

RADIO Engineering

A Magazine of Technical Accuracy for the
Radio Set Builder, Engineer and Manufacturer



Edited by
M.B.SLEEPER



APRIL, 1925

VOL. V NO. 1

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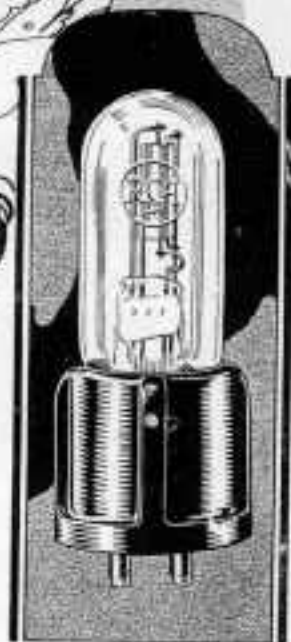
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Fifth Year

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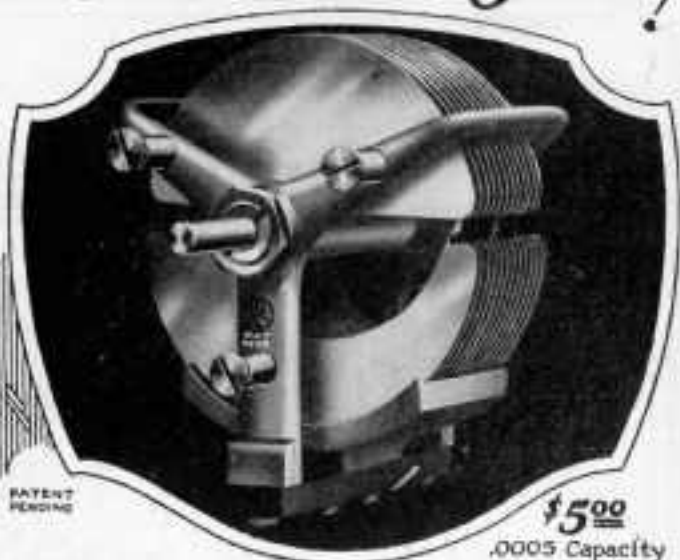
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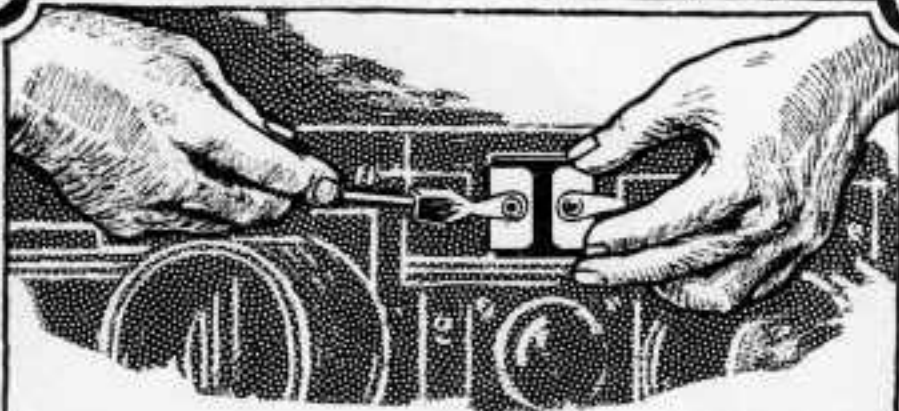
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Fig. 1. A typical Unipower installation in the testing room at the F. A. D. Andrea Company

Unipower A & B Supply Devices

Suggestions for the use and maintenance of these combination storage battery and charger units

THE problem of A and B battery current and voltage supply for vacuum tube receivers is one of the most important things that radio engineers have to work out. Dry cells for the filament current are entirely satisfactory on single-tube receivers or some kinds of 2 and 3-tube receivers but, in multi-tube outfits, where the current drain may run from 0.5 to 3 amperes, other sources of current supply are more satisfactory. The new dry cell B batteries are probably the most economical and certainly the most convenient sources of plate voltage supply but there is a growing demand for permanent installations to be built into receiving set cabinets.

Another problem is that of the test room or laboratory where both the A

and B supplies are required for continuous service and must maintain steady current and voltage day in and day out.

In Fig. 1 is an illustration of a typical test room installation. This picture was taken in the testing room of the F. A. D. Andrea Company. The use of dry batteries was not satisfactory because, to test the sets properly, and to make typical comparisons, a constant plate voltage was essential.

The accompanying illustrations show some of the equipment developed by the Gould Storage Battery Company—the Unipower A and B batteries.

Fig. 2 shows the 120-volt Unipower B which we use at the Darien laboratory for much of our testing and bench work. This unit, after several months of use,



Fig. 2. It is no trouble to maintain the Unipower B, for only regular charging and periodic filling are all that is necessary. Use a high resistance voltmeter, such as the Weston or Jewel types, for measuring the voltage

is holding up and is in as good condition as when it was originally installed. The heavy oak case has five 24-volt storage battery units grouped around the Balkite charger which is mounted just behind the horizontal panel. On the panel you will see a large handle which can be slid from left to right. At one side it throws the connections into the operating position; at the center the batteries are disconnected; and on the other side connections are made with the charger. Two pins just behind the handle fit into a plug which is connected by a long cord to the lamp socket.

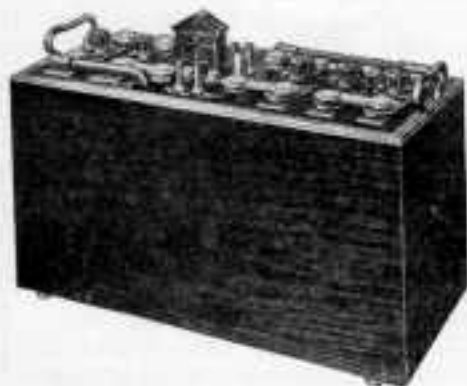


Fig. 3. The heavy-duty Unipower A, containing a 6-volt storage battery and Balkite charger.

This particular photograph was taken at a time when the battery was being examined and tested. The distilled water was poured into a glass, for convenience, and the batteries and charger cells, filled to a level just above the plates by squirting in the water with a medicine dropper. A very large water reserve is contained in the individual jars so that it is only necessary to put in water at long intervals. If the battery is kept charged by leaving it on over night about every second or third week, no other attention is necessary to keep it in perfect condition. The water should be added perhaps every three months, if it is required. Where the battery is in constant use it should be charged about once a week over night. By its nature, there is no fire risk involved, making it perfectly safe to leave the battery on charge without attention.

To check up on the condition of the cells, the voltage across each battery unit should be measured occasionally. This will indicate the condition of the cells. If any unit is down in voltage, then the voltage of the individual cells should be measured until the faulty one is located. It is not practical to test them with a hydrometer.

On the front of the case there are four

terminals to which connections can be made by special clips supplied with the battery. Two of the terminals are connected to the cells by flexible leads so that any voltage required, up to 120, can be obtained. The lower right hand terminal goes to + 120 volts while the left hand terminal goes to the negative side of the first cell.



Fig. 4. A special Unipower A for Radiola Super-Heterodyne sets. The vent pipe in the upper housing leads the gases outside the cabinet

It is advisable to keep the battery free of any accumulation of dust. Therefore, a cover, located by holes and pins, is supplied to fit tightly over the case.

This is the type of unit shown on the shelf at the right in Fig. 1. You will notice that, at the left of the terminal board, there is a Chicago fuse in the B battery circuit. In case the B battery is short circuited, this fuse blows out and another is put in its place. This not

only protects the battery but prevents the vacuum tubes from being blown out in case the B battery is connected to the filament side.

The Unipower B is made in a variety of types suitable for building into receiving set cabinets or for laboratory work. In addition, it can be set on the floor under the operating table, if there is no room to put it out of sight. It is reasonably attractive in appearance on the outside, making it suitable for installation in the living room or wherever the equipment is set up. The regular voltages supplied are 96 and 120. The separate storage B battery units, containing 12 cells, 24 volts, are also available.

The cells have a capacity of 2 ampere-hours at discharge rates up to 50 milliamperes.

Fig. 3 shows the plain type of Unipower A. At the right are three 2-volt cells giving the necessary 6-volt supply for the filaments, while the Balkite charger is set in at the left. In the center are the lugs for connection to the radio equipment and to the 110-volt A. C. line, as well as a switch for putting the battery on charge. Particularly for the laboratory or testing room, this is a most convenient unit because the storage battery and charger are built together. This equipment is also built in a variety of sizes to deliver 2, 4, or 6 volts, as may be required for WD11, UV199, or UV201A tubes. Still another type combines A and B batteries,



Fig. 5. Illustrating the method of installing the A type in a super-heterodyne. No special care for charging is required, as the battery floats on the line when the current is turned on at the electric light socket

Cotton Super-Heterodyne

Part 2. Conclusion of the step-by-step assembly instructions and suggestions for operating and testing, with a report of the results obtained with the original set

10. Solder the lower tab of a 0.0005 mfd. Micadon to wire 35 to 36, making connection 40. Connect 41, the lug on the bottom binding post, to 42, the lug on the screw which holds the fixed plates to the insulating strip on the condenser. This wire should pass through the hole in the upper lug of the Micadon just put in place, and should be soldered to make connection 43. Connect 44, the lug on the center binding post, to 45, the lug on the oscillator coupler mounting. Connect 46 to 46, a lug on the rear bearing of the coupler. Connect 47, the forward lug at the bottom of the coupler tube, to 21. This is a difficult connection to get at and must be made very carefully to assure perfect joint.

11. Fasten the remaining Daven grid-leak mounting to the tube panel behind the coupler, using a $\frac{3}{4}$ -in. 6-32 R.H. screw and nut.

12. Solder the lug on the right grid-leak clip to the G contact on the socket, making connection 48, and at this point solder the lower tab of a 0.005 mfd. Micadon also. Connect 49, the rear terminal at the bottom of the coupler tube, to 50, the upper tab on the 0.005 mfd. Micadon. Note that this wire goes down through a hole in the panel and up again.

13. Mount the three Pacent rheostats and the Pacent potentiometer on the front panel using the screws and nuts provided. Have all the terminals at the bottom. Put soldering lugs on the right hand and center binding posts of the rheostats and on all three terminals of the potentiometer. Tighten them before mounting as it is impossible to get at them afterward.

14. Connect 51, the right hand terminal of the right hand rheostat, to 52, the plus post on the Y socket. Connect 53, the center post on the right hand rheostat, to 54, a connection made to wire 13 to 14 where the latter goes up

through the hole to the plus post of the socket. Connect 55, a terminal on the center rheostat, to 56, a connection made to wire 53 to 54. Connect 57, the center terminal on the center rheostat, to 58, the plus post on the left hand rear socket. This wire should be insulated with MR tubing where it passes along the 1.0 mfd. condenser. Connect 59, the F— post of the filter, to 60, the left hand terminal of the right hand 1.0 mfd. condenser. Insulate this with MR tubing at each end. Connect 61, the right hand terminal of the left hand rheostat, to 62, the right hand post on the potentiometer. Connect 63, the minus post of the Y socket, to 64, a connection made to wire 61 to 62. Connect 65, the minus post on the right hand socket, to 66, a connection made to 63 to 64. Connect 67, the center post on the left hand rheostat, to 30. Connect 68, the F— post of the second rear socket from the left, to 69, a connection on wire 59 to 60. Connect 70, the F— binding post on the next socket, to 71, a connection made to 59 to 60. Connect 72, the center post on the potentiometer, to 73, the F— post of the right hand I.F. transformer. This wire must be protected with MR tubing. Just before this wire goes up through the hole to terminal 73, make connection 74 on a wire running to 75, a connection on 59 to 60. Connect 76, the left hand terminal of the potentiometer, to 77, the plus post on the socket. This wire must be protected with MR tubing. Connect 78, a connection made to wire 76 to 77 at the point where it starts up through the hole in the panel, to 79, a connection on wire 57 to 58. Connect 80, the left hand terminal of the center gridleak mounting, to 81, a connection made to wire 21 to 22.

15. Mount the left hand double circuit jack on the front panel and mount the 1 to 6 A.F. transformer on the tube panel, using $\frac{1}{4}$ -in. 6-32 R.H. screws.

16. Connect 82, the lower left hand

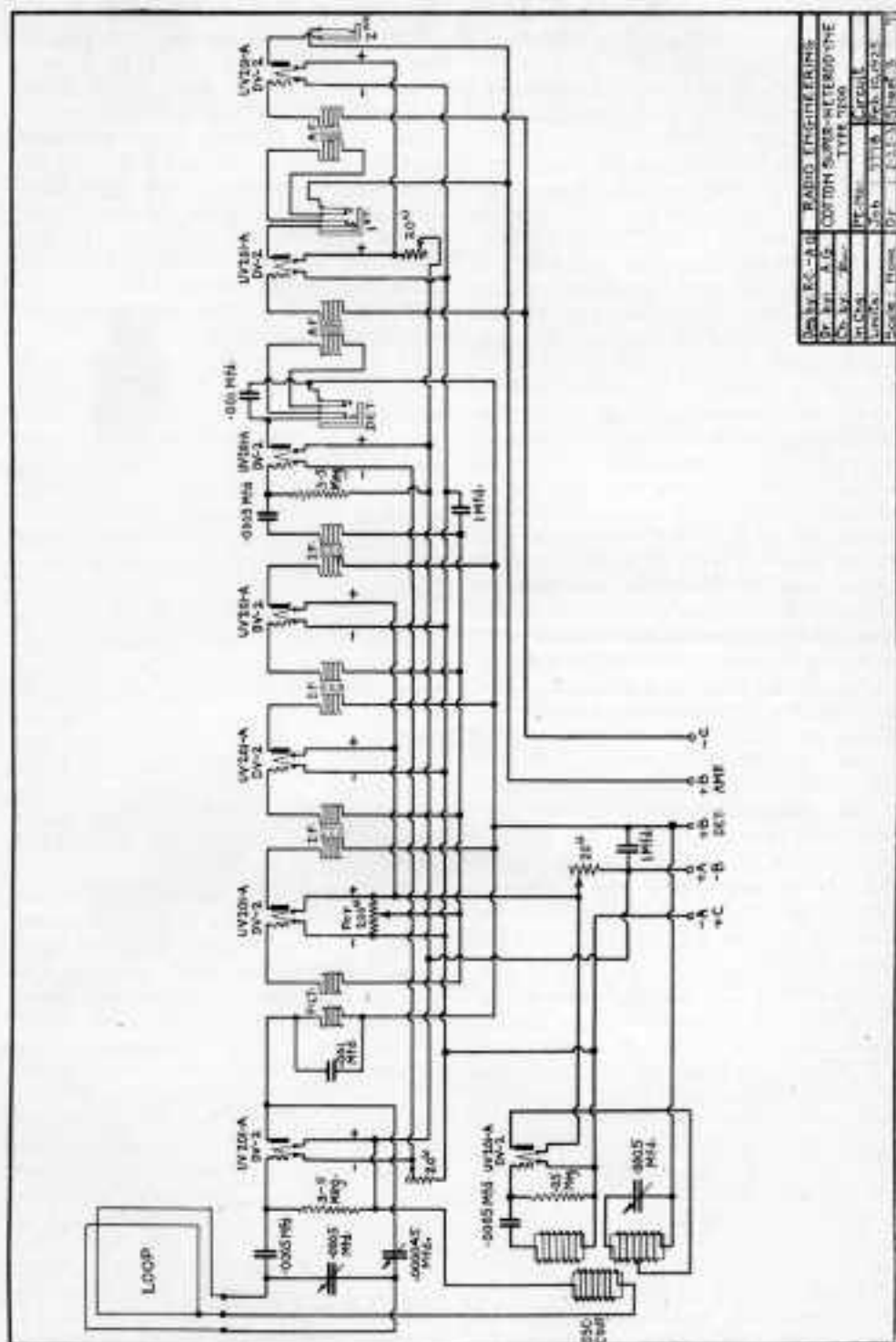


Fig. 6. Schematic wiring diagram of the cotton super-heterodyne receiver

tab of the jack, to 83, the P post on the socket. Connect 84, the lower right hand tab of the jack, to 85, the P post on the transformer. Connect 86, the upper left hand terminal of the jack, to 87, the B post on the transformer. Connect 88, the B+ post on the filter, to 89, the upper right hand tab of the jack. Fasten the slotted tab of the 0.001 mfd. Micadon on the P terminal of socket X, at terminal 83. Cut off the other tab and solder a wire to the short part remaining, making connection 90. The other end of the wire is soldered at 91, on the wire running from 88 to 89. Connect 92, the G post on the socket, to 93, the F post on the I to 6 transformer. Connect 94, the rear terminal of the rear gridleak mounting, to 95, a connection made on wire 13 to 14. Connect 96, the rear top lug on the comp'er tube, to 97, a connection made to wire 88 to 89. Connect 98, a connection made to wire 96 to 97, to 99, a lug on the bolt of the rear end plate at the condenser. This must be protected with MR tubing. Connect 100, the center lug at the top of the coupler tube, to 101, the P terminal on the socket. Connect 102, the forward contact at the top of the oscillator tube, to 103, on the variable condenser. Connect 104, the rotor terminal on the Chelton condenser, to 105, a lug under the bolt of the condenser end plate.

17. Solder the slotted tabs of a 0.001 mfd. Micadon to the P and B+ terminals of the filter. This serves as the mounting so that the soldering must be done carefully.

18. Connect 106, the B+ terminal of the center I.F. transformer, to 107, a connection made to wire 88 to 89. Connect 108, the +B post of the right hand I.F. transformer, to 109, a connection made to wire 88 to 89. Connect 110, the right hand terminal of the left hand 1.0 mfd. condenser, to 111, a connection made to wire 88 to 89 just before it goes up through the hole in the panel. Mount the Walbert lock Switch in the hole under the potentiometer. Connect 112, the left hand terminal of the lock switch, to 113, a connection made to wire 13 to 14. Connect 20, the right hand lug of the right hand 1.0 mfd. condenser, to 114, a

connection made to wire 65 to 66.

19. Mount the center telephone jack on the front panel and the 1 to 3 A.F. transformer on the base panel using $\frac{1}{2}$ -in. 6-32 R.H. screws and nuts.

20. Connect 115, the lower left hand tab of the jack, to 116, the P post of the Y socket. Connect 117, the right hand lower tab of the jack, to 118, the P post of the transformer. Connect 119, the upper left hand tab of the jack to 120, the B post on the transformer.

21. Mount the right hand telephone jack on the front panel.

22. Connect 121, the right hand upper tab of the center jack, to 122, the right hand tab of the right hand jack. Connect 123, the left hand tab of the right hand jack, to 124, the P terminal on the socket. Connect 125, the + post of the socket, to 126, a connection made on wire 51 to 52. Connect 127, the G post on the socket, to 128, the G. post on the transformer.

23. Mount the three inside binding posts on the rear terminal mounting strip, with soldering lugs at the rear pointing down. Use the two outside binding posts to fasten the strip to the two terminal panel support pillars. Fasten the pillars to the tube panel with $\frac{1}{2}$ -in 6-32 R.H. screws, with a lug under the head of the left hand screw pointing forward and a lug under the head of the right hand screw pointing to the right.

24. Connect 129, the F post on the transformer, to 130, a lug on the screw holding the right hand terminal panel support to the tube panel. Connect 130 also to 131, the G post on the transformer. Connect 132, the +B AMP binding post, to 133, a connection made to wire 121 to 122. Connect 134, the +B DET binding post, to 135, a connection made to wire 88 to 89. Connect 136, the A+ -B binding post, to 137, the right hand terminal of the lock switch. Connect 138, the -A +C binding post, to 139, a connection made on wire 19 to 20. Connect 140, the + post on the second rear from the left socket, to 141, a connection on wire 57 to 58. Connect 142, the B+ post on the next I. F. transformer, to 143, a connection made from wire 88 to 89. Connect 144, the

+ post of the right hand rear socket, to 145, a connection made to wire 57 to 58.

25. Put the grid leaks in the clips. The values are shown in the picture wiring diagram. Put the dials on the two variable condensers and then fasten the knobs in place so that the pointer is on the 180 degree marks when the plates of the condensers are totally interleaved. Finally put two coil mounting pillars on the screws under the tube panel, as shown in Fig. 5, so as to support the tube panel. This completes the assembly of the set.

used are mentioned in the section, "Notes on the Operation."

Turn the three rheostats until the tubes light with normal brilliancy. Set the potentiometer at about the center, and turn the condensers so that they read about the same. As soon as a station is heard, get the exact adjustment on the center rheostat. This is the only one that is critical. The other two should be set as low as possible so as to economize on battery consumption and to extend the life of the tubes. You will probably find the center rheostat must

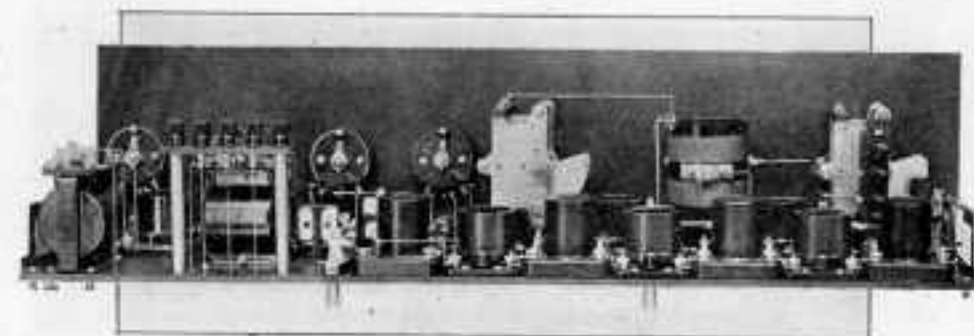


Fig. 7. This rear view shows clearly the arrangement of the parts

Testing and Operating Until you have made sure that there are no errors in the wiring, it is important to be careful about connecting on the batteries for, with eight tubes in the set, it would be a serious matter to burn them out. Consequently, the A battery should be connected first to see that all the tubes light properly. Then, with the negative side of the storage battery still connected, the positive lead should be touched to the two + B battery binding posts to see if, by any chance, the plate circuits have been connected to the filament side. If everything seems to be all right, put the A battery where it belongs, connect on the B battery, of 90 to 120 volts, with a 22½-volt tap for the detector, and put 4½ to 9 volts C battery on the C battery terminals.

The loop must be of a type with a center tap, such as the new Carter self supporting loop or the Marion design shown in Fig. 1. There is a wide possible range for both A and B battery supply. Some of the different methods which can be

be adjusted within two or three turns one way or the other. Below the correct point the set does not work. Above that point it squeals. Once adjusted, however, it is not necessary to change it while the set is being tuned over the entire wave length range nor will the set squeal at any adjustment.

Some of The Results Obtained Although it would not be right to say that this set is superior to all others in range and volume and quality, it is true that the Cotton super-heterodyne brings in regularly stations that we have never heard on any other receiving set we have used at the Darien laboratory. Below is a typical log of an evening's operation. There is nothing exaggerated about the results indicated. Although numerous stations were heard indistinctly no station was recorded unless it came in with full loud speaker volume so that the call could be plainly heard without

(Concluded on page 216)

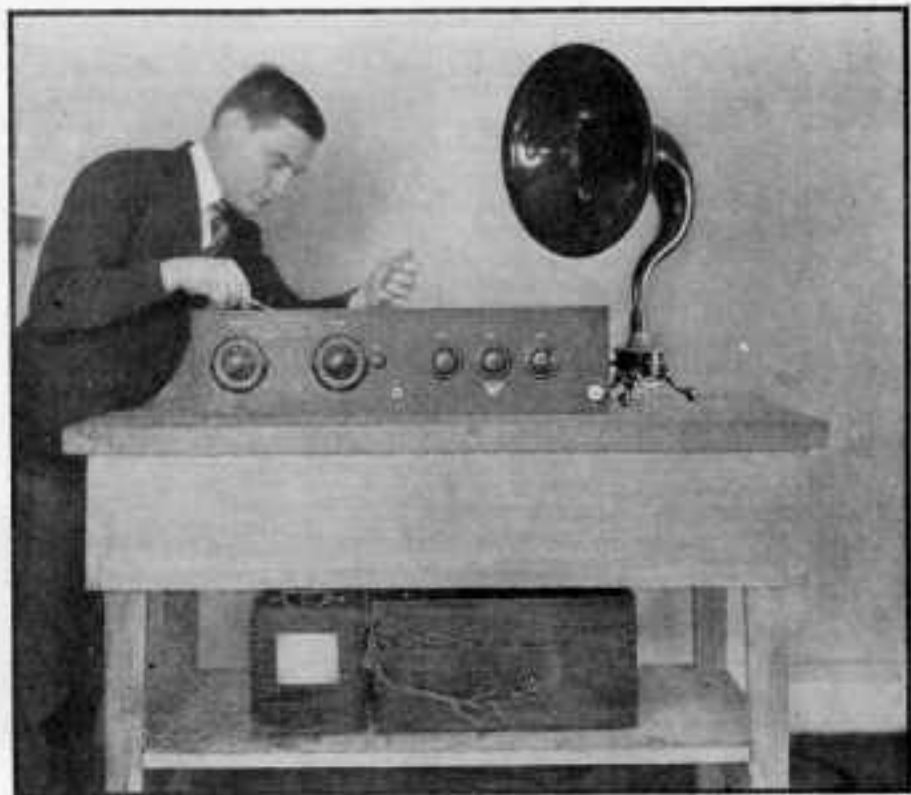


Fig. 1. Getting the Browning-Drake Five ready for testing

Browning-Drake Five Receiver

The Browning-Drake set with a three-stage Daven resistance-coupled amplifier makes a wonderful summer-time outfit.

WHEN Messrs. Browning and Drake delivered a lecture on their work before a gathering of radio engineers some time ago, it is doubtful if either of them had any conception of the remarkable popularity that their set was destined to receive within the course of a few months. The Browning-Drake receiver is all-popular in the New England States and its popularity, based on sheer merit, is growing day by day all over the country.

The Browning-Drake does not employ a trick hookup. Its success is due to the scientific methods applied in determining mathematically the various constants of the coils and condensers when used with the vacuum tubes now available. This

can be seen by studying the circuit diagram in Figs. 2 and 3.

A special feature of the Browning-Drake Five is that it has about half as many connections as an ordinary five-tube receiver. Therefore, it is a particularly fine outfit for the beginner or for the set builder who wants something that can be constructed very quickly. As a summer time proposition, this is an ideal outfit because it can be operated with a small indoor antenna, with correspondingly lower static pick-up.

Tests on this outfit settled definitely the question of B battery consumption. With five tubes in operation, under normal receiving conditions, the total plate current was 10 milliamperes. Five-tube

neutrodyne, for example, draw 20 to 30 milliamperes. This is a positive evidence that the resistance coupled amplifier draws less current than the transformer type. Moreover, when strong signals come in, the current is decreased and not increased.

The The publication of complete construction data for **Browning-Drake Five** the Types 6600 and 7000 Browning-Drake receivers has resulted in a demand for a set of this kind employing resistance coupled audio amplification. The Browning-Drake Five, in

ment Rheostat. One of 20 ohms controls the detector, and another, of 6 ohms, is connected to the three A. F. amplifier tubes. Tri-jacks are used for plugging in on the detector or last A. F. stage. Below the center rheostat dial is a Keelok filament switch, by means of which the tubes can be turned on or off without disturbing the rheostat settings. This switch is provided with an ON-OFF sign which fits against the panel, and the fact that its depth behind the panel is very small makes it just right.

The Browning-Drake receiver will not

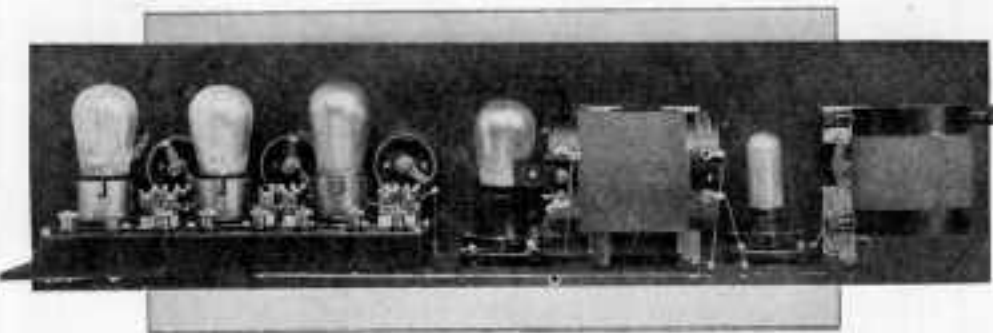


Fig. 4. The clean-cut design, so free from complicated wiring, makes this set unusually attractive

our opinion, represents one of the highest types of radio receivers in use today, combining as it does the extreme sensitivity and selectivity peculiar to this set, with a faithfulness of reproduction, thru the use of resistance amplification, which will satisfy even the most critical music lover.

By using the Daven Super-Amplifier unit which comes already wired, the construction of the set has been made very simple and neat, without any appreciable increase in cost. Practically all of the wiring has been kept under the tube panel, adding greatly to the appearance of the outfit when it is installed in a cabinet.

Operating The tuning is accomplished **Data on** by means of the two large **This Set** Velvet Vernier dials. The one on the left tunes the R. F. amplifier while the right hand dial tunes the detector circuit.

The R. F. amplifier tube filament is regulated by a 30-ohm General Instru-

ment interfere with reception of other stations, because the detector tube is not used in an oscillating condition, and the R. F. tube does not oscillate at all.

Standard The front panel is of Formica **Parts** measuring 7 by 28 by 3/16-in., **Required** and the base panel, of the same material, measures 3 1/2 by 23 by 3/16-in. Celoron, Dilecto, or Duresto, are also satisfactory panel materials for this set. The panels must be strong mechanically because they support the weight of the instruments and any extreme bending or sagging will probably result in open or short circuited connections.

The two National tuning units come already assembled with the coils mounted on the condensers. These are of the design developed by Browning and Drake and are made under license by the National Company. The first unit consists of a 0.0005 mfd. condenser with the antenna coil, while the second is made up of a 0.00035 mfd. condenser with the radio-frequency coil. Both of the con-

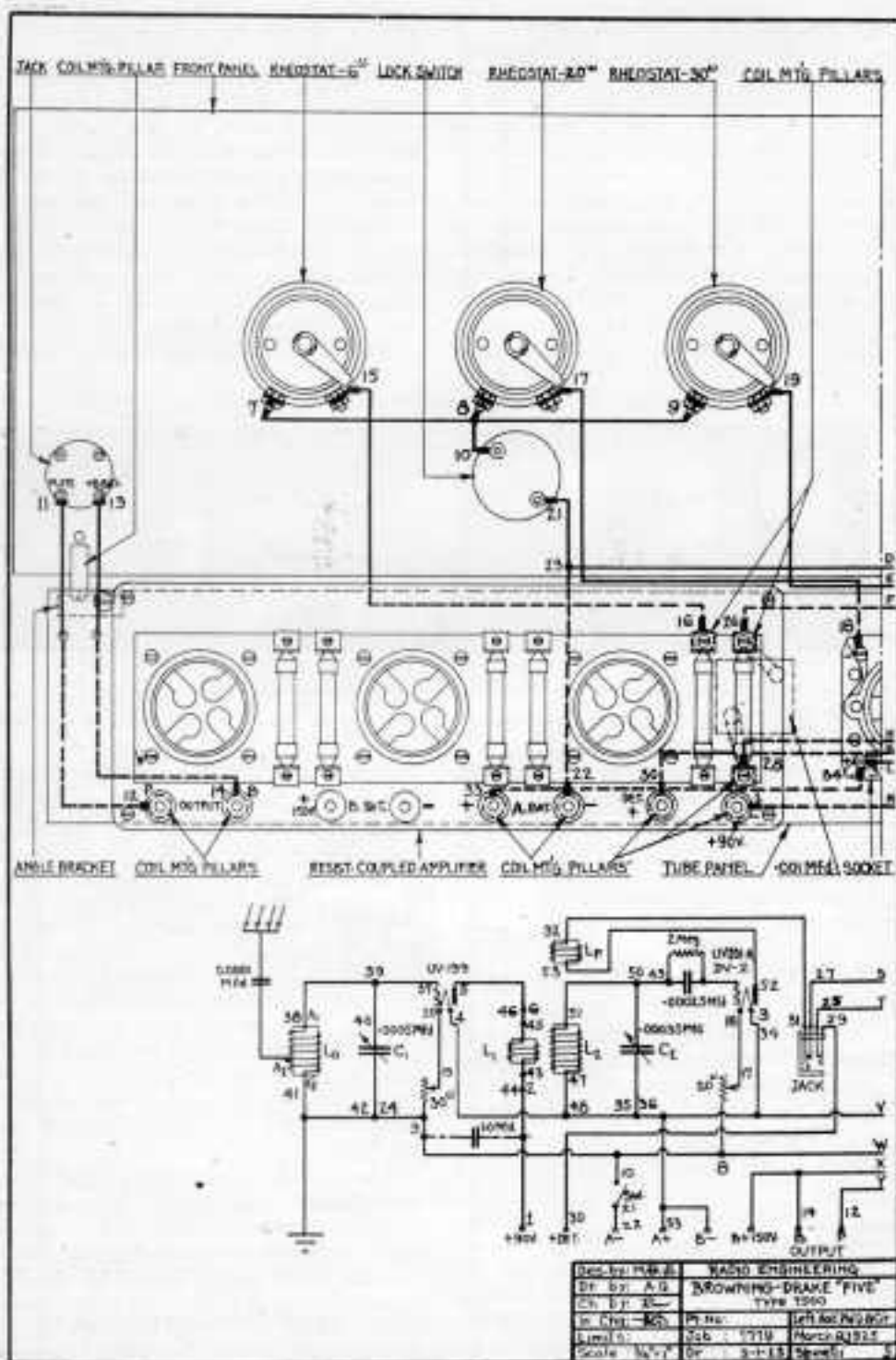


Fig. 2. Left hand half of the set, looking at it from the rear. The base panel is dropped down to show the connections more clearly.

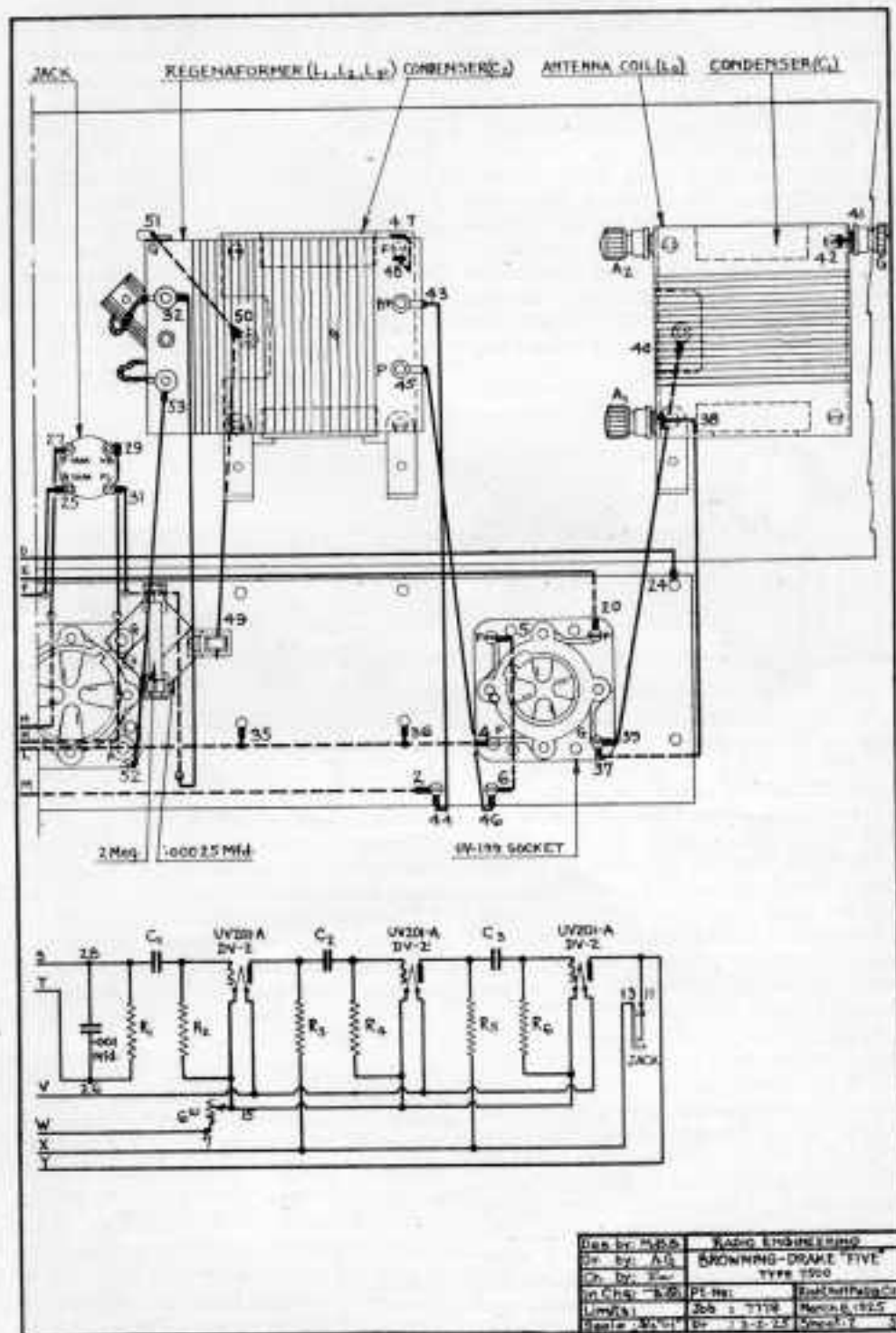


Fig. 3. Right hand half of the set. This is drawn to a scale of 3/8 in. to the inch. Numbers on the schematic are shown as a general guide

densers are provided with vernier dials. These dials have a reduction ratio of about 5 to 1, and are perfectly smooth and positive in operation.

On the front panel are mounted the three General Instrument rheostats, Kee-lok battery switch, and two Tri-Jacks. The base panel carries the Daven Super-Amplifier unit, one standard Benjamin socket, one Benjamin 199 socket, a 0.001 mfd. New York Coil fixed condenser, and a 0.00025 mfd. fixed condenser with gridleak mounting clips for the 2-megohm Daven gridleak. Three Eby or Marshall-Gerken binding posts are used on the antenna coil.

than the usual heavy bus bar. Stretch the Wirit in 10 or 12 ft. lengths to remove all the kinks, then cut it up in shorter pieces before using.

Put soldering lugs on the terminals of the various instruments as you mount them. The short heavy lines in the picture wiring diagram show the directions in which these lugs must point. Use either Kester or Belden rosin core solder, or plain soft solder with Nokorode paste put on very sparingly. We have found at the Darien Laboratory that the familiar spreading of the soldering paste over the panel at each connection can be eliminated entirely by slipping a small

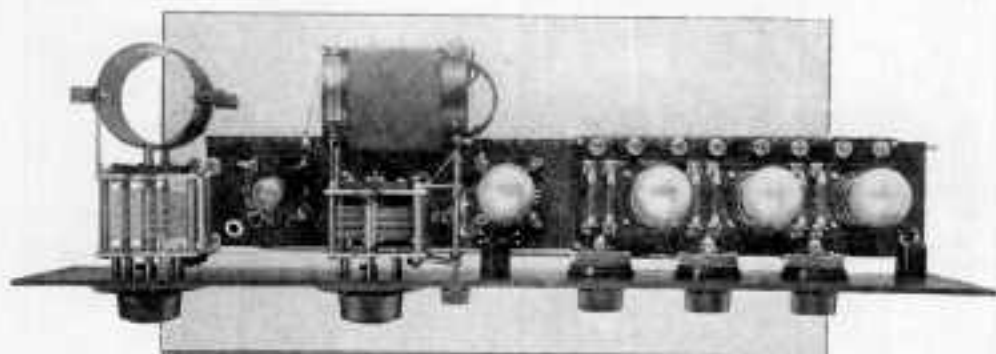


Fig. 5. The same general arrangement used in the type 6600 and 7000 sets is used in this outfit.

For hardware, one angle bracket and twelve coil mounting pillars are required. One of the pillars holds the tube panel to the front panel at the right hand end, nine of them are used for extending connections from the Super-Amplifier, while the other two are fastened to the underside of the tube panel as supports, for they rest on the bottom of the cabinet when the set is installed.

Assembly and Wiring Figs. 2 and 3 give the picture wiring and schematic diagrams for the set. The former shows the connections and wiring drawn exactly as they were arranged in the original receiver. The base panel is dropped down in order to show the parts more clearly. Wires shown by dotted lines are run under the tube panel. The connections in both drawings are numbered to correspond with the assembly instructions. Wirit is recommended for the connections as it is not only easier to work with, but makes a neater job

piece of ordinary newspaper, which is quite absorbent, under each lug while the soldering is being done. The paper absorbs the soldering paste, leaving a clean neat connection. Have the iron thoroughly tinned and hot enough to make the solder flow freely. If you cannot afford an American Beauty electric soldering iron, you can use a Nokorode soldering kit, which comes complete at a price of fifty cents.

1. Remove the nut under the binding post marked P input on the Daven Super-Amplifier. Also remove the short connecting strip to the screw holding the end resistor clip. Put the nut back, and on top of it, screw a coil mounting pillar. This will be the +90V. binding post. Remove the screw which fastens the clip of this resistor, enlarge the hole in the clip and amplifier base, and slip in a $\frac{1}{2}$ -in. 6-32 R. H. screw. Put a nut and a coil mounting pillar on the screw under-

neath the base. This will be terminal No. 28 later.

Remove the nut under the binding post marked B Input. Also disconnect the connecting bus going to this post, and put back the nut and a coil mounting pillar. This will be the Det+ binding post. Now remove the bus wire which ran from this post to the front clip of the first resistor. Enlarge the hole in this clip and the amplifier base and put in a $\frac{1}{2}$ -in. 6-32 R. H. screw. Put a nut and a coil mounting pillar on this screw under the base. This will be terminal 26 later. Remove the nut under the binding post

6-32 R. H. screws and nuts. Put $\frac{1}{2}$ -in. 6-32 R. H. screws through the holes in the tube panel into the coil mounting pillars under the amplifier base. These serve to bring the connections up to the amplifier. Put the necessary lugs under the heads of these screws, as shown in the picture wiring diagram and the bottom view, Fig. 6, of the set. When putting in the screws for terminals 26 and 28 be sure to fasten the tabs on the 0.001 mfd. fixed condenser with them.

2. Remove the screws and nuts from the +and- terminals of the Benjamin 201-A socket. Replace them with two $\frac{3}{4}$ -in.

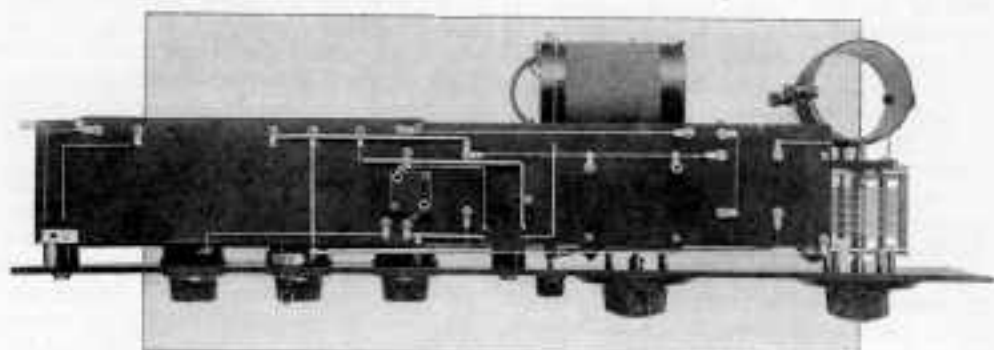


Fig. 6. By bringing the terminals from the amplifier to the under side of the base panel, most of the wiring is kept out of sight.

marked A Bat-, disconnect and remove the bus wire which runs over to the A-feeder bus, and put back the nut with a coil mounting pillar on top of it. This will be terminal 22 later.

Remove the screw and nut which fasten the front clip of the second resistor from the right of the amplifier. Enlarge the hole in both the clip and the base, and put in a $\frac{1}{2}$ -in. 6-32 R. H. screw. Put a nut and a coil mounting pillar on this screw under the base. This will be terminal 16.

Screw a coil mounting pillar on the A Bat+ binding post screw under the base. This will be terminal 33. Repeat this with the P output and B output binding posts.

Put a $\frac{1}{2}$ -in. 6-32 R. H. screw thru the front left hand mounting hole of the amplifier. This is a "blind" screw. Fasten the angle bracket to the tube panel in the position shown with a $\frac{1}{2}$ -in. 6-32 F. H. screw and nut. Now fasten the amplifier to the tube panel with three $1\frac{1}{4}$ -in.

6-32 R. H. screws in the opposite direction, with the round heads resting directly on top of the contact springs. Put the thumb nuts on the screws under the base of the socket, and then put the protruding ends of the screws right through the tube panel and fasten them with nuts on the underside. Put a $\frac{1}{2}$ -in. 6-32 R. H. screw through the mounting hole near the G terminal, into a nut between the socket base and the tube panel. Fasten with another nut under the tube panel. Slip the eyelet hole of the 0.00025 mfd. grid condenser through the G terminal screw, and fasten it with the thumb nut. Snap the gridleak in place on the condenser.

Remove all four terminal screws of the UV-199 socket, replacing them with $\frac{3}{4}$ -in. 6-32 R. H. screws, and fasten the socket to the tube panel in the same way as the other, remembering to put the necessary lugs under the nuts below the panel, and being careful to keep the

socket turned in the position shown in the picture wiring diagram.

Take two $\frac{1}{2}$ -in. 6-32 R. H. screws and put a lug under the head of each. Put these through the two holes at 2 and 6 in the tube panel, put a lug on each, under the panel, and fasten with nuts.

3. Now proceed with the wiring of the tube panel. While doing this be sure to keep the panel perfectly flat so that no wires will sag when it is finally fastened to the front panel.

Connect 1, the right hand binding post of the amplifier unit, looking at the tube panel from the rear, to 2. Connect 3, one of the lugs under the +terminal of the standard socket, to 4, the F terminal of the UV-199 socket. Connect 5, the P terminal of this socket, to 6.

4. Mount the three rheostats on the front panel, in the order shown in the picture wiring diagram, using the screws provided. Put lugs on the terminal screws, bent as shown. Remove the two binding posts from the Keelok switch, and replace them with 6-32 nuts, putting a soldering lug under each nut. Mount the switch on the panel, being sure to place the Off-On sign against the panel and behind the mounting nut. The slot for the key must be in a horizontal position. Make sure that the soldering lug which rests on the small insulating washer does not touch the metal switch case for this will short the switch.

Mount the two Tri-Jacks with the terminals arranged in the order shown and fasten the lugs under the terminal nuts.

Take four of the mounting legs supplied with the Browning-Drake kit, and fasten the long parts to the four screws which hold the front and rear end plates of condenser C_2 to the lower spacing pillars. Remove these screws one at a time, put them through the upper holes of the mounting leg, and turn them back into the pillars again. Keep the short ends of the legs pointing toward the rear of the set. Fasten two mounting legs to the left hand side of condenser C_1 , looking at the set from the rear, in the same way. Take the three Eby binding posts and slip the screws into the A_1 , A_2 , and GND. eyelet terminals of the Antenna coil, fastening them with the nuts on the inside. Put a lug on

the inside at the A_1 post, under the nut.

To remove the dial from the variable condenser, first loosen the set screw which holds the knob to the shaft and remove the knob. Take out the three R. H. screws which fasten the large dial to the friction disc box, remove the four screws holding the box to the condenser mounting posts, and loosen the set screw on the collar which fits over the condenser shaft. You can now pull the box and collar off the shaft. You will find three washers on each condenser mounting post. Take off all but one from each post.

Remove the set screw from the collar, put the collar through the large hole in the front panel, and screw the set screw back again. Put the condenser behind the panel, and put in the screws which go through the friction disc box and thread into the mounting pillars, put back the three small screws holding the dial to the gear box and, finally, fasten the knob in place by tightening the set screw in it. Turn the condenser plates so that they are totally interleaved, loosen the set screw on the collar over the condenser shaft, set the dial so that the 100 division line coincides with the index line engraved on the panel, and tighten the set screw again. Screw the small knob on to the threaded end of the tickler shaft. Fasten a coil mounting pillar to the front panel at the right hand end with a $\frac{1}{2}$ -in. 6-32 F. H. screw. Now put the three knobs on the rheostats, locking them to the contact arms by means of the thumb nuts at the rear. The index line on each knob should coincide with the off mark on the dial when the contact arm is all the way around to the left.

5. Connect the three terminals 7, 8, and 9 of the rheostats together. This wire should run close to the front panel. Connect 8 to 10. Fasten the front panel to the tube panel by means of $\frac{1}{2}$ -in. 6-32 R. H. screws and nuts through the short ends of the mounting legs on the variable condensers. Put a lug under the front mounting screw nut on condenser C_1 and a lug under each nut of the rear mounting screws on C_2 . Fasten the angle bracket at the amplifier end of the tube panel to the coil mounting pillar on the

(Concluded on page 210)

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APRIL, 1925

No. 4

EDITORIAL

THIS winter the life of the radio editors has not been what it used to be—and all because of the construction articles. Their days go like this:

At nine o'clock the advertising manager starts off with a complaint that the A. B. C. Transformer Company stopped advertising because their instruments weren't specified in the construction articles. At ten o'clock the circulation manager appears in the editorial office with a long face. The new statement shows heavy losses in the big cities where set building is popular. The construction articles have not been complete enough or sufficiently detailed. Just before lunch, the business department, having concluded a lengthy conference, in comes the business manager to report that it has just been decided that construction articles must be more general, without the specification of particular makes of instruments. Two hours later, one of the advertising solicitors, back from having lunch with a new prospect, bursts in to beg the editor to show the X. Y. Z. sockets in the next construction article so as to help him land the account. By three o'clock the circulation manager has his complete figures, showing a reduction in sales all over the country, which proves that the only way to hold up circulation is to put in simple, general articles, with no construction stuff at all. And then, just before time to go home, the business

manager breaks the sad news that the editorial expense is running so high that more of the free publicity articles sent out by manufacturers must be used, in order to save money.

The editor's life is, indeed, a difficult existence. The foregoing, while overdrawn, of course, is not so far from the truth. Circulation statements just made public show heavy losses on practically every one of the popular radio magazines. What is worse, advertising revenue is falling off, too. No one can tell just why, but it is probably due to the fact that, since the newspapers have awakened to the importance of running good radio articles, the general public finds it unnecessary to buy magazines.

Among the sixty-seven radio magazines published in the United States, Radio Engineering is the only one which is making steady advances in circulation as well as in advertising revenue. The March issue, for example, showed a 16% increase in advertising pages over February, with still another gain in April over March. In the last six months the circulation has increased over 60%. During the summer, unlike other publications, the circulation will not drop, but will remain practically constant until it goes up still higher in the fall, because over 70% of the readers are paid-in-advance yearly subscribers.

More than that, the editors' life is a very pleasant one. How do we account for all this? That's no problem. The answer is simple. The number of experienced set builders, and the resultant demand for complete and accurate construction data, is increasing steadily. There are more and more companies manufacturing radio equipment, making better equipment than ever before, and looking more sharply for ideas and information that will help them to improve their products. This is the first summer that engineering and designing staffs are to be increased, rather than reduced. These men want more data, newer ideas.

Radio Engineering supplies this increasing demand. Improvements? Certainly, just as fast as we can make them, but no changes. We decided long ago what we wanted to do, we're doing it successfully, and we're going to stay right on the job.

M. B. SLEEPER, Editor.

Data Sheet No. 7

ALL-AMERICAN OSCILLATOR COUPLER: This oscillator coupler was designed especially for super-heterodyne circuits, and has an oscillating range of 150 to 650 meters, which is equivalent to 2000 to 462 kilocycles. The windings are of the tuned air-core type and are completely enclosed in a Bakelite housing. Two mounting holes are provided in the base. The P, B+, and coupling 1, 2 terminals are on one face of the case, with the G and F terminals in the rear as shown in the drawing.

DUBILIER BY-PASS CONDENSER: This item is a fixed condenser of 1 mfd. capacity, used extensively for by-passing the radio frequency currents around the A and B batteries. The entire unit is enclosed in a metal case. The two lugs shown at the top of the drawing are for connections. The two lower lugs are part of the metal case and are provided for mounting.

RASLA R. F. TRANSFORMER: The Rasla transformer was designed solely for use in reflex circuits for coupling the crystal detector circuit with the R. F. tube with maximum efficiency. It has a single tapped winding and is therefore unsuited for coupling R. F. tubes in a straight R. F. circuit. The winding is enclosed in a black Bakelite case with three mounting holes at the bottom rim for No. 6 screws. The four terminals are at the top.

CUTLER-HAMMER RADIOLOC: This item is a battery switch which is operated by a key in the same manner as a door lock. It is very small in size and has two terminals at the rear. The front collar and stud is heavily nicked. One hole mounting is employed. A switch of this type prevents any unauthorized person from meddling with a set and protects batteries and tubes from being run down or burned out. Two duplicate keys and two lugs are provided.

SAMSON I. F. TRANSFORMER: This transformer was designed for super-

heterodyne circuits in which the intermediate frequency is 60 kilocycles. The coils are helical wound, to reduce the distributed capacity, and are enclosed in a black Bakelite case. Two mounting holes are provided in the base. Four terminal screws and upright soldering lugs are used for connection. The resonance curve is sufficiently broad for satisfactory long wave amplification a few thousand cycles above or below its rated frequency.

BENJAMIN BRACKETS: The drawing shows the left hand bracket, looking at the set from the front. A right hand bracket of similar dimensions is also provided together with necessary mounting screws and nuts. These brackets were originally designed for mounting the Cle-Ra-Tone Radio Gang Socket, but are now being used extensively for mounting sub or tube panels on sets. They are made of 1/16-in. brass, heavily nicked, with a satin finish. The flanges provide remarkable stiffness and rigidity and the center portion is blanked out. The rear flange may be used to support a binding post strip. Two holes are provided for mounting on the front panel, and two more are used for fastening to the tube panel or gang socket.

The drawings for the monthly data sheets are made to a scale of one-half inch to the inch. Therefore, any dimensions not shown on the drawings can be scaled off.

Designers and engineers find it most helpful to keep these data sheets where they can find them quickly to look up dimensions and characteristics of the various standard products, for many times, when it is not convenient, or there is not time to send out for the parts in question, the information about them can be obtained from the data sheets. They are particularly helpful when the overall dimensions are required or information as to the location of binding posts and mounting screws.

Design of the Paragon Four

The complete data on the Paragon Four is given for the first time in this article. In addition to the four-tube model, this type of receiver is also made up with one, two, and three tubes. This is the first set to be manufactured with a regenerative R. E. amplifier ahead of the detector.



FIG. 1. Only one tuning dial is necessary to tune the Paragon Four receiver.

EVER since the new line of Paragon receiving sets was brought out several months ago, a great deal of mystery has been attached to the type of circuit used for these outfits.

The unusual feature of the Paragon equipment which is first noticed from an examination of the outside of the set is that there is only one tuning control and an auxiliary adjustment for the regulation of the volume. The second small knob, at the right of the tuning dial, is a rheostat. In addition, two jacks are provided and an on and off switch in the filament circuit.

In Fig. 3 the exact wiring diagram of the Paragon 4-tube receiver is shown through the courtesy of the Adams-Morgan Company. Fig. 2 shows the interior arrangement with the case removed. It appears as if no mounting is provided for the terminal strip but, actually, this is fastened with screws to the inside of the cabinet at the rear.

An examination of the wiring diagram shows that the first tube is a regenerative radio frequency amplifier, followed by a non-adjustable radio frequency transformer working into a detector. In addition, there are two stages of audio frequency amplification. One adjustment is provided on the primary of the R.F. amplifier. A switch above and to the left of the main tuning dial is provided to short circuit a part of the primary winding. This gives an adjustment to cover each half of the wavelength range.

Altho we have not made any actual comparisons, theoretically it would seem as if greater amplification could be obtained from this circuit than from the Browning-Drake, in which a non-regenerative R.F. amplifier is connected ahead of a regenerative detector. This assumes, of course, that the efficiency of the transformers are equivalent.

To illustrate, if the initial voltage applied to the R.F. tube is 2, and the amplification into the detector is 4, the voltage on the grid of the detector will be 8. On the other hand, with a regenerative R.F. amplifier to give greater sensitivity, the voltage on the R.F. amplifier is 4, with the same amplification into the detector, the detector voltage will then be 16. Exactly how this works out in actual practice can be determined only by actual trial. It offers some very interesting possibilities to those who want to experiment with it.

The regenerative action is obtained through the coil in the plate circuit of the R.F. amplifier, coupled to the secondary tuning circuit. This coupling coil is rotated by the small knob below and at the left of the tuning dial.

Looking at the set from the rear, you will see the secondary inductance, primary coil, and tickler unit at the right hand side. Flush with the base panel is a 0.002 mfd. Micadon in series with the antenna lead. The Adams-Morgan Company is one of the few concerns using a single bearing variable condenser. This is of substantial design,

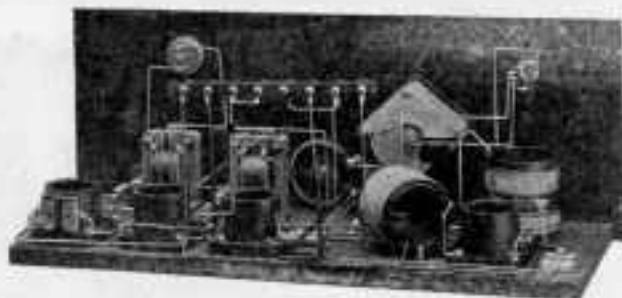


Fig. 2. Here you can see the design of the tuning unit, R.F. amplifying transformer, and variable condenser.

made with a bearing a little over an inch long, holding the shaft so firmly that, without any support from the rear, there is no play in the plates. At the left of the first socket is the R.F. transformer, wound on two Formica tubes, a type of construction somewhat similar to that employed in Neutrodyne receivers.

This set, you will see, is quite unique in design, for the circuit is different from that employed in any of the other types of receiving sets. In fact, for a low priced outfit, it seems much more practical to employ a system of this sort

than to use the familiar type of tuned R.F. circuit which must either be expensive, by its nature, or so cheapened as to make its efficiency and stability of design sometimes questionable.

The experience with various types of receivers show that there is no disadvantage in using a single control tuning circuit, when it is regenerative, over the three controls for tuned R.F. receivers is the matter of sharpness of tuning. As long as the antenna is coupled loosely to the secondary, a regenerative set is as sharp as a 3-control outfit.

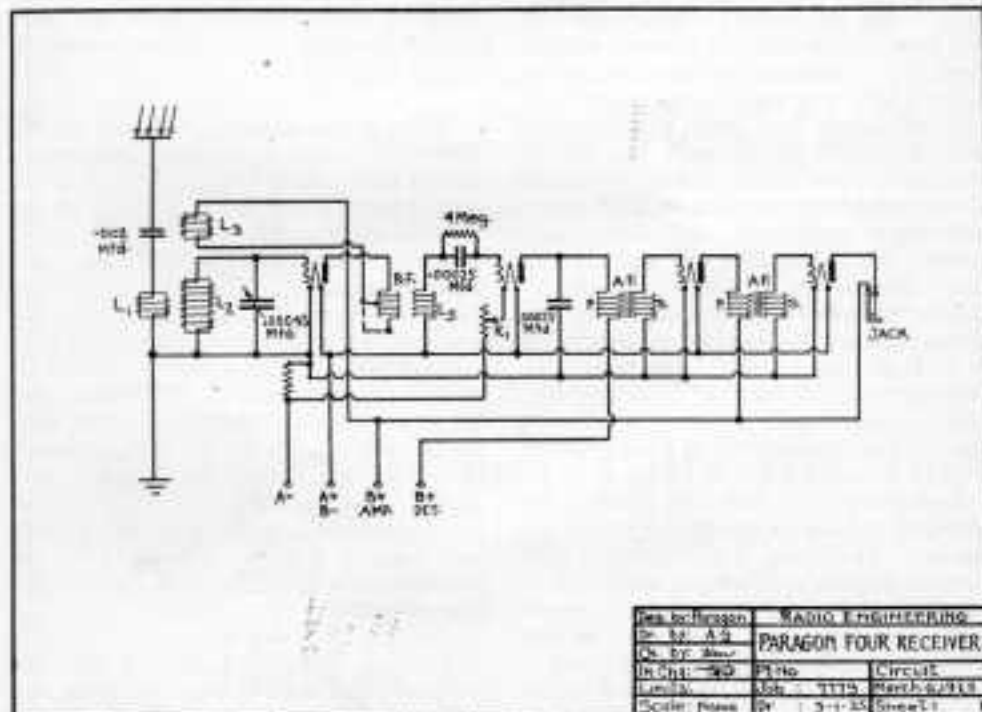
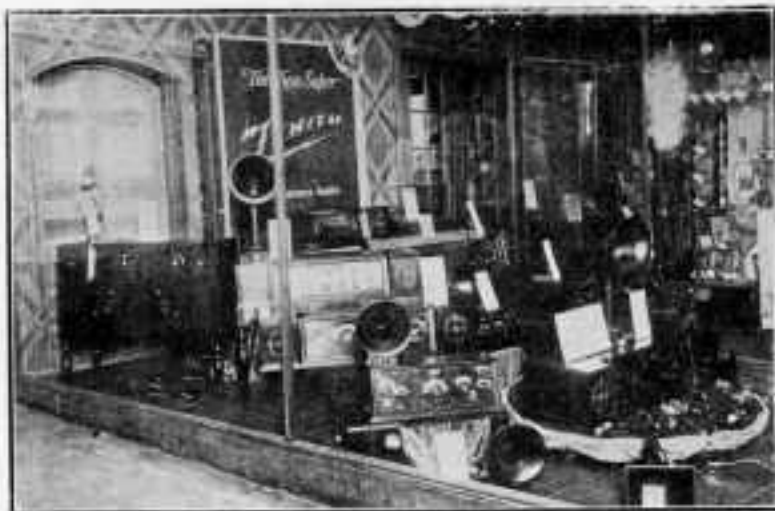


Fig. 3. Schematic wiring diagram of the Paragon Four, showing the connections for the regenerative radio frequency amplifier.



Window display of the Southern California Music Company

GRADUALLY radio manufacturers are learning that they must not tread on each others' toes. Chas. Freshman Company recently obtained an order against a concern who had been taking advantage of the advertising and publicity of the Freshman Company, preventing them from using the word Masterpiece in connection with the manufacture, advertising, and sale of radio receiving sets and parts. Moreover, the order forbids the manufacture and sale of receiving sets "so similar to the Freshman Masterpiece receiving sets in dress, style, size, shape, appearance, and relative positioning and locationing of the external parts thereof as to deceive or be calculated to deceive the public or the purchaser thereof." This is very interesting in view of the fact that other widely advertised receiving sets and parts are being copied, and should serve as a warning against the continuance of this practice.

Radio securities have, in general, declined sharply since the spring season has set in. This does not, however, indicate the condition of affairs which can be expected this fall. Some of the stocks that have fallen off badly will be far stronger this winter than they were a few months ago, while others are hardly expected to be in business this fall. Therefore, each stock must be judged

upon the merits of the company, its personnel, and policies.

In view of the wide use by radio manufacturers of the Eby Ensign binding posts, it is interesting to note that the price of these binding posts has been recently reduced from twenty cents to fifteen cents each.

Radio manufacturers have been greatly surprised at the recent price increase of Zenith radio receiving sets, at a time when most everyone else is ready to sell at any price in order to move the stock on hand. Already several manufacturers have unloaded equipment, chiefly through the department stores, and cut-rate dealers are being called in to make bids on left over parts which were produced in excess of actual requirements of their sales departments. It is hard to tell now what action will be taken by the manufacturers in getting rid of surplus materials and parts. There is very little to be gained by withholding these items. Possibly set building will be stimulated by the availability of good parts at exceedingly low prices.

The McGraw-Hill Company has now published the third number of their new jobber-dealer magazine, *Radio Retailing*.
(Concluded on page 216)

Manufacturers and Designers

Reference Data on

Rheostats, Resistances, Potentiometers

The data presented have been carefully compiled with the assistance of the manufacturers represented. By removing these pages from the magazine you will have a complete reference file on audio, radio, and super-heterodyne transformers. Next month this section will be devoted to fixed and variable condensers.

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Its construction prevents excess current reaching elements of the tubes and causes a small electric bulb to light as a warning of a short circuit.

The Kant-Blo signal is easily installed requiring no technical knowledge. The switch type is a plain pull "A" battery with the signal bulb into it and replaces the original battery switch on the set. List Price \$1.89



Binding Post Style

The binding post style is a binding post with the signal bulb into it and encloses the "B" battery binding post on the set. Only one of either type is necessary, can be used on any set regardless of the number of tubes.

Made of polished brass finely nickel plated. This style designed especially for sets without switches, or for use who does not care to replace a switch on a set. List Price \$1.09



Automatic Engraved Binding Posts

A very high grade and efficient binding post—nicely engraved with usual battery markings for 3 & 6 B, positive and negative, ground, aerial, or ground—specific markings desired.

With inserted thru the hole of the post to hold firmly by spring pressure and released by merely pressing the button like an ordinary electric bell push-button.

Moulded bakelite base is mounted on highly slotted shoulder post threaded and with retainer nut.

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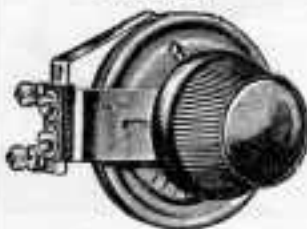
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Fits Standard Condensers

and accurate, and is not affected by atmospheric conditions, wear or jarring. Every FIL-KO-LEAK is guaranteed to be perfect electrically and mechanically, and to be accurately calibrated over the operating range for all tubes (A to E lengths). This calibration is doubly checked.

FIL-KO-LEAKS are specified for the West SYSTEM OF SIGNAL AUGMENTATION by the inventor, FRANCIS R. HOYT. We have a limited number of star printed copies of Mr. Hoyt's original laboratory notes on this new system together with nine circuit sketches, which will be sent free on receipt of four cent postage.

NEW and IMPROVED

FIL-KO-STAT \$2.00

SCIENTIFICALLY CORRECT RADIO RHEOSTAT

with Butterfly Switch

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Turn your tube filament with FIL-KO-Stat and receive stations you never heard before. Get greater distance, louder signals, sharper tuning, freedom from tube noise. FIL-KO-Stat is the only element that permits adjustment over the entire operating range of all tubes and enables you to get maximum audibility in phone or loud speaker. And now the improved model is fitted with factory switch that attaches to the regular mounting screws. Distinct signals "on" and "off" and enables you to

break circuit without changing FIL-KO-Stat adjustment. FIL-KO-Stat fits any type tube in any rack-up. Unconditionally guaranteed.

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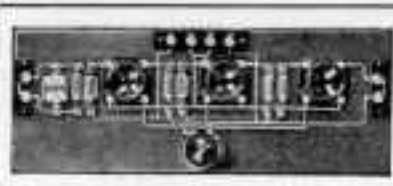
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Stop distortion and increase volume in your audio frequency amplifier. By utilizing a FIL-KO-Resistor across the secondary of each transformer. For resistance needed amplification, use FIL-KO-Resistor. It provides for a variable resistance ratio. Each one is individually calibrated in ohms and can be read through a star-printed hole. Every component with instructions for hand-set or transformer mounting. Unconditionally guaranteed.

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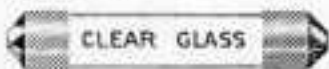
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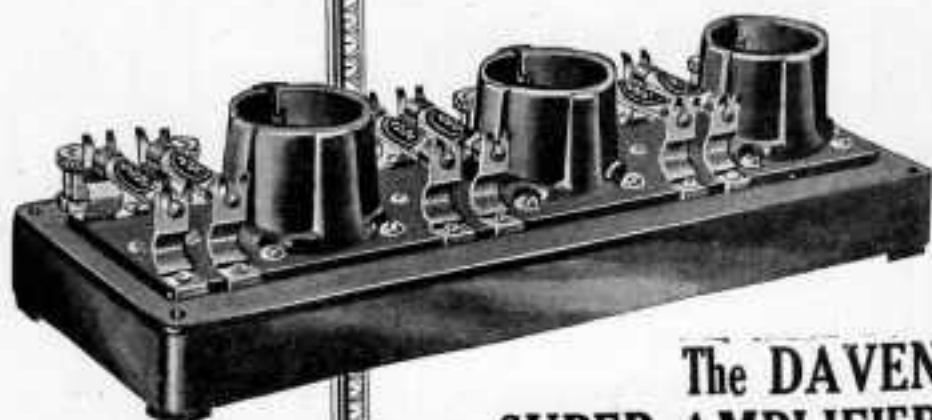
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Note: Dimensions are given in the order: Height, Width, and Depth behind panel unless the device is circular. s.c.—set screw; k—knob; K, P—knob and pointer; K, D—knob and dial; Resistances is given in ohms.

RHEOSTATS AND VARIABLE RESISTANCES

Manufacturer	Over-all size	Diam. of shaft knob fastened by	Diam. and height of knob	Maximum resistance	Resistance material	Method of adjustment	List price
Adams-Morgan Co., Inc.	2 1/2" diam. x 1"	1/4" molded	K, P, 1 1/2" x 3/4"	6, 15, 30	Graphite	Revolving arm	\$1.50
Allen-Bradley Co.	5/8 x 1 1/2 x 1 1/4"	1/4" molded	K, 1 1/2" x 1 1/4"	10,000-100,000 25,000-250,000 50,000-500,000	Graphite	Compression	1.85 2.00
Amsco Products Co.	2 1/4" diam. x 3/4"	1/4" special	Special	2, 4, 6, 8, 10, 14 15, 20, 30, 40, 50, 60 0-20, 0-30, 0-20, 20 15-30, 30-30	Advance	Revolving arm	
"	2 1/4" diam. x 1"	Special double element type	Special	0, 8, 30, 60	Advance	Revolving arm	
F. A. D. Andrews	2 1/4" diam. x 2 1/4"	3/4" S, S.	K, P, 1 1/2" x 3/4"	3, 6, 10, 20, 25, 30	Ideal	Revolving arm	1.75
Cartier Radio Co.	2 1/4" x 2 1/4" x 3/4"	3/4" S, S.	K, P, 1 1/2" x 1"	0-2,000, 0-50,000	Advance	Revolving element	2.00
Central Radio Laboratory	2 1/4" diam. x 5/8"	1/4" S, S.	K, D, 2 1/4" x 1"	6, 10, 20, 30	Advance	Revolving arm	1.25
"	"	"	K, 1 1/2" x 3/4"	0-100,000, 0-200,000	Graphite	Revolving arm	2.00
Consolidated Instrument Co.	3" diam. x 1 1/2"	1/4" S, S.	K, 1 1/2" x 3/4"	2	Advance	Revolving arm	1.25
"	"	"	"	6, 10, 20, 30	Advance	Revolving arm	1.00
Cutler-Hammer Mfg. Co.	2 1/2" x 2 1/4" x 3/4"	1/4" thread	K, 1 1/2" x 1"	4-6 variable	Revolving element	Revolving element	1.00
"	2 1/2" x 2 1/4" x 1 1/4"	"	K, 1 1/2" x 1"	Standard	Nickrome	Revolving arm	1.00
De Jure Products Co.	2" diam. x 1"	1/4" S, S.	K, P, 2 1/2" x 1"	6, 10, 20, 30	"	"	1.00
Electrad, Inc.	1 1/2" x 2 1/4" x 3/4"	3/4" S, S.	K, 1 1/2" x 3/4"	4 1/2, 6, 15, 25, 40	"	"	1.10
Electrical Research Labs	2" diam. x 3/4"	1/4" S, S.	K, P, 1 1/2" x 1 1/4"	6, 2	"	"	1.40
Federal Tel. & Tel. Co.	2 1/4" diam. x 3/4"	1/4" S, S.	K, P, 1 1/2" x 3/4"	1.5, 24	"	"	1.50
"	"	"	"	40	"	"	1.00
"	"	"	"	17, 6	"	"	1.70
General Instrument Co.	2 1/4" diam. x 1 1/4"	1/4" molded	K, D, 2 1/4" x 1 1/4"	0	"	"	1.25
General Radio Co.	1 1/2" diam. x 1 1/4"	1/4" S, S.	K, P, 1 1/2" x 3/4"	20, 50	"	"	1.50
"	3" diam. x 1 1/4"	1/4" S, S.	K, P, 1 1/2" x 3/4"	10, 30	"	"	1.55
Howard Radio Co., Inc.	2 1/4" diam. x 5/8"	1/4" threaded	K, P, 1 1/2" x 3/4"	2, 7, 20, 50	"	"	2.25
"	"	1/4" threaded	K, D, 2 1/4" x 3/4"	6 1/2, 25, 40, 60	Advance	"	1.25
Kellogg Sw't & Supply Co.	3 1/2" x 2 1/4" x 3/4"	1/4" foreed	K, P, 1 1/2" x 1 1/4"	6, 25	Advance	Revolving element	1.50
Klossner Radio Corp.	2" diam. x 3/4"	1/4" or 1/8" S, S.	K, D, 2" x 1 1/4"	6, 10, 20, 30	Ideal, advance	Revolving arm	1.25
Marshall Electric Co.	3/4" diam. x 1 1/4"	— molded	K, 1 1/2" x 3/4"	2, 10, 350 100	Nickrome	Compression	1.50

RHEOSTATS AND VARIABLE RESISTANCES—Continued

Manufacturer	Over all size	Diam. of shaft knob fastened by	Diam. and height of knob	Maximum resistance	Resistor material	Method of adjustment	List price
Metro Electric Mfg. Co.	1 1/2" diam. x 1 1/2"	1/4" molded	K. 1 1/2" x 3/4"	6, 30	.....	Compression	\$0.90
Pascent Electric Co.	2 1/2" diam. x 1 1/2"	1/4" molded	K. special	2 1/2, 6, 10, 20, 30, 50	.....	Revolving arm	1.00
Polymet Mfg. Co.	2 1/2" diam. x 3/8"	1/4" 8, 8,	K. 1 1/2" x 3/4"	30, 60, 200	.....	Revolving arm	.....
Premier Electric Co.	2 1/2" x 2 1/2" x 3/8"	1/4" 8, 8,	K. 1 1/2" x 3/4"	Special	Nichrome	Revolving arm	2.50
Sterling Mfg. Co.	1 1/2" diam. x 1"	1/4" 8, 8,	K. 1 1/2" x 1"	5, 15	.....	Revolving arm	2.00
				30, 50	.....		2.25

POTENTIOMETERS

Manufacturer	Over all size	Diam. of shaft knob fastened by	Diam. and height of knob	Maximum resistance	Resistor material	Method of adjustment	List price
Adams Morgan Co.	2 1/2" diam. x 1"	1/4" molded	K. P. 1 1/2" x 3/4"	300	.....	Revolving arm	\$1.75
Allen-Bradley Co.	1 1/2" x 1 1/2" x 1 1/2"	1/4" molded	K. 1 1/2" x 1 1/2"	200	.....	Compression	2.00
				400	.....		3.00
Amisco Products, Inc.	2 1/2" diam. x 3/8"	1/4" special	Special	250, 400	Nichrome	Revolving arm	.....
F. A. D. Andron	2 1/2" diam. x 3/8"	1/4" threaded	K. P. 1 1/2" x 3/4"	200, 400	Chrome	Revolving arm	2.00
Carter Radio Co.	2 1/2" x 2 1/2" x 3/8"	1/4" 8, 8,	K. P. 1 1/2" x 1"	200, 400	Nichrome	Revolving arm	2.25
			K. D. 2 1/2" x 1"	.....	.....	.....	.....
			K. 1 1/2" x 3/4"	400	Graphite	.....	1.50
				2,000	.....	.....	1.75
Consolidated Instrument Co.	3" diam. x 1 1/2"	1/4" 8, 8,	K. 1 1/2" x 3/4"	200, 400	Advance	.....	1.75
Cutler-Hammer Mfg. Co.	2 1/2" x 2 1/2" x 1 1/2"	1/4" thread	K. 1 1/2" x 3/4"	300	.....	Revolving element	1.50
De-Jar Products Co.	2" diam. x 1"	1/4" 8, 8,	K. P. 2" x 1"	Standard	Nichrome	Revolving arm	.....
Electrad, Inc.	1 5/8" x 2 1/2" x 3/8"	1/4" 8, 8,	K. 1 1/2" x 3/4"	200, 400	.....	.....	1.50
Electrical Research Labs.	2" diam. x 1 1/2"	1/4" 8, 8,	K. 1 1/2" x 1 1/2"	200	.....	.....	1.25
				400	.....	.....	1.40
Federal Tel. & Tel. Co.	2 1/2" diam. x 3/8"	1/4" 8, 8,	K. P. 1 1/2" x 1 1/2"	240	.....	.....	1.50
				480	.....	.....	1.70
				1,825	.....	.....	2.20
General Instrument Co.	2 1/2" diam. x 1 1/2"	1/4" special	K. D. 2 1/2" x 1 1/2"	500	.....	.....	1.50
General Radio Co.	1 5/8" diam. x 1 1/2"	1/4" 8, 8,	K. P. 1 1/2" x 3/4"	200	.....	.....	1.75
			K. P. 1 1/2" x 3/4"	200	.....	.....	1.25
			K. P. 1 1/2" x 3/4"	400	.....	.....	3.00
Howard Radio Co.	2 1/2" diam. x 3/8"	1/4" thread	K. P. 1 1/2" x 3/8"	200	Advance	.....	1.50
				400	.....	.....	2.00
Klossner Radio Corp.	2 1/2" diam. x 3/8"	1/4" 8, 8,	K. D. 2" x 1 1/2"	350	Nichrome	.....	1.50
			K. 1 1/2" x 3/4"	350	.....	.....	1.15
Pascent Electric Co.	2 1/2" diam. x 1"	1/4" thread	K. special	200, 400	.....	.....	1.25
Polymet Mfg. Corp.	2 1/2" diam. x 3/8"	1/4" 8, 8,	K. 1 1/2" x 3/4"	200, 400, 2,000	.....	.....	2.50
Premier Electric Co.	2 1/2" diam. x 3/8"	1/4" 8, 8,	K. 1 1/2" x 3/4"	200, 400, 500	Nichrome	2.50
Sterling Mfg. Co.	1 1/2" diam. x 1"	1/4" 8, 8,	K. 1 1/2" x 1"	400	2.75



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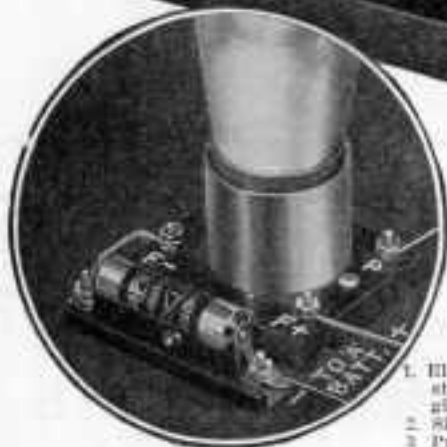
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4. No moving parts—therefore no grinding noises.
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AMPERITE takes the place of a good hand rheostat, a delicate meter and an expert operator. Operating on the thermo-electric principle, AMPERITE automatically changes its resistance as the "A" battery voltage changes. Mounts conveniently inside the set. No knobs to turn. Nothing to get out of order. Approved by every prominent laboratory. Standard equipment in such sets as Somerset, Ultradyn, Marshall, Phanstiel, Kilbourne & Clark, Ambassador, Cockaday, Penn-C, and numerous others. Fully guaranteed.

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10 ohms and 20 ohms
Price \$1.25
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CICO BAKELITE JACK



No. 30-Single circuit open. \$1.50
No. 31-Single circuit closed. .85
No. 32-Double circuit. .90
No. 33-"A" Battery Switch. .90

The Final Quality Touch to a Carefully Built Set

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The man who takes pride in what's behind the panel uses CICO Bakelite Jacks whether he builds sets for other people or only for himself.

Adding little to any set's cost, CICO Bakelite Jacks add much to beauty of workmanship and efficiency of reception. Moulded of pure bakelite, they are handsome. Having wide spaced, nickel-plated phosphor bronze springs and requiring no soldering, they are leak proof. Their sterling silver contacts are not affected by corrosion. They do not develop inefficiency from age and acid like ordinary jacks. CICO Switches match CICO Jacks.

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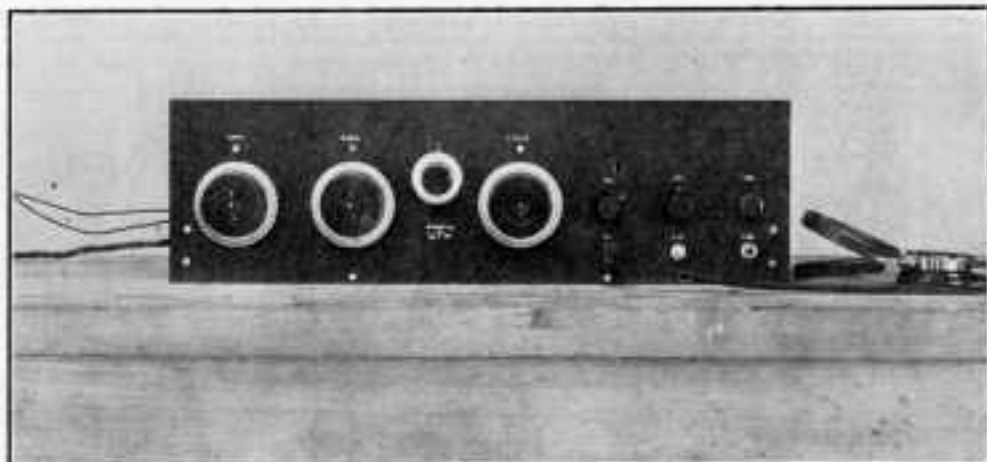


Fig. 1. A front view of the Nameless Receiver, showing the arrangement of the controls on the front panel

Bremer-Tully Nameless Receiver

Complete construction data on what has now become one of the most popular of the five-tube tuned R. F. receivers.

SOME time ago, when the Bremer-Tully Company had completed the development work on a new receiving set, they offered prizes for the best names with which to christen the outfit. In the meantime, it was referred to as the Nameless Receiver. So quickly did the set builders take up this type of circuit that it was widely known as the Nameless set before there was time to select the prize winning name. Therefore, it was finally decided to pick out the best names and award the prizes in accordance with the announcements which had been made, but the Nameless name stuck to the receiver.

The special features of the Nameless original design were the use of Circuit Bremer-Tully low-loss coils and condensers. These coils were the first to be wound on skeleton tubes, altho this design has been widely copied. Rather than to introduce fixed losses to prevent the receiver from oscillating, the Nameless circuit was designed for an adjustable absorption system. Referring to the wiring diagram in Figs. 3

and 4, you will see that the secondary of the second tuning unit and the primary of the third unit are coupled to small coils in series with a variable and a fixed condenser. Theoretically, when the variable condenser is at minimum capacity, the absorption is at minimum and regenerative action takes place. As the capacity is increased, however, the capacity reactance is reduced and a greater amount of energy is absorbed from the grid and plate circuits of the second R. F. tube. The 0.001 mfd. Micadon does not affect the actual operation of the absorption circuit but prevents the connection of the plate voltage to the filament in case the variable condenser plates become short circuited.

In this circuit, then, are all the advantages of tuned R. F. amplification, plus controlled regeneration by means of which the set can be regulated to a point just under oscillation where the full regenerative effect is obtained. This is more efficient and much more satisfactory than a set in which the losses are not adjustable and are made high enough to

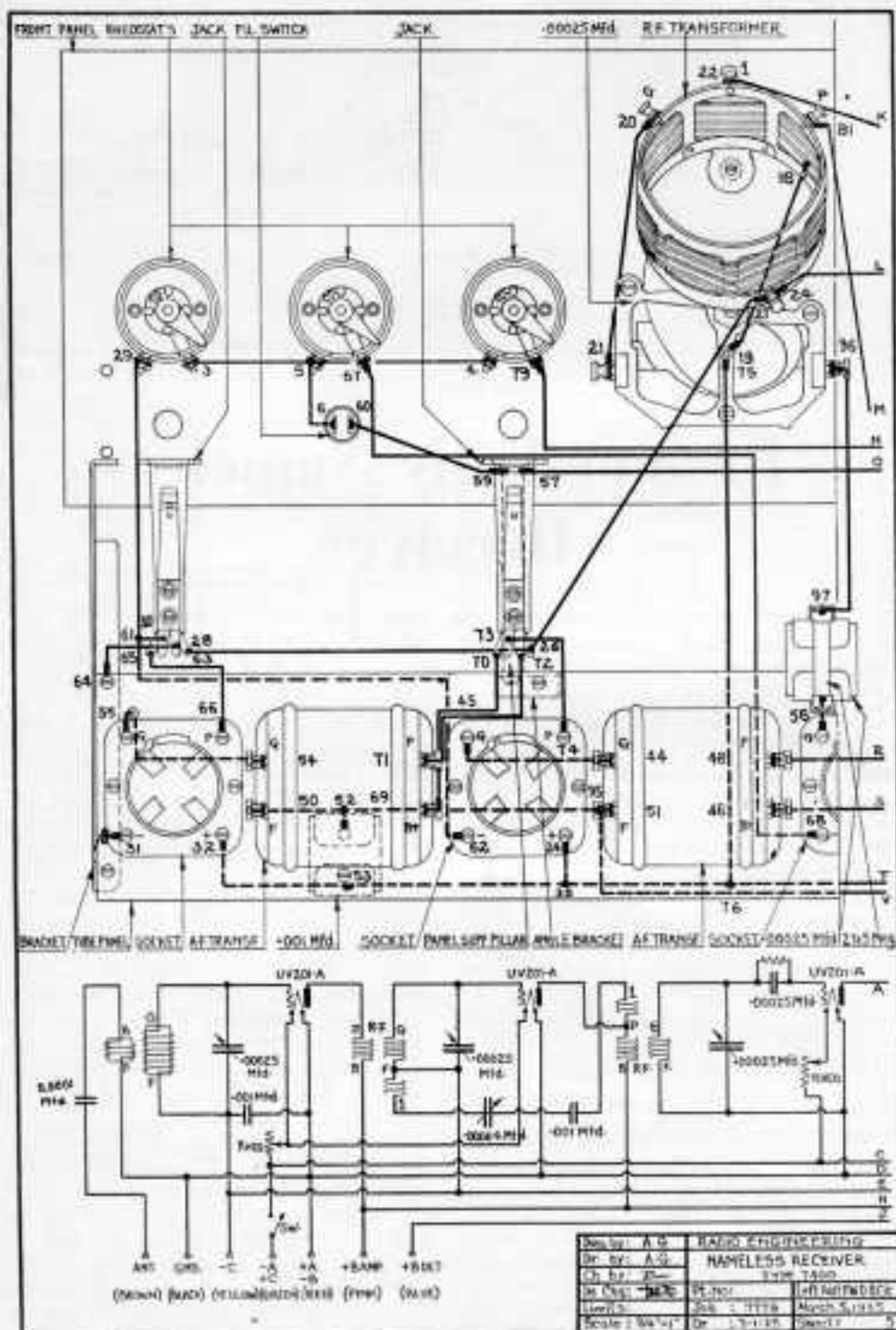


Fig. 3. Left hand half of the schematic and picture wiring diagrams

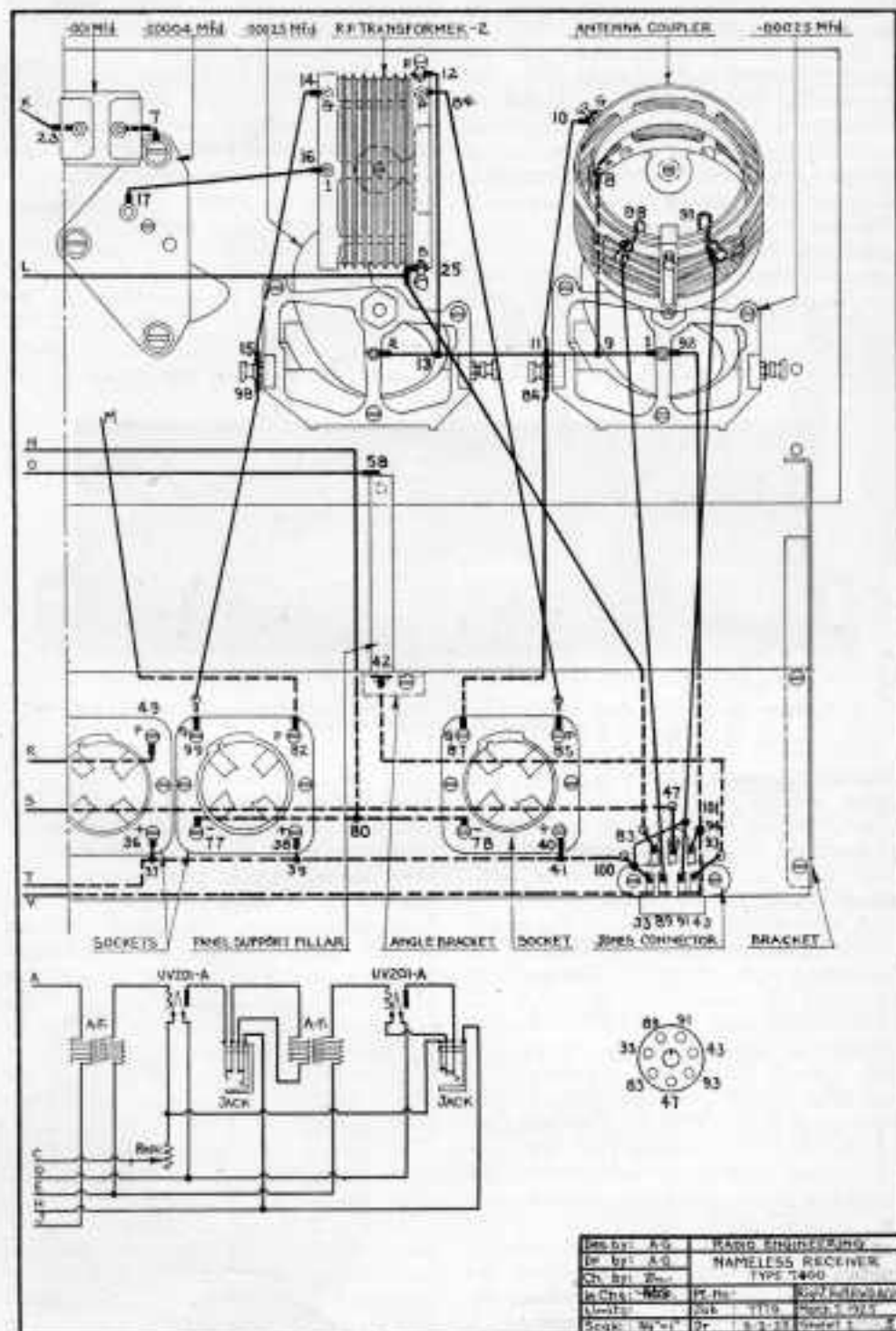


Fig. 4. Right hand half. Connections are shown as they were made on the original set

keep the set from oscillating over the entire wavelength range.

In this set we have carried out the general plan of the standard Nameless receiver but we have tried, in addition, to introduce a number of interesting features among the parts and in the general design. You will notice, for example, that the front panel is only 24 ins. long. This has been made possible by the special arrangement of the parts. Instead of mounting the coils on the tube panel they are fastened to the rear of the front panel so that all the room on the tube panel could be used for the sockets and transformers. By using the Benjamin

impossible to insert it except when the pins are properly lined up to make the connections as they should be.

Karas transformers were chosen for this outfit because of their popularity among set builders who are willing to pay a little more to get better reproduction. It should be noted that these transformers are not designed primarily for high amplification but to provide as near a perfect amplification curve as possible over the range of audio frequencies. However, a well designed five-tube set generally puts about as much into the last tube as the UV201A's can handle, making the form of the curve of far

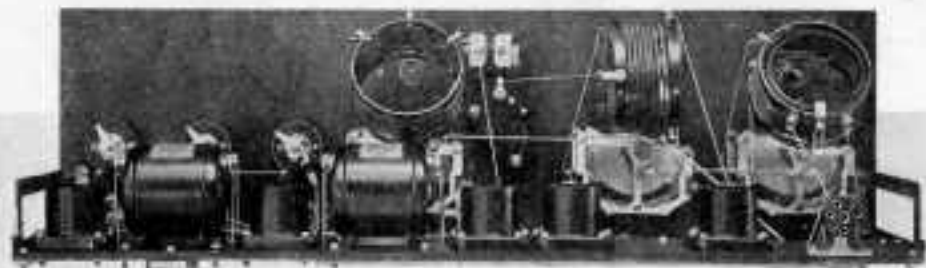


Fig. 2. Altho the variable condensers are in the fields of the end coils, they are so far away that they do not introduce losses.

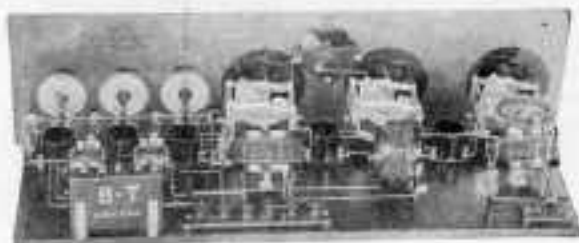
brackets we were able to hold the tube panel well to the rear from the front panel, thereby cutting down the amount of material for the tube panel by 50%. Two panel support posts provide additional bracing at the center.

A very great reduction in the length of the leads was obtained by lining up the sockets and transformers. This not only increases the efficiency but makes the construction work far simpler. Another feature of this set which, we predict, will become increasingly popular, is the use of the Jones connection plug. It can be seen in Figs. 2 and 6. The jack part of the device is mounted on the tube panel, and all leads brought to it. The plug has seven pins from which a cable is brought off to the batteries. The antenna and ground wires, that you will notice in Fig. 1, are separate from the cable so as to prevent any feedback action which might cause howling. A clever arrangement on the plug makes it

more importance than the degree of amplification obtained.

The Buell sockets deserve a moment's thought. With all the effort that has been put into socket and contact design, particularly on those employing the side-wise arrangement, the Buell provides perfect connection in a surprisingly simple method. The socket springs are in the form of straight narrow strips, cut off at a slight angle on the end. When the tube is inserted and turned for locking, the ends of the springs ride on the sides of the contact pins, making a firm self cleaning contact and at the same time holding the tube securely so that there is no danger of its turning back. The shell is of solid bakelite.

Referring to the diagrams in Figs. 3 and 4 you will see that the circuit is made up of two stages of tuned radio frequency amplification, a detector, and two stages of audio amplification. The two jacks permit plugging in at the first



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B-T 3 Circuit Tuner



B-T Low-Loss Condenser



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Before building your next set it will pay you to read “Better Tuning,” a 48 page booklet of hook-ups and helps to set constructors. At your dealers or by mail on receipt of 10 cents.

Bremer-Tully Mfg. Co.

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stage or the second stage. Normally, the last A. F. tube is not lighted when the lock switch is turned on. Plugging in at the second jack, however, closes the filament circuit of the last tube. The left hand rheostat regulates the filament of the R. F. tubes, the center one the detector, and the right hand rheostat the A. F. amplifier tubes.

Standard Parts Required Formica or any of the other makes of Bakelite panels are suitable for this set. Radion can be used also since the panels are well supported and are not required to carry any unusual strain. The front panel measures 7 by 24 by 3/16-in. and the base panel 3 1/2 by 23 by 3/16-in.

The Bremer-Tully kit provides the three 0.00025 variable condensers, the 3-plate control condenser, and the three inductance units. These are the key items of the set.

In addition, there are required five Buell sockets, a Carter single circuit filament control jack and a double circuit jack, a 2-megohm gridleak of Pudlin or Daven design, one 0.00025 and two 0.001 mfd. Micadons, three 25-ohm Howard rheostats, a Jones multi-plug and battery cable for the connections, two Karas Harmonik transformers, a 2-in. Accuratone dial for the control condenser, Walbert filament lock switch, and three Walbert Univermier controls with silver dials. The Univermier controls are particularly well adapted for this set because, as will be explained later, the dial can be fastened securely to the front panel by means of the threaded bushing which also holds the variable condenser.

For hardware and supplies there are three lengths of No. 7 Mitchell-Rand tubing, six coil mounting pillars, two panel support pillars, a pair of Benjamin panel support brackets, two nicked angle brackets, and the usual assortment of screws and nuts.

The wiring is done with Wirit, the new round tinned conductor, as it is so much easier to handle than the heavy square bus bar. Since Wirit comes on spools, it is advisable to straighten it. To do this, fasten one end of the wire to a pipe or other stationary object, un-

wind about fifteen feet, and pull the spool until the wire stretches about 18 ins. That will take out every trace of kinks or bends. Then cut the wire into 2-ft. lengths.

Drilling the Panels Drawings for the panels are not given, partly because they require so much space and partly because many set builders want to change the arrangement in small details. However, the type 7400 set of blue prints gives the panel patterns in full sizes. The easiest way to take off the dimensions is to glue the blue prints to the panel and then mark through the blue prints with a Starrett automatic center punch. With the automatic punch the work can be done much more accurately than with the ordinary punch and hammer. For those who do not want to drill their own panels, the panels already drilled and engraved are available.

Suggestions for Assembling Get all the parts ready and the panels completely drilled before you start putting the parts together. Then follow through the step-by-step instructions, guiding yourself by the picture wiring diagram in Figs. 3 and 4. These drawings were made up from the original receiver and the step-by-step instructions prepared in the most convenient order for putting the parts together so that you will not run into inaccessible corners where it is impossible to solder the joints without taking apart things that have already been put together.

Find out exactly how the lugs should point and tighten them on the terminals before each part is put in place. The Stevens Spintite wrenches for round and hexagonal nuts are invaluable in this work.

Use all possible care in making the soldered joints. For this purpose, Kestor rosin core solder or soft solder and Nokorode paste, applied sparingly, is recommended. To prevent the paste or rosin from getting on the panels, put a little piece of newspaper under each terminal while it is being soldered, and remove any excess as soon as the joint is made.

(Concluded in the May issue)

DONGAN

Radio Voltmeters Necessary for Efficient Radio Reception



Type P
List Prices
0-7 volts.. \$1.25
0-50 volts.. 1.50
0-100 volts.. 1.50



Type A
0-7 volts.. \$1.50
0-50 volts.. 1.50
0-100 volts.. 1.75



Type N
0-7 volts.. \$1.75
0-50 volts.. 1.75
0-100 volts.. 2.00



Type F
0-7 volts.. \$1.00
0-50 volts.. 1.50
0-100 volts.. 1.75

Set Manufacturers and fans now realize that efficient radio performance depends on correct tube and B Battery Voltage. Only in that way can you enjoy good radio all the time.

Dongan Voltmeters will keep an accurate check on your set operation. Accuracy over the entire range of scale, definite readings that can be relied upon feature Dongan Voltmeters—designed and manufactured by a company who has specialized for 15 years in the production of high-grade electrical instruments.

Dongan High-Resistance Voltmeters possess sufficient ohms per volt to insure efficient operation and are ruggedly built to give years of service.

Manufacturers' prices quoted on request.

Type P
Black enamel finish; 2 holes in flange for panel mounting; 2" diameter.

Type N
Handsome nickel rim, with black bezel clamp style mounting.

Type A
Black enamel finish; clamp style mounting.

Type F
(Portable)
Black enamel finish, with flexible leads for testing.

Dongan Quality Audio Transformers
are built in ratios, 2-1, 3½-1, 6-1

DONGAN ELECTRIC MANUFACTURING CO.
2995 Franklin St., Detroit, Mich.

Transformers of Merit for 15 years.

(Continued from page 196)

front panel with a $\frac{1}{2}$ -in. 6-32 R. H. screw. About $\frac{1}{4}$ -in. of this screw will have to be clipped off before inserting it.

6. Connect 11, the Plate terminal of the left hand jack, looking at the set from the rear, to 12. This wire runs from the jack down through the hole in the tube panel, and then to 12. Connect 13, the +B Bat terminal of the jack, to 14, the screw under the B output binding post. Connect 15, on the amplifier rheostat, to 16. Connect 17, on the detector rheostat, to 18, the - terminal of the detector socket. Connect 19, on the R. F. amplifier rheostat, to 20, on the R. F. socket. Cover this wire with varnished tubing and run it along the front edge of the tube panel. Connect 21, a terminal of the lock switch, to 22. Cover this wire with varnished tubing where it runs across the tube panel. Connect 23, a point on this wire, to 24, the lug under the mounting bracket of condenser C_{11} . Cover this wire with varnished tubing. This connects the filament return on the R. F. amplifier to the battery side of the filament switch instead of the rheostat side as shown in the schematic wiring diagram. This method is preferred by some as a precaution against possible faulty contacts in the battery switch. Connect 25, the B Tran. terminal of the detector jack, to 26. Cover this wire with varnished tubing and run it up through the hole in the tube panel. Connect 27, the P Tran. terminal of the jack, to 28. Connect 29, the +B terminal of the jack, to 30, the B+ Det binding post of the amplifier. Cover this wire with varnished tubing. Connect 31, the plate terminal, to 32, the upper tickler terminal of the regenerator. This wire also runs up through a hole in the tube panel, and should be covered with varnished tubing where it crosses other wires or terminals. Connect 33 to 34. Thirty-three is the A+ binding post of the amplifier and 34 is the + terminal of the detector socket. Solder wire 3 to 4 to the lugs at 35 and 36. Connect 37, the lug under the G terminal of the R. F. socket, to 38, the A_1 terminal of the antenna coil. Connect 39, the lug on top of this G terminal to 40, the stator terminal of the

condenser. Connect 41, the GND terminal of the antenna coil, to 42, a lug under the rear end plate screw of the condenser.

Connect 43, the B+ terminal of the regenerator, to 44. Connect 45, the P terminal, to 46. Connect 47, the F terminal, to 48, a lug under the rear end plate screw of the condenser. Connect 49, the clip on the grid condenser, to 50, the stator terminal of the condenser, and to 51, the G terminal of the regenerator. Connect 52, the P terminal of the detector socket, to 53, the remaining tickler coil terminal.

This completes the wiring of the set.

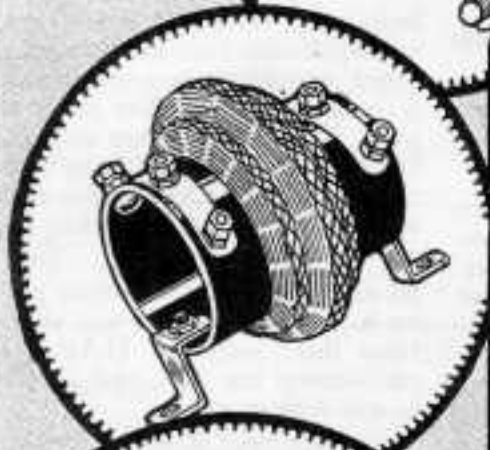
Testing and Installation The antenna and ground connections are made directly to the Eby binding posts on the antenna coil. The battery connections are made to the binding posts on the A. F. amplifier unit. The two binding posts marked Input P and B should have these markings removed. The post formerly marked P now becomes the +90V terminal, and the one formerly marked B is now the DET+ terminal. These markings are shown correctly in the picture wiring diagram. The markings for the rest of the binding posts remain as they are.

Connect a 6-volt storage A battery to the A+ and A- binding posts. Insert the tubes and turn the key in the lock switch to the right. When the rheostats are turned up, the tubes should light. If everything seems all right, connect 90 volts of B battery across the B- and 90V+ binding post, and bring off a 45-volt tap to the DET+ binding post. Connect either the 135 or 150-volt tap to the +150V. binding post. Light the filaments and plug the phones or loud speaker first into the detector jack and then into the last stage jack. A strong click should be heard in both cases. One of the new Belden battery cables for the A and B batteries, will be found very convenient for connecting up. Although 150 volts are commonly specified, 120 to 135 volts are sufficient.

Connect the antenna and ground and set the tickler coil at right angles to the main winding. Revolve the left hand condenser slowly while the other is turned back and forth.



RASLA



AT a recent test, made in the heart of New York City, broadcasters in Chicago, Atlanta and Canada were brought in on the RASLA Circuit for Three Tubes in the early evening. All the locals were going. Receiving conditions were not favorable. And yet all stations were heard with a loud speaker!

Doesn't that convince you about RASLA leadership? Surely, you, too, would like to duplicate such results. You can do it with the RASLA Circuit for Three Tubes.

The RASLA Circuit for Three Tubes incorporates tuned radio frequency. And it is easy to build.

Go to your dealer today and ask for full size layout diagrams of the various RASLA circuits FREE. If he cannot supply you write us.



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222 Fulton St. N.Y.C.



Design

For the Man who
Builds the Best

Silver Circuit Designs are the choice of everyone who demands first of all—the *extreme limit* in electrical and mechanical efficiency. Eminent radio engineers give their highest approval to Silver Circuit Designs. The leading radio journals sponsor them. And set builders everywhere are establishing long distance records with receivers built according to these circuits—are obtaining the maximum number of loud-speaker miles per dollar of investment.

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The Silver Four-Tube Receiver, Price 25¢
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Contains description and illustration of
all Silver Circuits. IT'S FREE.

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1081 So. Wabash Ave., CHICAGO

It's the Loud Speaker Miles that Count



SET BUILDER'S BOOK

Success Insurance for Radio Men

EVERY design in the Radio Set Builder's Book has been thoroughly tried and tested, for the designs in this book have been chosen from the best sets described in Radio Engineering Magazine.

Outfits with one, two, and four tubes are shown, including reflex, straight radio frequency, and regenerative models. Photographs, scale drawings, and picture wiring diagrams. The price of this book is fifty cents, or you can get it free with a year's subscription to RADIO ENGINEERING.

MORE MONEY?

*A Dollar and a Half an Hour
for You*

CAN you do radio installation and maintenance work? If so, have yourself officially registered in the I and M Registry in Radio Engineering, so that set owners in your town will know that you are doing this work.

¶ It costs only two dollars to have your name, address, and telephone number listed in the Registry for a whole year—less than what you are paid for a single job. Send in this data at once.



Hear the Formica
band every Wednesday
evening from 9
to 10 Central Stand-
ard Time over WLW

They have re-designed but they still use Formica!

THERE has been a great deal of activity in the engineering departments of the set makers since the first of the year—new models, new prices, newly simplified sets. Every conceivable substitute for Formica panels, tubes and insulating parts has been examined, tried and thoroughly tested.

But Formica is as prominent as ever in the sets that have been O.K.'d for production. For there is no substitute—nothing that combines the beauty and permanence of Formica, its strength, freedom from warping and distortion.

The makers know that Formica sets *never gives trouble!* And trouble is the most expensive thing the set maker can have. No small saving in material cost can make it worth while.

Last year 125 leading makers used Formica—this year the percentage will be just as high.

Dealers and jobbers prefer Formica because it is the best known and most easily sold line of panel materials.

Write for booklet, "What Formica Is."

THE FORMICA INSULATION COMPANY

4653 Spring Grove Ave., Cincinnati, Ohio

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8 South Clinton St.....Chicago, Ill.
134 Canton Bldg.....Cleveland, Ohio
1141 Cassette Bldg.....Hoboken, N. Y.
422 First Avenue.....Pittsburg, Pa.
1 Illinois Street.....Boston, Mass.
45 Calle Geary.....San Francisco, Calif.

200 Victoria St.....Toronto, Ontario, Canada
1028 Second Avenue.....Minneapolis, Minn.
128 Bellvue Bldg.....Philadelphia, Pa.
709 Title Building.....Baltimore, Md.
382 Mission Street.....San Francisco, Cal.
412 Ohio Building.....Cleveland, Ohio
244 Plymouth Bldg.....New Haven, Conn.
Waltney Central Bldg.....New Orleans, La.

Write for Booklet "What Formica Is"

- 1 Formica is used by 125 leading makers—and has for years been used by more makers than all other materials.
- 2 Formica will last forever.
- 3 Formica, by appearance, is the finest of all panel materials and always remains so.
- 4 Formica's electrical qualities of every kind far exceed any possible requirement.
- 5 Formica has high mechanical strength and will not break in use.
- 6 Formica will not run from heat or cold flow under pressure. It retains its dimensions. Everything you fasten to it stays tight and doesn't warp, you get it.
- 7 Formica panels are sold in neat, neat paper envelopes which assure you that you are getting the genuine.
- 8 Formica is one of the most widely approved materials in radio.

FORMICA

Made from Anhydrous Bakelite Resins

SHEETS TUBES RODS

STANDARD PARTS LIST

The materials used to make up the set described in this issue were supplied by the following companies. The manufacturers whose names appear below will be glad to send you bulletins describing other products which they make. Please mention RADIO ENGINEERING when you write them.

PARTS LIST, TYPE 7500, BROWNING-DRAKE RECEIVER

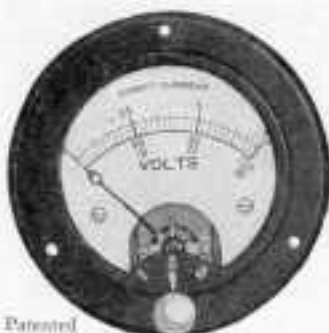
Type No.	Name	Price
	Benjamin Elec. Co., 647 West Jackson Blvd., Chicago, Ill.	
8645	1-Benjamin UV-201A Socket	1.00
8646	1-Benjamin UV-195 Socket	1.00
	Brooklyn Metal Stamping Co., 718 Atlantic Ave., B'klyn, N. Y.	
TJ	2-Tri-jacks	2.50
	Daven Radio Co., 9 Campbell St., Newark, N. J.	
SA	1-Daven Super-Amplifier	15.00
G	1-2½ Megohm Daven Grid-leak	.50
	Diamond State Fibre Co., 423 Broome St., New York City.	
P	1-Black Celoron Panel, 7 x 28 x 3/16 in.	4.59
P	1-Black Celoron Panel, 3½ x 23 x 3/16 in.	1.97
	Dubilier Condenser & Radio Corp., 48 W. 4th St., New York City.	
601	1-.0001 Micadon	.35
	H. H. Eby Mfg. Co., 40 So. 7th St., Philadelphia, Pa.	
E	3-Ensign Binding Posts, plain top	.45
	General Instrument Co., 423 Broome St., New York City.	
	1-5-ohm Rheostat	1.50
	1-20-ohm Rheostat	1.50
	1-30-ohm Rheostat	1.50
	James Goldmark Co., 83 Warren St., New York City.	
W	1-100 ft. spool of Wirit	.90
	Mitchell-Rand Mfg. Co., 18 Vesey St., New York, N. Y.	
MR	2-Lengths No. 7 special varnished tubing	.30
	Metro Elec. Mfg. Co., 121 Prince St., New York, N. Y.	
S	1-Metro Keelok Switch	.75
	The National Co., Inc., Cambridge, Mass.	
B-D	1-Complete Regenaformer Kit	22.00
	The New York Coil Co., 338 Pearl St., New York, N. Y.	
B.P.	1-0.001 mfd. New York Coil fixed condenser	.40
	1-0.00025 mfd. New York Coil gridleak condenser	.45
MISCELLANEOUS PARTS		
58	3-Pkgs. of 25 soldering lugs	.60
185	1-Angle bracket	.10
14	10-Coil mounting pillars	.80
62	1-Pkg. of 10, ½-in. 6-32 F. H. nickeled screws	.15
63	3-Pkg. of 10, ½-in. 6-32 R. H. nickeled screws	.36
6	1-Pkg. of 10, ¼-in. 6-32 R. H. nickeled screws	.14
143	1-Pkg. of 10, 1¼-in. 6-32 R. H. nickeled screws	.18
49	3-Pkg. of 10, 6-32 nickeled nuts	.24

COMPLETE SET OF PARTS \$59.13

PARTS LIST, TYPE 7400, BREMER-TULLY NAMELESS RECEIVER

Type No.	Name	Price
	Benjamin Elec. Mfg. Co., 827 West Jackson Blvd., Chicago, Ill.	
8629	1-Set mounting brackets	1.70
	Bremer-Tully Mfg. Co., 532 So. Canal St., Chicago, Ill.	
	1-Nameless kit	26.50
	Buell Mfg. Co., Cottage Grove Ave., Chicago, Ill.	
	5-Flawelling sockets	3.75
	Carter Radio Co., 209 So. State St., Chicago, Ill.	
103	1-Single circuit F. C. Jack	.90
104	1-Double circuit jack	3.00
	Daven Radio Corp., 9 Campbell St., Newark, N. J.	
	1-2-megohm Daven resistor	.50
	Diamond State Fibre Co., 423 Broome St., New York	
F.P.	1-7 by 24 by 3/16-in. Black Celoron panel	3.94
B.P.	1-3½ by 23 by 3/16-in. Black Celoron panel	1.97
	Dubilier Condenser & Radio Corp., 48 West 4th St., New York	
601G	1-0.00025 mfd. Micadon	.45
601	2-0.001 mfd. Micadon	.80
	James Goldmark Co., 83 Warren St., New York	
W	1-100 ft. spool Wirit	.90
	Howard Mfg. Co., 4248 N. Western Ave., Chicago, Ill.	
	3-25-ohm Howard rheostats	3.30
	Howard B. Jones Co., 608 So. Canal St., Chicago, Ill.	
	1-Jones Multi-Plug battery cable	5.00
	Karas Elec. Co., 19 So. LaSalle St., Chicago, Ill.	
	2-Karas Harmonik Transformers	14.00
	Mitchell-Rand Mfg. Co., 18 Vesey St., New York	
7	3-Lengths No. 7 varnished tubing	.45
	Mydar Radio Co., 9 Campbell St., Newark, N. J.	
R	1-Accurate rheostat dial	.75
	Walbert Mfg. Co., 925 Wrightwood Ave., Chicago, Ill.	
F	1-Filament lock switch	.50
O	3-Universer dials, black and silver	3.75
MISCELLANEOUS PARTS		
58	3-Pkgs. 25 soldering lugs	.60
185	2-Nickeled angle brackets	.20
14	6-Coil mounting pillars	.48
62	2-Panel support pillars	.60
63	1-Pkg. 10, ½-in. 6-32 F. H. nickeled screws	.12
6	1-Pkg. 10, 1-in. F. H. nickeled screws	.14
63	4-Pkgs. 10, ½-in. 6-32 R. H. nickeled screws	.48
6	3-Pkgs. 10, ¼-in. 6-32 R. H. nickeled screws	.42
49	6-Pkgs. 10 6-32 nickeled nuts	.72

COMPLETE SET OF PARTS \$72.68



Patented

PATTERN NO. 55
THREE READING
VOLTMETER

Your Batteries

Patent has just been granted to us, covering the self-contained multiple switch in our No. 55 radio voltmeter.

We take pleasure in offering this instrument to radio set owners for testing their batteries. Weak batteries cause 60% of all radio troubles.

SEND FOR OUR
15-A RADIO CATALOG

Order from Dealer

Jewell Electrical Instrument Co.

1650 Walnut St. - - Chicago



Nationalize

your radio receiving. Bring in DX stations clear and strong. Get your hook-ups in tune with the last word in progress. Do what the best minds in radio are doing. Use

NATIONAL RADIO TRANSFORMERS

The Dreadnaught The transformer for musical critics. Amplifies perfectly over the whole scale without distortion. A bigger and better transformer in every way. Finished in battleship gray.

The National Giving satisfaction in thousands of sets. Leading manufacturers of high-class radio equipment are using this model in their sets. Small in size, great in efficiency.

The U-Type Stripped of the case, the National U-Type Transformer is built for service. Construction the same as the Dreadnaught, with the needed extra weight in the core. Fine for mounting under panels and in enclosed sets.

The Cruiser Radio Frequency. Special split winding; designed especially for use in reflex circuits. Covers entire wave band, 200-600 meters, without distortion.

National Transformers are Fully Guaranteed.
Write for full information.

NATIONAL TRANSFORMER MFG. CO.,

Manufacturers of Transformers of all types
Dept. K, 154 Whiting St., Chicago

Gets DX— SLOW MOTION Tuning



REMEMBER how the "slow-motion" picture helped you see details that were unnoticed in the usual running?

In a similar way the "slow-motion" (24-to-1 ratio) of the new UNIVERNIER, helps you find dozens of stations that are missed if "searching" is done with the usual coarse adjustment (as you are compelled to do with many so-called vernier dials which merely duplicate the action of the obsolete warmer condensers.)

With its continuous "slow motion," the UNIVERNIER first finds the station you want—then cleans it up. That's why it's such a record-breaker for locating those hard-to-get distant stations and bringing them in so easily, quickly, clear and loud. Promise yourself a real surprise—replace your dial with UNIVERNIER'S tonight! At your dealer's or send postpaid on receipt of purchase price. (Please mention dealer's name.)

Mahogany Knob and Gold-plated dial . . . \$1.50

Black Knob and Silver-plated dial . . . \$1.25

Jobbers and Dealers: Write for Discounts

WALBERT MFG. CO.

81 Wrightwood Ave., Chicago, Ill.



**WALBERT
UNIVERNIER**
Micro-Selective Tuning Control

(Continued from page 189)
any guess work as it was logged.

WAAN	Newark, N. J.
WOAX	Trenton, N. J.
WTAX	Chicago, Ill.
WAHG	Long Island.
WTAS	Elgin, Ill.
WHN	New York.
WHAZ	Troy, N. Y.
WMBF	Florida.
WOR	Newark, N. J.
WJZ	New York City.
WOS	Jefferson City, Mo.
WEEL	Boston, Mass.
WEAF	New York City.
WOO	Philadelphia, Pa.
WCX	Detroit, Mich.
WNYC	New York City.
WWJ	Detroit, Mich.
WCBD	Zion, Ill.
WBZ	Springfield.
KDKA	Pittsburgh, Pa.
WFBH	New York City.
WCAE	Pittsburgh, Pa.
WSB	Atlanta, Ga.
WDAF	Kansas City, Mo.
WCPO	Minneapolis, Minn.
2XE	L. I., N. Y.
9XAZ	Iowa City, Iowa.

These stations represent a wide band of wavelengths from 250 meters to 528. They came in without distortion, nor was it necessary to make any changes in the settings of the controls to prevent squealing. The only controls used were the two variable condensers.

(Continued from page 202)

This publication should have a very helpful effect in the radio business for its editorial policy is conservative. At the same time, the articles are exceedingly well written, helpful, and interesting. Another commendable feature is the noticeable lack of obvious trade puffs.

The John O. Jesse Manufacturing Company, of Bryan, Ohio, is producing a very attractive console table for radio sets. This is a stock model altho they manufacture many other types on special order. This table, finished in dark brown hand-rubbed mahogany, has a center drawer and compartments on each side for batteries or current tap devices. The opening is at the rear so that the wiring is kept at the back of the table.

KESTER Radio SOLDER



Oh boy! it sure is
Safe & Simple

Here's the solder that contains the best recommended for radio engineers! The zinc resin core inside of Kester Radio Solder is a natural flux and can leave no harmful chemical or electrical residue on delicate parts or joints. It resists air heat.

In developing radio frequency, it was found that all tubes, except rods, sockets, tubes and run over delicate parts and joints. This causes leakage and makes the best insulation as near as a grid leak.

Solder with Kester Radio Solder. You will have no need to an iron and wire away surface flux. Leave what you can remove — it is a good insulator!

There you Save It! Kester Radio Solder is a safe and simple solder with which your set can be quickly, easily, safely and substantially soldered. Get a handy tin of Kester from your dealer.

CHICAGO SOLDER COMPANY
4224 Wrightwood Ave.
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WIRIT

James Goldmark Company

Speed Up Production

by using WIRIT for your sets. By actual time comparisons, you will find that assemblers can work faster and more neatly than with any kind of conductor.

WIRIT is No. 18 tinned copper wire, drawn to a temper which makes it stiff enough to hold its shape, tho it can be stretched sufficiently to take out the kinks.

WIRIT, moreover, is much less expensive than other conductors, saving both in material and labor.

WIRIT, per 100 ft. spool, . . . \$.90

*Special Prices in Quantity to
Manufacturers*

James Goldmark Company
83-A Warren St., New York City.

*Tautflex, for leads, Littendracht, Silk
and cotton covered magnet wire.*



Don't take chances!

LOCK

your set!



A BATTERY SWITCH

Plus!

1. **Easily installed** — One hole required.
2. **Convenient** — Negative line from filament inserted through outer battery switch.
3. **Maintenance** — Positive wiring resistant, won't wear out.
4. **Structural** — Made of brass, 4 x 4 key-handle included.
5. **Sturdy, simple** — Can't get out of order.

HERE'S a remarkable battery switch! Not only does it give sturdy, silent and efficient filament control — it locks your set, too!

There's no chance for anyone meddling with your set — running down your batteries or burning out your tubes — when the key to the Walbert LOCK-SWITCH is in your pocket. Your set is locked and off!

Play safe! Put a Walbert LOCK-SWITCH (the original locking battery switch) on your set tonight. It costs no more than a plain battery switch! At your dealer or sent postpaid on receipt of purchase price.

Walbert LOCK-SWITCH Silver plated 50c

Gold plated 65c

Extra key with key ring attachment 20c

Jobbers and Dealers; Write for discounts.

WALBERT MANUFACTURING CO.

931 Wrightwood Ave.
Chicago, U. S. A.

WALBERT LOCK SWITCH

Radio at its Finest

Now Within Your Reach



Factory-Mounted—
Ready to Wire

You buy ALL-AMAX SENIOR with all the parts properly mounted on panel and baseboard. Wire it in one delightful evening. Price \$42

ALL-AMAX JUNIOR (1 tube). Price \$22

WIN an ALL-AMAX Set
by submitting a SLOGAN

Ask at Your Favorite
Radio Store



Do you see the opportunity?

An expert can wire the Senior in an hour or so—no time lost picking out the parts, gluing them, etc. When finished you have a high grade set with one stage tuned c. f., one stage reflexed c. f., crystal detector and two stages of audio, all ready to slip into any stock 7 x 14-inch cabinet. And it's a beauty—in looks and in performance!

There is a new Radio Key Book with a new Super hook-up that will give you a surprise! Best for 10 cents, coin or stamps.

All-American Radio Corp.

E. N. Baulstrof, President

2682 Coyne St. - - Chicago, Ill.



KURZ-KASCH Aristocrat DIALS and KNOBS

THE line is complete. Your set may be completely fitted with matched dials and knobs. See the beautiful, dependable, simplified Kurz-Kasch Aristocrat models. Picture your receiver dressed up—made doubly attractive and much easier to operate—then choose controls that you know are good—Kurz-Kasch Aristocrat Dials and Knobs.

Genuine Kurz-Kasch products bear the following trademark on the back of each part.
Accept no substitutes.

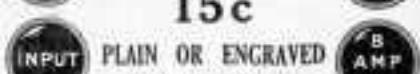
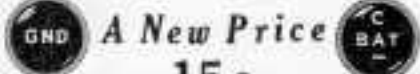
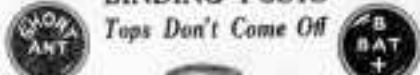


THE KURZ-KASCH CO.
DAYTON, OHIO



E B Y
BINDING POSTS

Tops Don't Come Off



**A New Price
15c**

PLAIN OR ENGRAVED
IN 25 MARKINGS

THE *Summit* TOROIDAL

is the World's Best Tuned Radio Frequency Transformer, acknowledged by leading engineers as the last word in transformer development. Positively self neutralized and well balanced, having no stray fields, leakages or feed backs. The Summit Toroidal Transformers will not howl or squeal, result—superior quality reception.

Transformers are individually tested for grounds, short circuits, coupling, ratio and resonance before leaving the factory and balanced within one per cent. (1%)

In genuine Bakelite housings—mated sets of three—\$18.00.

Distributors and Jobbers Wanted

SUMMIT RADIO MFG.
CO., Inc.
481 Broad Street
Dept. 46
Newark, N. J.

RADIO FREQUENCY TRANSFORMER



Pat. applied for.

An unfailing power supply for both circuits



U. S. Patent May 22, 1929
Balkite Battery Charger.
Charges 6 cell "A" storage
batteries.

Price \$19.50
West of Rockies \$20



Balkite "B"—replaces "B"
batteries and dry cells. Oper-
ates from light socket.

Price \$55

Here at last is an unfailing power supply for your radio set. Balkite Radio Power Units furnish constant uniform voltage to both "A" and "B" circuits and give your set greater clarity, power and distance. The Balkite Battery Charger keeps your "A" storage battery charged. Balkite "B" replaces "B" batteries entirely and furnishes plate current from the light socket. Both are based on the same principle, are entirely noiseless, and are guaranteed to give satisfaction. Sold by leading radio dealers everywhere.

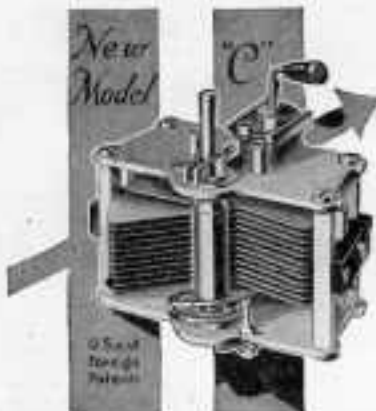
FANSTEEL
Balkite *Radio*
Power Units

BALKITE BATTERY CHARGER—BALKITE "B" PLATE CURRENT SUPPLY

Manufactured by FANSTEEL PRODUCTS COMPANY, Inc., North Chicago, Illinois

For Better Radio Hammarlund PRECISION CONDENSER

Copyright March 17, 1933



THE more you know about the technical requirements of radio, the more you appreciate the technical refinements of the Hammarlund New Model "C" Condenser.

It is an instrument of laboratory precision sold at a popular price by the better radio dealers. All capacities; plain and vernier.

Use Hammarlund Condensers in the receiver you build. Look for Hammarlund Condensers in the receiver you buy.

HAMMARLUND MANUFACTURING CO.

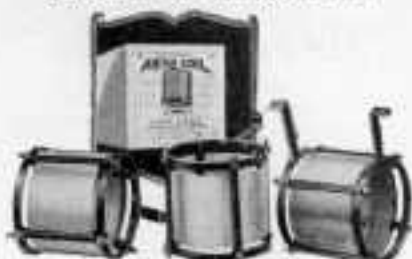
424-438 West 33rd Street, New York

9 points of superiority

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| <p>1—Bridged brass plates, chemically treated against corrosion; perfect alignment.</p> <p>2—Bridges plates specially shaped for easy tuning of low waves.</p> <p>3—Adjustable ball-bearing rotor shaft, grounded through metal end-plate.</p> <p>4—Bridged glass-spring (steel), with automatic stop.</p> | <p>5—Minimum dielectric losses; very small to be measured.</p> <p>6—Rigid, vacuum cast construction; cannot warp.</p> <p>7—Microscope can-vernier moves all plates; back or lever contact; no backlash.</p> <p>8—Tubes any size dial.</p> <p>9—The product of 14 years' experience, making precision instruments.</p> |
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The Most Efficient Inductance System For Tuned R. F.



The results obtained from tuned R. F. circuits incorporating Henninger Aero Cols. cannot otherwise be equalled. The facts include:

- 95% air dielectric and absence of dope or vitreous dielectric resistance losses.
- Proper air spacing between turns minimizes capacitor losses.
- Large wire (No. 22 D. C. D.) minimizes circuit resistance.
- Wide air spacing of primary and proper separation between primary and secondary gives full transfer of energy.

RESULTING IN:

Extreme sensitivity; high amplification of even low frequencies and such sensitivity as was never thought possible with the circuits of tuned R. F. Manufacturers! Look into our proposition. Fans! You will find complete satisfaction and will be amazed at the results obtainable from this inductance system and by loading dials and jokers, or direct.

Set of three Aero Cols. \$16.25. Single coil \$3.50.

HENNINGER RADIO CO.

1772-74 Wilson Ave.

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Best for Reflex

and Crystal Sets
FRESHMAN
Double Adjustable
Crystal Detector



No more searching for the sensitive spot—simply turn the knob as you would a dial.

For ease of panel mount—**\$1.50**
Inc. complete with Freshman Super Crystal.....

At your dealer's, otherwise send purchase order and you will be shipped postpaid.
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ENGRAVING-MACHINING

"POSTER'S Perfect Panels" is more than a sheet. It is a recognizing fact. The POSTER plant is the largest organization in the country devoted exclusively to the machining and engraving of radio panels for manufacturers and the better dealers. What the POSTER plant has learned from years of actual specialization it places at your disposal. Write us!

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BMS Fantail Jacks

The easiest soldering jacks made!

B. M. S. JACKS have the exclusive cupped fantail lugs, which make soldering easy. The jacks are made of solid brass, while the springs are of phosphor bronze.

Manufactured by

**Brooklyn Metal Stamping Corp.,
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who also make B. M. S. TRI-COIL, (\$2) TRI-JACK, (90c), and TRI-PLUG (75c).



204 DOUBLE CIRCUIT CLOSED



Made in 9
styles. At all
good dealers.



Type BM

Jones MULTI-PLUG

THE STANDARD SET CONNECTOR

As essential to the radio as the cord and socket to the electric iron! Neat and simple to install, it provides a plug-in connection between set and batteries, ground and antenna. One pull on the Jones Multi-Plug and the antenna, ground A and B batteries are instantly disconnected from the set. One push re-connects and **IT CAN'T BE PLUGGED IN WRONG**. The eight-foot cable permits placing batteries in basement or other suitable place.

Used by leading set manufacturers, including

**HOWARD, WORKRITE, ZENITH, MU-RAD
PFANSTIEHL and APEX**

MANUFACTURED AND GUARANTEED BY

HOWARD B. JONES

614-18 South Canal Street

CHICAGO

SAVE YOUR SET!



METRO KEELOK SWITCH

You lock your automobile when you leave it. Don't your radios set forgetting of the same way?

The KEELOK SWITCH protects your set from people (particularly children) who are not familiar with radio and who can cause irreparable damage to your tubes and battery. The KEELOK utilizes the advantage of the popular push-pull switch with absolute safety. You have and depend "on-off" when you use such switch. List, The

Manufacturers also of the well known Metro Solderless Jacks (single and double) and Metro Rheostats. We specialize in supplying the needs of set manufacturers.

Notes: Dealers are carried by the latter dealer. If not in stock write us direct.

METRO ELECTRIC MFG. CO.
121 Prince St. New York City



Experienced Radio Engineers



— seeking adequate safeguards for radio sets— invariably specify the famous

Brach Vacuum Lightning Arresters

and other Brach Radio products— devices that meet with approval by National Board of Fire Underwriters.

L. S. BRACH MFG. CO.
Newark, N. J.

For 20 years leaders in the field of electrical protective devices.



Brach-Stat

RADIO TUBES



All Types \$2.00 Each
Fully Guaranteed

All tubes tested on laboratory Radio tube testing machine.

Mail Orders Promptly Filled
We Ship C. O. D.

Style 0100 36 Amp. 1-4 Volts—Amplifier—Detector
Style 0201A 1/2 Amp. 2-8 Volts—Amplifier—Detector
Style 012 25 Amp. 1 1/2 Volts—Amplifier—Detector
Style 0200A 1/2 Amp. 1-4 Volts—Detector

Dealers—Write for Our Quantity Prices

RADIO TUBE MFG. CO.
154 Nassau St. Dept. 55 New York City

Browning-Drake Blueprints

Type 6600, for 201-A tubes, six full-size sheets, postpaid—\$1.50. Type 7000, for UV199 tubes, five full-size sheets, postpaid—\$1.25. Type 7500, with 3-step Doven resistance coupled amplifier, using one UV-199 and four UV201-A's, five full-size sheets, postpaid—\$1.25.

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M. B. SLEEPER, Inc.

4-22 Vanderbilt Ave., New York City

SCREW ASSORTMENTS for set builders and manufacturers

No. 6782



FREE
Cabinet
No. 6742
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to
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users
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ECLIPSE
screws

Send for Bulletin No. 67
HENRY FRANK JR, INC
374 Hudson St., New York City.

Will You Work With Us?

HOW would you like to build and equip a first-class radio laboratory—built with a sound-proof testing room containing every facility for experimenting, a drafting room for working out mechanical and design details, and a machine shop for making anything from a thumb screw to a receiving or transmitting set?

Now, because radio laboratories are very expensive to build and equip, it isn't possible for each radio man to have a place of his own. The next thing to it, then, is to have the benefit of such a laboratory, as well as to share in putting it up and equipping it.

Here's the scheme—If you will help me, I'm going to put up, near the present Darien Laboratory, which we have outgrown, a new building, specially constructed to house a laboratory more complete than most commercial laboratories are—a place where we can do original development and experimental work to give you more interesting articles about sets and instruments that you can build and test out. For the more advanced radio men we shall have facilities for making special tests and helping out in many ways that you may need to call upon us.

Most interesting of all, perhaps, will be the series of articles on the actual erection and fitting out of the laboratory, illustrated with photographs which will show the complete story from the bare ground to the finished building, how the equipment, measuring and testing instruments, and machinery are set up—all described with such detail that you can use the articles as a guide in fitting up your own laboratory.

The cost of the laboratory will be \$25,000. You can take part in the work in this way:

Every new subscription, renewal, or extension to RADIO ENGINEERING addressed to Our Laboratory Fund will be entered in the usual way, and the magazine sent out each month, but the two dollars will be set aside for the Laboratory Fund. Therefore, we need 12,500 new subscriptions or extensions to build the laboratory. That's why I am asking you to send in as many new subscriptions as you can possibly get, or to extend your subscription for as many years as you will, so as to make up the 12,500.

The plans for the building are already under way, the actual construction will start on April 15th. The first of the series of articles which will show the work being done for you, and by your help, will be in the May issue.

Checks or money orders should be made payable to M. B. Sleeper, Inc., and sent to

OUR LABORATORY FUND

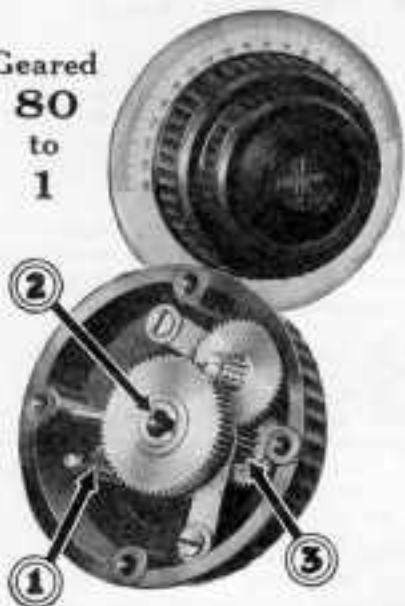
M. B. SLEEPER, INC.

A-52 Vanderbilt Ave.,

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Absolutely Essential for Sensitive Sets

Geared
80
to
1



ACCURATUNE FEATURES

1. **No back lash.** A new principle takes up all lost motion and back lash and produces a very smooth operating instrument.
2. **Long center bushing** eliminates all dial scabble and takes all standard condenser shafts. Permits dial mounting flush with panel. No cutting of condenser shafts.
3. **Gear Mesh and alignment** perfected to the same degree of accuracy as the mechanism of a watch. Ratio 80:1.

You can change from ordinary dials to Accuratune Micrometer Controls in an instant, no set alterations necessary. More efficient than built-in verniers—a revelation in fine tuning. At your dealers. Otherwise send purchase price (\$3.50) and you will be supplied postpaid.

Write for descriptive circular.

MYDAR RADIO COMPANY

9 E. Campbell St., Newark, N. J.

Canadian Representatives: Radio Ltd., Montreal
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86, London, E. C. 2

ACCURATUNE
MICROMETER CONTROLS



POWER

When it comes to making a loudspeaker deliver the goods, there's nothing like a pair of AmerTrans. Built to operate by the pair, they secure from two stages all you could possibly hope for in audio amplification.

Look for a pair of AmerTrans in the set you buy—use them in the sets you build. Learn just what the famous AmerTran "kick" means—and then get a loudspeaker to take it.

AmerTran is made in two types, ones quality—A F 6—ratio 5:1 and A F 7—ratio 3 1/2:1.

Buy them by the Pair!
Price wither model—\$7.00
at your dealer's.

Send for Blue print and circuit sketches, showing the use of AmerTrans in the new Howl System of Signal Amplification—enclose only 4 cents for postage.

**AMERICAN
TRANSFORMER
COMPANY**

Newark, New Jersey

"Transformer builders for over
twenty-four years"

AMERTRAN

Balloon Tires for Your Tubes

Delicately adjusted springs, at the base of a Benjamin Cle-Ra-Tone Socket, do the same for the radio tube that balloon tires do for the automobile—absorb jars and shocks.

Outside rattling traffic, inside instataps, mechanical and human activities amazingly vibrate floors of buildings—as finely adjusted scientific instruments have proved. This comparatively small shaking of the tube develops a very perceptible noise in the filament, and very often breaks this hair-like wire when it is cold.

Benjamin Cle-Ra-Tone Sockets "float" above their base and so escape this ever-present trembling. More sensitive experiments are thus possible and clearest, faint signals come in such clarity. Still bus wiring does not affect the flexibility of Cle-Ra-Tone Sockets. They are adaptable to every hookup and especially desirable in portable sets. No rubber parts to deteriorate. Bakelite is used wherever possible to insure sturdiness and long life. Contact points for tube terminals are perfect and permanent. Terminal lugs for soldering.



Made in two sizes: standard base, and a base for tubes similar in terminals to the UV-199

BENJAMIN CLE-RA-TONE SOCKET CLEARER RADIO TONE

Spring Suspended—Shock Absorbing—Accepted by leading manufacturers and radio engineers

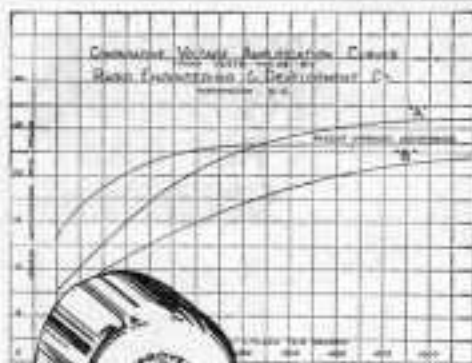
Mounted also in cases or Bakelite shell, with sliding parts and space for sockets. Benjamin Shift Brackets, Battery Switch and Grid Lock Panel simplify radio receiving set construction. Ask for descriptive folder.

Benjamin Electric Mfg. Company

120-128 S. Sangamon St., Chicago, Ill.

247 W. 17th Street, New York

448 Bryant Street, San Francisco



Comparative voltage amplification curves made by the Radio Engineering and Development Company of Washington, D. C.

Study this chart

The flawlessly clear tones and the lack of distortion that distinguish the Pacent Improved Audiformer are explained by this fact:

It gives uniform high amplification over the entire musical range—vocal or instrumental. No distorted peaks.

All the better class dealers carry the Pacent Improved Audiformer.

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Washington Minneapolis Boston San Francisco
Chicago Birmingham Philadelphia St. Louis
Buffalo Jacksonville Detroit
Canadian Licensees:
R. H. White Radio Co., Hamilton, Ont.

Pacent RADIO ESSENTIALS

"DON'T IMPROVISE — PACENTIZE"

The Spark or the Orchestra?

BETWEEN the shrill noise of a sputtering spark and the rich full tones of an orchestra or a great singer's voice, there's a world of difference. Yet when phones were first made for radio, the spark was all there was to listen to. And many phones and phone units used today date back to the days of the spark.

N & K Imported Phones, Loudspeaker, and Phonograph Unit were designed especially to receive music, to bring out clearly and correctly all the beautiful shadings of tone, from delicate high notes to soft low ones.

Because of their clearness, distinctness and richness of tone N & K reproducers are unique in the radio field. They are sold on a money-back basis—your money refunded if N & K tone doesn't please you better than that of any other phone, loudspeaker or phonograph unit you have ever used. Ask your dealer to let you try them—at home—on your own set.



Reg. U. S. Pat. Off.
Imported

**PHONES LOUDSPEAKER
PHONOGRAPH UNIT**



**N & K IMPORTED
LOUDSPEAKER**

Its new grille sound chamber filters the sound and sends it out in all directions. Economical of space, artistic in design. Beautiful color schemes. \$27.50.

**N & K IMPORTED
PHONES**

400 ohms. Clear, natural, tone. Unusually comfortable. Shut out external noises. Built-in ear. Insulated head band. Diameter length of cord... \$8.25.



**N & K IMPORTED
PHONOGRAPH UNIT**

Attaches instantly to any standard phonograph, making a loudspeaker of clear, rich tone. \$7.75.

TH. GOLDSCHMIDT CORPORATION
Dept. K 15 William St. New York

So Inexpensive!

The New and Improved
**Read'em'
Binding Posts**

"The Knobs Cost Come Off."
18 Styles Engraved—A Post for Every Requirement

Improving
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The
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At Your Dealers or Sent Postpaid 15c Each
MARSHALL-GERKEN CO.
Toledo, Ohio

NOKORODE FOR EASY SOLDERING

Clean with file or emery cloth all four pointed sides of iron.

Heat soldering iron. Avoid pointed end of iron, coming in contact with flux.

Apply a little NOKORODE and some solder. While iron is still hot, rub with solder gently on all four sides until iron is bright.

Apply a little NOKORODE to both parts to be soldered.

Whenever possible hold hot soldering iron underneath parts to be soldered. When the solder is running freely take away soldering iron and let soldered parts get cold. NOKORODE is so thoroughly efficient that only a little is required for perfect results.

M. W. DUNTON CO.
PROVIDENCE, R. I.
U. S. A.

Perfectly soldered joints in the building of radio sets are a prime essential for best results. Perfect soldering the easy way has been achieved by amateur builders everywhere who have used NOKORODE, the Soldering Flux which is recommended by leading electricians and radioicians throughout the world.



DURRANT

IS HEADQUARTERS
FOR SET BUILDERS'
RADIO SUPPLIES

When you build radio sets use DURRANT Construction Kits. The designs are absolutely dependable, the assembly instructions easy to follow, and the parts are all the best products of well-known manufacturers of established reputation.

COTTON SUPER: Do you want long distance reception on a loop antenna? Do you want a set that, with only two controls, cuts thru local interference and reaches right out for DX, bringing them in strong and clear with a minimum of static interference? Then build the Cotton Super-Heterodyne. It is the ideal set for the inexperienced operator because it is so easy to tune. It is just the set for the music-lover who must have a set free from noises and howling.—The set for anyone who wants the best that radio can offer. All parts as listed in Radio Engineering, panels drilled and engraved.....\$30.00

B-D FIVE: If you want more volume than the B-D 201-A can give, and big volume free from distortion, then the Browning-Drake-Five is the set for you. It uses the standard B-D circuit with three-step Daven resistance-coupled amplifier. This is, by the way, the simplest of all the sets to build, as it requires only one-half as many connections as any other five tube set. This means that you can assemble it quickly, with full assurance that it will work right the first time you hook it up. Complete parts, including Daven amplifier unit, panels drilled and engraved, everything but the tubes and batteries. Full instructions furnished...\$59.90

B-D 199: The outstanding success of this season is the Browning-Drake receiver. With the sharpness of tuned R.F. and the sensitiveness of regeneration, it surpasses in results most seven and eight-tube sets. The Browning-Drake 199 operates about two months on a set of dry cells, because it uses four UV-199 or C-299 tubes. B batteries last indefinitely, making this outfit extremely economical. The receiving range on a loud speaker is almost unlimited. The B-D199 construction kit contains every item required to build the set, including panels drilled and engraved. Type 7000 B-D199 kit, complete.....\$54.90

B-D 201-A: The Browning-Drake 201-A set is the outfit for the man who wants to hear everything that's in the air. It is designed for one UV199 and three UV201-A tubes, working from a 6-volt storage battery. For sensitiveness, freedom from oscillations, ease of tuning, and attractiveness of appearance, the Browning-Drake is unsurpassed. Since the panels are drilled and engraved, the outfit can be assembled with the simplest tools. Build the Browning-Drake and you'll discover new things about radio sets. Type 6600 B-D 201-A kit, complete. \$59.50

DURRANT ALSO SERVES AS A SERVICE STATION AND SUPPLY HEADQUARTERS FOR:

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All parts carried in stock

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Sockets and Brackets

Daven Radio

All parts carried in stock

Goldmark

Wires for connections

Formica

Drilled and engraved panels

DURRANT RADIO, Ltd.

Sales Room open from 9.00 a.m. to 5.00 p.m. daily, including Saturday

652 Vanderbilt Avenue

New York City



EASTERN

WHATEVER the circuit you're building, EASTERN Pickle Bottle Coils will give better results. These coils, designed by M. B. Sleeper himself, are the very latest thing in low-loss construction. They completely outclass coils wound on tubes.

EASTERN Pickle Bottle Coils are made for the Roberts Circuit (\$8.50 set), the Superlyne (\$8.00 set) and for three circuit and tuned radio circuits. Write for the FREE hook-up sheet.

EASTERN COIL CORP.,
22 Warren St., (Dept. RE),
New York City

pickle bottle **COILS**



60 Ft.

"HERCULES"
Aerial
Mast

\$45 Freight
Prepaid

20 Ft. Mast \$10 or 40 Ft. Mast \$25. All steel construction. Each Mast complete with masthead pulley and galvanized steel guy wires.

Ideal for transmitting or receiving. Mail coupon for literature and large **FREE** technical blueprint.

BLUEPRINT FREE

S. W. Hall & Co., Dept. M-3
2548 E. 79th St., Cleveland, O.

Without cost or obligation to me please send literature and large **FREE** technical blueprint of the Hercules Aerial Mast.

Name

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Stasco
Vernier Dial
Eliminates
Tuning Difficulties

\$2.00 When you want to get stations, easily, quickly, clear and loud, call on a STASCO **VERNIER DIAL**.

You can pick your station from the radio program and turn to same instantly.

And it's not necessary to drill any holes to attach the STASCO **VERNIER DIAL** to the panel—no complicated adjustments. Fits all standard condenser shafts.

Ask your dealer to show you one. If he can't supply you, write us direct. It is guaranteed.

Some dial without Vernier \$1.10

Sheffield Trimming & Stamping Corp.
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Also manufacturers of Rheostats, Bezels, Potentiometers, Grid Leak Mountings, Battery Clips, etc.

I^a_dM REGISTRY

The men whose names are listed below are prepared to handle all emergency work, take care of batteries, and replace tubes. Their charge is \$1.50 per hour, not including travelling time except to unusual distances.

The charge for listing in this section is 50c. for one month, \$2.00 for six months, \$3.00 for twelve months, payable in advance. The * indicates that we have received letters from six set owners stating that the man after whose name the * appears has handled their I and M work satisfactorily.

A REGISTRY OF RADIO INSTALLATION and MAINTENANCE SERVICE MEN WHO INSTALL, MAINTAIN, and REPAIR RADIO EQUIPMENT

- Conn., South Norwalk—A. GHIRARDI*
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201 Devonshire St. Tel. Cong. 5156
- Mich., Detroit—R. J. McLEOD
7725 Kellogg Ave. Tel. Bal. 9525
- Mich., Detroit—J. E. JOHNSON
91 Gladstone Ave., Tel. Empire 8581J
- Mich., Detroit—WM. MILLIGAN
6545 Woodward Ave. Tel. Northway 5691W
- Minn., Minneapolis—GEO. A. BECKER
4709 Wentworth Ave. Tel. Locust 6291
- Mo., Kansas City—J. K. O'BRIEN
2116 Penn St. Tel. Okl. 9533
- Neb., Omaha—W. J. F. SACKRIEDE
2622 Jaynes St. Tel. Kenwood 5628
- N. J., East Rutherford—D. R. DOREMUS
116 Hackensack Street
- N. J., Trenton—F. C. SCOBAY
478 Stuyvesant Ave. Tel. Web. 7254
- N. Y., New York—APEX RADIO CO.
123 Liberty St. Tel. Rector 3176
- N. Y., New York—HERBERT MULLER
954 Lexington Ave. Tel. Rhldr. 3905
154 Nassau St. Book. 8040
- N. Y., New York—RONALD MAAR
470 W. 157 St. Tel. Wada. 9799
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- O., Keok—KLADAG RADIO LABS.*
Kline Bldg. Tel. 127
- Pa., Scranton—J. J. MAHON
730 Capouse Ave. Tel. Bry. 2944
- Tex., Fort Worth—C. L. FARRIS
500 Taylor St. Tel. Wor. 3927

Back Issues of Radio Engineering

If you have missed any issues of RADIO and MODEL ENGINEERING for this year, check over the following list and order those that you did not get so as to make your file complete.

January—Tuska Superdyne, 4-tube Monotrol, oscillating wavemeter. . . . 10c.

February—7-tube super-heterodyne set, Cockaday Receiver.

March-April—Portable tuned R. F. set using UV-199 tubes, Harkness circuit for Diode or crystal detector.

May—Improved Rada reflex, the most successful 1-tube receiver ever built, 100-meter Sodian receiver.

June—Sodian reflex set using UV-201—

A amplifier, the Bestone V-60, tuning filter for cutting out interference.

July—Resistance coupled amplifier, Tools for the radio model shop, Crystals that oscillate.

August—Construction of 4-tube No-Loss regenerative receiver, Description of the Buonton light four receiver, The R-A-R receiving circuit.

September—R-D-X maximum modulation 1-tube regenerative reflex receiver, Assembly of the Haynes tuner, Ware type T neutrodyne, Freshman Masterpiece receiver, Ultradyn type super-heterodyne receiver.

The price of these issues is 20 cents each. They will be sent promptly upon receipt of a check, money order, or stamps to cover the cost. Postage is prepaid.



There's PROOF!



YES—scientific laboratory **PROOF** of the kind of quality that had never been built into an audio transformer before the Karas Harmonik came into the field.

A Laboratory Curve, showing the amplification factor at each audio frequency within the audible range. The only "Eye Witness" of the marvelous musical quality that your ears

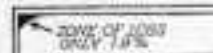
hear when you listen to radio reception amplified through Karas Harmonik Transformers. That is what the experts of Radio Engineering discovered when they were looking for a transformer to make the "Nameless"—the season's greatest circuit—even more popular than it had been before. Study this curve; Remember, low frequencies represent low notes. High frequencies represent high notes and the harmonics of middle tones. See the tremendous amplification at 100 frequency—the point where most transformers register no amplification whatever. Effective maximum is reached at 450 cycles. From there on it is uniform. None of the dropping off of vital harmonics and rich overtones common to ordinary transformers.

Here is performance equal to 98.1% of ideal perfection. Nothing like it was ever known before the Karas Harmonik was developed. Now you know **WHY** the speaker pours forth such beautiful, clear, rich, undistorted musical reception when Karas Harmoniks are used.

Never forget that the musical qualities of your set are determined first, last, and all the time by your audio transformers. Even if you are not going to build the "Nameless" set, there is no reason why you cannot have reception that is musically perfect. It is easy to install a pair of Karas Harmoniks in your old set. Why not do it? In case your dealer is not yet supplied, we will gladly send you a pair of transformers on receipt of the price, \$7.00 each.

KARAS ELECTRIC CO. Dept. RE 12, 404th N. Rockwell St. CHICAGO

Typical Transformer Curve compared with the Curve of the Karas Harmonik, and showing the "Curve of Loss" by comparison with the ideal standard. The curve that would mean 100% distortion. Black areas indicate areas of loss—no amplification.



E.g. 10% of the Karas Harmonik has 92.9% perfect amplification.

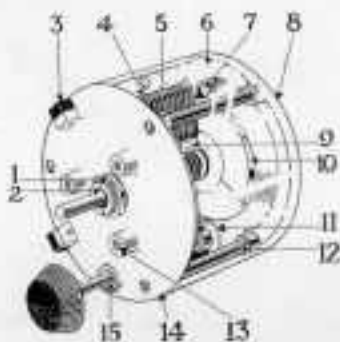


E.g. 10% of the average 45 transformer, 44.2% perfect.



The curve of the typical high radio transformer, showing the distortion low at low and high frequencies which results in only 20.2% complete amplification. This curve is also typical of most low priced transformers.

The ACME condenser has these advantages



All parts are of non-rusting metal, except steel bearing, which is covered with nickel-plated protective surface. End plate capacity is .000016 m.f., full capacity is .0205 m.f.

Price \$6.50

Distinctive Points

1. Steel to brass cone bearings adjustable.
2. Lock nut for bearing.
3. Highest grade hard rubber Dielectric in that part of the field to prevent losses.
4. Brass separator to which both rotary and stationary plates are soldered, making continuous circuit for each.
5. Brass silver plated plates; rotary plates logarithmic.
6. Dust proof covering.
7. Stops at extreme end of movements.
8. Coiled connections between shaft and heads allowing lubrication of bearings.
9. Brass separator in which both rotary and stationary plates are soldered, making continuous circuit for each.
10. Counterweight which balances rotary plates.
11. Noiseless friction Vernier control seven to one ratio.
12. Brass separators, to prevent twisting and to take strain off Dielectric.
13. Panel mounting holes for 120 degree spacing.
14. Metal heads.
15. Steel bushing to prevent wear on Vernier shaft.

Low loss, sharp tuning --- practically all currents on antenna can now be used

IT remained for Acme—manufacturers of the famous Acme transformers—to perfect the “lowest loss” Condenser. The Acme Engineers have been working for two years to bring out a condenser which would give to Radio Experimenters sharp tuning and minimum losses.

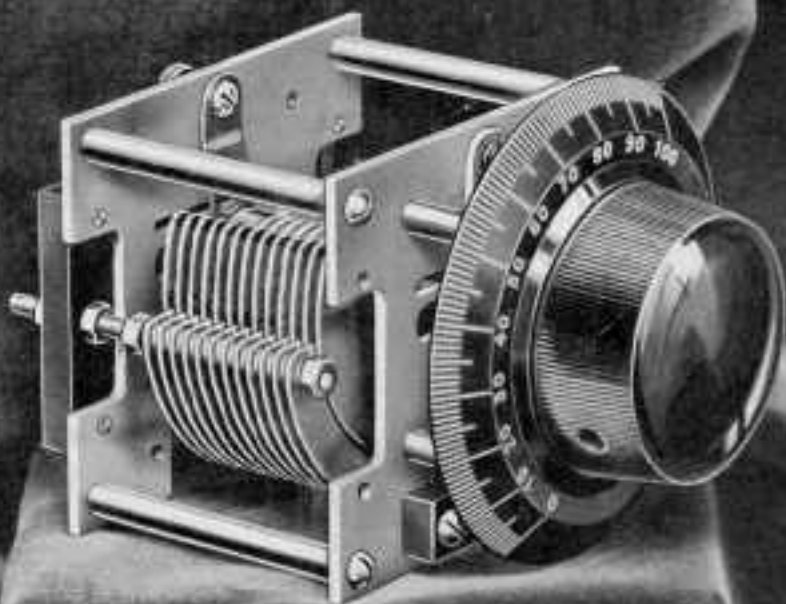
The new Acme Condenser has these fundamental advantages and also has many new improvements in structure and equipment. See the illustration with explanation, and, for more information, write to us for booklet—“Amplification without Distortion,” which contains many diagrams and helpful hints on how to build and get the most out of a set. Enclose 10 cents in stamps.

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ACME ~for amplification

NATIONAL

**VELVET CONDENSERS
VERNIER AND DIALS**



"As sweet as milk to my ears!" — Milton

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