SHORT WAVE GUIDE

How to Build Simple Short-Wave Receivers - Which is the Best Type of Aerial to Use? - A Simple "Ham" Transmitter - Questions and Answers on Short-Wave Problems - Short-Wave Kinks - Practical Hints on Tuning.

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PREFACE

The articles here presented have been very carefully selected by the editors of SHORT WAVE CRAFT with the object in mind that the subject matter should be of value to both the inexperienced as well as the more advanced short-wave "fan." The reader will find herein articles describing how to build simple yet efficient short-wave receivers, with which trans-oceanic reception of short-wave stations can be easily accomplished. Many people seem to have the idea that in order to hear European short-wave stations, for example, that one must have an expensive 6 or 8 tube set, but such is not the case if you are content to hear these interesting foreign short - wave broadcasters on a pair of headphones. Thousands of people are getting daily thrills from the short-wave police calls and a special "police call" receiver is described in this book. Probably no other subject in the realm of short-waves is so important and so neglected as that of Aerials or Antennae --- and a goodly section of the present treatise is devoted to this all-important subject.

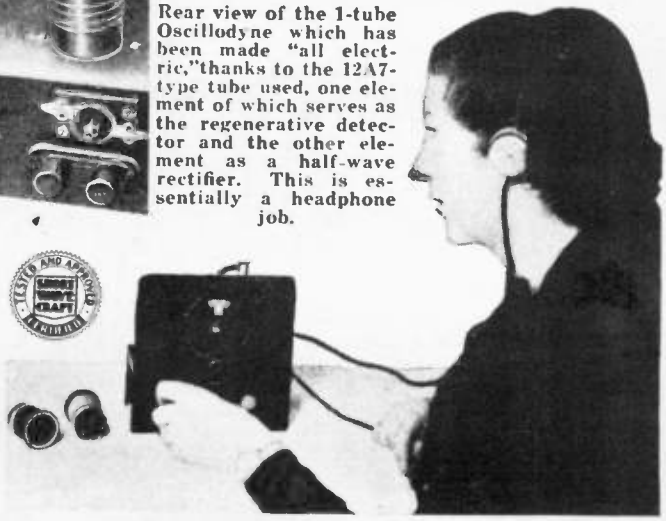
CONTENTS

1 - Tube All - Electric OSCILLODYNE

● BELIEVE it or not, this is really an *all-electric* short-wave receiver that employs but ONE tube! So far, we have had three tubes do the work of six, two tubes that work as well as four, but—this is the first *1-tube all-electric* receiver that we have seen. Of course, the

By ART GREGOR

Rear view of the 1-tube Oscillodyne which has been made "all electric," thanks to the 12A7-type tube used, one element of which serves as the regenerative detector and the other element as a half-wave rectifier. This is essentially a headphone job.

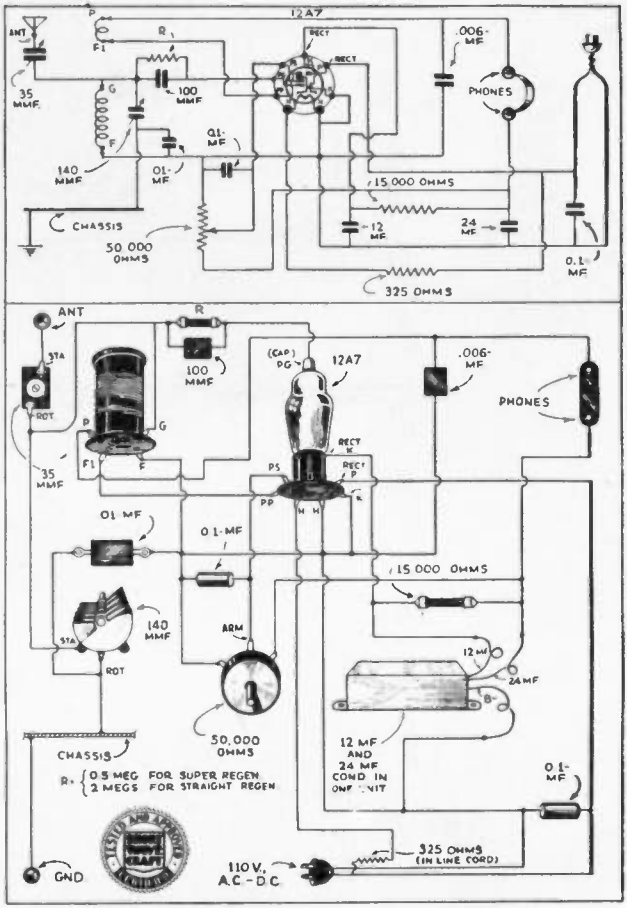


The 1-Tube All Electric Oscillodyne will find hundreds of everyday applications - it is ideal for travelers.

many novel sets described in this magazine could not have been built if it were not for the accomplishments of the tube engineers—they have done a remarkable job. And this set, too, owes it success to the newer tube developments.

Uses 12A7 Tube As Det. and Rectifier

The tube used in this receiver is known as the 12A7. It consists of a *pentode* and a *half-wave rectifier* all inclosed in a single glass envelope! The pentode portion is intended for audio frequency amplification; however we have still to see a tube that could only be used for a single purpose! After many tests and experiments it was found that this tube will do a great many things its inventors never thought of and you can look forward to seeing this tube in other rôles. As we started to say, the pentode section can be used as a *regenerative detector* and will perform as well as any other type.



Anyone with the slightest mechanical skill can easily build the 1-tube All-Electric set here described, which can be plugged into any 110-volt A.C. or D.C. lamp socket. It needs no batteries or eliminators.

Parts List for 1-Tube A.C. Set
Na-ald Plug-in Coil Data

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch.	19 T. No. 30 En. Close wound (CW)	½"
80-40	23 T. No. 28 En. Wound 16 T. per inch.	11 T. No. 30 En. C. W.	½"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	½"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	½"

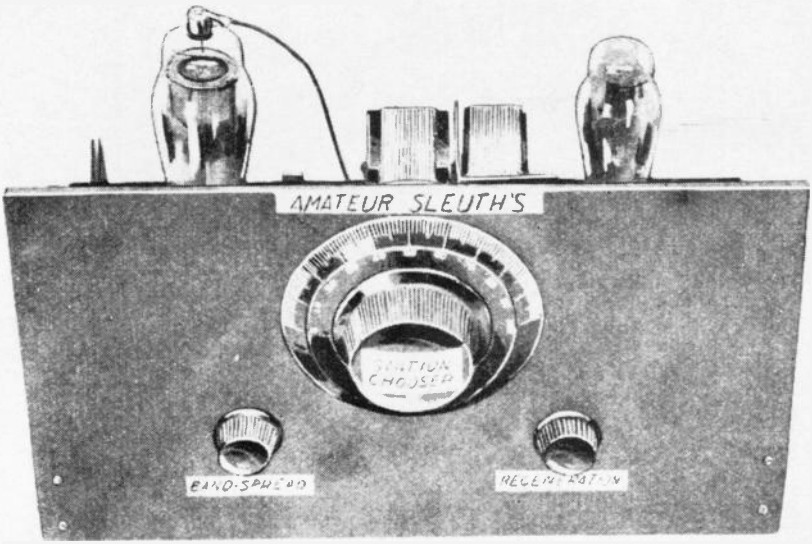
Coilform—2¼" long by 1¼" dia. 4-pin base.

The above coil data is correct when using a straight regenerative circuit. When using a super-regenerative circuit, the following tickler coils will be necessary:

Coil	Tickler
200-80	25 turns
80-40	15 turns
40-20	12 turns
20-10	10 turns

PARTS LIST FOR 1-TUBE A.C. SET

1—½ or 2 meg. grid-leak, see text. Lynch.
1—50,000-ohm potentiometer; Electrad.
1—15,000-ohm, 1 watt, resistor; Lynch.
1—line cord with 325-ohm voltage dropping resistor.
1—100 mmf. mica condenser; Aerovox.
1—.01 mf. mica condenser; Aerovox.
1—.006 mf. mica condenser; Aerovox.
—.1 mf. condenser, 300-volt rating.
1—Dual electrolytic condenser, 12 and 24 mmf. working voltage, 200.
1—35 mmf. antenna trimmer, I.C.A.
1—140 mmf. tuning condenser, Bud.
1—7-prong (small) wafer socket.
1—4-prong (small) wafer socket.
1—antenna ground terminal strip. I.C.A.
1—phone terminal strip. I.C.A.
1—small chassis; Blan.
1—12A7 tube; Sylvania.
1—pair of earphones; Trimm.



The "Police Alarm" Short-Wave Receiver

By Walter C. Doerle
Originator of the famous "Doerle" circuit.

Major Constructional Details

As this two-tube A.C. set was constructed to eliminate the many difficult features experienced by those desirous of short-wave reception, the outcome of extra effort in this direction, resulted in a very simple receiver

7"x12" panel fastened to the subpanel cleats by means of four ¾" wood screws. Then mounted on or through this panel are the various controls. The "Station Chooser" condenser C1 of .00025 mf. (250 mmf.) is quite near the top but in the center of the longest dimension. On the left of C1 is the "bandspread" condenser control.

On the right of C1 is the "regeneration" shield control. This was made so that the price of a feed-back condenser was eliminated. It gives very smooth feed-back action over the whole tuning range of approximately 100-200 meters. But more will be said later on regarding the fabrication of the *bandspread* and *regeneration* arrangements.

As to the subpanel (see photo), the parts manufactured and homemade were bolted to it by means of 6/32 round-head machine screws. This subpanel of 7"x12" tempered pressed wood was mounted on two ¾"x2"x7" wood cleats placed at the ends and held by six ¾" wood screws, four serving to also hold the "Ant.," "Gnd." and "Phone" Fahnestock clips in place. These 2"-deep wood cleats allowed sufficient depth for hooking up the parts, the placement of a radio frequency choke (R.F.C.) and screen-grid by-pass condenser C3 of .5mf. under the subpanel.

From photo No. 2 you learn the following facts which go hand-in-hand with the simplified circuit of this police-calls receiver. On the right-hand side of the subpanel are fastened the two plates of the antenna coupling condenser C2 with the lead-in clip, and toward the front panel is the other clip, which represents the "B—" and

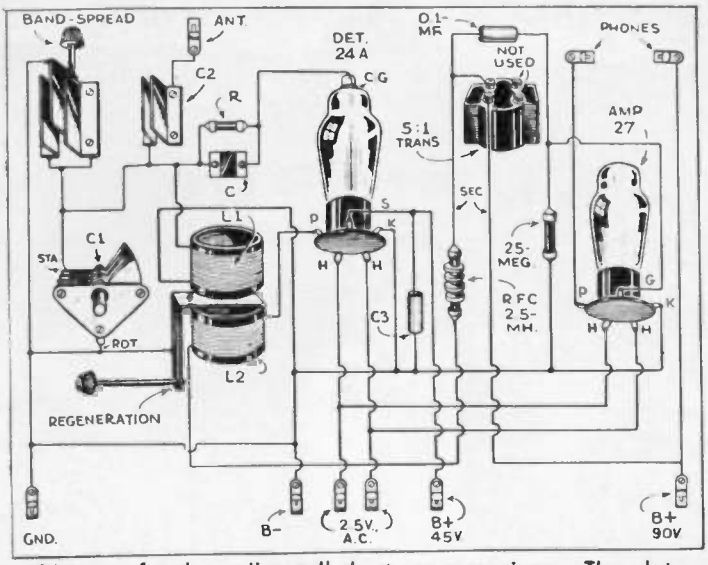


Diagram for the police call short-wave receiver. The plate current may be supplied by "B" batteries or a "B" eliminator.

"Gnd" connection to the set. Then following from right to left along the rear edge of this subpanel, you see the two filament clips (2.5 volts A.C.), the .00025 mf. grid-condenser C, the 5-megohm grid-leak R mounted on top of it, and finally the two clips respectively for the 45-volt and 90-volt B+ screen-grid and plate leads to the tubes.

On the extreme left of this subpanel are the "Phones" clips and near the front panel is the 5-to-1 ratio audio transformer.

Then traversing back across this subpanel is the 27 audio-amplifying tube, the tickler and secondary coils (L2, L1 with the *regeneration shield* between them) and the '24-A detector tube as shown with the flexible lead from the grid-condenser and leak to the cap on the control grid of this tube. Remember the screen-grid connection to this tube is the "G" terminal on the tube socket.

Minor Constructional Details of Importance

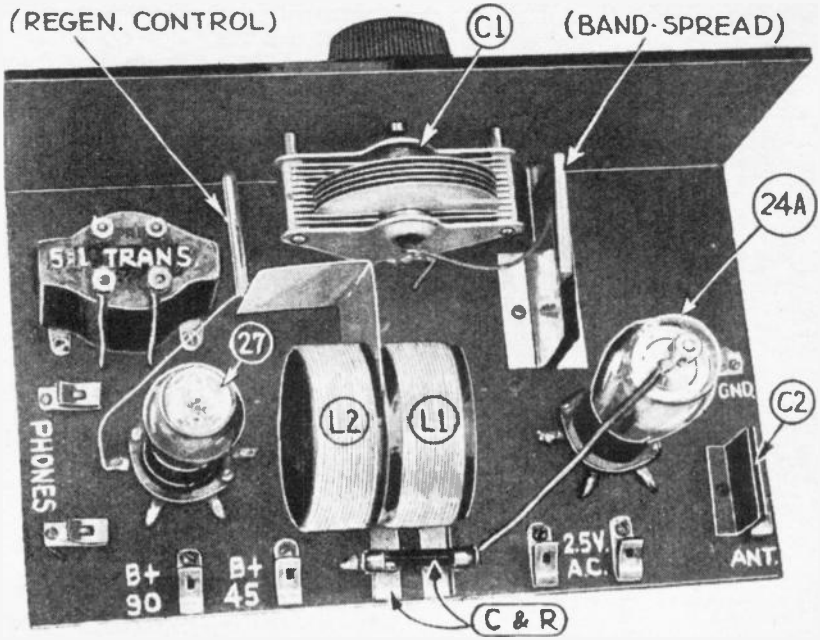
The eye quickly catches that which appears to be extraordinary and it is with this point in mind that your attention is drawn to some "made-at-home" features. Thus first for consideration, is the "half-stripped" tuning condenser — Station Chooser C1. This variable condenser had 19 plates, 2½" in diameter, but to make it a .00025 mf. all but five rotor plates were left intact. The others were politely ejected and you too will find it very easy to remove condenser plates from too-large condensers, with a few strong twists of pliers gripping them. Also pulling out these unnecessary plates nearer the control panel makes for better elimination of body capacitance effects.

The *regeneration shield* next falls in line for our argument, which is shown as a right-angled piece of thin metal between the two coils L1 and L2. This is easily made from a small piece of sheet-tin cut 2¾"x3½". It is mounted with the 2¾" dimension vertical and bent in the longer dimension so that the sides of the angle are 1½" and 2". The 2" side slides between the ⅛" spacing between coils L1 and L2.

This right-angled shield is fastened to one end of a 4" length of ¼" dowel-wood by means of a small wood screw. The other end of this dowel has a small knob on it which proves quite effective for moving this shield to and fro so that best regeneration conditions result. Then a 4" length of very flexible-stranded wire is soldered with one end to the shield and the other end to Gnd. or cathode connection of the audio tube, which in turn is grounded.

The Bandspread condenser is made with five pieces of material—three of sheet-tin and the other two of ¼" dowel-wood. The two stationary plates are cut 2"x2½" with a ½" bent from the longer dimension. Two ⅛" holes are punched through the centers of the ½" side and these stationary plates are bolted to the subpanel with ½" spacing between them.

The plate which slides between these two is cut 2"x1½". This allows the shorter-dimensioned edges to be inserted in "saw-cut" grooves in short lengths of ¼" dowel, which for convenience sake will be called "spacers." The top spacer is squared-up from the round stock, a coping-saw cut is made about half-way through and then this 2" length grooved piece pressed over the upper edge. Thus the top spacer prevents this movable center plate from touching either of the secondary plates. And for the bottom spacer, this is a 4" length



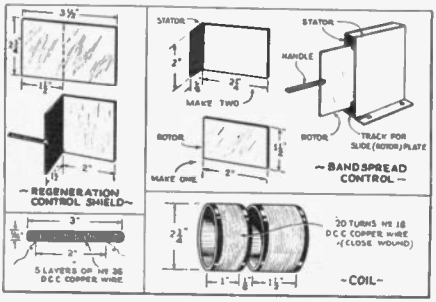
Rear view of the "Police Call" set.

of ¼" dowel dressed down and grooved similarly for 2" of its length. The bottom edge of the movable plate is pressed in the groove. The remaining 2" of the dowel projects through a ¼" hole in the control panel and the knob fastened on the end.

As with the regeneration shield, a 4" *spread control* forward or backward so that the pitch of the squeal decreases to zero and at the same time move the *regeneration* control in or out from between the two coils as this controls the feed-back energy. Thus in more simple terms, the *bandspread* permits of finer tuning and the *regeneration* of best operating point, commensurate with signal intensity.

List of Parts—"Police Alarm" Set

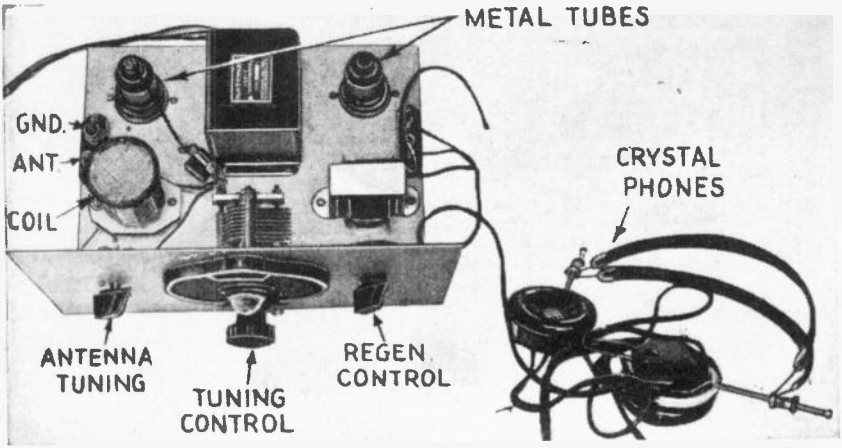
Control panel 7"x12"
Subpanel 7"x12"
Subpanel cleats ¾"x2"x7"
8 Fahnestock clips
.00025 mf. variable condenser C1
.00025 mf. fixed grid condenser C
.5 mfd. by-pass condenser C3. Aerovox.
5-megohm grid-leak R. IRC.
5-to-1 audio transformer
2 UY sockets
Coil forms—1½" length and 2¾" dia.
14" length—¼" dowel
6"x6" piece of thin sheet-tin
45' No. 18 D.C.C. copper wire
600' No. 36 D.C.C. copper wire
7 ft. rubber-insulated hook-up wire
12—¾" length round-head wood screws
20—¾" length 6/32" round-head machine screws
4" dial, ¼" shaft
2 small dials ¼" shaft
8" flexible pigtail wire
Control-grid clip
Tubes '27, 24-A
Filament transformer (110-2.5 volts)
Good "B" eliminator or 2—45 volt "B" batteries
Headphones



Details of "Police Alarm Receiver.

The "METAL TUBE 2

By GEORGE W. SHUART, W2AMN



General view of the 2-tube set using the new "metal" tubes.

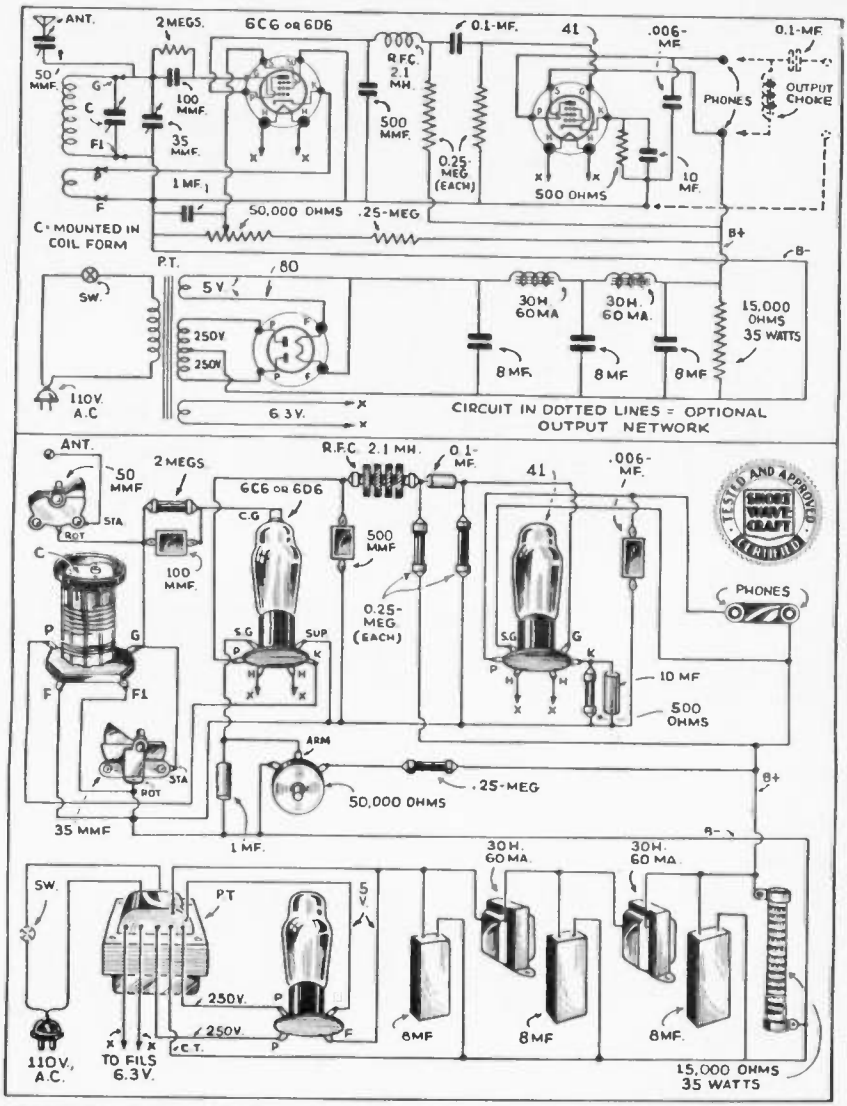
● UNDOUBTEDLY the greatest single change in radio within the last five years is the introduction of the new *all-metal* tubes. A good many of these tubes are of the same type as the former glass bulb tubes and seem to exhibit the same characteristics. The advantages and disadvantages of these tubes will be disclosed later when they have been given the "acid" test. At the present time all that we can say is that they work just as well as the glass tubes and can be used in the same circuits, although of course, they require an entirely different socket mounting because of the *8-prong* bases which these tubes have. You must be particularly careful when using these new tubes too, because it is a simple matter to place one in the wrong socket and consequently do a lot of damage. *Mark the tube number alongside of the sockets* so that there will be no mistakes made!

Works Down to 3 Meters

Tests conducted with the tubes made available to the writer showed that they will operate on all frequencies up to 100 mc. (three meters) and they should be ideal for all-wave and regular short-wave sets. The receiver shown in the photographs was selected for the new metal tubes because it is unquestionably the most popular with the average short-wave fan. The circuit is a standard regenerative one of proved per-

Parts List—Metal Tube Set

1—35 to 50 mmf. trimmer, National.
1—140-150 mmf. tuning condenser, National.
1—.0001 mf. mica condenser, Aerovox.
1—.0005 mf. mica condenser, Aerovox.
2—.1 mf. by-pass condensers, Sprague.
1—National "impedaformer coupler."
1—1 mf. by-pass condenser, Sprague.
1—2000-ohm resistor I.R.C.—1 watt.
1—3 meg. resistor I.R.C. ½ watt.
1—.5 meg. resistor I.R.C. 1 watt.
1—50,000-ohm Potentiometer, Electrad.
1—Output choke, or A.F. Trans. primary.
1—2.5 mh. R.F. choke, National.
2—8-prong tube sockets.
1—4-prong Isolantite socket, National.
2—Twin terminal strips.
1—National dial.
1—7×9×1 inch Aluminum chassis, Blan.
1—7×10 inch Aluminum panel, Blan.
1—Set plug-in coils. See Data.
1—6C5 tube (metal) RCA Radiotron.
1—6J7 tube (metal) RCA Radiotron.



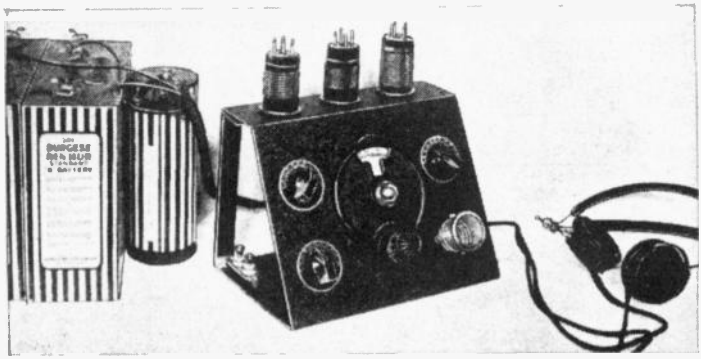
Physical and schematic diagrams showing the connections of the "Band-Spread-2."

PARTS LIST

1—crackle-finished 2-tube chassis.
1—set Hammarlund plug-in coils.
4—100 mmf. Hammarlund A.P.C. condensers.
1—35 mmf. tuning condenser, Hammarlund.
1—50 mmf. A.P.C. Hammarlund.
1—.0001 mf. condenser Aerovox.
1—.0005 mf. mica condenser Aerovox.
1—.006 mf. mica condenser Aerovox.
1—.1 mf. condenser Sprague.
1—1 mf. Sprague.
1—10 mf. electrolytic condenser Sprague.
1—2 meg. ½ watt resistor I.R.C.
2—¼ meg. ½ watt resistors, I.R.C.
1—500-ohm 1 watt resistor, I.R.C.
1—250,000-ohm 1 watt resistor, I.R.C.
1—50,000-ohm potentiometer, Electrad.
1—6-prong Isolantite socket, Hammarlund.
1—4-prong Isolantite socket, Hammarlund.
1—6-prong wafer socket, Na-Ald.
1—4-inch Vernier dial I.C.A.
1—6C6-tube
1—41-tube.
1—2.1 MH. R.F. choke Hammarlund.

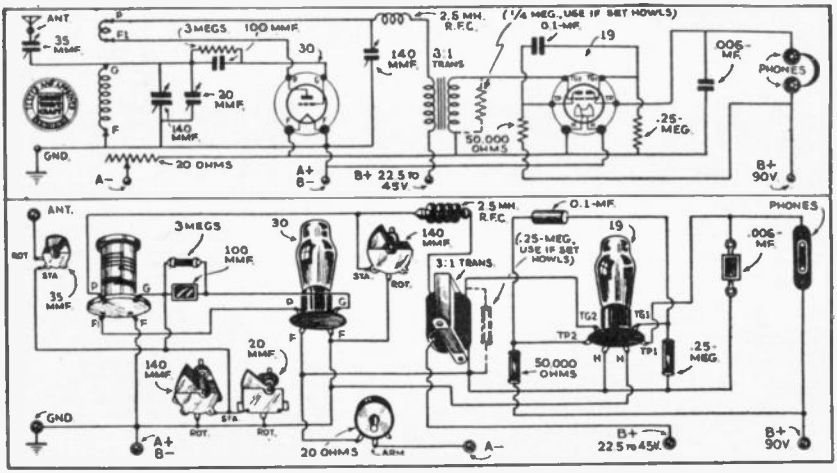
1935 "PROF" Doerle S-W RECEIVER

By GEORGE W. SHUART, W2AMN

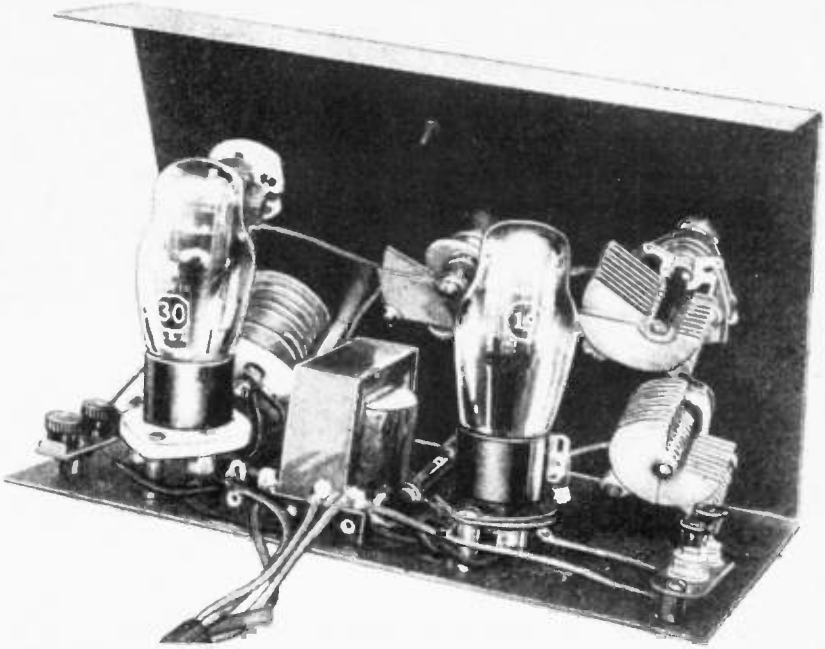


All Ready for World-Wide Reception on the "Prof" Doerle

Nearly every day some one of our readers requests information regarding the original Doerle receiver and it is for that reason we have written this article. We believe that, despite the fact that the circuit is one of the oldest known *regenerators*, interest among the beginners and less experienced S-W fans warrants the description of the Doerle using up-to-date parts. We have named it the "1935 'Prof.' (Professional) Doerle" because most of the modern set design features have been incorporated in it. The circuit fundamentals of the first Doerle set have been retained however,



Schematic and Physical Diagrams of the Modernized 2-Tube Doerle



This View Clearly Shows the General Construction of the "Prof" Doerle

The plates of the tubes are fed by two large 45-volt "B" batteries and due to the low amount of current drawn by the two tubes, they will give many months of service; good batteries should last nearly a year. The filaments are heated with two No. 6 dry cells. In order to cut the voltage of the two dry cells down from three to two volts, a 20-ohm rheostat is used. This rheostat is not mounted on the set but can be fastened to the batteries or battery box.

The antenna or aerial used with this little receiver during tests was 75 feet long, right from the binding post on the set to the far end; and we had no trouble in pulling in all the regularly received "foreign" stations.

Parts List 1935 "Prof." Doerle

1—Special Chassis—see drawing, Blan.
2—140 mmf. tuning condensers, Hammarlund (Na-Ald).
1—20 mmf. tuning condenser, Hammarlund (Na-Ald).
1—35 mmf. tuning condenser (Midget padding type), Hammarlund.
1—100 mmf. mica condenser. Aerovox.
1—.1 mf. bypass condenser, Sprague.
1—.006 mf. by-pass condenser, Aerovox.
1—3 meg. ½-watt resistor, I.R.C.
1—50,000-ohm ½-watt resistor, I.R.C.
2—¼-meg. ½-watt resistors, I.R.C.
1—3:1 ratio audio transformer, Kenyon.
1—20-ohm rheostat, Electrad.
1—2.5 M.H. R.F. choke coil. Hammarlund.
1—Set of coils; see coil table, Na-Ald.
2—4-prong Isolantite sockets, Hammarlund.
1—6-prong Wafer socket, Na-Ald.
2—Twin binding post strips, Na-Ald.
3—Small dials and pointers, Crowe.
1—Large Vernier dial, National.
1—4-wire Battery cable.
1—19-tube, RCA-Radiotron.
1—30-tube, RCA-Radiotron.

"Tube-Base" Coil Data

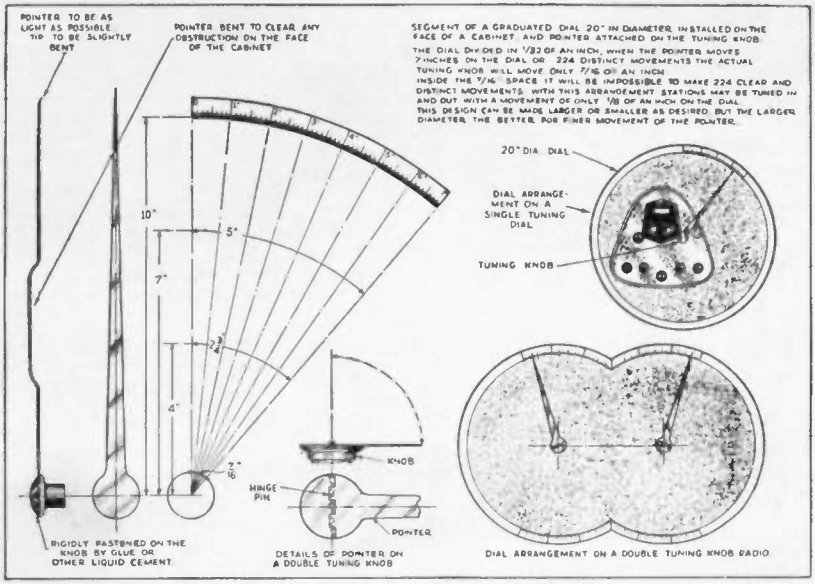
Coil Number	Wavelength Range in Meters	Turns on Secondary Coil	Turns on Tickler Coil	Distance Between Windings
1	19-34	5	5	1/16"
2	31-58	10	5	1/16"
3	54-102	20	5	none
4	100-210	55	11	none

Wound on 4-prong tube base, all close-wound

Na-ald Plug-in Coil Data

Meters Wavelength	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch.	19 T. No. 30 En. Close wound (CW)	¼"
80-40	23 T. No. 28 En. Wound 16 T. per inch.	11 T. No. 30 En. C. W.	¼"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	¼"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	¼"

Coilform—2¼" long by 1¼" dia. 4-pin base.



The drawing above shows a very interesting and practical way in which to greatly simplify the problem of short-wave tuning. A greatly lengthened indicator is employed with a highly magnified scale, the needle serving either as an indicator or as the actual tuning device.

MAGNI - DIAL

Simplifies S-W Tuning

By H. E. McCANN

● THE illustration herewith shows a practical idea which the writer has worked out and employed very successfully in tuning in stations halfway round the world, with the greatest of ease. One of my principal experiences with this greatly magnified dial for short-wave tuning has been in connection with the McMurdo Silver Masterpiece 2 All-Wave receiver. With one of these large dials fitted to this set I have been able to easily tune in Berlin, Moscow, Paris, Buenos Aires, Madrid or London (on the 20-inch diameter dial; at the writer's location, Cavite, Philippine Islands.) I can tune in any one of these stations and lose them again when I move the dial indicator 1/16 of an inch, either to the right or left of the exact point where the station comes in clearly.

As shown on the drawing for example, a section of the 20-inch diameter circle about 7 inches long can ordinarily be used. Now, if you divide this 7-inch segment into 1/32's of an inch, this means that you can very easily and accurately move the tuning knob 224 times, each movement covering the space of 1/32 inch, but on the knob alone these 224 movements in a space of 7/16 of an inch would be practically impossible, without the use of this or a similar design to allow the knob to be moved 224 times an equal distance in any one direction inside the space of 7/16 of an inch.

Receivers equipped with double tuning knobs may have a long pointer like that illustrated fastened on each knob, and used with half a ring or circle of the scale for each knob. In this case it will be found best to hinge the pointer at its center so as to complete a turn; the pointer or indicator is then started again, thus going twice around the half dial as shown in the drawing.

As the drawing makes perfectly clear, this design can be used in many different ways and on practically all

radio receivers regardless of the fact that it uses one or two tuning knobs or controls.

The principal advantage of this idea is that it need not cost practically anything and only requires a little ingenuity on the part of the set owner who wishes to adopt it. As the reader will at once realize upon a little reflection, there are many different ways in which this magnified dial idea can be figured out and the form of the dial and its angular spread will in many cases be dictated by the design of the particular receiver you happen to own or operate. In some cases the dial may have the graduations spread out over a half circle. Another angle of this invention is that you may simply use the new long indicating needle 10 inches in length for example, merely as an *indicator* and not as the *actual* tuning control to be set by grasping the end of it, and then perform the usual tuning operation by means of the vernier knob on the set.

Still another angle is that on sets having considerable band-spread, or those in which the stations are spread out on the dial pretty well, especially in some of the newer sets having switches to tune in the different bands, then you can easily arrange several dials made out of heavy cardboard or else drawing paper or bristol board, cemented or shellacked to a thin metal or cardboard backing, so that it will take but an instant to change dials for the different bands. By cutting a hole in the dial so that it will come just over the opening in the old escutcheon plate then when the set is turned on, the light may be seen through the hole which may be covered with a piece of red or green celluloid cemented to the back of the dial. In this way you have a pilot light, also very desirable.

(H. E. McCann, the author of this article, is manager of the El Varadero de Manila, Cañacao, Cavite, P.I., and the editors are pleased indeed to present this idea as it will undoubtedly prove a boon indeed to the thousands of short-wave listeners. Of course one may use a magnifying glass to aid in reading the fine divisions on some of the dials fitted on many short-wave receivers, but what we can see with the unaided eye and without the medium of a lens is after all the most pleasant and comfortable tuning. Mr. McCann suggests a 10-inch radius or 20-inch diameter dial, but we imagine in some cases that a dial even larger than this may be used. Possibly some genius will even carry out the idea on a much larger scale and instead of using a long mechanical indicator may work out a simple light-beam arrangement, whereby a sharply focused pencil of light will sweep over a large dial. And this gives us another idea which may appeal to some of our set-builders—they may elect to arrange a small light on the end of the indicator needle so that it moves along behind a transparent dial, a sharp line being focused on the scale of the dial by means of a diaphragm of suitable shape)—Editor.

4-TUBE RECEIVER

(Q) Would you be kind enough to publish a diagram of an A.C. receiver using a 24 as an untuned R.F. stage, a 24 or 27 regenerative detector, and a 45 or 47 audio frequency amplifier in the A.F. amplifier?

(A) We are very pleased to comply with your request for the above diagram and we are recommending that you use a 24 in the untuned R.F. stage and a 24 screen grid detector resistance coupled to a 27 first stage audio, which in turn is resistance coupled to 47 output tube. We are adding the 27 first stage of audio in order that full speaker volume may be obtained. The type 47 tube draws considerable plate current and it is advisable to use an output transformer for phones. However, a good magnetic speaker should work satisfactorily without the transformer.

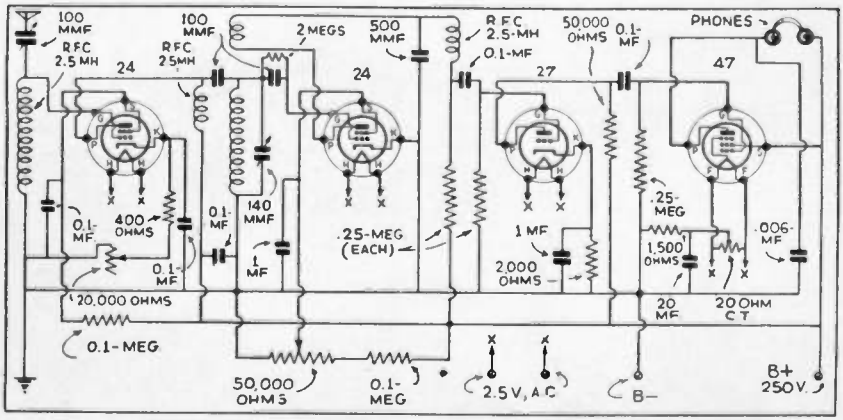
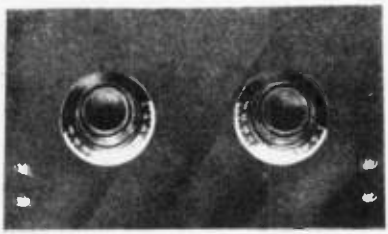
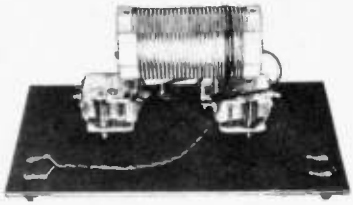


Diagram of 4-tube receiver using two 24's, one 27 and a 47.





Front and rear views of the antenna tuning device described

WHICH S-W AERIAL IS THE BEST?

By GEORGE W. SHUART, W2AMN

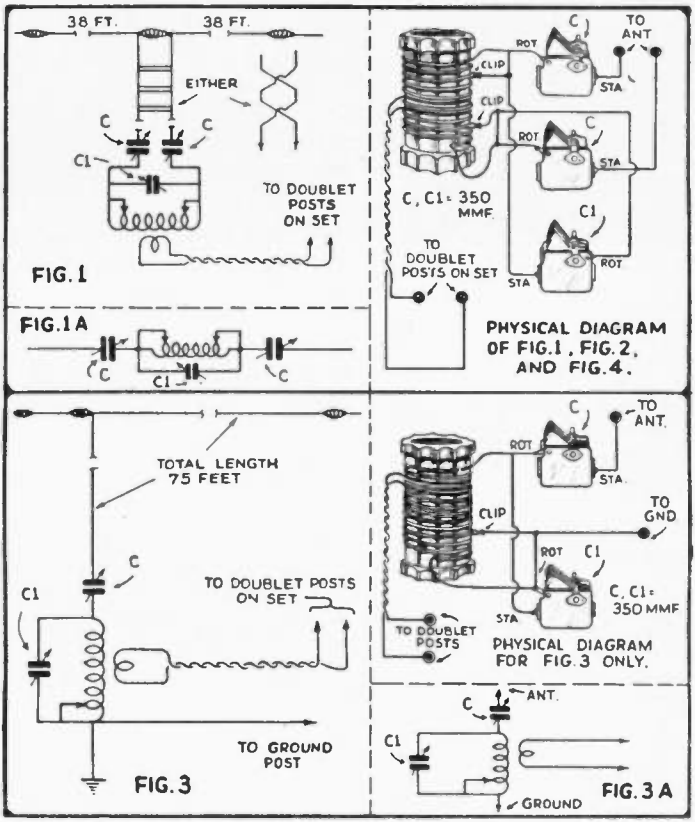
This "Impedance Matching" Business!

There is just one other point that should be made clear before we go any further and that is this "impedance matching" business. Considering "half-wave doublets" and their impedance, if you put up an antenna, that is of the doublet type, it will resonate at one particular frequency and at this frequency (meaning the lowest frequency at which it will resonate) it will be a half-wave doublet antenna and will have an impedance at the center of around 75 ohms. Now!—If you operate this antenna with a receiver tuned to some other frequency—then it will not be a half-wave doublet, in fact it is no longer a doublet. It's just a piece of wire cut at the center and not very effective except, as we said before, at the particular wavelength which is just twice the length of the antenna in meters. You can only expect this antenna to work well on *one wavelength*, or an *odd harmonic of that wavelength!* And on all other wavelengths you can look for a *loss* in signal strength.

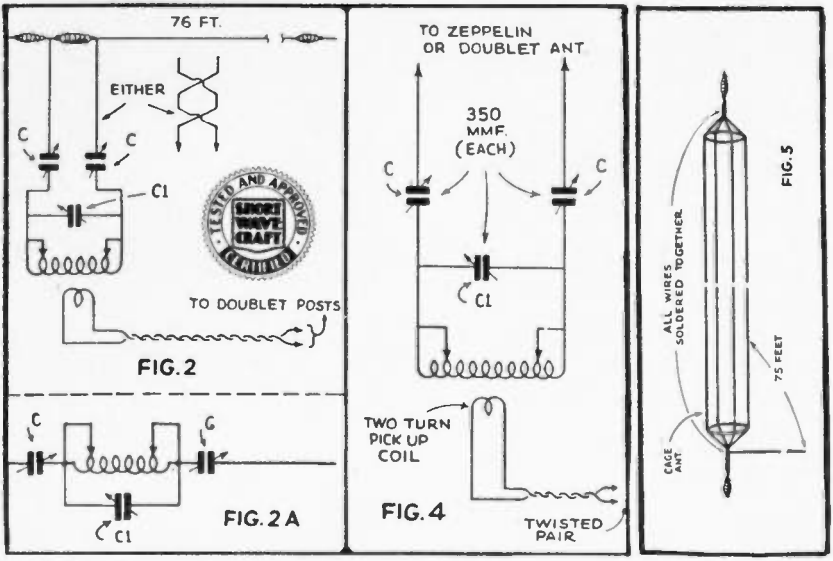
This undoubtedly will bring to your mind cases where the doublet gives less volume on the stations than a plain antenna and ground. True, the noise level is *down, but so is the station!* This is because the ground and antenna combination is broader in response than the doublet, the doublet giving less volume because we are not operating it on its own "natural period." A doublet, being so much sharper than other types, is the worst one to use for general short-wave reception, *unless we make some arrangement for tuning it!*

Doublet Should be Tuned!

We will probably hear plenty of "howls" as the result of the above statements, but nevertheless they are true and are *not* new ideas, as any good book on antennas will reveal. Why all this discussion? Because plenty of fans have put up these antennas *not* to *reduce noise*, but to get *better signals* and they have been disappointed.



In Figs. 1. 2, and 3 we find very practical methods of tuning antennas in order to bring up the strength of the stations, so that they will at least be "in the running" with the *noise!* In Fig. 1 we have a *real* doublet, the resonant period of which can be adjusted by the three condensers and the coil. To make it clear we consider it as one single wire, as in Fig. 1a, its length can be shortened by reducing the capacity of condensers "C." To make it work as an antenna longer than it really is, we short condensers "C" and use condenser "C1" and the coil which is equipped with a clip to "short out" the unwanted turns. Now if we fold it as shown in Fig. 1, the fields of the lead-in section will cancel and reduce the danger of picking up noise. In Fig. 2 we have the same system but there is only one flat section and it is not split. The flat section, however, is the same length as the whole of the flat top of the doublet. This antenna is commonly called the "Zepp," because it was originally designed for use on Zeppelins. The feeders should be spaced with 1½ to 2-inch ceramic insulators; or they can be transposed with transposition blocks. The two condensers marked "C" should be varied simultaneously, but the ratio between the two should be varied slightly by either advancing or retarding one or the other in order to obtain the least background noise. These condensers, be-



drawings covering the various Short-Wave antenna systems described

sides tuning the system, can be used as "phasing" adjustments to bring the currents in each feeder just opposite in order that the field will cancel and if they are run in the field of some electrical disturbance they will tend to reject the noise. The above holds true for both Figs. 1 and 2.

How to Build "Tuner" for Doublet Antenna

Figure 3 shows just a single wire which is equipped with a coil and two condensers. Condenser "C" reduces the effective length of the wire, and "C2," together with the coil, lengthens it. This antenna is just as good as the other two if one is not going to run the wire near any electric wires, etc.

The coil used in the universal antenna tuner is wound on a National steatite threaded coil form and has 26 turns of No. 12 or 14 bare, tinned copper wire. It will be necessary to make a small clip to fit the wire for varying the number of turns. The receiver pickup coil has two turns of cotton-covered wire (No. 18 hookup wire will do) interwound with the bare wire. For antennas in Figs. 1 and 2 it should be placed exactly in the center of the large coil; for Fig. 3, it should be placed four or five turns from the antenna end of the coil. Only one "shorting" clip is needed for the antenna in Fig. 3, while two are needed for those of Figs. 1 and 2. Condensers "C" and "C1" have a capacity of .00035 mf. and are midget broadcast condensers.

Do not use twisted pair or similarly close-spaced wire for the feeders, because the high distributed capacity of this wire makes it difficult to tune.

Tuning this type of antenna coupler is quite simple after the initial adjustments for each wave band have been determined. The number of turns used in the coil for the antennas shown in Figs. 1 and 2 will depend upon the length of the feeders or lead-ins. The feeders of Fig. 1 should be between 55 and 65 feet long for best results. For the "Zepp" the feeders should be no less than 35 feet long and can be as long as 75 feet. This system is not as flexible

as that shown in Fig. 1. The system shown in Fig. 3 is by far the most flexible of the three. This system is used by the writer in amateur work and provides stronger signals on all bands and surprising as it may seem, the background noise is reduced about 90 per cent as compared with a simple *untuned* antenna and ground arrangement.

Set the "shorting" clips so that about one-third of the coil is not in use; set "C" to maximum capacity and vary "C1" and the turns in the coil until the signal is loudest, then try for a combination of both "C" and "C1" which will give a still stronger signal with less noise! The leads of the two-turn coil should be connected to the "doublet posts" on your receiver. If you have no provisions for this connection then connect them to the "antenna" and "ground" posts. The *ground* post of the receiver should always be *grounded*. If one doubts the practicability of tuned receiving antennas, one has only to ask the question —why transmitting antennas are tuned— and the answer is obvious! At a later date we will endeavor to describe simple directive antennas for the "Fan" who is interested in picking up certain DX stations.

Figure 4 shows the schematic drawing of the coupler designed for use with either a doublet or a "Zepp" antenna. Note that there are two clips and these should be placed at equal distances from the center, the exact location depending upon the length of the feeders or the frequency on which it is being operated. Three condensers are used with this instrument while only two are used in the tuning unit for the Marconi antenna. The tuner for the Marconi antenna is shown in the photograph and a general idea of the construction and assembly can be obtained by referring to it.

Cage Antennas

Many comments and suggestions have been offered regarding the use of cage antennas. However, we have yet to see actual proof of one of these antennas giving better results than a single wire. During tests absolutely no difference could be noted between the single wire antenna and the multiwire affair such as the cage. However, we have no fault to find with this type of antenna and should the reader desire to construct his antenna either the doublet or Zeppelin type using the cage principle, he may do so but no increase in signal strength should be looked for. The construction of a cage antenna is shown in Fig. 5.

Antenna Construction

A few words might also be said regarding the type of insulators, wire, and general construction of antennas.

One point which should be stressed is the use of good insulators and plenty of them! If *small* insulators are used about two or three inches long, it is advisable to use *two or three of them connected in series* with short pieces of wire. Isolantite (or other good ceramic insulators) or Pyrex insulators, of course, are the most efficient and are recommended in every case. Then too, the tie-wire, that is the wire supporting the antenna, if of any appreciable length, should be broken up every three or four feet with an insulator. If possible, of course, it is best to use a rope rather than a wire. All connections in the antenna should be well-soldered. Connections, whether soldered or not, should be avoided wherever possible. The down lead or feeders, whichever you prefer to term them, should be kept away from metal leader pipes, telephone wires, electric wires, or any other metal. Keep it well out in the clear and away from trees whose branches may come in contact with it. If your antenna is supported by a mast by all means try not to use metal. If possible the mast should be constructed of wood and any guy wires supporting it should be broken every few feet with an insulator. If a metal mast is used to support the antenna don't run the end of the antenna too close to it! A good distance to keep is fifteen or twenty feet.

The Ground

When a ground is used and connected to a water pipe make sure that you attach it to the pipe where it enters the building if you are on the ground floor. Long ground wires are not very effective and considerable noise may be picked up by this wire even though it is grounded at one end. Therefore, in apartment houses it is permissible to ground the receiver to a steam or hot water radiator. Better results can be expected than if you were to run an extremely long and relatively fine wire from the set to the ground. Just merely driving a metal rod into the ground several feet does not necessarily constitute a good ground connection, unless the earth is quite moist and your ground rod is at least six or eight feet long. In many cases a much better ground is obtained by connecting to a water pipe.

Parts List for Antenna Tuner

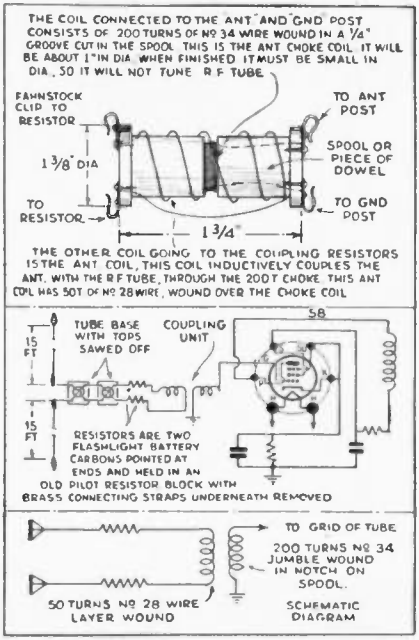
2—35 mmf. midget variable condenser.
1—National grooved Ceramic coil form.
Sufficient No. 12 or No. 14 tinned wire to wind the twenty-six turns.
1—Seven by ten inch bakelite panel.
4—Binding posts.
2—3-inch NaAld dials.

Coupling Doublet Aerial to Untuned R.F. Set

● Here is an interesting short-wave kink. It is a device to couple a transposed antenna to an untuned R.F. set. It consists of a wooden thread spool 1¾" x 1¾", boiled in paraffin, with a ¼" deep groove cut in the center (a wooden dowel may be substituted for the spool). In this groove 200 turns of No. 34 wire is wound in "jumble" (i.e., helter-skelter) fashion. This coil is the choke of the R.F. stage. It must be small in diameter so it will not tune the R.F. tube to a certain frequency. Over this winding a layer of insulating paper is wound. Over this 50 turns of No. 28 wire is wound, layer fashion, for a length of one inch. This coil is the antenna coil. The antenna is inductively coupled to the receiver by these two coils. Two Fahnstock spring clips are screwed to each end of the spool and the four leads of the two coils are respectively connected. A single layer of tape is then wound around the spool to give it a "commercial" appearance.

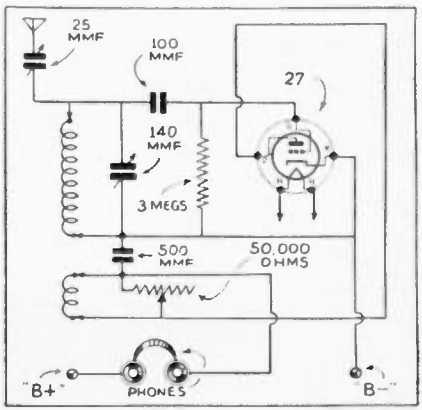
The antenna coupling resistors I used with this device were two flashlight battery carbons, pointed at each end and held in an old resistor block with the brass straps underneath removed. The regular choke or resistor in the set is removed and the secondary of the coupler connected to the antenna and ground posts, or it can be built into the receiver.

Of course, there is little use of using a special coupler and its associated equipment if a good job is not done in constructing and erecting the antenna. In noise reducing antennas it is absolutely necessary to mount the antenna as far away as possible from all sources of noise. This means that the lead-in will have to be extremely long in most cases. Two sections of the flat top in the antenna can be 15, 30, or 50 feet long each. Use enameled wire, either stranded or solid, preferably No. 12 gauge. The feeders can either be transposed with transposition blocks having one and one-half to two inch centers or can consist of any of the present day high frequency cables which are on the market. The lead-in should not be run too close to sources of noise than necessary and one should avoid very sharp bends in bringing the lead-in from the antenna. Where it is necessary to change the direction of the lead-in it is suggested that a well rounded out corner be used because of the losses effected by sharp angular bends.—Henry Mike Kiertscher.

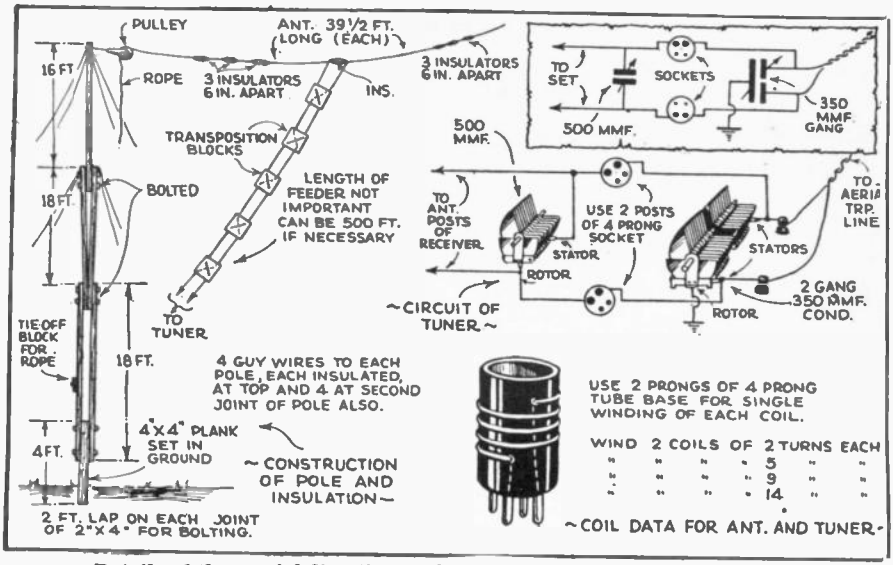


complete group of drawings showing the construction and connections of the doublet antenna "coupler."

OSCILLODYNE DIAGRAM



1-Tube Oscillodyne diagram.



Details of the special directive doublet antenna used by Mr. Johnson to "listen in" to European S-W stations are given above.

Best Aerial for "Europeans"

By HEINIE JOHNSON

● BECAUSE Europe with the D-G and F signals affords a goodly portion of the pleasurable listening, we have built a special antenna for reception of signals from that continent.

The top, or antenna proper, consists of two 39½ foot lengths of No. 4 aluminum wire at a height of 47 feet above ground, swinging from rope tie-offs between two wooden poles, made from 2 by 4's per sketch. The lead-ins are of No. 14 enameled copper wire, transposed each 15 inches, on home-made insulation blocks which were cut from plywood and boiled in paraffine.

Since aluminum cannot be easily soldered, except with special solder, the ends were flattened out with a hammer as shown and the copper lead-ins, after being well scraped, were wound in and around the holes in the flattened ends of the antenna conductors. Afterward the connection was covered with waterproof cement and well taped over. This forms an excellent connection we have found.

The lead-ins are brought through the wall to a special *antenna tuner* by means of twisted lamp cord. This tuner consists of one two-gang .00035 mf. condenser block, two coil sockets, one .0005 mf. condenser and four sets of coils (two to the set) wound on tube bases—and arranged as shown in the diagram. Coil data is described separately. The lead-ins are taken from this tuner to the antenna posts of the first T.R.F. stage. The antenna coil of this first stage has been freed of ground connection and brought back to the second antenna post, in order to complete the antenna circuit as a whole and the two .00035 mf. condensers furnish the ground capacity used in the antenna circuit—usually you'll find best operating conditions with these condensers well open; i.e., rotor plates well out of the stator plates.

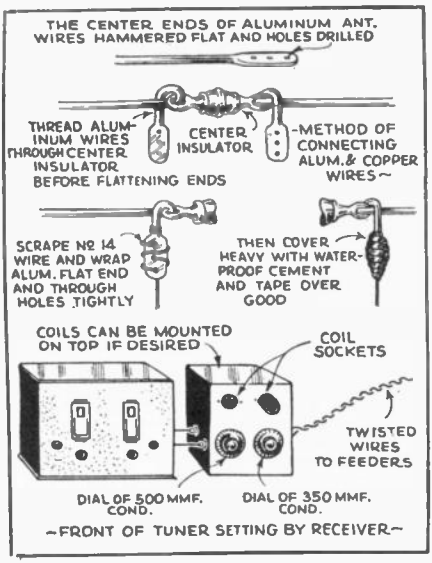
The efficiency of this hook-up will surprise you. You will find it possible to "peak" a signal to the extent of having FYA's 25.63 meter signal come in strong enough to "shake" a heavy loudspeaker with vibrations of their carrier alone, when no program is on! This will also prove true of the GSD and GSF carriers during the usual short periods when the carrier is on, *but no transmission is sent out.* Of course, such antenna efficiency will bring in the program much better

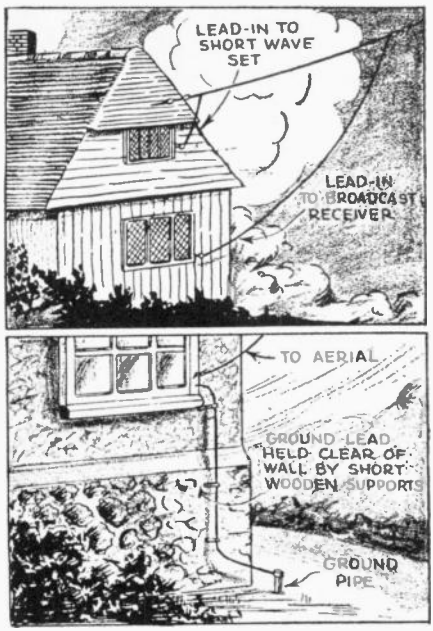
than the aperiodic form afforded by a transformer coupling, but will also require considerably more tuning than is required with the usual coupler. We don't mind that and don't believe any "dyed-in-the-wool" short-wave fan will either.

This antenna is "plenty" efficient from 6,000 kc. to 25,000 kc.; therefore covering the best part of the DX bands. It would work equally well if placed so as to be directional to South America, but since we built it for European and Asiatic reception, we run it from S.E. to N.W. due to the directional effect of the doublet being crosswise, or at right-angles to the wire.

Using this aerial system and a National FB7, plus two stages of added T.R.F. (tuned radio frequency) we can absolutely guarantee to let visitors hear England, France, Germany, Spain, and Italy daily, while Japan, China, and Australia "roll in sweet"!

It will be found that each set of coils cover only about 10 to 15 meters, but since the antenna is a complete circuit in itself, you can insert a 9 turn coil in one side and a 2 or 5 turn coil in the other side, and thereby cover that portion of the receiver dialing not covered effectively by matched coils. On some frequencies a single coil in one side with the other side vacant, will be effective: you are then coupling the two ends of the doublet through ground capacity of the .00035 mf. condensers only. Tuning will be very critical but the noise level will be raised to a noticeable extent. At this time the use of .00035 mf. condensers will be more effective. Leave them open when using matched coils in both sides.





This illustration shows how a single antenna may be used for both "broadcast" and "short-wave" reception.

Using Single Aerial for S-W and Broadcast

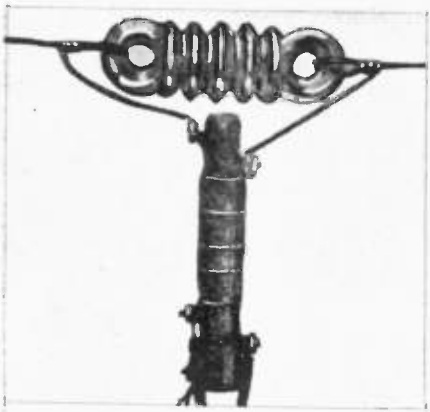
● SOME interesting facts concerning the aerials used for short-wave reception appeared in recent issues of *Popular Wireless*, an English weekly publication. The first of these is a hint for using a single aerial for both short-wave and broadcast reception. A glance at the illustration shows that a lead-in is brought into the house from each end of the aerial. One of these lead-in wires is connected to the broadcast receiver while the other connects to the short-wave set. When used in this way there is no interaction between the two receivers; each works as though it had an individual aerial and lead-in. The other hint concerns the placement of the ground lead which often introduces noises into a short-wave receiver, if it is placed near an electric light line or is allowed to rub against a wall, gutter or drain pipe. Varying capacity effects or static voltages set up either by induction or friction caused by rubbing introduces static voltages in the aerial coil which are picked up and amplified in the receiver.

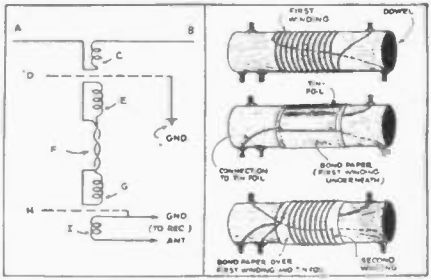
The solution to the problem lies in correctly spacing the ground lead from any pipes or wires by the use of wood or other insulated spreaders. A glance at the sketch shows how a typical installation is made.

There is no doubt that worthwhile improvements in short-wave receivers can be made by simple changes in the aerial, especially in the position and care with which it is insulated.

INTERFERENCE - REDUCING ANTENNA

By LOUIS R. HUBER



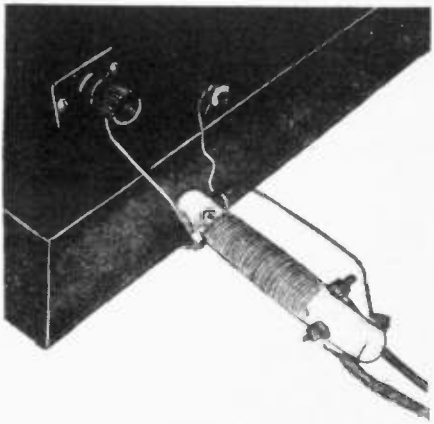


Left—The weather-proofed antenna coupler. Above—Fig. 1, connection of antenna and couplers to feeder line; Fig. 2, details of couplers. Right—The coupler used at the receiving set.

● INTERFERENCE generated by vacuum-cleaners, motors, X-ray machines, heating pads, and other household and industrial devices, is responsible for most of the noise which mars short-wave reception and often makes a short-wave receiving set worthless in some locations. A coupling device for use with the "doublet" antenna eliminates a good share of this interference by the simple expedient of putting the receiving antenna in a spot which is largely free from the interference and running a "feed line" from the antenna to the receiving set—the feed line, of course, being non-sensitive to radio waves.

The most important factor being the location of the antenna, one should select a place as remote as possible from all sources of interference. Height is generally the most successful factor, since the "belt of interference" lies at a height of from 10 to 25 feet above ground, and an antenna situated above this "layer," with a non-sensitive lead-in or feed-line, will not be affected greatly by the interference.

The type of antenna herewith described—the "doublet"—is suitable for use at only one wavelength or frequency, but by building several antennas of this type, the listener is equipped for all wavelengths on which reception is desired. A schematic diagram in Fig. 1 shows the method of connecting to the antenna. The system ACB comprises the antenna proper and the primary coil of



the antenna coupler, the antenna proper consisting of two equal lengths of wire separated by a strain insulator, at which point the antenna coupler is connected.

The system CDE is the antenna coupler, consisting of two coils with an electrostatic shield between them. The feed line F may consist of lamp cord or weatherproofed twisted pair such as telephone linemen use for house leads, or—*better yet—of number* 14 *B. & S. gauge enameled copper wires transposed every two feet on transposition insulators.*

The system GHI is the receiver coupler, exactly like the antenna coupler except for the connections. It will be

noticed that the electrostatic shield of the antenna coupler is led off to a ground in the vicinity of the antenna. This connection is not absolutely necessary but is desirable. The electrostatic shield of the receiver coupler, on the other hand, is connected to the ground post of the receiver, which may or may not be grounded; trial should be made to determine if the receiver functions better or worse with a ground.

Construction of Couplers

Four sets of couplers will provide the short-wave listener with an efficient short-wave antenna system that will cover nearly all the territory on which reception is desired, since the antennas are not excessively critical. For reception of a specific frequency, one special antenna may be designed, but it will also serve adjacent frequencies. It is considered most practicable, therefore, to use four systems having a harmonic relation from 160 meters on down through 80, 40 and 20 meters. This will allow reception of police calls around 180 and 120 meters, amateurs on 160 meters, aircraft on 90 and 52 meters, international broadcasting on 49, 30, 25 and 19 meters, and amateur radiophone on 75 meters.

Antenna lengths for the four systems are as follows:

160 meters—90 feet (45 feet on each side)
80 meters—80 feet (40 feet on each side)
40 meters—60 feet (30 feet on each side)
20 meters—30 feet (15 feet on each side)

The couplers for each antenna call for separate specifications. The details of construction are shown in Fig. 2, and specific directions for each antenna system are as follows:

160 meters—Coil form is ⅞" maple dowel 4 inches long. First winding of 100 turns number 30 d.c.c. copper wire. Second winding of 75 turns.

80 meters—Same coil form. First winding of 60 turns number 30 d.c.c. copper wire. Second winding of 45 turns.

40 meters—Coil form of ½" maple dowel 3½" long. First winding of 16 turns number 24 d.c.c. copper wire. Second winding of 14 turns.

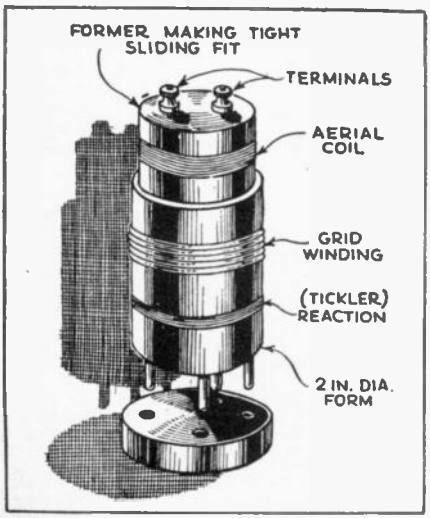
20 meters—Same coil form. First winding of 9 turns number 24 d.c.c. copper wire. Second winding of 7 turns.

In all coils the *electrostatic shield* consists of a 1¼ turn winding of tinfoil with a piece of bond writing paper separating the ends so as to keep the tinfoil from forming a one-turn absorption loop. The first winding is wrapped with 3 layers of bond paper, then the electrostatic shield is put on, three more layers of bond paper are wound on, and the second winding is applied.

The five binding posts are brass machine screws countersunk half the way through the coil forms. For the 160- and 80-meter forms, they can be ¾" round-heads size 6-32, and for the 40- and 20-meter forms they can be ½" round-heads size 4-40.

When both windings and the electrostatic shield are finished on each coupler, the entire form and coils are taped over completely with black friction tape, given three or four coats of clear auto finish, and they are weatherproof. It is important to cover everything but the binding posts with the tape, as the clear auto finish will not adhere to smooth surfaces in the action of sun, wind, rain and variable temperatures.

Adjustable Aerial Coupling



Drawing showing how to construct a variable antenna coupler.

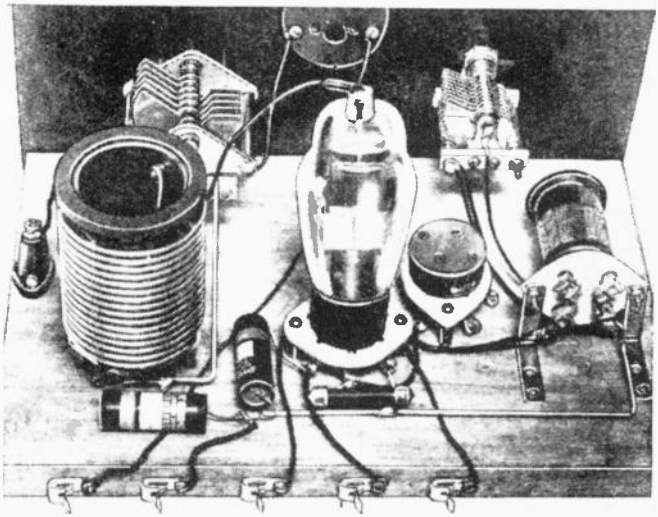
● THE advantages to be gained by variable aerial coupling short-wave receivers, especially of the regenerative type, have been exploited in numerous articles. There is little doubt that some means of accomplishing this variable coupling is worth while.

The arrangement however, is quite simple and has the advantage that individual aerial coils can be used for each wave band so that maximum efficiency can be achieved. As you will note from the illustration the aerial coil is wound on a form that will just slide inside of the coil on which the other windings are placed. If this sliding fit is rather tight, the primary will remain in any position in which it is placed. If tight coupling is desired two methods can be employed. The first of these is to slot the aerial coil form so that the wire will not be above the surface of the form which will permit it to slide completely inside of the main coil form. The second method would be to place the grid winding at the top of the main coil form so that the aerial coil will be close to the secondary winding when it is pushed down as far as it will go. A little experimenting with the number of turns on the primary will often make a worthwhile difference in the operation of the set.—*Popular Wireless.*

SIMPLEST HAM Transmitter Uses 802 Tube

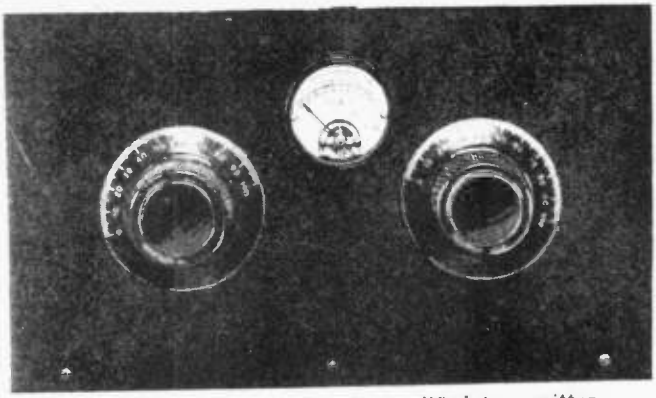
By George W. Shuart, W2AMN

This transmitter, while very simple and easy to build, has an output of 10 watts on C.W. or about 2 watts when used for phone. It is a complete crystal-controlled MOPA. This new 802 tube offers tremendous possibilities in simplifying amateur transmitters.



The 802 tube and its associated equipment as used in this Ham transmitter makes a very neat assembly.

WHENEVER there is a difficult problem to solve in radio the tube engineers are usually called upon to build a new tube which will solve that problem. Amateurs have for a long time needed a tube which would serve as a low-power *oscillator* and as a buffer or *frequency doubler*. A tube was needed that would make the average Ham transmitter simple and foolproof. Some Ham transmitters that



Front view of Mr. Shuart's latest simplified transmitter

were using *power* frequency multipliers were truly dangerous and very tricky and difficult to adjust. Not so today with the new RCA 802 screen-grid pentode, which will overcome all past ills if properly used.

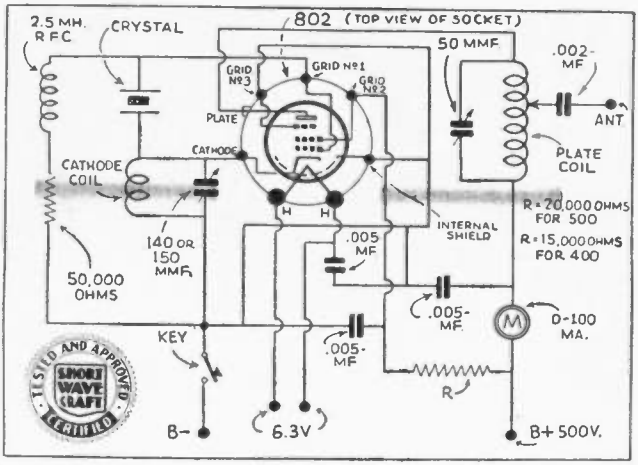
There are dozens of uses for this new tube and they will immediately suggest themselves to the thoughtful amateur; space will not permit us to describe all of them, but it is safe to say that they will be used mostly as crystal-controlled oscillators, buffers and doublers.

The little transmitter unit shown in the photograph is really the most simple Ham transmitter that could be built. It really is a 1-tube crystal controlled MOPA and will serve as an excellent low-power transmitter or as an exciter unit to take the place of the oscillator stage in an already existing transmitter, with a marked increase in efficiency.

The 802 will replace the now popular 59 crystal controlled oscillator with an increase in output and flexibility. The shielding in the 802 is so complete that the plate circuit can be tuned to the crystal frequency when using the familiar electron-coupled circuit. There are seven prongs on the base of the 802, the reason being that the shielding has its own separate pin instead of being connected internally. This allows free operation of the cathode in the so-called "electron-coupled" circuit. The plate connection is brought out at the top of the bulb to reduce coupling between it and the other elements.

When using this tube in the oscillator circuit shown in the diagram it is absolutely necessary that the suppressor grid be connected to the shield and the B minus. Do not connect the suppressor to the cathode if you are going to operate the plate circuit at the crystal frequency, because it will introduce coupling between the two circuits and the plate circuit will fall into oscillation and the whole thing will be useless. The liberal use of effective by-pass condensers is also necessary to maintain stable operation. The screen-grid should be by-passed to the B minus *as near to the tube terminal as possible* and the B minus or ground lead should be placed so that all these by-pass condenser leads are as short as possible. Probably a better method would be to use a metal (copper would be fine) base and make this the B minus or ground to which all leads should be thoroughly bolted or soldered.

The tube does not need a shield if the two coils are kept far enough apart. And with the cathode coil lying at right



It is hard to conceive of a simpler transmitter than the one shown in diagram form above.

angles to the plate coil there is not the slightest trace of feedback from plate to grid. Plug-in coils are used in both cathode and plate circuits; the form for the plate coil is 2¼ inches in diameter and wound according to the data given in the coil table. The cathode coil is wound on a 1¼ inch dia. form with ordinary double cotton-covered magnet wire. The maximum and recommended voltages for the 802 tube are 500 for the plate and 250 for the screen-grid.

In any case the same power supply should be used in order to prevent possible damage should the plate voltage fail. The plate voltage should not be removed unless the screen voltage is also disconnected, another good reason for the series resistor method of obtaining the screen voltage. For normal operation on either the fundamental or a harmonic of the crystal, the grid-leak found to give the best results was 20,000 ohms.

By glancing at the coil table we see that the cathode coil for an 80-meter crystal does not tune to 80 meters, but somewhere between 40 and 80, the adjustment of this cathode circuit is quite fussy; that is, it is neither adjusted for maximum plate current or minimum plate current, but for a maximum change in plate current as the plate circuit passes through resonance with either the fundamental or a harmonic. In other words adjust the cathode condenser until you get the greatest dip in plate current as the plate condenser is turned through resonance.

During tests it was possible to hit the fourth harmonic in the plate circuit with a noticeable dip. But for amateur use, the second is the only one which can be used, unless we have need for frequency tripling —and here the 802 is very good, as the third harmonic is nearly as strong as the second. The plate current will go as high as 40 mills (M.A.) and dip to 10 on the crystal frequency, 15 on the second harmonic and 25 on the third harmonic of the crystal frequency; these are with 500 volts on the plate, different voltages will, of course, give different readings. A word about the output—we worked stations on the 80-meter band over a distance of 600 miles and received fine reports with this 1-tube transmitter.

Plate Coil

Band	Turns	Length of Winding
80 meter	30	3 inches
40 meter	16	3 inches
20 meter	10	3 inches

Wound on 2¼-inch dia. 4-prong form with No. 14 tinned, soft-drawn copper wire.

Cathode Coil

80-meterXtal—20 turns No. 22 D.C.C. wire
40-meterXtal—10 turns No. 22 D.C.C. wire
Wound on 1¼-inch dia. 4-prong form.

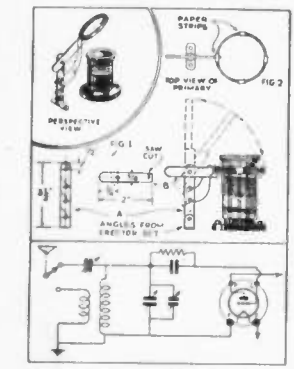
Parts List for Transmitter

1—50 mmf. double-spaced variable condenser, National.
3—.005 mf. high-frequency by-pass condensers, Sprague.
1—50,000 ohm, 5-watt resistor, Electrad.
1—voltage-dropping resistor 20,000 ohms, 25 watt, Aerovox.
2—4-prong isolantite sockets, National.
1—7-prong large isolantite socket, National.
3—large plug-in coil forms (Bud).
2—small plug-in coil forms (Bud).
1—80-meter crystal and holder.
1—5-prong socket for crystal.
1—2.5 mh. R.F.C. (Radio frequency choke). Hammarlund.
1—.002 mf. high-frequency condenser, Sprague.
1—small 0-100 ma. Milliammeter, Triplett.
1—Bakelite panel 7x12 inches, I.C.A.
1—baseboard 7x12 inches.
2—dials, Na-Ald.
1—802 tube, R.C.A. Radiotron.

Receiving "KINKS"

SIMPLE ANTENNA COUPLER

Here is a description of a home-made antenna coupler that can be used in conjunction with any of the four prong plug-in coils. Two pieces of hard rubber were cut from an old panel and drilled as shown in the accompanying drawing. (Fig. 1). The primary coil consists of ten turns No. 24 D.S.C. copper wire, wound on a form of approximately two and one eighth inches. Paper is first wrapped several times around



a two inch form and the end pasted. The wire is then wound over this, the turns being kept close together, and glued in several places. Small strips of paper are then glued on the outside of the coil and left to dry. The coil is then removed from the form and the strips of paper are then fastened around the turns, making a firm, self-supporting coil. The coil is fastened to the little rubber strip by inserting it into the saw cut at one end and glued. (Fig. 2)—Ernest Dummer.

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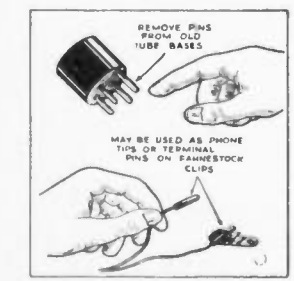

Wire Tips from Old Tube Socket

I have been reading your "Kinks" in SHORT WAVE CRAFT for some time, and think them very useful. So I thought that I would send one of my own in to you.

I have been using this kink for some time and it has proved very useful. The prongs on old discarded tubes can be used when soldered to antenna, ground, and battery leads, to make a very handy and efficient mean of connecting to Fahnestock clips.

They can easily be removed by breaking the entire tube base. Once you get the knack of it, it will prove very successful in making a low resistance connection. —Louis Hartman.

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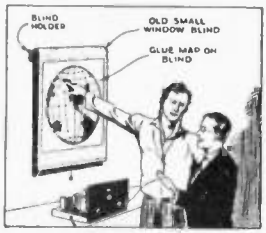
HANDY MAP

This map will be most convenient to a Short Wave DX'er. I am very much satisfied with this map.

It is made out of an old blind, set up the blind and glue your map to it. When not in use zip-up. This is welcome where space is limited.—John Vetter.



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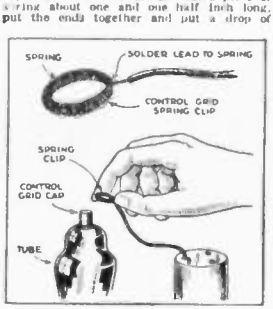
GRID CLIP FROM CURTAIN SPRING

Here is a description of an improved grid tap connector made out of spring curtain rods. A spring can be obtained at any five and 10 cent store. Cut a piece of spring about one and one half inch long, put the ends together and put a drop of



solder on to hold the ends tight together. Then solder a piece of wire on for the connection. Then place the completed cap over the grid connection of the tube as shown.—Ervin Sperath.

PUSH-PULL INPUT TRANSFORMER

Set builders desiring to use push-pull in the output stage can save the cost of an "input" push-pull transformer by wiring it in accordance with the accompanying diagram. Any standard audio transformer can be used, and gives tone quality equal to that obtained by using a regular push-pull input transformer.—David Eastman.

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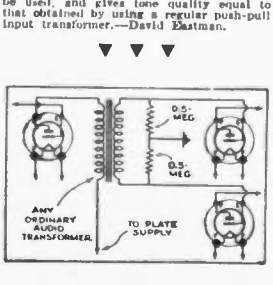
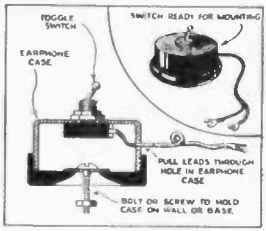


HANDY SWITCH MOUNT

Here is drawing of a dependable switch mount. This is made from an old discarded metal cased earphone. You just have to drill a hole in the middle and mount the switch. Then lead the wires from the switch out of a hole drilled in the side.



This is very handy for "bread-board" transmitters and receivers and in dark places where it is hard to find small toggle switches. It is a good idea to have a large washer when you mount the earphone cap, so as to take the strain off the bakelite.—Joe Bergsteker.

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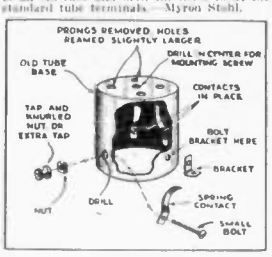
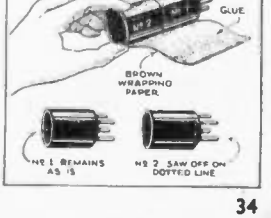
HOMEMADE TUBE SOCKET

Here's a very handy homemade tube socket, which can be used as a substitute for a ready-made affair. The drawing clearly shows just how to construct it. In order that the pin holes will be in the proper position, first cut the pins from the base of an old tube and drill the holes to fit the standard tube terminals.—Myron Stahl.



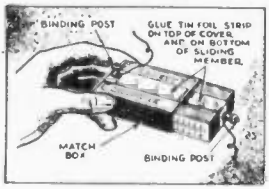
INCREASING SIZE OF TUBE BASE COILS

By using two tube bases as shown in the diagram you can increase the length of the coil in order to accommodate the larger windings. This is done by sawing off the prong end of one tube base. Then put the two coils end to end and wrapping them with glued paper.—H. S. Dekker.



MATCHBOX CONDENSER

A cheap and easily constructed variable condenser can be made with a safety matchbox and a few short pieces of tinfoil. In



the drawing we see that two pieces of tinfoil are used to form the two electrodes of a variable condenser. One piece of tinfoil is glued to the top of the box frame and the other piece is glued to the bottom of the sliding portion of the matchbox.

A binding post is used on each of these strips of tinfoil in order to facilitate connections. If desirable, a scale can be marked on one side of the sliding member. This is clearly shown in the drawing. When the box is entirely collapsed the capacity of the condenser is maximum; by sliding the inner section of the box outward the capacity is reduced. This is a handy instrument and many readers of "Short Wave Craft" will find various uses for it.—Gilbert S. Lowry.

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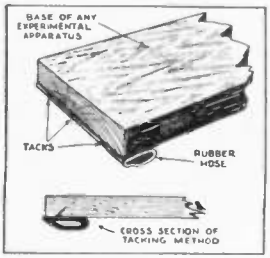

SHOCK ABSORBER

A short length of rubber hose can be used to form a very simple shock absorber to eliminate vibration in a radio receiver. The drawing clearly shows that the hose is tacked or screwed to the base with the screws or tacks in such a position that they will not rest upon the table or interfere with the cushioning action of the rubber hose. This kink is especially useful with battery receivers because these tubes are usually quite a bit more microphonic than the heater type of tubes. It can also be used in conjunction with the transmitters where vibration is liable to cause a pure signal by modulating the note.—Francis P. Srebro.

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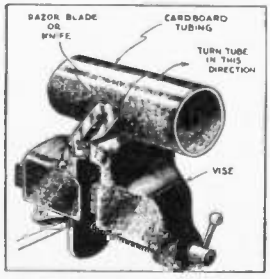
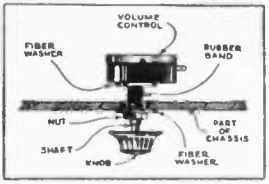


RAZOR BLADE FOR CUTTING TUBING

Probably the most difficult part of short-wave experimenting is cutting bakelite or other compound tubing the proper length for coil forms. Usually a hack-saw blade is used and in many cases a very jagged and uneven cut is made. However, by fastening a razor blade or knife blade in the vise and placing the tubing along-side of it, an accurate cut can be made. First wrap a piece of paper around the tubing in order to mark it where the cut is to be made. By squaring the edges of the paper, the mark on the tube will be perfectly square. By rotating the tube in one direction slowly and keeping the blade on the mark, accurate lengths of tubing can be cut with very little difficulty. The drawing clearly shows how this is done.—W. H. Hitchen.

SIMPLE SHAFT INSULATOR

Very often it is desired to insulate the electrically connected shaft of a volume or regeneration control from a metal chassis. Usually fibre washers with raised central portions are unavailable when needed and so I have resorted to the following simple method with great success. Place a flat insulating washer upon the shaft. Then twist a rubber band several times over the shaft until it is secure. Mount the object on the chassis with a washer on the other side and the job is complete.—Harry Klingener.



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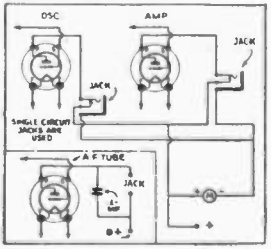
NOVEL METERING SYSTEM

Metering two or more stages with one meter is very simple if you use the following diagram. When you desire to meter a certain stage just plug a "dummy" plug into the desired jack and the meter will read that stage.

If you have a 5-meter super-regenerative receiver no doubt you are very much troubled by the hissing noise. If you care to help cure this trouble you can do so by placing a .1 mf. condenser across the phones. Apparently the voice signals are little affected.—Jerry Pilgrim.



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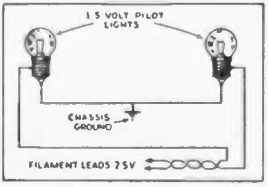
PILOT LIGHTS FOR CENTER TAP

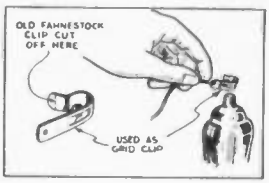
This kink not only provides the much desired center tap resistor for the 2.5 volt filament windings but also provides panel lighting. In sets having two tuning controls and therefore two pilot lights, the bulbs are connected in series as shown in the diagram eliminating the center tap resistor



and its current drain on the winding.—R. Sherburn.

Substitute Grid-Clip

The other day I was in need of several grid clips. As it was Sunday, and I didn't have any on hand, I had to make my own.



Here is how it is done in a jiffy. Just take an old Fahnestock clip, spread it open enough to slip over the contact cap on top of the tube, next solder a wire to it, and you're all set. If it is too bulky, it can be bent until it is form-fitting with a lip which protrudes as shown in the illustration.—Ralph Netzley.

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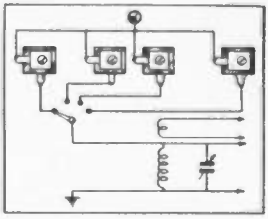
Antenna Trimmer Selector

Adjusting the antenna trimmer condenser every time a coil is changed is a lot of bother and may not always be the same, thus varying the dial settings. To overcome this, secure as many trimmer condensers as you have coils and place them on a bakelite panel. A switch arm



and contacts are then placed and connected as shown in the diagram. After connecting to the antenna and the set, the arm is placed on the first contact and the trimmer set to the correct value. The next coil and arm setting are adjusted the same way until you have as many individual settings as you have coils. Label each contact for a certain coil. The panel can be located in any convenient place and be controlled from the front panel of the set. —Herbert Hansen.

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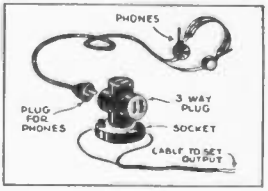


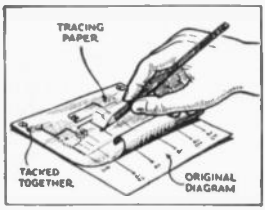
Multiple Headphone Connector

It is often desirable to connect more than one pair of phones to a set. An inexpensive and easily assembled connector can be made by connecting a 2-wire cable to a light socket. Then, insert a 3-way plug in the socket; fasten phone tips to attachment plugs, and plug in any number of headphones.—Wilbert Rohleder.

SIMPLIFYING RADIO CONSTRUCTION

I wish to offer the following short-wave kink which has proved to be of great value to me and is, as far as I know, an original idea.

Take a piece of ordinary tracing paper and lay it over the diagram or blue-print from which you are hooking up a receiver. As each connection is made, mark it with a pencil on the tracing paper. When the diagram on the tracing paper corresponds with the original, you know the set is correctly wired. This eliminates a lot of hunting for "lost" or "forgotten" leads and is invaluable in wiring complicated "supers" where a short connection may be accidently overlooked.—John C. Sherard.



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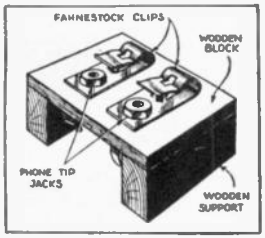
CONNECTION BLOCK FOR EXPERIMENTERS

I have found this kink very useful in connecting head-phones or speakers to experimental sets. When wiring up "breadboard" sets, one does not always have the phone tip jacks or clips ready to use. The kink described will do away with this worry.

Holes large enough for the tip jacks are drilled in the Fahnestock clips. The clips are then fastened to a small wooden platform by the jacks.—Samuel Peters.



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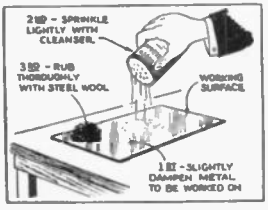
FINISHING PANELS AT HOME

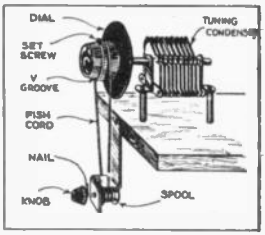
Many set-builders refrain from using low-cost galvanized iron for chassis or panels because of its finish, but by following these instructions, they may produce a beautiful satin finish on it. Lay the piece to be worked on, on a flat surface and pour a little water on it. Next, sprinkle a little Dutch Cleanser or kitchen cleanser on it, and then rub it well with steel wool, in a circular motion. In about five minutes a very silvery finish will be obtained, equal to that of aluminum. It may be given a high luster if polished with silver polish.

The sketch is enclosed on another sheet. I hope this kink will be acceptable.—Lloyd Canly, Jr.



HOME-MADE VERNIER

Sometime ago when in the need of a vernier dial, I hit upon the following idea, which is clearly shown in the drawing. The



only necessary parts are an old dial, some string or fish cord, a spool, and a short length of metal strip. The knob of the regular dial should be grooved for the fish cord. The metal is formed as shown in the drawing and fastened below the mounting board on which the condenser is fastened. Another advantage of this system is the total absence of "body-capacity" effects, because the hand is so far removed from the condenser.—Claude E. Longstreth.

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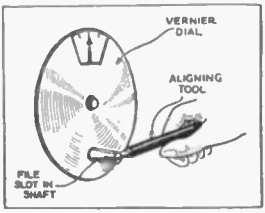
ALIGNING TOOL FOR FINE TUNING

Here's a kink I find very satisfactory for eliminating "body-capacity" where an insulated shaft coupling is not available. Remove the knob from the front of a vernier dial and file a slot in the shaft to fit the end of a trimmer condenser tool. This being insulated, gives very good results in eliminating "hand" capacities. It is especially



adjustable to ultra-short wave receivers, where hand capacities are annoying.—J. R. Blundin.

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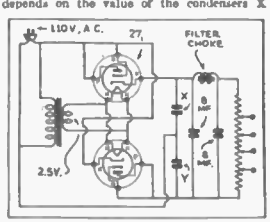
VOLTAGE-DOUBLING POWER SUPPLY

Here is a simple method of obtaining a high voltage "B" supply without the use of a power transformer. A couple of 27s are made to double the voltage and rectify it at the same time. The output voltage depends on the value of the condensers X



and Y, which should be from 4 to 8 mf. Although this kink is not original, I do not recall having seen it in *Short Wave Craft*. —Jerome Farmer.

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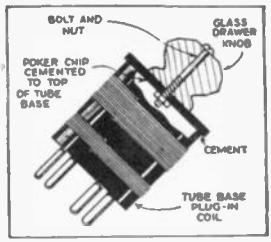
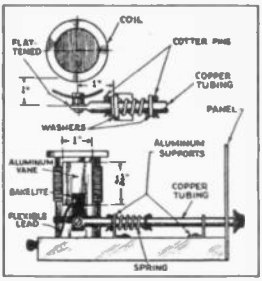
COIL HANDLE

My plug-in coils are fixed as shown in above drawing. Then use sandpaper to roughen the top edge of the coil; next cement a poker chip with glass knob fastened through hole in top to the coil. This is very handy when changing coils, and does not injure the coil windings.—Charles F. Deane.



Novel Antenna Coupler

Being one of those fellows who strive to



make a few tubes work as efficiently as possible, I find that the method of antenna coupling should be given considerable thought. Most of your "prize-winning kinks" worked very well, but they could not be easily operated from the front panel and were in the way when the coils were changed. With a couple of pieces of scrap aluminum and a short length of copper tubing, I made this antenna coupler which works very smoothly and is efficient. Not only is it a great help on the crowded bands as a selectivity-sensitivity control, but it "smooths out" the regeneration control. A smooth regeneration control is, in my opinion, the difference between a very FB receiver and just another squealer. The diagram is self-explanatory and the construction of this coupler should not be at all difficult. Be sure to use a flexible antenna lead to the vane. The length of the bakelite strip depends on the position of the tickler winding. This is the small winding that is invariably wound in the same position on each coil. The vane has no effect on this winding, so in an upright position the bottom of the vane should be above the tickler.—W. J. Kowalchik.

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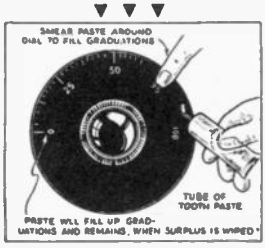
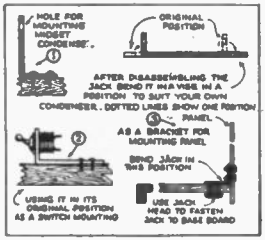


Touching Up Old Dials

This kink is not original with the writer, but he thinks it is worthy of passing on to the readers of SHORT WAVE CRAFT. The appearance of old dials can be improved considerably by taking a bit of white toothpaste, white lead, white candle wax on the end of one's fingers and smearing it around the edge of the dial as illustrated. The tooth paste will fill the notches on the dial. When the dial is wiped off with a rag, it will look as good as new.—Bob Miller.

USES FOR OLD PHONE JACKS



Undoubtedly nearly every experimenter who reads this magazine can find a large number of discarded old-fashioned phone jacks in the junk box. These should be saved by all means because they can be put to various uses such as shown in the accompanying drawing. In the drawing we have the base of the jack forming an "L" bracket which can be used for mounting midget condensers, volume controls, switches, and a number of other instruments.—James Slocum.

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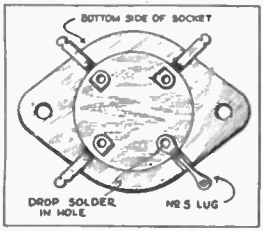
MENDING TUBE SOCKETS



How many times have you broken the terminal on your last tube socket? This happened to me one time and as I could not obtain another socket immediately, I had to devise a method of repairing the damaged one. After much thought, a No. 5 soldering lug was finally brought to play. This was attached to the under side of the socket with a drop of solder and presto, the socket was as good as new! However, you will find that most of the metal parts on sockets are nickel-plated and it will be necessary for you to scrape the nickel-plated rivet until all nickel plating is removed and the brass or other metal shows through, otherwise the solder will not adhere to it. When you are in a "jam" for a socket some time, try repairing your old ones in this manner and see how nicely it works out.—Edward Kolakowski.

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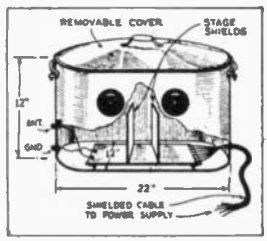
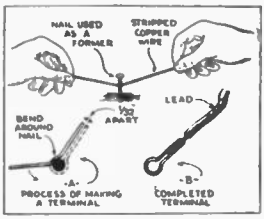
WASH-BOILER RADIO CABINET



After completing a 4-tube short-wave receiving set I found, much to my disappointment that it was an excellent receiver of passing automobiles—ignition noise, of course! The next move was to completely shield the receiver but funds were low so the idea, presented in the drawing, came into being. The cabinet I used was made from an old wash boiler which, incidentally, is copper and provides very effective shielding. The removable cover offers ease in getting at the inside of the receiver for changing coils or tubes. A shielded power cable was also used in order to eliminate pick-up. This in connection with the thorough shielding and the use of a good antenna, practically eliminated the interference.—C. E. Judson.

TERMINAL LUGS MADE FROM HEAVY WIRE

Once when I needed a wire terminal, and I had none available, I conceived this method of making them of some old wire that I had on hand. I hope it will help others as it has me. To make the terminals, I first scraped some No. 16 copper wire of



its insulation and made it bright, then I first bent about ½" of it almost at right angles to the remainder of the wire, then placing a nail, or some other piece (A) to form the hole the right size, I bent the wire around the form and made the two ends parallel about 1/32" apart. The finished terminal is shown at B. To use it, place the wire in slot X and solder it fast on both sides. Of course, if you wish to put terminals on small wire, make the terminals of wire about four sizes larger than the wire used.—Carl B. Sponseller.

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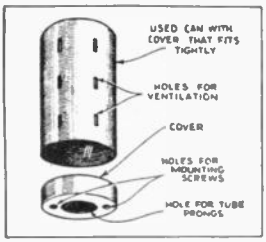
HANDY TUBE SHIELD



Having no tube shield I obtained some old cans with covers that fitted tightly, and then made a hole in the cover of the can the same as the hole in the sub-panel and two small holes that lined up with the mounting holes of the tube socket. A few holes in the side of the can allow sufficient ventilation for a tube. If it is to be used with screen grid tubes, the shield should have a hole in the top through which the grid connection can be made.—Jack Foster.

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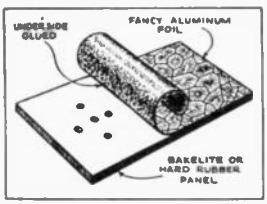
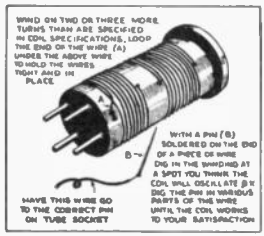


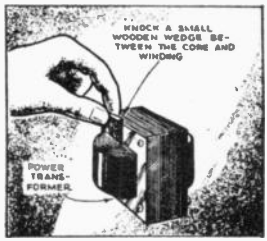
SHIELDING FOR BAKELITE PANELS

By procuring some fancy aluminum foil and gluing it to your present bakelite panel, you can not only introduce very effective shielding, but enhance its appearance tremendously. Various shades and designs can be obtained from your local Variety Shop.—Joseph Jacobs.



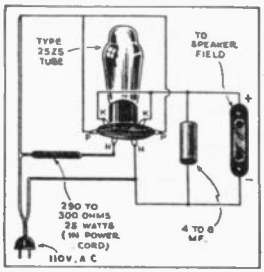
SIMPLIFYING COIL CONSTRUCTION

Many of the readers of "Short Wave Craft" have spent considerable time in wiring homemade plug-in coils. By using the scheme depicted in the drawing, the correct number of turns can easily be found. The pin is soldered to a short piece of wire and can be pushed through the insulation on any turn. When proper results are obtained, you can remove the unused turns and your coil is finished.—Howard Sigmund.



ELIMINATING TRANSFORMER HUM

Many fans who have all-electric short-wave receivers using power transformers are troubled by a loud buzzing noise in the transformer itself. This is usually due to either loose windings or a loose section of the core. In most cases where "E" type cores are used, the center leg of the two outer laminations makes all the noise. This can be stopped quite readily by removing the frame or mounting bracket of the transformer and wedging a small piece of wood between the winding and the core. If you will refer to the accompanying drawing you will see how this piece of wood is tapered in order that it may be easily inserted.—Francis P. Brebro.

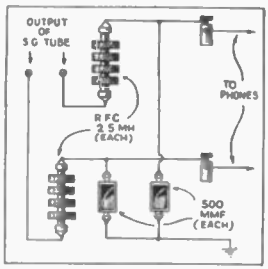


FIELD SUPPLY FOR DYNAMIC SPEAKER

Here is a very simple method of obtaining power for the field of a dynamic speaker. Although this is not original to the writer he thought it would be of interest to the average short-wave fan. A single 25Z5 is used in a halfwave rectifying circuit. The physical drawing shows just how the connection should be made. The smoothing condenser across the output of the rectifier can be anywhere from 4 to 8 mf. and is an electrolytic having a working voltage of somewhere around 200. Heater voltage for the 25Z5 is furnished directly by the line through the 290- to 300-ohms resistor which is built right into the line cord.—W1ED.

FILTER FOR HEADPHONES

Many short-wave fans are troubled with serious detuning each time the headphones are touched or the phone cord is moved. By keeping traces of R.F. out of the phone cords, this boresome condition is eliminated.



In the drawing you will find that 2 R.F. chokes and 2 condensers are used. There is a choke in each lead with a condenser by passing each lead to the B negative of the receiver circuit. Ordinary 2.5 MH chokes and .0005 mf. condensers work satisfactorily.—Robert Mushaben.

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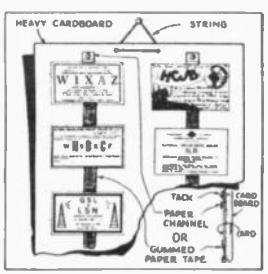
MOUNTING VERI CARDS

Here is a good way to put your verification cards and letters on the wall and not fill it full of tacks.

Get a large piece of cardboard; hang it on the wall; then tack your veris to it. Another way is to stick your veris together with some sticky paper tape (ask your butcher or grocer for a couple of feet).



Cut it into one-inch pieces, stick bottom edge of one veri to top edge of another, and so on. Then one tack will hold 8 or 10 veris, and when you have to take them down, you can stack them just the same as when they were separated.—Robert L. Vaughn.

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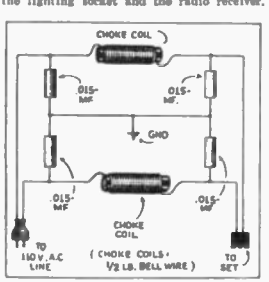
NOISE FILTER

The filter described herewith consists of two choke coils, each connected in one of the leads of the A.C. power line between the lighting socket and the radio receiver.



Each end of a coil is grounded through bypass condensers to shunt any stray oscillations into the earth. The two coils are wound on fiber or bakelite tubes that are about six inches in length and two inches in diameter. The wire used is No. 18 gauge double-cotton-covered and is wound in two layers of 100 turns each over a length of five inches. The D.C. resistance of each of the coils will be less than one ohm. The condenser arrangement requires four by-pass condensers each, having a capacity of .015 microfarads at about 200 volts. They must be arranged by pairs in series and connected between the ends of the coils as shown in the diagram. The inner common terminals are connected together, and this contact must be well grounded to a cold water pipe with a separate wire. Do not use the wire that grounds the radio receiver.—C. Doane, Jr.

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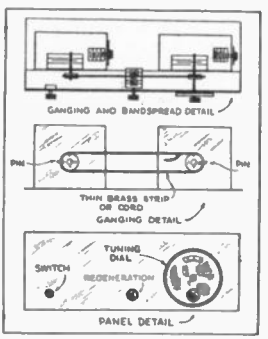
IMPROVING SUPER WASP

Brass wheels are put on the two shafts of band-spreading condensers. This is simple enough but the detector band-spreading condenser's shaft will have to be removed and a 4-inch shaft inserted so that shaft may reach the new dial on the new panel. The brass wheels are now tied together by means of a piece of good fishing twine as shown in the sketch. If one prefers, the twine may be replaced by a metal strip similar to the one used in the Atwater Kent receiver. If twine is used a knot is made about the pin in each of the brass wheels. —Francis E. McGee, W3DM.



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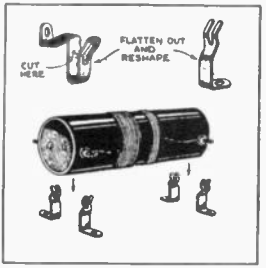
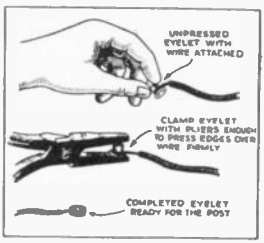
USES FOR FAHNSTOCK CLIPS

By cutting off and bending Fahnstock clips, as shown in the drawing, a very handy plug-in coil receptical can be constructed. The drawing shows the method used in mounting these clips. The contacts for the coil are ordinary machine screws which are allowed to protrude and fit tight the slot of the clip. The clip is to be formed so that when the coil is pushed down into them they will bear similarly against the nut which holds the screw to the coil form. Two windings are shown on the coil; however, this could be increased to three or four windings with a consequent increase in the number of clips.—Wm. H. Eaton.



HANDY CABLE LUGS

Experimenters who have found difficulty in making a neat binding post connection, when using stranded hook-up wire, will find this odd wrinkle a cheap method of making positive contact. A number of eyelets (obtainable at any stationery store) and a pair of pliers comprise the necessary equipment. First, twist the strands of the end of the wire to be connected and loop this terminal about one of the eyelets; clamp the eyelet firmly to the pliers, and it will be found that the end of the wire is being gripped between the two sides of the eyelet. The latter can then be slipped on and off the binding post rapidly, and without danger of the wire being forced from under the head of the post, as often occurs when using stranded hook-up wire.—Walter Kells.



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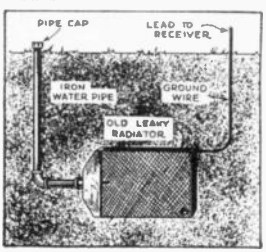
OLD CAR RADIATOR USED FOR A GROUND

I finally hit upon the idea illustrated in the accompanying drawing. I obtained an old radiator which had a good many leaks in it. After fastening a pipe to the filling hole on the radiator and soldering a wire to the other end, I buried the entire assembly in the ground four or five feet below the surface. I then proceeded to fill the radiator with water. This, due to the holes in the radiator, seeped outward and made the earth surrounding the radiator quite moist lowering the ground resistance considerably. The lead from this ground to the receiver was kept as short as possible, and really excellent results have been obtained.



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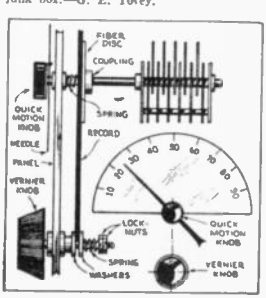
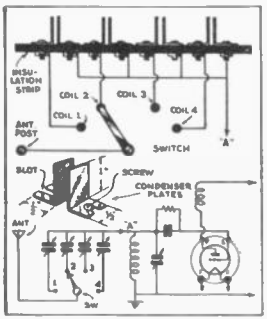
HOMEMADE VERNIER

Nearly every short-wave fan who builds his own equipment gets the greatest amount of fun out of building it rather than listening to the short-wave stations. The experimenter will find this dial easy to construct and very handy in operation. There are two knobs, one which is attached directly to the main shaft and gives a direct drive for rapid tuning, and another knob which drives the outer edge of the large disc for vernier tuning. All the parts of this simple vernier dial can be found in the shack junk box.—G. E. Tovey.



ANTENNA CONDENSER SWITCH



The short-wave experimenters who build simple receivers which require the use of an antenna-coupling condenser will find this kink especially valuable. It consists of a small strip of bakelite or other insulating material on which is mounted four antenna-coupling condensers. The drawing clearly shows how these plates should be made in order to be adjustable. There is a separate condenser for each short-wave band and when putting it into operation each condenser should be adjusted for that particular band. Then when you change from one band to another it is only necessary to rotate the switch and bring the antenna condenser for that band into use.—Charles Dopita.

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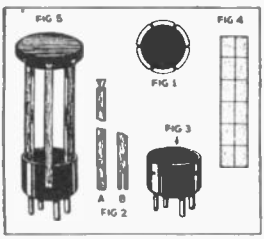

PLUG-IN COIL FORM

Good plug-in coil forms can be made using old tube bases. Cut a strip of paper the circumference of the tube base and use a compass or dividers to divide it into six equal parts (Fig. 4). Wrap this around the base and drill shallow holes in the base, on the division lines, with a knife point. Finish drilling the holes with a 1/16-inch drill. (Fig. 3.)

The top of the coil form is made of wood. A circle is cut from a three-eighths or one-half-inch board. Make the top one-half inch larger in diameter than the tube base. Draw a circle on the underneath side of the top one quarter of an inch smaller than its diameter. This is the guide line for adjusting the upper ends of the upright pieces. Divide the top into six equal parts and cut the notches for the upper ends of the upright pieces, on the dividing lines. The shape of the notches can be seen by looking at the finished coil form. (Fig. 5.)

The upright pieces may be made of wood, hard rubber or bakelite. Cigar-box wood is easy to work and makes good coil forms. The lower end is slotted to fit over the tube base. (Fig. 2B.)—Earl Ewens.

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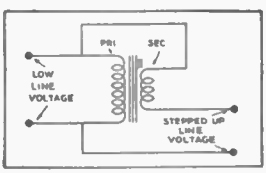


VOLTAGE BOOSTER

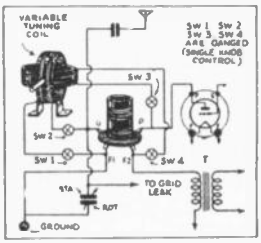
The A.C. line voltage, particularly in rural communities, sometimes drops to a low value during the evening hours. An easy and simple way to boost it to its proper value is to use a small transformer, with a secondary rating of between 5 and 15 volts, connected as shown.

It may be necessary to reverse the leads to the secondary to get the proper relation between primary and secondary windings. —George Jelinek.

Tuner for BC Band

Here is a description of the broadcast adapter which will permit the reception of stations operating on the regular broadcast band using a short-wave receiver.

To operate this instrument, remove the



plug-in coil and connect the new long wave tuner. This can be done either with a 4 gang switch or the leads from the tuner can be connected to a tube base which will plug into the plug socket.—Alfred Benzan.

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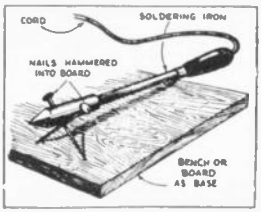
Handy Iron Stand

During a repair job I needed something to rest my hot iron on and hit upon the



idea depicted above. It consists merely of two large nails driven in a board as shown in the drawing.—Edward Brown.

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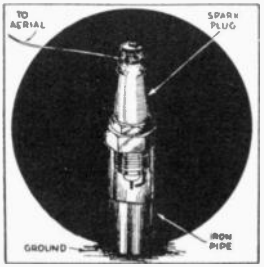
Novel Lightning Arrester

Here is just one more use for discarded spark plugs. Procure an old spark plug, one whose insulation is not damaged, and clean it thoroughly by removing all carbon. Then obtain a length of iron pipe which can be either threaded or which has an in



side diameter large enough to permit the insertion of a plug with sufficient tension to hold it firmly. The entire instrument should be driven into the ground as far as possible.—Burgess Brownson.

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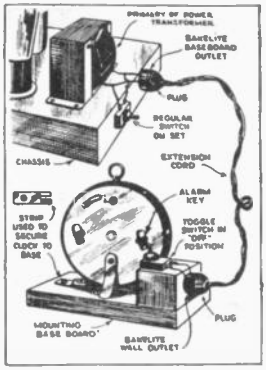
TIME SWITCH FROM ALARM CLOCK



Here is a kink using an ordinary alarm clock (spring wind type) as a time switch to turn on your short-wave set or ordinary broadcast set so that you will not miss your favorite program, or if you own a transmitter and receiver using the time switch to turn on your short-wave set when you have a schedule so that you will not forget same. The clock is secured to a wooden base with a small strip of metal with a notch to hold each leg down and secured to the base with a small wood screw. An additional strip of metal behind the alarm key holds the switch in the proper position, as the alarm goes off it strikes the top of the switch turning the set on.—Richard T. Nehuita.

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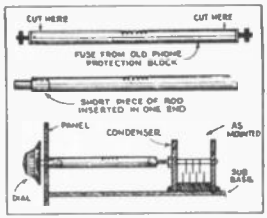
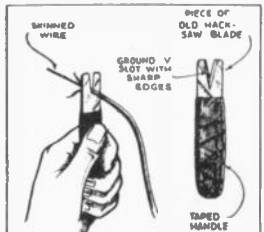
CHEAP COUPLING AND EXTENSION



Old fuses that are used in the telephone protector system on most all phones make fine anti-capacity couplings for short-wave condensers as are used in the coupling and tuning circuits of short-wave sets. The ends are cut off and a short piece of ¼ inch rod inserted in one end and shaft on condenser inserted in the other end. These old fuses are just the right size and a small amount of cement as is used for cementing wire on home-made coils is put in ends of tube before inserting rod and condenser shaft holds coupling very securely. —W. E. McLain.

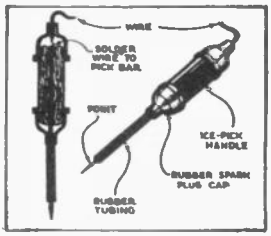
Simple Wire Cleaner

Here is a simple kink which can be made from an old hacksaw blade or a steel knife. File a V-slot in one end with a three-cornered file, and tape the entire instrument all but the cutting end.—Chas. Wilde.



HANDY TEST-PROD

A very serviceable test-prod can be made from ice-picks by covering part of the pick with rubber tubing (see drawing) and by placing rubber spark-plug caps on each end of the wooden handle. The wire goes in through the top.—Harry Hassink.



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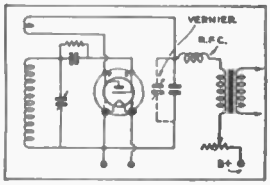
VERNIER REGENERATION CONTROL

For smooth regeneration control on very weak signals the following kink is very effective: Connect a three-plate midget condenser across the main regeneration control condenser. With the plates of this vernier condenser unmeshed, tune in a signal and stop the set from oscillating with the main control. Now, gradually increase the capacity of the vernier condenser and you will find that the signal can be built up to a much greater extent than with the ordinary control.—W. Zeleng.



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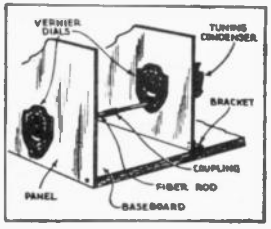
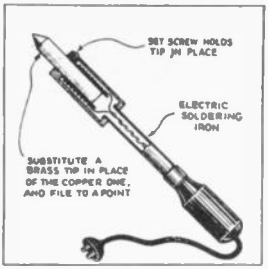
REAL VERNIER TUNING

For the radio operators who are having trouble tuning in stations on their vernier dial, I present the following kink: Take an ordinary vernier dial and remove the knob. Mount your tuning condenser on a second metal panel about three inches from the front panel, next mount a vernier dial with the knob removed on your second panel with a fiber insulating rod connecting the front vernier dial with the second one. Place the first knob on the front of your panel and place the second one in back on a supported metal panel and your "supervernier" tuner is complete.—Otis B. Hill, Jr.



SOLDERING IRON KINK

I found that the copper tip of my electric soldering iron oxidized very rapidly, making it difficult to keep the tip properly tinned. Knowing that brass does not oxidize readily, I procured a piece of brass rod the same diameter as the copper tip cut it to proper length and filed a point on it. The new tip was tinned with the aid of salammoniac and has given no trouble since. This particular iron has a hollow core in which the tip fits; a set-screw holds it in place. This idea can be adapted to other types of irons. The brass tip takes a little longer to heat (just a few minutes).—D. J. Vinir.



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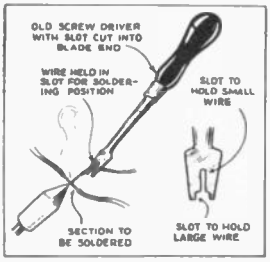
NEW USE FOR SCREWDRIVER

For soldering in tight places, an old screwdriver blade can be slotted, as shown



in Fig. 1. When soldering, the wire can be held in the slot of the blade so that the wire may be held for soldering in positions where it is impossible to (Fig. 2) reach your hand. The slot can be made by holding the screwdriver in a vise and using a hack saw that has two or three blades together, to make a wide cut. The end may be filed to make a notch for accommodating larger wires.—Joseph Goveia.

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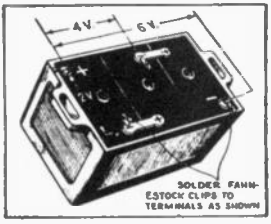
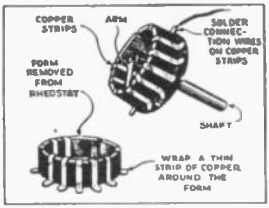
TAPPING STORAGE BATTERY

In obtaining different filament or heater voltage for tubes from storage batteries, I under Fahne-stock clips on each section of the battery, then I have 2 volts, 4 volts, and 6 volts. When reducing to a fraction of the next voltage, I use a variable resistor and a voltmeter to obtain the correct voltage.—Walter Rinkowski.



INDUCTANCE SWITCH

In order to make an inductance switch from an old rheostat, remove the element part and unwind the resistance wire. At even intervals wind a thin piece of copper strip around the form that the wire was wound on. Insert as many strips as you want contacts and reassemble rheostat. This switch can be used with tapped S-W coils. —Joe Naemara.



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FOR YOUR DX-ER TIPS

For the DX-er who receives tips and notices of special broadcasts and new stations from various sources and wants a compact way of recording them, this little idea might help.

Get a diary (at least 6x8 inches, with ruled pages for each day in the year) and as you receive your tips enter them in the diary. Then when doing your DX-ing you have all the information in front of you, by simply turning up the required day.

As an example you get a tip that a certain station is on Monday, Wednesday, and Saturday, and you wish to send them a report and you have not heard the same. Enter the station and frequency as well as time on the first M, W, and S, to come and then when DX-ing on that day, this information will be before you in compact form. This can also be used when you receive an advance notice of a special DX broadcast that you wish to hear.—James F. Maguire.

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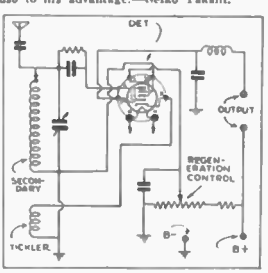
E.C. DETECTOR

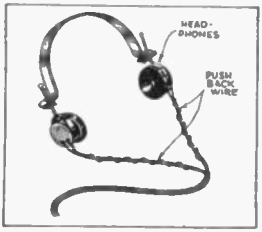
Here is my kink which I hope will be given consideration when you decide the winner for the best kink of the ones submitted. It is a method by which a two-circuit detector using the regeneration control in the screen-grid circuit may be converted into an electron-coupled detector. Only a few changes need be made in the wiring, and no extra parts need be added to the detector.

Since the electron-coupled detector is more preferable than the usual two-circuit detector, readers of your magazine will find this kink valuable. I have enclosed a short description and a diagram of the kink, which I think every radio "Fan" can easily use to his advantage.—Seiko Yakahi.



KEEPING PHONE CORDS UNTANGLED

After having so much trouble with the wire on my set of headphones, always continually twisting, I hit upon the idea of twisting push back wire around the two wires from phone to plug in cable. It solved the situation completely as it keeps the wires in the most convenient place.—Joel Levy, Jr.



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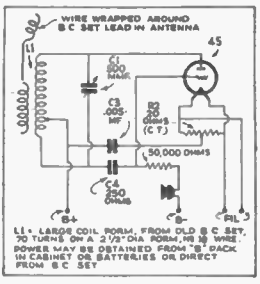
SIMPLE P.A. SYSTEM

Many times I have desired to make use of a public address system at parties, etc., and finally hit upon the idea of constructing a 245 oscillator which can be connected directly to the broadcast receiver. The oscillator is modulated with an ordinary microphone in series with the B negative supply. By tuning the oscillator and broadcast receiver to resonance the oscillator acts as a miniature broadcasting station and full speaker volume can be obtained. However, care should be taken to make sure that this instrument does not interfere with other receivers in the neighborhood.—Marine Schell.



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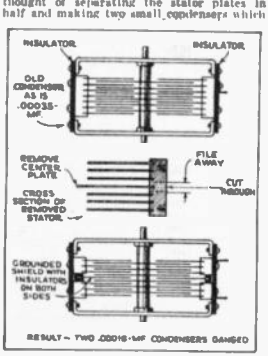
HANDY 2-GANG CONDENSER KINK

Short Wave condensers are quite expensive and having some old 00035 on hand I thought of separating the stator plates in half and making two small condensers which would be ganged together, and varied by the same rotor.

Taking the condenser in half, with the center plate removed and four plates on each side, the condensers will have a capacity of about .00016 mf. each.

The old condenser is taken apart or rather the stator is removed, the sides cut through at the middle plate which is removed, and the inside ends filed smooth. A metal plate is cut out to fit in between. And when the stators are assembled back this plate is inserted between the stators with rubber insulators holding it in place tightly. It is then grounded thus shielding the two condensers.

I have used this condenser in the two tube super-het in your December issue and have obtained fine results. Diagram appears above in next column. —E. M. Granville.



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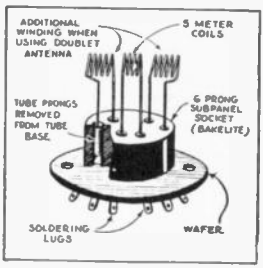

ULTRA S-W PLUG-IN COILS

This sketch as drawn shows how I have put to good use the prongs removed from tube bases. The advantage of being able to remove the coils (5 meter) for any necessary change or adjustment can be seen at once.

The UX socket was chosen because the double contact within the socket held the coils firmly in place and practically eliminated the possibility of poor joints and noise. One suggestion—solder the connections well, using rosin core solder. "Tin" the ends of each coil end before inserting it into the prong. Do a THOROUGH job the FIRST time! You won't have to do it over again and the results will be well worth the additional effort.—Harold J. Clark.

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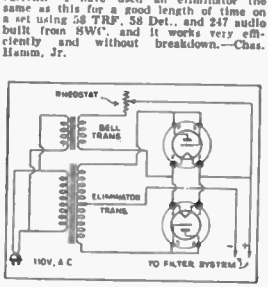
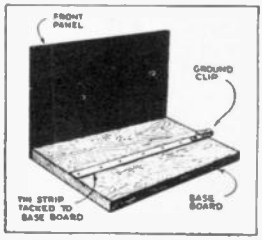
JUNK BOX RECTIFIER

This method will be found to be a very successful one when you do not feel equal to the price of a new Raytheon rectifier tube. All of the parts are inexpensive and you will most likely find them in the "Junk Box." Parts required are two type 201A tubes, one rheostat, one tube socket, one bell ringing transformer, or any other suitable low-voltage transformer. The filaments are connected in parallel. The plate and grid of each tube must be joined together or the voltage drop in the tubes will be excessive. Tubes such as the "71A" or "45" type will be found a little more efficient than the "201A's" if you are drawing current for a set using one or two large audio tubes such as the "247," "2A5," etc., which consume a heavy plate current. I have used an eliminator the same as this for a good length of time on a set using 58 TRF, 58 Det., and 247 audio built from 8W7, and it works very efficiently and without breakdown.—Chas. Hamm, Jr.



GROUND BUS-BAR

Here's how I solved my recent problem in building a set on a "bread board." I was at a loss as to where to "ground" my connections with as short leads as possible. This was solved by taking the long narrow strips of tin that you have left after opening a can of coffee. Taking this to my shop, I unwound it from its key to the length of my wood chassis; after cutting it to the proper length and tacking it into place, I soldered a clip taken from an old "B" battery to connect the ground wire to.—William Lausen, Jr.



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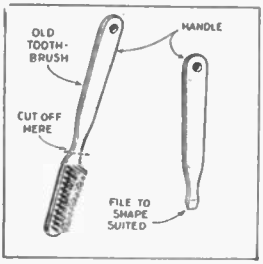
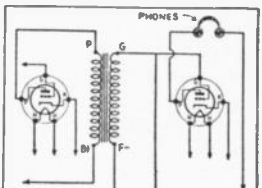


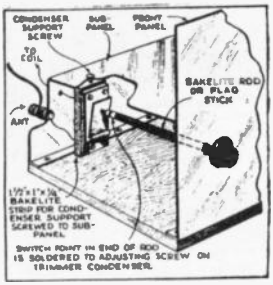
NEW USE FOR OLD TOOTHBRUSH

Many short-wave "Fans" have found occasion to employ a screw-driver made of some insulating material for adjusting trimmer condensers in antenna circuits or I.F. transformers. By removing the brush portion of a discarded tooth brush and filing a flat edge on the handle, an excellent non-magnetic screwdriver can be made.



ELIMINATING FRINGE HOWL AND MOTORBOATING

Fringe howl and motorboating may be eliminated by simply placing a resistor across the secondary of the A.F. transformer leading to the troubled stage. This method does not give maximum results. The resistor is to drain off audio voltage, but if it is too low a value, you will get weak signals. If it is too high, the receiver will howl. To get best results, put a 250,000 ohm potentiometer across the secondary of the audio transformer so that the optimum resistance may be found. This potentiometer also acts as a smooth working volume control.



PANEL KNOB FOR TRIMMER

Every time a condenser is approached by the hand to do any adjusting, the station generally fades, due to body capacity, which is the big "bugaboo" with the beginners. Adjusting the antenna trimmer condenser from the front panel without body capacity is the purpose of this kink. The trimmer condenser is mounted on a piece of bakelite 1" wide by 1⅛" long by ⅛" thick, a hole is drilled in the center, to allow the adjusting screw to pass through. The strip of bakelite is then mounted on the underside of the sub-panel, as shown in the diagram. Secure a bakelite rod ¼" in diameter or a wooden dowel that has been boiled in paraffine for 10 minutes, it should be about 5" or 6" long. Now get a switch point or similar kind of a bolt, then drill a small hole in the end of the rod, so the switch point or bolt can be forced in tight; drill a hole in the front panel so the rod can be pushed through to the head of the screw on the condenser. Solder both bolt heads together, and the job is finished except mounting a tuning knob on the other end of the rod, to be used for adjusting.—Leo De Wan.

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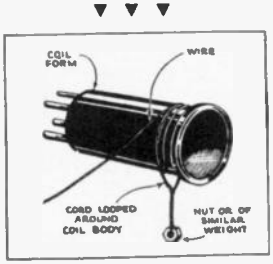
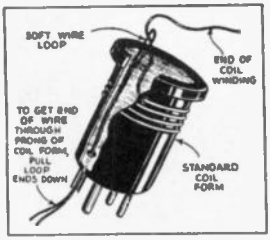


SPACE WOUND COILS

Here is a simple method for correctly spacing the winding on coils. All that is needed is a small weight such as a bolt and a short piece of cord or wire, the size of the cord or wire determining the spacing. Make a loop of the cord and slip over coil form. Start winding wire which is fastened at one end to hold taut and the cord will follow along and space each one the same. When the end is reached simply lift loop of cord off and a professional looking job will be the result.—Harold Bergquist.



Coil Winding Kink

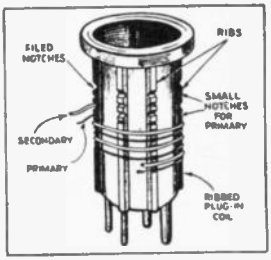
In winding plug-in coils, one is likely to have trouble in getting the end of the wire threaded through the prongs. I take a piece of soft wire, double it, then push it up through the prong, put the end of the coil wire through the loop, then pull the doubled wire down through prong and the coil is threaded.—W. Chester Casselman.

Improved Plug-In Coil

Here is a means of supporting the turns of a plug-in coil that provides for rigid and nonvarying turns.

With a triangular file, make notches in the ribs of a coil form so that they form a spiral. As most forms have eight ribs, the location of the notches can be easily calculated. If turns are spaced one quarter inch, file the notches on each successive rib 1/32" higher than the last. An inter-wound primary may be wound on smaller notches between the deeper ones.

If a tapped secondary is needed as in an electron-coupled detector, use tinned wire so the tap may be more easily located and soldered.—Stephen O. Edwards Jr.



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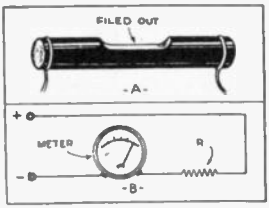
Increasing Meter Range

If you want to increase the range of your voltmeter it can easily be done with multiplying resistors. If the internal resistance "r" of the voltmeter is not known, have it tested. If the maximum reading is to be 10 times the scale reading the total resistance (R+r) must be = 10×r, or then R=9×r. If the new maximum is to be 50 times the former reading, R=49×r.

Always $R=(N-1)\times r$ where

$$N=\frac{\text{new maximum}}{\text{old maximum}}$$

Now to make the resistors; just take a cheap carbon pigtail resistor of slightly less resistance than is needed, with a curved-edge file, reduce the cross-sectional area of a portion of the resistor, until the resistance is increased to the exact size needed (as in Fig. A).—Robert Blaser.



EXTENSION SHAFT

When using a 5-meter receiver, or any other receiver for that matter, with which you have trouble caused by body capacity effects, this extension will overcome the difficulty. A homemade one was constructed as follows from an old "aligning" tube. This should be drilled and tapped for set screw "B". The slot marked "C" is the proper size for the standard ¼-inch condenser shaft. A ⅜-inch fiber shaft is used, and will take any standard tuning knob or dial.—C. C. Leininger.

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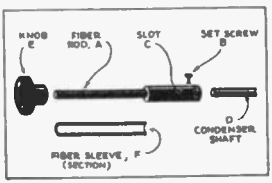

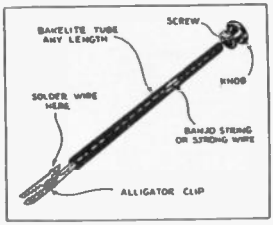

SIMPLE RETRIEVING TOOL

This handy instrument can be constructed from equipment found in the average "junk box." It consists of an "alligator clip," a short length of bakelite tubing, some strong wire, and a knob. The diagram is self-explanatory. In order to open the jaws of the clip, it is only necessary to pull upward on the knob, and release it when the jaws are to be closed. This has been used for retrieving nuts, screws, etc., in tight places where the hand or fingers cannot reach.—George D. Rodgers.

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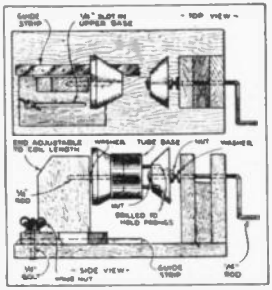
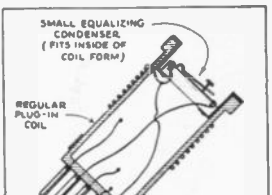


HOMEMADE COIL WINDING MACHINE

This coil winding machine is really very simple to build and will save much time and patience in constructing and winding coils of all descriptions. Nearly everything is constructed of wood except the crank and the wing nut. The "tail stock" is made to slide backward and forward in order that varying lengths of coils can be wound. No dimensions are given for the length of base as this will depend upon the size and type of coils you wish to wind. All the details are clearly illustrated in the drawing. —George Leitch.



ANTENNA COUPLING KINK

Here is a kink which eliminates the ills of the antenna coupling condenser. Purchase plug-in coil forms with one extra prong. Small equalizing condensers may be purchased which will fit in the top of the p.ug-in coils. One side of the condenser is connected to the "G" of the grid coil and the other side is connected to the extra prong. The corresponding prong of the coil socket is connected to the antenna post. The condensers are all adjusted for best results, and then they need never be touched again. Stations may be logged and will always be found in the same position on the tuning dial.—Merlin Berrie.

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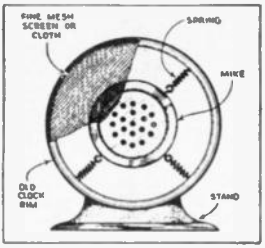
Transmitting "KINKS"

"MIKE" STAND



When wanting to make a "mike" stand and with no funds to be found, I turned to the trash box. After searching for quite a while I found an old Big Ben alarm clock, the case of which was in good condition. I removed all the working parts and levers including those for the control of the alarm having nothing left but the rim and stand. I then got four small springs, attached them to the hooks on the mike, and fastened the other ends to the rim of the clock by means of small bolts.—Joe Petsch.

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MAKING WIRE COILS

In order to make heavy wire fit tightly on a bakelite form, wind the wire first on a form with a diameter about 1/5th smaller than the form to be used. The wire can then be threaded on larger form and will stay tight.—T.S.C.

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NEON INDICATORS

About the handiest piece of apparatus around the "ham" station is the familiar neon bulb, which can be obtained in various sizes from ¼ watt upward. These can be used for R.F. measurements such as locating "standing" waves along transmission lines, or for lining up R.F. stages.

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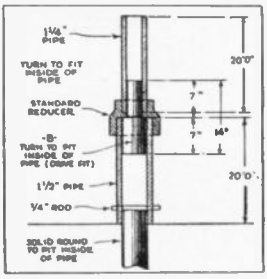
ANTENNA MASTS



Here you will find a kink in putting up antenna poles. I have two 40-ft. steel pipe poles. I drive a steel rod marked "A" into the ground, which is solid; if I had to dig a hole the ground would be very loose. The wind will sway or ice or rain will break the guy wire and the pole will sway back and forth. It may break the cast iron coupling and fall and someone may get hurt, so I had a solid piece of metal turned down to drive fit in the 1½" pipe marked "B", the other end turned down for a snug fit for the 1¼" pipe. This makes it like a solid pipe; you can get on top of the pole, it will bend but will not break. Last winter's ice broke my guy and the pole bent very badly; if it were not for the inside steel it would have caved in on my roof.—Gilbert G. Galambus.

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Useful Ideas and Short-cuts for the HAM Operator

SHIELDED "MIKE" CABLES

When using "low-level" microphones, or any microphone for that matter, in conjunction with "high-gain" amplifiers, it is necessary to employ shielding. Where regular shielded microphone cables are not readily obtained, very efficient substitutes can be found in the flexible shielded antenna lead-in wire. On single button microphones only one piece of this wire is necessary. With double microphones, two of these will be necessary. Place them side by side and drop a small amount of solder on to them every four or five inches.

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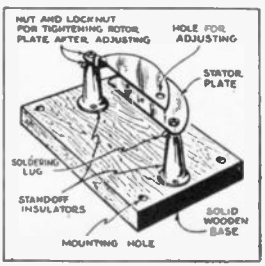
HOME-MADE NEUTRALIZING CONDENSER

A condenser that can be used as an antenna trimmer on receivers or as a neutralizing condenser on transmitters can be made from two midget stand-off insulators and two stator plates from an old discarded variable condenser.

The stand-off insulators used are about 1 5/16" high. A bakelite or wooden rod that is pointed is used to adjust the rotor. When the neutralizing adjustment is made, the rotor can be locked into place by tightening the nut indicated on the diagram. —Joe Balas.



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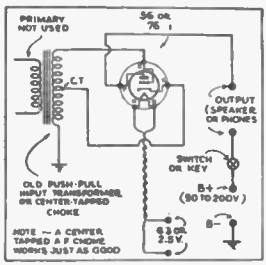
CODE PRACTICE OSCILLATOR

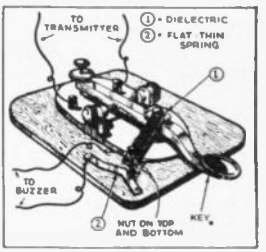
Here is my favorite kink and I hope that it is published in SHORT WAVE CRAFT. A center tapped push-pull input transformer may be connected as shown in the diagram and will make an excellent code practice oscillator. The oscillation is very good and it has an excellent tone. The tone of course, will depend a lot upon the tube and make of transformer used. Either a 56 or a 76 tube will work very nicely; 6.3 volts are used for the 76, while 2.5 volts are used for the heater of the 56. The output of this oscillator is sufficient to operate a small speaker with excellent volume.—Vic Mountain.



Nifty Keying System

If one desires to hear his own keying other than through monitor, while transmitting, the sketch illustrates how it may be done without any cost providing one has a buzzer and a couple of standard dry cells.

No. 1 is a small piece of any good dielectric about 2 inches long, ⅝ inch wide and ⅛ inch thick, drilled at both ends with holes of suitable size to fit the screw on the key lever which adjusts the spring

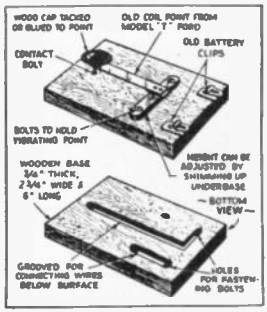


tension, and the screw one happens to have, for making contact to the spring.

No. 2 a small strip of spring steel bent as shown and fastened down at both ends. The bend permits of fine adjustment as the contact screw by swinging the dielectric strip backward or forward. Nuts should be placed above and below the dielectric strip on the contact bolt to hold it firmly in place. When the contact bolt or screw has been adjusted and the nuts tightened any further adjustment required may be made by simply moving the strip backward or forward.

This extremely simple kink works perfectly.—Harry Porter.

▼ ▼ ▼



Emergency Key

Here's how to make a practice or "emergency" key. The key is made on a block of wood 6"x2¾", the vibrating point of an old Model-T Ford, together with the base of vibrator included. Some points have a hole near the contact point and some do not; it is best to use the former. Two screws are fastened through the base of vibrating point, the heads of which are countersunk in block.—William Brubaker.

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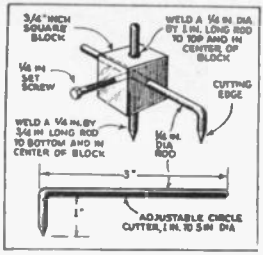
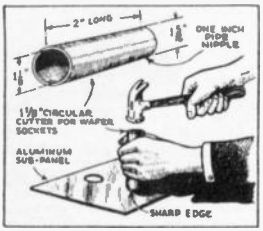
CHEAP LEAD-IN

I think that a pair of lead-in bowls made from two coffee pot tops is the cheapest that any "Ham" can get. Drill a hole in each top and through the pane of glass, then put one on each side of the window pane with a 6"x⅛" brass bolt with a washer and nut on each end of the tops.—Harry Gaul.

TOOLS FOR WORKING METAL CHASSIS



The above diagram clearly shows the construction of an instrument which can be used for cutting large holes in bakelite or metal panels. The drawing clearly indicates how simply this tool can be constructed. The cutting instrument should be made of high grade steel especially where hard materials are being worked. The ¾ inch square block can be made of ordinary iron. The drawing below shows a very simple method



of constructing a punch for making socket holes in metal panels or chassis. Secure a piece of 1 5/16 inch outside diameter pipe, file each end as straight as possible and sharpen one end in order that a cutting edge will be effected. Simply place the panel to be punched over some hard wooden material.—R. B. Wells.

▼ ▼ ▼

HANDY SUBSTITUTE

For the "Ham" who gets all set to test his Transmitter some evening and finds that his neon test bulb has been lost, stepped on, or the baby has swallowed it.

Dig down in the junk box and salvage an old Raytheon Rectifier tube, type BH, connect the four prongs with a piece of bare wire and you have as serviceable test bulb as you had before, giving a glow much the same as your neon bulb.—Marino Schell.

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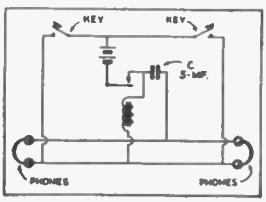
Multiple Code Practice

Here is a scheme by which two-way code practice is possible using only one bell or buzzer. The .3 mf. condenser is used

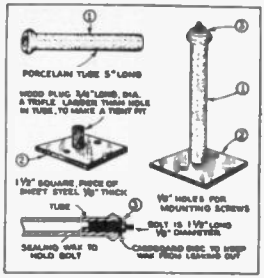


to keep the D.C. of the battery out of the phones. By connecting other keys and phones in parallel it is possible for more persons to practice at the same time.—Theodore Vega.

▼ ▼ ▼

NOVEL STAND-OFF INSULATOR

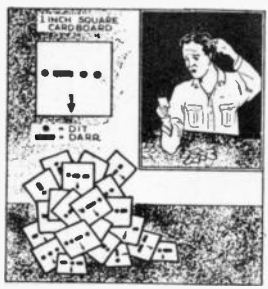
A very efficient stand-off insulator can be constructed from a 5 inch porcelain insulating tube. Both ends of the tube are fitted with wood dowels in order to facilitate mounting. The drawing below clearly shows how the screw is fastened in one end and how the base is fitted to the other end. —George Shenberger.



CODE ON CARDS

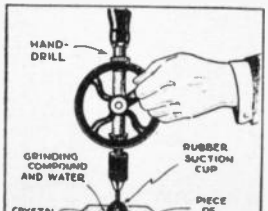
Here is a kink that I think will help the short-wave fan who has just started to learn the code. Cut twenty-six one-inch squares out of cardboard. Next, mark on them the translation of the alphabet from A to Z in the continental code. Also, put a small arrow at the bottom of each card so one will know which way the card is to be held. We now shuffle the squares just as a pack of playing cards, and one by one take each card, identifying the letter it represents, and place it apart from the unpicked ones. In this way one gets to know the letters from their continental translation instead of forming the habit of letter to code. As soon as one knows the letters, cards of the numbers can be made.—Norman Esplin.

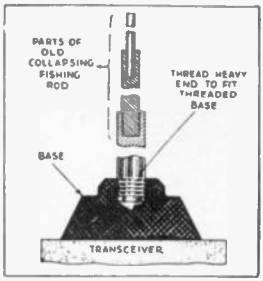
▼ ▼ ▼



GRINDING YOUR OWN CRYSTALS

Here is a kink that I would like to enter in the short-wave kink contest. In grinding crystals I used the regular method of a piece of plate glass, grinding compound, and water.—Edwin Cheever.



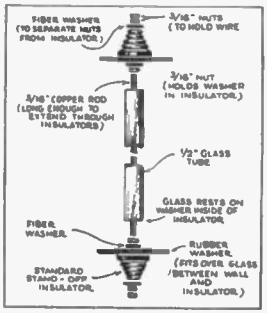


Fish-rod Antenna

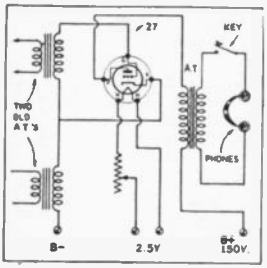
Being in need of a collapsible and compact aerial for my portable set, I obtained an old fishing rod, one of those very small collapsing kind. Then I removed the paint, the ferrules, and the handle; then I had the large end threaded to fit a base which I mounted on my set. This made a very good aerial for my small "transceiver."

The diagram will explain more fully.—R. Tweedie.

HANDY LEAD-IN INSULATOR



If a suitable lead-in insulator is not on hand, one can be constructed from a pair of regular stand-off insulators by the following method: Remove the fittings from two of these insulators and procure a length of 3/16-inch threaded brass or copper rod, 4 ⅛-inch fiber washers, 6 nuts to fix the rod and a length of ½-inch glass tubing; also make two rubber washers 3 inches in diameter with a ¾-inch center hole. These can be cut from an old inner tube. I am using a pair of these insulators for bringing in a transposed lead-in and I find them very satisfactory.—John Schlener, Jr.



IMPROVING OUR KINK

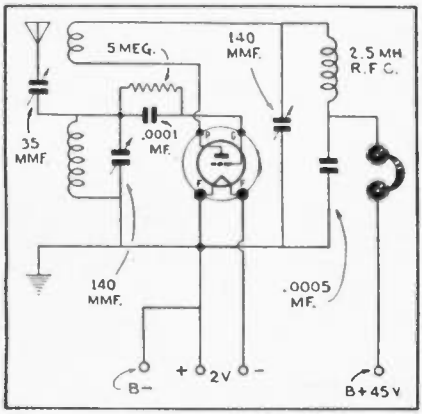
Tried out your "Short Wave Kink" for code practice in the October number, with some variations dictated by the fact that I did not have a center-tapped choke or P-P transformer. It gave me heavy key-clicks in every circuit I tried until I took the key and phones out of the plate circuit. With the circuit illustrated herewith, I get a fine note and an entire absence of clicks.—E. L. Bennett.

Questions and Answers on S-W Receivers

1 TUBE S.W. SET

Roy Haver, Delphos, Ohio,

(Q) Can I obtain the diagram of a one-tube short-wave receiver similar to the "One-Tube Scout" which was shown in SHORT-WAVE CRAFT some time ago?



Above—diagram of 1-tube battery receiver.

(A) Above we are showing a diagram of a one-tube receiver that should give you excellent results. However, you must remember that a one-tube set does not give much volume and it is very easy to pass right over a station. Also the tuning is very critical and the antenna condenser must be continually adjusted. The antenna used with the above receiver should be at least 100 feet long and mounted as high in the air as possible.

DOUBLET ANTENNA BEST?

J. Rand, New York City, N.Y.

(Q) Is the much talked about doublet antenna really better than a single-wire antenna?

(A) If properly constructed and mounted away from interfering objects, the doublet is far superior to the ordinary type. For constructional information we refer you to page 344 of the October 1934 issue. In cases where the flat-top portion of the doublet is not far from noise producing machinery, etc., there is little use of going to the trouble of changing your antenna.

COIL-WINDING FOR OSCILLODYNE

J. Linzmayer, Atlantic Highlands, N.J.

(Q) Please print in your QUESTION BOX the correct coil winding data for the one-tube *Oscillodyne* receiver.

(A) The coils for the *Oscillodyne* should be wound as follows, on 1½ inch coil forms.

Approximate wave-length	Secondary turns	Primary turns
14- 25 meters	4	6
23- 41 meters	7	9
40- 85 meters	14	12
83-125 meters	23	23
120-200 meters	36	36

Spacing between tickler and grid coil ⅛ inch.

ADDING AMPLIFIER TO 2-TUBE SUPER

Harry S. Wimer, Ellwood City, Pa.

(Q) I have built the 2-tube superhet that was described in the December 1933 issue and would like to know how I could add a 42 tube to it for a little more power output—do you think it would work O.K. with one 42 in the final? I have the 42 tube and the six prong socket.

(A) You should undoubtedly experience excellent speaker performance with the *Victor 2-tube Superhet* described in the December 1933 issue, with the addition of a 42 pentode power amplifier. It is not a very difficult job to add a 42 to the above set and if you follow the accompanying diagram you should have no trouble.

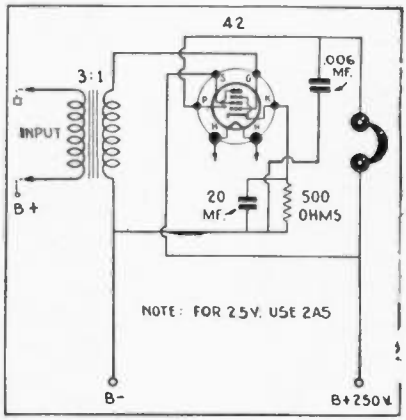
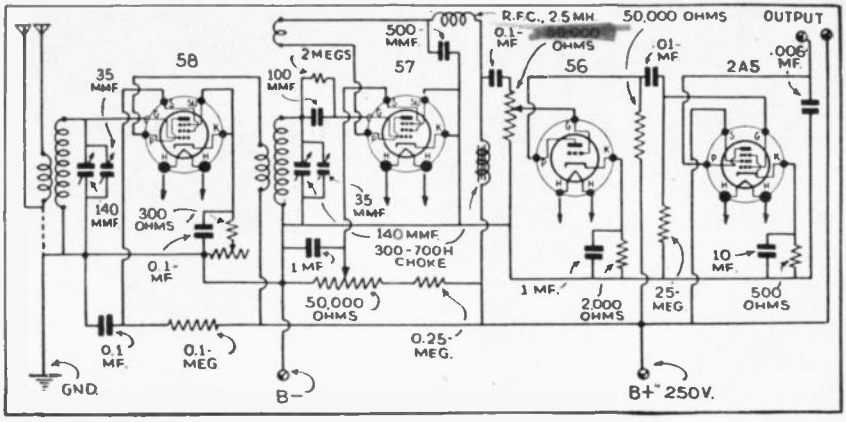


Diagram of type 42 amplifier.



4-Tube receiver with two stages of audio.

4-TUBE T.R.F. RECEIVER

Charles M. Bend, Jr., St. Paul, Minn.

(Q) I would greatly appreciate it if you would print a diagram of a 4-tube amateur receiver in your Question Box. I would like to have a 58 tuned R.F. amplifier and a 58 or a 57 detector. Someone told me that a 58 gave smoother regeneration; which should I use? The detector is to be followed by a 56 amplifier coupled to the detector by a National coupling unit. The output amplifier should be a 2A5 resistance coupled to the 56. I will use small variable condensers for band-spread.

(A) The 4-tube tuned R.F. receiver diagram appearing on this page should make an excellent amateur stand-by receiver. We have shown two volume controls; one is in the R.F. stage and another in the first audio stage. The use of an extra control in the audio circuit is well worth while because the output of the set can be cut down without disturbing its R.F. sensitivity. Regeneration is controlled by varying the screen-grid voltage of the detector tube which can be either a 57 or a 58. We prefer the 57, although the 58 seems to work very nicely with no change in the circuit.

BEST ANTENNA

P. Bixler, Jr., Westminster, Md.

(Q) Please send me information, best kind of antenna to use with the National S.W. 3 A.C.

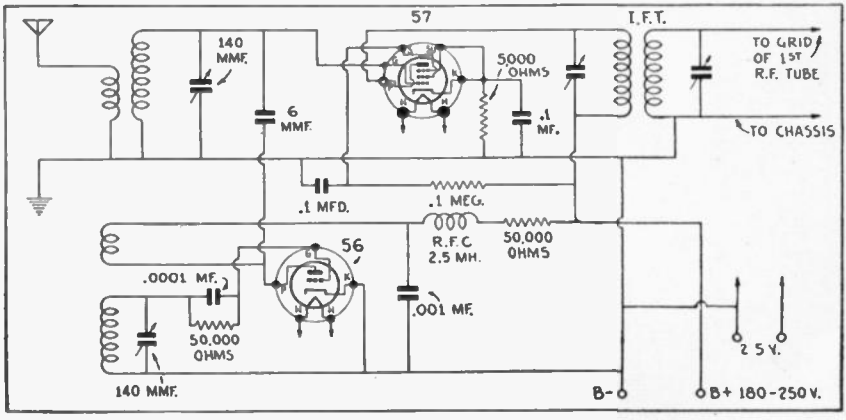
(A) If you have the room and facilities the inverted "V" antenna will undoubtedly give best results.

2-TUBE CONVERTER

P. Hoerner, E. McKeesport, Pa.

(Q) I am now using a short-wave converter with 2-tubes, type 24 and 27. I had European stations, with favorable weather, like locals. I would like to change to type 57 and 56 tubes. Will you please publish a diagram of a converter using these tubes?

(A) We are pleased to print a diagram of a converter using a 57 first detector, and a 56 oscillator. However, we do not believe there will be a tremendous amount of improvement over your present converter, which uses a 24 detector and a 27 oscillator.



2-Tube Superheterodyne Converter using type 56 and 57 tubes.

2-TUBES EQUAL 3

George Wohlwend, Ann Arbor, Mich.

(Q) I would appreciate it if you would publish a diagram of an A.C.-D.C. receiver using a 6F7 and a 25Z5. The 6F7 is to be used as a pentode regenerative detector and one stage of resistance-coupled audio amplification using the triode section. I would like this receiver to have as little hum as possible so kindly show the diagram of a good filter circuit.

(A) We are pleased to print the diagram you requested, although, we can offer no guaranty regarding the *hum-level.* The 6F7 works remarkably well as a regenerative detector and one stage of audio amplification. We have shown the filter circuit which should work as well as any, although it is just about impossible to eliminate all traces of hum in an A.C.-D.C. circuit. In wiring up the 6F7 do not fail to connect the grid-leak of the detector between the grid and the cathode, and *not* between the grid and "B" negative, The .1 mf. condenser shown connected across the 110 volt line has been found to eliminate all traces of *tunable* hum. We recommend that this be incorporated in all A.C.-D.C. receivers.

REMODELING B.C. SET FOR S.W. RECEPTION

Roy Magnuson, Minneapolis, Minn.

(Q) I have on hand an old Sparton A.C. 7 which I would like to convert into a short-wave receiver. I would appreciate any information or data that you can give me.

(A) From our past experience we have found that revamping broadcast sets in order to make them work on short waves is not a profitable proposition. We believe that it would be much more economical for you to either build a converter or an entirely separate short-wave receiver. In nearly every case where your idea has been carried out the net result has been a destroyed broadcast set and a short-wave receiver that wasn't worth two "hoots." Refer to some of the past issues of SHORT-WAVE CRAFT magazine and you will find plenty of excellent short-waves sets.

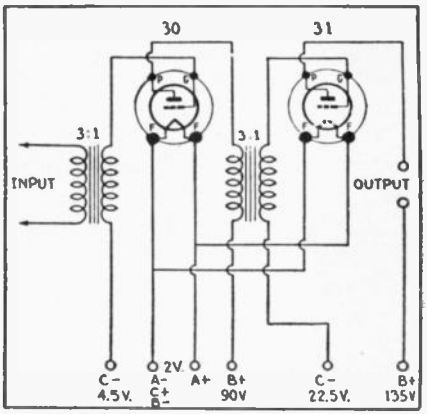
2-STAGE AUDIO AMPLIFIER

J. G. Tate, Ardmore, Pa.

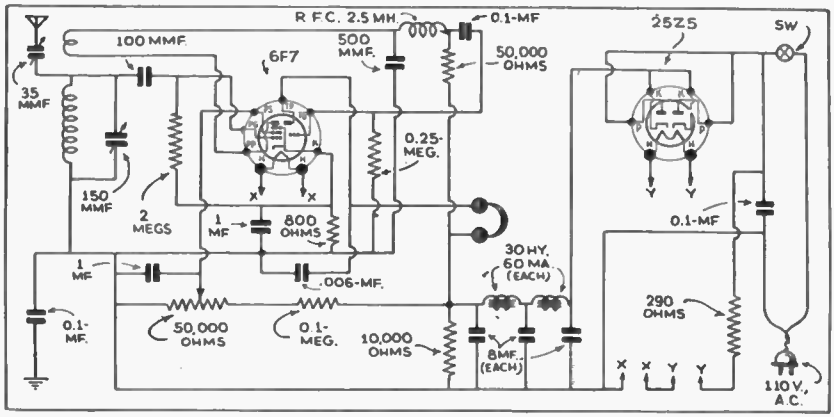
(Q) Would you please publish a diagram of a two-stage audio amplifier which can be used in conjunction with any 2-volt battery-operated short-wave receiver? This amplifier should use a type 30 as the first stage and a 31 as the output amplifier.

(A) We are very pleased to print the 2-tube audio amplifier diagram. C bias is necessary on both stages; a 22.5-volt C battery having a 4.5-volt tap will serve for both stages.

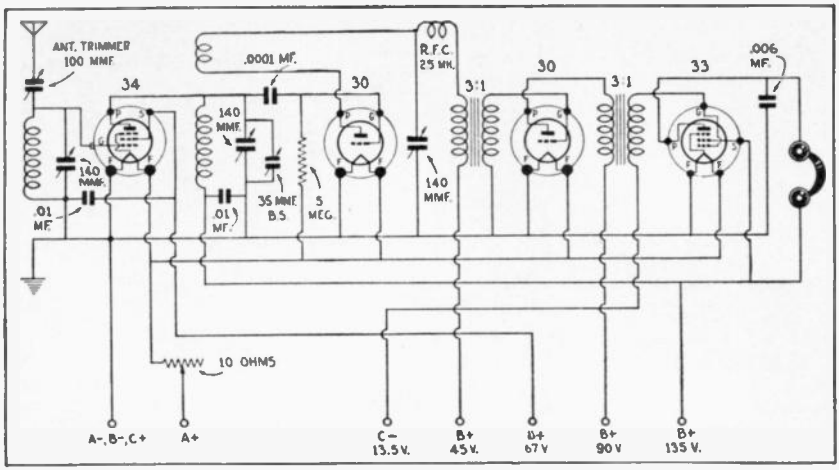
This amplifier in conjunction with a good battery-operated receiver should give loud-speaker volume on all "foreign" short-wave broadcast stations.



Two stage audio amplifier using dry-cell tubes. Note: bottom views of tube sockets are shown in the diagrams.



A good circuit for an A.C.-D.C. receiver, using a 6F7 and a 25Z5.



Above is diagram of 4-tube battery operated T.R.F. receiver. Note—bottom views of sockets are shown in these diagrams.

T.R.F. BATTERY RECEIVER

C. B. Ray, Shelbyville, Tenn.

(Q) Please publish a diagram of a 4-tube battery receiver using 2-volt tubes, with variable condensers to band-spread. I had thought of using one 32, two 30's and one 33. If you think some other line-up of tubes best please print what you think the best.

(A) A receiver using a line-up similar to the one you desire should give excellent service. However, the R.F. tube for best results should be a 34. The set, consisting of a 34 T.R.F. amplifier, a 30 regenerative detector, another 30 as the first stage of audio, and a 33 operating as the power output tube, should be capable of working a speaker with fairly good volume on the various foreign stations. Band-spread is accomplished by connecting a small condenser in parallel with the detector tuning condenser, the small condenser being used for band-spread tuning and the smaller one for band setting. No band-spread condenser is necessary in the R.F. stage because it is rather broad in tuning. If the two condensers were ganged, however, it would be necessary to have band-spread condensers in each stage.

ANTENNA BLOCKS

John Post, Flint, Mich.

(Q) I constructed the 2½- and 5-meter super-regenerator described in the November 1934 issue of SHORT WAVE CRAFT. When I attach an antenna to the grid circuit through the 6 mmf. condenser the detector goes out of oscillation. Could you tell me how this trouble could be overcome?

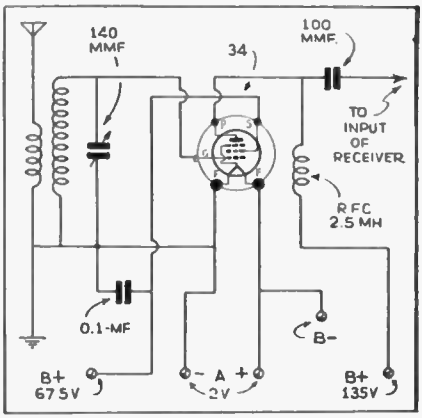
(A) Further experimentation with the 2-tube receiver showed that when the antenna is connected to the cathode of the tube a 25 mmf. condenser could be used in the antenna circuit and there will not be the least sign of *blocking*.

T.R.F. AMPLIFIER FOR BATTERY SET

W. L. Cornelius (W9JAJ), Bellevue, Iowa.

(Q) I have recently built a 5-tube superheterodyne using 2-volt battery tubes and would like to have you print a diagram of a tuned R.F. stage which may be added to this receiver in order to improve its pick-up and also to reduce the images.

(A) This tuned R.F. amplifier will work well with any type of battery-operated short-wave receiver. The output of the amplifier should be connected directly to the antenna posts of the receiver. If separate A and B batteries are used for the amplifier and receiver, a connection should be made to join the "B" negatives of both sets of batteries.



Tuned R.F. stage for use with any type battery-operated receiver.

LACK OF REGENERATION

L. H. Andrews, Manitoba, Canada.

(Q) I have recently wired up the Victor "Easy Tune" 2-tube Band Spreader illustrated in the June issue of SHORT-WAVE CRAFT. I cannot get regeneration below 31 meters. The wiring on the R.F. side is as short as possible, 35-foot antenna; my ground would have to be 20 feet, so I do not use one. I shall be very pleased if you can solve this problem for me.

(A) You may have insufficient number of tickler turns or your detector tube may not oscillate easily. Try another tube and also increase the number of tickler turns slightly. Also the antenna coupling condenser should have a very low *minimum* capacity.

4 TUBE BATTERY SET

L. E. Clarkson, San Juan, Calif.

(Q) Will you please publish a diagram of a 4 tube, 2 volt battery set using a 34 tuned RF. stage, a 32 regenerative detector, a 30 first audio, a 33 pentode, output tube. This set is to be used with standard plug-in coils and 140 mmf. tuning condensers in both stages, either ganged or operated separately, whichever is best.

(A) We are printing the 4 tube diagram you requested. This should make a very fine battery operated receiver and it should be capable of pulling in all the short-wave stations. Regeneration is controlled by varying the screen grid voltage. Make sure that the 50,000 ohm regeneration control potentiometer has a switch on the back of it, which should be connected in series with the 22½ volt lead in order that the potentiometer will not be a constant drain on the first section of the "B" batteries while the set is not in use. This switch should be turned off together with the filaments when the set is not in use. If you wish to gang the two tuning condensers it will be necessary to connect a 35 mmf. condenser across the RF. tuning condenser in order that compensation can be made for varying lengths of antennas, etc., and to keep the two stages in alignment.

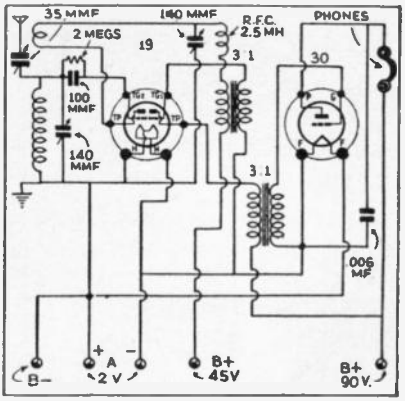


Diagram of 2-tube Battery Set Using One 19 and One 30

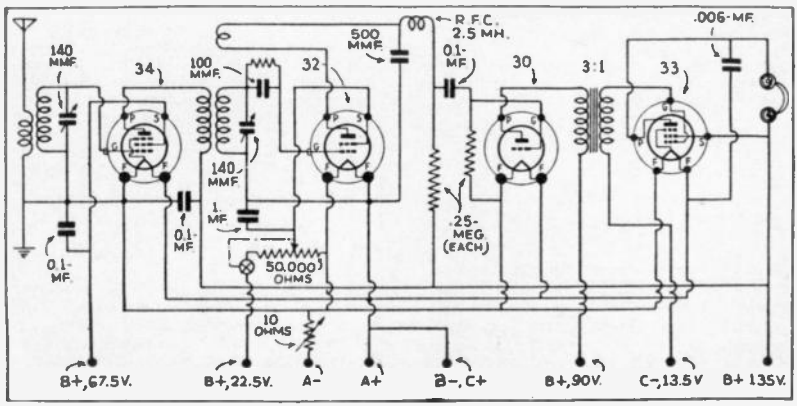
ECONOMICAL BATTERY RECEIVER

J. A. Daigle, Bangor, Me.

(Q) Would like to have you publish a circuit diagram of a set using two 19's or one 19 and one 30.

(A) A circuit diagram using a 19 and a 30 is shown above. The 19 performs the functions of regenerative detector and one stage of transformer-coupled audio amplification. The 30 is recommended rather than another 19, giving two stages of audio rather than three, as would be the case if two 19's are used. Three stages of audio usually results in considerable trouble and unless the output tube is a power tube, the three stages are unwarranted.

While the 19 functions as two separate tubes, we believe better results could be obtained with a type 15 screen-grid detector. Few of our readers realize that the 15 actually requires less heater or filament current than the 19; .26 ampere are required for the 19 while .22 ampere is required for the 15.

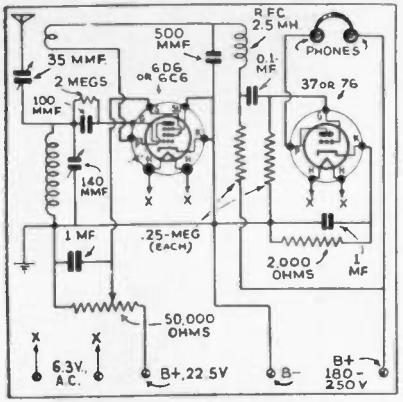


4-tube battery operated receiver having a stage of tuned R.F. ahead of the regenerative detector. This should give excellent results on all short-wave stations.

2-TUBE RECEIVER

Milton Berlin, Passaic, N.J.

(Q) Will you please publish in your QUESTION BOX a diagram of a short-wave



2-Tube Short-Wave Receiver

receiver using 6.3 volt heater type tubes? I would like to have it use a 6C6 detector and a 37 audio amplifier.

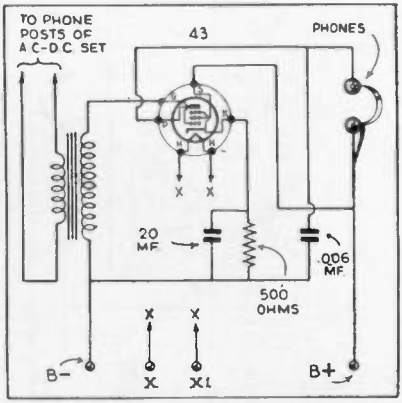
(A) The 6.3 volt henter-type tubes are becoming quite popular in present day radio receivers and we take pleasure in presenting your diagram. Either the 6D6 or 6C6 can be used as the detector and a 37 or 76 in the audio circuit with no change in the values which are given in the diagram.

AUDIO AMPLIFIER FOR A.C.-D.C. SETS

Roland C. Shaffer, Richmond, Ind.

(Q) Please print in your Question Box at the earliest convenience a diagram showing how a 43 pentode may be added to a 3-tube A.C.-D.C. set which uses type 37 tubes.

(A) We are showing a circuit diagram of a 43 pentode amplifier. In A.C.-D.C. sets



Audio amplifier for A.C.-D.C. set.

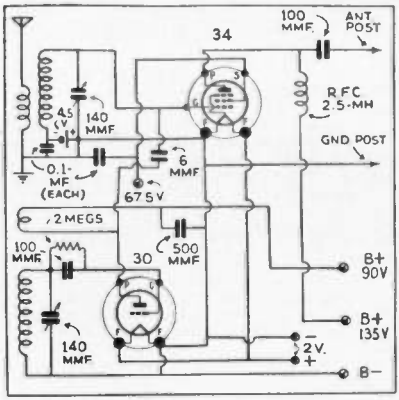
the filaments or heaters of the tubes are usually connected in series with a suitable line voltage dropping resistor. When adding the 43, break the filament circuit and connect each side of the circuit where it is broken to points "X" and "X1" shown in the diagram. This will place the 43 in series with the other tubes. It is now necessary to change the value of the line dropping resistor. The 43 tube has a heater resistance of 83 ohms; the new value of the limiting resistor will now be 250 ohms if your line voltage is higher than 110 volts. If you have 110 volts or slightly less, use a 225 ohm resistor.

BATTERY-OPERATED S.-W. CONVERTER

F. H. Helme, Lacadena, Sask., Can.

(Q) I would like to build a battery-operated short-wave converter and ask that you print a suitable circuit using a 34 detector and a 30 oscillator.

(A) We are printing a diagram of a converter which should give very fine results if used in conjunction with a *sensitive* broadcast receiver. Standard 4-prong plug-in coils are used and two coils will be



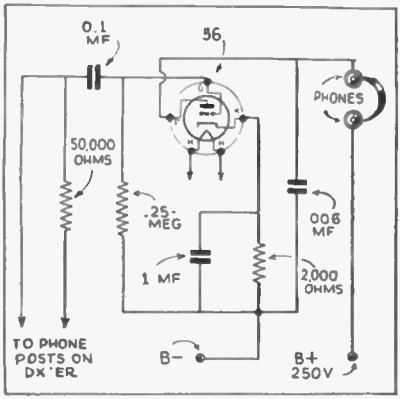
2-Tube Battery Converter

necessary for each short-wave band you wish to cover. The output of the converter should be connected to the antenna and ground posts of the broadcast receiver. These are labeled, "Ant. Post," and "Gnd. Post." The coupling between the detector and oscillator is accomplished by the use of a 6 mmf by-pass condenser. This small coupling can also be effected by running insulated wire from the oscillator to the grid lead of the detector. Wrap the insulated wire around the grid lead about three or four times. We suggest you experiment with the number of turns used in order to obtain best results. The diagram shown is one where separate controls are used. If you intend to gang the 140 mmf. condensers, insert a .001 mf. mica condenser in series with the oscillator condenser and connect a 35 mmf. condenser in parallel with the detector-tuning condenser for trimming.

AUDIO AMPLIFIER FOR 3-TUBE DXer

H. Gee, Victoria, B.C., Canada.

(Q) Will you please publish a diagram showing how I may hook another 56 audio amplifier to the "3-tube DX-er"



56 Audio amplifier for DX'er.

shown on page 18 of the May 1933 issue. I would like to use a 56 tube for this purpose.

(A) On this page you will find printed a circuit diagram of the 56 audio amplifier with resistance coupling. The two input terminals should be connected to the phone terminals of the "DX-er."

ELECTRON COUPLED DETECTOR

Harold Johnson, North Plainfield, N.J.

(Q) Please publish a circuit for a 3-tube receiver using a 58 untuned amplifier. I want to control the amplification of the R.F. tube by varying the bias of the R.F. tube.

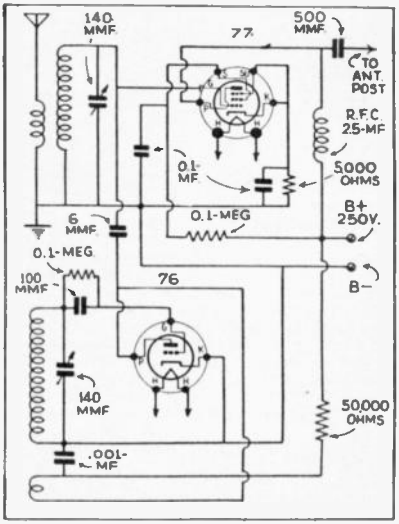
(A) We are printing your diagram using an electron-coupled detector together with an untuned stage, the volume is controlled with a variable resistor in the cathode circuit of the 58.

S.W. CONVERTER

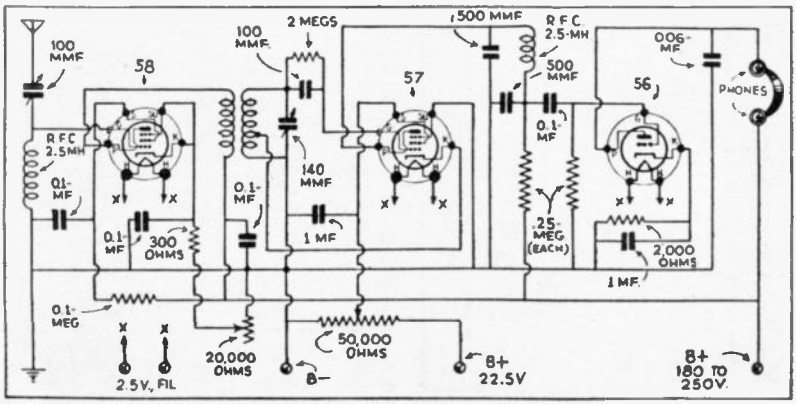
(Q) I would be very pleased if you would publish a diagram of the short-wave converter using a type 77 as the detector, and type 76 as the high frequency oscillator. This should be coupled to the antenna post of a regular broadcast receiver.

(A) You will find on this page a diagram of a short-wave converter.

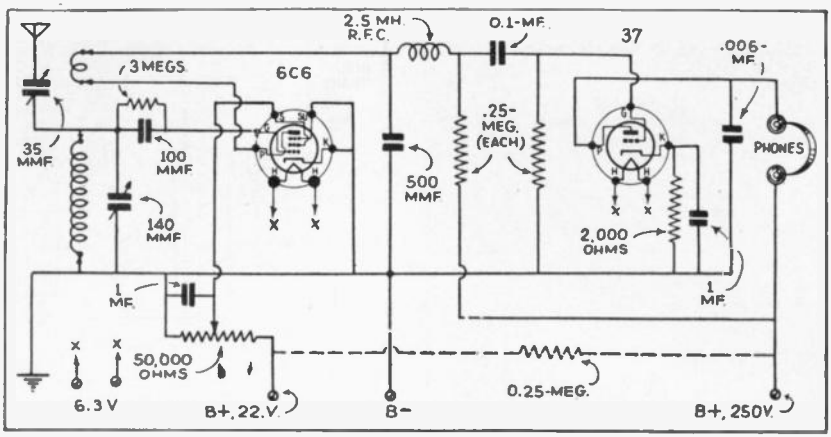
This converter will work very satisfactorily on any *sensitive* broadcast set. However, you will not obtain



very satisfactory results on old type T.R.F. receivers using tubes such as the type 26 or 201A. The output of the converter is connected directly to the antenna post of the broadcast set.



3-Tube Receiver with an electron coupled detector.



2-Tube regenerative receiver.

2-TUBE RECEIVER DIAGRAM

Harry Stewart, Detroit, Mich.

(Q) I would like to have you print a diagram of a small receiver using a 6C6 and a 37. The 6C6 should be used as a regenerative detector with the regeneration control connected in the screen-grid circuit and resistance coupled to the 37 audio amplifier.

(A) We are very pleased to print the diagram you requested in your letter and it should make an excellent short-wave receiver. The power supply should deliver 250 volts of well-filtered direct current and approximately 22½ volts for the screen voltage or the 22½ and 250 volt taps can be joined with a 250,000-ohm resistor, eliminating the low voltage tap of the power supply. For battery operation, of course, this resistor will be unnecessary.

NOISY CONDENSER

Kurt Sporre, Plainfield, N.J.

(Q) When the main tuning condenser of my 3-tube short-wave receiver is turned rapidly, loud clicks are heard in the headphones. Would you please tell me what the cause of this is?

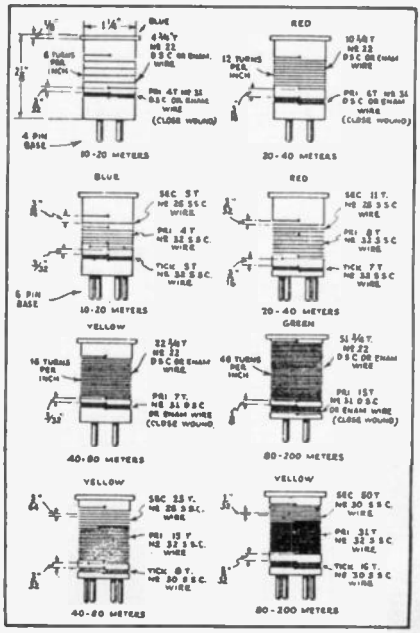
(A) Undoubtedly your trouble is due to dirty bearing in the condenser or possibly the rotary plates have become slightly bent and are shorting condenser.

We suggest that you give it a thorough cleaning and examine the plates to make sure they are not bent.

COIL DATA

Thomas Payne, Philadelphia, Pa.

(Q) We are again printing complete data on both 4- and 6-prong, 2- and 3-winding coils, which can be used in any short-wave receiver. This information has been requested by hundreds of our readers since it was published in the July 1934 Question Box. In the 2-winding coils the spaced winding will be used as the grid coil of a detector and small winding at the bottom of the coil for the tickler, and in an R.F. stage this small winding should be used as the antenna coupling coil. The 6-prong coils are used mostly in tuned R.F. receivers. When used as a detector coil, the large winding is for the grid circuit, the interwound winding (or primary) is used in the plate circuit of the R.F. tube, while the small winding is for the tickler. When used in the R.F. stage, the large winding (sec.) is the grid coil and the small winding (tick.), the antenna coupling coil. By connecting a 50 mmf. condenser across the interwound winding it can be used for padding or trimming the R.F. stage.



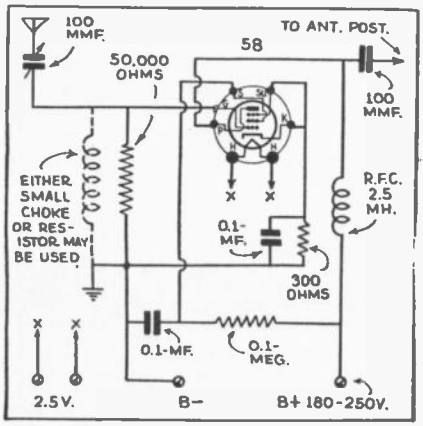
Coil data for 2 and 3 winding coils.

UNTUNED R.F. AMPLIFIER

M. Krochak, Rahway, N.J.

(Q) I am one of your lucky readers who built the "2-Tube Band-Spread Doerle" described in the May 1935 issue of *Short Wave Craft*. The set has been even better than you claimed it would be. However, I would like to add an untuned R.F. stage to it, using a 58 tube. Would you be kind enough to print the necessary diagram?

(A) The diagram of the 58 R.F. amplifier is shown herewith. You will notice that in the grid circuit we have shown both a coil and a resistor. These are not used



Untuned R.F. amplifier for Doerle set.

together. The choke coil, if one is used, should be 2.5 mh., and the resistor used should have a value of approximately 50,000 ohms.

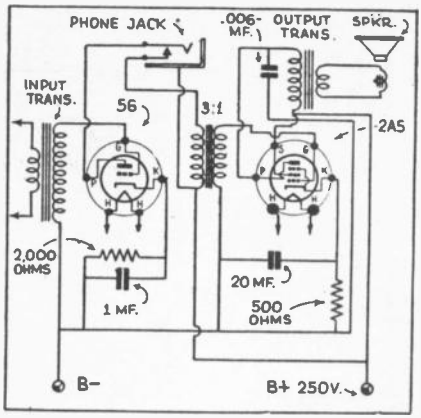
If the receiver with an untuned R.F. stage is to be operated in locations close to powerful broadcast stations, there is liable to be interference, moreso with the choke than with the resistor. The solution of the problem is to tune the R.F. stage. This is readily accomplished by replacing the choke with a plug-in coil and tuning this coil with a regular tuning condenser.

2-STAGE AUDIO AMPLIFIER

Donald Crutcher, Hamilton, Ohio

(Q) I would like to have you print a diagram of a 2-stage audio amplifier using a 56 in the first stage with a 2A5 in the last stage, also show how earphones may be connected to a 56 with a suitable jack arrangement which will turn off the 2A5.

(A) In this diagram which we are printing for you, a single closed circuit jack is used. When the phone plug is inserted the primary of the interstage audio transformer is disconnected and no signal will be heard in the speaker. The input transformer, if you intend to use this amplifier in conjunction with a triode, can be a regular 3:1 unit, the same as that shown between the 56 and the 2A5.



2-stage audio amplifier with headphone connection.

TUNED ANTENNAS

John Adams, Phila., Pa.

(Q) Do tuned antennas really provide better reception on short waves?

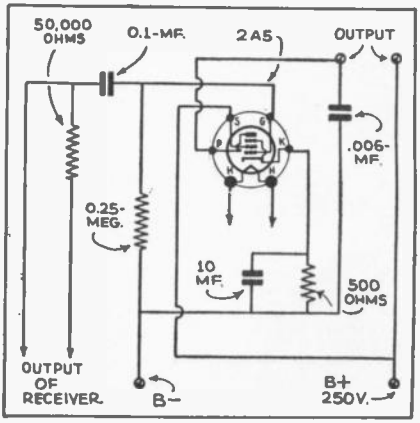
(A) Tuned antennas, if properly used are very good. See article on antennas appearing in this issue.

AMPLIFIER FOR HAM-BAND PEE-WEE

Matthew Dawidowiecz, Chicago, Ill.

(Q) Would you be good enough to illustrate a 1-tube amplifier, which could be added to the *"Pee-Wee"* receiver, using either a 47 or 2A5 tube, whichever would be best?

(A) We believe a 2A5 would be much more suitable than a 47, inasmuch as it has an indirectly heated cathode and allows a simpler method for obtaining bias. You will find a diagram printed herewith.



One-stage resistance-coupled amplifier using 2A5.

Questions and Answers S-W Transmitters

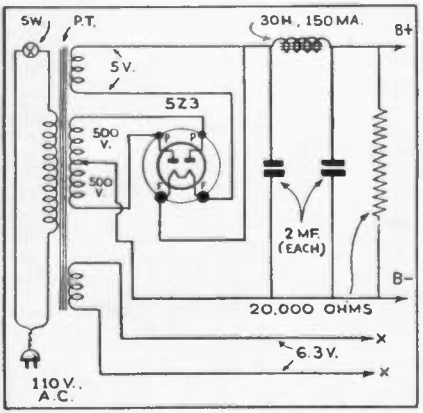
POWER SUPPLY FOR SIMPLEST TRANSMITTER

Walter Nagy, Carteret, N.J.

(Q) Will you please publish a diagram of a power supply which can be used in conjunction with the "Simplest Ham Transmitter" which was described in the June issue of *Short Wave Craft*?

(A) The transmitter using the single 802 tube has been found to be very effective, and we are pleased to print this power supply diagram which should be very satisfactory.

Make sure the power supply transformer has the 6.3-volt filament winding, otherwise it will be necessary to use a separate



Simple 500-volt power supply.

transformer for the heater. The transformer should be capable of supplying at least 500 volts at 150 milliamperes.

HAM SYMBOLS

Claude M. Willson, Newark, Ohio.

(Q) I would like to have some information regarding the various groups of letters used by amateurs. I have heard the various expressions and was, of course, unable to understand the conversation because I did not know what these meant. They are: OM, YL, HI, 73, QSL, FB, QST, CQ, QSO, VE4, W6, W2.

(A) They are respectively: old man, young lady, indicates laugh, best regards, verify reception, fine business, general broadcast by A.R.R.L., general inquiry call, establish contact, 4th Canadian District, 6th American District, 2nd American District.

100 WATT PHONE TRANSMITTER

G. K. Burtner, Jr., Goldthwaite, Tex.

(Q) I would like to build a 160-meter amateur transmitter having 100 watts input using inexpensive parts. Can this transmitter be built for around $30?

(A) We doubt very much that it is possible to build a good 160-meter phone transmitter such as you outlined for the small sum of $30.00. We do suggest, however, that you read the series of articles

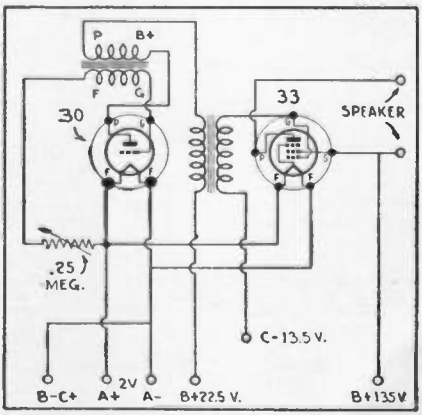
CODE-PRACTICE OSCILLATOR FOR SPEAKER

C. W. Earley, Akron, Ohio.

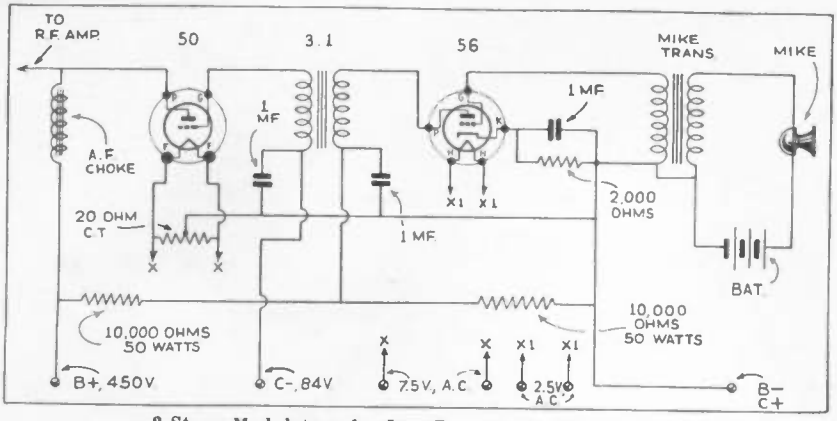
(Q) Would you be kind enough to print in your QUESTION BOX, a diagram of a code-practice oscillator that can be used with a loud-speaker? This is for battery operation.

(A) In the oscillator circuit that we have given, the oscillator tube is a 230 and the amplifier is a type 33. This should give enough volume for the average size room. The key is placed in the "B" plus lead of the oscillator; the variable grid-leak will provide a means of varying the tone. Two audio transformers are used, both of 3:1 ratio. The one in the oscillator circuit must be connected as shown. If no oscillation is obtained try reversing the leads to the primary winding.

The key should be placed in the B plus lead. A .002 mf. condenser across the key will reduce clicks. For increasing the pitch of the oscillator tune the secondary with a .0005 variable condenser.



2-Tube Audio Oscillator for code practice.



2-Stage Modulators for Low-Power Ham Transmitter

2-TUBE MODULATOR

Thomas Jones, Philadelphia, Pa.

(Q) I would like to have you print a diagram of a modulator using a 56 speech amplifier transformer coupled to a 250 power amplifier or modulator tube. I would like to use just one "B" supply for the modulator and R.F. amplifier.

(A) For low-power phone transmitters the modulator system diagrammed above is undoubtedly the most used among the amateurs. The power supply furnishing the 450 volts should be capable of supplying the plate current for the 250 together with that of the R.F. amplifier. The audio frequency choke, or modulating choke as it is sometimes called, should also be capable of handling the total current. Fixed battery bias is used on the modulator inasmuch as this provides greater output; Automatic bias is used on the 56 for convenience. This modulator will only work with a single-button microphone; another stage of amplification will be necessary for a double-button or crystal microphone.

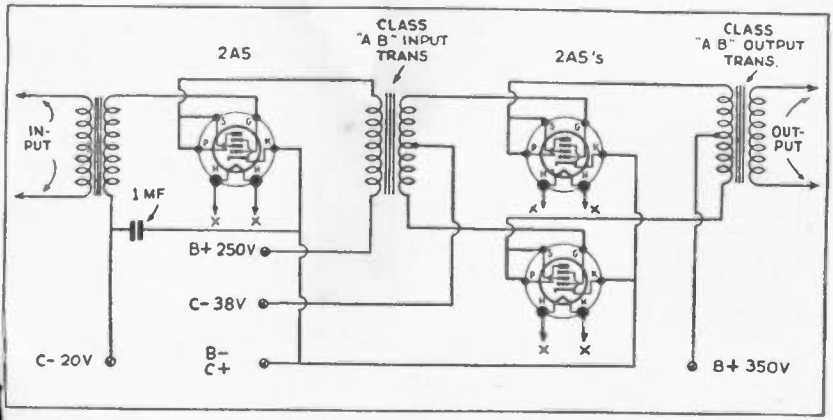
When using this modulator make certain that you do not over modulate your radio frequency amplifier. We say "radio frequency amplifier" because we trust that no one is using a *modulated oscillator*.

CLASS "AB" AMPLIFIER

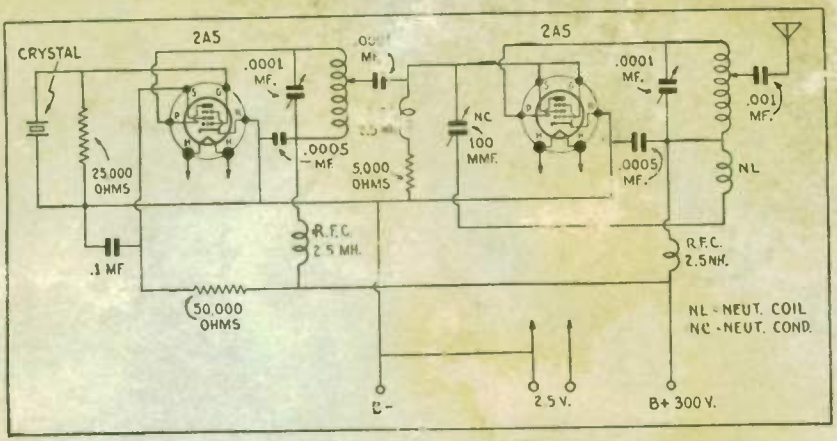
A New Jersey Ham, New Jersey.

(Q) I am a constant reader of SHORT WAVE CRAFT and thought that you might be good enough to help me in constructing an audio amplifier or modulator for my 5-meter transmitter. Please show the connections for two 2A5's in class "AB" with 2A5 driver.

(A) We are showing your circuit and this should prove to be an ideal modulator for a low power 5-meter transmitter. Remember though, that the transformers must be designed for this particular purpose and regular push-pull transformers will not work satisfactorily. Also, if you are using a fairly low level microphone, it will be necessary to use another stage of amplification. A 56 could be used ahead of the 2A5



Class "AB" audio frequency amplifier, using type 2A5 tubes.



Crystal-controlled MOPA transmitter using 2A5 tubes.

LOW-POWER TRANSMITTER

W. Stillwell, Albuquerque, N. Mex.

(Q) I intend to become an amateur in the near future and would like to have you print a diagram for a 2A5 crystal-controlled oscillator with 2A5 amplifier. About what would the input be with 350 volts on the plate of the oscillator tube and 500 on the plate of the amplifier tube?

(A) A transmitter using two 2A5's, one as a crystal-controlled oscillator and the other as a "high MU" R.F. neutralized amplifier, should give very fine results. You will notice in the diagram which we have printed, that the two grids have been connected together in order to make the 2A5 amplifier a high MU tube. When connected in this manner no fixed bias is necessary. The grids are returned through a fixed resistor. However it is not advisable to place more than 300 volts on the plate. The plate current of the final amplifier under load should not exceed 50 milliamperes for best results.

"HAM" MONITOR

John Quirk, Paterson, N. J.

(Q) Please show a diagram of a simple monitor and wave meter for the "Ham" bands.

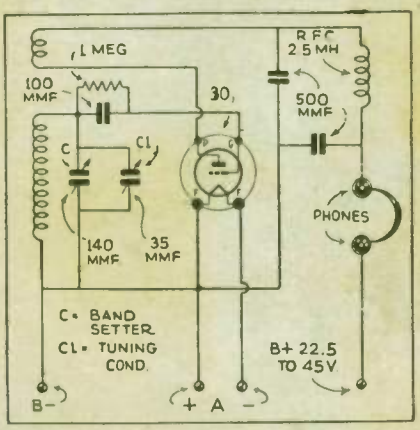
(A) We are very pleased to print your diagram which uses a type 30 detector tube. Condenser "C" is for setting the tune circuit so that "C1" will spread the band over a considerable portion of the dial. Needless to say, this entire monitor should be enclosed in a metal shield in order to reduce its sensitivity.

FREQUENCY METER

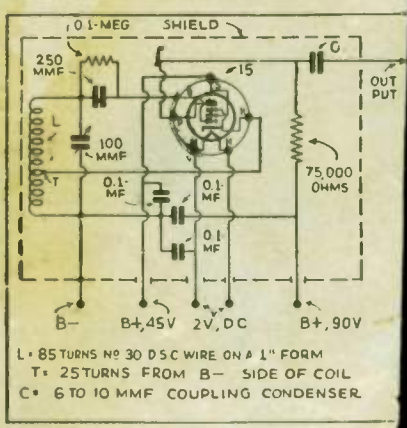
Robert T. Smith, Sac City, Iowa.

(Q) I wish to build a compact frequency meter and would like to have you print a diagram of one which should be preferably electron-coupled to obtain greater stability. Also, I would like to have you use 2-volt tubes and as low "B" voltage as possible also give the coil specifications for 1750 kc.

(A) The new type 15-battery type tube which has an indirectly heated cathode offers a distinct advantage in building a battery-operated frequency meter.



"Ham" band monitor.



"Ham" frequency meter.