OCT. 20th
1928
15 CENTS

NEWS!

RADIO WORLD
REG. U.S. PAT. OFF.
The First and Only National Radio Weekly
343rd Consecutive Issue—Seventh Year

ONLY HALF A LOAF?

RADIO BOARD (to WGY): "Take what I see fit to give you, madame, and shut up!"

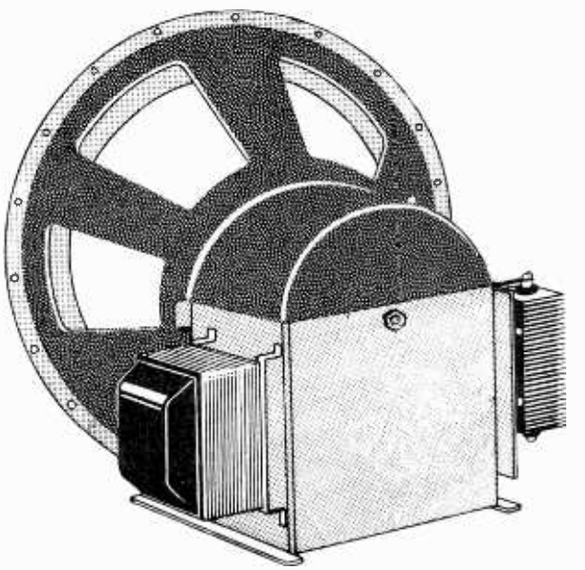
WGY: "The public insists I demand a full loaf. If you don't take orders from the public, who is your master?"

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, 6½" deep. Weight 13½ lbs. Cat. R-13, list price $40.00 Our price to you (40% and 2% off list) **$23.52**



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

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 ½ ampere at 6 volts. Output transformer is built into the housing. Supplied with 10 ft. cord. Dimensions 9" wide, 9" high, 6½" deep. Weight 10 lbs. Cat. R-14, list price $30.00 Our price to you (40% and 2% off list) **$17.64**

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 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 permsision, 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, 6½" 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:
(Put cross in square below.)

☐ 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)

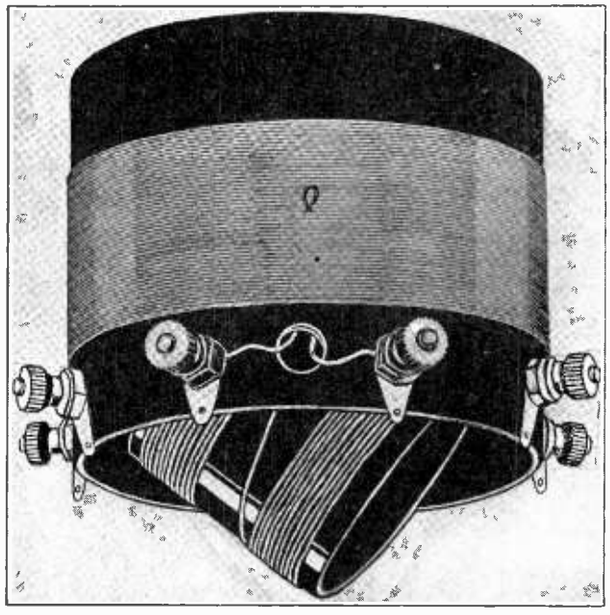
☐ I am enclosing remittance of $..... and you are to pay packing and cartage.
☐ Please send C.O.D. and I will pay a little extra for packing and cartage.

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, 6½" deep, overall. Weight 12½ 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 2½x 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

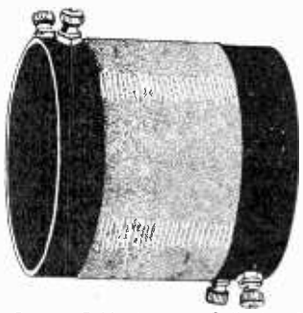
3-circuit tuner, for .0005 mfd. Secondary center-tapped for short waves. (Model T5) $2.25

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 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 postman the advertised prices, plus a few cents extra for postage.
☐ Model..... ☐ Model..... ☐ Model..... ☐ Model..... ☐ Model.....
Name .....
Address .....
City .....
State .....
SEND NO ..... (RW)

SCREEN GRID COIL COMPANY
143 WEST 45th STREET
NEW YORK CITY
Just East of Broadway

RADIO WORLD, a weekly paper, published by Hennessy Radio Publications Corporation, from Publication Office, 145 West 45th Street, New York, N. Y. Phone: BRYant 0558 and 0559. 15c per copy, $6 per year. This issue is dated October 20th, 1928, and is Vol. XIV, No. 5. Whole No. 343. Entered as second-class matter, March 1922, at the post office at New York, N. Y., under Act of March 1879.

11,000 Mile Range $18.50

COMPLETE WASP KIT, WITH MICARTA PANELS DRILLED AND ENGRAVED, ALL OFFICIAL PARTS, AND 5 WASP COILS, POSTPAID

Be the first among your friends to hear the foreign broadcast stations. Build the WASP short wave receiver. Use the WASP coils, the same coils which, during tests on Byrd's airplane receivers, brought in Java, Holland, and England in the daytime. Use the Official design, developed by R. S. Kruse and M. B. Sleeper. Official WASP sets are being used by the U. S. Signal Corps, A.R.R.L. operators, and DX fans who want distance that can be obtained on no other set.

17-30 M 30-52 M 48-105 M 73-202 M 200-500 M

Prompt Delivery

Send in your order TODAY and your Kit, with blue prints, 48 page book, and call list will be rushed to you at once.

SPEED, Inc.

Fastest Mail Service
103-D Broadway, Brooklyn
New York

LYNCH

Five-tube deck suitable for Short Wave and Television experimental work $12.50

Send for free book.

ARTHUR H. LYNCH, INC.
1775 Broadway New York City

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.

LATEST RADIO GUIDE

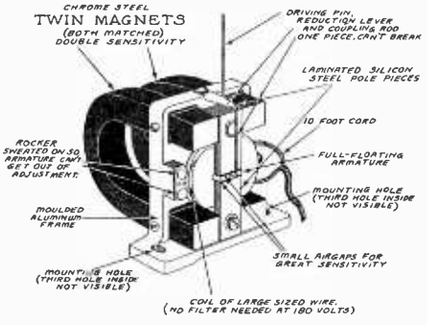
Send for your copy today — NOW.

BARAWIK CO. 1310 S. Canal Station, CHICAGO, U. S. A.

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 it 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.....

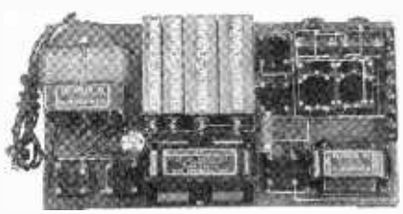
Address.....

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

NINETY-DAY Money-Back Guarantee

Victoreen

THE 1929 "B" POWER SUPPLY



A super radio achievement embodying vital improvements which make it the most remarkable power supply on the market. Makes any good set better—produces marvelous tone quality.

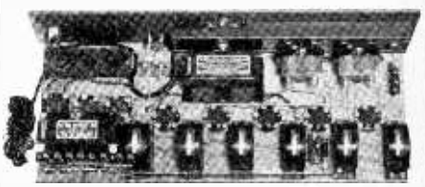
Uses the new UX250 Tube. Two voltage regulator tubes assure a constant voltage potential of 90 and 180 volts, thus making possible the use of definite known values of "C" voltage. As a result, fluctuation in the output circuit cannot affect the first audio and thus cause distortion. Four voltages are supplied—0-90 variable, 90, 180 and 450 volts constant potential.

Write for Free Blue Prints

Vital improvements in Victoreen R.F. Transformers, together with changes in the circuit itself, have still further perfected and simplified a "Super" which for years has had no superior.

The heart of this new Victoreen circuit is of course the world-famous Victoreen R.F. Transformer—greatly improved in efficiency, with binding posts located for maximum convenience in wiring. Each transformer is individually tuned to a precision of less than 1/3 of one per cent by the Victoreen patented method.

The New Victoreen A.C. and D.C. Circuits



This remarkable circuit offers now:

A redesigned R.F. Transformer.

A Special Oscillator, eliminating objectionable repeat points.

A Smooth Volume Control.

An Improved Method of Detection.

A Simplified Circuit, making easier assembly.

Variable adjustments reduced in number.

BLUE PRINTS FREE together with full constructional details. Write for it today.

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

"UNINTERRUPTED READER INTEREST"
EVERY WEEK — EVERY YEAR

RADIO WORLD

OCTOBER 20th, 1928
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[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

WGY Order Protested Throughout Country

Listeners in the New York and New England Areas Storm Commission With Complaints—Blind and Bed-Ridden Plead for Night Programs From Their Only Station—Short Wave Reception Covers Continent, and Devotees Beseech Retention—Board Refuses to Yield, Says Sacrifice Must Be Made to Improve Service as Whole

RICE BRANDS BOARD AS RUTHLESS AND INACCURATE

The denial of a cleared channel to WGY, the Schenectady, N. Y., station of the General Electric Company, under the Federal Radio Commission's reallocation plan, effective 3 A. M., November 11th, has evoked protests from various parts of the United States, where the short waves are received well, and particularly from the New York and New England area, where the regular broadcast wave of this station is often the only one received well. Protests from shut-ins that they would be deprived of their only station at night were numerous,

The station will not send out short waves unless broadcast waves go out at the same time.

So many letters of protest were sent to the Commission in Washington, D. C., that a form letter of reply is being sent out.

Martin P. Rice, manager of broadcasting for the General Electric Company, accused the Commission of acting "ruthlessly" in promulgating the order and of making inaccurate statements in its form letter.

The Commission refused to recede from its position. Its secretary, Carl H. Butman, in a letter explained that such sacrifice as is exacted of WGY must be made in the interest of better reception throughout the country. This remark Mr. Rice ridiculed.

Washington.

As the result of numerous protests made by listeners against the ruling of the Federal Radio Commission virtually confining WGY, Schenectady, N. Y., to to daylight transmission, except at the expense of KGO, the Commission, through its secretary, Carl H. Butman, is answering complaints in a form letter stating that WGY must be thus treated "to conserve wavelengths and to give maximum radio to the largest number of people."

Under the reallocation plan, that shakes up nearly all stations as to wave, power and time on the air, WGY and KGO, both General Electric Company stations, share the 790 k. c. frequency (379.7 meters). The wave is given to KGO primarily, and to WGY only supplementary. The plan is effective November 11th at 3 A. M.

WGY Wants Clear Channel

This frequency assignment puts WGY on KGO's wave, except that at night, when interference would result, the two must not be on the air at the same time.

WGY demands an exclusive channel, and cites its record as entitling the station to that consideration, but the Board insists that if WGY wants to broadcast until 10 P. M. exclusively on that wave it must take the time away from KGO.

Secretary Butman in his letter, which follows in full, means WEAF when he refers to "a 50,000-watt station only 150 miles distant."

Mr. Butman's letter follows:

"So far as the Radio Commission is concerned, station WGY is authorized to operate all day long and throughout each evening until 10 o'clock (and also later, on special occasions), upon the discretion of its management.

Exclusive During Daytime

"During its operating hours, Station WGY has the exclusive use of a cleared wavelength from which all interference has been removed, so that the station should reach out with a clear, unmarred signal and maximum service to you as a listener.

"The Commission feels sure that you and other listeners will willingly yield an hour or so of WGY's late evening time (after 10 or 11 P. M. when its programs are being duplicated on a 50,000-watt station only 150 miles distant) in order that listeners in other parts of the country may enjoy their share of radio reception under the new equalized radio arrangement required by Congress.

"Forty other great stations of 5,000 to 50,000-watt rating in crowded sections are being asked to accept reductions of half-time, or more, in the interest of good radio reception for the entire United States.

"Slight Reduction"

"Certainly the slight reduction of an hour or so a night, of WGY's time will impose no hardship comparable with the half-time reductions necessary in the Middle West and South, in order that all sections of the country may share equally in the enjoyment of our limited number of radio wavelengths.

"Channel 790 kilocycles is assigned primarily to the General Electric Company station KGO, at Oakland, Calif., in Zone V, with a supplementary assignment to General Electric Company Station WGY, at Schenectady, N. Y., the latter being authorized to operate at all hours when interference will not be caused with KGO.

"Because of clock-time difference and

(*Continued next page, column 2*)

Rice Ridicules Board

Schenectady, N. Y.

Martin P. Rice, manager of broadcasting for the General Electric Company, took exception to statements made by the Federal Radio Commission in letters addressed to WGY listeners who have appealed to the Commission for a modification of the ruling which makes WGY a part-time station after November 11th. Mr. Rice states:

"Will the Federal Radio Commissioners correct the mistake that has been made in the recent WGY ruling or will they merely explain? The Commission is sending a circular letter to those who have protested against the curtailment of WGY's evening program.

Answer Held Indefinite

"According to the letter 'the Commission feels sure that listeners will willingly yield an hour or so of WGY's late evening time in order that listeners in other parts of the country may enjoy their share of radio reception under the new equalized radio arrangement, required by Congress.'

"I am sure that protesting listeners will feel that such an appeal should be much more specific.

"It should not only say just what hours are to be given up, but it should say precisely who benefits, when nearly 3,000,000 people are ruthlessly deprived of their most dependable and, in some cases, their only broadcast programs. For whom is this sacrifice made, and how does it equalize radio reception?

Board's Feelings Analyzed

"Obviously, the Commission is not worrying about listeners on the Pacific Coast, because the Commission suggests that we silence our Pacific Coast station and borrow its wavelength when we want to operate WGY in the evening. The listeners for whom sympathy and generosity are asked must then be in the East—in the first zone.

"Now, without getting technical, let us see what provisions the Commission has made so that listeners in this (first) zone may enjoy their share of radio reception under the equalized law enacted by Congress.

"New York City, with a population of about 7,000,000, is served by four cleared wavelengths (wavelengths on which no other station is broadcasting), and as there are also many part-time stations in this area, listeners in New York City have a choice of fourteen programs every evening.

N. Y. City Favored, He Hints

"There are other parts of this zone that are also adequately served, but in the area 100 miles around Schenectady there is a population of nearly 3,000,000 which is almost entirely dependent upon WGY.

"The New York City stations, even with their cleared channels, cannot be relied upon in this area because of fading and static.

"Apparently the 3,000,000 people almost totally dependent upon WGY, living in New York, Vermont, New Hampshire and Massachusetts, are denied one of the eight cleared channels, and are appealed to by the Commission to yield their evening broadcasting so that New York City may not have to give up one of its four cleared channels or its fourteen programs —and the Commission ironically explains that it is to equalize radio reception as required by Congress.

Deprecates Synchronization

"The letter is not clear. The first sentence says that WGY is authorized to operate until 10 o'clock in the evening, but a footnote explains that WGY's wavelength was transferred to the Pacific Coast as a cleared channel, and that WGY can operate until sunset at Oakland, California—corresponding to about 7:45 Eastern time during the Winter.

Asking Too Much

"The same footnote refers to synchronizing WGY and KGO, although not one of the Commissioners in Washington last week had any idea how these stations could be synchronized, and Commissioner Caldwell said that he as a business man would certainly not recommend trying to synchronize stations separated by 2,600 miles until stations separated by 100 miles or less had been synchronized successfully.

"The Commission says 'it will make no objection to KGO's standing by from sunset until 7:00.' Will the people on the Pacific Coast, who are entitled to this important program period, be equally complacent, or will they start another storm of protest?

Another Inaccurate Statement

"Public interest, convenience or necessity is stated in the law as the basis of radio privilege.

"The Commission's letter says that 'forty other great stations of 5,000 to 50,000 watts rating in crowded sections are being asked to accept reduction of half time or more.' This is another inaccurate statement which, when analyzed, has no bearing on WGY.

"Commissioner Caldwell has sent me a list of these stations. None of them is licensed to broadcast on 50,000 watts. All but six are in districts adequately served by at least one other station. With two exceptions it is not a list of great stations. None of them ranks with WGY in priority in developmental contribution to radio or in service to the public.

"Why not suggest that the public study the list of stations, which the Commission has put ahead of WGY by giving them full-time privileges?

Important Work Ignored

"If the Commission has decided to explain a mistake rather than rectify it, more circular letters will follow, but the fact remains that the most important developmental broadcasting station in the world, and one on which more listeners are solely dependent, has been ignored in the Commission's allocation, and it is doubtful if any amount of explanation will satisfy the public.

"Someone may have thought that an order crippling our country's biggest station would be popular, but the listening public is doing its own thinking, and when thousands of people in several States arrive at the same conclusion, it is probably right."

(General Electric Photo)

MARTIN P. RICE, MANAGER OF BROADCASTING, GENERAL ELECTRIC COMPANY, WHO CHARGES THE FEDERAL RADIO COMMISSION WITH CRIPPLING THE COUNTRY'S BIGGEST STATION

Board Gives Its Side of WGY Controversy

(*Continued from preceding page*)

reduced transmission while daylight intervenes between the two stations, this means that Station WGY can operate all daylight hours and three hours into the night (or until sunset at Oakland) without any possibility of interference.

"After nightfall at Oakland there will be interference unless the two stations divide time (or synchronize).

Offers Option

"The Commission has indicated that in order to conserve wavelengths and to give maximum radio to the largest number of people at popular listening hours, it will make no objection but will approve KGO's standing-by from sunset to 7 P. M. at Oakland, in order that WGY may continue until 10 P. M. with full power on an exclusive channel."

Shake-up to be Made on Due Date

Washington.

Although rumors to the contrary have circulated, the reallocation plan will go into effect November 11th as ordered by the Commission, according to a statement by Judge E. O. Sykes, Vice Chairman of the Commission. He thinks that the greater number of broadcasters will try the new plan to see how it works. Judge Sykes is of the opinion that no court order can be made that will hold up the effective date of the plan.

M. H. Aylesworth, of the National Broadcasting Company, has protested against the chain order, and representatives of the Columbia chain are expected to do so. Martin P. Rice, of WGY and KGO, has conferred with the Commission on sharing of time by WGY under the reallocation plan. Mr. Rice told the Commission of the long and excellent service of the Schenectady station and said that it was entitled to a cleared channel. The Commission took no action and suggested to Mr. Rice to apply for a hearing after October 12th. He will do so, it is understood.

Give WGY a Square Deal!

POLITE DIFFERENCE OF OPINION BE-tween WGY and the Federal Radio Commission, as to what status the General Electric Company's station at Schenectady, N. Y., deserves, has ceased to exist. Now open warfare is waged.

WGY wants an exclusive, cleared national channel. Instead a channel has been granted "primarily" to KGO, the General Electric Company's station at Oakland, Calif., while WGY was assigned to the Oakland station's wavelength as a "supplementary" consideration. During daylight anywhere between the two stations they can be on the air simultaneously. But when night intervenes, only one can broadcast. As KGO has afternoon programs, WGY must quit early in the evening, for when it is 4:45 P.M. in Oakland it is 7:45 P.M. in Schenectady.

TO THE PROTEST MADE BY WGY AND A great array of its listener-defenders, the Commission replies that the company can operate its Schenectady station in the evening simply by omitting the afternoon programs and early evening programs of its Oakland station. It is strange that such power of administration should be delegated by the Commission to one of its victims. For WGY is, if anything, a victim.

That the clash has become bitter is proved by the accusations flung against the Commission by Martin P. Rice, broadcasting manager of the company. He charges the Board with making a "ruthless" decision against WGY, of circulating falsities regarding the merits of the dispute and the technical facts on which it is based, and of seeking public favor by attacking a powerful corporation. He remarks that the expected public approval turned out to be a protest.

THAT THERE IS MALICE AGAINST WGY is obvious. The mere statement that the cleared channel was granted "primarily" to KGO is in itself suspicious, for WGY outranks in importance its sister station of the West. The Commission itself proved that by having long continued WGY at ten times the power of KGO.

WGY is an important experimental and scientific station, in the sense that it has gushed gold and brains into improving broadcasting on regular waves and short waves, pioneered in television, given excellent programs, virtually encircling the globe, and served an area containing 3,000,000, some of whom, as in upper New York and New England, can get no other station well or at all.

Canada and England Want WGY Recognized

Schenectady, N. Y.

Radio listeners in England and Canada have joined their protests to thousands received from listeners in city and country within a hundred miles of WGY.

The English and the Canadian listeners offer their protests somewhat uncertainly for, as they explain, they have no voice with a United States Commission.

Listeners in England hear WGY's programs through the short wave stations, 2XAF and 2XAD, which regularly bear the programs of the broadcast station.

From South England

J. F. Park, of Bournemouth, South England, wrote:

"I am very much concerned about WGY going off the air, as on this side it is the best U. S. station we get and the only one that does not fade, and the only one it is possible to get on the loudspeaker with three valves in circuit.

"Since 1923 this station has greatly improved. At this moment it is no doubt the best radio station in your country, if not in the whole world. May I therefore ask you to do all you can to keep WGY on the air. If you were to appeal to the British radio public no doubt you would receive many letters in full support."

Lathamite Writes

From Eastham, London, F. Askine wrote: "I appreciate the programs sent out by WGY, and I sincerely trust that the representations which you propose to make to the Federal Radio Commissioners will result in a modification or, better still, a complete withdrawal of their decision."

To George R. Lunn, of WGY, William T. Trusler of Enfield Chase, England, wrote: "The closing down of your station, or at least the curtailing of its activities, will deprive many listeners not only in the U. S. A., but also in these islands, of a transmission which is noted here for clearness, absence of fading, and above all, reliability."

And From Woolwich

H. U. Matkin, Woolwich, England, stated:

"This station beats everything else in wireless transmission you have in the U. S. A. or Canada, and for clearness and reception and the splendid variety of programs it is always worth sitting up for."

Jersey as a State Intervenes in Fight

Governor Moore of New Jersey has directed Attorney General Edward L. Katzenbach to ask the Federal Radio Commission to grant a hearing to the New Jersey broadcasters to discuss the fairness of the reallocation of radio facilities, it has been reported.

Fourteen of the eighteen operators in New Jersey had told the Governor that the allotment to New Jersey, as proposed by the Commission to take effect November 11th, is not fair. Mr. Katzenbach would not say what action would be taken if the Commission refused to modify its ruling.

The committee that met the Governor was headed by Joseph Coustin, general manager of WAAT, Jersey City. The committee told the Governor that New Jersey was scheduled to receive only about one-half as many wavelengths as it was entitled to under the law. "The effect of the reallocation," said Mr. Coustin, "will be to force the smaller operators out of business and give the large companies a monopoly. Our tabulation of figures of the Commission's new plan shows very clearly that New Jersey's rights are being trampled on."

Power Cut Is Fought at the Bar

Chicago.

Arguments have been presented before Federal Judge James H. Wilkerson on the right of the Federal Radio Commission to enforce its ruling on wavelengths and power of broadcasting stations and to bar stations from the air entirely.

The arguments were on the application for a temporary injunction in behalf of Clinton R. White, operator of WCRW, and Emil Dennemark, operator of WEDC, to restrain George E. Q. Johnson, U. S. Attorney, and the local radio supervisory board, from prosecuting them for violation of the Federal Radio Commission's order that they cut down the power by 80 per cent.

Both stations are broadcasting in defiance of the order of the Commission and seek the injunction to escape prosecution for violating the order. The application for a temporary injunction named the Federal Radio Commission as a codefendant, but Judge Wilkerson ruled that the Commission could not be named a defendant in his court, as he had no jurisdiction over it. Therefore the arguments went on with Johnson and the local radio supervisors as defendants.

The dispute does not arise under the reallocation plan, but under a special order.

SHOULD PHONOGRAPH PROGRAMS BE ENCOURAGED? DID YOU EVER HEAR OF A BIG STATION NOT ONLY SAYING SO, BUT GLORYING IN ITS DAILY PHONOGRAPH PROGRAM, AFTER THE FEDERAL RADIO COMMISSION FROWNED ON SUCH TRANSMISSION? READ FULL DETAILS IN RADIO WORLD NEXT WEEK, ISSUE DATED OCTOBER 27TH.

Shut-ins Beg for Music

Schenectady.

The dread of long, lonely, silent winter nights is emphasized in many letters received by WGY, Schenectady, N. Y., from aged people, invalids and from the blind, who depend upon programs for their only entertainment. The letters are sent to WGY for transmission to the Radio Commission as protests against the new regulations which on November 11th make WGY a part-time station.

"Having lost my sight," writes Mrs. Isabelle Clough, of Cohoes, "my pleasures are very few and my happiest hours are spent enjoying the delightful programs I hear from WGY. Its news items bring the world close to me, its music and plays have filled a big empty space in my life, and I dread the long winter nights that to me will be both silent and sightless."

The wife of a former Vice-President of the United States, Mrs. James S. Sherman, of Utica, N. Y., wrote: "Here WGY is the only really dependable station. If such action as is threatened by the Radio Commission is taken to prevent broadcasting after 7:45 P. M., this radio of mine goes to the junk heap. I can never repay you for all the pleasure and profit I have received through your kindness. I can only tell you that you have given much to this shut-in!"

"I will die with grief, as I am alone," writes Mrs. Mattie Reinhart, of Berne, N. Y. "I do hope WGY will never be out of the air. It worries me so I can't sleep. This is my plea for WGY to continue. How lonely I'll be if I can't hear WGY this long winter. It is a world of comfort to me."

Mrs. E. E. Cook, of Binghamton, N. Y., a blind woman, asked a neighbor to write a plea for continuance of service, saying that she would be "perfectly miserable without WGY."

J. L. Bryce, of Gloversville, N. Y., describes himself as one of the "wheel-chair brigade." "I have everything coming over the air and it is the only means I have of being entertained and sincerely hope something can be done."

From Cold Brook came a letter written by an 82-year-old woman, Mrs. Charles Cave, who also does not want to think of "the long winter evenings" without WGY.

"I have a mother 79 years old and a very feeble husband," writes a Troy woman. "I am forced to work at home and so all three of us are tied in. The wonderful radio is all of our enjoyment, living as we do in a small cottage alone. Mother is really grieving, fearing her pleasure will be taken from her. So with all my heart I am entering this protest, not for us alone, for there are hundreds in like condition."

Mrs. E. A. Harrington, of Hallowell, Me., aged eighty, reports that WGY is the only station she can get and "it does come so well in Maine." Mrs. Harrington asks if there is any thing she can do for WGY.

Many physicians, knowing of the dependence which invalids in homes and hospitals place upon radio for their entertainment, have written in protest. Dr. G. F. McKay, addressing the Federal Radio Commission, says: "I am wondering if there are many more important stations than WGY? Of course I do not know. Four of my patients are bedridden. They have radios One has hers across the room and she pulls the switch with a long ribbon which runs from her bed to the radio. I asked them which stations they favor. All of them say WGY.

"Of course I feel that the Radio Comsission does not mean its recent ruling as the last word, nor have they given it in an ex-cathedra spirit, so as one who has inspiration, education and entertainment over the air from WGY, I add my voice to the many thousands who must feel that you will be able to bring about a satisfactory solution of the troublesome question."

From Dr. Lawrason Brown, of Saranac Lake:

"I have learned with great regret that WGY will not be allowed to operate except for one hour in the evening. As a large number of patients in Saranac Lake depend tremendously upon the radio to while away many of the long hours that they must spend in bed while suffering from tuberculosis, I am hoping that you can make some arrangement with the Radio Commission which will enable you to broadcast for a longer time, for many of our patients are unable to get other stations save WGY many days during the year."

Short Wave Fans Resent Ruling

Schenectady, N. Y.

Protest letters received by WGY, among them copies of letters sent the Commissioners direct, indicate that the listeners of WGY's programs, carried by the short wave stations 2XAF and 2XAD, are far more numerous than has been thought.

In the mail of WGY in one week were letters from short wave listeners in Pasadena, Calif.; Ophir, Utah; Brownsville, Texas, and Oklahoma City, Okla. All view the action of the Commission unfavorably and have added their plea to the authorities to reconsider a ruling which will limit the operation schedule of WGY.

Won't Run Short Wave Alone

"While the short wave stations are not included in the ruling, if WGY cannot operate to serve the 2,500,000 people within a radius of 100 miles of the station, it would not be economically desirable to operate the short wave stations alone," said an announcement from WGY.

W. Vincent Parsons, living at 1646 Francisca Street, Pasadena, Calif., wrote the Commission as follows:

"Permit us, as California listeners, to commend your new assignments of wavelengths and power. We hope that you will stick to them and enforce them wherever it appears best to do so.

"However, may we protest against one of the assignments? Why should WGY be made a daylight station? We here in California seldom hear the WGY broadcast wave, but the same programs come to us every day on short waves, and they are by far the best that we receive.

"They come in like locals, and the quality of transmission is better than that from most of our Southern California stations.

"Not only are the WGY programs much better than those of KGO, but also the Schenectady wave usually comes in much better here than does that from Oakland. This is due, of course, to the use of short waves.

"We cannot expect the General Electric Company to give us wonderful short wave programs if their broadcast wave must be silent. Why, then, must the world lose the best part of the transmissions from its greatest experimental station? May we request that you reconsider your decision with regard to WGY?"

B. J. Jarvis, chief radio electrician, U. S. Navy, and for eighteen years connected with radio and naval communications, wrote from Brownsville, Texas, as follows:

"May I add my name to your list of those protesting the discontinuance of your high frequency broadcasting band?

"I feel safe in saying that a large number of listeners in this vicinity would be without concerts during the Summer months, as it is practically impossible to hear San Antonio, Texas, stations during the static season.

"I can safely say without fear of contradiction that your high-frequency program comes in better than any other in the United States, even including KDKA.

"I might add that I have been connected with radio and naval communications for the past eighteen years and have gained some knowledge of quality reception during that time."

Another letter is addressed to the Commission by H. M. Hartmann, manager of the Ophir Hill Consolidated Mining Company. Mr. Hartmann writes:

"This afternoon, while listening to 2XAF, I heard the statement that in the reallocation WGY was to be closed down at 7:45 P. M. Eastern time, or 5:45 P. M. our time.

"In arriving at this decision have you given due consideration to the wonderful service that station has given and is still giving? For example, I am at present listening to the program from WGY through 2XAF. At this time of day and as a rule up until 8 in the evening WGY, through one of its short wave stations, furnishes the only program worth listening to.

"I do not mean to disparage our local station KSL, but until the time comes when it can be tied into one of the National networks it cannot be expected to furnish the type of program that WGY does, the talent not being available.

"I know there are a number in this locality who follow the same course that I do. This being the case, the number throughout the country must be enormous to whom WGY is giving a great deal of pleasure."

Hopes for the Best

Mr. Hartmann explains that his letter is not written in a spirit of criticism, but in the hope that the Commission will reconsider its decision "so that we may not be forced to hear some southern California station's phonograph records, or some station in Iowa going through a mail order catalogue, while WGY, with its wonderful programs, which come through perfectly here in Utah, is silent."

"It seems to me that a great injustice is being done to the people of the West and Southwest, due to the fact that WGY is the best Eastern station that we can always bet with unfailing regularity," writes John Fulton, of 715 East Seventh Street, Oklahoma City, Okla.

"The programs from the stations have been of untold benefit to me. I am writing this letter in the hope that it may have some little weight with you in getting you to reconsider your recent decision as to the status of WGY."

16 More Protests Filed

Washington.

Protests were filed by sixteen stations against their "draw" in the reallocation plan.

The Federal Radio Commission made the following announcement (which does not include WGY):

The following applications for a modification of their assignments under the new allocation have been filed with the Federal Radio Commission by radio broadcasting stations:

Station WCFL, Chicago Federation of Labor, Chicago, Ill., requests change of frequency from 620 kilocycles to 670, 720, 770, 810, 870, or 1,000 kilocycles. Requests increase of power from 1,000 watts to 25,000 watts with 25,000 experimental. Requests change in hours of operation from sharing with WJJD and WRM to unlimited.

Station KLX, Tribune Publishing Company, Oakland Calif., requests change of frequency from 1,270 kilocycles to 590 kilocycles. Requests change in hours of operation from sharing with KTAB to unlimited.

More Power Wanted

Station WGES, Oak Leaves Broadcasting Station, Inc., Chicago, Ill., requests increase in power from 500 watts to 1,000 watts. Requests change in hours of operation from sharing with WJKS-WPCC to 2-3 time on 1,360 kilocycles.

Station WIBS, New Jersey Broadcasting Corp., Elizabeth, N. J., requests change in power from 250 watts to 500 watts. Requests change in hours of operation from sharing with WBMS, WNJ, WAAT, WKBQ, to 44½ hours per week.

Station WMES, Massachusetts Educational Society, Boston, Mass., requests increase of power from 50 watts to 100 watts; requests change of frequency from 1,500 kilocycles to 1,120 kilocycles, requests change in hours of operation from sharing with WLOE to daylight hours at 6 p. m.

Station WJAS, Pittsburgh Radio Supply House, Pittsburgh, Pa., requests increase in power from 500 watts to 1,000 watts.

Station WGN-WLIB, The Tribune Company, Chicago, Ill., requests increase in power from 15,000 watts to 25,000 watts.

Station WLTH, Voice of Brooklyn, Inc., Brooklyn, N. Y., requests increase in power from 250 watts to 1,000 watts. Requests change in frequency from 1,400 kilocycles to 90 kilocycles, daily until 9 p. m., 1,400 kilocycles after 9 p. m.

Want Other Waves

Station WRJN, Racine Broadcasting Corp., Racine Wis., requests change in hours of operation from sharing with WCLO to full time.

Station WTMJ, The Journal Company (The Milwaukee Journal), Milwaukee, Wis., requests change in frequency from 570 kilocycles to 920, 940, 620, 610, 930, 590, or 580 kilocycles. Requests increase in power from 1,000 to 5,000 watts. Requests change in hours of operation from sharing with WHA to full time.

Station WMBC, Michigan Broadcasting Company, Inc., Detroit, Mich., requests increase in power from 100 to 500 watts. Requests change in frequency from 1,420 to 570 kilocycles. Requests change in hours of operation from sharing with WAFD to unlimited.

Station WHAD, Marquette University, Milwaukee, Wis., requests change of frequency from 1,120 kilocycles to 900 kilocycles. Requests increase of power from 250 watts to 1,000 watts daytime (750 watts night time). Requests change in hours of operation from 1-7 time (sharing with WISN) to a maximum of 12 hours per week.

Other Requests

Station WEAN, The Shepherd Company, Providence, R. I., requests change of frequency from 1,160 kilocycles to 890 kilocycles; requests reduction in power from 500 watts to 250 watts; requests change in hours of operation from daytime to unlimited.

Station WLEX, The Lexington Air Station, Lexington, Mass., requests increase of power from 50 watts to 100 watts.

Station WNAC-WBIS, The Shepherd Stores, Boston, Mass., requests change in frequency from 650 kilocvcles to 940 kilocycles.

Station KFJZ, Henry Clay Allison, Fort Worth, Texas: 1. Requests increase of power from 50 watts to 500 watts—letter 7-25-28 amended to 1,000 watts; requests change in location from 2121 Refugio St., to 3219 Ave. L; requests change in frequency from 1,200 kilocycles to 1,250 kilocycles. 2. Requests change in location from 2121 Refugio Street to Katy Golf Course; requests change in frequency from 1,200 kilocycles to 1,240 kilocycles; requests increased power from 50 watts to 2,000 watts. 3. Requests change in location from 2121 Refugio Street to Katy Golf Course; requests increase in power from 100 watts to 2,000 watts; requests change in frequency from 1,370 kilocycles to 1,240 kilocycles.

Better Deal Asked by Brooklyn

Washington.

Protests relative to the treatment of Brooklyn stations in the new allocation plan have been received by the Federal Radio Commission. One of those who have discussed the situation is Representative Thomas H. Cullen of Brooklyn. Commissioner O. H. Caldwell, representative of the Eastern Zone, discussing the subject said:

"The situation as it now stands gives Brooklyn one channel for its four radio stations. Compared with this situation Manhattan has only three transmitters located on the island—WNYC, which is, of course, as much a Brooklyn as a Manhattan station; WMSG and WHN. Omitting WNYC, the total time occupied by WHN and WMSG is seven-twelfths, or a little over one-half.

"The other stations in the metropolitan area are those which serve the entire residential section of the greater city. Certainly, stations like WEAF and WABC, which are located on Long Island, serve Brooklyn more than any other region. Repeated investigations which the commission has made to ascertain the public interest in various stations in the New York area show that even among Brooklyn people themselves the Brooklyn stations are near the bottom of the list."

Samuel J. Gellard, President of WLTH, Brooklyn, has criticized as unfair the statement of Radio Commissioner O. H. Caldwell that Brooklyn people themselves placed Brooklyn stations "near the bottom" in their list of preferences. Mr. Gellard cited an instance where Brooklyn Safety Council several years ago wished to secure time on a New York station, but was quoted a large price as the cost of the time on the station. He said that WLTH has been giving this time to the council without charge ever since, which showed that one Brooklyn station was willing to do what no New York station would do. The station has engaged Karl A. Blaustein, Brooklyn attorney, to represent it.

A plan has been broached to circulate a petition and to file it with the Federal Radio Commission.

WLW—WS AI Division Protested

Cincinnati.

The reallocation order compels WLW and WSAI, Crosley stations, to divide time on the 700 kilocycle frequency. No formal protest has been made.

Powel Crosley ,Jr., said that the Federal Radio Commission will be influenced only by an appeal from the listeners strong enough to convince them of the necessity of retaining both stations on a full time basis. Only a regional channel is being asked for WSAI and the Commission has been so notified.

Thousands of names have been signed to petitions and sent directly to the Radio Commission or to the Crosley Radio Corporation for forwarding.

Letters of protest have poured onto Mr. Crosley's desk by the hundreds. Still other hundreds contain copies of letters sent to the Commission.

According to Mr. Crosley, listeners never before have been so unified in their demand for radio legislation.

"People do not write to their favorite broadcasters as much as they used to, but this thing has crystalized public feeling to an extent we could never have believed possible," he said.

"I firmly believe that no one thing has struck so closely to the hearts of the people as this thought of the elimination of two stations."

O. K. Given to Test of New Waves

Washington.

Stations who must use a new frequency under the reallocation plan have been authorized to test on the new frequency by the terms of the Federal Radio Commission's new order as follows:

"General Order No. 45.—At a session of the Federal Radio Commission held at its offices in Washington, D. C., on September 24, 1928.

"For the purpose of permitting broadcasting stations to make such tests as may be necessary to enable them to change to the frequencies assigned to them respectively under the allocation effective on November 11, 1928, and thereafter to maintain said frequency with the degree of accuracy required by the regulations of the Commission.

Tests Authorized

"It is ordered that any broadcasting station, the frequency of which has been changed by the new allocation effective on November 11, 1828, be, and it is hereby, permitted until further order of the Commission, to make such tests on its new frequency, provided these tests be conducted at hours when interference will not be caused with the broadcasting of other stations. These tests must be limited to the period between 2 and 7 o'clock a. m., Eastern standard time, in the case of stations located east of the Mississippi River, and to the period between 1 and 7 o'clock A. M., mountain standard time, in the case of stations located west of the Mississippi River.

Interference Is Prohibited

"Such tests will not be permitted to continue in cases where interference develops. On applications in particular cases, broadcasting stations may obtain leave to make tests and experiments during the daytime if, in the opinion of the Commission, interference will not result."

The letter issued reads in full text as follows:

In answer to your inquiry as to arrangements for testing on your new frequency, I am enclosing copy of General Order No. 45, just issued by the Radio Commission.

Time for Tests Limited

General Order 45 authorizes any broadcasting station to immediately begin "after-midnight" operation for test purposes on the new frequency to which it is assigned November 11, providing that such tests are made only after the close of ordinary programs and providing also that no interference is caused with other stations meanwhile regularly assigned to such frequencies.

Help to Stations

In order to assist stations in reconstructing antennas and rearranging equipment to meet the new assignments, it was felt that such privileges of immediately proceeding to do night testing would be extremely useful in adjusting frequencies. Through such advance tests it is also believed that stations may make practically all necessary change-over preparations prior to November 11, instead of after, so that when the new allocation takes effect, stations may occupy their new wavelengths with the least confusion and inaccuracy of settings, thus minimizing heterodynes.

Chain Restriction Postponed by Board Until December 31st

Washington.

Postponement from November 11th, 1928, to January 31st, 1929, of the effective date of its order affecting broadcasting (General Order No. 43), limiting the broadcasting of chain programs by stations on cleared channels to those more than 300 miles apart, was announced by the Federal Radio Commission.

In a new General Order (No. 46), the Commission stated that it had decided to take this procedure to "determine the actual extent of duplication of chain programs on cleared channels" under the new allocation of broadcasting stations, which becomes effective November 11th. In addition, it was stated in the order that practical experience was desired to determine the "most practical regulatory measures to reduce such duplication."

The original order was promulgated with the plan for reallocation, to become effective coincident with the reallocation. Complaints against the order, on the ground that it was restrictive and would sharply curtail chain program service to listeners through the elimination of many stations, were made to the Commission by the National Broadcasting Company, individual chain stations, and listeners.

The Radio Manufacturers Association also conferred with the Commission, because of the probable effect of the order upon sales of radio sets. The Columbia Broadcasting System suggested that the order be amended.

Full Text of Order

The full text of the new general order follows:

In order to determine the actual extent of duplication of chain programs on cleared channels, under the reallocation of broadcasting stations, effective November 11th, 1928, and,

"In order that practical experience obtained may indicate the most practical regulatory measures to reduce such duplication:

"The Federal Radio Commission hereby postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart, until the end of the next broadcasting-license period, January 31st, 1929."

Washington.

An application has been filed with the Commission by WLTH of Brooklyn for the use of 920 kc during daylight hours instead of 1,400 kilocycles. Also WOV of New York has filed application for the wavelength now used by WFBL of Syracuse and by WMAK of Lockport.

Plot Against Labor Charged in WCFL Case

Chicago.

E. N. Nichols, Secretary of the Chicago Federation of Labor, charged that there is a plot to silence WCFL, the union-owned broadcasting station on the municipal pier in this city. He made the assertion when outlining the labor union's plan for appearing before the Radio Commission October 28th for protesting the order of the Commission diminishing the power of WCFL and changing its wavelength.

"We will put into the record," he said, "the fact in what we charge amounts to a conspiracy to silence the station. We shall spare no one who, we feel, is responsible for the attempt to give the air to a few large interests. Failing to obtain what we consider our rights in the ether, we shall carry our battle to the floor of Congress and make a record there for voters to read."

Columbia Asks Chain Be Limited

Washington.

An amendment of the reallocation order was suggested by the Columbia Broadcasting System at a conference with the Federal Radio Commission. Dr. Leon Levy, of Philadelphia, representing the chain of 22 stations, most of them east of the Mississippi, issued this statement:

We are greatly indebted to you (the Federal Radio Commission) for the opportunity to present our suggestions as to the regulation of duplicating programs on cleared channels. The new allocation recently announced by your body, which, while it has had some very harmful effects upon us, will unquestionably promote stability in the broadcasting industry. For that reason, we subscribe to it.

Threatened With Ruin

We have poured a vast amount of capital and untold industry into the broadcasting industry and cannot stand by and see its future threatened with ruin by reason of a single phase of regulation.

We believe that unrestricted duplication of programs on cleared channels would certainly bring such a storm of protests that adverse legislation would be demanded by the listening public and its enactment would be a certainty.

It is a big question whether such legislation would be scientifically sound. If it were not, the entire foundation of the broadcasting allocation would be destroyed and all the efforts of this Commission would be wasted.

Fears Millstone

It is our belief that permitting the larger share of high-powered channels to carry identical programs on the three nation-wide networks would make chain broadcasting, which is now the backbone of radio, a millstone around its neck. If the listening public tunes in the same program at point after point on its dials, public resentment, fanned by the energetic independent stations, would do untold harm to the entire radio structure.

After a careful study of the extent to which duplication might be tolerated by the public, we suggest that the Commission amend Order 43 as follows:

The same identical program shall not be duplicated on a cleared channel more than once in any zone, except where additional stations are separated by 300 miles or more from all other duplicating stations on clear channels; the regulation not to apply as between stations in different zones.

Majestic Set Seller Freed in Serial Case

A radio set is not a mechanical device within the meaning of the law, according to Magistrate Bushel of the Tombs Court, New York City. He discharged Isaac Greenberg, proprietor of a radio store at 79 Cortlandt Street, New York, after a hearing on a charge that Greenberg violated Section 436 A of the penal law by having radio sets in his place from which serial numbers had been removed.

Edward H. McCarthy, of the Grigsby-Grunow Mfg. Co., makers of Majestic sets, appeared as complainant against Greenberg, who was the first person to be arrested under the law, which went into effect in 1922. The magistrate held that the law applied only to automobiles and their parts.

Great Music School of Air Inaugurated

A group of the country's leading educators has been selected by Walter Damrosch, noted symphony conductor, to act in an advisory and cooperative capacity for a series of music educational concerts which the Radio Corporation of America is sponsoring this Fall.

These concerts, which begin October 26th, are the first programs of their kind ever to be broadcast nationally and on an organized scale to the schools of the country. They will be presented Friday mornings, during the school sessions, and carefully graded so that students of Intermediate, High School and College age will be addressed at different periods.

The first advisory body to be called into consultation by Mr. Damrosch was the Committee on Music Appreciation of the Music Supervisor's National Conference.

Committee's Duty

Its official duty is to formulate a standard course of study in music appreciation to coordinate with theoretical and applied music now taught in the public schools of the country. In their new connection, the members of this committee are seeking to make the nationally broadcast concerts an integral part of the accepted public school course in music.

The Committee includes Lenore Coffin of Indianapolis; Edwin N. C. Barnes of Washington, D. C.; Frances Kessler, supervisor of Bloomington, Ill.; Max Krone, of Illinois State University; Louis Mohler of Teachers College, Columbia University; Inez Field Damon of State Teacher's College, Lowell, Mass.; Margaret Lowry of Kansas City, Mo.; Helen Roberts of Cincinnati Conservatory of Music," Sudie L. Williams of Dallas, Texas; Frances Dickney Newenham of Washington State University, Seattle, and Grace P. Woodman of Jacksonville, Fla.

Other nationally known music directors included in the advisory group and sponsoring the radio concerts are: Edgar Gordon of Wisconsin State University and George Oscar Bowen of Tulsa, Okla., both former presidents of the Music Supervisors National Conference; John A. O'Shea, director of Music in Boston, Joseph Maddy whose recent organization of brought him international attention; Paul Weaver of the University of North Carolina; Sara Conlon of St. Louis, Mo.; Blenn Woods of Oakland, Calif.; Helen McBride of Louisville, Ky., and John Beattie of North Western University at Evanston, Ill.

City Directors Assist

Among the City Superintendents sponsoring this first nation-wide effort in radio education are: David E. Weglein of Baltimore, Md.; Paul C. Stetson of Dayton, Ohio; J. W. Studebaker of Des Moines, Iowa, and Willis A. Sutton of Atlanta, Ga.

"These men, themselves prominent in educational circles, can contribute much to directing administrative matters in large city schools where there is a real task of curiculum adjustment," said Mr. Damrosch.

"While many large cities will benefit greatly by these radio concerts, the schools more removed from centers of culture will profit most by the national dissemination, through broadcasting of music education," reads the announcement.

The music education concerts will be broadcast each Friday in half hour periods beginning at 11 A. M. and 11.30 A. M., and will be known as the R.C.A. Educational Hour. The project is the consummation of a long cherished idea which Mr. Damrosch conceived in the early days of broadcasting, when he realized the potentialities in the new medium for disseminating music culture on a vast scale to an almost unlimited audience representing all strata of American life.

How It Was Born

He confided his hopes to David Sarnoff, vice-president and general manager of the Radio Corporation of America, sensed its possibilities, and in February two experimental broadcasts were given over the air.

The response was immediate and encouraging. It was estimated that Mr. Damrosch received well over 10,000 letters from pupils, teachers and music directors all over the country, commending the programs and urging their continuance. Soon after, the Radio Corporation of America decided to sponsor the series of educational concerts under Mr. Damrosch's direction.

The concerts are broadcast over the WJZ network of the National Broadcasting Company and its associated stations, which includes WJZ, New York; WBZA, Boston; WBZ, Springfield, Mass.; WBAL, Baltimore; WHAM, Rochester; KDKA, Pittsburgh; WEAR, Cleveland; WLW, Cincinnati; WJR, Detroit; KYW, Chicago; KWK, St. Louis, WTMJ, Milwalkee; WCCO, Minneapolis; KVOO, Tulsa; WFAA, Dallas; KPRC, Houston; WOAL, San Antonio; WHAS, Louisville; WSM, Nashville; WMC, Memphis; WSB, Atlanta; KOA, Denver; WOC, Davenport; WHO, Des Moines; WDAF, Kansas City; WRC, Washington, and WOW, Omaha.

Australia Decides on Federal Control

Washington.

Control of broadcasting in Australia has been taken over by the Federal Government, the Trade Commissioner at Sydney, E. C. Squire, advised the Department of Commerce.

The full text of the report follows:

The new policy contemplates that the Government shall be the owner of the plant, equipment, and mechanical means of broadcasting in all "A" class stations and relay stations, and that provision shall be made for broadcasting of complete programs of news and entertainment throughout the Commonwealth.

Program Schedule of the Music Course

Programs and dates for the four series of radio concerts for children which will be given by Walter Damrosch beginning October 26 have been announced. The RCA Educational Hour, as it will be known, will be broadcast from the studios of the National Broadcasting Company through twenty-six stations.

The first series, for the third and fourth grades, is designed to appeal to the very young, and aims to show how music is tied up with the everyday things of life. There is one entire program on 'Fairies in Music,' another on "Nature in Music" and still another headed Animals in Music."

Through other programs Damrosch will bring out the quality of the four different varieties of instruments in the orchestra: strings, woodwind, brass and percussion.

List of Subjects

The complete list of subjects for the Grade 3 and 4 series follows: Grades 3 and 4, Friday mornings at 11:00 o'clock: October 26, My Musical Family (the orchestra); November 9, The Magic Door (The Overture); November 23, Fairies in Music; December 14, Nature in Music; January 4, Animals in Music; January 18, Violin and Violoncello; February 1, Flute and Clarinet; March 1, Oboe, English Horn and Bassoon; March 15, Horn and Trumpet; April 5, Trombone and Tuba; April 19, The Percussion Instruments; May 3, Dances.

A somewhat similar grouping of subjects appears in the series for Grades 5 and 6. The compositions chosen, however, are slightly more difficult, nad in place of 'Fairies" one finds "Fun in Music" and slightly more difficult, and in place of quality, such as the program on "Sorrow and Happiness."

The series for Grades 5 and 6 will begin November 2. The dates and subjects follow:

Grades 5 and 6, alternate Friday mornings at 11:00 o'clock: November 2, My Musical Family; November 16, Violin, Viola and Violoncello; December 7, Flute and Clarinet; December 21, Oboe, English Horn and Bassoon; January 11, Horn and Trumpet; January 25, Trombone and Tuba; February 8, Kettledrums and Cymbals; March 8, Percussion; Tambourine, Triangle, Xylophone, Brass Drum; March 22, Nature in Music; April 12, Animals in Music; April 26, Fun in Music; May 10, Sorow and Happiness.

Junior High Schools

In the Junior High School series for Grades 7, 8 and 9, Damrosch begins to take up the forms of music, such as the symphony and symphonic poem. As in the other series, he gives detailed attention to the various instruments.

Junior High School, Grades 7, 8 and 9, Friday mornings at 11:30 o'clock: October 26, My Musical Family; November 9, The Stringed Instruments; November 23, Flute and Clarinet; December 14, Oboe, English Horn and Bassoon; January 4, Horn and Trumpet; January 18, Trombone and Tuba; February 1, Percussion Instruments, Kettledrums and Military Drum; March 1, Percussion, Cymbals and Tambourine; March 15, The Symphony; April 19, The Symphony; May 3, The Symphonic Poem.

The High School and College series includes musical compositions practically the equivalent of what would be played as a regular symphony concert, although the grouping of subjects is almost identical with that of the former series. There are two complete programs, however, illustrating the symphony.

Other Programs

High Schools and Colleges, alternate Friday mornings at 11:30 o'clock: November 2, Emotions in Music; November 16, The Overture; December 7, The Stringed Instruments; December 21, Flute and Clarinet; January 11, Oboe, English Horn and Bassoon; January 25, Horn and Trumpet; February 8, Trombone and Tuba; March 8, Percussion, Kettledrums; March 22, Percussion, Drums, Cymbals, Tambourine; April 12, The Symphonic Poem; April 26, The Symphony; May 10, The Symphony.

"Proceedings" of Institute of Radio Engineers, September Issue

"The Use of Radio Field Intensities As a Means of Rating the Outputs of Radio Transmitters," by S. W. Edwards and J. E. Brown.

The paper describes a method by which the outputs of radio transmitters could be regulated by Federal authority as required by law in terms of measured radio field intensities instead of watts power in transmitter or antenna circuits. The method was developed from measurements of fields of five different broadcast stations. The method is developed on averages taken from the actual measurements and it is applicable to all broadcast conditions found in the broadcast band at the present time. Numerous curves and field strength maps are included in the paper to illustrate the method.

"Note on Radio-Frequency Transformer Theory," by H. Diamond E. Z. Stowell.

This is a brief paper on the mathematical theory of radio-frequency coupling transformers, in which there exists distributed capacity between the windings. Theory is supplemented with graphs showing how the voltage amplification depends on the mutual inductance and the distributed capacity between the windings and also how it varies with the frequency and on the load on the secondary.

Beacons Discussed

Clayton C. Shangraw, Associate Radio Engineer, Signal Corps Aircraft Radio Lab., Wright Field, Dayton, Ohio, contributes an interesting paper on "Radio Beacons for Transpacific Flights." The paper describes the operation of the equisignal radio-beacon system as developed by Dayton laboratories during the past few years and relates the many applications of the system to the transpacific flights of Lieutenants Hegenberger and Maitland, Messrs. Smith and Bronte, and of the Dole fliers. The paper deals with both the historical and the technical features of the radio beacons and their application to the flights.

G. Breit, M. A. Tuve and O. Dahl, of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, contribute a paper entitled "Effective Heights of the Kennelly-Heaviside Layer in December, 1927, and January, 1928." It is shown, with improved conditions of measurment, that the heights of successive reflections of radio waves from the "ceiling" are approximately in the ratios 1, 2, 4.

Licensing Principles

Captain S. C. Hooper, U.S.N., Director of Naval Communications, Navy Department, gives a paper entitled "Considerations Affecting the Licensing of High-Frequency Stations," in which he explains the principles followed in assigning high radio frequency channels for experimental and traffic purposes. He tells what channels are available for various classes of service and in what portion of the spectrum they are located. He also gives rules observed regarding the question of priority among applicants for channels in the most important fixed service bands.

Dr. L. W. Austin, Bureau of Standards, contributes a paper on "Long Wave Radio Receiving Measurements at the Bureau of Standards in 1927." The data included in the paper have been taken on many foreign and American trans-continental long-wave stations. Annual average signal for a number of these stations is given in the form of graphs, as well as curves, showing the seasonal variations of the signals from these stations.

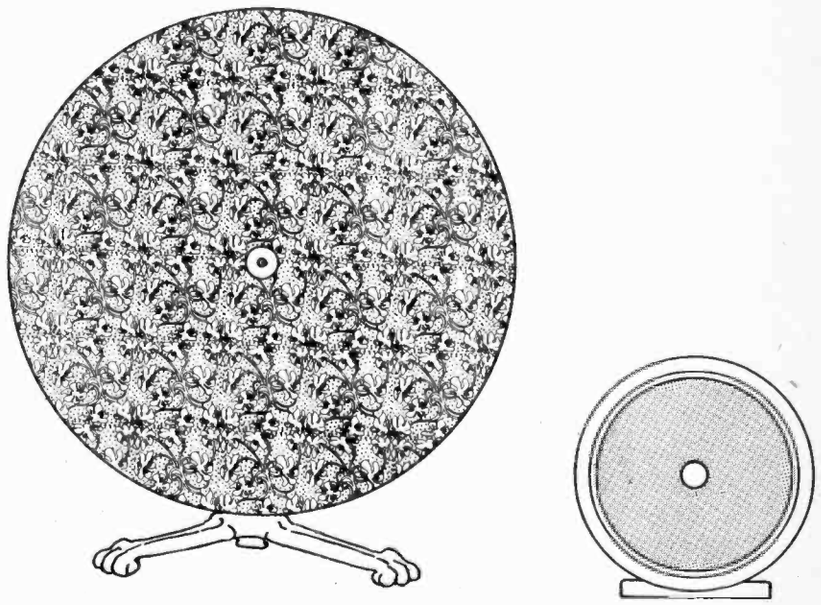
One om the most interesting chapters is a review by Stuart Ballantine of directive antennas for short waves.

The Dyna

Why Low Notes Come Through

By James

Contributing Editor, Assoc



THIS ILLUSTRATES THE RELATIVE SIZES OF MAGNETIC AND DYNAMIC SPEAKERS. THE MAGNETIC SPEAKER AT LEFT HAS A LARGE PISTON AND THE DYNAMIC AT RIGHT A SMALL ONE, YET THE LOW NOTE EFFECTIVENESS OF THE DYNAMIC IS GREATER THAN THAT OF THE MAGNETIC. THE ACCOMPANYING ARTICLE EXPLAINS WHY.

FOR a long time it has been held in radio that a necessary condition for the reproduction of low notes is that the sounding surface must be very large. This idea has been responsible for the enormous cones, linen diaphragms and horns.

And now dynamic speakers are used for high quality receivers because they are especially good on the reproduction of low notes. Yet these speakers are relatively small. The cone used as the sounding surface rarely exceeds nine inches in diameter. And the dynamic speakers boom out the low notes at least as well as, nearly always better than, the enormous cones formerly used.

Where lies the discrepancy?

Is a large sounding surface not a necessary condition for low note reproduction? Is the theory of the long exponential horns and large bell openings all wrong?

No, the theory is not wrong. The large sounding surface is a necessary condition in certain cases. The long exponential horn with the large opening is correct in principle, and the large dimensions are necessary under certain circumstances.

Two Methods

But there are two ways of achieving the same result. The small cone and the dynamic speaker can be made to radiate low frequency sounds as well as, or better than, the magnetic speaker with the large sounding surfaces. And they usually do when they are properly fed. The reason for this is to be found in the nature of sound.

Sound is a wave motion in air. Air particles move to and fro and the wave, not the air, moves away from the sounding body. The amplitude of the air wave is half the distance any one air particle moves. This has nothing to do with the wavelength or frequency of the sound. But the energy in the wave depends not only on the frequency but also on the amplitude. In fact, the energy is proportional to the square of the product of the amplitude and the frequency. The power radiated, being the rate at which energy is radiated, also is proportional to the same quantity.

At low frequencies the amplitude will have to vary much more greatly than at high frequencies, to radiate the same power. For example, let the power radiated at 1,000 cycles be unity when the amplitude is .001 inch. At 100 cycles the amplitude would have to be .01 inch and at 30 cyles it would have to be .0333 inch, if the same power is to be radiated.

This is not unlike the power of an engine, which depends on the bore and the stroke. For a given power the stroke must vary inversely with the bore, that is, the area of the piston head.

Limited Stroke

In a magnetic type speaker the stroke of the armature is limited by the pole pieces, and the amplitude of the sounding surface, and hence of the air, is limited by the movement of the armature. The air cannot be given an amplitude on the low notes enough to radiate much power, unless some means be taken to offset the effect. A large sounding surface is the solution. Just how that solves the problem will be taken up later.

What holds true of the magnetic speaker would also hold true of the dynamic if the armature were limited. But the dynamic speaker is constructed so that there is practically no limit to the movement of the arma-

mic Riddle

So Well from Small Diaphragm

I. Carroll

, Insitute of Radio Engineers

ture. In some dynamics there is an allowance of a maximum swing as much as one-fourth inch, in others only one-eighth of an inch. Few magnetic speakers allow more than 1/32 inch. An amplitude of more than 1/32 inch is often required to reproduce low notes, but rarely is an amplitude of ¼ inch required. Hence it may be truly said that when the allowance is ⅛ inch or more the armature is practically unlimited.

If a magnetic speaker could be designed so as to allow a large free swing of the armature it would reproduce the low notes as well as the dynamic, under otherwise similar conditions. But so far no magnetic unit has been devised which will allow a large swing without very greatly cutting down the efficiency and sensitivity of the unit.

Large and Small Pistons

The sounding surface is a piston which communicates the mechanical vibrations to the air. If the sounding surface is large, only a small movement is necessary to transduce a certain amount of electrical energy to acoustic energy. If the sounding surface is small a proportionately larger amplitude is necessary to transfer the energy. Since the dynamic speaker is so constructed that the small piston can be given a wide free swing it will radiate the low notes as well as, or even better, than the magnetic speaker with a larger piston.

If a stretched string be agitated violently, that is, with a large amplitude, very little sound is radiated from it. It cuts through the air without causing much disturbance. The air just flows around it. If a stretched ribbon be similarly agitated more sound will be radiated for the ribbon takes hold of more air. If the ribbon be widened out to a large sheet and this be agitated very much sound will be produced for much air will be stirred up. This holds true even if the amplitude of the vibration remains the same for the string, ribbon and membrane.

It takes more power to vibrate the membrane than the string. That is, the membrane constitutes a greater load on the driving element. Radio fans have undoubtedly observed that as soon as the set screw at the tip of cone speakers is loosened the armature runs wild and strikes the pole pieces. The load has been removed. The armature itself cannot stir up the air. There must be a piston, a large sounding surface. But even the armature alone, if it could swing widely enough, would radiate sound of some intensity.

Baffle Board and Leaky Pump

In the dynamic speaker the piston is relatively small, yet it radiates low frequency sounds effectively because of the large amplitude possible. The small piston goes out after the load. But there is considerable leakage of air around the edges of the piston, just as there is around the piston in a leaky pump. This leakage does not contribute any to the power radiation. It is for this reason that baffle boards are recommended with speakers. The air forced forward by the piston cannot flow around the edges of the baffle board as easily as around the unbaffled piston. Therefore more sound is radiated on the low notes with a baffle than without one. This helps to load up the piston and to stop the leaks.

When a baffle board is used with a dynamic speaker the armature coil does not move as far as it does without the baffle for the same sound radiation. It does not have to.

Attenuation of Sound

Another way of looking at the effect of a large piston and baffle board is to consider attenuation of sound as the distance away from the sound source is increased. If the sound disturbance occurs at a point the attenuation, that is, the decrease in amplitude, is proportional to the square of the distance. If the disturbance takes place in a large plane with equal distribution throughout the plane, the attenuation is proportional to the distance. A loudspeaker is a cross between these two extreme cases. The disturbance takes place in a contracted plane. The larger the sounding surface the more nearly will the attenuation approach the condition for an infinite plane. The baffle board around the piston increases the extent of the plane so that at a given distance in front of the speaker the sound will be more intense than it would be without the baffle board.

Of course, with a baffle board the distribution of the disturbance will not be uniform, for there is no disturbance at the baffle. But for all that the board prevents the sound from spreading out in all directions.

Effect of Horn

A horn in front of a loudspeaker unit serves the purpose of confining the air vibrations in one direction and to put a heavy load on the piston. It prevents the air from leaking around the piston. If a sound disturbance is set up in a pipe of uniform diameter there is no attenuation with distance. The sound amplitude is everywhere the same, except for friction losses. A horn in a way is a cross between a large vibrating plane and a pipe, which explains the apparent effectiveness of the horn.

In an exponential horn there is no reflection of sound at any frequency, and hence there is no accentuation of certain notes due to resonance. But to be really effective at low frequencies the horn should be at least one-half wave length long and have an opening comparable with one-fourth wave length. If an exponential horn, and that is the only suitable horn, is of the required dimensions it becomes unwieldy and cumbersome. But even if it is only half as large as it ought to be, it will greatly improve the radiation of sound, at the lower notes as well as at the higher.

Horns and Dynamics

Exponential horns are rarely used with dynamic speaker units. But there is no reason why they should not be combined. Some of the very finest speakers have been made by putting a long exponential horn in front of a dynamic driving unit.

This idea can be carried out with commercial dynamic speakers.

Brightness Is Important in Any Experimentation with Television

Certain systems of television require a point source of intense light the strength of which can be varied instantaneously. The so-called crater neon lamp has been developed for this purpose. But this lamp is not available to the general experimenter in television. The only lamp which is available to all is a neon lamp with a comparatively large luminous surface, of which the Raytheon Kino-lamp is a well-known example.

Although the luminous plate of this lamp is 1.5 x 1.5 inches and not very intense, the lamp in conjunction with a condensing lens may be used for obtaining a point source of light of the required characteristics. By placing a magnifying glass, preferably of large diameter, between the Kino-lamp and a screen, any desired size of image of the lamp may be obtained by suitably arranging the distances between the lens and the lamp and the lamp and the screen. For example, it is possible to form an image which is only 1/16 inch square.

Brightness Affected

All the light gathered up by the lens would be brought within the 1/16 inch area and the brightness of the small square image would be as many times the brightness of the original square plate as the area of the plate is greater than the area of the small image. Since the ratio of the area of the 1.5 x 1.5 inch square to that of the 1/16 x 1/16 inch square is 576, the brightness of the small square bears the same ratio to that of the large square.

Another application of such an arrangement is in recording speech and music on film. While the reddish light from a neon lamp is not very actinic, it can be used for exposing a photographic film if the light is intense enough. And the intensity can be increased by converging the light on one small spot as previously explained.

The length of the slit used in recording sounds on film is about one-tenth of an inch and width is less than .001 of an inch. A spherical lens could be used for reducing the light to about .1 x .1 inch square, and then, if necessary, a cylindrical lens could be used to reduce the light spot to an area about .002 inch wide and .1 inch long. The intensity of the small strip of light would be about 100,000 times greater than that of the original plate. Of course, the actinic power of the light is great enough to make this all intensification unnecessary.

Instantaneous Response

The process of recording is simple. The sound to be recorded is impressed on a high quality microphone and the electric impulses generated amplified by a high quality audio amplifier, preferably a resistance coupled circuit.

In the output of this circuit is placed the neon lamp, the light of which is focused on the slit as explained. The intensity of the light on the slit would follow accurately and instantaneously the sound waves impinging on the microphone. Hence the exposure of the film moving in front of the slit would be true to the sound waves. After development and printing of the film a true record would be obtained. This would be of the variable density type.

Still another application of the Kino-lamp is to stroboscopic phenomena. The apparent speed of rapidly moving machinery can be slowed down to any desired value in the forward direction, or it can be stopped, or even made to reverse. For example, a sprocket and chain which move so rapidly that only a blur can be seen with the unaided eye can be made to move very slowly so that every sequence of motion can be observed.

Electric Reproduction

SELLS PHONOGRAPH RECORDS BECAUSE TONE IS BETTER

By Herbert E. Hayden

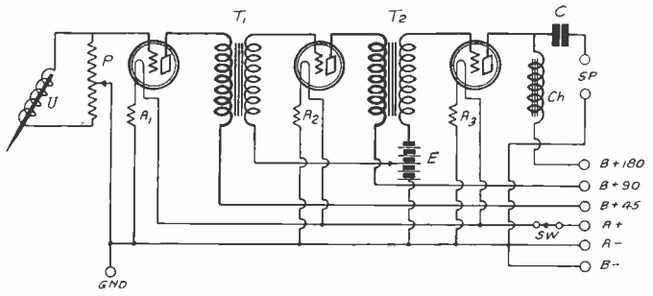


FIG. 1

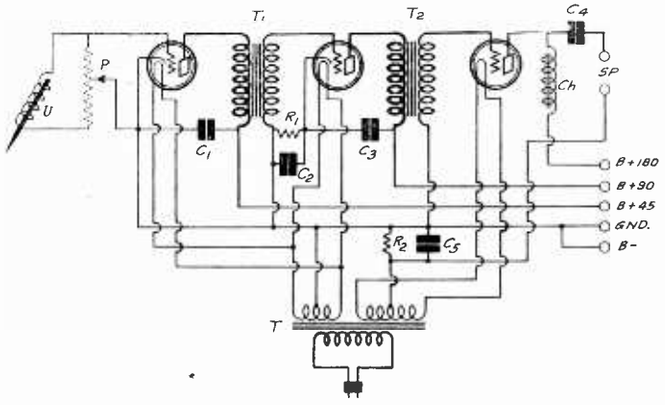


FIG. 2

THE CIRCUIT DIAGRAM OF A BATTERY OPERATED THREE-TUBE PHONOGRAPH RECORD DEMONSTRATOR (AT LEFT, FIG. 1). THE CIRCUIT DIAGRAM OF AN AC OPERATED THREE-TUBE PHONOGRAPH RECORD DEMONSTRATOR IS AT RIGHT.

THERE are two ways of demonstrating phonograph records to prospective customers. One is the old mechanical way, the other is the new electrical way.

The number of persons who play their records electrically is constantly increasing. The reason for this is that more people have radio sets than phonographs, and they have come to like the sound of a loudspeaker better than the sound of a mechanically played phonograph. They want the same quality from their records as from their loudspeakers.

When the converts to electrical phonograph reproduction go to buy new records they want them demonstrated electrically. A small percentage of stores selling phonograph records are as yet equipped with the apparatus for doing this properly, if at all. For this reason they lose many sales.

If these stores were properly equipped for playing both electrically and mechanically they could materially increase their business by selling the electrical pick-up units as well as parts for the audio amplifier with which to amplify the pick-up signals, for they would convert many customers to the superiority of the electrical method.

Audio Amplifier Required

The necessary equipment for playing records electrically is a suitable turntable and motor, a magnetic pick-up unit, a high quality audio amplifier and a good loudspeaker.

The turntable and motor may be the same as that used in the mechanical reproducer, for all that is required is that the record be turned at a constant rate at 79 revolutions per minute and that the table does not wobble. An electrically driven turntable is preferable to a spring driven only because it obviates the necessity of winding up the spring.

The loudspeaker may be any good cone or exponential horn, driven by either a good magnetic or dynamic speaker unit. The choice of speaker is based on the same principles as the choice of speaker for a radio receiver. The choice of amplifier is the subject of this article.

Amplifier for DC Current

Some stores are located in districts served by direct current and others in districts served by alternating current. Others have no electricity. The amplifier used must be designed for the current that is available.

The most suitable amplifier for the purpose of a record demonstrator is a three-tube transformer coupled circuit. This is not because this type of circuit is superior in quality to certain other types of amplifier, but because it gives the least trouble and requires least attention. The quality of its output will be first-class, provided that proper voltages and good quality transformers are used.

There is no dearth of good audio transformers now.

Low Ratio Transformers

Fig. 1 shows a circuit diagram of a record demonstrator for battery operation. U is a magnetic pick-up unit. P is a 25.000 ohm potentiometer by means of which the volume is adjusted. In addition to furnishing an effective volume control this potentiometer also removes much of the needle scratch and similar sounds often noticed when an inductance is connected across the grid without any resistance across it. In this it will not be effective unless the resistance element is wire-round. Such potentiometers of 25,000 ohms can be purchased.

The two audio transformers T1 and T2 should be of the best quality and they should be of moderately high ratio, say 1-to-2 or 1-to-3. Such transformers are usually better on the low note response than transformers of higher ratio. The reduction in the amplification due to the low ratio is of no consequence, for the three tubes take care of the gain.

The total amplification will be about 300 times. This with an average pick-up unit will more than overload the last tube, even when a soft needle is used. By means of P the volume of output can be adjusted from zero to full maximum, and overload be prevented.

The tubes used in the circuit are assumed to be two -01A and one -71A. No. 1A amperites are used for filament control.

The filament voltage is supplied by a 6-volt storage battery.

A different plate voltage is used for each tube. Only 45 volts need be used on the first tube, for the signal level will be low in that tube. But 90 volts should

(*Continued on next page*)

LIST OF PARTS

For DC Record Demonstrator

U—One magnetic pick-up unit (Pacent Phonovox).
P—One 25.000 ohm wire wound potentiometer (Carter).
T1, T2—Two audio frequency transformers.
Ch—One 30 henry choke coil.
C—One Tobe 4 mfd. condenser, 400 volt test.
A1, A2, A3—Three 1A amperites.
Sw—One filament switch
Three sockets.
Nine binding posts.
One 7x8 wooden baseboard.

LIST OF PARTS

For AC Record Demonstrator

U—One magnetic pick-up (Pacent Phonovox).
P—One 25,000 ohm wire wound potentiometer (Carter).
T1, T2—Two audio transformers (Pacent Superaudioformers).
T—One filament transformer with one 2.5 volt and one 5 volt windings.
Ch—One 30 henry output choke.
C1, C2, C3—Three Tobe 1 mfd. 200 volt condensers.
C4—One Tobe 4 mfd. 400 volt condenser.
C5—One Tobe 4 mfd. 250 volt condenser.
R1—One 1,200 ohm resistor.
R2—One 2,000 ohm resistor to carry more than 20 milliamperes.
Seven binding posts.
Two Y type tube sockets.
One X type tube socket.
One 7x10-inch wooden baseboard.
One B battery eliminator with 45, 90 and 180 volt taps.

The Wasp Short Wave

By M. B. Sleeper

[*Part I of this article on the Wasp, a 4-tube short wave receiver, was published last week, issue of October 13th. Part II, the conclusion, follows.*]

IN wiring up the Pilot Wasp short wave receiver there is one thing that should receive careful attention, and that is the connections to the coil socket. An error may prove costly if not discovered before the coil is inserted and before the power is turned on. Or it may simply result in no signals. Only lack of care in wiring can result in an error, for the directions are specific. Attention is called to the subject only because several careless builders have made the mistake.

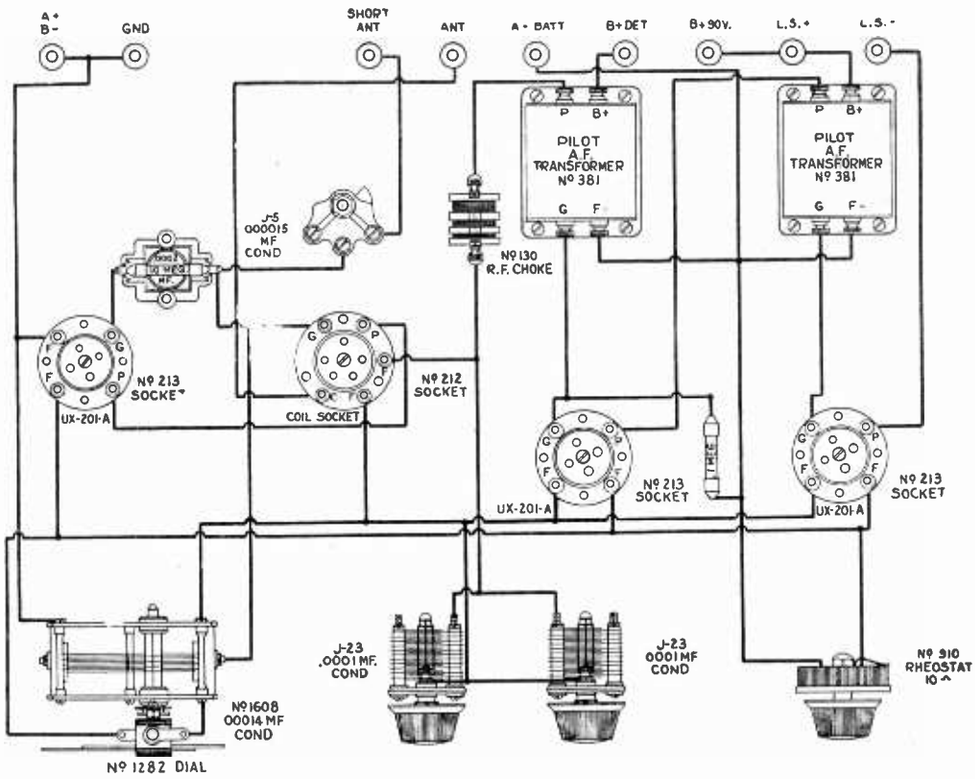
The outline of the coil socket is published with the circuit diagram. The terminals are marked G. P. F1, F2 and C. There are similar markings on the circuit diagram. The drawing shows that P on the coil socket should be connected to the P terminal on the tube socket, that F1 on the coil socket should be connected to one side of the RF choke and to the stator of the tickler condenser, that C on the coil socket should go to the "Ant" post, that F2 on the coil socket should go to the positive side of the A battery, or to ground, that the G post on the coil socket should go to the stator of the tuning condenser and to one side of the grid leak and condenser and to the stator of the antenna series condenser.

These directions are so explicit there there should be no chance of a mistake.

Finger Rings Important

There are funny little colored rings at the top of the Pilot Wasp coils. They are small things, but they serve several important purposes. First they serve to distinguish one coil from the other. There is one color for each wave length range. They also serve as handles for inserting and removing the coils from the socket. The value of this feature only those who have used coils without handles can appreciate fully. The coils can be handled without any danger of breaking them, without displacing the wires and without changing the inductance values. Calibration charts of the coils thus have a real meaning.

The five coils in the Wasp set covers the entire range from 17 to 500 meters, with appropriate overlapping of adjacent ranges to insure against any gaps. Thus no matter what station which is desired in this wide range, it can be had by tuning for it, provided that its signals are strong enough and also provided that the station is transmitting. More stations can be expected from each of the three middle coils than the two extremes.



PICTURE WIRING DIAGRAM OF THE WASP SHORT WAVE RECEIVER.

Double Regeneration Control

It will be observed that there are two knobs on the panel marked "Regeneration." Many have wondered why there are two when there is only one tube in which regeneration can occur. The advantage of two will become apparent when close tuning is done on the short waves. When only one tickler condenser is used it must be large in order to cause regeneration at all wave lengths. But when it is large it is difficult to manage at critical places, unless an extremely slow motion dial is used. But such a dial is tedious to operate.

A very simple solution of this problem is to use two midget condensers in parallel. One can be used for rough adjustment and the other for vernier effect. And such an arrangement works out very well.

Bias Factors in Phonograph Amplifiers

(*Continued from preceding page*)

be used on the second tube and 180 volts on the third. All these voltages should be supplied with batteries.

The bias on the first tube is derived from the drop in A1 and most of the bias for the other tubes is obtained from a battery E. This should have a total voltage of 40.5 volts, since that is required for the last tube, and it should be tapped so that a bias of 4.5 volts may be given the middle tube.

Output Filter Needed

An output filter is needed for the demonstrator. This should consist of a 30 henry choke coil Ch and a 4 mfd. condenser C. Note that the loudspeaker is connected between the 4 mfd. condenser and the filament rather than from the condenser to plus 180, as is often done. The connection shown gives the better results.

Although there is no radio frequency involved in the demonstrator it is well to provide a good ground connection for the circuit. It steadies the circuit and prevents howling.

The record demonstrator circuit for AC supply is essentially the same as that for DC supply, but it looks very much different on Fig. 2, which is the diagram of the circuit. U. P, T1, T2, Ch and C4 are the same as the corresponding components of the DC circuit. C1, C2 and C3, each of which is a 1 mfd. condenser, are used to aid in filtering out the alternating current hum and to prevent feed-back through the grid bias resistors.

C5 serves the same purpose but its value should be 4 mfd. Since the voltage across the condenser will never exceed 50 volts, condensers of low voltage rating may be used.

Bias on Grids

No grid bias is provided for the first tube. None is needed, for the signal level will be low on this tube and the impedance in the grid circuit is so low that it will not limit the grid potential when the grid goes a little positive.

A bias is needed, however, on the second tube, and it is furnished by the voltage drop in R1. The value of this resistor should be 1,200 ohms. The value is not critical and the nearest commercial unit may be used. The bias on the power tube is supplied by R2, a 2,000 ohm unit capable of carrying over 20 milliamperes.

T is a filament transformer having one 2.5 volt winding capable of carrying 3.5 amperes, and one 5 volt winding which can carry one half ampere.

A "B" Supply That Al

By H. B.

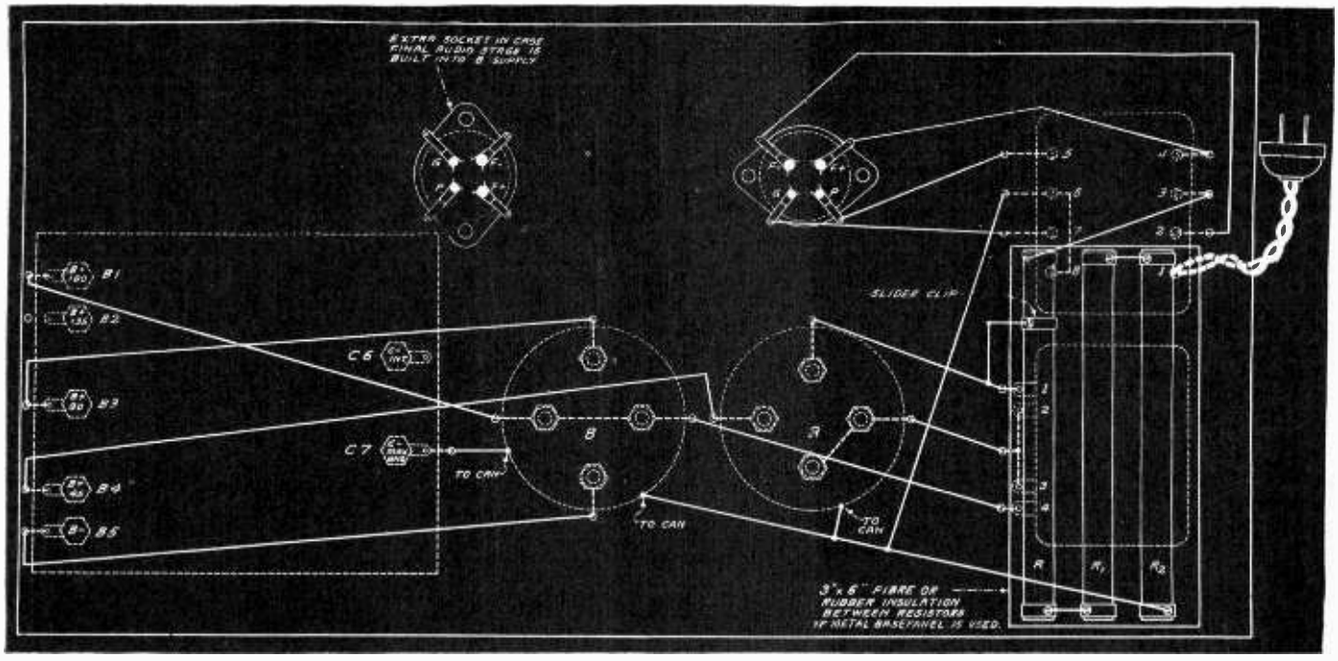


FIG. 1. PICTURE DIAGRAM OF THE EXCEPTIONAL B SUPPLY DESCRIBED IN THE TEXT.

THE possession of a B Supply that affords adequate excess power, so that the field of a dynamic speaker may be energized, and still leave plenty of voltage and current for the receiver, is a distinct advantage.

The 180-volt factory-made B eliminators will not do this, nor will they provide the biasing votage, since this is additional. In other words, if 180 plate volts are desired, and sufficient bias for a 171 or 171A power tube, the total voltage would have to be the sum of the two, or 220 volts, even though the B Supply is normally rated at 180 volts.

Only the maximum plate voltage is considered in the rating, and you must inquire whether the biasing voltage is there, too.

In the present B Supply you have the 180 plate volts, also the 40 volts maximum bias, and also an intermediate C bias, due to the versatility of the new Electrad Truvolt Divider, a resistance bank built into a bakelite case, and properly ventilated. Each of the four positive voltages is adjustable, also each of the two C biasing voltages.

Fine Filtration

The filtration is exceptionally fine in this B Supply, due to the inclusion of the Amrad Merson electrolytic condensers. These possess remarkably high capacity, and that capacity is used to best advantage in the present design, with the largest single aggregation of capacities across the line at the end of the filter system. That gives you a reservoir of capacity that shows up strongly as an assurance of low-note reproduction at high volume and with remarkable faithfulness. The low notes put a severe test upon the last condenser in the filter system.

The Mershon condensers are made up in circular copper cans, with binding posts on top. The Q9, consists of four condensers of 9 mfd. each, and the Q-2-9-2-18 consists of two condensers of 9 mfd. each and two of 18 mfd. each.

It will be seen that a Silver-Marshall 329 power transformer, with 5 volt filament winding, is used. The transformer has a center-tapped 440 volt secondary. As full-wave rectification, with a 280 tube, is used, the voltage is one-half, or the necessary 220.

It has become almost standard practice to include a resistor network directly across the output of the rectifying tube in B Supplies of the better sort. This serves a double purpose—it tends to safeguard the filter condensers, preventing blowouts, because some voltage is dropped in these resistors, and also it improves regulation, making the output voltages less sensitive to line voltage fluctuations. The Mershons, however, are self-healing in the event of puncture, and are rated at 400 volts DC. Particularly are the resistors. R, R1 and R2 in Fig. 3, advantageous if a 280 tube is to be used with a power transformer with 600 volts across the secondary, that is 300 across each half, as is true of the Silver-Marshall 330.

Use of Another Transformer

The problem then arises, how can a power transformer, of higher voltage than recommended, be used with the 280 tube? The voltage of the filament winding of such a power transformer is 7½ volts, not the 5 volts (and may not be center-tapped), required by the 280 tube. The output voltage also is about 160 volts too high. It is not desired to vary the maximum voltage, once it is reduced to the desired quantity, therefore what shall be done about the variable maximum post of the Truvolt Divider?

All these problems are easy enough of solution.

The filament voltage of the filament winding, if 7½, may be reduced to 5 by putting a 1-ohm fixed resistor of 1½ ampere current carrying capacity in series with the filament posts of the rectifying tube socket. This is shown on the blueprint which will be sent complimentary to all RADIO WORLD readers who send their request to John F. Rider, care of RADIO WORLD, 145 West 45th Street, New York City. The blueprint shows the entire 280 B Supply, not only in life-sized picture diagram form, but also schematically.

Disposition of Excess

The center-tap of the 7½ volt winding is provided by using a 50-ohm fixed resistor with center-tap.

The excess 160 volts at the output may be taken up in full or in part across the voltage reducing strip, consisting of R, R1 and R2. But a voltage somewhat in excess of the orthodox may be used, nevertheless, by not dropping the full 160 volts, but, say, only 90 volts. The useful maximum would then be 250 volts. The constructor may suit himself about this. In series with the end of the filter system, that is from the No. 4 post of the 33 S-M 331 Unichoke to the B1 post of the Truvolt Divider, would go a Truvolt resistor. It should have a slider clip on it, and you simply set the slider until the voltage at the B1 post of the Divider is 180. You can then apply 180 volts to a 171 or 171A tube, and the highest voltage of 250 volts to a 210. The booklet supplied with the Divider covers this point and many other considerations very fully.

How Capacities Are Used

An extra binding post should be provided for the maximum unvariable voltage post, say 250. The rest of the binding posts are on the Truvolt Divider. And if the B Supply is built using the 329, with 220 volts across each half of the second-

The Mershon Condensers Self-Puncture and Provide Amazing Working Voltage, While the VoltagePrecision

so Energizes a Dynamic

Herman

LIST OF PARTS

One Electrad Truvolt Divider
Two Mershon Condensers, type Q-9, and type Q-2-9-2-18.
One Silver-Marshall No. 329 Power transformer.
One Silver-Marshall No. 331 Unichoke.
One Electrad 40-000 ohm fixed resistor, type D, with slider clip.
One Electrad 40,000 ohm fixed resistor, with slider clips (these two clips not used in present hookup).
One Diamond of the Air aluminum subpanel, 10x20 inches, with four sockets riveted on, and supplied with removable insulating washers.
One 280 tube.
One B plus Max. binding post (optional).
Six aluminum brackets, or two metal rings with upright support, for securing the condensers cans.

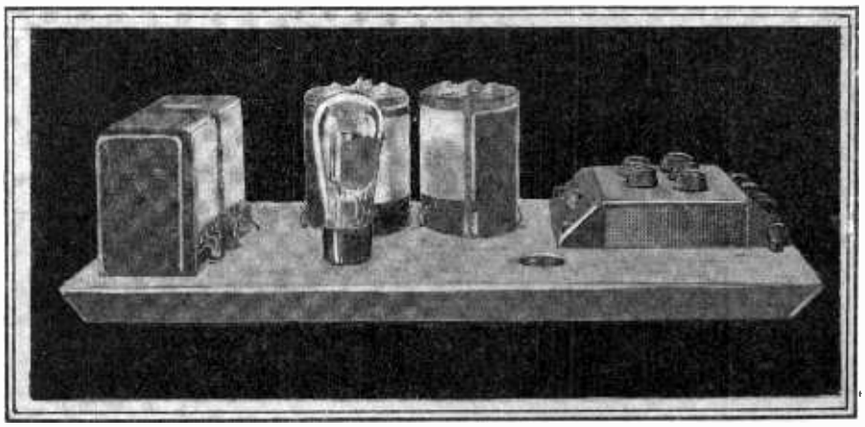


FIG. 2. SIDE VIEW OF THE B SUPPLY, WITH THE TRUVOLT DIVIDER AT RIGHT.

ary, then all the binding posts you need are on the Divider. The blueprint shows this well.

The division of the capacities is indicated in the schematic diagram. A is the Q-9 can and B is the Q-2-9-2-18 can. Hence, 9A, the first capacity at left, is on the can nearer the power transformer. Each of the four capacities in this can is 9 mfd. There is no need, therefore, to distinguish them.

The 18 mfd. across the mid-point of the SM-331 Unichoke consists of two parallel-connected 9 mfd. capacities in that same can. That leaves one 9 mfd. capacity in this can unused yet. This goes from B4 to ground and is therefore from B plus 45 to C minus 40. Of course it is understood each of these voltages is independently variable, but the highest voltage is cited for simplicity.

Healing Immediately After Any Capacities Slightly Above New Truvolt Divider Insures and Versatility

Thus is the first can taken care of completely.

The two 18 mfd. condensers of the second can are parallel-connected, giving 36 mfd., joined from the maximum voltage point to ground (maximum C minus). The higher capacity pair may be distinguished from the two 9 mfd. condensers in this can only by their greater distance from the rim of the copper can. Watch this carefully, as the visual difference is not great, although easily distinguished, once one's attention is called to it.

The two 9 mfd. capacities remain. They are connected across B minus and ground and B 3 (90 volts) and ground. B minus refers to the point where the negative A of your receiver is connected for the common voltage supply point, anything below that being for negative bias, anything above being for positive B supply to the plates of the tubes in your receiver.

The condenser cans have no mounting device. Three aluminum brackets may be used for each, being bent as shown in the diagram (Fig. 3). The cans have an indented ring near the top, and a metal ring may be bolted to this, and thus kept secure, a support running from the ring to the baseboard or metal subpanel.

In the present instance the aluminum subpanel of the Diamond of the Air was used. This has four sockets riveted on. Two of these sockets were removed, leaving one for the rectifier tube, and another one, not used yet, but intended for use whenever an extra stage of audio is to be built into the B Supply, thus making it a power pack. This extra stage of audio is quite the thing, and most fans will want to include it. If by chance they desire this extra stage to be push-pull, of course three sockets will be left on the Diamond subpanel. There is plenty of room for a push-pull stage.

If a dynamic speaker is to be energized—any type that works from a B Supply, usually at from 90 to 150 volts—this may not be done by tapping off at some output post of the Divider, because the voltage supplied to your receiver from this post then would be considerably lowered, and besides the current might become too high in the Divider. If your set is drawing about 55 mils you may simply connect the field coil of the dynamic speaker in series with the No. 4 post of the Unichoke and the B1 post of the Divider, and the field coil will then drop about 90 volts. See the specifications furnished with the dynamic speaker you buy. Other ways of connecting the dynamic speaker are shown elsewhere in this issue.

When you have completed this B Supply you will have something of extraordinary performance, dependability and steadiness, something that will enable your reception to be of a most superior sort.

[*Any reader of* RADIO WORLD *desiring a complimentary blueprint of this B Supply, affording* 180 *volts for the plates, with* 40 *volts maximum C bias and an intermediate C bias, may obtain one by addressing John F. Rider, care of* RADIO WORLD, 145 *W.* 45*th Street, New York City. Full information concerning how to reduce current and otherwise work the Truvolt Divider will be found in the comprehensive booklet supplied by Electrad, Inc., to each purchaser of a Divider.*]

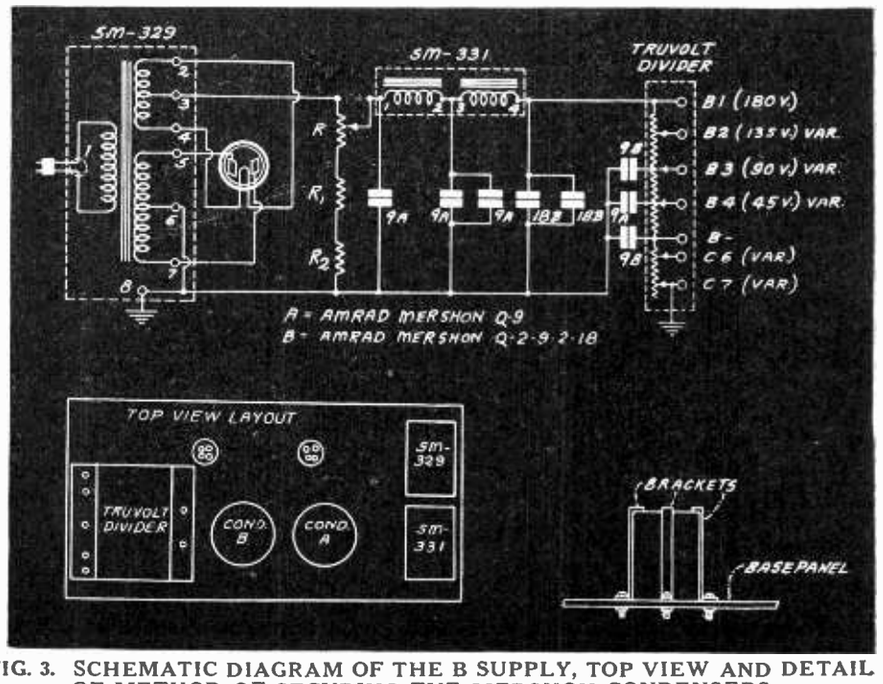


FIG. 3. SCHEMATIC DIAGRAM OF THE B SUPPLY, TOP VIEW AND DETAIL OF METHOD OF SECURING THE MERSHON CONDENSERS.

A THOUGHT FOR THE WEEK

NOW that "The Literary Digest" has sent out 19,000,000 *pieces of mail in an effort to discover before Election Day who our next President will be, let some charitably disposed person contribute* $1.80 *to a fund to defray the cost of discovering the worst voice among American broadcasters. Even one raucous voice less will help.*

RADIO WORLD

The First and Only National Radio Weekly

Radio World's Slogan: "A radio set for every home."

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⅛ Page, 4⅛" S. C.	57 lines	37.50
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1 Inch		10.00
Per Agate Line		.75

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CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum 10 words. Cash with order. Business Opportunities, 10 cents per word. $1.00 minimum.

Entered as second-class matter March 23, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

R.M.A. Hires Clarkson to Report on Television

R. P. Clarkson, radio author and regular contributor to the New York "Sun" Radio Section, has been chosen by the Radio Manufacturers' Association to write a series of articles to advise the public regarding television. Mr. Clarkson's technical and popular articles on radio and television have been appearing in prominent trade and other periodicals for years. He was engaged by H. B. Richmond, of the General Radio Company, Cambridge, Mass.

Mr. Richmond acted in his capacity as director of the R. M. A. engineering division.

Latest List of Short Wave Calls

[*These United States stations send programs*]

Call Signal	Wavelength (meters)	Frequency (Kilocycles)	Power (Watts)	Controlled by and Location
8XK	Variable	Variable	40,000	Westinghouse El. & Mfg. Co., East Pittsburgh, Pa.
4XE	Variable to 200	Variable to 1,499	250	Wm. Justice Lee, USNR
8XP	10-150	29,982 to 1,999	500	General Electric Co., Schenectady, N. Y.
2XAD	21.96	13,650	Var.	Westinghouse El. & Mfg. Co., East Pittsburgh, Pa.
2XAL	30.91	9,700	500	Experimentor Pub. Co., Coteysville, N. J.
2XAF	31.4	9,550	Var.	General Electric Co., Schenectady, N. Y.
8XAO	32	9.370	75	WJR (Inc.)
6XBR	40 and 105	7,496 and 2,855	500	Warner Bros., Los Angeles, Calif.
8XAL	52.05	5,760	500	Crosley Radio Corp., Harrison, Ohio
7XAO	53.54	5,600	100	Wilbur Jerman Inc., Portland, Ore.
2XBH	54.02	5,550	150	Charles G. Unger, Coney Island, N. Y.
8XJ	54.02	5,550	50-250	Ohio State University, Columbus, Ohio
3XL	59.96	5,000	30,000 max	R. C. A., Bound Brook, N. J.
9XU	61.06	4,910	510	Mona Motor Oil Co., Council Bluffs, Iowa
2XBA	65.18	4,600	50	WAAM (Inc.) Newark, N. J.
2XAQ	65.4	4,610	50	L. Bamberger & Co., Newark, N. J.
6XAI	66.04	4,540	50	Los Angeles Radio Club, Los Angeles, Calif.
8XF	66.04	4,540	500	Radio Air Service Corp., Cleveland, O.
6XUA	104.1	2,880	50	Times Mirror Co., Los Angeles, Calif.
6XBX	105	2,885	50	McWhinnie Electric Co., Venice, Calif.
9XAB	105	2,885	50	R. J. Rockwell, Omaha, Neb.
1XY	105, 109	2,855 and 2,751	50-250	Booth Radio Laboratories, Tilton, N. H.
7XC	105.2	2,850	5-250	Northwest Radio Service Co., Seattle, Wash.
6XAN	105.9	2,830	250	Freeman Lang, Los Angeles, Calif.
6XA	107.1	2,800	100	Los Angeles Evening Express, Los Angeles, Calif.
6XAK	108.2	2,770	50	F. Wellington Morse, Eureka, Calif.
6XBA	108.2	2,770	250	Echofone Mfg. Co., Los Angeles, Calif.
6XAL	108.2	2,770	50	L. E. Taft, Los Angeles, Calif.
6XAF	108.2	2,770	100	Clarence B. Juneau, Los Angeles, Calif.
1XAA	200	1,499	7.5	Stanley N. Read, Providence, R. I.
2XE	236.1 and 106	1,270 and 2,828	50	Atlantic Broadcast-Company, Richmond Hill, N. Y.

Molybdenum Test Told by Mine Bureau

Washington.

The determination of molybdenum in ores containing vanadium or tungsten is the subject of a publication issued by the Bureau of Mines, and made public by the Department of Commerce. The statement follows in full text:

With ores containing either vanadium or tungsten, the usual methods for determining molybdenum will yield high, erroneous results, unless special precautions are observed, according to the Bureau of Mines. It is evident that many assayers do not realize the necessity for precaution, even when they know interfering elements to be present.

In describing the quantitative determination of molybdenum, most texts present a method of limited application and either omit or append the precautions necessary to guard against certain interfering elements.

TRADIOGRAMS

THE DEFOREST RADIO COMPANY announces lower list prices for certain Audions as follows: 412-A, from $4 to $3.25; Type 426, from $3 to $2.75; Type 427, from $6.00 to $5.00; Type 471-A, $4 to $3.25; Type 480, $6 to $5; Type 481, $10 to $8.50. The list prices of other DeForest Audions are unchanged.

* * *

BURTON GREENE, vice president and general manager of the new Erla Corporation, formed recently through the merger of the Electrical Research Laboratories and the Greene-Brown Manufacturing Company, said the Erla Corporation booked a great volume of business in the new Erla Duo-Dynamic speaker recently placed on the market. The new company is about to bring out a new receiver embodying innovations. The Erla Corporation was recently licensed under R.C.A. patents.

* * *

THE Chicago-Jefferson Fuse & Electric Company of 1500 South Laflin Street, Chicago, Illinois, has just published its new catalog No. 33R-1, which illustrates and describes its entire line of radio transformers, accessories and fuses for the coming season. A copy of this catalog may be had by addressing the above company and mentioning RADIO WORLD.

* * *

EDGAR H. FELIX, technical writer, broadcasting and merchandising consultant and author of "Using Radio in Sales Promotion," has joined the staff of the National Electrical Manufacturers Association to specialize in radio problems.

* * *

FOR TELEVISION and other applications calling for photo-electric or light-sensitive cells, the Raytheon Manufacturing Company of Cambridge, Mass., now announces a comprehensive line of Raytheon Foto Cells. These cells are made in the hard-vacuum and the gas-filled types, as well as in bulb and tubular shapes.

* * *

D. E. REPLOGLE, well-known engineer, and engineering representative of the Raytheon Manufacturing Company of Cambridge, Mass., has accepted the chairmanship of the Committee on Television Standards of the Radio Manufacturers Association. The Committee plans to adopt television standards and television terms. Definite standards are to be worked on for such features as scanning disks, scanning disk speeds, neon tubes, photo-electric cells.

* * *

"THE ENGLISH MARKET for American radio set essentials and accessories is a large and increasing one," said Nat Greene, of the Polymet Manufacturing Corporation in a recent interview. Since the first of the year when he and Otto Paschkes of the corporation were in Europe, the amount of merchandise shipped to England has increased each month.

* * *

A PRACTICAL folder on the control of the scanning disk and the kino-lamp or neon glow tube by a clarostat speed control will be sent to any one addressing the Clarostat Mfg. Co., Inc., 285-7 North Sixth St., Brooklyn, N. Y., and mentioning RADIO WORLD.

* * *

THE NEW Pilot double and triple gang condensers are announced. They may be mounted on either front or subpanels, or both, providing additional rigidity. Full details are obtainable from Pilot Electric Mfg. Co., 323 Berry Street, Brooklyn, N. Y. Mention RADIO WORLD.

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 .....

F. S. Brion, 516 West Carson St., Pocatello, Idaho.
Louis N. Printz, Waynesville, Ohio.
Harry G. Becker, 1626 Rascher Ave., Chicago, Ill.
H. A. Dahline, 203 So. Indiana Ave., Auburn, Ind.
F. L. Pilgrim, Dept. of Public Works, Ottawa, Canada.
R. O. Murray, c/o C. E. Murray, Dechard, Tenn.
Edward L. Kane, Crosstown Station, Memphis. Tenn.
T. L. Brady, Claude, Texas.
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Geo. Walsh, 821 Summer St., Bakersfield, Calif.
E. W. Matthews, c/o Riverside Mills, Augusta, Ga.
Ed. Freeman, New Harmony, Ind.
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R. D. McKenzie, 515 A, Congress St., Portland, Maine.
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Earl Beach, Nacodoches, Texas.
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Geo. Gueraud, 1351 Springfield Ave., Irvington, N. J.
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Louis Sutro, 575 Westminster Ave., Elizabeth, N. J.
Willie E. Hunter, Magazine Agt., Radio Elec. Supplies, Prosperity, S. C.
Jacob A. Distel, 1627 Macomber St., Toledo, Ohio.
J. E. Seaborn, 12431 Chesterfield Ave., Cleveland, Ohio.
Francis G. Hofstaedter, 2147 N. Second St., Philadelphia, Pa.
Carl Schindler, 590 49th Ave., West Allis, Wis.
L. T. Auber, 58 Concord St., Waterbury, Conn.
Harold B. Dorman, 2684 North Ave., Bridgeport, Conn.
J. Watson, 191 W. 102nd St., New York City.
Arno Wold, Opportunity, Wash.
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A. B. Rice, Tekamah, Neb.
A. B. Gardner, 511 Green St., Dowagiac, Mich.
Lani Kamiki, Box 1226, Raleigh, N. C.
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A. C. Morley, 1917 Walton Ave., New York City.
Jos. L. Winter, 1st & Prospect St., Keyport, N. J.
V. E. Trent, 2640 E. 9th St., Kansas City, Mo.
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Wade Baker. R. No. 8, Box 635, Toledo, Ohio.
F. M. Pelone, 111 Arsenal St., Watertown, N. Y.
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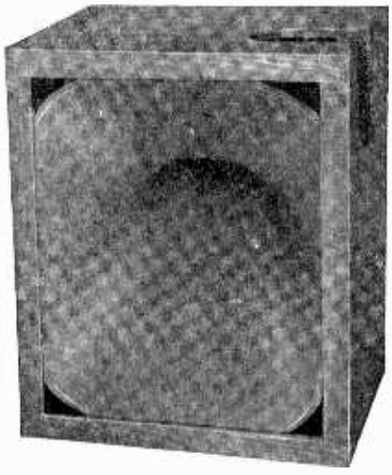
WOODEN HORN LOUD SPEAKERS GIVE BEST TONE!



8-FOOT TONE TRAVEL!

Real MUSICAL Instruments are made of wood—Violin. Piano, Cello, etc. Wood is the Unsurpassed Vehicle of Sound. Wood ground to a pulp, pressed under thousands of pounds pressure, and moulded into an 8-foot long Tone Travel, gives you the very finest results! The Horn is wound around to Economize Space. All Notes come through Splendidly. Human Voice Incredibly Natural. In an Orchestra you can pick out each instrument. Unit ($4.20 extra) fits in top, right.

Cat. No. 595; 21¼" high, 18" wide, 15" deep; mounted in baffle board **$10.80**

Get No. 595—but if you can't spare the space, use Cat. No. 570 (6-foot tone travel; in baffle; 15" x 12" x 12") $7.80

NEW HORN MOTOR!

Horn Motor, Cat. No. 112. Price $4.20.

A splendid unit for horn loudspeakers. Stands 250 volts without need of filtered output. Enormous volume. Won't rattle. Excellent frequency response throughout audible range. Fits any standard nozzle, including our No. 595 and 570.

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ACOUSTICAL ENGINEERING ASSOCIATES,
143 West 45th Street, New York City.

Please ship me at once the following (check off):

☐ One No. 595 at $10.80, plus a little extra to defray shipping costs; send it already mounted in FREE baffle board.

☐ One No. 570 at $7.80, plus a little extra to defray shipping costs; send it already mounted in FREE baffle board.

☐ One No. 112 horn motor (universal nozzle) at $4.20 plus a few cents extra for shipping.

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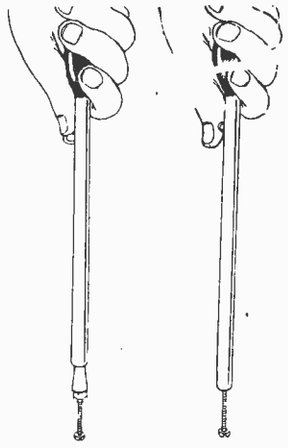
5-Day Guarantee of Money Right Back
Not only will we return your money, if you're not delighted, but we will then pay all packing charges and freight charges BOTH WAYS!

SOCKET WRENCH

FREE



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 6½" 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

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 los 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.
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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.

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Enclosed find $6.00 for which send me RADIO WORLD for twelve months (52 numbers), beginning ..... and also without additional cost, Radio News, or Science and Invention, or Radio Dealer, or Radio (San Francisco), or Boys' Life (or $10.00 for a two-year subscription to one address), thereby getting RADIO WORLD and the other selected magazine, BOTH for two years. No other premium with this offer.

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Offer Good Until
November 30, 1928

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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.

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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.

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☐ 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.

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

NEW POWERTONE UNIT
with 10 ft. cord
Designed Front Sheet
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Tri-Foot Pedestal
Instruction Sheet
ALL FOR ONLY

$6.00

Cat. No. 36

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

REMARKABLE GUARANTY!

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

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Build the speaker. If not overjoyed at results, return the built-up speaker in five days and get ALL your money back!

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BLUEPRINT FOR Bernard's Economy 3

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Bakelite Front and Aluminum Subpanel for the 4-Tube Screen Grid DIAMOND OF THE AIR - -

$5.00

Five-Day Money-Back Guaranty

Finest eye appeal results from construction of the 4-tube Screen Grid Diamond of the Air when you use the official panels. The front panel is bakelite, already drilled. The subpanel is aluminum, with sockets built-in, and is self-bracketing. Likewise it has holes drilled in it to introduce the wiring, so nearly all of it is concealed underneath set. Make your set look like a factory job.

Front panel alone, bakelite, drilled.....$2.35
Aluminum subpanel alone, drilled, with sockets built-in..... 3.00

GUARANTY RADIO GOODS CO.
145 WEST 45TH STREET NEW YORK, N. Y.

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.

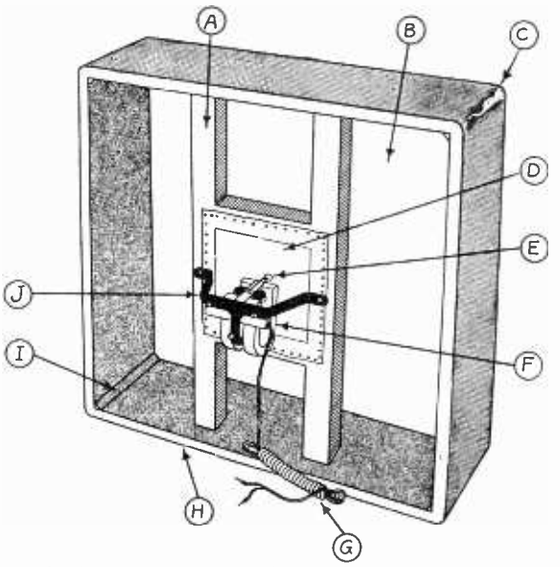
You will be overjoyed with the new 1929 model improved Powertone Unit. Order one TO-DAY!

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

Enjoy the BIG THR-RILL!

The New HBH

Irish-Linen Diaphragm Speaker



Symbolic Rear View of the New HBH Speaker

A—Upright "H" Support.
B—Front Cloth (thinnest linen).
C—Rounded Edges.
D—Rear Cloth (airplane cloth).
E—Apex.
F—Polo Unit.
G—10-Foot Cord.
H—Rigid Frame, 24x24".
I—Splice Jointed.
J—Moulded Metal Bracket.

BUILD IT IN ONE HOUR!

Enjoy the *Big Thrill!*

THE new HBH Irish-Linen Diaphragm Loudspeaker, using the new Polo Unit, is designed to produce *more volume* and handle *more power* than any other electro-magnetic type speaker!

The volume is so stupendous as to be utterly amazing. You would think you had added a couple of more audio stages, whereas all you did was to substitute the HBH Speaker for some other type.

The tone is pure throughout the audio range, and the low notes get specially favorable treatment, to equalize their final intensity with that of the higher audio frequencies.

Matching the finest unit with the finest daphragm, tightly stretched on a rigid baffle and properly "doped," produces the outstanding results.

Buy at kit. Put the Speaker together in one hour (most of this time is devoted to waiting for the successive coats of "dope" to dry.) Then listen to this speaker and *enjoy the big thrill of your radio life!*

If the results are not louder, clearer, better than anything else you have heard in this line, using your own individual judgment, in five days return the speaker, even in its built-up condition, and we will refund your entire money, besides paying shipping charges both ways! Money right back! No delay! No questions asked!

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(Just East of Broadway).

Please ship at once C.O.D. express, at advertised price plus little extra for cartage, the following, on 5-day money-back guaranty, including refund of cartage cost:

☐Cat. A No.. ☐Cat. A No.. ☐Cat. A No..
☐Cat. A No.. ☐Cat. A No.. ☐Cat. A No..
☐If built-up speaker, ready to play, is desired add cross here.

Name .....

Address .....

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

SEND NO MONEY!

CAT. A-No. 1-DL
Price $17.50
Consists of the following complete kit:

One 24x24" erected frame, with artistic finish in mottled blue-and-brown gold edging, and four strips of moulding for front.
One upright support "H" piece, same artistic finish, with hardware.
One Polo Unit.
One 10-Foot Cord.
One Apex.
One Chuck.
One Thumbscrew.
One Nut.
One 26x26" thinnest Irish-linen diaphragm cloth.
One 8x8" airplane cloth.

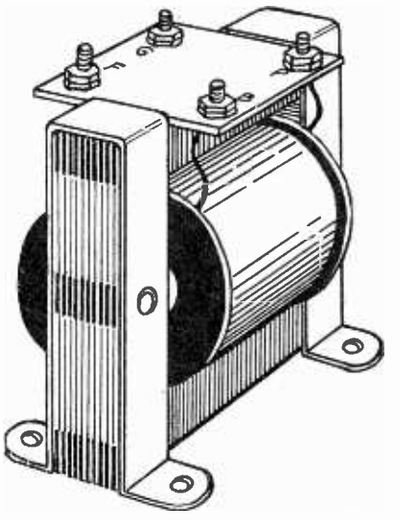
CAT. A-No. 1-DL, BUILT-UP, ready to play **$19 50**

PRICE LIST

Cat. A No. 1 DL (described above).....$17.50
Cat. A No. 1 (same as A No. 1 DL, except that frame and upright undecorated 16.00
Cat. A No. 2 (same as Cat. A No. 1, except that new Powertone Unit is supplied instead of Polo Unit)..... 12.00
Cat. A No. 2 DL (same as Cat. A No. 2, except that the de luxe finish is on frame and upright)..... 13.50
Any of above, built-up, ready to play, $2.00 extra.
Cat. A No. 3. Built-up, high-grade, round-edged wooden frame, splice-jointed not nailed; size 24x24 inches, with moulding; also H-shaped upright support, splice-jointed; also hardware for attaching upright to frame..... 3.50
Cat. A No. 4. Above with de luxe finish 5.00
Cat. A No. 5. Thinnest Irish linen for front diaphragm, 26x26 inches..... 2.00
Cat. A No. 6. Airplane cloth 8x8 inches .25
Cat. A No. 7. Polo Duo-Magnetic Unit, with factory-adjusted and sealed armature; apex, thumbscrew, chuck, nut, 10-foot cord, moulded mounting bracket..... 10.00
Cat. A No. 8. Powertone 1929 model adjustable armature unit, with apex, thumbscrew, chuck, nut, 5-foot cord, mounting bracket 3.75
Cat. A No. 9. One pint can Aerolac "dope" (good for three thin coats)..... 1.00
Cat. A No. 10. Two pint cans Aerolac "dope" (one quart for 5 good coats).... 1.75
Cat. A No. 11 Apex, chuck, thumbscrew, nut ..... .25

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.

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

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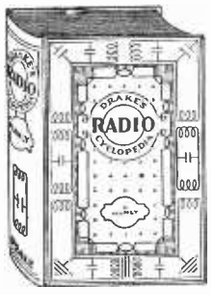

DRAKE'S RADIO CYCLOPEDIA (New Edition)

has been developed to answer the questions of service men, custom set builders and home constructors, of experimenters, students, salesmen and operators of receiving equipment and to allow all these to have instant access to the information they want. The author, Harold P. Manly, has collected and translated into plain English the material formerly obtainable only from dozens of scattered sources.

Each rule, fact, method, plan, layout and diagram is instantly picked out and separated from everything else by placing all subjects in alphabetical order with cross references for every imaginable name under which the information might be classed.

BOOK IS 2½" THICK, WEIGHS 3¾ LBS., 1,025 ILLUSTRATIONS.

This alphabetical arrangement lets the experienced worker refer directly to the one thing in which he is interested at the moment without hunting through non-essentials. The needs of the beginner are cared for.

The important articles deal primarily with receivers and reception. They do not stop with the electrical end, but go also into the mechanics of construction. Every new thing in radio is covered in detail.

1,680 Alphabetical Headings from A-battery to Zero Beat
1025 Illustrations, Diagrams, Layouts and Graphs
920 Pages, Each 6 by 9 Inches
240 Combinations for Receiver Layouts

OF THE PRINCIPAL ARTICLES

159 concern service men, 129 help the set builder, 162 help the experimenter, 155 interest the student, 75 assist in sales work, 73 interest set owners.

Radio World: "The most suitable volume for those who want the facts stripped as far as possible of intricacies. Useful addition to any library."

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5-DAY MONEY-BACK GUARANTY!

Booklet by DeForest

Under the title of "Helpful Hints for Better Radio," Dr. Lee DeForest, "The Father of Radio," has written an analysis of broadcasting and how reception may be improved by the individual radio listener. The booklet contains 32 pages. It will be sent free to anyone requesting a copy by addressing the DeForest Radio Company, Jersey City, N. J., and mentioning RADIO WORLD.

New Jobber Sales Policy

The American Transformer Company, of 172 Emmet Street, Newark, N. J., formerly selling its line direct to dealers, C. O. D., has changed to jobber distribution and open account.

Chambers & Halligan, 549 W. Washington Blvd., Chicago, have been appointed Middle West representatives.

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Write us for our literature on Television Control. It deals with the two main problems —scanning disk speed, and kino-lamp luminosity. The former is accomplished with the new SPEED CONTROL CLAROSTAT—in a handsome metal case, amply ventilated, protected screw terminals, controls small motor from standstill to full speed, pushbutton for quick starts and momentary acceleration—all for $5.00. The latter calls for the STANDARD CLAROSTAT.

Ask your dealer for your copy of "Television Control," or write us for this and other Clarostat literature.

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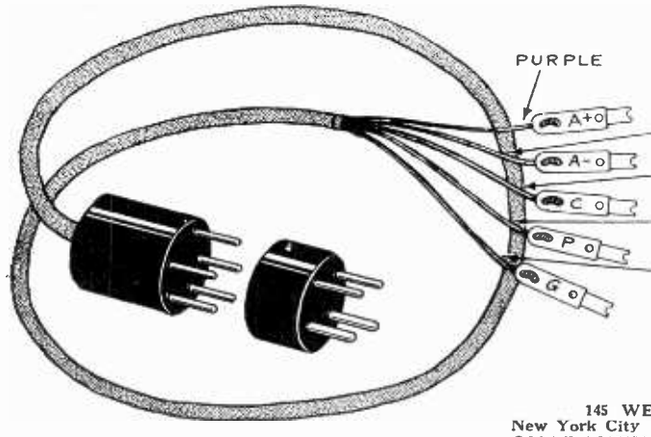
Handiest thing for ANY short-wave adapter. Put detector tube of your present set in socket of any short-wave adapter you build, put plug in detector socket of your broadcast receiver. Cable, 34". Leads identified both by color scheme and tags. 5-prong plug and 5-lead cable for AC short wave adapter. 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.



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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.

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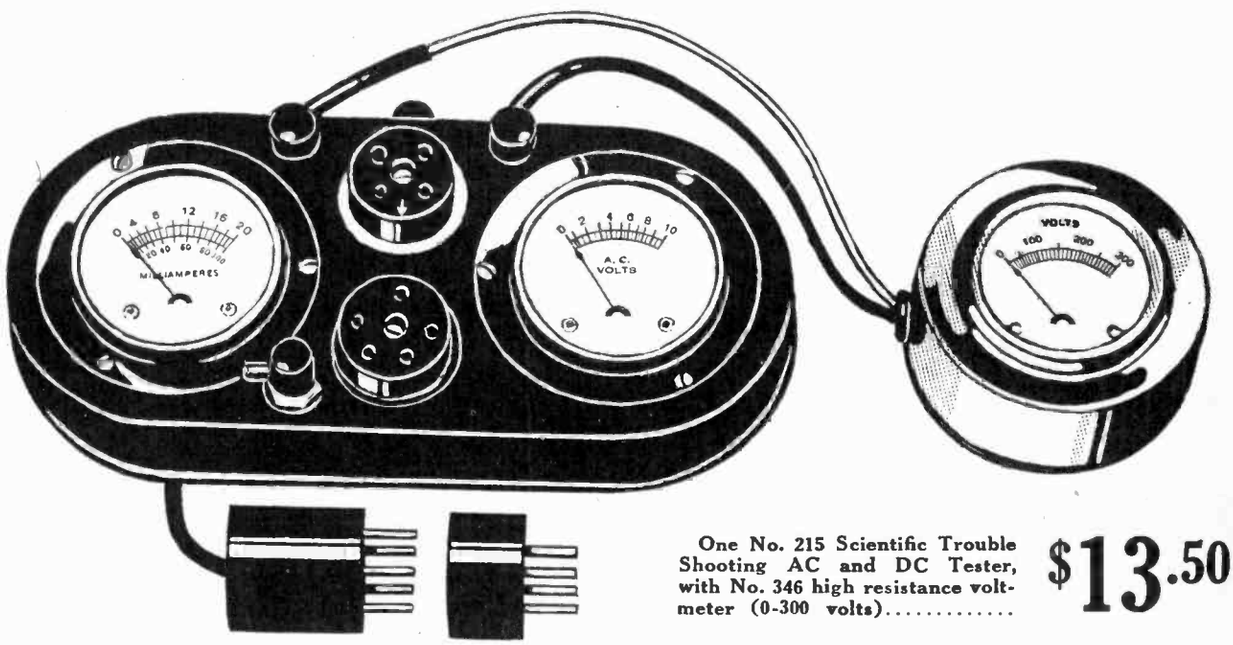
Tube Any Good?
Set Getting Proper Voltages?
Any Shorts or Open Circuits?
Universal Tester Answers 12 Questions in a Jiffy!

You are lost without meters when you shoot trouble and seek remedies. The Universal Tester is your reliable diagnostician for both AC and DC.



One No. 215 Scientific Trouble Shooting AC and DC Tester, with No. 346 high resistance voltmeter (0-300 volts)..... **$13.50**

The Scientific Trouble Shooting AC and DC Tester (at left) and high resistance meter (at right) Make Twelve Vital Tests in 4½ Minutes. The instruments are exactly TWICE the size pictured. They are handy and handsome.

Amply Accurate, Even for Service Men!

SERVICE men, going out on calls, must have a reliable test set. The Universal Tester and separate Voltmeter are reliable and versatile. The readings are accurate to 5% plus or minus, which is ample. Twice as great accuracy as this costs four to five times as much money, and isn't really necessary, except for engineering work in laboratories.

The Universal Tester and Separate Voltmeter can be used to make ALL the following twelve tests in 4½ minutes:

(1) to measure the filament voltage, up to 10 volts, of AC and DC tubes. (2) to measure the plate current of any one tube, including any power tube, from less than 1 milliampere up to 100 milliamperes; (3) to measure the total plate current of a receiver or amplifier, up to 100 milliamperes. (Hardly any set draws more.) Open common A and B of set and connect to P of tester socket and to P prong under adapter plug; (4) to measure the B voltage applied to the plate of tube; the voltage across B batteries or B eliminators, up to 300 volts (5) to determine the condition of a tube, by use of the grid bias switch. (6) to measure any tube's electronic emission (tester cuts in at no load, hence plate current equals filament emission). (7) to regulate AC line, with the aid of a power rheostat, using a 27 tube as a guide, turning rheostat until filament voltage is 2.5 or 2.25 volts. (8) to test continuity of resistors, windings of chokes, transformers and circuits generally. (9) to find shorts in bypass and other condensers, as well as in inductances, resistors and circuits generally. (10) to read grid bias voltages including those obtained through drops in resistors (bias read by noting plate current and voltage and consulting chart) (11) to determine the presence of distortion and overloading, by noting if milliammeter needle fluctuates. (12) to determine starting and stopping of oscillation, as milliammeter needle reads higher current for oscillation and lower for no oscillation.

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GUARANTY RADIO GOODS CO.,
145 West 45th Street, New York City.

☐ Please send me at once, by parcel post, on a five-day money-back guaranty, one complete Two-in-One (AC and DC) scientific trouble-shooting test set, consisting of one No. 215 and one No. 346, for which I will pay the postman $13.50, plus a few cents extra for postage.
☐ If 0-500 v. 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.

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FIVE-DAY MONEY-BACK ABSOLUTE GUARANTY!

Try out the combination tester and high resistance voltmeter. If you are a service man, custom set builder, home constructor, experimenter, teacher or student. You run no risk. These instruments are guaranteed. Money back if you're not satisfied after a five-day test.

High value and low price combine to give these instruments a field all to themselves, because they meet your needs fully in quality as well as in economy.

HERE'S WHAT YOU GET FOR ONLY $13.50:

(1) One two-in-one 0 to 10 voltmeter for AC and DC. Same meter reads both. Scale specially 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-inch cord for AC detector tubes, etc., and one 4-prong adapter for other tubes.

(5) One grid switch to change bias.

(6) One 5-prong socket.

(7) One 4-prong socket.

(8) Two binding posts.

(9) One handsome noire metal case.

(10) One instruction sheet.

[If 0-500 voltmeter No. 347 is desired instead of No. 346, price of combination is $14.50.]

No. 215 Universal AC-DC Tester Alone.....$10.00
No. 346 high resistance 0-300 voltmeter alone..... $4.50
No. 347 high resistance 0-500 voltmeter alone..... $5.50

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