RADIO Engineering

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

20¢

IN ENGLAND 1/-

Edited by

M.B.SLEEPER

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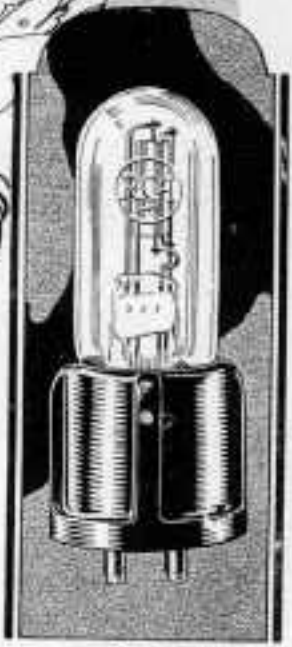

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RADIO ENGINEERING

Edited by M. B. SLEEPER
Associate Editor, Alfred A. Ghirardi

Fifth Year

Vol. V, No. 4

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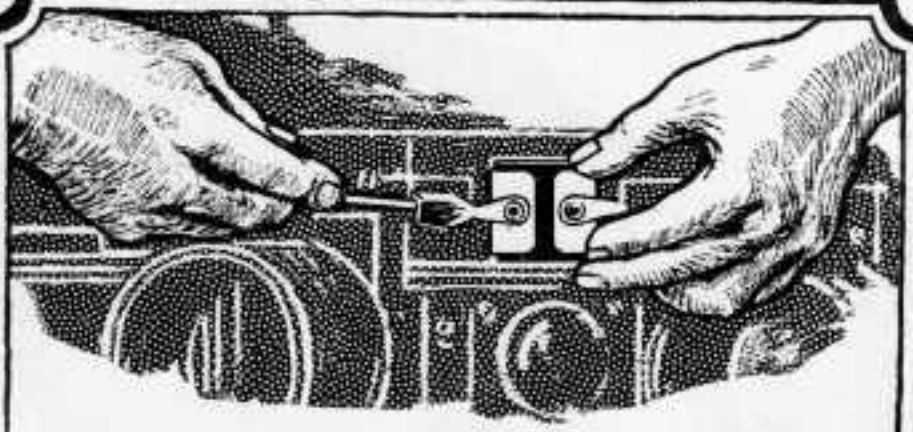

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For best results use Micadons

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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.

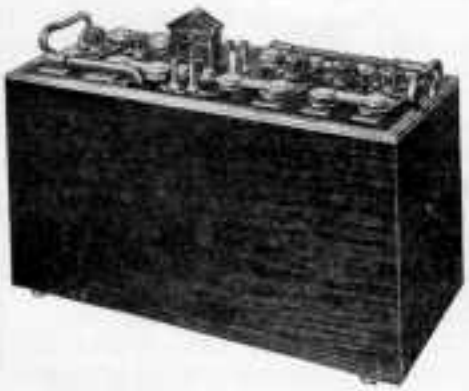


Fig. 3. The heavy-duty Unipower A, containing a 6-volt storage battery and Balkite charger

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. 6. 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 trough 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 oscilator coupler mounting. Connect 16 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 ¾-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 ½-in. 6-32 R.H. screws.

16. Connect 82, the lower left hand

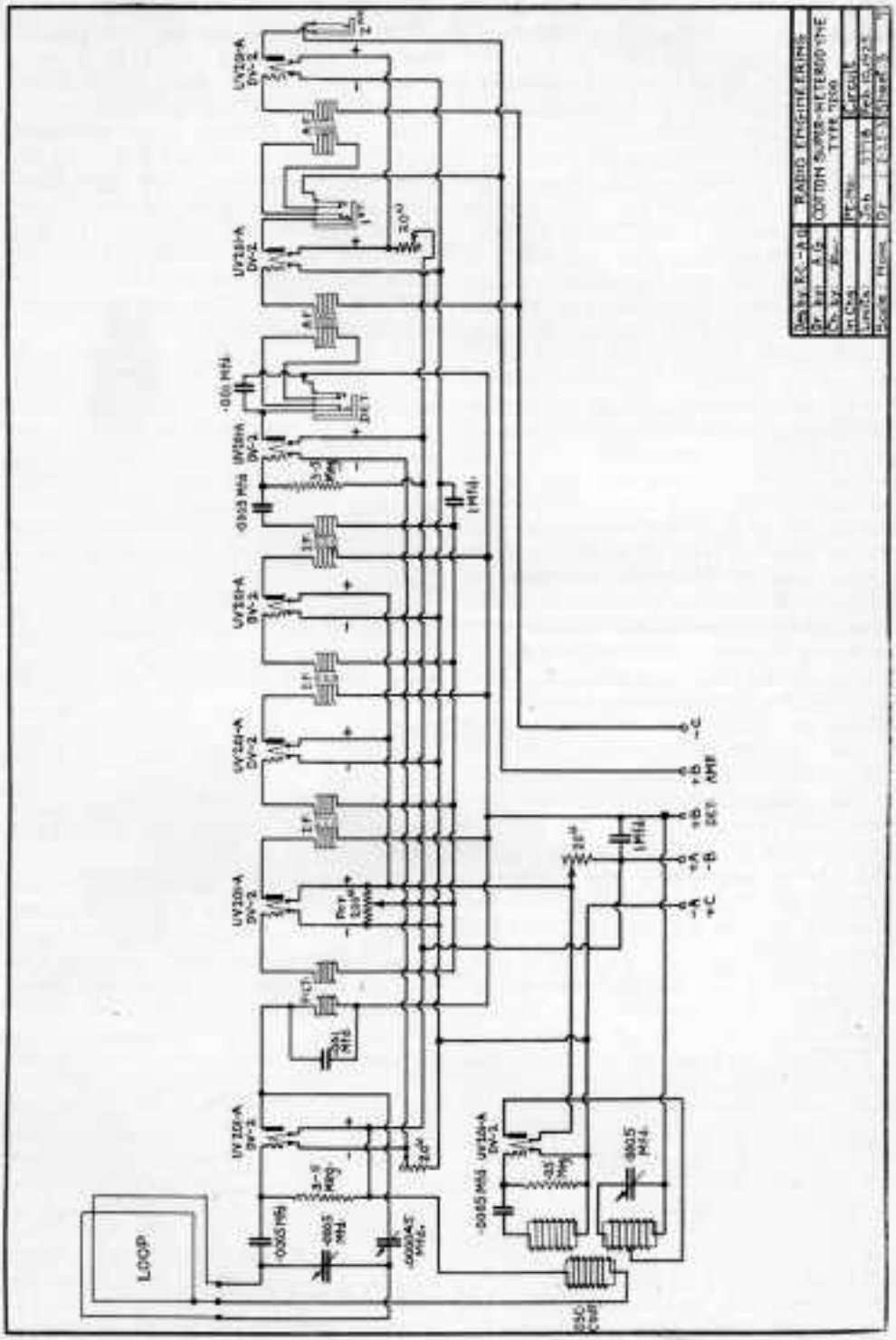


Fig. 6. Schematic wiring diagram of the cotton super-heterodyne receiver

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 1 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 coupler 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 Chelten 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 ½-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 ½-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 comp'etes the assembly of the set.

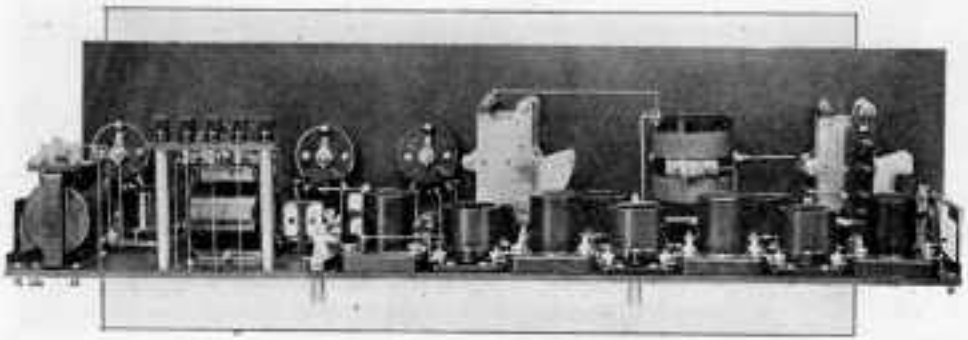


Fig. 7. This rear view shows clearly the arrangement of the parts

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 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 outer 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 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*)

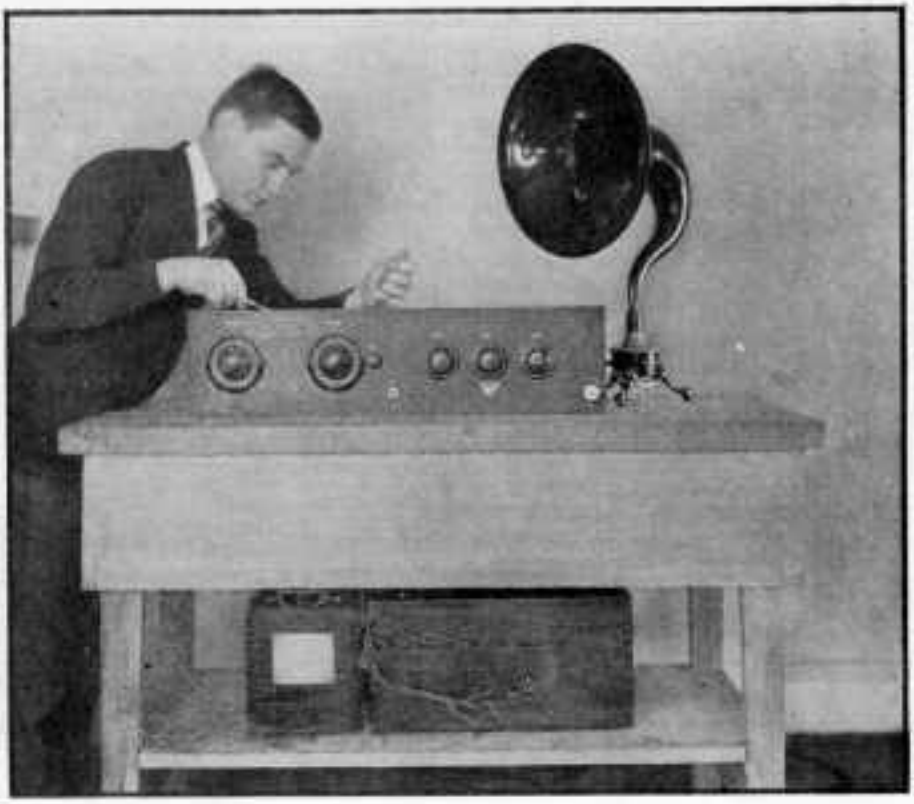


Fig. 1. Getting the Browning-Drake Five ready for testing

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

neutrodynes, 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 Browning-Drake Five

The publication of complete construction data for 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 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.

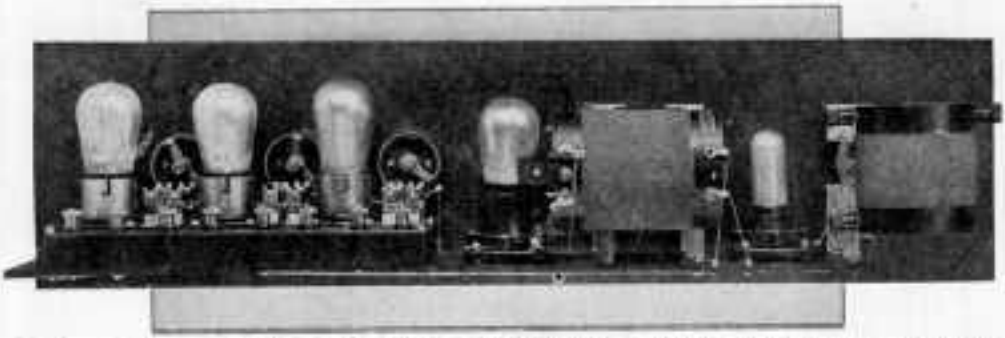


Fig. 4. The clean-cut design, so free from complicated wiring, makes this set unusually attractive

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 Data on This Set

The tuning is accomplished by means of the two large 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 Instrument 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 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 Parts Required

The front panel is of Formica measuring 7 by 28 by 3/16-in., and the base panel, of the same material, measures 3½ 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-

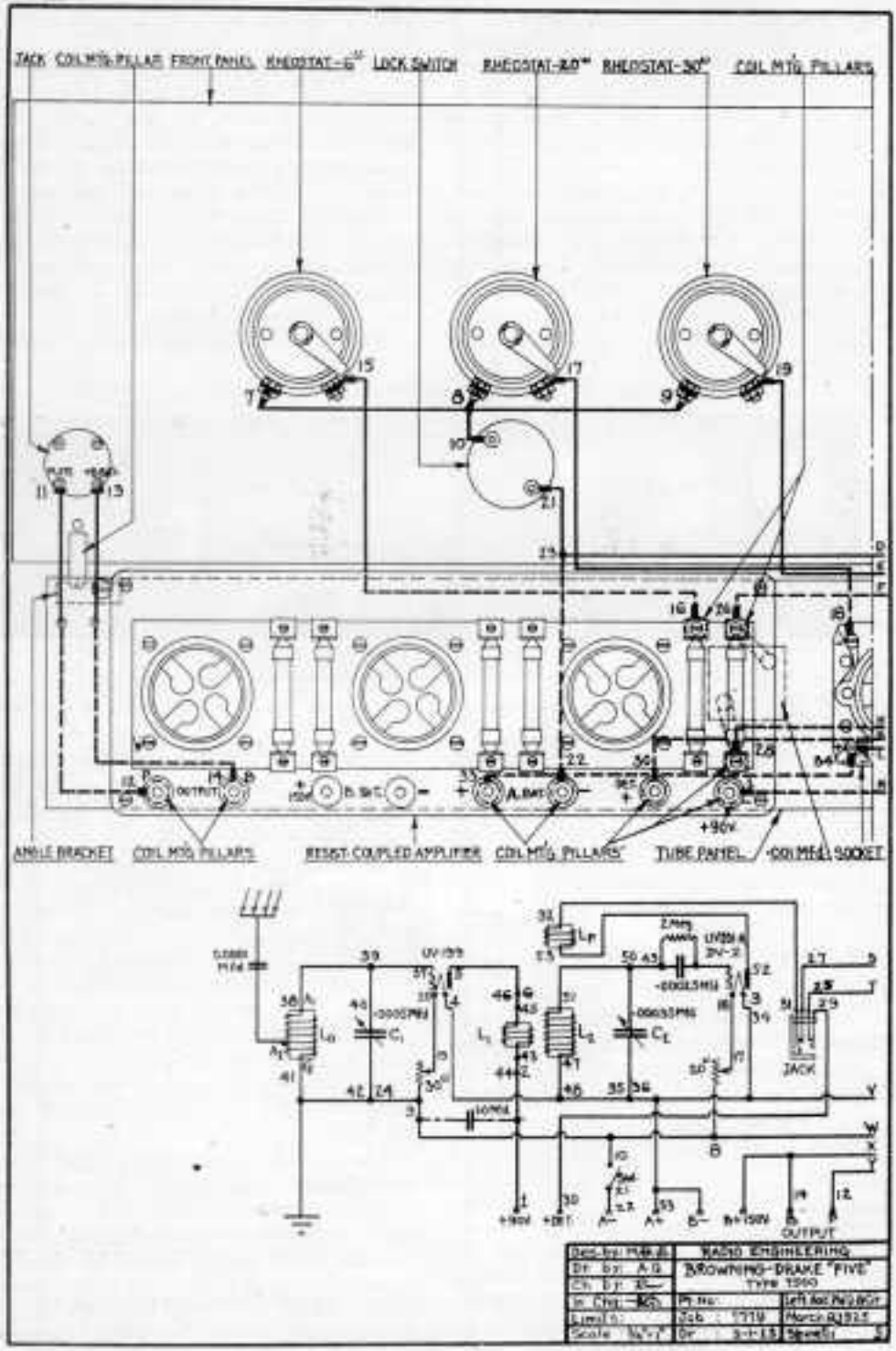
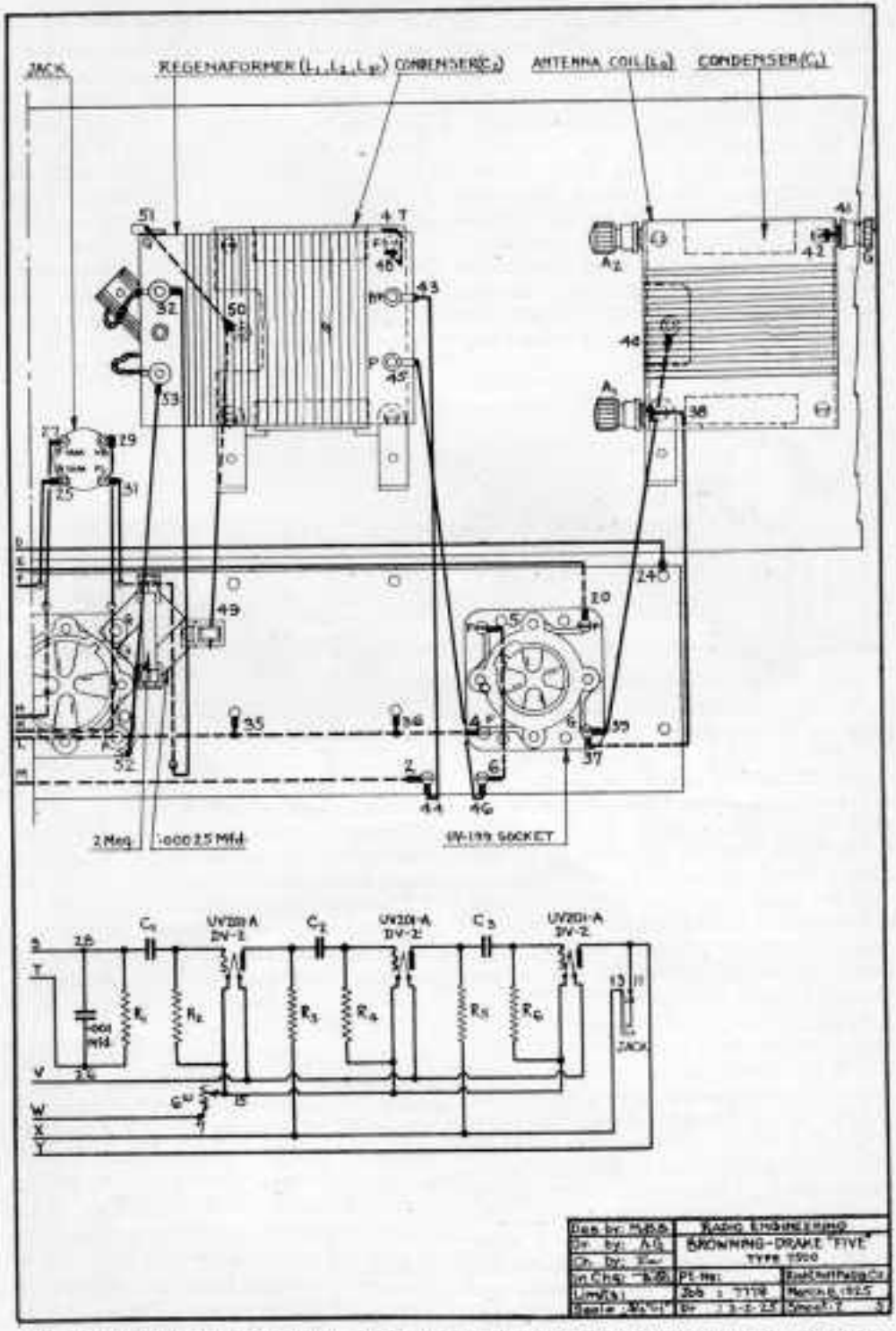


Fig. 2. Left hand half of the set, looking at it from the rear. The base panel is dropped down to show the connections more clearly



Des. by: H.G.B.	RADIO ENGINEERING
Dr. by: A.G.	BROWNING-DRAKE "FIVE" TYPE 1500
Ch. by: [illegible]	Pt. No: [illegible]
In Chg: H.G.B.	Job: 7778
Date: 3-2-25	Drg. No: [illegible]

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, Keelok 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.

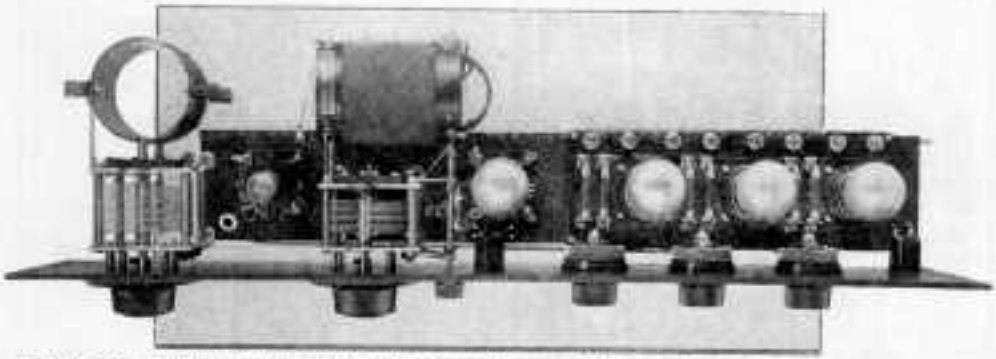


Fig. 5. The same general arrangement used in the type 6600 and 7000 sets is used in this outfit

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 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 piece of ordinary newspaper, which is quite absorbent, under each lug while the soldering in 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 ½-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 ½-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 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 ½-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 ⅝-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 ½-in. 6-32 F. H. screw and nut. Now fasten the amplifier to the tube panel with three 1¼-in. 6-32 R. H. screws and nuts. Put ½-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 ¾-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 ¾-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 ¾-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

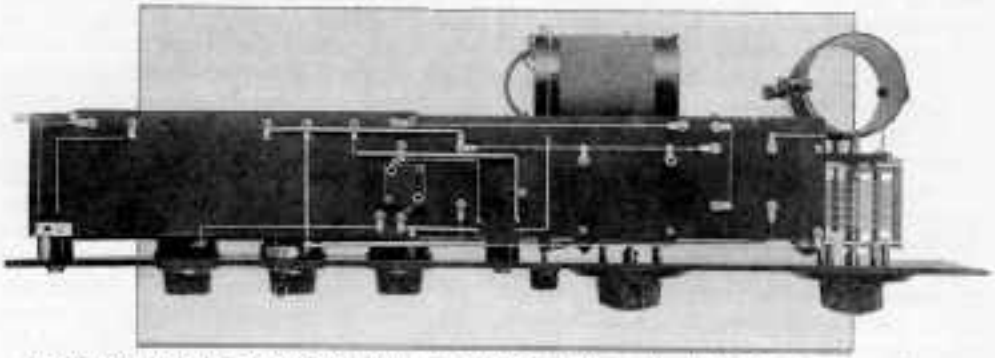


Fig. 6. By bringing the terminals from the amplifier to the under side of the base panel, most of the wiring is kept out of sight

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

Take two ½-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 ½-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 ½-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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Vol. V 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.

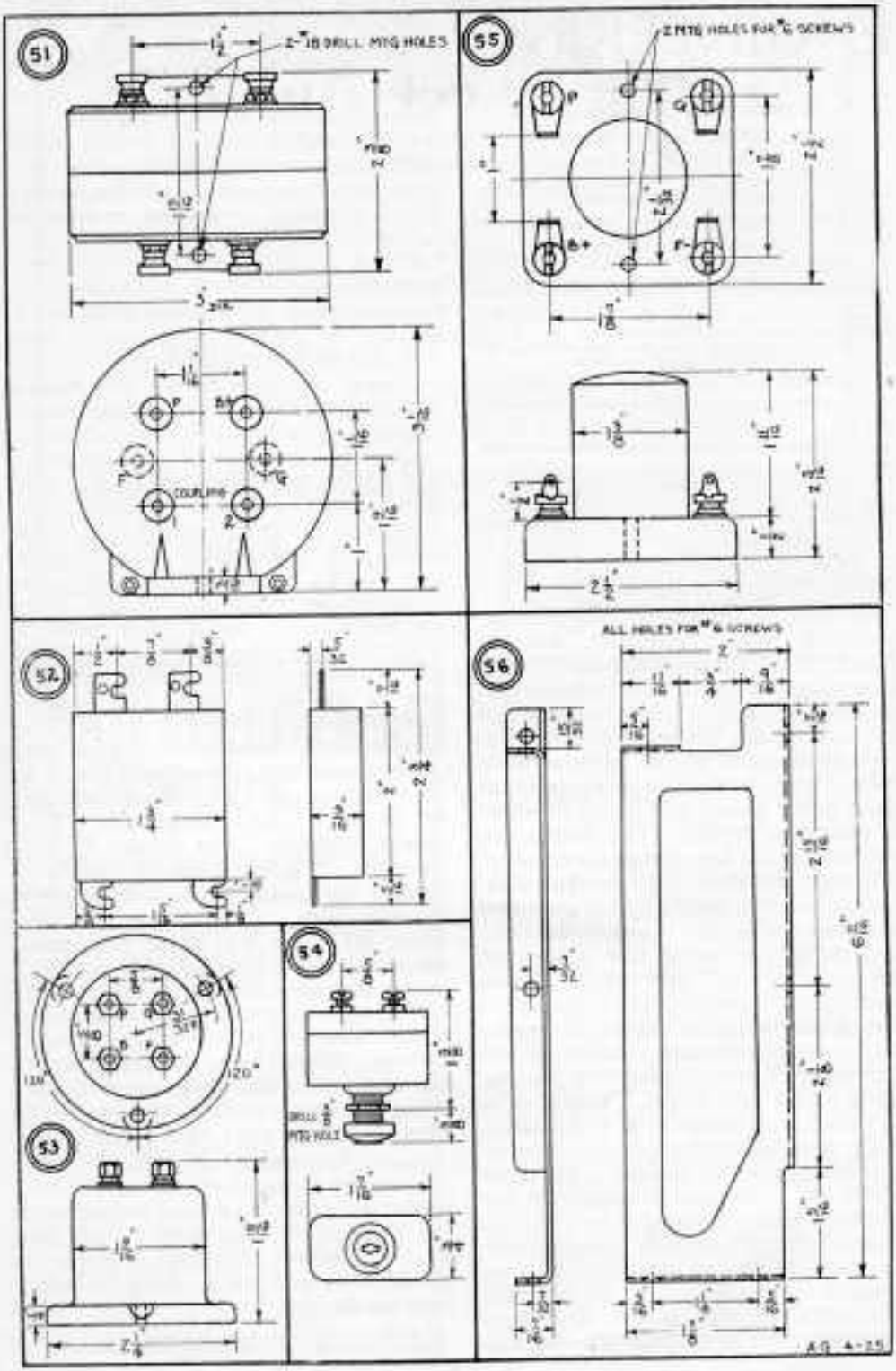
The editor's life is, indeed, a difficult existence. The foregoing, while overdrawn, of course, is not so far from the truth. Circulation statements just made public show heavy losses on practically every one of the popular radio magazines. What is worse, advertising revenue is falling off, too. No one 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.*


51
2-#18 DRILL MTG HOLES
COUPLING
55
2 MTG HOLES FOR #6 SCREWS
B+
F-
52
53
54
56
ALL HOLES FOR #6 SCREWS

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 condencer 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 nickeled. 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 nickeled, 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 sensitiveness, 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,

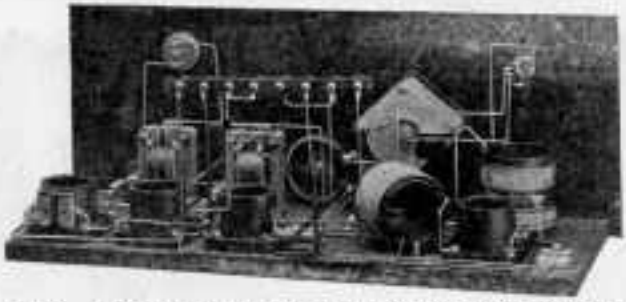


Fig. 2. Here you can see the design of the tuning unit, R.F. amplifying transformer, and variable condenser.

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.

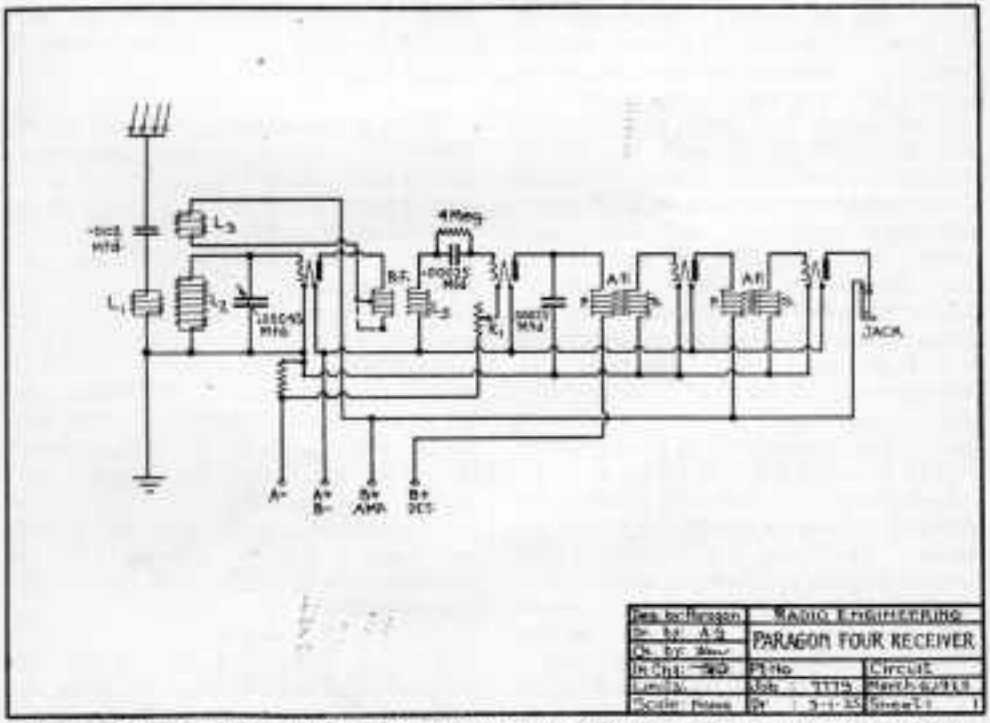
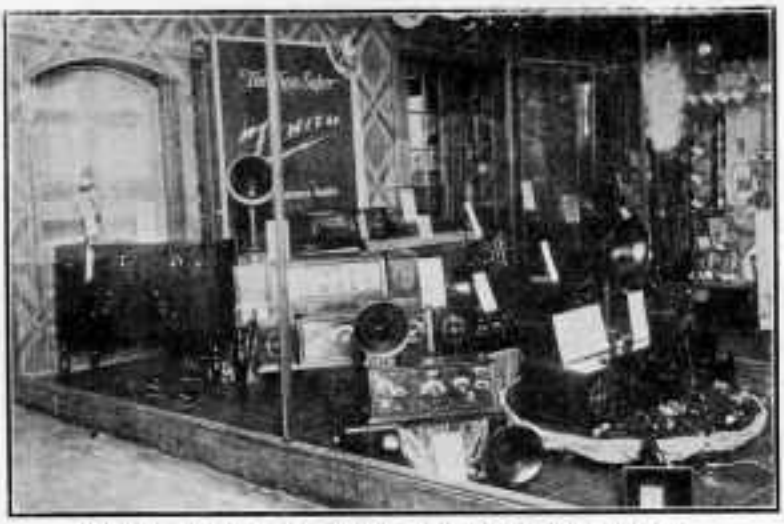


Fig. 3. Schmatic wiring diagram of the Paragon Four, showing the connections for the regenerative radio frequency amplifier.



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.

Specifications for Rheostats, Potentiometers and Resistances

Note: Dimensions are given in the order: Height, Width, and Depth behind panel unless the device is circular. s.s.=set screw; k=knob; K. P.=knob and pointer; K. D.=knob and dial; Resistance 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.	2½" diam.x1"	¼" molded	K. P. 1½"x¾"	6, 15, 30		Revolving arm	$1.50
Allen-Bradley Co.	⅞ x1 1/16"x1¼"	¼" molded	K. 1⅛"x1¼"	100	Graphite	Compression	1.85
" "		"	"	10,000-100,000	"	"	2.00
				25,000-250,000			
				50,000-500,000			
Amsco Products Co.	2½" diam.x⅞"	¼" special	Special	2, 4, 6, 8, 10, 14	Advance	Revolving arm	
				15, 20, 30, 40, 50, 60			
" "	2½" diam.x1"	Special double	- element type	6-20, 6-30, 20-20		Revolving arms	
				15-30, 30-30			
F. A. D. Andrea	2½" diam.x¾"	4/32" S. S.	K. P. 1¼"x⅞"	6, 8, 30, 60	Ideal	Revolving arm	
Carter Radio Co.	2⅜"x2⅜"x⅞"	¼" S. S.	K. P. 1 1/16"x1"	3, 6, 10, 20, 25, 30	Advance	Revolving element	1.75
" "	"	"	K. D. 2½"x1"	"	"	" "	2.00
Central Radio Laboratory	2½" diam.x⅝"	¼" S. S.	K. 1½"x⅝"	6, 10, 20, 30	Advance	Revolving arm	1.25
" "	"	"	"	0-2,000, 0-50,000	Graphite	" "	2.00
				0-100,000, 0-200-000			
Consolidated Instrument Co.	3" diam.x1⅜"	4/32" S. S.	K. 1⅛"x¾"	2	Advance	Revolving arm	1.25
" " "	"	"	"	6, 10, 20, 30	"	" "	1.00
Cutler-Hammer Mfg. Co.	2½"x2½"x⅞"	¼" thread	K. 1⅜"x½"	6		Revolving element	1.00
" " "	2½"x2¾"x1⅜"	"	K. 1⅝"x1"	4-6 vernier		" "	1.50
De Jur Products Co.	2" diam.x1"	¼" S. S.	K. P. 2"x1"	Standard	Nichrome	Revolving arm	
Electrad, Inc.	1½"x2½"x⅜"	¼" S. S.	K. 1½"x¾"	6, 10, 20, 30		" "	1.00
Electrical Research Labs.	2" diam.x⅞"	¼" S. S.	K. P. 1½"x1¼"	4½, 6, 15, 25, 40		" "	1.10
Federal Tel. & Tel. Co.	2⅛" diam.x⅞"	¼" S. S.	K. P. 1 1/16"x⅞"	6.2		" "	1.40
" " "	"	"	"	1.5, 24		" "	1.50
" " "	"	"	"	60		" "	1.60
" " "	"	"	"	17.6		" "	1.70
General Instrument Co.	2 1/16" diam.x1⅛"	4/32" molded	K. D. 2½"x1¼"	6		" "	1.25
" " "	"	"	"	20, 30		" "	1.50
General Radio Co.	1¾" diam.x1⅛"	¼" S. S.	K. P. 1½"x1½"	10, 30		" "	1.25
" " "	3" diam.x1¼"	¼" S. S.	K. P. 1¼"x⅝"	2, 7, 20, 30		" "	2.25
Howard Radio Co., Inc.	2½" diam.x⅝"	4/32" threaded	K. P. 1"x⅝"	6½, 25, 40, 60	Advance	" "	1.25
" " "	"	4/32" S. S.	K. D. 2½"x1⅝"	"	"	" "	
Kellogg Sw'b'd & Supply Co.	3⅛"x2¼"x¾"	¼" forced	K. P. 1¼"x½"	6, 25	Advance	Revolving element	1.50
Klosner Radio Corp.	2" diam.x⅞"	4/32" or ¼" S. S.	K. D. 2"x1⅜"	6, 10, 20, 30	Ideal, advance	Revolving arm	1.25
" "	"	"	"	2, 60, 350	Nichrome	" "	1.50
Marshall Electric Co.	⅝" diam.x1½"	— molded	K. 1⅛"x⅞"	100	Discs	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	Resistance material	Method of adjustment	List price
Metro Electric Mfg. Co.	1¾" sq.x¾"	¼" molded	K. 1¾"x¾"	6, 30		Compression	$0.90
Pacent Electric Co.	2½" diam.x1"	¼" molded	K. special	2½, 6, 10, 20, 30, 50		Revolving arm	1.00
Polymet Mfg. Co.	2½" diam.x⅞"	¼" S. S.	K. 1¼"x¾"	5, 6, 10, 15, 20 30, 60, 200		Revolving arm	
Premier Electric Co.	2¼"x2¼"x⅞"	¼" S. S.	K. 1⅛"x¾"	Special	Nichrome	Revolving arm	2.50
Sterling Mfg. Co.	1¾" diam.x1"	¼" S. S.	K. 1½"x1"	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	Resistance material	Method of adjustment	List price
Adams Morgan Co.	2½" diam.x1"	¼" molded	K. P. 1¾"x¾"	300		Revolving arm	$1.75
Allen-Bradley Co.	1 1/16"x⅞"x 1/16"	¼" molded	K 1⅛"x¼"	200	Discs	Compression	2.00
" "	"	"	"	400	"	"	3.00
Amsco Products, Inc.	2½" diam.x⅞"	¼" special	Special	250, 400	Nichrome	Revolving arm	
F. A. D. Andrea	2½" diam.x⅞"	¼" threaded	K. P. 1¼"x¾"	200, 400	Chrome	Revolving arm	
Carter Radio Co.	2⅜"x3 1/16"x⅜"	¼" S. S.	K. P. 1 1/16"x1"	200, 400	Nichrome	Revolving arm	2.00
" "	"	"	K. D. 2⅛"x1"	"	"	"	2.25
Central Radio Labs.	2½" diam.x⅝"	¼" S. S.	K. 1½"x¾"	400	Graphite	"	1.50
" "	"	"	"	2,000	"	"	1.75
Consolidated Instrument Co.	3" diam.x1⅝"	¼" S. S.	K. 1½"x¾"	200, 400	Advance	"	1.75
Cutler-Hammer Mfg. Co.	2⅛"x2¼"x1¼"	¼" thread	K. 1⅛"x½"	300		Revolving element	1.50
De Jur Products Co	2" diam.x1"	¼" S. S.	K. P. 2"x1"	Standard	Nichrome	Revolving arm	
Electrad, Inc.	1⅝"x2⅛"x¾"	¼" S. S.	K. 1½"x¾"	200, 400		"	1.50
Electrical Research Labs.	2" diam.x1 1/16"	¼" S. S.	K. 1½"x1 1/16"	200		"	1.25
" "	"	"	"	400		"	1.40
Federal Tel. & Tel. Co.	2½" diam.x⅞"	¼" S. S.	K. P. 1 1/16"x1 1/16"	240		"	1.50
" "	"	"	"	480		"	1.70
" "	"	"	"	1,825		"	2.20
General Instrument Co.	2 1/16" diam.x1⅜"	1/16" special	K. D. 2½"x1 1/16"	200		"	1.50
" "	"	"	"	400		"	1.75
General Radio Co.	1¾" diam.x1½"	¼" S. S.	K. P. 1⅛"x½"	200		"	1.25
" "	3" diam.x1¾"	¼" S. S.	K. P. 1½"x¾"	400		"	3.00
Howard Radio Co.	2½" diam.x⅝"	⅛" thread	K. P. 1"x⅝"	200	Advance	"	1.50
" "	"	"	"	400	"	"	2.00
Klosner Radio Corp.	2½" diam.x⅞"	⅛", ¼" S. S.	K. D. 2"x1⅛"	350	Nichrome	"	1.50
" "	"	⅛" thread	K. 1¾"x¾"	350	"	"	1.15
Pacent Electric Co.	2½" diam.x1"	¼" molded	K. special	200, 400		"	1.25
Polymet Mfg. Corp.	2½" diam.x⅞"	¼" S. S.	K. 1¼"x¾"	200, 400, 2,000		"	
Premier Electric Co.	2½" diam.x⅞"	⅛" S. S.	K. 1⅛"x¾"	250, 400, 500	Nichrome	"	2.50
Sterling Mfg. Co.	1¾" diam.x1"	¼" S. S.	K. 1½"x1"	400	"	"	2.75

AUTOMATIC FILAMENT CONTROLS

L. S. Brach Mfg. Co. ..... Cartridge with metal contact ends, containing special wire which increases in resistance with an increase in current, thus maintaining the current constant.
Daven Radio Co.
Radiall Co.

TUBULAR GRID LEAKS

Danziger-Jones, Inc. ..... Grid leaks for standard mountings.
Daven Radio Co.
Dubilier Condenser & Radio Corp.
Durham Co.
Eagle Electric Mfg. Co.
Electrad, Inc.
Chas. Freshman Co.
Leslie F. Muter Co.
Pacent Electric Co.
Pudlin Engineering Co.

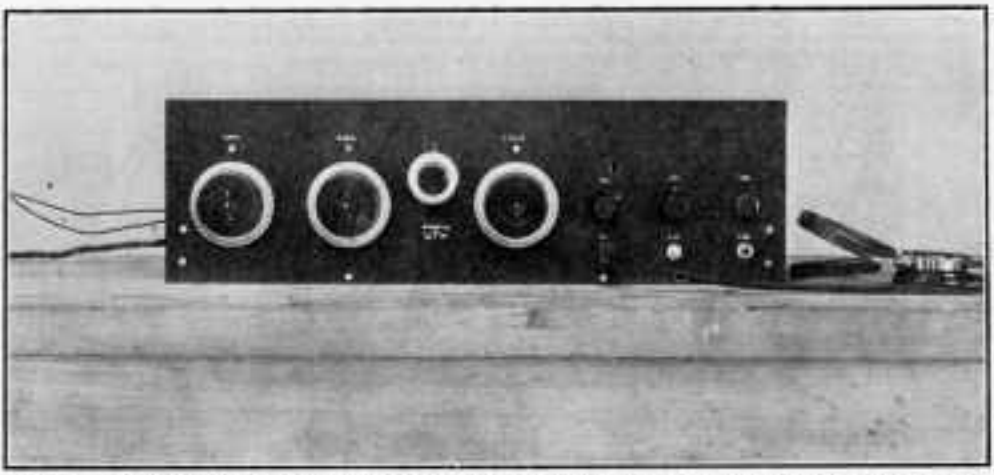


Fig. 1. A front view of the Nameless Receiver, showing the arrangement of the controls on the front panel

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 Nameless Circuit

The special features of the original design were the use of 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 Namesless 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

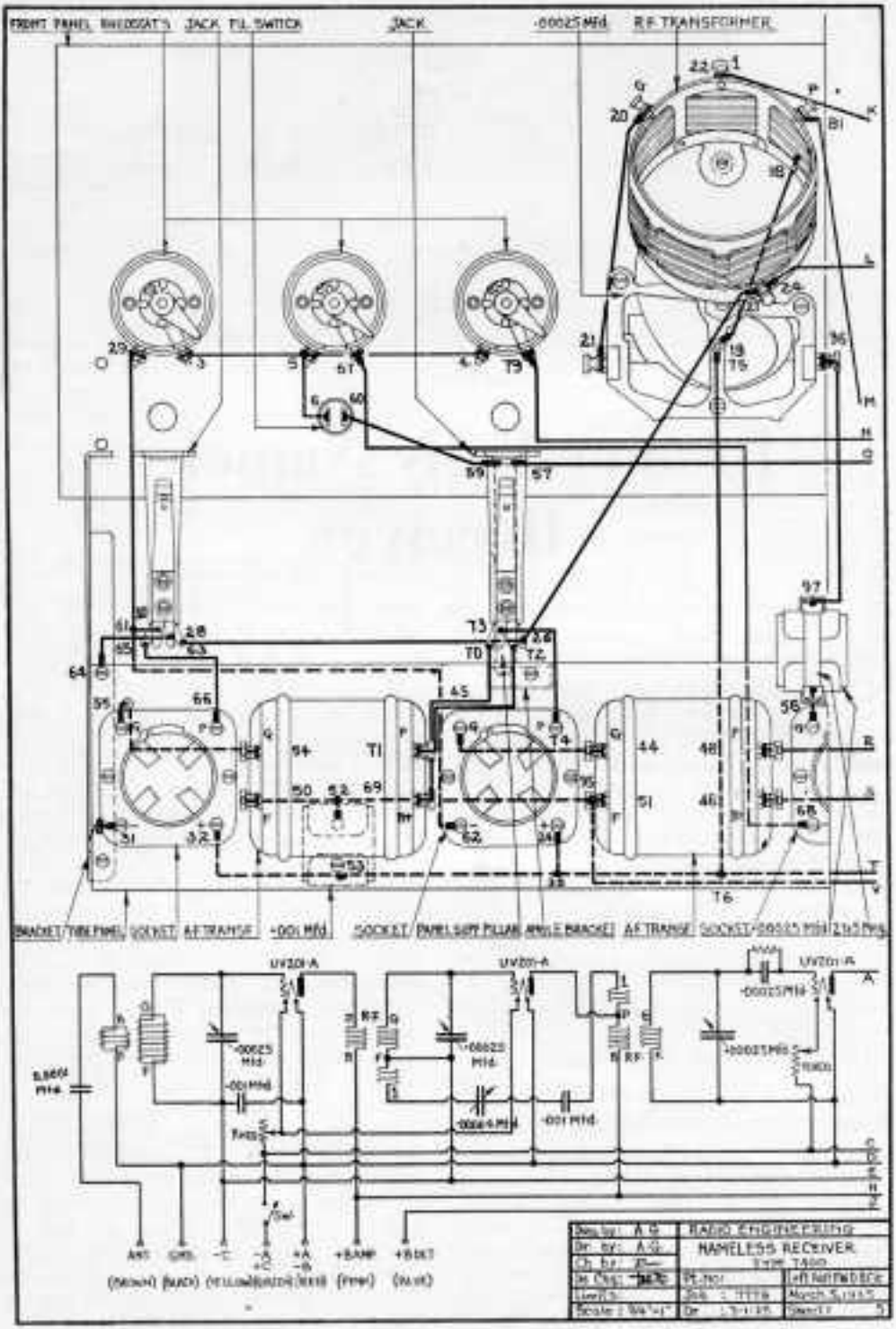


Fig. 3. Left hand half of the schematic and picture wiring diagrams

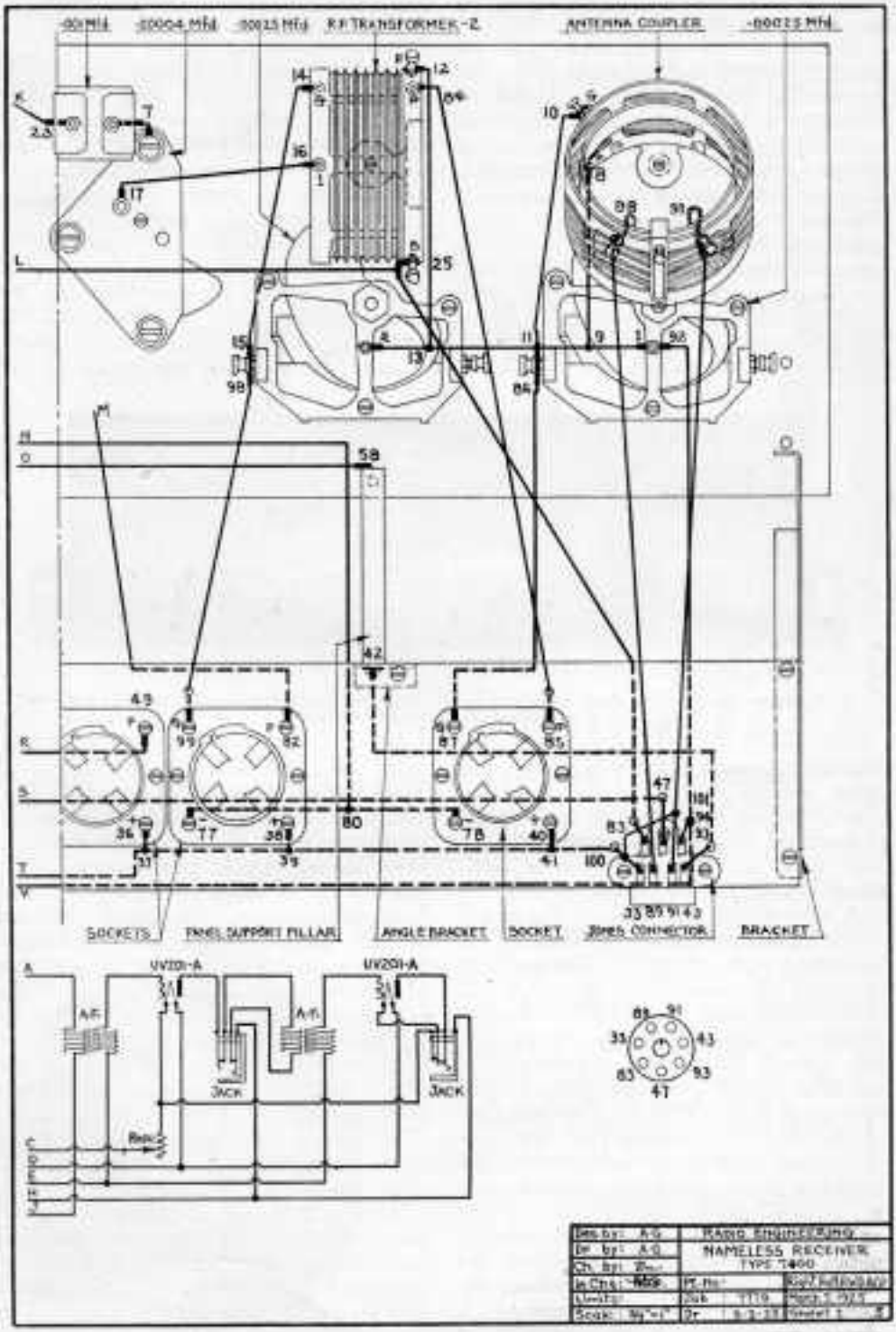


Fig. 4. Right hand half. Connections are shown as they were made on the original set

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 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 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 more importance than the degree of amplification obtained.

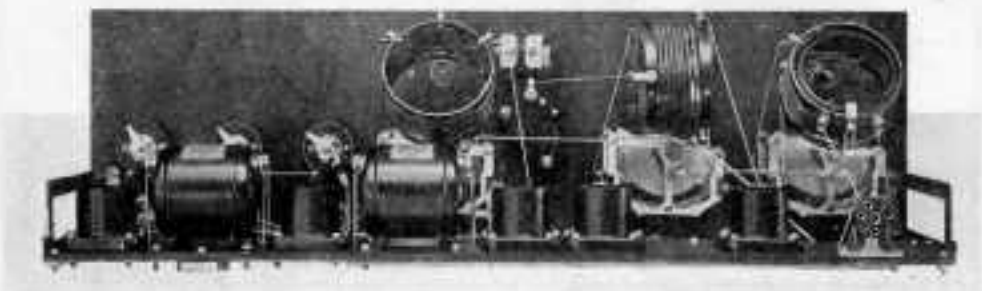
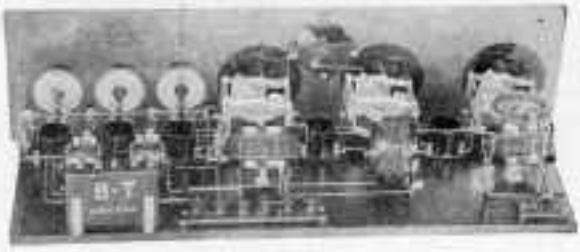


Fig. 2. Altho the variable condensers are in the fields of the end coils, they are so far away that they do not introduce losses

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-wipe 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



The 5 Tube B-T Nameless

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B-T 3 Circuit Tuner

B-T Low-Loss Condenser

B-T Radio Frequency Trans.

That tense moment when the last wire has been soldered in place, the batteries, ground and aerial all connected up—and you plug in to see if "she works." When the call letters of a distant station come in as if voiced at your elbow—then is the joy of "building your own."

More and more are set builders turning to B-T inductances and condensers to insure success. Whether for your own favorite hook-up or for one of the B-T circuits using one to five tubes there are B-T parts that will make your set better.

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.

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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 3½ 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. Accuratune dial for the control condenser, Walbert filament lock switch, and three Walbert Univernier controls with silver dials. The Univernier 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 nickeled 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, unwind 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

Type P
List Prices
0— 7 volts.. $1.25
0— 50 volts.. 1.55
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.. $1.50
0— 50 volts.. 1.50
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Necessary for Efficient Radio Reception

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.

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Type P
Black enamel finish; 3 holes in flange for panel mounting; 2" diameter.

Type A
Black enamel finish; clamp style mounting.

Type N
Handsome nickel rim, with black bezel 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 ½-in. 6-32 R. H. screw. About ¼-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_1. 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 regenaformer. 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 regenaformer, 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 regenaformer. 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.

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They have re-designed but they still use Formica!

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1 Formica is used by 125 leading makers—and has for years been used by more makers than all other materials.

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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-199 Socket	1.00
	Brooklyn Metal Stamping Co., 718 Atlantic Ave., B'klyn, N. Y.	
TJ	2-Trijacks	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 Micadons	.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.	
	1-6-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	.12
63	3-Pkg. of 10, ⅝-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	$.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-Flewelling 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	1.00
	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-Accuratune rheostat dial	.75
	Walbert Mfg. Co., 925 Wrightwood Ave., Chicago, Ill.	
F	1-Filament lock switch	.50
O	3-Univernier 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
151	2-Panel support pillars	.60
62	1-Pkg. 10, ½-in. 6-32 F. H. nickeled screws	.12
	1-Pkg. 10, 1-in. F. H. nickeled screws	.14
63	4-Pkgs. 10, ⅝-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

(*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.
WEEI	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.

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

ALL-AMERICAN
TRADE MARK

Do you see the opportunity?

An expert can wire the Senior in an hour or so—no time lost picking out the parts, placing them, etc. When finished you have a high grade set with one stage tuned r. f., one stage reflexed r. f., crystal detector and two stages of audio, all ready to slip into any stock 7 x 18-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! Sent for 10 cents, coin or stamps.

All-American Radio Corp.
E. N. Rautenol, *President*
2683 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

EBY
BINDING POSTS
Tops Don't Come Off

A New Price
15c
PLAIN OR ENGRAVED IN 25 MARKINGS

THE Summit TOROIDAL RADIO FREQUENCY TRANSFORMER

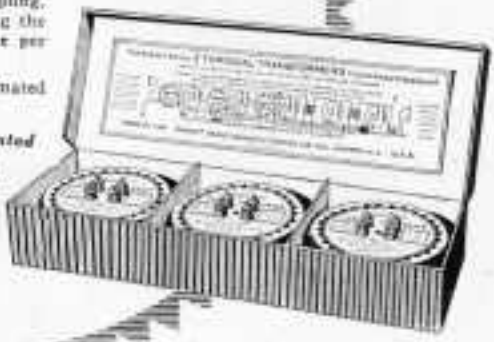
is the World's Best Tuned Radio Frequency Transformer, acknowledged by leading engineers as the last word in transformer development. Positively self neutralized and self balanced, having no stray fields, leakages or feed backs. The Summit Toroidal Transformers will not howl or squeal, result—superior 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—$10.00.

Distributors and Jobbers Wanted

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



Pat. applied for.

An unfailing power supply *for both circuits*

U. S. Patent May 22, 1928
Balkite Battery Charger. Charges 6 volt "A" storage batteries.
Price $19.50
West of Rockies $20

Balkite "B"—replaces "B" batteries and dry cells. Operates 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*

BMS Fantail Jacks

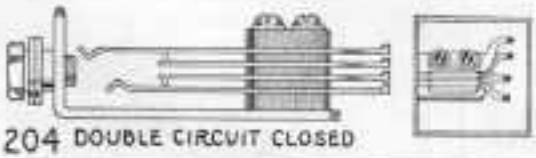
The easiest soldering jacks made!

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.,
718 Atlantic Ave., Brooklyn, N. Y.

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**

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

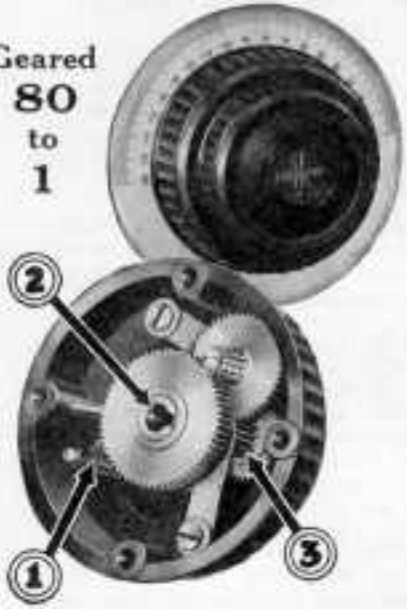
OUR LABORATORY FUND

M. B. SLEEPER, INC.

A-52 Vanderbilt Ave., New York City.

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 wabble 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
English Representatives: G. F. Metlock, 27 Amies St., 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 3½:1.

Buy them by the Pair!

Price either model—$7.00 at your dealer's.

Send for Blue print and circuit sketches, showing the use of AmerTrans in the new Hoyt System of Signal Augmentation—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 rumbling traffic, inside footsteps, 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 distant, faint signals come in much clearer. Stiff 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 stand-ness and long life. Contact points on 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 panel of Bakelite shelf, with binding posts and space for meters. Benjamin Shelf Brackets, Battery Switch and Grid Leak Panel simplify radio receiving set construction. Ask for descriptive folder.

Benjamin Electric Mfg. Company

120-138 S. Sangamon St., Chicago, Ill.
247 W. 17th Street, New York — 448 Bryant Street, San Francisco

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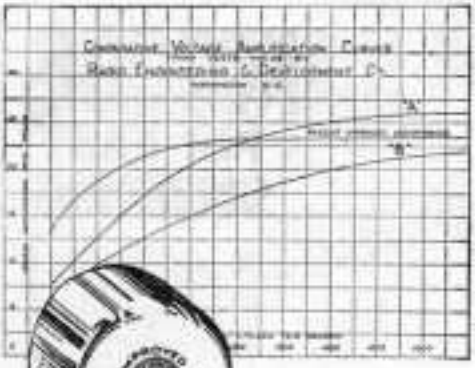


Comparative voltage amplification curves made by the Radio Engineering and Development Company of Washington, D.C.

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.

PACENT ELECTRIC COMPANY, Inc.
91 Seventh Avenue, New York City

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 record 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 receivers 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 phones, loudspeaker or phonograph unit you have ever used. Ask your dealer to let you try them—at home—on your own set.

N&K

Reg. U. S. Pat. Off.

Imported

PHONES LOUDSPEAKER PHONOGRAPH UNIT

N & K IMPORTED PHONES

4000 ohms. Clear, natural, true. Unusually comfortable. Wax cut external poles. Sanitary, leather-covered head bands. Generous length of cord. $8.50.

N & K IMPORTED LOUDSPEAKER

Its new principle sound chamber **filters** the sound and sends it out in all directions. Economical of space, artistic in shape. Beautiful ivory schemes. $27.50.

N & K IMPORTED PHONOGRAPH UNIT

Attaches instantly to any standard phonograph making a loudspeaker of clear, rich tone. $7.50.

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

So Inexpensive!

The New and Improved

Read'em Binding Posts

"The Knobs Can't Come Off."

18 Styles Engraved—A Post for Every Requirement

Improving the Appearance of Over 40 Leading Sets

The Utmost in Quality at the Lowest Price

At Your Dealers or Sent Postpaid 15c Each

MARSHALL-GERKEN CO.
Toledo, Ohio

NOKORODE FOR EASY SOLDERING

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.....$80.00

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 BD199 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:

Pacent Electric
All parts carried in stock

Daven Radio
All parts carried in stock

Samson Electric
Amplio and Super transformers

Goldmark
Wirit for connections

Benjamin
Sockets and Brackets

Formica
Drilled and engraved panels

DURRANT RADIO, Ltd.

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

C-52 Vanderbilt Avenue — New York City

I and M 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*
Rowayton. Tel. Nor. 2724

D. C., Washington—A. C. BURG
U. S. Soldiers' Home. Tel. Col. 750 Br. 41

Ill., Chicago—WEILAND & CO.
6711 Stewart Ave. Tel. 1124 Normal

Md., Baltimore—OTTO U. JAHELKA
3710 No. Rd., Walbrook. Tel. Liberty 1202

Mass., Boston—H. A. NICKERSON
201 Devonshire St. Tel. Cong. 5156

Mich., Detroit—R. J. McLEOD
7725 Kellog 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. SCOBEY
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. Beek. 8040

N. Y., New York—RONALD MAAR
470 W. 157 St. Tel. Wads. 9799

N. Y., New York—PAUL FRANCK
317 West 119th St. Tel. Morningside 9140

N. Y.,—Brooklyn—J. McPARTLAND
932 Flatbush Ave. Tel. Fla. 1758R

N. Y., Buffalo—L. A. JEWELL
69 Leslie St. Tel. Lan. 9234

N. Y., New York—RADIO CONST. LABS.
71 W. B'way. Tel. Walker 2143

N. Y., New York—J. ROEMISCH
841 Lexington Ave. Tel. Lex. 4420

O., Hillsboro—A. HEDGES
395 E. Main St. Tel. 409-J

O., Kent—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 Raala reflex, the most successful 1-tube receiver ever built, 100-meter Sodion receiver.

June—Sodion 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 Boonton 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, Ultradyne 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.

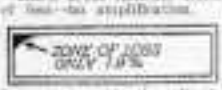
A Laboratory Curve, showing the amplification factor at each audio frequency within the audible range. The only "Eye Witness" of the marvelous musical quality that your ears hear when you listen to radio reception amplified through Karas Harmonik Transformers. That is what the experts of Radio Engineering 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 Curves contrasted with the Curve of the Karas Harmonik and showing the "Zone of Loss" by comparison with the ideal straight line curve that would mean 100% perfection. Black areas indicate zones of loss—no amplification.



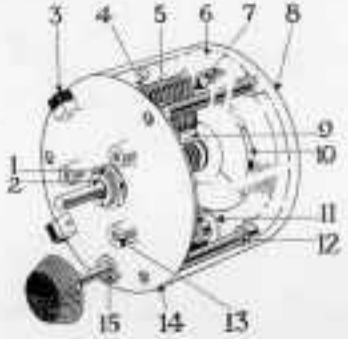
The curve of the Karas Harmonik proves only 1.8% perfect amplification.

The curve of the average 45 transformer, 44.3% perfect.

The curve of the typical high ratio transformer, showing the tremendous loss at low and high frequencies which results in only 39.3% complete amplification. This curve is also typical of most low priced transformers.

WILLIAMS PRESS, INC., ALBANY — NEW YORK

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 .000018 m.f., full capacity is .0003 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 to 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 holds for 120 degrees 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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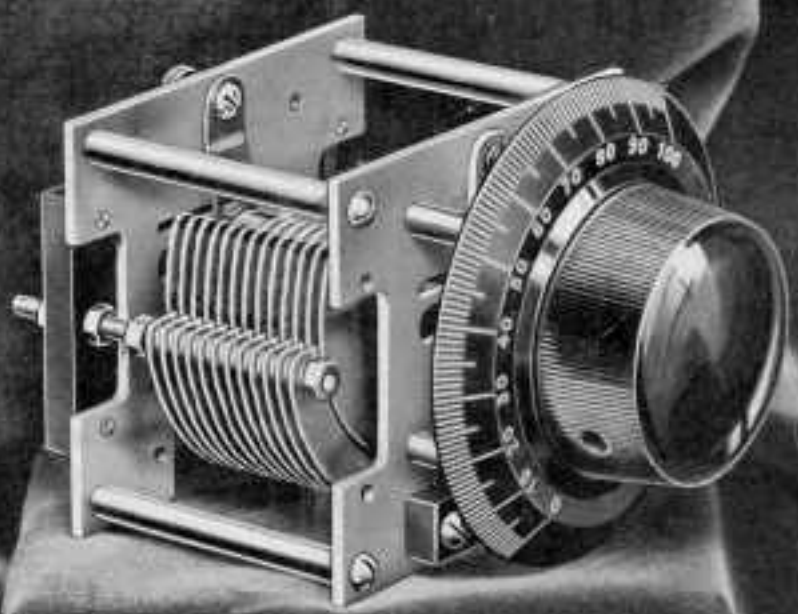
NATIONAL

VELVET VERNIER CONDENSERS AND DIALS



"*Its merit raised to an eminence*"—*Milton*

NATIONAL *Velvet Vernier* CONDENSERS and DIALS

are used by Lieutenant Frederick H. Schnell (Traffic Manager, American Radio Relay League) for communication with amateurs on wave lengths from 85 to 150 meters from the Pacific Fleet during the cruise to Australia and return. High honor!

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