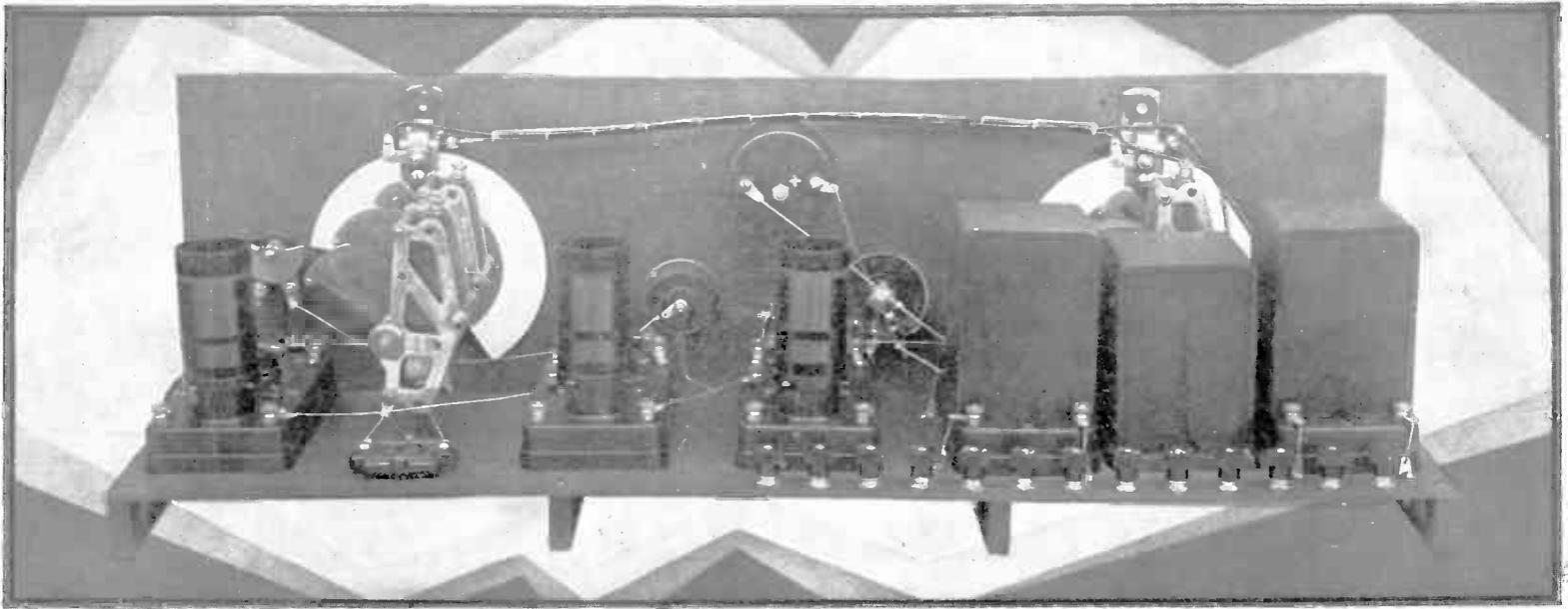


# RADIO DESIGN

October 15, 1927

Criterion of Styles and Methods of Radio Construction



Think of it! A complete A.C. set, tubes and all, at a price everyone can afford!

## A.C. OPERATED SET NOW COSTS LESS

*Socket Power Set Can Be Assembled with Screw-Driver, Pliers, Soldering Iron, and Three Evenings of Real Fun ~ by M. B. Sleeper*

**FACTS:** The SP-5 represents the finest commercial design practice adapted to the special requirements of home construction. It is actually equivalent to the latest sets selling at \$300 or more.

**OPERATION:** Two illuminated vernier dials control the single and double tuning condensers. For bringing up the distant stations there is a balancing condenser, altho that is not used for locals. Volume is controlled by a Resistograd. The rheostat is adjusted to make the meter read 60 milliamperes. There are no controls on the eliminator.

**INSTALLATION:** The receiver and power pack comprise the entire outfit, for all power is obtained from the light socket—110 to 115 volts, 50 to 60 cycles. A good ground is necessary, and an average antenna. A small indoor antenna can be used for local and medium distance reception.

**COST:** The entire cost of the installation, including antenna, loud speaker, tubes, etc., should be under \$110, or about \$75 for all the parts for the set and power-pack.

**ASSEMBLY:** So entirely have special kinks and tricks been eliminated from the SP-5 design that, with the Dataprints<sup>1</sup> as guide, showing all the construction details, wiring, panel pattern, etc., the

total novice can be sure of success. There are no delicate adjustments, no neutralizing—just plain work with the screw-driver and soldering iron. The total assembly time for a novice should be about 18 hours, or 4 hours for an experienced set builder.

**TUBES:** Four UX-199's and a UX-171 are used in the set, and a 125-mil Raytheon for the power pack.

**LOUD SPEAKER:** We recommend the Western Electric cone or R. C. A. speaker or, if the set is to be put in a cabinet which also holds the speaker, a Baldwin or Erla unit with a Wood Products orthophonic horn.

**ASSEMBLY:** You can go thru the assembly of the SP-5 with a speed that will make you astonished with yourself. The wiring can be done with flexible leads fitted with lugs, thereby eliminating all soldering, or bus bar can be used, as in the photographs. Since the panels can be obtained all drilled and engraved, no tool work is required.

**DATAPRINTS:** The Official Dataprints<sup>1</sup> show

the rear of the front panel, top of the base panel, and bottom of the base panel, with the parts and wiring drawn in as they appear in the finished set. In addition, there are panel patterns for those who want to drill their own panels, parts list, and special instructions. The Dataprints are planned for use by inexperienced constructors, so that anyone can follow them with ease.

**FRONT PANEL:** The drilled and engraved front panel<sup>2</sup> which is made up for the SP-5 is of walnut-finished Micarta, altho undrilled black panels can be obtained if preferred. The parts should be mounted on the panel in the order listed below.

**MIDGET CONDENSER:** Mount the 7-plate midget condenser at the left-hand end of the front panel, looking at the set from the rear. This is held in place by a large nut at the front of the panel. Put the knob on so that the arrow is up when the condenser plates are half-way intermeshed.

<sup>2</sup> If your local dealer cannot supply complete SP-5 parts, write to SPEED, 103 B'way, Brooklyn, N. Y.

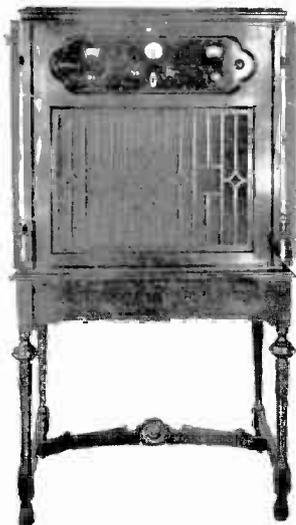
**DOUBLE CONDENSER:** Mount the vernier dial as shown in the instructions which accompany it, and fasten the double condenser to the dial. A slotted piece is furnished with the dial which should be fastened by a screw thru the slot going into a threaded bushing on the dial frame just above the condenser shaft. The other end of the piece must be fastened to the condenser by a screw going thru the slot and into a threaded bushing on the condenser end plate.

**RESISTOGRAD:** Put the Resistograd in place, clamping it firmly with the nut which goes on the front panel. Have the binding post arm, between the Resistograd cover and the front panel, pointing downward.

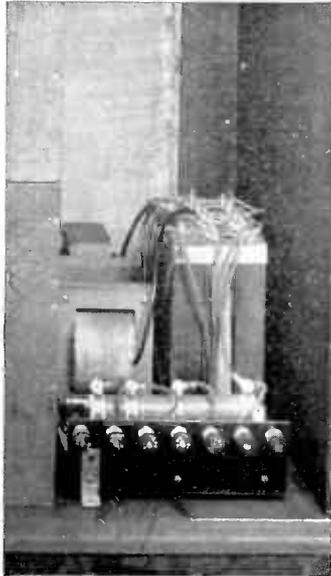
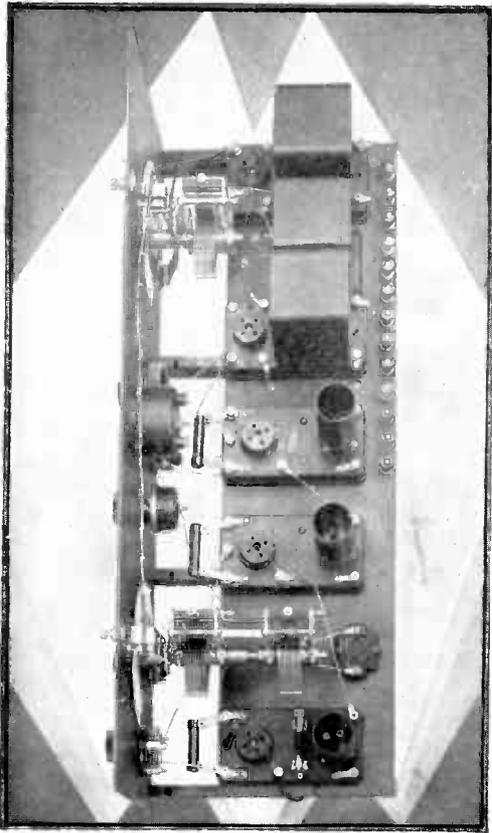
As you proceed with the assembly if you are going to use bus bar and soldered connections, put on lugs, pointing in the positions shown on the Dataprints.

**TOGGLE SWITCH:** Fasten the toggle switch in place by the two screws provided, putting them through the indicating plate, the front panel, and into the switch itself. You will notice that the switch is stamped on at one end. This marking should be on the top of the switch when it is in place.

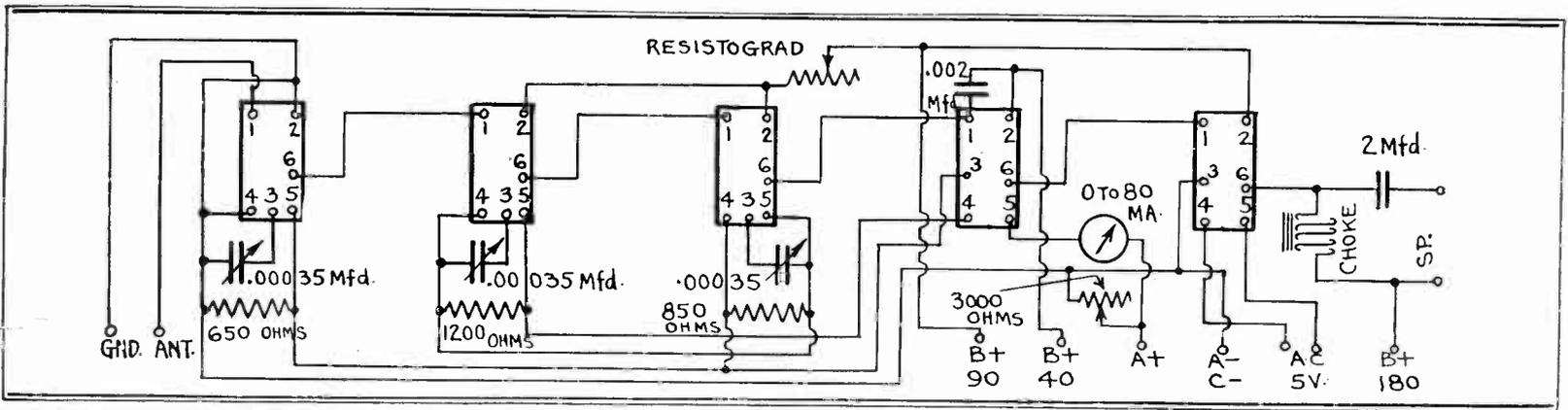
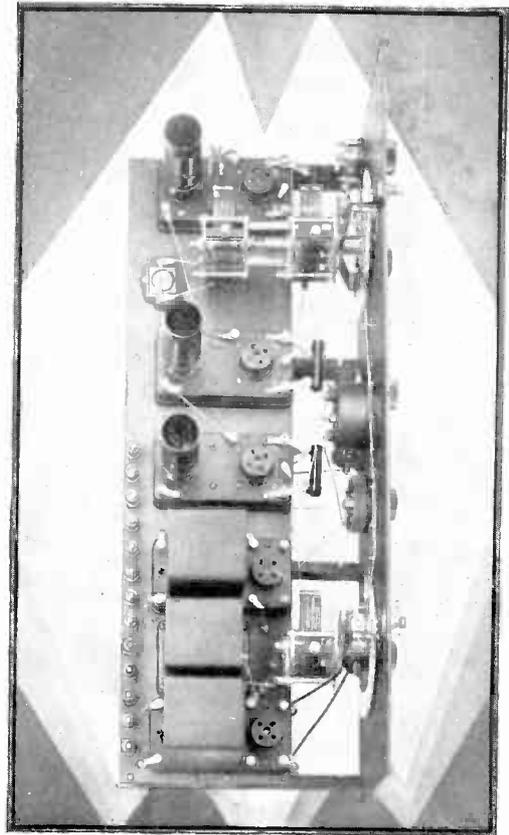
**RHEOSTAT:** The 3,000-ohm rheostat for controlling the tubes is also made for center-hole mounting. Looking at the rheostat from the rear, the center and right-hand terminals are used, and the left-hand terminal left open. Turn the



<sup>1</sup> SP-5 Dataprints can be obtained from A. L. Farris, Radio Hill, Poughkeepsie, N. Y. \$1.00 postpaid.



SP-5 is a beautiful radio mechanism—irresistible to amateur or professional set builder. Above, the ABC eliminator mounted in a console cabinet. Below, the complete schematic



contact arm all the way to the right and put on the indicating knob so that the arrow points toward the bottom of the panel.

**SINGLE CONDENSER:** Mount the single condenser at the right-hand end of the panel, with its vernier dial, in the manner already described. Be sure that the lighting bulbs are in place.

**BASE PANEL:** Black Micarta is used for the base panel. This can be bought already drilled, or you can drill your own from the panel patterns in the Dataprints. Mount the parts on the base panel in the order listed.

**DETECTOR UNIT:** The Redi-blox detector unit is mounted with four 1/4-in. round head screws and nuts. Be sure to have the spring tube socket toward the front of the set. Put a 2-megohm Polymet grid leak in the clips provided on the Redi-blox detector. Connect the 850-ohm by-pass resistance across the front corner binding-posts of the detector unit. .00002 CONDENSER: Fasten the .00002 mfd. fixed condenser to the base panel with 1/2-in. R.H. screws, and with 1/4-in. screws fasten the lugs to the threaded terminals.

**BASE PANEL BRACKETS:** Fasten the four 1-in. Bakelite brackets to the base panel, using 1/2-in. oval head screws. Do not use longer screws, or you will crack the Bakelite brackets. The nuts are held in place by the recesses in the brackets. These brackets must be mounted before the other Redi-blox units are put in place, for they cover some of the screws. **SECOND R.F. UNIT:** Next comes the

second R.F. Redi-blox unit. This must be fastened in place with 1/4-in. R.H. screws and nuts also. Put a lug under the heads of the mounting screws, as shown in the Dataprints. Then put corresponding lugs on the corner binding posts, to make connections to the underside of the base panel. Fasten the 1,200-ohm by-pass resistance across the front corner binding-posts of the R.F. unit.

**FIRST R.F. UNIT:** The R.F. Redi-blox is mounted similarly to the preceding ones. The same notes concerning the lugs on the mounting screws also apply. Fasten the 650-ohm by-pass resistance across the front corner binding posts of the R.F. unit.

**.002 CONDENSER:** Before the first A.F. Redi-blox unit can be mounted, the .002 mfd. fixed condenser must be put in place. This is held by 5/8-in. R.H. screws which also hold the soldering lugs to the terminals.

**FIRST A.F. UNIT:** Use 1/4-in. R.H. screws, as before, for mounting the Redi-blox transformer A.F. unit. You will see that there are four 1/2-in. screws going through the base panel, carrying lugs at the top and bottom, for making connections to the binding posts on the A.F. unit. Put those screws and lugs in

place also. There is another 1/2-in. screw through the base panel, with lugs above and beneath, for inter-panel connection purposes.

**SECOND A.F. UNIT:** The second Redi-blox transformer A.F. unit is mounted like the other units. There are three screws going through the base panel with lugs above and below for connections to the binding posts on the unit.

**BINDING POSTS:** There are 13 engraved Bakelite binding posts to be put on place. Be sure that you get them in the same order as they appear in the Dataprints. Otherwise, you will make mistakes in connecting the set to the power pack.

**OUTPUT IMPEDANCE AND CONDENSER:** The output impedance and 2-mfd. condenser must be mounted simultaneously, for the screws which hold the output impedance also hold the two mounting strips which clamp the condenser. Use 1-in. R.H. screws. First put on nuts to hold the choke in place. Then put on the clamping strips, which you can cut from a piece of thin brass sheet, and fasten the strips with nuts. Make sure

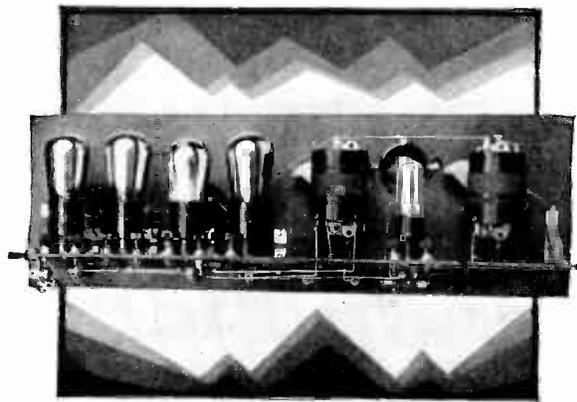
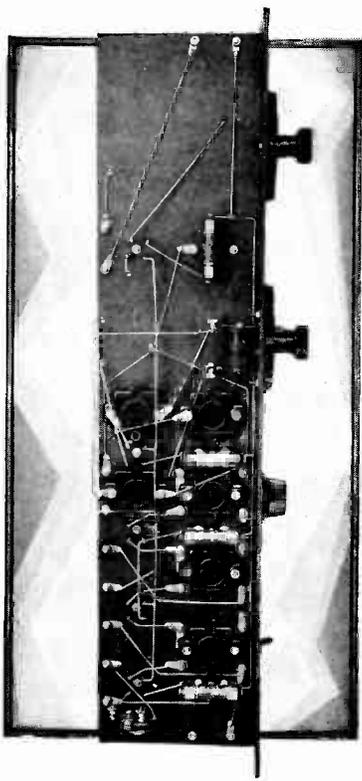
that you have the terminals of the condenser toward the right, and put on the lugs before mounting the condenser, for you will not be able to get at the terminals later.

**WIRING AND TESTING:** When the Dataprints show wires starting at a terminal and ending at a number, on one panel view, a corresponding wire will be found below starting with a number and finishing at a terminal. This is done only because it complicates the appearance of the drawing to run the heavy lines from one panel view to another. The schematic diagram can be used, however, by those who are thoroughly familiar with set construction. It is plain sailing. Bare bus bar can be used except for the two wires which connect the light bulbs on the illuminated dials, the two leads

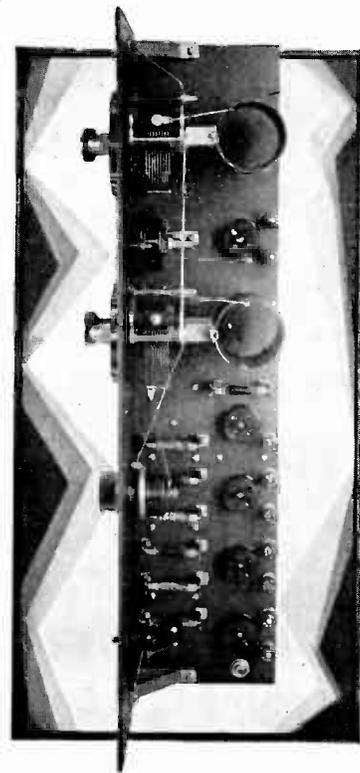
#### OFFICIAL PARTS LIST FOR SP-5

Made by Pilot Electric:

- 2—Illuminated vernier dials
- 1—.00035 mfd. single condenser
- 1—.00035 mfd. double condenser
- 1—Toggle Switch
- 1—3,000-ohm potentiometer
- 1—Resistograd
- 1—7-plate Midget condenser
- 4—1-in. Bakelite panel brackets
- 1—Redi-blox detector unit
- 2—Redi-blox R.F. units
- 2—Redi-blox A.F. transformer units
- 1—Output impedance
- 1—.002 mfd. fixed condenser
- 1—.00002 mfd. fixed condenser
- 13—Engraved Bakelite posts
- 1—1,200-ohm by-pass resistance
- 1—850-ohm by-pass resistance
- 1—650-ohm by-pass resistance
- 1—2-mfd. output condenser
- 1—Front Panel 7×24×1/8 Westinghouse Micarta
- 1—Base Panel 6×23×1/8 Westinghouse Micarta
- 1—0 to 100 Jewel milliammeter
- 3—179 plug-in coils, Twin Coupler



Here's the X-11 mystery set, M. B. Sleeper's new hook-up by which the tendency of the set to oscillate is controlled when the detector regeneration is regulated. In this way, both R. F. and detector tubes are maintained at highest efficiency thruout the broadcast band



## X-11 SET IS FALL SEASON'S MARVEL

*Latest Scientific Principles Exemplified in This Design Which Has Taken Eastern Set Builders by Storm ~ John Geloso*

**FACTS:** The X-11 was specifically designed for high quality reception at the lowest possible cost, and as such represents a new and highly successful engineering achievement. The original idea behind the X-11 was to produce a set equivalent to the Browning-Drake, or Roberts circuits, but with the price engineered down—not up—yet without any sacrifice of operating ease or efficiency. As it worked out, new features were incorporated which are not found in the other, older circuits, thus introducing considerable improvement in sharpness and quality, and making the assembly far easier.

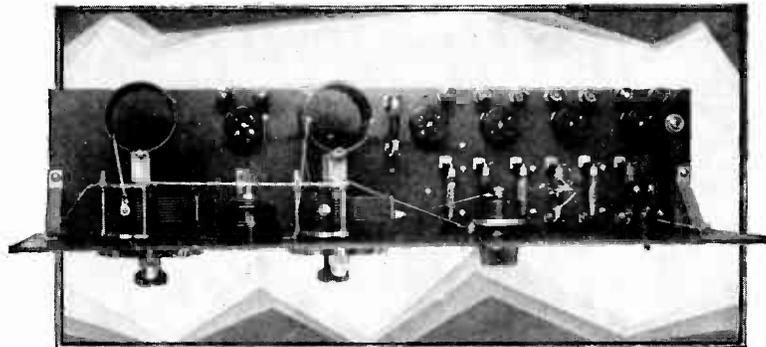
**OPERATION:** Wave length is controlled by two vernier art dials, with a Resistograd to regulate regeneration and volume.

**COST:** Parts for the X-11 set, including Micarta panels, the coils, condensers, resistances, in fact everything required for the construction of the set, come to about \$20.00, leaving only tubes, batteries, loud speaker, and a cabinet to buy extra. Considering that this set is equivalent to kits costing sixty dollars or more, you can understand what remarkable skill is represented in the X-11 design.

**INSTALLATION:** 135 volts of B battery are required with a UX-112 in the last stage, or, for greater volume, 180 volts with a UX-171 power amplifier. A storage battery of 60 amp.-hours is recommended. B eliminators can be used on the X-11 but cheap ones are not recommended because they are liable to motor boat. A C battery is needed, 9 volts with a UX-112 tube or 40 volts with a UX-171.

**TUBES:** A UX-109, UX-200-A, two UX-240's, and a UX-112 or 171 comprise the tube equipment. The entire X-11 circuit is built up around this combination of tubes, and substitution must not be made, for it will upset the selectivity, the oscillation control, and the signal strength.

**X-11 CIRCUIT:** In the X-11 set, a stage of tuned R.F. precedes regenerative



detector, with three stages of resistance coupling for the A.F. amplifier. This combination is not new, but the design details have been worked out in such a way as to give decidedly superior results.

The inductively coupled antenna circuit greatly increase the selectivity. By designing the set for a UX-200-A detector greater dependable range can be obtained. Finally, the efficiency of this type of circuit is increased through the combination of the Phasatrol and a special circuit for the Resistograd regeneration control, giving the set exceptionally high efficiency over the entire range. The fundamental reason for this is that the Resistograd, in combination with the circuit employed, supplements the action of the Phasatrol, so that it is not necessary to depend altogether upon a fixed adjustment of the Phasatrol for neutralizing.

**ASSEMBLY:** Although the complete winding data for X-11 coils is given in the Dataprints, the coils can be purchased already wound. If the finished coils are purchased, the total assembly time for the X-11 should not be more than 12 hours for an utter novice, and as low as 2 hours for an experienced set builder.

**LOUD SPEAKER:** Any of the good new speakers, designed for operation with a 112 or 171 tube, can be used in this set.

It is not really necessary to use an output device, although some loud speakers may not carry the full current of a UX-171. It is best to decide upon this by actually trying the speaker on the set.

**DATAPRINTS:** The Official Dataprints<sup>1</sup> for the X-11 set show the rear of the front panel, top and bottom of the base panel, and the panel patterns for drilling. The drilling is such a simple matter that you can do it easily. The complete parts list, picture wiring diagram, schematic and special notes are given in the Dataprints.

**PARTS:** Following is the official parts list for the X-11 receiver:<sup>2</sup>

- Made by Pilot Electric:
- 2—Vernier Art Dials
  - 1—Resistograd
  - 1—Bakelite toggle switch
  - 2—.00035 mfd. Centraline condensers
  - 3—Small panel brackets
  - 5—Set builders' sockets
  - 1—Midget jack
  - 9—Engraved binding posts

<sup>1</sup> Can be obtained from A. L. Farris, Radio Hill, Poughkeepsie, N. Y. \$1.00 postpaid.

<sup>2</sup> If your local dealer cannot supply you, write to S P E E D, 103 Broadway, Brooklyn, N. Y.

- 3—Resisto-blocks, with .01 mfd. condensers
- 1—.00025 mfd. grid cond. with clips
- 1—.006 mfd. condenser
- 1—.0005 fixed condenser
- 1—Set of X-11 coils, Twin Coupler Co.
- 1—Neutrocap R.F. choke, Twin Coupler Co.
- 1—Phasatrol, Electrad Inc.
- 1—6 V 199 filament control, Polymet
- 1—¼ amp. filament control, Polymet
- 2—½ amp. filament, controls, Polymet
- 1—1. meg. resistance, Polymet
- 3—.1 meg. resistance, Polymet
- 1—.5 meg. resistance, Polymet
- 1—.25 meg. resistance, Polymet
- 1—10. meg. resistance, Polymet
- 1—Westinghouse Micarta Panel 7×21×½
- 1—Westinghouse Micarta Panel 4½×20×½

**FRONT PANEL:** The holes in the front panel can be laid out quickly by fastening the pattern on the panel, and marking thru with a center punch. The drawing shows all hole sizes. The parts should be mounted on the front panel in the order listed below:

**TOGGLE SWITCH:** Mount the toggle switch at the left of the front panel, looking at the set from the rear. Two screws provided go through the name plate front panel and into the switch itself. Be sure to mount the switch so that the letters ON are upward.

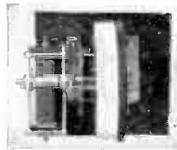
**RESISTOGRAD:** Mount the Resistograd, clamping it firmly with the nut on the front of the panel. Have the contact arm which goes on the mounting collar pointing to the right.

**DETECTOR COIL AND CONDENSER:** Fasten the detector coil on the .00035 mfd. variable condenser so that the primary coil, the concentrated winding, is up, and the

*Concluded on page 7*

# SET BUILDERS' DESIGN NOTES—1

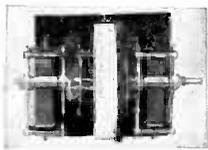
## USE OF DRUM CONTROLS



SINGLE CONDENSER

THE Pilot single vernier drum control takes both the Pilot Centraline and Pilot S.L.F. condensers, as well as practically any other make of condenser.

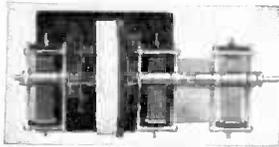
A single drum can be used in a variety of plain tuning circuits, while two single drums are adaptable to all super-heterodyne circuits, Browning-Drake, Roberts, various regenerative hook-ups, X-11 circuit and many others.



DOUBLE CONDENSER

SINGLE-control super-heterodyne circuits work beautifully with the two-condenser arrangement. In tuned R.F. circuits, where mechanical design makes separate single vernier drum control units preferable to the double vernier drum, a single condenser and a double condenser, each on single drums, work to perfection.

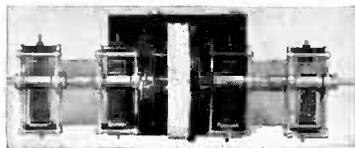
If the arrangement of the parts make it necessary, both condensers can be put on either side of the single drum.



TRIPLE CONDENSER

VERY successful results have been obtained with the triple condenser arrangement in special circuits where two condensers are used for tuned R.F. circuits and the third condenser, sometimes of lower capacity, as a capacity regeneration control.

The triple unit is also used for single-control tuned R.F. sets having two stages of R.F. and detector. Again, used with a single drum and condenser, three stages of R.F. and the detector can be tuned.



QUADRUPLE CONDENSER

WITH four condensers on the single drum, they can be divided between the two sides in any combination, but for mechanical balance the two-and-two plan is best.

The single dial, with four condensers, will tune three R.F. stages and the detector, and if a single drum and condenser are used in addition, the combination will handle four R.F. stages and detector.

# WANT A VICTOREEN SUPER-HET?

Read This and Save Fifty Dollars on Your Victoreen Super

IF expense has kept you from building a Victoreen Superheterodyne receiver, you do not need to worry about that anymore. You can build a Victoreen super-heterodyne for \$50.00, and the only difference between the set built at that price, and the set made from the parts called for in the original list, will be in the money saved. As far as results are concerned, they will be identical. It is just a matter of knowing the Victoreen circuit well enough to understand what parts can be substituted without affecting the results, and then the proper parts to use, so that the revamped design will be in every way equivalent to the standard outfit.

Below is the official parts list, with a list of Pilot Precision parts<sup>2</sup> which can be substituted. If the changes are made as specified, there will be no sacrifice whatever in distance, sharpness, attractive appearance, or mechanical excellence.

- 1—No. 53 Pilot condenser
- 1—1. mid. Pilot by-pass
- 2—51M Pilot condensers
- 2—No. 381 Pilot transformers
- 8—No. 206 Pilot cushion sockets
- 1—No. 42 Pilot toggle switch
- 10—Pilot Bakelite posts

Two .0005 mid. PILOT Centraline condensers, operated by the PILOT double drum dial, are substituted for the Master control and vernier specified in the original list. The double drum and condensers take up less panel space. At the same time, you get the benefit of

recommended. This is an entirely new transformer, designed by John Geloso, inventor of the famous Geloso Eliminator Circuit. Unlike most audio-transformers, the No. 381 type was not designed to give a specified curve under laboratory test conditions. Instead, it was designed for the finest musical reproduction under actual operating conditions, where many factors are present, affecting the quality considerably, which are not found in test circuits.

The No. 206 cushion sockets are spring mounted, but the strain, when the tube is removed from the socket, is not upon the springs themselves, for stops are provided on the center button which pull against the molded socket base, thus relieving the springs themselves from all strain.

It seems to most set builders that a toggle switch should be a very simple thing to build. As a matter of

fact, many toggle switches have proved unsatisfactory because very simple forms of mechanism were employed, which did not provide solid contacts. If those simple methods could be made satisfactory, you would find them, for example, in electric light switches. The PILOT toggle switch is a real piece of mechanism, as you will find if you examine it. Actual experience shows that special, positive contact design is necessary.

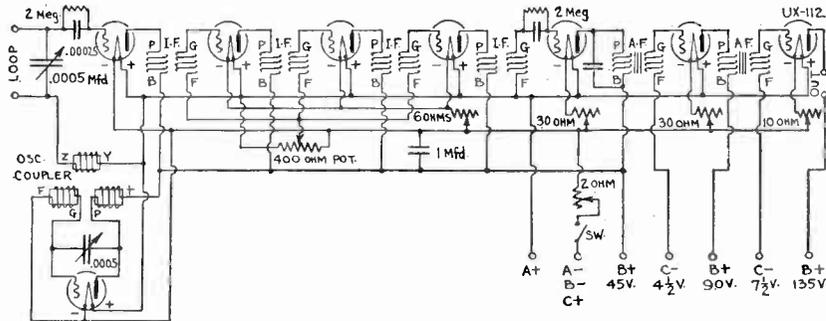
Otherwise, the switch will soon wear out inside and the contacts will not close the circuit positively.

Little need be said as to the high efficiency of the Victoreen, for that has been proved by the thousands of set builders who have used this circuit. It is highly important to follow the wiring diagram exactly, in each detail. Changing values as specified, altering the grid returns, or varying the oscillator and detector circuit will surely reduce the efficiency of the Victoreen set.

Space does not permit a detailed description of the completed set, although all the information necessary is presented in the Dataprints. This outfit, built in the RADIO DESIGN laboratory, follows the general plan of the standard Victoreen assembly, but several improvements have been made to simplify the work and to improve the general appearance.

You'll like the set with the PILOT drum dials better than any arrangement of flat dials, not only because the drums give the set a real commercial appearance, but because, in addition, the drums, with their individual verniers, make it so much easier to tune distant stations right on the nose.

If you are a DX fan, this extra-fine tuning will add twenty or thirty stations to your log records of long-range reception.



### ORIGINAL PARTS LIST

Parts starred below are those for which Pilot Precision parts should be used.

- \*1—Master control
- \*1—Tuning dial
- 4—Victoreen transformers No. 170
- \*2—30-ohm rheostats
- \*1—10 ohm rheostat
- \*1—6-ohm rheostat
- \*1—2-ohm rheostat
- 1—Victoreen antenna coupler No. 160
- \*1—400-ohm potentiometer
- 1—Victoreen oscillator coupler No. 150
- \*1—.001 mfd. fixed condenser
- \*1—1. mid. by-pass condenser
- \*2—.00025 mfd. grid condensers
- 2—2 meg. grid leaks
- \*2—A.F. transformers
- \*8—Sockets
- \*1—Filament switch
- \*10—Engraved binding posts
  - 1—Bakelite panel 7×26×3/16 in.
  - 1—Wooden base board 10 1/2×25×1/2 in.
  - 1—Bakelite strip 6×3/4×3/16 in.
  - 1—Bakelite strip 5×3/4×3/16 in.

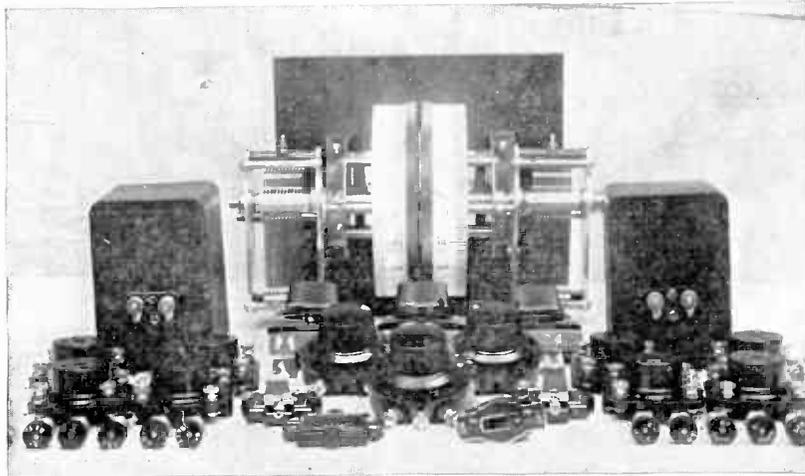
### PILOT PRECISION PARTS

- 2—No. 1523 Pilot condensers
- 1—No. 1281 Pilot double drum
- 2—No. 930 Pilot rheostats
- 1—No. 910 Pilot rheostat
- 1—No. 906 Pilot rheostat
- 1—No. 902 Pilot rheostat
- 1—No. 400 Pilot potentiometer

<sup>1</sup> Complete construction Dataprints for the Victoreen can be obtained from A. L. Farris, Radio Hill, Poughkeepsie, N. Y., \$1.00 post-paid.

<sup>2</sup> If you cannot get these parts from your local dealer, write to SPEED, 103 B'way Brooklyn, N. Y.

Above, the best of Victoreen hook-ups, capable of extreme distance and selectivity. A set of Victoreen intermediate transformers and coupling coil, plus the Pilot Precision parts shown below, comprise the complete kit of construction parts. By using the Pilot parts, the set can be built for less than \$75.00, a saving of about \$50.00 to you.



single dial control, for the PILOT double drum dial is so designed that both drums can be turned simultaneously with the thumb. Then, since each condenser can be adjusted individually by means of its own vernier disc, you get the greater efficiency of the two-control arrangement.

If the set is made up for 19 tubes, with a 120 power tube in the last stage, this same combination of resistances will be all right.

The fixed condensers specified are the PILOT Bakelite molded condensers, so designed that they are impervious to moisture and free from any capacity changes due to tightening terminal screws. Connections to the PILOT bakelite condensers are made to threaded bushings molded into the Bakelite. These condensers have mica dielectric between the plates.

For audio-frequency transformers, the No. 381 PILOT giant transformers are

# NEW SUPER BUILT AROUND S-M UNIT

*Here's the Very Latest Thing in Super-Het Construction*

**N**OW, a real super-range type of super-heterodyne, a set that will give you that feeling of tremendous power held in leash by the touch of your finger on the vernier drum controls, ready to reach out, at your bidding, to bring in stations thousands of miles away.

That's the impression you'll get from this set built with Pilot parts in conjunction with the Silver-Marshall type 440 amplifier unit. The first model was described in Radio Broadcast for August, 1927, and in the Call Book. Claims made for the set have been thoroughly substantiated by tests in the RADIO DESIGN laboratory. It is an amazingly powerful set.

Now comes the question of expense. Personally, I prefer to put extra time and care into each set I build—and I find that the careful planning in advance is repaid to a surprising extent by savings I can make in the cost of the parts. At the same time, I insist upon the very highest quality, for out-of-date parts, cheap as they may be, take the edge off the pride that every skilled set builder takes in his equipment.

This is my method of saving without sacrificing: I checked over the original parts list, and then made the changes noted.<sup>1</sup> First you will see the original parts list, as given in the various magazines. Then comes the list of PILOT parts<sup>2</sup> which can be substituted without actually changing the set, but which afford a very substantial saving in the cost of the construction kit. If you, too, want to try out every new hook-up, you know the importance of these small collective economies.

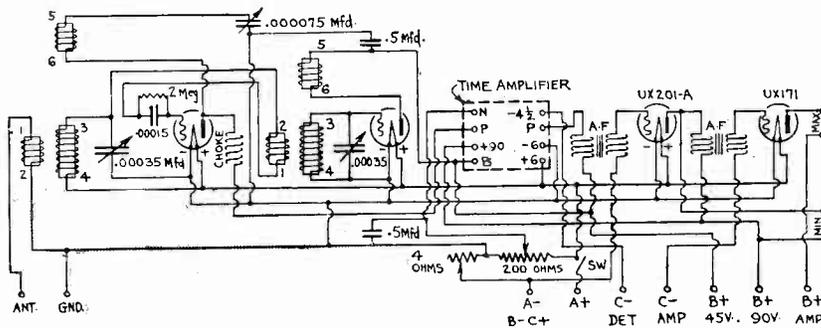
## ORIGINAL PARTS LIST

Parts starred are those for which Pilot Precision parts should be used.

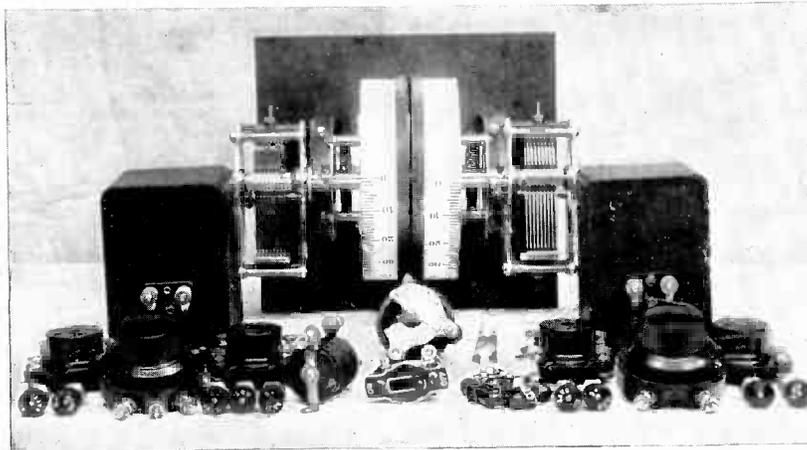
- \*1—.00025 condenser with clips
- \*1—200-ohm potentiometer
- \*2—.5 by-pass condensers
- \*1—3-ohm rheostat
- \*1—Filament switch
- 4—tip jacks
- 1—2-meg. grid leak
- \*2—A.F. transformers
- \*4—Sockets
- \*2—drum dials
- \*1—R.F. choke
- \*1—.000075 midget condenser
- 1—Silver-Marshall 440 amplifier unit
- 2—S-M 515 coil sockets
- 2—S-M 111 A coils
- \*2—.00035 variable condensers
- \*9—binding posts
- 1—7×24×3/16-in. Micarta panel
- 1—7×23×1/2-in. base board

## PILOT PRECISION PARTS FOR LABORATORY SUPER

- 1—Pilot condenser No. 51M
- 1—Pilot potentiometer No. 200
- 2—Pilot condensers No. 800
- 1—Pilot rheostat No. 904
- 1—Pilot toggle switch No. 42
- 2—Pilot giant trans. No. 381
- 4—Pilot sockets No. 206



Above, the complete schematic wiring diagram for the new Laboratory Super, using the S-M shielded intermediate amplifier and coils, and the Pilot Precision parts illustrated below. Using the Pilot double vernier drum for tuning single-control operation can be obtained, and with the efficiency of a two-control super for each drum has its individual vernier.



- 2—Pilot drum dials No. 1260
- 1—Twin Coupler choke No. 130
- 1—Pilot midget No. J-23
- 2—Pilot Centraline No. 1517
- 9—Pilot engraved posts

The new 23-plate Pilot midget condenser is a handsome little device. The solid frame is of polished, molded Bakelite, with gold-finished plates. Also the original specifications call for .000075 mfd., the regulation of the feed-back is a little better, at long waves, with the .000100 mfd. capacity of the Pilot midget condenser.

Centraline or the S.L.F. variable condensers can be used with the drum dials. Now, just a word or two about drum dials. Like all new things there are good ones and those not so good. The Pilot vernier drum was designed to be "more good."

You can see from the illustration that heavy angle brackets are used at each side. Three pillars, fastened to each bracket, carry an inside bearing plate. That provides a bearing for each drum 1-in. long. Thus the condenser bear-

ings are relieved of all strain when you press your finger against the drum. The condenser is held to the bracket at two points with a substantial, universal brace which fits all types of condensers.

Using a positive type friction drive for the vernier wheel, there is no rough feeling or noise from gears. Moreover, the drum and the vernier wheel turn in the same direction. On other makes, the drum is moved up to increase capacity, and the vernier moved down for further increase. This was found so awkward

and confusing that the Pilot drum was designed with an entirely new vernier mechanism to overcome that defect.

The double Pilot vernier drum control is pictured here altho, if you prefer, you can use two separate single drums.

There are the new Pilot giant audio-transformers and the shock absorbing sockets which take both U X and U V tubes. Only four sockets are needed, since four tubes go in the intermediate amplifier can.

At the left of the Bakelite toggle switch is the new 80-millihenry Neutrocap R.F. choke, designed by M. B. Sleeper. This choke is wound in three

sections, to split the distributed capacity in three parts. Since these capacities are, in effect, in series, the total over-all capacity must be less than the capacity of the smallest section. Over the broadcast band, the capacity varies from 2 to 5 micro-microfarads—not zero capacity, but so close to it that special precision instruments are necessary to measure this negligible amount.

Complete Dataprints, showing the construction of the Laboratory super-heterodyne, built with the S-M intermediate amplifier unit and Pilot Precision parts give all the information, panel patterns, and picture wiring diagrams needed to build this high-power receiver. The total cost of the parts and panels is about fifty dollars, by far the lowest price at which it has ever been possible to build a fine type of super set.

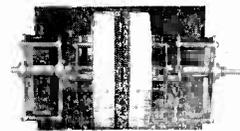
Using this intermediate amplifier unit makes the construction and wiring unusually simple. The number of leads and connections is cut about in half, for all the assembly in the can is completed. As the wiring diagram shows, there are just eight connections to be made to the terminals on the can.

The can, with partitions to shield each stage, contains all the sockets, transformers, and condensers required for the intermediate amplifying stages of the set, and protects the parts from dust.

Official Dataprints for this Super can be obtained from A. L. Farris, Radio Hill, Poughkeepsie, New York, \$1.00 postpaid.  
\*If you cannot obtain these from your local dealer, write to SPEED, 103 B'way, Brooklyn, New York.

## SET BUILDERS' DESIGN NOTES—2

### USE OF DRUM CONTROLS

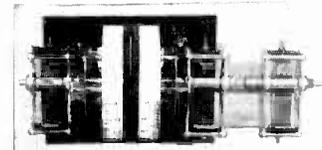


TWO SINGLE CONDENSERS

**T**UNING with the double drum is a real experience when you do it for the first time. Either drum can be turned separately, or they can be turned simultaneously. It's just a matter of putting your thumb on one or both drums. Then each control can be brought to hair-line accuracy with its individual vernier.

The double drum is ideal for Reinartz circuits, Browning-Drake, Roberts, Diamond of the Air, all super-heterodynes, and the Infradyne.

It is also possible to arrange a condenser on one side and a tickler coil on the other, so that drum dial control can be used on three-circuit tuner sets.

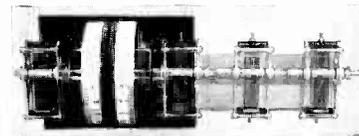


SINGLE AND DOUBLE CONDENSERS

**T**HREE condensers with the double drum are ideal for neutrodyne and the familiar tuned R.F. sets. Here are some useful hints about balancing.

Use the single condenser for the antenna stage. Across one of the double condensers put a .00002 mfd. Pilot Bakelite fixed condenser No. 50E. Across the other section put a .000025 mfd. Pilot midget condenser, No. J-7.

That will add a slight amount of capacity to the second R.F. tuning circuit. Then, to compensate for the grid condenser in the detector stage, you can adjust the midget condenser to get an accurate balance.



SINGLE AND TRIPLE CONDENSERS

**T**HE double drum with the one-three condenser combination is a real temptation to build a high-power tuned R.F. set.

Such an arrangement can be worked out to perfection with the No. 176 or 179 plug-in coils—the former for UX-201-A tubes and the latter with UX-199 tubes—with the No. 205 sockets to mount them.

Stage shields are not needed with the plug-in coils, unless you want them for appearance.

For maximum volume at all wavelengths, use 90 volts on all the R.F. tubes with a Resistograd in the lead to the B battery. That will control oscillations, and serve as a volume regulator as well.

## SET BUILDERS' DESIGN NOTES—3

CENTRALINES AND S. L. F. CONDENSERS



PILOT CENTRALINE TYPE

**PILOT** Centraline condensers are made in the following ranges:

- No. 1608—.00008 to .000165 mfd.
- No. 1613—.00008 to .000255 mfd.
- No. 1617—.00012 to .000370 mfd.
- No. 1623—.00012 to .000500 mfd.

Calibration curves, made from precision instrument readings, are supplied with the condensers.

For broadcast reception, the secondary tuning inductance, used with the No. 1613 condenser, should have 98 turns of No. 24 D.S.C. wire on a 2-in. tube. The range from 10 to 100 divisions on the dial will be 198 to 575 meters.

No. 1617 condenser, with a coil of 83 turns of No. 24 D.S.C. wire on a 2-in. tube, shows 195 to 580 meters.

No. 1623 condenser, with a coil of 68 turns of No. 24 D.S.C. wire on a 2-in. tube, shows 195 to 590 meters.



PILOT S. L. F. TYPE

**PILOT** S.L.F. condensers are made in the following ranges:

- No. 1508—.00008 to .000130 mfd.
- No. 1513—.00010 to .000285 mfd.
- No. 1517—.00012 to .000370 mfd.
- No. 1523—.00014 to .000500 mfd.

S.L.F. condensers are generally preferred by those of technical inclinations. Also, with the new wavelength allocations, many prefer them because of their tuning curve. Like the Centraline type, they are accurately matched for gang control. The No. 1608 is intended for use with all standard short wave coils.

For broadcast reception, the secondary tuning inductance, used with the No. 1513 condenser, should have 98 turns of No. 24 D.S.C. wire on a 2-in. tube. The range from 10 to 100 divisions on the dial will be 194 to 575 meters.

No. 1517 condenser, with a coil of 68 turns of No. 24 D.S.C. wire on a 2-in. tube, shows 185 to 580 meters.

No. 1523 condenser, with a coil of 83 turns of No. 24 D.S.C. wire on a 2-in. tube, shows 185 to 580 meters.

# GELOSO ABC ELIMINATOR FOR SP-5

*Here Is the Perfect Eliminator for Full A.C. Operation*

**T**HE first striking thing that you'll discover about the Geloso ABC eliminator is that it works perfectly. Not in any almost satisfactory way, mind you, but in that exactly right fashion that will make you tell those who have had hard-luck experiences—"Say, I've got it now! Honest-to-goodness A.C. operation!"

That's the first impression. Bye and bye, when you've lived with it for months, as I have, you'll have that friendly, kindly feeling toward your Geloso ABC that you have toward your favorite easy chair. You know—it's always ready for you, never failing.

Confidence like that doesn't happen. It's engineered with brains in the research laboratory, and built with intelligence in the factory. Yet the parts for the Geloso ABC cost very little, and anyone can do the simple assembly work required.

No dangerous voltages are employed, nor does the unit offer any fire hazard. It can be put away in a console cabinet, or hidden in any convenient place.

**GELOSO CIRCUIT:** This ABC eliminator,<sup>1</sup> working with a 125-mil Raytheon, supplies 180 volts B, 40 volts C, and 5 volts A, for a UX-171 amplifier tube, 90 and 40 to 45 volts B for UX-199 tubes, and A current for four to ten 199's connected in series.

This combination takes care of the SP-5 receiver, tho it is not at all limited to that circuit, for it will run multi-stage tuned R.F. sets and eight or ten-tube supers just as well.

Using the PILOT transformer and chokes designed for this unit, the PILOT X-process filter condensers, and the PILOT wire-wound resistors, ample electrical allowances are provided to give splendid voltage regulation on heavy and light loads.

**LONG SERVICE:** When the eliminator is operating the SP-5 set, the drain is only 80-mils, or 36% below the rating of the new Raytheon. This increases the life of the tube greatly, so that your first tube will last indefinitely. No other part will require replacement. PILOT X-process condensers, operating under normal life, are guaranteed for 10 years. By that time we may not need eliminators.

**PARTS REQUIRED:** Following is a list of PILOT parts<sup>2</sup> required for the Geloso ABC:

- 1—125-mil Raytheon tube
- Made by Pilot Electric Co.:
- 8—2 mid. filter condensers
- 1—.1-.1 mfd. buffer
- 2—1. mfd. by-pass condensers
- 1—Condenser block clamp
- 1—No. 41 tube socket
- 1—ABC transformer
- 2—ABC chokes
- 1—ABC resistance
- 1—2250-ohm resistance
- 9—Engraved binding posts
- 1—Micarta terminal strip
- 1—Wooden baseboard

**ASSEMBLY:** Space does not permit a detailed description of the assembly, but all necessary construction data are provided in the official Dataprints,<sup>1</sup> including the layout pattern, picture-wiring diagram, and special notes.

It is an easy matter to mount the parts on the baseboard. Your attention is called particularly to the PILOT method of assembling the filter condenser unit.

<sup>1</sup> Complete Dataprints can be obtained from A. L. Farris, Radio Hill, Poughkeepsie, N. Y. \$1.00, postpaid.

<sup>2</sup> If your local dealer cannot supply you, write to SPEED, 103 Broadway, Brooklyn, N. Y.

Instead of sealing the condensers in a solid block, 2-mid. units and the buffer, each in an individual metal case, are solidly clamped together. Now, if you want to change your eliminator at any time, you will have the units available to hook up in any kind of circuit, while if they had been sealed in a single can, you would have to discard the whole thing and buy a new condenser block.

A partial view of the ABC unit is given on page 2. This eliminator, the first to be put on test, is mounted in a console cabinet, beside the box containing an orthophonic horn. You can see the terminal strip, resistance unit, the chokes without their cases, and the filter condenser. The power transformer and Raytheon are hidden at the rear.

**SERIES CIRCUIT:** Some set builders have felt an antipathy toward series filament connections, and have offered what may appear to them valid reasons for their prejudice.

Here are the actual facts about series wiring. This system is much older than broadcast reception, for Western Electric sets made before the War were designed that way. And certainly no one will question the practices of those circuit supermen, the Western Electric engineers.

Now it may be that inexperienced designers who do not understand the facilities for taking off grid biases which series circuits offer may condemn the method thru ignorance, but to those in the know, the series filaments can be made to do all kinds of tricks.

To give you a few simple examples:

Keep this simple form of Ohm's Law in mind,  $E=I \times R$ , where  $E$  is the voltage,  $R$  the resistance in ohms, and  $I$  the current in amperes.

Suppose you have four 199 tubes in series. The current must be adjusted to 60 milliamperes. That is fixed. You know that 3 volts are required to push 60 mils thru a 199 tube. In other words, there is a 3-volt drop across each 199. This much information is given on the box the tube comes in.

Starting from the F- binding-post, a wire is run to the first tube. If no bias is required, the grid return is run directly to the filament post on the socket.

But if you want, say, 2 volts bias Ohm's Law will show you how to get it. The voltage drop is 2 volts, the current is fixed at .06 ampere. This makes  $R=33$  ohms. Just connect a 33-ohm resistance between F- and the tube, run the grid return to the F- side of the resistance, and you will have 2 volts negative bias on the grid.

Or if you should want 2 volts positive bias, put that same resistance between the first and second tubes, and run the grid return of the first tube to the resistance at the end connected to the second tube.

Without such resistance, 12 volts must be applied to four 199's in series. When a resistance to give a special bias is added, the total voltage must be 14 volts.

Biases on the second and following tubes can be obtained in the same manner. A simpler method can be employed sometimes. Suppose 6 volts negative is required on the third tube. The grid return can be run to the F- side of the first tube. Since there is a 3-volt drop across the first tube, and a 3-volt drop across the second, the total of 6 volts negative bias is obtained.

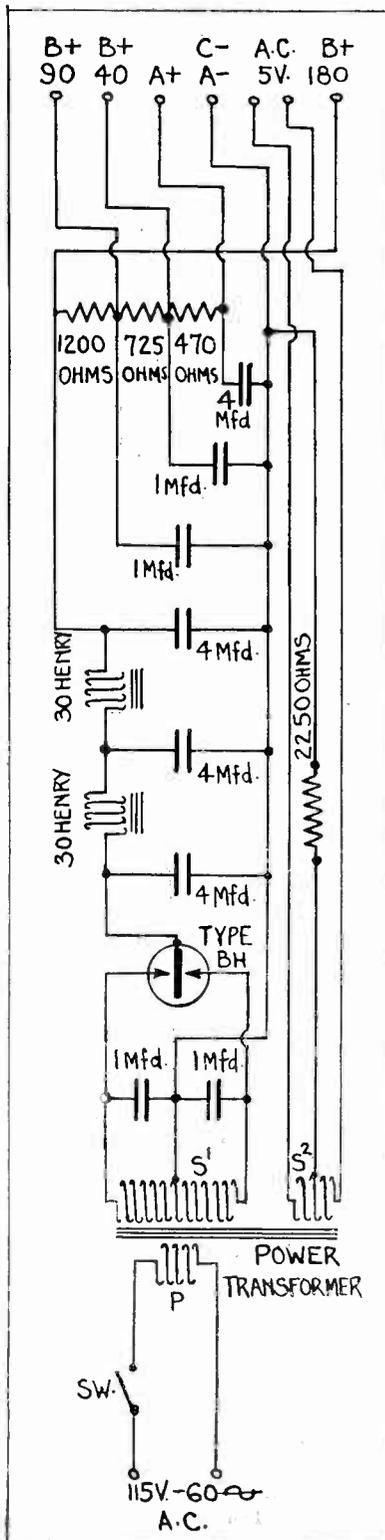
### SPECIAL DX ISSUE

As the Advance Fall Issue of RADIO DESIGN goes to press we are completing the laboratory work on sets to be shown in the Winter Number. It will be mailed to subscribers on November 1st.

We aren't going to tell you in advance about the special things now in preparation, but if you'll take a little tip from the inside, you'll get your quarter mailed P D Q for a year's subscription. Take no chance of missing the Winter Number.

Just one inkling—you may have heard from time to time about new apparatus developed in the commercial laboratories, but not released to the public. One of the sets under way is a totally new design, built for a new tube which, we are assured, will be put on sale in time for us to show the receiver in the Winter Number.

If we are given the release, RADIO DESIGN will be first to publish the dope. In fact, you'll find RADIO DESIGN pretty much in the lead with new stuff. Keep your eye peeled!



# X - 11 MYSTERY

Continued from page 3

long side of the fixed condenser plates are up. One coil bracket goes under the nut which holds the bottom frame pillar of the condenser, and the upper bracket is held by a machine screw passing through a hole in the condenser frame.

Clamp the condenser firmly with the nut on the front of the panel, put the Art dial in place, and fasten the dial with the screw and nut provided.

**PHASATROL:** Mount the Phasatrol on the front panel with  $\frac{3}{4}$ -in. F. H. screws and nuts. The terminals marked PC and P should extend out horizontally.

**R.F. COIL AND CONDENSER:** Mount the R.F. coil on the other .00035-mfd. variable condenser just as the detector coil was mounted. Have the small primary winding toward the bottom. Mount the condenser and set the dial as previously described.

**PANEL BRACKETS:** Fasten the three triangular panel brackets on the front panel, using  $\frac{1}{2}$ -in. F. H. screws. As you will see from the Dataprints, a lug must be put on each upper fastening screw. This is to make connections from parts on the front panel, through the brackets, to parts under the base panel.

**R.F. CHOKE:** Mount the R.F. choke on the front panel, using  $\frac{1}{2}$ -in. F. H. screws and nuts.

**BINDING POSTS:** Mount the nine engraved Bakelite binding posts on the sub panel, fastening the lugs in place as you go along.

**BASE PANEL:** Black micarta is used for the base panel also, drilled from the panel pattern in the Dataprints. Mount the parts on the base panel in the following order:

**SOCKETS:** Mount all four sockets. Put the springs into the socket button in such a way that the longer half of the contact spring will press against the contact pins of the tube. Fasten the buttons with the screws and nuts provided. Each socket should have the arrow pointing toward the rear of the base panel.

**RESISTO-BLOCKS:** Remove the resistor clips from the base of the resisto-blocks, take off the .01 condensers, as well as the two connecting strips. Discarding the Bakelite bases, remount the parts on the base panel, the clips above and the connecting strips underneath. The exact method is illustrated in the Dataprints.

**FILAMENT CONTROLS:** There are four filament control mounting clips required. They must be mounted next, using  $\frac{1}{2}$ -in. R.H. screws and nuts, except for the right

hand clip, which must be mounted with a  $\frac{1}{2}$ -in. F. H. screw. The reason for this is that the panel bracket will come directly above the resistance clip later on.

**GRID CONDENSER:** Mount the grid condenser at the right of the group of four sockets. Use  $\frac{3}{4}$ -in. R. H. screws. Put the screws through the grid leak clips, and turn them into the threaded bushings in the condenser.

**.0005 CONDENSER:** A .0005-mfd. fixed condenser is used across the first amplifier plate resistance. It is mounted between the third and fourth sockets of the group of four. Use  $\frac{3}{4}$ -in. R. H. screws, putting them through the panel, and threading them into the condenser terminal bushings. Fasten on the lugs with nuts.

**.006 CONDENSER:** In series with the Resistograd is a .006 mid. fixed condenser. This is mounted in front of the grid condenser, with  $\frac{3}{4}$ -in. R. H. screws. Under that, as the Dataprints show, the rear terminal of this condenser has a lug underneath, but on the front mounting screw a lug is put on the screw at the top of the base panel.

**MIDGET JACK:** Mount the midget jack at the rear and left hand corner of the sub panel.

**FRONT PANEL WIRING:** If you are working from the Dataprints, you will see that the wiring is shown for each panel separately. There are also wires on the front panel which started at terminals but end simply at numbers, such as 1, 2, 3. Where wires of this sort appear, if you will run your eyes straight down you will see on the drawing of the top or bottom of the base panel, a wire starting with the same number and finishing on a terminal of one of the base panel parts. This is done simply to avoid the necessity of drawing in the wires where they run between panels.

With the parts mounted on the front panel, all the front panel wiring should be done. Later, the base panel wiring will be done, and then after the two panels have been fastened together the interpanel wiring will be put on.

**BASE PANEL WIRING:** With the parts all mounted on the base panel, the base panel wiring should be done. That is all simple work. The only special precaution necessary is where wires are soldered to the socket contact springs. The wire should be put through the small hole in the spring and bent over slightly if possible. Then an ample amount of solder must be put on each spring. Rub each spring with a little sand paper. Do not use soldering paste on any socket spring, for it will surely cause trouble by reducing the resistance between grid, plate, and filament. If you use rosin cone solder, be careful that the rosin doesn't run up inside the socket through the hole in the panel, for it may prevent contact with the tube pins.

**BASE PANEL MOUNTING:** Fasten the base panel to the brackets, using  $\frac{1}{2}$ -in. R.H. screws and nuts. Note that the front mounting screw takes a lug under the base panel, there is a lug under the rear mounting screw for the center bracket, and lugs under both screws for the right hand bracket.

**INTERPANEL WIRING:** Only the wires between panels should be left now. Start with interpanel wire No. 1 and go right through them all. You will see that most of these wires are run through holes in the base panel.

**OPERATION:** Put the Polymet filament controls in the clips. From left to right, looking at the set from the rear, they should go in the following order:— .5 amp., .5 amp., .25 amp., and 6V 100. From left to right also, the resistances are as follows: .25 megohm, .1 megohm, .5 megohm, .1 megohm, 1. megohm, and .1 megohm. Then there is the 10. megohm leak for the grid leak.

Connect the batteries as shown in the diagram. The C post takes 40 volts or 9 volts negative C bias with a 171 or 112 respectively. The other C post should have 3 or  $4\frac{1}{2}$  volts. You can determine this experimentally. The B AMP. post takes 180 or 135 volts, according to the power tube used. B DET. takes 45 to 90 volts. Some set builders prefer  $67\frac{1}{2}$  volts, although we seem to get the best results with 90 volts on the detector and R.F. tubes.

Tune in a station at about 500 meters, with the Resistograd turned all the way out. Adjust the Phasatrol until the set is just under the oscillating point. Then, as the wave length is reduced, the oscillations can be controlled by turning the Resistograd in.

**SUMMARY:** The X-11 gives more high class radio results at a lower cost than any other set we have ever handled. It is a safe set for the novice and can be recommended, without reservation, for use in homes where utmost of quality reception is expected at an exceedingly small expense.

## SP - 5 RECEIVER

Continued from page 2

from the light circuit of the right-hand dial down to the corner binding post of the second Redi-blox A.F. unit, and the two leads which run from the binding posts on the second A.F. unit to the binding posts. It is a good idea to insulate the leads from the toggle switch to the binding posts, also, although this was not done on the original model.

If you make soldered connections, Kester rosin core solder is recommended. With this solder you must have a hot iron, and the lugs must be rubbed off with sandpaper, so that they will be clean and bright. Apply sufficient heat to make the solder flow freely. All Pilot parts are of genuine Bakelite, so that they will not be injured by any ordinary amount of heat.

If you must use soldering paste, put on only the tiniest speck for each terminal, and if there is any excess visible, wipe it off with the greatest care.

**PLUG-IN COILS:** This set is designed for use with the No. 179 Twin Coupler plug-in coils. With the condensers provided, they cover approximately 190 to 550 meters.

Plug the coils into the fixed sockets, put the UX 171 tube in the right-hand unit and 109's in the others. Make the necessary cross connections to the eliminator, plug the eliminator into the light socket, and push the toggle switch up. Adjust the rheostat until the ammeter reads exactly 60 mils. The light bulbs on the dials can be turned on or off at will. Tune in a station by adjusting the two dials. If it is weak, you can bring the station up to full strength with the midget condenser. Volume can be regulated by the Resistograd. This control affects the ammeter reading slightly. If it brings the needle down below 60 mils, readjust the rheostat.

**SUMMARY:** The simplicity, ruggedness, and dependability of this set make it thoroughly satisfactory as an outfit to provide the finest radio entertainment for the home. Service troubles, renewals, and breakdowns have been brought down to an almost irreducible minimum. In fact, there is nothing which should go wrong over a period of years. Occasionally, a tube will go out. When one 190 tube burns out, the others will not light until the defective one has been replaced, since they are all in series.

If the filament current drops off, after a year or so of operation, it may be that the Raytheon needs replacement. Other than this, there should be no difficulty of any sort.

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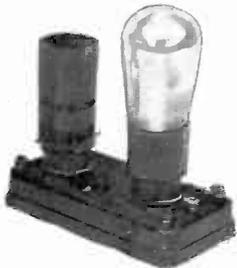
Look for this Pilot window display! It signifies a dealer who handles products of the world's largest Radio Parts Plant. "Utmost value for every Radio dollar!"



# Again Leading the Way in RADIO PROGRESS

Redi-Blox Detector Unit. Spring mounted tube socket takes all U X and U V tubes. Positive or negative grid return. Plug in coils for 180 to 3000 meters. Designed for .00035 mfd. tuning condenser.

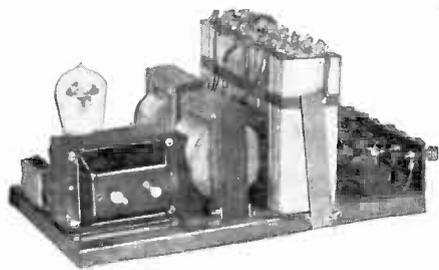
## M.B. Sleeper's REDI-BLOX WIRED RADIO UNITS



Redi-Blox R. F. Unit. Construction similar to detector unit. Wired for battery or eliminator circuits with series or parallel filaments. Genuine Bakelite base, as used in all Redi-Blox units.



Redi-Blox A. F. Unit. Equipped with new Pilot Giant Audio Transformer in handsome steel case which also acts as a shield. Takes all power tubes including 210.

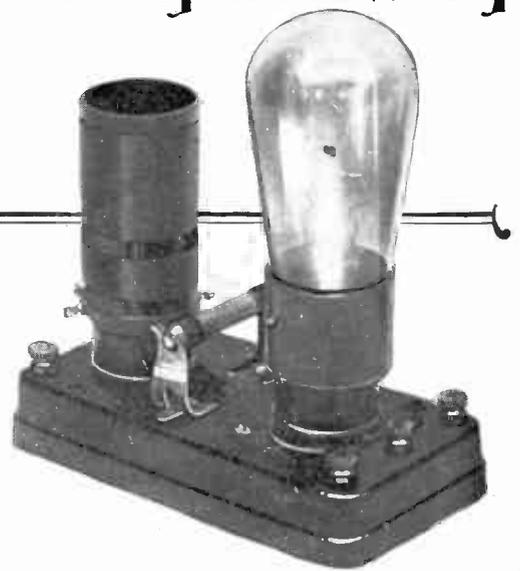


Socket-Power Radio is the pass-word today! With the Pilot ABC Eliminator you can easily change your present battery set to a dependable trouble-free A-C operated receiver. If you are building a new set, it will be electric, of course!

Redi-Blox Radio Wired Units is the application of the sectional book-case idea for radio construction!

To the experimenting set-builder, Redi-Blox offers the Key to countless combinations. With Redi-Blox Units any circuit is built in minutes instead of hours.

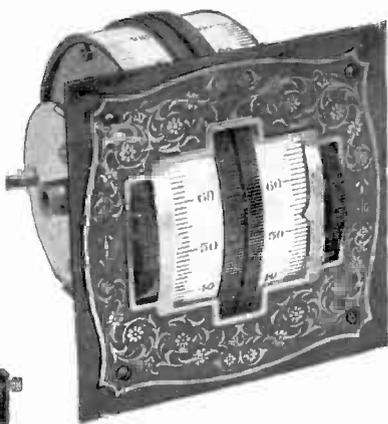
The man with fair technical knowledge, who wants to build a real good set, at minimum cost and labor, finds Redi-Blox the solution to his problem.



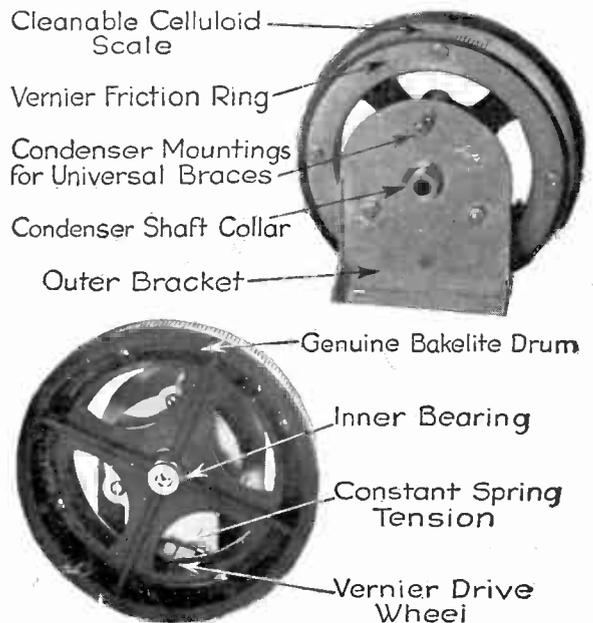
For instance, to build a Five-tube R. F. set, simply hook-up two R. F. Redi-Blox, one Detector Redi-Blox and two Audio Redi-Blox.

No soldering! Completely wired! Simply connect the various Redi-Blox Units just as you'd hook-up a couple of dry cells!

## PILOT Vernier Drum Dials



Smooth and silent, the PILOT vernier drums can be revolved singly or together with the pressure of your thumb, and set to hair-line accuracy with the individual verniers. Made with single or double drums. Single drum takes condensers on both sides. Fits all condensers.



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