

STATIONS PREPARE FOR IMPENDING REALLOCATION

OCT. 27th, 1928

15 CENTS

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly

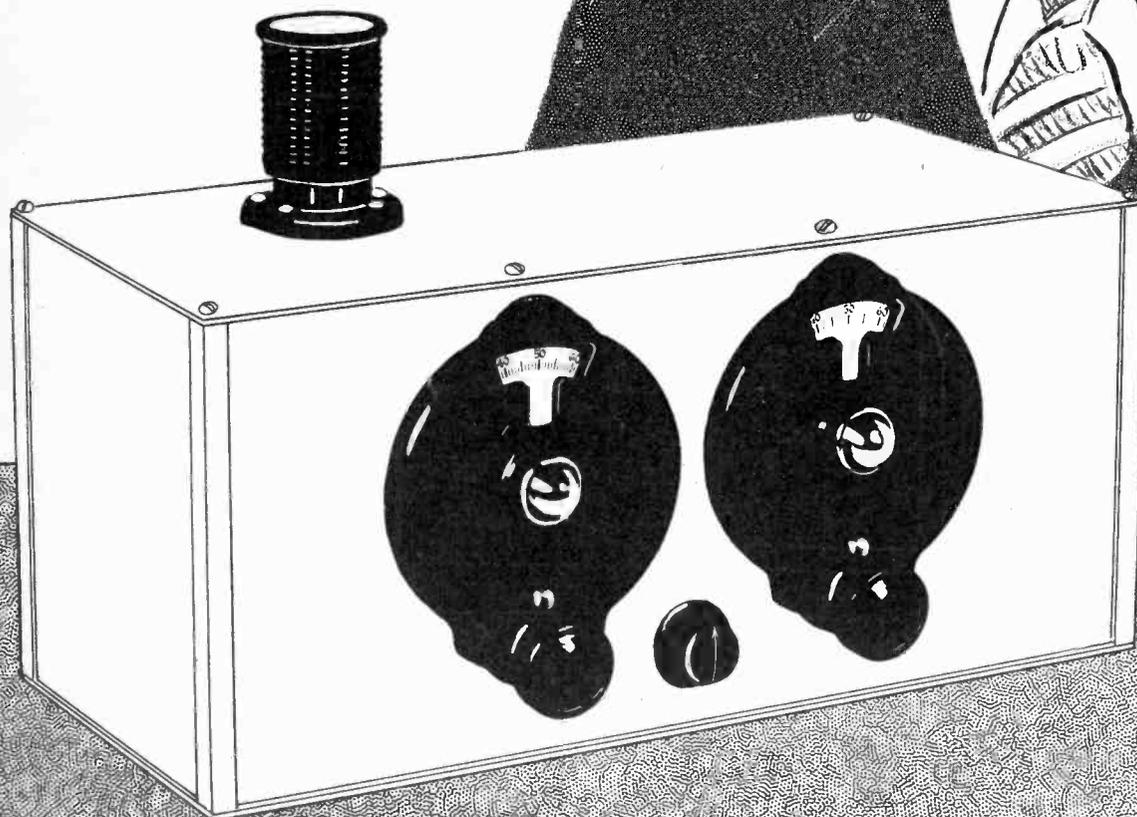
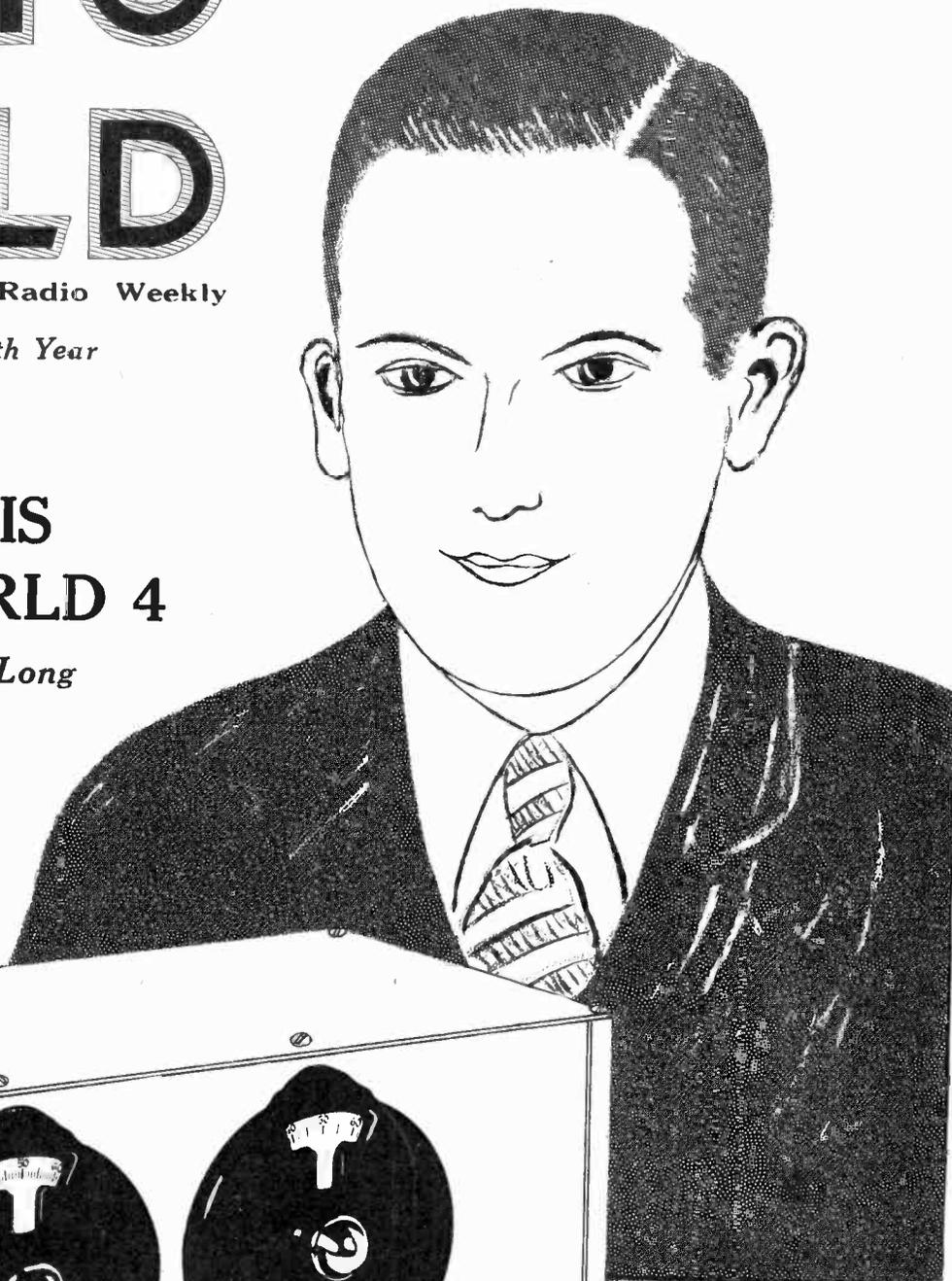
344th Consecutive Issue—Seventh Year



PROUD OF HIS ROUND-THE-WORLD 4

It Gets Short Waves and Long

SEE PAGES 12 AND 13



A shielding cabinet, with coil receptacle on top, makes the Round-the-World Four doubly attractive and convenient. It is a short wave set, but plug-in coils may be had to include broadcast waves.

for THAT 250 POWER TUBE—

A wonderful tube, no doubt. But don't forget the grid biasing! A power tube is no better than its grid bias. Yet with the POWER CLAROSTAT, it's an easy matter to adjust it until the precise grid biasing is obtained for any plate voltage, and the tone quality is at its best.

Ask your dealer about the Clarostat line, and be sure you get our literature. If you prefer, write direct to

CLAROSTAT MFG. CO., Inc.
285-7 North 6th Street Brooklyn, N. Y.

CLAROSTAT
Reg. U. S. Pat. Off.

IMPROVE YOUR RADIO

With the Paola, a new scientific instrument that replaces loud speakers. Makes old radios equal the new high priced models. More volume with life-like tone. Works with or without power tubes. Requires no adjustments. Demonstrator on 5 days trial. Agents wanted.

THE PAOLA ELECTRIC CO.
1906 B Kensington, Kansas City, Missouri



LYNCH

3 stage resistance-coupled amplifier Kit for quality television reception..... **\$9.00**

Send for free book.

ARTHUR H. LYNCH, INC.

1775 Broadway New York City

JUST TURN KNOB



to switch from one speaker to another, or to operate both together! Instantaneous Convenience!

Those who have two loudspeakers in their home or store have been without a simple method to switch from one to another. When they wanted two loudspeakers to play at the same time, they had to make certain connections. And then when they wanted only one speaker to play they had to change the previous connections.

This new Speakerelay (illustrated) is enclosed in a bakelite case and is so constructed as to make two loudspeakers operate separately or together from your radio set, without any loss in volume. By merely turning a small knob to the left one loudspeaker operates, when the knob is turned to the right, the other loudspeaker operates, disconnecting the first one. When the knob is placed at position marked "2" both loudspeakers operate together. Price **\$2.00**

Send no money! Order C. O. D. Five-day money-back guaranty!

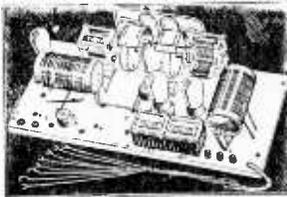
Guaranty Radio Goods Co.

145 W. 45th St., N. Y. City
(A few doors east of Broadway)

RADIO WORLD, published every Wednesday, dated Saturday of same week, from publication office, Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y., just east of Broadway. Roland Burke Hennessy, President; M. B. Hennessy, Vice-President; Herman Bernard, Secretary. Roland Burke Hennessy, Editor; Herman Bernard, Managing Editor; J. E. Anderson, Technical Editor; Anthony Sodaro, Art Editor.

SM

HEAR LONDON ON SHORT WAVES CHANGE BANDS AS QUICKLY AS CHANGING A TUBE



Your television experiments and short wave reception—do you depend on a receiver which is itself of "experimental" construction and requires excessive attention to insure reliability and time to change wave lengths? If you own an S-M "Round-the-World" Receiver, in its neat aluminum shielding cabinet, with its screen grid r.f. stage and quick-action plug-in coils, you can rest assured your reception—whether code, voice, or pictures—interstate or international—will be top-notch all the time.

COMPLETE KIT

Everything necessary to build the complete four tube r.f. regenerative (non-radiating) short-wave set, including aluminum cabinet and two S-M Clough audio transformers. 730 Complete Kit.....\$51.00

ADAPTER KIT

Complete with aluminum cabinet, less the two audio stages. Used with an adapter plug, it converts any broadcast receiver for short-wave use. Ideal for Television. 731 Adapter Kit.....\$30.00

ESSENTIAL KIT

Contains the two tuning and tickler condensers, four wound plug-in coils, coil socket, and three r.f. chokes, with full instructions for building a 1, 2, 3, or 4 tube set. 732 Essential Kit.....\$16.50

You can use your Round-the-World Four on broadcast bands with the new extra coils—131X for 190-350 meters, \$1.25; 131Y for 360-650 meters, \$1.50.

Are you receiving the "The Radiobuilder" regularly? Every month it gives you all the earliest S-M news, operating hints and kinks. To S-M Authorized Service Stations, it comes free of charge, with all new constructional Data Sheets. If you build professionally, write us about the Service Station franchises.

SILVER-MARSHALL, Inc.,
878 W. JACKSON BLVD., CHICAGO, U.S.A.

Silver-Marshall, Inc.
878 W. Jackson Blvd., Chicago, U. S. A.

....Send your complete catalog, with sample copy of the Radiobuilder.

....For enclosed 10c, send five sample S-M Data Sheets.

Name

Address

SM

"Round the World FOUR"

Here are the trimmest short wave sets ever—the new "Round the World" Kits

IMMEDIATE DELIVERY ON ALL LATEST S-M CIRCUITS
Write for our new big Catalog with maximum discounts to dealers and set builders

WHOLESALE RADIO SERVICE CO.
6 Church Street, New York City

SM

VALUE!

"Round the World Four"

DOLLAR FOR DOLLAR VALUE
THE NEW "ROUND THE WORLD FOUR" IS UNBEATABLE
IF IT'S SILVER-MARSHALL, WE HAVE IT!

Dealers Write for Our New Big Catalog

CLARK & TILSON, Inc.
122 Chambers St., New York City

SM

METROPOLITAN DISTRIBUTORS

"Round the World FOUR"

IMMEDIATE DELIVERY

Largest Silver-Marshall Stock in New York
We Distribute Over 130 National Standard Radio Lines
Dealers, Write for Our Catalog Listing Standard Parts
GRAYMORE RADIO CORP.

142 Liberty Street

New York City

SM "Round the World FOUR"

730 AND 731 SHORT WAVE RECEIVERS
All Silver-Marshall sets, Power Amplifiers and Eliminators are always on demonstration at our showroom.
IMMEDIATE DELIVERY ON ALL S-M PRODUCTS
Write for details of Technical Service for set builders with maximum discounts
ROSSITER, TYLER & McDONELL, Inc.
136 Liberty Street New York City

Manufacturers of highest quality condensers and resistors that are—
Built to Endure!

AEROVOX "Built Better"
12 WASHINGTON ST., BROOKLYN, N.Y.

Write for the Research Worker, a free monthly publication.

SM **Predominant!**

"Round the World Four"

Sensation at Radio World's Fair and at Chicago Radio Show Dealers, we can make Immediate Delivery on all Silver-Marshall Kits
ROYAL EASTERN ELECTRICAL SUPPLY CO.
16-18 West 22nd Street, N. Y. City

BUILD A 36-INCH CONE—LOWEST COST FOR FINEST TONE!

NEW POWERTONE UNIT
with 5-ft. cord
Designed Front Sheet
Plain Rear Sheet
Radio Cement
Mounting Bracket
Apex
Chuck
Nut
Tri-Foot Pedestal
Instruction Sheet
ALL FOR ONLY \$6.00

Note: If 24" kit is desired, order Cat. No. 24; same price. Cat. No. 36

REMARKABLE GUARANTY!
This 36" Cone Speaker Kit is sent complete, as listed, carefully packed. Order one sent C. O. D.

SEND NO MONEY!
Build the speaker. If not overjoyed at results, return the built-up speaker in five days and get ALL your money back!

GUARANTY RADIO GOODS CO.
145 WEST 45TH STREET
N. Y. City Just East of Broadway

SM "Round the World FOUR"

COAST TO COAST FOUR : : : 720 SCREEN GRID SIX 675 A.B.C. POWER PACKS
Official Silver-Marshall Service Station
MAIL ORDERS FILLED TECHNICAL INFORMATION FREE
S. HAMMER RADIO CO.
142 Liberty Street New York City

SM SEND 10¢ in Stamps or Coin for BLUEPRINT of the Silver-Marshall

"Round the World Four"
GUARANTY RADIO GOODS CO.
145 West 45th Street New York City

SUBSCRIBERS!
Look at the Expiration Date on Your Wrapper

Please look at the subscription date stamped on your last wrapper, and if that date indicates that your subscription is about to expire, please send remittance to cover your renewal.

In this way you will get your copies without interruption and keep your file complete.

SUBSCRIPTION DEPARTMENT
RADIO WORLD
145 WEST 45TH ST., N. Y. CITY
A few doors east of Broadway

FILL OUT AND MAIL NOW
SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 145 West 45th Street, New York City (Just East of Broadway)

Please send me RADIO WORLD for months, for which please find enclosed

SUBSCRIPTION RATES:
Single Copy \$.15
Three Months 1.50
Six Months 3.00
One Year, 52 Issues 6.00
Add \$1.00 a Year for Foreign Postage; 50c for Canadian Post-
age.

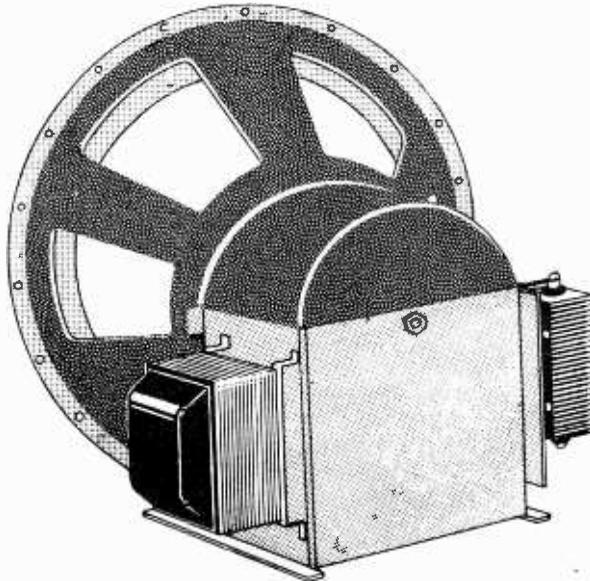
Supreme Dynamic Speaker at Merely the Price of a Fair Cone!

Great on any set that has 171, 171A, 210 or 250 power tube, or any two of these as push-pull output. Not suitable for 112, 112A and 120 power tubes, or sets that have no power tube.

110-125 Volt AC, 50-60 Cycle Dynamic Chassis R-13

This is a dynamic speaker (illustrated at right) operating direct from the alternating current (AC). It has a built-in dry rectifier and filter to supply the field coil with the necessary current and voltage. Uses only 3.5 watts from line. Also built-in is an output transformer (in the housing). No additional output transformer need be used. Supplied with 10-foot cord. Dimensions 9" wide, 9" high, 6 1/2" deep. Weight 13 1/2 lbs. Cat. R-13, list price \$40.00. Our price to you (40% and 2% off list)

\$23.52



6 Volt DC Dynamic Chassis R-14

This is our lowest priced dynamic chassis. All of our four models produce exactly the same results, in fact all are simply different powered models of the same speaker. The R-14 may be powered from a 6-volt storage battery or A eliminator. Field coil draws only 1/2 ampere at 6 volts. Output transformer is built into the housing. Supplied with 10 ft. cord. Dimensions 9" wide, 9" high, 6 1/2" deep. Weight 10 lbs. Cat. R-14, list price \$30.00. Our price to you (40% and 2% off list)

\$17.64

Rear view of R-13, the model described at left. (Note: These dynamic chassis are licensed under both the Magnavox and the Lektophone patents.)

All Other Commercial Types of Speakers far Outclassed in Tone by the Dynamic!

FOR sheer range and fidelity of tone nothing in the commercial field today even compares with the dynamic speaker. Also, the dynamic speaker handles more volume than any other type of speaker. Supreme in tone and volume, the only things that count! Then these amazing dynamic speakers must be frightfully expensive, you might imagine! Except for the high price you'd get one right away! But the interesting reverse is true now. You can get a dynamic chassis at \$17.64, which is less than you'd pay for an indifferent cone or cloth speaker.

Four chassis models of the supreme dynamic speaker are available. It is the same speaker—tone exactly as pure, volume exactly as great—and it comes ready to play.

The chassis is built-up. It consists of the cone, supported by a ring at the edge; the diaphragm; the field coil, which magnetizes the voice coil, the two constituting the motor; the supporting frame; the built-in output transformer (not visible) and the 10-foot cord. You may place the speaker in a console or anywhere else, or enclose it in any sort of box or baffle you prefer.

It is called a chassis because it does not come in a finished wooden case. You encase it yourself, if you like and where you like. It is a built-up speaker, not a kit—and is all built up ready to play.

The Supreme Dynamic Chassis never wears out!

THE dynamic speaker plays no favorites. The soprano—oh, you've heard the jokes about the radio soprano. No more joking now. The realism is so startling you are sometimes suspicious some one has intruded into your home. Your friends will listen with you and admire your expert speaker choice. You'll have to tell them to go home. Nobody wants to stop listening to music like that, singing like that!

And it's louder than your new or old cone or cloth speaker!

Purer, louder, better, less expensive!

How can you ever resist a combination like that?

Hundreds of thousands haven't been able to, because they know.

Put a dynamic speaker on your set by connecting the usual tipped cords to the speaker output posts of your set. In the direct current (DC) models two other wires emerge. (These go to the field coil voltage source. See the information in the corners herewith.) In the alternating current (AC) models these two extra leads also emerge, but end in a wall socket plug.

With the supreme dynamic speaker connected up, marvel at the difference between dynamic reproduction and any other you have ever heard. The low notes are strong and real. Strange you never heard them as crisp, clear and distinctive as that before or perhaps not ever at all, on that set. It wasn't the set, after all, but the speaker!

Dynamic Speakers All the Rage—Order Yours Today!

On everybody's lips, in every radio store, on the street, in homes, in automobiles and airplanes, everywhere the dynamic speaker is under discussion. Not under debate, for there's nothing to debate. Hundreds of thousands have been sold recently—the figure this year may exceed a million. The dynamic has taken the country by storm! And now is your opportunity to get a fine one at a low price!

Be a dynamic fan yourself. Order one of our dynamic chassis. If it does not give the most wonderful reproduction you ever got from your set, return the chassis in ten days, without getting our permission, ask for your money back, and your purchase money will be refunded at once in full! No questions asked. You'll be more than overjoyed, we know; but you will decide that at our risk.

110-150 Volt DC Dynamic Chassis R-15

This model may be operated from any DC source of 110-150 volts, for instance, from the house lighting socket in districts that have 110 volts direct current. Power required, about 5 watts. It may be powered from a B eliminator of sufficient current capacity. Note especially the versatile voltage range within which it works splendidly, also the low power consumption. The current is 44 milliamperes at 110 volts, 60 milliamperes at 150 volts. The resistance of the field coil is 2,500 ohms, and its inductance is 40 henrys at 40 milliamperes. Model has output transformer built into housing. Supplied with 10-ft. cord. Dimensions 9" wide, 9" high, 6 1/2" deep. Weight 10 lbs. Cat. R-15. List price \$35.00. Our price to you (40% and 2% off list)

\$20.58

Acoustical Engineering Associates, 143 West 45th St., N. Y. City (Just E. of B'way).

Please ship at once, 10-day money back absolute guarantee, dynamic speaker chassis as follows:

- Cat. No. R-13, 110 to 125 volts AC, 50 to 60 cycles; price \$23.52.
- Cat. No. R-16, 110 to 125 volts AC, 25 to 40 cycles; price \$26.46.
- Cat. No. R-14, 6-volt DC (storage battery or A eliminator operation); price \$17.64.
- Cat. No. R-15, 110 to 150 volts DC (for DC house current connection or energy from a B eliminator); price \$20.58.

All models are the same speaker in performance, all have built-in output transformer, also 10-ft. cord, and all are exactly as described in your advertisement in RADIO WORLD. (Also put cross in one square below)

- I am enclosing remittance of \$..... and you are to pay packing and cartage.
- Please send C.O.D. and I will pay a little extra for packing and cartage.

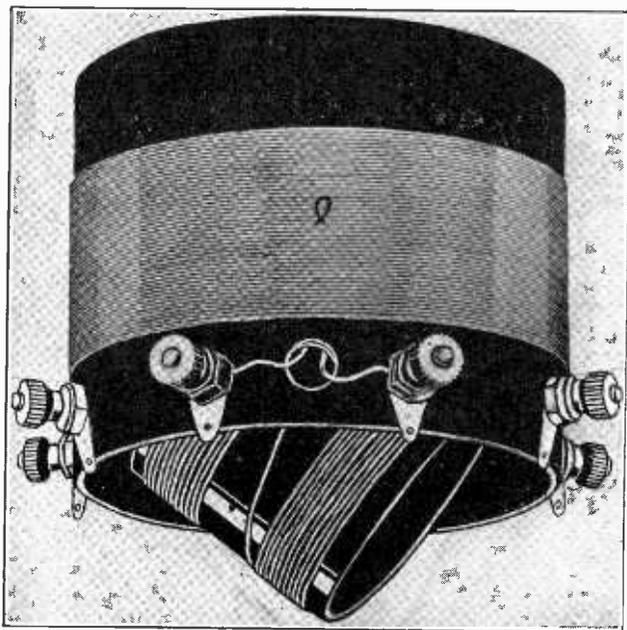
Name
 Address
 City State.....

100 to 125 Volt AC, 25 to 40 Cycles Dynamic Chassis R-16

In many districts residents desire the advantages of dynamic speaker reproduction direct from the AC house lighting socket, but instead of the usual 50-to-60 cycles they have 25-to-40 cycles. Therefore the standard AC model cannot be used. The winding about the power transformer core must be specially large—high inductance—and there must be more iron core. Therefore this 25-to-40 cycle model is the highest priced chassis. It is otherwise exactly the same as the R-13 (described at upper left), and has precisely the same appearance. Provided with 10-ft. cord and built-in output transformer. Dimensions 9" wide, 9" high, 6 1/2" deep, overall. Weight 12 1/2 lbs. Cat. R-16. List price \$45.00. Our price to you (40% and 2% off list)

\$26.46

New Coils Produce Revolutionary Results!



High Impedance Screen Grid Tuner, three windings. Primary center-tapped for short waves. Single hole panel mount. (Model 5HT)..... **\$3.00**

**ENORMOUS VOLTAGE GAIN!
MORE VOLUME! MORE DX!
THE SHORT AND LONG WAVES
WITHOUT CHANGING COILS!**

WORKING out of a screen grid tube, the High Impedance Tuner develops incredible voltage.

The primary, the outside winding, is tuned by a variable condenser the user puts across it. At resonance this gives *infinite impedance!* What the screen grid tube needs is a high impedance plate load, otherwise the tube's full, amazing quantity of amplification is missed. Could there be any impedance higher than *infinite?*

The secondary has a step-up ratio of about 2-to-1, the first time a voltage increase by radio frequency coupling ever has been made available with a tuned primary. The secondary is wound on a separate form, and riveted inside the primary form.

The third winding is rotatable inside the secondary form, from a front panel knob, and has a variety of uses. Bakelite forms are used exclusively.

It is inconceivable the revolutionary effect this coil has—volume so great you would never imagine it possible—greatly increased sensitivity, often 100 times greater than an ordinary TRF coil—more distant reception, much more, in fact—and—short waves may be tuned in by shorting out half of the primary, without change of coil or condenser.

Mount coil upside down for short leads. All terminals are then on bottom.

High Impedance Screen Grid Tuner Primary Center-tapped for short waves. Single hole panel mount (for .0005 mfd.). Model 5HT **\$3.00**
For .00035 mfd. Model 3HT..... **\$3.25**

Wonders of Screen Grid Tubes Fully Capitalized for First Time

ANTENNA COIL

Like the High Impedance Tuner, the Screen Grid Antenna Coil is specially designed for input to a screen grid tube. Its inductance is so arranged that the dial readings of the antenna circuit will be like those of the tuned circuit in which the High Impedance Tuner is used.

The antenna coupling is conductive, giving the maximum signal strength consistent with selectivity—a degree of volume that is so enormous as to astound you! Using these two coils, the volume is so great that only one stage of audio works a loud speaker superbly—thrillingly!

For short wave reception all except 14 turns of this single, continuously-wound coil are shorted out, and short-wave tuning confined to the succeeding stage or stages.

The Screen Grid Antenna Coil is matched to the High Impedance Tuner, by having dissimilar turns that equalize the tuning. Dial readings track nicely because the Screen Grid Antenna Coil's individual inductance is made to atone for the effect mutual inductance has on the High Impedance Tuner's primary.

Screen Grid Antenna Coil. One tap for short waves. For .0005 mfd. (Model 5A) **\$1.75**
For .00035 mfd. use (Model 3A)..... **\$2.00**

REPLACEMENT COIL

A great many persons now possess good radio receivers and do not desire to part with them, but would like to gain the benefit of the wonderful new screen grid tubes that, with proper coils, increase volume and sensitivity enormously, and without reducing selectivity.

Moreover, they do not want to tear down existing receivers and virtually rebuild them. No need to do so. The Screen Grid Replacement Coil, for either .0005 mfd. or .00035 mfd. tuning, occupies a space only 2½ x 2½ inches, so can be put in almost any receiver from which the old coil has been removed.

The replacement coil has an untuned primary of high impedance—generous number of turns—while the secondary is tuned. Thus it conforms to requirements of the usual tuned radio frequency receivers. Custom Set Builders, Service Men and Home Experimenters will welcome this opportunity to redeem "the old set," make it pep up and step out—cure that loss of the old kick—capitalize the great advantages of radio's outstanding tube! In replacement work one of these coils should be used as the antenna coil.

Screen Grid Replacement Coil for .0005 mfd. Secondary center-tapped for short waves. (Model 2R5) **\$1.50**

Screen Grid Replacement Coil for .00035 mfd. Secondary center-tapped for short waves. (Model 2R3) **\$1.75**

OTHER SCREEN GRID COILS

For circuits using screen grid tubes, with single tuning control, four models of coils are manufactured with rotors that serve as trimmers, so that no midget trimming condenser is needed.

These single control coils are:

Model 2SC5. Conductively coupled antenna coil, for input to a screen grid tube, with two turns taken from the stator and wound on the rotor. Thus the variations in tuning, due to the antenna's capacity effect on the tuned circuit, are compensated for by turning the panel knob. For .0005 mfd. tuning. Usual tap for short waves. (Model 2SC5) **\$2.75**

Model 2SC3, same as above, except that inductance is for .00035 mfd. tuning. Usual tap for short waves. (Model 2SC3)..... **\$3.00**

Model 2RSC5 is a replacement coil for single control sets, corresponding to 2R5, but having the trimmer coil on a rotatable form, so that any interstage coupling out of a screen grid tube may be accomplished efficiently. Usual tap for short waves.

(Model 2RSC5) **\$2.75**

Model 2RS3, same as above, except this is for .00035 mfd. tuning. Usual tap for short waves. (Model 2RSC3)..... **\$3.00**

Coils for Other Than Screen Grid Tubes

For all circuits other than screen grid circuits the STANDARD group of coils is manufactured, as distinguished from SCREEN GRID Coils. The STANDARD coils are for 201A, 240, 199, 226AC, 227AC and all other non-screen grid tubes.

All the coils, both STANDARD and SCREEN GRID, have 2½ inch diameter, the smallest diameter consistent with high efficiency!

All are sturdily made and are carefully designed and constructed with the idea of having them last TEN YEARS. That includes coils with rotatable forms, for they are no less rugged than the others—another exceptional virtue.

All coils have a short-wave tap, but this need not be used, if not desired.

STANDARD COILS

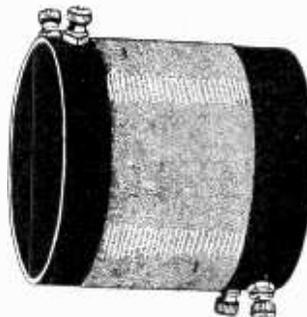
3-circuit tuner, for .0005 mfd. Secondary center-tapped for short waves. (Model T5) **\$2.25**

3-circuit tuner for .00035 mfd. Secondary center-tapped for short waves. (Model T3) **\$2.50**

TRF coil. Interstage coupler and also used as antenna coil. For .0005 mfd. Secondary center-tapped for short waves. (Model RF5) **\$1.00**

TRF coil. Same as above, except it is for .00035. Secondary center-tapped for short waves. (Model RF3) **\$1.25**

[Note: This advertisement contains our complete line of coils. Inquiries invited from the trade, custom set builders, etc.]



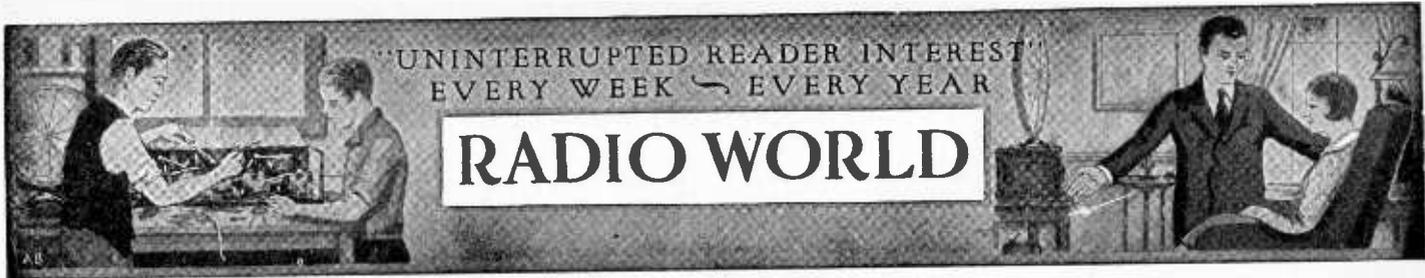
Screen Grid Antenna Coil, for Input to any Screen Grid RF Amplifier. Tapped once for short waves. (Model 5A) **\$1.75**

SCREEN GRID COIL COMPANY

143 WEST 45th STREET
NEW YORK CITY

Just East of Broadway

Screen Grid Coil Co., 143 W. 45th St., N. Y. City. [Specify Quantity in the Squares]
Please mail me at once your following coils, for which I will pay post-
man the advertised prices, plus a few cents extra for postage.
 Model..... Model..... Model..... Model.....
Name.....
Address.....
City.....
State.....
SEND NO..... (RW)



UNINTERRUPTED READER INTEREST
EVERY WEEK ~ EVERY YEAR

RADIO WORLD

OCTOBER 27, 1928
Vol. XIV, No. 6. Whole No. 344
15c. Per Copy, \$6 Per Year.
[Entered as second-class matter, March,
1922, at the post office at New York,
N. Y., under Act of March, 1879.]

Latest News and Circuits
Technical Accuracy Second to None

A Weekly Paper published by Hennessy
Radio Publications Corporation, from
Publication Office, 145 West 45th Street,
New York, N. Y.
(Just East of Broadway)
Phone: BRyant 0558 and 0559

Listeners Organizing Big Protest

Schenectady, N. Y.
The General Electric Company issued the following:

WGY's appeal to the Federal Radio Commission for a reconsideration of the Commission's action making the Schenectady transmitter a part-time station, has virtually been taken out of the hands of the General Electric Company, owners of the station, and a powerful protest has been set up by the listeners in the service area of WGY.

Organized campaigning on behalf of the listeners has been and is being conducted in an area roughly within 150 miles of WGY.

The boards of aldermen of several cities have passed resolutions requesting the Commission to restore WGY to a full-time, clear-channel operation.

Chambers of commerce, Rotary, Kiwanis, Lions and other service clubs have taken emphatic action.

Federal, state, county and local officials have filed their protests. Thousands of petitions have been circulated in affected neighborhoods, interested listeners carrying the petitions from door to door, and in some cases from town to town.

Business men have put petitions in their stores and through these and every other means a great volume of protest has been built for presentation to the Commission.

Thousands Write

In addition to the organized effort, thousands of listeners have written direct to the Commission and to WGY explaining their dependence on the Schenectady station for program service. Patients in hospitals, victims of tuberculosis in various sanatoriums in the Adirondacks, including the veterans of the World War, now under treatment at the Tupper Lake Sanatorium, have written in protest. From the aged, the infirm and the blind have come pathetic letters begging that their only amusement and source of entertainment may be continued through the long, lonely night hours of the Winter.

The service area of a broadcasting station is generally estimated as that territory within a radius of from 50 to 150 miles of the station. Actually the signal-range cannot be defined or confined.

"3,000,000 Disregarded"

It has been found that the people of both Vermont and New Hampshire get their best and, in most cases, their only clear reception from WGY, though they are nearer Massachusetts stations. Northern New York, including Ogdensburg, Watertown and Plattsburgh, depend upon WGY, as do Oneida, Oswego and other cities.

While the condition is not general, it

Clear Wave and Hearing Both Refused

Washington.

WGY, the General Electric Company's station at Schenectady, N. Y., which, under the reallocation plan, effective November 11th, at 3 A. M., would become a "limited" station, deprived of a cleared channel, applied to the Federal Radio Commission for permission to use 150,000 watts and to retain its present frequency (790 k. c.) as a cleared channel. The reallocation makes WGY surrender its cleared channel to KGO, the General Electric Company's station at Oakland, Calif., but with the right to use the channel secondarily.

The board denied the request without a hearing. WGY in its application sought to have changed the assignment of time division on its present channel and its limitation to 50,000 watts.

The General Electric Company contends that placing the two stations on the same channel does not give KGO the cleared channel to which it is entitled.

To deprive WGY of a cleared channel, it further contends, "will not serve the public interest, convenience and necessity."

WGY's Case

The full text of the statement of the General Electric Company accompanying the application for modification follows:

"WGY has broadcast on a wavelength of 379.5 meters (790 kilocycles) since May 21, 1923, since which time this wavelength has been maintained a cleared channel.

"WGY serves an area in New York, Vermont, Mass., and New Hampshire which depends almost exclusively on this

has been found that in some places in Illinois and Ohio, WGY's signals are received free from interference and of much better quality than nearer stations.

Among the protests have been many from distant listeners who enjoy their radio through the short wave stations of WGY. Letters have been received from Utah, California and Oklahoma declaring dependence on WGY. The most emphatic protests have come from the Canal Zone, where, because of heavy static, only short wave signals can be received.

The real protest rises from among the population of 3,000,000 people within 150 miles of WGY whose "convenience and necessity" have, apparently, been disregarded by the Federal Radio Commission.

station for broadcast service. The population within a range of 60 miles of WGY is approximately 1,000,000. Within a range of 100 miles there is a population of 2,440,000, to many of which WGY supplies the most dependable program. The people in this area are much more dependent upon radio for their general information and entertainment than the people in the large metropolitan centers.

Advanced the Art

"General Electric Company has made many contributions to the development of radio science and industry through WGY, and this station stands for scientific progress and development.

"During the period when the Department of Commerce recognized developmental broadcasting stations, WGY was one of the three stations licensed in this class. The improvements first demonstrated through WGY have been incorporated in the regular operations of many of the better broadcasting stations throughout the country.

"The program of WGY have included the best in music, entertainment, statesmanship, economic, instruction and religion. The reports on weather, markets and stocks have been of inestimable value to the agriculturist and the business man. The broadcasting in co-operation with the State Department of Health and the Department of Agriculture have constituted a real service.

"WGY's programs on short waves are not only regularly received by hundreds of listeners throughout the United States, but are also heard daily in many foreign countries. The newspapers and magazines of the British Isles, South Africa, Australia and South America regularly print WGY's programs. This broadcasting is a factor in promoting international understanding and good will.

"In the recent reallocation, WGY's wavelength (790 kilocycles), was transferred to the Pacific Coast as one of the eight cleared channels assigned to Zone 5. Order No. 40 specifies that such assignments connote periods of full time operation, that is to say, 24 hours daily, and every allocation of a frequency to a particular zone is to be considered as carrying with it an assignment of full-time operation on that frequency to that zone.

Wants Cleared Channel

"No other wavelength has been assigned to WGY to replace the wavelength transferred to Zone 5 for 24-hour operation. However, in the list of stations under the new allocation, WGY has been designated a limited station to operate on the 790-kilocycle frequency, with the added note that such stations will not be permitted to operate during the evening hours simultaneously with other stations assigned to the same frequencies.

"Overlooking for the time being our

STATIONS PREPARE FOR REALLOCATION

Washington. With the reallocation effective date less than two weeks off, stations throughout the country are preparing for the new power, wavelengths and hours on the air. About two-thirds of all the stations are affected in at least one particular, usually in all three ways.

The general acceptance of the ruling is taken for granted, even though most stations that have to suffer reduction are

keeping quiet and acting obediently, without being enthusiastic. It is recognized that the reallocation is intended for the public good, although a few inequalities have crept in. These can be straightened out after the legal hearings on appeals are conducted, the Commission points out.

The stations are waiting to see how things turn out in actual practice. Some of them have been testing on the new frequencies and power.

Quickly Denied

property and priority right, we believe that the transfer of WGY's wavelength to the Pacific Coast without replacing it by an equally satisfactory cleared channel will not serve the public interest, convenience or necessity.

Hurts One or the Other

"In a letter from Commissioner O. H. Caldwell to Martin P. Rice, dated Washington, September 25, and initiated by Commissioners Pickard, Lafount and Sykes, the suggestion is made that slight modifications in the schedule of KGO and WGY would enable both of these stations to enjoy exclusive channel operation. The definite suggestion is that KGO stand by from sunset until 7 p. m. or 8 p. m., and that WGY sign off at 10 p. m. or 11 p. m.

"This suggestion would deprive Zone 5 of approximately 35 per cent. of the broadcasting now regularly scheduled over KGO and it would reduce the evening broadcasting of WGY approximately 25 per cent. during the winter.

Cites Public Interest

"Moreover, it does not conform to the equalization plan allocating eight cleared channels to each zone; for the wavelength assigned to Zone 5 is no longer a cleared channel if it is to be used during the evening by a station in another zone. It is evident therefore that either the fifth zone does not receive a cleared channel to which it is entitled, or if it does WGY has no right to broadcast after sunset on the Pacific Coast.

Case in N. Y. City

"The reallocation results in the assignment of four cleared channels to serve New York City, which also has the choice of at least 10 other programs on the local or regional assignments. The public dependent upon WGY have no other reliable program.

"In the public interest we request that WGY be permitted to continue broadcasting on its present frequency (790 kilocycles), as a cleared channel without restrictions as to time."

Board's Position

The Commission, it was stated after its meeting, denied the application for modification of the license awarded the station under the reallocation plan, on the ground that it conflicted with existing orders relative to station assignments. Consequently it declined to set a date for hearing of the application.

The view is taken by the Commission, according to the oral announcement, that the application of the General Electric Company is in conflict with General Order 40, which promulgates the new-allocation of wavelengths, power and time, and also with General Order 42, which limits the power assignments of broadcasting stations to 25,000 watts regular power and 25,000 watts additional for

No 150,000

Watt Permit for Station

experiments. WGY now has the maximum power assignment.

Chance for New Plea

The Commission announced that the only way WGY would be enabled to get a hearing on its application for modification would be to amend the application to conform with the General Orders of the Commission relating to the reallocation and to maximum power allowances.

Moving Train in Canada Picks up English 5SW

Montreal.

A new record in radio reception has been established by the Canadian National Railways in receiving English short wave transmission on a moving train. The Continental Limited, moving eastward from Vancouver to Montreal, carried in the observation car a special receiver capable of being used for the short wave and general broadcasting channels.

While the train was in the station at Vancouver at 8:30 p. m., Pacific Time, the operator picked up 2XAD, Schenectady. On the journey towards the East various short wave stations were heard but the prize, 5SW, Chelmsford, England, came through while the Continental Limited was passing Favel, situated between Sioux Lookout and Redditt, Ontario, 1,219 miles west of Montreal. Contact was maintained with the English station on a short wave for fifteen minutes. The time of reception from England was 4:00 p. m. Central Time.

149 Stations Changed Again in Reallocations

Washington.

The Radio Commission announced new reallocations of 149 stations, effective November 11th. The changes are designed to improve public service and to effect greater economy of daytime operation. These are changes in the first reallocation list.

[The list will be published next week.]

PICTURE DIAGRAM of 4-tube Screen Grid Diamond, next week, issue of November 3rd.

Ordered Off Air, Stations Will Resume

Washington.

Announcement by WOK - WMBB, Homewood, Ill., near Chicago, that they will resume broadcasting on the wavelength 1,190 kilocycles presently, in spite of the action of the Federal Radio Commission in ordering it off the air September 1 for failure to serve the public interest, has been received by the Commission. The case has been referred to the Department of Justice for investigation and action.

WOK-WMBB had 5,000 watts power, and a transmitter of 20,000 watts capacity.

Louis G. Caldwell, general counsel of the Commission, said that it may decide to wait until the stations go on the air again, as the stations announced in newspaper advertisements, before starting criminal proceedings. The second step, he said, is that of starting an injunction suit in the immediate future, or before the stations begin operating, on the theory of the sovereign right of the United States to keep the ether channels free and unobstructed except to serve the public interest, convenience and necessity.

For such violations of the law, Mr. Caldwell brought out, there is a penalty of \$5,000 fine or three years imprisonment or both.

Mr. Caldwell already has been designated Special Assistant to the Attorney General in Federal radio matters, and together with B. M. Webster probably will represent the Department of Justice in the case.

WOK-WMBB were ordered off the air September 1 and have not been operating since. The former frequency, 1,190 kilocycles, is at present unoccupied, but has been allocated to other stations under the reallocation to become effective November 11th. Consequently, it is explained by Commission engineers, the stations, should they follow their intended course of going on the air presently, will cause no interference, other than the normal interference existing in the Chicago zone, but after November 11th undoubtedly would seriously impair the allocation set-up in the Chicago area and prevent any reception on that particular wavelength.

NAVY DAY CELEBRATION

WASHINGTON.

Observance of Navy Day on October 27 will be marked by special radio features and competitions. The objects of Navy Day, held annually, are to pay tribute to the past and present services of the Navy to the Nation and to acquaint the American people with naval activities.

Wave Clean-up Promised

Good Reception to be Restored Nov. 11th, Says Caldwell; Attacks Stations Stirring Up Protests

By Orestes H. Caldwell

Federal Radio Commissioner, Representing the First Zone

SHALL the radio broadcasting situation be cleaned up now and for all time and good radio reception be restored to our millions of listeners? Or shall radio be allowed to slip back to the confusion of interference and heterodyne which have beset the broadcasting waves for the past two years?

That is the issue before the radio listeners of the United States during the next thirty days. For on November 11th the public will have within its grasp a radio set-up with reduced number of stations, for which the people, Congress and radio folk generally have patiently waited all these many months.

So far as the Federal Radio Commission is concerned, the reallocation—exactly as ordered by Congress, but embodying sound radio principles—will go through as announced, on the morning of November 11th. There will be no turning back or postponement by the Commission. There will be no compromise of the public's or listener's interests by their radio representatives at Washington.

The Commission is determined to stand firmly on its order, affecting big and little broadcasters alike, and to bring back to the American people good radio reception, equitably apportioned throughout the nation as required by law.

Yet from now on till November 11th it is likely that public sympathy will be appealed to by some few selfish broadcasters and that the aid of groups of listeners themselves will be sought by specious arguments that this or that station is to have its service unduly cut.

On such selfish appeals listeners, in their own interest, are urged to withhold their judgment, and certainly their participation. For investigation will show that the allocation assignments, as made, are generally fair and equitable to all—and have been arranged solely so to secure the fullest possible service to all listeners in each State and section.

If minor injustices have crept in, as

between the hours or position of this station and that station, simple and direct methods are provided by the law for getting quickly at the facts, by having testimony on all sides presented before the body of five Commissioners, so that following such public hearing each situation can be adjusted fairly in the best public interest.

More on Low Waves

Of course there will be time-sharing and time reductions for individual stations. Of course some stations will find themselves with lower wavelengths than before. And of course there will be some power cuts.

All of these will follow in any rearrangement of 600 stations, by which only 315 will hereafter be permitted on the air simultaneously—as good radio requires.

And obviously, also, if we are going to utilize all our 90 channels fully, the efficient (if less-popular) high frequencies will have to carry their share, and some stations will thus be "moved down." But the stations so shifted will have the future compensation of "getting out" with their programs to larger audiences than ever before.

Only by reducing the number of stations that are simultaneously broadcasting on our 90 channels can radio be reclaimed from the heterodynes that have continued since the 1926 breakdown of the law. Every radio fan and every radio listener knows this.

And after trying every other expedient the Radio Commission has finally, as a body, recognized this fact, and now upon sound engineering principles has erected the reallocation ordered for November 11th.

Broadcasters big and little are asked to co-operate in the public interest and to accept their new positions and portions, in the inevitable solution of the problem.

To the credit of the broadcasters as a

whole be it said that they generally recognize the scientific necessity, and the unpleasant duty imposed on the Commission, and all but very few have willingly accepted the sacrifices entailed. Some few (ignoring the remedies provided by the the Commission and the law) have undertaken to enlist their local publics against the whole orderly change which is designed to bring improved radio to millions.

The issue is clean-cut. On the one side stand these few who insist on preserving their excess or present share of the radio facilities, in the face of the public interest in other communities and the need for a general reduction. Some would even attack the whole radio structure, if in the general confusion and disaster they could hold onto their present schedules, though radio and the public suffer.

On the other side are the interests of the public, the far-seeing broadcasters, the radio industry, and the real friends of radio. This is the position on which the Federal Radio Commission stands resolute—with full powers from Congress and with convictions burned deep into the souls of its members who have withstood the ordeals of a year or more of Commission service.

Sees Public Aroused

This is the side of good radio reception for 120,000,000 of our population; good radio to every home on the continent, nightly programs of inspiration, information and entertainment to every farm and city listener, every remote mountain, prairie and island dwelling. The broadcasting reallocation is effective November 11th as announced.

And an aroused public opinion, backed by an army of interested listeners, will deal in its own way with any selfish minority which seeks to upset or delay the new orderly arrangement which will restore the full miracle of radio to 120,000,000 people.

Byrd Ship at Equator Hears Soprano in N. Y.

Sylvia Miller, young lyric soprano of Major Edward Bowes' Capitol "Family" of the air, received a radiogram from the SS. City of New York, by R. W. Konter, present with Commander Byrd on his South Polar expedition. It reads:

We are in the Pacific about to cross the Equator bound for Samoa. Thrilled when I heard your voice over WGY tonight.

R. W. KONTER.

Mr. Konter is known as Commander Byrd's "right hand man" and has accompanied him on several expeditions, including the one to the Arctic in 1926.

WGBS FOUR YEARS OLD

Four years ago Gimbel Bros., New York City, opened WGBS. The station's fourth birthday was celebrated with song, humor and instrumental music.

Flora Le Breton, of "Present Arms," was one of the celebrants.

Young Is Appointed An N.B.C. Announcer

John Shaw Young, formerly of WBZ and WBZA, operated by the Westinghouse Electric and Manufacturing Company in Springfield and Boston, has joined the staff of announcers of the National Broadcasting Company.

Young is the first of the NBC announcers to come direct from college to broadcasting. He is also one of the two announcers who are not singers. The other is Edward Thorgerson, a pianist. The new announcer, who is a native of Springfield, received his education at Yale University, where he studied playwriting under Professor George P. Baker after he had finished his undergraduate work. He was graduated in 1927.

"FAUST" ON MONDAY

The grand opera "Faust" will be given by the National Broadcasting Company over its chain Monday, October 29, at 10:30 p. m.

WCGU Appeals from Its New Assignment

Washington.

An application for modification of the station license assigned to WCGU, at Coney Island, N. Y., was filed with the Federal Radio Commission by Charles G. Unger, president of the United States Broadcasting Corporation, operator of the station.

The application will be considered along with 16 others already filed with the Commission.

The application requested change in the frequency, power, and hours of operation assigned the station under the new allocation of broadcasting facilities to become effective November 11th. The terms of the present license call for operation on 1,370 kilocycles with 500 watts of power. The modification requested is 920 kilocycles with 1,000 watts of power. The hours of operation specified in the reallocation are 32 hours weekly, and the modification requested is to 12 hours per day.

By the Rev. S. Parkes Cadman:

How Radio Has Rekindled the Vital Spark of Religious Spirit

[Dr. Cadman recently became staff preacher of the National Broadcasting Company. On his assumption of his new and enlarged duties he wrote the following article.]

SEVERAL years ago an invitation was extended to me to place the morning service of the Central Congregational Church of Brooklyn, N. Y., on the air. The outcome of that (for me) memorable incident was that the Bedford Branch of the Y. M. C. A., Brooklyn, undertook to broadcast through WEAF the Men's Conference I had held there for twenty years previously. Within a few weeks I discovered the seemingly infinite possibilities of the novel venture.

It passed at a bound beyond the experimental stage and challenged the best endeavors of all engaged in it. For a prolonged period before the National Broadcasting Company began to universalize religious privileges, church leaders had lamented the comparative failure of the normal means for the transmission of those privileges.

It was frequently said by church authorities that the vital spark was no longer kindled in the pulpit. The lessening of popular interest in institutional religion, the decreased attendance upon divine services, the increased pursuit of recreation and pleasure, the break-down of the observance of the Lord's Day, and the falling off of multitudes of young people from Bible Schools and kindred organizations troubled countless devout and sincere souls.

The cry went up from numerous quarters: "What can be done to arrest this decay in the nation's spiritual development?"

Hand-Maiden of Religion

At so critical a juncture radio broadcasting was introduced and the scene was changed. That latest marvel of science showed that, rightly used, science was still the hand-maiden of religion. Never since time began, has a more influential agency appeared than this near-miracle of invisible audition.

It arouses wonder in the dullest and most inert minds, and goes beyond the highest expectations of the brightest and most alert.

Through its mysterious agency the songs, prayers, readings, meditations and utterances of selected men were placed at the command of every household in the land. Sixty-three thousand letters on file, and, indeed, many more which have been otherwise disposed of, demonstrated the deep and, indeed, the passionate allegiance of the American people to what has been finely phrased as "the things of the Spirit."

At least sixty-five per cent of these letters dealt with major matters which have fascinated thought from the birthday of human consciousness. These were the being and nature of God, the immortality of the soul, the life beyond the grave, and equally grave and momentous questions.

Necessity for Instruction

They came as a revelation to some of us who had been living in a somewhat circumscribed world, hedged about by erroneous ideas. Moreover, they not only asserted beyond successful contradiction the widespread desire for religious instruction, but the imperative necessity for it. Without for a moment disregarding the conscientious differences existing between creeds and denominations, it was clear that outworn and superfluous barriers separated them from mutual sympathy and understanding and from that cooperative

service which is the world's chief good today.

As these experiences, gained by actual radio contacts, grew from more to more, it dawned upon me that I ought to dedicate all I am or can hope to be to so providential an opportunity. Musicians, educators, scientists, statesmen and dramatists were quick to seize its skirts. Their concerts, addresses and plays speedily won millions of constituents. Surely religion, which is the first business of a free people, should be placed where it belongs in radio's splendid realm—at the front.

Thanks to the generous provisions of the broadcasting authorities, it has had an unprecedented hearing in the past decade. And its future is so radiant with promise that moderate forecasts would sound like wild predictions.

Vision Often Arises

Had not men and women of every rank and condition written from near and far I might have retreated before the solemn responsibilities which radio broadcasting imposes on those who employ its vast medium. The vision of the throngs awaiting the moment for "tuning in" has often risen before me. Roman Catholics, Jews, Protestants, and those of no particular religious persuasion, were ever present in one's heart. Their multiform necessities, sorrows, joys, beliefs or non-beliefs were claimant and stormy in my ears. Truly in order to reach so complex a mass the message must be basic, comprehensive, pertinent and alive with the ideals and sentiments which register humanity at its best. Anything merely peculiar or personal or eccentric or segmental was plainly out of place here.

The paramount demand evidenced by the unseen audience was for light rather than heat, conference rather than controversy, and above all, constructive helpfulness and not chronic faultfinding. I therefore resolved that wherever I could fan the spark of faith to a flame, burn on what altar it may, I was obligated so to do.

Allow me to herewith acknowledge the inexpressibly valuable help and guidance a radio audience gives. And speaker gets back what he gives. It is returned to him pressed down and running over. If he is bitter, bigoted and denunciatory, he reaps

as he has sown. If he is brotherly, magnanimous and considerate, there is no nation more hospitably inclined to reciprocate in kind than our nation.

Sense Sincerity of Purpose

At the same time, the American people are quick to detect sooth-saying, lack of moral courage or infirmity of purpose in a radio speaker. They require that he or she shall be bold, and again bold, and yet not too bold. Their courtesy, patience and ability to "go along" with the speaker at the microphone are nothing short of remarkable. But he must not take unfair advantage of an issue, nor blink the argument to floor the man. They like to feel that he can put himself in the other person's place, get under his skin, see life as he sees it, and then do all possible to exchange with him the conceptions which illuminate the dark path and ease the heavy load.

The famous clergyman and author, Ian Maclaren, said to me just before his death: "What people really need today is relief and succor, and if I had to recommence my ministry tomorrow I should strive to give these to them."

I have gone to my new duties with his words ringing in my memory. Pursuant to a great call I have undertaken my Lord's Day Radio addresses and answers to questions with those advantages the past has conferred, and by a strict observance to those principles I have briefly outlined here.

Asks Nation's Support

The Federal Council of the Churches of Christ in America has given its approval to this larger public service and the services themselves will be under the sponsorship of this nation-wide organization.

But I earnestly solicit the sanction and support of citizens of every faith who crave the moral ascendancy of the American Republic. Not in clever politics, nor in actual statesmanship; not in material possessions nor in scientific learning, but in the will of our beloved nation to fulfill the Highest Will are her safety and her strength. That the tendency toward that Will is more prevalent than surface indications suggest, I for one, firmly believe.

Only Dance Tunes at Late Hours Lamented

Cincinnati. Variety in the programs of WLW and WSAI with not one moment of duplication when the two stations are broadcasting simultaneously is announced by the Crosley Radio Corporation.

This was the aim toward which the stations have been pointed ever since the Crosley Corporation took over the control of station WSAI in May, said an announcement made for the two stations.

Crosley's Statement

Powel Crosley, Jr., said: "When we took over WSAI, my first idea, beyond maintaining the individuality of the station as it had been known to so many of its friends, was to have the programs so arranged that the listener always would have a selection of entertainment from which to choose. I am pleased to say that Ford Billings, our

director, has been successful in getting the stations' offerings so organized."

Mr. Billings pointed out further some of the more interesting changes that the program differentiation will make in Cincinnati offerings.

Late-Night Dance Music

"Only dance music late at night probably has been the greatest criticism of all radio stations, and we have remedied that flaw in our new bookings," Mr. Billings said:

"Never at any time will dance orchestras be playing from both of the Crosley stations at the same time, although we have had great difficulty in making satisfactory arrangements for our excellent remote control orchestras.

"To please all parties it has sometimes been necessary to keep the stations on the air for an extra period after midnight."

Private Air Routes Get Federal Radio Aid

Washington.

The airways communication station being constructed by the Department of Commerce at the Cleveland airport is nearing completion, the Department announced in the following:

The new Airways Communication Station of the Commerce Department, located on the northeast corner of the Cleveland airport, is rapidly nearing completion. The building is about 85 per cent completed and contract has been let for erecting the new 125-foot steel towers.

A 2,000-watt radio transmitter similar to transmitters used in broadcasting stations and adequate receiving equipment, are being installed. When this installation is completed the present Cleveland radio station, located at the foot of East Ninth Street, will be discontinued and dismantled. This station, which is capable of radio telegraph transmission only, was originally installed by the Navy Department many years ago for communication with ships on the Great Lakes.

Uses for New Stations

The new station will be used for communicating with aircraft flying the Civil Airways in the vicinity of Cleveland and particularly for advising pilots of weather condition along the airways and at terminal landing fields.

This equipment will also be made available to aircraft operating companies so that instructions can be given to a pilot while enroute.

Such service is of particular value in case of fog forming suddenly over a landing area, in which case the pilot can be advised of a nearby field that may be free of fog.

The transmitting equipment has been completed, and is now being tested at the factory by engineers of the Airways Division.

The transmitter is of a special type, designed for either radiotelephone or radiotelegraph transmissions. It is capable of reliable communication with aircraft up to 100 miles by radiotelephony and to many times that distance by radio telegraphy.

All communications with aircraft will be on a frequency of 333 kilocycles or wavelength of 900 meters. This frequency was reserved internationally for aircraft communication by the International Radio Convention held in Washington, D. C., during October and November, 1927.

Will Report Movements

The station will also be used for communication by radiotelegraphy between other Airways Communication Stations operated by the Department for collecting weather information and reporting plane movements.

This installation is the second of this type to be made by the Airways Division.

The first installation was made at Hadley Field, New Brunswick, N. J. Twelve additional transmitters, of the same type as is being installed at Cleveland, are under contract and will be used to replace obsolete apparatus now in use at important stations on the transcontinental route and to establish a new station at Key West, Fla.

Associated with the communication station is a radio range or directive radio-beacon. This apparatus is located about a quarter of a mile from communication station.

Five More Stations to Reduce Flight Risk

Washington.

Airways communication stations with 500-watt high frequency radiotelegraph trans-

mitters and suitable receiving apparatuses are to be installed on selected sites along the Dallas-Chicago route, the Department of Commerce announced. The statement follows in full text:

The installation of Airways Communication Stations on the Dallas-Chicago route is nearing completion. Sites have been selected at Fort Worth, Texas, Oklahoma City, Okla., Wichita, Kans., Kansas City, Mo., Unionville, Mo., and Moline, Ill.; buildings have been leased, contracts placed for erection of antenna poles and all equipment shipped.

These installations will be used for handling weather information and plane movements messages. The equipment will consist of a 500-watt high frequency radiotelegraph transmitter and suitable receiving apparatus.

Quarrelling Stations Get Extra Probation

Washington.

Four broadcasting stations in Pennsylvania, placed on probation by the Federal Radio Commission on August 29 because of the broadcasting of "personal disputes," have had their licenses extended until November 11th, when the new allocation goes into effect, and will be permitted to continue to operate provided they observe the Federal regulations, the Commission ruled.

The probationary periods of these stations expired on October 1. They are stations WAK, owned by C. A. Cummins, Erie, Pa.; WABF, owned by the Markle Broadcasting Corporation, Kingston; WBRE, owned by Louis G. Baltimore, Wilkes-Barre, and WMBS, owned by Mack's Battery Co., Lamoyne, Pa.

The stations were included among the 164 cited for alleged failure to serve the public interest, convenience and necessity. The owners of the stations were charged with having indulged in continuous personal controversies, in the course of which they were alleged to have used their stations for purposes of abuse against each other, and with other broadcasting station in the respective areas not cited under the general order.

Get Assignments

After the month probationary period the Commission has decided, it was stated, to continue the licenses of the stations. They have been assigned frequencies under the new allocation.

When the question of disciplining these stations came up the Commission answered the argument that free speech was constitutionally guaranteed hence the stations were at liberty to broadcast as a matter of right even disputatious matter. The Commission's answer to this follows:

"Even on a subject of public importance a man is not permitted to get up in a public place such as on a street or in a public park, in many cities, and speak to the public without a permit.

Public Protection

"With these limitations already imposed by the law on unrestrained utterance, is the Commission powerless to protect the great public of radio listeners from disturbances and nuisances of this kind? Should a man who is forbidden to per-

Improved Beacon Aids Mail Fliers

Washington.

The Department of Commerce made the following announcement:

The beacon at College Park, Md., has been further improved and is now ready to supply service to the mail contractor on the northern section of its New York to Atlanta air mail run.

A study is in progress of further simplifying the transmitting equipment and a cooperation program arranged with several manufacturing companies towards developing the special apparatus necessary.

An alternating current unit has been developed for operating the station course indicating instrument which is used for accurately checking and maintaining a given beacon course.

A new type of vibrating reed for beacon receiving equipment on aircraft has been developed in which the change in frequency with temperature is practically eliminated.

petrate such a nuisance in a public street, or in such a manner as to disturb people living in the vicinity, be allowed to invade the homes of radio listeners over a vast area in something so disagreeable and annoying?

"Listeners have no protection unless it is given to them by this Commission, for they are powerless to prevent the other waves carrying the unwelcome messages from entering the walls of their houses.

"Their only alternative, which is not to tune in on the station, is not satisfactory, particularly when, in a city such as Erie, only the local station can be received during a large part of the year. When a station is misused for such a private purpose the entire listening public is deprived of the use of a station for a service in the public interest.

Free Speech Question

"The Commission is unable to see that the guaranty of freedom of speech has anything to do with entertainment programs as such. Since there are only a limited number of channels and since an excessive number of stations desire to broadcast over these channels, the Commission believes it is entitled to consider the program service rendered by the various applicants, to compare them and to favor those which render the best service.

"If one station is broadcasting commercial phonograph records in a large city where original programs, for which it is making a great financial outlay, the Commission believes that the second station should be favored and that the question of freedom of speech is not involved. This is only one example of many that might be cited. Entertainment such as music is not "speech" in sense in which it is used in the first amendment to the Federal Constitution.

Promises Caution

"Nevertheless, on all matters that seem near the border line, the Commission will proceed very cautiously, and where it feels that it may reasonably be contended that freedom of speech is involved although the Commission may not entirely agree with the contention, it will give the station the benefit of the doubt, as has been done in the cases which have come before it."

Phonograph Programs Asset to WBZ-WBZA

The first "big voice" to be lifted in favor of putting phonograph music on the air is that of WBZ-WBZA, Massachusetts twin stations of the Westinghouse Electric & Manufacturing Company. Heretofore small stations, unable to maintain quality programs any other way, have "fitted in" with record renditions. WBZ-WBZA makes an individual feature of the record-transmission, instead of subordinating it or apologizing for it.

The Federal Radio Commission recently objected to constant use of records for broadcasting, adding:

"For example, the public in large cities can easily purchase and use phonograph records of the ordinary commercial type. A station which devotes the main portion of its hours of operation to broadcasting such phonograph records is not giving the public anything which it cannot readily have without such a station.

"If, in addition to this, the station is located in a city where there are large resources in program material, the continued operation of the station means that some other station is being kept out of existence which might put to use such original program material.

"The Commission realizes that the situation is not the same in some of the smaller towns and farming communities where such program resources are not available. Without placing the stamp of approval on the use of phonograph records under such circumstances, the Commission will not go so far at present as to state that the practice is, at all times and under all conditions, a violation of the text provided by the statute."

WBZ-WBZA stress the great voices and orchestras it puts on the air from records. A question that naturally arises is: "Can you tell when the broadcasting is being done from a record, and if not, what is the real objection to broadcasting it?"—Editor.

Boston.

Radio broadcasts of phonograph recordings have proved so popular with morning radio listeners, announces WBZ-WBZA, Westinghouse stations, that the Victor concerts will be continued. John L. Clark, director of programs, said these concerts were inaugurated four months ago as an experiment in the use of voice-reproduction equipment.

Regular Feature

As soon as the station had an installation that was satisfactory to its chief engineer, Dwight A. Myer, the Orthophonic Hour became a regular feature six days a week.

Since June more than 100 programs of some 1,000 recordings have been presented. Mail response, the only direct measure of a program's appeal that the radio program makers have, has been heavier than for any other morning program originating in the Boston or Springfield studios.

He Is Satisfied

"The effort has been warranted," Mr. Clark declares, feeling that "such a response as we have had vindicates our estimate of this new type of program.

"We have to heed the mandate of listeners. They want the best. They are not, as a matter of fact, interested in the mechanics of producing a program. It is what comes out of the loudspeakers that counts with them."

Speaking of the abhorrence which audiences are supposed to feel toward phonograph recordings on the air, Mr. Clark said that he approached this innovation with qualms, feeling that the audience would immediately tune out reproduced music. Not

so. The response has been 100 per cent approval, he said.

For the most part, the mail has included requests for future programs.

Counts On Continuity

"There is a secret, of course, to the successful production of a phonograph program. You will hear the criticism that any one may buy these same records at any music store. We reply to that by saying, 'So can you the sheet music of every musical score ever heard on the air.'"

But the paramount consideration is the individual treatment—the radio investiture which keeps a staff of continuity writers busy every week. Around every air recording is spun an atmosphere which makes of the song, symphony or dance music a separate story—a self-sufficient entity.

Every morning at 11 the "Queen of Sheba Cortege" ushers in the artists of the day. "The Magic Stage" the continuity men have named it, for it brings back Caruso; it presents the prima donnas of grand opera in the morning long before they themselves are out of bed; it gives us night club merriment after the sun is up at high noon; it renews for us the ecstatic moment when Lindbergh landed and received the acclaim of the nation.

No Qualms as to Future

These radio recordings have opened up an entirely new field, with the perfection now attained by the phonograph in giving to radio audiences the greatest moments in the musical, artistic—even the historic life of the nation, little trepidation should be entertained for the future of this type of pro-

WLW Starts Tests on New 50,000 Watts

Washington.

The Federal Radio Commission authorized WLW, Cincinnati, managed and operated by the Crosley Radio Corporation to increase its power from 5,000 to 50,000 watts.

The Crosley Corporation some time ago was granted a construction permit to build a 50,000-watt transmitter, it was explained orally at the Commission, and now has been authorized to use this transmitter. The Crosley Corporation also operates WASI, Cincinnati.

Fourteen weeks after the ground at Mason, Ohio, was broken for the new 50,000-watt transmitter building of the Crosley Radio Corporation, the new station went on the air for a test program. Authority had been received from the Federal Radio Commission to test the station between midnight and 6 A. M.

Speed has marked the erection of the new building and the installation of the transmitter. Every part of the work was so scheduled and planned that no delays were experienced.

Many Report Reception

While the first program was put on the air merely as a preliminary test of the equipment to make a final check of the numerous and complicated adjustments of the transmitter, telegrams began to pour in within a half hour after the first sounds went out from the new antenna.

The first telegram bore an address in the heart of New York City. Its message was this: "Transmission perfect. Better than most local stations."

Although the Bell Laboratory at Whip-

gram. This is the firm conviction of WBZ-WBZA officials.

The station announcement continues:

"If the taste is for operatic gems there are Mme. Schumann-Heink, Lucretia Bori, Galli-Curci and Emilio de Gogorza. Concert artists include such names as John McCormack and Reinald Werrenrath, while the instrumental masters are Ignace Paderewski, Jascha Heifetz, Sergi Rachmanioff, Fritz Kreisler and many others.

Jazz Symphony

"Those whose predilection is for symphonic jazz may hear Paul Whiteman or Roger Wolfe Kahn, while such famous bandmasters as Sousa and Pryor are also recorded for the 'Magic Stage.'"

Short Wave Plea Dropped by Producer

Washington.

The United Artists Corporation, motion picture producers, the Federal Radio Commission announced, has defaulted its right to a hearing on its application for a short wave point to point channel between Hollywood, Calif., and New York City, by failure to have itself represented at the scheduled hearing. After the Federal Radio Commission had waited for half an hour beyond the scheduled time of the hearing, it recorded the Corporation as having defaulted.

The application of the Corporation was to transact the Corporation's business over the short wave channel between 9 a. m. and 6 p. m.

Universal Pictures Corporation and the Paramount Famous Lasky Corporation also have filed applications for hearings with a view of obtaining licenses in the short wave band, it was stated orally at the Commission.

pany, N. J., where the new transmitter was built, had not been notified of the test, the engineers had been listening.

Hardly had the new transmitter signed off than the Bell engineers telephoned to congratulate the Crosley Corporation both on the excellent transmission of the new set and the great speed with which the final adjustments had been made.

The carrier of the new transmission had been radiating only a few minutes when telephones in the studios in the Crosley Radio Corporation began ringing with inquiries regarding the test. At one time the telephone operator was forced to stop answering calls because they became so numerous.

700 Kilocycles on Test

R. H. Langley, director of engineering of the Crosley Radio Corporation, and J. A. Chambers, supervisor of broadcasting, have been in charge of the construction of the new transmitter building and the installation of the 50,000-watt equipment.

H. S. Price, Western Electric engineer, has been in direct charge of the installation, assisted by John Smith and William Adams. Joseph Whitehouse, formerly transmitter operator of WLW at the Harrison, Ohio, station, which still is broadcasting the programs of WLW, is the operator in charge at Mason. When the new transmitter is officially in operation he will be assisted by two shifts of two men each.

Call letters W8XAL and the WLW frequency of 700 kilocycles are being used in testing the new Crosley transmitter.

A Shielding Cabin or A

By F. Edw

WHICH is the better, a short wave adapter or a complete short wave receiver? That is a question which agitates the minds of many radio fans who are planning to join the ranks of the short wave clan.

Many factors enter into the problem to affect the decision. If the fan has a first class audio frequency amplifier in his broadcast receiver there is no necessity for building a complete short wave receiver.

Let no one worry about which is the better electrically. There is no difference, other things being equal.

No one can deny that it will be more convenient to have two independent receivers, one for short waves and one for broadcast. If the fan values this convenience more than the cost of an extra high grade audio amplifier, then the

called first detector is not a detector at all, but a modulator. It is odd that some one has not wondered if the adapter should not be plugged into the modulator socket of the transmitter!

Sensitivity Requirements

Many claims of phenomenal DX reception have been made for short wave adapters and receivers. Are these really true? Many fans are dubious. Some of them wonder even after they have built an adapter. As a rule the claims are true, but often the fans who read the claims misinterpret them. They think that any short-wave receiver will receive stations from the antipodes any time. No such claims were ever made for any adapter, for short waves are too fickle for any adapter invariably to substantiate. But the claims are that a good short

covered make it unpractical to use more than one tuner, and some short-wave signals cannot be received at all without regeneration.

But these conditions do not limit the receiver to one tube, that is, to the detector. Just as a radio frequency tube ahead of the detector makes a broadcast receiver much more sensitive, so it does to a short-wave circuit. And the screen

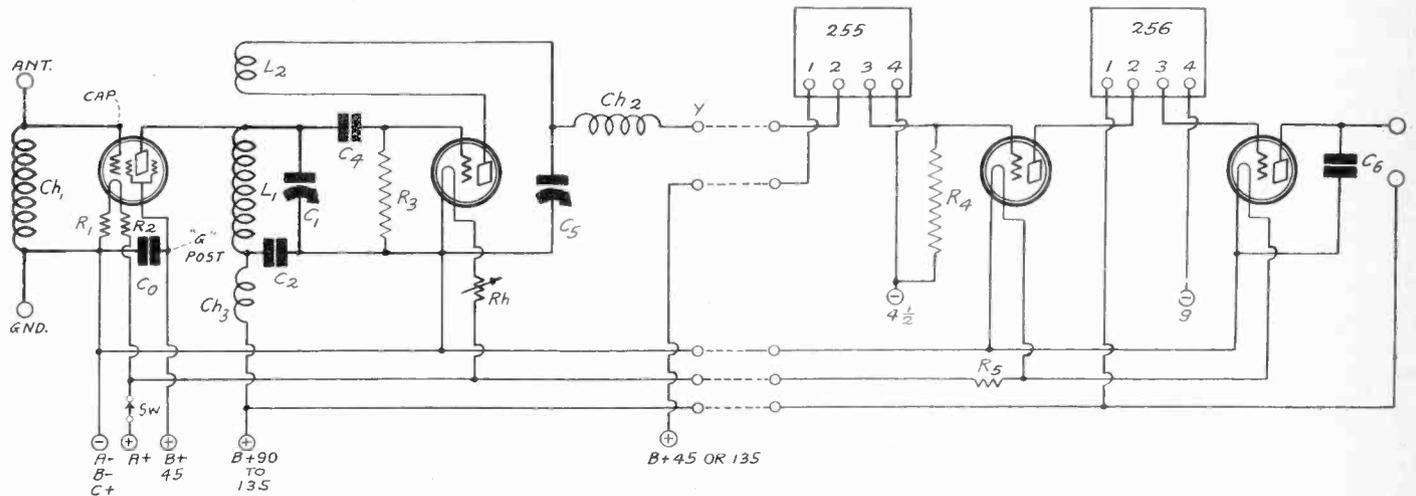


FIG. 1
THE CIRCUIT DIAGRAM OF EITHER THE "ROUND THE WORLD SHORTWAVE ADAPTER" OR "ROUND THE WORLD RECEIVER." THE ADAPTER IS AT THE LEFT OF THE DOTTED LINES. THE ENTIRE DIAGRAM IS THE COMPLETE FOUR-TUBE RECEIVER.

proper thing to do is to build two separate receivers.

If cost must be kept down to a minimum a little inconvenience will not matter, for a while at least. It is possible to add a separate audio amplifier to the short-wave tuner. The future possibility of doing this should be thought of in building the short wave adapter, by allowing room for it in the cabinet housing the short wave tuner.

How to Use Adapter

Thousands of queries have been received regarding the use of short-wave adapters in receivers already built. Can they be used in this receiver and that? Can they be used in a Super-Heterodyne, and if so in which detector should they be plugged, the first or the second?

The answer to the first question is that an adapter can be used in the type of receiver for which it has been designed. If the detector in the receiver is AC operated an AC adapter should be obtained. If the detector in the receiver is of the DC type a DC adapter should be obtained. The present adapter should be plugged into the detector socket in the receiver. That covers the Super-Heterodyne without ambiguity. There is only one detector in a Super-Heterodyne. The so-

wave adapter or receiver may pick up any station, no matter where located with respect to the receiver, and that it very often does. It is just as likely to pick up signals from a station 12,000 miles away as from a similar station only 120 miles away. There is something almost uncanny about the way short waves behave and the way simple short-wave receivers bring them in unexpectedly.

When you do get signals you are never certain whether they originate at a remote point or at a point comparatively close, and the thrill comes when the announcer reveals the location, to those who can understand his language.

Choice of Receiver Important

Obviously, the number of stations that can be picked up with a short-wave receiver or adapter depends on the design of the circuit, or on its sensitivity, as well as on the location. So does the ease with which the stations can be tuned in. Not all short wave receivers have been designed with equal skill, with the same adherence to correct principles.

It is generally admitted that a short-wave receiver or adapter should not have more than one tuning control, and that it should be regenerative. The nature of short waves and the wide range to be

grid tube is the most logical radio frequency amplifier in a short wave receiver. It can be made to step up the signal more than any other tube and with much less trouble and with fewer complications. Therefore a short wave receiver or adapter incorporating this tube in the first stage should receive first consideration in choosing a circuit.

Round the World

The Silver-Marshall "Round the World Four" is one of the few short wave receivers which incorporates a screen grid tube as radio frequency amplifier, and in a manner which makes utmost use of the properties of the screen grid tube.

Much interest has been shown in this circuit, one of the best McMurdo Silver ever turned out, and a detailed description of it will be given of it in its new shielding cabinet in response to numerous requests.

The circuit diagram of both the "Round the World Four Receiver" and the "Round the World Adapter" are given in Fig. 1. The antenna circuit is not tuned and thus the tuning characteristics of the circuit are independent of the antenna constants. This is of utmost importance in a short wave set, as then the circuit can be used with any antenna. It is also

McMURDO SILVER'S "ROUND THE WORLD FOUR"

et Short Wave Set

apter

n Schmitt

a necessity if the tuned circuit is to be calibrated for the various coils and tuning ranges.

A calibration chart or tuning log is a great aid in tuning in short-wave stations, for there are so many stations that it is impossible to remember the dial settings of all of them, or even of a small portion of them.

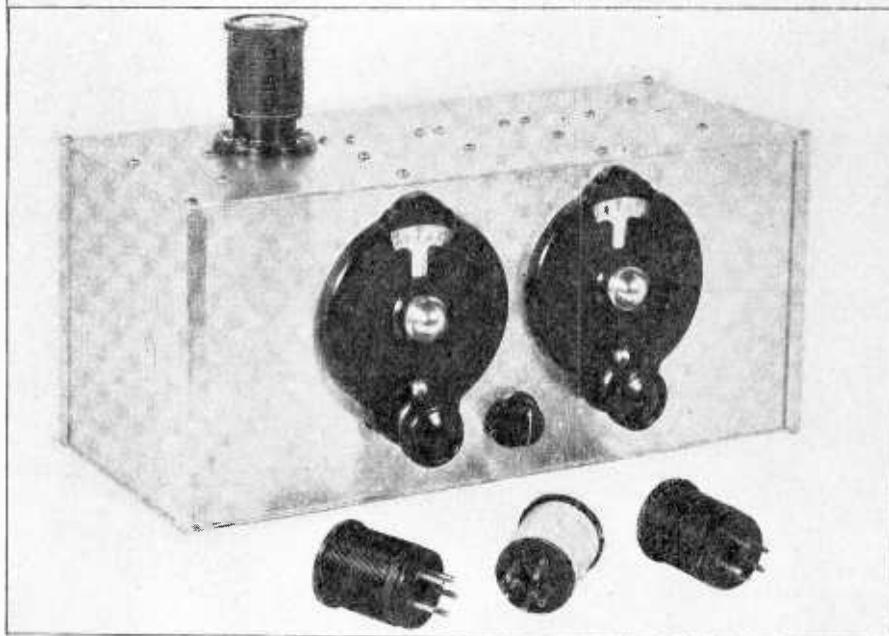
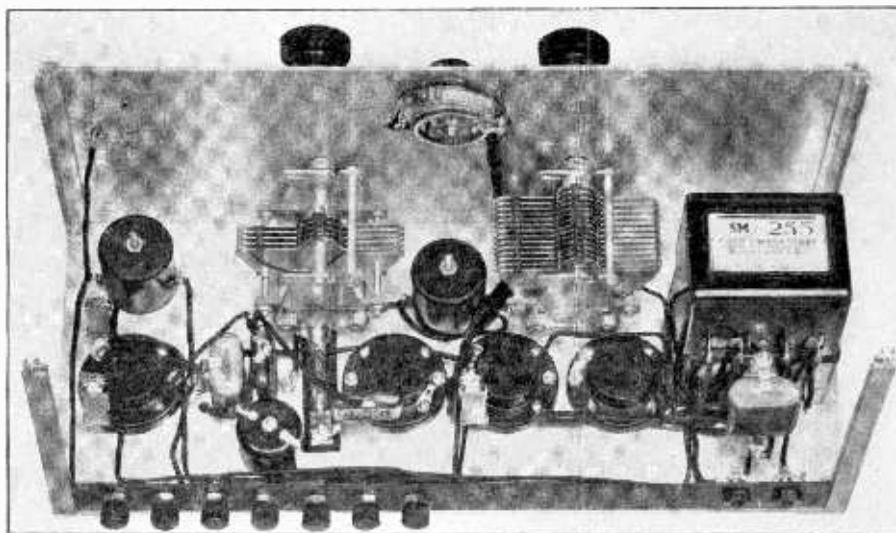
The antenna coil is a radio frequency choke, Ch1, across which the signal establishes a potential. This potential is impressed on the grid of the screen grid tube and is amplified many times by virtue of the high amplification constant of the tube and the tuned impedance load in the plate circuit of the tube.

Highest Load Possible

The parallel tuned impedance is the highest possible selective impedance that could be put on the tube, and therefore the tube is used to its maximum effectiveness. This tuned impedance is obtained

LIST OF PARTS

- Ch1, Ch2—Two S-M No. 277 radio frequency chokes.
- Ch3—One S-M No. 275 radio frequency choke.
- L1, L2—One set of S-M short-wave, plug-in coils Nos. 131-T, 131-U, 131-V and 131-W.
- C0—One Tobe .25 mfd. by-pass condenser.
- C1—One S-M 317, .00014 mfd. tuning condenser.
- C2—One .005 mfd. mica dielectric condenser (Polymet).
- C4—One .00015 mfd. grid condenser (Polymet).
- C5—One S-M 316B, .00035 mfd. tickler condenser.
- C6—One .002 mfd. by-pass condenser (Polymet).
- R1, R2—Two Carter type H-10, 10-ohm resistors.
- R3—One Lynch 5 or 10 megohm grid leak, with mount.
- R4—One Lynch 60,000 ohm resistor.
- R5—One Carter type H-2, 2-ohm resistor.
- Rh—One Yaxley 20-ohm rheostat.
- Sw—One Yaxley 500 switch attachment.
- One S-M 255 audio frequency transformer.
- One S-M 256 audio frequency transformer.
- One S-M 512 five prong socket.
- Three S-M 511 tube sockets.
- One Naald 481XS spring socket for detector.
- Nine binding posts.
- Two National vernier dials.
- Two Yaxley tip jacks.
- Twenty-five feet of S-M 818 hook-up wire.
- One S-M 734 aluminum cabinet.
- An assortment of hardware.



FIGS. 2 AND 3

INTERIOR VIEW OF THE "ROUND THE WORLD FOUR" SHORT-WAVE RECEIVER, SHOWING FIXED AND VARIABLE CONDENSERS, RADIO FREQUENCY CHOKE COILS, FOUR SOCKETS AND THE TWO AUDIO FREQUENCY TRANSFORMERS (ONE ON TOP OF THE OTHER.)

EXTERIOR VIEW OF "ROUND THE WORLD FOUR" SHORT-WAVE RECEIVER, THE TWO VERNIER DIALS, THE TUNING COIL ON TAP AND THE ALUMINUM CABINET. THREE EXTRA TUNING COILS ARE ALSO INCLUDED.

from the coil L1 and the tuning condenser C1.

A condenser C3 of .005 mfd. capacity is put in series with the circuit. This is so large that it does not affect the tuning characteristic to any appreciable degree. Its object is to permit the grounding of the rotor of the tuning condenser, and thus to stabilize the circuit. Without this series condenser the rotor would be connected to the high voltage of the plate battery. The condenser also serves as a filter for the high frequency currents. In conjunction with choke coil Ch3 it stops feedback.

The higher the parallel tuned impe-

dance L1C1 the greater will be the amplification. One way of increasing the impedance is to regenerate. That is the reason tickler coil L2 is used. By varying the amount of tickling, with condenser C5, the impedance of the circuit can be made as large as is desired, and hence the amplification can be made practically as high as desired.

Amplification figures could be given for the optimum adjustment, but they would be so large as to be meaningless. And a feature of an arrangement like this is that the weaker the original signal, the greater the amplification will be.

(Continued next week)

R" OR "TWO" PROVES EQUALLY DEPENDABLE

NUMEROUS schemes for scanning in television transmission and reception have been proposed. Most of these are old and have lain dormant for many years for lack of suitable light sources at the transmitter and receiver and also for lack of any means of amplification of the signals, both at the sending and receiving ends.

Before the development of the vacuum tube there was no practical way of amplifying signals, and therefore this condition prevented the application of television principles until about 1912.

While the vacuum tube as it is now

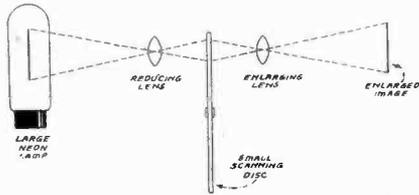


FIG. 1

THIS ILLUSTRATES A METHOD OF CONCENTRATING THE LIGHT OF A NEON LAMP PERMITTING A REDUCTION IN THE SIZE OF THE SCANNING DISC TO COMPARATIVELY SMALL PROPORTIONS.

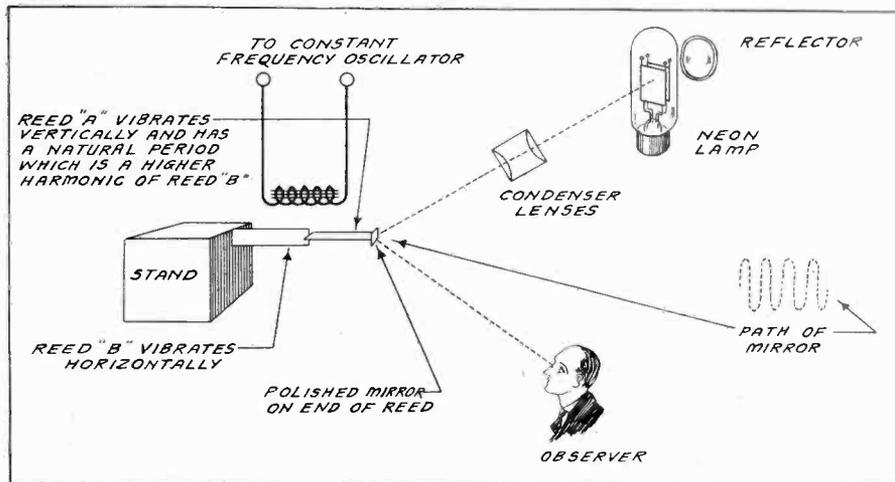


FIG. 2.

THIS SHOWS THE PRINCIPLE OF SCANNING BY MEANS OF VIBRATING REEDS. THE LIGHT OF THE NEON LAMP IS CONCENTRATED AND THEN DISTRIBUTED OVER THE FIELD OF VIEW.

known was invented in 1907, not for several years thereafter was it developed sufficiently to act as a faithful amplifier. It was not until about 1912 that the device was taken up by the large electrical laboratories and was thoroughly studied. After the world war the tube emerged in its present state of development. Since the end of the war developments of the tube have been mostly refinements and application of principles learned during the previous years.

Amplification Not Enough

But amplification alone was not enough to make the application of television schemes practical. It was necessary to develop photo-electric cells for converting light energy into electrical energy.

Previous to the advent of the photo-electric cell, selenium cells and thalofide cells were used for this purpose. These cells do not work on the same principle as the photo-electric cell. When light falls on these cells the resistance to an electric current changes considerably. The ratio of the resistance of a cell in darkness and in daylight was as high as 1,000-to-1, or even greater. The light reduced the resistance.

Although these cells were very sensitive compared with the photo-electric cell they

were unsatisfactory because extremely sluggish. Television requires practically instantaneous response to changes in light intensity. The selenium and thalofide cells required appreciable time to react to fluctuations in light intensity. Hence they could not be used for transmitting television.

Photo-Cell Long Known

The principle of the photo-electric cell has been known even longer than the principle of the vacuum tube amplifier. But it did not become a useful device until the photo-electrically active elements were placed in vacuum tubes.

The development of this cell to its present status was slow, but during the last few years an enormous amount of research work has been done on it. This has resulted in a cell of greatly improved sensitivity, greater constancy and much more convenient form.

The present photo-electric cell and thermionic vacuum tube are two of the

The Outstan in Tel

By J. E.

Technical

of these attacks on the problem. The most familiar form of the glow tube is the neon lamp, which gives a rather feeble orange colored light. There are other forms of glow tube which give lights of different colors.

In one sense the neon lamp is a complete solution to the problem. It responds instantaneously to variations of electric current supplied to it. At least there is no time lag as long as a millionth part of a second. That meets the problem of speed well enough.

The disadvantages of the glow tube are that the light is not white and that it is not strong enough. The question of intensity can be met by making larger glow tubes and concentrating the light. There is no question that the problem will be attacked in this direction. In fact it has already been accomplished to some degree. There are many methods available for intensifying the light, many of which are closely related to the method of scanning and distributing the light on the viewing screen.

Limitations of Light Valve

There is no lack of a source of intense white light. If there were, moving pictures would not be possible, nor any other form of projection of pictures or print. The best source is an arc light. The next best is a nitrogen-filled incandescent light with a concentrated filament. Both of these could be used in television provided a speedy light valve and a suitable light distributor were available.

A mechanical light valve cannot be made fast enough. Many have been tried and found unsatisfactory. Light valves based on magneto-optical principles have also been tried and with some success. The possibility of using piezo-electric crystals of very high natural periods of vibration have been suggested, but it does not seem that these can be made to vibrate with an amplitude great enough.

The valving method of controlling the light beam to be distributed does not seem to offer much promise of immediate satisfactory solution.

Methods of Scanning

The most familiar method of scanning the object or the image is that employing the Nipkow disc. This calls for a large luminous surface the brilliancy of which can be varied instantaneously. The neon glow tube is most frequently used with it. The main objection to the scanning disc is that it takes up too much room. This is a real objection for home receivers and portable transmitters, but is not of much consequence for public receivers and fixed transmitters.

The disc results in a uniform field of view provided the holes in the disc are shaped and located properly. A mild objection to the disc is that the image delineated is not square but is bounded by two arcs of a circle and two radii. This effect can be concealed by means of frame in front of the disc or between the disc and the neon lamp.

There are many variations of the disc idea, all of which produce about the same

essential elements in television. The photo-electric cell responds faithfully and instantaneously to light variations and converts them into equivalent electrical variations. The thermionic vacuum tube responds faithfully and instantaneously to electrical variations and amplify them to any desired degree.

Something Was Lacking

But there was something else required before television could be thought of seriously, and before any of the old scanning methods could be applied practically. That something was a suitable light source, or a suitable light valve.

The high operating speed of the photo-electric cell and of the thermionic vacuum tube was of no avail as long as there was no means of varying the intensity of a suitable light with the same speed. Ordinary electric lights respond too slowly to changes in of current. The best was even slower than the selenium cell. That left the alternative seeking a light valve of the required speed or another light source which could be changed in intensity with the required speed. The problem was attacked in both directions.

The Glow Tube

The glow tube was the outcome of one

ding Problems

levision

Anderson

Editor

effect. But the disc with the holes arranged in a spiral is the simplest.

The disc can be reduced in size by first concentrating the light of the luminous surface and then after scanning enlarging the scanned image, as has been suggested in *RADIO WORLD*. A degree of compactness is gained thereby at the added expense of a few lenses.

The Scanning Drum

In place of a scanning disc a scanning cylinder may be used, as has been done by C. Francis Jenkins, of Washington, D. C. The neon lamp is placed inside the cylinder and the scanning holes are cut in a spiral in the surface of the cylinder. The image formed by this method is square, or of the same shape as the luminous plate. And the cylinder occupies much less space than the disc, and the image is uniformly intense. It seems to be a distinct advance in the process of scanning.

An endless belt with holes perforated in a diagonal line has been suggested also as a method of scanning. It is similar to the cylinder method, and may be considered as a generalized case of it. Compactness can be achieved with it and it partakes of all the advantages of the cylinder except mechanical simplicity.

Mirrors on Drum

Several prominent workers in television, notably E. F. W. Alexanderson of Schenectady and Prof. Carolus of Germany, have used a large cylinder with a large number of mirrors arranged on the convex surface for scanning. The mirrors have been so set that the entire object was covered by lines, equal in number to the mirrors used, for each revolution of the mirror.

The scanning can be made faithful and uniform if the mirrors are set properly, but the drums so far exhibited have been very large and cumbersome, requiring considerable power to run them. They have not appealed to the popular fancy for these reasons.

A similar scanning effect can be produced by two rotating cylinders carrying mirrors, one rotating slowly to carry the scanning lines across the screen and one rotating rapidly to carry the light beam tracing the lines in the other direction. This method will result in lines slightly diagonal across the field of view.

Vibrating Reeds Carrying Mirror

In the Oct. 6 issue of *RADIO WORLD* Mr. James Millen described a scanning method in which two vibrating reeds are used, both driven by an electro-magnet actuated by a current having a frequency equal to the natural frequency of the reeds. The smaller reed, carried by the first, is tuned to a frequency which is an exact harmonic of the other and as many times higher as the number of scanning lines desired per frame. The slow mirror, for example, might be driven with a frequency of 20 cycles per second and the rapid 960 cycles per second. There would be 40 repetitions per second and 48 lines per frame.

The smaller and more rapid reed carries a tiny mirror which reflects a concentrated beam of light to the viewing screen.

This method of scanning is not considered satisfactory because the light is not evenly distributed over the screen, the angular speed of the beam of light not being the same all over. There would be a greater concentration of light at the edges of the frame. The lowest intensity of the light would be in the middle of the frame.

This is a serious disadvantage. If an attempt is made to even up the illumination by allowing the light beam to overshoot considerably the edges of the frame, most of the light would be lost, and the light would be active only part of the time.

This method of scanning also complicates the synchronization, for not only would the two frequencies have to be adjusted carefully but also the amplitudes of the reeds.

While this method is extremely simple

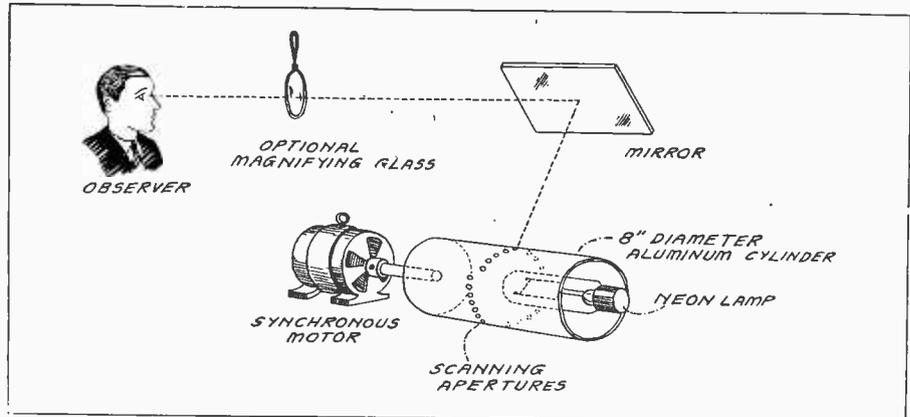


FIG. 3
THIS ILLUSTRATES THE PRINCIPLE OF THE SCANNING DRUM WITH THE NEON LAMP IN THE CENTER. THIS METHOD DISTRIBUTES THE LINE OF SIGHT OVER THE LUMINOUS PLATE.

in conception it is not likely to be applied because of its many inherent disadvantages.

Another method of scanning the received image involves the use of the Braun cathode ray oscillograph. A narrow stream of electrons in a suitably shaped vacuum tube is made to impinge on a fluorescent screen. A greenish glow appears where the electrons strike. This beam of electrons may be made to trace out a picture by varying its intensity and position.

There are two advantages in this system. One is that the electron beam has no weight and that it can be made to follow the signal without lag. The other is that the light can be varied in intensity without appreciable lag. Hence this device satisfies two conditions.

The rest of the properties are all disadvantages. The light is very feeble and not of a pleasant color. The light cannot be distributed evenly over the screen by any simple circuit arrangement. As in the case of the vibrating reed method very little light can be obtained in the middle of the field. In fact the method has nearly all the disadvantages of the reed method and many more in addition. It would seem that time and effort spent in experimenting with this method could be used to much greater advantage with some other method.

There are two methods for scanning the object to be transmitted over a television circuit. One is that of the indirect method

of illumination. An intense beam of light is made to play on the object and the light reflected from the object due to this beam is caught by several large and sensitive photo-electric cells. This method has produced the best results so far. But it is only applicable to limited views.

The other method depends on the direct illumination, or natural illumination. The object is flood lighted. Then it is scanned so that the light from any given area at any instant falls on a single sensitive photo-electric cell. This is the more desirable method because it does not limit the size of the object. For example, outdoor scenes may be transmitted.

The disadvantages of the method are that an ultra-sensitive photo-electric cell and a very high order of amplification of the signal are required. The object must be illuminated very brightly, yet not so intensely that persons in the frame are injured by the light. So far this method has been successful in full daylight on the object.

This was made possible by the development of a very sensitive photo-electric cell in the Bell Telephone Laboratories, by the use of a special high gain resistance coupled amplifier, and by the use of a very large and powerful photographic lens to form an image of the object. The image was scanned by a large size Nipkow disc.

There are also two methods of scanning at the receiver. In one the line of sight is distributed over a large luminous plate the brightness of which varies. The plain Nipkow disc, the drum and endless belt and similar devices are of this type. In the other method a narrow beam of light of varying intensity is distributed over the field of view. The vibrating reed, the Braun tube oscillograph, the drums with mirrors and the disc with lenses are of this type.

It will be noted that the beam distributing method is analogous to the indirect method of scanning at the transmitter and that the line of sight distributing method is analogous to the direct method of scanning the object.

Whichever method be adopted for transmitting it would seem that ultimately some variation of the beam of light distributing method will be used at the receiver. This of course can be used in conjunction with a concentrated neon or other glow tube as well as for other glow tube as well as for other sources of illumination, even for an arc light if a suitable light valve can be found.

The reasons for this opinion are that an intense light is necessary to secure adequate brilliancy of the received image in order to enlarge it and that light distributing method makes use of all the light all the time whereas the line of sight distributing system makes use of only a very small fraction of the total light available at any one instant.

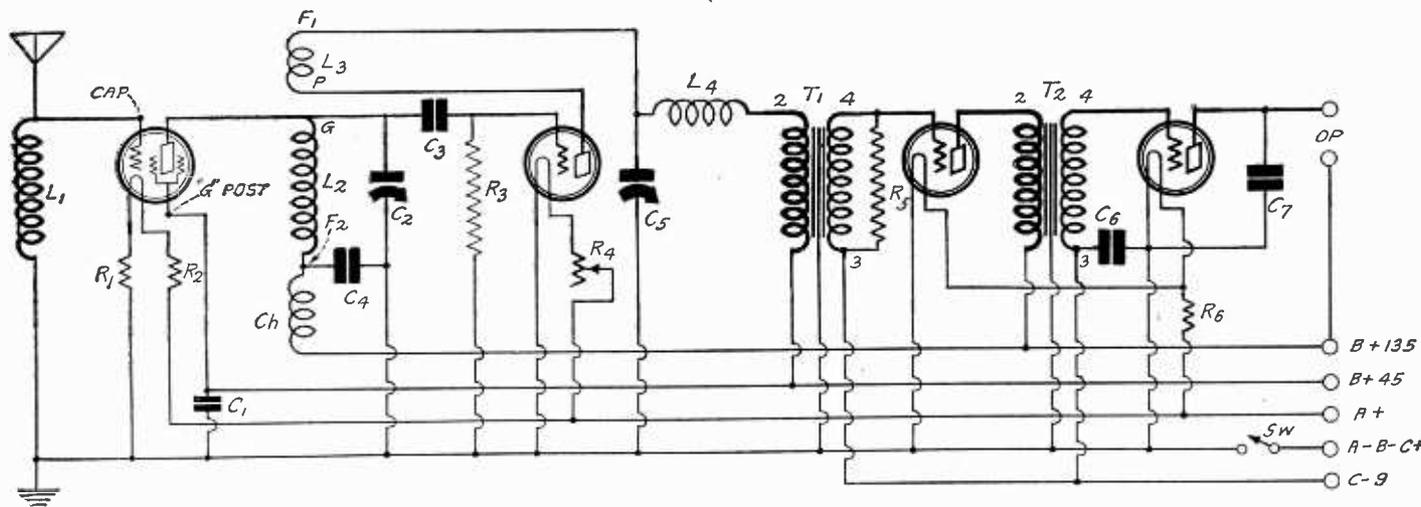


FIG. 713
 THE CIRCUIT DIAGRAM OF A FOUR TUBE RECEIVER USING ONE SCREEN GRID TUBE, A REGENERATIVE DETECTOR AND DIRECT SELECTIVE COUPLING BETWEEN THE FIRST TWO TUBES. CIRCUIT REQUESTED BY VINCENT BARTOLOMEO.

Radio University

When writing for information give your Radio University subscription number.

A FREE Question and Answer Department conducted by RADIO WORLD for its yearly subscribers only by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 45th St., New York City.

WILL YOU KINDLY publish a circuit diagram of a four tube receiver incorporating one screen grid tube, regeneration and direct selective coupling between the screen grid tube and the detector, and only one tuning condenser.

(2)—I have three radio frequency choke coils. Can I use these advantageously in a receiver of the type?

VINCENT BARTOLOMEO,
 Toronto, Ontario, Canada.

(1)—See Fig. 713 for the circuit you request.

(2)—Three radio frequency choke coils have been incorporated in the receiver. They are not only advantageous but they are necessary. L1, L4 and Ch are these three coils.

* * *

I WISH to use a type -27 tube in a resistance coupled amplifier. What voltage amplification can be expected from it?

(2)—What value of plate resistor should be used for best results?

(3)—What plate voltage should be used on this tube if it is put before a -71A power tube?

(4)—What should the grid bias be on the -27 tube under the conditions given?

(5)—I would like to see grid voltage, plate output voltage curves for this tube. If you have published them, please refer to issue of paper.

ANDREW S. CAMPBELL,
 Lincoln, Nebraska.

(1)—An amplification of 8 is possible.

(2)—The plate resistor should be .5 megohm if this amplification is to be expected. The value is not at all critical.

(3)—An applied plate voltage of 135 volts will be ample if the tube is followed by a -71A or a smaller tube.

(4)—The grid bias should be from 5.5 to 7.5 volts. Six volts is a good value.

(5)—Such curves were published in the October 6 issue on page 15.

* * *

I HAVE BEEN USING a -50 type power tube for about 6 months with splendid results. Lately the quality has not been good and the set is not so sensitive as it was. Can you suggest a reason for the change?

(2)—I have noticed that the filament of the power tube is much brighter than the filaments of the rectifier tubes or of

the 112A tube I used for detector. Has this anything to do with the quality?

EARL M. WESTMAN,
 Chicago, Ill.

(1)—The electron emission of the power tube has probably failed and the tube needs replacement.

(2)—One of the symptoms of failure of an oxide coated filament tube is increased brightness, usually in spots.

* * *

IS IT NOT NECESSARY to use a higher plate voltage in resistance coupling than in transformer coupling in order to get the same effective values on the plates?

(2)—Is it possible to load a -50 type power tube up to the limit when the voltage on the plate is 450 volts, with a type -40 high mu tube, without distortion of the signal?

(3)—What is the best value of plate coupling resistor in a resistance coupled amplifier?

(4)—What is the best value of coupling condenser in the same circuit?

WILLIAM ST. ELMO
 Forest Park, Ill.

(1)—It is not necessary to have the same

effective plate voltages. Neither is it necessary to increase the voltage applied, for the effective plate voltage has little significance.

(2)—Theoretically it is if the voltage on the plate of the high mu tube is high enough, but it is doubtful that the tube will stand the high voltage required, even when a resistance of one megohm or more is put in series with the voltage. If the applied voltage is 180 volts the possible undistorted amplitude of the signal on the power tube may be as high as 75 volts. Eighty-four is the usual limit.

(3)—There is no best value of plate coupling resistor for all tubes and circuits. Values between .1 and 1.0 megohm are all right. For a high mu tube a value of .25 or .5 megohm is all right and for a general purpose tube a value of .1 to .25 megohm is suitable.

(4)—Any mica dielectric condenser having a value between .006 and .02 mfd. is satisfactory provided that the grid leak is chosen properly. For a small condenser a high value grid resistance should be used. A rough guide is to keep the product of the capacity in farads and the resistance in ohms equal to .02.

* * *

WHAT DETERMINES the amplification constant of a vacuum tube?

DAVID SUTAR,
 Springfield, Mass.

(1)—The relative spacings between the filament and grid and the filament and the plate as well as the mesh of the grid.

Join RADIO WORLD'S University Club

And Get Free Question and Answer Service for the Coming 52 Weeks
 This Service for Yearly Subscribers Only

Have your name entered on our subscription and University lists by special number. Put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put at the head of your queries. If already a subscriber, send \$6 for renewal from close of present subscription and your name will be entered in Radio University. No other premium given with this offer.

[In sending in your queries to the University Department please paragraph them so that the reply can be written under or alongside of each query. Write on one side of sheet only. Always give your university number.]

RADIO WORLD, 145 West 45th Street, New York City.

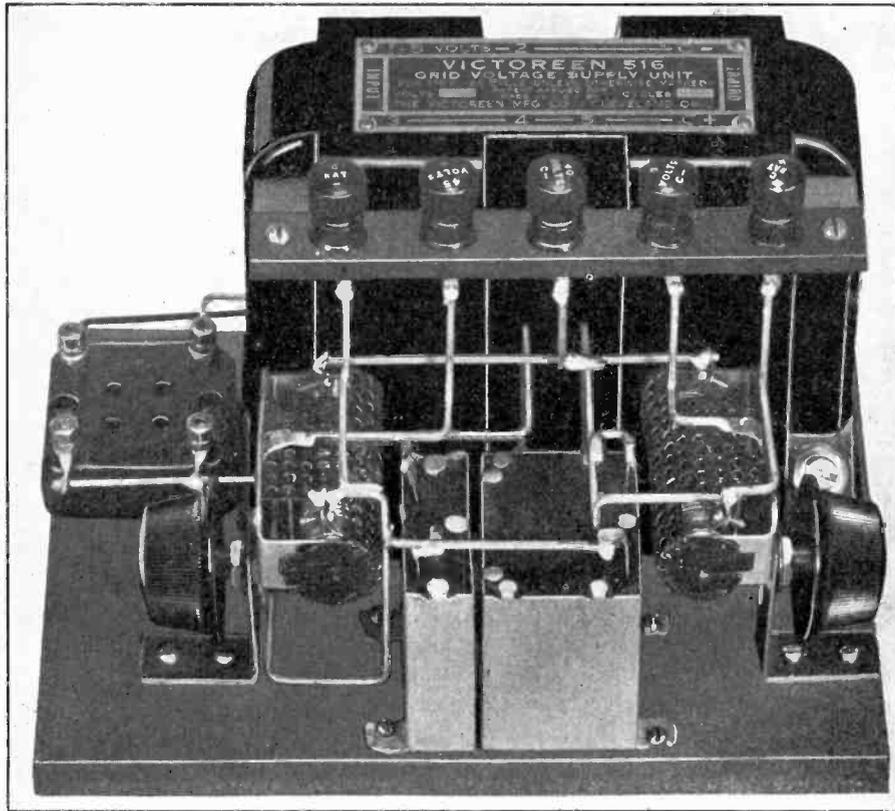
Enclosed find \$6.00 for RADIO WORLD for one year (52 nos.) and also enter my name on the list of members of RADIO WORLD'S University Club, which gives me free information in your Radio University Department for 52 ensuing weeks, and send me my number indicating membership.

Name

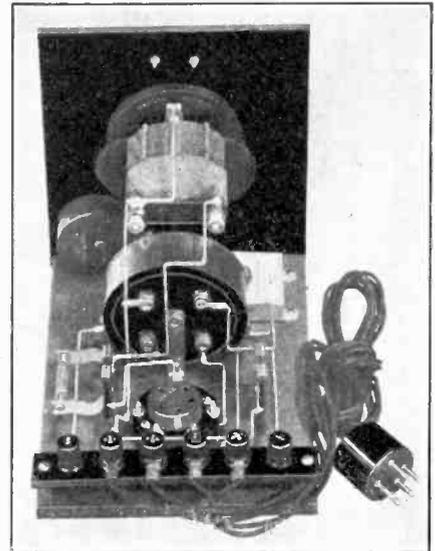
Street

City and State.....

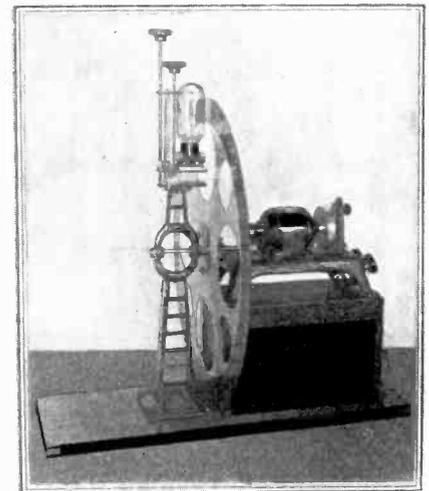
The New Victoreen Circuits and Assemblies



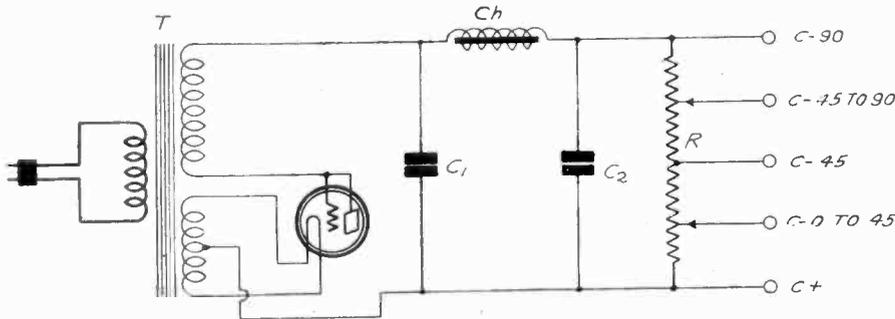
THE BUILT-UP C ELIMINATOR



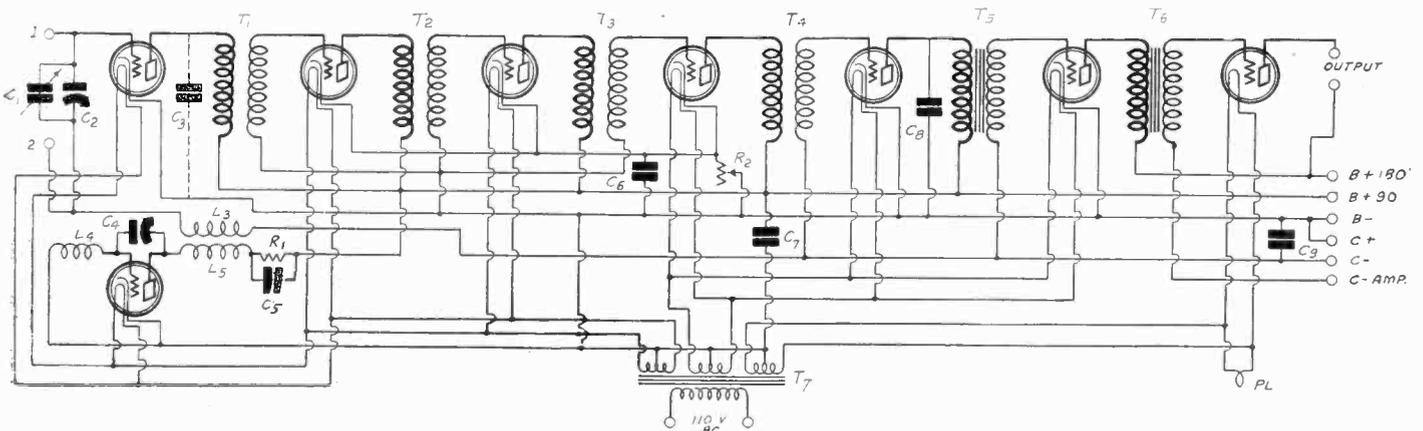
REAR VIEW OF THE VICTOREEN SHORT WAVE ADAPTER FOR USE WITH A -27 TYPE AC TUBE. THIS PARTICULAR ADAPTER PLUGS INTO THE FIRST DETECTOR.



THE CLAROSTAT TELEVISION ASSEMBLY, CONSISTING OF A MOTOR, A SCANNING DISC, A KINO LAMP WITH HOLDER AND A TELEVISION CLAROSTAT SPEED CONTROL. TELEVISION RECEPTION WITH SUCH A DEVICE, IN CONJUNCTION WITH A VICTOREEN RECEIVER, IS POSSIBLE, ESPECIALLY WITH THE SHORT WAVE ADAPTER.



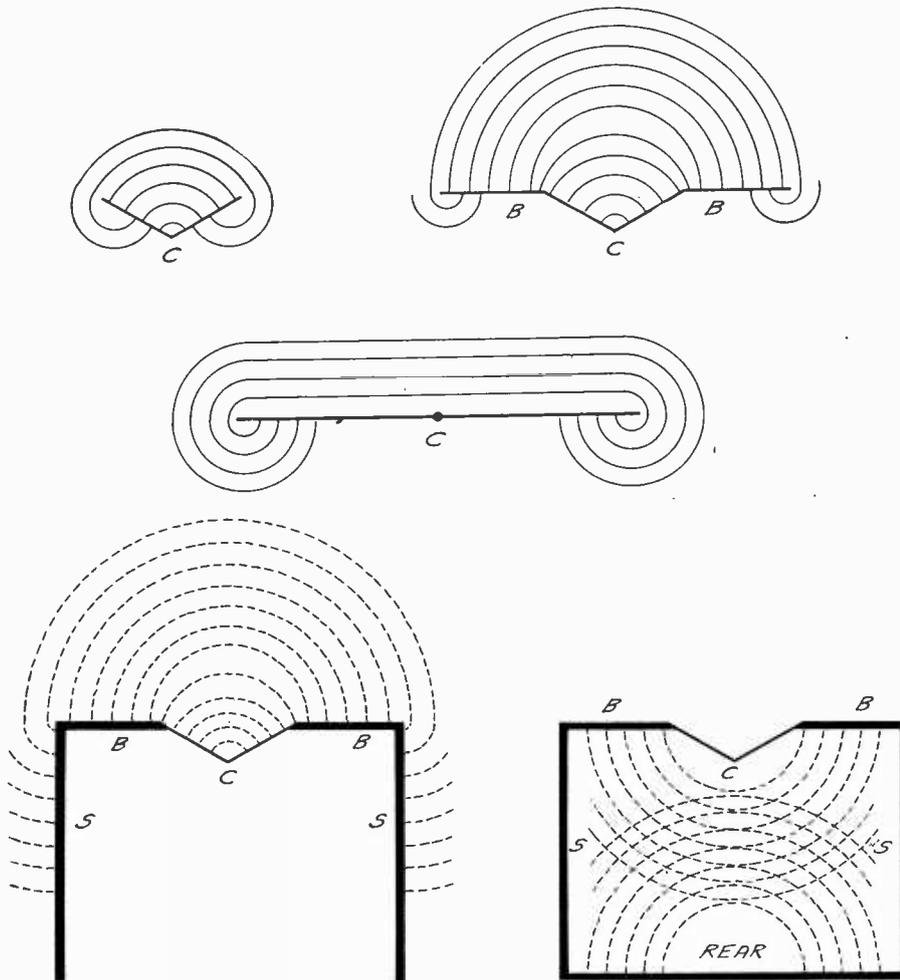
THE CIRCUIT DIAGRAM OF A C BATTERY ELIMINATOR SUCH AS THE VICTOREEN 516 C SUPPLY UNIT.



THE CIRCUIT DIAGRAM OF THE 1929 MODEL VICTOREEN FOR AC OPERATION

Dynamic Speaker Action

The Principle of the Motor Is Expounded



UPPER LEFT SHOWS HOW THE AIR WAVES SPREAD OUT FROM A CONE C WHEN NO BAFFLE BOARD IS USED. THE WAVES AT THE REAR ARE OMITTED. UPPER RIGHT SHOWS HOW THE WAVES SPREAD OUT FROM THE CONE C WHEN A BAFFLE BOARD BB IS USED. CENTER PICTURE SHOWS HOW THE SOUND WAVES SPREAD OUT IN FRONT OF A VERY LARGE VIBRATING SURFACE. AT LOWER LEFT IS SHOWN HOW THE SOUND WAVES SPREAD OUT IN FRONT OF A CONE C MOUNTED IN A BOX OPEN AT THE REAR. BOTH THE FRONT BB AND THE SIDES SS SERVE AS BAFFLE. WAVES IN THE BOX ARE OMITTED. AT LOWER RIGHT IS SHOWN HOW THE WAVES TRAVEL FROM THE CONE C INSIDE A CLOSED BOX. WAVES ARE REFLECTED FROM THE REAR WALL, PRODUCING RESONANCE.

THE electro-dynamic speaker is the latest development in radio for the reproduction of musical sounds and speech.

This device has the distinct advantage of showing no partiality to sounds on account of frequency differences over practically the entire audible range.

It is also capable of handling comparatively large amounts of power. To convert this power into sound a greater input of power is required, although the dynamic speaker is both more sensitive and more efficient as a converter than the older types of speaker.

One of the reasons for the superiority of the electro-dynamic speaker is that it has only one light, moving part mounted so that it is not resisted by stiff springs. The tendency toward resonance points is therefore practically nil.

The underlying principle of the electro-dynamic speaker is essentially the same as that of the electric motor. A small light coil, which is the moving element or armature, is suspended on very flexible supports in a strong magnetic field. This field is established by another and larger

coil in which a steady electric current flows. The signal current representing the sound is passed through the small coil, often called the voice coil. The large coil is the field coil.

It is a general property in electro-magnetism that when a wire carrying a current is placed in a steady magnetic field the wire moves in a direction at right angles to the direction of the magnetic field as well as to the direction of the current. It is this reaction which produces motion in the armature coil in the electro-dynamic speaker.

This principle has been known for many years but only recently has it become popular in sound reproduction. That this popularity should come was inevitable, because of the inherent qualities of the principle.

The small coil, or armature, is usually connected directly to a cone or membrane. By means of the cone the electric power is transferred to the air in the form of sound power.

When the radio set is tuned in on a certain station, the current in the output

tube is an electrical equivalent of the air vibrations in front of the microphone at the transmitter. The current flows through the wires of the armature coil, which coil as a whole is caused to vibrate by the reaction between the field of the electro-magnet and the current in the armature. These vibrations are mechanical equivalents of the sound that impinged in the microphone.

The small coil and the cone or membrane transmit these vibrations to the air, and the original sound is reproduced faithfully.

So realistic is the reproduction that one might truthfully say that the sounds are recreated.

Step-down Transformer Used

As the moving coil must be light its impedance must be low. But the plate impedance of the tube is comparatively large.

To obtain the optimum transfer of electric power it is necessary to employ a step-down transformer between the tube and the armature coil. The ratio of this transformer is often as great as 30-to-1. Thus the current in the smaller coil becomes 30 times larger, though the voltage is one-thirtieth. But what you want is current.

If it were practical to construct a power tube with an impedance as low as that of the moving coil it would be unnecessary to use the step-down transformer. But until such a tube arrives the transformer serves as a very efficient and faithful means of matching the impedances of the power tube and the armature coil. The step-down transformer therefore is built into the speaker.

The faithfulness of reproduction of all sounds of the electro-dynamic speaker often results in bringing out high frequency noise which adds nothing to the entertainment value of the speaker. These sounds are the microphone hiss, the rushing sounds due to irregular detection, the strays and the needle scratch in electric phonograph reproduction.

Hiss Easily Removed

The unpleasant high frequency noise can be removed very easily. A low pass filter is used for the purpose. This is designed so that it passes all sounds below a certain frequency without any attenuation and so that it does not pass any above that frequency. Sometimes the so-called cut-off frequency is chosen as low as 5,000 cycles and at other times it is put as high as 10,000 cycles.

The lower it is put the more completely does the filter cut out hissing noises, but at the same time it detracts a little from the intelligibility of speech as reproduced. If music is the main consideration then the cut-off may well be put at 5,000 cycles.

Ordinarily the sounding surface or cone of a dynamic speaker is not greater than nine inches in diameter. This is strangely large enough to give low sounds a good chance to come out in full force. A baffle board is usually recommended in conjunction with such a speaker to prevent the sound waves from flowing around the edges. A hole of about the same diameter as the cone is cut in a suitably large board and the cone is clamped over it. The larger this board is, the better, a good minimum being 30" square. It is rarely necessary to make it larger than three feet square. There need be no sides. There must be no back. This remains open.

Knowing Ohm's Law

Novices' Questions Show They Miss Its Significance

There is a great deal of misunderstanding of Ohm's law. This leads novices to ask questions which are not answerable. A type of question often asked is: "What value of resistance is necessary to cut the voltage down from 110 to 6 volts?" Such a question means nothing. One megohm may not cut down the voltage at all and a 6-ohm resistance may cut it down to practically zero. It all depends on the current flowing in the resistance. The voltage drop in the resistance is the product of the resistance and the current flowing in it. That is Ohm's law. When a question as the above is asked the current expected must also be given to make the question answerable.

Suppose we have a DC supply of 110 volts and it is desired to cut down the voltage so that there is a net voltage for the filaments of the tubes of 5 volts. The first thing we must ask ourselves is how much current the tubes will take. When that has been answered the problem is capable of solution by the application of Ohm's law.

Suppose there is only one tube drawing a current of .25 ampere when the voltage across its terminals is 5 volts. The difference between 110 and 5 is 105 volts. Hence the resistance must be such that there is a voltage drop of 105 volts in it when the current is .25 ampere. That is, the resistance must be 420 ohms.

Now suppose there are two tubes, each drawing .25 ampere. The total current is .5 ampere and the resistance required to cause a drop of 105 volts is 210 ohms. Suppose the total current required by the set is 2 amperes. Then the resistance should be only 52.5 ohms.

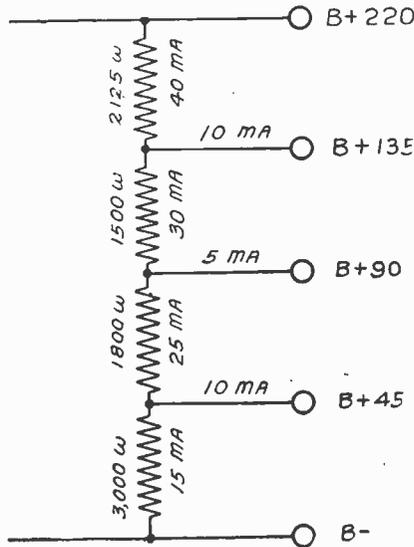
Drops in Voltage Divider

The above was a simple example of the application of Ohm's law. A more complex example is that of determining the proper values of resistance between the various taps on the voltage divider in a B battery eliminator. A question often asked in this connection is: "What should the resistance be between the 45 volt tap and B— to give the proper voltage?" The only answer possible is that it should be such that the voltage drop in it is 45 volts. The answer cannot be any more definite than the question.

As a matter of fact the resistance value may be chosen at will over a range of values. The choice of resistance merely selects the current that is to flow through it. The voltage is fixed at 45 volts. Suppose a resistance of 3,000 ohms is selected. Then the current is 15 milliamperes. It is assumed here that the supply voltage and the other resistors in the voltage divider are such that this current is possible.

It is not possible to say what the resistances between the other taps should be unless the currents in those resistors are known. And the currents will not be the same for any two receivers. Suppose the current in the lower resistor is 15 milliamperes as calculated above. That does not mean that the current in the resistor just above it is also 15 milliamperes. It is greater. How much greater depends on how much is taken off at the 45-volt tap. And that in turn depends on how many tubes are served by that tap, and what the grid bias on those tubes is and what type of tubes they are.

If the current tapped off at the 45-volt tap is 10 milliamperes, the current in the resistor just above the 45-volt tap is 25 milliamperes. Now suppose that the



THE CIRCUIT OF A VOLTAGE DIVIDER, SHOWING THE RESISTANCE VALUES REQUIRED FOR A GIVEN CURRENT DISTRIBUTION TO THE VARIOUS TAPS

next tap is at 90 volts. We now have enough information to calculate the value of the resistance between the 45 and the 90-volt taps. The drop in it is 45 volts and the current is 25 milliamperes. Hence by Ohm's law the resistance should be 1,800 ohms. But that applies only to a case meeting the assumed conditions.

Third Resistance Value

The next tap on the voltage divider may be 135 volts, just 45 volts higher than the 90-volt tap. But we cannot figure the resistance required until we know the current. This is 25 milliamperes plus the current drawn at the 90-volt tap. Suppose this current is only 5 milliamperes. Then the current in the resistor between the 90 and the 135-volt taps is 30 milliamperes. The resistance must therefore be 1,500 ohms. If some other value of current is drawn from the 90-volt tap another value of resistance must be used.

The next tap may be at 220 volts. What should the resistance be between the 135 and the 220-volt taps? We can't say until we know the current between the two taps. Suppose that the current drawn from the 135-volt tap is 10 milliamperes. The current in resistor is therefore 40 milliamperes, and consequently the resistance must be 2,125 ohms, since the drop in it must be the difference between 220 and 135 volts.

It must be realized that these resistance values will not be correct unless the current distribution is as assumed. If there is some other current distribution the resistances have to be determined for that distribution.

Difficulty of Determination

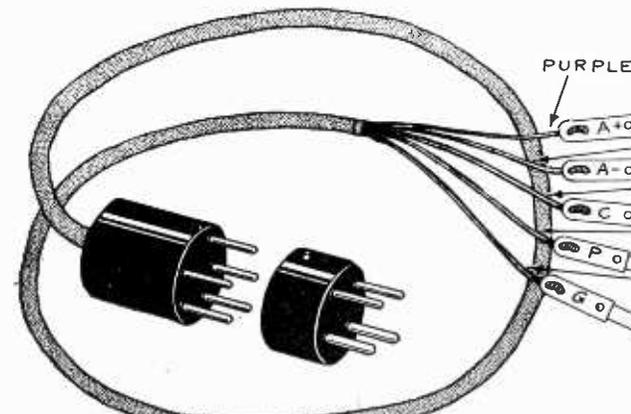
It is not easy to determine either the current distribution or the resistances in any specific case. A milliammeter may be inserted in series with the various taps to measure the current drawn. But that does not give the current distribution when the resistors have the correct values. Hence the currents obtained cannot be used as a basis for calculation of the resistances. And if the resistors have the correct values there is no need of measuring the current.

One way of getting approximate values of the currents at the various taps when the voltages and resistors are correct is to make use of the grid voltage, plate current characteristics of the tubes used on the various taps. There is a current value for every tube, every grid bias and every plate voltage. The desired plate voltages, grid bias values and tubes used are all known. Hence the total current at any tap can be estimated closely if the curves are available. How curves can be obtained with the aid of a milliammeter, a voltmeter and a few accessories will be explained in detail in a future issue.

Another case in which the necessity of knowing the current when determining voltage drops is that of chargers. Questions are frequently asked how much resistance should be inserted in series with a charger to cut the voltage down to 6 volts. In most cases the questioner forgets to state from what voltage it is to be cut as well as the current that the charger is supposed to deliver. There cannot be an answer where there is no question, and there is no question when no conditions are given.

PLUG AND CABLE for any SHORT WAVE ADAPTER

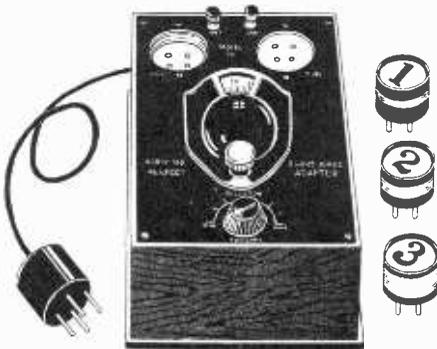
Handiest thing for ANY short-wave adapter. Put detector tube of your present set in socket of any short-wave adapter you build, put plug in detector socket of your broadcast receiver. Cable, 34". Leads identified both by color scheme and tags. 5-prong plug and 5-lead cable for AC short wave adapter. May be used as 5-lead battery cable plug with UY socket. (Cat. No. 21AC) \$1.50. 4-prong extra plug only, necessary addition to other for DC short-wave adapter (Cat. No. 21DC) \$0.50.



Cat. No. 21AC and 21DC ordered together \$1.75. Cat. No. 21AC and 21DC with 99 adapter \$2.25.

145 WEST 45TH STREET
New York City Just East of Broadway
GUARANTY RADIO GOODS CO.

AIR-KING SHORT WAVE ADAPTER



Completely built-up, ready to receive; includes three plug-in coils, also built-in plug and cable. Tunes 18 to 78 metres. Requires no extra tube. Chart tells just where each wavelength comes in. DC model (for all sets except AC tube sets).. **\$14.50**

AC Model, for sets using 227 Type AC detector tube **\$15.50**

Order one now C.O.D.

Ten-day Money-Back Guarantee!

The Air-King Adapter plugs into the detector socket of your present broadcast receiver and brings in the short waves on the speaker. Bakelite panel, handsome real mahogany cabinet. Full directions with each adapter. Any novice can work it. Send for FREE list U. S. and foreign short wave stations.

RADIO SUPPLY COMPANY

217 Havemeyer Street, Brooklyn, N. Y.
[Inquiries Invited from the Trade]

PILOT WASP

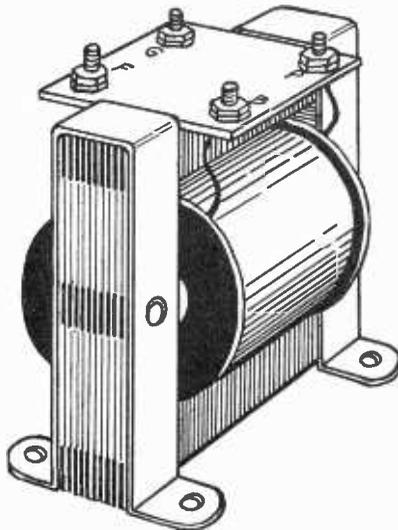
17 to 500 Meters

11,000-Mile Range on Short Waves
Complete Set of **\$18.50**
Parts, postpaid.

SPEED, Inc. 103-D BROADWAY
BROOKLYN, N. Y.

HERE IT IS!

The Transformer You Have Been Looking for so Long



1-to-3½ ratio audio frequency transformer; exactly same size as illustrated; two stages provide enormous volume for speaker operation. Tone pure, construction sturdy. Excellent for portables, home receivers, phonograph amplifiers, etc. Cat. 3521. Each... **\$1.75**

EXCELLENT FOR REPLACEMENT

When any audio transformer goes bad in a set you often wonder where to get another to replace it. This one is an ideal replacement transformer. Where any audio transformer is taken out, this one fits in. Money back if not satisfied in ten days.

SEND NO MONEY

Guaranty Radio Goods Co.,
145 West 45th Street, N. Y. City
(Just East of Broadway)

Please send at once C.O.D. Cat. No. 3521 Audio Transformers. (Write quantity in square.)

NAME
ADDRESS
CITY STATE

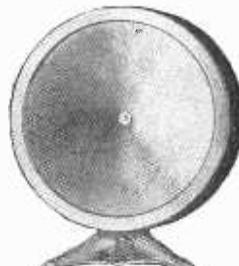
You can hear and understand the voice over your radio on the new Pausin Speaker as naturally and life-like as that of a friend a few feet away from you.



Octagon Model

\$10.00

Ideal for multi-tube high-power sets, and is the perfect Speaker for Electric Receivers in every price class.



Circular Model

Sent prepaid if cash with order or plus postage if C. O. D.

Understand! You can not get a better speaker at double the price!

Sold direct only by the manufacturers

Pausin Engineering Company

727-739 Frelinghuysen Avenue

Newark, New Jersey

HARMONIQUE

RADIO TUBES

201A	.....	\$1.06
200A	.....	2.00
112A	.....	2.00
171A	.....	2.00
112	.....	1.85
171	.....	1.85
UX199	.....	1.25
UV199	.....	1.25
UV199 (standard socket)	...	1.25
226AC	.....	2.00
227AC	.....	3.50
240	.....	1.50
222	.....	3.50
280	.....	3.50
281	.....	5.00
210	.....	6.50
250	.....	8.50

KELLY TUBE COMPANY

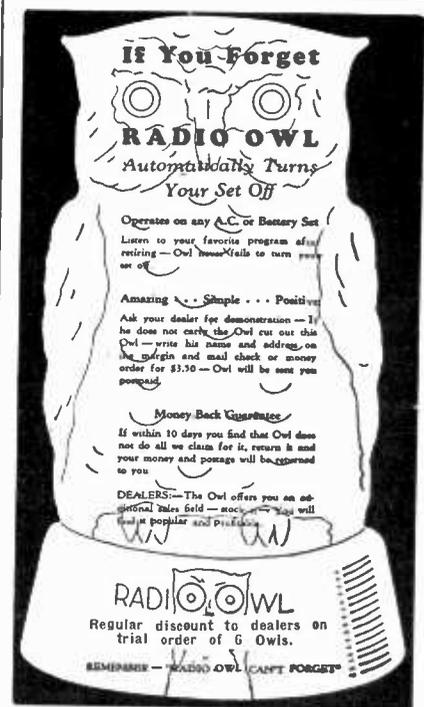
8718 Ridge Boulevard, Brooklyn, N. Y.

More Profits To Set Builders

One good radio idea may be worth millions. Barawik has thousands of ideas for radio set builders to make more money. Barawik's Big Radio Book will help you while elections are on and big national events stir the world.



Send for your copy today - N^o 1310-C Canal Station, CHICAGO, U. S. A.



RADIO OWL SALES CO.
6018 John R. St. Detroit, Mich.

BLUEPRINT

FOR

Bernard's Economy 3

Price \$1.00

PHILIP COHEN

236 VARET STREET
BROOKLYN, N. Y.

Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufacturers, jobbers, dealers and mail order houses are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

RADIO WORLD,
145 West 45th St., N. Y. City.

I desire to receive radio literature.

Name

Address

City or town

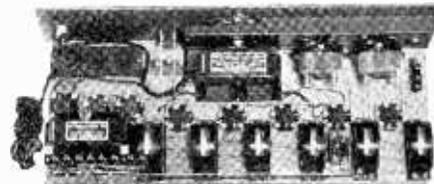
State

LITERATURE WANTED

- E. Stella, Stella Bros. Mfg. Co., 1464 Howard St., San Francisco, Calif.
- E. V. Weller, 241 Monadnock Bldg., San Francisco, Calif.
- H. Haggan, North Bend, B. C., Canada.
- Steve Stempki, 454 12th Ave., Milwaukee, Wisc.
- J. B. Hull, 246 W. 102nd St., New York City.
- C. C. Kent, 69 State St., Albany, N. Y.
- Radio Repair Shop, No. 4 Springfield Ave., Upper Darby, Pa.
- N. E. Butler, Greensboro, Md.
- Madison Cooper, Jr., Calcium, N. Y.
- E. T. Crooker, 1937 Sarah Ave., Columbus, Ohio.
- Chas. J. Novy, Advertising Art Studios, 505 Beckman Bldg., Cleveland, Ohio.
- Hilbert Albrecht, 1321 29th St., Milwaukee, Wisc.
- A. F. Dittman, Box 294, Brownsville, Texas.
- R. O. Rosen, 8917 S. Broadway, St. Louis, Mo.
- E. F. Lilly, R.-5, Columbia, S. C.
- Austin C. Lescarbourea, Croton-on-Hudson, N. Y.
- W. C. Duncan, International General Electric Co., 120 Broadway, New York, N. Y.
- J. P. Clark, Box 1516, Brandon, Man., Canada.
- L. Green, 6229 Market St., Philadelphia, Pa.
- E. F. Clark, 833 Landis Ave., Vineland, N. J.
- T. W. Gilman, 49 Harrison Ave., No. Abington, Mass.
- Luther Wyrick, Richmond, Ky.
- John C. Wurfel, 12573 Gratiot Ave., Detroit, Mich.
- Wm. Hansell, Ottumwa, Iowa.
- Wm. J. Kettleberger, 815 Vine St., Philadelphia, Pa.
- Harold L. Naylor, 216 West 78th St., New York City.
- Fred Muro, 129-58 135th St., South Ozone Park, L. I.
- Fred R. Pope, 67 Maple St., White River Jct., Vermont.
- J. M. Flynn, 56 Everton St., Dorchester, Mass.
- W. L. Piercy, 3506A Emerson St., Oakland, Calif.
- Arthur L. Young, 3419 Fulton St., Brooklyn, N. Y.
- C. I. Elrod, 622 W. Page St., Dallas, Texas.
- Dorance B. Cook, 645 So. Division St., Kellogg, Idaho.
- S. H. Murphy, Jr., 2808 Oakcrest Ave., Hamilton, Baltimore, Md.
- W. H. McDowell, 1401 Rockefeller Bldg., Cleveland, Ohio.
- Clinton H. Martin, M.D., 135 West 69th St., New York City.
- J. V. Eshelman, 436 West Oley St., Reading, Pa.
- Harry Brookins, 791 East 157th St., Cleveland, Ohio.
- W. M. Tice, 724 Commerce St., Fredericksburg, Va.
- Chas. C. M. Harris, c/o Hobart Elec. & Radio Co., 311 So. Washington St., Hobart, Okla.
- LeRoy Dunkle, 132 N. Wheeling, Tulsa, Okla.
- R. W. Ashworth, Charlton City, Mass.
- O. O. McBride, 601 N. Church St., McKinney, Tex.
- Reed Lynn, 2222 Princeton St., Wichita Falls, Tex.
- James A. Mander, 5231 Del Valle Drive, Los Angeles, Calif.
- N. E. Butler, Greensboro, Md.
- Carlton Duncan, 114 Ozone St., S.W., Atlanta, Ga.
- Mrs. F. M. Stiner, 233 W. 40th St., Shadyside, Ohio.
- Louis Aclin, 1335 Boynton Ave., New York City.
- Chas. J. Bussius, 1516 1/2 Washington St., Charleston, W. Va.
- Leland L. Howard, 519 Irving Ave., Wheaton, Ill.
- W. D. Hutchinson, 130 No. 22nd St., Camden, N. J.
- M. F. Siebert, Bank of Biscayne, Miami, Fla.
- Z. A. Huff, Jefferson Court Apts., Orlando, Fla.
- G. J. Anello, 5429 19th Ave., Brooklyn, N. Y.
- Philip S. Rust, 23 Whittemore St., West Roxbury, Mass.
- Julius C. Toudy, 2718 Westfield Ave., Camden, N. J.
- Henry R. Tiedeman, P. O. Box 993, Aberdeen, Wash.
- G. L. Berry, 150 12th St., N. E., Washington, D. C.
- Thomas A. Taper, Box 493, Lake Linden, Mich.
- W. Clyde Cook, 221 Creston Circle, Chattanooga, Tenn.
- Wm. W. Morris, 19 Norwood Ave., Upper Montclair, N. J.
- Wm. R. Hall, 115 Lancaster St., E., Kitchener, Ont., Can.

- Chas. B. Hillman, 226 No. L. St., Lake Worth, Fla.
- Luther Myrick, Collins Street, Richmond, Ky.
- Gordon C. Gates, Radio-Trician, Poultney, Vt.
- Thomas F. Smith, 24 Adelaide Ave., Providence, R. I.
- A. Klem, 1502 Ave. A., New York City.
- Rudolph Oppedisano, Rudy's Radio Service, 778 Myrtle Ave., Brooklyn, N. Y.
- James R. Wylie, 30 Devine Ave., Lowell, Mass.
- Frank Jennings, 49 West White St., Rock Hill, S. C.
- Chas. Nickolsberg, 914 Eastern Parkway, Brooklyn, N. Y.
- David Rowe, c/o Aeon Garage, 76th St. & Broadway, New York City.
- John Howard Paine, 1221 Conn. Ave., Washington, D. C.
- W. Peddle, 901 Easter Road, Victoria, B. C., Can.
- Joseph Hunter, 2 S. Maple Ave., Irvington, N. J.
- W. Potter, 30 Sixty-seventh Place, Long Beach, Calif.
- C. W. Henson, 2637 Clinton St., New Westminster, British Columbia, Canada.
- Dr. Noble A. Powell, Oxnard, Calif.
- H. D. Gott, 27 South St., Rockport, Mass.
- E. F. Lilly, R.-5, Columbia, S. C.
- Fred F. Dowd, 53 Hobart St., Brighton, Mass.
- E. A. Vivarttas, 10 Midwood St., Brooklyn, N. Y.
- W. L. Lamont, 1808 Grant St., Berkeley, Calif.
- Geo. T. Miller, c/o B. 51, Fort Monmouth, N. J.
- Edward Woerz, Hall Place, Tuckahoe, N. Y.
- J. Gregory, 136 Belford Ave., Rutherford, N. J.
- C. Mills, 132 Queen East, Toronto, Ont., Can.
- David Hughes, 742 46th St., Oakland, Calif.
- John Offerman, 432 Gold St., Brooklyn, N. Y.
- Fory Gel Electric Shop, 960 Grant Ave., San Francisco, Calif.
- W. J. Wilson, c/o Hale & Wilson, 501 Sunderland Bldg., Omaha, Nebr.
- R. O. Rosen, 8917 S. Broadway, St. Louis, Mo.
- W. S. Harvey, 8240 John R. Street, Detroit, Mich.
- Carl A. Kellerman, Huron St., P. O. Box 194, Oakland Beach, N. Y.
- G. L. Gordon, 5421 Superior Ave., Cleveland, Ohio.
- Henry Moos, 212 New York Ave., Union City, N. J.
- Leonard C. Dengel, 854 48th Ave., San Francisco, Calif.
- Milton Anderson, 1614 N. 46th St., Merchantville, N. J.
- Radio Repair Shop, No. 4 Springfield Ave., Upper Darby, Pa.
- Edwin Bauer, c/o Bauer Lumber Co., Route 4, Box 208, Houston, Texas.
- T. F. Maxey, 511 Overton St., Newport, Ky.
- W. F. Brown, 18 Francis Street, Malden, Mass.
- E. F. Clark, 833 Landis Ave., Vineland, N. J.
- Wiften Electric Co., H. Z. Carpenter, 82 Martine Ave., White Plains, N. Y.
- The Locke Radio Co., 11442 Superior Ave., Cleveland, Ohio.
- S. K. Young, 57 King Street, Stratford, Ont., Can.
- A. E. Bryant, 61 Federal St., Lynchburg, Va.
- Edward G. Barnes, 87 Randolph St., Buckannon, W. Va.
- E. Eriksrud, 6867 Reuter Ave., Fordson, Mich.
- Chas. W. Yeager, 1316 So. Date Ave., Alhambra, Calif.
- C. W. Crump, care Geo. H. Smith, Colonial Ave. & 22d St., Norfolk, Va.
- Arthur S. Uebner, 935 1/2 So. 8th St., Quincy, Ill.
- Chester J. Baker, 3474 Belden Ave., Youngstown, Ohio.
- Jos. A. Matulavich, 1072 Blair Ave., Scranton, Pa.
- Gilbert H. Nase, Thomaston, Conn.
- J. Gordon Palmer, 2406 Cleveland St., McKeesport, Pa.
- John Morrice, Jr., 143 4th Ave., Brooklyn, N. Y.
- G. W. Grauel, High School, 110 E. Elm., Gillespie, Ill.
- Morris F. Reichenbach, P. O. Box 316, Quakertown, Pa.
- C. G. Dalby, 2015 No. 7th St., Philadelphia, Pa.
- I. Horowitz, 755 Gravesend Ave., Brooklyn, N. Y.
- J. E. Scott, P. O. Box 131, Cleburne, Tex.
- Geo. T. Ritter, 202 So. Overland Ave., Burley, Idaho.
- James D. Chilcote, 4130 Falls Road, Baltimore, Md.
- C. Brown, 29 Frye St., Lowell, Mass.
- Thos. A. Dunn, 1317 S. Howard St., Philadelphia, Pa.
- C. Sterner, Townshend, Vt.
- Chas. A. Prescott, 93 Blossom St., Fitchburg, Mass.

Until you have heard the
NEW VICTOREEN
"A.C." - or - "D.C."
you cannot realize the Marvelous
Development in Radio Reception



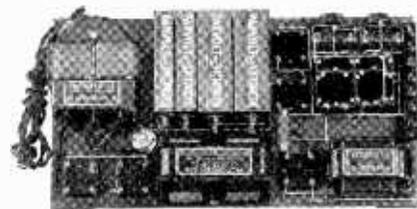
The new Victoreen is simply wonderful—that is the only way to describe it. It has wonderful tone—wonderful selectivity—Wonderful sensitivity. It is wonderfully simple to assemble, wonderfully easy to operate. Anyone who has the slightest "knack" can assemble in a few pleasant hours a set which, from every standpoint, simply cannot be surpassed.

This is a season of wonderful radio programs. With a Victoreen you can enjoy them from coast to coast. If a Victoreen can't get a station it can't be had.

Victoreen R. F. Transformers have been greatly improved; the circuit has been still further developed; many other radical improvements have been made which make Victoreen more than ever, the world's standard "Super."

Write for the complete Victoreen story and the FREE Blueprint giving constructional data and full directions. You'll have a set that you can boast about when you have a Victoreen.

The Blueprint is FREE
Victoreen
Power Amplifier
and "B" Supply
Makes Any Good Set Better



Supplies 45, 90, 180 and 450 volts, using a UX210 or 250 in the last stage. Contains two voltage regulator tubes so that the 90 and 180 volt taps are supplied with a constant volt potential. It is the last word in "B" supply. For the most satisfactory results you MUST have it.

FREE BLUEPRINT with list of parts and complete assembly instructions will be sent upon request.

Victoreen

The GEORGE W. WALKER Co.
MERCHANDISERS OF VICTOREEN RADIO PRODUCTS
2825 CHESTER AVENUE CLEVELAND OHIO

Tune-in for Quickest Results on Elections

Election results, national, state and local will be "covered" by a nation-wide network of the National Broadcasting Company and associated stations. Results of the Presidential and Con-

gressional elections will be broadcast from the NBC studios in New York. This program will be occasionally interrupted for announcement of results of State, County

and municipal election news, from each of the various stations. The national election news will be furnished to the radio audience through the courtesy of The Associated Press, the United Press Association and the International News Service. A large staff of political experts, experienced in compiling, collating and presenting election results, will be in charge of news dissemination by the National Broadcasting Company.

BIG OFFER!

Radio World for Four Weeks **50c**
Blueprint FREE!
of 4-Tube Screen Grid Diamond of the Air

At 15c per copy RADIO WORLD costs you 60c for four weeks. But if you send 50c NOW you get the first and only national radio weekly for four consecutive weeks and a blueprint FREE! This blueprint is life-sized and shows in easy picture diagram form how to mount parts and wire this super-sensitive receiver. One screen grid tube is used as radio frequency amplifier. The rest of tubes are two—01A and one 112A. This circuit gives you distance, tone quality, ease of performance. No shielding, no neutralizing required!

ACT NOW!

This offer holds good only until November 30th and coupon below MUST be used as order blank.

Radio World, 145 West 45th Street, New York City

Enclosed please find 50 cents (stamps, coin, check or money-order) for which please enter my name on your mail subscription list for the next four issues of RADIO WORLD, and send me FREE at once a blueprint of the Four-Tube Screen Grid Diamond of the Air (front panel and subpanel wiring, schematic diagram and parts list.

Name

Address

City State

Renewal.

If you are a mail subscriber for RADIO WORLD you may extend your subscription four weeks. Put a cross in the square in front of the word "renewal," to show you are a subscriber already.

AIR COLUMN HORNS ARE SPLENDID!

Especially Those Made of Molded Wood

EVERYBODY who uses a horn loud speaker of the latest type, consisting of an air column design, with long tone travel, agrees that the tone is splendid. Our Model 595 has a travel distance of 8 feet from the unit to the large end of the "bell." If you must economize on space, use Model 570, with a 6-foot tone travel, with not quite as strong reproduction of low notes. But No. 595 is better and, if you've the room (21 1/4" high, 18" wide, 15" deep), choose that one. Every purchaser is a delighted customer. Order one of these specially moulded wood horns. Try it for 90 days. If not delighted, return it and get back your money, including any shipping charges you paid! (Note: Not a single one of these horns has ever been returned to us, though we've sold many hundreds!)



Model 595 (illustrated above) Baffle board (not shown) FREE with each order. List price \$18.00. Our price (40% and 2% off list price) —

\$10.58



Model 570, size 15" high by 12" wide by 12" deep, 6-foot tone travel. FREE baffle board. List price \$13.00. Our price (40% and 2% off list price) .. \$7.64

Model 112 horn motor stands 250 volts without filtering (illustrated at right). List price \$6.00. Our price (40% and 2% off list price).....\$3.53

ACOUSTICAL ENGINEERING ASSOCIATES, 143 West 45th St., New York City. (Just East of Broadway) Please ship me at once the following (check off): One No. 595 at \$10.58, plus a little extra to defray shipping costs; send it already mounted in FREE baffle board. One No. 570 at \$7.64, plus a little extra to defray shipping costs; send it already mounted in FREE baffle board. One No. 112 horn motor (universal nozzle) at \$3.53, plus a few cents extra for shipping. NAME..... ADDRESS..... CITY..... STATE..... 90-DAY MONEY-BACK GUARANTEE!

Quick Action Classified Ads

Radio World's Speedy Medium for Enterprise and Sales

10 cents a word — 10 words minimum — Cash with Order

TAKE Your Choice of 5 Other Publications for New Radio World Subscribers Ordering Now. Radio World has made arrangements to offer, with one year's subscription for Radio World, a year's subscription for any one of the following publications FREE: Radio News or Science and Invention or Boys' Life or Radio Dealer or Radio (San Francisco). Send \$6.00 — now. State which other listed publication you desire. Radio World, 145 W. 45th St., N. Y. City.

EXCELLENT unit for phonograph attachment, to play records. Connects to speaker terminals, nozzle to phonograph, \$4.20. P. Cohen, 236 Varet St., Bklyn., N. Y.

NEW B BATTERY ELIMINATORS 135 Vts. C. O. D. \$7.90. Money back if dissatisfied. National Mfg. Co., 2309 Lawrence, Toledo, Ohio.

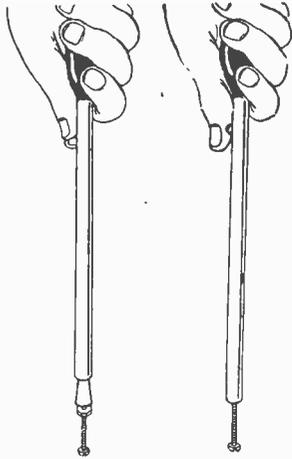
RADIO FURNITURE BUILT TO ORDER. CABINETS CONSOLES AND TABLES. FREE CATALOG.—FULBRIGHT CABINET COMPANY, HICKORY, NORTH CAROLINA.

COMPLETE ADVANCE STATION LIST—Sept. 22 issue of RADIO WORLD contained complete advance list of stations compiled according to the new allocation plan of the Federal Radio Commission, effective Nov. 11. Mailed for 15 cents a copy, or send \$1.00 for trial subscription of 8 weeks, including Sept. 22 issue. RADIO WORLD, 145 W. 45th Street, New York City.

QUICK SERVICE. Order radio goods now, shipments made day following receipt. All merchandise pre-tested. Set of Screen Grid Coils for Bernard's Economy Three, consisting of antenna coil Model 2A and High Impedance Tuner, Model 5 HT, \$4.75. One screen grid tube, one high mu tube, one —12A tube, total for three tubes, \$7.00. Blueprint for Bernard's Economy Three, \$1.00. Front panel and subpanel for 4-tube Screen Grid Diamond of the Air, \$5.00. All merchandise guaranteed on five-day moneyback basis. Send remittance and I pay carrying and shipping charges. Philip Cohen, 236 Varet Street, Brooklyn, N. Y.

SOCKET WRENCH

**F
R
E
E**



Push out control lever with knob (as at left) and put wrench on nut. Push down on handle only (at right), then turn nut left or right.

ONE of the handiest tools for a custom set builder, service man or home constructor is a BERNARD socket wrench.

It consists of a 6 1/2" long metal tubing in which is a plunger, controlled by a knob. The plunger has a gripping terminal (called a socket, hence the name "socket wrench") that may be expanded or contracted to fit 6/32, 8/32 and 10/32 nuts, the most popular sized nuts in radio.

Use the knob to push out the plunger, press down on the handle to grip the nut, then turn the nut to left for removal or to right for fastening down. Total length, distended, including stained wooden handle, 10". Gets nicely into tight places. Send \$1 for 8 weeks' mail subscription for RADIO WORLD and get this wrench FREE.

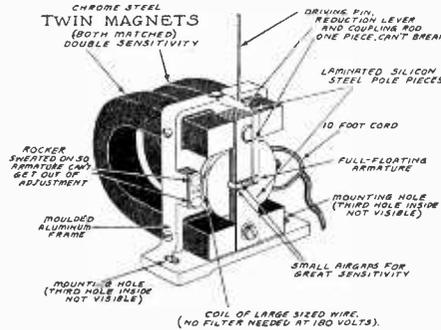
No other premium with this offer. Present subscriber may extend subscription by stating he is one, and entitle himself to this FREE premium, making \$1 remittance.

RADIO WORLD
145 WEST 45TH ST., N. Y. CITY
A few doors east of Broadway

Ninety Days to Compare

Send \$6 now for the Polo Unit, the Finest Electro-Magnetic Unit on the Market. Balance of \$4 to Be Paid in Ninety Days, or Unit Returned for Full Refund if it does not Outclass ALL Others.

MOST REMARKABLE OFFER!



Polo Unit (With Bracket, Cord, Apex, Chuck and Hardware)
List Price, \$10.00

THE POLO Duo-Magnetic Unit has been acclaimed the outstanding unit.

Satisfy yourself it is louder, clearer, stronger, purer, better. Compare it with anything else in the world. Take NINETY DAYS for your trial: At the end of that time, if you want to keep the unit—and you will—then send the extra \$4. Otherwise return the unit in 90 days and get your \$6 back.

Just think of it! NINETY-day trial!

Compare!

Make your comparisons all-inclusive, even against dynamic speakers. If you have a 171, 171A, 210, or 250 output tube, or any of these in push-pull, there won't be so much difference between the \$10 Polo Unit and the considerably more expensive dynamic speakers. But if you use 112, 112A, 120 or other similar power tube, or no power tube, the Polo Unit, with any cone or cloth speaker, will far outclass even the dynamic.

Take immediate advantage of our liberal offer. You must use attached coupon. Send \$6 and try out this marvelous Polo Unit at OUR risk.

We guarantee immediate shipment.

YOU MUST USE THIS COUPON

POLO ENGINEERING LABORATORIES

(Tel. Cortlandt 5112)

57 Dey Street, New York City

Enclosed please find \$6.00 on account, for which please send me at once one Polo Twin Magnet Unit, mounting bracket, 10-ft. cord, apex, chuck and hardware. I will send you the extra \$4 (making total of \$10) within 90 days after your date of shipment, to complete the purchase; or within 90 days will return the unit for complete, quick refund of purchase money.

Name.....

Address.....

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

NINETY-DAY Money-Back Guarantee

New Powertone Unit Brilliant to Eye and Ear! 1929 Model Far Excels Anything Else in Its Price Class!

Having won highest repute last season, the Powertone Unit, which gave maximum volume and quality reproduction at lowest price, again wins leadership because, without any increase in price, it assures still better performance.

The coil is wound a new way, with double the former impedance, giving remarkably faithful low-note reproduction, a region in which many units are deficient. The middle and high notes are faithfully reproduced, too.

GOLD AND VAN DYKE

The magnet is gold-dipped, giving it a rich and handsome appearance. The dipping is done before the "horseshoe" is magnetized, so there is no detrimental effect on flux. The back frame is sprayed with a Van Dyke finish—deepest brown, a splendid color combination. Imagine gold against Van Dyke! Use this unit for its superior performance and fetching appearance!

WHAT YOU GET:

At \$3.75 each, this unit represents the utmost you can obtain at anywhere near this price. Not only do you get the unit, but also a mounting bracket, apex, chuck, thumbscrew nut and 5-foot cord.



\$ 3.75

This unit will drive any type of cone, airplane cloth, linen or similar speaker, but will not work a horn. The Powertone Unit will stand 150 volts without filtering and is fully guaranteed against ALL defects for one year. The armature is adjustable to power tube impedance. Order a unit NOW!

SEND NO MONEY!

Just order one new Powertone Unit with equipment. It will be mailed at once C. O. D. You will pay postman \$3.75 plus a few cents extra for postage.

Try it for five days. If you don't think it superb, simply return the unit with a letter asking for refund, and your purchase money will be returned immediately! You run no risks! All you can do is win!

36" OR 24" KIT

You can use this unit on any type cone or other diaphragm speaker you prefer. If you want to build a 36" or 24" cone yourself, specify which, and unit, paper, bracket, apex, nut, thumbscrew, cement, pedestal, cord and instructions will go forward at \$6.00 C. O. D. plus small cost of cartage.

You will be overjoyed with the new 1929 model improved Powertone Unit. Order one TO-DAY!

GUARANTY RADIO GOODS CO., 145 W. 45th St., New York City. Just East of Broadway

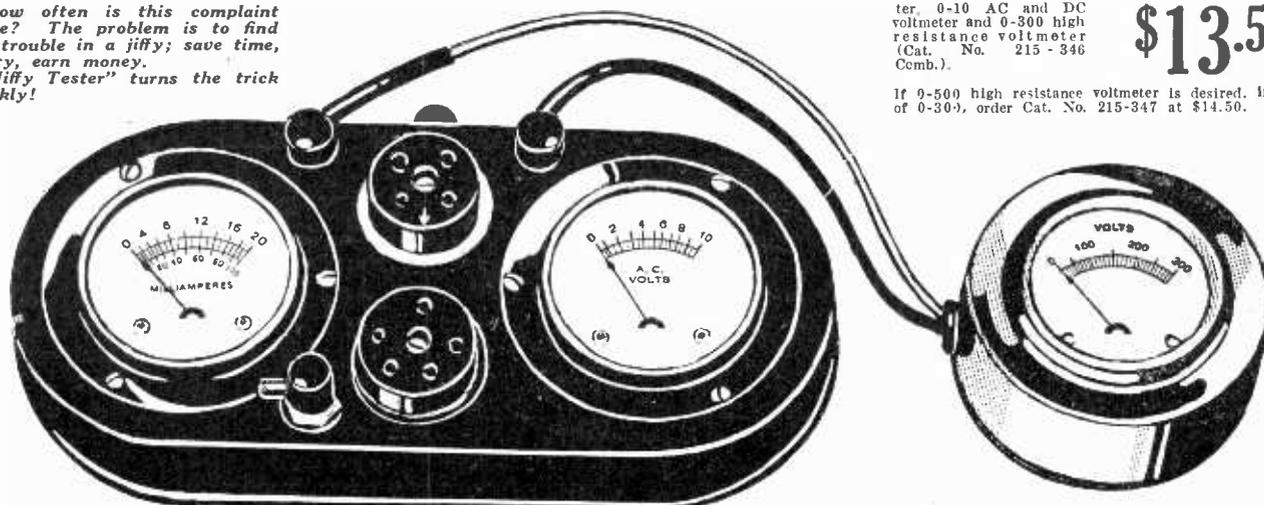
"JIFFY TESTER" Pays You Profits!

"Something wrong with my set!"
 How often is this complaint made? The problem is to find the trouble in a jiffy; save time, worry, earn money.
 "Jiffy Tester" turns the trick quickly!

Jiffy Tube and Set Tester, consisting of 0-20, 0-100 combination milliammeter, 0-10 AC and DC voltmeter and 0-300 high resistance voltmeter (Cat. No. 215-346 Comb.)

\$13.50

If 0-500 high resistance voltmeter is desired. Instead of 0-300, order Cat. No. 215-347 at \$14.50.



The 5-prong plug fits 5-prong AC tube socket of receiver. The 4-prong adapter converts the plug for tests of 4-prong tubes.

The 215 Jiffy Tester makes twelve vital tests in 4½ minutes, locates trouble, ends fuss, saves you time and nerves, and makes money for you, because you get the same pay for doing the same job quickly and scientifically as you can get for doing it slowly and unscientifically. The Tester is built to withstand hard knocks and rough usage.

Even More Accurate than Your Work Requires

The meters are accurate to 5% plus or minus, which is more than ample for service work, home experimenting, and all other needs, except commercial laboratory testing.

Twice as great accuracy costs four times as much. Note how extremely low the price is. You cannot buy any other such Tester at anywhere near that price. Great production makes possible our low price.

- Cat. No. 215-346 Comb. Consists of:
- (1) One newly-designed Two-in-One 0 to 10 voltmeter for AC and DC. Same meter reads both. Scale especially legible at 1½ to 7½ volts. This meter reads the AC and DC filament voltages.
 - (2) One DOUBLE reading DC milliammeter, 0 to 20 and 0 to 100 milliamperes, with changeover switch. This reads plate current, which is always DC in all sets.
 - (3) One 0-300 volts high resistance voltmeter, No. 346, with tipped 30" cord to measure B voltages.
 - (4) One 5-prong plug with 30" cord for AC detector tubes, etc., and one 4-prong adapter for other tubes.
 - (5) One grid switch to charge bias.
 - (6) One 5-prong socket.
 - (7) One 4-prong socket.
 - (8) Two binding posts.
 - (9) One handsome nickel metal case.
 - (10) One instruction sheet.

[Note: A pair of adapters for UV199 tubes, Cat. No. 999, at \$1 extra. These are not sold except with 215-346 Comb. or 215-347 Comb.]

Individual Meters for Portable or Panel Use

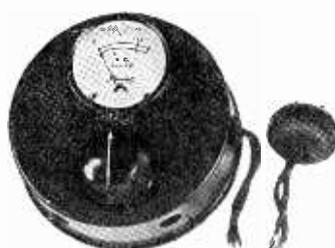


0-300 high resistance voltmeter, for testing all B voltages up to 300. 30" tipped cord. Nickel finished case. Cat. No. 346 \$4.50



Cat. No. 326 The panel voltmeter Cat. No. 326 reads DC voltages, 0-6. Put one on any set you build, using DC tubes.....\$1.65

Cat. No. 390 The panel milliammeter, Cat. No. 390, reads 0-100. This is much more current than any set is likely to draw, so you can read the total B current drain of any set.....\$1.65



Cat. No. 218 Voltage Regulator, to save life of AC tubes.....\$5.00

POCKET AND PORTABLE VOLTMETERS

- No. 8—For testing A batteries, dry or storage, 0-8 volts DC scale.....\$1.65
- No. 10—For testing A batteries, dry or storage, 0-10 volts DC scale.....1.65
- No. 12—For testing A batteries, dry or storage, 0-16 volts DC scale.....1.65
- No. 50—For testing B batteries, dry or storage, but not for B eliminators, 0-50 volts DC scale.....1.65
- No. 39—For testing B batteries, dry or storage, but not for B eliminators, 0-100 volts DC scale.....1.85
- No. 40—For testing A and B batteries, dry or storage, but not for B eliminators; double reading, 0-8 volts and 0-100 volts DC scale... 2.25
- No. 42—For testing B batteries, dry or storage, but not for B eliminators; 0-150 volts DC scale.....2.00
- No. 346—For testing B voltages, including eliminators. High resistance water 0-300 volts DC scale.....4.50
- No. 347—Same as No. 346, except that scale is 0-500 volts.....5.50
- No. 348—For testing AC current supply line, portable, 0-150 volts.....4.50

PANEL AC VOLTMETERS

- (Panel meters take 2-5/64" hole)
 - No. 351—For reading 0-15 volts AC.....\$2.25
 - No. 352—For reading 0-10 volts AC.....2.25
 - No. 353—For reading 0-6 volts AC.....2.25
- (See No. 348 under "Pocket and Portable Voltmeters.")

PANEL VOLTMETERS

- No. 335—For reading DC voltages, 0-8 volts, 1.65
- No. 310—For reading DC voltages, 0-10 volts, 1.65
- No. 316—For reading DC voltages, 0-16 volts, 1.65
- No. 328—For reading DC voltages, 0-6 volts, 1.65
- No. 337—For reading DC voltages, 0-50 volts, 1.65
- No. 339—For reading DC voltages, 0-100 volts, 1.75
- No. 342—For reading DC voltages, 0-150 volts, 1.75
- No. 340—For reading DC voltages, double reading, 0-8 volts, 0-100 volts.....2.25

VOLTMETERS

- No. 18—For testing amperage of dry cell A batteries and voltage of dry or storage A batteries, double reading, 0-8 volts, and 0-40 amperes DC.....\$1.85
- No. 35—For testing amperage of dry cell A batteries and voltage of B batteries (not B eliminators); double reading, 0-50 volts, 0-40 amperes DC.....2.00

PANEL MILLIAMMETERS

- No. 311—For reading 0-10 milliamperes DC...\$1.95
- No. 325—For reading 0-25 milliamperes DC...1.85
- No. 350—For reading 0-50 milliamperes DC...1.65
- No. 390—For reading 0-100 milliamperes DC...1.65
- No. 399—For reading 0-300 milliamperes DC...1.65
- No. 394—For reading 0-400 milliamperes DC...1.65

VOLTAGE REGULATOR

- No. 218—For preventing excess voltage on the filament and cathode of AC tubes, by compensating for excess line voltage.....\$5.00

POCKET AMMETER

No. 1—For testing dry cells, 0-40 ampere DC scale pocket meter.....\$1.50

DC PIN JACK VOLTMETERS

- No. 306—For Radiolas No. 25 and 28, 0-6 volts DC.....\$2.50
- No. 308—For No. 20 Radiola, 0-6 volts DC...2.50
- No. 307—Desk type voltmeter with cord, 0-6 volts DC.....2.50

6-VOLT A BATTERY CHARGE TESTER

No. 23—For showing when 6-volt A battery needs charging and when to stop charging; shows condition of battery at all times.....\$1.85

PANEL AMMETER

No. 338—For reading amperage, 0-10 amperes DC.....\$1.65

GUARANTY RADIO GOODS CO.,
 145 West 45th Street, New York City,
 Just East of Broadway

- Please send me at once, by parcel post, on a 10-day money-back guaranty, one Jiffy Test Outfit, consisting of one No. 215 and one No. 346 combination, for which I will pay the postman \$13.50, plus a few cents extra for postage.
- If 0-500 volts, high resistance voltmeter No. 347 is preferred, put cross in square and pay \$14.50 plus postage, instead of \$13.50, plus postage.
- One No. 215 and one No. 346, with two adapters, for UV199 tubes, \$14.50.
- One No. 215 and one No. 347, with two adapters for UV199 tubes \$15.50.
- One No. 215 alone, \$10.00.
- One No. 346 alone, \$4.50.
- One No. 347 alone, \$5.50

Send me the following individual meters (quantity in square):

- Cat. No. Cat. No. Cat. No.
- Cat. No. Cat. No. Cat. No.

NAME

ADDRESS

CITY STATE.....

TEN-DAY MONEY-BACK ABSOLUTE GUARANTY!