

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly
Eleventh Year—528th Issue

MAY 7

1932

15¢

per copy

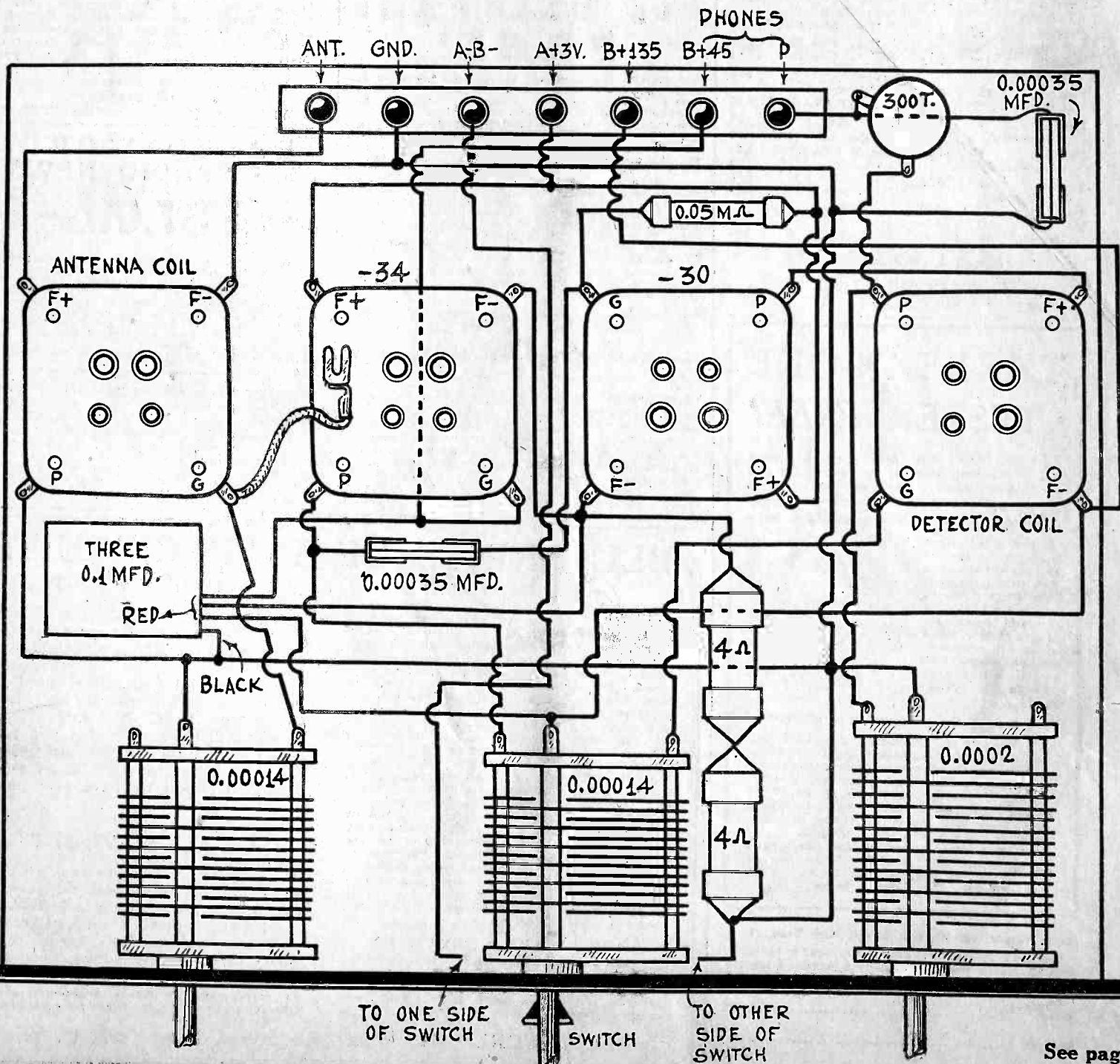
Uses for 5 New Tubes
Super-Regenerative
Experimental Circuits

8-Tube Auto Set for
Grounded A- or A+

Making an Audio Choke

How to Calibrate Oscillator

2-TUBE BATTERY-OPERATED SHORT-WAVE TUNER



See page 11.

NEW INVENTIONS WANTED

Have you or your friends a new development that can be sold into the home? If so, we'll handle all manufacturing, sales counsel, showing you BIG returns from article of commercial possibilities.

Write us at once—send Blue Prints and Patents.
JOART ENGINEERING CO., Dept. R.W.
 Engineering, Development, Research of Invention,
 Manufacturing and Sales Counsel
 501 Graybar Bldg. New York, N. Y.

MOORE SUPER-DA-LITE-R

Distance and Pure Tone Quality Unequaled
BLUE PRINTS, \$1.00
 Custom Built Sets or Kits
 Demonstrations every Monday from 8 P.M.
 Supers adjusted and lined up
MOORE RADIO CO.
 74 CORTLANDT ST. NEW YORK CITY
 Phone: Barclay 7-0015

Dynamic Speaker Replacements

We can supply cone and voice coil replacement assemblies for dynamic speakers, as listed below, at stated prices. Besides, we can supply replacement cone and voice coil assemblies for non-listed speakers, prices furnished on request, if you will supply the following information: inside diameter of voice coil, extreme diameter of cone, including floating ring, depth of cone.

Make of Speaker	Size	Price	Make of Speaker	Size	Price
Peerless (1-turn)	7"	\$1.60	Victor (RE 32, RE 45)		\$1.35
Peerless (1-turn)	9"	1.95	R.C.A. (No. 106)		1.95
Peerless (1-turn)	11"	2.10	R.C.A. (No. 105)		1.95
Peerless (1-turn)	15"	2.85	R.C.A. (No. 104)		1.95
Peerless (1-turn)	7"	1.45	Jensen (D7 concert)		2.25
Peerless (wire-wound)	9"	1.65	Colonial (No. 33)		2.25
Peerless (wire-wound)	11"	2.25	Symington 9"		1.90
Peerless (wire-wound)	15"	2.75	Symington 11"		2.25
Farrand (Induct. Dynam.)	7"	2.25	Zenith (No. 52)		2.25
Farrand (Induct. Dynam.)	11"	1.35	Eveready 9"		1.90
			Eveready 11"		2.25
			Newcomb 7"		2.25
			Hawley		
			Magnavox 7"		2.25
			Sterling 7"		2.25

DIRECT RADIO CO.

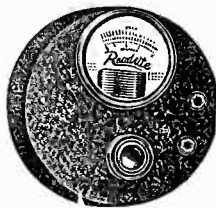
145 WEST 45th STREET
 NEW YORK, N. Y.

THREE-IN-ONE TESTER FREE!

EVERYBODY who does any radio work whatsoever, whether for fun or for pay or for both, needs a continuity tester, so he can discover opens or shorts when testing.

A mere continuity tester is all right, but—

Often it is desired to determine the resistance value of a unit, to determine if it is correct, or to measure a low voltage, and then a continuity tester that is also a direct-reading ohmmeter and a DC voltmeter comes in triply handy.



So here is the combination of all three:

A 0-4½-volt DC voltmeter, a 0-10,000-ohm ohmmeter and a continuity tester. A rheostat is built in for correct zero resistance adjustment or maximum voltage adjustment. The unit contains a three-cell flashlight battery. Supplied with two 5-foot-long wire leads with tip plugs. Case is 4-inch diameter baked enamel. Weight, 1 lb. Sent you with an order for one year's subscription for RADIO WORLD (52 weeks) at the regular rate of \$6. Order Cat. PR-500. Use Coupon below.

Radio World, 145 W. 45th Street, New York, N. Y.

Enclosed please find \$6 for one year's subscription for Radio World (one copy a week, 52 issues). Send Cat. PR-500 as premium.

Name

Address

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

AT LAST!

Automatic control at low cost! New clock switch automatically turns Radios or electrical appliances on or off at any desired time. Only \$1.00, postpaid. "BROWNIE," 415 Union, Traverse City, Mich.

BUILD A SET FOR SHORT WAVES ON EARPHONES (Battery Operated)

- COILS**
 One set of plug-in coils, four pairs, total eight coils \$3.00
 One 300-turn honeycomb coil..... 30
- CONDENSERS**
 Two 0.00014 mfd. junior midline tuning condensers (both)..... 2.40
 One 0.0002 mfd. junior midline tuning condenser..... 1.35
 Two 0.00035 mfd. fixed condensers (both)..... 30
 One shielded block containing three 0.1 mfd. condensers (black, common, to a minus; reds interchangeable)..... 57
- RESISTORS**
 One 0.05 meg. pigtail resistor (50,000 ohms)..... 15
 Two 4-ohm filament resistors in series, to constitute 8 ohms (both)..... 20
- OTHER REQUIREMENTS**
 One 9 x 7½ inch wooden baseboard..... 25
 Four UX sockets (two for tubes, two for coil receptacles)..... 40
 One 7 x 10 inch bakelite drilled front panel..... 1.25
 Two knobs, one for r-f condenser, other for feedback condenser (both)..... 10
 One vernier dial..... 50
 One push-pull A battery switch..... 20
 One binding post strip with eight posts on it..... 25
 One—34 tube and one—30 tube (both)..... 2.61
 One pair of earphones..... 1.20

GUARANTY RADIO GOODS CO.

145 West 45th Street New York City

115 DIAGRAMS FREE!

115 Circuit Diagrams of Commercial Receivers and Power Supplies supplementing the diagrams in John F. Rider's "Trouble Shooter's Manual." These schematic diagrams of factory-made receivers, giving the manufacturer's name and model number on each diagram, include the MOST IMPORTANT SCREEN GRID RECEIVERS.

The 115 diagrams, each in black and white, on sheets 8½ x 11 inches, punched with three standard holes for loose-leaf binding, constitute a supplement that must be obtained by all possessors of "Trouble Shooter's Manual," to make the manual complete. We guarantee no duplication of the diagrams that appear in the "Manual." Circuits include Bosch 54 D. C. screen grid; Bakelite Model F, Crosley 20, 21, 22 screen grid; Eveready series 50 screen grid; Wris 234 A. C. screen grid; Peerless Electrostatic series; Philco 76 screen grid.

Subscribe for Radio World for 8 months at the regular subscription rate of \$1.50, and have these diagrams delivered to you FREE!

Present subscribers may take advantage of this offer. Please put a cross here to expedite extending your expiration date.

Radio World, 145 West 45th St., New York, N. Y.

"DYKE'S AUTOMOBILE AND GASOLINE ENGINE ENCYCLOPEDIA," by A. L. Dyke. New 16th Edition, covering all the latest developments. A complete training in every part of automotive work, and for easy study is divided into a series of 85 simple instructions. 1,339 pages, 4,400 illustrations and diagrams. 6½ x 9¼. Cloth, \$6.00, Flexible, \$7.50. Radio World, 145 W. 45th St., New York City.

BLUEPRINTS OF STAR CIRCUITS

8-TUBE AUTO SET

Sensitivity of 10 microvolts per meter characterizes the 8-tube auto receiver designed by J. E. Anderson, technical editor of Radio World, and therefore stations come in with only six feet of wire for aerial, and without ground. Most cars will afford greater aerial pickup, and besides the car chassis will be used as ground, so with this receiver you will get results. The blueprint for construction of this set covers all details, including directions for cars with negative A or positive A grounded. The circuit features are: (1) high sensitivity; (2), tunes through powerful locals and gets DX stations, 10 kc either side; (3), latest tubes, two 239 pentode r-f, two 236 screen grid, two 237 and two 238; push-pull pentodes, all of 6-volt automotive series; (4), remote tuning and volume control on steering post, plus automatic volume control due to low screen voltage on first detector; (5), running board aerial. The best car set we've published. This circuit was selected as the most highly prized after tests made on several and is an outstanding design by a recognized authority. Send for Blueprint 631, @.....50c

SHORT-WAVE CONVERTER

If you want to build a short-wave converter that costs only a very few dollars, yet gives good results, furnishing all its own power from 110 volts a-c, and uses no plug-in coils, you can do so from Blueprint 630. Price.....25c

5-TUBE AC, T-R-F

Five-tube a-c receivers, using variable mu r-f, power detector, pentode output and 280 rectifier, are not all alike by any means. Forty circuits were carefully tested and one selected as far superior to the others. This prized circuit was the 627, and if you built it, you will always be glad you followed our authentic Blueprint, No. 627. This is the best 5-tube a-c t-r-f broadcast circuit we have ever published. Price.....25c

A-C ALL-WAVE SET

An all-wave set is admittedly what many persons want, and we have a circuit that gives excellent broadcast results, and is pretty good (not great) on short waves. No plug-in coils used. Cost of parts is low. Send for Blueprint, No. 628-B, @.....25c. In preparation, an 8-tube broadcast super-heterodyne for 110v d-c. Write for particulars.

RADIO WORLD, 145 West 45th Street, New York, N. Y.

Brunswick

Radio Factory Service

Brunswick Radio Corporation's only authorized Service and Replacement Parts Bureau.

Write for Free Parts List

United Radio Service Co.

619 West 54th St., New York, N. Y.

1,000 PAGES! 2,000 DIAGRAMS! IN RIDER'S NEW 7-POUND MANUAL

JOHN F. RIDER'S PERPETUAL TROUBLE SHOOTER'S MANUAL is the book you need if you want to do profitable servicing.

This loose leaf volume contains every bit of radio service information of all popular commercial broadcast receivers manufactured since 1920 and includes the latest diagrams. In addition to the wiring diagrams of the receivers the Manual contains chassis layouts, color coding, electrical values, chassis wiring diagrams, and the wiring of units sealed in cans. It also contains a course in Trouble Shooting, the use of set analyzers, data upon Superheterodynes, automatic volume control, etc. Page size is 8½x11, bound, 1,000 pages, index and advertisements on additional pages. Order CAT. RM-31 and remit \$4.50. We will then pay postage in the United States. Shipping weight 8 pounds. Ten day money back guarantee.

RADIO WORLD

145 WEST 45th ST NEW YORK CITY

RADIO WORLD and "RADIO NEWS"

BOTH FOR ONE YEAR

\$7.00

Canadian and Foreign \$8.50

You can obtain the two leading radio technical magazines that cater to experimenters, service men and students, the first and only national radio weekly and the leading monthly for one year each, at a saving of \$1.50. The regular mail subscription rate for Radio World for one year, a new and fascinating copy each week for 52 weeks is \$6.00. Send us \$1.00 extra, get "Radio News" also for a year—a new issue each month for twelve months. Total, 64 issues for \$7.00. RADIO WORLD, 145 West 45th Street, New York, N. Y.

"THE RADIO MANUAL," by G. E. Sterling. Edited by S. Kruse, E.E. Second edition. A clear, logical presentation requiring no previous knowledge of higher mathematics or electrical engineering. An authoritative account of license requirements written by a Government Examining Officer. 805 pages. Flexible Fabrikoid, 5½ x 8, illustrated. \$6.00. Radio World, 145 W. 45th St., New York City.

ROLAND BURKE HENNESSY
Editor

HERMAN BERNARD
Managing Editor

RADIO WORLD

The First and Only National Radio Weekly
ELEVENTH YEAR

J. E. ANDERSON
Technical Editor

J. MURRAY BARRON
Advertising Manager

Vol. XXI

MAY 7th, 1932

No. 8. Whole No. 528

Published weekly by Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y.

Editorial and Executive Offices: 143 West 45th Street, New York

Telephones: BR-yant 9-0558, 9-0559.

OFFICERS: Roland Burke Hennessy, President and Treasurer; M. B. Hennessy, Vice-President; Herman Bernard, Secretary.

Entered as second-class matter March, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. Title registered in U. S. Patent Office. Printed in the United States of America. We do not assume any responsibility for unsolicited manuscripts, photographs, drawings, etc., although we are careful with them.

Price, 15c per Copy; \$6.00 per Year by mail. \$1.00 extra per year in foreign countries. Subscribers' change of address becomes effective two weeks after receipt of notice.

Uses for the New Tubes

Excellent Opportunities—Circuit Requirements

By J. E. Anderson

A VAST FIELD for experimenting and development of new radio sets and devices has been opened up by the introduction of a new series of tubes.

The new tubes have the type numbers 46, 56, 57, 58, and 82. The fact that extra grids have been brought out to external terminals on some of these tubes makes them particularly suitable for experimenting. We are not bound by the voltage combinations reported by the makers, provided we don't overstep specified safety limits. Indeed, the manufacturers suggest that by giving the different grids various voltages, other desirable effects may be obtained.

The 46 tube seems to have been put out with the idea of tempting people to use Class B amplifiers. However, the arguments in its behalf are not strong enough to overcome some of the practical difficulties, namely, distortion, the need of a driver stage, and the need of a B supply of very good regulation. And the advantage of the circuit is greater output with a vastly greater overall efficiency. No doubt the Class B amplifier has its legitimate uses, but audio amplifier in a home radio set is not one of them.

As Class A Amplifier

But the 46 is a splendid tube as a Class A amplifier. As such it has an amplification factor of 5.6, requires a grid bias of 33 volts, passes normally a plate current of 22 milliamperes, requires a load impedance of 6,400 ohms, and puts out up to 1.25 watts of undistorted power. Its applied plate voltage should be 250 under these conditions. It takes an a-c voltage of 2.5 volts on the heater and a current of 1.75 amperes.

An unusual feature of the 46 tube when used in a Class B amplifier is that no grid bias is needed because the amplification constant is so high that the plate current is virtually zero at zero bias. Hence the tube always works with a positive grid voltage and therefore takes considerable grid current. Because of this it is necessary that the two tubes in the Class B amplifier be preceded by a driver which is capable of supplying the power lost by the grid current. A single 46 tube is recommended as the driver but operated as a Class A amplifier and delivering its output into a push-pull input transformer having a step-down ratio.

General Purpose Tube

The new 56 tube is a general purpose tube that can be used as amplifier, oscillator, and detector. It is of the heater type and takes 2.5 volts, either a-c or d-c, with a current of one ampere. Thus this tube is more economical than the 227 tubes, which it resembles most. It has a higher mu than the 227, 13.5 against 9. This means that it will be a more sensitive detector both when used with grid bias and with grid leak and condenser. It will also be more effective as a voltage amplifier in a resistance coupled circuit.

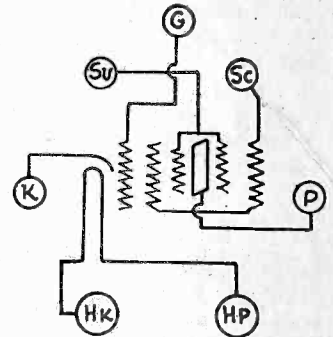
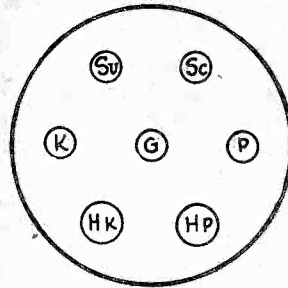


FIG. 1

At left is terminal arrangement of the standard six contact socket that fits the new 57 and 58 tubes. At right is the connection of the elements of the tube to the base pins and the cap.

As we have better radio frequency amplifiers, audio amplifiers, and detectors in the same series of tubes, the use of the 56 probably will be limited to oscillator and condenser-leak detection. Occasionally, of course, it will find other uses.

Triple-Grid Tubes

Of greatest interest are the two new triple-grid tubes, the 57 and 58. These are provided with a six-pin base in addition to the control grid cap. Therefore there are seven connections to be made to one of these tubes. Two are for the heater current, one for the plate, one for the cathode, one for the screen grid, one for the suppressor grid, and one for the control grid. Many of the older tubes have just as many elements but in no other tubes has the seventh element, the suppressor grid, been made accessible for different connections. In the older tubes it was made to the cathode or to the midpoint of the filament inside the structure. In the new tubes the element is accessible so that it may be given any desired voltage, d-c or signal.

The Triple-Grid Detector

The 57 is primarily a detector although it can also be used as an amplifier. It has a cut-off at 7 volts on the control grid when the applied plate voltage is 250 volts and the screen voltage is 100 volts, the suppressor grid being connected to the cathode. Its amplification factor is 1,500. As an amplifier the

(Continued on next page)

(Continued from preceding page)

bias should be 3 volts negative and as a biased detector, 6 volts.

This tube is somewhat alike the 224 and the 236 in its characteristics and should be used under similar conditions. The manufacturers of the tubes specify that the plate voltage should be 250 volts and the screen voltage 100 volts for both amplification and detection. It is very likely, however, that when the tube is used with a high resistance load, whether as an amplifier or detector, that a much lower screen voltage would work better. When the screen voltage is lower, the control grid bias must also be lower.

The Triple-Grid Amplifier

The 58 is the amplifier in this series of tubes. It differs from 57 in that it is a "super control" tube. That is, it has a variable μ , or it is of the remote cut-off type. Because of this feature it is especially adapted for use as amplifier in either audio or radio circuits, because wave form distortion will be low, as will cross modulation. The tube has a lower amplification factor and a lower plate resistance than the 57 tube, but a considerably higher mutual conductance at the normal operating point. As the control grid bias changes from 3 volts to 50 volts the mutual conductance changes from 1,280 to 2 micromhos.

The 58 is especially recommended not to be used as a detector, but it is recommended for use as frequency changer in a superheterodyne. For this use the recommended grid voltage is 10 volts negative while the peak of the oscillator voltage impressed on the same grid should not be more than 9 volts. The recommendation that the tube be used as a frequency changer is directly opposed to the assertion that the tube does not cross-modulate. Therefore it is clear that we have to regard amplification and detection characteristics as relative. Even the "super control" tube detects, and detects well at that, under certain voltage conditions. The recommendation that the 58 be used as a frequency changer is in the nature of a concession for this particular type of detection only.

No Dynatron Oscillator

The 58 falls in the same class as the 235, the 239, and the 234, although it is not exactly like any one of them. It is distinctly the amplifier in the series of tubes, and especially the radio frequency amplifier.

Neither the 57 nor the 58 is recommended as dynatron oscillator. In view of the uncertainties of performance of the dynatron oscillator it may be that this recommendation is against the dynatron rather than against these tubes being used as such.

Short Wave Club

The following is a list of new members of the Short-Wave Club:

Julio Baronte, 145 West Clark St., Eureka, Calif.
 Stanley Pyatt, 212 Irwin St., Phillipsburg, N. J.
 Edward Brogan, Jr., 480 Park Ave., Yonkers, N. Y.
 Louis C. Skipper, Jr. (w4cw), 671 Loeb St., Memphis, Tenn.
 H. J. Richardson, 315 South Third St., Clear Lake, Iowa.
 Clarence E. Laatsch, Embarrass, Wis.
 Eduardo Biascochea, Mendez Vigo St., No. 110, Mayaguez, P. R.
 Vincent Herbst, Berkeley Heights, N. J.
 James Johnson, 26 E. Ashmead, Philadelphia, Pa.
 H. D. Stark, Mgr., Stark Radio Service, 1231 8th St., S. E., Minneapolis, Minn.
 Georges Henri Dufour, 51-4eme Rue, Limoilou, Quebec, Canada.
 Floyd M. Brokaw, 1608 Wallen Ave., Chicago, Ill.
 Charles E. Brand, 1063 Lafayette Ave., New York, N. Y.
 Jack M. Stephens, Rt. 1, Box 34, Fair Oaks, Sacramento Co., Calif.
 George J. Lang, Jr., 515 Richard St., Dayton, Ohio.
 Robert Palmguard, 308 West Kemp, Watertown, So. Dak.
 Edgar J. Miller, R. R. 2, Chippewa Falls, Wis.
 Henry Bresina, Tilden Br., Chippewa Falls, Wis.
 Henry L. Fraventhal, 209 E. Seaman Ave., Freeport, N. Y.
 Frank Klaschke, 2316-22nd Ave., S., Minneapolis, Minn.
 Fairbanks Tryon, Box 27, Wellston, Okla.
 Hammond Mathews, Dist. Supt., The Western Colorado Power Co., Silverton, Colo.
 R. E. Brackett, Sanbornville N. H.
 O. Ingmar Oleson, Ambrose, N. D.
 Donald Gossard, 608 Third Street, Ambridge, Penna.
 E. E. Brandon, Lock Box 57, West Middlesex, Penna.
 J. E. Rice, P. O. Box 283, Lake Worth, Fla.
 H. G. Williams, 22 Craven Terrace, W. 2, London, England.
 Jack Sundberg, R. F. D. No. 4, Box 398, Ogden, Utah.
 William Schulze, 4620 Grace St., Chicago, Ill.
 George S. Dean, New Milford, Conn.
 V. E. Smith, 128 Second Avenue, Schenectady, N. Y.
 Thaddeus S. Filipek, 51 Elm Street, Meriden, Conn.
 Edward Schlundt, 405 Wooster Ave., Dover, Ohio.
 Eino Hendrickson, R. No. 4, Box 49, Cokato, Minn.
 Robert J. Raver, 714 Mahoning Ave., Youngstown, Ohio.
 E. M. Allen, 92 Ives St., Waterbury, Conn.
 Nelson B. Isdell, 100 Lancaster St., Albany, N. Y.
 William C. Harris, 704 Oak St., San Francisco, Calif.
 Warren R. Davee, 222 N. Monitor St., West Point, Nebr.
 Fred Leiberherr, Jr., 237 Marietta St., Mt. Joy, Penna.
 O. Ingmar Oleson, Ambrose, No. Dak.

Short Wave Editor, RADIO WORLD, 145 West 45th St., New York
 Please enroll me as a member of Radio World's Short Wave Club. This does not commit me to any obligation whatever.

Name

Address

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

There does not seem to be any real need for ever using the dynatron hook-up when it is so simple to get a dependable oscillator by using one of the standard oscillator hook-ups, either with a three-element tube or with one of the tubes having more elements. The advantage of the dynatron is supposed to be constancy of frequency, but where is the real advantage if there is no oscillation at all? After all, the real advantage of an oscillator is that it oscillates and particularly that it oscillates when a bit of power is taken from the tube. A 56 tube, or any similar tube, will oscillate very readily even when some power is taken from it, and such a tube is just as simple to connect as a dynatron.

Similarity of 247 and 46

In looking over the characteristics of the 247 pentode and the new 46 power tube we note a very close similarity. They require the same filament voltage and current as well as nearly the same plate voltage. When the 46 is used as a Class A amplifier it has an optimum plate load resistance of 6,400 ohms, while the 247 requires 7,000 ohms. Used this way the grid adjacent to the plate in the 46 should be tied to the plate, while in the 247 the grid should be tied to the plate return.

The 247 requires a grid bias of 16.5 volts whereas the 46 requires twice that bias. If in the 46 the grid next the plate were tied to the plate return the two tubes might be more closely alike in their performance and characteristics. The 46 has an amplification factor of 5.6 when the tube is used as a Class A amplifier, whereas when it is used as a Class B amplifier, with both grids tied together, it has an extremely high factor. Somewhere between these two conditions the amplification factor would be about what it is for the 247 tube. By returning the grid next to the plate to a suitable voltage this condition might be brought about.

Versatility is one indicated characteristic of the 46, but since the extra grid in the 247 is also free this tube also has many possibilities not yet explored.

Speculation as to Results

It is to be hoped that many different curves of both tubes will be brought out so that the various possibilities may be seen. What will happen, for example, if the grid next to the plate in the 46 is varied from zero volts to the voltage at the plate return? What will happen in the 247 if the same variation is performed? We may assume that the operating conditions recommended are the best for both tubes, but these fixed conditions do not suggest any other uses for the tubes.

As a Class B amplifier it is recommended that the two grids of the 46 be tied together and that the grid bias be zero. Thus the tubes will always operate on the positive side, since the current cut-off is at zero. This method of operation requires a driver amplifier capable of supplying the power dissipated in the grid circuit.

But can we not also operate the tube on the negative side as a Class B amplifier?

We would need a negative bias on one of the grids and the other grid would have to be given a positive voltage so that the cut-off would be at a considerable distance to the left of zero bias. Such application of the tube would obviate the need of a special driver.

OHM'S LAW

CAN A BATTERY charger be made with a transformer which gives 20 volts when connected to a 110-volt line and a dry rectifier? What will the voltage be across the terminals when it is connected to a 6-volt storage battery and the current is 2.5 amperes? How much will the drop of voltage be in the rectifier?—G. B. M., Los Angeles, Calif.

The answer to the first question is affirmative. The answer to the second question is that the voltage across the terminals connected to the battery will be the voltage of the battery, six volts approximately. The third question is a riddle and nothing else. In connection with the second question it must be added that there is no certainty that the current will be 2.5 amperes unless you actually measured it under the stated conditions. The voltage drop in the secondary of the transformer and in the rectifier will be the difference between the open circuit voltage of the transformer and the voltage at the battery. That is, it will be about 14 volts.

SOME SET, IF—

THE SIGNALS from 10 to 550 meters at antenna post of the mystery set are received by the grid of the first detector. The three chokes prevent signals from going to ground. The first oscillator is variably tuned, say, from 20,000 kc down, and will mix with only one signal frequency at a time, the resultant mixture frequency being accepted by the coupler in the plate circuit of the first detector, which should be tuned to a high frequency. This first intermediate frequency may beat with a fixed oscillator, also of high frequency, to develop a frequency low enough for r-f amplification. After this second intermediate amplifier would come the third detector.

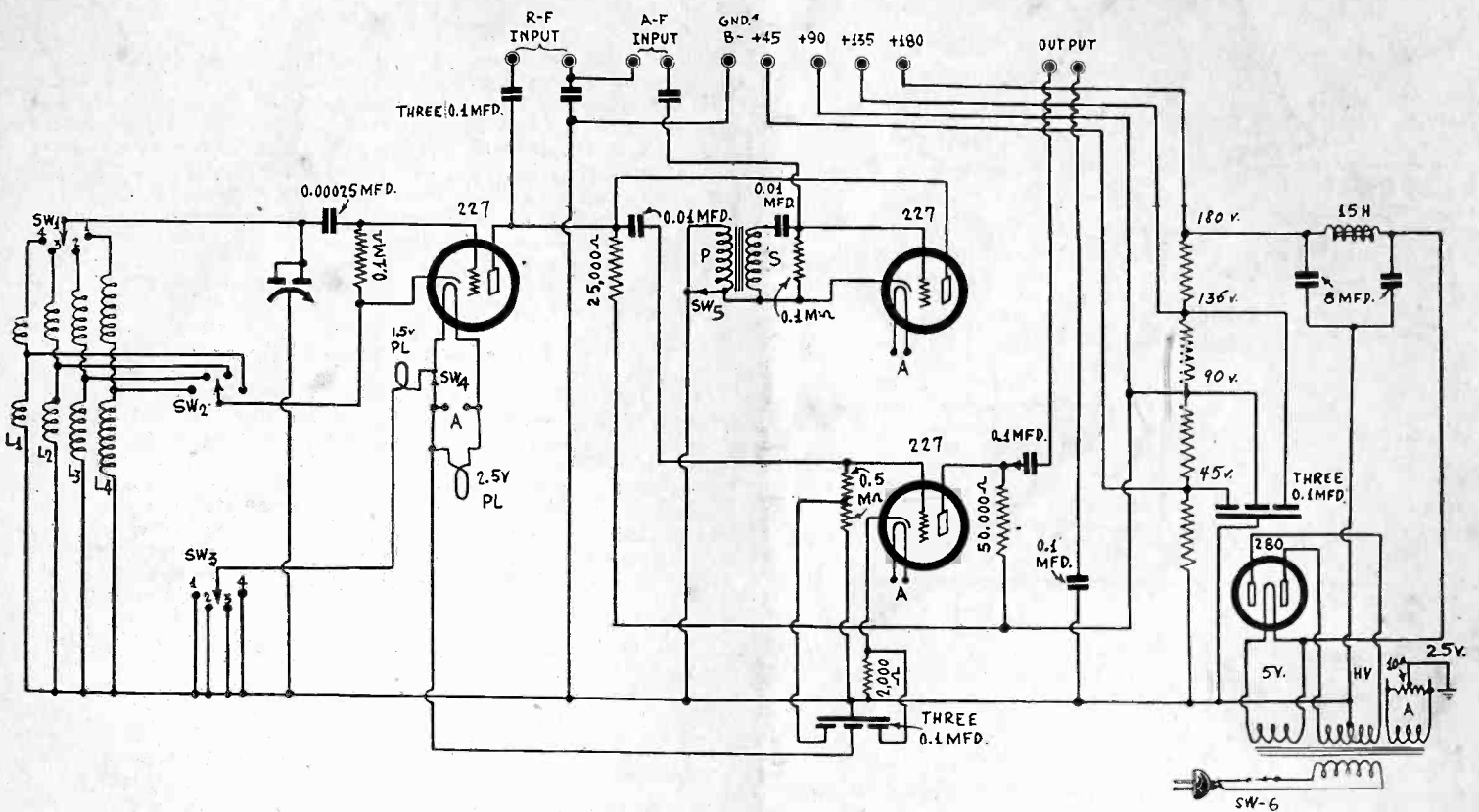
This will be some set if it works O.K.

—INTERESTED READER.

The "Do-All" Oscillator

Purposes of Device, Particularly Switches

By Herman Bernard



FOLLOWING the publication of details of the Do-All Oscillator last week, issue of April 30th, there were requests for modulating a radio wave with phonograph music. Some service shops line up circuits that way, others use standard frequency records and take an audio response curve. But the audio response curve would be of doubtful value unless one knew the characteristics of the pickup. The connection is the same as for regular phonograph pickup or other external audio, but the r-f oscillator is kept going. Then the output is modulated with the pattern introduced at "A-F Input." In straight audio output the oscillator may be cut out (SW-4).

Terminal Strip

The output strip includes two posts, "Output," with no d-c potential at either, thus making safe any connection to a measured circuit; ground, which is B minus; A-F, R-F Inputs, a-f when using the audio amplifier for external purposes; and four positive potentials for external d-c use.

A single resistor may be used for the voltage divider, at least 10 watts, preferably 25 watts, and the 90-watt tap located to afford that voltage when the four tubes are worked. An inexpensive meter may be used. It is recommended the total divider resistance be 10,000 ohms or more.

The device may be used as a short-wave converter by connecting aerial to the post at upper left in the diagram, which is optional, the condenser below being very large, but may be to 0.00025 mfd. The aerial may be as long as aerials come, and there'll be no harm. One "Output" post would go to vacated antenna post of the receiver, the other output post to ground of the receiver, the correct polarity being necessary, otherwise there may be no results.

Purposes of Switches

The juice is turned on by SW-6, a line switch built into the 50,000-ohm potentiometer.

SW-1, SW-2 and SW-3 are three switches in one assembly.

SW-4 simply turns off the oscillator tube when the audio power amplifier, or B supply alone, are used with some external device, as there is no need to have the oscillator going under such conditions, the power used by one tube being almost 4.5 watts.

SW-5 stops the audio oscillator from oscillating, but does not interfere with its actual operation. It is necessary to keep the audio oscillator functioning as a tube, even though not as an oscillator, so that by manipulating SW-5 you can have modulated-unmodulated service at will, without waiting for the audio oscillator tube to heat up when modulation is required.

LIST OF PARTS

Coils

- Four center-tapped coils as described.
- One power transformer with 400 v. a-c., 5 v. and 2.5 v. p amp. secondaries, and 110 v. primary.
- One audio frequency transformer.
- One 15 henry B choke.

Condensers

- One two-gang 0.00035 mfd. shielded straight frequency line condenser.
- One 0.0025 mfd. fixed condenser.
- Two 0.01 mfd. fixed condensers.
- Six 0.1 mfd. fixed condensers.
- Two shielded blocks, three 0.1 mfd. in each block.
- Two 8 mfd. electrolytic condensers.

Resistors

- Two 0.5 meg. pigtail resistors (500,000 ohms).
- Two 0.1 meg. pigtail resistors (100,000 ohms).
- One 0.05 meg. pigtail resistor (50,000 ohms).
- One 0.05 meg. potentiometer with a-c. switch.
- One 0.25 meg. pigtail resistor (25,000 ohms).
- One 2,000 ohm pigtail resistor.
- One 10 ohm center-tapped resistor.
- One voltage finder, 10,000 ohms up, 5 watts or more, with sliders, adjusted to 90 and 180 volts at points shown; or from fixed resistors, about 2,500 ohms each.

Other Requirements

- One long switch, triple pole, quadruple throw (three-deck, four-point), totally insulated (SW 1, 2, 3); with knob.
- Two push-pull switches (SW4, SW5).
- Note: SW6, is a-c. line switch built into attenuator potentiometer.
- One a-c. cable and plug.
- One terminal strip with eleven binding posts.
- Three UY (five-spring) sockets and one UX (four-spring) socket.
- One knob for attenuator, to match switch knob.
- One vernier dial.
- One 7x10 inch front panel.
- One 9½ x 8½ inch subpanel.
- One 2.5 v and one 1.5 volt pilot lamps.
- Three 227 tubes and one 280 tube.
- Two pilot brackets.

Try the Super-Regenerator for Experimental Circuits for

By Jack

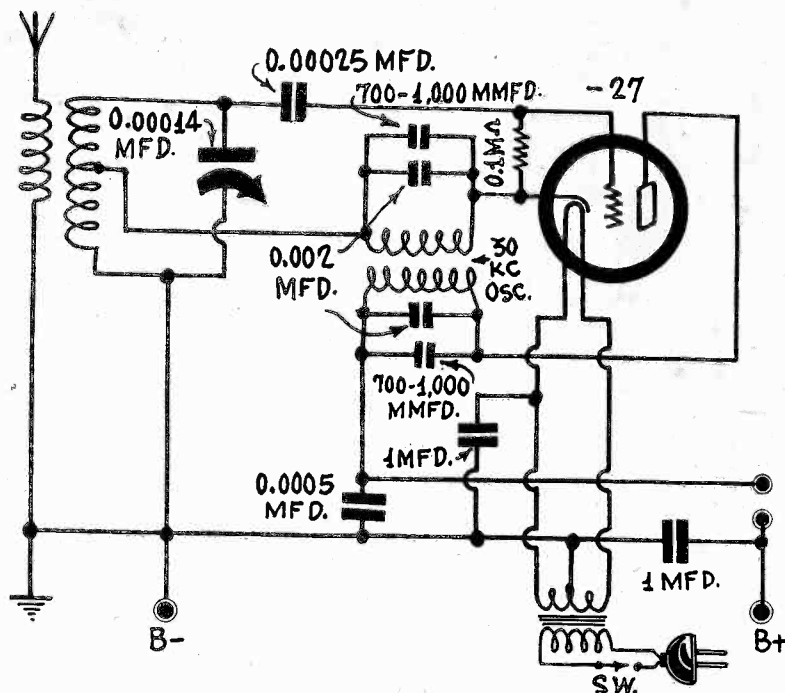


FIG. 1

This one-tube hookup will serve as a guide to those desiring to experiment with super-regeneration.

SUPER-REGENERATION has been a bugbear for a long time, but now that better results are being obtained many will like to make some experiments with this promising but elusive circuit, especially as when it is working properly it develops high sensitivity well under control.

The theory of super-regeneration is that the tube's most

sensitive point is moved upward by introducing another oscillation which prevents spillover. Ordinarily a tube is most sensitive when worked just below the point of oscillation. In the super-regenerator this remains true, also, in that much greater sensitivity is obtained by stopping the spillover by the auxiliary oscillation. That is, the super-regenerator is regenerating but not oscillating. A tube is oscillating when it generates a wave. It is regenerating when there is feedback but of a lesser value than that which causes oscillation.

Another way of looking at the super-regenerator is to regard it as in a condition for oscillation, with the actual oscillation prevented by the auxiliary frequency.

Intended for Short Waves

In the early days the auxiliary frequency was within the audible range. This constituted a serious drawback, as the steady tone of the auxiliary frequency modulated the tube. When higher frequencies, beyond audibility, were tried the sensitivity was not nearly so great. However, recently methods have been devised for attaining high sensitivity even with the extra frequency beyond audibility.

Since a tube may oscillate at more than one frequency it is proposed that experimenters try a super-regenerator of the type shown in Fig. 1, where the same tube performs both frequency functions.

The advantage of the super-regenerator lies in the short-wave region, as the selectivity is not high enough for broadcast frequencies. So the antenna coil would be of that type, and with the 0.00014 mfd. condenser would cover a frequency ratio of about 2.2-to-1. So if you start at 1,500 kc you would wind up at 3,300 kc. The next coil, if plug-ins are used, would cover from 3,000 kc to 7,260 kc.; the next from 7,000 kc to 15,400 kc, and the next from 15,000 up. Using No. 28 enamel wire on tube base diameter (1.25 inches), the first secondary may consist of 60 turns, the primary of 15 turns, would adjacent, close coupling. The next coil would have 28 turns of No. 28 enamel for secondary, 10 for primary; the next 13 turns of No. 18 enamel for secondary, 8 for primary; the next 6 turns of No. 18 enamel for secondary and 4 turns for primary, the separation for the last coil, primary and secondary, being $\frac{1}{8}$ inch. The secondary is center-tapped in each instance. The primary wire is always the same size as the secondary's.

Attaining 30,000 Cycles

The input circuit is set up for oscillation, and is of the Hartley type. Due to the leak and condenser, and grid return to cathode, grid detection will take place. The plate circuit has the primary of a 175 kc intermediate coil interrupting the lead to B plus, while the secondary is connected in series with the cathode on its way to the center-tap of the antenna coil's secondary. In fact the primary and secondary of the intermediate transformer are identical, and interchangeable, since the ratio is 1-to-1 and the adjustable condensers across the windings are the same.

The frequency would not be much lower than 160 kc at maximum capacity setting of the adjustable condensers, therefore two condensers of 0.002 mfd. are put across the two windings, and in addition two variables, 700-1,000 mmfd., which are of the setscrew type used in padding superheterodynes than have an intermediate frequency of 175 kc and tuning condensers of 0.00035 mfd.

The intermediate coils were of the aluminum shielded type (although the shield is not designated in the diagram) and had 800-turn honeycomb coils of the same small size, about an inch in diameter, $\frac{5}{8}$ -inch separation, with 20-100 mmfd. equalizers. These equalizers are not shown, but may be left as they are, being set near minimum, with the principal adjustment made with the padding type condensers. The shield, of course, should be grounded.

Easy to Try

The extra frequency of oscillation thus introduced may be of the order of 30,000 cycles, since the 800-turn coils have an inductance of about 10 millihenries, requiring a capacity of about 0.0028 mfd. However, the frequency need not be put 30,000 cycles.

The r-f circuit won't stand a large primary. The extra circuit, to generate 30,000 cycles, may not oscillate, as the coils have to be connected a particular way, so reverse the connections

Install Car Aerials, Radio Men Advised

Philco sent out the following to its distributors:

Frequently we hear that so-and-so is charging \$10 or more for an auto antenna. And they feel justified in charging this because they have to pay some outside top man from \$5 to \$10 for the work.

There is still a lot of hokum connected with installing an antenna. You could do it, I could do it, practically anybody except the extremely careless person could do it, and do a good job of it. And it wouldn't take more than two or three hours to do it, either. That top man or upholsterer is certainly getting the cream.

Here are some actual figures. There is a service station not far from here where they do their own antenna work from the Ford to a Lincoln limousine. They have a young chap who knows enough to keep his hands clean when working with the headlining. They pay him \$22 a week. In addition to installing the antenna he also helps with the rest of the installation and motor interference suppression. They average about eleven cars a week and in case installations are not so frequent he is used for other work.

Not considering the other work, he installs eleven antennas per week at an average cost of \$2 each for labor. The actual cost of this labor figured out over a period of several months however, is well under \$1.50.

The cost of copper screen is approximately \$1 per car where used. Inasmuch as copper screen is not required in 50 per cent of all installations, the average cost of the screen is only 50c. The actual cost of installing an antenna at this service station is \$2, including labor and material. This certainly is a lot better than paying an outside man \$5 to \$10 for each job and never knowing in advance just when you can get him to work.

Extremely High Sensitivity; Earphones and for Loudspeaker

Tully

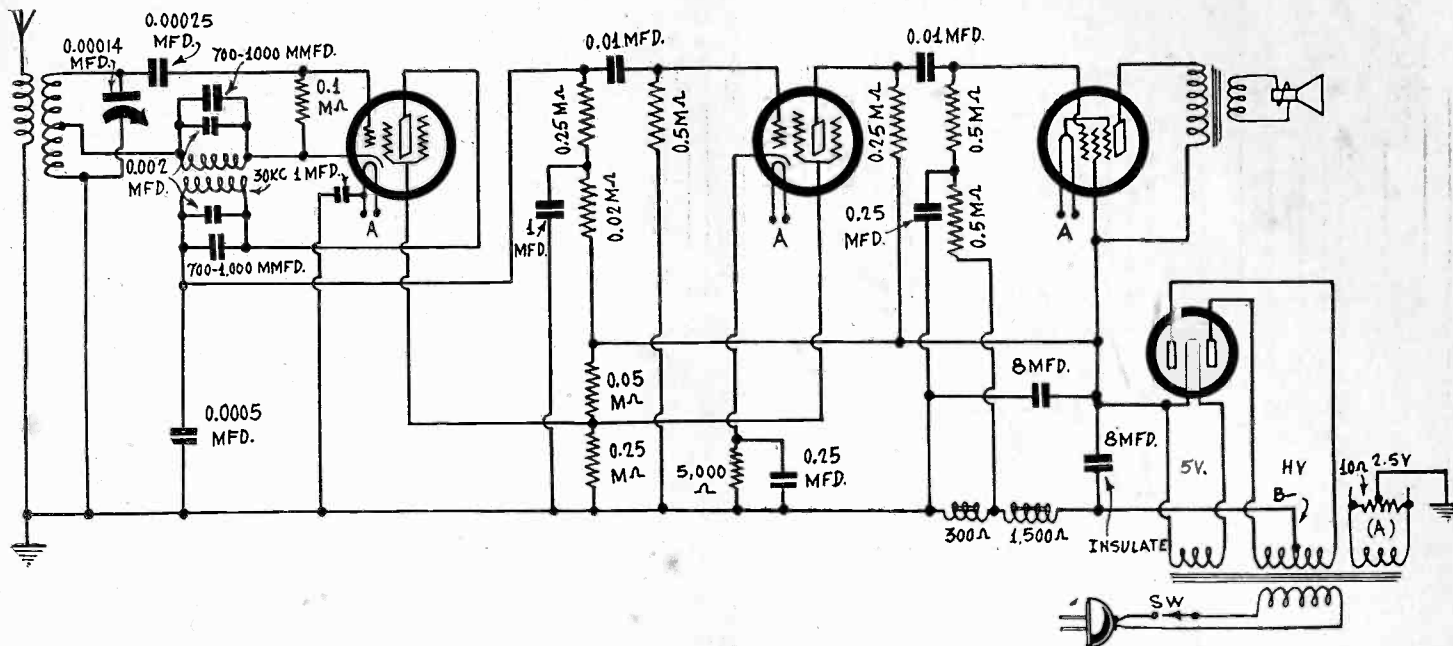


FIG. 2

Those who make a go of the experimental one-tube super-regenerator may desire to build a speaker set and may follow this diagram.

to either winding of the 175 kc type transformer if after adjustment the r-f oscillation is not broken down.

As the circuit is a simple one it is easy to try, and besides many have all the parts necessary. The hookup is not applicable to battery operation, because the cathode is grounded in all battery systems using filament type tubes. But with any heater type tube, no matter how powered, it will work. For instance, automotive tubes may be worked from a 6-volt storage battery.

Earphones are connected to the two encircled posts shown at lower right in the diagram.

No control of the r-f detector-oscillator is shown, but it will be found advisable in most instances to introduce one. It may be a 10,000-ohm rheostat between the cathode joint of the 0.1 meg. and the near side of the 800 turns.

Four-Tube Design

After the circuit is made to work properly the experimenter may be tempted to elaborate on the improved sensitivity, and have speaker operation. Therefore a diagram is shown, Fig. 2, for a four-tube speaker-operating set, with the field coil of the dynamic speaker used as the B supply choke.

Since there are two stages of audio amplification, using resistance coupling, the filter in the detector plate lead consists of a relatively low resistor and a high capacity (20,000 ohms and 1 mfd.), as high capacity is needed here to reduce hum considerably. The phase of the audio feedback to the detector is such as to require a high capacity. In the pentode grid circuit, however, the filter capacity is much smaller, (0.25 mfd.) and the resistor larger (0.5 meg.).

Motor Noise in Auto Set

WHERE is the best place in the car to put a receiver to avoid noise from the motor? I have had the set in the engine compartment, on the dash in the driver's compartment, and under the body, but in all places I get noise.—B. R. L., Bronx, N. Y.

The best place is as far from the engine as possible. Even if all the spark gaps, distributor points and the commutator have been filtered, there may still be noise in the heater circuit. This, too, should be by-passed in bad cases. It is also well to by-pass the plate battery with a large condenser. Of course no set is designed without a by-pass condenser across the battery, but it may not be large enough in all cases.

Hum is Welcome

A well-defined path of dots and dashes on which a pilot can fly as true as a homing pigeon, day and night, even if the landscape is blotted out, has resulted from the installation of Department of Commerce directive radio beam on most of the established airways over which the mail-passenger planes fly. How pilots listening to the radio beacon signals maintain their course is described in a bulletin of United Air Lines, whose planes fly with the aid of the directive beam.

The radio beacon stations, spaced approximately 150 miles apart, transmit dots and dashes. Dot-dash means one side of the line of flight and dash-dot the other side; but a steady stream of dashes means "you are on the direct course." The "on-course" signal comes to the pilot over his headphones as a steady hum, broken only by the identification characteristic of the particular station transmitting the signals.

As the pilot approaches a station, the signal strength increases and he knows when he is directly over the radio station even if he cannot see it, as he will receive no signal because the station does not transmit signals vertically.

The beacon is invaluable when visibility is such that the pilot cannot orient himself by distinguishing landmarks.

The radiophone headset used by pilots enables them to receive the long-wave radio beacon signal and the Department of Commerce weather report broadcasts, and also the two-way short-wave radio telephone enables them to converse with ground stations, never more distant than 100 miles, and with pilots of other planes in flight. A tuning device, like the handle of a coffee grinder, enables the pilot to accentuate or diminish the intensity of both long- and short-wave signals or conversation he gets through his earphones. He can also shut out entirely either the directive radio signals or the conversation over short wave.

Every twenty minutes the "radio fence" signals, which keep the pilot on his course, are interrupted momentarily to allow the broadcasting of long-wave weather reports. However, if any pilot telephones down that it is vital that the beacon signals continue without interruption, the beacon beam will be kept on. The man on the ground will then broadcast the weather to pilots aloft on another frequency and the pilots receive it just as the person at home can get a different station by dialing.

The world's longest airway with directive radio beacon service is the New York-Pacific Coast line, 2,766 miles, pilots following the "hum" from the Golden Gate to the Statue of Liberty.

8-TUBE "UNIVERSAL" AUTO R INDEPENDENT

By Charles

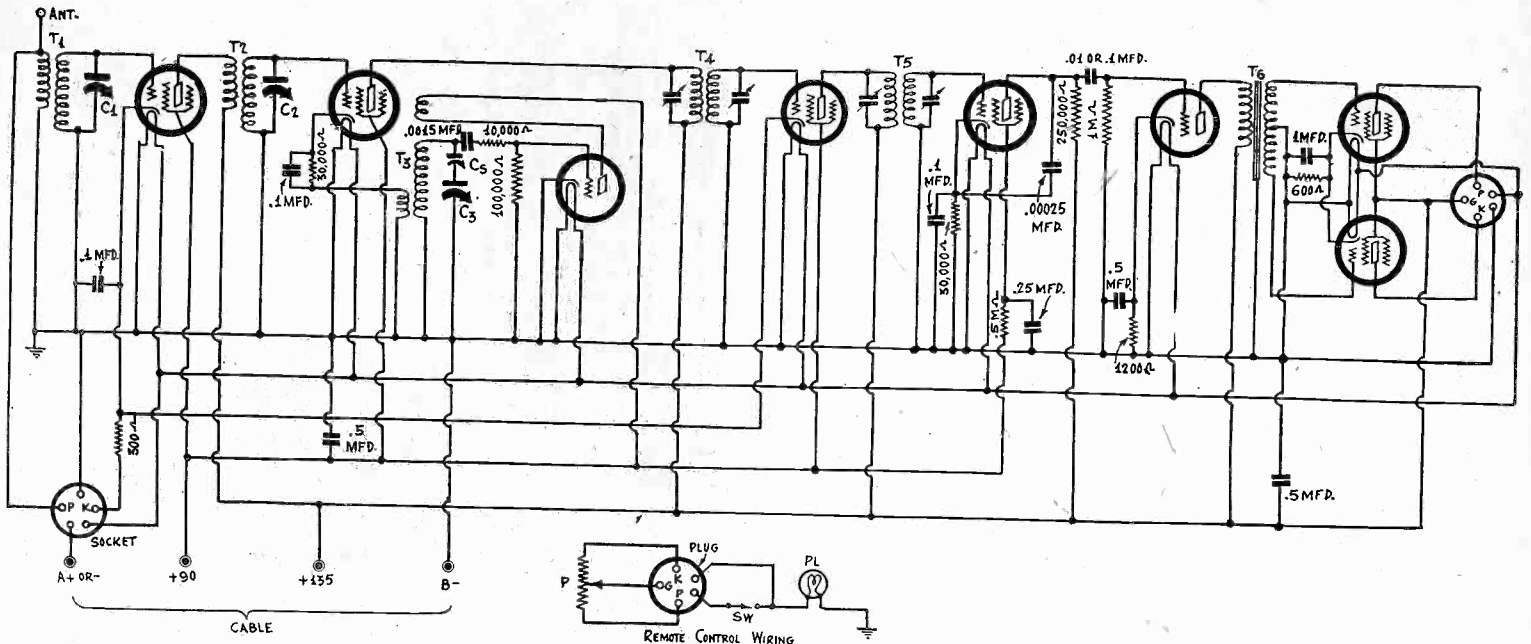


FIG. 1

An eight-tube universal automobile superheterodyne. Operates on all types of cars regardless of which side of storage battery is grounded.

FROM THE point of view of automobile set designers it would be a desirable thing if the automobile manufacturers would get together and decide to standardize on the method of grounding the storage battery. It would be very convenient if all used either negative grounding or positive grounding. One source of auto radio trouble would then be eliminated. It seems that more and more manufacturers are turning to positive grounding. The reason for this may be the same as the reason why power engineers on d-c lines use positive grounding wherever possible. Reduction of electrolysis is that reason.

But while there are cars of both types radio sets must be designed so that they will fit any car, either directly or with the least possible change in the wiring. This does not alone mean the least number of wiring changes but also changes that can be done most easily by one who is not especially versed in electricity.

Universal Car Receiver

A car receiver that can be connected to either type of automobile might be called a universal receiver. Such a set is easily designed. Unfortunately, it will necessitate a few sacrifices, but perhaps the advantages gained are enough to offset circuits which will fit a car in which the positive of the battery is connected to chassis.

If a set is designed for positive grounding of the battery it will fit one with the negative grounded as well, provided it meets certain requirements. What are these requirements? First, the heater circuit must not be connected to any part of the signal circuit except at one point. One side of the chassis of the set is connected to the heater circuit. If then the set chassis is connected metallically to the car chassis, one heater connection is automatically made.

The second condition is that all the tubes in the receiver should be self biased, or at least that they should be biased entirely independently of the storage battery voltage. In Fig. 1 we show a circuit of an 8-tube automobile superheterodyne in which all the tubes are biased by means of resistances in the cathode leads and which can be connected to any type of car without danger of short-circuiting the storage battery or anything else in the receiver or in the car.

Connection of Remote Control

Note first that the negative of the B battery is connected to the receiver chassis, which is also the car chassis. Therefore the B minus lead may be connected by means of a wire to the set chassis or it may be connected at the most convenient point to the car chassis. Second, note that the "hot" side of the heater circuit is connected to side of the storage battery not

Coils

One set of three shielded automobile coils, consisting of two identical t-r-f coils and one oscillator coil.

One set of two shielded intermediate frequency transformers, 400 kc, primary and secondary tuned, Hammarlund superheterodyne condensers built in.

One push-pull audio frequency input transformer.

Condensers

One three-gang 0.00035 mfd. tuning condenser, trimmers and sectional shields built in.

One set of three 0.5 mfd. tubular bypass condensers.

One shielded block containing three 0.1 mfd. condensers.

One 0.0015 mfd. mica bypass condenser.

One 0.00035 or 0.00025 mfd. fixed condenser.

One 0.1 mfd. tubular bypass condenser.

One 0.0015 mfd. fixed condenser.

One 0.01 mfd. fixed condenser.

One 1 mfd. bypass condenser.

One 0.25 mfd. bypass condenser.

One Hammarlund adjustable padding condenser 350-450 mmfd.

Resistors

One set of eight pigtail resistors consisting of one 300 ohm, one 600 ohm, one 10,000 ohm, two 30,000 ohm, one 100,000 ohm, one 250,000 ohm, one 1,000,000 ohm, one 1,200 ohm, and one 0.5 megohm.

Other Requirements

One set of ten wafer sockets consisting of one marked VC for remote control connection, one marked SPK for speaker connection, two marked 239, two marked 236, two marked 237 and two marked 238. One set of six grid clips.

One remote control tuning and volume control unit, consisting of dial, two cables, 10,000 ohm potentiometer, pilot light, switch key, clamp, pulley, counterspring and UY plug.

One 7/8 x 11 9/16 x 2 3/4 inch drilled steel chassis, one steel cover to fit over chassis, and one removable front for cover, front pierced at two places to receive remote control and speaker plugs, and one B battery box.

One four-lead cable, 8 ft. long., for A and B battery connections.

One set of six spark suppressors, to go on spark plugs, and one 1 mfd. bypass condenser, to be connected to commutator.

One dynamic speaker for autos, with 6 volt 4-ohm field, 1.5 amperes.

One special auto aerial, to go under the running board, two brackets to hold aerial 6 inches from board.

Two dozen 6/32 screws and two dozen nuts.

One set of four 6/42 Parker screws.

One roll of hookup wire, 25 feet.

Tubes: two 236, two 237, two 238, two 239.

RECEIVER; OF D-C POLARITY OF GROUND

R. Endicott

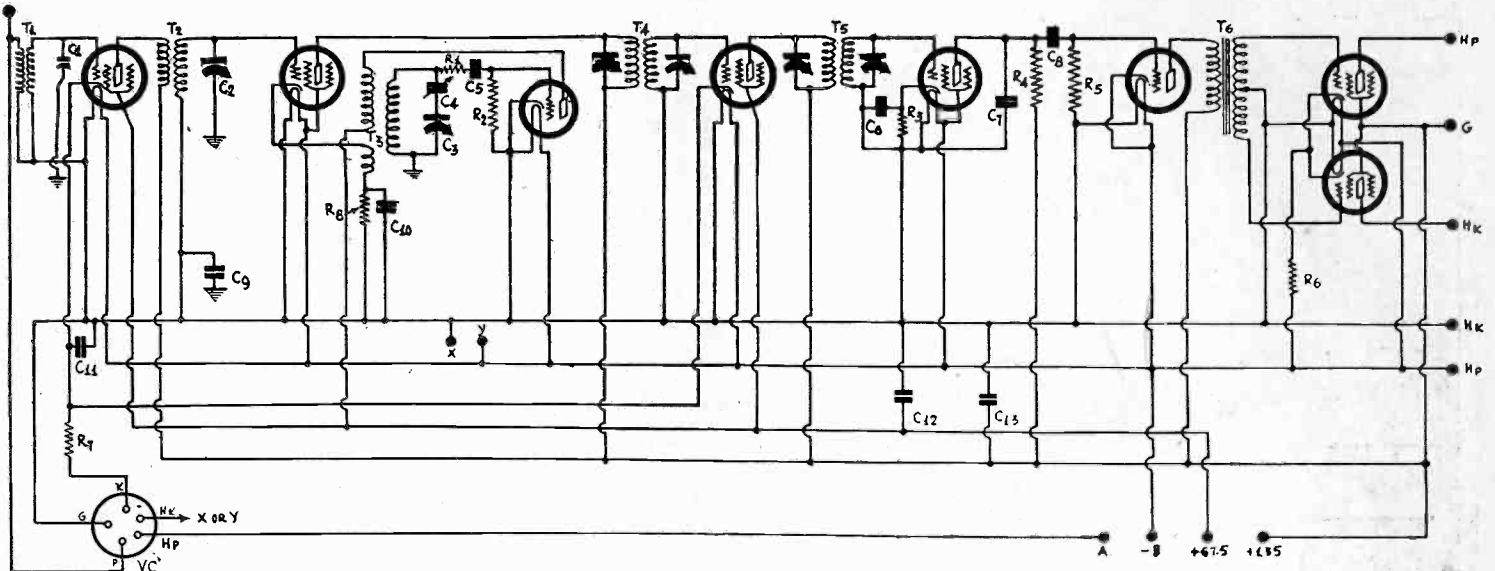


FIG. 2

This is the diagram of an eight-tube automobile superheterodyne in which bias for some of the tubes is taken from the storage battery. Adaptation for positive or negative grounded cars is effected by changing two leads. The above circuit is covered by blueprint 631.

connected to the chassis. Sometimes, of course, this is positive and sometimes negative. Therefore in any case it is only necessary to connect this lead in the battery cable so that the tubes light up. There can be no uncertainty.

The remote control connection is the same in both cases. It must be noted, however, that the "hot" side of the car battery should be connected to the remote control socket and not to the ungrounded side of the heater circuit. This is connected to another spring on the remote control socket. The object of connecting the heater circuit to one spring and the hot side of the battery to the other is to permit the insertion of the filament switch between the two. The wiring of the remote control unit has been inserted to indicate all the connections when the circuit is complete. The live side of the battery is connected to Hp on the remote control socket. Hp on the remote control plug picks up the line and it goes directly to the switch Sw. The other side of the switch picks up the pilot light and also the Hk pin on the plug. This in turn picks up Hk on the remote control socket and the "hot" side of the filament circuit. One side of the pilot light is connected to the frame of the remote control unit, which is in metallic contact with the frame of the car, and hence with the "cold" side of the car battery. The way the switch is placed it is clear that it controls not only the tubes but also the pilot light and the speaker. The speaker socket is that to the right of the two output tube sockets.

Bias Resistances

The two radio frequency amplifiers, the first and the fourth tubes in the circuit, are biased by a common 300 ohm resistance in their cathode leads and also by a portion of the potentiometer P in the remote control unit. The return to the chassis and to B minus is made through the slider and the G pin on the plug and the corresponding spring on the socket.

The frequency changer tube, the second, is biased by means of a 30,000 ohm resistor in the cathode lead of that tube. This does not go to the chassis directly but first goes through the pick-up coil on the oscillator. In the oscillator cathode lead there is no bias resistance but the tube is biased by the grid current which flows in the 100,000 ohm grid leak.

The detector is biased by another 30,000 ohm resistor in the cathode lead of that tube, the first audio tube by a 1,200 ohm resistor and the two output tubes by a 600 ohm resistor in their common cathode lead. A resistance of 750 ohms could be used in the last stage but 600 is nearer the correct value. The higher value has the advantage that the stage will stand a little greater signal voltage without overloading and also that the total plate current will be slightly less.

The tubes in the automobile series call for a maximum plate voltage of 135 volts. Hence all the tubes, with the exception of the oscillator, are given this voltage. This accounts for one

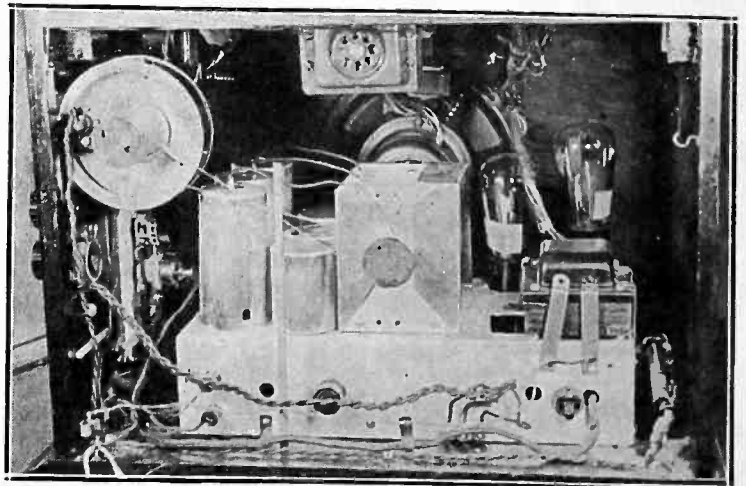
of the leads in the battery cable. If we use 239 r-f amplifiers the screen voltage on these tubes should be 90 volts, and that disposes of another lead in the battery cable.

WHERE OHM'S LAW FAILS

ARE THERE any cases where Ohm's law does not apply in radio or in electricity? If so, please name a few.—B. W. L., St. Paul, Minn.

Yes, there are many cases where Ohm's law does not apply. The most familiar case is that of the vacuum tube. In the case of a two-element tube the current is not proportional to the voltage, as is clear when we look at a curve representing the relationship between current and voltage. The same applies to a vacuum tube having more than two elements. Another case is the crystal rectifier. If Ohm's law held we would not have a rectifier. The copper-oxide rectifier is another example. A carbon resistor is another which does not obey the law very closely, and the carbon arc deviates very much from the law. Many other examples could be mentioned.

Set Tuned from Side of Console



Having a console that originally housed only a speaker, but was large enough for a set, one experimenter located the dial at the side and used a pulley for actuating the condenser.

An A-F Oscillator Choke

Pitch Between 500 and 2,000 Cycles Obtained

By Paul Erwin

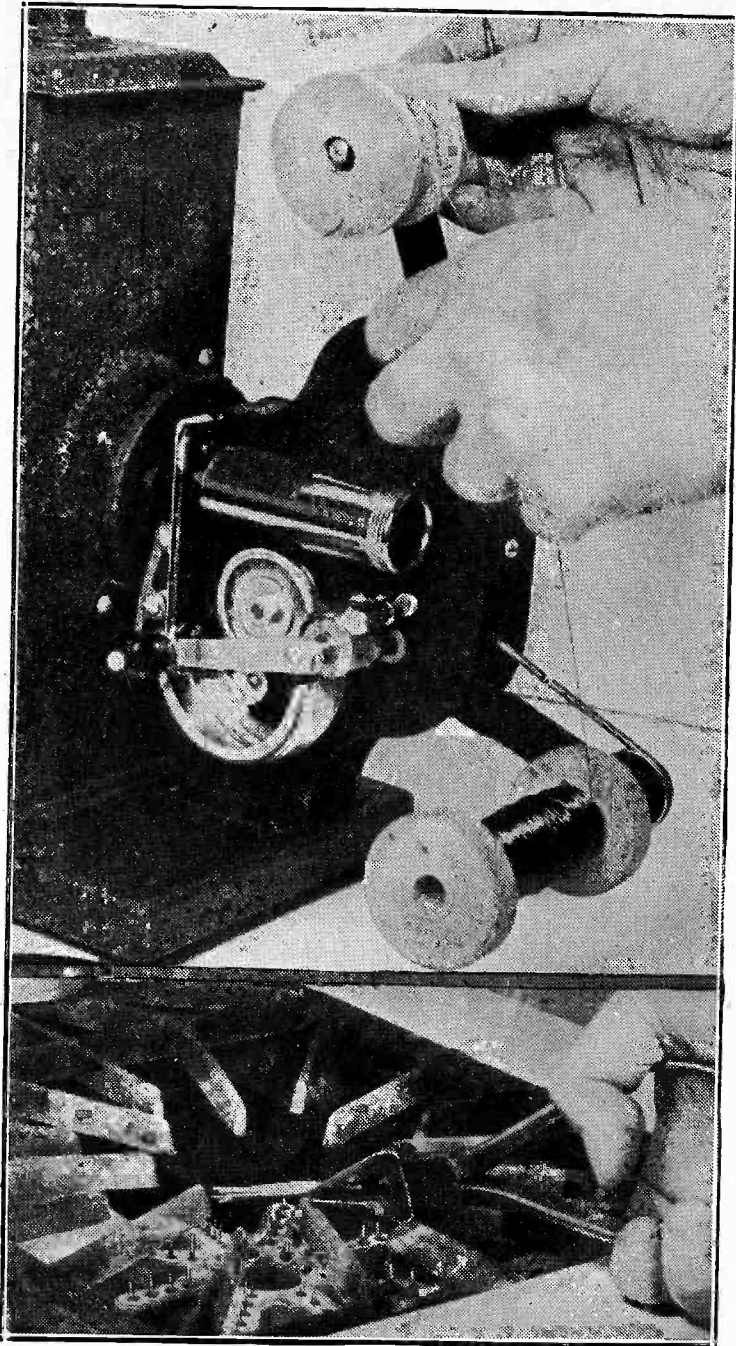


FIG. 1

(Upper)—A home movie projector makes an excellent coil winding machine by using the film re-wind mechanism.

(Lower)—Iron wires for the core of the audio oscillator coil should be annealed by heating them to dull red temperature over a gas flame.

WHEN AN audio frequency oscillator is to be constructed the recommendation is usually made that an old audio frequency be used as the inductance. The only reason is that there is no other suitable coil available. There is one objection against using an audio transformer, and that is that the frequency generated is usually too low, especially if the oscillator is to be used for modulating a radio frequency oscillator. The better the audio transformer is, as such, the lower the frequency is likely to be when it is used for an audio oscillator. The reason for this is that it takes a very high inductance to make a good audio frequency transformer.

What is needed for an audio oscillator is a comparatively low inductance so that with a small condenser across one of the windings, or across both, the oscillation frequency will be

somewhere between 500 and 2,000 cycles per second. A transformer of this kind is very easily made.

Making Audio Oscillator Transformer

Start with a wooden spool having a winding space about 0.5 by 1 inch, about $\frac{3}{4}$ or 1 inch inner diameter. There should be a hole through the center of this spool about 0.5 inch in diameter. Between the inside of the winding space and the center hole there should be a little space as practicable so that the wire will start near the center.

Fill the winding space with enameled wire using a total of about 2,000 turns. Bring out a tap at the middle turn. Jumble winding will be all right. The size of wire to use depends on the space available. No. 32 enameled wire should be all right. The size does not really matter, for even as fine as No. 40 would work. However, if the wire is too heavy enough turns cannot be put on, and if it is too fine the coil will not be as good for oscillation. No. 32 is a good average.

After the wire has been put on the spool bring the terminals to soldering lugs, which may be attached to the form by means of small wood screws. There will be three of these, one for each terminal and another for the center tap.

Using Iron Core

The inductance of the coil will not be high enough unless an iron core is used. To make this a large number of short lengths of iron wire should be put through the hole in the center of the spool, filling the space as nearly as possible.

If the core wires are long enough they may be bent around the outside so that the spool is entirely covered with iron when the coil is finished. However, this is not necessary, as the inductance will be high enough if the core wires are just the length of the spool so that the ends will be flush. The method is entirely optional.

The core will be better if soft iron is used. Therefore after the wires have been cut to the desired length they should be annealed by heating them to a dull red over a gas flame. How this is done is shown in the lower part of Fig. 1. After the wires have been heated to a dull red temperature let them cool slowly. After they have cooled off insert them in the central hole in the spool.

If the wires are long enough to bend around on the outside, tie them together with tape. If they are short and just the length of the spool, melt some sealing wax and pore it into the spaces between the wires. This is just to hold them in place and to keep them from vibrating. If the wires are long enough to bend around the outside care must be taken to insulate the three leads and bring them out through the wires.

Winding the Coil

It is a somewhat tedious task to put on 2,000 turns of fine wire by hand. A winding machine of some kind will help a great deal. In the upper part of Fig. 1 is shown how one man solved the problem of winding. He had a home movie projector which he converted to a winding machine. He removed the reels intended for the film and in one place he put the spool to be wound and on the other the spool of stock wire. He then used the crank intended for rewinding the film for winding the spool. This arrangement works like a charm.

Perhaps not many will have a device of this kind, but then there are many other devices which will serve the same purpose. One is an ordinary hand drill. Mount this in a vise so that the spindle is horizontal and so that it turns freely as the handle is turned. Rig up a chuck which will hold the spool and insert it into the chuck of the hand drill. The spindle will turn faster than the handle but there is a definite ratio, and this ratio can be determined before the winding begins. After this ratio is known it is only necessary to count the number of revolutions of the handle to count the turns. In one case the ratio was 4.4. Hence to put on about 2,000 turns with this it would be necessary to turn the handle 455 times.

Wiring the Oscillator

If a lathe is available the winding can be done with this easily. There should, however, be a provision for quickly stopping the lathe in case the stock wire should become entangled. This often happens, especially when the stock spool is not mounted so that it will turn freely as required.

Three terminals only were provided in this coil. This means that it should be used in a Hartley oscillator, which is one of

(Continued on next page)

T-R-F in Short-Wave Set

Battery-Operated Two-Tube DX Model

By Fred Warren

CAN you dig up a couple of four-prong sockets around the house somewhere? I thought so. Some tube bases? Well, why hold onto burnt-out tubes? Why not knock the envelopes off and use the bases? Quite so. A trio of tuning condensers of some kind handy? Well, one of them may be of almost any size from 0.0002 mfd. up. The other two had better be 0.00014 mfd., so perhaps you'll have to buy them, or you can put a 0.00025 mfd. fixed condenser in series with each of two 0.00035 mfd. variables that you have, and the net result would be 0.000145 mfd. for each, which is fine and dandy.

Now you have most of the electrical parts for a two-tube battery-operated short-wave tuner that affords most excellent earphone results. If loudspeaker operation is your goal you will find an article on that type set, with full scale picture diagram, in the April 16th, 1932, issue.

It is all so very simple and easy, costs so very little, that whoever has not owned a short-wave device had better build this one now. Results in Summer from Europe are especially good.

Old-timers know that a circuit like this one is utterly reliable, and when it comes to short waves, a most dependable circuit is the only one that is worth any attention.

Equal Coils in Two Tuned Circuits

The coils you can wind yourself, and the data are given for five coils for 15-200 meters, the overlap being considerable, as many novices will build such a circuit, and if the wire is wound a bit unevenly or attains an unexpectedly large winding (axial) length, there'll be no harm. Commercial coils for such a circuit consist of four, because more accurately wound, but the results are just as good with one or the other.

All told, then, you will use ten home-made coils, or eight factory-made coils, for any one frequency span requires two coils, one for the grid circuit of the r-f pentode amplifier, the other for the plate circuit. Individual coils in a pair are equal.

You must have separate tuning condensers for the grid and plate circuits, for that method keeps the B battery resistance out of the tuned circuit and avoids conflict of d-c voltages, one condenser being grounded to A minus and the other grounded (on an r-f basis) to B plus 135 volts. Moreover, the two circuits will not tune identically. The grid circuit tuning condenser may be actuated by a knob, but the plate circuit condenser should have a vernier dial. Therefore the plate circuit tuning is relied on for calibration.

The layout of parts and the wiring are shown clearly in the picture diagram (front cover), while the schematic may be used for wiring reference, as it coincides in all particulars.

In tuning the set, work the vernier dial slowly, meanwhile more rapidly turning the r-f tuning condenser knob back and forth, and in this way stations will be located. After this is done a tuning curve should be drawn up on graph paper, or at least a list of dial setting and frequencies prepared. Then a list of shortwave stations, giving hours on the air, should be consulted, and stated time accommodated to local time. Merely "fishing" for short-wave stations, instead of trying to tune them in by frequency at schedule, is rather disappointing.

Coil Instructions

The coils should be wound so that as to any one coil the windings are in the same direction. Begin at the top and connect G of the coil form, winding the tuned inductance and terminating at F minus. Leave just enough space to clear, then put on the smaller winding, beginning connected to P of the coil form, end to F plus. As you hold the form upright, filament (large) pins at bottom toward you, F minus is at left, F plus at right, and grid behind F minus and plate behind F plus. Grid, plate, F plus and F minus have no reference to anything but the coil form in these data.

There will be considerable overlap, but that is unobjectionable.

(Continued from preceding page)

the simplest and most dependable. Using a heater type tube connect on terminal to ground, the tap to the cathode, and the other terminal toward the grid of the tube. Not directly to the grid, but toward the grid. Put a condenser of 0.5 mfd. capacity between the grid and the coil and use a 100,000 ohm grid leak between the grid and the cathode. The plate voltage, from 22.5 to 90 volts, should be applied between the plate and ground.

The tuning condenser should be connected across the entire coil, that is, from the grid to ground terminals. The capacity required depends entirely on the frequency desired and on the inductance of the coil. First use no condenser at all. Listen in with a headset by connecting one terminal of the phones

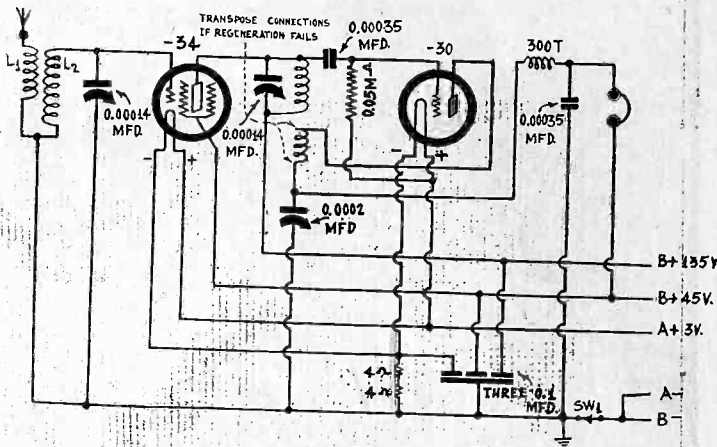


FIG. 1

Two tuned circuits and a feedback relationship in the detector stage characterize this earphone short-wave tuner.

if the following data are used, the statement of meters being approximate, but very conservative:

Grid Coil No. Turns, Enamel	Plate Coil No. Turns, Enamel	Approximate Range, Meters
60 of No. 32	32 of No. 32	200 to 118
33 of No. 24	15 of No. 32	118 to 69
20 of No. 18	10 of No. 32	69 to 40
10 of No. 18	10 of No. 32	40 to 24
4 of No. 18	7 of No. 28	24 to 15

If regeneration fails, leave the detector coil as it is, but transpose the external connections to it.

LIST OF PARTS

Coils

- One set of coils as described, for antenna and interstage.
- One 300-turn honeycomb coil.

Condensers

- Two 0.00014 mfd. junior midline tuning condensers.
- One 0.0002 mfd. junior midline tuning condenser.
- Two 0.00035 mfd. fixed condensers.
- One shielded block containing three 0.1 mfd. condensers (black, common, to A minus; reds interchangeable).

Resistors

- One 0.05 meg. pigtail resistor (50,000 ohms).
- Two 4-ohm filament resistors in series, to constitute 8 ohms.

Other Requirements

- One 7x10 inch bakelite front panel.
- One 9x7 7/8-inch wooden baseboard.
- Four UX sockets (two for tubes, two for coil receptacles).
- Two knobs, one for r-f condenser, other for feedback condenser.
- One vernier dial.
- One push-pull A battery switch.
- One binding post strip with eight posts on it.
- One -34 tube and one -30 tube.
- Two No. 6 dry cells to be connected in series for 3-volt A battery.
- Three 45-volt B batteries.
- One pair of earphones.

to the cathode, leaving the other free. If the tone is satisfactory, no condenser is needed. If it is too high, connect a small condenser, say 0.001 mfd., across the terminals. If the tone is still too high in pitch, connect a larger condenser. Without a condenser it may be that the pitch will be above the audible limit. Hence if no sound is heard connect a condenser of a convenient value. If no sound is heard regardless of the condenser value, try a new tube, check the filament voltage, or increase the plate voltage. There is no chance that the tickler is reversed if the cathode of the tube is connected to the tap on the coil, so that can be dismissed as a possible source of trouble. It is seldom that an oscillator of this kind fails to work. As a rule, there is only one possible cause for failure, excessive capacity across the winding.

An A-F Oscillator Choke

Pitch Between 500 and 2,000 Cycles Obtained

By Paul Erwin

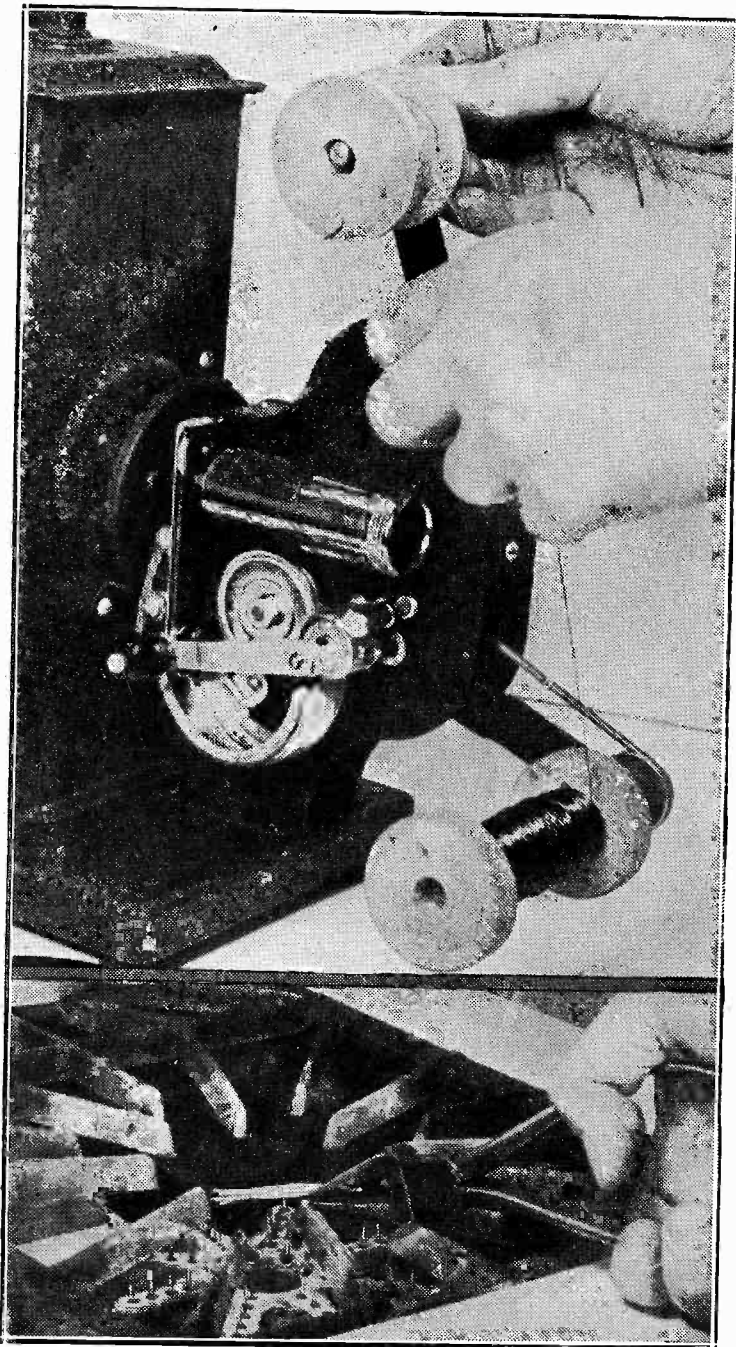


FIG. 1

(Upper)—A home movie projector makes an excellent coil winding machine by using the film re-wind mechanism.

(Lower)—Iron wires for the core of the audio oscillator coil should be annealed by heating them to dull red temperature over a gas flame.

WHEN AN audio frequency oscillator is to be constructed the recommendation is usually made that an old audio frequency be used as the inductance. The only reason is that there is no other suitable coil available. There is one objection against using an audio transformer, and that is that the frequency generated is usually too low, especially if the oscillator is to be used for modulating a radio frequency oscillator. The better the audio transformer is, as such, the lower the frequency is likely to be when it is used for an audio oscillator. The reason for this is that it takes a very high inductance to make a good audio frequency transformer.

What is needed for an audio oscillator is a comparatively low inductance so that with a small condenser across one of the windings, or across both, the oscillation frequency will be

somewhere between 500 and 2,000 cycles per second. A transformer of this kind is very easily made.

Making Audio Oscillator Transformer

Start with a wooden spool having a winding space about 0.5 by 1 inch, about $\frac{3}{4}$ or 1 inch inner diameter. There should be a hole through the center of this spool about 0.5 inch in diameter. Between the inside of the winding space and the center hole there should be a little space as practicable so that the wire will start near the center.

Fill the winding space with enameled wire using a total of about 2,000 turns. Bring out a tap at the middle turn. Jumble winding will be all right. The size of wire to use depends on the space available. No. 32 enameled wire should be all right. The size does not really matter, for even as fine as No. 40 would work. However, if the wire is too heavy enough turns cannot be put on, and if it is too fine the coil will not be as good for oscillation. No. 32 is a good average.

After the wire has been put on the spool bring the terminals to soldering lugs, which may be attached to the form by means of small wood screws. There will be three of these, one for each terminal and another for the center tap.

Using Iron Core

The inductance of the coil will not be high enough unless an iron core is used. To make this a large number of short lengths of iron wire should be put through the hole in the center of the spool, filling the space as nearly as possible.

If the core wires are long enough they may be bent around the outside so that the spool is entirely covered with iron when the coil is finished. However, this is not necessary, as the inductance will be high enough if the core wires are just the length of the spool so that the ends will be flush. The method is entirely optional.

The core will be better if soft iron is used. Therefore after the wires have been cut to the desired length they should be annealed by heating them to a dull red over a gas flame. How this is done is shown in the lower part of Fig. 1. After the wires have been heated to a dull red temperature let them cool slowly. After they have cooled off insert them in the central hole in the spool.

If the wires are long enough to bend around on the outside, tie them together with tape. If they are short and just the length of the spool, melt some sealing wax and pore it into the spaces between the wires. This is just to hold them in place and to keep them from vibrating. If the wires are long enough to bend around the outside care must be taken to insulate the three leads and bring them out through the wires.

Winding the Coil

It is a somewhat tedious task to put on 2,000 turns of fine wire by hand. A winding machine of some kind will help a great deal. In the upper part of Fig. 1 is shown how one man solved the problem of winding. He had a home movie projector which he converted to a winding machine. He removed the reels intended for the film and in one place he put the spool to be wound and on the other the spool of stock wire. He then used the crank intended for rewinding the film for winding the spool. This arrangement works like a charm.

Perhaps not many will have a device of this kind, but then there are many other devices which will serve the same purpose. One is an ordinary hand drill. Mount this in a vise so that the spindle is horizontal and so that it turns freely as the handle is turned. Rig up a chuck which will hold the spool and insert it into the chuck of the hand drill. The spindle will turn faster than the handle but there is a definite ratio, and this ratio can be determined before the winding begins. After this ratio is known it is only necessary to count the number of revolutions of the handle to count the turns. In one case the ratio was 4.4. Hence to put on about 2,000 turns with this it would be necessary to turn the handle 455 times.

Wiring the Oscillator

If a lathe is available the winding can be done with this easily. There should, however, be a provision for quickly stopping the lathe in case the stock wire should become entangled. This often happens, especially when the stock spool is not mounted so that it will turn freely as required.

Three terminals only were provided in this coil. This means that it should be used in a Hartley oscillator, which is one of

(Continued on next page)

T-R-F in Short-Wave Set

Battery-Operated Two-Tube DX Model

By Fred Warren

CAN you dig up a couple of four-prong sockets around the house somewhere? I thought so. Some tube bases? Well, why hold onto burnt-out tubes? Why not knock the envelopes off and use the bases? Quite so. A trio of tuning condensers of some kind handy? Well, one of them may be of almost any size from 0.0002 mfd. up. The other two had better be 0.00014 mfd., so perhaps you'll have to buy them, or you can put a 0.00025 mfd. fixed condenser in series with each of two 0.00035 mfd. variables that you have, and the net result would be 0.000145 mfd. for each, which is fine and dandy.

Now you have most of the electrical parts for a two-tube battery-operated short-wave tuner that affords most excellent earphone results. If loudspeaker operation is your goal you will find an article on that type set, with full scale picture diagram, in the April 16th, 1932, issue.

It is all so very simple and easy, costs so very little, that whoever has not owned a short-wave device had better build this one now. Results in Summer from Europe are especially good.

Old-timers know that a circuit like this one is utterly reliable, and when it comes to short waves, a most dependable circuit is the only one that is worth any attention.

Equal Coils in Two Tuned Circuits

The coils you can wind yourself, and the data are given for five coils for 15-200 meters, the overlap being considerable, as many novices will build such a circuit, and if the wire is wound a bit unevenly or attains an unexpectedly large winding (axial) length, there'll be no harm. Commercial coils for such a circuit consist of four, because more accurately wound, but the results are just as good with one or the other.

All told, then, you will use ten home-made coils, or eight factory-made coils, for any one frequency span requires two coils, one for the grid circuit of the r-f pentode amplifier, the other for the plate circuit. Individual coils in a pair are equal.

You must have separate tuning condensers for the grid and plate circuits, for that method keeps the B battery resistance out of the tuned circuit and avoids conflict of d-c voltages, one condenser being grounded to A minus and the other grounded (on an r-f basis) to B plus 135 volts. Moreover, the two circuits will not tune identically. The grid circuit tuning condenser may be actuated by a knob, but the plate circuit condenser should have a vernier dial. Therefore the plate circuit tuning is relied on for calibration.

The layout of parts and the wiring are shown clearly in the picture diagram (front cover), while the schematic may be used for wiring reference, as it coincides in all particulars.

In tuning the set, work the vernier dial slowly, meanwhile more rapidly turning the r-f tuning condenser knob back and forth, and in this way stations will be located. After this is done a tuning curve should be drawn up on graph paper, or at least a list of dial setting and frequencies prepared. Then a list of shortwave stations, giving hours on the air, should be consulted, and stated time accommodated to local time. Merely "fishing" for short-wave stations, instead of trying to tune them in by frequency at schedule, is rather disappointing.

Coil Instructions

The coils should be wound so that as to any one coil the windings are in the same direction. Begin at the top and connect G of the coil form, winding the tuned inductance and terminating at F minus. Leave just enough space to clear, then put on the smaller winding, beginning connected to P of the coil form, end to F plus. As you hold the form upright, filament (large) pins at bottom toward you, F minus is at left, F plus at right, and grid behind F minus and plate behind F plus. Grid, plate, F plus and F minus have no reference to anything but the coil form in these data.

There will be considerable overlap, but that is unobjectionable.

(Continued from preceding page)

the simplest and most dependable. Using a heater type tube connect on terminal to ground, the tap to the cathode, and the other terminal toward the grid of the tube. Not directly to the grid, but toward the grid. Put a condenser of 0.5 mfd. capacity between the grid and the coil and use a 100,000 ohm grid leak between the grid and the cathode. The plate voltage, from 22.5 to 90 volts, should be applied between the plate and ground.

The tuning condenser should be connected across the entire coil, that is, from the grid to ground terminals. The capacity required depends entirely on the frequency desired and on the inductance of the coil. First use no condenser at all. Listen in with a headset by connecting one terminal of the phones

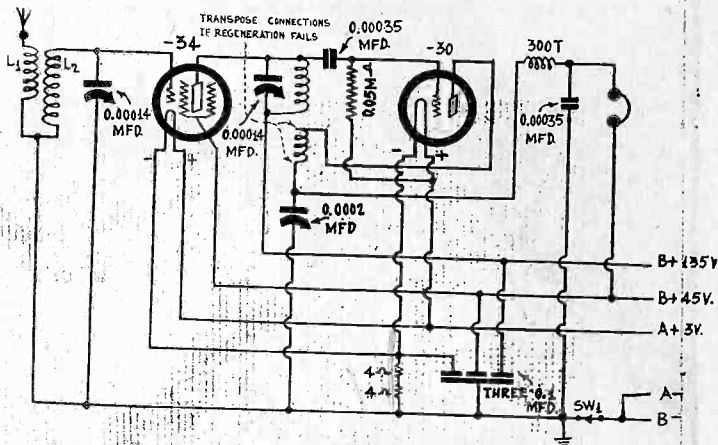


FIG. 1

Two tuned circuits and a feedback relationship in the detector stage characterize this earphone short-wave tuner.

if the following data are used, the statement of meters being approximate, but very conservative:

Grid Coil No. Turns, Enamel	Plate Coil No. Turns, Enamel	Approximate Range, Meters
60 of No. 32	32 of No. 32	200 to 118
33 of No. 24	15 of No. 32	118 to 69
20 of No. 18	10 of No. 32	69 to 40
10 of No. 18	10 of No. 32	40 to 24
4 of No. 18	7 of No. 28	24 to 15

If regeneration fails, leave the detector coil as it is, but transpose the external connections to it.

LIST OF PARTS

Coils

- One set of coils as described, for antenna and interstage.
- One 300-turn honeycomb coil.

Condensers

- Two 0.00014 mfd. junior midline tuning condensers.
- One 0.0002 mfd. junior midline tuning condenser.
- Two 0.00035 mfd. fixed condensers.
- One shielded block containing three 0.1 mfd. condensers (black, common, to A minus; reds interchangeable).

Resistors

- One 0.05 meg. pigtail resistor (50,000 ohms).
- Two 4-ohm filament resistors in series, to constitute 8 ohms.

Other Requirements

- One 7x10 inch bakelite front panel.
- One 9x7 7/8-inch wooden baseboard.
- Four UX sockets (two for tubes, two for coil receptacles).
- Two knobs, one for r-f condenser, other for feedback condenser.
- One vernier dial.
- One push-pull A battery switch.
- One binding post strip with eight posts on it.
- One -34 tube and one -30 tube.
- Two No. 6 dry cells to be connected in series for 3-volt A battery.
- Three 45-volt B batteries.
- One pair of earphones.

to the cathode, leaving the other free. If the tone is satisfactory, no condenser is needed. If it is too high, connect a small condenser, say 0.001 mfd., across the terminals. If the tone is still too high in pitch, connect a larger condenser. Without a condenser it may be that the pitch will be above the audible limit. Hence if no sound is heard regardless of the condenser value, try a new tube, check the filament voltage, or increase the plate voltage. There is no chance that the tickler is reversed if the cathode of the tube is connected to the tap on the coil, so that can be dismissed as a possible source of trouble. It is seldom that an oscillator of this kind fails to work. As a rule, there is only one possible cause for failure, excessive capacity across the winding.

How to Calibrate an RF Oscillator Stations M

By Brun

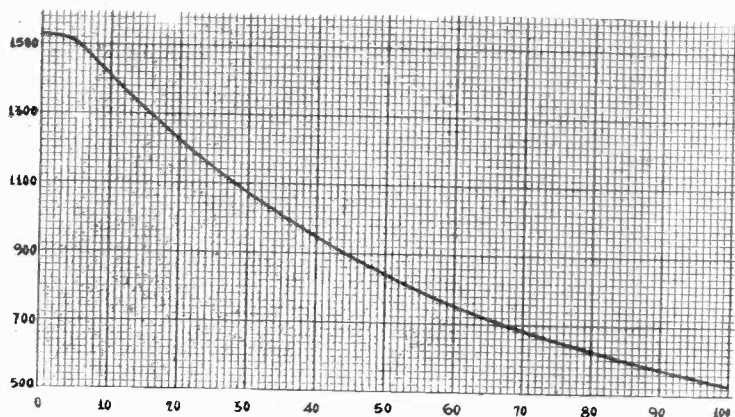


FIG. 1

The calibration curve of an oscillator covering the broadcast band. Each major division on the frequency scale represents 200 kc. The scale would be more convenient to read if it were doubled.

QUITE frequently we have said "calibrate the oscillator" and almost as many times we have described in detail how to do it. Nevertheless we receive, in nearly every mail, complaints that we are always saying "calibrate the oscillator" but that we never say how it should be done.

The trouble seems to be that if we do not follow up every "calibrate the oscillator" with a complete outline how to do it, without interposing a single paragraph, we have never told how.

It is with the hope that some of those who have complained will see the following paragraphs that we repeat how to calibrate an oscillator. But let it be understood that in telling how to calibrate an oscillator we cannot tell how to build an oscillator, or how to build a power pack, or an automobile receiver, or to explain how an oscillator works, or to discuss any other subject. We shall try to stick to the main subject, that of calibrating an oscillator.

The Oscillator Is Built

Since we are to tell only how to calibrate an oscillator we must assume that the oscillator to be calibrated has been built and that it is ready for calibration. To be specific, we shall assume that it is a broadcast oscillator. We shall take up other oscillators later in this article.

First, besides the oscillator to be calibrated we must have something against which to calibrate it, something with which to compare it. Since we are to calibrate a broadcast oscillator we shall assume that we have access to a number of broadcast stations of known frequencies. We may get access to a large number of them with any ordinary radio receiver. Our next assumption is that such a receiver is available. Not any particular broadcast receiver but any receiver with which we can pick up a few stations the frequencies of which we can identify. The more broadcast stations that can be picked up with the receiver, and the frequencies of which can be learned, the easier will be our task.

On a sheet of paper write down all the broadcast frequencies from 550 to 1,500 kc, and allow a few extra spaces for lower and higher frequencies.

Start the broadcast receiver and tune in a station that can be identified as to frequency. Start the oscillator to be calibrated. Place the oscillator near the broadcast receiver. If necessary, run a wire from the antenna and place it near the oscillator coil, without actually connecting it either at the antenna or at the oscillator. Now turn the dial on the oscillator from one end to the other. At some point there will be a loud squeal in the loudspeaker. There may be many points at which squeals will be heard but pay attention only to the loudest. If that squeal is entirely too loud for comfort move the wire mentioned away from the oscillator coil. Adjust the oscillator dial very carefully for zero beat with the selected

station. Note the dial setting on the oscillator at which the zero beat occurs. Set this dial reading down opposite the frequency on the list previously prepared. The point of zero beat is that point from which the oscillator dial cannot be turned in either direction without causing a loud squeal, beginning with a low growl and going up in frequency until the sound passes the audible limit.

Getting Other Points

Thus we get one point on the calibration chart, the data from which chart are later to be used in constructing a calibration curve. Next turn the broadcast receiver to some other station and again find the point of zero beat. Put the new dial reading opposite the frequency of the station tuned in. We have got two points. Repeat this process for as many points as desired, or for as many points as can be found. The only limitation is the number of different broadcasting stations that can be picked up with the receiver. We set down all the frequencies in the broadcast band in our list because with a good receiver we can pick up most of them, and because we do not know beforehand just which stations can be picked up.

It is not necessary that we should pick up stations on all the channels. It is sufficient if we pick up one out of every five. This is especially the case if we are to plot a curve, but if we can pick up most of them there is nothing against doing it, except that it takes a lot of time. The points we do get, however, should be well distributed so that there will not be any wide gaps.

In drawing a calibration curve from a set of data we can always make a fairly good guess, but we do not know where the curve should be unless we have many points close together. It is always safe, however, to assume that the curve is regular and that it has no sharp kinks in it. As a matter of fact, if there is a kink in the curve it is a safe bet that it is the result of an error either in reading the dial or in recording the point on the graph. Or it may be that we did not have the station we thought we had. A check of every irregularity should be made and it should not be accepted unless all the checks confirm it.

How to Draw the Curve

Now we cannot go into detail about the drawing of the curve. That is another subject and comes properly in analytic geometry. The best we can do is to show a typical calibration curve, obtained from a calibration just like the one we have just described. But we can offer a few suggestions.

Enter all the data obtained, that is, all the frequencies and the corresponding dial settings, and locate the points accurately on cross-section paper. Don't use a blunt pencil for making the points. A sharp one works better. Also, don't use a soft pencil, but a moderately hard one. A soft pencil will cause a dirty smear and will introduce a great uncertainty of the location of the point.

When all the data have been entered on the cross-section paper in the form of small and neat points, draw a smooth curve through all the points. Use the hard and sharp pencil so that the line will be clean and neat. A smooth curve cannot easily be made with a short pencil. A long one will yield a much better line.

Before drawing the line it is well to sight along the row of dots to note whether they are regular. By sighting, it is easy to tell whether a point is off. If there is a kink in the row of dots, check it immediately. If there is no error in the frequency or in the location of the dot, then check points near it, or take this particular point over again with the oscillator and the broadcast set. Draw the line only when the location of every point is certain.

Checking the Curve

After the line has been drawn, sight along it again. Any errors in drawing can be detected easily. There is always a tendency to curve the line too much between points, especially when a short pencil is used. Also, it is well to sight along the line while actually drawing the curve. In case the line should not "sight" well after it has been drawn, rub it out in spots and draw it in the right place. But don't rub the dots out

Be Used as Primary Standards

Brunn

unless they are out of place. The closer the dots are together in the first place the less the chance of deviation from the true line between the dots.

After the curve has been drawn as accurately as possible it is well to check it at doubtful points or at points for stations not previously used. For example, suppose two points have been obtained at 600 and 660 kc but no point in between. The curve may be slightly off at 630 kc, or at any of the other channels between the two. Set the oscillator just calibrated at the dial reading called for by the curve and then tune in the station in question by means of the broadcast set and note whether or not the heterodyne can be heard. In case no broadcast station can be tuned in between the two points, use a harmonic station. It may be, for example, that no station can be received at 630 kc but one can be at 1,260 kc. If the higher frequency station can be identified it is just as good as that of 630 kc for the test.

Extending the Curve

It should not be expected that the setting will be exactly at zero beat, but the heterodyne should not be more than 2,000 or 3,000 cycles in pitch. Of course, just how much allowance should be made depends on how closely the dial can be set and read.

In case the oscillator being calibrated extends lower than 550 kc, or lower than any broadcast station that can be received and identified, the curve may be extended by the method of harmonics. Suppose we find that 550 kc comes in at 90 on the oscillator dial. Then we have no broadcast station by which we can calibrate between 90 and 100 on the dial. But we can tune the broadcast receiver to the second harmonic of the frequencies below 550 kc. Let us set the oscillator dial at 95 and then turn the broadcast set dial from zero up. We may hear a heterodyne. Make this as loud as possible by tuning the broadcast set and then adjust for zero beat with the oscillator. Identify the station to which the broadcast set is tuned and find its frequency. The oscillator is then generating a frequency half of that of the station. Enter this frequency against the exact dial setting of the oscillator on the curve. It may be that we found that the broadcast station had a frequency of 1,060 kc. The frequency of the oscillator is then 530 kc.

Extending the Range Upward

In like manner we can find other points between 90 and 100 on the dial of the oscillator. It is important to take points as near hundred as possible because the curve is irregular from about 95 to 100. That is, the rate of change of frequency with dial settings is not the same in this region as at other points. With many condensers there is practically no change in frequency between 95 and 100 and in most cases the change is not more than 2,000 or 3,000 cycles.

In case the oscillator goes higher in frequency than the broadcast band, the calibration can be extended down to zero on the dial in exactly the same way as it was extended downward in frequency. It may be that the oscillator goes up to 2,000 kc while the highest available broadcast frequency is only 1,500 kc. In such cases we can use harmonics of the broadcast stations and beat them against the fundamentals of the oscillator. If we have available a station of 1,000 kc and tune the set to this, the oscillator will cause a heterodyne with it when the oscillator is set at 2,000 kc. Thus we can locate the 2,000 kc point. In like manner we can locate any other frequency between 2,000 and 1,500 kc. Indeed, we are not limited to 1,500 kc. We can calibrate a large part of the oscillator by means of second harmonics. If the lowest frequency of the oscillator should happen to be 600 kc and the highest 2,000 kc, we can use second harmonics of broadcast stations from 2,000 to 1,200 kc, or we can use first harmonics from 600 to 1,500 kc. Thus between 1,200 and 1,500 kc we have a double check.

Calibrating an I-F Oscillator

So far we have used only first and second harmonics. We can also use higher harmonics if necessary, for getting both higher and lower frequencies. However, as the order of the harmonics goes up it becomes more difficult to tell which harmonic we are dealing with.

In calibrating an intermediate frequency oscillator against

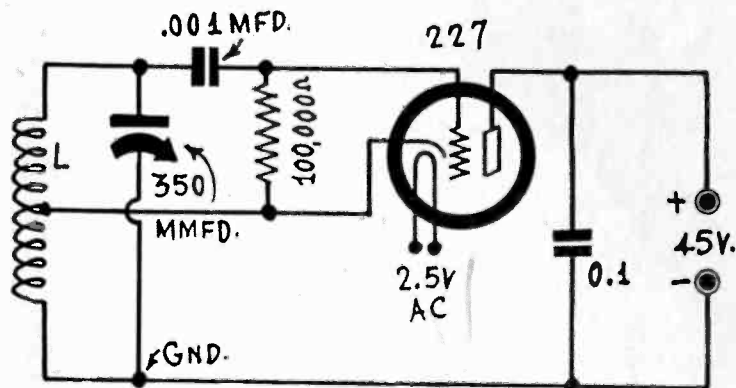


FIG. 2

A simple oscillator circuit which may be used as an aid in calibrating another oscillator or it may itself be calibrated permanently. The coil L depends on the frequency to be covered.

broadcast station frequencies we must use higher harmonics, this time of the oscillator we are calibrating. But the process is exactly the same as before. Let us suppose that the oscillator covers a range of frequencies from 150 to 450 kc. In such a case it is easiest to start calibrating at the higher frequency because it is nearer the broadcast band. We know that the second harmonic of 450 kc is 900 kc, which is in the broadcast band. We also know that the second harmonic of 275 kc is 550 kc. Hence we can use second harmonics of the oscillator and beat them against the fundamentals of broadcast stations between 275 and 450 kc.

If we start at the higher frequency end of the oscillator we should first tune in a station around 900 kc. Then we should turn the oscillator dial slowly to observe the points at which squeals are heard. Several will undoubtedly be heard, and they bear a definite relation to the broadcast, namely 1/2, 1/3, 1/4, 1/5, and so on.

Thus if we actually have a broadcast station of 900 kc, we have the frequencies 450, 300, 225, 180, and 150 kc, provided that our oscillator covers the band from 450 to 150 kc. But there will be many other points at which squeals will be heard and we are not absolutely certain which frequencies we have. We may decrease the uncertainty by tuning in a station of 750 kc and again turn the oscillator dial. Now we should hear squeals at 375, 250, 187.5, and at 150 kc. One of these points is common to the two sets, which is a check. Selecting a frequency of 600 kc we would get squeals at 300, 200, and 150 kc. All of these were contained in the first set and therefore we have three additional checks. If we select a few more broadcast stations and find the corresponding settings on the oscillator for the different harmonics we not only get additional points on the oscillator but also additional checks. When we have got a large number of points on the oscillator we plot the curve in the same way we plotted the curve for the broadcast range oscillator. All the points should lie on the curve if we have selected the right harmonics. It is clear that we can get about as many points as we like for every broadcast frequency will provide several.

Calibrating With a Calibrated Oscillator

If we have a calibrated oscillator covering the broadcast band we can calibrate the i-f oscillator much more easily, and we shall be more certain of our frequencies. Suppose the i-f oscillator goes up to about 450 kc. We set it at this point and then turn the dial of the calibrated broadcast oscillator from maximum setting of the condenser to the minimum. The first squeal we hear may be due to the second harmonic of the low frequency oscillator. The second squeal may be due to the third. From the calibration curve of the broadcast oscillator we look up the two frequencies. Divide the lower of the two

(Continued on next page)

Broadcast Oscillator Well Worth Having

(Continued from preceding page)

by 2 and the higher by 3. In each case the quotient should be the same, and it should be the frequency of the i-f oscillator. As an additional check subtract the lower from the higher and the difference should be equal to the quotients obtained before. This check is definite. Another way of going about it is to subtract the lower from the higher of the two broadcast frequencies and then divide the two by the quotient. In one case the quotient should be 3 and in the other 2.

Getting Other Points

The same method can be used for obtaining the frequency for any other setting of the i-f oscillator. The difference between two consecutive settings of the broadcast oscillator should be equal to the frequency of the i-f oscillator. But in dividing the other frequencies by the difference we may get the numbers 2 and 3, 3 and 4, and any other two consecutive integers. After one frequency of the i-f oscillator has been obtained, it is better to get the rest by sticking to the same harmonic. This is easily done if we don't move the dial of the i-f oscillator more than 5 divisions at a time. Thus we may stick to the second, the third, or any other harmonic.

In doing this, however, we will run off the scale of the broadcast oscillator at some setting of the i-f. In that case we have to change the harmonic to the one next higher by turning the condenser of the broadcast oscillator back until a squeal is heard. This change-over is best done on a frequency just before we run off the scale, for this will leave us a check. For example, suppose broadcast oscillator is set at 570 kc and we are working on the second harmonic. The i-f oscillator is then generating a frequency of 285 kc. The third harmonic of this is 855 kc. Hence the broadcast oscillator should be set at zero beat on 855 kc. From now on we use the third harmonic, which brings us down to 183.5 kc, assuming that the broadcast oscillator goes only to 550 kc. After that we have to change to the fourth harmonic in the same way.

Construction Warranted

The advantage of a calibrated broadcast oscillator warrants the construction of such an oscillator before beginning the calibration of the i-f oscillator. It serves as an intermediary between the standard (broadcast frequencies) and the oscillator to be calibrated, and it can be used just as advantageously for calibrating oscillators of higher frequency than the broadcast range. It does not have to be elaborate in construction, not permanent. In Fig. 2 we show a circuit of a suitable oscillator together with the proper values to use. Of course, the circuit can be used for any oscillator, temporary or permanent, by changing the coil values. For the coil L 127 turns of No. 32 enameled wire on a one inch form may be used. The tap should be placed so that 70 turns are in the grid circuit and 57 in the plate circuit. That is, 57 turns should be between the cathode and ground.

If the coil is unshielded no pick-up winding need be used as there will be enough radiation from it for the purpose to which it is to be put. If it is shielded about 10 turns should be put on near the ground end. Two separate binding posts or leads should be provided for this winding. Ground the circuit where indicated both while calibrating it and while using it thereafter. A good dial should be put on the variable condenser because the calibration cannot be any better than accuracy with which the dial can be set and read.

Choice of Scales

The choice of scales for the curve on the cross section paper sometimes offers difficulty. The scale should not be selected until the entire frequency range of the oscillator has been obtained. Then it should be selected so that as much of the sheet as possible is used, provided the scale is easily read. Every division on the paper should be made to represent 5, 10, 20, 100, or some other convenient number of kilocycles. It is awkward to make each division represent 8, or 4, or some such number of kilocycles.

The choice of scale for the dial readings is determined by the number of divisions on the dial. Presumably it is 100. For such a dial there should be ten full major divisions on the paper. Start with zero in the lower left corner of the paper and number the main divisions consecutively to the right, from zero to 100. There will be at least 10 small divisions for each of the larger so that there will be one small division for each division of the dial. This is a very convenient scale for the dial readings.

Selection of Cross Section Paper

The scale in the frequency direction depends on the total frequency coverage as well as the number of major divisions available in that direction. Cross-section paper can be found

Auto Set, Short Waves, Television Reviewed

A very timely and instructive paper is given by Leslie F. Curtis, United American Bosch Corporation, Springfield, Mass., on "Electrical Interference in Motor Car Receivers" in the April issue of "Proceedings" of the Institute of Radio Engineers. The main sources of interference are pointed out and electrical diagrams of the equivalent circuits given.

Interference originates in spark discharges (a) at the spark plugs, (b) at the high tension distributor or at poorly connected leads in its circuit, (c) at the low tension interrupter, or (d) at the generator brushes. Many suggestions are given for the suppression of the various types of interference and special attention is given to stubborn cases. This paper is highly important and should be studied by every one who designs, builds, or installs receivers in automobiles.

Short-Wave Data

Those interested in short-wave reception will learn a great deal about the vagaries of short waves by reading an article on "Some Effects of Topography and Ground on Short-Wave Reception," by R. K. Potter and H. T. Friis, American Telephone and Telegraph Company and Bell Laboratories.

The paper contains some results of an experimental study of the effects which ground and its irregularities have upon short-wave signal reception. The advantage of selecting a suitable site for the receiver is clearly shown by the data. Amateurs and fans who have trouble getting certain short-wave stations may find the answer to their problem by reading this paper. Their trouble may be one of local topography.

Television Amplifier

Henry M. Lane, of "The Boston Post," Boston, Mass., discusses "Resistance-Capacitance Coupled Amplifier in Television." The paper is particularly devoted to the solution of amplification of transients, such as are encountered in television signals. In most cases only the steady-state solution is given, but in this case the solution is complete. The summary sets forth:

"The amplifier response to the unit impressed voltage is shown to be of an oscillatory nature. The amplifier performance will be good provided the duration of the first positive swing of its response to unit impressed voltage is long compared with the duration of the actual signal impulse. In general, the greater the time constant of the amplifier, the better. The indication is that the greater the scanning speed the better the amplifier performance."

These conclusions are based on the particular conditions assumed and do not necessarily hold in general. No account was taken of shunt capacities but only of series capacities. Shunt capacities would naturally lead to conclusions directly opposite. Hence in a practical amplifier the conclusions would be somewhat modified.

In last week's issue, April 30th, the other articles in the April "Proceedings" were reviewed, e. g.: "Empirical Standards for Broadcast Allocations," "A Simple Harmonic Analyzer"; and "Acoustical and Electrical Power Requirements for Electric Carillons."

which is a little longer in one direction than in the other. For example, one paper has 10 divisions in one direction and 12 in the other. We would naturally choose the longer direction for frequency.

Let us assume that our oscillator covers the range from 530 to 1,550 kc. The difference is 1,020 kc. If we let each of the major divisions represent 100 kc we need a little more than 10 such divisions. In fact, if we start from 500 kc we still need less than 12. Therefore we can start at the lower left corner with 500 kc and then number each major division in the vertical direction 600, 700, 800 kc, and so on. Most of the paper will then be used and the scale will be convenient to read.

New Patents

A recent patent covers a circuit tunable throughout a frequency range and adapted primarily for coupling a capacity type antenna to the input of a thermionic tube, comprising a tunable secondary circuit having coupled thereto a primary circuit including inductance sufficient to resonate with a certain antenna capacity at a frequency fixed at about the lowest frequency of said tunable range, and shunt resistance associated with said primary circuit sufficiently high in maximum magnitude to have an inappreciable effect upon the operation of said coupling circuit when connected to an antenna having said certain capacity, said magnitude being sufficiently low to prevent serious detuning for a given frequency adjustment of said tunable secondary circuit when said primary circuit is connected to an antenna of less than said certain capacity.

A Question and Answer Department conducted by Radio World's Technical Staff. Only Questions sent in by University Club Members are answered. Answers printed herewith have been mailed to University Members.

Radio University

To obtain a membership in Radio World's University Club for one year, send \$6 for one year's subscription (52 issues of Radio World) and you will get a University number. Put this number at top of letter (not envelope) containing questions. Address, Radio World, 145 West 45th Street, New York, N. Y.

Annual subscriptions are accepted at \$6 for 52 numbers, with the privilege of obtaining answers to radio questions for the period of the subscription, but not if any other premium is obtained with the subscription.

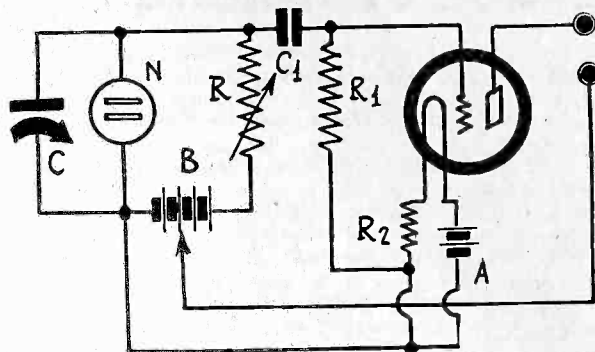
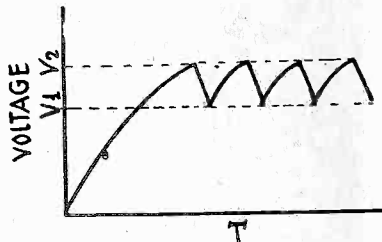
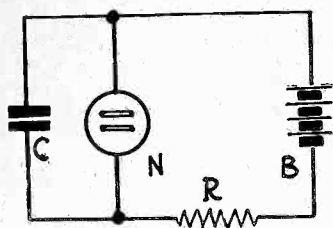


FIG. 1,006

These illustrate the use and principle of the neon tube oscillator. The left figure is a simple oscillator; the right the same oscillator coupled to an amplifier. The middle shows the mode of oscillation.

Principle of Neon Tube Oscillator

PLEASE PUBLISH the circuit of a neon tube audio oscillator and explain the principle on which it works. I have a neon tube and I wish to try the oscillator in conjunction with stroboscopic work.—R. B. B., Rockford, Ill.

You will find circuits in Fig. 1,006. That at the left is a simple neon tube oscillator, that in the middle is a graph illustrating how the tube oscillates, and the circuit at the right shows how the output may be impressed on an amplifier. The battery B must have a voltage slightly greater than the ionization voltage of the tube. It must be adjusted very closely or the circuit will not oscillate. The rate of oscillation is determined by C and R. C charges slowly through the resistance R until the voltage across the condenser, and hence across the tube, is equal to the ionization voltage. The condenser will then discharge rapidly through the tube until the extinguishing voltage is reached. Then the process starts over again.

* * *

Excessive Pick-up

WHAT IS likely to happen if the voltage impressed on the mixer tube in a superheterodyne is greater than the grid bias on that tube so that the grid is positive part of the time?—G. W. J., Newark, N. J.

There is likely to be cross-modulation and excessive squealing in the output of the set. Correct adjustment of the pick-up is very important. In case there is too much coupling the number of turns on the pick-up coil should be reduced or else the turns should be put farther away from the tuned winding. To test whether there is excessive pick-up the grid current may be measured. This measurement should be made when no signal is impressed on the first detector other than that from the pick-up coil. There should be no grid current. The test should be made at several settings of the oscillator condenser, especially at the two extreme positions.

* * *

Effect of Potentiometer on Selectivity

I HAVE observed that when a potentiometer of 5,000 ohms is connected across the primary of the first r-f transformer for controlling the volume the selectivity of the circuit is not as good as when no resistance is across the winding. Why is this? It seems to me that since the resistance is not in the tuned circuit it should not affect the selectivity.—F. W. K., Portland, Ore.

Since the resistance closes the primary it forms a circuit in which current can flow. This produces a power loss. Any power loss is equivalent to a resistance in the tuned circuit. This is stated in a general way. To state it more precisely it would be necessary to express the conditions mathematically. The point is that any circuit coupled to the tuned circuit, and in which current flows, produces the effect of additional resistance in the tuned circuit. The way to overcome the effect is to use a high value of resistance.

* * *

Cathode Current

IN A SCREEN grid tube is the cathode current different from the plate current? If so, in what way does it differ?—P. C., Bronx, N. Y.

The cathode current is the sum of the plate and the screen currents. If the grid takes current because it becomes positive,

the grid current is also added to the cathode current. The cathode is the electron emitter and is the source of all current, provided that there is no secondary emission from any of the other elements.

* * *

Making an Audio Oscillator

RECENTLY you have shown simple oscillators of the Hartley type. I have tried them using audio transformers but the frequency has been entirely too low, even when I used no condenser across the transformer windings. It occurred to me that I might use a relay magnet winding instead of the transformer. This relay has an iron core about half inch in diameter, but it is wound with heavy wire. I doubt that the inductance is high enough. What could be done about rewiring?—L. W. S., Houston, Tex.

If you remove the old wire and put on a lot of fine wire you ought to get enough inductance. Bring out a tap at the middle of the winding or from a point a little to one side. You should either remove the armature of the relay or else lock it so that it cannot move around.

* * *

Auto Set for Positive Grounding

WILL YOU kindly publish a circuit of an automobile receiver like your eight-tube superheterodyne that can be used on either negative or positive grounding of the car battery without any rewiring? I assume that it is possible to build such a circuit.—W. H. B., Harrisburg, Pa.

You will find such a receiver elsewhere in this issue. The description is not complete because most of it would be merely a repetition of the 631 automobile set. (February 13th issue). Tuning coils and condensers are the same. The only way in which the circuits differ is in the fact that in the "universal" all tubes are self-biased. A few additional parts are needed but not many. If the values of bypass condensers differ in the two circuits, it means that they are not critical. As a rule, more bypassing is needed in a circuit that is self-biased throughout than in one in which the bias is obtained from the storage battery. Yet a set that is self-biased is likely to pick up less noise from the ignition system in the car.

* * *

Design of Superheterodyne Oscillators

IN SOME superheterodyne oscillators the series padding condenser is connected above the tuning condenser so that the voltage across both is impressed on the grid. In others it is connected so that only the voltage across the tuning condenser is impressed on the grid. In this case it seems to me that oscillation may not always take place. What would happen, for example, if the coil and the series condenser resonated? No voltage at all would be impressed on the grid, would it?—H. B. A., Greenwich, Conn.

If the series condenser is larger than the largest value that the tuning condenser capacity we may assume there will be no serious difficulty. If, however, the tuning capacity should be larger than the series capacity the voltage across the tuning condenser may be zero. Hence the circuit would not oscillate. No doubt, there is a region about this point where no oscillation could take place.

WATCH IS KEPT ON AMATEURS' USE OF 'PHONE

Washington.

The monitoring stations of the Department of Commerce, under the supervision of the Radio Division, will test the frequencies used for amateur 'phone work on the so-called 20 and 80-meter bands, in the same manner that these monitoring activities encompass broadcasting stations. The reason is that there have been some violations of a rule promulgated recently, restricting the 'phone work in these bands to amateurs holding an unlimited license, for which an examination must be taken. The phone transmissions are confined to 3,300-4,000 kc and 14,150-14,250 kc.

The amateur bands as at present constituted, with 'phone restrictions, are as follows:

GENERAL		
Kilocycles	Meters	License
1,750—2,000	171.3 — 149.9	Regular
3,500—4,000	85.66 — 74.96	Unlimited
7,000—7,300	42.83 — 39.98	Regular
14,000—14,500	21.42 — 20.68	Unlimited
28,000—30,000	10.708 — 9.994	Regular
56,000—60,000	5.345 — 4.997	Regular

'PHONE RESTRICTIONS		
Kilocycles	Meters	License
1,875—2,000	159.9 — 149.9	Regular
3,900—4,000	76.88 — 74.96	Unlimited
14,150—14,250	21.18 — 21.04	Unlimited

Some Violations Heard

The new order requires that amateurs operating 'phone transmitters in the 20 and 80-meter bands take an additional examination to prove their fitness to use 3,900-4,000 kc and 14,150-14,250 kc for 'phone, because these are regarded as long-range frequencies, and unless there is strict adherence to frequency there will be interference not only in this country but in foreign countries, including Europe.

Some of the amateurs working 'phone in these two bands were found to be disregarding the new order, in one district where a check-up was made, and thereupon the general check-up was ordered by Director William D. Terrell, of the Radio Division. The minimum penalty for violating the new order is a suspension of license.

The regular amateur license permits 'phone operation on other bands, and of these only the lowest frequency band has a frequency restriction as to 'phone, and this a small restriction. The three other bands, open to holders of regular licenses, may be worked in their entirety with 'phone or code.

Remedy Recommended by A.R.R.L.

The new change, requiring the special unlimited license for the 20 and 80-meter bands, was put into effect after the problem of interference was taken up with the American Radio Relay League, the amateurs' organization, which recognized that special requirements would be necessary, and recommended the method adopted.

The Bureau has found the amateurs unusually co-operative in policing the air, and infractions of rules have been infrequent, considering that there are now more than 25,000 holders of amateur licenses. It is believed the present trouble is mostly the result of inadequate equipment, and not of any daring on the part of violators, hence that the situation will be remedied presently.

The bands themselves have not been narrowed, but the restrictions as to licenses for the use of phone on the two stated bands have been made more stringent.

Programs from Abroad Increase

Programs from foreign countries carried over National Broadcasting Company networks increased 175 per cent. during the first quarter of 1932 over the same period last year.

Among the speakers heard from abroad during the first quarter were President Paul von Hindenburg of Germany, Crown Prince Gustaf Adolph of Sweden, President Paul Doumer of France, Foreign Minister Dino Grandi of Italy, ex-President Jose Gil Fortoul of Venezuela, Chancellor Heinrich Bruening of Germany, Prince Potenziani, former governor of Rome, and delegates to the World Disarmament Conference from China, Japan, Germany, France, Italy and Great Britain, as well as many others prominent in world affairs.

EARL RECEIVER GETS 3 YEARS

Newark, N. J.

Three years in State prison for contempt of court was the sentence imposed on Harry G. Hendricks by Vice-Chancellor Backes following Hendricks' removal as co-receiver of the Earl Radio Corporation. Hendricks had been appointed by Vice-Chancellor Church and has served as receiver in sixteen cases.

C. Wallace Vail, counsel for the receivers in the Earl bankruptcy, had charged that there was a shortage of \$177,658. Vail stated that the deposit money should have amounted to \$322,228, but instead was \$144,566, distributed among three banks. Checks had been drawn by Hendricks, payable to himself and to the Livingston Sand and Gravel Company, amounting to more than \$100,000, Vail charged.

Oscar A. Klamer, the co-receiver, was on a trip in the Middle West when the charge was made against Hendricks. Klamer continues as co-receiver. It was Hendricks who had personal charge of the accounts.

Ralph E. Lumm, counsel for Hendricks, announced after the imposition of sentence that an appeal would be taken.

The Hendricks case is one of several instances that have prompted a committee of 100 to ask for revision of the bankruptcy practices, and meanwhile Chancellor Walker has delegated Vice-Chancellor Backes to draw up amendments to the law.

It is proposed that a receiver be permitted to act in only one case at a time, that the fees be set according to the basis for executors' fees in handling estates, and that no counsel be assigned to a receiver unless litigation is threatened.

Governor Moore, speaking at Trenton, said he would ask Chancellor Church himself to appoint all receivers until new regulations are in effect.

STUDIO NOTES

LOUIS SILVER first conducted an orchestra when he was fifteen years old. . . IRVING KAUFMAN made his first public appearance at the age of seven; he impersonated a Russian midget. . . ISHA JONES was born in Coalton, Ohio. . . MAX SMOLEN, the popular "Evening in Paris" orchestra leader, caught a fly ball on the end of his finger while playing ball with his son; his finger was swollen so severely he could hardly hold his baton, but it's okay now.

ONE OPERATOR SEIZED AS RUM RUNNERS' TOOL

The shores of Long Island are being carefully watched for illicit radio transmitters because of increased activity in the handling of traffic between bootleggers "at sea" and their agents ashore.

Long Island Sound is on the north shore, the Atlantic Ocean on the south shore.

Part of Long Island is in New York City, in fact, the Boroughs of Queens and Kings are entirely on the Island, and some of the activity is therefore within the city limits.

One vessel was seized recently at Astoria, Queens, heavily laden with a liquor cargo, and an investigation is being made as to whether George H. Ceiger, radio operator, had any connection with the ring supposed to have operated the craft in its liquor-smuggling ventures.

Operator Arrested

Ceiger was arrested, charged with conspiracy to violate the Radio Law, in that he operated an unlicensed station, and with conspiracy to violate the tariff act. He pleaded not guilty in Federal Court and was held in bail of \$5,000 for appearance in the Federal District Court to answer an indictment found several months ago.

It is charged in the indictment that Ceiger communicated with vessels at sea, using an unlicensed transmitter, and that the messages concerned rum-running. The complaint set forth that the messages were sent from Ceiger's home in Flushing, Queens.

Two Men Flee Raiders

The police, Coast Guard and agents of the Radio Division and of the Department of Justice united to ferret out the mystery of a long series of radio messages sent in code. While it was easy to decipher the code, as has been true in all instances all over the country, it was difficult to discover the origin of the transmission.

At first it was suspected that the operator had several plants and would run from one to another to carry on his traffic, but this idea finally was discarded when it became apparent he would have to have a transmitter in nearly every house in the Rockaways, Queens County.

Then the united arms of the law seized an automobile in the garage of an unoccupied house at Rockaway, and in it found a portable short-wave transmitter.

The set, it is said, had been operated for several months. Two men concerned in its operation escaped through the lots behind the garage when they saw the raiders coming.

Victor Home Talkie Projector is Reported

RCA-Victor is reported to have given an "inside" demonstration of a home talkie projector. The film is 16 millimeter, with only one edge perforated, driven by a special sprocket.

Instead of the perforation on the other edge there is the sound track. A photocell is used for pickup and a power amplifier is built into the assembly.

MADE ADVANCE IN TELEVISION, SAYS MARCONI

Rome, Italy.

The man who first introduced radio communication across the Atlantic Ocean, when the letter S, flashed from Ireland, was received by him in Nova Scotia, a generation ago, also may be the first one to introduce practical television on a commercial basis.

"I have conducted experiments to such a point that I look forward to the firm establishment of regular television transmission and reception, with sound accompaniment, at an early time," said Guglielmo Marconi.

He is looking forward to being able to see and hear New York action while he is aboard his yacht, Elettra, but sooner than that he expects to institute a secret telephone service for Pope Pius, between the Vatican and the Summer home of His Holiness at Castle Grandolfo, using ultra waves.

Marconi says that not only has his method proved successful but that it is secretive, as well. He is one of the earliest developers of beam transmission, and ultra waves lately have been subjected to beam transmission, as well as invested with real privacy by other means.

The installation for communication between the Vatican and Castel Grandolfo will be for telephone use only, at first, but is later to be expanded so as to include television, in which the Pontiff has expressed a deep interest.

Marconi is said to have overcome the vision-radius of ultra waves. However, he has not disclosed any technical details of his recent accomplishments, but may do so at a scientific society meeting he is to address in the Fall.

Literature Wanted

Readers desiring radio literature from manufacturers and jobbers concerning standard parts and accessories, new products and new circuits, should send a request for publication of their name and address. Send request to Literature Editor, RADIO WORLD, 145 West 45th Street, New York, N. Y.

- William Bolch, 613 Hoffman St., Hammond, Indiana.
- Floyd M. Brokaw 1608 Wallen Ave., Chicago, Ill.
- Warren R. Davee, 222 N. Monitor St., West Point, Nebr.
- John McCollom 3rd, 220 South 22nd St., Allentown, Penna.
- Geo. Zranek, 1044 Baldwin, Sharon, Penna.
- H. A. Cummins, 103 Atlantic, Peoria, Ill.
- U. J. Falconer, 1311 Columbus St., Peoria, Ill.
- W. H. Quelch, 215 Commonwealth, Peoria, Ill.
- H. T. Sedgwick, 404 Melbourne, Peoria Ill.
- American Telephone and Telegraph Co., 320 Fulton St., Peoria, Ill.
- Paul W. Glass, Electrical Contracting & Repairing, Fallen Timber, Penna.
- Lawrence M. Ittel, 140 Prospect St., Bradford, Penna.
- Harry R. Thorpe, 187 Adams St., Tonawanda, N. Y.
- Jack Shephard, 1107 Longwood Ave., Pueblo, Colo.
- Glem Gibson, 517 Lahoma St., Norman, Okla.
- Howard C. Murray, Jr., 423 Margaret St., Herkimer, N. Y.
- J. T. Myers El. Co., P. O. Box 68, Coral Gables, Fla.
- Ray Birren, 3753 Wilson Ave., Chicago, Ill.
- Frank J. McAllister, 115 Archibald St., Moncton, N. B., Canada.
- O. Ingmar Oleson, Ambrose, No. Dak.
- Stark Radio Service (H. D. Stark), 1231 8th St., S. E., Minneapolis, Minn.
- F. S. Corbitt, Pearson, Ga.
- A. J. Benson, 2348 N. Clark, Chicago, Ill.
- Louis C. Skippen, Jr. (Sta. W4CW), 671 Loeb St., Memphis, Tenn.
- T. Champe Fitzhugh, Jr., new parts and testing equipment, Fitzhugh & Company, 1611 West Ave., Waco, Texas.

Mexico Shuts Down 8 Ruthless Stations

Mexico City, Mexico.

Eight broadcasting stations that had violated international agreement as to wavelengths to be used, and thus interfered with stations in the United States, by heterodyning with them, were closed by order of the Minister of Communications. When the stations satisfy the Minister that they are prepared to resume on an orderly and legal basis their reinstatement will be considered.

Many protests had been received by the Minister of Communications from listeners and stations in the United States, as well as from listeners in his own country that like to tune in United States stations frequently. Besides, the State Department at Washington had made inquiries about the situation, as many protests were lodged in Washington by offended stations.

One of the shortcomings of the interfering Mexican stations was their frequency instability, sometimes of the order of 1,500 cycles. A national regulation calls for crystal control, and offense against this rule was a cumulative reason for the summary action.

The Mexican State Department is said to have backed up the Minister's action, if not having actually inspired it.

FINN PROGRAM USED IN PLOT

Helsingfors, Finland.

That the Soviet secret police has been using a Russian broadcasting station in directing the activities of its agents in Finland has been discovered by the Finnish authorities. Eleven Finnish Communists, two of whom are women, have been given long sentences in the penitentiary. It was discovered that the orders were included in the regular programs and arranged so that the agents for whom they were intended could intercept them.

One of those involved was a railway man who had access to official mail. He opened mail bags and when he found documents of military and political value he made copies of them and later sent them to Russia. The secret orders broadcast were for assisting Russian couriers making contact with the Soviet agents in Finland in the transmission of the information and thus save the spies in Finland from danger of interception in crossing the border.

Board Lists Stations Owned by Utilities

Washington.

A compilation made by the Federal Radio Commission, for the benefit of the Federal Trade Commission that is investigating utility companies, shows that six radio stations "appear to be owned" by public utility companies in the gas and electric fields, one station by a city producing electricity, and seven by concerns making electric and radio equipment.

There had been previous mention at the Trade Commission's hearing of the activities of utility companies in the radio field, and counsel for the Trade Commission requested a report from the Radio Commission so that the facts would be at hand. This is the first time such a list has been compiled.

ALL ZONES OFF QUOTA, THREE OVER, 2 UNDER

Washington.

Three zones are over-quota, two are under-quota, the Federal Radio Commission reported. Also, some individual States are over-quota.

The standard rating for each zone is 80 units. One unit equals approximately one 1,000-watt station on full time.

New York	Oklahoma	South Dakota
New Jersey	Louisiana	Washington
Maine	Florida	Colorado
Delaware	Illinois	Oregon
Kentucky	Missouri	Utah
Virginia	Minnesota	New Mexico
West Virginia	Iowa	Nevada
Texas	Nebraska	Alaska
Tennessee	North Dakota	

Zones 1 and 2 are under-quota while Zones 3, 4 and 5 are over-quota. The highest over-quota zone is the Fourth, with 101.12 or 21.12 in excess of the 80 due, equalling 26 per cent. excess.

The tabulation is as follows:

Zone	Due	Total Assign.	Quota due Units	Pct.
Zone 1:				
N. Y.	35.07	38.17	+3.10	+9
Mass.	11.84	10.06	-1.78	-15
N. J.	11.26	11.53	+0.27	+2
Md.	4.55	4.10	-0.45	-10
Conn.	4.48	3.55	-0.93	-21
P. R.	4.30	0.20	-4.10	-95
Me.	2.22	2.45	+0.23	+10
R. I.	1.91	1.40	-0.51	-27
D. C.	1.35	1.30	-0.05	-4
N. H.	1.29	0.92	-0.37	-29
Vt.	1.00	0.42	-0.58	-58
Del.	0.67	0.70	+0.03	+4
V. I.	0.06	0.00	-0.06	-100
Total	80.00	74.80	-5.20	-7
Zone 2:				
Pa.	27.63	20.29	-7.34	-27
Ohio	19.07	18.76	-0.31	-2
Mich.	13.89	10.84	-3.05	-22
Ky.	7.50	8.50	+1.00	+13
Va.	6.95	9.50	+2.55	+37
W. Va.	4.96	4.95	-0.01
Total	80.00	72.84	-7.16	-9
Zone 3:				
Tex.	16.22	22.67	+6.45	+40
N. C.	8.82	7.95	-0.87	-10
Ga.	8.10	8.10	-0.00
Ala.	7.37	6.22	-1.15	-16
Tenn.	7.29	12.83	+5.54	+76
Okla.	6.67	8.44	+1.77	+27
La.	5.85	8.40	+2.55	+44
Miss.	5.60	3.40	-2.20	-39
Ark.	5.16	4.60	-0.56	-11
S. C.	4.83	1.70	-3.13	-65
Fla.	4.09	8.45	+4.36	+107
Total	80.00	92.76	+12.76	+16
Zone 4:				
Ill.	22.52	34.76	+12.24	+54
Mo.	10.71	11.79	+1.08	+10
Ind.	9.56	7.53	-2.03	-21
Wis.	8.67	7.86	-0.81	-9
Minn.	7.57	9.08	+1.51	+20
Iowa	7.30	11.50	+4.20	+58
Kans.	5.55	5.37	-0.18	-3
Nebr.	4.06	7.30	+3.24	+80
S. Dak.	2.05	2.94	+0.89	+43
N. Dak.	2.01	2.99	+0.98	+49
Total	80.00	101.12	+21.12	+26
Zone 5:				
Calif.	36.86	36.44	-0.42	-1
Wash.	10.15	15.66	+5.51	+54
Colo.	6.72	9.32	+2.60	+39
Oreg.	6.19	9.22	+3.03	+49
Mont.	3.49	3.30	-0.19	-5
Utah	3.30	6.60	+3.30	+100
Idaho	2.89	2.80	-0.09	-3
Ariz.	2.83	2.50	-0.33	-12
N. Mex.	2.75	4.03	+1.28	+47
Hawaii	2.39	1.84	-0.55	-23
Wyo.	1.46	0.60	-0.86	-59
Nev.	0.59	0.80	+0.21	+36
Alaska	0.38	0.47	+0.09	+24
Total	80.00	93.58	+13.58	+17

LARGER SPACE FOR WCGU

WCGU, Brooklyn, N. Y., of which C. G. Unger is president, has leased a large space in the Fulton-Flatbush Building to be used as studios and executive offices.

A THOUGHT FOR THE WEEK

He thought with his songs he would kill 'em,
If once on the air he could trill 'em.
His wife wasn't certain.
He tried, failed—the curtain!
Said she: "There's the twins—you can thrill 'em!"

RADIO WORLD

The First and Only National Radio Weekly
Eleventh Year

Owned and published by Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y. Roland Burke Hennessy, president and treasurer, 145 West 45th Street, New York, N. Y.; M. B. Hennessy, vice-president, 145 West 45th Street, New York, N. Y.; Herman Bernard, secretary, 145 West 45th Street, New York, N. Y. Roland Burke Hennessy, editor; Herman Bernard, managing editor and business manager; J. E. Anderson, technical editor; J. Murray Barron, advertising manager.

Tubes of Promise

WHAT! More new tubes! Yes, indeed. Five of them. It is getting hard to remember the numbers of all the receiving tubes, more so the characteristics. And yet no one can safely pass up the new tubes, for they offer much promise.

It is not to be expected that the full knowledge of all the uses to which these tubes may be put, and the peculiar requirements to gain fullest advantage, are known now. The history of new tubes has been that determination of the right way to use them has been born of long experience, rather than of long calculations. Even the instructions as to how to use certain tubes have undergone change since early announcements by the manufacturers.

We recall particularly that in the beginning no distinction as to negative bias was made between a-c operated and d-c filament type tubes. In these very columns first attention was called to the necessity for increasing the apparent bias for a-c, to yield the correct effective bias, and subsequent data from manufacturers included these precautions. Also, the general proposition of regarding comparing the screen voltage to the effective rather than the applied voltage was set forth in these columns, with the result that a very low order of screen voltage for the 236 as detector and audio amplifier, and other screen grid tubes for audio amplification particularly, was stressed, and that became the general practice.

So we hope to make some contributions to the knowledge of how to use the new tubes to best advantage. The new tubes should give rise to special circuits of complete satisfaction.

The tubes are five in number. One is a mercury vapor rectifier, the 82, characterized principally by voltage constancy despite load difference within stated limits. The lowest-numbered of the new tubes, the 46, is an output tube that may be used for Class B and Class A power stages, has a UY base and two control grids. As a Class B amplifier the mu is very high, no grid bias being used; maximum plate voltage, 400 volts. As a Class B amplifier the continuous power output is 20 watts. As a Class A amplifier, 33 volts negative bias, the maximum undistorted power output is 1.25 watts, maximum plate voltage 250 volts.

The 56 is something like the —27. The connections are the same, but at 2.5 volts on the heater the current is 1 ampere instead of 1.75 amperes. The amplification factor is 13.8, instead of around 8, and the tube is therefore especially useful in

audio frequency amplifiers using resistance coupling, including a detector stage feeding such an amplifier, while it makes a good oscillator, too.

While one might have expected a tube ending with a "7" to be of the general purpose, good-detector type, it so happens one ending in "6", as just related, is more like the —27, while the 57 is a screen grid tube that really has three grids: the control, the screen and the suppressor. It is not vari-mu but has a sharp plate current cutoff; its amplification factor is greater than 1,500. In appearance it is quite different from any other receiver tube we have had, because of its dome-top bulb, with control grid cap at top and six pins at the base.

Like the 57 in appearance is the 58 super-control (vari-mu) tube, also screen grid, also three grids: control, screen and suppressor. The amplification factor is 1,280. Top cap and six base pins are provided.

The 56, 57 and 58 all have 1 ampere 2.5 volt heater ratings, and thus make for power economy, permitting smaller power transformers, compared to 1.75-ampere tubes.

With the opportunities presented by these tubes much may be done in a-c design. While four of the tubes are cited as a-c or d-c for heater operation, naturally there will not be very many d-c uses, because even at 1 ampere the drain is rather high. In a-c circuits there will be a variety of uses for the tubes, and both the public and the manufacturers should benefit.

Summer Prospects

THE trade may well expect a fairly good Summer, all things considered, for the Presidential conventions of the Republican and Democratic parties will be held, the Olympic games in Los Angeles, ball games and a fight for the world's championship between Max Schmeling and Jack Sharkey. Who will fight for the Democratic nomination is hard to say, for there's no telling which one of several aspirants mentioned will succeed, if any, or whether a dark horse will get it, and no list of contenders could be complete without the ultimate victor, would it? As for the Republican situation, this may be classed as "no contest," yet not divested of interest despite absence of suspense, for all like to hear the political leaders.

So there are some broadcasts for the trade to welcome especially, and these include other major events, like regattas, swimming, automobile, and boat races.

The more interesting the events that go on the air, the better the radio business is. If people haven't as much money this Summer as they had in some recent Summers of pleasant memory, perhaps they won't go about so much, for going about costs money. Staying home results in listening considerably to the radio. And listening makes replacement and installation business. Or, if there is to be much auto riding, the car set offers opportunity. Some mail order houses report the auto sets and parts for them are "the only things that are moving."

That is, you can see the sunny side ahead, if you like, no matter which way the public mind and body move. Radio will get them in the end.

However, there is one requirement. It is harder to get business now, margins are less, and much activity and turnover are necessary to keep ahead of expenses. Unfortunately, the depression has not only depressed tangible values but also zeal and initiative. One of the world-wide effects, hardly ever remarked, is that besides currencies and other tangibles, there has been a deep deflation of enthusiasm. The rewards do not promise so much, so why work so hard? is the query. But it is not the answer.

Music Fees

THE American Society of Composers, Authors and Publishers proposes upward revision of fees charged for permission to broadcast copyright music, amounting to more than 300 percent increase. The present rates paid would be continued, substantially without change, to be known as the "sustaining license rate," while 5 per cent. of the amount charged by stations to advertisers will constitute the new and additional amount, to be known as the "commercial license rate."

The Society has watched the growth of advertising revenue by broadcasters, particularly the large chains, and has seen the income increase very considerably. Since music plays such an important part in the advertising programs, the Society feels that its members should be benefited accordingly, especially since its revenue from sheet music and phonograph records has fallen off. The income comparison with 1924 as index is: 1927, 111 per cent.; 1928, 116 per cent.; 1929, 78 per cent.; 1930, 33 per cent.; 1931, 28 per cent.; first three months of 1932, 4 per cent., or estimated total for 1932, 16 per cent.

WJZ and WEAf networks of the National Broadcasting Company, for instance, show increasing revenue: 1927, \$3,760,000; 1928, \$10,250,000; 1929, \$18,729,000; 1930, \$26,815,000; 1931, \$35,791,000; first three months of 1932, \$12,176,000, or estimated total for 1932, \$48,704,000.

Besides, the stimulus to broadcasting results in the sale of more receivers. It is expected that the total broadcasting revenue will be around \$60,000,000 for 1932, while \$400,000,000 in radio sets and accessories will be sold, and \$10,000,000 in station plant equipment. Thus the total becomes \$470,000,000 for a year, and if the Society takes in \$3,500,000 it figures it will be less than 1 per cent. of the total business to which its music has contributed.

Certainly the Society puts its best foot forward in correlating music with all sales and revenues resulting directly and indirectly from broadcasting as if all programs were 100% music. The present proposal is offered as "an emergency measure," the emergency being that the music publishers virtually without exception report that they are losing money, and the Society itself reports difficulty in holding all its membership together. Top price payment to members, so-called Class A publishers, is \$40,000 a year, as paid to T. B. Harms and to M. Whitmark & Sons, the latter prized possessor of Victor Herbert music copyrights.

As broadcasting has become Big Business, so the publishers and authors of music desire to move along apace, and like to think that nothing but copyright music makes the present success possible. However, a truce has been declared until September 1st.

Million-Dollar Fund

Suggested for Opera

Washington.

Listeners will have to pay directly for radio, in the long run, as a safeguard of their self-respect, says Cyrenus Cole, Representative from Iowa (Fifth District). He says so many advertising announcements are vulgar that listeners with good taste will not tolerate them much longer, but would prefer to pay directly.

He suggests that public-minded citizens who like good music raise a fund of \$1,000,000 to permit continuing the broadcasting of the Metropolitan Opera over chains. This year the National Broadcasting Company provided the feature at its own expense.

STATION SPARKS

By Alice Remsen

The Tears of a Child

For Angelo Patri
WABC, Sunday, 8:45 p.m.

A lost little boy
Weeps in the street.
His tiny face,
That was so sweet,
Now dirt begrimed;
While bitter tears,
That dig furrows
Through the years,
Rain from his eyes.

*Sweet babe, weep while you can!
That fountain dries
When you become a man!*

—A. R.

* * *
ANGELO PATRI, HEARD EVERY SUNDAY OVER WABC, is a famous authority on children. If you are interested in learning something of the psychology of children, tune in on Mr. Patri. His talks are very helpful to both parents and children.

* * *
HELEN HANDIN, OF "TWO TROUPERS" FAME, left New York on April 30th, on the S.S. Virginia for the Pacific Coast. Helene will be heard this Summer on KFI, Lon Angeles, doing a wise-cracking monologue with songs. She will bill herself as "The Truthful Trouper."

* * *
RUSS COLUMBO HAS A SERIOUS RIVAL in the person of Samuel Adams, colored page boy of WOR. Samuel has been working at WOR for four years, but was only recently discovered as a sweet-voiced crooner. He will be given a chance on the air soon.

Sidelights

GEORGE FRAME BROWN was one of Lanny Ross' steady customers when Lanny was selling Liberty Loan bonds. . . JULIUS SEEBACH, Columbia's program director, was once a teacher of French in a New Jersey public school; among his pupils was Jack Norton, a master control engineer at WABC. . . GEORGE BEUCHLER has bought a new dog, a pedigree Scotch terrier, ten months old. . . RUTH ETTING once sang in Chicago for five dollars a night. . . ERNO RAPEE directs his orchestra from a high stool during rehearsals. . . B. A. ROLFE uses a three-foot baton at rehearsals. . . HOWARD CLANEYS hobby is painting pictures; he sells them, too. . . NORMAN BROKENSHIRE is making movie shorts. . . DANA SUESSE wrote "My Silent Love," theme song of the new Bath Club series; it is part of her "Jazz Nocturne". . . VAUGHN DE LEATH was recently received at the White House by Mrs. Herbert Hoover. . . DON VOORHEES at the age of twelve had already mastered the violin, piano and pipe-organ. . . DAVID ROSS says that the most superstitious men in the world are xylophonists—they are always knocking on wood. . . NED WEVER has had more than twenty songs published—all heard in New York revues. . . HELEN BOARD'S most enthusiastic fan is a Baltimore minister. . . ETHEL MERMAN was a stenographer no fewer than three years ago. . . ANDRE BARUCH was once the backstroke swimming champion of France. . . LULU VOLLMER'S "Moonshine and Honey-suckle" is still going strong over the NBC air-waves; it's just as interesting as ever.

Biographical Brevities

A Few Facts About
Ada Patterson

It is almost impossible to do justice in the space at my disposal to the career of Ada Patterson, one of the original sob sisters and well-known magazine writer. However, here are a few high-lights, and I hope they will help you to enjoy more fully Miss Patterson's radio contribution, "Interesting People I Have Met," if you tune in on Station WMCA, Tuesday at 10:30 a.m., EDST.

Ada Patterson was born in the little town of Mount Joy, Lancaster County, Pennsylvania. When she was just a few years old, her mother, who, in spite of ill health, was a decisive little person, decided that the family would move to Colorado. On the way they stopped off to visit friends in Nebraska. The climate proved excellent for the mother's health—and so Ada grew up in Nebraska.

When in her early 'teens she paid a visit to Salt Lake City, fell in love with it and stayed to get a job on a newspaper. The editor was a Mormon, with three wives. He took such an interest in Ada that her co-workers declared she would be wife number four, but Ada decided otherwise and departed for San Francisco, where she served on the daily staff of "The Call" as a reporter. One day a big story broke—the police couldn't get the "woman in the case" to talk. The feature woman writer was absent; the editor said "Why not send the little new one?"—so Ada was sent at midnight—and she got the story. Right there her career as a feature writer was really started. Another one of her sensations on the Pacific Coast as a baby reporter was when she was sent to put some pep in a murder trial. The story was about dead when Ada arrived and started nosing around. She dug up a laundress who had seen the victim in a church, the scene of the crime. This laundress told Ada of seeing a "little white hand" and the murderer's profile, outlined against the gloomy background of the church. The way Ada played up the story of the "little white hand," in sentimental sob-sister fashion, created a sensation and caused a St. Louis daily to send for her, dubbing her the "Nellie Bly of the West."

The men on that St. Louis paper were anything but sentimental. They put Ada through her paces. She was sent to walk a plank ninety feet above the street and write up her sensations and the view—which she did. Then they sent her to drive a locomotive, tearing through the country in the middle of the night; she did. Every impossible assignment was given to Ada and she survived the ordeal; but the culmination of these tortures came when she was sent to attend the execution of a murderer whom she had interviewed a number of times. She stood right beside him on the scaffold and is certain that she could never have gone through with it if she hadn't been the daughter of a member of the G. A. R. As it was, she couldn't eat for weeks afterward.

Twenty years ago Ada Patterson came to New York. Bradford Merrill, the distinguished editor of the New York "World," had been watching her work and sent word to the editor of the St. Louis "Dispatch" to keep an eye on her. The rumor reached Ada and that was enough. She packed up and came East—but alas, Merrill was away on a vacation. Ada's youthful ardor was dampened a trifle, but, as luck would have it, Rich-

ard Harding Davis told her of a feature article needed on the New York "American." She wrote it—sold it—and once again became a member of the daily pencil-pushers' brigade.

She worked hard and saved until she had enough money—put by to exist on while she tried out her cherished ambition, that of becoming a magazine writer. That ambition has been realized many times over. Articles by Ada Patterson have appeared in over sixty-seven different magazines. Miss Patterson knows everyone in the dramatic profession and has written many, many criticisms, but her metier is character studies of stage people. She is fond of them, they are her friends. The late lamented "Theatre Magazine" carried her stories; the old "Dramatic Mirror" featured her as "The Matinee Girl," and for years she supplied a column for the New York "Star."

A New York editor, known for his antipathy toward stage folk, once said to her: "Miss Patterson, I understand you are very fond of the people of the stage!" "Yes," answered Ada, "I like them very much; in fact, I think stage people are my best friends." "But," said the editor, "you are an intelligent woman. I shouldn't think you'd have anything in common with stage people."

Answered Miss Patterson; "I have everything in common with them—people of the stage are extremely intelligent, witty, entertaining, and loyal. If ever misfortune should come to me, I would turn to my friends of the stage, for I know they would say: 'Poor woman; she's in trouble, let's do something to help her.' I certainly wouldn't turn to you, for the first thing you would say would be—'She's been making good money all her life. What did she do with it?'—and that is why, Mr. Blank, I am very sincere when I say that I love the people of the stage."

Miss Patterson received her title of "sob-sister" from an anonymous writer on the New York "Sun," who coined the phrase during the Harry K. Thaw trial, referring to Ada Patterson, Dorothy Dix, Nixola Greeley Smith and Winifred Black, who were all covering the trial from a woman's point of view, as "sob-sisters" and the "Sympathy Brigade."

Many of the most startling episodes of Ada Patterson's life were incorporated into the recent film success, "Sob Sister," and "Liberty" magazine also published a brief biography of this remarkable woman.

Ada Patterson, in spite of her newspaper experience, is not a hard-boiled individual. Although up to the minute in her newspaper work, she is an old-fashioned little lady, possessing a kind and simple soul. She loves her fellow creatures. She always carries sugar in her pocket-book, with which she feeds horses. She pats every dog she meets, which sometimes gets her into trouble with sensitive dog-owners. She adores nature in all its aspects and spends most of her spare time wandering through the country-side, or when in town, walking through Central Park. She says nature taught her not to be afraid of death, for in nature nothing dies.

In appearance Miss Patterson is olive-skinned, with a mop of naturally curly dark-brown hair, slightly gray. Her eyes are kindly, alert and bright, gray-blue and large. She is full of wisdom, knows human nature thoroughly and has a rich, soft, speaking voice.

Hers is a very interesting personality, with a fascinating background of actual experience in the newspaper and theatre world; a charming person with whom to talk and to listen—and when you meet her, you'll listen. So tune in, Tuesday morning, 10:30, WMCA. I'm sure you'll like her.

* * *

(If you would care to know something of your favorite radio artist, drop a card to the conductor of this page. Address: Miss Alice Remsen, care RADIO WORLD, 145 W. 45th Street, New York, N. Y.)

BILL PLANNED TO CURB SALES TALKS ON AIR

By EDWIN L. DAVIS

Representative, Tennessee; Chairman of the House Committee on Merchant Marine, Radio and Fisheries

For more than two years, I have been warning the industry that if it does not control advertising on the air and if the Federal Radio Commission fails to do so, it will be incumbent upon Congress to do it. I am satisfied that the American people will not indefinitely tolerate the present situation.

It is infinitely better to regulate the use of advertising than to permit the situation to become so acute that perhaps we would be driven to Government ownership or some other drastic and undesirable action as a result of the conditions.

Too Much Sales Talk

I think that from the standpoint of the advertisers they are putting on entirely too much sales talk. Advertising is useful only when it commands good will. When it reaches the point that it has the opposite effect, it ceases to be useful advertising.

My observation and information from widespread sources is to the effect that radio listeners will listen to brief and unobjectionable advertising announcements but when the advertising is of the opposite character the listeners become disgusted and either will make critical comment or cease to listen until the regular program resumes.

It is certain that only a moderate amount of advertising is all that you can expect listeners to receive and absorb. Beyond that point, you are losing the very effect you expect to attain.

Will Introduce a Bill

I intend to introduce a bill dealing with this subject. I had hoped the industry would properly regulate the situation, as many of those in the industry have been insisting they would and could do. I have become convinced that they cannot do that themselves.

Many broadcasting executives have told me that they agree with my position, but that competitive conditions make it necessary to have more advertising and sales talk than they themselves think best, and the advertising agencies insist upon advertising talks. I was advised by some of the advertising agencies that their clients have insisted upon as much of their time being allotted to advertising as is possible.

Assuming that a large percentage of both broadcasting and advertising agencies recognize the importance of proper limitations, there is no way for them to force their competitors to the same conditions of limitations. I think it is better for a legal regulation to apply to all.

Killing Gold-Egg Goose

As the conditions are today, the goose that lays the golden egg is being killed. There is a high responsibility resting on Congress. As to lottery contests, Congress has properly and necessarily assumed supervision over radio broadcasting and it cannot afford to license stations to violate the laws of every State in the Union.

Length of "Blurb" Not Deemed Vital

Discussion among advertising agencies that have charge of radio programs for their clients, who buy time on the air, discloses that some advertisers have selected radio as the exclusive means of making their products known to the public, and that agencies are in doubt as to just what the public reaction is to certain types of advertising "credits," as the blurbs are called.

The length of the "credit" is considered not to be of paramount importance, but rather the nature of it, the idea conveyed and the announcer's manner of presenting it. Even a short credit that offends credulity or good taste is deemed deplorable by some agencies, although a long one that presents matter of genuine interest to the listener is regarded as permissible.

It is pointed out that persons with a grievance usually are quick to express it, but that satisfied persons have a habit of remaining silent, therefore complaints made against credits are likely to be over-rated.

TRUCE AGREED ON MUSIC FEES

The National Association of Broadcasters announced that it has reached an amicable agreement with the American Society of Composers, Authors and Publishers to negotiate the question of the fees to be paid by the broadcasters for copyright American music. This agreement was reached following the announcement by the Society that broadcasters would have to increase their \$1,000,000 present annual payments by \$3,000,000, to \$4,000,000 a year, starting June 1st.

The agreement involves the immediate opening of negotiations between committees of the two organizations in the hope of reaching before September 1st a working basis satisfactory to both. The Society, meantime, has suspended its demands until September 1st unless the two committees shall be able to come to an accord before that date.

A decision to negotiate ensued upon the broadcasters notifying the American Society that the broadcasting industry was wholly unable to support such total payments as had been suggested, and that it could not agree to the proposed basis of assessment.

"The strong mutual interest which broadcasters, composers, authors and publishers all have in fostering American music, which can only be safeguarded by insuring adequate and equitable returns to the producers of such music, was heartily recognized by both sides in agreeing upon a course which has served to prevent the impasse which threatened as of June 1st," the association set forth.

LEMMON QUILTS VISION COMPANY

Shortwave and Television Corporation, of Boston, Mass., announces that Walter S. Lemmon, formerly vice-president and director, is no longer connected with the organization.

The offices in New York have been closed and all business is transacted directly from the general offices at 70 Brookline Avenue, Boston.

VISION STATION TAKES RESPITE TO IMPROVE

The Jenkins television station, W2XCR, of New York, has suspended its program activities to permit the installation of new television apparatus so that the program development begun a year ago can continue.

About a year ago W2XCR inaugurated the first serious attempt to give the metropolitan area regular sight and sound programs, regularly announced as part of the development plan of the Jenkins Corporation. The program has caught up to the equipment so that it is necessary to install new equipment if further experimentation along program lines is to be carried on.

W2XCR opened on April 26th, 1931. From that night forth W2XCR, in conjunction with WGBS, through whose broadcast channel the sound element of the program was sent, transmitted many hours a day. Both motion picture films and living subjects came before the television camera. When WGBS became WINS, the Jenkins station combined with WINS to continue these synchronized programs.

"When W2XCR reopens it will again lead the way to better sight-and-sound broadcasting as it pointed the way almost a year ago," says an announcement.

Ziegfeld Imposes

8-Hour Rehearsal

Florenz Ziegfeld has made such a success of his Sunday night half-hour programs that many have wondered how he has been able to keep up the high calibre week after week.

An inquirer found out that the program is carefully prepared under the director's supervision, after he has been consulted on every point, and that the rehearsal of the presentation continues uninterruptedly for eight hours up to the time the program actually goes on the air. Also, the program draws on the Ziegfeld successes of a quarter of a century, and on the stars of to-day.

Winchell Collapses;

Long Rest Ordered

Walter Winchell, whose voice has been heard over National Broadcasting Company networks on the Lucky Strike Dance Hour since November 3, 1931, has been ordered by his physician to take a protracted rest.

The newspaper and radio columnist has suffered a collapse due to overwork, his physician said, and must stay away from writing and broadcasting for an indefinite period.

Winchell's place on the Lucky Strike Dance Hour has been taken by Louis Sobel, Broadway columnist of the New York "Evening Journal."

MANNA FROM LISTENERS

When characters in skits embark on any enterprise or acknowledge their needs, listener response is often quite embarrassing. When Amos 'n' Andy started a bank, nearly \$300 was sent for deposit, most of it to Andy, and mostly in \$1 bills, while an episode relating that a pencil was missing brought in several hundred pencils.

SYNCHRONIZED TESTS ENDING; REPORT ASKED

Washington.

May 16th has been set as the date when the Federal Radio Commission desires to have in its hands reports of participating stations on the results of synchronization and simultaneous operation. With synchronization there is a control station for keeping the two waves synchronous, whereas with simultaneous operation the stations depend on matched crystals and do not make any further effort at identity of frequency of transmission.

The subject is regarded by the Commission as of vast importance, because if synchronization or simultaneous operation or both prove successful they open the way to reduction of interference and expense, and increase of the service area.

Permits Continued

Two notable instances of synchronization are those of WBAL, Baltimore, Md., with WJZ, New York, on 760 kc. and WTIC, Hartford, Conn., with WEAJ, New York, on 660 kc. Permission to continue synchronization to June 1st was granted recently by the Commission for both these experiments.

WHO, Des Moines, Ia., and WOC, Davenport, Ia., have been conducting simultaneous operation for about a year. Both stations are owned by the same company. Other cases of simultaneous operation are being continued, so that a full report may be received on the set date.

Commission engineers so far have not been fully satisfied with results, as they observed them, but as improvements were expected by the participating stations, the reports to be rendered are expected to clear up the differences.

May Reduce Waves Used

The stations themselves have been interested in getting rid of any troubles that developed, as the stations have a strong interest in attaining economical operation such as synchronization or simultaneous operation or both promise. The Commission's interest is primarily an administrative one, as there are more than 600 broadcasting stations now on the air, and overcrowding is admitted. The experiments give promise of a solution, if they are successful, in that the number of frequencies used may be materially reduced.

Where synchronization or simultaneous operation obtains the same program is sent out by the participating stations.

Stations report that so much progress has been made that it is to be expected that their reports will be favorable. Freedom from interference, particularly absence of a circuit tone due to failure of identity of frequency, has been achieved, it is said, although there remain several difficulties, some of them serious.

Other Examples

WBZ, Springfield, Mass., and WBZA, Boston, Mass., are using simultaneous operation with matched crystals. Other stations that had similar experience were WHEC-WABO, Rochester, N. Y.; WOKO, Albany, N. Y.; WHP, Harrisburg, Pa.; and WFEA, Manchester, N. H. These stations likewise were authorized to continue their tests.

Only a year ago there was sharp difference of opinion whether simultaneous operation was at all practical. WGY, Schenectady, N. Y., and RGO, Oakland, Calif., were the first to try it.

Read 'Em and Weep

Some of the new tubes ought to stand up. They have six pins.

* * *

Midget sets started a world-wide vogue. Look at the one-pound babies!

* * *

Radio Manufacturers Association, Inc., warns about overdone claims by some manufacturers of short-wave devices. One of the investigators on the Association's staff must have failed to get Europe one night.

* * *

Knowing how to pad a superheterodyne and calibrate an oscillator, all the service man needs now is a job.

* * *

A 300 per cent. music fee increase to stations is threatened. The Senate wants to tax stations \$670,000 a year. The Senators are also thinking of excise-taxing radio products 5 per cent. Seeing as nobody has any money, all hands are optimistic except the intended victims, which makes us suspect somebody has been hoarding while the fluid in the red ink bottles ran low.

* * *

All hands get rich when Congress takes away from them what they haven't got.

* * *

The only thing the stations have left is the right to charge advertising sponsors whatever those firms don't like.

* * *

If salesmen could sell a share of television stock to every board, commission, committee and exchange that has warned against the purchase of such stock, business would be good with the accused and warnings welcome.

* * *

Yet what is so rare as a day in jail?

* * *

The trouble with television seems to be that the man on the street wants to see some action for his money, besides disappearance.

* * *

Short waves are coming in from Europe at a rate that suggests violation of the Immigration Law. Once a guy imports his first wave from Europe he can't tell enough people about it—to satisfy the manufacturers.

* * *

Cut the frequency in half and the effectiveness of a broadcast transmitter is multiplied five times. How about cutting the sales talks in half?

* * *

Five new tubes before we've learnt the connections for the preceding dozen!

* * *

One new tube a month is the goal. Then the 13-month year!

Amateurs Exceed 25,000, New Record

Washington.

There are more than 25,000 amateur radio operators in the United States, the largest single group of radio license holders, and, if applications are granted at the present rate the total by the end of the year will exceed 30,000. The present figure is a new record.

The number of women holding such licenses is in excess of 1,000, but the rate of increase is faster than normally. All told, applications from all amateur sources are received at the Federal Radio Commission at a rate of about 1,000 a week in Winter and 400 a week in Summer.

TRADE WILLING TO ACCEPT TAX IF CUT TO 3%

Washington.

A protest against the proposed 5 per cent. excise tax on radio sets and accessories was lodged with the Senate Finance Committee by the radio industry. Frank D. Scott, counsel to Radio Manufacturers Association, Inc., was the spokesman at a committee hearing. He said that since 1928 about half the radio manufacturers had gone out of business and that fewer than 150 remain, and besides employment during that period had shrunk 80 per cent.

Paul Klugh, of the Zenith Radio Corporation, Chicago, doubted whether the industry could survive a tax, and protested against the discrimination that singled out radio as if it were a luxury for tax imposition. He feared sales would be reduced 20 per cent.

Told that Disaster Threatens

Disaster as well as discrimination would result from the House bill, the Committee was told. Reduction at least to 3%, on the same basis as the proposed automobile tax, was urged and the Senators were told that a general sales tax, or a general manufacturers' tax, exempting food, clothing, medicine, etc., would be distinctly preferable and fairer than the proposed discriminatory tax of the House bill. It was urged that the House tax proposal is an undeserved penalty on a few industries.

James M. Skinner, president of the Philadelphia Storage Battery Company, dealt with the broad aspects of the proposed tax and declared that the 5% tax would seriously cripple, if not destroy, the radio industry. Mr. Skinner stated the industry had been "seriously sick for over two years and would be sicker before it got better." He predicted that no radio manufacturing company in the country would show a profit in 1932 and that the serious conditions were real and not fancied.

Cites Radio's Importance

Emphasis was placed by Mr. Klugh on the importance of practical uses of radio in the nation's life and homes. Radio gives service to the farmers on weather, stock, and produce quotations, Mr. Klugh pointed out, together with information to airplanes, both passenger and mail. Information by radio to the police departments in nearly every large city in the protection of life and property was also stressed by Mr. Klugh. He declared that radio was quite as much a necessity of modern American life as the automobile.

Senator Reed of Pennsylvania requested data on the probable results of a general tax as compared with the proposed special excise tax. The Treasury experts estimate receipts of around \$11,000,000 from a 5% tax. Mr. Scott told the committee that a 5% excise tax on radio would produce only about \$3,500,000, a 3% excise tax approximately \$2,700,000.

Mr. Scott also pointed out to the committee that many radio manufacturers also made electric refrigerators, which would be included in the tax of 5% under the House bill. He also added that the radio industry in its operations is largely confined to home domestic markets, as foreign markets are being closed either by tariff walls or restricted importation quotas.

FEE BY BUREAU WINS APPROVAL

Washington.

The House Economy Committee program includes authorization of the Bureau of Standards to charge fees for services, and also the sale of all Government publications at 30 per cent. above printing cost, compared to present sale at actual cost.

The Bureau deals with many standards besides those of radio, but in the radio field alone it has had to turn down thousands of requests for measurement services. Manufacturers desiring measurement of their own devices have use for the Bureau's services. Heretofore also lack of sufficient personnel has been another reason for turning down requests, but on a fee basis it is believed that any considerable undertaking could be made more than self-supporting. The nature of the measurements is rather restricted, relating to high standards of accuracy for secondary standards in making test equipment.

There are many Government publications, some of them of exceptional value, relating to radio. A list of such publications is obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Columbia to Make Sets; Avoids Mass Production

With H. E. Ward as president and H. Curtiss Abbott vice president in charge of sales merchandising and advertising, Columbia Phonograph Co., Inc., 55 Fifth Avenue, New York City, announces extension of its operations to include the manufacture and marketing of a new line of radio receiving sets.

"Our company enters the radio field in an enviable position," said Mr. Ward. "We have not a dollar in debts; we have cash on hand for effective operation, no plant and equipment to maintain and no thought of mass production. The Columbia receiving sets will create a market volume of their own and we shall supply that and no more. Probably this reversal of the generally accepted American theory of mass production is a little startling. But Columbia is making this departure. We are not compelled to produce any maximum number of sets; hence, our dealers will not be overstocked and suffer the paralyzing results of distress merchandise and obsolescence."

N. W. Ayer & Sons Inc. have been appointed advertising agent for the new Columbia outfit.

Manufacturers Warn They'll Pass Tax to Buyer

In anticipation of Federal taxation of radio sets and apparatus, as well as State tax, some manufacturers are rubber-stamping their bills to warn customers the tax will be passed on, even retroactively. Here is one example:

"Federal or State taxes now or hereafter imposed in respect to this instrument or any transaction involved therein and/or the production, treatment, manufacture, sale, delivery, transportation or proceeds of the product above specified, shall be for account of the buyer, and if paid or required to be paid by the seller the amount thereof shall be added to and become a part of the price payable by the buyer hereunder."

Tradiograms By J. Murray Barron

Netson Radio Co., 78 Cortlandt Street, New York City, is opening a special department with bargain counters. Small parts and accessories are featured.

* * *

Market & Broad Music Co., 163 Market Street, Newark, N. J., are enlarging their radio department on the street floor. Tubes and accessories as well as standard radio receivers will be displayed.

* * *

Try-Mo Radio Co. announces the opening of a new store at 89 Cortlandt Street, New York City. This is one of the largest retail radio stores. With this great space, enlarged departments will be installed with greater variety of merchandise. Additional window space will permit bigger displays.

* * *

Radio Surplus Co. is leaving Vesey Street, New York City, for 179 Greenwich Street, a ground floor store. There will also be a large basement fitted with departments covering replacement and small parts for the serviceman and experimenter.

* * *

Alan Radio Corp. is moving to the south side of Cortlandt Street, New York City. The new address will be 83. This block, between West and Washington Streets, is rapidly becoming a radio parts center.

* * *

United Radio Service Co., 619 W. 54th St., has assumed the replacement parts and service departments of the Brunswick Radio Corporation. All orders formerly sent to Muskegon or Dubuque factories of Brunswick Radio Corporation will be handled in New York. A complete staff of Brunswick factory service engineers is now connected with United Radio Service Co.

New Incorporations

Walter Craig, New York, N. Y., radio broadcasting.—Atty., J. W. Bonney, 364 West 34th St., New York, N. Y.

Trans-Air Broadcast Corp., New York, N. Y., radio broadcasting.—Attys., Herberman & McTigue, 250 West 57th St., New York, N. Y.

Vim Radio Television Corp., New York, N. Y.—Attys., Bushel & Gottlieb, 270 Broadway, New York, N. Y.

Casey's Electrical and Radio Shop, New York, N. Y.—Attys., Levy & Levy, 270 Broadway, New York, N. Y.

F. W. Erickson Electrical Co., New York, N. Y.—Atty., J. McClosky, 475 Fifth Avenue, New York, N. Y.

Peck Television Corp., New York City.—Atty., P. H. Sullivan, 285 Madison Ave., New York City.

Ferry & Smith, Inc., Newark, N. J., electrical, radio and television products.—Atty., Walter Ferry, Newark, N. J.

Consolidated Radio Artists, New York, N. Y., organize bands, orchestras.—Atty., H. Beriman, 475 Fifth Ave., New York, N. Y.

Forers Music and Radio Shop, New York, N. Y.—Atty., S. Wollan, 401 Broadway, New York, N. Y.

Lang Electric Co., Buffalo, N. Y., electrical and mechanical business.—Atty., G. H. Unfug, Buffalo, N. Y.

Wharton-Fisher Co., Milford, Del., electric refrigerators, electric supplies.—Attys., Bayard and Wharton, Milford, Del.

Advanced Audio Patents Corp., New York, N. Y., sound recording systems.—Atty., J. O. Driscoll, 130 Clinton St., Brooklyn, N. Y.

Le Winter Utility Corp., Brooklyn, N. Y., refrigerators, gas ranges.—Atty., M. S. Gottdenker, 521 Fifth Avenue, New York, N. Y.

John M. Touche Co., Mount Kisco, N. Y., electrical appliances.—Atty., E. A. Kniffin, 40 Wall St., New York, N. Y.

Packard Electric Corp., Detroit, Mich., goods, wares, merchandise.—Attys., Corporation Trust Co.

ASSIGNMENT

The David Coyne Company, Inc., radio, radio repair and electrical business, 61 East 59th St., New York, N. Y., has assigned to Jesse Luxenberg, 11 West 42nd St., New York, N. Y.

CAPITAL REDUCTION

Standard Broadcasting System, Brooklyn, N. Y., \$100,000 to \$50,200.

CAPITAL INCREASE

Radio Television Industrial Corp., Boston, Mass., \$1,000,000 to \$3,000,000.

INVENTORY LOW BUT SALES RISE

Washington.

The last quarter of 1931, including the so-called "radio season," was marked by the maintenance by radio wholesalers of a low inventory, 42.01 under that for the end of the third quarter, while sales were 30.47 per cent higher.

The statistics were issued by the Bureau of Census, Department of Commerce, which reported as follows:

"At the end of the third quarter of 1931, radio merchandise on hand was valued at \$5,935,400, and at the end of the next quarter, at \$3,441,849, the figures disclosed. In the former period, the average stock per wholesaler was shown to have been worth \$16,672, and in the latter period, \$9,668; indicating a considerable reduction of stocks on hand.

"The average value of sales per dealer in the third quarter of 1931 was \$32,586, and in the final quarter \$42,514. Radio merchandise, as classified and compiled in the Census Bureau's table, is shown to include receiving sets of various kinds, home talking picture machines, batteries, vacuum tubes (receiving), including tubes in sets, loudspeakers (not in sets), and miscellaneous radio accessories and parts."

Sonora Asks Permit for Vision Station

Washington.

An application for permission to erect a television transmitter "to determine the transmission characteristics of ultra short waves over metropolitan areas, in conjunction with development of suitable television equipment" was made to the Federal Radio Commission by the Sonora Manufacturing Company, of Chicago.

The application was filed by the prime movers of the re-constituted Sonora Company, Gustave Frankel, Leonard C. Wellington and Gustave Kraus. It is planned to make R. M. Arnold chief engineer of the station and to have actual transmission start within 160 days of the issue of the license. The frequencies asked are 43-46 mcg, 48.5-50.3 mcg and 60-80 mcg. Power sought is 5,000 watts. First transmissions would be from film. Later studio pickup would be tried.

Change of Address in Two Offices of RMA

In Chicago the new address of Radio Manufacturers Association, Inc., is 307 N. Michigan Avenue. Telephone, Central 8445.

In New York the new address is 22 East 40th Street, at Madison Avenue. Telephone—ASHland 4-0057.

Offices especially for conduct of the annual trade show and convention will be maintained in the Stevens Hotel by Bond Geddes, Executive Vice President of the Association.

ALICE REMSEN'S ANSWERS TO CORRESPONDENTS

COLUMN READER, Anderson, Ind.—Thanks for the information, and you will see I am using it on page 19.

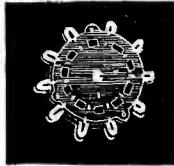
LEONARD C. JOHNSON, Chicago—You may reach Harriet Wellen by writing to her in care of the Billboard Publishing Co., Cincinnati, Ohio.

Anderson's Auto Set

In an automobile set what you need and must have is **SENSITIVITY**. You read about high-powered home receivers having a sensitivity of 10 microvolts per meter. Here is an 8-tube auto set, chassis 7 x 11 1/2 x 2 1/2 inches, that has just such sensitivity. It brings in DX through 50,000 watt locals 10 kc. removed. Did you ever hear of that before in an auto set? Volume is high, without distortion. Push-pull pentode output. This circuit was designed and engineered by J. E. Anderson and is by far the best auto set we've ever heard. Variable mu, pentode r-f tubes.

Complete kit of parts, including remote tuning control, running board aerial, speaker, battery box, everything but tubes which are: two 236, two 237, two 238 and two 239 (automotive 6-volt series). Order Cat. JE-631 @\$35.00
Set of tubes for car receiver (Cat. 630-TUK), @\$11.80

SHORT WAVE SWITCHES

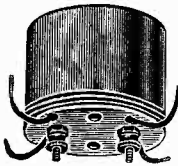


SWITCHES of special precision, positive contact, non-shorting, are needed for short waves. These rotary selector switches are suitable for moving the stator connections of tuning condensers to taps or to separate coils. Single knob actuates multiple circuits. Knob can't slip on shaft and switch can't slip on panel.

- Single circuit, 4 taps and index. Cat. 4-1-SW @\$1.05
- Two circuits, 4 taps and index for each. Cat. 4-2-SW @\$1.87
- Three circuits, 4 taps and index for each (fewer taps may be used). Cat. 4-3-SW @\$2.28

These switches may be used for any purpose where single, double or triple circuits are to be worked, up to four different positions, and are suitable for all wave switching because the shafts are totally insulated. These are anti-capacity switches of the precision type.

INTERMEDIATE FREQUENCY TRANSFORMERS



FOR short wave superheterodyne work 1,600 kc. is the popular intermediate frequency, because you can tune to below 9 meters without interlocking of modulator and oscillator circuits, due to the high intermediate frequency. Our 1,600 kc. shielded transformers have large diameter wire, loose coupling for selectivity and stability, and Hammarlund's new superheterodyne condensers built in, accessible to a screwdriver. Both plate and grid circuits are tuned. Shield is 2 1/2 inch diameter, 2 1/2 inches high. For variable mu tubes. Order Cat. FF-1600 @\$1.65
Doubly tuned fixed-frequency transformer, 1 to 1 ratio, 175 kilocycles. Band pass filter characteristic. Hammarlund 20-100 mfd. equalizers across primary and secondary accessible. Aluminum shield (must be grounded) 2 1/2 inches diameter, 2 1/2 inches high, removable bottom. For variable mu tubes. Order Cat. FF-175 @\$1.50
Same as directly above, for 400 kc. Order Cat. FF-400 @\$1.50

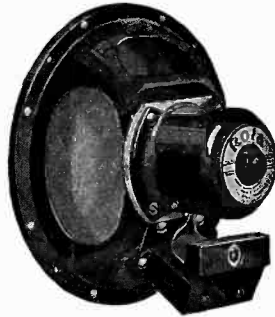
ROLA DYNAMIC SPEAKERS

Series F, Rola dynamic speakers for single pentode output, with 1,800 ohm field coil tapped at 300 ohms. Field coil may be used as B supply choke, with 300 ohm section for 247 bias, if field is put in negative rectifier leg. Output transformer built in. 7" cone. Cat. RO-18 @\$4.50

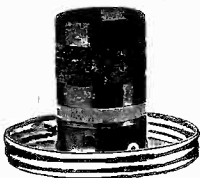
Same as above, except that cone diameter is 10.5 inches. Cat. RO-18-10 @\$5.85

Same as above, except that cone diameter is 12 inches. Cat. RO-18-12 @\$6.95

Magnavox dynamic 6-inch cone for automobile sets, 6 volt field to be connected to car's storage battery. Speaker fits on fire-board under the instrument board. Shielded cable is supplied with each speaker. Cat. MG-AU @\$4.95



BROADCAST COILS WITH 80-METER TAP



The shielded 80-550 meter coils have a side lug (shown at left) and four identified lugs at bottom. The side lug is for grid return. The ground symbol lug is the 80-meter tap. P and B go to antenna and ground or plate and B plus. For oscillation B goes to plate and P to B plus.

TAPPED coils are proving very popular, as they make for economy of room and also afford good results. The Roland coils are obtainable for broadcast coverage, 200 to 550 meters, with tap for going down to 80 meters, so television, airplane talks, amateur and other interesting transmission may be heard. An insulated three-deck two-tap long switch is needed for front panel band shifting. See illustration at right. These coils are wound on 1 1/8 inch diameter and are attached at the factory to aluminum screw bases, with four identified lugs protruding at bottom and a fifth lug at side. An aluminum cover (not illustrated) screws over the base.

The primary is wound over the secondary, with insulating fabric between, and the inductance is kept exactly equal for all coils by keeping the axial length of the winding identical, as well as the number of turns. Therefore at top (what looks like a separate winding), a space is "spun," as well as at bottom, to insure such identical inductance.

For 80-550 meters, for use with 0.00035 mfd. three gang, order Cat. M-35-C (three coils, three shields at this price) @\$2.45

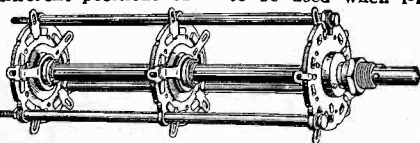
For 0.0005 mfd. order Cat. M-05-C @\$2.45

175 kc tuning unit: 3-gang condenser, trimmers, r-f and modulator coil, and special oscillator coil with 700-1000 mmf. padding condenser and 0.6 mmf. grid-to-grid coupling condenser. Padding directions supplied, (Cat. 175-TU) @ \$6.03

LONG SWITCHES

Three decks, four different positions on each deck. Cat. LSW-4-3 @\$2.95

Three decks, two different positions on each deck (used in 627 circuit). Cat. LSW-2-3 @\$2.65



SUPER CONDENSERS

Fine padding condenser, 700-1,000 mmf. to be used when i-f is 175 kc. Cat. PC-710 @\$.50

Coupling condenser, oscillator grid to modulator grid, 0.6 mmf., no pickup winding needed. Cat. C-6T @\$.10

Battery Set 15 to 200 Meters

A SHORT-WAVE receiver, using two 230 (2-volt) tubes, requiring 3 volts filament battery source and 90 volts of B battery. The circuit is detector and one transformer coupled audio stage. This "detector and one step" has been standard for ten years. With this circuit reception the world over has been enjoyed and the elated users number into the teeming thousands. Ranges 15 to 200 meters, using five plug-in coils. Old-timers know this circuit well. Persons who have had no experience with short-waves will find this a most appropriate circuit for a thrilling beginning. The circuit can be wired in 1 1/2 hours.

PARTS REQUIRED: 4 plug-in coils, \$1.50; Hammarlund 0.00014 mfd. tuning cond., \$1.20; Hammarlund 0.0002 tuning cond., \$1.35; three UX sockets, 30c; audio trans., 70c; 50,000 ohm leak, 10c; 300 turn honeycomb, 30c; 0.00025 mfd. clips, 15c; 20-ohm rheostat, 40c; 20-100 mmf. equalizer, 20c; battery switch, 20c; 6 bind. posts, 30c; bind. post strip, 10c; vernier dial, 50c; two knobs, 10c; 7 x 10 bakelite panel, \$1.25; 7 x 10 baseboard, 25c.

Designed by Jack Tully.

Complete parts, with blueprint, less tubes, (Cat. SW-DAF), @\$9.10
Two 230 tubes @ total of.....\$1.92

NATIONAL DRUM DIAL



National Velvet Vernier drum dial, type H, for 1/4" shaft. An automatic spring take-up assures positive drive at all times. Numbers are projected on a ground glass. Rainbow wheel changes colors in tuning. Order Cat. ND-H @ \$3.13.

Precision Parts

800 TURN HONEYCOMB coil, total diameter 1 1/4 inches; will tune to 175 kc. with 0.0001 mfd. (or 20-100 mmf equalizer) Cat. HC-800 @\$.50
300 TURN HONEYCOMB coil, same style, tunes to 400 kc. with 0.0001 mfd. Also may be used without condenser as antenna input coil, screen and plate choking, or two used inductively coupled for evening the amplification of t-r-f sets, in untuned stage feeding detector. Cat. HC-300 (each) @\$.30

50 TURN HONEYCOMB coil, 1/4 millihenry, for all short wave purposes. Cat. HC-50 @\$.25

1 WATT PIGTAIL RESISTORS, all resistance values. Mention Cat. PGR and state resistance in ohms thereafter. Price @\$.15

5 WATT 2,250 OHM resistor to drop maximum B to B plus 180 volts for plates of r-f tubes in any t-r-f set. Cat. 5-W-2 @\$.45

POTENTIOMETERS: 400 ohms at 27c; 5,000 ohms @ 95c; 25,000 ohms @ \$1.25; 50,000 ohms @ \$1.25; 100,000 ohms @ \$1.25; 500,000 ohms @ \$1.25.

POTENTIOMETER with a-e switch attached, 10,000 ohms, for variable mu grid bias as volume control. Cat. POT-5-SW @\$1.55

WALNUT FINISH, EITHER DORSET OR STANTON CABINET for midger sets, cut for 7-inch cone. Cat. MDCB @\$4.90

TWO GANG 0.00035 MFD, straight frequency line condenser, brass plates; long 1/4 inch shaft; nickle-plated. Cat. DJA-35 @\$1.95

Shielded. Cat. DJA-35 @\$1.95
KELFORD 30 henry choke; stands up to 100 ma; in black shield case. Cat. KEL-30 @\$1.75

KELFORD 15 henry B supply choke; 60 ma; unshielded. Cat. KEL-15 @\$.95

2.5 VOLT center tapped fl. trans., 8 amperes (will stand up to five heater tubes, when voltage is 2.25 v). Cat. FLT @\$1.62

HAMMARLUND 0.0002 mfd. variable condenser, junior midline; rotation is within 2-inch diameter; for short waves. Cat. H-20 @\$1.35

HAMMARLUND 60 mmf. manual trimming condenser. Cat. H-60 @\$.79

HAMMARLUND 20-100 MMFD. EQUALIZERS: adjusting screw works in a threaded brass stud, so excess force cannot damage the unit. Cat. 3-EQ-100 (price is for three) @\$.60

CHASSIS for midger, fits in Roland cabinet; chassis is 13 1/2 inches wide, 7 1/2 inches front to back; flaps front and back 3 inches high; drilled for sockets and speaker plug and for volume control and switch at front. Cat. 5-TCH @\$1.75

CHASSIS for 6 tube midger. Cat. 6-TCH @\$1.75

TWO GANG 0.00035 MFD, straight frequency line condenser, brass plates; long 1/4 inch shaft; nickle-plated. Cat. DJA-35 @\$1.95

THREE 0.1 MFD. condensers in one shield case; black lead is common; three red leads go interchangeably to destination; mounting screw built in. Cat. 31 @\$.57

MIDGET POWER TRANSFORMER, for five-tube set, to handle three heater tubes, one 247 and one 280. Cat. MPT-5 @\$3.15

MIDGET POWER TRANSFORMER for six-tube set, to handle four heater tubes, one 247 and one 280. Cat. MPT-6 @\$3.55

8 MFD. WET ELECTROLYTIC condenser, for inverted mounting; washer and extra lug provides insulation from chassis for circuits with B choke in negative leg. Cat. LCT-8 @\$.62

TELEVISION KIT, 80-100 meters, using two stages 235-r-f, 224 power detector, 224 first a-f, 247 output, 280 rectifier. R-f coils have right-angle honeycomb chokes with 4-turn pickup windings. Designed by Edwin Stannard. Dorset cabinet and Rola speaker included. 110 v., 50-60 c. Order Cat. TK @\$18.95

LOOKING FOR FINE GOODS AT BARGAIN PRICES? HERE THEY ARE!

WE carry a complete line of Rola dynamic speakers, all sizes, all purposes, as well as the exclusive Farrand inductor speaker for push-pull pentode output that requires no output transformer.

The Rola speakers are very popular in midset sets, both of the broadcast and short-wave type, as well as for all-wave coverage, and are used also to great advantage in automobiles.

The Rola speakers for home receivers are obtainable with field coils that may be used also as the B supply choke coil, and which field coil has a tap, so that bias for a pentode may be obtained from the field coil itself. This method introduces audio regeneration, which improves tone and sensitivity. The tapped coils have a total resistance of 1,800 ohms and the tap is at 300 ohms from the ground end. The grid return of the power stage is connected to the tap. This is the method used in all our a-c circuits.

Rola dynamic speaker, 1,800 ohm field coil, tapped at 300 ohms. Output transformer matched to single pentode is built in. Diameter of cone is 7 inches. Cat. RO-18 @ \$4.50

Same as above, except that cone diameter is 10.5 inches. Cat. RO-18-10 @ \$5.85

Same as above, except that cone diameter is 12 inches. Cat. RO-18-12 @ \$7.25

Magnavox dynamic 6 inch cone for automobile sets, 6 volt field to be connected to car's storage battery. Speaker fits on bulkhead under the instrument board. Shielded cable is supplied with each speaker. Cat. M-AU @ \$4.95

TAPPED COILS FOR BAND SHIFTING

For 80-600 meters, for use with 0.00035 mfd. three gang, order Cat. M-35-C (three coils, three shields at this price) @ \$2.45

For 0.00048 mfd. order Cat. M-46-C MSSC @ \$2.45

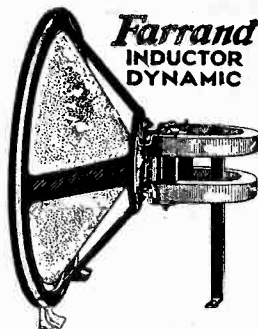
For 0.0005 mfd. order Cat. M-05-C @ \$2.45

of some types of superheterodyne condenser construction. Three trimmers are built in. The three shielded coils, of the same general appearance as the one illustrated at upper position on this page, and dial are supplied. The oscillator coil is already padded. Order Cat. CMTU @ \$6.65

Set of three shielded coils, padded for 0.00035 mfd., for use with 175 ka intermediate amplifier. Tap is included. Cat. SUC-35 @ \$3.10

Same as above (set of coils) except for 0.00048 mfd. Cat. SUC-46 @ \$3.10

Same as above, except for 0.0005 mfd. Cat. SUC-5 @ \$3.10



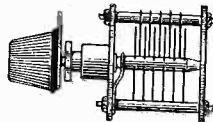
Farrand
INDUCTOR
DYNAMIC

FARRAND inductor dynamic, for pentode push-pull requiring no output transformer. Simply connect the two tipped leads to the plates of the pentodes and connect the untipped (yellow) lead to the maximum B plus voltage. By this method no plate current flows through the winding, only signal current so there is no danger of burnout or premature saturation, and the tone quality is superb.

This speaker has one of the best audio curves of any ever produced, but it is not quite so sensitive as other type dynamic speakers, and therefore should be used on high powered sets. It is suggested therefore that it be used on a-c sets having fewer than six tubes or battery sets having fewer than seven tubes. It is strongly recommended, however, that the speaker be used on all high powered sets using push-pull pentode output. These pentode speakers are not generally obtainable. We're privileged to have a source of supply that enables us to fill the needs of those most discriminating as to tonal values. Order Cat. FAR-PENT @ \$8.75

MIDGET CONDENSER

The rotor has no end stop and therefore precision calibration of oscillators and tuners is not upset by dial-jarring.



A MIDGET condenser for high frequency work, equipped with knob and pointer, and including a milled bushing that can be attached for taking 1/4 inch dial hub. This condenser may be used either as a trimmer for a main condenser or alone for tuning in the high frequencies. Particularly valuable for amateur wave reception, short wave converters and short wave sets generally, where wide dial spread is highly desired, and five coils are used for coverage of 200 to 15 meters. The capacity is 0.00045 mfd. (45 mmfd.). Cat. CHMG-45 @ \$0.59

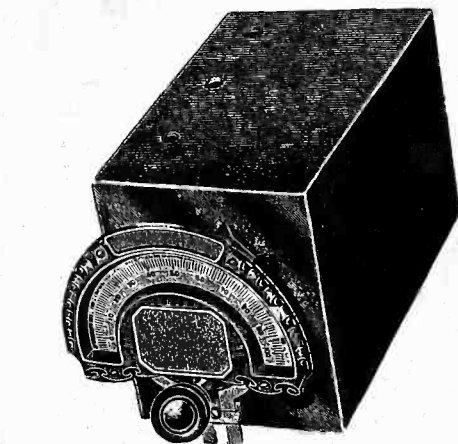
The same model condenser also is obtainable in 0.00055 mfd. (55 mmfd.) capacity. Order Cat. CHMG-55 @ \$0.59

Eveready Raytheon Tubes

227 @ \$0.60	245 @ \$0.66	240 @ \$1.80	236 @ \$1.65
224 @ .96	250 @ 3.60	112A @ .90	237 @ 1.05
235 @ .98	U-99 @ 1.50	222 @ 2.70	238 @ 1.65
247 @ .93	V-99 @ 1.68	220 @ .96	239 @ 2.05
228 @ .48	120 @ 1.80	231 @ .96	280 @ .60
171A @ .54	201A @ .45	232 @ 1.30	281 @ 2.00
210 @ 4.20	200A @ 2.40	233 @ 1.65	Neon @ 4.50

Guaranty Radio Goods Co.

145 West 45th Street New York City



MATCHED COMBINATION TUNING UNIT, to cover from 80 to 600 meters, using a coil system including a single tap on each secondary, and serving as the tuning adjuster in superheterodynes with an intermediate frequency of 175 kc. The tap need not be used if only the broadcast band is desired. The oscillator circuit is accurately padded for that intermediate frequency. The matched tuning unit includes a three gang, brass-plate, steel-frame condenser, with stator shields built in, the entirely shielded again, with extra partitions built inside to serve as rotor shields (illustrated). Low vibration factor to avoid grunting

Quick-Action Classified Advertisements

7c a Word — \$1.00 Minimum
Cash With Order

TRANSFORMERS, (Radio Power) rewound; specials made. Supreme Radio Laboratory, Dept. W, 16 Fulton Ave., Rochester, N. Y.

S. GERNSBACK'S "RADIO ENCYCLOPEDIA," SECOND EDITION. A Guide-Book of Radio Information topically arranged in Alphabetical Order. Radio in all its branches, described, explained and illustrated. Size 9 x 12, 352 pages, Red Morocco-Keratol Flexible Binding. Loose-Leaf Arrangement. Price \$3.98 postpaid (Foreign and Canada add 35c extra). Radio World, 145 W. 45th St., New York City.

"THE MODERN GASOLINE AUTOMOBILE," by Victor W. Page, M.S.A.E. New Revised and Up-to-date Edition. A whole library of information now complete in one large octavo volume of 1,146 (6 x 9) pages—1,000 engravings. Bound in flexible scarlet fabricoid. Price \$5.00. Radio World, 145 W. 45th St., New York, N. Y.

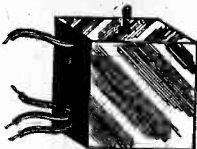
RADIO WORLD AND POPULAR MECHANICS MAGAZINE—Radio World is \$6.00 a year, and Popular Mechanics Magazine is \$2.50 a year. Popular Mechanics Magazine does not cut rates, but Radio World will send both publications to you for one year for \$7.00. Radio World, 145 West 45th St., New York City.

"HANDBOOK OF REFRIGERATING ENGINEERING," by Woolrich—Of great use to every body dealing in refrigerators. \$4. Book Dept., Radio World, 145 W. 45th St., N. Y. City

PHONOGRAPH PICK-UP—Made by Allen-Hough. \$3.32. Guaranty Radio Goods Co., 143 W. 45th St., New York City.

"FORD MODEL—'A' Car and 'AA' Truck," by Page. \$2.50. Radio World, 145 W. 45th St., N. Y. C.

Three 0.1 mfd. in One Case



Three Supertone non-inductive fixed condensers of 0.1 mfd each, (250 v.) in steel case, provided with a 6/32 mounting screw, built in. The black lead is common to the three condensers, the three red leads are the other sides of the respective

capacities. Size, 1 1/2" square by 1/2" wide. Order Cat. SUP-31, list price, \$1.00; net price, 57c.

GUARANTY RADIO GOODS CO
143 West 45th St., New York, N. Y.

SOLDERING IRON FREE!



Works on 110-120 volts AC or DC, power, 50 watts. A serviceable iron, with copper tip, 5 ft. cable and male plug. Send \$1.50 for 13 weeks' subscription for Radio World and get these free! Please state if you are renewing existing subscription.

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

Two for the price of One

Get a FREE one-year subscription for any One of these magazines:

- RADIO CALL BOOK MAGAZINE AND TECHNICAL REVIEW (monthly, 12 issues)
- Q.S.T. (monthly, 12 issues; official amateur organ).
- POPULAR SCIENCE MONTHLY
- RADIO INDEX (monthly, 12 issues), stations, programs, etc.
- RADIO (monthly, 12 issues; exclusively trade magazine).
- MODERN RADIO (monthly).
- EVERYDAY SCIENCE AND MECHANICS (monthly).
- RADIO LOG AND LORE. Monthly. Full station lists, cross indexed, etc.
- AMERICAN BOY—YOUTH'S COMPANION (monthly, 12 issues; popular magazine).
- BOYS' LIFE (monthly, 12 issues; popular magazine).

Select any one of these magazines and get it FREE for an entire year by sending in a year's subscription for RADIO WORLD at the regular price, \$6.00. Cash in now on this opportunity to get RADIO WORLD WEEKLY, 52 weeks at the standard price for such subscription, plus a full year's subscription for any ONE of the other enumerated magazines FREE! Put a cross in the square next to the magazine of your choice, in the above list, fill out the coupon below, and mail \$6 check, money order or stamps to RADIO WORLD 145 West 45th Street, New York, N. Y. (Add \$2.00, making \$8.00 in all, for extra foreign or Canadian postage for both publications).

Your Name.....

Your Street Address.....

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

- If renewing an existing or expiring subscription for RADIO WORLD, please put a cross in square at beginning of this sentence.
- If renewing an existing or expiring subscription for other magazine, please put a cross in square at the beginning of this sentence.

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

DOUBLE VALUE!