interest is being shown in the wagon and its cargo of receivers developed in the RADIO BROADCAST LABORATORY



Principles of Feed Back Circuits

Various Applications of this Method, Regeneration, to Receivers—A Simplified Explanation

WHAT MAKES THE WHEELS GO 'ROUND: IX

BY WALTER VAN B. ROBERTS

IT IS particularly fitting that this installment of Mr. Roberts's interesting series of technical discussions which we have been printing since the March, 1924, RADIO BROADCAST should have to do with regeneration and the feed back principle, for the interesting application of that method is one of the features of his now famous Roberts Knock-Out circuit. Many wild claims are being made these days for various neutralizing circuits, and good radio terms are being played with fast and loose. Some of Mr. Roberts's remarks may serve to clear up misunderstandings which exaggerated claims have caused. This installment is quite worth the reading.—THE EDITOR.

BESIEGED on all sides by new circuits bearing peculiar Greekish names such as Homodyne, Neutrodyne, Pliodyne, and Superdyne, and others less mysterious-sounding but equally impressive, such as regenerative and super-regenerative, the radio enthusiast will do well to deepen his understanding of the principle of "feed back," upon which the operation of most receiving circuits depends in greater or less degree.

Fundamentally, the idea of "feed back" is quite simple: energy in the form of alternating current is picked up by the antenna and amplified by one or more vacuum tubes. Some of the amplified alternating current energy is then used to produce a voltage that is fed back to the antenna or other part of the circuit. In the simple regenerative circuit, the voltage thus fed back into the antenna increases the current in the antenna, and hence

increases the strength of the signals. Figs. 58 and 59 are familiar single-circuit regenerative receivers working in this fashion. In Fig. 1, voltage is fed back into the antenna circuit by the coupling to the coil L of the coil T (the tickler) which carries the amplified alternating current.

74. THE TUNED PLATE CIRCUIT

IN FIG. 59, the voltage produced by the amplified current flowing through the variometer V is fed back to the antenna circuit through the capacity (shown in Fig. 59, as a small condenser drawn in dotted lines) that exists inside the tube between the grid and plate and the wires leading to them.

This latter is often called a "tuned plate circuit" regenerative receiver, but it is easy to see that the plate circuit is *not* tuned, at least not in the ordinary sense of the word, because the amount of inductance in the variometer required for regeneration is very largely determined by the filament current and B battery voltage, whereas the inductance required for tuning in the ordinary sense is determined only by the frequency of the signal.

75. RELATION OF VOLTAGE PHASE TO FEED BACK

SO FAR, only simple special cases of feed back have been considered. In general, feed back has two features:

1. The amount of voltage fed back, and
2. The *phase* of the voltage fed back.

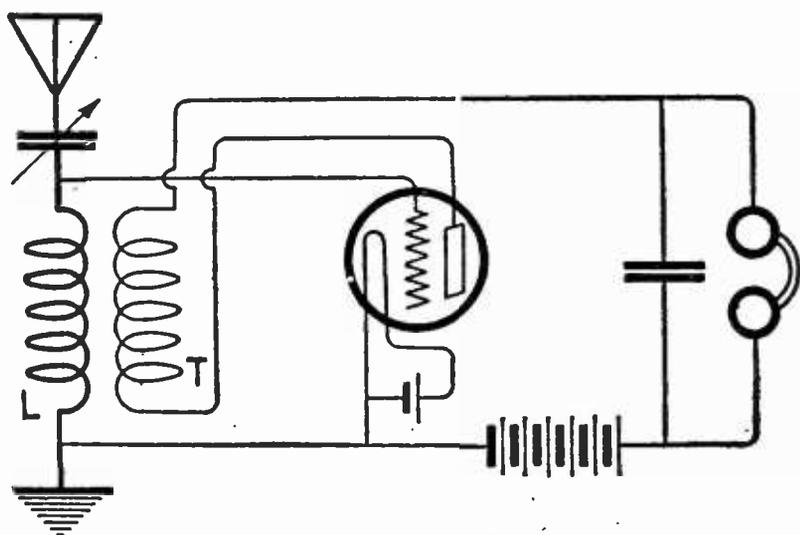


FIG. 58

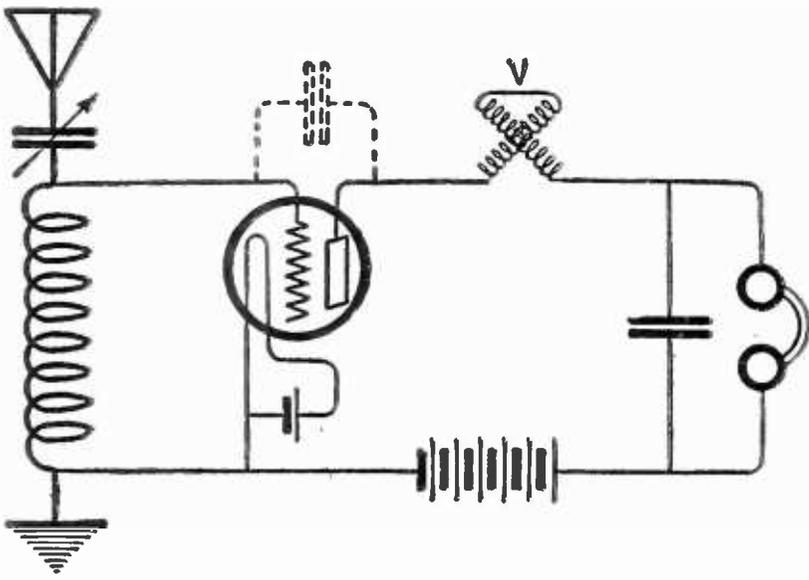


FIG. 59

While a complete explanation of the word "phase" would be too much to include here, yet those unfamiliar with it may be able to get an idea of its meaning from the following: Consider the familiar circuit of Fig. 58. Regeneration is accomplished by bringing the feed back coil T up close to the antenna coil L. Now suppose that coil T is turned around so as to present its other side to L without changing the distance between them. (Or, what is

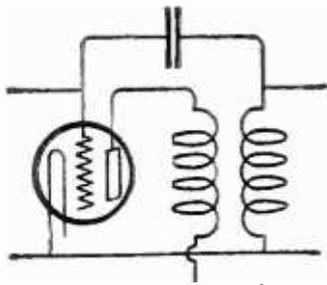


FIG. 60

the same thing, the connections to T are reversed). The *amount* of voltage fed back into the antenna circuit will be unaltered but its *phase* will be reversed, or expressed otherwise, its phase will be changed by 180 degrees. It might seem reasonable to suppose that if we turned the tickler coil only, say, a tenth of the way around we would alter the phase of the feed back by 18°. This is however not the case. In this simple circuit we can adjust the amount of feed back to whatever we want, but the only control we have over its

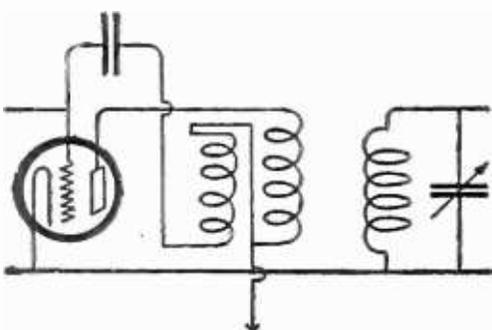


FIG. 61

phase is the choice of the two values 180° apart. If, by reversing the connections to T, we get the wrong one, the result is that instead of *regeneration* we will have what might be called *degeneration*, or weakening of the signals. In between these two extremes there are other possibilities. If we could manage somehow to feed back a voltage having a phase 90° different from those considered above, there would be no effect upon the signals. Feed backs having other phases cause more or less regeneration or degeneration.

76. HOW CORRECT PHASE IS ATTAINED

WHENEVER feed back is desired, whether for regeneration or to neutralize some undesired feed back, it should be supplied not only in the correct amount, but also in the correct phase. In practice, a small error in phase is not serious, as the feed back can be considered to be composed of two feed backs, one having just the right phase and the other being off by 90° and hence having no effect at all. Theoretically however it would be desirable to have complete control over both the phase and amount of feed back to any part of the receiver or amplifier, and this can be obtained in a number of ways, the same general idea being behind them all.

Perhaps the most elegant method is that shown in Fig. 62. To make things definite, suppose this represents the last tube of a radio-frequency amplifier. Coils a and b are in a fixed mounting, concentric but at right angles. The condenser in series with "a" is adjusted so that the phase of the current through "a" is the same as if resistance alone were present in the lower branch. The condenser in series with "b" is adjusted so that the *reactance* of the upper branch is equal to the *resistance* of the lower branch. Thus the currents in the two coils will be equal in magnitude but 90° out of phase. As a result, a rotating magnetic field is produced. If now a small coil "c" is properly pivoted inside the other two coils, it will pick up a voltage which will be of the same amount in whatever direction it is turned, but the phase of the voltage depends upon the position into which it is turned and can be set to any value whatever. The feed back from "c" to the desired part of the circuit can be effected either magnetically as shown in Fig. 63 or electrostatically as shown in Fig. 64. If it is desired to feed back to two different points another coil "d" may be placed inside of "c" and operated

independently of "c." In Fig. 63 the amount of the feed back is controlled by the closeness of magnetic coupling to the desired part of the circuit, in Fig. 64 by the amount of capacity coupling; in both cases the phase is adjusted

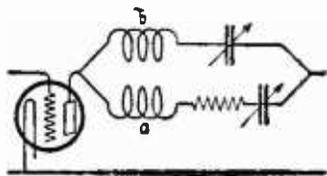


FIG. 62

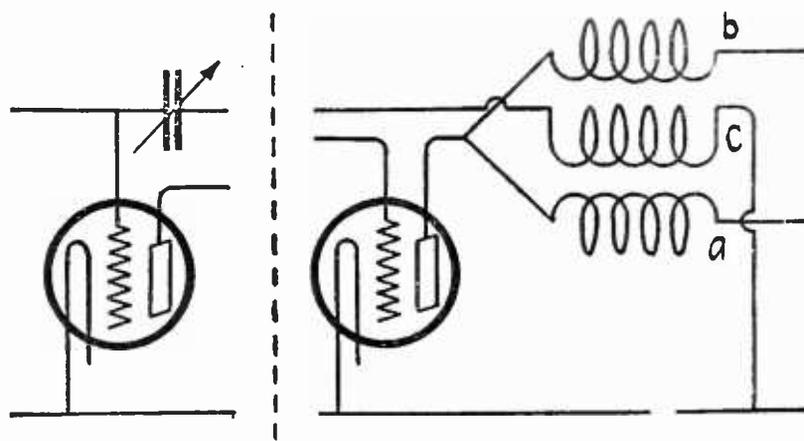


FIG. 64

by rotating coil "c." When it is desired to listen to a different station the two condensers in Fig. 62 must be readjusted, but as their adjustment is not critical they may be shafted together and the dial set to the wave length desired, the dial readings being previously

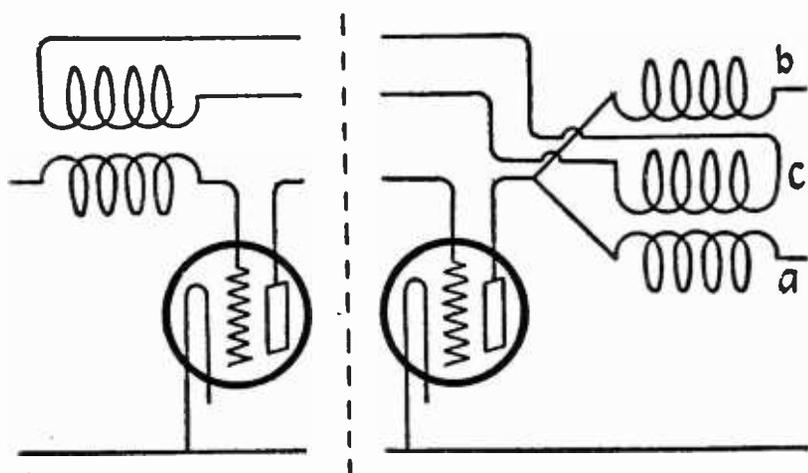


FIG. 63

calibrated in wave lengths. In actual practice a radio-frequency choke coil would have to be shunted around one of the condensers to afford a path for the direct component of plate current.

The above very general type of feed back was devised about two years ago by the writer and successfully used to control the tendency to regenerate in a two-stage Radio Corporation U.V. 1714 transformer-coupled amplifier. On account of its complexity however it is by no means recommended for ordinary use. The chief thing is that it is a general method of which regeneration, the neutrodyne, and the superdyne as well as other less well known circuits are merely simplified special cases, and if its action is well understood, many queer looking new circuits can be "solved" at a glance.

The next article in this series by Mr. Roberts will discuss the super-heterodyne.

The Complete Re

RADIO BROADCAST Will Publish Its Own Com
Radio Broadcast Tests Involving Two

By ARTHUR

THIS number of RADIO BROADCAST is going to press just as the International Radio Broadcast tests are at their zenith and it is impossible to get a complete story of the most interesting radio event in history into type in time to make our presses. The first two days of the tests, every telephone in the Doubleday, Page & Company plant was swamped with local and long-distance calls, and the telegraph offices in our vicinity were overwhelmed with messages from every part of the United States, reporting successful reception of foreign broadcasts.

The forecast, made in earlier numbers of this magazine, that reception from abroad would be very generally and surprisingly successful this year, in certain contrast to last year, is certainly borne out in no uncertain fashion. Thousands and thousands of listeners have reported their success to us, and that, in spite of great atmospheric difficulties the first few nights.

We are compiling the complete story of the tests for the February RADIO BROADCAST, which is as soon as we can possibly print it, and we know that every radio fan, whether or not he is a regular reader or subscriber to the magazine will be intensely interested in reading the fascinating story of events radio as they progressed at our laboratory at Garden City, at the Army Air station at Mitchel Field, in the offices of the British Broadcasting Company at London, and at the *Wireless World and Radio Review* in the same city.

OFFICIAL LISTENING POSTS

WELL known radio amateurs, newspapers, broadcasting stations, and manufacturers' engineers were all appointed as official listening posts and it is going to take some time to group their reports and to analyze their experiences. Some of the best radio locations in the New York territory were secured and special receivers installed. Stories of loud-speaker reception of the foreign stations await only the telling.

An official of the New York office of the United Press told us that the interest expressed by newspapers all over the country as shown by telegrams and telephone calls in their office was "positively phenomenal." Several men in the various news services did nothing

port in February

plete and Exclusive Story of Its International
Continents and Millions of Radio Listeners

H. LYNCH

else for several days but devote themselves to handling news matter about the tests.

The International Radio Broadcast tests are full of powerful potentialities for international betterment and a firmer basis for understanding. More than one person has agreed with us on this stand. We have the following copy of a telegram which bears out this contention and phrases the idea in most powerful fashion.

RADIO WTAS
KIMBALL BUILDING
CHICAGO

HEARD MENTION LAST EVENING OF TONIGHT'S GALA PROGRAM AND CONGRATULATE YOU THEREON STOP THIS WEEK IS CERTAINLY A GALA EVENT IN RADIO BUT PEOPLE SEEMINGLY REGARD INTERNATIONAL BROADCASTS AS JUST INTERESTING FEATS STOP MOMENT'S THOUGHT WILL REVEAL AMAZING POTENTIALITIES FOR BENEFIT MANKIND IN FREE EXCHANGE OPINIONS BETWEEN NATIONS STOP IF ANYTHING WILL PUT ALL BATTLESHIPS AT BOTTOM OF OCEAN WHERE THEY BELONG UNDER A REAL CIVILIZATION RADIO'S INFLUENCE IN PROMOTING BETTER UNDERSTANDING AND MORE INTELLIGENT PUBLIC OPINION AMONG THE NATIONS WILL BE THAT FACTOR

ERIC H PALMER BROOKLYN NEW YORK
24 NOVEMBER 1924

We shall make an effort to print the names of all those whose reception of the foreign programs has been verified, but the number may grow too large by the end of the test, in which case other arrangements will have to be made.

All the American broadcasters showed unanimously that they appreciated the importance and interest attaching to this test and were good enough almost unanimously to keep off the air during the foreign transmission periods. It was almost without exception that the American stations kept off the air and used every means within their power to see that the American air was free for listeners on this side. This involved considerable sacrifice on the part of some of the stations who had contracts with various organizations.

The official detailed story complete with exclusive photographs will appear in February.



WHEN YOU WRITE THE GRID . . .

Don't fail to enclose a stamped, self-addressed envelope with your inquiry if you expect a personal reply.

Don't be impatient if you do not receive an immediate answer. Every letter is answered in the order of its receipt. Do not send a second letter asking about the first.

Look over your files of RADIO BROADCAST before asking a question which might have been covered in a previous issue.

Don't ask for a comparison between manufactured apparatus. The addresses of manufacturers of articles used in the construction of apparatus described in RADIO BROADCAST will be given on request.

Don't include questions on subscription orders or inquiries to other departments of Doubleday, Page & Co. Address a separate inquiry to The Grid.

Don't send us a fee for answering your questions. The Grid Department is maintained for the aid and convenience of readers of RADIO BROADCAST and there is no charge for the service.

QUERIES ANSWERED

HOW MAY I ADD AN R. F. AMPLIFIER TO MY HAYNES SUPER'?

W. H.—Baldwin, L. I.

HOW CAN I INSERT A JACK IN MY CIRCUIT FOR LOOP USE?

E. J. B.—Lansing, Mich.

WHAT IS A COUNTERPOISE AND HOW IS IT USED?

L. W. A.—Chicago, Illinois.

CAN YOU GIVE ME A FEW POINTS ON TROUBLESHOOTING IN THE KNOCKOUT CRYSTAL REFLEX CIRCUIT?

W. E. D.—Peru, Indiana.

MY ROBERTS RECEIVER DOES NOT OPERATE CORRECTLY. HOW CAN I TEST IT FOR DEFECTS, ETC.?

C. J. F.—Chicago, Illinois.

CAN CYLINDRICAL COILS BE USED IN THE ROBERTS CIRCUIT?

M. J. M.—Atlanta, Georgia.

WILL YOU PUBLISH A BUZZER CIRCUIT FOR THE PRACTISE OF CODE?

A. W. M.—Bronx, New York City.

WHAT RHEOSTATS SHOULD BE USED WITH 201-A TUBES?

R. N. R., Memphis, Tennessee.

MAKING THE "SUPER" MORE SENSITIVE

FOR those who, like Mr. W. H., wish to make their Haynes super-heterodyne more sensitive to weak signals emanating from great distances, the information contained herewith should be helpful.

The circuit in Fig. 1-A shows the use of an

antenna and an extra stage of neutralized radio-frequency amplification placed before the first detector tube of the "super" receiver. It is quite necessary that this stage of amplification be neutralized, especially when the antenna is used, so that radiation does not occur. Ordinarily a good super does not require the use of an antenna as a collective agency and its use is poor practise. In Fig. 1

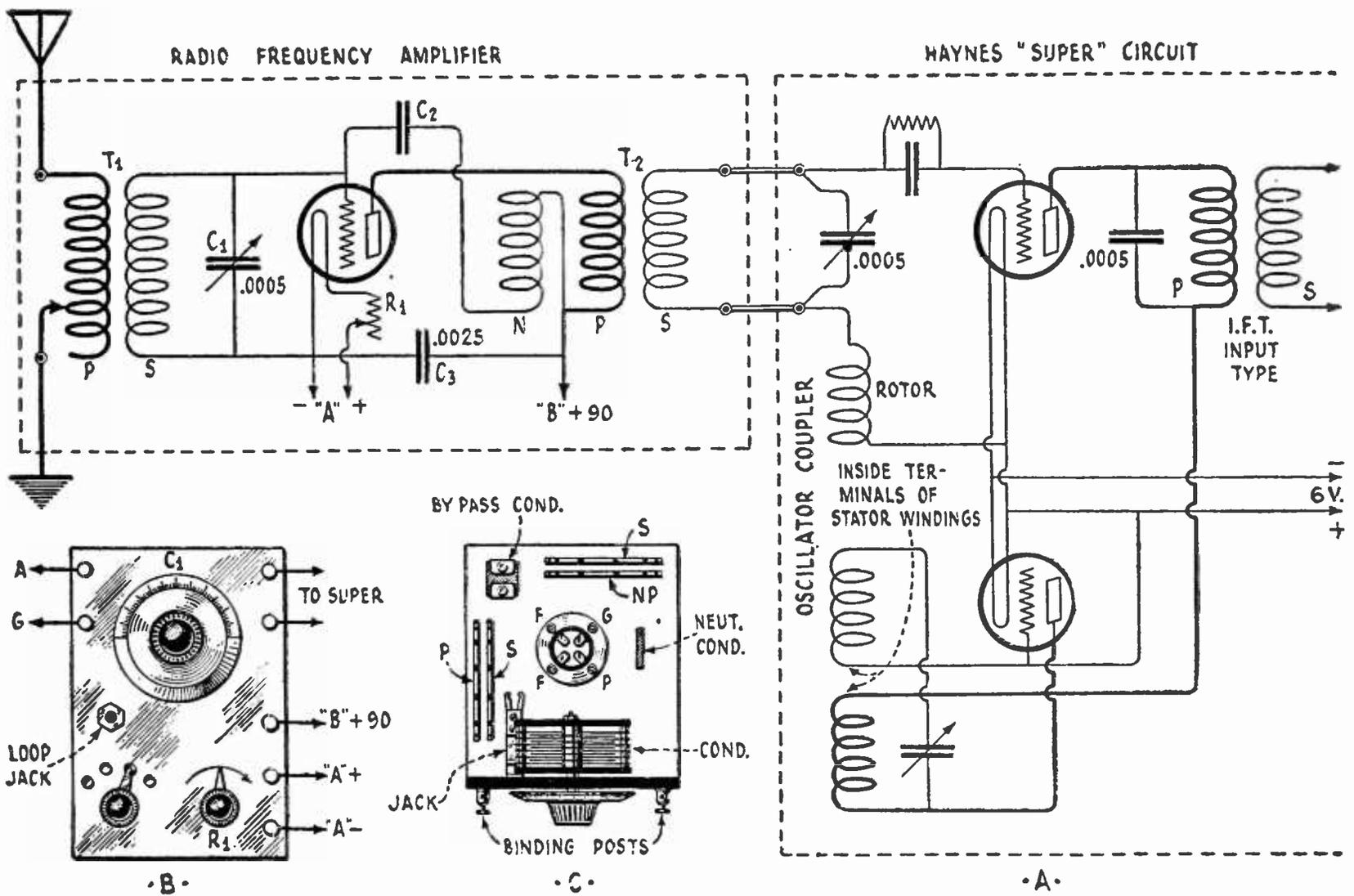


FIG. 1

its use is indicated for general purposes when the R. F. amplifier is connected with other circuits. The method for plugging in a loop is shown in Fig. 2.

Explaining the circuit in Fig. 1-A, no changes or alterations are necessary in the Haynes circuit. The amplifier may be constructed so as to be entirely contained in its own cabinet as a separate unit. See Fig. 1-B and C. For the sake of compactness P and S of T1 and N P-S of T2 may be wound on spiderweb forms similar to those used in the Knock-out Roberts receivers. The number of turns for each coil is as follows:

T1-P 40 turns No. 22 dcc wire—S 44 turns No. 22 dcc wire. T2-N 20 turns No. 24 dcc wire—P 20 turns No. 24 dcc wire—S 44 turns No. 22 dcc wire.

If it is desired, P of T1 may be wound with about ten turns to make the antenna circuit a periodic or untuned. C2, the neutralizing capacity may be made by connecting a 4" piece of bus bar to the grid post of the tube. A piece of spaghetti insulating tubing is slipped over it and on top of this is wound two or three inches of bare wire with the turns soldered together making it one continuous piece of wire tubing. C1 is a .0005 mfd. variable condenser preferably of a vernier type.

Coils N and P are wound as a parallel pair of wires. In this instance two spools of No. 24 dcc wire may be used for simultaneously winding both turns together. A panel and base layout are shown for use primarily as a guide, not as an actual definite placement for the parts. This type of amplifier will fit in nicely as an addition to any type of receiver. See articles in the March and May, 1924, RADIO BROADCAST for additional details.

DOUBLE CIRCUIT JACK FOR CHANGE-OVER PURPOSES

IN THE multi-tube radio frequency receivers, super-heterodynes, and neutrodynes, a double circuit jack may be included to change automatically from loop to antenna by merely inserting a plug to which the loop has been connected, in the jack. This feature will also apply especially to those who are inclined to experiment with couplers of various designs, antennas, loops, etc. The circuit in Fig. 2 shows how the adaption is made. The secondary of an additional coupler may be connected to the inserted plug which is of the Weston or other "instant change" type.

USE AND VALUE OF A COUNTERPOISE

MANY operators of receivers are troubled by broad tuning or by their peculiarity of picking up local disturbances caused by telephone ringers, house-lighting circuits, vacuum cleaners, elevators etc. Usually these defects may be attributed to faulty ground systems to which many of the above named apparatus are connected. A counterpoise, very similar to an ordinary flat top antenna, excepting that it is mounted just above the earth or in the cellar of one's home, may be advantageously employed to eliminate these forms of disturbances. In Fig. 3, several forms of counterpoise are shown with their constructional details and method of use. It is only necessary to remember that to be efficient they should be well insulated from near-by objects. Any type of wire, insulated or bare, may be used. Porcelain cleats may be economically used as insulators. The counter-

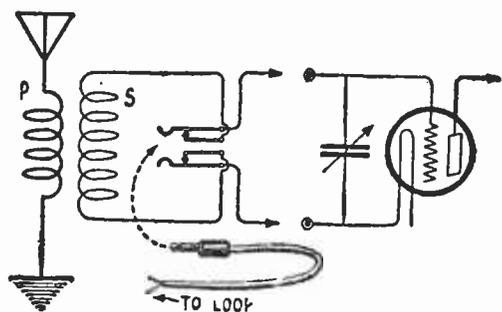


FIG. 2

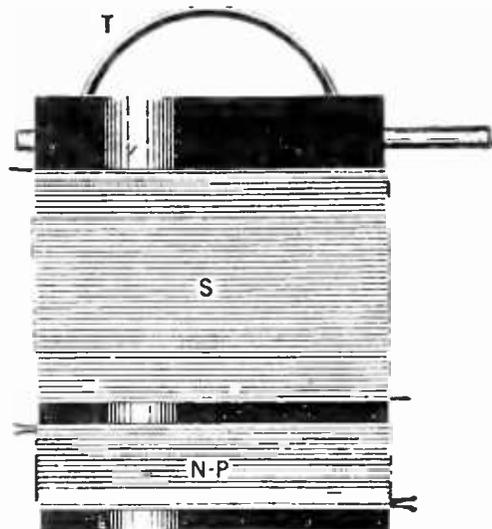
poise is connected to the radio receiver in place of the ordinary ground connection.

USING STANDARD PARTS FOR THE ROBERTS CIRCUIT

IN THE matter of substitute coils to replace the spiderwebs used in the RADIO BROADCAST Knock-out circuit, it is well to understand from the start that endeavors along these lines so far have been experimental in nature. Many experimenters are working on the problem, and in a short while no doubt the needs of all will be satisfied in this particular connection.

RADIO BROADCAST has experimented with various forms and herewith is presented a few guiding facts which may prove helpful to those who wish to experiment of their own accord.

In most instances those couplers now on the market such as Ambassador, Shamrock, Fischer, Eastern pickle-bottle, and others of a similar constructional nature may be advantageously experimented with by merely adding to, or rewinding the primary coil constituting the N-P winding of the Roberts circuit. The turn ratio between primary and secondary will vary according to the coupler used and no definite value can be given. In general it is well to use the same number of turns as specified for the spiderwebs, then vary for satisfactory operation. Instead of a double wound primary a coil of twice the number of turns as specified may be used



DOUBLE WOUND N-P COIL PLACED ON SAME PLANE WITH SECONDARY

FIG. 4

taking off a center tap as shown in Fig. 5 and 6. In most instances the placement of the primary N-P coil will have a very decided effect upon the operation of the receiver. The usual practice is to rewind the primary N-P coil directly over the secondary with cambric cloth insulation between the two.

Standard neutroformers offer an opportunity for interesting experiment. The present primaries may be removed and double-wound coils substituted. In this case the N-P coil would consist of as many turns per coil as the removed primary. A variometer in the plate circuit of the detector tube will provide regeneration.

Mr. Roberts, in his original article describing the two-tube receiver, mentioned the fact that the two wires constituting the N-P winding should be wound physically as close together as is possible. From Mr. Roger Whitman, Associate Editor of *Country Life*, comes the suggestion of cutting two pieces of wire long enough to provide 20 turns each for the N-P coil and twist them together. Mr. Whitman has found that with about 3 to 5 twists to the inch

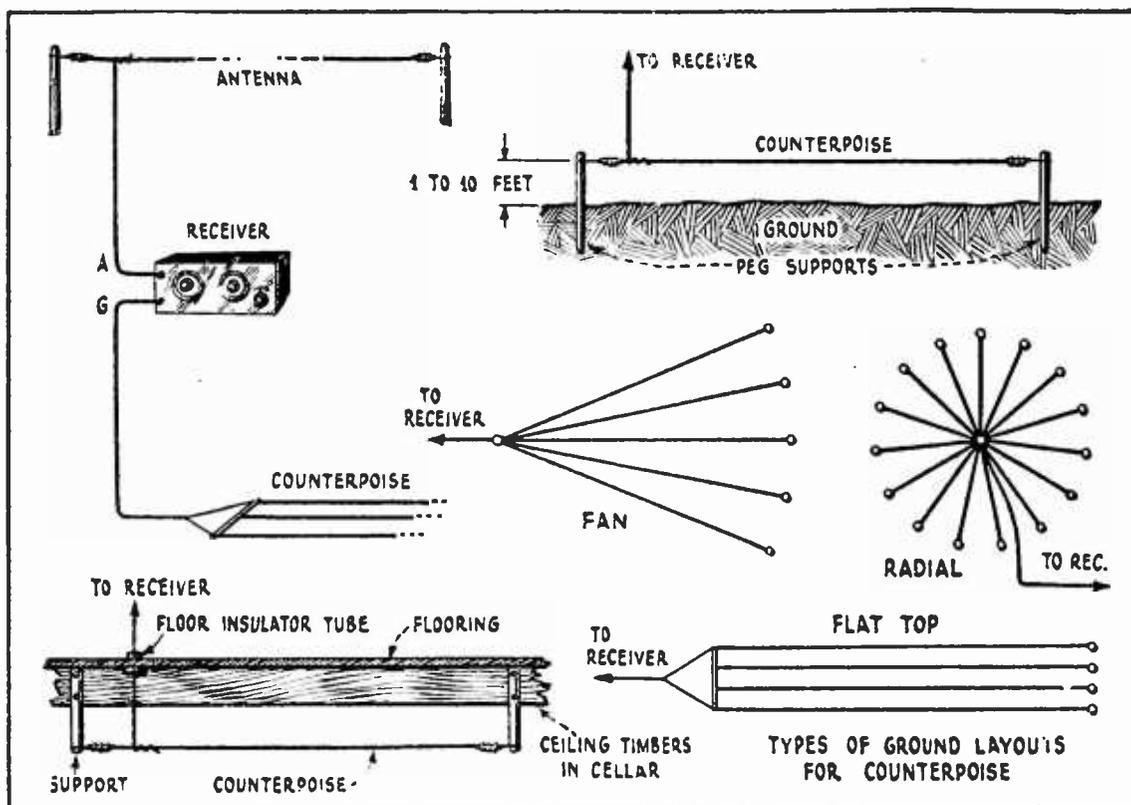


FIG. 5

this arrangement provided more stable, sharper operation. Figs. 4 and 5 are illustrations of the various points explained herein. Fig. 6 shows the circuit diagram for the connection of the coupler with the split primary illustrated in Fig. 5

GENERAL POINTERS ON THE ROBERTS CIRCUIT

MR. C. J. F'S. question is similar to a number of others received by THE GRID. The following general pointers will serve as an aid in locating and eliminating the troubles sometimes found in the RADIO BROADCAST Knock-out Roberts receivers.

1. Check over all the parts to be used, before assembling, with a view to preventing the use of defective parts. A pair of phones and a C battery, used as a testing circuit, will uncover any open circuits in the various coils, transformers etc., and any possible short circuits in the several condensers to be used.
2. Tubes offer one of the greatest hindrances to proper, efficient operation. This is

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especially true in the case of the detector tube. Change around the tubes until their best operating position is found.

3. Manufactured and home-made coils may be so mounted that the direction of winding in several of the coils is found to be opposite. Check over the coil assembly and be sure that

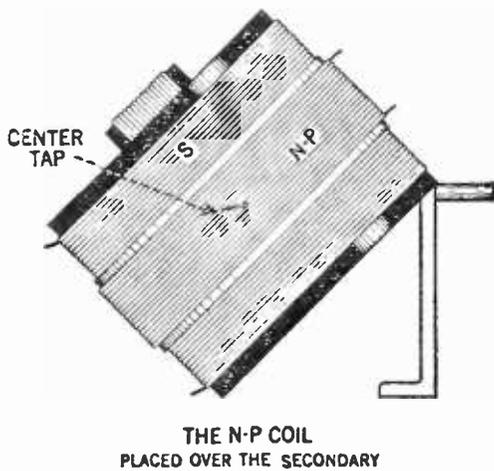


FIG. 5

all the coils are mounted so that the winding direction in all the coils is the same.

4. When regeneration does not occur, it is an indication that the tickler coil is reversed. Also, the B battery voltage on the detector tube may be too low. On the other hand, if regeneration is too pronounced, the circuit going in and out of oscillation with a decided "plop," it is quite evident that excessive detector plate voltage is being applied and must be reduced for more stable operation.

5. Howling may be due to (a) an interaction or feedback between the several circuits; (b) Reversed leads to the primary of the audio reflex transformer. (c) Incorrect values of C battery. In some cases it will be found necessary to ground the negative side of the A battery to obtain stability.

6. Grid leaks clear up, to a marked degree, the volume and tone quality delivered by the receiver. Try various values of leak and grid condenser.

7. The spiderweb coils, as designed, will cover the entire broadcasting wavelength when the secondaries are shunted by .0005 mfd. variable condensers. When the sensitivity of the receiver varies for different wavelengths, that is to say, when signals received are louder on the lower wavelengths than on the higher wavelengths, the receiver is then in a condition where the step-up of energy is not the same over the entire wavelength scale. To overcome this, the primaries and secondaries of the two couplers must be made semi-variable so that resonance may be obtained at all the wavelengths. Variation of the turn-ratio between primary and secondary will also serve to eliminate this trouble.

8. The use of a by-pass condenser shunted across the C battery and secondary of the audio reflex transformer as outlined in the November GRID is not a general cure-all for poor volume output. In a majority of cases this procedure does "tone up" the receiver quite appreciably. This usually depends upon the value of C battery and type of audio reflex transformer used.

TROUBLE SHOOTING IN THE CRYSTAL REFLEX RECEIVER

THE use of good, tested crystals in the RADIO BROADCAST Knockout crystal reflex receiver cannot be emphasized too much. Poor crystals will cause squealing due to regeneration

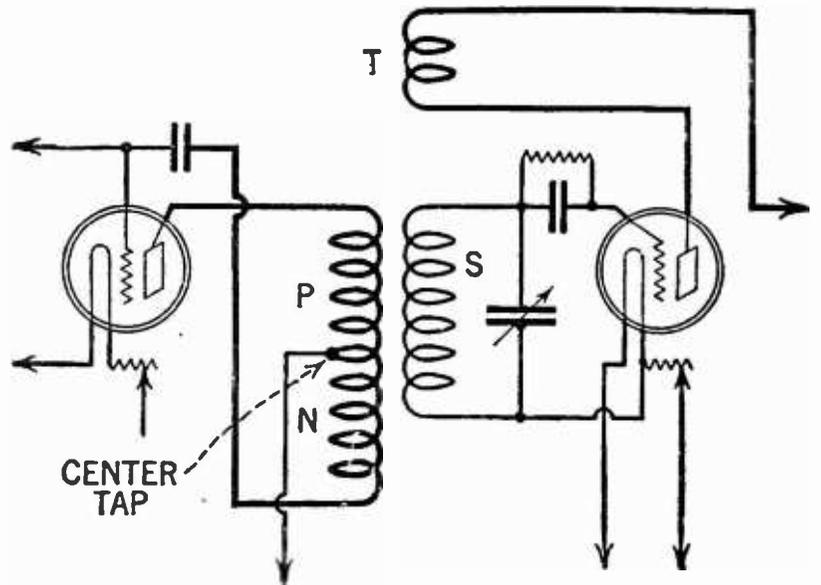


FIG. 6

produced by a high resistance contact on the crystal. This condition also causes body capacity effects resulting in unbalanced operation.

It is essential that the negative side of the A battery be grounded. It would be well to have the negative side of the A and B battery connected together, thus providing a common ground for both

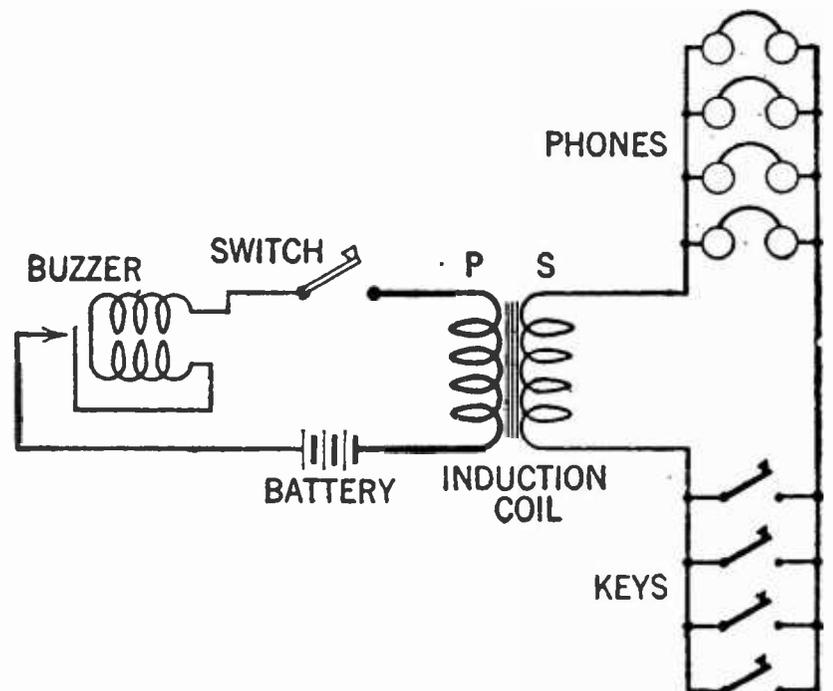


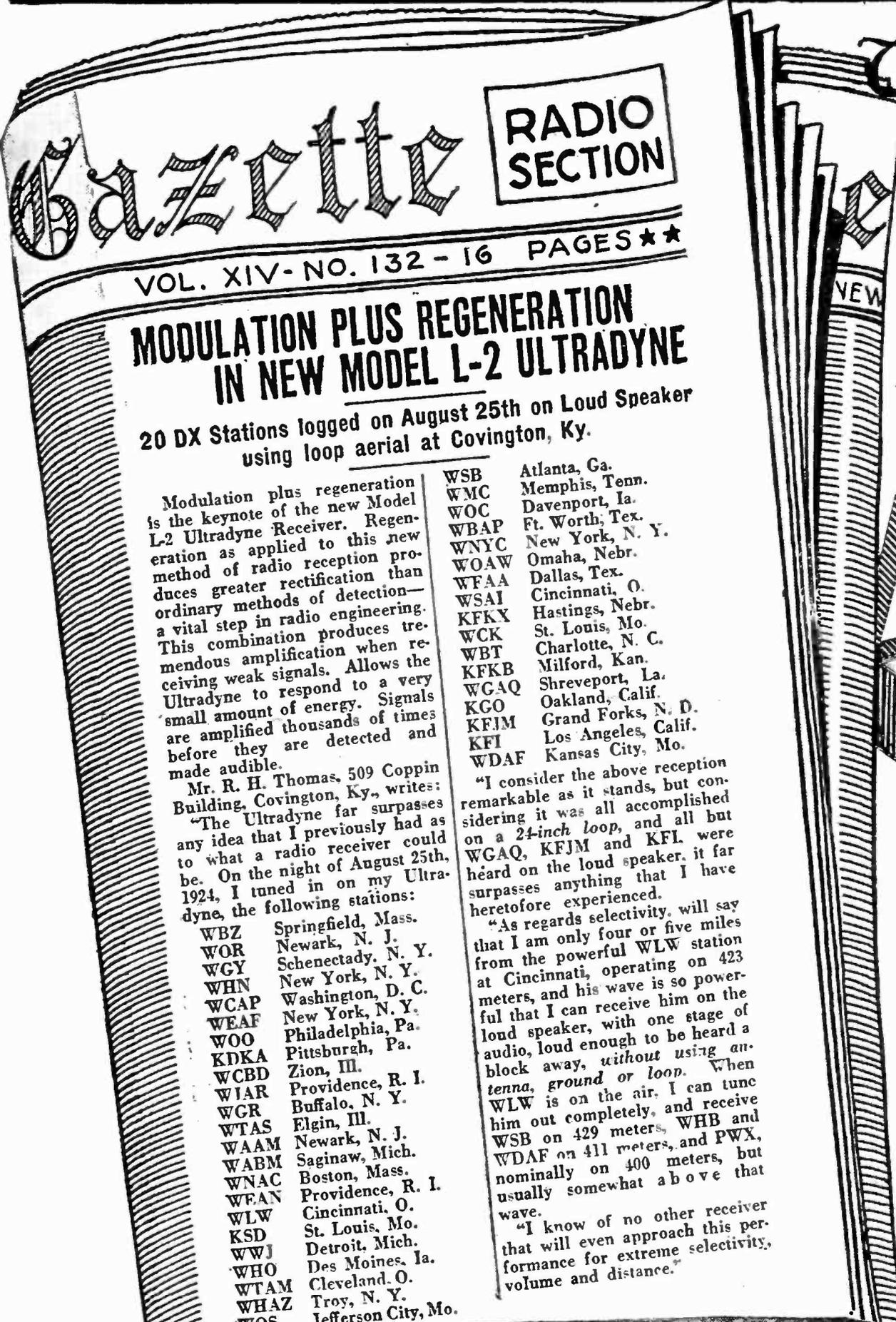
FIG. 7

batteries. In some cases, due to internal characteristics of the receiver this does not work out well and it is necessary to connect the negative B to the positive A post.

A CIRCUIT FOR CODE PRACTICE

THOSE who have a longing to know the code used in radio communication will find the circuit shown in Figs. 7 and 8 useful in the practise of sending and receiving dots and dashes. The system is especially applicable to Radio Clubs,

Modulation *plus* Regeneration



MODULATION PLUS REGENERATION IN NEW MODEL L-2 ULTRADYNE

20 DX Stations logged on August 25th on Loud Speaker using loop aerial at Covington, Ky.

Modulation plus regeneration is the keynote of the new Model L-2 Ultradyne Receiver. Regeneration as applied to this new method of radio reception produces greater rectification than ordinary methods of detection—a vital step in radio engineering. This combination produces tremendous amplification when receiving weak signals. Allows the Ultradyne to respond to a very small amount of energy. Signals are amplified thousands of times before they are detected and made audible.

Mr. R. H. Thomas, 509 Coppin Building, Covington, Ky., writes: "The Ultradyne far surpasses any idea that I previously had as to what a radio receiver could be. On the night of August 25th, 1924, I tuned in on my Ultradyne, the following stations:

- WBZ Springfield, Mass.
- WOR Newark, N. J.
- WGY Schenectady, N. Y.
- WHN New York, N. Y.
- WCAP Washington, D. C.
- WEAF New York, N. Y.
- WOO Philadelphia, Pa.
- KDKA Pittsburgh, Pa.
- WCBD Zion, Ill.
- WIAR Providence, R. I.
- WGR Buffalo, N. Y.
- WTAS Elgin, Ill.
- WAAM Newark, N. J.
- WABM Saginaw, Mich.
- WNAC Boston, Mass.
- WEAN Providence, R. I.
- WLW Cincinnati, O.
- KSD St. Louis, Mo.
- WWJ Detroit, Mich.
- WHO Des Moines, Ia.
- WTAM Cleveland, O.
- WHAZ Troy, N. Y.
- WOS Jefferson City, Mo.

- WSB Atlanta, Ga.
- WMC Memphis, Tenn.
- WOC Davenport, Ia.
- WBAP Ft. Worth, Tex.
- WNYC New York, N. Y.
- WOAW Omaha, Nebr.
- WFAA Dallas, Tex.
- WSAI Cincinnati, O.
- KFKY Hastings, Nebr.
- WCK St. Louis, Mo.
- WBT Charlotte, N. C.
- KFKB Milford, Kan.
- WGAQ Shreveport, La.
- KGO Oakland, Calif.
- KFJM Grand Forks, N. D.
- KFI Los Angeles, Calif.
- WDAF Kansas City, Mo.

"I consider the above reception remarkable as it stands, but considering it was all accomplished on a 24-inch loop, and all but WGAQ, KFJM and KFI were heard on the loud speaker, it far surpasses anything that I have heretofore experienced.

"As regards selectivity, will say that I am only four or five miles from the powerful WLW station at Cincinnati, operating on 423 meters, and his wave is so powerful that I can receive him on the loud speaker, with one stage of audio, loud enough to be heard a block away, without using antenna, ground or loop. When WLW is on the air, I can tune him out completely, and receive WSB on 429 meters, WHB and WDAF on 411 meters, and PWX, nominally on 400 meters, but usually somewhat above that wave.

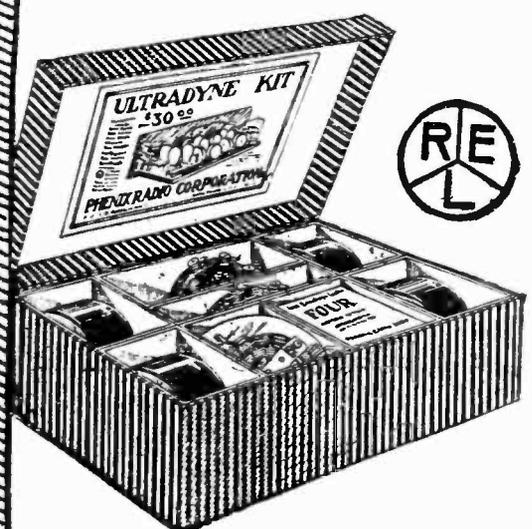
"I know of no other receiver that will even approach this performance for extreme selectivity, volume and distance."

ULTRADYNE

MODEL L-2

This application of regeneration is the most recent development of R. E. Lacault, E.E., A.M.I.R.E., since his perfection of the "Modulation System" used exclusively in the Ultradyne and which has so revolutionized all conception of selectivity, sensitivity, volume and range.

This Model L-2 Ultradyne, without a doubt, represents the peak of present day super-radio engineering skill.



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Consists of one low loss Tuning Coil, one low loss Oscillator Coil, one special low loss Coupler, one type "A" Ultraformer, three type "B" Ultraformers, four matched Grid Condensers.

The Ultraformers are new improved long wave radio frequency transformers, especially designed by R. E. Lacault, Consulting Engineer of this Company and inventor of the Ultradyne.

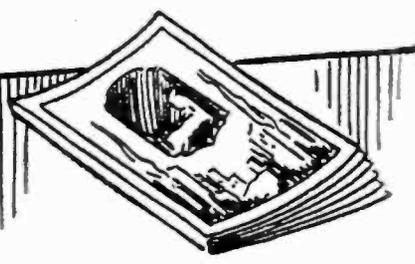
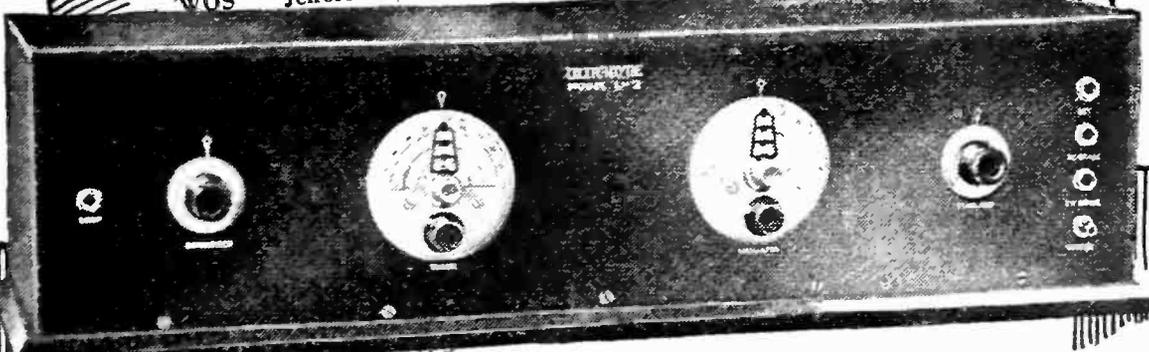
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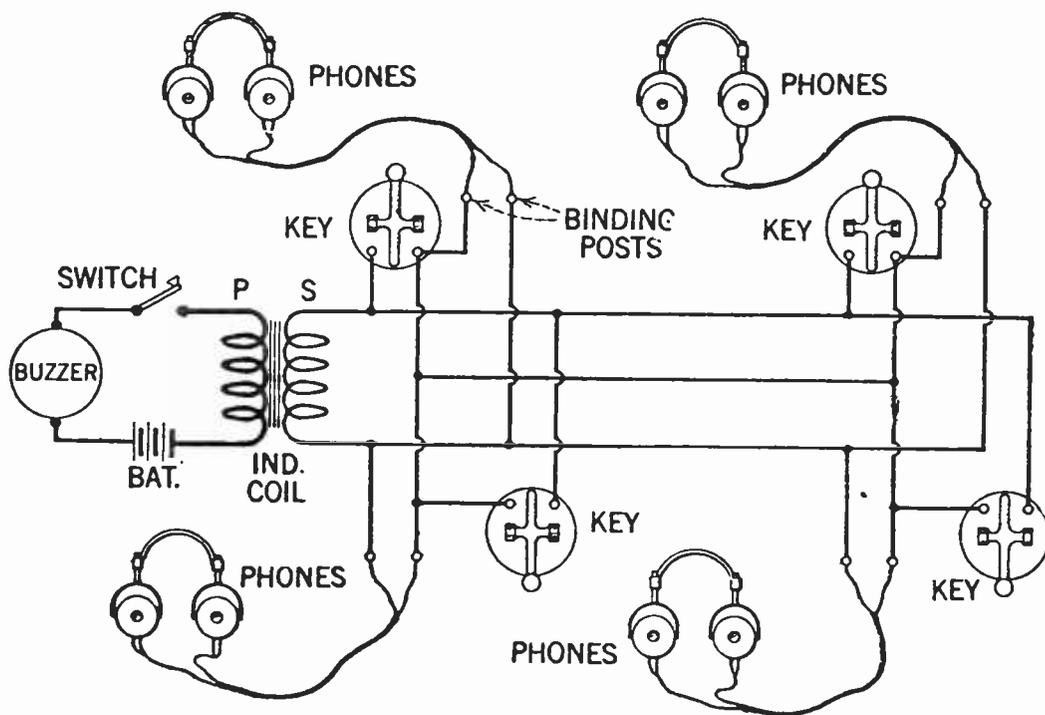


FIG. 8

A picture diagram of the actual layout of the parts and wiring. Only the keys, buzzer, coil, binding posts, etc., need be mounted on the top of the operating table while all the wiring is made on the underside. As may be seen from the schematic diagram in Fig. 7 the secondary-key-phone circuit is a series parallel one allowing provision for additional operating positions

quency transformer and is a positive means for controlling the volume with its resultant distortion. The Bradleyleak and other commercial types of variable resistance are admirably suited for this use.

In a unit of this kind a power amplifier tube works better than the ordinary type of vacuum tube—the UV201A. The standard 5 watt tube or any of the Western Electric power amplifier tubes are fine for this purpose. Power amplifier tubes require a higher plate voltage than the UV201A's and in most circuits the addition of a C battery inserted in the lower lead of the secondary of the transformer returning to the negative side of the filament supply will often clarify and stabilize the circuit quite noticeably. The negative side of the C battery should connect to the secondary of the transformer and the positive terminal of the C battery should connect to the negative side of the filament supply. The value of C battery is governed by the amount of plate voltage used and is outlined in the following table:

school classes, and other organizations desiring a means for group practise.

The material needed is a buzzer capable of producing a high-frequency note (the General Radio and Federal buzzers are very good for this work) a telephone induction coil, a switch, a key and pair of phones per person, and the necessary batteries.

By arranging the parts as shown in Fig. 8 the circuit may be controlled by any one of the keys, the signal being heard in all the phones. In this way it is possible to maintain intercommunication between the several receiving points.

By putting the buzzer in a continuously operated circuit, the tone produced will be more constant than if the several keys were used to interrupt the buzzer circuit. Also, by placing the keys in the secondary side of the circuit there will be no appreciable "lag" or "key thump" in the signals as transmitted.

A POWER AMPLIFIER AND C BATTERY

THE fundamental idea involved in the design and construction of a power amplifier is briefly outlined in the circuit shown in Fig. 9. First, a low ratio audio frequency transformer is necessary to prevent distortion and unbalance in the input side of the vacuum tube. The resistances unit composed of various values of resistance from 25,000 to 100,000 ohms directly shunts the secondary of the audio fre-

PLATE VOLTAGE	C BATTERY VOLTAGE
40	0.5 to 1.0
60	1.0 to 3.0
80	3.0 to 4.5
100	4.5 to 6.0
120	6.0 to 9.0
150	9.0 to 12.0

The use of a C battery in any audio-frequency amplifier circuit will materially reduce the current drain on the B batteries, thereby increasing the number of hours of use of these batteries. A C battery will also permit a vacuum tube to function at its most efficient point of operation, amplifying the signal applied to the grid of the tube in a distortionless and also economical manner.

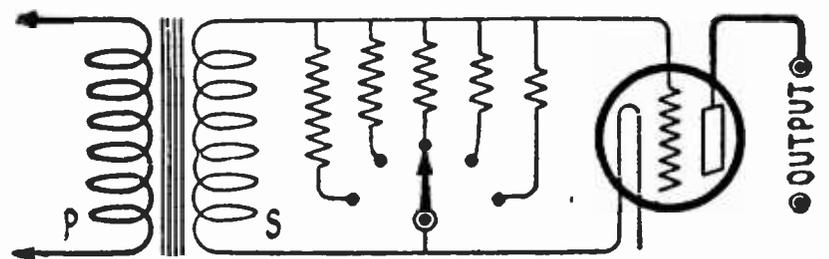
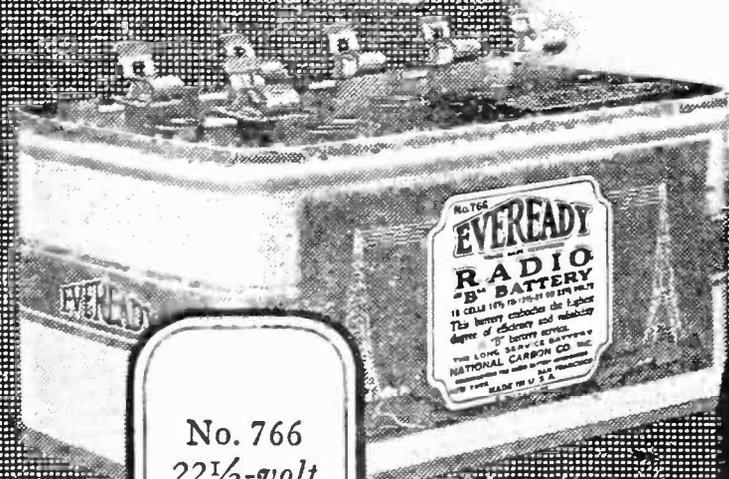


FIG. 9

Shows a power amplifier circuit. The volume output is controlled by the shunt resistances



No. 772
45-volt
large
vertical
Price
\$3.75



No. 766
22½-volt
large
horizontal
Price
\$2.00

*Dry "B" Batteries
are more economical
and more dependable
than any other
source of plate
current!*

★ Cut your operating cost

THIRTY years' experience in the manufacture of dry batteries has enabled us within the past two years to steadily and greatly improve "B" Battery quality. Eveready "B" Batteries are now from two to three times better than ever before.

Eveready "B" Batteries will long outlast any others, and are the most economical and dependable source of plate current. These are strong statements, but they have been proved by tests in our own and in independent laboratories. Check them for yourself on your own radio set. Get Eveready "B" Batteries.

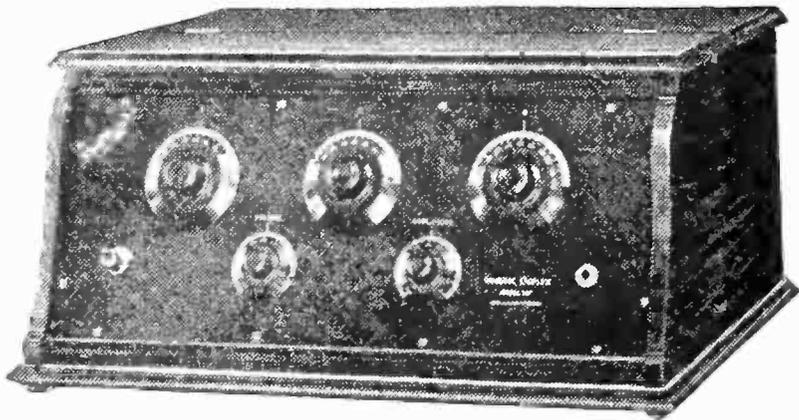
There is an Eveready Radio Battery for every radio use.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery Information
 New York San Francisco
 Canadian National Carbon Co., Ltd., Toronto, Ont.

EVEREADY
Radio Batteries
-they last longer

★ Tested and approved by RADIO BROADCAST ★

New Equipment

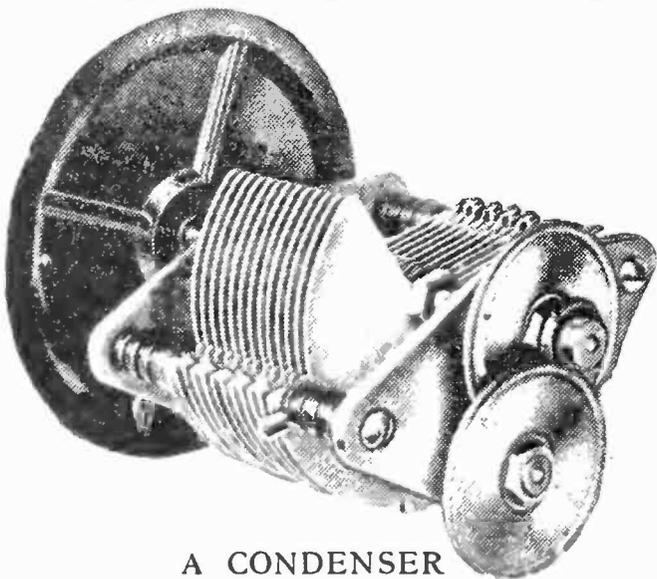
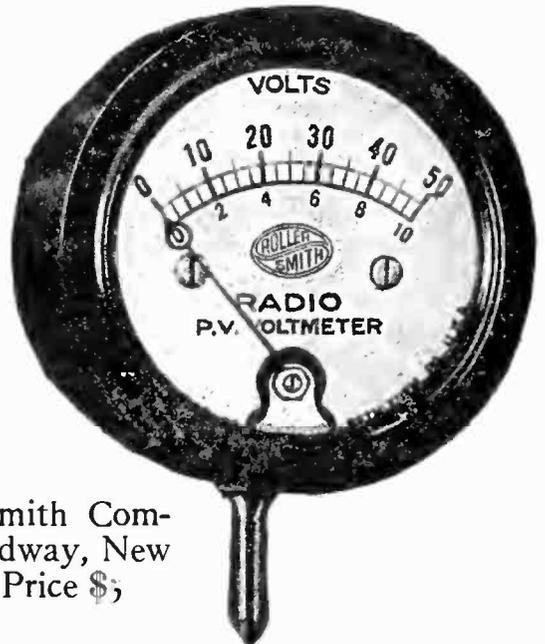


GRIMES INVERSE DUPLEX

An inverse duplex receiver designed by the inventor of this system of reflexing. It employs three tubes and a crystal detector and is very satisfactory for quality and distance. Made by David Grimes, Inc., 1571 Broadway, New York City

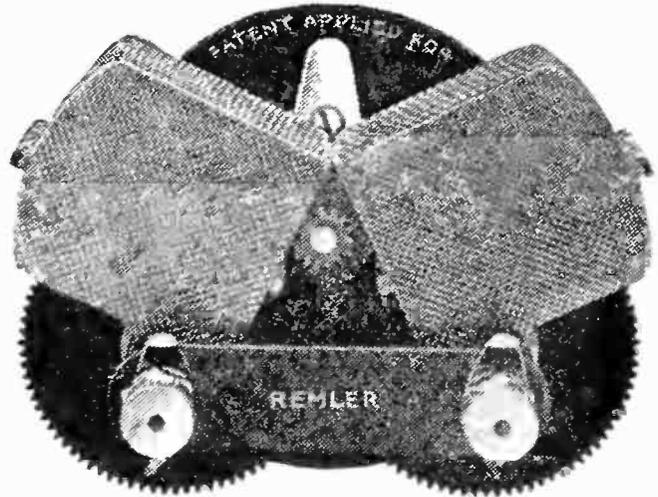
RADIO VOLTMETER

A double range, 0-10 and 0-50 volts, voltmeter which is well made. The double range makes it possible to take accurate readings of A, B and C batteries. Made by the Roller-Smith Company, 233 Broadway, New York City. Price \$5



A CONDENSER

Of the all-vernier type, the vernier control is attained by means of the friction plates showing at the back of the condenser. One possibility of loss is eliminated because the stator plates are stamped from one piece of aluminum and not severed. A very good range of capacity is covered. Made by the U. S. Tool Company, Inc., 117 Mechanic St., Newark, N. J.



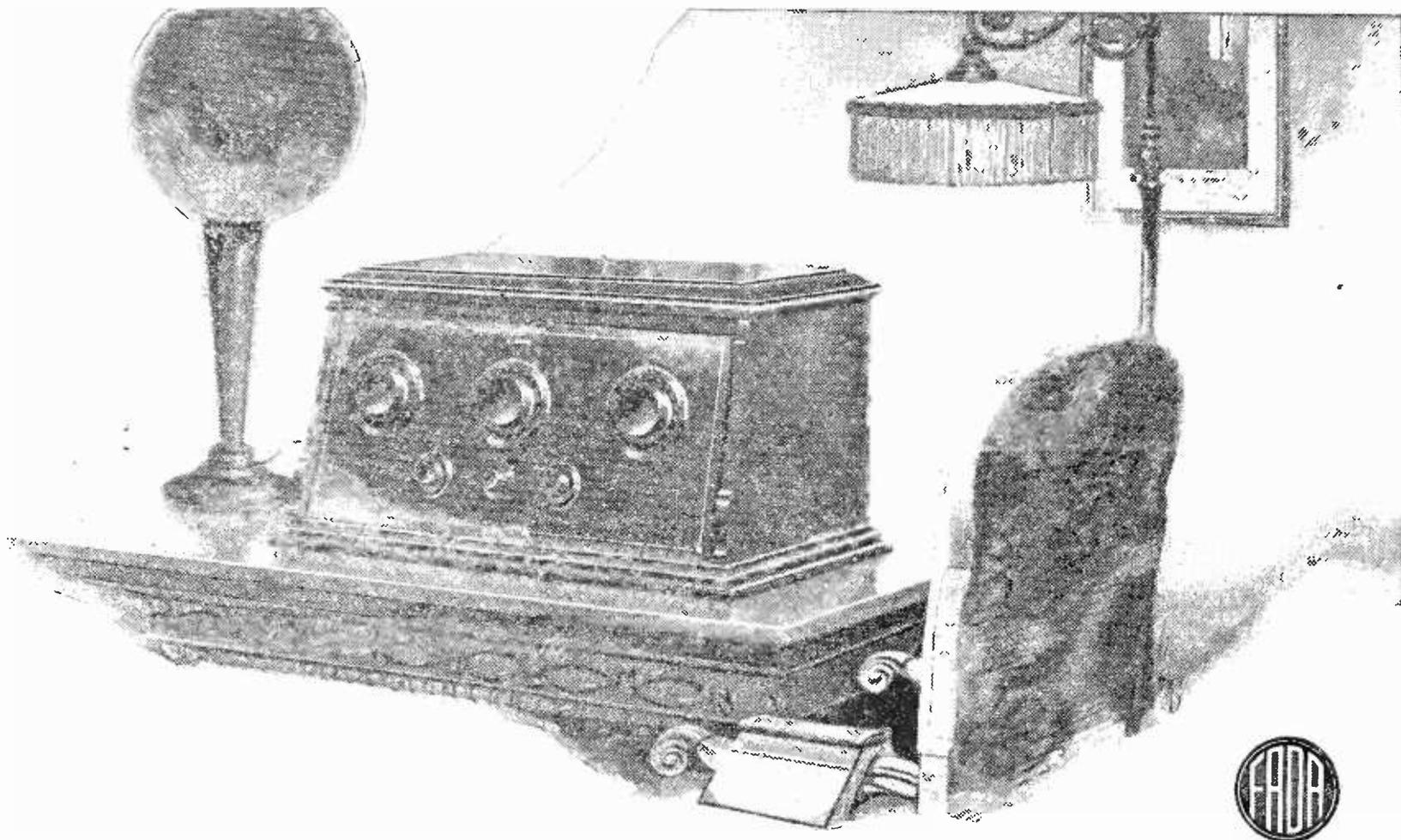
REMLER CAPACITY UNIT

An instrument of novel design very well built. The photograph is the rear view showing the embossed plates, twin rotors, and all-vernier control. Made by the Remler Radio Mfg. Co., 154 W. Lake St., Chicago, Illinois



SPLITDORF RECEIVER

The Splitdorf receiver is a five-tube neutralized set of the tuned radio-frequency type. It is of fine appearance and a very pleasing set to operate. Made by the Splitdorf Electrical Co., 392 High St., Newark, N. J. Price \$150



The FADA Neutroceiver

will surpass anything you have expected of a radio receiver

VOLUME? The FADA Neutroceiver will give you all the controlled volume you can possibly desire. Designed to use powerful tubes and operate on either indoor or outdoor antenna, it is guaranteed to give powerful results.

Clarity? This wonderful, five-tube Neutrodyne offers you a tone quality which is unexcelled. It reproduces every tone of the human voice and of every musical instrument with lifelike fidelity.

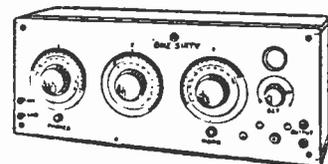
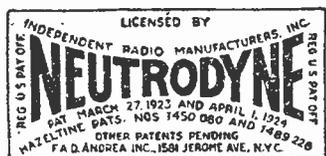
Selectivity? Separates stations, tunes through powerful local broadcasting and brings in distant concerts—even when their wave lengths are but a few meters apart.

Simplicity of control? Anyone, without exper-

ience, can operate the Neutroceiver. You can turn your dials to previously located stations and bring them back night after night.

Beauty? As a piece of art-furniture, the FADA Neutroceiver is a masterpiece. The cabinet is solid mahogany, with the panel perfectly balanced and sloped gently to facilitate easy tuning.

Supplementing the FADA Neutroceiver and making a complete FADA line, are five other Neutrodyne receivers—three, four and five tube sets—in plain as well as artcraft cabinets. You have a price range from \$75 to \$295 from which to select. Each model extraordinary in results; each a remarkable value. See your dealer.



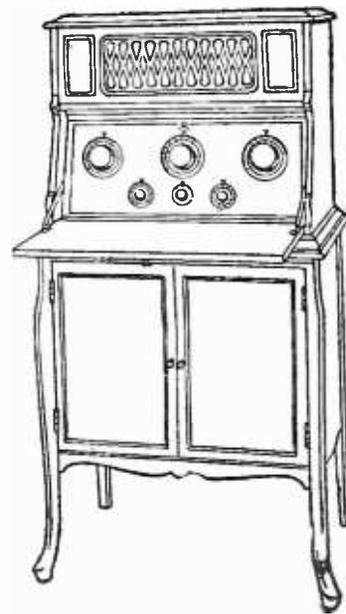
FADA "One Sixty" No. 160-A

"The receiver that has taken the country by storm." The best known of all Neutrodynes. Four tubes. Price (less tubes, batteries, etc.) \$120.



FADA Neutrola Grand No. 185/90-A

The five-tube Neutrola 185-A, mounted on FADA Cabinet Table No. 190-A. Price (less tubes, batteries, etc.) \$295.



F. A. D. ANDREA, INC., 1581 JEROME AVENUE, NEW YORK

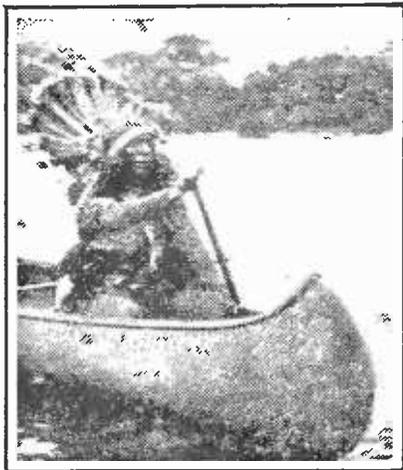
FADA

Radio ★

★ Tested and approved by RADIO BROADCAST ★

Among Our Authors

REMINGTON SCHUYLER is represented with the cover on RADIO BROADCAST this month and a story "Static Days and



REMINGTON SCHUYLER
In Indian Costume

Nights" both of which tell some of his experiences in ranch life in the West. "Building a house has certainly kept me busy," writes Mr. Schuyler, but my first celebration in the new home is going to be a Four-Tube Knock-out set." Mr. Schuyler is one of the best known of American painters

of Indians. During Maréchal Foch's recent tour of this country he was official American Legion painter and made portraits of French and American officers on the trip.

IN SEEKING release from amateur photography, I found a substitute in radio. I hocked all my cameras and bought condensers. I haven't had a fish rod in my hands since I became infected. I am fond of soldering paste in my coffee and own a Roberts Knock-out receiver." The photograph is a flashlight of Mr. Bradford being much pained by the squealers. Mr. Bradford, cartoonist for the Philadelphia *North American*, did the cartoon which appears as our frontispiece this month.



W. R. BRADFORD

In a self-posed photograph, saying something definite about "bloopers"

of Indians. During Maréchal Foch's recent tour of this country he was official American Legion painter and made portraits of French and American officers on the trip.



B. F. MIESSNER

B. F. MIESSNER is a consulting engineer with Wired Radio, Inc., New York. He has been for many years engaged in radio and electrical work for the Navy, John Hays Hammond, Jr., and Emil J. Simon. For a time, he was director of the

acoustical research laboratories of the Brunswick Balke Collender Company at Chicago. Mr. Miessner invented the Automatic Helio-

trophic Machine (the Electric Dog). He is also the author of *Radio Dynamics*, published by D. Van Nostrand and Company.

JAMES MILLEN is a student at Stevens Institute of Technology and is specializing in radio work.

ALBERT C. ALLEN "was born and raised in the regular army, and served in the Spanish and Phillipine wars." He has always lived in what he calls "the real West"—West of the Rockies, and has of late been particularly interested in horticulture, and also in photographing wild life.



ALBERT C. ALLEN
Taking movies of wild life

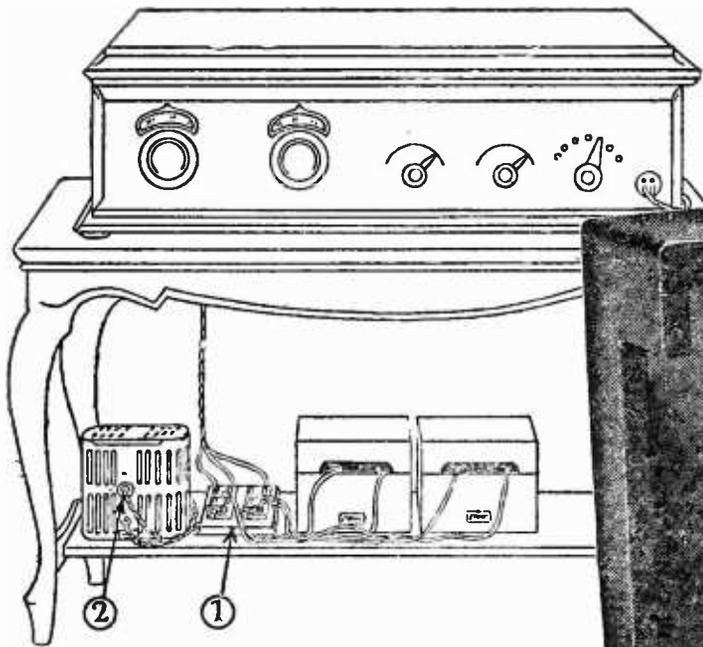
ROBERT H. MARRIOTT is not unfamiliar to readers of this magazine, for his contributions have appeared here quite frequently. One of Mr. Marriott's distinctions is that he was the first president of the Institute of Radio Engineers. He was one of the first to take up radio engineering as a profession and began actively in 1901. He is now chief radio engineer for the Puget Sound Navy Yard at Bremerton, Washington.

FRANK E. BUTLER is well known to many old timers in radio when it was wireless. The story of his experiences with Dr. Lee De Forest in the early experimental days is printed in this magazine for the first time, and, according to the mail we are receiving in the office, is attracting an unusual amount of attention. There are more articles by him to follow.

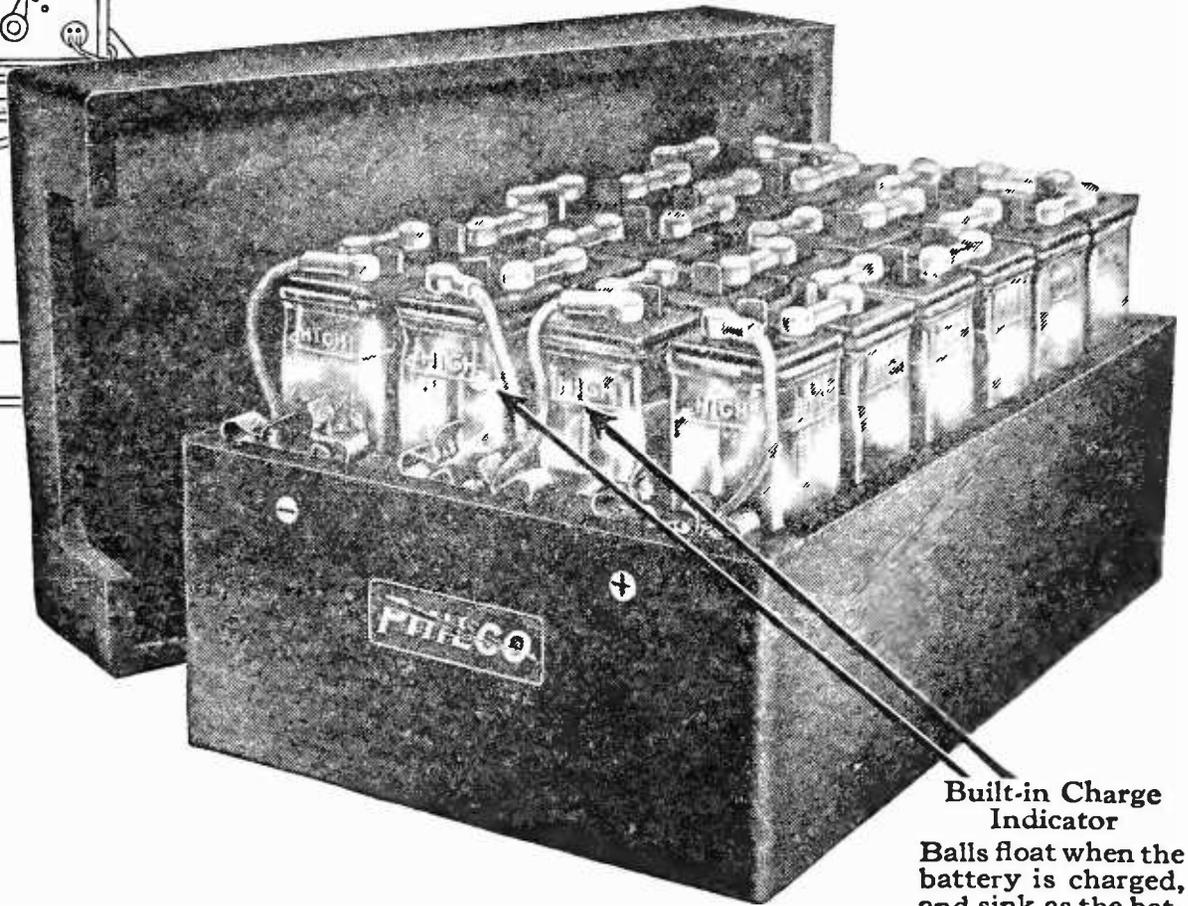
MCMURDO SILVER is a rare combination among radio men. His spare hours, instead of being devoted to radio, as are those of most other radio men, are devoted to James Branch Cabell, Arthur Machen, and Roland Firbank.



MCMURDO SILVER

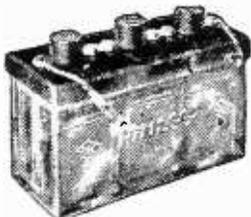


Philco Type DX "B" Battery with de luxe mahogany-finish case with cover (48 volts). Price—\$20.00
 Type DXO, without cover—\$16.50
 "B" Charging Panel, factory-wired and ready for use—\$2.75



Philco "B" Batteries on Charge
 To connect the batteries to your set, throw over switches on Charging Panel (1) and pull out plug (2) disconnecting the Philco Charger. Simple as A B C. Philco Single Charger for all "B" batteries and UD44 "A" batteries. Noiseless. Price—\$9.75
 Philco Double Charger for all "B" batteries and UD86 "A" batteries. Noiseless. Price—\$15.00
 Charger prices include plugs and receptacles.

Built-in Charge Indicator
 Balls float when the battery is charged, and sink as the battery becomes discharged.



Philco Pressed-Glass Case "A" Batteries

Spray-proof. Stay dry and clean always. Built-in Charge Indicators.

Type UD86 for storage battery tubes—\$16.00.

Type UD44, "a dry cell replacement" enabling you to get better results out of dry cell tubes. Occupies less space than three dry cells and may be installed permanently in the radio cabinet. Price—\$8.00.



Philco Mahoganyized-Case "A" Batteries

Types RAR and RW for storage battery tubes. In beautiful Adam-brown mahogany-finish cases harmonizing with your radio cabinet. Price—\$14.50 up.

Philco Charge Tester—permanently mounted in filler cap—avoids fussing with a hydrometer—\$1.00 extra.

Recharge in your living room without changing a wire!

You need storage "B" batteries because clear and distant radio reception depends on steady, non-drooping voltage and strong, hum-free current.

Philco has made the use of "B" storage batteries more convenient than the frequent renewal of dry cells—and far more economical, too.

To Recharge—just throw the Charging Panel Switches and insert the plug in the Philco NOISELESS Charger. Cost—five to ten cents.

You don't move the batteries nor disconnect a wire. You avoid all danger of getting positive and negative mixed and burning out tubes.

Clean, Dry and Beautiful. The tightly sealed glass cells are assembled in Adam-brown mahogany-finish cases, harmonizing with radio cabinets and furniture.

Built-in Charge Indicator. Tells you at a glance how much charge is in the battery at any time. Does away with the old-fashioned hydrometer.

Dynamic — Fresh. Philco Radio Batteries are shipped to your dealers Dynamic — CHARGED but absolutely DRY. He carries them in stock just as Victrola Records or tubes.

There's no deterioration because the life of a Philco Radio Battery does not start until you or your dealer pours in the electrolyte. This insures your getting a fresh, new power-packed battery.

You can buy Philco "B" Batteries and Chargers—also Philco "A" Batteries of similar convenience—at your nearest Philco Service Station, Radio or Music Dealer.

Philadelphia Storage Battery Company, Philadelphia

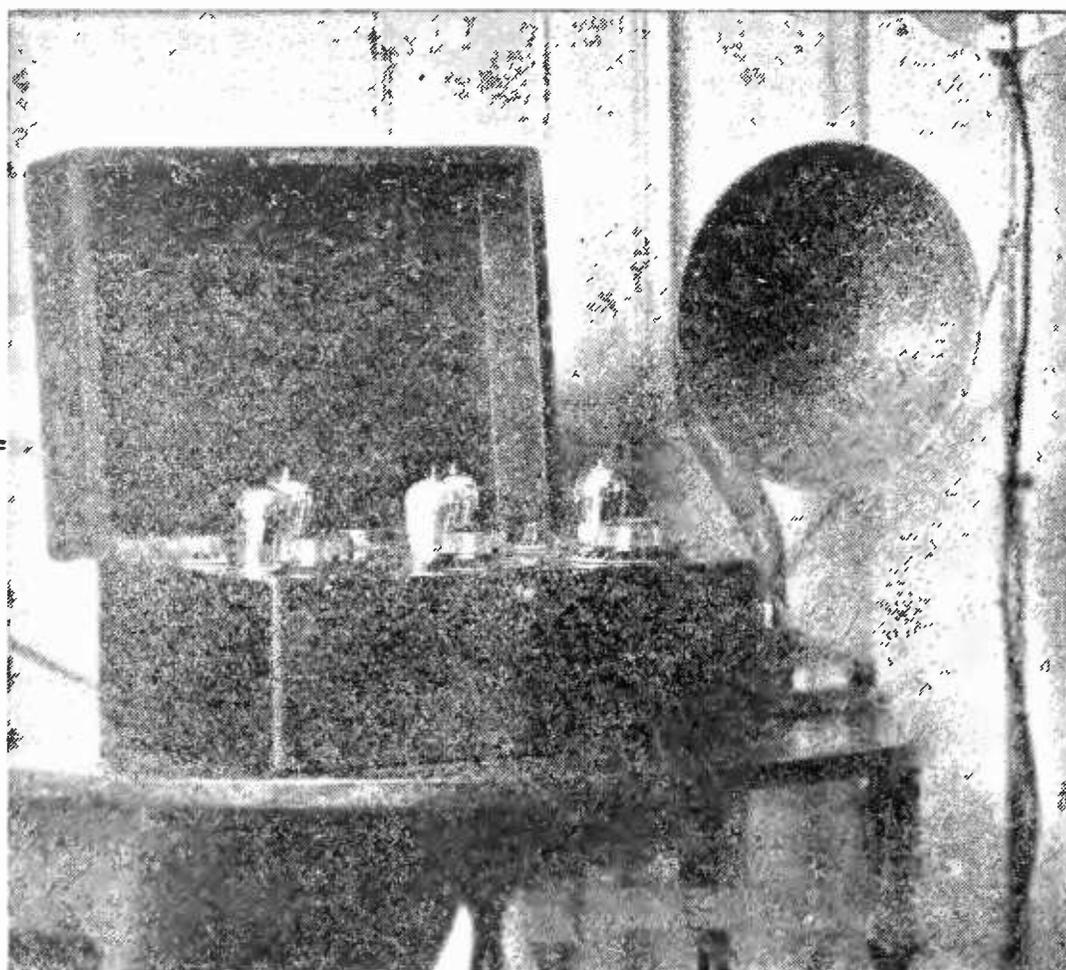


DRYDYNAMIC RADIO BATTERIES

JOBBERS and DEALERS—Philco has brought radio batteries out of the cellar and put them in the living room. Our new Radio Manual tells how. Fill out coupon below and we will mail you a copy.

Name _____
 Street _____ City _____
 State _____ Jobber Dealer

★ Tested and approved by RADIO BROADCAST ★



The Dynergy Receiver
is complete as shown
for Direct current.
\$185.00

The Public Instantly Accepted Dynergy

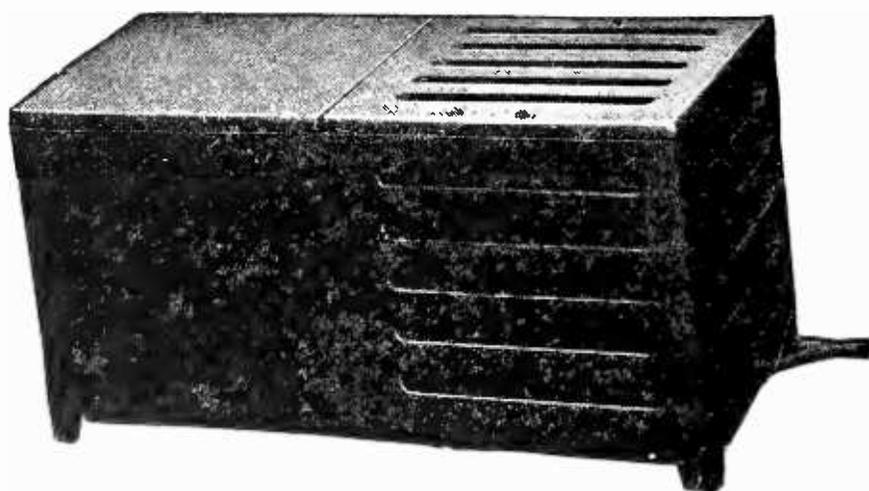
¶ In the Dynergy Radio Receiver has been accomplished what has long been the hope of all forward-looking radio manufacturers; namely, the building of an efficient receiver that takes all its electrical impulse directly from the electrical lighting socket and that eliminates the use, expense, and inconvenience of all batteries (A, B, and C).

¶ The Dynergy Radio Receiver is the first reliable radio receiver ever built that operates directly from either alternating or direct current (no A, B, or C batteries of any kind required). To make positively sure that the Dynergy would receive as well as the best receiver, numerous tests were made under all sorts of varying and trying conditions.

¶ The Dynergy has been tested and approved by the best authorities in the industry, by men who know. Under their supervision came at some time or other practically every receiver built. Some of these authorities who have tested and approved Dynergy are: Mr. Wm. Hedges of the Chicago Daily News; the Editor of Radio Broadcast Magazine; the Chief Engineer of KYW, Chicago; the Radio Editors of the New York Sun; Telegram-Mail; World; Journal; and the Springfield Republican. Radio Labora-

tories of recognized standing have tested and approved the Dynergy. Exhaustive tests have been conducted in the radio laboratories of the Brooklyn Navy Yard; Radio Broadcast Magazine; and practically every radio publication of any national significance.

¶ But the greatest stamp of approval that the Dynergy has received comes from the thousands of delighted owners who corroborate in a most enthusiastic and sanguine manner the judgment of the many eminent authorities who have tested it. Such an endorsement is the best you can get. Such an instant approval insures you and immediately bars misleading claims and far-fetched promises.



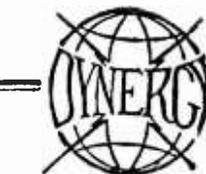
DYNAMOTIVE RADIO CORP.
47 NINTH AVENUE
NEW YORK CITY

In operating on A. C. the
Dynergy Rectifier is em-
ployed in conjunction with
the D.C. Receiver.

★ Tested and approved by RADIO BROADCAST ★



The Dynergy Receiver shown complete.



Miss America dancing to the Dynergy.

See and Hear Dynergy Yourself!

¶ The Dynergy Radio Receiver will eliminate for you at once all the expense, inconvenience, bother, and messiness of batteries, for it takes its power directly from the electric lighting socket absolutely without batteries (A, B, or C) of any kind. To the discerning person, this is a forward step that eliminates one of the major difficulties—a step that makes a radio receiver in the home almost a necessity.

¶ The Dynergy Radio Receiver is a complete and highly efficient five-tube receiver that takes all its electrical impulse (filament lighting; plate and grid voltages in detector and four amplifying tubes) directly from the lighting socket. Interruption in the middle of an interesting program due to run-down batteries; constant expense for recharging; bother and delay as a result of changing batteries; messiness and damage caused by leaking electrolyte are things of the past to Dynergy owners. In place of unreliable batteries has been substituted a dependable, unvarying, and constant flow of quiet, perfectly controlled, electrical power. Just turn on your electric lighting switch and your Dynergy is ready for Reception.

¶ The annoying hums and disturbing tube noises are singularly absent in the Dynergy

Radio Receiver. This five-tube receiver with its two stages of tuned radio frequency amplification, a detector, and two stages of audio frequency amplification is surprisingly inexpensive to operate. For Direct Current (D. C.), the operating cost is less than $\frac{1}{4}$ cent per hour. If Alternating Current (A. C.) is used, the consumption runs less than $\frac{1}{2}$ cent per hour.

¶ The other big item in the average receiver is replacement cost. In the Dynergy, it is eliminated except for vacuum tubes and in the case of A. C., rectifier tubes (2). Even this expense is ridiculously low because a burnt-out tube is an impossibility, for the removal of one or more tubes does not vary the voltage input. As a consequence, tubes last from one and one half to two years with ordinary care.

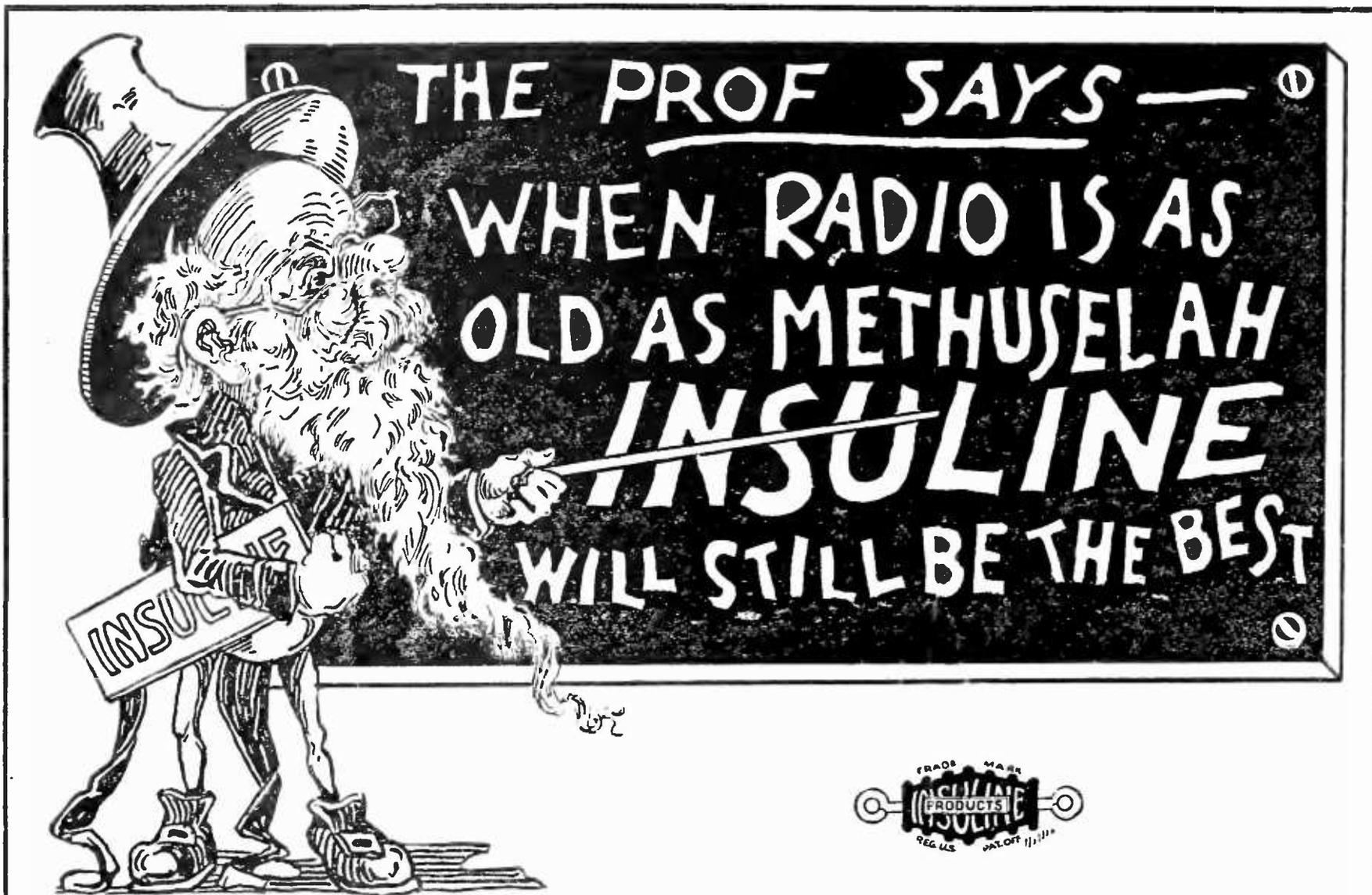
¶ The resonant, clear tone, the strong, sure volume, the sensitivity and sharpness of tuning, and the distance getting qualities are outstanding characteristics of the Dynergy. It is non-reradiative and simple to tune. The replacement cost is to all practical purposes, nothing. These, coupled with the fact that your Dynergy takes all its electrical impulse directly from the electric lighting socket, present to the thoughtful radio enthusiast just the combination in a radio receiver for which he has been looking.

¶ The Dynergy Radio Receiver is complete in itself for Direct Current. For Alternating Current, the Dynergy Rectifier is supplementary to the receiver.

DYNAMOTIVE RADIO CORP.
47 NINTH AVENUE
NEW YORK CITY



★ Tested and approved by RADIO BROADCAST ★



LIKE JOFFRE AT THE MARNE!

INSULINE panels, being poor conductors, stand against all the forces that waste your set power and say: "*They shall not pass.*"

INSULINE panels increase the range of your set and give you that beautiful, rounded, mellow tone.

INSULINE panels possess to the highest degree those qualities that make perfect insulation. They are impervious to all weather conditions—never warp or sag—and hold all mounted parts in a vise-like grip. They do not absorb moisture, and are Colossus-like in dielectric strength.

INSULINE panels are easily engraved and machined.

INSULINE panels come in three beautiful colors—black, black anti-capacity, mahogany,—and the new frieze finish. In standard and special sizes.

For panels, dials, tubing, sockets, and mounting strips,
Insist that your dealer gives you INSULINE.

★ Radio Panel and Parts Corp.

(INSULATING COMPANY OF AMERICA)

59 WARREN STREET

NEW YORK

WESTERN BRANCH

INSULATING CO. OF AMERICA, Madison, Wis.

Manufacturers, Jobbers and Dealers Write Our Nearest Branch for Booklet and Prices.

★ Tested and approved by RADIO BROADCAST ★

Our Customers Make Our Policies!

☐ A positive, complete, and unqualified guarantee of complete satisfaction covers every article sold.

☐ Everything shipped on approval! Send no money in advance! Examine your order in your express office before you accept it. If it is not satisfactory in every particular, the express agent will return it to us at our expense. If after you have operated in your home and given a reasonable trial to anything bought from us you find it unsatisfactory in any way, return it to us undamaged and we will willingly refund your money.

☐ We pay all shipping charges.

☐ Your order is shipped within 24 hours after receipt.

☐ Telegraph your order for a set. We will pay the Telegraph charges.

☐ If you can buy anywhere an order of radio parts, radio receivers, or radio accessories of equal quality for less money than you have paid us for your order, give us the facts at once and we will gladly send you our check for the difference.

NOTE:—

All Receivers and parts sold by this company are quality products. They are the product of the most responsible and best manufacturers in the industry and you cannot make a mistake in ordering any one of them. They have all been thoroughly tested and approved by experts of national prominence. They carry not only the manufacturer's guarantee and the approval of qualified authorities, but they carry our guarantee of absolute satisfaction.

☐ We are one of the largest radio houses in the world. We carry everything in demand in radio. If the particular receiver you have in mind is not offered here, telegraph us collect or write immediately and we will send it to you on the same liberal conditions as anything else we sell.

☐ Your radio questions are welcomed. Our experts will be pleased to help you without obligation to you.

☐ All correspondence answered promptly.

☐ Our business has been built on the solid basis of good will. A sincere effort is made to make a friend of every purchaser. Prompt and courteous attention is given to every order, inquiry, or communication. In short, we are more interested in gaining a friend than we are in merely getting an order. This is one reason why our guarantee actually means absolute satisfaction.

Liberty Mail Order House

"The Radio House of Friendly Service"

106 Liberty Street

Dept. A676

New York City

Tell Your Friends About the Liberty Offer

Get all the parts and accessories complete and Build the One-Tube Knock-Out Set

This truly marvelous set has caused highly favorable comment from thousands of enthusiastic set builders all over the United States and Canada and elsewhere. It is especially good for distance; it is sharp and easy of tuning; it has remarkable volume; it is surprisingly selective; it is not a "blooper"; and for sweetness and purity of tone it is not excelled. This receiver as well as the entire series of "Knock-Out" receivers cannot be recommended too highly.

Get from a specialist all your parts and all your accessories for the One-Tube "Knock-Out" receiver just as described by Radio Broadcast magazine. Your outfit includes diagrams, charts, and a copy of the "Knock-Out" booklet. Everything is shipped on approval! Send no money! Buy from the Radio House of Friendly Service (Headquarters for Everything in Radio) and save time, save patience, and save money.

Telegraph (at our expense) now for your one-tube "Knock-Out" set complete with all accessories—nothing more to buy. Shipped on approval! Send no money with order.

Here are a few of the thousands of comments:

From the *bushels* of commendatory letters which have been written about the one-tube, the following few taken at random give a clear idea of the high degree of satisfaction with which novices and experts alike from all over the country have greeted the advent of this marvelous little receiver.

Havana, San Francisco and Calgary from Louisville!

Here is a list of stations received one night with the "Knock-Out" one-tube set, using a C301-A bulb; PWX, WOR, WTAM, WGY, WPQ, WTAV, CKAC, WJAZ, WRC, WOAW, WDAP, KYW, WFAA, WSB, WDAF, CFCN, WGR, WPAL, KFKB, KPO, KFI. This set is hard to beat. A. J. Hammerle, 1426 Christy Ave., LOUISVILLE, KY.

Excellent for Distance!

I have constructed the one-tube set and am very much pleased with it. It is excellent for DX. Richard Selman, 5908 Mansian Pl., WOODSIDE, N. Y.

Hundreds Building It!

I have recently built the "Knock-Out" one-tube receiving set and I think it was a real scoop for the Radio Broadcast magazine because as a result hundreds are building this little wonder. Otto Bank, 908 Edwards Bldg., CINCINNATI, OHIO.

Beats Standard 3-Tube Set!

I constructed the one-tube reflex receiver and will say it is a "knock-out" as claimed. With a Magnavox loud speaker I have been able to get all the well known large stations in the South and East, and also Portland, Ore. Using phones alone, most of these came in too loud for comfort. The first night I tried, I got KFI in California *much clearer* than I was able to get it on a standard 3-tube set at the same time. C. P. Carlson, Dept. of Science, Eveleth Public Schools, EVELETH, MINN.

Very Easy To Tune!

After building the one-tube reflex "Knock-Out," I had to write of my appreciation of its performance. The results are splendid. Using two sets of phones, I can hear Texas, Los Angeles, Detroit, etc., and if I use only one set I can attach them to a homemade loud speaker and about 10 feet away from the speaker hear KFI quite distinctly. By tabulating the stations there is no guesswork when you want to find them again. Merely by knowing the wave length you know just about where your marks on your dial have to be. It's an all-around family set as my kid sister can operate it. H. R. Varcoe, BRANDON, MANITOBA.

"Knock-Out" Superior To All Others

In appreciation of the one-tube knock-out reflex, I thought I would write of my results as it happens to

be a one circuit which justifies the claims made for it, and you perhaps will be pleased to receive data from outside sources regarding it. I, in common with many other radio fans, have tried most all of the circuits that appeared in the last year or so, in search of the perfect receiver and have gradually discarded them for one reason or another. I honestly believe that for an all purpose one-tube receiver this one-tube reflex is the answer to date. This is not flattery as to the best of my memory this is the first testimonial I have ever written and only do so in the interest of the "game." W. H. Simonson, 30 Church St., NEW YORK, N. Y.

Complete List of Parts

	Reg. Price
1 Cabinet, mahogany stained 7x10	\$3.00
1 Panel, hard rubber, drilled, 7x10	1.75
1 Baseboard, 6 1/2 x 9 1/2	.35
1 Set coils, Sickles Reflex	4.00
2 Condensers, Variable, 23-plate, R. C. Co.	3.60
1 Detector, Crystal, Harco	1.00
1 Rheostat and mounting, Amperite	1.10
1 Socket, panel type, Federal	1.50
1 Transformer, 5 to 1 Shermatran	4.65
1 Jack, filament control, Millimeter	1.00
2 Dials, black, 3 in.	1.00
6 Binding Posts, moulded	1.20
2 lengths of tubing, varnished	.60
1 doz. lengths bus bar (wire)	.30
1 Radio Broadcast Booklet, 48 pages, showing plainly in detail how to proceed step by step in constructing	.50

Regular Price \$25.55

14P93 Parts, transportation paid \$20.92

Complete List of Accessories

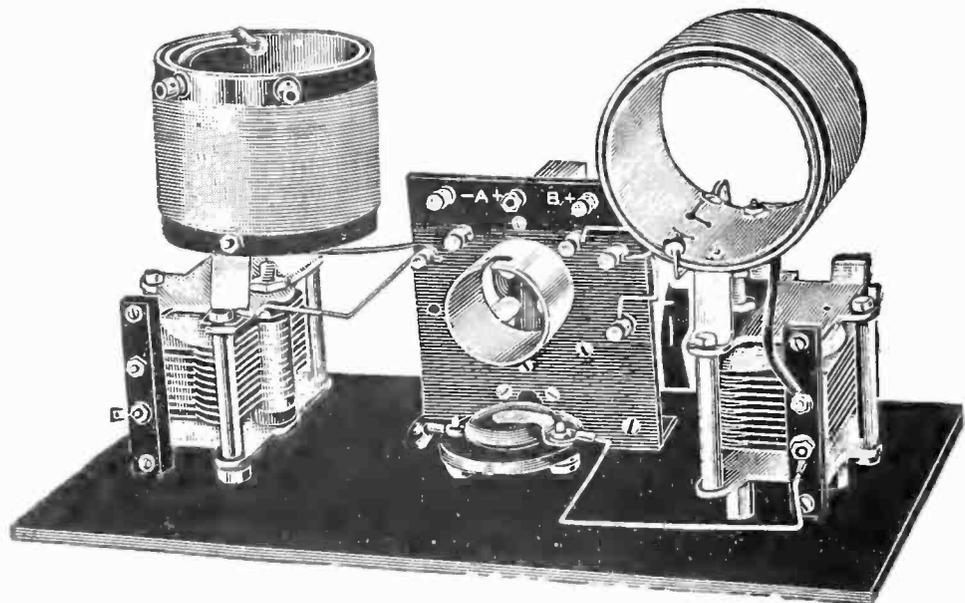
1 Battery, B, 22 1/2 V, Eveready	\$1.75
4 Batteries, A, dry cells, Ray-O-Vac	1.60
1 pair head phones guaranteed	4.50
1 phone plug, Pacent	.70
1 tube, UV-201A	4.00
1 Antenna Equipment	4.00
*We recommend the use of 45 volts instead	

Regular Price, \$16.55

14P94 Accessories, our price, transportation paid \$11.87

14P139 Complete, Parts and Accessories, our price, transportation paid \$32.79

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.



Liberty Mail Order House

"The Radio House of Friendly Service."

106 Liberty Street Dept. A676 New York City

Every "Knock-Out" Order Includes Radio Broadcast's Instruction Booklet.

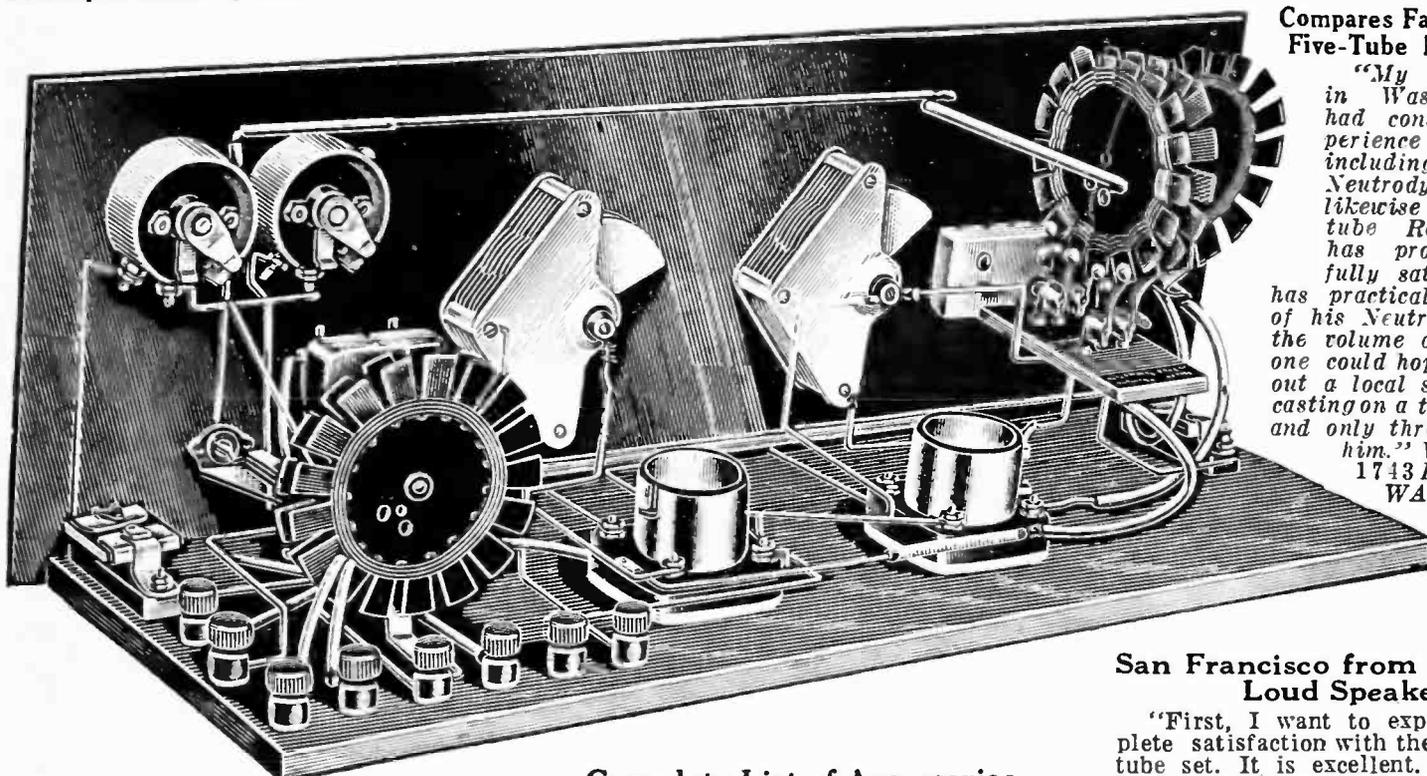
Radio Broadcast's Unequaled Two-Tube "Knock-Out" Receiver

(Developed by Walter Van B. Roberts)

Radio Broadcast's "Knock-Out" Roberts circuit is recognized by all who know as one of the great developments of the radio industry. It was produced after months of painstaking and thorough research in the laboratories of Radio Broadcast Magazine by Mr. Walter Van B. Roberts who is acknowledged to be one of the foremost radio engineers of America. Nothing was overlooked, no feature was slighted. Every detail was checked and re-checked and tested and re-tested before the circuit was editorially described in and approved by Radio Broadcast Magazine.

The extraordinary results obtained from the very first, have justified many times the extreme care and thought exercised in the development of this circuit. It gives us pleasure to recommend unhesitatingly and guarantee unqualifiedly this set to any one who is particular and demands the best. It combines every element that goes to make a radio receiver a joy and pleasure. You will see what we mean by this, when you compare with other sets, your smooth-working, easily-tuned, non-howling, non-squealing "Knock-Out" two-tube receiver made of high-class parts procured from the Liberty Mail Order House.

Telegraph (at our expense) your order for the complete parts and accessories for the Roberts Two-Tube "Knock-Out" Receiver. Your shipment will include an exact reprint with diagrams, sketches, etc., of the descriptive article which appeared in Radio Broadcast. Get the complete parts and accessories at one time, in one order—all from one house which specializes in what you need and guarantees full satisfaction. This will save you time and bother. We will save you money and we guarantee to please you in every particular. Order your Roberts Two-Tube "Knock-Out" receiver now! Shipped on approval! Send no money! Transportation paid!



Compares Favorably with Five-Tube Neutrodyne!

"My brother here in Washington has had considerable experience building sets including five-tube Neutrodyne, and he likewise built a two-tube Roberts which has proven wonderfully satisfactory. It has practically the range of his Neutrodyne and all the volume and selectivity one could hope for, cutting out a local station broadcasting on a thousand watts and only three blocks from him." W. W. Massey, 1743 F. St., N. W., WASHINGTON, D. C.

Complete List of Parts

	List Price
1 Cabinet Mahogany finish 7x14	\$3.50
1 Panel, h.r., 7x14, drilled...	2.25
1 Baseboard, 6 1/2 x 13 1/2	.50
1 Set Coils, Roberts	8.00
2 Con., var., 23-pl., R. C. Co.	3.60
1 Grid Condenser, Micadon .00025	.35
1 Grid Leak, 2 Megohm, Daven	.50
1 Condenser, fixed, Mica .0025	.40
1 Condenser, fixed, Micadon .005	.60
1 Condenser, neutralizing	2.00
1 Rheostat, Tillman 60 ohm	.75
2 Resistance units, 25 ohm, C-H	.50
1 Socket, Federal	1.00
1 Socket, Federal UV-199	1.00
1 Transformer, Sherma-Tran 5-1	4.65
2 Dials, Black, 3 in.	1.00
1 Switch, Inductance, Fada type	.25
7 Switch points	.10
2 Switch stops	.05
8 Binding posts, Moulded	1.60
1 Battery C Eveready type 771	.60
2 Lengths tubing, varnished	.60
1 Doz. Lengths wire, Bus Bar.	.30
1 R. B. 48-p. book, How to build, how to proceed step by step	.50

Regular Price \$34.60

14P95 Parts, Our Price, Transportation Paid.....\$26.91

Complete List of Accessories

2 Batteries B Eveready 45V..	\$ 7.50
1 Battery A Westinghouse storage 70 ampere hour	15.00
1 Pair Phones, head, Little Tattler	4.50
1 Plug, phone, Comsco	1.00
1 Tube UV-199	4.00
1 Tube UV-201-A	4.00
1 Antenna Equipment	4.00

Regular Price \$40.00

14P86 Accessories, Our Price, Transportation paid.....	\$31.44
Regular Price, Complete,	\$74.60
14P140 Our Price Complete, nothing more to buy, postpaid.....	\$58.35

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

Not Surpassed for Selectivity, Simplicity and Control

"Among my friends here in Cincinnati, there are several who are very enthusiastic about the Roberts two-tube Knock-Out Receiver. Abner Thorp, Jr., 420 East 4th St., CINCINNATI, OHIO.

San Francisco from Dayton on Loud Speaker!

"First, I want to express my complete satisfaction with the Roberts two-tube set. It is excellent. Last evening I picked up on an inside aerial the following stations in less than an hour and a half: WTAS, WSAI, WMH, KDKA, WBZ, KFKX, WOI, WGN, WGY, WTAM, WOR, WLW, WOS, WCAP, WFAA, WMC, WOC, WEA, WWJ. I have tuned in KGO, San Francisco, without any difficulty. This I consider very good inasmuch as it is not being received here very well yet. Several have built the set after having heard mine and are very enthusiastic. One of them received KGO last evening at 12:15 on the loud speaker." L. C. Bauer, Mutual Home Bldg., DAYTON, OHIO.

It Logs Just Like a Five-Tube Neutrodyne!

"The Roberts set logs just like a five-tube Neutrodyne, only there are just two controls instead of three. The local broadcasting station can be tuned in or out in a few degrees and distant stations tuned in without interference from either local or distant stations. It's a great circuit, and Mr. Van Roberts deserves the highest commendations for devising it." C. E. Oldacre, 218 Pearson Ave., TORONTO, CANADA.

Liberty Mail Order House

"The Radio House of Friendly Service."

106 Liberty Street Dept. A676 New York City

Deal With a Concern that Specializes in What You Want.

Canadian Government OK's Radio Broadcast's Four-Tube "Knock-out" Receiver

(Developed by Walter Van B. Roberts)

The Director of Radio of the Canadian Government thinks so highly of the Radio Broadcast's Four-Tube Knock-out Receiver which was developed by Walter Van B. Roberts that he has had the article in Radio Broadcast describing this receiver photostated. He sends one of these photostatic copies to everyone who writes him for information on how to build a radio set.

Such official approval denotes a confidence arising only from *exhaustive tests and a complete knowledge of performance*, which necessarily was competitive.

Mr. Lynch says:

Mr. Arthur Lynch, Editor of Radio Broadcast, under whose supervision the Roberts Four-Tube "Knock-Out" Receiver was developed, says in part about this wonderful set:

"... Tube for tube, dollar for dollar, and result for result, we will stack it up against any receiver for home construction ever described by any radio publication and gamble that it comes out a winner."

We say:

"... that we have seen hundreds of letters from radio enthusiasts everywhere who have built this remarkable Roberts Four-Tube "Knock-Out" Set and these letters range from conservative expressions of appreciation to wild-eyed enthusiasm. Thousands of others have built this receiver (all with marked success) and so can you. We recommend it unqualifiedly to YOU.

Certainly is Great!

"I have built one of the Roberts four-tube sets and it certainly is great." L. Hopkins, Eaton, Crane & Pike Co., PITTSFIELD, MASS.

Receives Calif. from N. Y. on two Tubes!

"I have followed the development of the Roberts circuit with results far beyond all expectations. I find it to be EXACTLY as efficient as described although I was skeptical as to the unusual operation that it was said to have accomplished. I no longer have any doubts, for in the last week of August and to date in September, I have received KGO at least four times. On one of these occasions I received it on my Dictogrand loud speaker, using only two tubes! I have consistently received long distance, such as Dallas, Fort Worth, Auburn, La., Hastings, and Kansas City, in all about 65 stations while just "fishing." Locals, such as Pittsburgh, Schenectady, New York City, Chicago, Boston, etc., it need not be mentioned, are perfect, even on occasions when I have used neither aerial nor ground. I am sure it was a lucky day when this set came to my attention. L. L. Clifford, 190 Second Street, FULTON, N. Y.

It is All that is Claimed!

"I constructed the four-tube Roberts Knock-Out set and found it all that is claimed for it." Louis I. Mason, Dr.

Mason's Hospital, Fairview Street, WILMANTIC, CONN.

Selectivity Better than Eight Tube Heterodyne

"Last week I constructed the four-tube Roberts Knock-Out set. I am more than pleased by its operation, its selectivity being better than my eight tube super-heterodyne. On a poor night I was able to bring in WOS, WGN, WOC, WSAI, WBZ, and all at loud speaker intensity." Louis R. Jeffrey, 51 Newark St., HOBOKEN, N. J.

A Wonder in Sensitivity, Volume Tuning and Quality

"I find the Roberts circuit a very satisfactory one and it is a wonder in its combination of sensitivity, good volume, ease of tuning and tone quality." Kenneth S. Wyatt, KINGSTON, NOVA SCOTIA.

See what "Old Timer" says

"I have been in the Radio receiving game since I was 12 years old, and I have made and operated a countless number of receiving sets from crystal to super-heterodyne, but the Roberts is the only one that I can put any confidence in, because now when I want a distant station, all I have to do is to turn to some dial settings and in she comes on the loud speaker with the same clarity and volume of the local stations. And as for re-radiation, I have forgot very nearly what that is since the fellow upstairs had me make him one like mine. We both have our aerials alike in every way and they are only 12 feet apart, and no trouble to each other at all at any time. This is remarkable." Geo. Wm. Bruffy, 1417 Tea Street, S. E., WASHINGTON, D. C.

Read This About the Instructions!

"What pains the Radio Broadcast and Mr. Brennan have taken is plainly shown, for the whole booklet and blue print are a complete masterpiece of simplicity." W. J. Mixon, Jaynxon Radio Laboratory, 57 Dey Street, NEW YORK, N. Y.

Why not send right now for yours?
No money in advance—no obligation to accept.

CLASS OF SERVICE		SYMBOL	
Telegram			
Day Letter	Blue		
Night Message	NMs		
Night Letter	N L		

If none of these three symbols appears after the check (number of words) this is a telegram. Otherwise its character is indicated by the symbol appearing after the check.

WESTERN UNION

TELEGRAM

NEWCOMB CARLTON, PRESIDENT GEORGE W. E. ATKINS, FIRST VICE-PRESIDENT

Form 1204

CLASS OF SERVICE		SYMBOL	
Telegram			
Day Letter	Blue		
Night Message	NMs		
Night Letter	N L		

If none of these three symbols appears after the check (number of words) this is a telegram. Otherwise its character is indicated by the symbol appearing after the check.

RECEIVED AT

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SANPEDRO CALIF 12op sept 22 1924

ARTHUR H LYNCH

EDITOR RADIO BROADCAST

RECD CABLE THIS MORNING CONFIRMING TWO WAY COMMUNICATION. HELD WITH NEWZEALAND FOUR A A BELL TWELVE TWENTY TO ONE FORTY SUNDAY MORNING RECEIVED ON ROBERTS LOW WAVE RECEIVER AS PER ZEH BOUCK DOES THIS INTEREST YOU SIX B C P

W V MAGNER

836a

Think what this Telegram means to You!

Liberty Mail Order House

"The Radio House of Friendly Service"

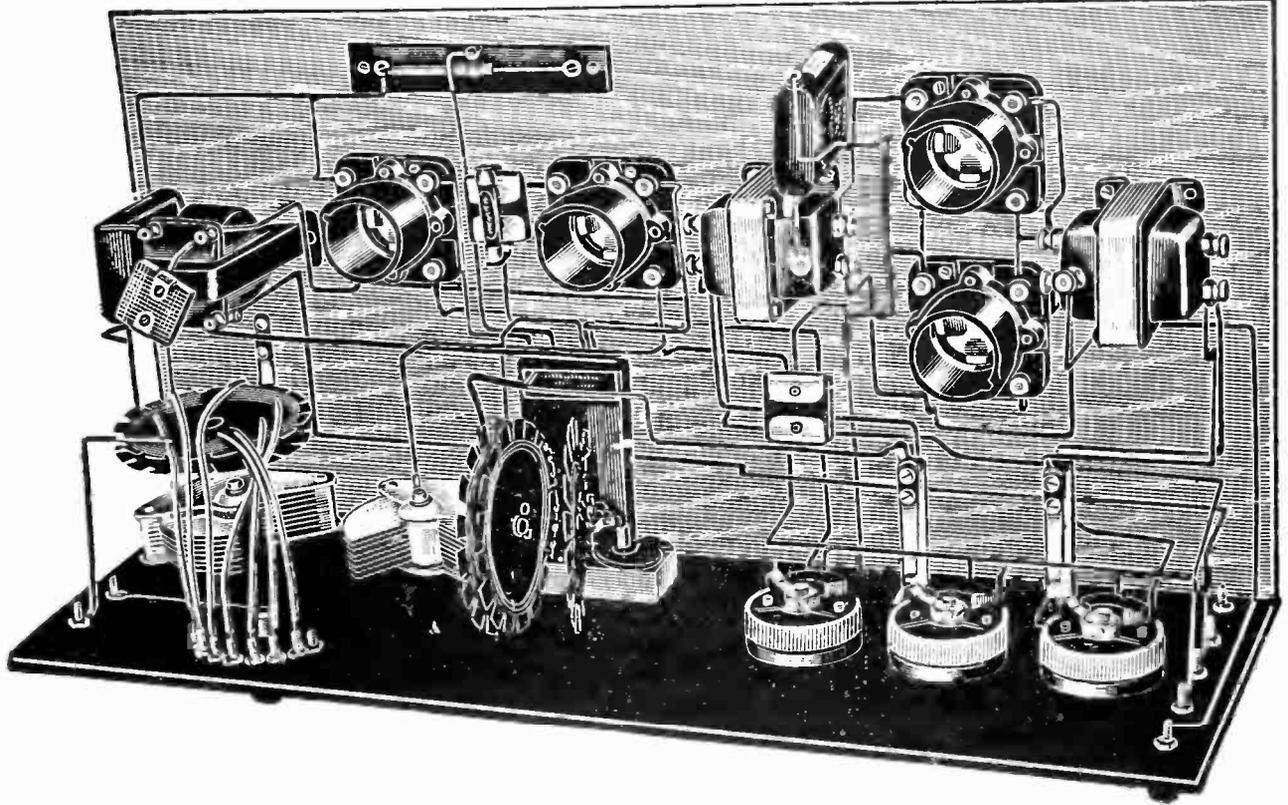
106 Liberty Street

Dept. A-676

New York City

Headquarters for Everything Needed in the "Knock-out" Series.

**Very
Easy to
Set Up—
You Can
Do It!**



**Complete Parts and Accessories for Radio Broadcast's
Perfect Receiver**

Four-Tube "Knock-out" Set

Developed by Mr. Walter Van B. Roberts

The Radio Broadcast four-tube "Knock-Out" Receiver is the Ace of the "Knock-Out" series. It was designed in the laboratories of Radio Broadcast by Mr. John B. Brennan on the fundamental circuit developed by Mr. Walter Van B. Roberts, one of the foremost radio engineers of this country.

READ—THINK WHAT THIS MEANS! COULD ONE ASK MORE?

It combines the principles of Reflex, Neutralization, Tuned Radio Frequency, Regeneration, (without blooming) and Push-Pull amplification. These principles give you in the Roberts Four-Tube "Knock-Out" Receiver *low first cost and low upkeep*, remarkable ease of tuning, the selectivity of the super-heterodyne, greater sensitivity than any other receiver ever designed for home construction, and volume enough for dancing. It is a thoroughly tried and developed receiver that met with instant approval and has stirred up *proud enthusiasm* and given *utmost satisfaction* everywhere. It is the ideal receiver for home construction! If you want the very best, we are offering it to you right now. *You cannot possibly find its superior!*

Telegraph (at our expense) now your order for complete parts and accessories for this perfect home-construction receiver. The clearly edited booklet and carefully checked blue-prints just as printed in Radio Broadcast Magazine that accompany each order, will make the building of this receiver absorbing and interesting. Ordering from us will save you time and trouble. We will save you money and guarantee absolute satisfaction in every particular. Shipped on approval! Send no money! Examine it in your express office before you accept it. If you are not satisfied after you have given it a reasonable trial in your home, we will take it back and refund your money!

Headquarters for Everything Needed in the "Knock-out" Series

Complete List of Parts		Quantity	Reg. Price		Quantity	Reg. Price
Cabinet, Mahogany-finish, piano polish, 7x21	1	\$ 5.00	Batteries, C Eveready Type 771	2	1.20	
Panel, hard rubber, 7x21, drilled and engr...	1	4.00	Doz. lugs, soldering	1	.10	
Baseboard, 6 1/2 x 20 1/2	1	.60	Tubing, varnished, lengths	3	.90	
Set coils, Roberts	1	8.00	Doz. length wire, bus bar	1	.30	
Condensers, variable, 23-plate, U. S. Tool	2	6.80	Blue prints and Instructions	1	1.00	
Grid condenser, micadon .00025	1	.35			Regular Price \$61.85	
Grid leak, 2 megohm, Daven	1	.50	14P98 Parts, Our Price, transportation paid,.....		\$48.35	
Condenser, Fixed Micadon .0025	1	.40	Complete List Accessories			
Condenser, Fixed Micadon .005	1	.60	Batteries, B, Eveready, 45 v.	2	\$ 7.50	
Condenser, Neutralizing	1	2.00	Battery, A, Storage, 70 A.H., Westinghouse	1	15.00	
Rheostats, 20-ohm, Tillman	3	2.40	Headphones, Guaranteed	1	4.50	
Sockets, Federal	4	4.00	Phone plug, Comsco	1	1.00	
Pair Transformers, Como Push-Pull	1	12.00	Tubes, UV-201-A	4	16.00	
Transformer, 5-1 Sherma-tran	1	4.65	Antenna Equipment	1	4.00	
Switch, Inductance, Fada type	1	.25			Regular Price \$48.00	
Switch, points	7	.10	14P99 Accessories, Our Price, transportation paid		\$38.14	
Switch, stops	2	.05	14P138 Complete Parts and Accessories, nothing more to buy, Our Price, transportation paid		\$86.49	
Dials, Univernier	3	3.75	If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.			
Binding posts, moulded	7	1.40				
Jack, closed circuit, Millimeter	1	.80				
Jack, open circuit, Millimeter	1	.70				

Liberty Mail Order House

"The Radio House of Friendly Service"

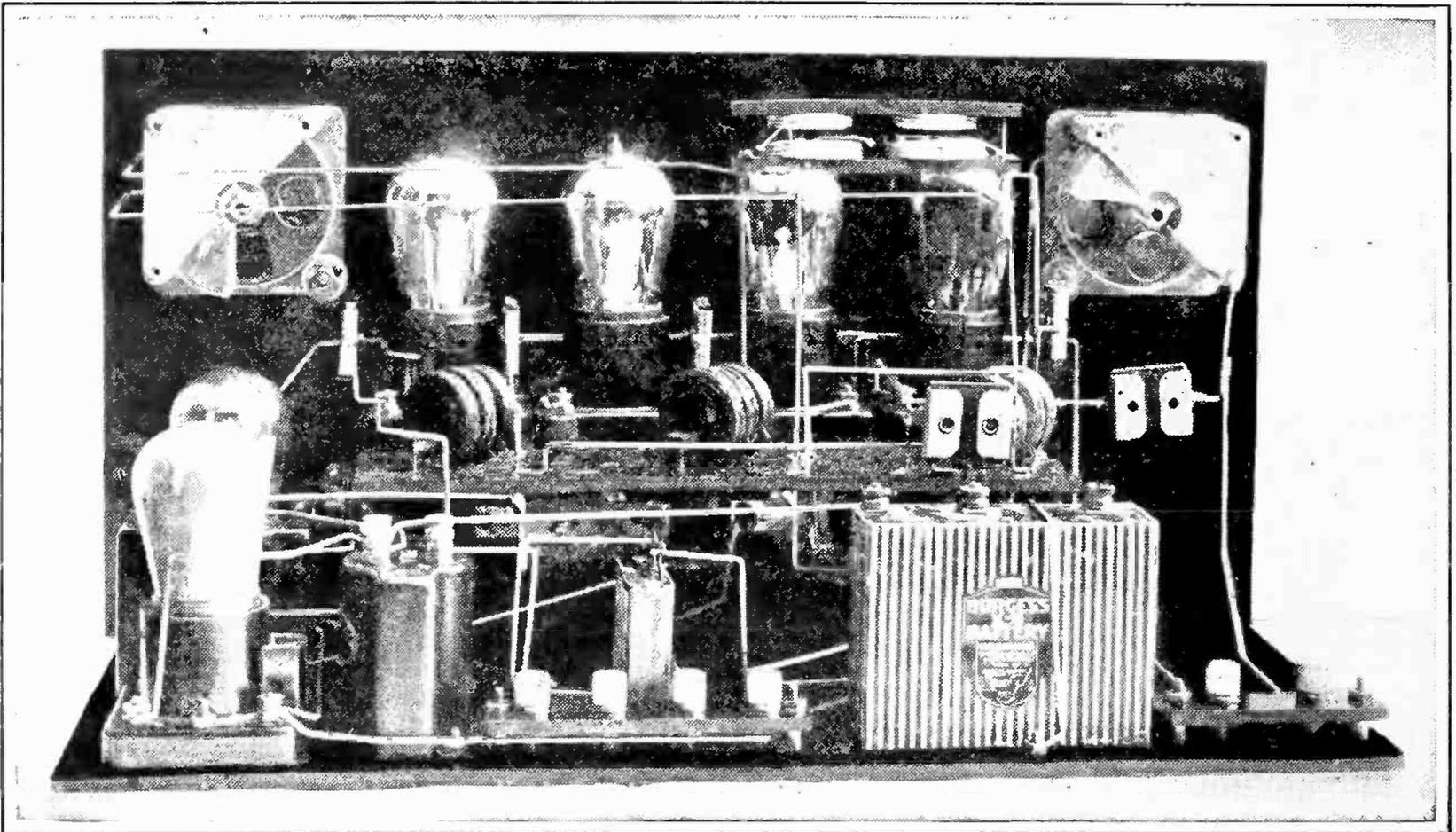
106 Liberty Street

Dept. A676

New York City

Radio Broadcast's Complete Booklet including diagrams, sketches and layouts, is included in every "Knock-out" Order

RADIO BROADCAST HAS DISCOVERED A Real Super-Heterodyne At Last FOR HOME CONSTRUCTION



Allan T. Hanscom has designed a super-heterodyne that has removed with one gesture all the outstanding and attendant super-heterodyne difficulties.

It is a six-tube reflexed super-heterodyne that brings KGO into New England with a loop right through WSAI. This receiver is, first, easy for the home builder to construct; it is just as easy to operate; it is one of the least expensive of all good receivers to construct; B Battery consumption and operating cost is a mere fraction of the ordinary super-heterodyne; and the results are definite, reliable, and conducive to much honest pride.

Mr. Arthur Lynch, Editor of Radio Broadcast, in presenting editorially the Hanscom Super-Heterodyne to his readers said in part:

"For some time we have been looking for a super-heterodyne which required fewer tubes and was more economical to operate than those we have described heretofore. . . . It is easy to tune, selective, sensitive, and produces exceptional volume with clarity far above the ordinary.

"Receivers of this type are going to improve beyond our powers of imagination and this improvement is indicated very clearly in Mr. Hanscom's work which we feel is a long step in the right direction."

Such an endorsement as this coming from such an authority as Mr. Lynch, commends this super-heterodyne enough for us to place our guarantee of "absolute satisfaction in every particular" on it. We are glad to go one step further. Order your parts now, construct this receiver and give it a reasonable trial. If it is not absolutely satisfactory in every particular, return it to us, undamaged, and we will gladly refund your money.

Telegraph (at our expense) now for your Hanscom Super-Heterodyne parts complete with all accessories—nothing more to buy. Examine parts and accessories in your express office before you accept them! Send no money with order!

Hanscom's Six-Tube Super-Heterodyne just as described by Radio Broadcast, complete with all accessories, nothing more to buy.

Item	List Price
1 Cabinet, mahogany finish, piano polish, 7x26...	\$ 6.25
1 Panel hard rubber, drilled, 7x26	6.00
1 Baseboard, 6 1/2 x 25 1/275
1 Hanscom "Superunit"	37.50
2 G. I. Variable Low Loss Condensers, .0005 mfd.	10.00
1 Chelton Midget Condenser	1.50
2 Univernier Dials, Black	2.50
2 Shermatran Audio-frequency Transformers	9.30
2 Tube sockets, Na-ald	1.50
1 Rheostat, 6 Ohm, Tillman75
1 Rheostat, 20 Ohm, Tillman80
1 Condenser, Dubilier Bypass, 1 mfd.	1.25
1 Single Circuit Jack, Millimeter70
1 Double Circuit Jack, Millimeter80
1 Dozen Lengths Bus Bar Wire30
Instructions	Regular Price \$79.90

14P128 Our Price, Transportation Paid,.....\$73.00

COMPLETE ACCESSORIES

1 A Battery, Storage, 6v, 100 AH, Prestolite ...	\$18.00
2 B Batteries, 45 volts, Eveready	7.50
1 C Battery, 4 1/2 volts, Eveready 77160
6 Radiotrons, UV 201-A	24.00
1 Pair Head phones, Baldwin Type C	12.00
1 Phone plug, Comsco	1.00
1 Loud Speaker, Perfectone	15.00
1 Ritter Collapsible Loop	6.50
	Regular Price \$164.50

14P188 Our Price, Transportation Paid.....\$138.11

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

Liberty Mail Order House
106 Liberty Street Dept. A676 New York City

Tell Your Friends About the Liberty Office

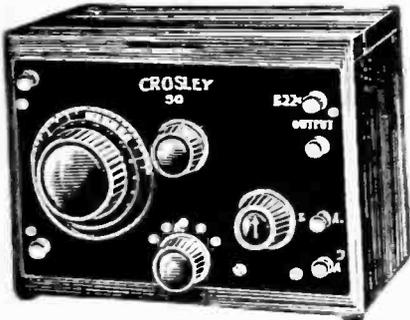
A Crosley Will Give you Real Enjoyment at Minimum Cost

The individual who, up to this time, has not felt the urge of radio or who has not wanted to lay out much money for a radio receiver, will find in the Crosley selection just the receiver for which he has been waiting. To the former, a Crosley set brings the delightful and interesting programs that once heard would not be missed again. To the latter, Crosley receivers open the gates of radio enjoyment because Powel Crosley, Jr., is to the radio what Henry Ford is to the Automobile. Mr. Crosley determined to make good radio receivers in such great volume as to enable him to sell at prices away below those asked for inferior sets. He has succeeded. He makes many thousands sets a day, more than any other maker.

One cannot say too much about this excellent line of radio receivers that range in price from \$16.00 to \$120.00 (without accessories) to suit every taste and pocketbook. The design of every Crosley receiver has been based on sound engineering principles. Every one is carefully constructed of reliable parts and is placed in good cabinet. The Crosley firm feels that successful operation of every Crosley manufactured, is a personal matter. Their guarantee and ours protects you.

Telegraph (at our expense) now an order for your complete Crosley with all accessories—nothing more to buy. We guarantee to give you absolute satisfaction in every particular. Examine it at your express office before you accept it and if, after a reasonable trial, it does not prove satisfactory in every way, return it to us and we will gladly refund your money. Shipped on approval! Send no money with order.

Crosley One-Tube Receiver No. 50

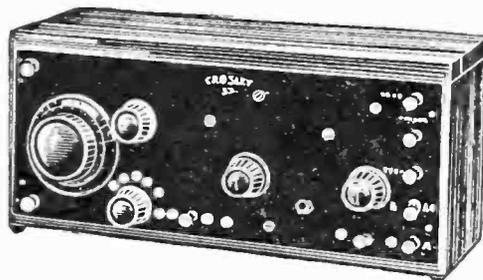


1 Crosley One-Tube Receiver, \$14.50; Complete Accessories—1 Dry Cell 1½ Volts, Ray-O-Vac, \$.40; 1 Radiotron WD-11, \$4.00; 1 B Battery, 22½ volts, Cyclone No. 9280, \$1.50; 1 Pair Head Phones, Little Tattler, \$4.50; 1 Aerial Equipment, \$4.00 Regular Price, \$28.90
14P109 Complete, transportation paid...\$23.01

Description of Receiver

"Crosley"; Type—Regenerative; Tubes—Detector (1); Battery—A Storage or Dry; B 22½ to 45 Volts; Controls—Tuning, 1; Tube, 1; Dim.—1½x5 7/8x11; Wt.—7½ lbs.; Price—\$14.50.

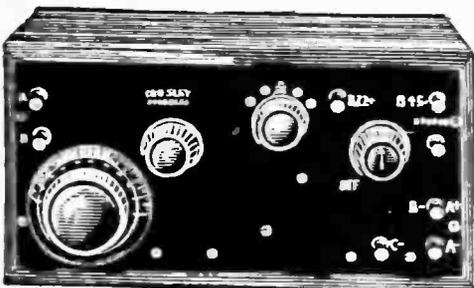
Crosley Three-Tube Receiver No. 52



1 Crosley Three-Tube Receiver, \$30.00—Complete Accessories—1 A Battery, Storage, 6 volt, 100 A.H., Prestolite, \$18.00; 2 B Batteries, 45 volt, Cyclone, \$7.00; 3 Radiotrons UV-201-A, \$12.00; 1 Pair Head Phones, Little Tattler, \$4.50; 1 Phone Plug, Comsco, \$1.00; 1 Loud Speaker, Perfectone, \$15.00; 1 Aerial Equipment, \$4.00. Regular Price, \$91.50.
14P107 Complete, transportation paid.....\$72.04

Same as Model 51, except—Tubes 3; Battery—"B" 45 to 90 Volts; Dim.—4¾x5 7/8x13¾; Wt.—10 lbs.; Price—\$30.00.

Crosley Two-Tube Receiver No. 51



1 Crosley Two-Tube Receiver, \$18.50—Complete Accessories—1 6 volt Storage A Battery, 85 A. H., Prestolite, \$17.00; 1 45 volt B battery, Cyclone, \$3.50; 2 Radiotron UV-201-A Tubes, \$8.00; 1 Pair Head Phones, Little Tattler, \$4.50; 1 Aerial Equipment, \$4.00.

Regular Price, \$55.50.

14P108 Complete, transportation paid.....\$46.05

Description of Receiver

"Crosley"; Type—Regenerative; Tubes—2; Battery—"A" Storage or Dry; "B" 67½ Volts; "C" 4½ Volts; Controls—Tuning 1; Tube, 2; Dim.—1½x5 7/8x11; Wt.—9 lbs.; Price—\$18.50.

Crosley Receiver XJ

1 Crosley Model XJ, \$55.00; Complete Accessories—1 A Battery, Storage, 6 volt, 100 A.H., Prestolite, \$18.00; 2 B Batteries, 45 volt, Cyclone, \$7.00; 4 Radiotrons UV-201-A, \$16.00 1 Pair Head Phones, Little Tattler, \$4.50; 1 Phone Plug, Comsco, \$1.00; 1 Loud Speaker, Perfectone, \$15.00; 1 Aerial Equipment, \$4.00. Regular

price, \$120.50.

14P137 Complete, transportation paid.....\$97.89

Description of Receiver

"Crosley"; Type—Tuned Radio Frequency; Tubes—4; Battery—A—Storage or Dry; B—45 or 90; Controls—Tuning—3; Tubes—4; Dim.—21½x7½x6; Wt.—11 lbs. Price—\$55.00.

W. J. Rodman, of Oklahoma City, Okla., Trirdyn owner, writes as follows:

"Last night we obtained such wonderful results on the Crosley Trirdyn Special that I just had to write and tell you about them. We think this set is the best receiver on the market, regardless of price. We will be willing to put it up against any receiver regardless of the price or number of tubes used because we know the Trirdyn will out perform all.

"We tuned in KGO, Oakland, California; KHF, Los Angeles; and CYB, Mexico City, besides such 'local stations' as Dallas, Cincinnati, Schenectady, Pittsburgh, Chicago, Kansas City, Winnipeg, Northfield, Minn., Des Moines, Iowa; Fort Worth, Omaha, Memphis, Zion City, and Elgin. All these stations were tuned in with perfect ease and logged perfectly.

"KGO, Oakland, was put on a loud speaker, using two tubes, under adverse atmospheric conditions."

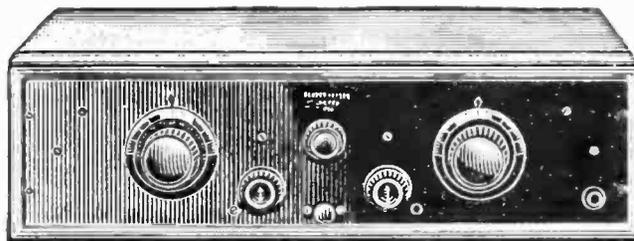
Crosley's Greatest Achievement

Crosley Trirdyn Receiver 3R3

1 Crosley Trirdyn Receiver, \$65.00—Complete Accessories—1 A Battery, Storage, 6 volt, 100 A.H., Prestolite, \$18.00; 2 B Batteries, 45 volt, Cyclone, \$7.00; 3 Radiotrons UV-201-A, \$12.00; 1 Pair Head Phones, Little Tattler, \$4.50; 1 Phone Plug, Comsco, \$1.00; 1 Loud Speaker, Perfectone, \$15.00; 1 Aerial Equipment, \$4.00. Regular price, \$126.50.

14P106 Complete, transportation paid.....\$103.54

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.



One of the Best Sets in Existence

"Trirdyn"; Type—Regenerative Radio Frequency (Reflexed); Tubes—3; Battery—A Storage or Dry; B 90 Volts; C 4½ Volts; Controls—Tuning, 2; Tube, 3; Dim. 22x6¼x7¾; Wt.—15 lbs.; Price—\$65.00.

Liberty Mail Order House

"The Radio House of Friendly Service"

106 Liberty Street

Dept. A676

New York City

We Guarantee Absolute Satisfaction in Every Particular or Money Gladly Refunded

Everyone Has Confidence in Radiolas

The RCA (Radio Corporation of America); is the Daniel Boone of the radio industry. To this great organization belongs, to a large extent, the extraordinary development of radio. All of its products, whether the Radiola III or the Radiola Super VIII, do all that is claimed and much more. These products are quality products and are always listed among the best manufactured. The international scope of this powerful concern, coupled with its constant laboratory research, insures to you quality, reliability, good results. One cannot recommend these receivers too highly. "RCA" is a symbol on which you can place your confidence.

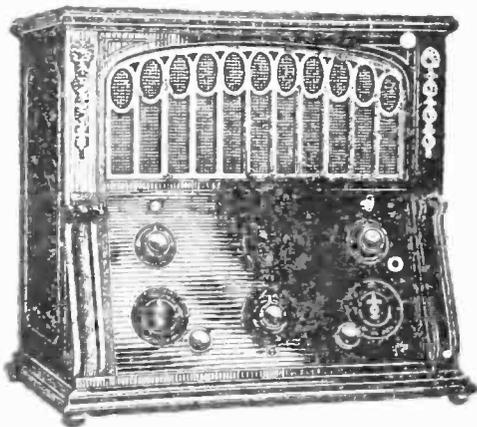
Besides tubes and loud speakers, this company manufactures six receivers ranging from \$30.00 for the Radiola III (without accessories) to \$425.00 for the Radiola Super VIII (equipped with six UV-199 tubes and a built-in loud speaker). It offers a splendid line from which to make a selection that will fit any pocketbook. Every Radiola carries not only the company's guarantee of performance, but our guarantee of absolute satisfaction. Get a Radiola complete with all accessories—nothing more to buy. Send your order now, examine at your express office, install your Radiola, give it a trial, and if after a reasonable trial, you are dissatisfied in any particular, return the receiver to us, undamaged, and we will gladly refund your money. Shipped on approval! Send no money!

Get your complete Radiola and all accessories in one order. This saves you time and trouble. We guarantee to save you money and to give you absolute satisfaction.

Telegraph (at our expense) now an order for your complete Radiola and all accessories.



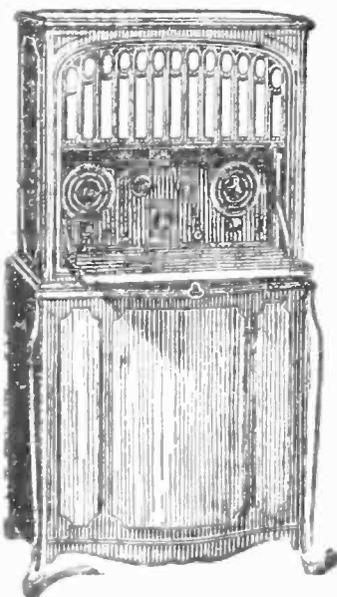
Radiola Regenoflex \$191.00



Radiola X in mahogany art cabinet with built-in loud speaker and four WD-11 Radiotrons \$245.00



Radiola Super-Heterodyne (second harmonic) \$220.00



Radiola Super VIII with six UV-199 Radiotrons and enclosed loud speaker \$425.00

Radiola Regenoflex
Antenna—Outdoor; *Tubes*—4; *Battery*—"A" Dry; "B" 90 Volts; "C" 4½ Volts; *Dim*—30³/₈x11⁵/₈x11⁵/₈; *Wt.* 27 lbs.; *Controls*—Tuning 2; Station Selectors, 1 and 2, also amplification and volume control; Tube controls, 1; with lock and key; *Price*—With following equipment: 4 WD-11 Radiotrons and UZ-1325 loud speaker, \$191.00. (Not sold without equipment.)

Complete with all Accessories Nothing More to Buy
 1 Radiola Regenoflex, \$191.00. Complete Accessories—1 A Battery, 6 Ray-O-Vac Dry Cells, \$2.40; 1 B Battery, 4 22½ Volt Eveready No. 768, \$7.60; 1 C Battery, 1 4½ Volt Eveready No. 771, \$.60; 1 Antenna Equipment, Complete, \$4.00. Extra Equipment—2 Radiotrons WD 11, \$8.00; 1 Pair Headphones Baldwin Type C, \$12.00; 1 Phone Plug, Comsco, \$1.00; 1 Sterling Voltmeter, \$2.75; 1 Extension Cord, 25 feet, \$1.75.

Regular Price, \$231.10
14P124 Our Price, Transportation Prepaid.....\$204.38

Radiola X
Tubes—4; *Battery* "A" Dry; "B" 90 Volts; "C" 4½ Volts; *Dim*—21½x15¾x19¾; *Wt.*—38 lbs.; *Controls*—Tuning, 2; station selectors, 1 and 2, also amplification and volume, tube controls, 1; *Price*—With following equipment: Self-contained loud speaker, phone, and 4 WD-11 Radiotrons, \$245.00. (Not sold without equipment.)

Complete with all Accessories Nothing More to Buy
 1 Radiola X, \$245.00. Complete Accessories—1 A Battery, 6 Ray-O-Vac Dry Cells, \$2.40; 1 B Battery, 4 22½ Volt Eveready No. 765, \$7.60; 1 C Battery, 1 4½ Volt Eveready No. 771, \$.60; 1 Antenna Equipment, Complete, \$4.00. Extra equipment—2 Radiotrons WD 11, \$8.00; 1 Pair Headphones Baldwin Type C, \$12.00; 1 Phone Plug, Comsco, \$1.00; 1 Sterling Voltmeter, \$2.75.

Regular Price, \$283.35
14P123 Our Price, Transportation Prepaid.....\$251.48

Radiola Super-Heterodyne (Second Harmonic)

Antenna—Loop; *Tubes*—6; *Battery*—"A" Dry; "B" 90 volts; "C" 4½ Volts; *Dim.* 35x11¼x 11; *Wt.*—37 lbs.; *Controls*—Tuning, 2; Station Selectors, 1 and 2; Tube Controls, 2; *Price*—With following equipment: 6 UV199 Radiotrons and UZ-1325 loud speaker, \$269.00. (Not sold without equipment.)

Complete with all Accessories Nothing More to Buy
 1 Radiola Super-Heterodyne, \$269.00 Complete Accessories—1 A Battery, 6 Ray-O-Vac Cells, \$2.50; 1 B Battery, 2 45 volt Eveready 767, \$7.50; 1 C Battery, 1 4½ volt Eveready No. 771, \$.60. Extra Equipment—2 Radiotrons UV199, \$8.00; 1 Pair Head Phones, Baldwin Type C, \$12.00; 1 Phone Plug, Comsco, \$1.00; 1 Sterling Voltmeter, \$2.75; 1 Extension Cord, 25 feet, \$1.75.

Regular Price, \$305.00
14P122 Our Price, Transportation Prepaid.....\$275.95

Radiola Super VIII
Antenna—Loop (self-contained); *Tubes*—6; *Battery*—"A" Dry; "B" 90 Volts; "C" 4½ Volts; *Dim.*—19x26½x49; *Wt.*—93 lbs.; *Controls*—Tuning, 2; Station Selectors, 1 and 2, also volume and Tube Controls, 2; *Price*—With following equipment: Self-contained loud speaker and 6 UV-199 Radiotrons, \$425.00. (Not sold without equipment.)

Complete with all Accessories Nothing More to Buy
 1 Radiola Super VIII, \$425.00—Complete Accessories—1 A Battery, 6 Ray-O-Vac Dry Cells, \$2.40; 1 B Battery, 2 45 Volt Eveready No. 767, \$7.50; 1 C Battery, 1 4½ Eveready No. 771, \$.60. Extra equipment—2 Radiotrons, UV199, \$8.00, 1 Pair Head Phones, Baldwin Type C, \$12.00; 1 Phone Plug, Comsco, \$1.00; 1 Sterling Voltmeter, \$2.75.

Regular Price, \$459.25
14P121 Our Price, Transportation Prepaid.....\$249.95

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

Liberty Mail Order House

"The Radio House of Friendly Service"

106 Liberty Street

Dept. A676

New York City

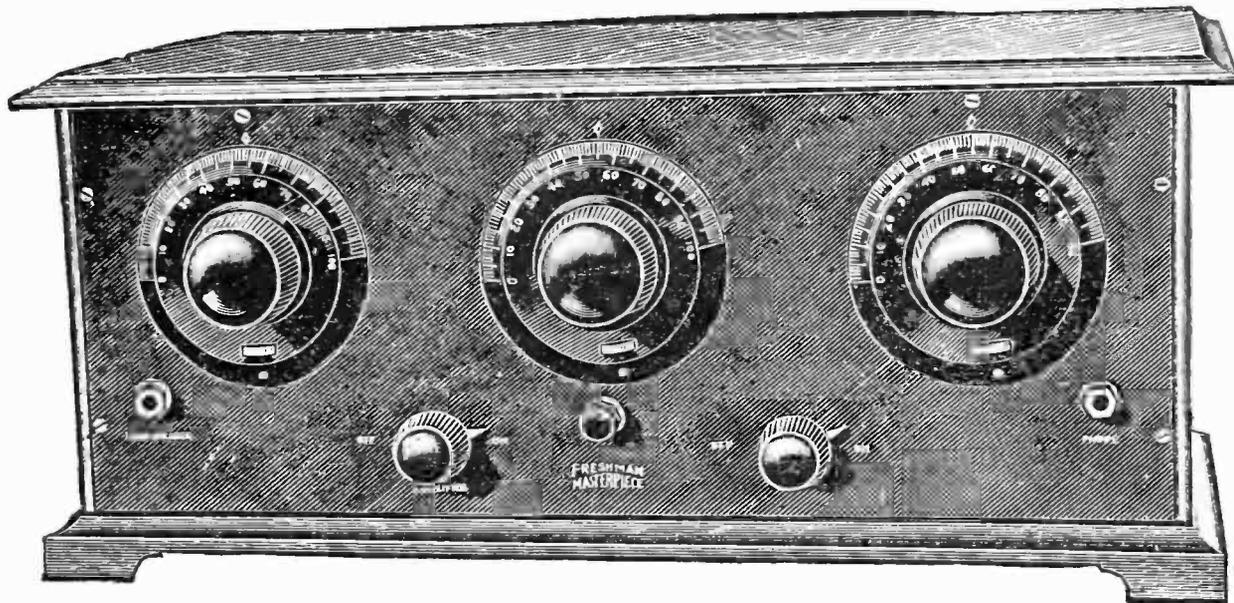
Every Article Advertised by Us is a Quality Product

FRESHMAN MASTERPIECE

Complete
Ready to use, only

\$112.50

**Clarity
Beauty
Volume
Distance
Selectivity**



The popularity of this remarkable receiver has swept the country. It is the talk of radio circles. Everyone said that a good five-tube receiver, well constructed, built in a fine cabinet, and employing the principle of radio frequency, could not be built on a big production basis. Freshman, one of the best and most responsible radio manufacturers in the country, has done it. More than that he produced it so we could offer it to you for \$60.00! (without accessories). It is a receiver with which anyone will be well pleased. It has very great volume. It is excellent on distance. It is selective and of sharp tuning. And it produces a pleasing, natural tone. We have no hesitancy in guaranteeing this receiver in the strongest terms.

Telegraph (at our expense) now for the complete Freshman receiver with all accessories. Give it a reasonable trial, and if not satisfactory in every particular, return it to us, undamaged and we will gladly refund your money. Shipped on approval! Send no money in advance!

"Freshman Masterpiece"; Type—Tuned Radio Frequency; Tubes—5; Battery—"A" Storage or Dry; "B" 90 Volts; Controls—Tuning, 3; Tube, 2; Dim.—7 x 7 x 18; Wt.—21 lbs.; Price—\$60.00.

Freshman Masterpiece

Complete with all Accessories, nothing More to Buy

List
1 Freshman Masterpiece Receiver\$60.00

Complete Accessories

- 1 6 Volt, 100 AH Storage Battery, Prestolite\$18.00
- 2 45 Volt B Batteries, Cyclone No. 9285 7.00
- 5 Radiotrons, UV-201-A 20.00
- 1 Pair Head Phones, Brandes Superior 6.00
- 1 Loud Speaker, Perfectone 15.00
- 1 Phone Plug, Comsco 1.00
- 1 Aerial Equipment—Complete 4.00

Regular Price \$131.00

14P61 Our Price, POSTPAID\$112.50

Freed-Eisemann Four Tube Neutrodyne NR 12



Model NR-12; Type—Neutrodyne; Tubes, 4; Controls—Tuning, 2; Tube, 2; Dim.—12 x 22 x 12½; Wt. 18 lbs.; Price—\$100.00.

Freed-Eisemann Neutrodyne NR 12 Complete with all Accessories, nothing More to Buy

List
1 Freed-Eisemann Receiver NR 12\$100.00

Complete Accessories

- 1 6-v., 100 A.H. Stor. Bat., Prestolite\$18.00
- 2 45 volt B Batteries, Eveready No. 767 7.50
- 4 Radiotrons, UV-201-A 16.00
- 1 Pair Head Phones, Brandes Superior 6.00
- 1 Phone Plug, Comsco 1.00
- 1 Loud Speaker, Perfectone 15.00
- 1 Aerial Equipment 4.00

Regular Price \$167.50

14P116 Complete, Our Price, Transportation Paid \$141.24

If you have any of the parts listed on this page, order the remainder needed and we will charge you on the same basis as though you had ordered all.

One of the most popular receivers is the Freed-Eisemann. It has made friends and firm boosters for it all over the United States.

We do not hesitate to place our absolute guarantee of satisfaction in every particular on this excellent receiver. Examine it in your express office before acceptance! Send no money with your order.

Telegraph (at our expense) now for your Freed-Eisemann complete with all accessories—nothing more to buy.

Liberty Mail Order House

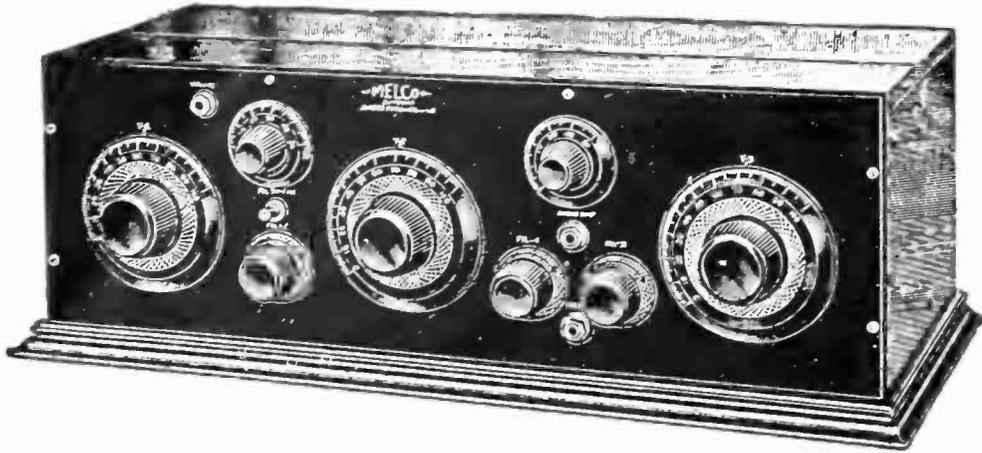
"The Radio House of Friendly Service"

106 Liberty Street

Dept. A 676

New York City

As a Gift, Nothing is More Lasting or Practical than a Quality Radio Receiver



The Melco Supreme Endorsed by Thousands

Many users declare there is no better receiver! Owners of this splendid receiver have been most enthusiastic in their praise. Letters come from all over the country telling of the fine results obtained.

And they may well be satisfied, for the Melco Supreme is one of the receivers manufactured by the Amsco Products, Inc., a company noted for fine workmanship, design, construction, and performance. Everyone unites in recommending the products of this concern. We have never heard one complain against the Marvelous Melco.

Such wide approval, therefore, cannot help but react most favorably to your benefit. This wide acclaim coupled with our unqualified guarantee of absolute satisfaction protects you. We go one step further. We prove to you we mean what we say. Order now a Melco Supreme complete with all accessories, and if, after a reasonable trial, you are not absolutely satisfied in every particular, return it to us, undamaged, and we will gladly refund your money.

Telegraph (at our expense) now for your Melco Supreme, complete with all accessories, and begin enjoying it without further loss of pleasure and profit! Shipped on approval! Examine it in your express office, subject to your acceptance! Send no money with your order!

Specifications:

Name—"Melco Supreme"; Type—Radio Frequency; Tubes—4; Battery—"A" Storage; "B" 60 to 90 Volts; Controls—Tuning, 3; Tube, 3; Antenna—Loop, Indoor and Outdoor; Dim.—23 1/4 x 8 7/8 x 8; Wt. 20 lbs.; Price—\$150.00.

MODEL MS 25

Same as above, except—Tubes—5; Dim. 23 1/4 x 9 3/8 x 8; Wt.—22 lbs.; Price—\$165.00.

Complete with all Accessories, Nothing More to Buy
Five-Tube Receiver MS 25 List. \$165.00

14P120—THE MELCO FIVE-TUBE KIT—K. D. 25 COMPLETE WITH ALL ACCESSORIES NOTHING MORE TO BUY
REGULAR PRICE \$181.00

Accessories

- 1 6 volt, 100 A. H., Storage A Battery, Prestolite..\$18.00
- 2 45 Volt B Batteries, Cyclone 7.00
- 5 Radiotrons, UV-201-A 20.00
- 1 Pair Head Phones—Brandes Superior..... 6.00
- 1 Phone Plug—Comsco 1.00
- 1 Loud Speaker—Perfectone 15.00
- 1 Aerial Equipment 4.00

List Price \$236.00

14P119 Complete, Our Price, Transportation Paid **\$193.59**

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

OUR PRICE, TRANSPORTATION PAID **\$153.59**

New Eagle Balanced Neutrodyne in Eagle Console Cabinet!

The Eagle Radio Co. builds one of the best neutrodynes manufactured. The new Eagle Balanced Neutrodyne gives greater selectivity, greater distance, and is easier to operate.

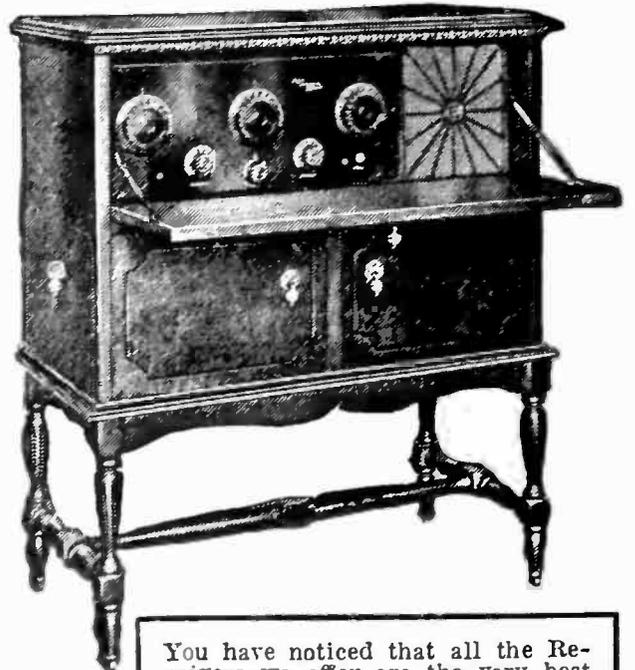
House the new Eagle Balanced Neutrodyne in the Eagle console cabinet and you have a combination of efficiency and artistry that is hard to equal.

Telegraph (at our expense) now for yours, complete with all accessories—nothing more to buy. Our absolute guarantee of satisfaction in every particular covers this beautiful receiver. We pay all transportation charges. Examine it in your express office before you accept it! Send no money with order.

Complete with all Accessories, Nothing More to Buy

- 1 New Balanced Eagle, Type BS Console Cabinet, \$270.00—Complete Accessories—1 6 Volt, 100 AH Storage A Battery, Prestolite, \$18.00; 2 45 volt B Batteries, Eveready No. 767, \$7.50; 5 Radiotrons UV-201-A, \$20.00; 1 Pair Head Phones, Brandes Superior, \$6.00; 1 Phone Plug, Comsco, \$1.00; 1 Amplion Phonograph Attachment, Type 35A, \$25.00; 1 Aerial Equipment, \$4.00.

Regular Price, \$351.50
14P113 Complete, Our Price, Transportation paid, **\$327.64**



You have noticed that all the Receivers we offer are the very best made. Just think of the names! Probably you know all of the sets by reputation. As to the Eagle, doubtless friends have remarked to you they believe it to be the best of all the Neutrodynes. Be that as it may, you know you are safe in ordering any receiver from us, and we will look for your telegram with the others.

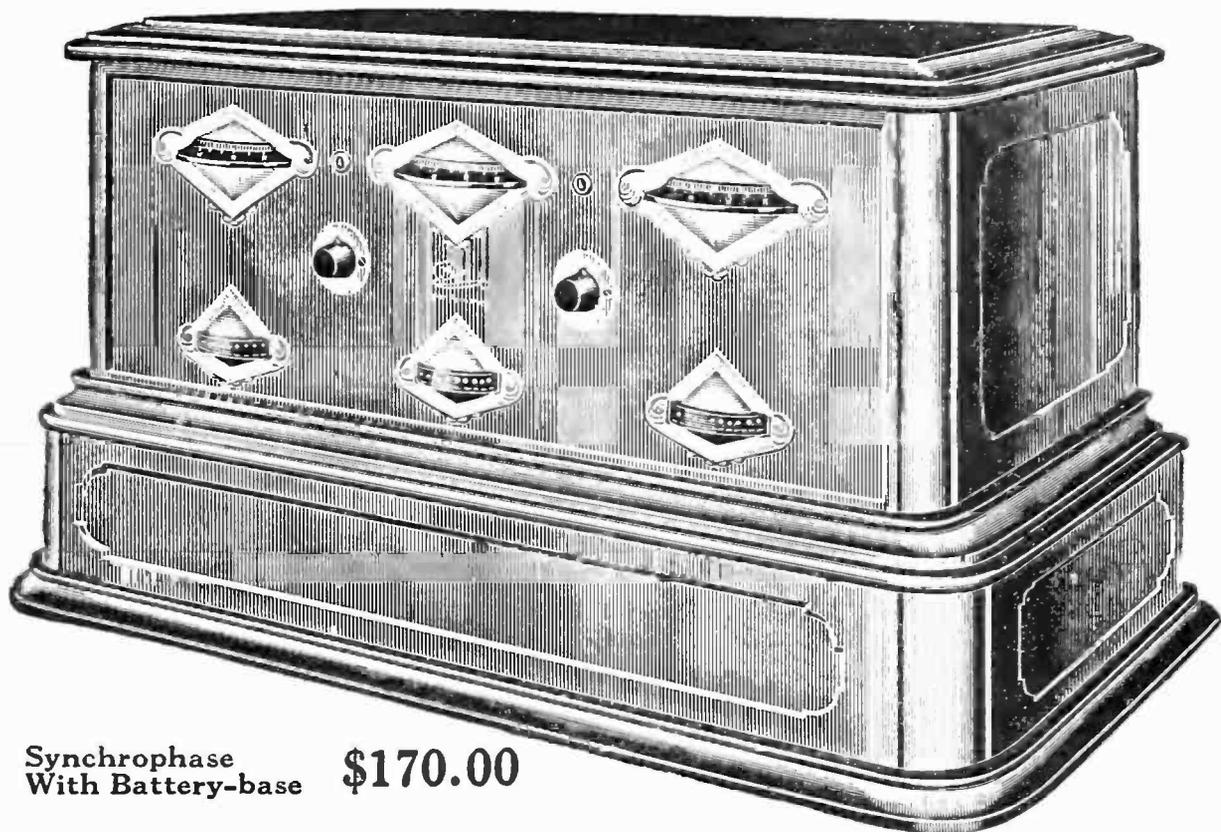
Liberty Mail Order House

"The Radio House of Friendly Service"

106 Liberty Street, Dept. A676, New York City

This Firm Specializes In What You Want

Your Home Deserves the Best —Hard to Beat This Set!



Synchronphase With Battery-base \$170.00

The Grebe Synchronphase Receiver Pleases the Most Discerning

This latest addition to the Grebe family of receivers is called the "Grebe Synchronphase." It is regarded by many of the best informed, as one of the most nearly perfect sets being built to-day not only from a result standpoint, but also because of its appearance. It is a most attractive addition to any home. The results obtained in distance and volume, combined with its rare selectivity, sharpness of tuning, and good tonal qualities, certainly warrant this belief.

The enviable reputation of A. H. Grebe & Co., one of the oldest and best Manufacturers of radio receivers and radio equipment (began manufacturing amateur radio equipment in 1909), has been attained by producing radio products of quality and distinction—only.

You will be unquestionably satisfied in every particular with a Grebe receiver. Order the Synchronphase now, complete with all accessories—nothing more to buy! Install it in your home, and if, after a reasonable trial, you are not satisfied in every particular, return it to us, undamaged and we will gladly refund your money. We guarantee the Synchronphase absolutely.

Telegraph (at our expense) now for your Synchronphase complete with all accessories. Everything shipped on approval! Examine in your express office and if not completely satisfactory, return it at our expense. Send no money with order!

Grebe Synchronphase. MU 1

Name—"Synchronphase"; Type—Balanced radio frequency; Tubes—five, UV-201-A; Battery—"A"—Storage, 6 Volts, "B"—90 volts; Controls—Tuning 3, Tube 2; Dim.—22 3/4 x 13 3/4 x 9 1/2; Wt.—22 lbs., Price—with battery base, \$170.00; \$15.00 less without battery base.

Grebe Synchronphase. MU 2

Name—"Synchronphase"; Type—balanced radio frequency; Tubes—6, UV199; Battery—"A"—3 dry cells or 6 connected series-parallel; "B"—90 Volts; Controls—Tuning, 3; Tubes—2; Dim.—22 3/4 x 13 3/4 x 9 1/2; Wt. 22 lbs.; Price, with battery base, \$170.00, \$15.00 less without battery base.

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

Grebe Synchronphase Receiver with Battery Base, Complete with all Accessories, Nothing More to Buy

1 Grebe Synchronphase Receiver Type MU 1.....	Reg. Price
(For Storage Battery Operation) With Battery Base	\$170.00

<i>Complete Accessories</i>		<i>Reg. Price</i>
1 6 volt, 100 AH Storage A Battery, Prestolite		\$18.00
2 45 volt B Batteries, Eveready No. 767.....		7.50
5 Radiotrons, UV-201-A		20.00
1 Pair Head Phones, Brandes Superior		6.00
1 Phone Plug, Comsco		1.00
1 Loud Speaker, Perfectone		15.00
1 Aerial Equipment		4.00

Regular Price \$241.50

14P135 MU-1 Our Price, Transportation Paid	\$197.59
14P136 MU-2 Our Price, Transportation Paid	\$190.95

(For Dry Battery Operation) with Battery Base

Liberty Mail Order House

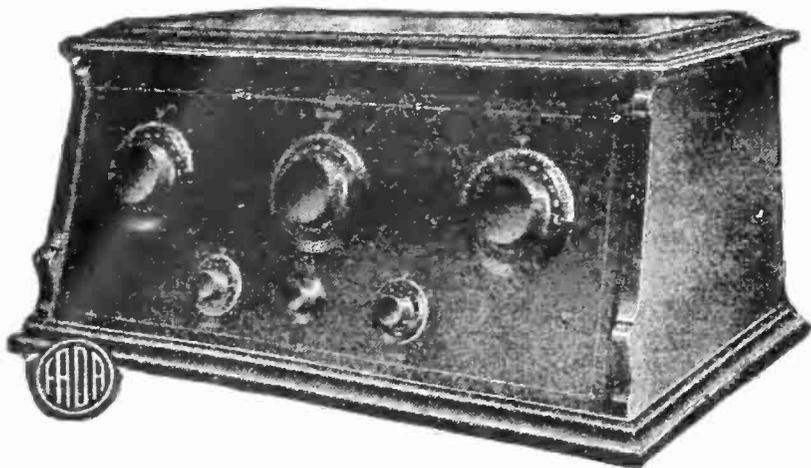
"The Radio House of Friendly Service"

106 Liberty Street

Dept. A676

New York City

Headquarters for Quality Radio Products



The New Fada 5-Tube Neutroceiver

Fada receivers have an extraordinarily good reputation everywhere. They have produced uniformly splendid results and have a host of friends who willingly testify in their behalf.

For volume, clarity, selectivity, and simplicity of control and beauty of appearance you will not be disappointed. And every switch, socket, rheostat and other part is mechanically simple and scientifically correct in design. The same care in workmanship, perfection in design and attention to detail that have always characterized the work of the celebrated F. A. D. Andrea, Inc., has been carried to the utmost degree in the Fada Neutroceiver.

Only extreme confidence in this product, allows us to make the unqualified guarantee of absolute satisfaction in every particular, that we do. We go a step further. You can order now your Fada complete with all accessories, install it in your home; and if, after a reasonable trial, you are not absolutely satisfied in every way, return it at our expense, undamaged, and we will gladly refund your money.

Telegraph (at our expense) now for your Fada. Shipped on approval! Examine it in your express office before you accept it! Send no money with your order! Your money refunded after trial if not satisfied.

Complete with all Accessories, nothing More To Buy

1 Fada Neutroceiver (Model 175-A—Five Tubes) .. \$160.00

Complete Accessories

- 1 6 Volt, 100 A H Storage A Battery, Prestolite....\$18.00
- 2 45 Volt B Batteries, Cyclone 7.00
- 5 Radiotrons UV-201-A 20.00
- 1 Pair Head Phones, Brandes Superior 6.00
- 1 Phone Plug—Comsco 1.00
- 1 Loud Speaker—Perfectone 15.00
- 1 Aerial Equipment 4.00

Regular Price, \$231.00

14P114 Complete, Our Price, Transportation Paid, \$184.79

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

MacMillan Used the Zenith

The intrepid arctic explorer, Captain MacMillan, had his ship the Bowdoin, equipped with Zenith radio apparatus. With it and even though near the North Pole, he kept in touch with the U. S. No more striking tribute could be paid to the efficiency, the durability, and the character of the Zenith Radio Corporation's products.

The new Super-Zenith is a six-tube non-regenerative receiver. It is really the summation of practicability, artistry, and efficiency. Unquestionably one of the most beautiful as well as one of the highest quality radio receivers manufactured.

The new Super-Zenith has several exclusive features. It is equipped with the Zenith Battery Eliminator. Just connect to the ordinary electric light socket (either Alternating or Direct Current) and your receiver is ready for distant or local reception. Requires no A or B batteries or charger. Such an innovation is a distinct step forward, one characteristic of Zenith.

SUPER-ZENITH X contains another new feature excelling all other receivers. Built-in, patented, Super-Zenith Duo-Loud Speakers, (harmonically synchronized twin speakers and horns) designed to reproduce both high and low pitch tones otherwise impossible with single-unit speakers. Price (without tubes) \$550.00.

Telegraph (at our expense) now for your Super-Zenith X.

Liberty Mail Order House

106 Liberty St. Dept. A 676 New York



Super-Zenith X, Complete

1 Super-Zenith X with Battery Eliminator \$550.00

Complete Accessories

- 6 Radiotrons, 201A \$24.00
- 1 Antenna Equipment 4.00

Extra Equipment

- 2 Radiotrons, 201A \$ 8.00
- 1 Pair Headphones, Baldwin Type C 12.00
- 1 Phone Plug, Comsco 1.00

Regular Price, \$599.00

14P134 Complete, Our Price, Transportation Paid \$563.95

The Liberty Specializes in Quality Products

De Forest Reflex Radiophone D-12 Satisfies the Most Exacting!

The De Forest products have behind them a painstaking, highly respected and dependable organization, headed by one of the greatest geniuses in the world of radio achievement, Dr. Lee De Forest. To him, perhaps more than to any other individual, belongs the credit for taking from "the air" in a practical manner one of its greatest secrets. He is a pioneer in wireless and radio and is the inventor of the audion tube. If any one in the world knows how to produce a perfect radio receiver and has a reputation to sustain, it is Dr. De Forest.

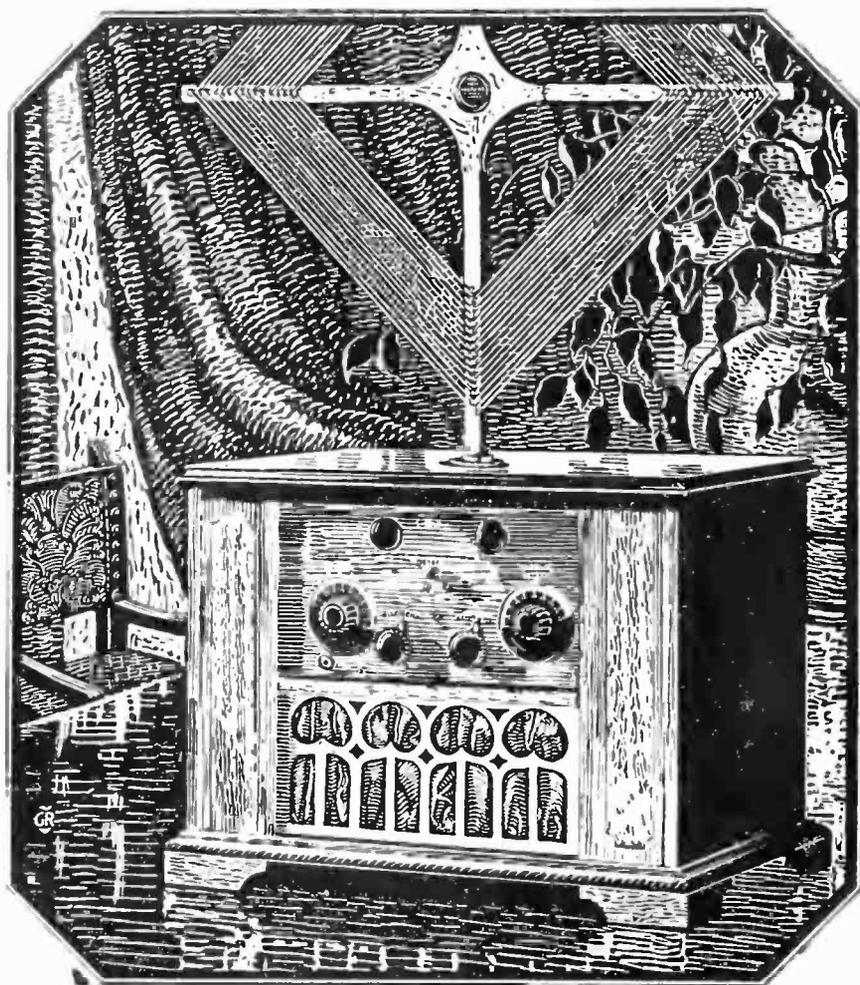
You may rest assured, any radio product bearing the label De Forest, is well worth its price and it will always over-perform its claims. The De Forest Radiophone is not only a mechanically correct receiver into which tried and proved engineering principles have been incorporated, but it is housed in a variety of exceptionally attractive and well planned cabinets combining beauty and practicability to an unusual extent.

For instance, every De Forest receiver is self-contained. It is so constructed that the usual required ground is eliminated; while the receiver itself carries a loop as standard equipment. This, coupled with the fact that each De Forest is equipped with batteries and tubes, makes this receiver a self-contained unit that may be moved or installed and operated at a moment's notice. **This characteristic alone has proven of great importance to many.**

To the person who up to this time has hesitated in purchasing any radio receiver because of its lack of fine appearance and incongruous effect on fine appointments, the De Forest will prove to be particularly harmonious with elegant surroundings. To the particular woman, any one of the four models of the Reflex Radiophone will appeal because of its natural artistic appearance and simplicity of operation. Then, **too, there is a certain pride that attaches itself to owning a De Forest.**

The special features are: *Compactness*—all apparatus intact, neat. *Simplicity*—few controls, easily operated. *Efficiency*—absolute fidelity of reproduction, great range of volume and distance. *Low Up-keep Costs*—only four tubes. *Portability*—easily carried anywhere. *Beauty*—one of the handsomest sets in existence. *Remarkable Low Price*—several hundred dollars below any sets that compare in distance, range, efficiency, and appearance. A De Forest receiver is a valuable asset in any home.

Telegraph (at our expense) now for your Radiophone with all accessories, complete. Install it in your home, and if after a reasonable trial you are not absolutely satisfied in every particular, return it to us, undamaged, and we will gladly refund your money. Orders are shipped, subject to examination in express office! No money in advance!



DE FOREST D12 RADIOPHONES (Complete)

Including loop, self contained loud speaker, four De Forest tubes, A and B batteries, and all equipment ready to operate. With each set we add as extra equipment one pair of Baldwin Type "C" headphones, phone plug, 25 feet extension cord and two De Forest tubes. List price \$24.75.

WITH DRY BATTERIES

We pay all Transportation Charges List

14P129 In two-tone gray and black Fabrikoid Cabinet \$161.20
 14P130 In two-tone Mahogany Cabinet 176.20

WITH STORAGE BATTERY

14P131 In two-tone gray and black Fabrikoid Cabinet \$180.00
 14P132 In two-tone Mahogany Cabinet..... 195.00

Liberty Mail Order House

"The Radio House of Friendly Service"

106 Liberty Street

Dept. A67c

New York City

Tell your Friends about the Liberty Guarantee of Absolute Satisfaction in Every Particular.

Dynergy—No Batteries

Takes All Its Power Direct From Light Socket

The Dynergy Radio Receiver operates absolutely without A, B, or C batteries of any kind. All electrical impulse for this set comes directly from your electric light socket.

This advanced step in radio development eliminates the inconvenience of constant battery recharging, all battery expense, and it eliminates the messiness and damage that batteries often cause. In using the Dynergy, you are never interrupted in receiving a program by run down batteries because this remarkable receiver gets an unvarying, dependable flow of perfectly controlled electrical impulse direct from your light circuit. Simply screw attachment into light socket and turn on the switch and your Dynergy is ready to receive. Battery troubles are a thing of the past with Dynergy owners.

The Dynergy radio receiver is a thoroughly efficient five-tube receiver, simple to tune, clear and fine in tone, highly selective and sharp in tuning, strong in volume, and exceedingly good on distance. It is non-radiative. Its upkeep is practically nothing because the removal of a tube does not vary the voltage input and a burnt out tube is an impossibility.

Tubes last from a year and a half to two years. The operating expense is nearly nothing. Using alternating current, the current consumption is less than 1/2 cent per hour; while in direct current, the operating cost is less than 1/4 cent per hour.

This receiver has been tested and endorsed by authorities and independent laboratories all over the country, such as the New York Edison Co., Radio Broadcast Magazine, the U. S. Government radio laboratories of the Brooklyn Navy Yard, etc. To this imposing list of authoritative endorsements, we add our guarantee of absolute satisfaction.

Telegraph (at our expense) now for your Dynergy radio receiver complete with all accessories. Be sure to state whether you have A. C. or D. C. in your home. Install this excellent receiver in your home, give it a reasonable trial, and if it does not satisfy you in every particular, send it back to us at our expense, undamaged, and we will gladly refund your money. We guarantee not only absolute satisfaction but we save you time, bother, and money! Examine the Dynergy at your express office before you accept it! Send no money with your order.

The Ware Type T

stands in the front rank of neutrodyne. The extensive laboratory and research work that the Ware Radio Corporation has done on the neutrodyne reflex circuit, is only properly understood and demonstrated by the performance of this excellent receiver.

It is a well constructed, properly designed neutrodyne that gives real satisfaction to its owners. Type T is a three-tube, delicately sensitive and selective, wide range, and power to spare receiver into which the Ware people have put unmistakable quality.

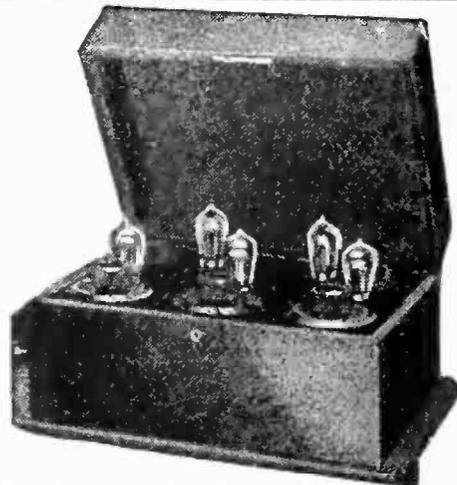
We guarantee that the Ware will give you absolute satisfaction in every particular. If, after a reasonable trial, you are not entirely satisfied, send it back to us, undamaged, and we will gladly refund your money. Your Ware Type T complete with all accessories—nothing more to buy—is ready for you. Telegraph (at our expense) now for it.

Liberty Mail Order House

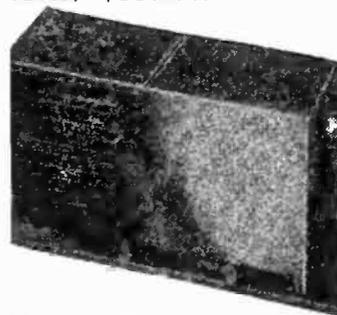
106 Liberty Street

Dept. A676

New York City



The Dynergy Receiver is complete as shown for Direct Current (D. C.) (Does not include tubes) \$185.00.



For Alternating Current (A.C.) the Dynergy Receiver requires only the Dynergy Rectifier. \$50.00.

Dynergy Receiver Complete with all Accessories, Nothing More to Buy for Direct Current *List*

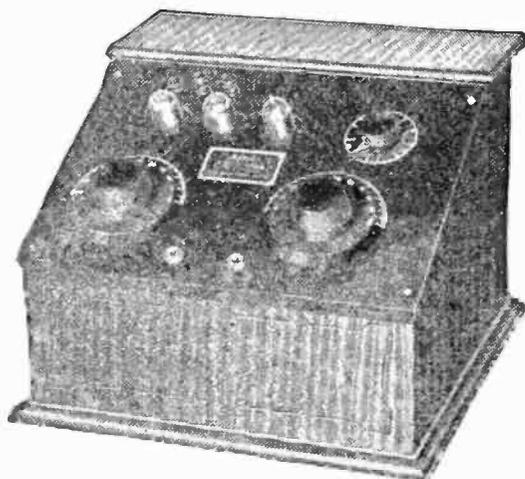
1 Dynergy Receiver	\$185.00
<i>Complete Accessories</i>	
5 Radiotrons UV-201-A	\$ 20.00
1 Loud Speaker, Perfectone.....	15.00
1 Phone Plug, Comsco	1.00
1 Pair Head Phones, Brandes Superior	6.00
1 Aerial Equipment	4.00
	<u>Regular Price \$231.00</u>

14P112 Our Price, Transportation Paid.....\$199.14

Dynergy Receiver Complete with all Accessories for Alternating Current

1 Dynergy Receiver	\$185.00
1 Dynergy Rectifier	50.00
Accessories same as for D. C. Dynergy	46.00
	<u>Regular Price \$281.00</u>

14P133 Our Price, Transportation Paid.....\$241.95

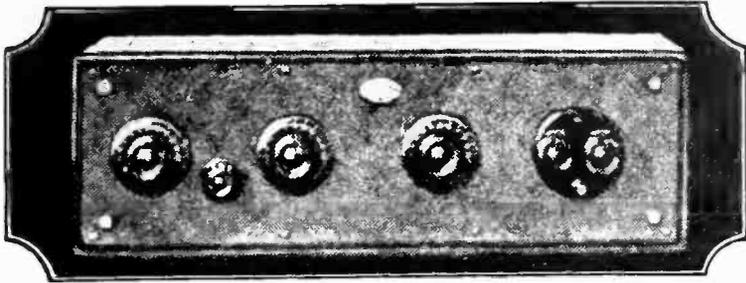


Ware Type T Complete with all Accessories, Nothing More to Buy *List*

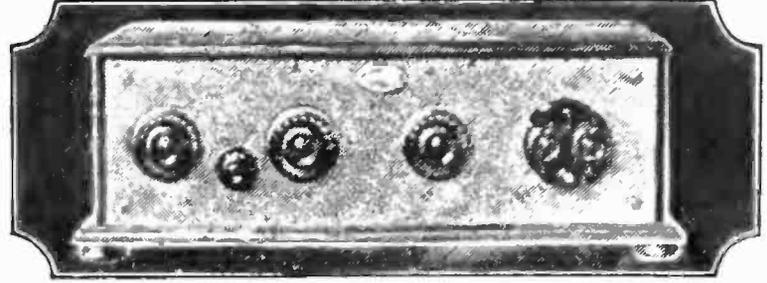
1 Three-Tube Neutrodyne Receiver...	\$65.00
<i>Complete Accessories</i>	
3 Dry Cells—A Battery—Ray-O-Vac..	\$ 1.20
5 B Batteries Eveready	
1 No. 763—22 1/2 v.	1.50
4 No. 768—22 1/2 v.—Special	7.60
1 C Battery Eveready—No. 771—4 1/2 v.	.60
3 Radiotrons UV-199.....	12.00
1 Pair Head Phones, Brandes Superior	6.00
1 Phone Plug, Comsco	1.00
1 Loud Speaker, Perfectone.....	15.00
1 Aerial Equipment	4.00
	<u>Regular Price ..113.90</u>

14P125 Our Price, Transportation Paid.....\$97.00

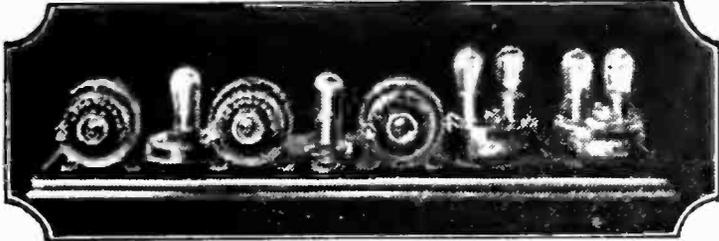
No Storage Battery needed. All dry cells.



De Luxe Model
5 Tubes, Special Cabinet \$120.00



Model 20
5 Tubes enclosed \$100.00



Model 12
6 Tubes, open \$105.00



Model 10
5 Tubes open \$85.00

Atwater-Kent is one of the Best

Many radio enthusiasts who are staunch admirers and happy owners of Atwater-Kent radio receivers believe it is the greatest all around set built. Such a feeling is readily understood because any one becomes enthusiastic once an Atwater-Kent is acquired.

Atwater-Kent is an old established firm which, long before the advent of radio, had established a national reputation for the manufacture of delicate electrical instruments—devices that required meticulous attention to design, skillful workmanship and precise measurement. Bearing this in mind, it is no wonder that when this well equipped, well trained organization turned its attention to the building of radio equipment, it immediately forged ahead into the front rank of national producers. It is, therefore, but natural that Atwater-Kent should produce a receiver that justifies the warm admiration of all who know it.

The Atwater-Kent series of receivers are carefully designed, are exceedingly well built, and present an appearance that is unmistakably one of quality. They are really instruments of hair-line precision whose characteristics of fineness, simplicity of operation, and performance are readily discernible. The fine reputation of this old firm certainly has been maintained in its radio products. We cannot recommend the Atwater-Kent receivers too highly. In fact, we do more—we guarantee them fully and without hesitation.

Telegraph (at our expense) now for your Atwater-Kent complete, with all accessories, nothing more to buy. We pay all shipping charges. Examine it in your express office, subject to your acceptance! Install it in your home. Give it a reasonable trial and if it is not absolutely satisfactory to you in every particular, return it to us, undamaged, and we will gladly refund your money. Send no money with your order!

De Luxe Model

Type—Tuned Radio Frequency; Tubes—5; Battery—"A" Storage; "B" 60 to 120 Volts; Controls—Tuning, 3; Tube, 2; Dim. 26½x9¾x9¼. Price, \$120.00.

Complete Accessories—1 6 Volt, 100 A.H. Storage A Battery, Prestolite, \$18.00; 2 45 Volt B Batteries, Eveready No. 767, \$7.50; 5 Radiotrons, UV-201-A, \$20.00; 1 pair Head Phones Brandes Superior, \$6.00; 1 Loud Speaker Perfectone, \$15.00; 1 Aerial Equipment, \$4.00.

Complete with all Accessories, nothing more to buy.

Regular Price, \$190.50

14P104 Our Price, Transportation
Paid\$158.90

Model 20

Type—Tuned Radio Frequency; Tubes—5; Battery—"A" Storage; "B" 60 to 120 Volts; Controls—Tuning, 3; Tube, 2; Dim. 26x8¾; Wt.—17 lbs.; Price, \$100.00.

Complete Accessories—1 6 Volt, 100 A.H. Storage A Battery, Prestolite, \$18.00;

2 45 Volt B Batteries, Eveready No. 767, \$7.50; 5 Radiotrons, UV-201-A, \$20.00; 1 Pair Head Phones Brandes Superior, \$6.00; 1 Loud Speaker Perfectone, \$15.00; 1 Aerial Equipment, \$4.00.

Complete with all Accessories, nothing more to buy.

Regular Price, \$170.50

14P141 Our Price, Transportation
Paid\$141.90

Model 10

Type—Tuned Radio Frequency; Tubes—5; Battery—"A" Storage; "B" 60 to 120 Volts; Controls—Tuning, 3; Tube, 2; Dim. 26x10x6; Wt.—16 lbs.; Price, \$85.00.

Complete Accessories—1 6 Volt, 100 A.H., Storage A Battery, Prestolite, \$18.00; 2 45 Volt B Batteries, Eveready No. 767, \$7.50; 5 Radiotrons, UV-201-A, \$20.00; 1 Pair Head Phones Brandes Superior, \$6.00; 1 Loud Speaker Perfectone, \$15.00; 1 Aerial Equipment, \$4.00.

Complete with all Accessories, nothing more to buy.

Regular Price, \$155.50
14P142 Our Price, Transportation
Paid\$127.90

Model 12

Type—Tuned Radio Frequency; Tubes—6; Battery—"A" Storage; "B" 60 to 120 Volts; Controls—Tuning, 3; Tube, 2; Dim. 34x10; Price, \$105.00.

Complete Accessories—1 6 Volt, 100 A.H. Storage A Battery, Prestolite, \$18.00; 2 45 Volt B Batteries Eveready No. 767, \$7.50; 6 Radiotrons, UV-201-A, \$24.00; 1 Pair Head Phones Brandes Superior, \$6.00; 1 Loud Speaker Perfectone, \$15.00; 1 Aerial Equipment, \$4.00.

Complete with all Accessories, nothing more to buy.

Regular Price, \$179.50

14P105 Our Price, Transportation
Paid\$149.25

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

Liberty Mail Order House

"The Radio House of Friendly Service"

106 Liberty Street

Dept. A676

New York City

We Pay All Shipping Charges

A few of the "1001" parts carried by Liberty The Radio House that Specializes in What you Want!

The following enumerated kits give an idea of the great number of parts carried by the Liberty. If the kit that you want is not listed, tell us what the kit is comprised of and we will forward it to you promptly.

Order your complete kit now. If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all. Everything is covered by our guarantee of absolute satisfaction in every particular. Examine your order in your express office before you accept it. Send no money with order.

Cockaday One-Tube Complete Kit of Parts

	Reg. Price
1 Cabinet Stained mahogany, 7x14	3.50
1 Hard rubber drilled panel, 7x14	3.50
1 Baseboard, 6 1/2 x 13 1/2	.35
1 Cockaday Coil	3.50
2 Variable Condensers, 17 Plate R. C. Co.	3.30
1 6 ohm Tillman Rheostat	.75
1 Na-ald Socket	.75
1 Grid Leak and Condenser, Freshman .00025	1.00
1 Nickel Plated Bezel, 1 1/2 ins.	.20
1 Switch Lever and Points, 2 stops, 7 points	.40
1 Single Circuit Jack, Millimeter	.70
12 Lengths Bus Bar wire	.30
8 Binding posts	.64
2 Ft. Spaghetti tubing	.30
2 Dials, Black, 3 in.	1.00
Regular Price	\$20.19

14P29 Our Price, Transportation Paid\$11.46

Two-Tube Reflex Complete Kit of Parts

	Reg. Price
1 Cabinet, 7x18, mahogany finish	\$4.75
1 Panel, drilled, 7x18	4.00
1 Baseboard, 6 1/2 x 17 1/2	.60
1 Rasla Tuner	4.00
1 Condenser, 13 Plate, G. I. Variable Con.	4.50
1 Rasla Fixed Detector	1.25
1 Rasla Compensating Condenser	1.75
1 Rasla Tran. Type CR	4.00
1 Modern 10:1 Audio Transformer	5.50
1 Modern 4:1 Audio Transformer	5.00
2 Rheostats, 30 ohm—Tillman	1.60
2 Sockets, Federal Standard	2.00
1 Jack, Single Circuit, Millimeter	.70
1 Jack, Double Circuit, Millimeter	.80
1 Switch, Filament, Cutler-Hammer	.60
1 Con. fixed, .00025 mfd.	.35
1 Cond. fixed, .005 mfd.	.60
1 Dial, 4 in., Radion, Black	.60
7 Binding Posts, moulded	.56
1 Dozen lengths of Bus Bar Wire	.30
Regular Price	\$43.46

14P143 Our Price, Transportation Paid\$36.69

Ambassador Three-Tube Complete Kit of Parts

	Reg. Price
1 Cabinet Mahogany Finish 7x18	\$4.75
1 Panel, Hard Rubber 7x18 Drilled and Engraved	4.00
1 Baseboard 6 1/2 x 17 1/2	.60
1 Ambassador Three Circuit Tuner	5.50
1 Variable Condenser, G. I. 21 Plate .0005	5.00
1 Grid Leak and Fixed Condenser —2 megohm .00025, Freshman	1.00
2 Sherma-tran Transformers	9.30
3 Tube Sockets, Federal	3.00
1 Cutler-Hammer Battery switch	.60
2 Double Circuit Jacks, Millimeter	1.60
1 Single Circuit Jack, Millimeter	.70
6 Binding Posts, Moulded	.48
2 Radion Dials, 3 in. Black	1.00
3 Rheostats, Tillman, 20 ohm	2.40
Regular Price	\$39.93

14P144 Our Price, Transportation Paid\$32.53

Erla Four-Tube Reflex Complete Kit of Parts

	Reg. Price
1 Cabinet, mahogany finish 7x21	\$ 5.00
1 Panel, rubber, 7x21	1.75
1 Baseboard, 6 1/2 x 20 1/2	.45
1 Variable Condenser, .0005 Mfd. Certified Low loss, 25 plate	3.00
1 Variable Condenser, .00025 Mfd. Certified low loss, 13 plate	2.50
1 Erla Selectoformer	5.00

	Reg. Price
1 Erla Reflex Transformer No. 1	5.00
1 Erla Reflex Transformer No. 2	5.00
3 Erla Audio Transformers 3 1/2 to 1	15.00
4 Sockets, Erla	3.00
4 Rheostats, 25 Ohm, Federal	4.40
1 Fixed Crystal Rectifier, Erla	1.00
1 Fixed Condenser .002 mfd. Dubilier	.40
1 Fixed Condenser .001 mfd.	.40
1 Fixed Condenser .00025 mfd.	.35
2 Dials, 3 in., Black	1.00
3 Bezels	.60
1 Jack Single Circuit. Open, Fed.	.60
1 Jack Double Circuit. Closed, Fed.	.80
1 Battery Switch, Cutler-Hammer	.60
7 Binding Posts	.56
1 Doz. Lengths of Bus Bar Wire	.30
Regular Price	\$56.71

14P145 Our Price, Transportation Paid\$46.14

Note: All receivers and parts sold by this company are quality products. They are the products of the most responsible and best manufacturers in the industry and you cannot make a mistake in ordering any one of them. They have all been thoroughly tested and approved by experts of national prominence. They carry not only the manufacturer's guarantee and the approval of qualified authorities, but they carry our guarantee of absolute satisfaction. Pick out the set that suits your requirements and pocketbook and telegraph your order (at our expense). Here is your opportunity to get an approved and guaranteed radio receiver complete with all accessories—nothing more to buy. Don't deny yourself any longer the pleasures and benefits of a dependable radio. Order now by telegraph. We pay for the message.

A Personal Note to You

Dear Reader:—
You can do this to save time—
Telegraph your order for your set—we will pay for the message.
You can do this to avoid risk—
Do not send any money with order. Tell us to ship by express subject to examination at your express office, without deposit or promise or obligation to accept. After acceptance, give the set a trial. If you are not satisfied in every particular, return your order to us, undamaged, and we will gladly refund your money. Remember, we pay all transportation charges.
All orders receive friendly attention but if you wish, you may address your order direct to me for special care.

Yours sincerely,



General Manager

If you have any of the parts listed, order the remainder needed and we will charge you on the same basis as though you had ordered all.

Workrite Five-Tube Neutrodyne Complete Kit of Parts

	Reg. Price
1 7x26 Drilled Panel	\$ 5.00
1 Baseboard, 6 1/2 x 25 1/2	.55
1 Set WorkRite Neutrodyne with Neutralizing Condensers	17.50
2 Sherma-Tran Transformers Standard ratio	9.30
1 Single Circuit Jack, Millimeter	.70
1 Single Circuit Filament Control Jack, Millimeter	1.00
1 20 ohm Rheostat, Tillman	.80
1 6 ohm Rheostat, Tillman	.75
1 Switch Cutler-Hammer	.60
2 Micadons .006	1.50
1 Grid Condenser .00025G 601	.45
1 Grid Leak, 2 Megohm Daven	.50
5 Sockets Standard V. T.	3.75
7 Binding Posts, Moulded	.56
1 Binding Post strip	.40
3 Dials, Black, 3 in Radion	1.50
3 Bezels, 1 1/2 in.	.60
12 Lengths Bus Bar Wire	.30
2 Feet of Spaghetti Tubing	.30
Regular Price	\$46.06

14P37 Our Price, Transportation Paid\$38.33

A Few Friendly Suggestions!

To your friends who already have a radio set, any one of the following articles will prove a most lasting and useful remembrance. We will be glad to include your card and send direct to your friends.

As a gift, nothing is more welcome to the Radio Enthusiast than any one of the combination offers.

SUGGESTION NUMBER 1

	Reg. Price
13P30 Extension Cord, 25 ft.	\$1.75
2P42 Hydrometer	.75
2P39 Voltmeter, Sterling, 0-50 Volts	2.75
Regular Price	\$5.25

14P146 Our Price, Transportation Paid\$4.21

SUGGESTION NUMBER 2

13P10 Baldwin Head Phones Type C	\$12.00
13P40 Rubber Ear Cushions	1.00
13P39 Extension Cord, 25 feet	1.75
Regular Price	\$14.75

14P147 Our Price, Transportation Paid\$10.89

SUGGESTION NUMBER 3

4P1 Henley's 222 Radio Circuit Diagrams	\$1.00
4P22 Radio Questions Answered	.25
4P8 Radio Frequency Amplifiers	.25
4P9 100 Radio Hookups	.25
4P28 How to Tune Your Radio Set	.25
4P7 How to Make Radio Phone Receiving Sets	.25
Regular Price	\$2.25

14P148 Our Price, Transportation Paid\$1.50

SUGGESTION NUMBER 4

13P4 Music Master Loud Speaker	\$30.00
13P10 Baldwin Phones, Type C	12.00
13P39 Extension Cord, 25 feet	1.75
13P40 Rubber Ear Cushions	1.00
Regular Price	\$44.75

14P149 Our Price, Transportation Paid\$35.64

Liberty Mail Order House

"The Radio House of Friendly Service"

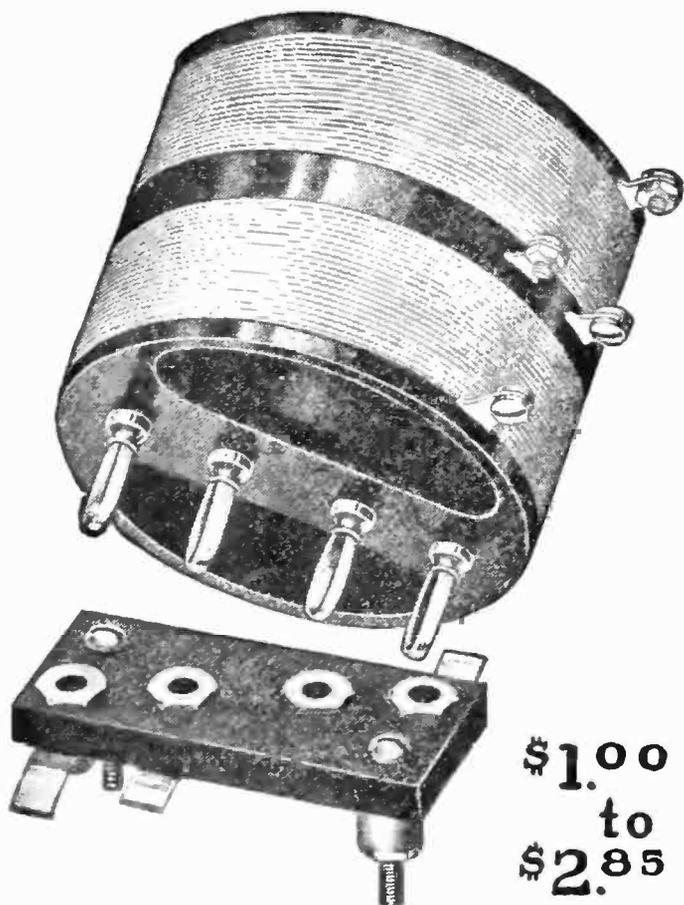
106 Liberty Street

Dept. A676

New York City

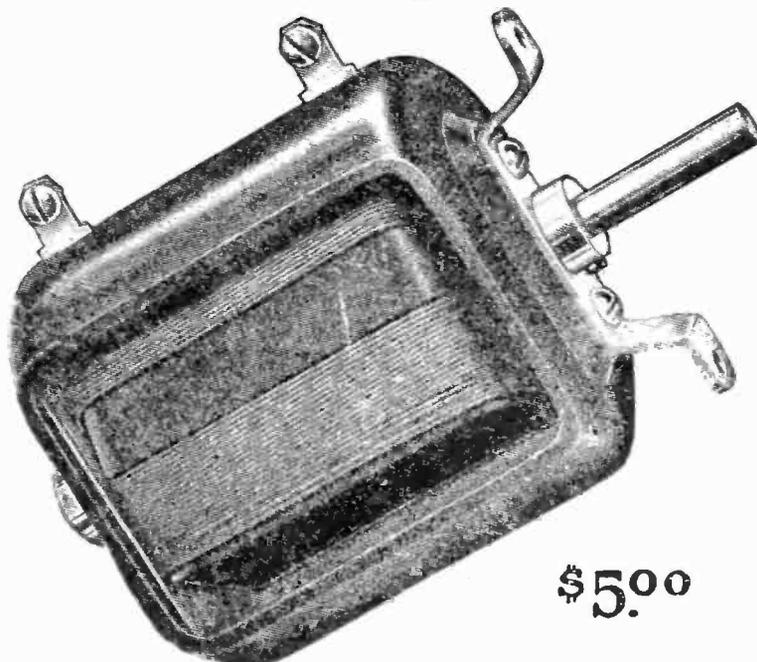
Designating Department Numbers will Expedite the Shipment of Your Order—Considerably

NEW GENERAL RADIO PRODUCTS



\$1.00
to
\$2.85

New Low Loss Coils



\$5.00

A New Variometer

RADIO BUILDERS AND EXPERIMENTERS,—here are the newest additions to the well known *General Radio* line of Quality Parts!

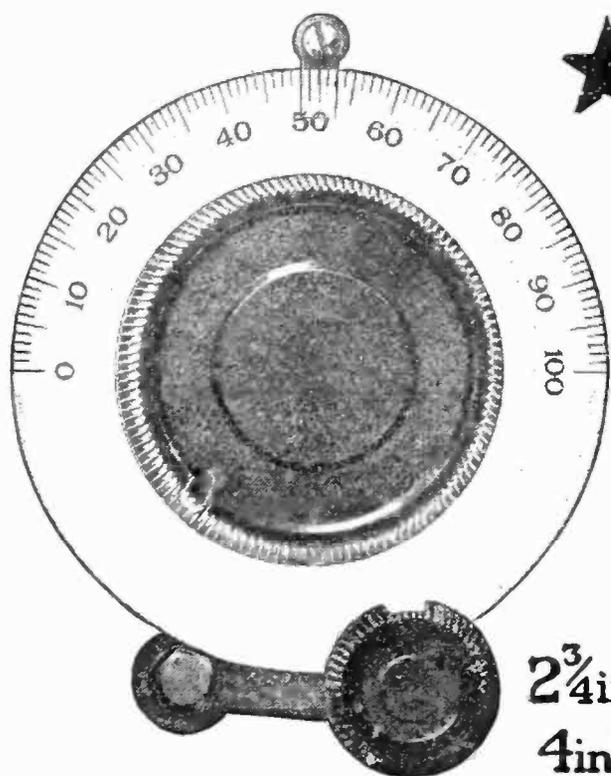
A *variometer* unusually compact in size and efficient in operation.

Low Loss Coils that mount as easily as a vacuum tube—ideal for oscillator and antenna coupling coils for super-heterodyne circuits.

The new *Geared vernier dial*—an improvement in the appearance and operation of any well planned set.

They are all popular instruments selling at popular prices.

See them at your dealer's or write for our new radio catalogue 919-B.



2³/₄in. \$1.50
4in. \$2.50

New Geared Vernier Dials

GENERAL RADIO CO.

Cambridge, Mass.

★ Tested and approved by RADIO BROADCAST ★



Send For This Sensational Radio Bargain Book-FREE

Order Direct from This Page! Save About One-Half!

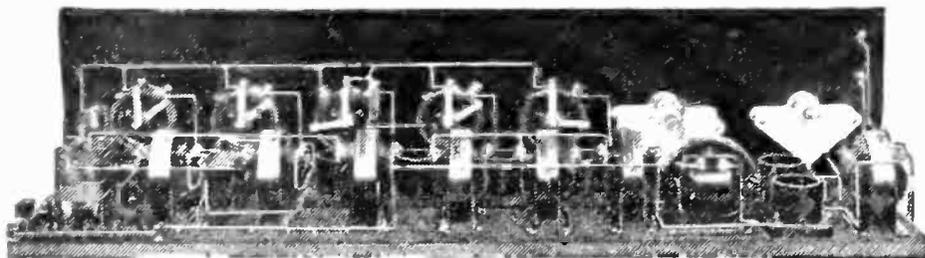
Compare our prices with others. Only highest grade nationally known GUARANTEED parts. OUR GUARANTEE PROTECTS YOU. Money cheerfully refunded if you are not satisfied. Be sure to write your order and state prices plainly. Send post office or express money order or bank draft for total amount to insure prompt shipment. ALL PRICES ON THIS PAGE INCLUDE SHIPPING CHARGES RIGHT TO YOUR DOOR. Refer to any bank or commercial agency regarding our reliability. If your favorite circuit is shown here, order direct from this ad. No skill required to build your own radio with Randolph parts. Panels are all drilled. Instructions are simple and complete. Everything comes ready to assemble. Order direct! All shipping charges prepaid.

COMPLETE PARTS FOR ACME 1-Tube REFLEX . . . \$17.45
ACME 4-Tube REFLEX . . . 39.85

with Genuine Acme parts as specified, drilled bakelite panel and full wiring diagram.

COMPLETE PARTS FOR Reinartz
1-Tube Reinartz Set . . . \$10.45
3-Tube Reinartz Set . . . 17.55

Our Guarantee
 Every article exactly as represented. Every article is tested before shipping. Complete satisfaction guaranteed or money will be cheerfully refunded.



COMPLETE PARTS FOR 8-TUBE SUPER-HETERODYNE

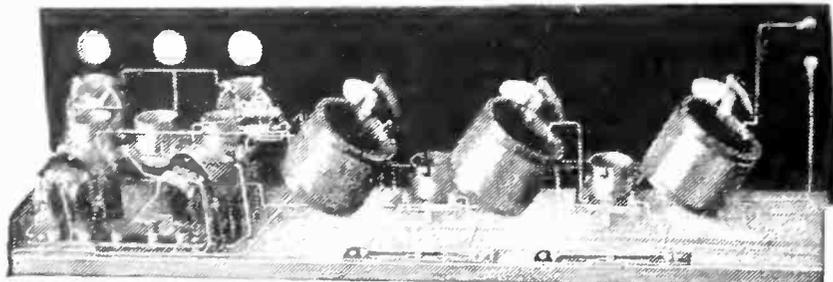
- 2 23-Plate Bremer-Tully or Duplex Low Loss Condensers
- 3 Remler or Columbia Intermediate Frequency Transformers
- 1 Remler or Columbia Tuned Circuit Transformer
- 1 Special Oscillator Coupler
- 1 Midget Condenser
- 8 Bakelite Sockets
- 2 Thordarson or Columbia A. F. Transformers
- 1 Connecticut Filament Switch
- 2 Bakelite 6 ohm Rheostats
- 2 Bakelite 30-ohm
- 1 Bakelite Potentiometer, 400 ohms
- 1 Carter Double Circuit Jack
- 1 Dubilier 1 mfd. Condenser
- 1 .006 Mica Condenser

- 1 .0005 Mica Condenser and 2 megohm Grid Leak
 - 3 .0025 Mica Condensers
 - 10 Binding Posts
 - 1 .00025 Mica Condenser
 - 1 Bakelite Terminal Strip for Binding Posts
 - 1 Multicord cable for connecting batteries
 - 1 7x30x3/4 Drilled Bakelite Panel
 - 1 Baseboard
 - 35 ft. Hook-up Wire
 - 2 4 in. Bakelite Dials
 - 2 4 1/2 volt C Batteries
- \$59.75**
- Complete wiring diagrams, base board layout, blue-prints and instructions.

COMPLETE PARTS FOR 2-Tube Harkness Set
 including Licensed Harkness Coils, Drilled Panel and wiring diagram. Easy to build. Wonderful results. **\$17.95**

COMPLETE PARTS FOR Two Stage Amplifier
 with Thordarson or Columbia Transformers; with drilled panel & wiring diagram **\$10.90**

Randolph Special Headphones
 2200 Ohm **\$2.45**
 3000 Ohm **2.95**



COMPLETE PARTS FOR 3 AND 5-TUBE NEUTRODYNE RECEIVING SET
 Genuine Hazeltine Licensed Neutrodyne Parts Furnished.

PARTS FOR 5-TUBE SET

- 1 7x24x3/4 Drilled Panel
- 2 Thordarson or Columbia Audio Transformers
- 3 4" Bakelite Dials
- 2 Precision Jacks
- 1 Bakelite Rheostat, 30 ohm
- 1 Bakelite Rheostat, 6 ohm
- 1 Bakelite Binding Post Strip
- Complete blue-prints and working diagrams.
- 7 Marked Binding Posts
- 1 Grid Leak and Condenser
- 5 Bakelite Sockets
- 1 .001 Condenser
- 1 .006 Mica Condenser
- 35 feet Hook-up Wire
- 1 Kit consisting of 3 Hazeltine Licensed Neutrodyne Transformers and 2 Neutrodons
- 1 Baseboard
- 2 Bezels

\$33.75

Easy to build your own radio set. All complete parts for sets consist of standard advertised guaranteed parts and include drilled bakelite panels and wiring diagrams for easy set construction. Everything guaranteed on money-back basis. All transportation charges paid.

FREE — BIG MONEY SAVING RADIO CATALOG containing a thousand bargains of everything on radio—parts, supplies, complete parts for sets, complete sets, etc., also a mine of very latest information on all different circuits, complete list of broadcasting stations, and other valuable, up-to-the-minute radio data. Send your name and address on a card or letter. We will send catalog free.

FREE Service Department
 Our radio engineers will help you solve all your radio problems, and furnish up-to-date information on set construction, operation and improvement. This service is free to our customers.



COMPLETE PARTS FOR 3-TUBE COCKADAY RECEIVING SET

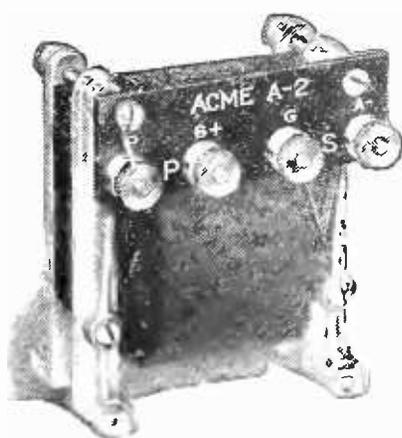
- 1 Cockaday Coil
- 2 23-Plate Hy-Grade Cond.
- 1 Bakelite Rheostat, 6 ohm.
- 2 Bakelite Rheostat, 30 ohm.
- 3 Bakelite Sockets
- 1 high ratio Columbia or Thordarson Transformer
- 1 Single Circuit Jack
- 1 low ratio Columbia or Thordarson Transformer
- 2 Double Circuit Jacks
- 2 3 in. Bakelite Dials
- 1 Grid Leak and Mica Cond.
- 7 Switch Points. 2 stops.
- 1 Bakelite Binding Post Strip
- 7 Binding Posts
- 1 7x21x3/4 in. Drilled Bakelite Panel
- 3 Bezels
- 1 Baseboard
- 1 switch lever
- 24 ft. Hook-up Wire
- Complete blue-prints and wiring diagrams.
- 1-Tube Set **\$10.45**

Complete 5-Tube Improved Cockaday Receiving Set
 Parts for 5-Tube Improved Cockaday Receiving Set
 With Resistance Coupled Amplification
 As designed by L. M. Cockaday. Including drilled panel and wiring diagram complete, ready to wire. **\$39.65**

RANDOLPH RADIO CORPORATION

159 N. Union Ave. Dept. 282 Chicago, Illinois

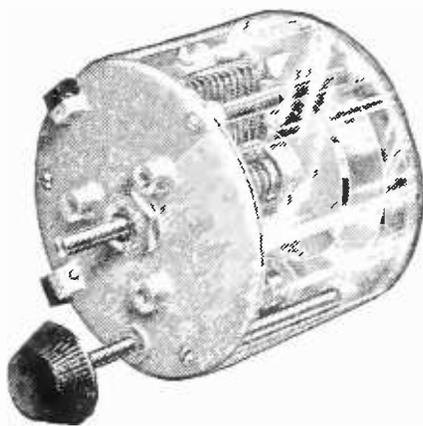
Low Losses and Amplification *go hand in hand*



ACME A-2
Audio Frequency
Transformer



ACME R-2, 3, 4
Radio Frequency
Transformer



ACME .0005 M. F.
Low Loss Condenser

THE energy that your antenna or loop receives is at best only a little. Every bit of this energy you can save is the same as amplification. No matter what the circuit, you must have both low losses and amplification so that your loud-speaker can reproduce the distant stations loud and clear.

Acme Apparatus insures low losses, and amplification without distortion, for any circuit.

To get low losses, just replace your present condenser with a new Acme "lowest loss" condenser, and to get amplification without distortion, use Acme Transformers. Then you will get ten times the fun tuning in distant stations. You will get everything on a loud-speaker so that a whole roomful of people can hear and you will be able to enjoy all year 'round radio.

Send 10 cents for 36-page book, "Amplification without Distortion", containing many diagrams and helpful hints on how to get the most out of any set.



ACME APPARATUS COMPANY
Dept. 108

Cambridge, Mass.

ACME ~for amplification

★ Tested and approved by RADIO BROADCAST ★



ALL-AMERICAN

Fills Every Radio Requirement

If You Want to Improve Your Present Set ~



If You Want to Build a High Grade Receiver ~



Install genuine ALL-AMERICAN Audio Transformers. Two of these instruments, fitted into any set not already equipped with them, will give the receiver greater loudspeaker volume with remarkable purity of tone. ALL-AMERICAN Transformers are so designed that they amplify fundamentals and harmonics equally, throughout practically the entire audible range. Hence, voice and tones are reproduced *faithfully*. 3 to 1 Ratio, \$4.50; 5 to 1 Ratio, \$4.75; 10 to 1 Ratio, \$4.75.

Use ALL-AMERICAN Super-Fine Parts, and you can have an intermediate-frequency receiver embodying all the most advanced features known in Radio.

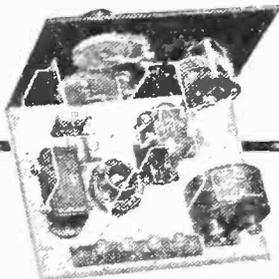
Super-Fine Parts are easily installed. Their operation is smooth and flawless. Sets built with Super-Fine Parts are unsurpassed for selectivity, range, volume, and tone quality. They represent in a very real sense *the ultimate* in radio broadcast reception.

Price, \$26.00

ALL-AMAX JUNIOR

The ideal set for the youthful beginner in Radio. A one-tube reflex already mounted on panel and baseboard. Photographic instructions make wiring the easy task of one evening.

Price, complete (semi-finished) \$22.00



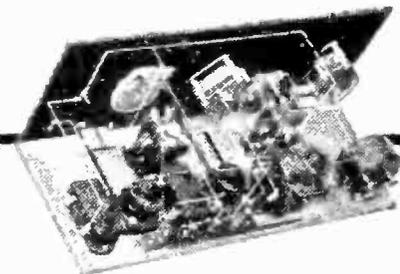
The Radio Key Book Will help anyone to hear farther and better. Contains practical hints and tested hookups. Sent for 10 cents, coin or stamps.

RAULAND MFG. CO.
2652 Coyne St., Chicago
Pioneers in the Industry

ALL-AMAX SENIOR

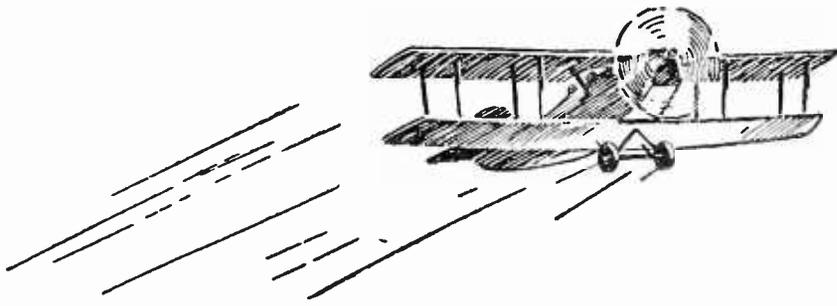
The Senior is a complete receiver of the highest type—a three-tube reflex with great range and selectivity. It comes completely assembled with full directions for wiring.

Price, complete (semi-finished) \$42.00



Largest Selling Transformers in the World

★ Tested and approved by RADIO BROADCAST ★



Bringing to earth the airplane type receiver

RADIO frequency transformers as designed by Jackson H. Pressley, Chief Engineer, Radio Laboratories, U. S. Signal Corps, Camp Vail, New Jersey, and manufactured by the Sangamo Electric Company, assure you of precision instruments.



The essential needs for airplane use are:

First—Extreme compactness with maximum amplification per transformer stage;

Second—A transformer so designed that there is negligible coupling between stages no matter how they are spaced;

Third—Stability without the aid of manual controls.

It was only after months of experimenting that Mr. Pressley was able to attain these results, and the uses of his transformers as standard for airplane use speaks for itself.

A set of these radio frequency transformers and coupler coil will be delivered anywhere in the United States for \$22.50.



ASSOCIATED SANGAMO ELECTRIC COMPANIES
CAPACITY 3500 METERS PER DAY

SANGAMO ELECTRIC COMPANY
Springfield, Illinois

BRITISH SANGAMO COMPANY LIMITED
Pondersend, Middlesex, England

SANGAMO ELECTRIC COMPANY
OF CANADA LIMITED *Toronto, Ontario*

ASHIDA ENGINEERING COMPANY
Osaka, Japan

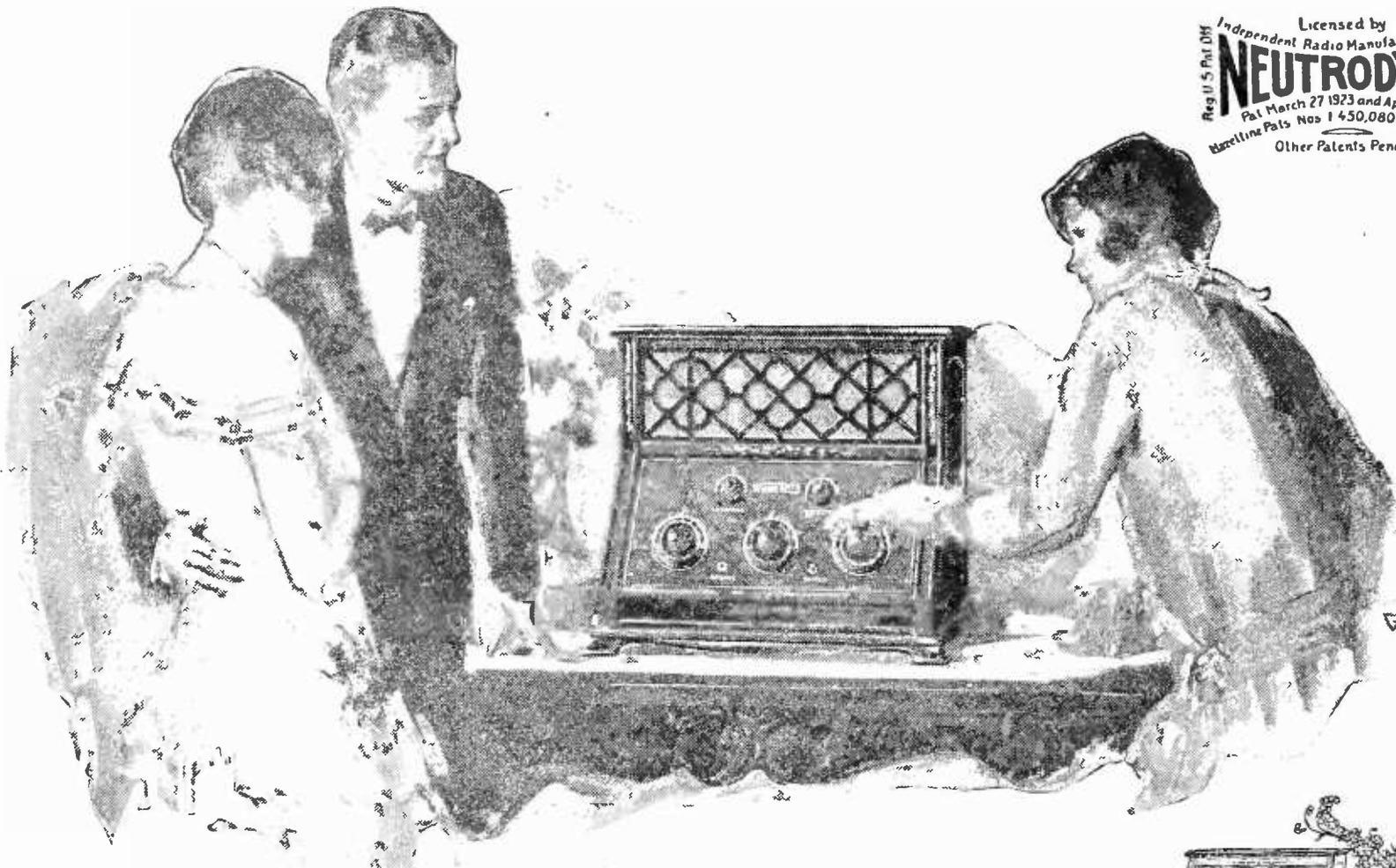
8820-2

Domestic Offices—New York, Chicago, Birmingham, San Francisco, Los Angeles. Radio Division—50 Church Street, New York

★ Tested and approved by RADIO BROADCAST ★

W O R K R I T E R A D I O S E T S W O R K R I G H T

Reg. U. S. Pat. Off. Licensed by Independent Radio Manufacturers, Inc. Reg. U. S. Pat. Off.
NEUTRODYNE
 Pat. March 27 1923 and April 1, 1924
 Mailing Pat. Nos. 1 450,080 and 1 489,228
 Other Patents Pending.



Select any station that's on the air!

You never imagined that radio *could be* so sure—so simple to use. Just think! Once you've tuned in a station with WorkRite Super Neutrodyne Receivers, you can turn to it instantly, at any time, simply by referring to your "log."

Select what you want to hear from the daily programs—and know in advance that WorkRite will get it for you—clear as a bell, with no loss of quality, richness or brilliance, and free from distracting howls or whistles.

WorkRite brings in distant stations—not just once in a while—but regularly and distinctly on the loud speaker. Under favorable conditions, it will bring in broadcasting from across the continent.

Amazing Selectivity

There's another great WorkRite advantage that you'll appreciate. It's this. No matter how powerful your local stations may be, you can easily tune them out and bring in other stations using practically the same wave length.

The first time you use one of these beautiful, companionable sets, you'll think it's

almost magical. But there's really no secret to WorkRite remarkable range and selectivity. They are due largely to two things. First—WorkRite's ingenious Super Neutrodyne "hookup." Second—the way WorkRite is built—the fine materials that go into every set—the intimate, careful attention given to every detail of manufacture.

Already Tremendously Successful

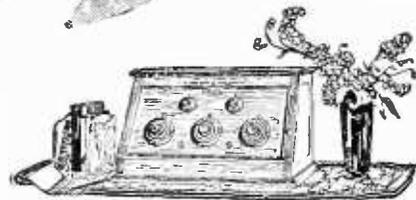
WorkRite has already won a host of enthusiastic friends. Dealers in many cities find themselves pressed to meet the demand for WorkRite. So, if the store you visit is unable to demonstrate WorkRite for you, write us and we will send you the name of a store that can. Or, if you want to know more about WorkRite sets before you see them, mail the coupon below and we will send you a beautifully illustrated rotogravure folder giving full information on all WorkRite Models.

By all means know what WorkRite will do. It would mean so much to you and your family—a new delight, a fresh treat, every day.

DEALERS—If you don't know about WorkRite Super Neutrodyne Receivers, by all means write us immediately for full particulars.

THE WORKRITE MANUFACTURING COMPANY
 1810 EAST 30th STREET CLEVELAND, OHIO
 Branches: Chicago, 536 Lake Shore Drive; Los Angeles, 239 South Los Angeles Street

★ **WORKRITE**
 SUPER NEUTRODYNE RADIO SETS



WORKRITE AIR MASTER

A 5-tube Neutrodyne Set

Encased in brown mahogany cabinet with graceful sloping panel. Almost identical with WorkRite Radio King, shown in main illustration, except the latter has a loud speaker built into cabinet.

Prices:

Air Master, without accessories, . . . \$160
 Radio King, without accessories, . . . \$220

WORKRITE CHUM

A 3-tube Neutrodyne Reflexed Set

Similar to Air Master in appearance. Equal to 4-tube sets in performance. Cabinet provides space for both A and B batteries.

Price, without accessories \$75

WORKRITE ARISTOCRAT

A 5-tube Neutrodyne Set

In this beautiful mahogany console, the loud speaker is placed on one side and compartment for A and B batteries on other side. All connections made inside with cable and plug. A set unsurpassed in any respect.

Price, without accessories \$350

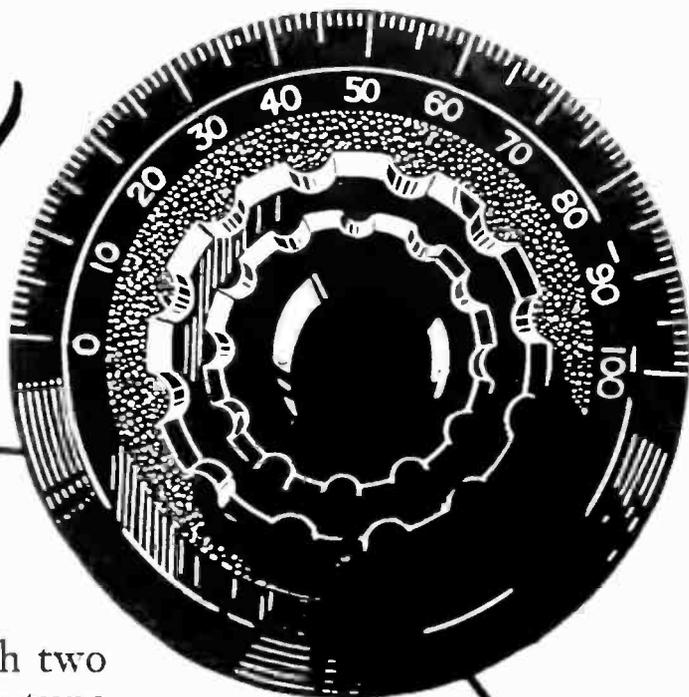


Send Coupon for FREE Rotogravure Booklet

The WorkRite Manufacturing Co.
 1810 East 30th Street Cleveland, Ohio
 Please send me FREE a copy of the Rotogravure booklet which describes WorkRite.
 Name.....
 Address.....
 City.....State.....

★ Tested and approved by RADIO BROADCAST ★

Just One Dial to Tune



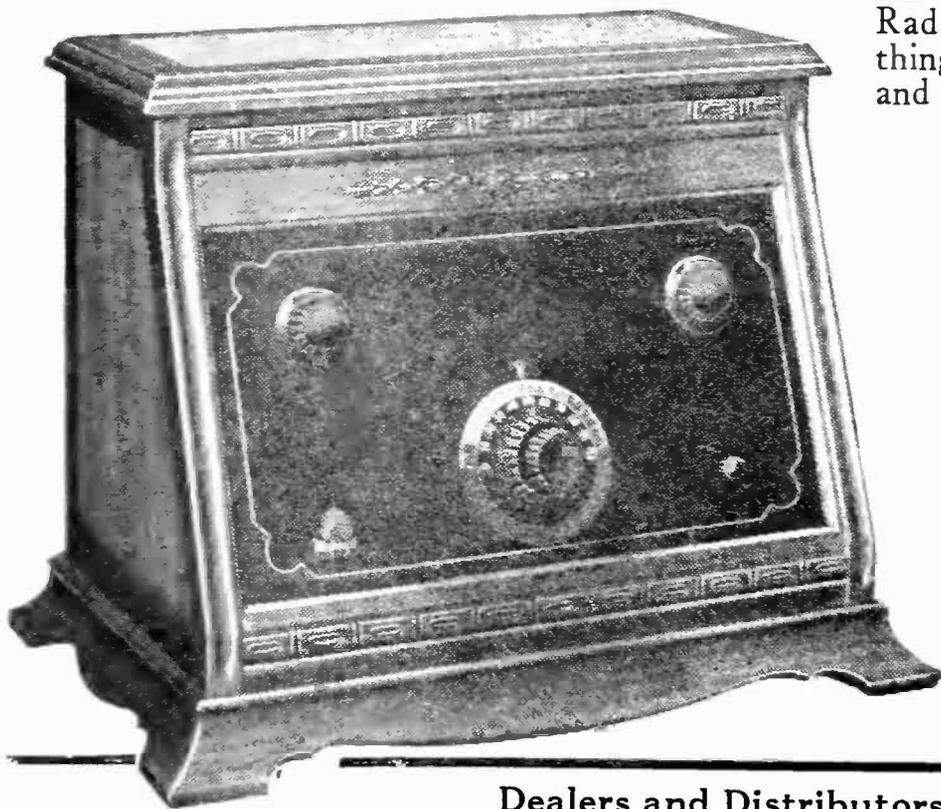
No longer do you have to fuss and fumble with two or three dials and a couple of other controls to tune in your favorite Radio Station. Now you tune in any station from coast to coast on just **one** Dial with this amazing new Radio set.

The Mohawk 5-Tube Receiver

The beautiful simplicity and compact design of the new MOHAWK Receiver with "Just **one** Dial" is the greatest improvement of the age in Radio construction. The single, super-selective tuning dial on the MOHAWK puts the entire radio atmosphere at your finger tips. **It cuts out the nearby stations and brings in the distant ones clear and distinct.**

Tuning no longer becomes a tedious task of carefully adjusting several controls. With just **one** Dial to tune, it is easy, simple, positive and precise. Just turn the dial and in the flash of an eyelash you can tune in and tune out station after station from the lowest to the highest customary wave lengths.

The result of this compact, synchronized, low-loss construction under the Mohawk's exclusive type **one** Dial Control produces a crystal clear reception with absolute naturalness of tone and an unusual volume without distortion. A demonstration will convince you that this amazing new Radio set with just **one** Dial will do anything any other five tube set will do—and do it easier, quicker and better.



Built in a distinctive period type walnut cabinet, this beautiful receiver is both a delight to see and to hear. Ask your dealer about it. Insist on seeing and hearing it before you buy.

If he does not handle it—write us. Send to-day for FREE descriptive folder telling all about this remarkable new MOHAWK Receiver.

MOHAWK ★
ELECTRIC CORPORATION

2226 Diversey Blvd.
CHICAGO, ILL., U. S. A.

Dealers and Distributors Wanted Everywhere

★ Tested and approved by RADIO BROADCAST ★



Adapto

RADIO CABINET

Beautiful
Furniture Piece
To Enclose
Your Radio Set

WHERE room charm is indispensable as radio, there is a decorative problem which a mahogany or walnut Adapto Radio Cabinet delightfully solves.

This charming cabinet holds everything "radio"—out of sight. Insert your own set—if small, adapt it with special adaptor frames at either end. Slip battery and other essentials in a drawer. Inbuilt at top is a horn—needing only your loud speaker unit. Small drawer for tools—spacious shelf for B batteries—other conveniences too numerous to mention here!

Send to-day for circular



Dept. B

**L. R. DONEHUE LUMBER
COMPANY**

Perth Amboy, N. J.

★ Tested and approved by RADIO BROADCAST ★



A-C DAYTON XL-5



ELIMINATING THE GUESS-WORK

You can buy a Receiving Set backed by an absolute guarantee of satisfaction. We have eliminated the guesswork. When you select an A-C DAYTON XL-5 for your home you can be sure of continued satisfaction. Before the XL-5 leaves the factory it must measure up to a rigid performance test. We know that it will back up every claim we make for it.

The A-C DAYTON XL-5 is a five-tube Super-Receiver, designed and manufactured to meet the demand for a high-grade receiving set that can be depended upon. In selectivity, volume, range and simplicity of operation, the XL-5 recognizes no superiors, and in *clearness of reception*, the deciding feature in any set, it leads the field.

If you are looking for such a Receiver, at a reasonable price, the XL-5 will command your interest. At \$115.00, less tubes and batteries (\$120.00 Denver and west) this remarkable Receiver sets a new standard in radio value.

The A-C DAYTON Dealer in your community will gladly demonstrate the XL-5 for you. Ask to see it, and hear its clarity of tone. If there is not an A-C DAYTON dealer near you, write direct to us for complete information and location of nearest dealer.

**THE A-C ELECTRICAL MFG. CO.
DAYTON, OHIO**

Makers of Electrical devices for over twenty years.

The A-C DAYTON XL-5--Five Tubes--Dark Mahogany Cabinet

Do You Want to Build your own set?



Then ask your dealer for the A-C DAYTON XL-5 Knock Down Kit. Sold complete with all parts and directions for

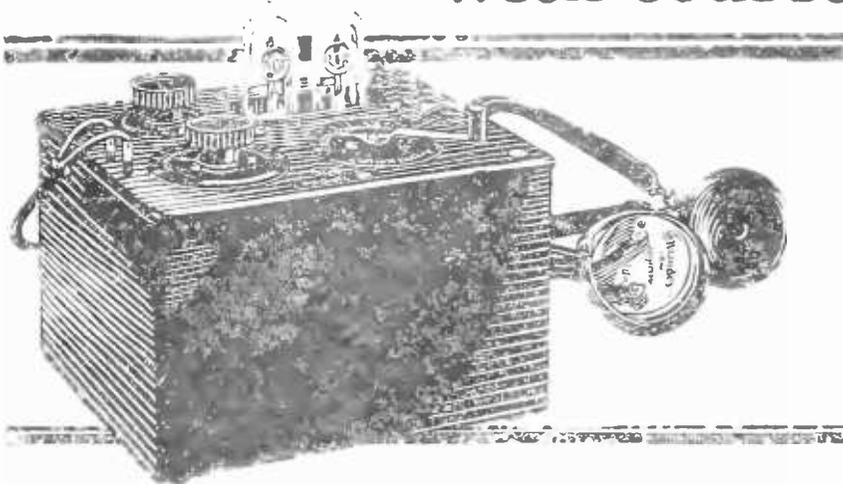
\$72.50

(\$76.50 Denver and west)



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**RADIOLA III—FREE
with course**



**A Life Career
for YOU in RADIO**

Thousands have won success in radio. Right now our graduates are voyaging to foreign ports as radio operators—ships' officers—with good pay—and no expense for rations and quarters. And hundreds of them are holding high salaried positions on land.

You, too, can earn big pay—and visit strange lands—or win success in radio right in this country! A few months of interesting study at home on the special Home Study Course of the Radio Institute of America and you can secure your Government Commercial Radio License—and your first radio job.

**RADIOLA III—FREE
with course**

The course is a new one, completely revised. New text-books. Radiola III with two tubes and Brandes headset and other exceptionally high grade apparatus free with course. Experts correct and grade your papers and answer all your questions. The most comprehensive and up-to-date radio instruction obtainable anywhere.

Don't delay. Fill out the coupon and send it today for our new booklet.

Radio Institute of America
(Formerly Marconi Institute)
Established in 1909
328 Broadway, New York City

RADIO INSTITUTE OF AMERICA
328 Broadway, New York City

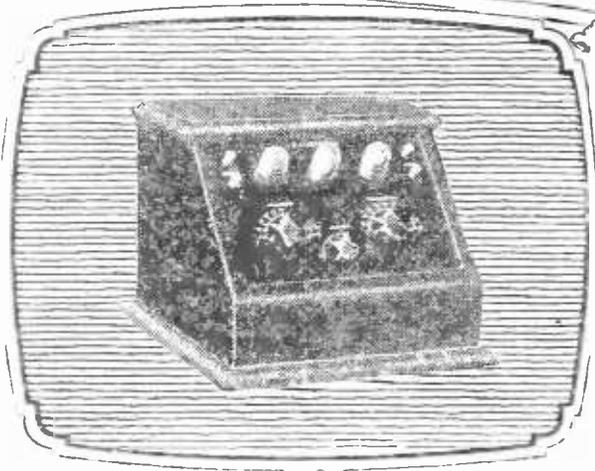
Please send me full information about your Home Study Course of radio instruction.

I am interested in the complete course including code instruction.

I am interested in the technical course without code instruction.

Name.....

Address.....



**Echoes of Opera
Through the
ECHOPHONE**

**Echophone
"V-3"**
Licensed under
Armstrong
Patent No.
1,113,149
Without Tubes
and Batteries

\$50



**Echophone
"F-5"**
Without Tubes
and Batteries

\$110.00

The Echophone "V-3" singles out the stations radio-casting the entertainment you want to hear—lets you in on the thrills of grand opera—the jokes and merriment of musical comedies.

Its range covers all the better known stations in the country. Gives loud speaker volume on stations 1500 and 2000 miles distant. Voice modulations high and low notes are reproduced in clear, undistorted tones.

Simple to operate (only two tuning controls)—and economical to maintain—(uses dry cell batteries) this beautiful 3 tube regenerative receiver with its self-contained mahogany finished cabinet is for \$50.00 the outstanding value in moderately priced sets.

For those who want longer range and still greater volume there is the Echophone "F-5" a 5 tube combined radio and audio-frequency receiver that operates from either indoor or outdoor aerial.

Ask your dealer about these sets today. In the meantime drop us a postal for our descriptive folder. Address

The Armac Radio Co., Agents
1120 N. Ashland Ave., Chicago, Ill.

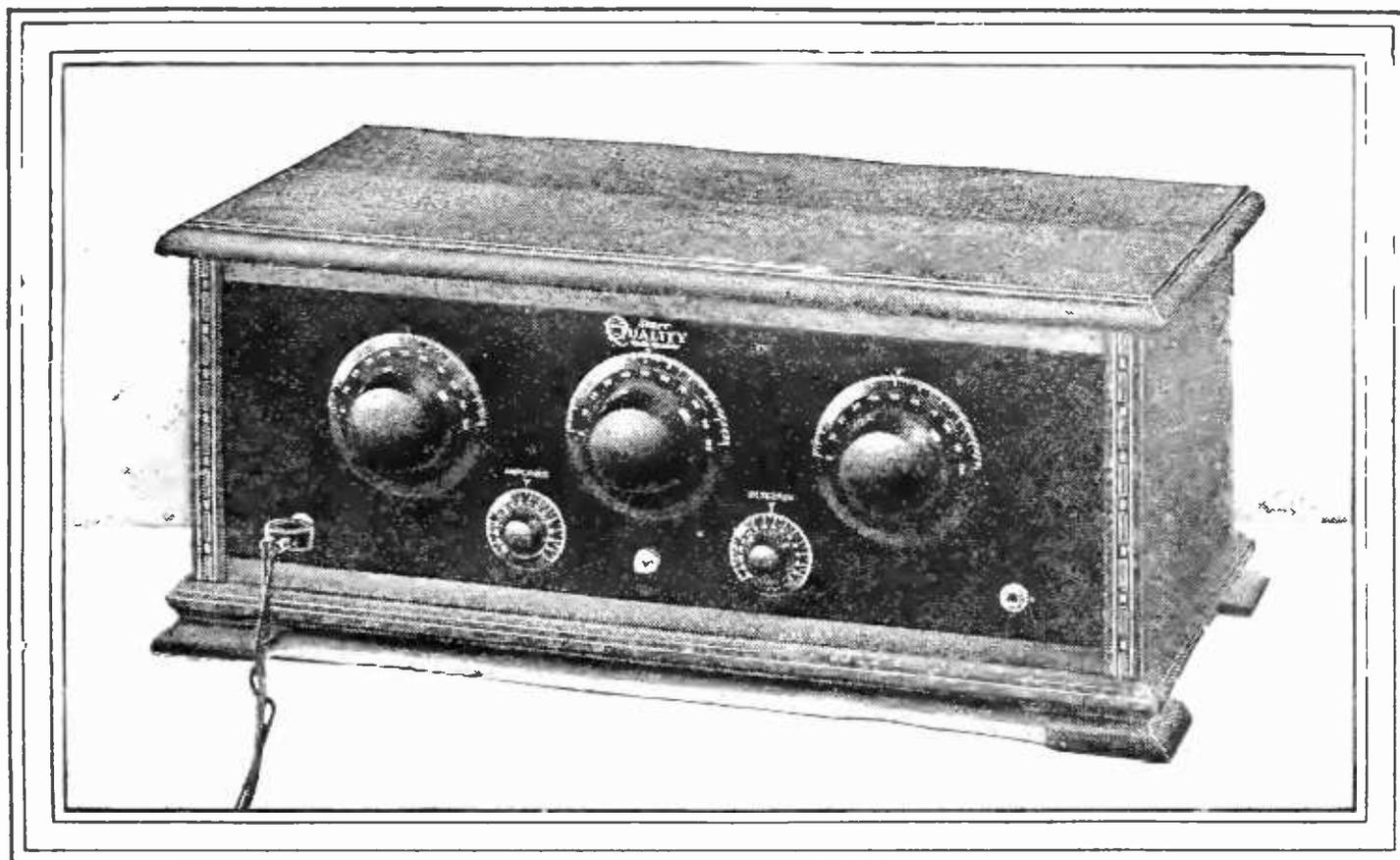
Manufactured by The Radio Shop
1120 N. Ashland Ave., - Chicago, Ill.
Long Beach, Cal. - Sunnyvale, Cal.

ECHOPHONE
Storage Battery Results at Dry Cell Cost

★ Tested and approved by RADIO BROADCAST ★

A NEW CIRCUIT

BRINGING INCREASED VOLUME—IMPROVED TONE



THE Starr Harmonic circuit, based on an entirely new method of stabilization, gives perfect control of the radio frequency without blocking. As a result, the Starr Quality Radio Receiver, first radio set to employ this circuit, has not only extreme selectivity and long range, but also a clearness and naturalness that come as a distinct surprise to each new listener. And this appeal is accentuated by unusual beauty of cabinet design, beauty which makes the Starr Quality Receiver a fit companion for the furniture of the finest home. If your dealer is not yet showing Starr Quality Radio Receivers write us for full information.

STARR EQUIPMENT CORPORATION, 237 BUSH ST., BROOKLYN, N. Y.


Starr


QUALITY

Radio Receivers

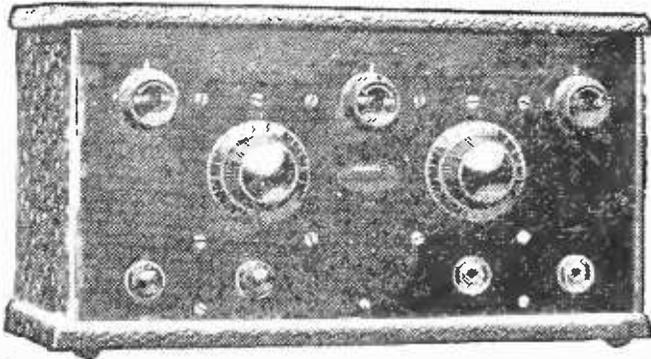
NO PICTURE CAN DO IT JUSTICE

Model D, newest Starr Quality Receiver. Case of burlled walnut beautifully matched and quartered. Carved base and inlaid pilasters. "B" batteries enclosed and all wiring concealed. Price \$150.

WATCH FOR THE NEW STARR QUALITY CONSOLE MODEL

★ Tested and approved by RADIO BROADCAST ★

RADIO FOR EVERY PURPOSE
AND ANY PURSE—\$5 TO \$32.50



Model C-13 Three-tube Receiver.
Gives five-tube volume with
only three tubes, due to reflex
amplification. Finished in black
leatherette.

\$28⁰⁰ ★

Start the year RIGHT —with KODEL

KODEL means the best that radio can give you, at amazingly low prices. One dial brings in all the stations anybody wants—everything that's hearable. Two dials in the 3 and 4 tube sets only. Nothing over \$32.50!

There's a KODEL receiver for everyone—crystal, portable, one, two, three and four tubes.

All KODEL sets embody the unique KODEL circuit, discovered by an independent experimenter. Either dry or storage batteries may be used at will. KODEL operates without an antenna, if necessary. The receiver that is making radio history.

See the KODEL line at your dealer's. If he does not carry these marvelous sets, send us his name and address and we will send you the interesting KODEL catalog, from which you can order direct. Money returned if any KODEL set does not more than satisfy you.

DEALERS: The KODEL is a sensation wherever introduced. Write for terms.

KODEL MANUFACTURING CO.

*Under the same management that
made the HOMCHARGER famous.*

128 West Third Street Cincinnati, Ohio

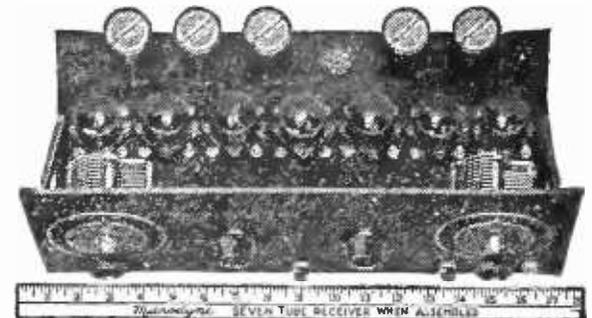
FREE! Write for instructive KODEL catalog, entitled "Radio for Every Purpose and Any Purse." **FREE!**

APEX VERNIER DIAL



It Brings 'Em In!

Get more stations—greater range—bigger volume—finer selectivity—less interference. Lasts forever. The one big advance yet made in tuning. Ratio 12 to 1. Quickly applied to any shaft. For sale by all good Radio Dealers. If unable to obtain from dealer, enclose \$2.50 for nickel-silver finish, or \$3.50 for De Luxe satin finished gold.



7-Tube Super-Heterodyne for \$97.50

Receive the parts complete to assemble your own set. Coast to coast on an 18-inch Loop. Assemble this 7-tube Microdyne Super-heterodyne on a 7x18 in. panel in three hours. Parts complete, including drilled and engraved panels, condensers, sockets, transformers, dials connecting plugs, cables, etc., with drawings, diagrams and instructions. Price of cabinet—to fit—on application. If your radio dealer cannot supply parts for complete Microdyne Radio Set, send check or money order for \$97.50 and name of your dealer.

APEX ELECTRIC MFG. CO., Dept. 104
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SEND RADIO MAGAZINES

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Let me estimate on your list NOW and save you money. Twenty Radio Publications.

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Publishers' Representative

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License



Honeycomb Coils

Back and Front
Panel Mountings
Plain or Geared—
Genuine Bakelite

The Universal all-wave inductance—accepted as standard in regard to superior construction and electrical units of measurement. Ask your

"Old Timer" radio friend why sets using honeycomb coils are better; they give closer tuning, greater selectivity and range. No dead end losses, easy to operate. 16 sizes, mounted and unmounted. Interchangeable with all mountings. Be sure the set you buy or build has them.

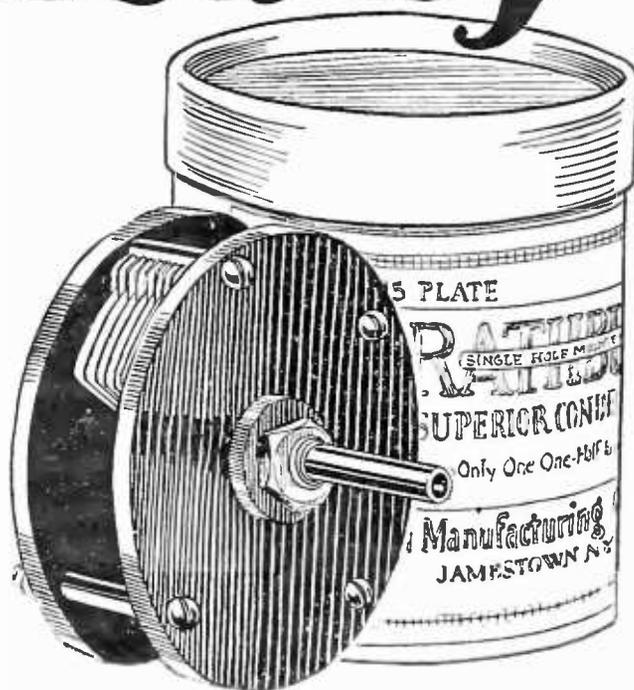
Send 25c for Super Heterodyne, Radio Frequency and Honeycomb coil Circuits and Complete Catalogue. ★

Chas. A. Branston, Inc., Dept. 7, 815 Main St., Buffalo, N.Y.

In Canada—Chas. A. Branston, Ltd., Toronto

★ Tested and approved by RADIO BROADCAST ★

Are You Fooled by "Low Loss" BUNK!



A RATHBUN Condenser is *Honest!*

WHY?

BECAUSE NO CLAIMS ARE MADE FOR IT THAT CANNOT BE SUBSTANTIATED. It is not only LOW-LOSS, but HIGHLY EFFICIENT (see Lefax report). LOW-LOSS, a questionable phrase usually adds \$2 or \$3 to the price of a condenser. Metal End Plates Do Not Necessarily Mean Low-Losses. EDDY-CURRENTS must be taken into account.

These do not exist in BAKELITE End Plates. They are often more serious than dielectric losses at radio frequencies.

EXPERTS SAY

"Replacing the dielectric material in a condenser by metallic materials for the purpose of lowering its resistance, may not always bring the results that are desired. What is gained in the way of reducing dielectric absorption may be more than over-balanced by what can be lost in the way of eddy-currents, etc. This, in fact, may be pronounced as we go toward the ultra-short wave lengths, for it must be remembered that eddy-current losses and skin-effect go up rapidly with the frequency, while dielectric absorption goes down."

—SYLVAN HARRIS.

"Losses due to eddy-currents in metal end plates of condensers are more serious at radio frequencies than in condensers using a good dielectric material, such as Bakelite."

—H. F. HARMON, *Engineer*
Formerly of Bureau of Standards

Statements that Say:

"Our Condenser has NO-LOSS"

"Our Condenser has LOWEST LOSS"

"Losses CANNOT BE MEASURED"

ARE BUNK

"Rathbun" tells the truth.

Write for information and learn the TRUTH.

NOTE THESE POINTS: Low prices, single-hole mounting, overall plate protection, correct alignment, rigid, simple, light, compact and durable. Nothing to get out of adjustment. Will stand a life time of service. Low loss and high efficiency.

GUARANTEE: If you can get *Longer* distance, *Sharper Tuning*, *Clearer* reception or *More Volume* with any other condenser on the market to-day, return ours, your money will be refunded.

DEALERS: If your jobber does not carry Rathbun Condensers, order direct.

RATHBUN MANUFACTURING COMPANY, INC.

Dept. RB2

Jamestown, N. Y.

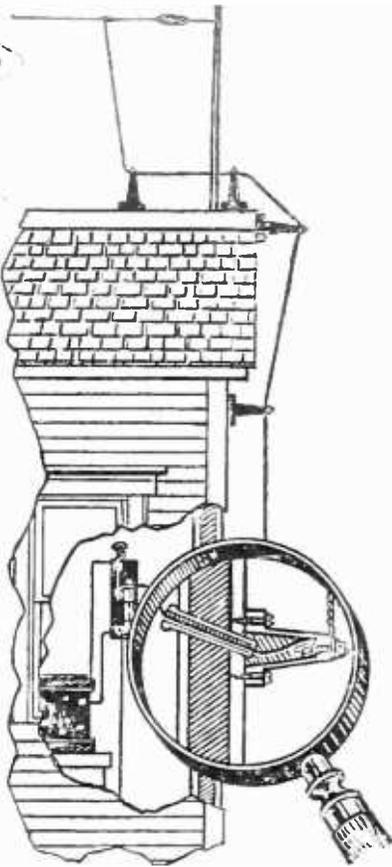


RATHBUN
SINGLE-HOLE MOUNTING
SUPERIOR CONDENSERS

Molded on every original single-hole-mounting, low-loss, unconditionally guaranteed Condenser.

BARKELEW

Porcelain Pedestals



AN insulator with a rigid clamp for the lead-in wire.

A pedestal mounting for Ground Switches, Lightning Arrester Switches or Lightning Arresters.

An insulating spacer for mounting free of table or wall, any other piece of apparatus.

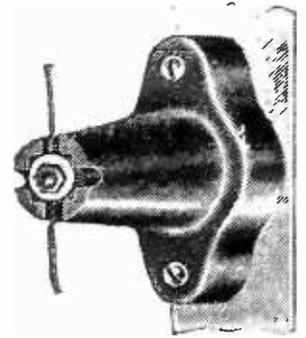
In all cases it spaces the apparatus 5" clear of the mounting surface.

This brown glazed Porcelain Pedestal has so many different applications that it at once becomes a fast moving stock article.

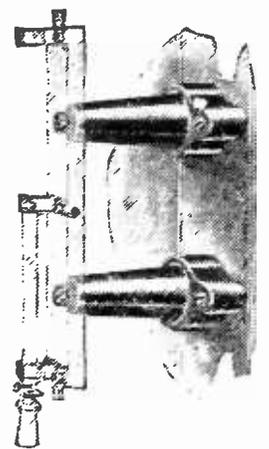
Two wood screws 2" long are furnished with each pedestal.

For full description see our Radio Catalog No. 32 at your dealer. If he hasn't his copy, we have one for him.

The Barkeley Electric Mfg. Co.
Middletown, Ohio, U. S. A.



BROWN GLAZE
No. 611 Price \$.40 ea.



CHICAGO, 15 Clinton St.
DETROIT, McKerchey Bldg.
DENVER, Denham Bldg.

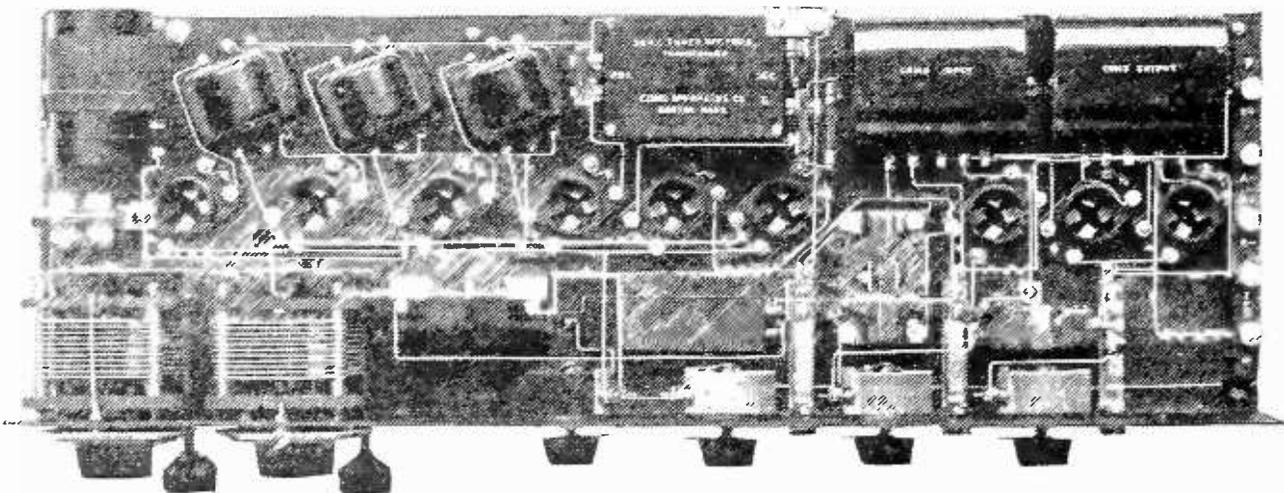
NEW YORK, 157 Chambers St.
WASHINGTON, D. C., Mills Bldg.
MINNEAPOLIS, 1017 Lumber Exch.

SAN FRANCISCO, 75 Fremont St.
LOS ANGELES, 443 S. San Pedro St.
SEATTLE, 1041 Sixth Ave., S.

COMO 9-TUBE SUPERHETERODYNE KIT

Including Como Push-Pull Amplification

This set is designed to be the best that money can buy—yet it is moderate in price. Como and General Radio parts are a guarantee of performance.



Tubes: 2 detectors, 1 oscillator, 3 radio frequency amplifiers, 3 audio amplifiers, 199 or 201A. Everything shown in picture is included in Kit. Very easy to construct; all holes drilled.



PRICE

\$125.00 (199) \$130.00 (201A)

MAINE TO CALIFORNIA!

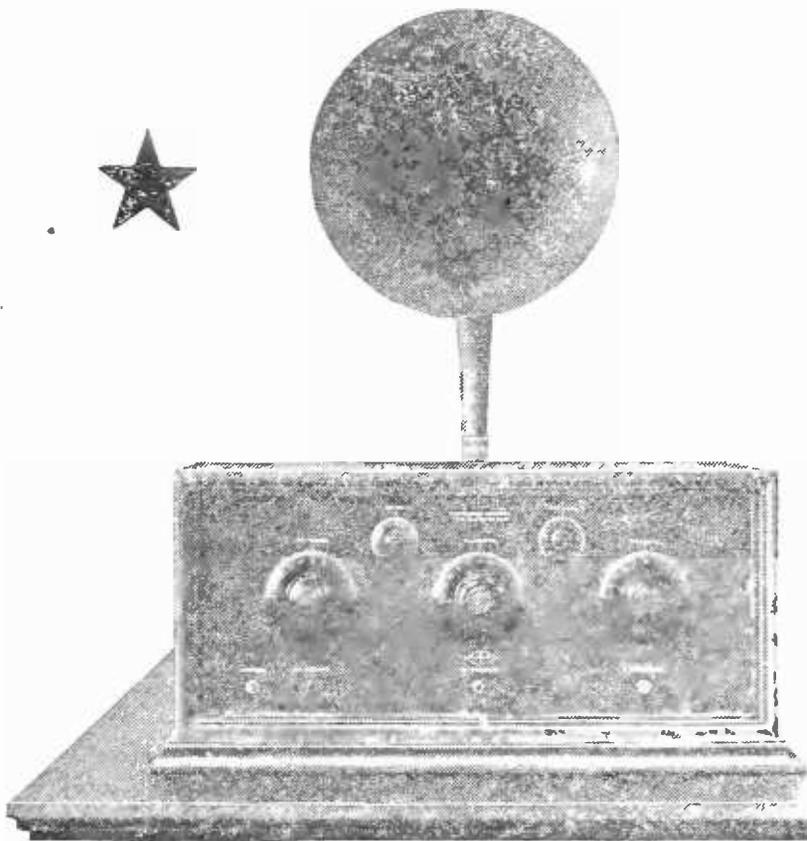
“had 58 stations last night—held California (KGO) on loud speaker an hour.”
Carl S. Wheeler, Mountain View, Maine.”

Send for Literature

COMO APPARATUS CORPN. 446 Tremont St., Boston, Mass.

★ Tested and approved by RADIO BROADCAST ★

Murdock Five Tube Neutrodyne!



Built in Loudspeaker.
 There's a compartment
 in the cabinet for
 "B" batteries.
 and the price is
\$100.⁰⁰

We have been making high quality radio apparatus since 1904—20 years of successful experience and this is our newest achievement, a Murdock Five Tube Neutrodyne with built in loudspeaker to sell for \$100.⁰⁰. When you have heard the clear reproduction of distant and local stations and when you have seen the beautiful mahogany cabinet design you will agree with us that it is the best radio set value

WM. J. MURDOCK CO.
 501 Washington Ave. Chelsea, Mass.

Branch Offices

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Washington	Seattle

MURDOCK RADIO PRODUCTS

Standard since 1904

Send for this free booklet—paste this coupon on a post card and mail.



WM. J. MURDOCK CO.
 501 Washington Ave., Chelsea, Mass.

Gentlemen:—Please send me, without obligation, your free booklet describing the Murdock Neutrodyne Receiver.

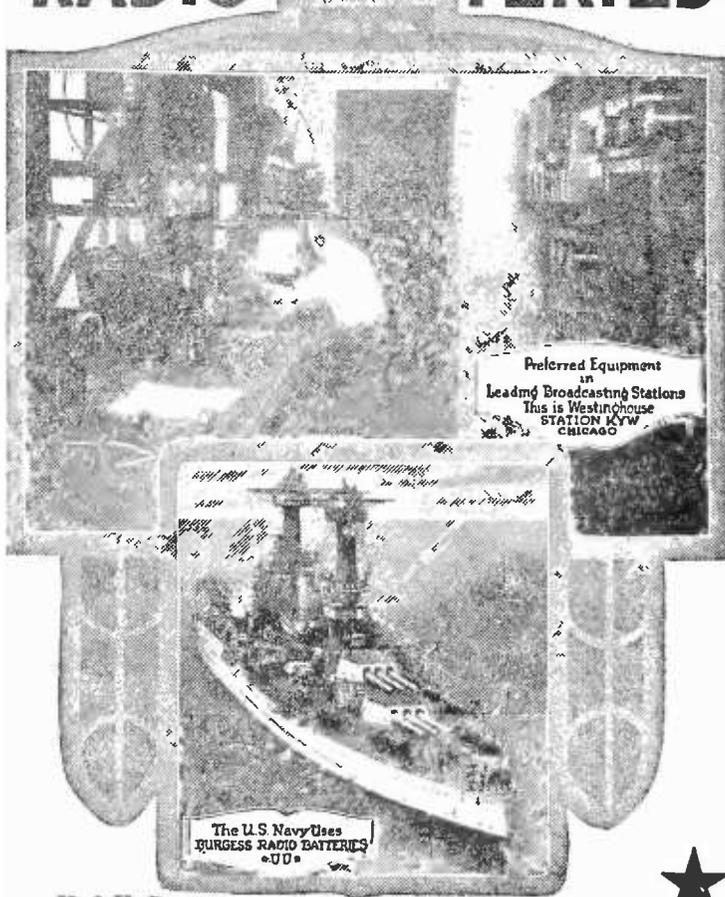
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Street

City State

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More Adventures of BURGESS RADIO BATTERIES



The same Burgess Radio 'A', 'B' and 'C' Batteries which are today faithfully serving the nation's armed forces on land and sea and in the air, and used by leading radio broadcasting stations, experienced radio engineers and amateurs, are sold in your own community by your own dealer for your own receiving set.

When you replace your old batteries, ask your dealer for Burgess. Insist upon this brand of laboratory products—you will receive the same measure of satisfactory service that has won the confidence of the radio public.

"Ask Any Radio Engineer"

BURGESS BATTERY COMPANY

Engineers DRY BATTERIES Manufacturers
Flashlight • Radio • Ignition • Telephone

General Sales Office: Harris Trust Building, Chicago

Laboratories and Works:

Madison, Wisc.

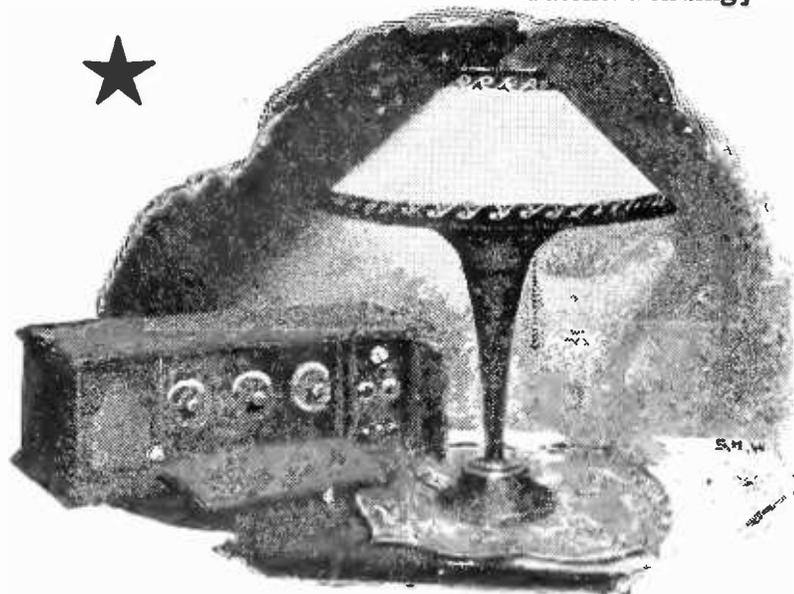
In Canada:

Niagara Falls and Winnipeg



Thor Speaker Lamp

[Patents Pending]



The Phantom of Radio

AS inevitable as the "hornless" phonograph, Radio, too, is destined to cast into oblivion its awkward, unsightly loud speaker horns.

Thor Speaker Lamp is gradually supplanting the horn-type speakers. In appearance it does not suggest other than a fine reading lamp. Yet, concealed within its base is a marvelous speaker unit that amplifies and reproduces perfectly the full range of instrumental and vocal tones, so that they may be heard distinctly in every part of the room.

Thor Speaker Lamp comes in both floor and table models. Base is stippled antique gold polychrome. Shade is parchment or any color silk. Table Lamp \$35. If your dealer cannot supply you, we will send one, prepaid express. If not satisfactory return at our expense.

Franchises in certain territories still open. Dealers and Jobbers are invited to write for full details.

THOR Radio Division

of the GOLDEN GATE

BRASS MANUFACTURING CO.

1239-1243 SUTTER STREET

SAN FRANCISCO

(119)

No library complete without Kipling complete

"Built First- **Coto** *-to Last"*

INSIST ON THE SILVER PLATED AIR CONDENSER FOR YOUR RADIO SET.

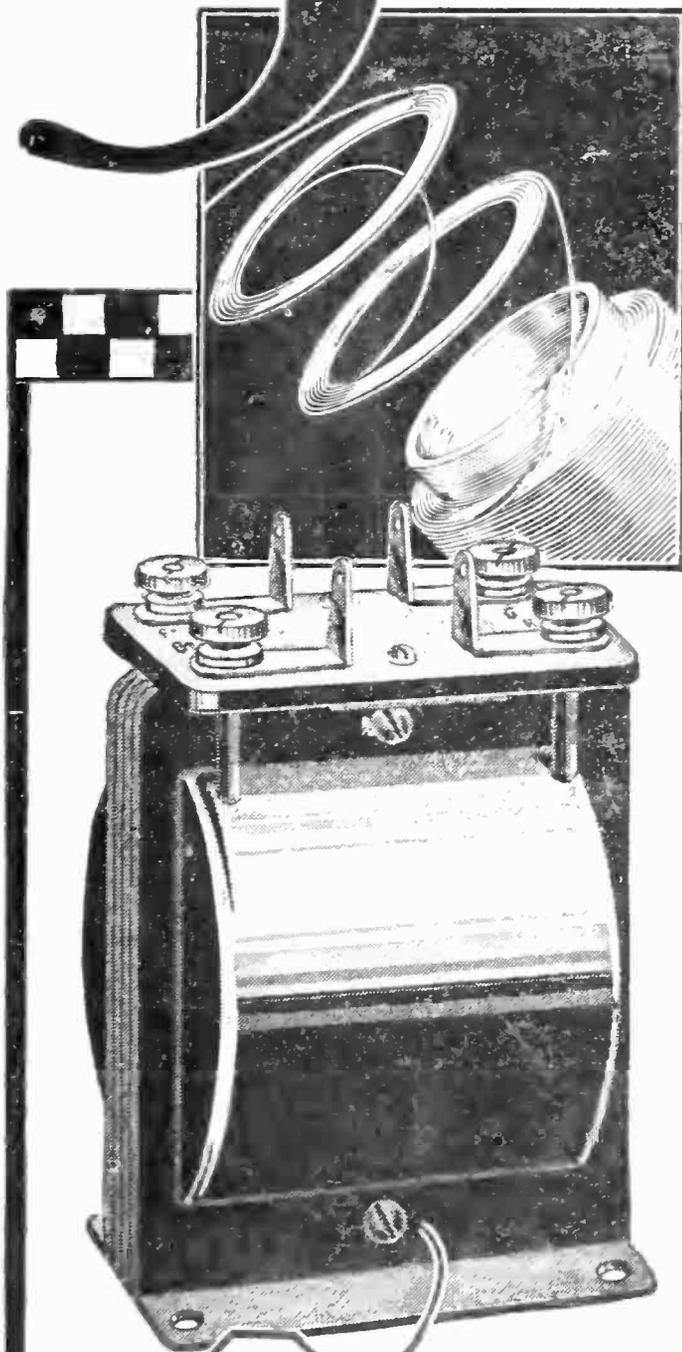
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3 BIG THINGS that this WINDING

does to improve Reception

ALL transformers are alike *except* SAMSON'S. For SAMSON'S are the *only* transformers with Helical Wound Coils—with the wire wound in discs which are laid at right angles to the coil. No paper insulation is needed or used. Helical Winding gives SAMSON Transformers three big advantages:

- (1) **Maximum Amplification:** SAMSON transformers have been shown, by scientific tests, to have an *exceedingly uniform* amplification efficiency reached at a lower frequency than in any other transformer.
- (2) **Minimum Distortion:** The Helical Winding practically eliminates distortion throughout entire audio range.
- (3) **Minimum Distributed Capacity Effect:** Adjacent turns of wire in SAMSON Helical Windings are but 80 turns apart instead of 800 to 1200 or more as in others. This reduces distributed capacity effect to an absolute minimum.



H.W.
stands for
HELICAL
WINDING

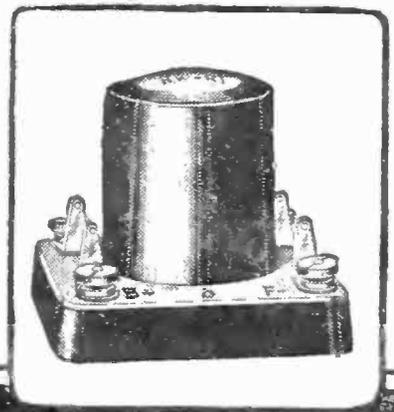
Samson Helical Wound Transformers

Examine SAMSON Helical Wound Transformers at your radio dealer. Test them. Use them in the set you are building; or replace transformers in the set you now have. Insist on your dealer showing you SAMSON HW Transformers.

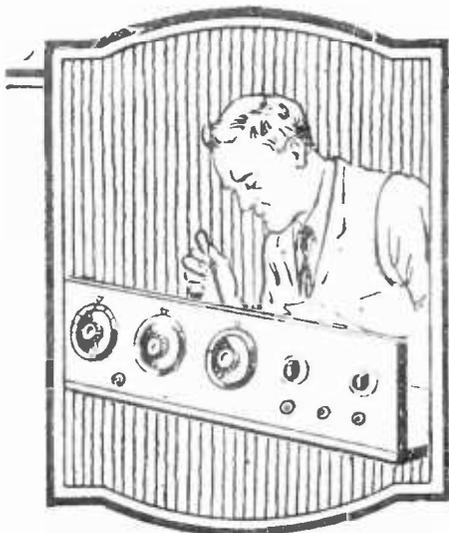
★ SAMSON ELECTRIC CO.
CANTON, MASS.
Sales Representatives in Larger Cities

Write for information on our Super-Kit and proof of SAMSON superiority.

NOW
\$5.00
Two Ratios
3 to 1
6 to 1



★ Tested and approved by RADIO BROADCAST ★



When it's "Pacentized" you are sure of results

SELECTIVITY—distance—volume—these results are dependent on the parts you use. It's poor economy to slight such vital parts as jacks, rheostats, condensers, etc., when Pacent Radio Essentials, built by the pioneer radio parts manufacturer, cost no more than inferior parts.

18 years of radio experience are back of every Pacent part. Over 30 of the leading makes of receiving sets are Pacent equipped. This is convincing proof that the Pacent trade mark stands for leadership. Let the judgment of those makers be your guide in buying parts. Send for our complete catalog.

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91 Seventh Avenue, New York City

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RADIO ESSENTIALS

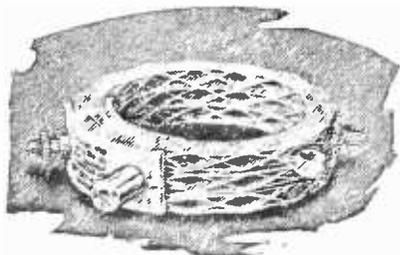


PACENT Radio Essentials

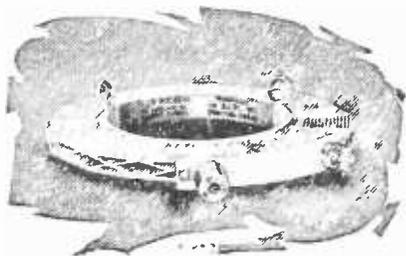
Adapters
Improved Audioformer
Autoplug
Balcon
Coil Plug
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Twinadapter, etc., etc.



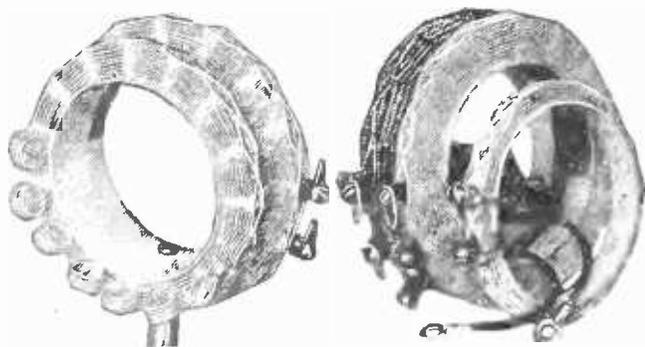
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Knockout Reflex Coil No. 8
Price \$4.00 a Pair



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Price \$2.00



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Price \$8.00 per set

SICKLES

DIAMOND-WEAVE COILS

Patented Aug. 21, 1923

For The Roberts Circuit

Two units of remarkable efficiency, built specifically for the immensely popular Roberts Circuit. Primary and secondary coils in unit No. 1 are mounted on an insulating sleeve, with the primary coil left free to allow for adjustment in coupling.

Unit No. 2 contains primary, secondary, neutralizing coil, and tickler. The tickler is provided with 180 degree dial control. The tickler is also provided with an additional adjustment of coupling to conform to different characteristics of tubes or variations in plate voltage.

Among other popular Sickles products are the Tuned Radio Frequency Coil for self-neutralizing Tuned Radio Frequency Circuits, and the Knockout Reflex Coils. We manufacture coils for all popular Circuits and for special requirements.

Send for descriptive catalogue



The F. W. Sickles Co.

335 Worthington Street
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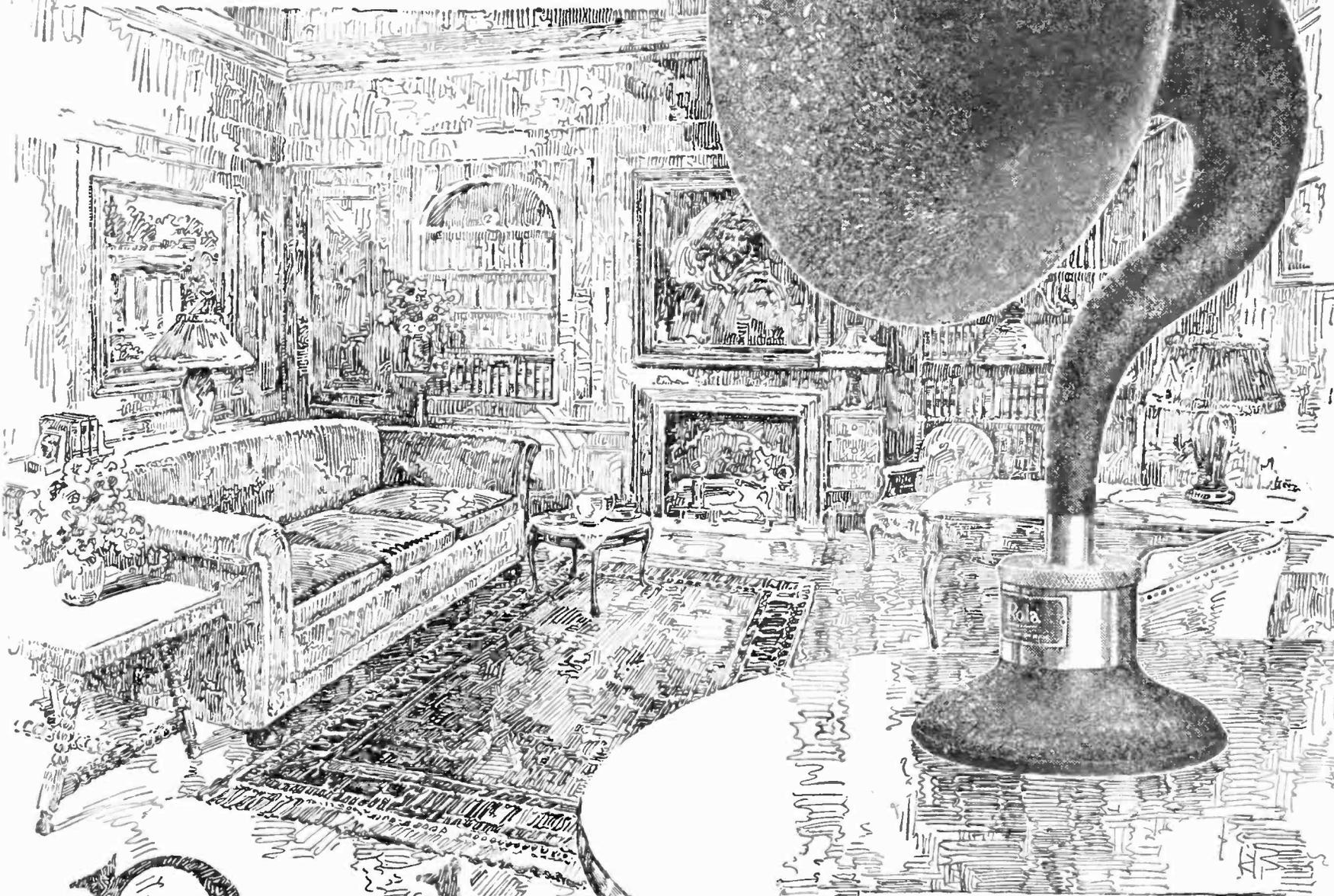
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• *Distinction* •

THE SAME QUALITIES that give pre-eminence to a rare print or an old master are to be found in the Rola Re★Creator—beauty and harmony in line and workmanship, individuality, creative skill.

The Rola Re★Creator is a radical departure in construction and in performance from the commonly known type of reproducer or "loud-speaker." It achieves results which have long been considered impossible in the radio world. A Rola demonstration carries convincing proof. You may hear it at your dealers.

A Product of
THE ROLA COMPANY
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Rola

Price complete with 14-in. horn and cord
 \$36.00
 Phonograph Unit with adaptor
 \$22.50

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An easy way to get distant stations more clearly

IF you want clear radio reception—with more freedom from those disturbing noises—you must have clean, perfect contact between tubes and sockets.

With Na-Ald De Luxe Sockets the two to eight tubes do not have to be removed and sandpaper used to scrape the socket contacts. Duo-contacts are easily cleaned and film of oxide between tube and socket—better known as corrosion, which can ruin contact—is quickly removed by rotating each tube three or four times.

Lowest loss and highest insulating qualities are insured in Alden Sockets by using Alden Processed genuine Bakelite.

Use Na-Ald Sockets not only in the set you build but also install them in the set you buy, if not already adopted by the manufacturer. Sockets for all tubes. De Luxe 75c; others 35c, 50c, 75c.

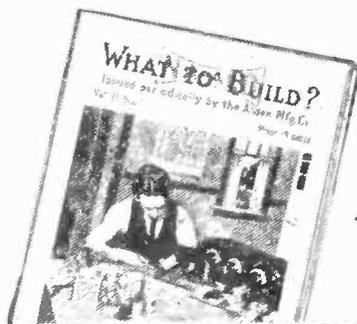
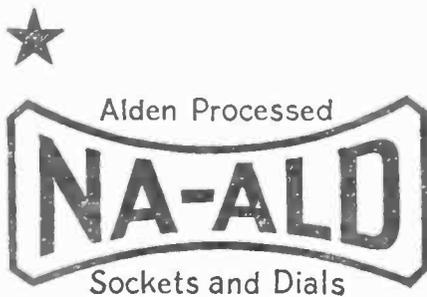
Send for free copy of radio booklet—"What to Build."

ALDEN MANUFACTURING COMPANY

Also makers of the famous Na-Ald Dials

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Springfield, Mass.



ALDEN MANUFACTURING COMPANY
Dept. B-2, Willow Street, Springfield, Mass.
Please send free copy of booklet "What to Build," showing tested and selected circuits.

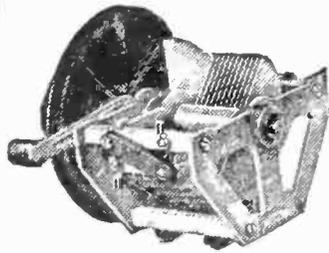
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Facts Count!

All manufacturers make various claims regarding their condensers, but FACTS count. We can prove the efficiency and superiority of

DUPLEX CONDENSERS

This proof is set forth in two interesting folders entitled "Cons" and "Facts." Write for them to-day and you will have the truth about condensers.



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NONE OTHER 

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A low loss precision condenser of High value and unusually low price.

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Use it to build the Super-Heterodyne, Ultradyne and other long wave circuits.

See Duplex Products at your dealer's. Ask him or write direct for our complete literature.



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ROBERTS' SETS

2-4 tubes, push pull and resistance coupled, built by us for this magazine as illustrated in past numbers are now available to the public, including our Low Loss Coils.

ALL PARTS IN STOCK

We specialize in Roberts' and Super-Heterodyne sets and parts.

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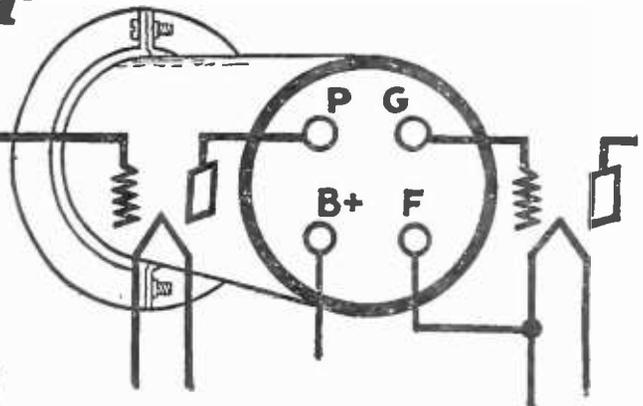
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RADIO FREQUENCY AMPLIFICATION with the BALLANTINE VARIOTRANSFORMER

**No extra condenser
for this tuned
r.f. instrument**



**BALLANTINE
VARIOTRANSFORMER
UNITS**



Transformer only \$9.60
for panel or base
At dealers or postpaid

**Pure inductance tuning gives
maximum amplification**

SIMPLICITY and efficiency are usually found together. That's one reason why your tubes pass on a greater proportion of their energy—when coupled through BALLANTINE Variotransformers.

Self-contained; takes less space

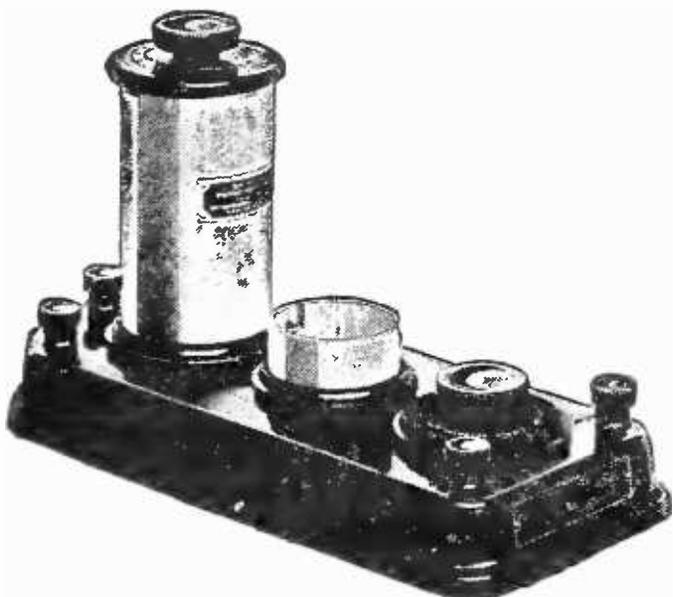
Entirely shielded by its metal case (only 1 3/4" diameter) this instrument may be placed close to other parts of the circuit. The sketch shows how simple is the link between the plate of one tube and the grid of the next. No extra condenser to cut voltage; and no condenser dielectric to absorb energy. Only with the *continuously* variable inductance tuning of the BALLANTINE can you cover the broadcast range—and get highest amplification in every tube with fine tone quality assured.

This booklet yours on request

“Radio Frequency Amplification with the Ballantine Variotransformer” tells how to get better results with fewer parts. Your copy is ready to mail.



*A Boonton
Guaranteed
Product*



Complete radio frequency
amplifier unit with \$15.00
socket and rheostat



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RADIO FREQUENCY AMPLIFICATION with the BALLANTINE VARIOTRANSFORMER

★ Tested and approved by RADIO BROADCAST ★

Why it is Better

THE picture tells the story—seven practical, sensible reasons why Federal sockets should be in your “pet” hook up. Federal sockets are but another evidence of the care and engineering skill used in designing and making Federal Standard Radio Parts.

There are over 130 standard parts bearing the Federal iron-clad performance guarantee—their use means—“Balanced Circuits” with better performance.

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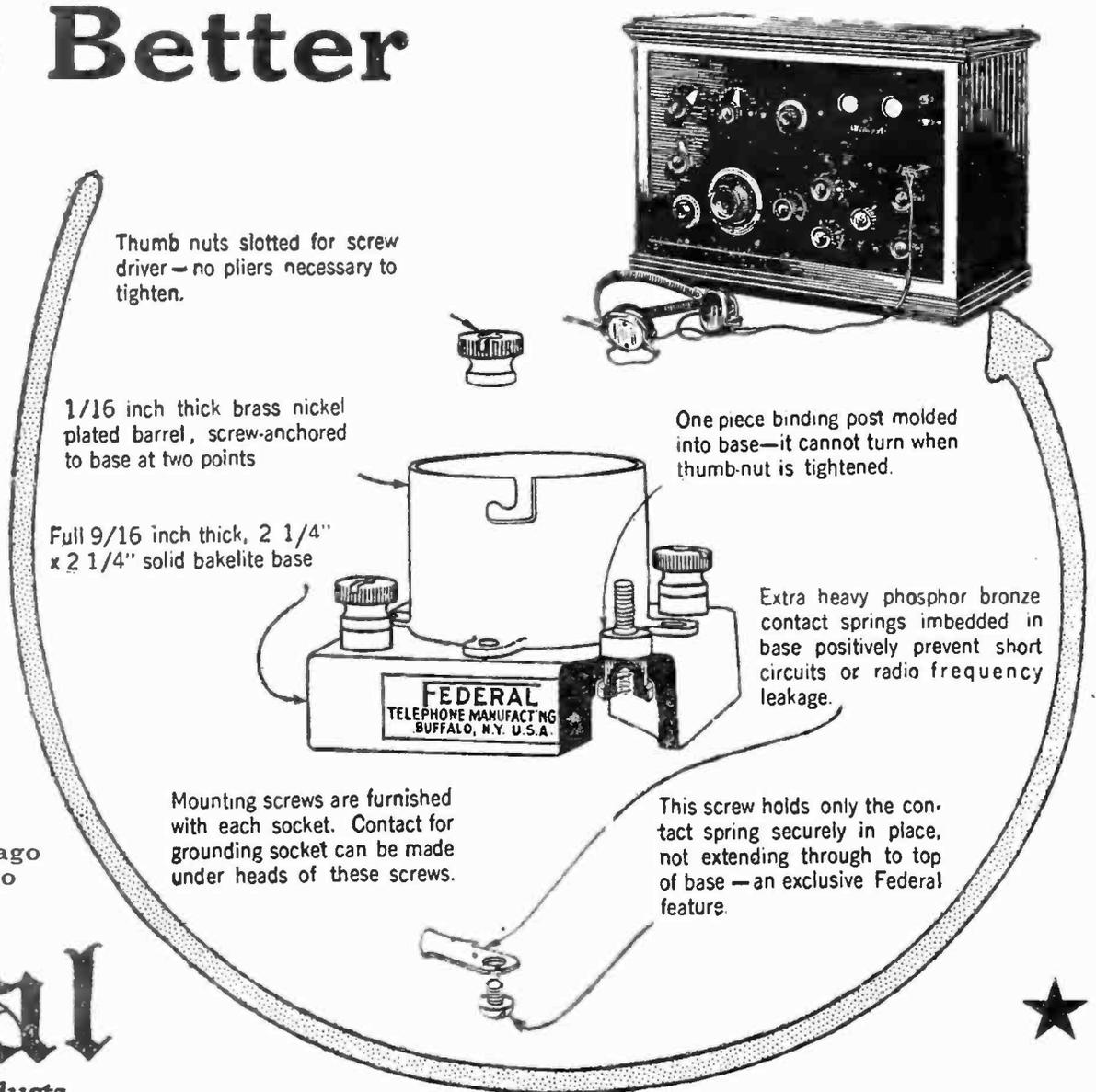
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Standard RADIO Products



The SINGER Compendyne

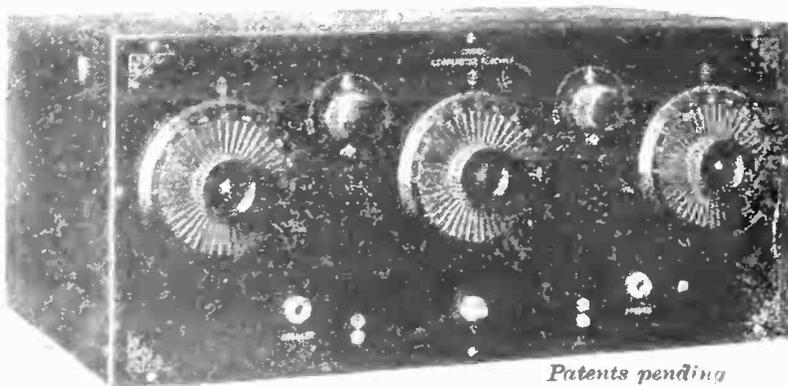
The *Compendyne** 5 tube tuned R.F. low loss receiver has brought in sixty-seven distant stations on the loud speaker, while powerful local stations were broadcasting. Squeals, howls and distortion are eliminated. You get great volume with sweet, pure tone. Have your dealer arrange for a demonstration.

Cabinet and panel are matched in mahogany; trim is gold.

Write for descriptive literature.

Formerly \$95

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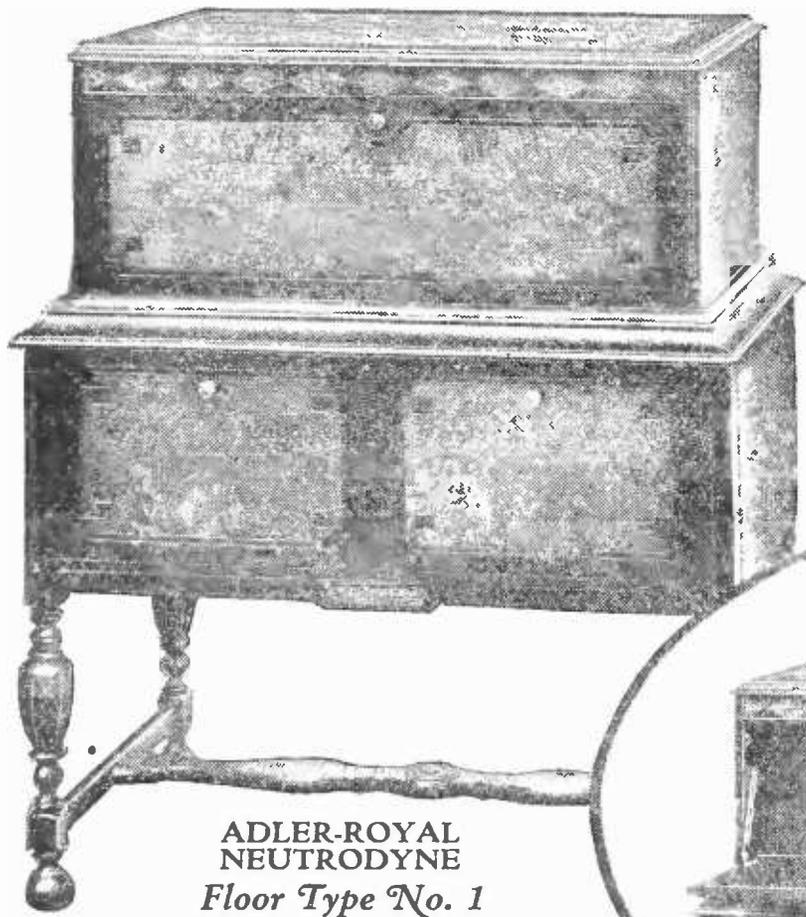


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Get the program
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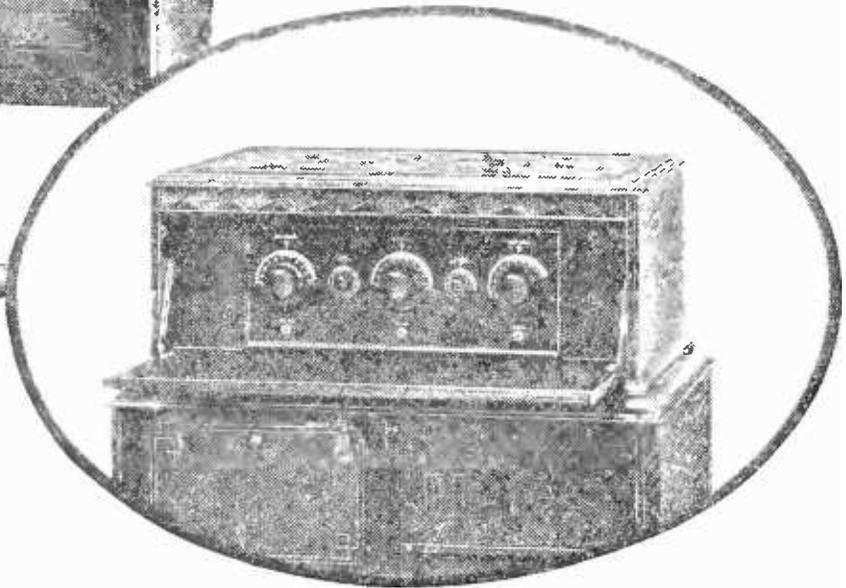
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Floor Type No. 1

ELIZABETHAN

\$350.00 loud speaker built in,
without tubes or batteries, other
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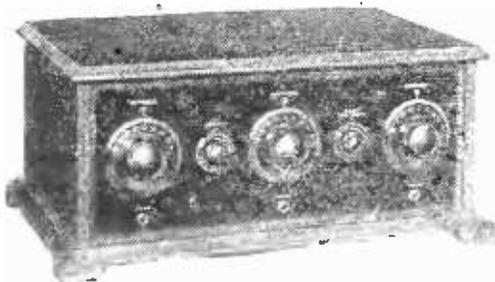
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This Free Log Book

SEND the coupon below to-day for your copy of a fascinating booklet describing the complete Royal line of radio sets, phonographs and combinations, with prices, together with a log book of principal sending stations to make your own records of dial readings.

Adler-Royal 5 Tube Neutrodyne

Set 199 designed and built for dry cells
Set 201 A designed and built for Storage Battery

ADLER-ROYAL Neutrodyne incorporates the most recent advances in Radio engineering. You have your choice of two different styles. Set 201 A operates on the usual "A" storage battery. Set 199 is designed and built to operate on dry cells. Wave amplifiers not only produce exceedingly high wave reinforcement but at the same time they are extremely selective.



Adler-Royal Neutrodyne 201-A

Control for audio frequency and radio frequency is separated. In simplified language this means that when a station is amplified, the desired tone volume is obtained without distortion.

Remarkable Selectivity

EVEN in the hands of a beginner, it has been possible to tune in on twenty-five stations the first night. The Adler-Royal Neutrodyne not only meets the needs of those who are simply interested in broadcasting reception, but for the radio expert, it will more than satisfy. Wired like the finest telephone switchboard and with power to amplify that is remarkable, it may be truthfully said that "the air holds no secrets from an Adler-Royal Neutrodyne."

Adler-Royal is on exhibit only at the higher class stores whose reputation is an additional guarantee of the quality of the Royal line.

ADLER MANUFACTURING COMPANY, INC.
General Sales Offices: 881 Broadway, New York City
Factories: Louisville, Ky.



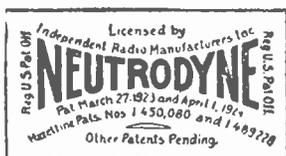
Adler-Royal NEUTRODYNE

ADLER MANUFACTURING COMPANY
881 Broadway, New York City. RB-1

Please send me the Adler-Royal illustrated Booklet and Log.

Name

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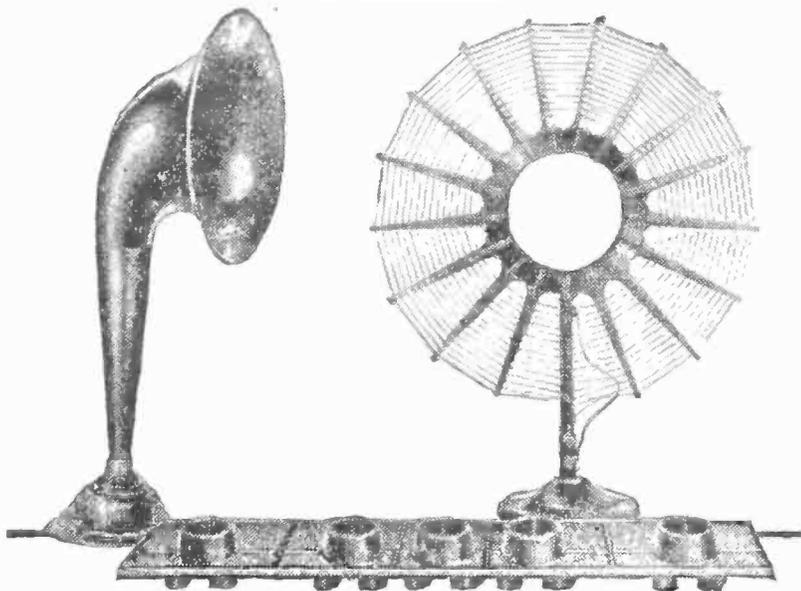


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A constant factor in radio development

RADIO design progresses rapidly—but radio's standard insulation continues to be Bakelite.

For the further refinement of radio sets and parts, radio engineers rely upon Bakelite. Typical of many new Bakelite applications are the Musette Loud Speaker, the Paramount Loop and the Amsco Tube Mounting Panel.

Of all insulating materials Bakelite alone combines the many characteristics vital to efficient radio reception.

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are the registered Trade Marks for the Phenol Resin Products manufactured under patents owned by **BAKELITE CORPORATION**

Send for our Radio Map

The Bakelite Radio Map lists the call letters, wave length and location of every broadcasting station in the world. Enclose 10c to cover the cost and we will send you this map. Address Map Department.

THE MATERIAL OF A THOUSAND USES

"Good Parts Make a Good Set"



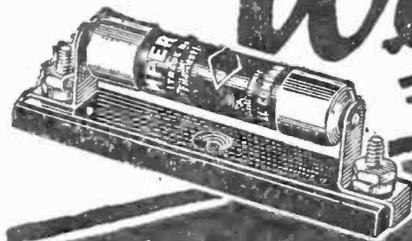
The Filter Tuner

THE BEL-TONE Low-Loss Filter Tuner takes all the guess-work out of building a Filter Tuner Set. This unit has been built to the exact specifications laid down by McGinnis and Maher of the N. Y. Journal. It bears their signature of approval. The BEL-TONE Filter Tuner is made with bakelite tubes and green silk wire. It is packed in a neat box with complete instructions. **\$3.75**

BEL-TONE RADIO CO.

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Other BEL-TONE Good Parts are: Bel-Tone Kit type AC-30, Bel-Tone Variometer, Bel-Tone Variocoupler, Bel-Tone Mounted Binding Posts.

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The "SELF-ADJUSTING" Rheostat

\$1.10

Everywhere

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Hook-Ups

No rheostat knobs on panels to turn—no meters needed—no tube worry. One amperite, used in series with each tube, inside the set, automatically supplies just the right current for each individual tube's greatest efficiency. Works on thermo-electric principle. Simplifies wiring. Reduces set cost. Proven in use. Adopted by more than 50 set manufacturers. No set is up-to-the-minute in design without it.

RADIALL COMPANY

Dept. R. B. 2

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★ AMPERITE

"means right amperes"

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Build Your Set with Goodrich Rubber

*Here's Why It Will Bring In Those
Distant Stations Clearer Than Ever*

BY scientific tests, Goodrich Rubber Radio Products show the lowest dielectric losses of any practical radio insulating materials. This quality alone means that they give the greatest efficiency in radio frequency amplification. The set built of Goodrich Products will give maximum range and selectivity for its type.

Fifty-five years of rubber manufacturing experience are a guarantee of their reliability. Build for the greatest efficiency with these—

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GOODRICH RADIO PANELS—dielectric constant, at radio frequencies, 3.5; low moisture absorption and high softening points make them superior. They may be worked with ordinary tools, and retain their rich glossy finish. Full assortment of sizes in attractive black or mahogany colors.

GOODRICH V. T. SOCKETS—Special spring lock—releases at a touch of the finger, no turning or twisting the tube. Contacts may be cleaned without removing the tube. Eliminates danger of tube breakage. Low dielectric losses.

GOODRICH RADIOPHONE EAR CUSHIONS—Shut out all outside noises.

GOODRICH BATTERY MATS—A protection from overflowing liquids.

GOODRICH VARIOMETERS (UNWOUND)—Wind them to suit yourself.

GOODRICH HARD RUBBER TUBES—Very low dielectric losses.

GOODRICH SPAGHETTI TUBING—Will not corrode wiring.

Send for our booklet "Rubber for More Perfect Radio Reception"

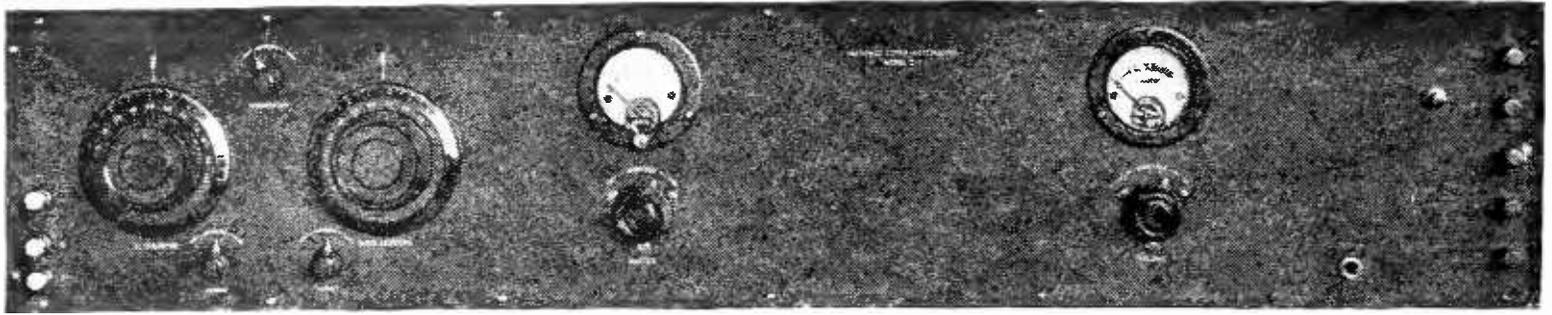


THE B. F. GOODRICH RUBBER COMPANY
Akron, Ohio

ESTABLISHED 1870

Goodrich Rubber Products
for *Radio*

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Laboratory Apparatus—What It Means

Among the scores of Super-Heterodyne parts and circuits, which are the best? Severe impartial laboratory tests alone can give you the answer. Only after a model has proved itself in that way do we endorse it. Super-Heterodyne distance, volume, tone purity—that is what Norden, Hauck laboratory apparatus means to you.

Super-Heterodyne

C-7

A Long Distance Concert Receiver

Will Be Your Eventual Receiver

The famous Experimenters Information Service C-7 Design—laboratory apparatus—naval standards. A regenerative super-heterodyne employing a local oscillator. None of the so-called new “circuits” or modification of standards approaches it in efficiency.

All material we furnish is endorsed and recommended by the designers



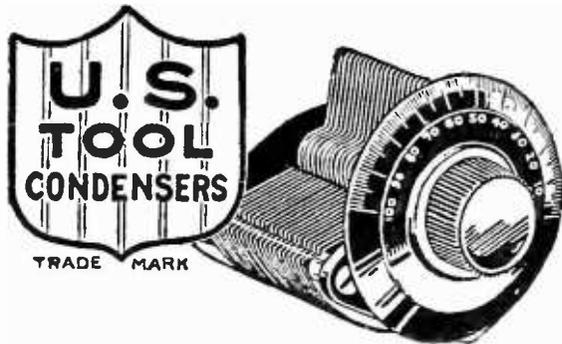
Send For Price List—Saves You Money

FREE INFORMATION—Write for descriptive matter and price list on this remarkable unit.

Full Stock On Hand—Norden, Hauck & Co. carry complete stock of parts for immediate shipment.

NORDEN, HAUCK & CO.

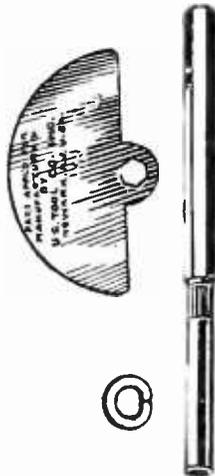
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New Hexagon Shaft

Insures Condenser Perfection

To eliminate fanning, the rotor blades are stamped with a hexagon hole and held rigidly on hexagon shaft. Found in types 3 (plain) and 4 (all-vernier), CELORON END PLATES; types 5 (plain) and 6 (all-vernier), METAL END PLATES.



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U.S. TOOL COMPANY, Inc.
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Mfrs. of Special Tools, Dies, Jigs, Automatic Machinery and Sub Presses.

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Positive Contact

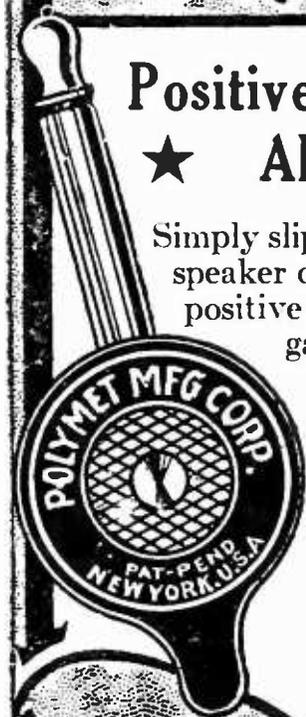
★ **Always Maintained**

Simply slip the Polyplug into the loud speaker or head phone socket and a positive contact is maintained regardless of pulls, jerks and jars on the phone cords. The tension slot, an exclusive feature, makes the Polyplug the most convenient and efficient plug made.

It's genuine Bakelite, too
At all reputable dealers

POLYMET MFG. CORP.

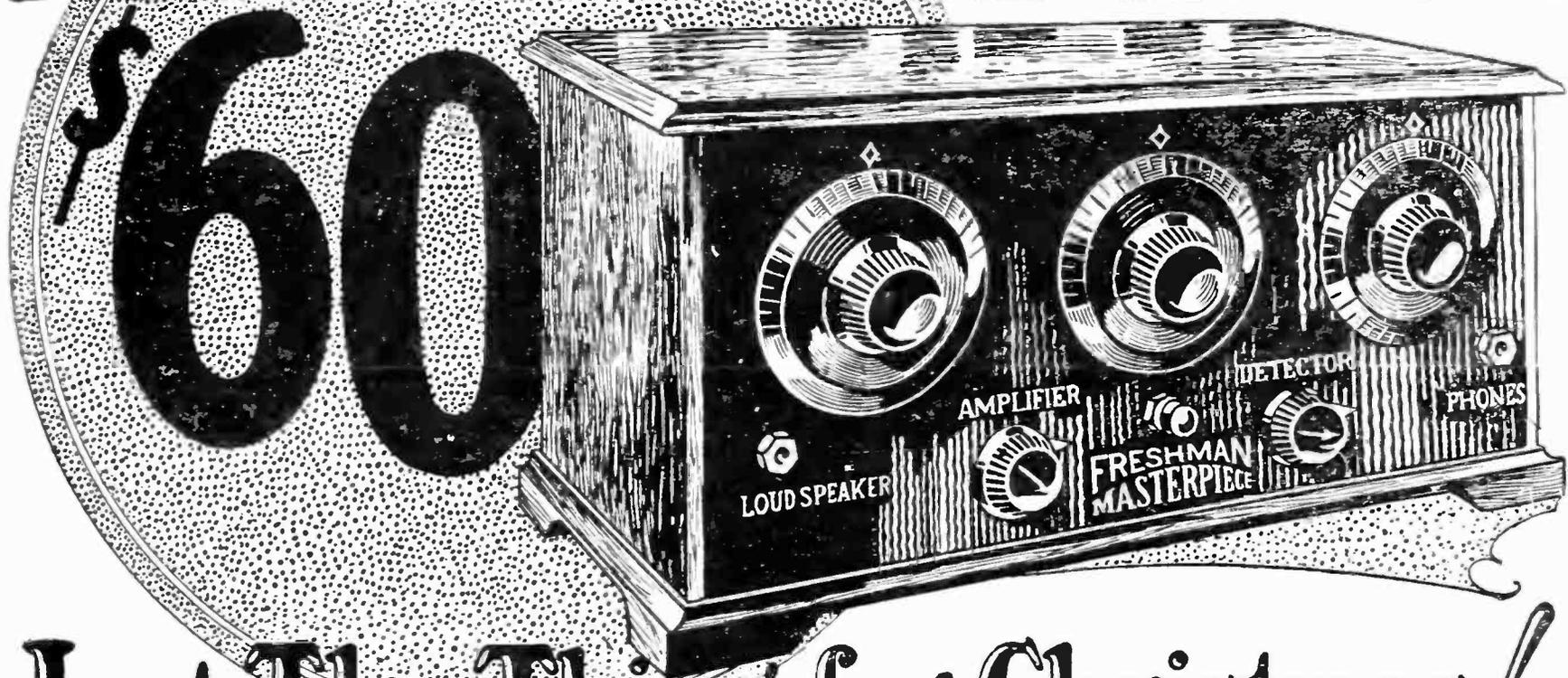
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75¢
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A 5 Tube Tuned Radio Frequency Receiver

made of the finest low loss materials and in a beautiful genuine solid mahogany cabinet, that is attractive enough for the most pretentious room, and at sixty dollars, economical enough for the most modest. Users claim it is

The Greatest Value Ever Offered in a Radio Receiving Set

Combines all points essential to the perfect receiver. Real distance reception without that squealing and howling. So selective that once a station is picked up—it can be brought in again on the same points on the dials, whenever you want it. And what's more

It's the easiest set in the world to operate

All genuine Freshman Masterpiece Sets have a serial number and trademark riveted on the sub-panel. The Receiver is not guaranteed if number has been removed or tampered with.

Ask your dealer to install one in your home

Beware of Imitations and Counterfeits



Chas. Freshman Co. Inc.
Radio & Condenser Products

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More Money For You in **RADIO**

THE amazing expansion of radio has opened up hundreds of wonderful new positions on land and sea. Big salaries, fascinating, easy work, short hours, and a wonderful future are offered to ambitious men who get into Radio now.

Take advantage of these wonderful opportunities to step into a big paying position in this great new field. Radio offers you an opportunity to travel and see the world, with all expenses paid, and a fine salary besides. Or you can stay at home and work up to a position paying up to \$10,000 a year. One of our recent graduates secured a position one week after graduating, paying a salary of \$300 a month. Hundreds of others report equal success.

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Hundreds of men are already earning handsome incomes in this wonder science. If you want to get into a profession where opportunities are unlimited make Radio your career—become a Certified Radio-trician.

Thousands of Certified Radio-tricians are wanted to design Radio sets; to make new Radio improvements, to manufacture Radio equipment and to install it; to maintain and operate great broadcasting stations and home Radio sets; to repair and sell Radio apparatus; to go into business for themselves; to operate aboard ship and at land stations.

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Send for **BIG BOOK**

No other field to-day offers such great opportunities as Radio. Take your choice of the many wonderful openings everywhere. Prepare now to step into the most interesting and best paid profession to-day. Read about the opportunities open now—the different kinds of work—the salaries paid. Write to-day for the 32-page book that tells how America's first and biggest Radio school can teach you to become a Certified Radio-trician in your spare time. Mail the coupon or write a letter NOW.

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Without obligation send me your book, "Rich Rewards in Radio," which tells all about the opportunities in Radio, how spare time study at home will qualify me quickly as a Certified Radio-trician so I can get one of the splendid positions, and how your Employment Service helps me to secure a big pay job. Please write plainly.

Name..... Age.....
Street
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Prevents tubes burning out

Safeguard your tubes against "B" battery wires being connected to the filament or "A" battery circuit binding posts through error; against "B" battery wires coming in contact with the filament wires while making adjustments inside the set; or against short circuits caused by tools dropped across the wiring by installing the

"**GEM**" RADIO FUSE

Is it worth risking the loss of tubes that cost \$20.00 or more when you can positively protect them from burn-outs due to short circuits for a few cents with a "Gem" Fuse?

With this fuse in your set, you simply blow the fuse when there's a "short" and don't injure your tubes. A new fuse can be slipped into the socket in a second and costs but 35c.

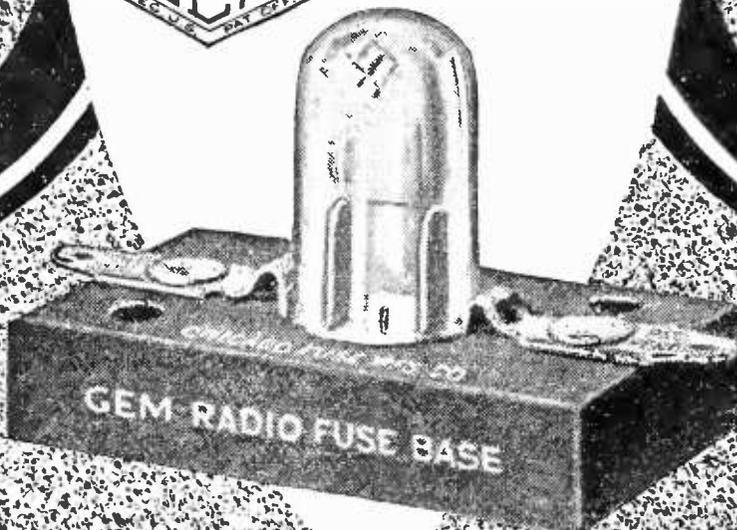
"Gem" Fuses are *guaranteed*. If not at your dealer's, sent postpaid, with fuse block for attaching to your set, for 60c. Write for interesting booklet.

Chicago Fuse Mfg. Co.

Manufacturers of
Electrical Protecting Materials
and Conduit Fittings

1505 West 15th Street
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Dealers: Write for our
attractive proposition



"The Voice of the Air"

AMRAD NEUTRODYNE

only
\$**85**

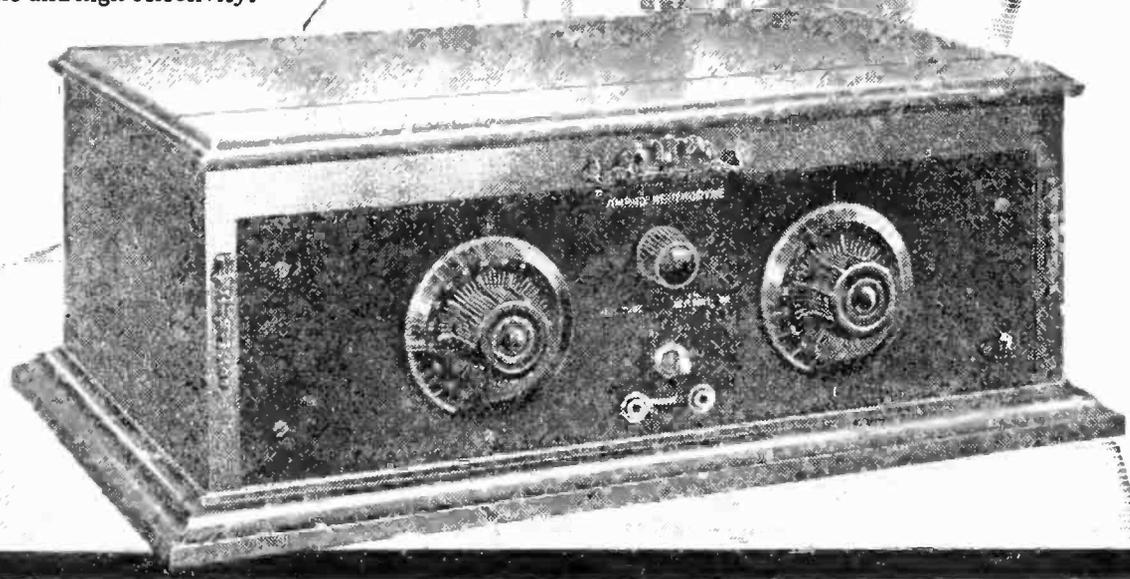
Five Tubes

**Tremendous Power—Positive
Simplicity**

A GENUINE Neutrodyne—made by AMRAD, one of the Radio pioneers—with the tremendous power delivered by FIVE TUBES controlled by only TWO tuning adjustments. And at a price lower than many three or four tube sets.

Go to your dealer and see this Set. Take plenty of time to make comparisons. Your choice will be this AMRAD NEUTRODYNE, with simplified controls, five tubes, beauty of appearance, marvellous tone and high selectivity.

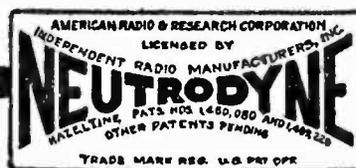
Send for Folder 520 explaining in detail the features that distinguish this wonder Neutrodyne.



AMERICAN RADIO AND RESEARCH CORPORATION

DEPT. B

MEDFORD HILLSIDE, MASS.



★ Tested and approved by RADIO BROADCAST ★

Build Your Own "Super-Het"



EXPERIENCE the thrill of getting all the distant stations with a Super-Het built by yourself. It's easy with the RECEPTRAD KIT shown here. It contains all the essential parts with complete instructions. From your dealer or by mail for the remarkably low price of \$53.50. Smaller kit containing only the most essential parts \$33. Either set will operate a loudspeaker on an indoor, outdoor or loop aerial.

RECEPTRAD

GREIFF DOUBLE SELECTOR MULTIFLEX KIT

The Perfect 4 Tube Circuit—Loop Operating

Uses four tubes: Two stages of radio frequency, a crystal detector and three stages of audio frequency. No station too distant to be brought in with good clear volume. Assembled by anyone in a few hours. Superior to a 5 tube Neutrodyne.

\$29.50 Containing principal parts. \$50 Including all parts

FREE *Blue prints of wiring diagrams of both circuits. Just drop a line giving your dealer's name and address.*

RADIO RECEPTOR CO.
59 Bank Street, New York



Your Radiola Super-Heterodyne IS DIRECTIONAL IN THE LENGTH OF THE BOX

Turning the set toward the desired station eliminates interference—Gets maximum distance. Get the benefit of this Wonderful Feature

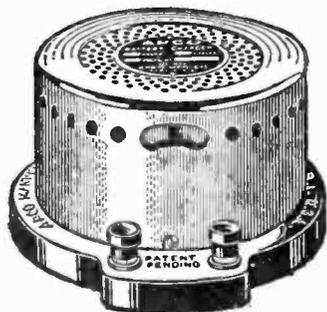
Put one of Our Special "Super-Het" Ball Bearing Mountings Under Your Set

And you can Rotate it with One Finger

★ SOLID AND SUBSTANTIAL ATTACHES PERMANENTLY IN 3 MINUTES AND RAISES SET BUT 1/4 In. FROM TABLE

\$5.00 post paid ANYWHERE IN U. S. A.

HENDERSON AND LATHROP, Inc.
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Don't Blame Your Set!

If the batteries run down, you're lucky to get anything but "sounds."

APCO Battery Charger keeps radio batteries *alive*. Works noiselessly, efficiently, surely, fully charging any radio battery over-night for a few cents. 7 1/2 ampere capacity. Pays for itself in six months. Guaranteed one year.

Write for circular and dealer's name.

APCO M'F'G. CO. ★

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APCO BATTERY CHARGERS
for "A" and "B" Batteries

★ Tested and approved by RADIO BROADCAST ★

W *HEN* "The King of the Ivories" is tickling the keys at WOS.
HEN WOR comes rolling in from the East and KFI, in its time and turn brings greetings from the Pacific coast.
HEN your Saturday evening dance from WTAM is making just the biggest kind of a hit—*remember that*

WILLARD RADIO BATTERIES

are contributing to your enjoyment, for at these and at 175 other leading Broadcast Stations Willard Batteries are used to furnish the steady current that is required for perfect amplification of voice and music.

Write to **WTAM** for this booklet
 [*The Voice of the Storage Battery*]

Every owner of a receiving set should have these booklets. They tell how to get greater distance, more volume and better tone quality; and they show why Willard Batteries are the most economical and most satisfactory form of power you can use.

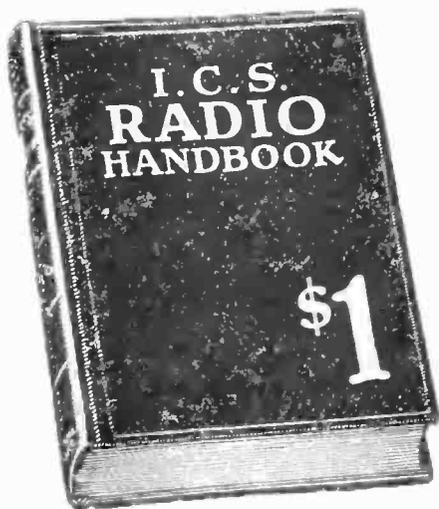


WTAM is the Radio Research Laboratory and Broadcast Station of the Willard Storage Battery Company, Cleveland, Ohio. The wave length is 361 meters—on the air for your enjoyment every Monday, Wednesday and Saturday evening.

Tear me off the page and mail me to WTAM. I'll bring you "Better Results" and "Proper Use and Care."
 Name.....
 City and State.....
 Address.....
 R. B. 5

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Biggest dollar's worth in RADIO



100,000 SOLD

Compiled by
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Formerly with the Western
Electric Co., and U. S. Army
Instructor of Radio.
Technically edited by
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THE greatest book on Radio ever written. Price only \$1. Filled with sound, practical, tested information for every radio fan, from beginner to hard-boiled owl. Written, compiled and edited by radio ex-

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Send \$1 today and get this 514-page I. C. S. Radio Handbook before you spend another cent on parts. Money back if not satisfied.

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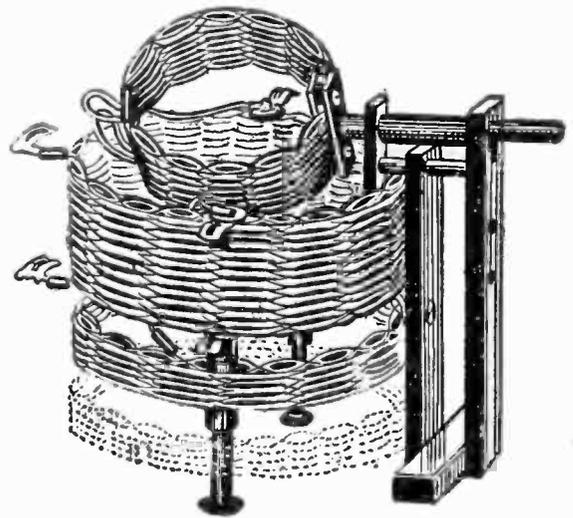
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TRANSCONTINENTAL LOW LOSS TUNER

List Price **\$7.00** Sold Everywhere

If you contemplate building a receiver or rebuilding your old one, include in your specifications this wonderful Transcontinental Low Loss Tuner. By doing so it will enable its operator to tune his set more sharply, eliminating local interference, and bring in distant stations with much greater volume and clarity.

This tuner is of three-circuit design and has an adjustable untuned primary, and with the primary, a secondary and tickler feed-back. By its use there is positively no loss of radio energy. It covers all wave lengths from 200 to 600 meters when used in combination with a triple-five capacity condenser. It has no binding post—perfect locking, solderless lugs are used exclusively in its manufacture.

Beware of imitators or "something just as good." If your dealer cannot supply you, write us, enclosing postal order of \$7.00 and we will mail immediately.

DISTRIBUTORS and JOBBERS.

We have choice territory open—should you desire to add this tuner to your line, we shall anticipate a letter from you.

TRANSCONTINENTAL SALES CO.
241 Market St. Newark, N. J.

★ Tested and approved by RADIO BROADCAST ★

Get the "WHY"-----

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It's FREE!

the Book of Facts that every Radio Fan should have—Real up-to-the-minute dope on the very latest developments in Radio.

PARTS TO BE PROUD OF SILVER SUPER SPECIALS

BRING YOUR OLD SUPER UP-TO-DATE

No. 101—Oscillator Coupler, 150-600-meters....	\$2.50	No. 401—50 KC RF Transformer Unit.....	\$14.00
No. 201—30 KC Tuned Output Transformer....	3.50	No. 501—5-Gang 199 Socket.....	3.00
No. 301—.0005 Low Loss Condenser.....	4.50	No. 601—Collapsible Center-tapped Loop.....	6.50

Circulars upon request.

Shipments prepaid East of the Rockies.

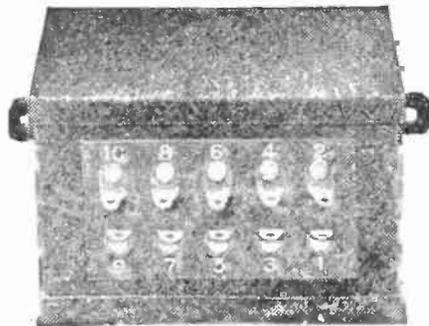
Silver Coupling Unit



Type 101

150 to 600 meters. Small, Compact and Ultra-Efficient—for use as an oscillator, radio frequency transformer, or antenna coupler—with any standard tubes—ideal for super-heterodyne circuits. Maximum Selectivity. Price..... \$2.50

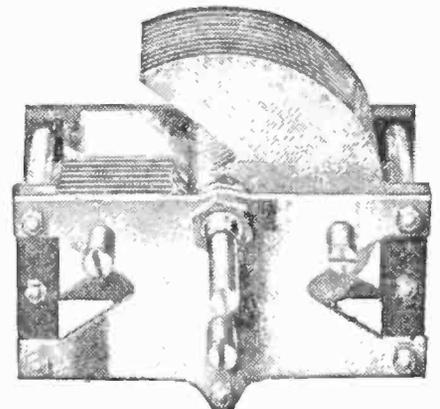
Silver Transformer Unit



Type 401

50 Kilocycle. The Original—employs two interstage and 1 filter transformer—1½ to 3½ times the amplification of similar types on the market—Provides undistorted speech amplification over narrow wave length band at approximately 50 kilocycles—Used with standard tubes in any Super-Heterodyne or other circuit requiring a sharply-tuned, long wave amplifier. Tested, matched and sealed in metal container. Price \$14.00

Silver Low Loss Condenser



Type 301

Capacity .000009 to .0005. Practically immeasurable loss—rotor plates grounded to frame—stator plates mounted within frame and supported by highest grade insulating material—sturdily constructed—embodies latest developments in condenser design. Price..... \$4.50

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Silver Super Specials are quality parts—backed by the satisfaction or your money back Guarantee. Silver Super Parts are made of the finest materials throughout—they are parts that will contribute a maximum of efficiency to your receiver.

Eastern Dist. Twentieth Century Radio Corp.

102 Flatbush Ave., Brooklyn, N. Y.



Silver-Marshall, inc.

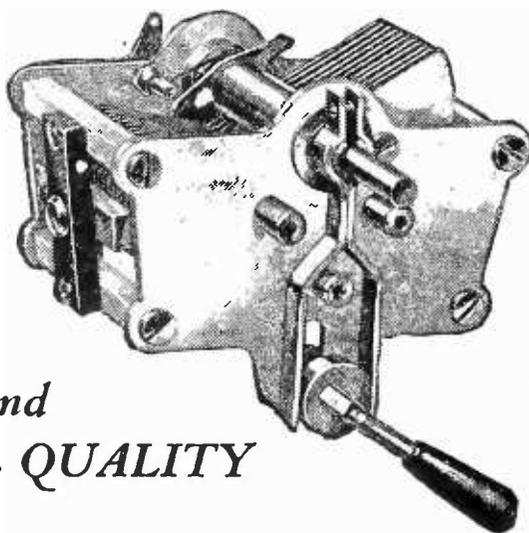
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Chicago

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For
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Less Interference, and
BETTER TONAL QUALITY

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years' experience
making the highest
type of precision
instruments.

**NEW
MODEL
"C"**

U. S. & For.
Patents

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★ **VERNIER and PLAIN CONDENSERS**

Buy a Hammarlund at Your Dealer's

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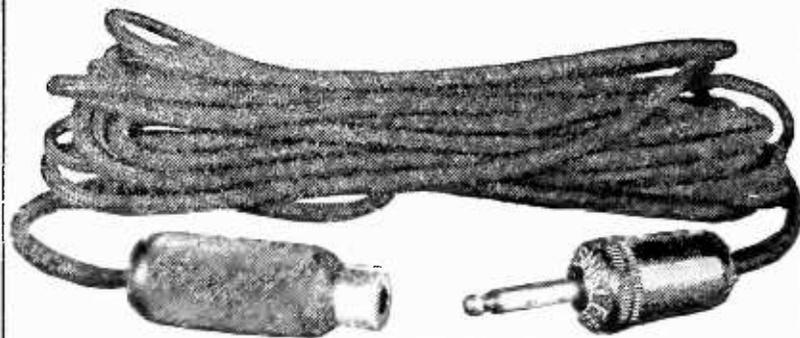
- Special 2-Volt Radio Storage Battery, \$3.75
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We ask for no deposit. Simply send name and address and style wanted. Battery will be shipped the day we receive your order Express C. O. D., subject to your examination on arrival. Our guarantee accompanies each battery. We allow 5% discount for cash in full with order. You cannot lose! Act quick. Send your order today—NOW.

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1215 South Wabash Ave.
Dept. 10 Chicago, Ill.



A new **FOUR WAY** Product!



(Patent Applied For)

Loud Speaker Extension Unit

★ **COMPLETE**

THIS COMPLETE UNIT enables those who want to use the Loud Speaker in other parts of the house to do so without removing set. Insert plug from loud speaker into jack; place plug on end of cord, into set. This can be done readily and saves the trouble of using tools or soldering iron.

PRICES, including Jack, Plug and Cord

10 foot cord.....	\$2.25	40 foot cord.....	\$3.00
20 foot cord.....	2.50	50 foot cord.....	3.50
30 foot cord.....	2.75	100 foot cord.....	5.75

Manufactured by

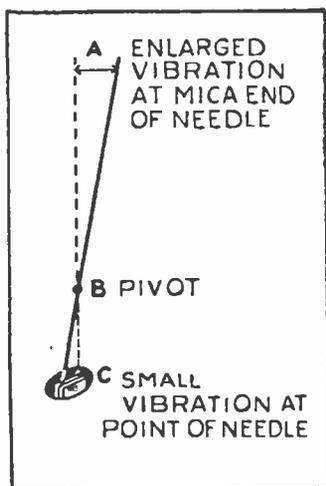
Four Way Co. :: Myrick Bldg. :: Springfield, Mass.

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When There's Dancing On The Air



RHAMSTINE* Needlephone



“Magnified Reproduction” Principle

The delicate vibrations of the reed at “C” are transmitted through the pivoted needle of the phonograph and magnified at “A” where it is attached to the mica diaphragm. As a result the most delicate variations of tone are enlarged and given fuller values.

Throw back the rugs, tune in your favorite dance orchestra and step to the lively scintillating tune of the latest Fox Trot as it comes in over the Needlephone and phonograph.

For better reproduction you will want the Rhamstine* Needlephone because it embodies the principle of “magnified reproduction” and the laws of acoustics as worked out in the phonograph.

The Needlephone gives all the advantages of the phonograph without removing the needle. It is easier to attach, requires no special batteries, is convenient to handle and conserves space. It can be used on any phonograph, including Edison with Victor adapter.

If your local radio dealer cannot supply you, order on the attached coupon.

J. THOS. RHAMSTINE ★

506 E. Woodbridge
DETROIT, MICH.

J. THOS. RHAMSTINE* 12
506 E. Woodbridge St., Detroit, Mich.

**Mail This
Coupon
To-Day**

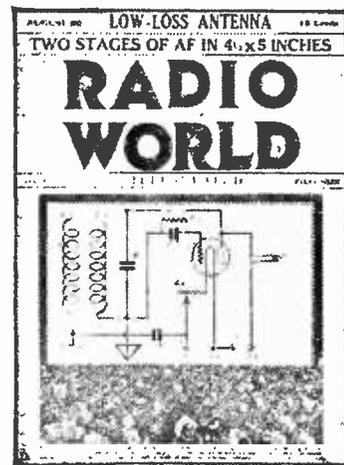
Send me the Needlephone. I'll pay the postman \$10 upon its arrival. It is distinctly understood I may return it if I desire, within 5 days and receive a refund in full.

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Address.....

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Enclosed herewith find \$1 for which send me Radio World for 10 issues, beginning with current number, and including all special numbers published during this period.

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Absolutely the best metal case headset on the market. Selling at a moderate price, it gives you more than your money's worth. Bi-polar type, with forged magnets of highest grade tungsten steel, wound to full 2400 ohms.

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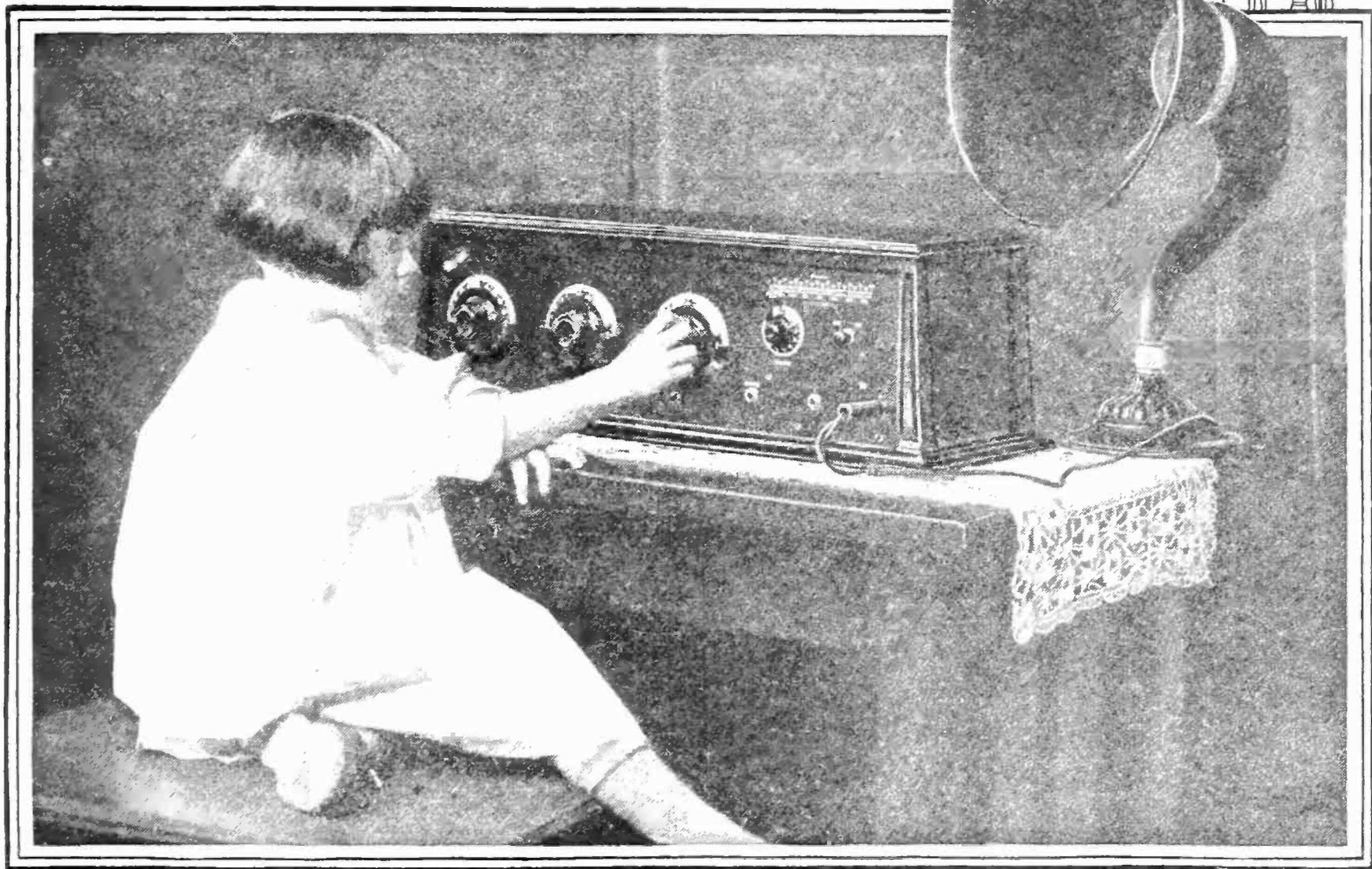


Member Radio Manufacturers' Association

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So Easy to Tune

— Comes in like Velvet



—the Pfanstiehl Model 7 Receiver

A 5-tube Receiver using the new system of tuned radio frequency

RADIO is no longer a scientific toy, something to play with. Like the telephone, the piano, and the phonograph, it has become a modern home convenience. The chief use of radio today is that of an instrument of communication and entertainment. Hence, what people want in a receiver is trouble-proof service. That means a simple instrument—a receiver a child can tune. And, they want distance *plus* a tone that is clear, sweet, pure and natural.

A Non-Oscillating System

What Pfanstiehl has done has been to design the simplest and least complicated receiver known in radio. He has developed a non-oscillating system that gets rid of all stray oscillations, that keeps them out. There is no

need of choking or neutralizing devices. The absence of all such devices greatly improves tone purity and tone-sweetness. Speech and music are naturally received, naturally reproduced. Distance makes no difference. There is no distortion however great the amplification. And tuning is so sharp that wave lengths can be received distinctly and separately less than 8 meters apart.

See and hear this new system that is revolutionizing radio—the Pfanstiehl Model 7—at your dealers. Or let us send you free descriptive booklet.

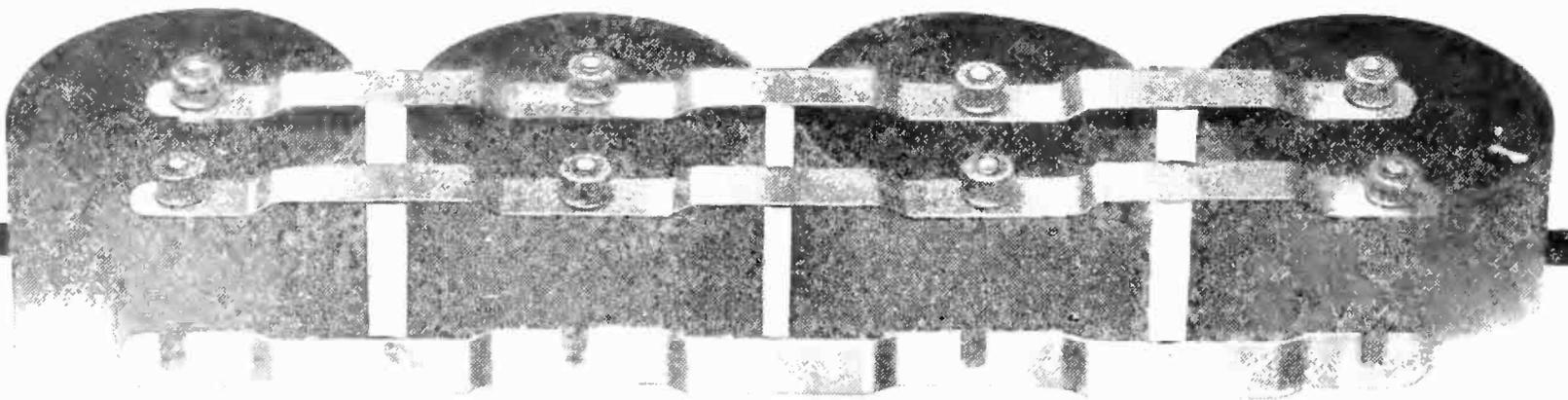
Dealers: Write for the special Pfanstiehl proposition.

PFANSTIEHL RADIO COMPANY
Highland Park 23 S. Second Street Illinois

Pfanstiehl



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Mitchell Battery Connectors

will hook up your dry cells in a jiffy. No fumbling with wires. No danger of blowing your tubes through incorrect connections. If you follow the picture, you can't possibly go wrong. One of the greatest little time savers in Radio.

WD11, WD12 Tube Chart	
No. of Tubes	No. of Cells
1	2
2	3
3	4
4	5
5	6

To hook up dry cells in parallel, for operating WD 11 and WD 12 tubes, slip the slots of two Mitchell Connectors over the binding posts, and tighten nuts as shown in picture. For less than four cells, cut off connectors. For more than four cells, use two or more pairs of con-

nectors. Follow the cell chart at the left. To hook up dry cells in series, cut a pair of connectors into four two-cell strips. Use these strips to connect the positive pole of one cell to the negative of the next. One pair of connectors will thus care for five cells.

★ Price, 25 cents per pair

R. MITCHELL CO. [Instrument Makers for 47 Years] 255 ATLANTIC AVE. BOSTON, MASS.

Up to 120 Volts of "B" Battery IN SERIES

can be easily and quickly charged with the France Multi-Duty Super-Charger. No troublesome wire changing—just leave your batteries wired in series, attach clips, insert ordinary lamp to regulate charging rate and turn on current. Simple—Quick and Convenient.

Two, Four, Six, and Eight volt Radio "A" or Auto batteries can also be charged at a 5 to 7 ampere rate.

No bulbs or acids, no noise, no sticking or sparking contacts—it embodies every desirable feature.

★ THE SILENT
FRANCE
MULTI-DUTY
SUPER-CHARGER



Price \$22.00; West of Rockies, \$23.00; Canada — \$30.80 F. O. B. Toronto

Dealers and Jobbers—Now is the time to tie up with France and increase your profits. Write us to-day for discounts and details.

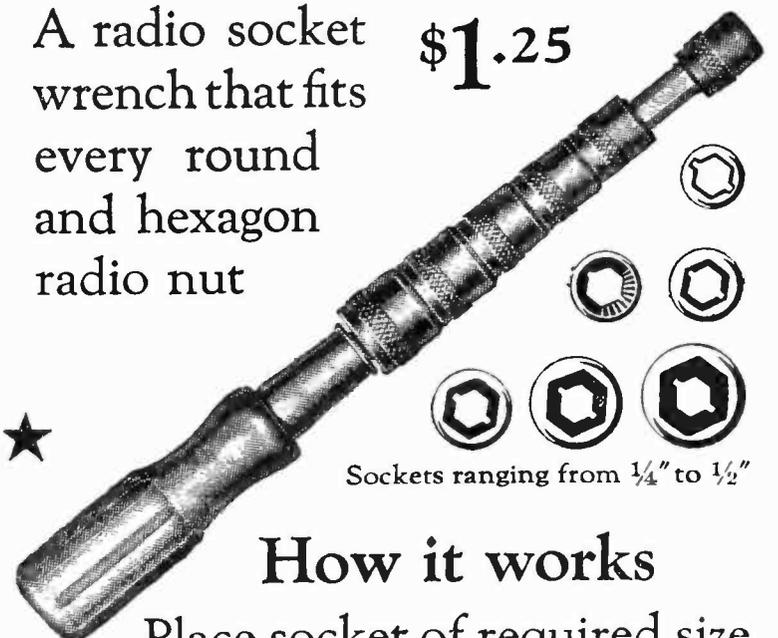
The France Mfg. Co.
10327 Berea Road

Cleveland Ohio

Stock carried at convenient points throughout the United States and Canada.

Six Tools in One

A radio socket wrench that fits every round and hexagon radio nut \$1.25



★ How it works

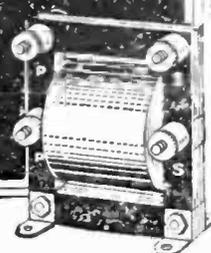
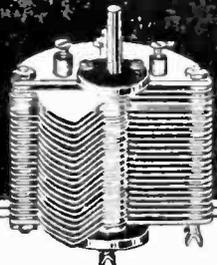
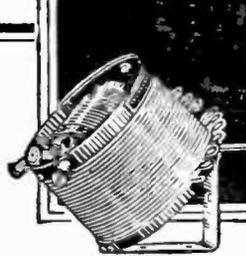
Place socket of required size on end of shaft with slots not in line with lugs on shaft.

Buy it from your dealer or direct from us

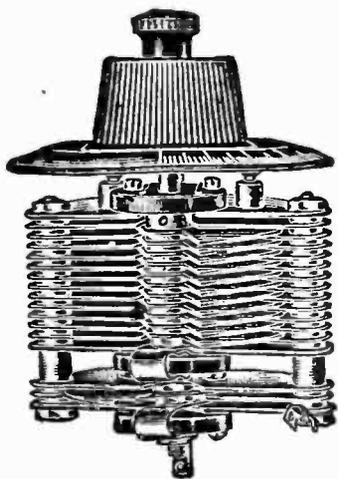
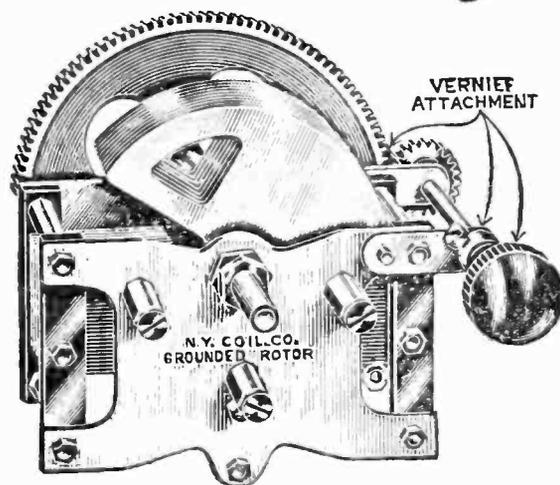
THE PERRY-FAY COMPANY, Elyria, Ohio
Screw Machine Products

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New York Coil Company's Radio Products



ANY CONDENSER CAN BE CALLED LOW LOSS, BUT ONLY ITS PERFORMANCE QUALIFIES THE NAME. In THE NEW YORK GROUNDED ROTOR scientific designing, together with the highest grade of materials and instrument workmanship combine to produce a condenser that is in a class by itself—no other condenser manufactured incorporates so many *actual improvements*.



.0005 (23 plate) without Vernier, \$4.50.

Geared Vernier attachment complete \$1.50.

OUR STANDARD NON-GROUNDED CONDENSERS are made in four sizes with or without vernier, are universally recognized for their efficiency, workmanship and low price, made possible by large production.

Price with Vernier Knob and Dial

23 Plate . \$3.50	17 Plate . \$1.80	43 Plate . \$3.00
Without Vernier, 23 Plate		\$2.00

NEW YORK PRECISION MICA FIXED CONDENSERS add the *real* undistorted true tone quality to your receiver—and play a most important point in selectivity, volume, and distant reception. In fact no item used in a Radio

Receiver requires more precision and makes use of such exacting measurements as our Mica Condensers. They are universally endorsed by the leading Radio engineers and most discriminating manufacturers,—yet they cost you no more than the ordinary product.



Type A—No Clips



Type B

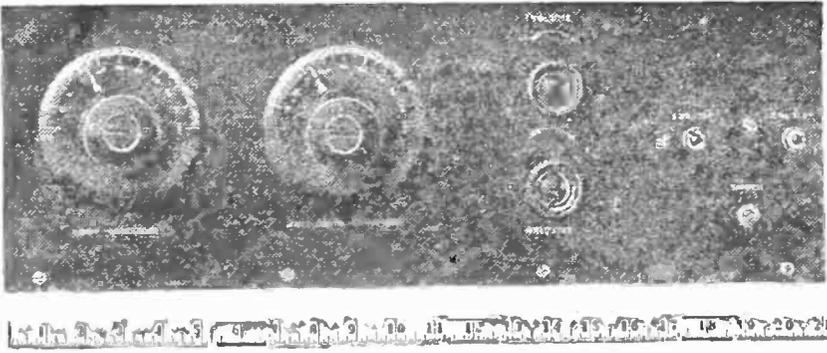
NEW YORK COIL COMPANY

338 Pearl Street, New York City, N. Y.

Pacific Coast—MARSHANK SALES CO., 1240 S. Main St., Los Angeles, Calif.

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BRANSTON RADIO



R-199 Kit contains eight transformers—a perfectly matched set.

Matched to the same Resonant Frequency. Each one Given an Operation Test and Absolutely Guaranteed—\$35.00

Build a Super Heterodyne Set That Will Give

- Greater Distance
- Remarkable Selectivity
- Excellent Tonal Quality

ALL ON A LOOP

Make seven 199 tubes do the work of ten by reflexing. Reduce your panel size to 7x21 inches, with but two tuning controls.

Increase your range and amplify distant stations to the volume of a local station by adding short wave radio frequency to your set.

Send 25c. in coin or stamps for complete blueprints and layout covering Super Heterodyne, Radio Frequency and Honeycomb Coil Circuits; also complete catalog of Branston Quality Radio Products.

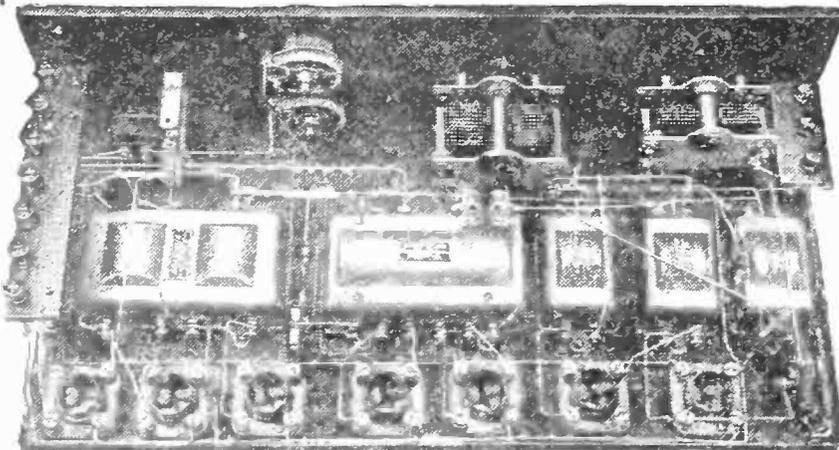
★ *Your dealer has Branston Kits or can get them for you.*

CHAS. A. BRANSTON, Inc.

813 Main St., Buffalo, N. Y.

Manufacturers of Branston Violet Ray High Frequency Generators

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SUPER HETERODYNE SET

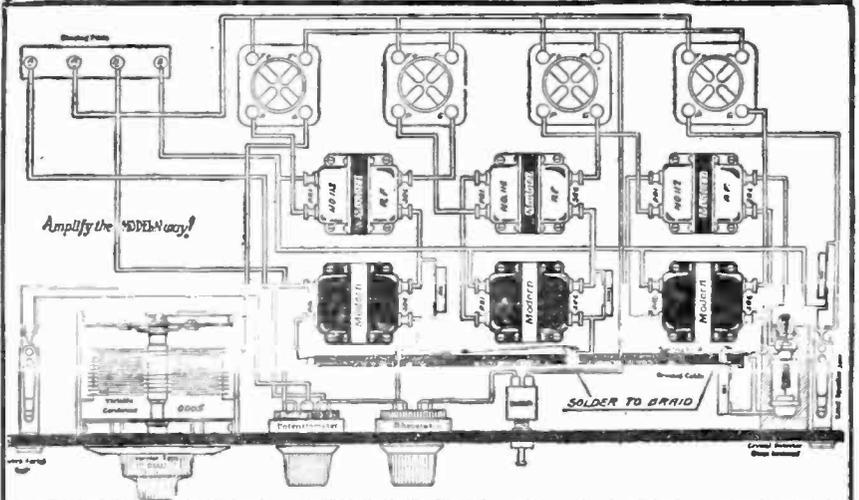
Made by a Buffalo, N. Y. radio fan who used Branston Transformers. This is but one of several circuits in which these transformers can be used



One Dial

But one dial to tune, no unsightly outside Antenna, no Ground to bother with. It's easy to get Volume, Distance and Selectivity with the

MODERN Super-Six "REFLEX"



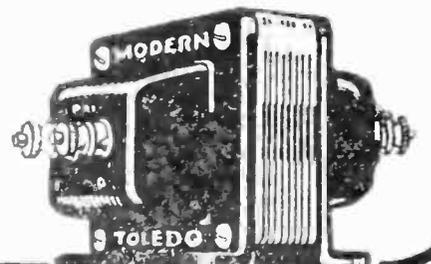
This set is easy to build and your friends will marvel at the results from this set. Full size wiring diagram and complete constructional bulletin of above circuit sent on receipt of 4c. in stamps. Write for it to-day.

MODERN Engineers have steadfastly refused to cheapen their product to meet the requirements of some set manufacturers. When you buy MODERNs in a set you'll know price was not the consideration for the manufacturer's choice of MODERN Transformers.

THE MODERN ELECTRIC MFG. CO.

Toledo, Ohio

World's largest transformer manufacturers making transformers exclusively for Radio purposes.



★ Tested and approved by RADIO BROADCAST ★



*Resonant Wood
insures
Tone Quality*

**MUSIC MASTER
GIVES LIFE TO
RADIO VOICES**

WORLD fame comes to singers through a mysterious something in the voice—a personal quality that grips the hearers and holds them in a spell of delight.

When voices with delicate modulations and elusive sweetness of tone are broadcast, only a master instrument can reproduce them faithfully. Such an instrument is Music Master.

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Radio impulses entering the sensitive precision instrument in the base are translated into sound waves, undistorted and faithful to the original voice or instrument. In the tapered tone chamber of cast aluminum these sound waves grow clear and bell-like and, finally, the full, mature tones pour forth in rich resonance through the Music Master amplifying bell of natural wood.

Music Master is a musical instrument—the *musical instrument of radio*. Hear it at your dealer's; or, better still, have one sent to your home to prove with your own set.

Dealers Everywhere

**MUSIC MASTER
CORPORATION**

Makers and Distributors of High Grade Radio Apparatus

10th and Cherry Street

Chicago PHILADELPHIA Pittsburgh



**Music
Master**
RADIO REPRODUCER

Connect Music Master in place of headphones.

No batteries required.

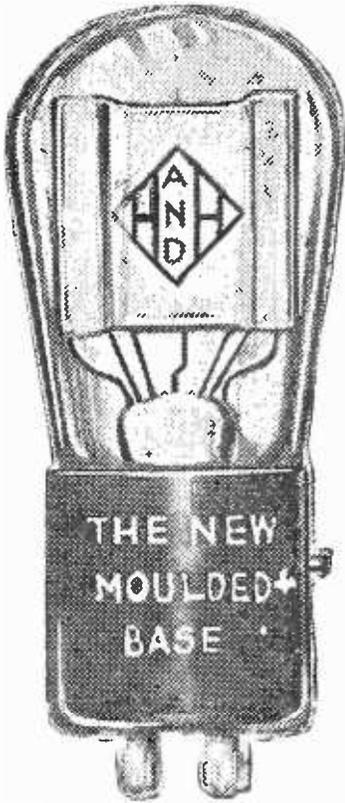
No adjustments.

MODEL VI 14 inch bell \$30

MODEL VII 21 inch bell \$35

MODEL VIII (Cabinet type) with "Full Floating" Wood Horn \$35

★ Tested and approved by RADIO BROADCAST ★



A sensation among radio fans!

Like countless others, you too will welcome the results given by Airtron Tubes. Due to their improved, scientific construction, every syllable and note comes in on an Airtron flawlessly clear, round, full and natural in tone; And they're guaranteed for *stamina*—good, long, active service. Used and endorsed by Radio Authorities.

Type 200-6 Volt-1 Amp. Det. Type 12-1½ Volt-25 Amp. Det. & Ampl.
 Type 201A-5 Volt-25 Amp. Det. & Ampl. Type 199-¾ Volt-.06 Amp. Det. & Ampl.

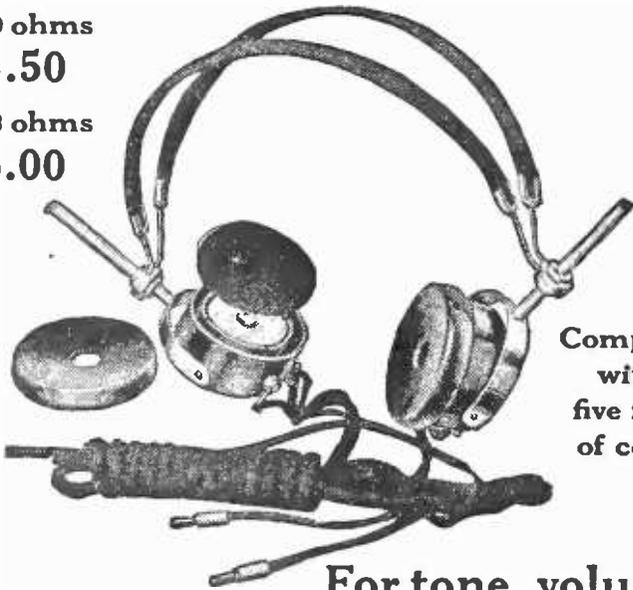
List Price \$4.00

Sold by all dealers. or shipped C. O. D. direct by parcel post. Mention type when ordering.
H. & H. RADIO CO., Dept. 109, 514 Clinton Avenue, Newark, N. J.

DEALERS
 Write for discounts



2,000 ohms
\$4.50
 3,000 ohms
\$5.00



Complete with five feet of cord

For tone, volume

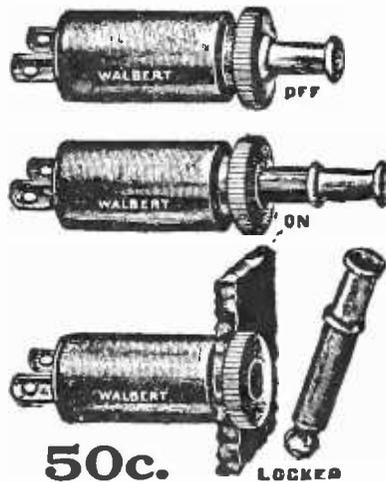
and clarity of broadcasting reception Schwarzze Head Phone sets have proven ideal. Pure tones at maximum volume, distortion entirely eliminated and *true articulation*—these are the results of Schwarzze super-sensitiveness and true-to-tone qualities. The phones are hard rubber, mounted on polished swivels which are instantly adjustable. The powerful Schwarzze magnets give direct center pull on diaphragm. Pole pieces are ground uniformly and accurately. Every set comes to you carefully tested, ready for use. The complete sets are light and comfortable. At these prices you can easily afford several Schwarzze sets.

SCHWARZE ELECTRIC CO., Adrian, Mich.

SCHWARZE

Radio Head Phones

The best switch made
 and it **LOCKS**
 your set, too!



DON'T worry any more about someone meddling with your radio set while you are away. Simply remove key from Walbert Filament Lock Switch and take it with you just as you'd take the ignition key from an auto. Sturdy, compact, efficient. Shell and key handle insulated from circuit. No finer switch, and none made with unique lock fixture. Extra key with special key ring attachment, 20c.

50c.

At your dealer or sent postpaid on receipt of purchase price.

(Please mention dealer's name)

Jobbers and Dealers: Write for Discounts

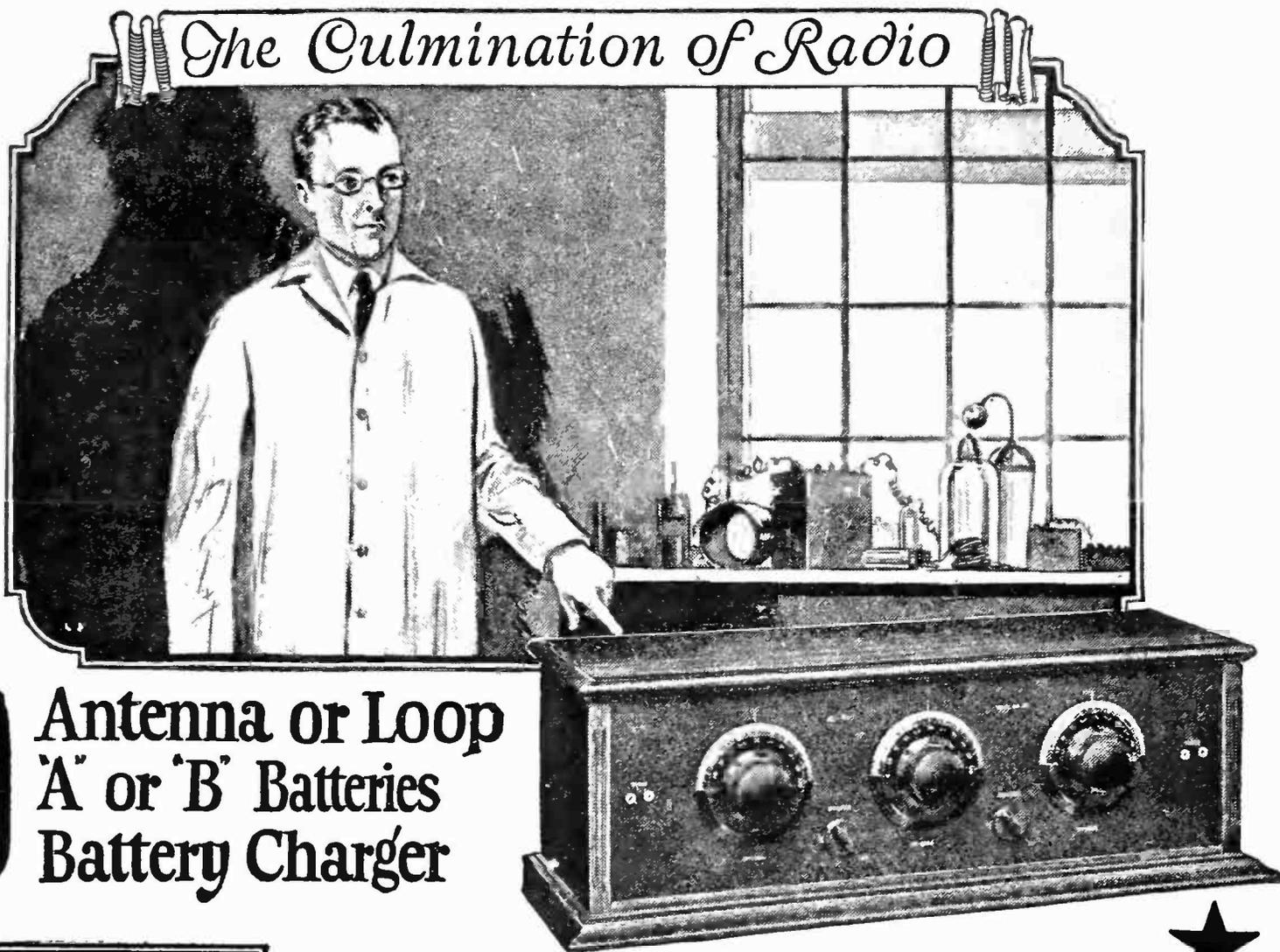
THE WALBERT MANUFACTURING COMPANY
 927 Wrightwood Avenue Chicago, Ill.

WALBERT FILAMENT LOCK SWITCH

Safeguards Tubes and Batteries

★ Tested and approved by RADIO BROADCAST ★

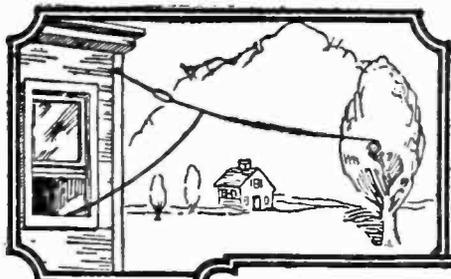
The Culmination of Radio



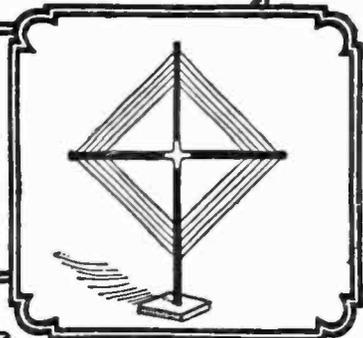
NO Antenna or Loop
 'A' or 'B' Batteries
 Battery Charger



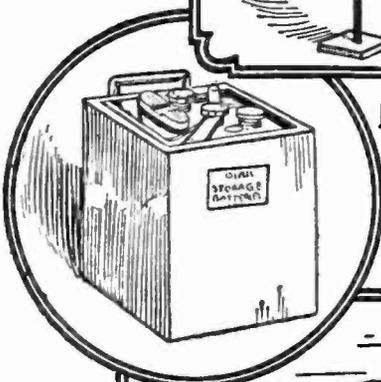
JUST plug into the nearest lighting socket, and the *Mu-Rad MA-20* will entertain you without any further attention.



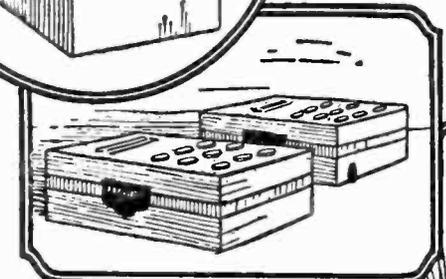
No, Outside Aerial



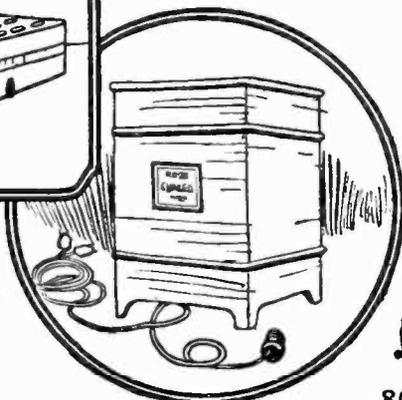
No Loop



No Storage Battery



No "B" Batteries
 No Battery Charger



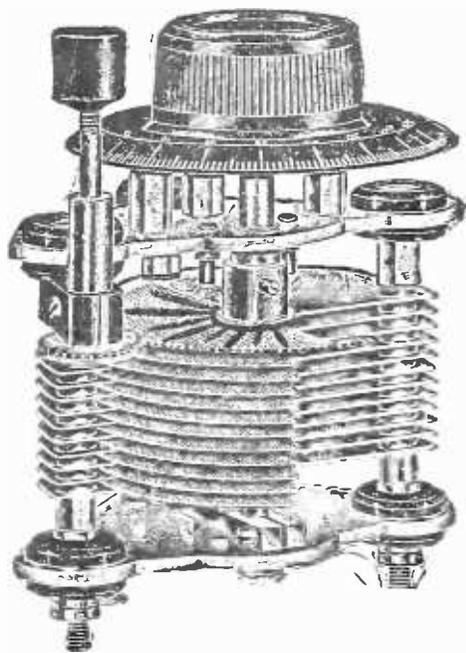
The New
MU-RAD RECEIVER
 MA-20

The Last Word in Radio

Cumbersome aerials and loops, mussy storage batteries, troublesome "B" Batteries, and the battery chargers—all the former expensive and complicated accessories of radio—made obsolete by this "culmination of radio."

Write for illustrated Literature and the name of the nearest store where you can see Mu-Rad Receivers.

MU-RAD LABORATORIES, INC.
 803 FIFTH AVE ASBURY PARK, NEW JERSEY



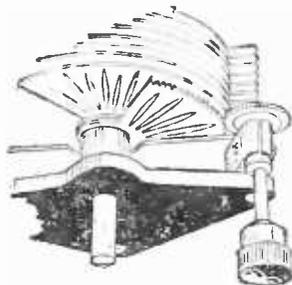
HEATH RADIANT Non-Dielectric CONDENSERS

Used by "Marconi"

In designing a receiver to bear the magic name of "Marconi" only the most *dependable* instruments were safe even to consider. The eventual selection—after exhaustive research and tests—of HEATH CONDENSERS for this famous receiver, tells a convincing story of *lasting dependability*—the hidden extra value that you get with every Heath Condenser. See the *Heath Condenser* at your dealers.

Permanently Flat Plates

Stamped under huge presses to absolute flatness and tempered to prevent warping.



Micrometer Geared Vernier

Ordinary adjustments reduced by separate geared adjustment to hairbreadth distinction. We guarantee the Heath Vernier Condenser to be more highly selective than any condenser employing a vernier which actuates ALL of the plates.

Prices for Vernier Condensers

	With Dial	Without Dial
No. 12AV 12 Plate.....	\$5.00	\$4.35
No. 24AV 24 Plate.....	5.50	4.85
No. 44AV 44 Plate.....	6.50	5.85

Non-Vernier types in all capacities.

Heath Sockets with the Exclusive Shock Absorber Features, 75c Heath Bakelite dial in 3 diameters.

Write for Literature

HEATH RADIO & ELECTRIC MFG. CO.
207 First St. Newark N. J.

Canadian Distributors:
Marconi Wireless Telegraph Co., of Canada, Ltd.

Little Things That Improve Receiving



Interstage
Radio Jack
Code No. 4—\$1.00



You will like the extreme care given to every detail in the manufacture as well as the correct and original design and superior construction which distinguish

YAXLEY

Approved Radio Products

It is this care with the little refinements, the result of years of experience in the manufacture and development of radio and telephone equipment, which improve your receiving when you use Yaxley products.

Take the Yaxley Jack as an example. The single nut mounting without the use of spacer washers is a distinct advantage to you. The phosphor bronze springs, the pure silver, self-cleaning contact rivets and other exclusive features, mean better satisfaction.

Your dealer will gladly show you these standard jacks or we will send you full information, if you write,

YAXLEY MFG. CO.

Dept. B., 217 No. Desplaines St., Chicago



Burns

Loud Speaker

of Distinctive
Beauty

Generous
Proportions

NATURAL TONES WITH VOLUME

A Reproducer that Satisfies

Aluminum Sound Column. 14 inch pyralin bell. Convenient adjuster.

No. 205B Polished Black Flare \$22.50
No. 205D Mahogany Tinted Flare 25.00

Manufactured by

American Electric COMPANY

State and 64th Sts.

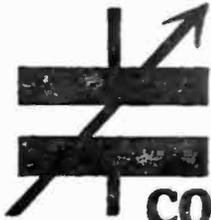
Chicago



Anti-capacity JACKS



Anti-capacity SWITCHES



Lower-Loss Vernier VARIABLE CONDENSERS



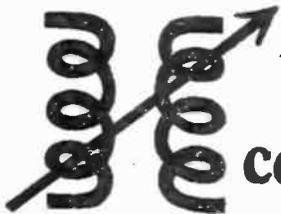
Lower-Loss PHONE PLUGS



Lower-Loss RHEOSTATS



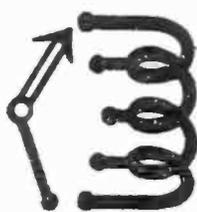
Lower-Loss SOCKETS



Lower-Loss VARIO-COUPERS



Lower-Loss GRID LEAKS



Lower-Loss INDUCTANCE SWITCHES



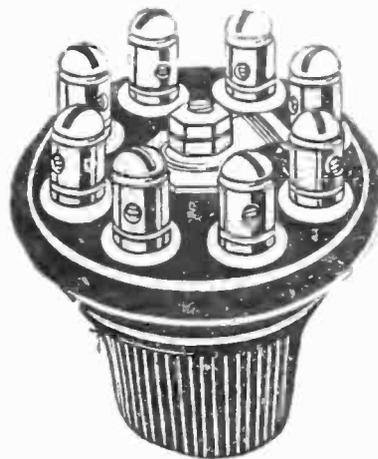
Lower-Loss POTENTIOMETERS

NO SOLDERING: LESS DRILLING: SCIENTIFICALLY BUILT

DX—but not only DX— Volume and Tone!

All Jos. W. Jones radio parts are *low loss*. So a set built with these parts bring in longer DX with greater clarity, selectivity, and more natural tone.

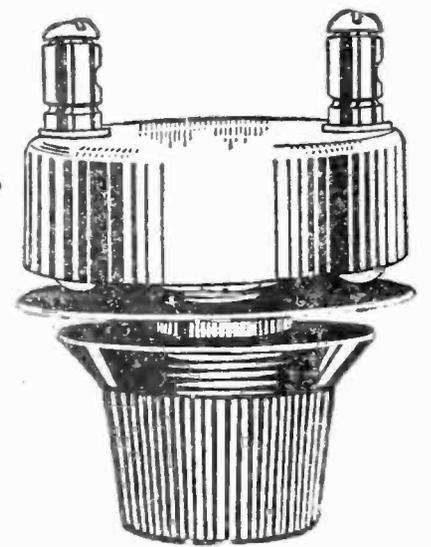
Jos. W. Jones parts make set-building easier, too, for they require *less drilling* and *no soldering*.



JOS. W. JONES

Low Loss

INDUCTANCE SWITCH



VARIABLE GRID LEAK

Jos. W. Jones Jacks and Switches are anti-capacity. Made for radio use only. No long parallel leads; which means no capacity effects. Always ask for the switches with the little red button.

For Best Results Build With JOS. W. JONES

Jacks
Switches

Sockets
Grid Leaks
Inductance Switches

Variable Condensers
Rheostats
Phone Plugs

Vario-Couplers
Potentiometers

JOS. W. JONES

TRADE MARK

"IMPROVED"

radio parts

JOS. W. JONES RADIO MFG. CO., Inc. 40-42-44-46 W. 25th St., New York
(Formerly Radio Improvement Co.)

Headed by Jos. W. Jones—for 28 years a successful engineer and builder of precision instruments

Branch Offices:

Philadelphia: 1011 Chestnut St. Chicago: 53 W. Jackson Blvd. Boston: 99 Bedford St.

★ Tested and approved by RADIO BROADCAST ★

"The Set with the Tone Modulator"

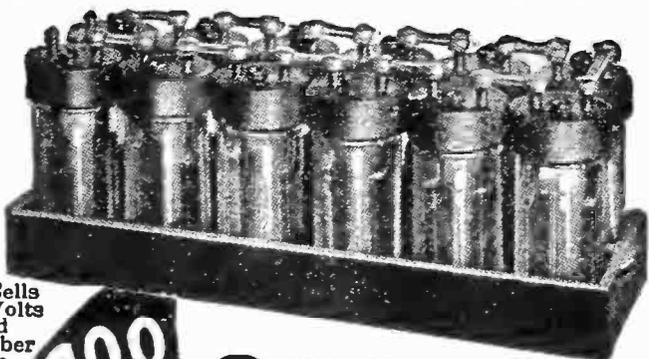
YOU have always wanted a radio set whose tone and volume you could regulate to suit your fancy. At last it is available. The RESAS Tone-A-Dyne is such a set.

The Tone Modulator, a feature of the RESAS Tone-A-Dyne, is to be found in no other set. A turn of the knob and music or speech is reproduced at its best.

The RESAS Tone-A-Dyne is a powerful 5-tube set in a handsome cabinet. You will be proud to own it. And it sells for only \$78!

Ask your dealer at once.

★ **RESAS INC.**
112 Chambers St.
New York City



12 Cells
24 Volts
Solid
Rubber
Case

\$4.00 CO. D. **SPECIAL**
INTRODUCTORY PRICE

For a limited time *only*, and to introduce this new and superior Storage "B" Radio Battery to the Public, we are selling it for \$4.00. Regular Retail Price is \$6.00. You save \$2.00 by ordering NOW. A finer battery cannot be built than the

World Storage "B" Battery

(12 CELLS—24 VOLTS)

To ten million homes with Radio Sets—and to countless millions of prospective buyers—this WORLD Storage "B" Battery brings a new conception of battery economy and performance. Here is a battery that pays for itself in a few weeks—will last for years and can be recharged at a negligible cost. And you save \$2.00 by ordering now.

A Superior Battery Equipped With Solid Rubber Case
Has heavy duty 21-8 in. x 1 in. x 1-4 in. plates and plenty of acid circulation. Extra heavy glass jars allow ready observation of charge and prevent leakage and seepage of current. It holds its charge, while idle, at constant voltage. You will find this battery a boon to long distance reception. It does away with a great many noises so often blamed on "static." Mail your order today.

SEND NO MONEY

Just state number of batteries wanted and we will ship day order is received. EXTRA OFFER: 4 batteries in series (96 volts), \$15.00. Pay Expressman after examining batteries, 5 per cent discount for cash in full with order. Send your order NOW and save \$2.00.

WORLD BATTERY COMPANY
Makers of the famous World Radio "A" Storage Battery
1219 S. Wabash Ave., Dept. 78, Chicago, Ill.

SAVE \$2.00 BY ORDERING NOW!

RADIO

Big, complete stock. Standard prices. And you're sure it's reliable if it comes from Andrae.

Send for our catalogue

JULIUS ANDRAE & SONS CO.
112 Michigan Street Milwaukee, Wis.

ANDRAE *In Business Since 1860*

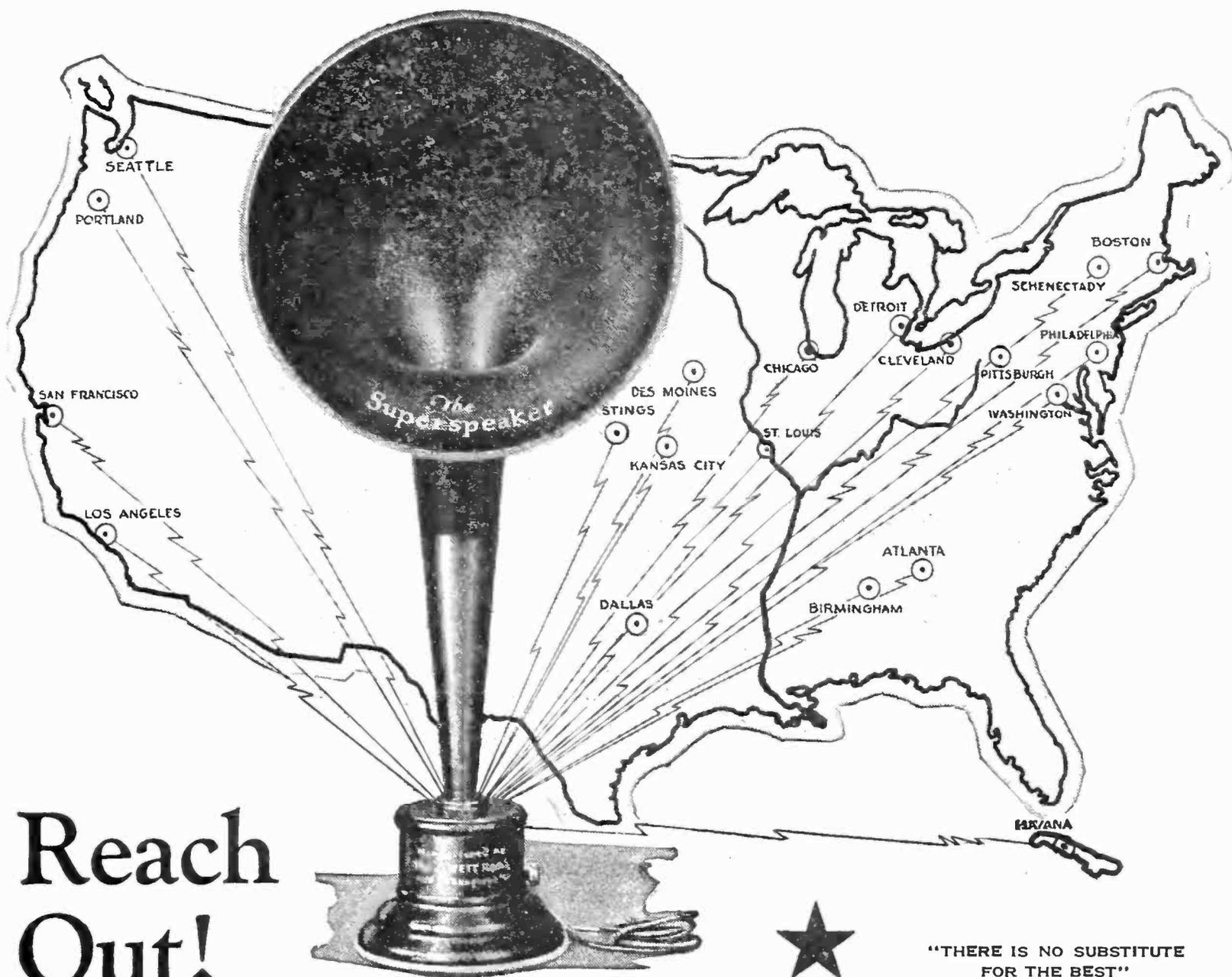
Big Dealer-discounts

IT lists and illustrates absolutely dependable, guaranteed sets and parts. Give your customers what they want—when they want it; but buy it so that you can make a good profit. We're supplying hundreds of radio dealers satisfactorily every day. Write for catalogue and discount sheet. You'll be astonished at the prices quoted.

Ask for catalogue No. 8.

W.E. Fuetterer Radio Supply Co.
2123-25 Locust St. Louis, Mo.





Reach
Out!

"THERE IS NO SUBSTITUTE
FOR THE BEST"

Loud-Speaker reception from nearby stations will be only a small part of your enjoyment of a Superspeaker and a modern Radio Set. The air is full of music and voice from far and near. Nearly 100 high powered stations are begging admission to your home theater. Tune your set to the entertainment that suits you best. Through the graceful throat of the Superspeaker, reception will come in naturally, clearly, and with amazing volume.

For The Superspeaker is a true musical instrument. It is the work of experienced musical instrument builders. In design, materials, workmanship and performance, it differs notably from all other devices of its kind.

Regardless of the size or power of your set—regardless too, of your prior experience in amplified reception—Superspeaker performance will surprise and delight you. Just ask any of the thousands of Superspeaker users from coast to coast.

Enjoy your home theater to the full limit of its possibilities. Install a Superspeaker and sweep the ether.

A big, substantial instrument, 26 inches high, with 14-inch bell, and weighing over 5 pounds—Handsomely finished in ebony gloss—Needs no extra batteries or coils—Adjustable for volume—Wears forever—Built complete in our own plants at Detroit and Allegan, and backed by the guarantee of a million-dollar corporation.



THE SUPERSPEAKER
For Homes or Public Reception.

THE JEWETT PARKAY
CABINET
With Parquetry Top—All
Standard Panel Sizes.

THE JEWETT ADAPTO
CABINET
Houses Any Set and
Equipment—Superspeaker
built-in.

THE JEWETT MICRO-
DIAL
Makes Tuning 50 Times
as Accurate.

The JEWETT RADIO & PHONOGRAPH CO.
5672 TWELFTH STREET, DETROIT, MICHIGAN

Superspeaker

Trademark
Registered

★ Tested and approved by RADIO BROADCAST ★



When you buy a set of Spintites you buy *real tools*, built for *lasting service*.

Shank and head of tough drop-forged steel that stands the gaff of long wear; convenient one-piece construction, giving greater strength and durability; no separate parts to weaken with use or get lost.

Quality tools through and through. Heads accurately machined to size. Handle of hard-wood, rubberoid finish—not painted; deeply fluted to form a sure and comfortable grip. Substantial *steel ferrule*. Shank firmly anchored to prevent "turning" in handle under heavy stress.

You'll be proud to own a set of these convenient Spintites, which enable you to get into the cramped corners with ease, making joints that are *as tight as if soldered!*

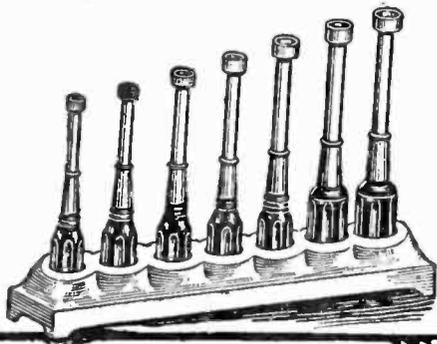
**SPINTITES MAKE
ACCEPTABLE
HOLIDAY GIFTS**

Set of 3 most popular sizes for Round or Hex nuts, as desired, in box \$1.00.

Set of 7 Hex sizes in handsomely finished metal base \$3.50.

If your dealer can't supply Spintites order direct from us. Write today for Booklet 22, describing all the "Speed-Up" Tools for radio.

Stevens & Co.
Toolsmiths since 1899
375 Broadway, New York



Won't
warp or swell!

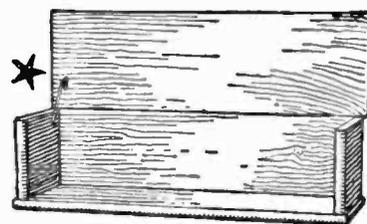
Heat won't warp a *red stripe* Bakelite-Dilecto panel and water won't make it swell. No weather element can change its form or sleek finish.

bakelite-dilecto
(Distinguished by its Red Stripe)

Makers of finest radio sets use Bakelite-Dilecto for panels. Amateurs who make their own outfits know it to be the most satisfactory material known. Identify genuine Bakelite-Dilecto by its *red stripe*.

THE CONTINENTAL FIBRE CO.
Factory: Newark, Delaware

Service from:
NEW YORK, Woolworth Bldg. SAN FRANCISCO, 75 Fremont St.
CHICAGO, Wrigley Building LOS ANGELES, 307 S. Hill St.
PITTSBURGH, 301 Fifth Ave. SEATTLE, 1041 Sixth Ave., So.



NATURAL WOOD

Finish it yourself to match any wood. 11 stock sizes all 7 inches deep, from
7" x 9" \$1.80
to 7" x 36" 4.75
Send for free catalogue of cabinets for every radio set.

NEAT FIT CABINETS

EXPRESS BODY CORP.
44 Lake St., Crystal Lake, Ill.

**Are you looking
for trouble?**

*If it is in your "B" Batteries
you can locate it with a*

SAMBER

**VOLT
METER**

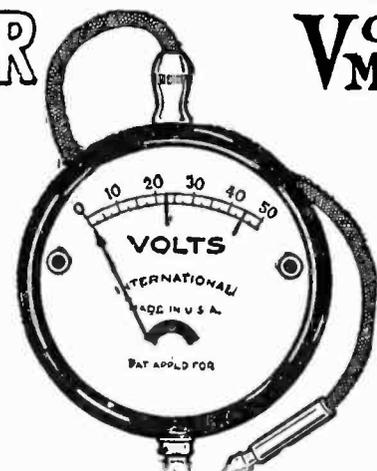
\$1.00

\$1.00

Post Paid
Anywhere

10 to 50
Volts

Send
Check or
Money
Order



Nickel
Plated

SAMBER RADIO PRODUCTS CO.
27 School Street Boston, Dept. A

★ Tested and approved by RADIO BROADCAST ★



GILFILLAN NEUTRODYNE



*“What a lovely tone
this set has”*

THE clear true tone of the Gilfillan Neutrodyne brings out the finer shadings of musical reproduction. With the aid of the finding chart anyone can tune in quickly without howls or squeals. Distant and difficult stations are easily brought in even while locals are playing.

The Gilfillan Neutrodyne is extraordinarily sensitive to faint signals and has an almost uncanny power of selectivity. This is especially desirable where many stations are broadcasting and the interference is great. The volume, clarity and ease of operation of these sets is a revelation.

We invite a comparison of the workmanship and performance of these sets with any others. The excellence is due to the years of experience in the manufacture of radio equipment.

STYLE GN-1 In a handsome two-tone American Walnut cabinet harmonizing with any interior. Price without accessories, **\$175**

STYLE GN-2 has the same Neutrodyne construction and features in a smaller cabinet. Price without accessories **\$140**

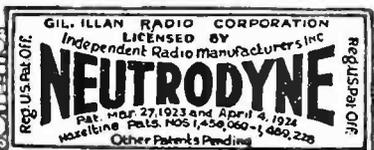
These sets are manufactured at three factories conveniently located to the jobber and dealer.

Send for Literature to Nearest Office

2525 W. Penn Way
KANSAS CITY

GILFILLAN BROS. INC.
1815 W. 16th St., LOS ANGELES

225 W. 57th Street
NEW YORK CITY

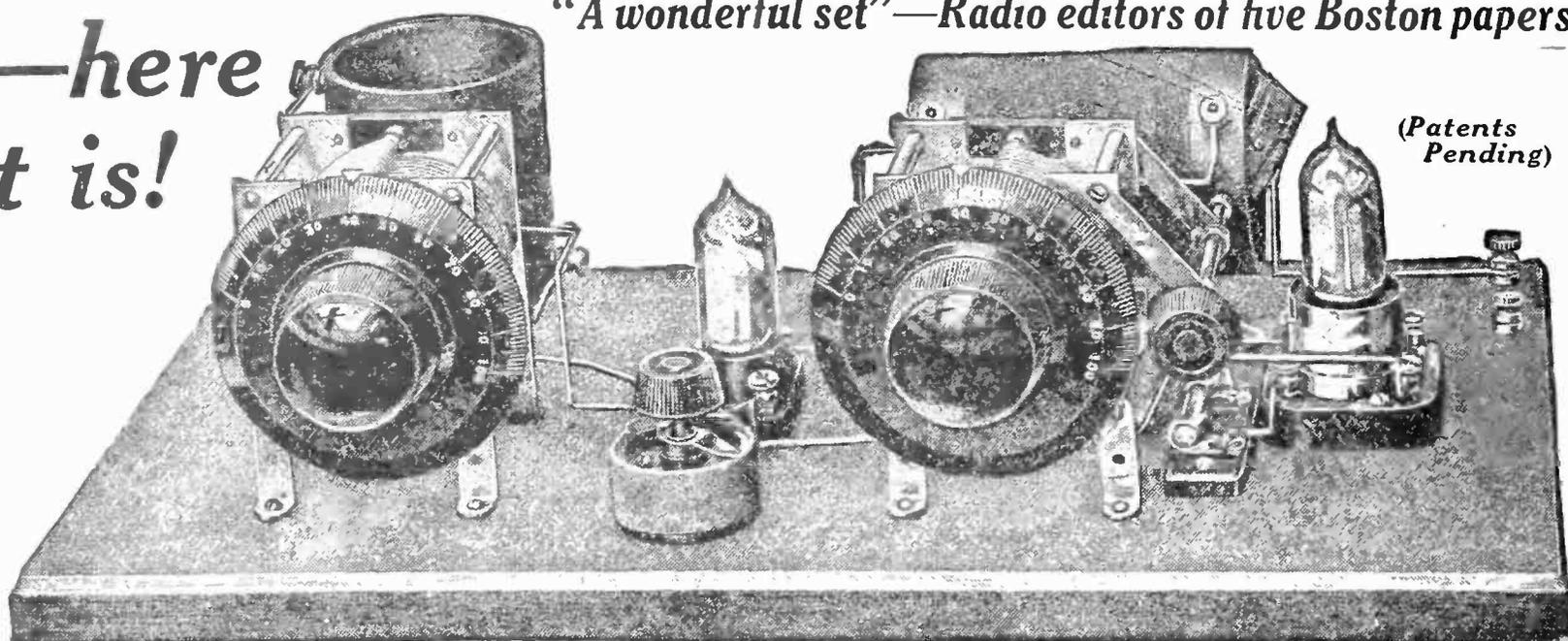


★ Tested and approved by RADIO BROADCAST ★

—here
it is!

“A wonderful set”—Radio editors of five Boston papers

(Patents Pending)



THE NATIONAL REGENAFORMER KIT for the Browning-Drake Receiver

consisting of

- 1 NATIONAL REGENAFORMER CONDENSER WITH 4" DIAL
- 1 NATIONAL ANTENNA INDUCTANCE
- 1 NATIONAL .0005 Velvet Vernier CONDENSER WITH 4" DIAL
- 1 SET OF HARDWARE
- 1 NATIONAL .00035 Velvet Vernier CONDENSER WITH 4" DIAL
- 1 SET OF INSTRUCTIONS FOR WIRING

Regenaformer and Antenna Coil only—Price \$7.50

PRICE
\$22.00

Coils completely mounted on back of Condensers ready for wiring

Sets made with this Regenaformer Kit have spanned the continent. Send for Bulletin 105RB

Manufactured by NATIONAL CO., Inc., 110 Brookline St., Cambridge, Mass.

PYREX
INSULATORS

A STITCH IN TIME SAVES NINE

AN hour to change your antenna insulators and install PYREX will save many hours of poor reception.

At all Good Dealers
★ PRICE 45c EACH

CORNING GLASS WORKS
Industrial Division
CORNING NEW YORK

“Reading Carpenter’s World Travels is seeing the world.”
For sale wherever books are sold.
Price, per volume, \$4.00.

Doubleday, Page & Co.

VOLT-X
VARIABLE GRID LEAK

Give Your Tubes a Chance

The Grid Leak determines the efficiency of your set. The proper Grid resistance varies for each tube, and the conditions under which it operates.

VOLT-X GRID LEAKS are positive and smooth in action with an accurate range of from ½ to 15 megohms. They fit any standard leak mounting, and get the absolute maximum from your tubes.

Grid Leak \$1.00
Grid Leak Mounting .30

BURTON & ROGERS
MFG. CO.
755 BOYLSTON ST., BOSTON, MASS.

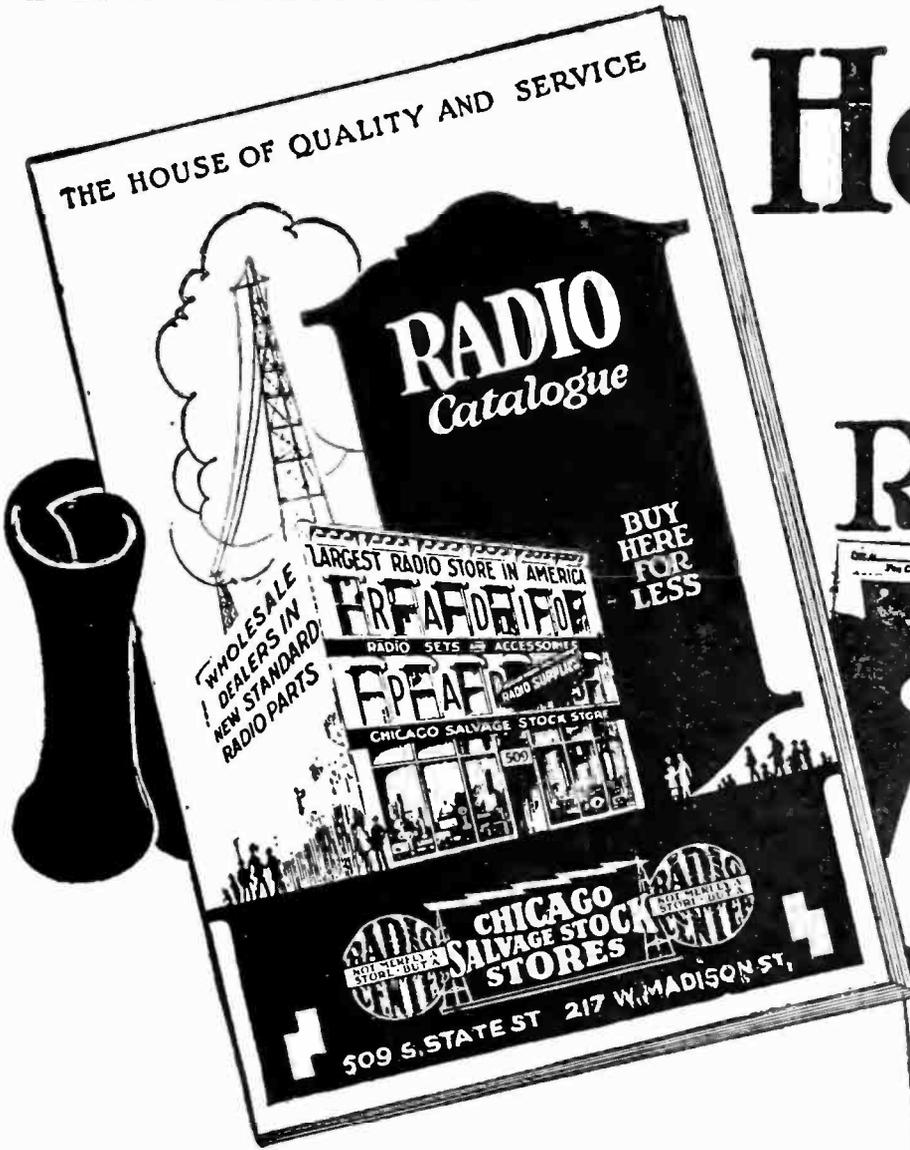
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THE LARGEST RADIO STORES IN AMERICA

Hookups!

All the latest and best "Kits" in our new

RADIO CATALOG



NO other Radio Catalog includes such a complete assortment of the best and latest Knock-Down Kits, Parts, and Accessories. You need this book—write for your **FREE** copy today!

An Unequaled "Kit" Service

All parts for each "KIT" have been carefully selected and tested by our staff of graduate Radio Engineers—satisfactory results are guaranteed.

Completely drilled and engraved panel included with each "KIT." Makes set building easy and sure. No other concern gives this **FREE** service.

Easy to understand **Instruction Book** and **Blue-Prints** included with each Outfit. No technical knowledge required to build your radio set.

Save Money On GUARANTEED APPARATUS

Our business is to buy up manufacturers' and government surplus stocks, jobber and dealer bankrupt stocks—but only brand-new, fully guaranteed, nationally advertised apparatus. Our enormous buying power permits us to pay spot cash and get rock-bottom prices—even way below manufacturer's costs. That's why our catalog is crammed with thousands of wonderful Radio Bargains.

**Dealers!
Jobbers!
Manufacturers!**

ATTENTION!

We will pay you spot cash for your surplus stocks—brand-new apparatus only! Write and tell us what you have.



Remember our motto: **Salvage means—
SAVE, SERVICE, SATISFACTION**

FAHLBERG

MADISON, WIS.

Safe, Quick Soldering at Home on the Xmas Set

★ Reddy HOT

Soldering Furnace
(Burns Denatured Alcohol)
and Tested Supplies

Do Professional Soldering Jobs at Home

WHEN Mr. Fahlberg, manufacturer of Reddy Hot Soldering Furnaces and Supplies, brought out this outfit, it was to place in the hands of the amateur the same scientifically prepared materials that were formerly used only in the manufacturers' laboratories. The Reddy Hot home soldering outfit is complete—weighs only 20 oz.—all you have to do is buy a few ounces of denatured alcohol and start to work.

HOT IRONS IN 2 MINUTES
With This Complete Outfit!

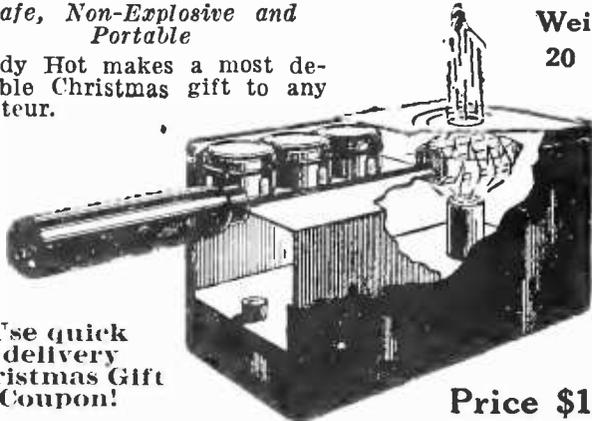
No longer is it necessary for the amateur to worry with the bunglesome makeshift irons. Reddy Hot has one delicate copper for fine radio work, another bigger iron for general household purposes—equipped with detachable handle. Each furnace is equipped with one generous ingot of Reddy Flo Household Solder (highest grade on the market) one ingot Reddy Melt Electrical Solder, a special bismuth alloy which melts readily at low temperatures, one can Reddy Stik Soldering Flux, guaranteed to be non-corrosive and specially adapted to amateur use, as it provides a surface easily wet by the solder. There is also one can Reddy Prest Sal Ammoniac to keep your soldering tip clean and bright and one book of Reddy Rub Abrasive Tape for quick cleaning and polishing.

E. D. FAHLBERG MFG. CO.
Madison, Wis.

Safe, Non-Explosive and Portable

Reddy Hot makes a most desirable Christmas gift to any amateur.

Weight
20 oz.



Use quick delivery Christmas Gift Coupon!

Price \$1.50

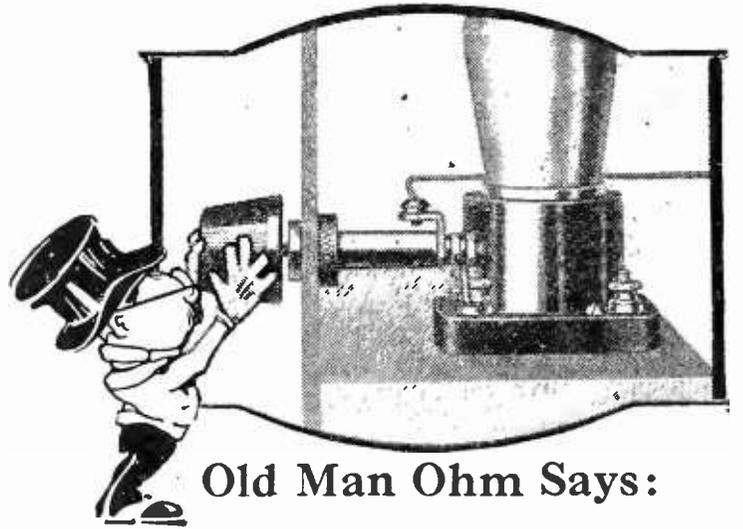
E. D. FAHLBERG MFG. CO., Madison, Wisconsin

Send me prepaid one Reddy Hot Soldering Furnace for which I enclose \$1.50.

My dealer's name is.....

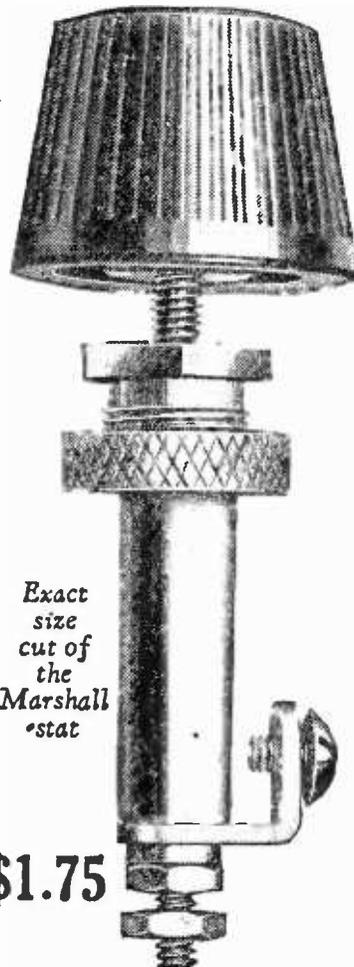
Signed: Name

Address



Old Man Ohm Says:

“Here is the Ideal Rheostat for all Tubes



Exact size cut of the Marshall-stat

\$1.75

—and he ought to know. He is the fellow who measures resistance. He finds that the Marshall-stat varies resistance not step by step, but smoothly, continuously and uninterruptedly from zero to maximum.

He also finds—and you will too—that the Marshall-stat: Is compact.

Requires only one hole in panel.

Is vernier all the way but requires only one adjustment.

Can be used with any tube or combination of tubes.

Has only two terminals and cannot be connected incorrectly.

MARSHALL ELECTRIC CO.
3233 Locust Blvd. St. Louis, Mo.



Old Man Ohm has an interesting folder on the Marshall-stat. Send for it.

The FRENCH BINDERS

Good books with artistic binding

COUNTRY LIFE PRESS

GARDEN CITY, N.Y.

Get Better Amplification



AUDIO FREQUENCY TRANSFORMERS give you extra volume and preserve the original tone quality as well. The correct design with the needed extra weight in the core makes the difference. Shell type laminated core. Accurately wound coils. Fully Guaranteed

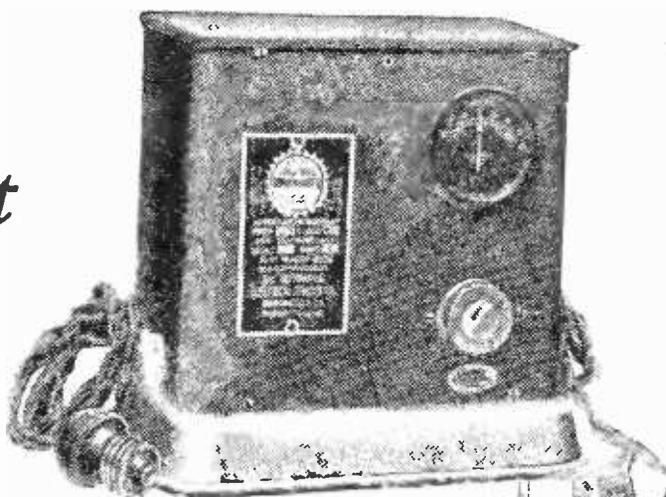
3 1/2 to 1 Ratio \$4 : 6 to 1 Ratio \$4.50
Ask your dealer. If he cannot supply you, send his name with your order to

National Transformer Mfg. Co.

Manufacturers of Transformers of All Types

Dept. B, 154 Whiting St., Chicago, Ill.

The secret of easy charging



MAYBE you think the storage battery a difficult proposition. Charging is what used to cause trouble—until we developed

The New Silent GOLD SEAL HOMCHARGER



Now charging is as simple as ABC. Here's the HOMCHARGER way: Slip two spring clips over the battery terminals, and screw a plug into any lamp socket. That's all. Go right on using your set, if you want. You can even sleep in the same room with the HOMCHARGER, it's so quiet.

So get a good storage battery, the new silent GOLD SEAL HOMCHARGER, and enjoy radio at its best.

Handsome: Finished in mahogany-red and gold. Non-scratching rubber feet. Absolutely safe, absolutely certain, care-free. Unqualifiedly guaranteed.

THE AUTOMATIC ELECTRICAL DEVICES CO.

Largest manufacturers of Vibrating Rectifiers in the World

128 West Third Street, Cincinnati, Ohio

Under the same management as the Kodak Manufacturing Co.

FREE!

Ask your dealer or send direct for a copy of the booklet, "The Secret of Distance and Volume in Radio," containing valuable information as well as complete details of the new silent

GOLD SEAL HOMCHARGER



14 GOLD SEAL HOMCHARGER features

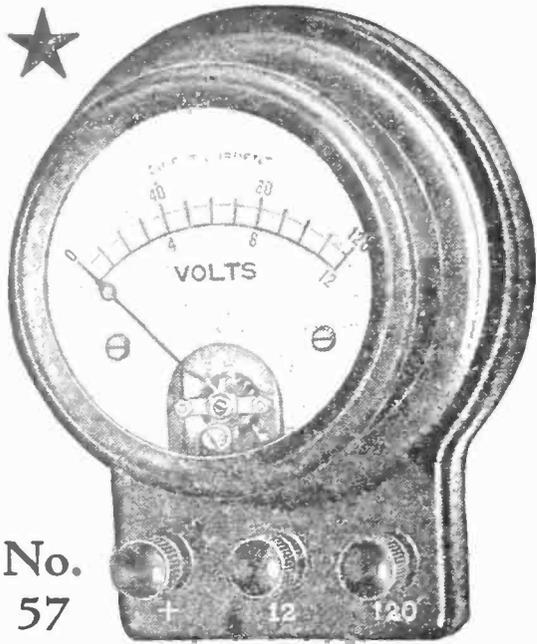
- | | | |
|---|--|---|
| <p>1—Simple; needs no care.</p> <p>2—Efficient; costs about 5c to charge the average battery, much less than bulb or liquid types of charger.</p> <p>3—Quick; brings battery up to full charge overnight.</p> <p>4—Tapers charge; cannot injure the battery.</p> <p>5—Clean; no bulbs to break, no liquids to spill or produce fumes.</p> <p>6—Dependable; adjusted and sealed at factory.</p> <p>7—Lasts forever; only one</p> | <p>moving part, the Tungsten contact, which can be replaced at \$1 after many thousands of hours of use.</p> <p>8—Fool-proof; charges automatically, no matter which clip is attached to which battery terminal.</p> <p>9—Safe; approved by Fire Insurance Underwriters. No danger of shock or fire.</p> <p>10—Beautiful, sturdy metal case finished in mahogany-red and gold.</p> | <p>11—Universal; made in types for all voltages of alternating and direct current. Charges all radio "A" and "B" batteries and automobile batteries.</p> <p>12—Quiet; its faint hum cannot be heard in next room.</p> <p>13—Unqualifiedly guaranteed.</p> <p>14—Popular price; sold everywhere for \$18.50; in Canada \$26. Complete, no extras to buy.</p> |
|---|--|---|

★ Tested and approved by RADIO BROADCAST ★



JEWELL No. 57

SEMI-PORTABLE VOLTMETER



No. 57

"A" and "B" Battery Voltmeter 7½ and 150 volts - - \$10.50

is made in several ranges for radio work—the 7½ and 150 volt range being most popular.

Don't guess—test your batteries often—poor and run-down batteries cause over 60% of all radio trouble.

Jewell instruments are sold by radio dealers everywhere. Write for our 15-A Radio Catalogue.

Order from Dealer

Jewell Electrical Instrument Co.

1650 Walnut St. - Chicago

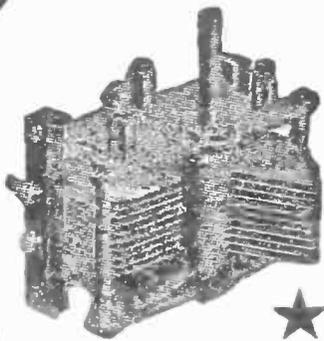
"25 Years Making Good Instruments"

CARDWELL

THE ORIGINAL LOW LOSS ROTOR-GROUNDED

CONDENSER

The CARDWELL is the original low loss rotor grounded condenser, and to this day it is without a peer. The leading radio engineers and technical editors still recognize the CARDWELL as the ONE BEST. Scientifically designed in the beginning, it has



not been necessary to change the CARDWELL in any material way to maintain its undisputed superiority.

See the CARDWELL at all dealers. A post card to us will bring you an education on condensers.

ALLEN D. CARDWELL MFG. CORP.

81 Prospect St.

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JUDGMENT OF THE STORM

By Roy Mason

A novel written from the photoplay of Ethel Styles Middleton which has been produced by the Palmer Photoplay Corporation. \$1.50.

Doubleday, Page & Co., Garden City, N. Y.

Greater Distance Clearer Reception

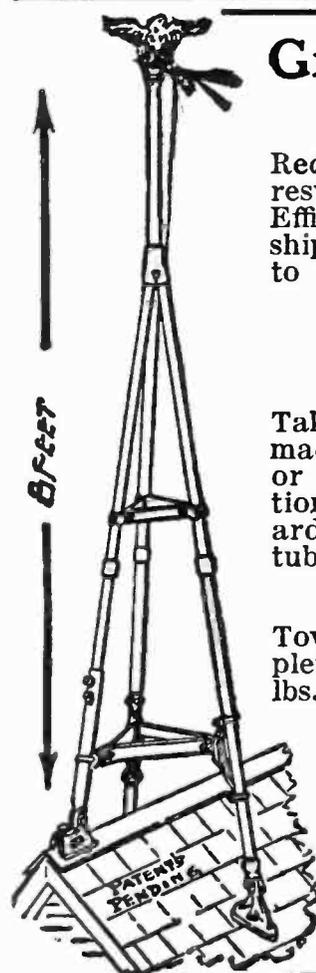
Reduced losses, less noise are the results of a good outside aerial. Efficient long distance sets, including ships at sea, use best possible aerial to get results.

EAGLE RADIO TOWERS

Take the place of unsightly home-made masts. Adjustable to fit single or double slope or flat roof. Additional height added by fitting standard pipe to top. Strong, hollow-tube construction.

One Tower FREE

Towers shipped knocked down complete with instructions. Weight 50 lbs. Boy can assemble in an hour. Write for literature, prices, and plan whereby you can get one tower free. Money-Back Guarantee.



J. R. BURRELL CO.

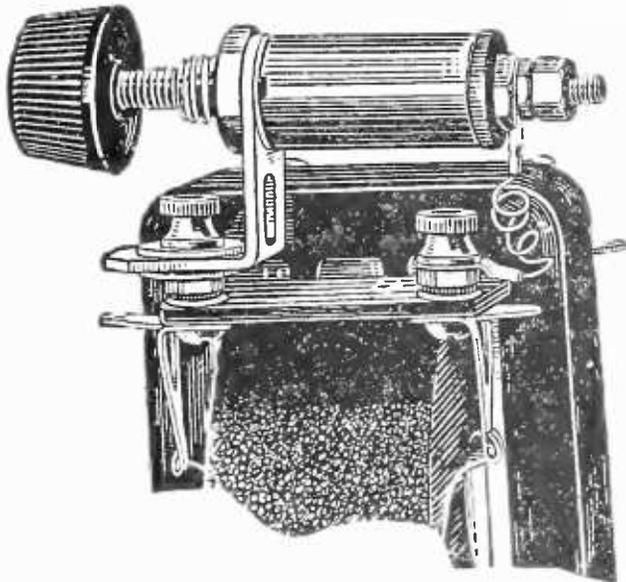
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Dept. 16

Milwaukee, Wis.

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The Difference They Make in Reception is Amazing



Electrad Audiohm

Eliminates Distortion

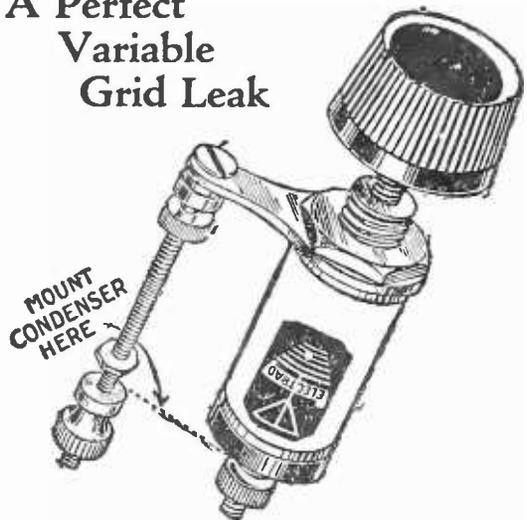
Also whistles, squeals and howls. Assures clear-cut, smooth reception of all notes of music and voice—bringing out the true, actual values of each tone. Reproduces all notes without blur or falsetto exaggeration.

You mount the Audiohm across the secondary of your audio transformer. Can be attached in a minute, and without solder. Easy to operate as setting your watch. Fits any transformer—and lasts for years.

Buy an Audiohm to-day and get perfect reception. We guarantee results.

Price only \$1.50

A Perfect
Variable
Grid Leak



Electrad Variohm

Gives that Last Hair's-Breadth Tuning

Permits you to get stations you never heard before. Clears up those stations you have heard only indistinctly. Affords that super-fine tuning which every discriminating fan has long been seeking.

The Variohm is a wonderful, variable grid leak that works with exquisite precision. Allows infinitely fine variations of adjustment from $\frac{1}{4}$ to 10 megohms, and coarser adjustment from 10 to 30 megohms.

Install a Variohm in your set to-day—and get the fullest power, clarity and distance from it. Guaranteed.

Price \$1.25 unmounted

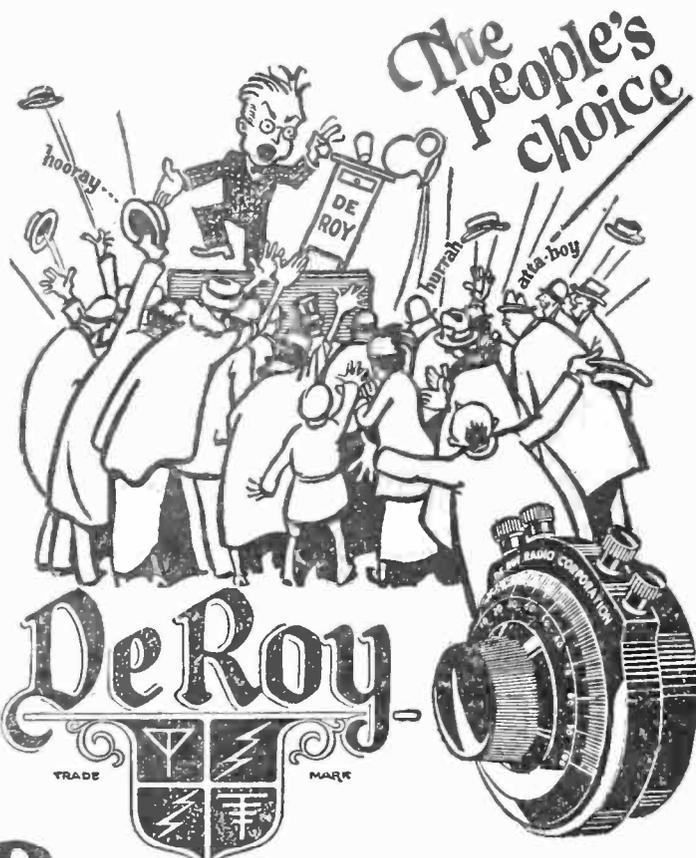
\$1.50 mounted

Electrad Audiohms and Variohms are on sale at most good radio stores. If your dealer doesn't carry them, order direct, and give his name.

ELECTRAD INC.

428 Broadway •• New York City

★ Tested and approved by RADIO BROADCAST ★



Phusiformer

Manufactured Under License Agreement

Simplicity Wins!

ELIMINATE the complicated assemblies of condensers, vario-meters, couplers and frequency transformers! Forget the worries of balancing and neutralizing this maze of instruments.

The *DeRoy Phusiformer* takes their place and does their work more efficiently. Build any number of different circuits with the same *DeRoy Phusiformers* without discarding one single part. Increase your range and volume from one to six tubes as you wish simply by adding *DeRoy Phusiformers*. No complicated wiring, no muss, no fuss! Sets built this way do NOT howl, whistle, squeal or distort the programs in the slightest—absolutely tone-pure reception!

Price With Dial **\$9.00**
Each

If your dealer does not as yet handle *DeRoy Phusiformer*, send money order for the required amount of units.

DeROY RADIO CORP.
286 Plane Street Newark, N. J.



**Just what
you need**

Valley Battery Charger

Here is just what you need to increase the pleasure and entertainment of your radio. With the Valley Battery Charger as part of your equipment, you need never miss a program because of a dead battery.

The Valley Battery Charger will completely recharge 2-volt peanut tube cells, 6-volt A batteries and from 1 to 4 V 24-volt batteries. It is the only charger necessary for all radio batteries.

Quiet in operation
Full 6-ampere charging rate
No liquids. No bulbs

Plugs into the ordinary light socket like a fan or other household necessity. Just as easy to operate. Takes only about a dime's worth of current to bring your battery up to full charge.

It has grained and engraved Bakelite panel which harmonizes with any radio set. Clear glass top shows the simple, patented working parts at all times.

At radio dealers everywhere.

VALLEY ELECTRIC CO.
3157 S. Kingshighway - - St. Louis, Mo.

Read **RUDYARD KIPLING'S** Books

For sale everywhere

Doubleday, Page & Co.

40 Ft.

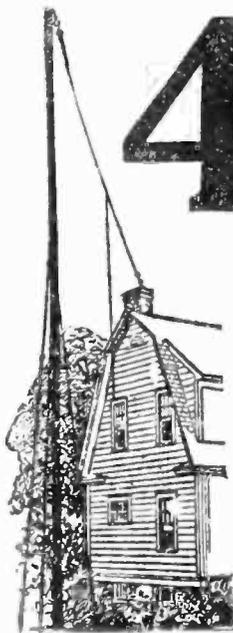
"HERCULES" ★
Aerial Mast \$25

FREIGHT PREPAID

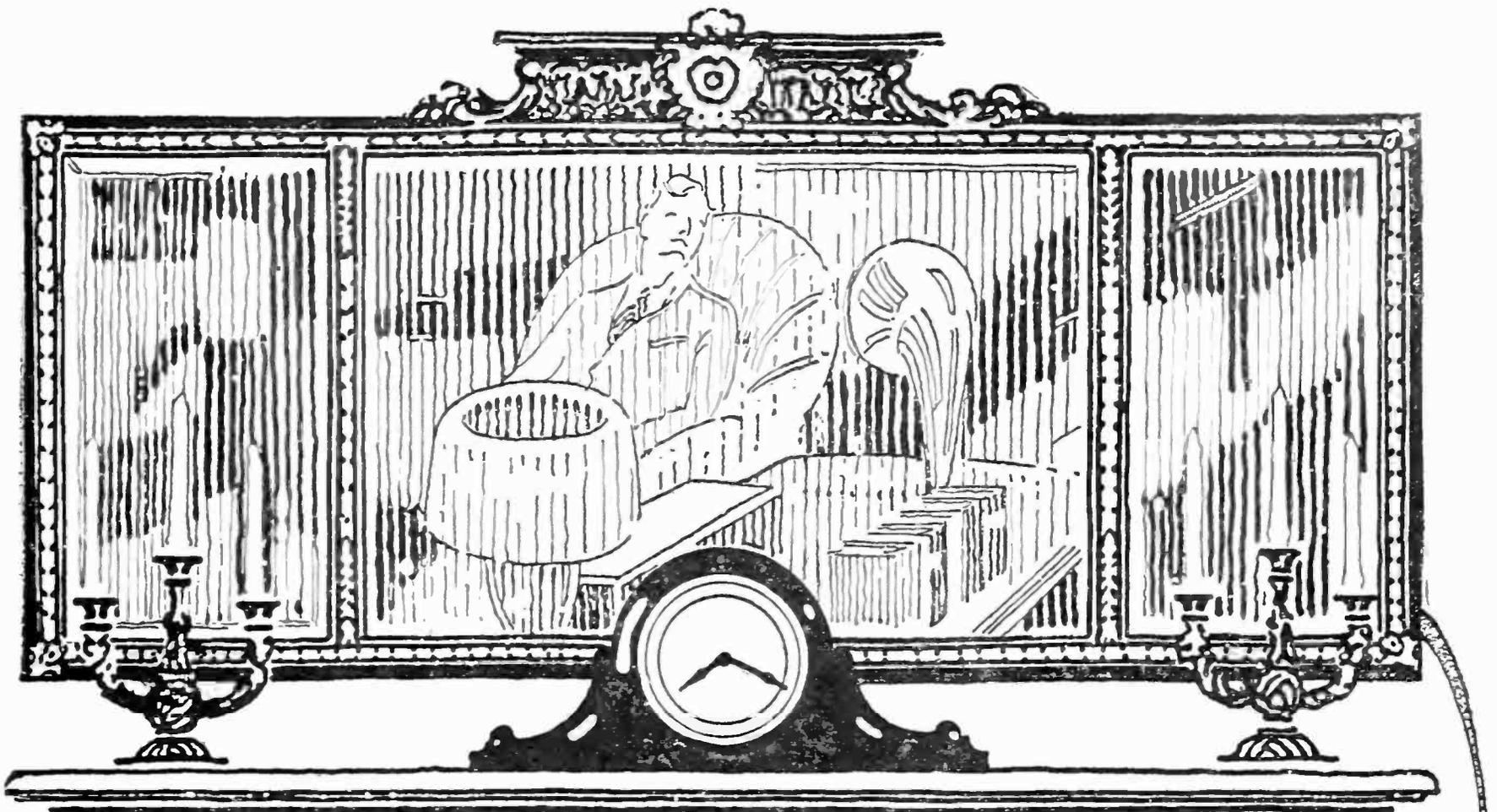
20 Ft. \$10 or 60 Ft. \$45.

All steel construction. Each Mast complete with Guy wires and masthead pulley. Write for literature and **FREE BLUEPRINT.**

S. W. HULL & CO., Dept. F2
2048 E. 79th Street, Cleveland, Ohio



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!! Perfect Reception - Indoors - Anywhere !!

THERE are so many places to use TALKING TAPE—indoors. It adapts itself anywhere.

TALKING TAPE is flexible—yet strong—and is easily handled without kinking or curling. Its twelve parallel strands of flat metal, woven with the fabric, provide maximum receptive surface with minimum bulk, and bring in distance with surprising quality and volume. Wonderfully selective, too.

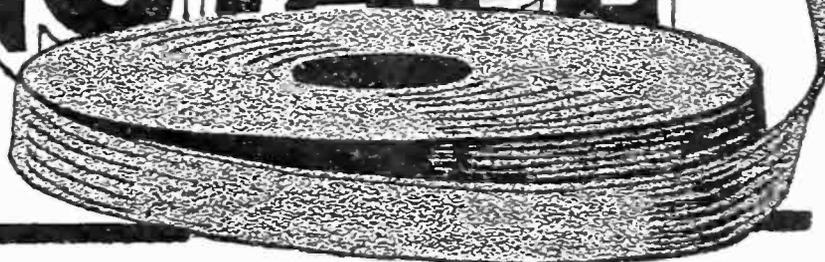
TALKING TAPE works perfectly with all types of receivers—tube or crystal. Buy two or three boxes from your dealer today—and use it indoors in different rooms in different ways. Various suggestions for use are given with each box.



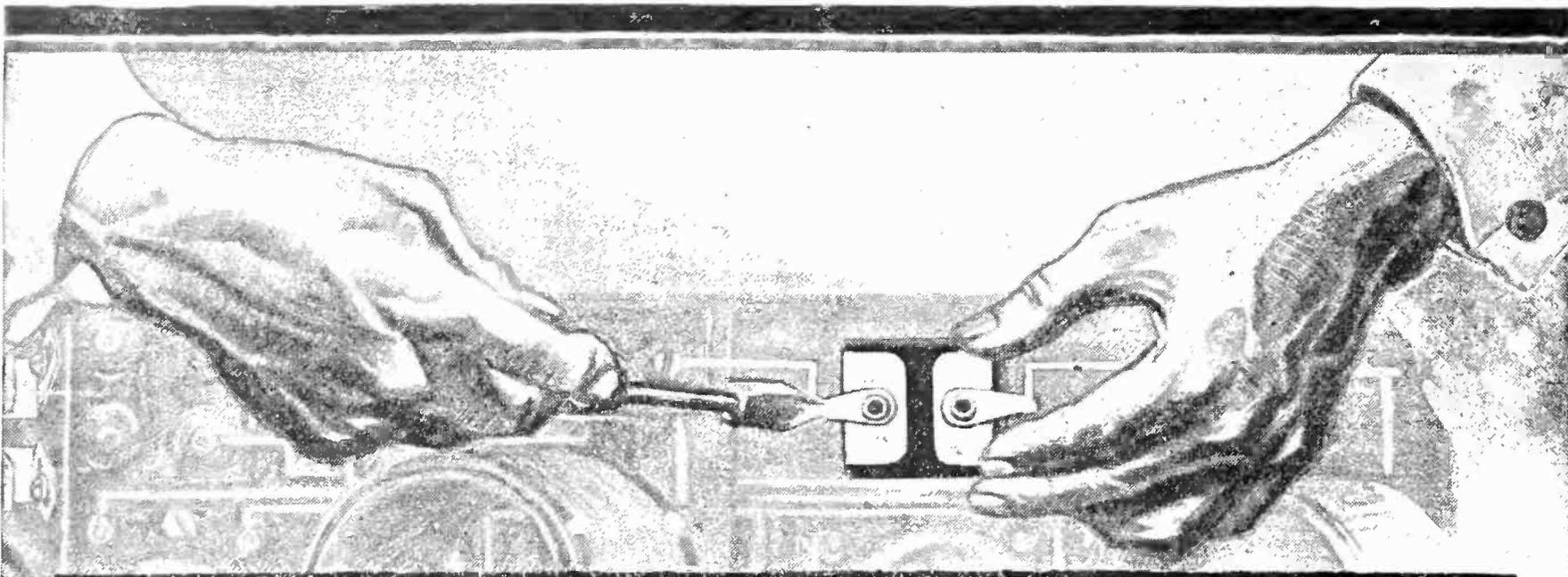
Manufactured by
HOPE WEBBING COMPANY
 For Forty Years
 The World's Largest Manufacturers of Electric Tapes
 PROVIDENCE, R. I.

★ TALKING TAPE

**The Perfect
 Radio Aerial**



★ Tested and approved by RADIO BROADCAST ★



Nine out of ten sets use MICADONS

Nine out of every ten sets made, use MICADONS—the standard fixed radio condenser. Set builders choose them for many reasons.

They know that the MICADON is a Dubilier product: hence supreme in quality and efficiency.

They know that MICADONS can be obtained in accurately matched capacities and the capacity is permanent.

They know that MICADONS are easily installed, equipped as they are with extension tabs for soldering and eyelets for set screw assembly.

They know that MICADONS are made with type variations to meet every possible requirement.

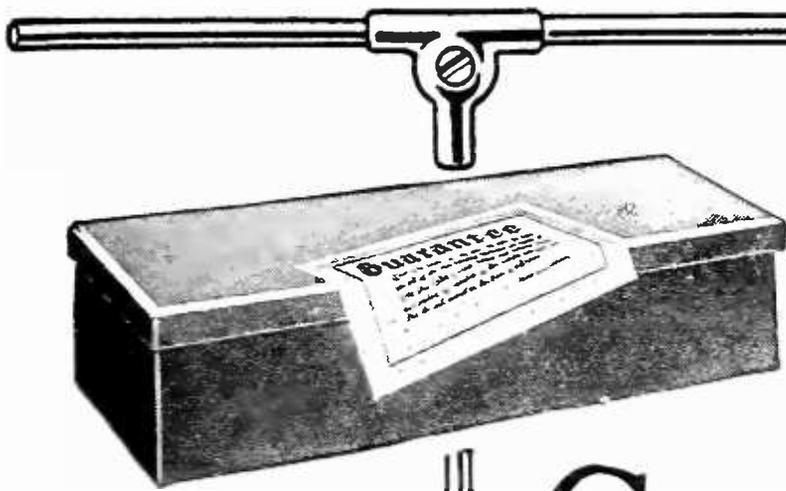
For best results use MICADONS



Dubilier

CONDENSER AND RADIO CORPORATION

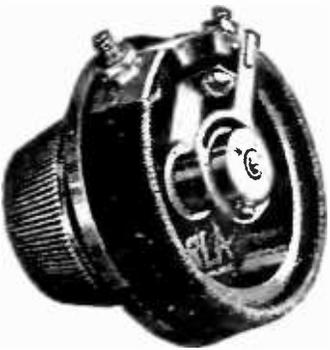
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CIR-KIT makes the Greatest Circuits Easiest to Own



★
Secondary output windings of high impedance make Erla Push-Pull Transformers, exclusive in design, best suited to high resistance loud speakers. \$10 per pair.



Only the special spring arm, the perfected bearing and winding of Erla Precision Rheostats permit such supersensitiveness. Single-hole mounting preserves factory adjustment. \$1.10.



Neatest, most convenient in form, Erla Autogrip 2-Way Phone Plugs assure smoothest connection of tips and most positive contact, with no manipulation. A typical Erla improvement. 75c.

In a motor car—the engine. In a skyscraper—the sub-structure. In a radio receiver—the circuit. The circuit, Erla knew, must be the foundation of finest possible radio. So Erla first evolved those particular circuits which have ever since been rated most powerful, tube for tube, a result inherent only in Erla principles. And today the trend in radio clearly indicates that Erla Supereflex circuits may be selected in full confidence of continued pre-eminence.

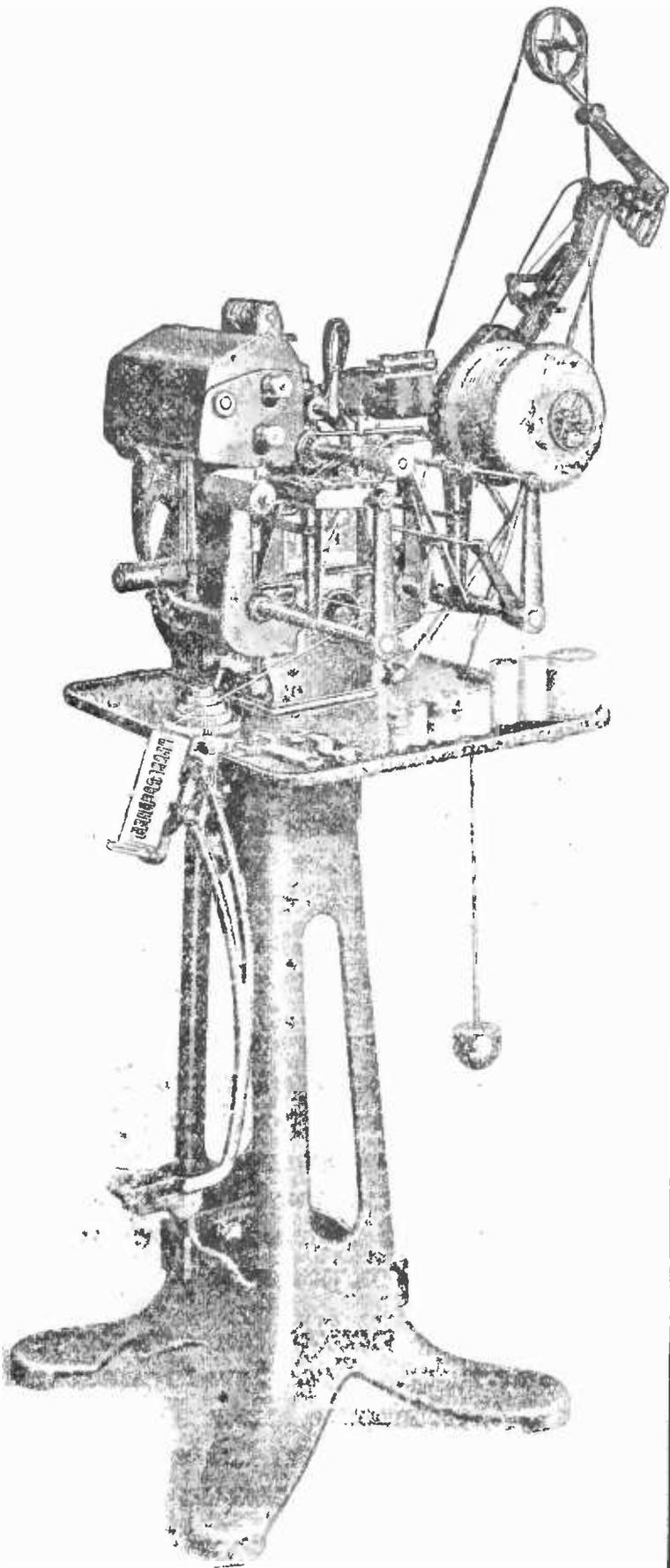
That these fundamentally superior circuits are at the same time also easiest to construct, with utmost economy, is another epochal Erla attainment, made possible by the Erla *CIR-KIT*. With *CIR-KIT* you yourself can construct Erla Supereflex circuits from genuine Erla Precision Radio Apparatus, specially designed to assure the most efficient functioning of Erla Supereflex principles.

Erla *CIR-KIT* supplies everything needed, in a factory-sealed carton, sold under warranty. Erla Synchronizing Transformers, Erla Miniloss Condensers, Erla Precision Rheostats, Erla Cushion Spring Sockets, Erla Tested Crystals, and all the other matchless Erla units are provided. You can assemble them with perfect results virtually guaranteed by full-sized blueprints, drilled and lettered panel, stenciled baseboard, precisely locating every unit and connection. There is no soldering, thanks to Erla Solderless Connectors. Pliers and screwdriver alone are needed to bring you the de luxe radio of Erla Supereflex circuits, at lowest possible cost.

ELECTRICAL RESEARCH LABORATORIES
Department J, 2500 Cottage Grove Avenue, CHICAGO

ERLA

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No. 96 UNIVERSAL

Coil Winding Machine

In wide use both here and abroad, for the economic production of transformer and other layer-wound coils.

Semi-automatic features in this machine permit the use of unskilled operators. Exact laying of the wire insures coils of extreme accuracy and durability.

Daily production estimates based on your requirements will be furnished on application.

UNIVERSAL WINDING COMPANY

Manufacturers of coil winding equipment covering practically every phase of the electrical industry

MAIN OFFICE:

95 South Street,
Boston, Mass.

PLANT OFFICE:

P. O. Box 1513,
Providence, R. I.



Puts the Joy In Radio

After all, what is sweeter to your ears than the music from some DX station coming in on the loud speaker, clear and undistorted? To insure amplification without distortion, use the "HEGEHOG." This marvelous little audio transformer, half the size of any other made is *different* in design—the most efficient construction known, for transformers. It has an exclusive self-shielding feature that shuts out foreign noises. Unsurpassed for volume and tone quality. Saves space, mounts anywhere and easy to connect. Ideal for portables.

Ratios 1 to 3, 1 to 4 and 1 to 5 \$3.50
Ratio 1 to 10 4.50

Write for Free Bulletin No. 94 showing complete line of Premier Quality Radio Parts. Ask your dealer for Premier Free Hook Ups. If he does not have them send his name and receive a set free.

Premier Electric Company ★

3812 Ravenswood Ave.

Chicago

Maker of

PREMIER

Quality Radio Parts

YOUR CRYSTAL SET

will work 400 to 1,000 miles if made by my plans. No tubes or batteries. Copyrighted plans, \$1.00; or furnished FREE with complete parts for building set, including special coil and panel correctly drilled for only \$5.00. Satisfaction guaranteed or money refunded. Satisfied customers everywhere. Particulars free.

LEON LAMBERT, 673 Kaufman Bldg., Wichita, Kansas

FROST-RADIO

Catalog and Instruction Book

THIS new booklet on the care and operation of **FROST-FONES** and **FROST-RADIO** is now ready. Contains 36 pages of valuable information on radio apparatus. Your copy mailed free on request.

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Herbert H. Frost, Inc.

154 West Lake Street
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FREE! ★

A post card from you will bring this 40-page catalog.

★ Tested and approved by RADIO BROADCAST ★



What Dealers say about the CUSTOMERS we referred to them

Monarch Electric Co., Pittsburgh, Pa.
"We consider this method very beneficial to the retail merchant."

National Electric Service Co., Morgantown, W. Va.
"We have had several good leads."

Weller Battery & Ignition Co., Zanesville, Ohio.
"We have sold some supplies from these inquiries."

Blakeslee Elec. Supply Co., Du Bois, Pa.
"We have been very successful in following such leads."

Moulthrop Bros., Du Bois, Pa.
"They have helped me very much in interesting prospects."

O. D. Mott & Co., New Castle, Pa.
"It has helped us quite a lot and has given us a chance to sell radio to people we would not have had any other way."

Crouch Elec. Appliance Co., Homestead, Pa.
"Very good. Please send some more."

Geo. Meyers Hardware Co., Altoona, Pa.
"It helps us to sell more radio supplies."

Utility Electric Co., Indiana, Pa.
"We secured over 50% of them."

Gardner Bros., Elwood City, Pa.
"Very good; keep it up."

W. F. Frederick Piano Co., Uniontown, Pa.
"Fine."

Altoona Elec. Supply Co., Altoona, Pa.
"Have sold some of prospects mailed us."

McHugh-Keys Co., Steubenville, Ohio.
"They have usually made new customers."

Seltz Battery & Elec. Co., East Liverpool, Ohio.
"They have brought in new customers and consequently more sales."

The Salzer Elec. Company, Cleveland, Ohio.
"This method is ideal."

Fred B. Jackson, Greensburg, Pa.
"I have had very good success."

Holt-Rowe Novelty Co., Fairmont, W. Va.
"Helps our sales and advertises us."

Virginia Novelty Co., Martinsburg, W. Va.
"Have sent some business to us."

Peterson Elec. Co., Wheeling, W. Va.
"We have used them and received results."

W. Va. Radio Sales Corp., Charleston, W. Va.
"Have proven very useful."

Kerber Elec. Co., Cleveland, Ohio.
"They have brought us in contact with people we would not have met otherwise."

Scottdale Battery Service, Scottsdale, Pa.
"Have given your Company credit for your interest taken this way and appreciate same."

Hommel's policy of referring customers to their local dealers means additional sales and real money profit to them.

We make the co-operation between our dealers and ourselves as close and as tangible as is possible.

Your name could just as well be on our dealer list, and you could profit just as these dealers are profiting.

Our illustrated Encyclopedia of Radio Apparatus 266-B is free to dealers. Ask for it.

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EXCLUSIVELY

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929 PENN AVENUE

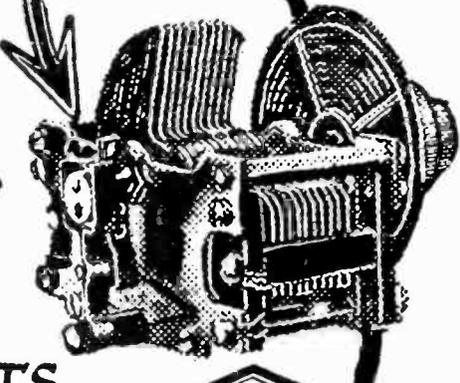


PITTSBURGH, PA.

★ Tested and approved by RADIO BROADCAST ★



DUAL RATIO GROUNDED ROTOR



LOW-LOSS CONDENSER
PLAIN & VERNIER TYPE
PRECISION MOVEMENT, ABSENCE OF GEARS OR COMPLICATED PARTS

Improved Type RHEOSTATS and POTENTIOMETERS All Sizes

SUPERIOR CONSTRUCTION **GENUINE BAKELITE**



United Scientific Laboratories, Inc.
92-94 E. 10TH ST. NEW YORK CITY



★ **PYRATEK**
TRADE MARK



FIXED Crystal Rectifier

Guaranteed to give utmost sensitive reception with absolute stability. Especially designed for REFLEX work. Tested and recommended for the "Knock-out" Reflex by "Radio Broadcast" Laboratory.

WITH MOUNTING CLIPS \$1.25
At your dealers or sent direct upon receipt of purchase price
The Erisman Laboratories, 3785 Broadway, New York, Dept. B

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*Twenty-five They Don't
Different Lose
Engraved Tops Their Heads*



B DET + **H. H. EBY MFG. CO.** **SHORT ANT**
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The Famous

BEL-CANTO

★ **Loud Speakers**

NOW at your DEALER

10" Bell—22" High . . \$10
15" Bell—29" High . . \$15
(Goose Neck)

If your dealer cannot supply you, write us and we will advise where to purchase one.

BEL-CANTO RADIO & TEL. EQUIPMENT CO., Inc.
872 Broadway, New York City Tel., Stuyvesant 1921

FAHNESTOCK CLIPS

The Perfect Radio Connectors—are used by manufacturers of standard sets and parts—and makers of wet and dry batteries everywhere.



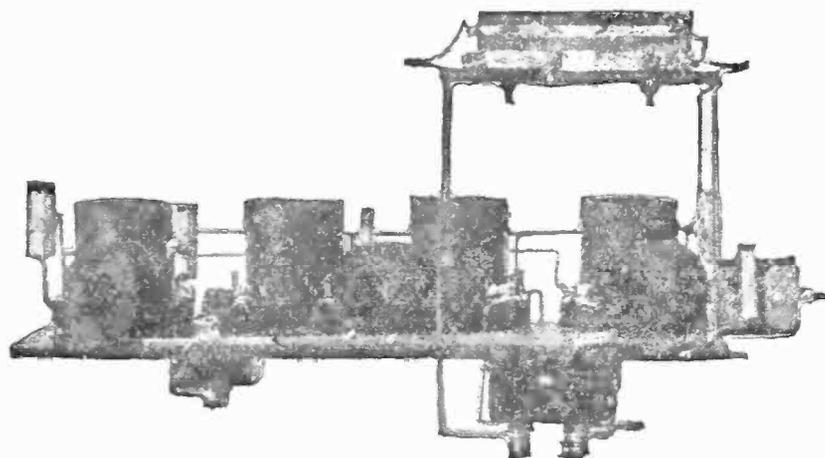
★ **FAHNESTOCK ELECTRIC CO.** Long Island City

Their *Sure Patented Grip* is recognized universally by enthusiastic users.

★ Tested and approved by RADIO BROADCAST ★

THE HANSCOM "SUPERUNIT"

Patent Applied For



HERE IT IS!

A completely wired and tested assembly with the guess work taken out.

Parts Needed to Make a 6-Tube Set

- 1 Hanscom "Superunit."
- 2 .0005 Vernier Condensers.
- 1 Chelten Midget Condenser.
- 1 Front Panel (at least 18 inches long.)
- 1 Baseboard.
- 1 6-Ohm Rheostat.
- 1 Mfd By-Pass Condenser.
- 1 30-Ohm Rheostat.
- 2 Audio Frequency Transformers.
- 2 Tube Sockets.
- 1 Single Circuit Jack.
- 1 Double Circuit Jack.

This set can be constructed by a novice and when finished it will do this:

—Reduce your "B" battery consumption to 6 to 10 milliamperes for all 6 tubes.

—Tune sharper than most sets possibly can.

—Bring in coast to coast reception on a small loop.

No radiation, no potentiometer, perfect volume control.

Shipped anywhere in the U. S. A. for \$37.50.

(Charges collect)

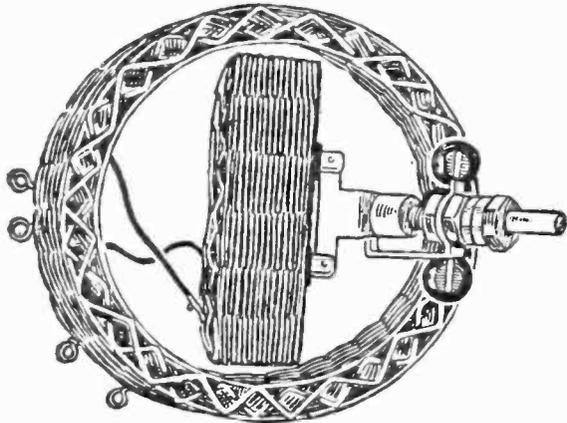
A. T. HANSCOM

★
Woonsocket, R. I.



LOW LOSS PRODUCTS

RADJO products are efficient anti-capacity parts that stand the acid test of comparison.



“RADJO”

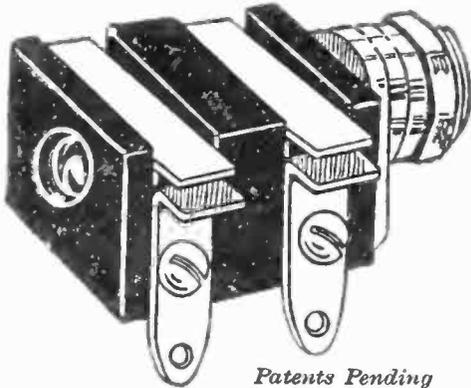
180° Low-Loss Tuner

It can be mounted in any position necessary to meet the wiring requirements of your present circuit, and can be substituted for any coupler you are now using. Lorenz system basket weave, the most efficient yet devised.

Radjo Low-Loss Tuners are made in two models.

The three circuit tuner with a 180° movement of the rotor.

The single or double circuit tuner has the primary with eight taps as the stationary coil, with a 180° movement of the rotor. Price, either type, \$5.50



Patents Pending

“RADJO” Anti-Capacity Jacks and Switches

A new departure in radio apparatus. Designed for radio circuits exclusively with advantageous features possessed by no other jack on the market. Their infinite low capacity merits their use. Wiping contact is of extremely large area under a maximum tension. Radjo jacks are small and compact, requiring very little space.

The Line Consists of Five Jacks and Three Switches

Write to-day for interesting literature giving complete information regarding Radjo Low-Loss Products,

Jobbers—Distributors. Write for Our Proposition.

ELECTRIC CITY NOVELTY AND MANUFACTURING CO.

(Licensed Manufacturers)

SCHENECTADY NEW YORK



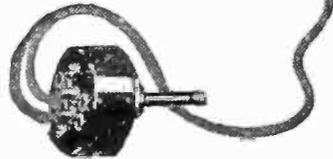
MURDOCK PHONES

are backed by 20 years of successful experience. There are over 1,000,000 in use to-day. Murdocks are famous for distinct reproduction and for their light weight. With the Murdock Multiple Plug you can use from one to four phones at the same time.

WM. J. MURDOCK CO.
509 Washington Ave. Chelsea, Mass.

Free Booklet

Write for our free booklet “The Ears of Radio.” It contains important data on headphones.



MURDOCK RADIO PHONES

Standard since 1904

Five Inches High

Reflectone \$8

THE MIDGET LOUD SPEAKER WITH THE GIANT VOICE

RICE & HOCHSTER

132 Washington Place New York City

YOU WANT—from your set



List Price \$9.50

Greater volume — clearer reproduction — balanced amplification, no distortional inter-transformer couplings, all the high notes and all the low notes, pure sweet tones over the entire scale. You want music and voices that are natural and intelligible. **YOU WANT--**

TWIN-AUD the double audio transformer

PEERLESS RADIO CORPORATION
Newton Lower Falls Boston, Mass.

★ Tested and approved by RADIO BROADCAST ★

Radio Apparatus that Brings in the Stations Say the Radio Bugs!

February 14, 1924

KELLOGG SWITCHBOARD & SUPPLY CO., Chicago, Ill.

Gentlemen:

My antenna is fifty feet high, and slants towards the lead-in. I have a three-circuit set, completely equipped with Kellogg parts. In the list which I am enclosing, those stations marked with an asterisk were received in one night [five hours]. The complete list numbers 154 stations, all received over a period of 115 days.

WOS*	WMC*	WEAF*	WPA	KJR	KFAF*	KNJ*
WOC*	WJY	PWX	WAAW	9CGU	WJAK	WJAD*
WHB*	WNAV*	8XG	WCK*	CKAC	CFGX*	ICU
WLAG*	WGR*	CKCK*	WEAH	WBL	KFKX	WJAL*
WJAN	WSAI	KSD*	KLZ	WOAI	WLAT	WXV*
WHAZ	9XN	WII	KWH	3KY	WHO	6KW*
CFAC	WCX*	WBAH	CFA	WOAT	WGAH*	WEAD*
WHAS*	WTAS	KFKB*	WRM	(5NO)	WLAO	5RK*
WGY*	WPAD	WTAM	WSY*	CHCE	WHAA	CFCD*
KYW*	9DYY	WOO*	KFBV	5CA	WDAV	KDZE*
WOAE	WWJ*	WAAZ	WFI	(2LO)	WKY	WKAQ
WJAZ*	WEB	WJAG	WOI	9CFK	WHN	WWAC
WOAW*	WOO*	WBAV	WIP*	9DXL	WBY	WPE
WFAA*	WEAS*	WRC*	KFDY	WIAS	CYL	CJCI
WDAF*	WDAR*	WHA	KON	WSAB	KFED	CFCN
WSB*	KFEB	KOI	WMAJ	WBZ	KFMX	WDAN
KDKA	WBAP*	WBAK	WEV	WEAN	WCAN	9BD
WMAQ*	KPO*	NAA*	WMAK	WNAC	KFFQ	9CDK
KFI*	WCAE*	WOR	KLX	WJAR*	WIAO	9CDU
KHJ*	WJZ	WPAH	KGW*	WNAD*	WPB	KOE
WLW	WHAN	WJAO	WGAM	WPAM	KFEL	9DCK
WCBD	CFAC	WHAM	KGN*	WMAB	5CU	WDAP*

Thirty-four of these stations are over a thousand miles, and the whole list includes over thirty-five states, all but one of the Canadian Provinces, Cuba, England, Porto Rico, Mexico, Honolulu and Alaska.

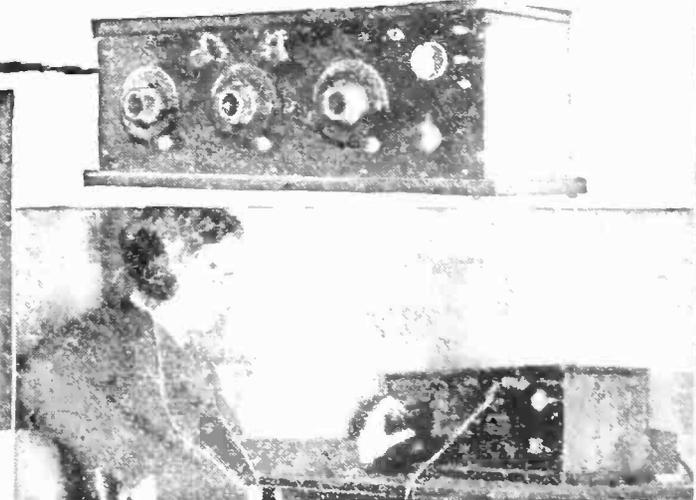
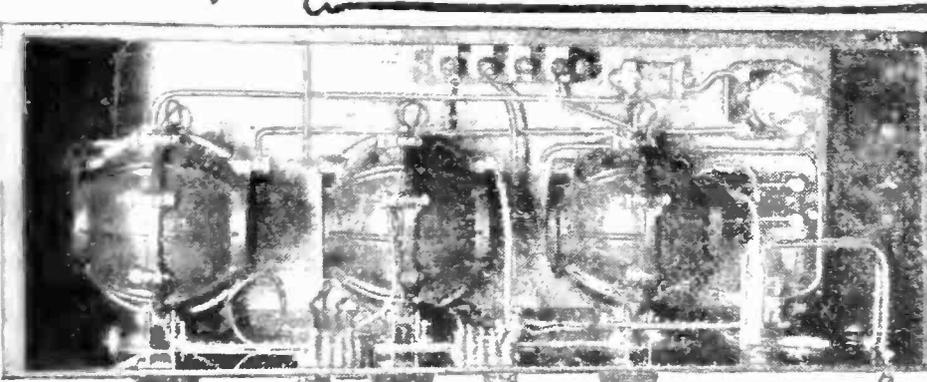
Let's give nine hurrahs for Kellogg parts. the best in the world.

Yours very truly, H. C. BROWN, Peoria, Ill.



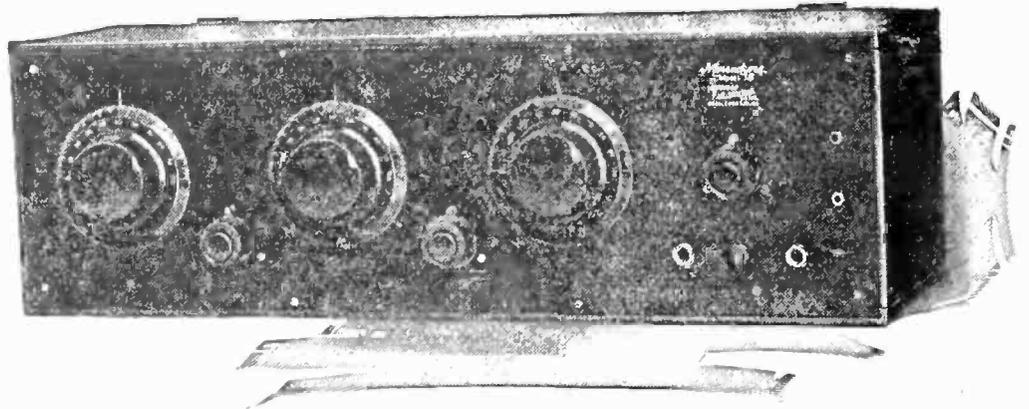
Every piece of Kellogg radio is guaranteed—your protection of absolute satisfaction. Get the most out of your favorite circuit by using Kellogg parts. USE—is the Test

Kellogg Switchboard & Supply Co.
1066 W. Adams St., Chicago, Ill.



★ Tested and approved by RADIO BROADCAST ★

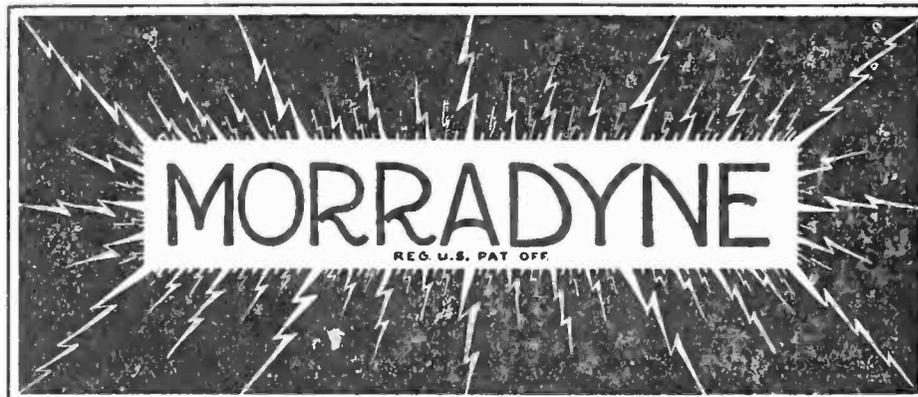
*Perfect
Radio
Reception*



Model III, Morradyne Receiver

is what experts say. Its rare selectivity, constant repetition of distance records, and superior tone quality all combine to win for

The



Receiver

unreserved admiration. You will find it simple to operate—no special knowledge of radio required.

Manufactured by MORRISON RADIOPHONE CO., Inc.

Jobbers and dealers

Bridgeport, Conn.

Write for our plans.



Clean Your Set Behind the Ears

HOW can you expect to get the most out of a set filled with dust and dirt? Every radio fan needs a NODUST to keep his outfit *clean* and *efficient*! A bright, shiny panel and a highly polished cabinet won't make your radio work any better; your set must be clean *inside*.

Each powerful blast of a NODUST shoots compressed air into every nook and corner of your set and removes all particles of dirt. You need a NODUST handy to keep your set working at its best.

NODUST

Strongly constructed of best materials, 12 inches long. Wood mountings to prevent short circuiting. Easy to operate, yet very effective. If your dealer has not received his supply yet, send us a dollar bill, and we will ship your NODUST by return mail.

PEIFFER & COMPANY

86 Liberty St.

Newark, N. J.

The Andrews ★
Deresnadyne
Radio Receiving Set

combines tone quality and selectivity with distance and volume. Price \$150 without accessories. Write for literature.

ANDREWS RADIO CO.

327 S. La Salle St., Chicago

CARTER "ONE-WAY"
Plug



50c

Look this plug over. Compare it with all others, then you will know why set and loud speaker manufacturers have adopted it as standard equipment. There is nothing to equal it for quality, workmanship, design and service.

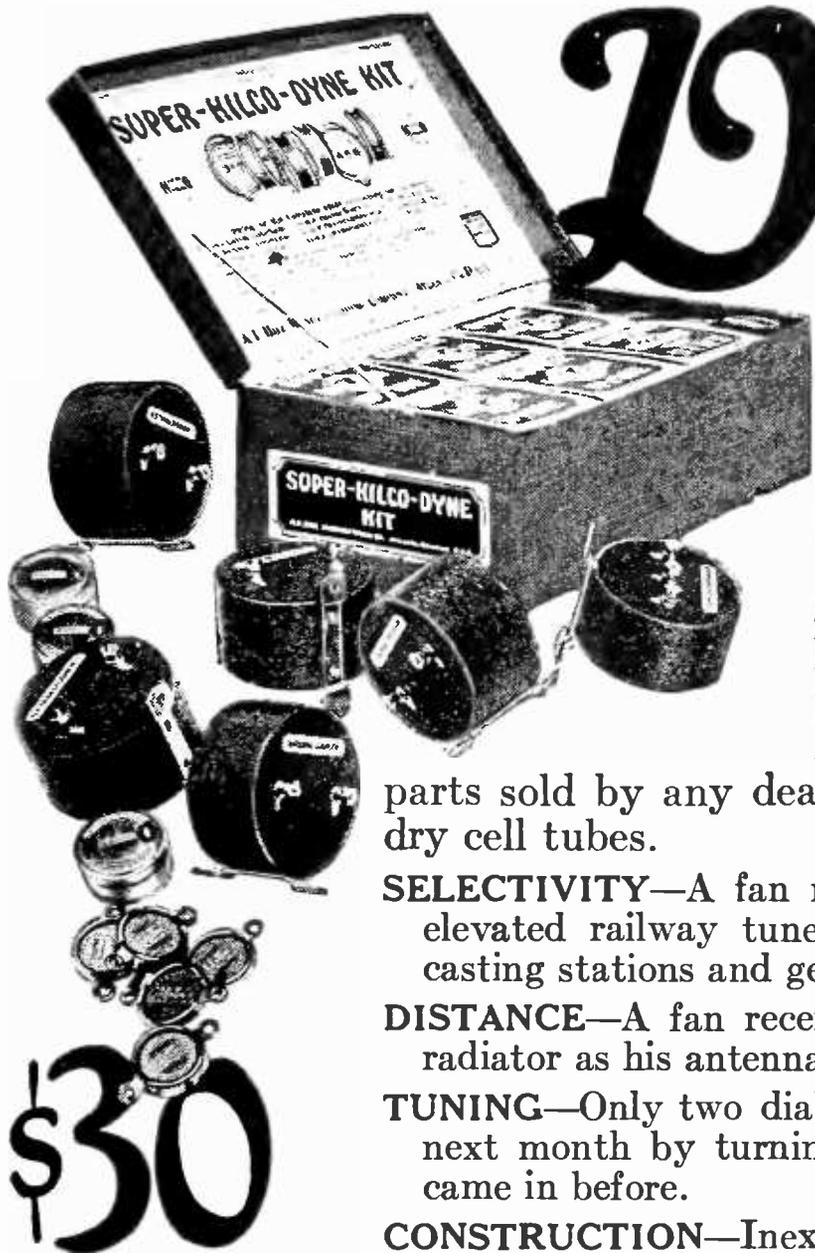
Don't waste time and money experimenting, buy the best—buy Carter. Any dealer can supply. Write us for catalogue.

In Canada—Carter Radio Co., Limited, Toronto



★ Tested and approved by RADIO BROADCAST ★

Different -and superior to any other circuit!



THE SUPER HILCO-DYNE RECEIVER—a seven tube set superior in every way and different from the conventional super heterodyne (note wiring diagram below) is made from the \$30 SUPER HILCO-DYNE KIT and about \$45 worth of standard radio

parts sold by any dealer. It operates either on storage battery or dry cell tubes.

SELECTIVITY—A fan receiving in New York next to the high voltage elevated railway tunes in or out all the nearby high powered broadcasting stations and gets what he wants when he wants it.

DISTANCE—A fan receiving in a large metropolitan hotel uses the steam radiator as his antenna and gets coast to coast reception.

TUNING—Only two dials. Stations can be located to-day, to-morrow or next month by turning back the dials to the place where those stations came in before.

CONSTRUCTION—Inexperienced fans all over this continent have built these sets without trouble.

RADIATION—Not a squeak, squawk or squeal comes from the SUPER HILCO-DYNE to bother your nearest neighbor. It does not radiate.

DISTORTION—Absolutely true tone qualities from the lowest note of a base horn to the highest note of a coloratura soprano.

VOLUME—You can dance any night with a SUPER HILCO-DYNE RECEIVER. Loud speaker reception on all stations.

WAVE RANGE—90 to 600 meters.

SIZE OF RECEIVER—Only 7" x 28" panel.

Each SUPER HILCO-DYNE KIT is thoroughly tested and the air core transformers are matched and balanced in our own laboratories.

Here is selectivity, great distance, volume, clarity, easy tuning, simple construction. It is YOUR set, custom built to YOUR requirements. It is the ONE you want; the ONE you have been hoping for. Order from your dealer or send for descriptive literature on the SUPER HILCO-DYNE KIT and other famous Hilco radio apparatus. Address Dept. 12.

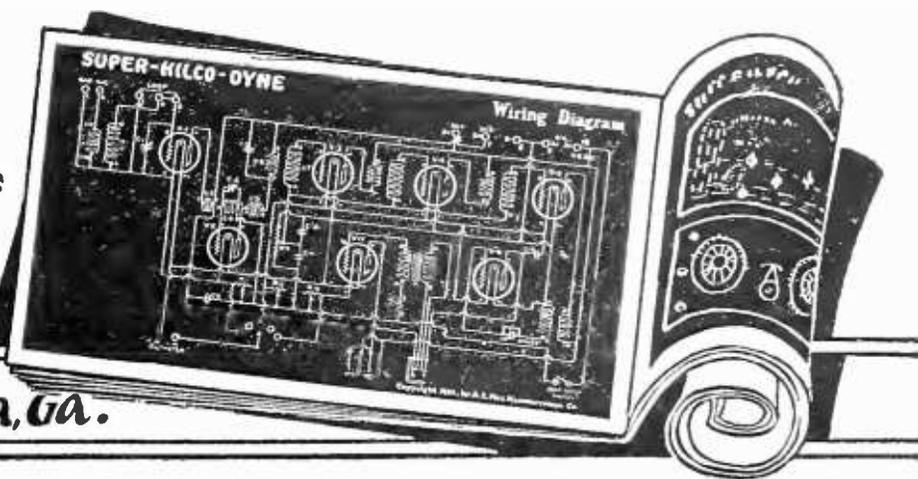
Scientific Radio apparatus that is distinctively different and superior in efficiency and appearance

**THE KIT
CONTAINS**

The six essential SUPER HILCO-DYNE instruments, together with the required number of HILCO Precision Fixed Condensers and a 20-page book thoroughly describing and illustrating by text and blueprints all details of the SUPER HILCO-DYNE RECEIVER.

Price of book separate from the kit—\$1.00

SUPER-HILCO-DYNE BOOK



A·E·HILL MFG·CO· Atlanta, Ga.

Are You Ever Ashamed of Your English?

DO YOU say "who" when you should say "whom"? Do you say "between you and I" instead of "between you and me"? Do you mispronounce common words in your speech or use them incorrectly when you write?

Many a man has been held down all his life and suffered untold embarrassment because of mistakes in English.

You do not need to make these mistakes any longer. Right at home, in spare time, in the privacy of your own room, you can make up the education you missed in the days that you should have been at school.

The International Correspondence Schools will teach you, just as they have taught thousands of other men, by a simple new method which shows you instinctively which word to use and how to use it.

Mail the coupon to-day for free booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 8300-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

GOOD ENGLISH

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| <input type="checkbox"/> Business Management | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> French |
| <input type="checkbox"/> Personnel Organization | <input type="checkbox"/> Advertising |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Better Letters |
| <input type="checkbox"/> Business Law | <input type="checkbox"/> Show Card Lettering |
| <input type="checkbox"/> Banking and Banking Law | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Accountancy (including C.P.A.) | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Nicholson Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Common School Subjects |
| <input type="checkbox"/> Private Secretary | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Spanish | <input type="checkbox"/> Illustrating |

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| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Blue Print Reading |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Contractor and Builder |
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| <input type="checkbox"/> Steam Engineering <input type="checkbox"/> Radio | <input type="checkbox"/> Mathematics |

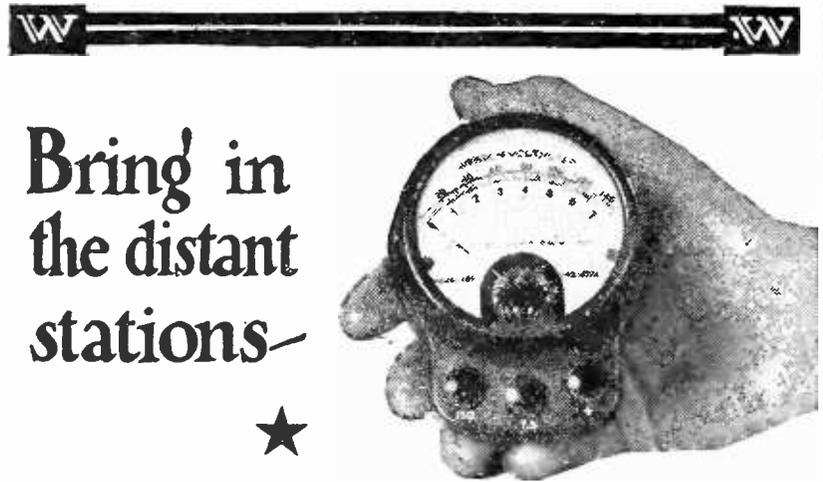
Name.....

Street Address.....

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

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



Bring in the distant stations—



If you can't get them, don't blame your set. Your batteries may be weak, or probably your tubes are not being operated at the correct filament voltage. Check up with this Weston Table Volt-

meter. It insures best radio results. Tests A, B and C batteries. Locates trouble instantly. Full directions given so anyone can use it. Step into the nearest radio store and ask to see it.

Weston Electrical Instrument Co.

179 Weston Avenue

Newark, N. J.

WESTON

Electrical Indicating Instrument Authorities Since 1888

STANDARD—The World Over

Gold Plated Aerial Works Wonders

Amazing new antenna **The Goldenrod** works wonders with any set. Clearer reception; more stations; greater volume; no "fading"; won't corrode, lasts lifetime. Used by Government, Ocean Liners, Broadcasting Stations.

Now Everyone Can Have It

Solid Phosphor Bronze Wire, heavily plated with 18 kt. gold. Gold antenna long known to be best, but too costly. Now thru Goldenrod methods of manufacture, every set user can have one.

FREE illustrated folder giving complete details and proof of wonderful results from Goldenrod Aerial—"Best Because It's Gold Plated." Write quick and soon get new joys in radio reception!

IMP RADIO CORPORATION

Dept. 102

6 East Lake Street,

CHICAGO

Radio and Electrical Mailing Lists

- | | | |
|---|----------|--------|
| 15,369 Radio Dealers Retail..... | per M. | \$7.50 |
| 1,670 Radio Mfgs..... | per list | 15.00 |
| 2,321 Radio Supply Jobbers..... | per list | 20.00 |
| 402 Radio Mfgs. complete sets..... | per list | 5.00 |
| 16,000 Electrical Supply Dealers..... | per M. | 7.50 |
| 610 Electrical Supply Dealers (who).... | per list | 8.50 |

Can furnish all other Radio and Electrical Lists and all other classifications. Ask for General Price List and Red Book.

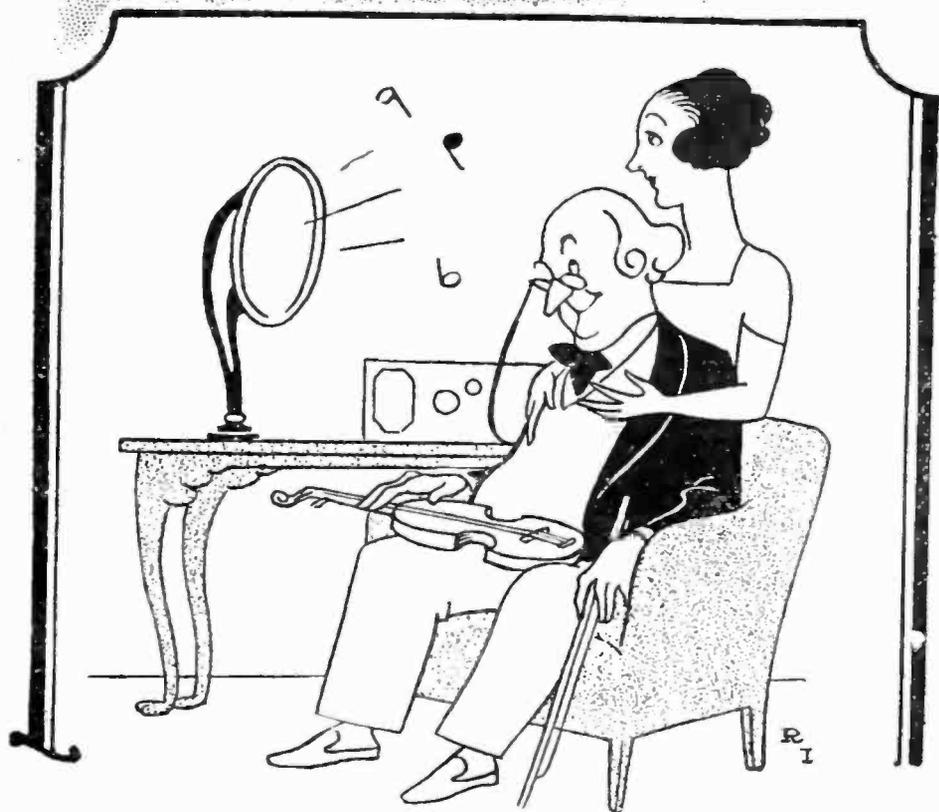
A. F. WILLIAMS, Mgr., List Dept.
Trade Circular Addressing Co.

168 W. Adams Street

Chicago, Ill.

Established 1880

★ Tested and approved by RADIO BROADCAST ★



Radiola Loudspeaker

Type UZ-1325

Now \$25.00



Music for the critical

Time was when people were so impressed with the wonder of radio, and so entertained by the fun that came over, that they actually didn't mind the bluster of a noisy horn. But most of us aren't like that now. We want music that is music—we want speech that is really human speech—unclouded by horn sounds. And we can have it now—with a Radiola Loudspeaker.

You cannot blame every extraneous sound on the loudspeaker. But if your set is working perfectly, all it needs, to give you clear, faithful, undistorted reproduction, is a Radiola Loudspeaker. Hear one today, and if you really want to judge the difference, ask to hear it in competition with others.

Radiola

REG. U. S. PAT. OFF.

LOUDSPEAKER ★

This symbol
of quality



is your
protection

RADIO CORPORATION
OF AMERICA

Sales Offices:

233 Broadway, New York
10 So. La Salle St., Chicago, Ill.
28 Geary St., San Francisco, Cal.

★ Tested and approved by RADIO BROADCAST ★

WORLD'S RECORD Coils

For ROBERTS 2 and 4 Tube Sets

USING these coils W. B. Magner 6BCP, San Pedro, Calif., and F. D. Bell, Waihemu, New Zealand, held two way communication for the first time in history over 6900 miles for one hour and a half Sept. 21, 1924, establishing a WORLD'S RECORD.

Using New LOW LOSS Principle

An innovation in broadcast receivers, results never before attained. These coils, and important arrangement, construction and changes made possible this record. Rebuild your old set and get the same results. Complete set coils, instructions, layout, blue prints, etc., showing improvements.



Broadcast Band 200 to 600 Meters } \$7.00 Postpaid
Amateur Band 60 to 200 Meters }

Complete Kits, LOW LOSS Features Throughout \$55.00

WORLD'S RECORD COILS CO.

W. B. Magner, 6 B C P, Pres.

464 6th Street, San Pedro, Calif.

The
Quiet NILES

Battery Charger

It's Easier To Do It At Home
Charge your batteries at home with a Quiet Niles. It's easier, quicker and cheaper. No bulbs. No liquids. No fumes. Light to handle. Delivers 72% of the current. Model A for 6-volt batteries \$19.00; Model AB for 6-volt and 24-volt batteries \$21.00.
Write for literature.

NILES MANUFACTURING CO.
Dept. 80 Ypsilanti, Mich.

REDUCE STATIC

Pat.
Pending
690459



by using our super-sensitive
Omni-Directional Aerial

*Collapsible, Ornamental,
Mechanically Perfect*

Can be used either as a loop
or antennae inside or outside.

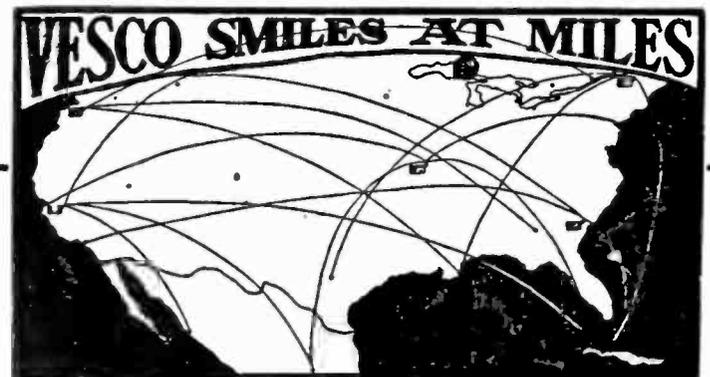
A wonderful value featured at a
price within the range of all.

Ask your dealer or send order direct

\$10.00
Prepaid in U. S.

The Portable Globe Aerial Co.
1602 Locust Dept. 12 St. Louis

No Library Complete Without Kipling Complete



ON ONE TUBE

BIG FREE BOOKLET tells the story. California users of **CROSS COUNTRY CIRCUIT** hear Atlantic Coast, Canada, Cuba, Mexico, and Hawaii. Atlantic Coast users hear England to California. Our new plan makes this set easiest and cheapest to build. One hour puts in operation. One tuning control. No soldering. Any Novice can do it. **BIG BOOKLET FREE** or complete instructions for 25c stamps or coin.

VESCO RADIO CO.

Box RB-117

Oakland, California

★ Tested and approved by RADIO BROADCAST ★

Pure, clear tones from your speaker, must start with your transformers

You want more than noise from your loud speaker.

You want *pure* tones, clear, mellow reproduction.

But no speaker can be *better* than your A. F. transformers.

And *any* speaker will be improved when you use transformers that are designed for loud speaker use!

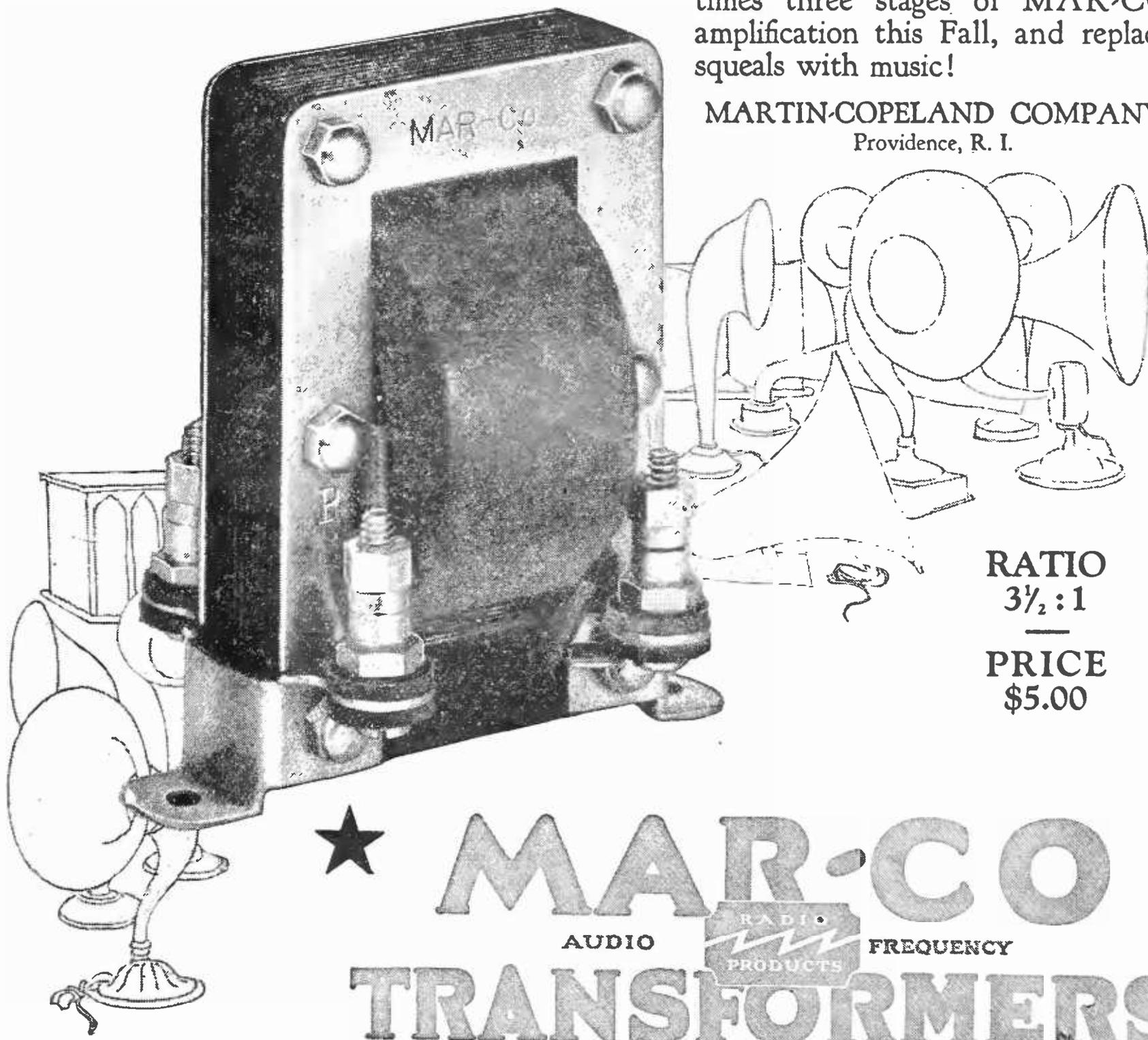
Transformers that produce the greatest possible *amount* of amplification unfortunately also introduce imperfections in the tone. And the speaker magnifies such imperfections.

Fortunately, however, when the *tone* is *clear*, you don't need anywhere near so much *volume* of sound.

In designing MAR-CO transformers, an amplification ratio has been used, which provides the *most* volume that is consistent with absolute purity of tone. And, of course, they are built, like all other MAR-CO parts, with the famed MAR-CO precision that stops leaks and conserves radio energy!

So, now, those who value tone purity highly, will use two and sometimes three stages of MAR-CO amplification this Fall, and replace squeals with music!

MARTIN-COPELAND COMPANY
Providence, R. I.

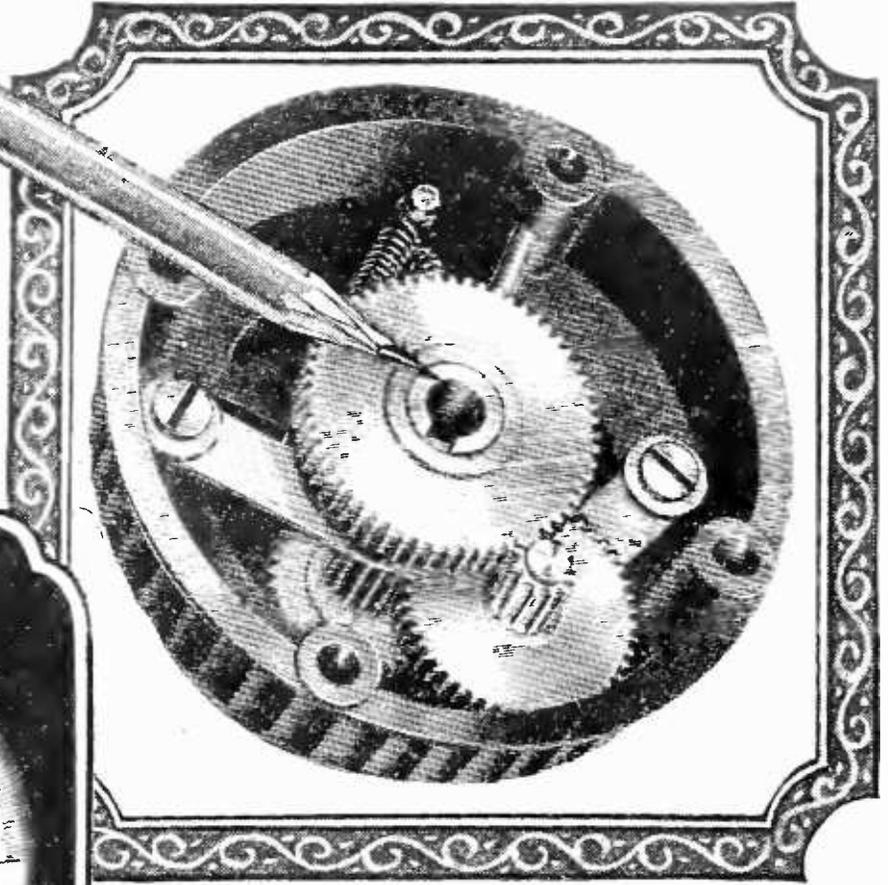
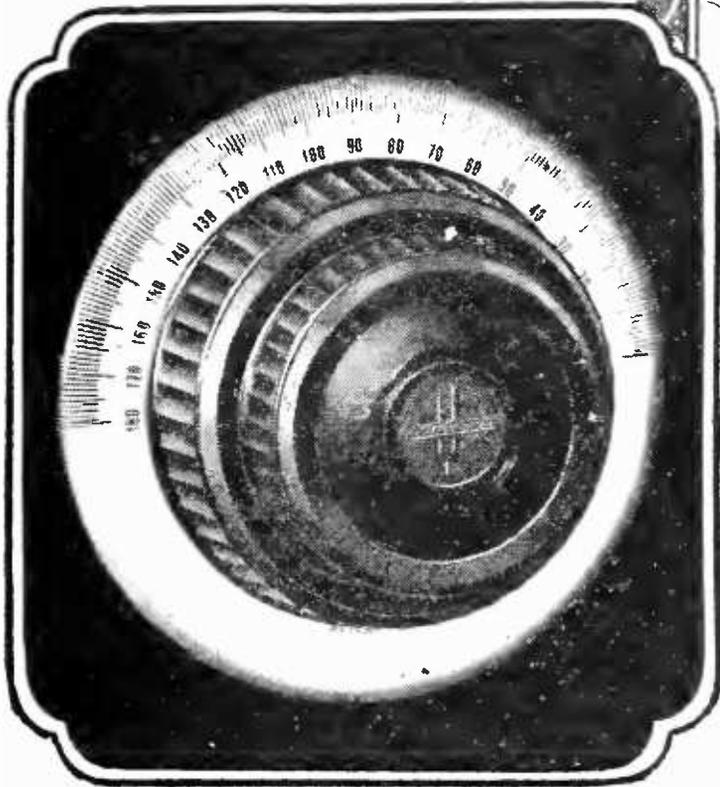


RATIO
3 1/2 : 1
—
PRICE
\$5.00

★ **MAR-CO**
AUDIO **RADIO PRODUCTS** FREQUENCY
TRANSFORMERS

★ Tested and approved by RADIO BROADCAST ★

All
Wobble
Eliminated



By Long
Center Bushing

New
ACCURATUNE
Features

- Geared 80-1 ratio.
- No back lash.
- No cutting of condenser shafts.
- Flush panel mounting.

Canadian Rep.
Radio Ltd. Montreal



LOOK at that long center bushing! Watch the new model Accuratune when you tune in—how smooth it operates—how precise its movements without the slightest indication of wobble.

Few vernier dials, built as they must be to take all standard condenser shafts, are designed as the Accuratune to positively eliminate this universal objection—dial wobble. And just this one point of refinement characterizes the complete makeup of the Accuratune Micrometer Control—features that assure most unusual tuning efficiency.

Micrometer Controls easily replace ordinary dials without any set alterations. Just tighten the set screw on the large knob. At your dealers, otherwise send purchase price and you will be supplied postpaid. Price \$3.50.

ACCURATUNE

GEARED 80-1

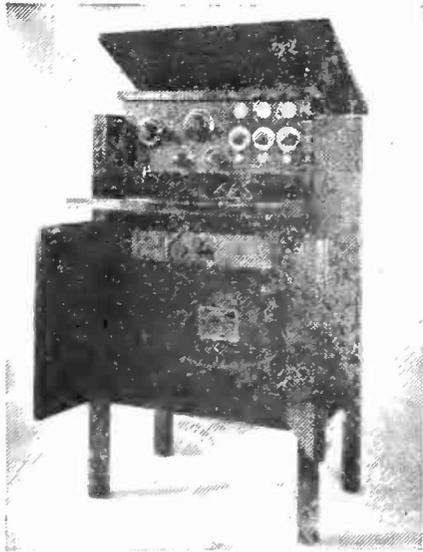
MICROMETER CONTROL

MYDAR RADIO COMPANY

9-D Campbell Street

Newark, N. J.

★ Tested and approved by RADIO BROADCAST ★



If You Built Your Radio Set You Can Build This Cabinet

Construction of Cabinet has special groove arrangement to hold panel rigid which prevents warping and also makes it very easy to remove your set. Special shelf provides ample room for writing, these special features make this cabinet very adaptable for your radio set.

Cabinet can be built by you from detail plans and instructions furnished by us at the small cost of \$3.50. These plans provide for sets with panels 7 in. high and any width desired, accurate in every detail, giving correct measurements for each piece of wood which is numbered to correspond with assembly sheet showing complete construction of the cabinet.

Mail your remittance by bank draft, money order, or personal check and receive these plans and complete instructions by return mail and start your cabinet at once.

WAL RADIO CABINET CO.

Fort Lee

New Jersey

ULTRA ANTENNA

LOW LOSS INDUCTANCE

ARISTOCRAT OF LOOPS

D
I
S
T
I
N
C
T
I
V
E

B
E
A
U
T
I
F
U
L



PRICE
FIFTEEN DOLLARS

Shipped neatly
packed

Completely
assembled

The ULTRA ANTENNA represents a great advance in loop design both from an energy collecting and appearance standpoint. Circular skeleton construction. Maximum Area with minimum conductor. Low capacity losses. Stagger wound on polished black Dupont Pyralin. Low dielectric loss. 16 in. in diameter yet only 6 oz. of dielectric in magnetic field! Axially mounted precision magnetic compass for logging. Practically indestructible. Three types for 31-23-11-plate tuning condensers. Literature? ASK YOUR DEALER OR OUR

Sales Office: 4417 Vancouver Ave., DETROIT, MICH.

PHILLIPS LABORATORIES, GRAND RAPIDS, MICH.

NEW LAMP BURNS 94% AIR

Beats Electric or Gas

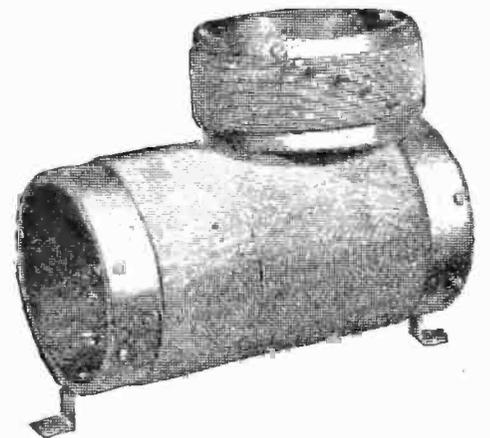
A new oil lamp that gives an amazingly brilliant, soft, white light, even better than gas or electricity, has been tested by the U. S. Government and 35 leading universities and found to be superior to 10 ordinary oil lamps. It burns without odor, smoke or noise—no pumping up; is simple, clean, safe. Burns 94% air and 6% common kerosene (coal oil).

The inventor, G. R. Johnson, 609 W. Lake St., Chicago, Ill., is offering to send a lamp on 10 days' FREE trial, or even to give one FREE to the first user in each locality who will help him introduce it. Write him to-day for full particulars. Also ask him to explain how you can get the agency, and without experience or money make \$250 to \$500 per month.

The Authorized Cockaday Coil

\$5.50

Specified in
October
POPULAR
RADIO
as



Cockaday Precision Coil

The only coil specified by Mr. Cockaday in his New Four Circuit Tuner, with resistance coupled amplification because it meets all his specifications.

The only authorized Cockaday Coil, made in strict accordance with specifications of Laurence M. Cockaday, inventor of the famous Cockaday Four Circuit Tuner. Wound on hard rubber tubing, $\frac{1}{8}$ inch wall, with No. 18 D. S. C. copper wire which insures selectivity, greater volume, sharp tuning and maximum sensitivity. Guaranteed.

Gets distant stations easily and clearly. Hundreds have substituted this quality coil for those of inferior make and are amazed at the improved reception, selectivity and general D-X results.

At your dealers, otherwise send purchase price and you will be supplied postpaid. Canadian price \$7.75, Canadian Distributor Perkins, Ltd., Montreal

PRECISION COIL CO., Inc.

209-E Centre St., New York

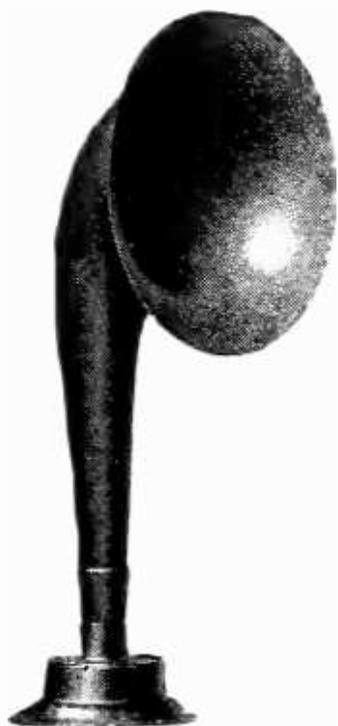
DX "mushy"?

FREE BOOKLET

On "Tube Control" tells how to bring in distant stations clear and loud. Just drop a postcard to

UNITY MFG. CO.
230 North Halsted Street
CHICAGO, U. S. A.

★ Tested and approved by RADIO BROADCAST ★



You'll Want Both These ★ Manhattan Radio Products

The Manhattan Junior Loud Speaker

The Manhattan Junior is the first Loud Speaker with an adjustable *Concert Modulator* to be marketed at the popular \$10.00 price. It is a real loud speaker with a reproducer unit especially constructed to operate the long air column of the horn.

The *Concert Modulator* in the base allows the reproducer unit to be adjusted to varying conditions of operation so that best results may always be obtained.

The Manhattan Junior is a good looking, well built instrument which reproduces the work of broadcasting artists with wonderful fidelity, ample volume and excellent musical quality—a wonderful value for \$10.00!

Hear one at your dealer's.

Red Seal Map-Loop Aerial

The Red Seal Map-Loop Aerial is needed to complete the attractive appearance of any set designed for loop reception. It replaces the usual spider's web of wire with a handsome broadcasting map—an ornament in perfect keeping with your good looking radio cabinet and the other tasteful furnishings of your home.

In the Map-Loop the wires are concealed between two maps of the United States on which the broadcasting stations are listed and located. The frame and base are solid mahogany. Further interest and decorative quality has been given the maps through faithfully employing the odd technique of the old map masters of the 17th Century.

The Map-Loop is not only extremely good looking but is technically correct and designed for easy, convenient operation with the superheterodyne. Price, \$20.00.

Manhattan Electrical Supply Co., Inc.

New York

Chicago

St. Louis

San Francisco

ASK FOR
Manhattan
RADIO PRODUCTS

MADE BY THE MAKERS OF THE FAMOUS RED SEAL DRY BATTERIES

★ Tested and approved by RADIO BROADCAST ★

**10 Days
FREE
TRIAL**



**UNCONDITIONALLY
GUARANTEED 1 YEAR**

**The
New
Majestic Speaker**

The Last word in Radio Re-Creation

Embodies all proved principles of reproduction. Delicate shading, inflection and modulation of voice—this and the musical instrument re-created with remarkable volume and clarity of tone, with astounding purity and faithfulness, even when sending is weak. **Floods room with best that's in your set.** Horn acoustically perfect. No battery needed—simply plug in like headphones. Handsome crystalline finish fibre horn approx. 22" high; heavy base prevents tipping. Polar indicating connecting cord included.

You Save Middlemen's Profits

Send direct—today—for your Majestic Speaker. Try it for ten days. Hear distant stations plainly. Test its clarity of tone and volume—no distortion, no harshness, no rattle, no blare or screech. **Compare it with loud speakers selling for \$15 to \$25 and more.** Then if you're not satisfied, simply return it at our expense and back goes your money. You—and you alone, are the judge. So mail your order today.

JAMES M. DAVIS CO.

30B Euclid Arcade, Cleveland, Ohio

Send a Majestic Speaker on your 10-day free trial offer. I enclose \$8.50. I reserve the right to return it at your expense within ten days if not satisfied and receive full refund of my money.

Name.....
Address.....
City..... State.....

R A D I O D Y N E

NO LOOPS—NO AERIAL ★

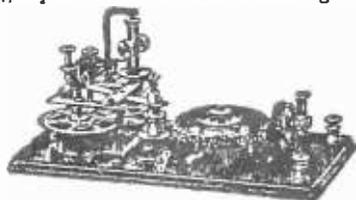
Ready for operation by grounding to a water pipe or radiator and throwing a few feet of wire on the floor. Uses any standard tubes—dry cell or storage battery. Extremely selective Simple to operate—**only two controls.** Wavelength from 200 to 700 meters. Write for Folder describing this (antennaless) receiver.

WESTERN COIL & E. CO.
318 Fifth Street Racine, Wis.

"No library complete without Kipling complete"

LEARN THE CODE AT HOME with the OMNIGRAPH

"Just Listen—The Omnigraph will do the teaching"



THE OMNIGRAPH Automatic Transmitter will teach you both the Wireless and Morse Codes—**right in your own home**—quickly, easily and inexpensively. Connected with Buzzer, Buzzer and Phone or to Sounder, it will send you unlimited messages at any speed, from 5 to 50 words a minute.

THE OMNIGRAPH is not an experiment. For more than 15 years, it has been sold all over the world with a money back guarantee. The OMNIGRAPH is used by several Depts. of the U. S. Govt.—in fact, the Dept. of Commerce uses the OMNIGRAPH to test all applicants applying for a Radio license. The OMNIGRAPH has been successfully adopted by the leading Universities, Colleges and Radio Schools.

Send for **FREE** Catalogue describing three models. **DO IT TO-DAY.**

★ **THE OMNIGRAPH MFG. CO., 16K Hudson St., New York City**

If you own a Radio Phone set and don't know the code—you are missing most of the fun

★ Tested and approved by RADIO BROADCAST ★

**Power "B" Supply
from your light circuit**

See page 268 December Radio Broadcast

Assemble your own power unit easily and quickly.

**Kit of Finished Parts Ready to Wire
\$19.75**

results equal to any finished power unit

Kit contains—power transformer—30 Henry choke—4 Mf condensers—Det. & Amplifier variable voltage controls—induction shielding metal cabinet. (Parts sold separately if desired.)

Radio Corp. Super Het. style loops \$12.00

Get details of new Hi-Power Super-Heterodyne—The Knock-out Super

All parts for Ultradyne — Tropadyne — or Super-Het. Circuit

1716 style long wave transformers \$5.75

Radio Freq. Iron and Long Wave windings to your specifications

Our Knock-Out Audio kit gives ideal results Aeriola style space wound low loss 2 rotor unit \$5.90 Gov't. BB-4 Edison batteries for 199's. A few at \$6.85

Dealers—get our new list

Our products embody high class material and workmanship

A special department takes care of Radio receivers and rebuilding

Quality Radio Shop

Richmond

Indiana

Magnadyne Reflex Coils

Manufactured by Coast Coupler Co.

ADVANTAGES

The Magnadyne Reflex Coils have greater efficiency because they minimize dielectric losses and distributed capacity. No substance is used to distort operation. Adaptable to every set using a reflex circuit.

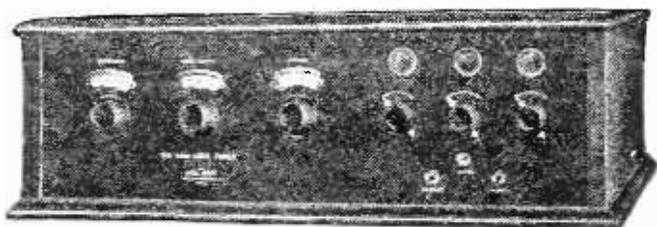
**Perfect your Reflex Set
with Magnadine Coils**

Mail us your check for \$2.00 and we will send you a pair of coils postpaid anywhere in the U. S.

COAST COUPLER COMPANY

East 7th Street Long Beach, California

Satisfaction plus better reception
 A FEATURE IN
The Brunswick de Luxe Low Loss Receiver



with
VISIDIALS

Sharp tuning, selectivity without vernier made possible by the use of visidials. Brunswick De Luxe Low Loss receiver equipped with visidials forms an unequalled combination. Low Loss

instruments of the highest grade are used throughout the entire circuit. It is without doubt the "lowest loss" receiver that has ever been offered to the public.



Price \$65.00

Dealers write for attractive discounts

HAROLD M. SCHWAB, Inc.

Manufacturers and Distributors

55 VESEY STREET

Dept. RBJ

NEW YORK CITY

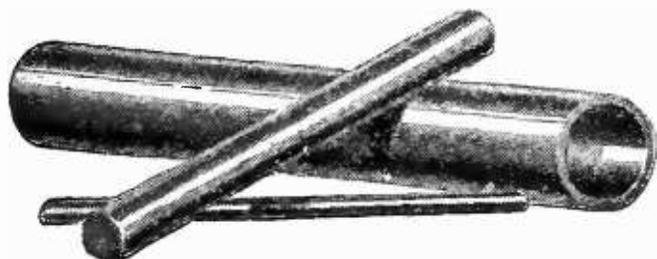
Daniel Boone: Wilderness Scout

by Stewart Edward White

An out-of-doors story for fathers and sons

At bookstores, \$1.75

Doubleday, Page & Co.



**SPAULDING
 BAKELITE-DURESTO
 TUBES**

used by

POSTER & CO (Cut to length for retail trade)
 PHENIX RADIO CORP. (Ultradyne Sets)
 WARE RADIO CORP. (Neutrodyne Sets)
 ALLEN D. CARDWELL Mfg. Co. (Cardwell Sets)

The unqualified endorsement of leading radio manufacturers is the greatest recommendation of Spaulding Bakelite-Duresto quality.

These men know quality depends solely upon manufacture. They know by experience that Spaulding Bakelite-Duresto tubes possess high dielectric properties and great strength; that they will not warp; do not split, and do not laminate.

Spaulding

BAKELITE-DURESTO

SPAULDING FIBRE COMPANY, Inc., TONAWANDA, N. Y.

Factory: Tonawanda, N. Y.

Sales Offices—Warehouses

484 Broome St., N. Y. C. 141 N. 4th St., Phila.

659 W. Lake St., Chicago 15 Elkins St., Boston

310 E. 4th St., Los Angeles 171 2nd St., San Francisco

509 First National Bank Bldg., Milwaukee

FREE



To Each Purchaser of a **World Battery**

A 24-Volt "B" Storage Battery positively given FREE with each purchase of a WORLD "A" Storage Battery. The WORLD Battery is famous for its guaranteed quality and service. Backed by years of Successful Manufacture and Thousands of Satisfied Users. You save 50%.

Prices That Save and Satisfy

Auto Batteries		Radio Batteries	
6-Volt, 11 Plate	\$12.25	6-Volt, 100 Amps.	12.50
6-Volt, 13 Plate	14.25	6-Volt, 120 Amps.	14.50
12-Volt, 7 Plate	17.00	6-Volt, 140 Amps.	16.00

Shipment Express C. O. D. subject to examination. 5 per cent discount for cash in full with order.

2-Yr. Guarantee Bond in Writing With Each World Storage Battery

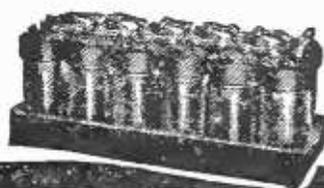
proves satisfactory World performance. Mail this ad with your name and address—we will ship battery day order is received; and give you your choice of "B" Storage Battery or a handsome nickel finish Auto Spotlite, FREE. Write TODAY.

WORLD BATTERY COMPANY

1219 So. Wabash Ave. Dept. 24, CHICAGO, ILL.

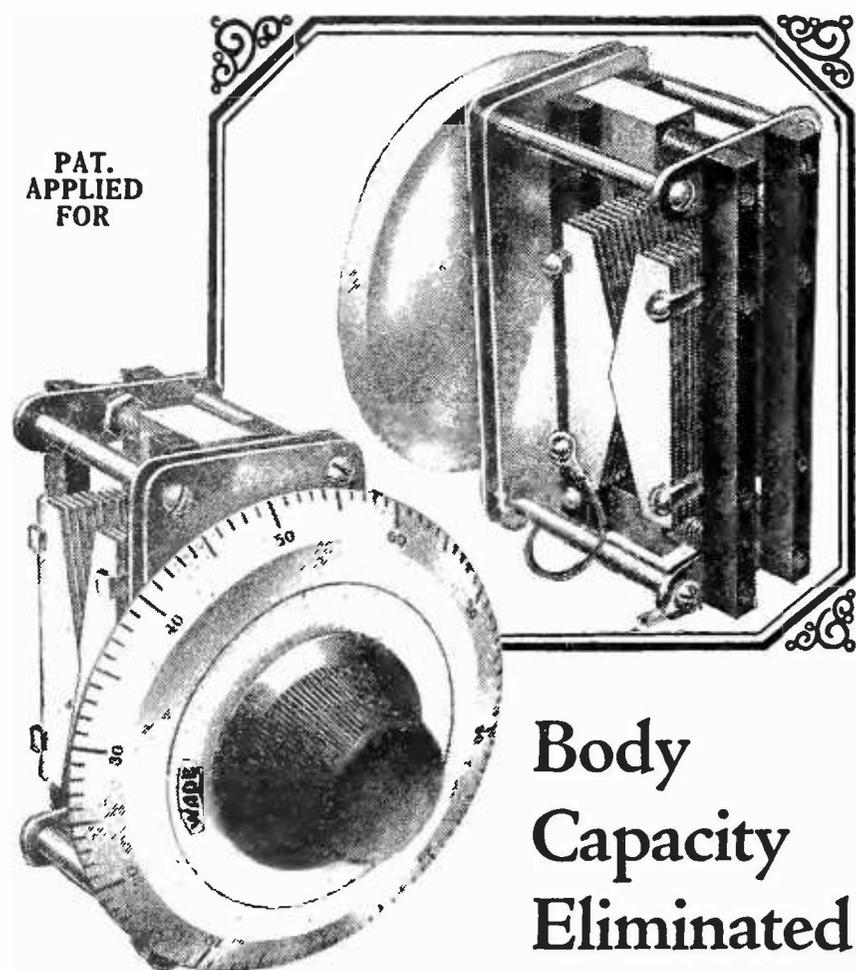
This FREE "B" Storage Battery takes the place of dry cell "B" batteries. Can be recharged and will last indefinitely. To be sold retail for \$6.00. It is the only battery of its kind equipped with solid rubber case—and insurance against acid and leakage. Take advantage of this remarkable introductory offer NOW. (To those who prefer it, we will send FREE a handsome nickel finish Auto Spotlite, instead of the "B" Battery. Be sure to specify which is wanted.)

GIVEN FREE
 To introduce this new and superior World "B" Storage Battery to the Public



★ Tested and approved by RADIO BROADCAST ★

Wade Low-Loss Condenser Unit



PAT.
APPLIED
FOR

Body
Capacity
Eliminated

by Separately Grounded Frame

THE Wade square-law variable condenser marks such a drastic advance in construction and compels so complete a revolution in all previous ideas of efficiency that you can appreciate its unusual performance only by actual test.

Separately grounded frame insulated from both sets of plates *shields the condenser from all body capacity effects*—a vital feature, exclusively in Wade condensers.

All Wade condensers are equipped with full-turn, silvered, 4-inch, vernier dials, 32-1 ratio, giving the finest possible control with absolutely no back-lash.

A new idea in one-piece brass plate design gives accurate square-law curve and lowest minimum capacity.

Negligible loss is obtained with the use of hard rubber insulating strips of long leakage paths placed in the weakest part of the electrostatic field. Its small size, ruggedness, and single hole mounting make Wade the most desirable condenser on the market.

All sizes, complete with 4-inch vernier dial, for:

Short Wave, .000125 mfd. \$7.50

Tuned Radio Frequency .00025 mfd. \$7.75

Super-Heterodynes, .0005 mfd. \$8.00

Oscillators, Wave-meters, etc., .001 mfd. \$8.50

At your dealers, otherwise send purchase price and you will be supplied postpaid.

WADE MANUFACTURING CO.

1819-C Broadway

New York

WADE

TITAN

A 5 Year 48 V. "B" Battery
6000 Milliamperere Hours!



The life of the Titan rechargeable "B" battery begins when you fill the cells with electrolyte—not before.

The Titan is shipped dry charged. No initial charge necessary.

Capacity in Ampere Hours in your "B" battery is important to your receiver.

Buy a Titan and forget your "B" battery troubles. Carefully packed with complete directions. Shipped anywhere.

Titan Rechargeable 48 V. 6000 Milliamperere hour "B" battery **\$17.50**

Ask your dealer or write direct.

GENERAL LEAD BATTERIES CO.

Chapel Street and Lister Ave.

Newark, N. J.

Jobbers and Dealers: Write for our Merchandising plan.



By W. B. MAXWELL:

The Day's Journey

"The novel is a masterpiece of comradeship on the highest level." *Boston Herald.* (\$2.00)

Doubleday, Page & Co.

The Standard of the World



The base-type
Freshman Variable Grid Leak

is the standard for those who build their own sets. It is the most compact and being entirely sealed it always remains unaffected by any climatic conditions.

Complete with either .00025 or .0005 Freshman Condenser—**\$1.00**
without condenser..... .75

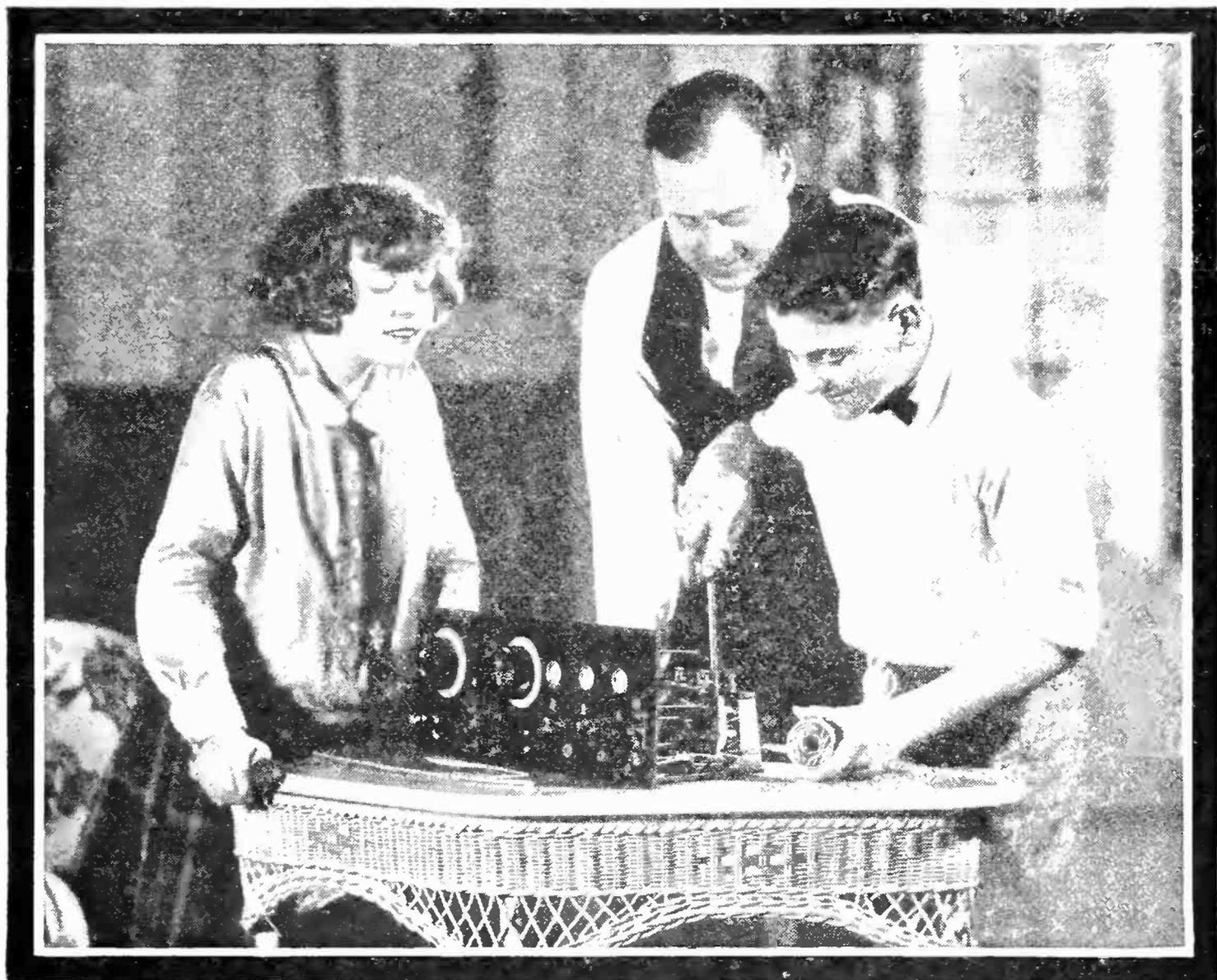
At your dealer's, otherwise send purchase price and you will be supplied postpaid

Chas. Freshman Company, Inc.
106-7th Ave., New York

★ Tested and approved by RADIO BROADCAST ★

KESTER *Radio* SOLDER

(Rosin Core)



Oh boy!

**It Sure is Safe
and Simple**



**"Requires
Only
Heat"**

KESTER Rosin-Core
RADIO SOLDER



IF NOT - USE THIS COUPON

**Chicago
Solder
Company**

4222 Wrightwood
Ave., Chicago, Ill.

Gentlemen: Send me
one can Kester Radio
Solder, for which I en-
close 25c in stamps.

(Postpaid anywhere in U. S. A.)

Name.....

Address.....

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

Dealer.....

**YOUR DEALER
CAN SUPPLY YOU**

★ Tested and approved by RADIO BROADCAST ★

Jiffy RIBBON ANTENNA

Doubles Your Range

Puts you in touch with stations and programs never reached before—gives you better service and wider distance with far greater volume and wonderful clarity.

Get the utmost from your radio set by equipping it with Jiffy Ribbon Antenna. Jiffy is absolutely non-corrosive, immune to kinks or curls and of great tensile strength. The average ribbon soon collects black oxide, retarding reception and cutting down the efficiency of your set. Jiffy remains bright, clean and efficient indefinitely. Jiffy is easily and quickly installed and once up, is up to stay.

100 Feet with 2 Insulators



\$1.50

★ If Your Dealer Cannot Supply You—Mail the Coupon Below TO-DAY!

COUPON

APEX STAMPING CO.
Dept. 37, Riverdale, Illinois

Send me Jiffy Ribbon Antenna. I agree to pay postman \$1.50 each, plus few pennies postage.

Name

Address

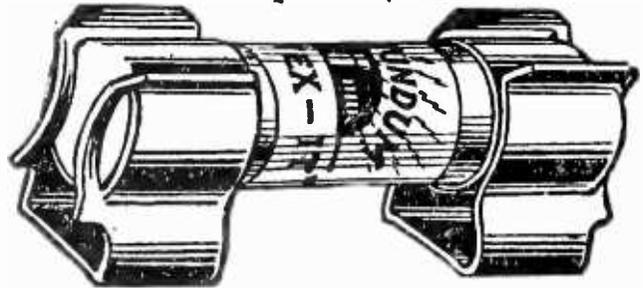
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NO REFLEX COMPLETE WITHOUT CELERUNDUM COMPLETE



DE-TEX-IT

Complete \$1.25



A low loss positive contact Fixed Detector

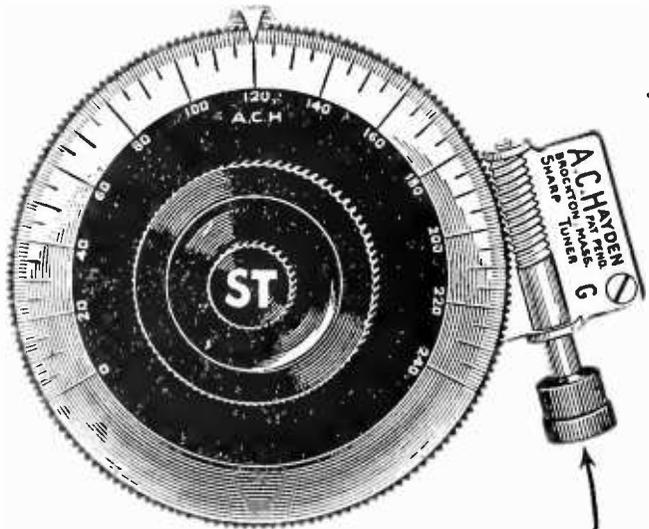
Requires no adjustment. Cat whisker troubles eliminated. Will not burn out.

Best for Reflex Power-Tone-Volume

Jobbers write for samples and discount

Celerundum Radio Products Co.
70-78 Woodbine Street, Wollaston, Mass.

ACH TUNING INSTRUMENT Using Expensive WORM GEAR



Why the A.C.H. is different

- 3 in. DIAL → A.C.H. → (156-t0-1)
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Price 3-inch size.....\$2.50 Price 4-inch size.....\$5.00
Regular fitting 5/16 shaft. 1/4 and 3/16.....5c each extra

The expensive worm gear is a type of gear in a class by itself. Ask for the

WORM GEAR

A new way to spell
SELECTIVITY—WORM GEAR
A WORM GEAR HAS NO SUBSTITUTE OR OTHER NAME

Mail orders—prepaid U. S. A.—if not at dealers

A. C. HAYDEN RADIO & RESEARCH CO.
BROCKTON, MASS., U. S. A.

★ Tested and approved by RADIO BROADCAST ★



J. MATHESON BELL
President, Ozarka, Inc.

I have trained 2274 men to make big money in radio

I can do the same for you

WHO were these men? They came from all walks of life. I have just looked up ten of them. One school teacher, one railroad man, one drug clerk, one die-maker, one electrician, one insurance man, one farmer's son, one traveling salesman.

How much are they making? \$50 to \$500 a week. The \$50 men are mostly those who give me their spare time. A great many of my representatives start that way.

How much did they know about radio at the start? Very little, in many cases nothing. Lack of radio knowledge is not a handicap. In fact, I rather prefer the man who hasn't delved too deeply into radio theory. We have our own methods—they are successful—and the man with nothing to unlearn makes the biggest success of our plan.

Sales experience naturally would be of some value, but it is not absolutely necessary. Unlike other articles, a radio instrument does its own talking. The best time for your demonstrations is evenings, which is possibly your spare time. You can safely put Ozarka in competition with any

instrument on the market to-day, regardless of its price.

The man I want is known in his community as upright and reliable. He may not have any considerable amount of money, but he has a little; in fact, in many cases the man who is particularly interested in my plan is the man who is having rather a hard time making ends meet. He is, however, the type of man who would not handle anything unless he was thoroughly convinced of its merit. If you are this kind of a man and are really sincere in wanting to improve your financial conditions, I'll be very glad to tell you of the Ozarka Plan. I can train you to make considerable more money than you are now making. I have done this with 2274 men in the past two years, and I will do it for you if you will do your part.



This button identifies Ozarka representative in your city—is your assurance of complete radio satisfaction.

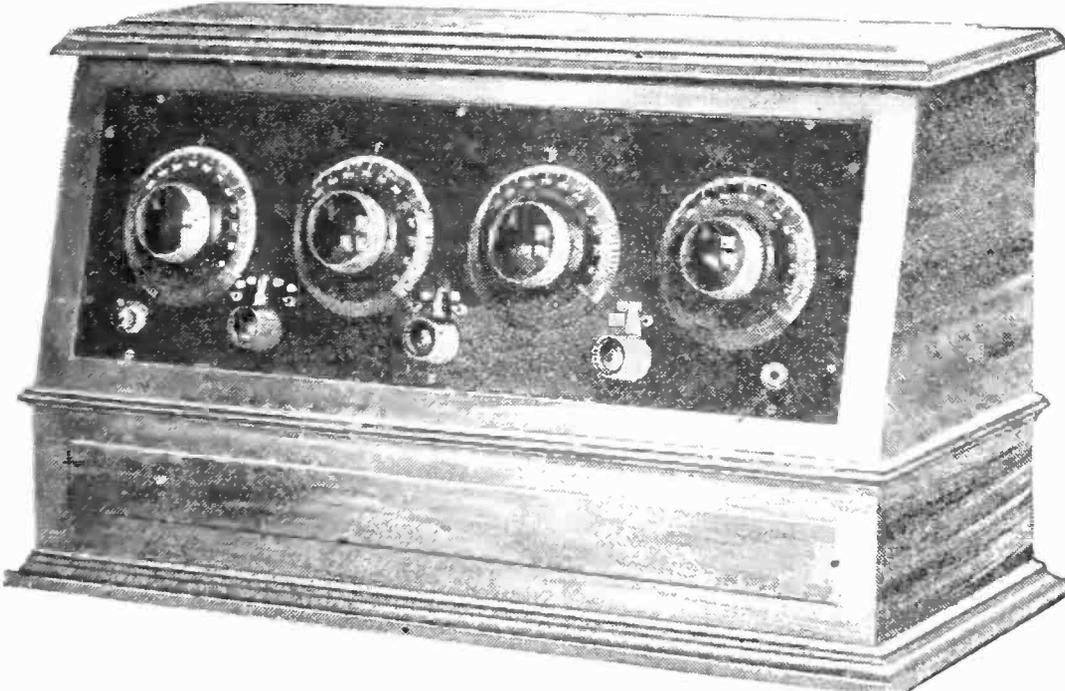
This Large Book tells how to make \$100 per week under Ozarka Plan



The Ozarka Plan is fully described in a large illustrated book. I will send a copy to men who are willing to tell me fully about themselves. The Ozarka book is a true

story of life, of men, of why they fail, and how they succeed. It tells how men are carving out futures for themselves in this fascinating business of radio.

In territory not now covered, I want the right man. If you feel qualified and are willing to put forth the necessary effort to obtain a splendid, profitable business of your own, write me and say, "Send your Ozarka Plan Book No. 100." It may be the turning point in your life. Don't fail to mention the name of your county.



Ozarka four tube radio for operation with loud speaker as low as

\$39⁵⁰

OZARKA, INC.

605 Washington Blvd., Chicago

★ Tested and approved by RADIO BROADCAST ★

Junk Your "B" Batteries

Use the

MU-RAD B-Radicator



End of "B" battery troubles—noises, "fading" and frequent replacement. "B" battery current, steady, uniform ALL THE TIME. A practical instrument—not an experiment. Supplies current enough for sets using as many as 8 tubes. No generator hum. Absolutely harmless, does not interfere with lighting current: protected against damage to itself. See the B-Radicator at work in your Dealer's Store.

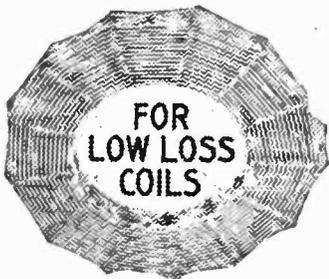
Write for Literature and the Name of the Nearest Mu-Rad Dealer

MU-RAD LABORATORIES, INC.

803 FIFTH AVE ASBURY PARK, NEW JERSEY

What It Is

Primarily, the Mu-Rad B-Radicator is an instrument for transforming ordinary house-lighting current (110 Volt, 60 cycle alternating current) into the same sort of current as was formerly obtained from B batteries. Not in the least complicated to use—the plug on the end of the cord attached to the B-Radicator is screwed into any lamp socket just as you attach a vacuum cleaner, electric heater, or iron. The wires which formerly led to the "B" batteries are connected to the binding posts on one end of the B-Radicator. Takes up little more room than one 45-Volt B Battery—the metal box is 6" wide x 4½" deep x 10" long. Uses ordinary UV-201-A or C-301-A vacuum tubes.



THERE IS A
FASCINATION
IN MAKING
ALL KINDS OF
FORM WOUND

LOW LOSS COILS

and a surprise in the extraordinary good results obtained if you use

SAFE-GUARD INSULATION

In clear, and semi-transparent colors for stiffening coils, replacing spaghetti, etc. Reduces dielectric absorption and capacity effects to a minimum.

At your dealers, or sent direct postpaid.

★ Put up in .50 and \$1.00 cans

SAFE-GUARD INSULATION CO.

Lansdale

Penna.

RADIO ENCYCLOPEDIA



FREE! Thousands of radio bargains, standard sets, standard parts for sets, vacuum tubes, etc., at one-third less than regular prices, also latest information on all circuits, complete list of broadcasting stations and other valuable data. Send name and address, we'll send you 50c book FREE!

NORWALK RADIO CORP.

Dept. 57A 66 READE ST., NEW YORK

No library complete without Kipling complete.

Best for Reflex

and Crystal Sets ★
FRESHMAN

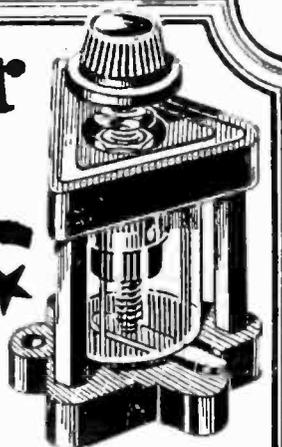
Double Adjustable
Crystal Detector

No more searching for the sensitive spot.
—Merely turn the knob as you would a dial.

For base or panel mounting, complete with Freshman Super-Crystal **\$1.50**

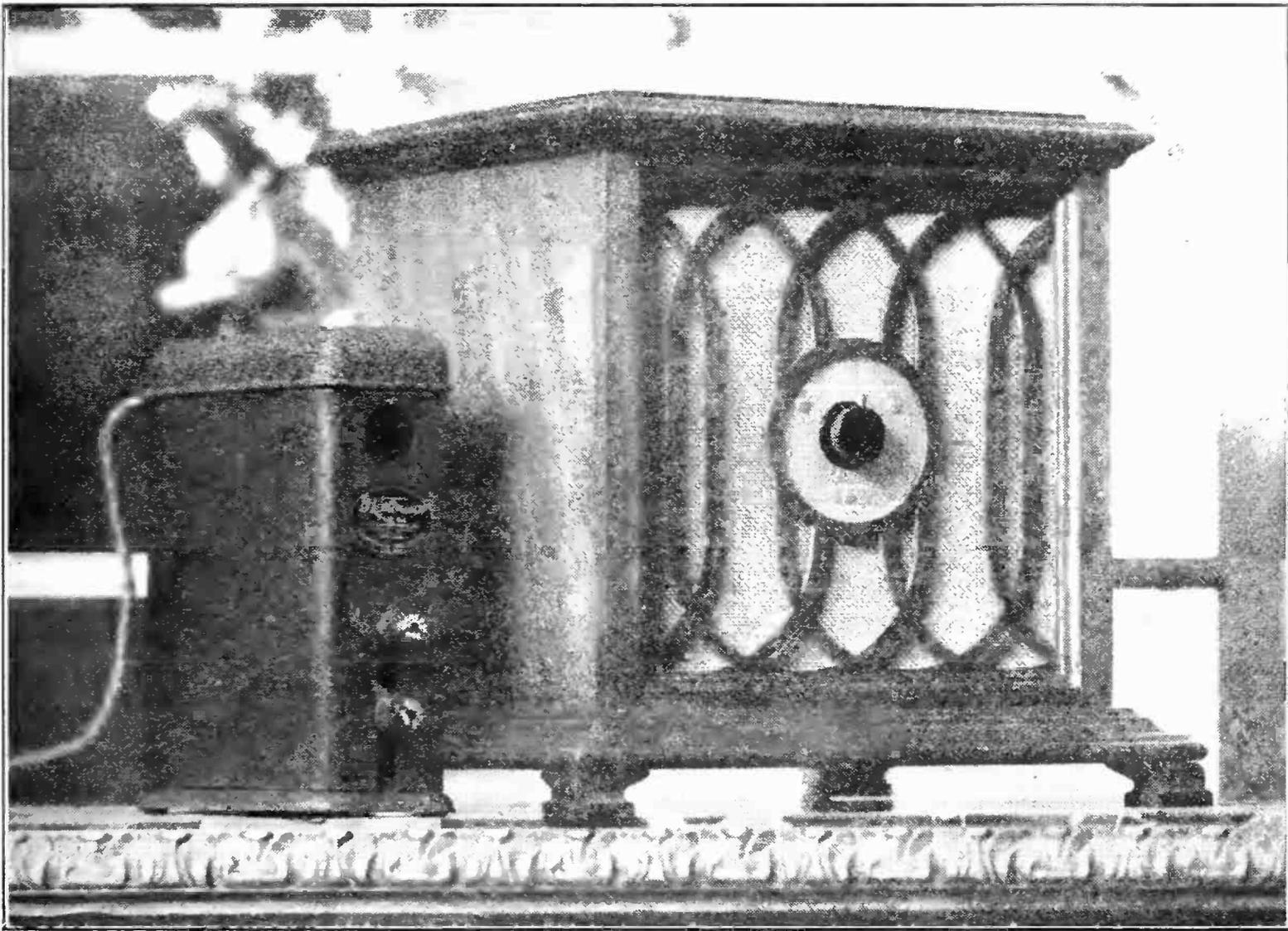
At your dealer's, otherwise send purchase price and you will be supplied postpaid.

CHAS. FRESHMAN CO., Inc.
106-7th Avenue, New York



★ Tested and approved by RADIO BROADCAST ★

Two of The Biggest Things in Radio To-day



The little device on the left (8" x 6" x 3") is the B-Limiter which takes the place of B batteries. \$35 (without tube). Its companion is a Timmons Talker, the remarkably beautiful cabinet type loud speaker with horn concealed; noted for its superior tone purity and volume. Type A, \$35.00.

Timmons Talkers and B-Limiters



The B-Limiter (patented May 15, 1923) as shown above replaces all B batteries by using any alternating house current through your 110 volt, 60 cycle light socket.

*T*HERE is no name that has more rapidly crowded to the front rank of the radio industry than the name Timmons.

The Timmons products illustrated are now established as two of the most important examples of the tremendous progress made by radio.

Present or prospective radio set owners cannot afford to be unfamiliar with the new receiving satisfaction made possible by these two remarkable products. They are sold by good radio dealers most everywhere.

No reputable radio jobber or dealer can profitably fail to consider the important influence of these two products on radio sales now and in 1925.

Descriptive printed matter and details may be had by any responsible person upon request

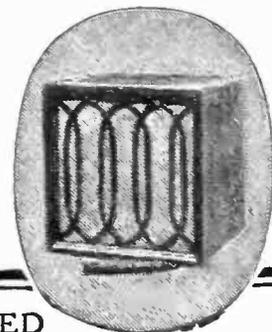
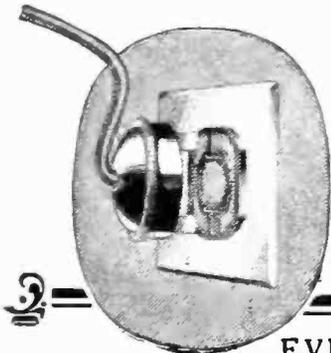
Timmons quality also built into a more modest cabinet for the thrifty buyer who realizes the advantages of concealing horn and mechanism but prefers a loud speaker at a lower price. Type N, \$18.00.

Timmons Radio Products Corporation

GERMANTOWN



PHILADELPHIA



EVERY TIMMONS RADIO PRODUCT IS ABSOLUTELY GUARANTEED

★ Tested and approved by RADIO BROADCAST ★

EARN

**\$3,000 to \$10,000
a Year as Radio Expert**

Enter fast growing radio field, thousands of big pay jobs waiting for you. U. S. Gov't., Steamships, R. R's., Corporations eagerly seek Radio trained men. Advancement rapid, earn from \$3,000 to \$9,000 yearly.

Pleasant Home Study In

RADIO

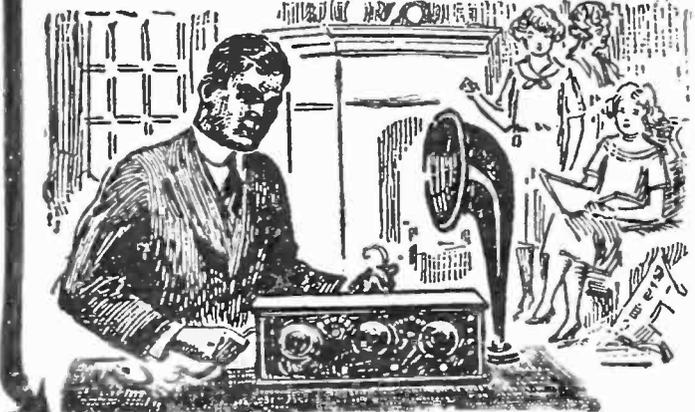


A. G. MOHAUPT

Prepare for Big Pay in Spare Time

My reputation as Radio Engineer and instructor insures you complete, speedy success, at home in spare time; **earn while you learn.** I make you expert in radio designing, building, repairing and operating and teach you only practical "inside" dope. You quickly complete my course

and a few pleasant hours prepare you to step in to Big Pay. No experience required.



**FREE
1000 Mile
Radio Outfit**

This set, when completed, has a range of over 1000 miles. I give it free with my course. I give you practical training by having you work on this set. The knowledge you gain is not mere book knowledge but is usable, practical experience.

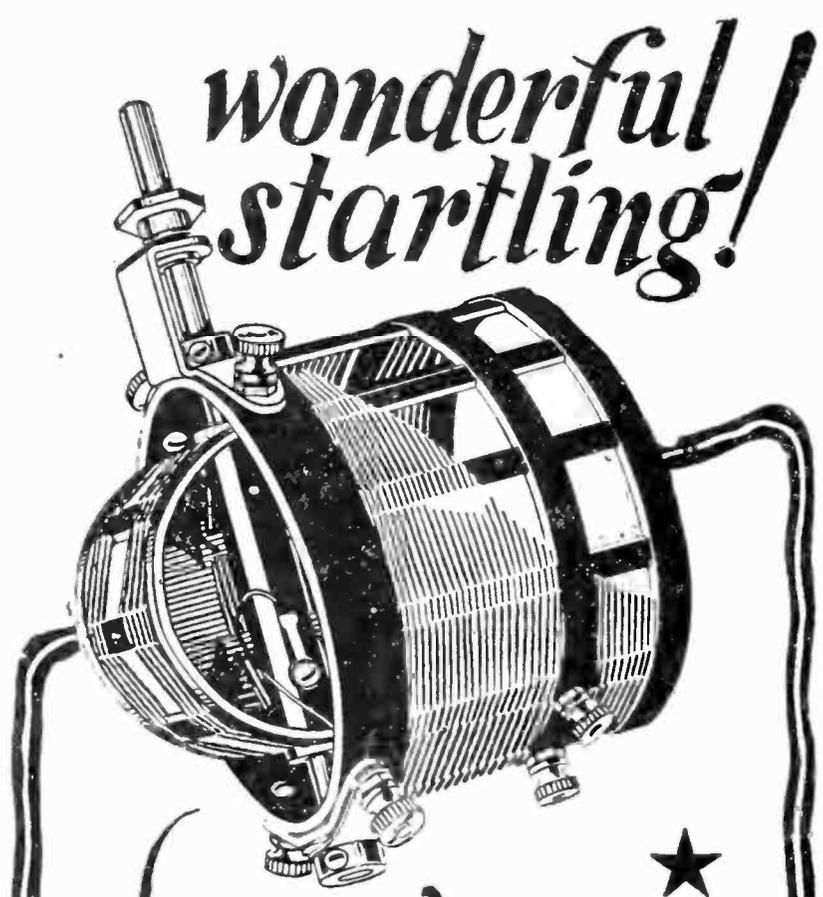
When you have finished my course, you can sell this set at a price that will pay the cost of the course. For a short time only, by my special plan, I will give a tube radio set in handsome cabinet to men, absolutely **FREE**. Send at once for my **FREE** wonder-book of inside Radio "dope." Act quickly.



MAIL COUPON

A. G. MOHAUPT, Radio Engineer,
Radio Association of America,
4513 Ravenswood Ave., Dept. B-1 Chicago
Please send me details of your Home Study Course—
also your Free "Radio Facts" and information on
how I can get a FREE 1000-mile Radio Set.

Name.....
Address.....
City..... State.....

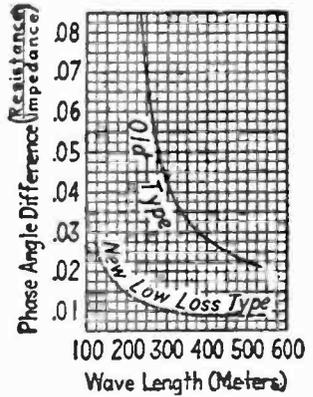


*wonderful!
startling!*

The NEW UNCLE SAM MASTER COIL TUNING COIL

THE COIL WITHOUT LOSSES

- 1—U. S. Bureau of Standards forms of latticed hard rubber.
- 2—Perfect spacing of each turn because of new type American Ambassador Litz.
- 3—Eliminates adhesives.
- 4—Increases volume 50 to 180 per cent over old type coils. Also improves selectivity.
- 5—Laboratory tests prove conclusively that it is the only coil worthy of the name low loss.
- 6—**WARNING**—Use Ambassador Condensers and Transformers designed and manufactured by Ambassador Engineers, for best results with the Ambassador Coil.



FREE! Ask your dealer or send self-addressed stamped envelope for wiring diagrams of circuits in which this remarkable coil can be used.

UNCLE SAM ELECTRIC CO.
219 E. Sixth St. Plainfield, N. J.

Write today for your free copy of

Ward's New Radio Catalogue

Tested and guaranteed
Radio equipment sold with-
out the usual Radio profits

WARD'S Radio Department is headed by experts who know and test everything new. Who know by experience what is best—what gives the best service.

Our catalogue is prepared under their supervision. It shows all the best hook-ups, everything in parts and complete sets—so simple that you yourself can install them in a short time.

Headquarters for Radio

Today Ward's is serving thousands upon thousands of Radio fans who have written for our catalogue, who have been surprised to see how low in price the standard Radio equipment can be sold without the usual "Radio Profits."

You, too, can profit by writing for a free copy of Ward's Radio Catalogue. If interested at all in Radio, you should write for this book. See for yourself the savings.

Our 52-Year Old Policy

For 52 years we have sold quality merchandise. We never sacrifice quality to make a low price. In buying Radio Equipment at Ward's, you are buying from a house of proven dependability. Address our house nearest you: Dept. 27-R.

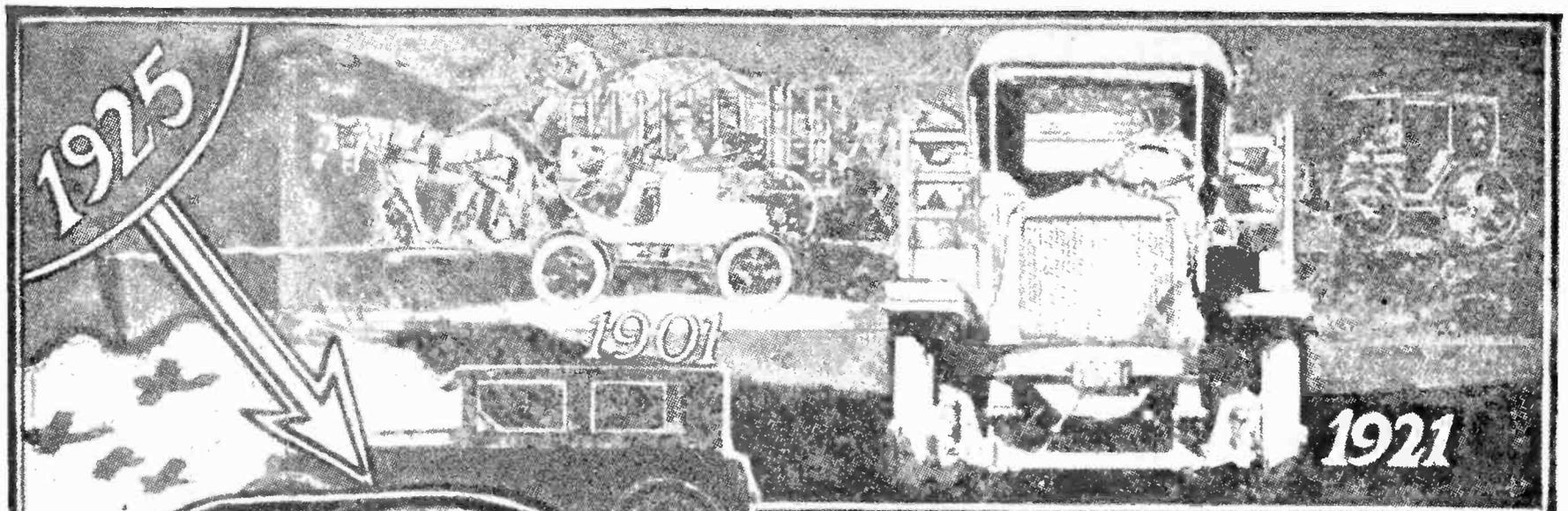


WARD'S Radio Catalogue is a big 68-page book—a real reference volume on quality Radio Equipment. In addition to descriptions of sets, parts and hook-ups, much matter of general interest to every radio fan is included. The book will prove fascinating to the confirmed radio enthusiast as well as the beginner.

ESTABLISHED 1872
Montgomery Ward & Co.

The Oldest Mail Order House is Today the Most Progressive

Chicago Kansas City St. Paul Portland, Ore. Oakland, Calif. Ft. Worth



Aristocrat Model

The Bestone V-60 Five-Tube Receiver in beautiful, distinctive antique Polychrome cabinet, with built-in high-grade loud speaker and battery compartment. New popular price **\$150.00**

We lay particular emphasis on the tone qualities. Sublimity of perfect tone, entirely free from distractive noises and distortion.

Volume—distance and selectivity—so simple.

We welcome comparison. In justice to your taste and purse see and hear the new BESTONE V-60.

Write for Particulars

Manufactured, Guaranteed and Distributed by

HENRY HYMAN & CO., INC.

476 Broadway
New York

212 West Austin Ave.
Chicago



TRADE MARK

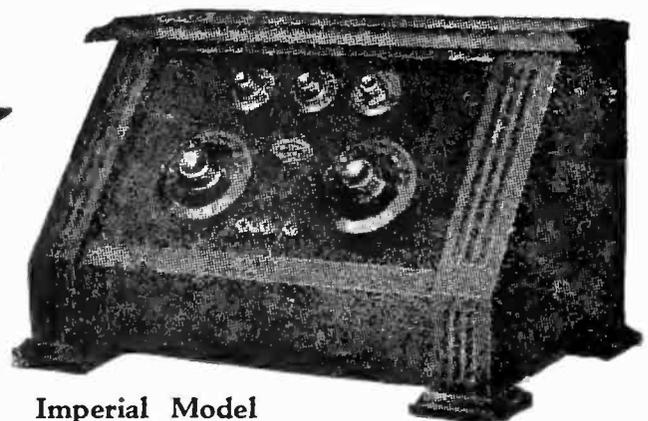
“The Aristocrat of Radio”

There is prestige in owning a Bestone V-60.

The inside is mechanically perfect. The outside is a superb piece of furniture.

There is philosophy in buying the best. Henry Hyman & Co. have been in business long enough to know the value of manufacturing superior goods.

“Just as good” means nothing. We call the Bestone V-60 the “Aristocrat of Radio.” One look at it and the pride of ownership is yours without apology.



Imperial Model

Imperial Model Bestone V-60 5-Tube Receiver in beautiful mahogany cabinet. New popular price **\$100.00**

★ Tested and approved by RADIO BROADCAST ★

SUCCESS depends on—

How well your set is made.
Not how many tubes you use.



MRC-4, \$150.00

Michigan MRC-4 is America's most beautiful set. Not only is it the best of the cabinet maker's art, but electrically it has no equal.

One stage of radio frequency, a detector and two stages of audio frequency give you

Distance
Selectivity
Volume

with a tone arm that eliminates all harsh or mechanical notes. You have perfect reproduction.

The Set is equipped with a self-contained Loud Speaker unit and horn. The unit is adjustable. Ample room is provided for "A" and "B" Batteries, etc.

Other Michigan Models from the MRC-2, two tubes, to MRC-4, four tubes, priced from \$37.50 and up.

There is a Michigan for every requirement. Go to your dealer and ask for demonstration.

We will be glad to send you illustrated folder of all models. Write us.

Licensed under Armstrong U. S. Pat., 1,113,149-letters pending 807,388

MICHIGAN RADIO CORPORATION

32 Pearl Street

Grand Rapids, Michigan

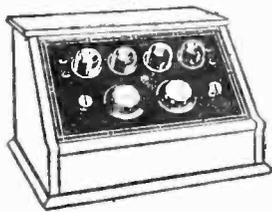


★ Tested and approved by RADIO BROADCAST ★

KENNEDY



★ Opening the door to Dreamland



Model VI, For loud-speaker reception of distant stations. Selective, but simple to tune. Each station is always found at its own setting on No. 1 dial. The other dial regulates volume. Non-radiating.

Licensed under U.S. Pat. 1,113,149

Less Accessories \$105.00

West of the Rockies \$107.50
You'll appreciate the KENNEDY most when you hear it. An authorized KENNEDY dealer is located near you—we'll send his address if you write.

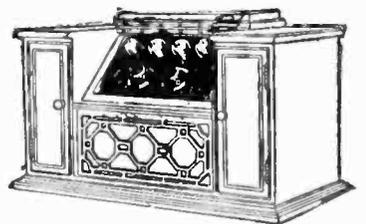
"SH-H-H! Here's the bedtime story!" As easily as she finds a favorite page in her book, Grandmother sets the tuning dial of the KENNEDY. Riotous fun stops. The familiar voice of a friend whom the children love but have never seen fills the quiet room.

Your home is filled with more of life's sunshine when you install a KENNEDY. Your family can choose from wonderful programs, and hear the feature selected reproduced with lifelike brilliancy. Your KENNEDY serves in turn as a newspaper, lecturer, musical instrument, and enlivening

story telling companion, all in one. Something to suit your mood can always be found on the air—your KENNEDY brings in any desired station within a good long range, simply by turning to the dial setting for that station.

The perfection of to-day's magnificent broadcasting is matched by the perfection of KENNEDY reception. There is nothing complicated to be fussed with; although easily operated and trouble-proof, the KENNEDY includes the most advanced principles of radio engineering.

Model XV, (Illustrated) Super-selective long range R. F. model. Cuts through local broadcasting and brings in distance. Logged tuning. Non-radiating.
Less Accessories \$142.50
West of the Rockies \$145.00



Model XI, Mahogany cabinet with inlays. Built-in loud speaker. Brings in out-of-town stations with loud-speaker volume. Logged tuning on one dial. Controlled volume. Non-radiating.

Licensed under U. S. Pat. 1,113,149

Less Accessories \$185.00

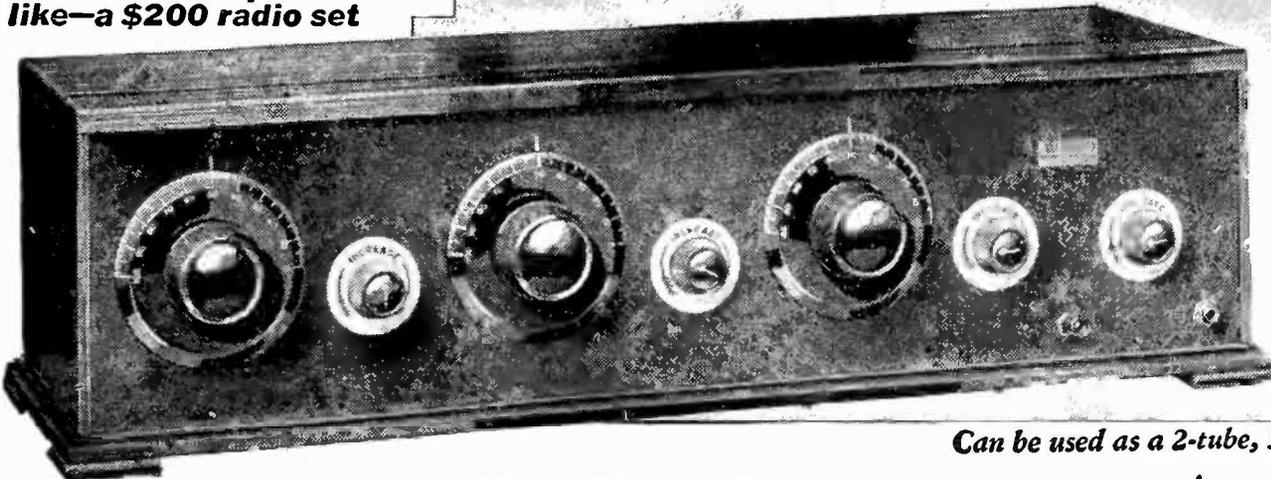
West of the Rockies \$190.00

THE COLIN B. KENNEDY COMPANY, Saint Louis

★ Tested and approved by RADIO BROADCAST ★

Unsurpassed selectivity, sensitivity, range, volume and tone combined

Looks like—and performs like—a \$200 radio set



BUILT TO GIVE LOUD SPEAKER ENTERTAINMENT FROM STATIONS THOUSANDS OF MILES DISTANT WHILE LOCAL STATIONS ARE BROADCASTING

Can be used as a 2-tube, 3-tube, 4-tube or 5-tube set!

"Coast to Coast" reception

verified by Miraco Users

Every Miraco user is an enthusiastic booster—these letters are typical of the many we receive.

Miraco "Shows" Missouri

I bought one of your radios last summer, and like it fine. Have picked up stations from Coast to Coast and from Canada to Cuba. My motto with the Miraco is: "What's the use to pay more when the Miraco will reach as far as you can understand the language?"

—George V. Scott, Moberly, Mo. N. Y. Hears England & Brazil

Am very glad I bought a Miraco as it works the best of any I have heard. All the people who come to listen say that when they buy a set it will be a Miraco. Have heard London, England, and Rio de Janeiro, Brazil, with my Miraco. It sure works fine. It is the best set on the market for the price.—Leo Link, Marcy, N. Y.

Pennsylvania Hears Calif.

The Miraco is a real "Coast to Coast" set. Last night I tuned in on KGO, Oakland, Cal., WFAA, Dallas, Texas, KFKX, Hastings, Neb., besides fifteen other stations. Have received 55 in all. It is a wonderful set for the price.—Earl C. Way, Coleman, Pa.

Iowa Hears N. Y. to Calif.

Have heard from New York to California on my Miraco. All who have heard it think it fine.—Chauncey Bailey, Stockport, Iowa.

Beats Some \$300 Sets

The Miraco that I bought last fall is giving better satisfaction than some \$300 sets others have here.—Otis Morris, Warren, Idaho.

Nebraska Hears Cuba

Miraco sure is a go getter. I get better reception than anyone in this neighborhood. Had WSAI, Cincinnati, on loud speaker in July—pretty good for warm weather. I tuned in KGO, Oakland, Cal., and WBZ, Springfield, Mass., and have heard PWX, Havana, Cuba, a number of times.—Verne J. Gustason, Blair, Nebr.

"Hears the Scotch"

I am proud of my Miraco. Have had Cuba, Canada, Glasgow, Scotland—of which any one should be proud—with nearly every station in the U. S.—Parke A. Neet, Catlin, Ind.

The Marvelous **MIRACO** Ultra 5

costs only \$75

★

Send for free bulletins and SPECIAL OFFER today!

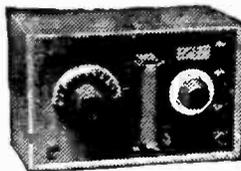
[FIVE TUBE OUTFIT IN BEAUTIFUL SOLID MAHOGANY CASE]

Completely built, thoroughly tested and factory guaranteed by one of America's oldest and most reliable manufacturers of quality sets! Years of experience and quantity production explain its almost incredible price. Users say that friends who see and hear it are amazed that it sells for less than \$150 or \$200. Radio experts, who know good construction and quality parts, are equally astonished. You, too, will be delighted, thrilled, amazed with your big five-tube Miraco Ultra 5 in its beautiful hand-rubbed solid mahogany cabinet!

Imagine getting all this for \$75—a beautiful sweet toned "coast to coast

loud speaker" set, composed of finest parts, equipped with the latest improvements, refinements and features found on costliest sets. An instrument approved by radio's highest authorities! A set anyone can connect and operate. Even beginners learn quickly to cut through the "locals," get distant stations loud and clear, log stations and return to them at will. (Full directions with each set.) It is non-radiating, non-distorting, non-howling. Has cut-out switch—and a first stage phone jack for tuning—on Bakelite panel. All wiring concealed under Bakelite sub-base. Works on storage battery or dry cells. Literature describes other newest features.

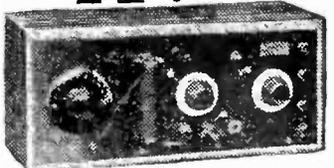
Other Miraco Long Distance Sets \$14³⁵ up



Miraco Model R justly deserves its title, "Radio's finest low priced quality receiver." One tube acts as a tuned radio frequency amplifier and detector combined. A great distance getter. Easy to

operate and log. Covers all wave lengths 150 to 625 meters. Like all Miraco sets, it operates on a storage battery or dry cells. Never such value before at only \$14.35. Send coupon today!

This wonderful new Miraco Model R-3 is the three-tube, long distance, loud speaker set that has created such a sensation.



Easy to tune and log. Covers wave lengths 150 to 625 meters. Detector acts also as a tuned radio frequency amplifier. 2 stages audio frequency amplification. Has no equal for simplicity, volume, range or clearness at anywhere near its price of \$29.50. Use coupon!

All the Proof you want is waiting for You!

Reports from the many users in every state prove Miraco Tuned Radio Frequency Receivers—at rock bottom prices—have efficiency of sets costing up to three times as much. Remember that Miraco Sets are the product of a long established, reputable manufacturer—pioneer builders of sets. Send for further evidence that they are Radio's finest moderately priced receivers. All Miraco sets bear the endorsement of radio's highest authorities. Mail coupon now for latest bulletins, SPECIAL OFFER and plenty of additional testimony from users leaving no doubt that "Miraco Radio Gets 'em Coast to Coast."

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The wonderful tone, volume and distance-getting ability of Miraco Sets makes them easy to sell. Send coupon for proposition; good territory open.

Send coupon for free bulletins!
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Pioneer Builders of Sets, 406-K E. Eighth St., Cincinnati, O.
Send free literature, SPECIAL OFFER and all particulars regarding Miraco Sets. () Jobber () Dealer () Agent () User

NAME.....
ADDRESS.....

★ Tested and approved by RADIO BROADCAST ★



Of Course It's
a CROSLLEY
 Better-Costs Less
 Radio

"O H boy! There's the West Coast! Last night I had the East Coast, and the night before that, Havana. I bet I get London soon. This Crosley sure does bring 'em in. I can tune out local stations any old time and get what I want. There's nothing like a Crosley!"

That's what thousands of men, women and boys are finding out every evening in all parts of the United States. So enthusiastic are they that hundreds of voluntary letters tell us daily of the really remarkable performances of Crosley Radios and the complete satisfaction that they give. Here is what a few of them say:

Parkesburg, W. Va. September 30, 1924
 "Wish to congratulate you on the one-tube Crosley 50. Have listened to Havana, Cuba, and as far west as Oakland, Los Angeles and San Francisco. This is what I call a wonderful set."

Rockville, Maryland. October 1, 1924
 "I thought it would interest you to know that on September 15th, I received Oakland, California on my two-tube Crosley 51. That station is 2,434 miles from here. I had a hard time making my friends believe it until I wrote to California and had them verify what I heard. As soon as I can afford it, I expect to get a Trirdyn."

Olney, Illinois. October 15, 1924
 "I'm getting stations from New York to Seattle, Wash., on my Trirdyn. Monday night, October 13th, I received clearly and plainly the announcer and music from Honolulu, Hawaiian Island, 7,000 miles away. My machine is not for sale."

(Names upon request)

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 For Sale By Good Dealers Everywhere

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Crosley One Tube Model 50, \$14.50
 With tube and Crosley Phones \$22.25

Crosley Head Phones
 Better—Cost Less
 \$3.75



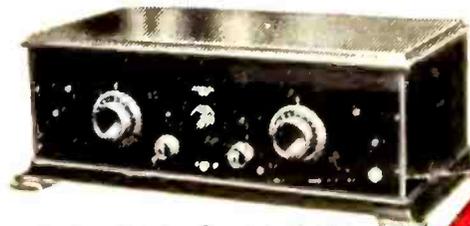
Crosley Two Tube Model 51, \$18.50
 With tubes and Crosley Phones \$30.25



Crosley Three Tube Model 52, \$30.00
 With tubes and Crosley Phones \$45.75



Crosley Trirdyn Regular, \$65.00
 With tubes and Crosley Phones \$80.75



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The Crosley Radio Corp'n.
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