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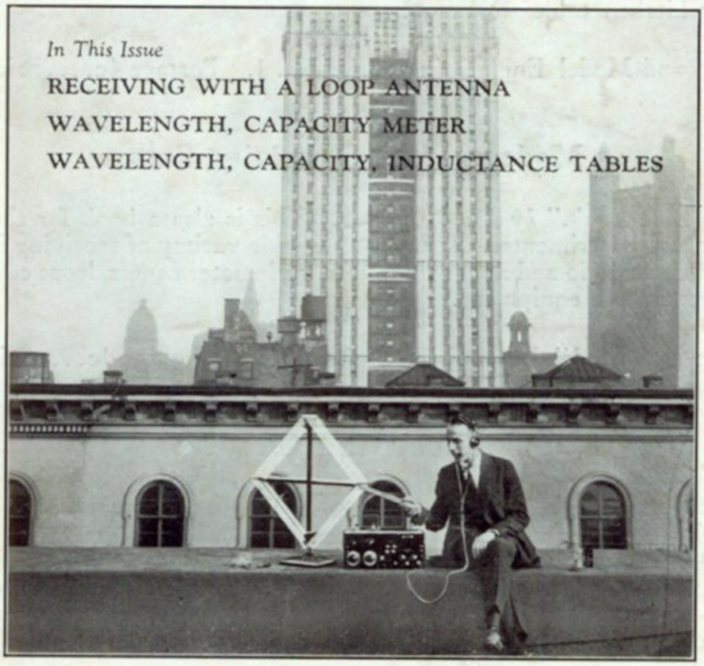

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Receiving With a Loop Antenna

Exceptionally good results have been accomplished with this receiver. Of special advantage is the extremely sharp tuning.

Purpose of the Set

IN spite of the warning given to Experimenters against attempting the construction of a super-regenerative set without entire familiarity with the problems involved, many Experimenters have built those outfits only to report keen disappointment with the results obtained. Altho remarkable distances and surprising signal strength have been achieved by successful users of the super-regenerative circuit the man of only average experience and ability will be far more pleased with the results obtained on a loop receiver such as is described here.

Essentially the outfit, shown in detail in the accompanying illustrations, is made up of a variable condenser and vernier connected across a loop antenna and to the grid and filament of the detector tube. In the plate circuit is a variable condenser shunted around a small inductance. Maximum signal strength is obtained when both loop and plate circuits are adjusted to resonance with the incoming signals.

A special feature of this outfit is that it is designed to oscillate strongly at the point of maximum signal strength when receiving from telephone transmitting stations. This fact, coupled with the extremely sharp tuning obtained, greatly decreases the interference from spark signals because those signals are made mushy and less loud when the receiving set is oscillating. In fact, the tuning is so exceedingly sharp that, without the vernier, it is not possible to adjust the set to maximum signal strength. Tuning in the plate circuit is less sharp.

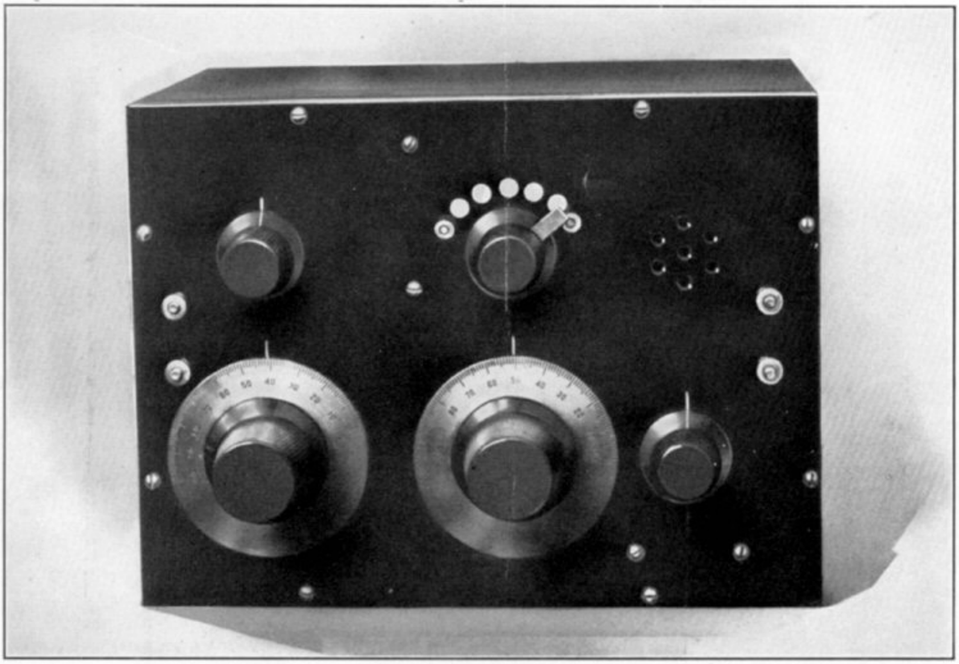

Fig. 1. Unlike other receivers, the fine tuning is accomplished with one vernier condenser and the filament rheostat. Using the detector alone results are nearly equal to a crystal set on a regular antenna; with a two-step amplifier they are much superior

This outfit is equally suitable for broadcast reception and regular operation within the limits of loop receivers. Using the 2-step amplifier already described, stations within a radius of 25 miles can be brought in with very nearly the signal strength of the super-regenerative set. Such experiments as we have been able to make so far indicate that on long distance reception this outfit may be superior to the other. At least it does not evidence the characteristics of the super-regenerative circuit which indicate that it is more efficient on short distance work than when receiving stations far away.

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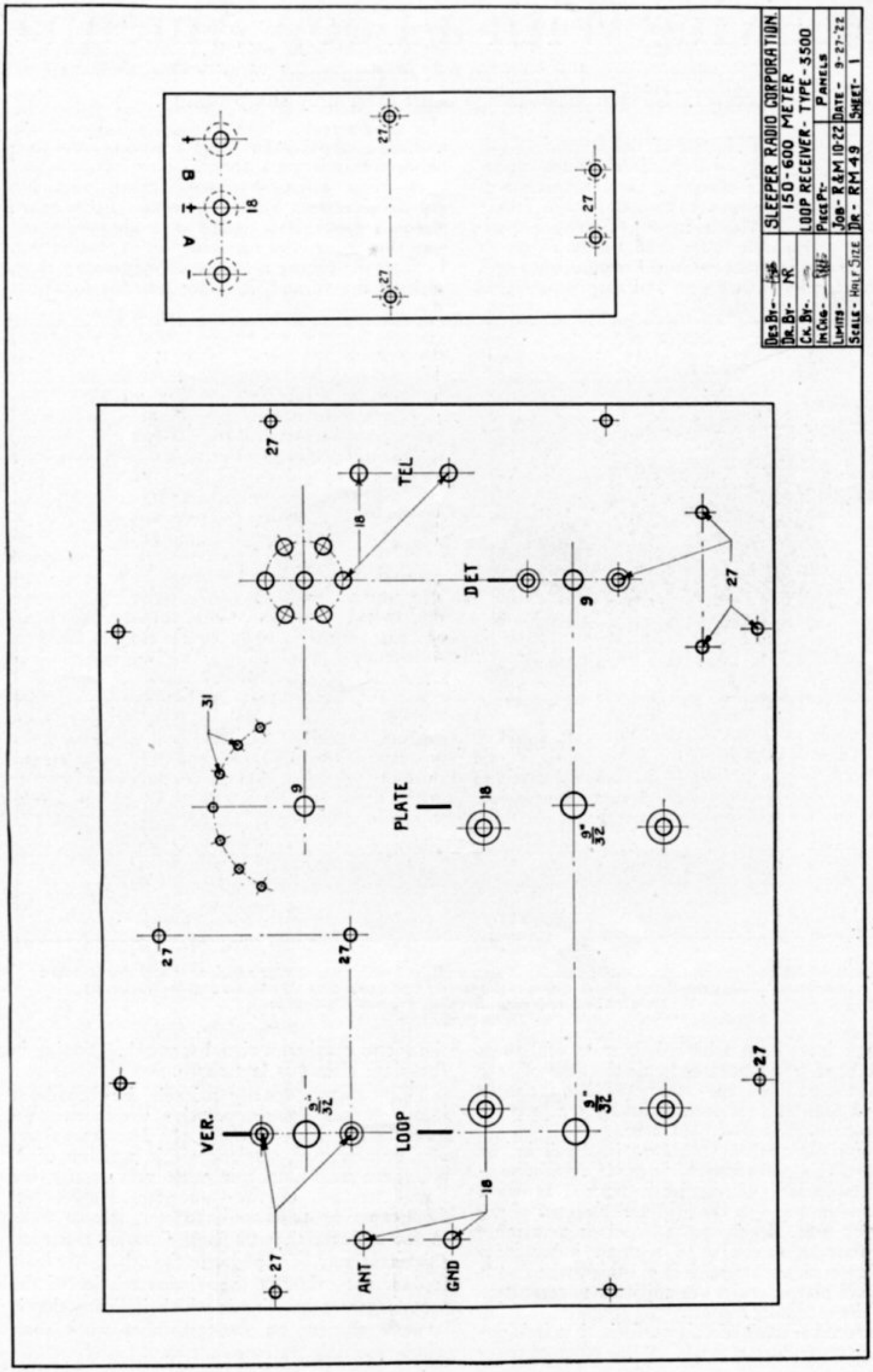

Fig 2. Exactly one-half size. Drawing of the front and back panels, showing the location of the holes and engraving. When you lay out your panels, double each dimension on these drawings

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Laying out the Panels

In Fig. 2 drawings are given for the front panel and the base panel which carries the socket and battery connections. These drawings are exactly one half size. Dimensions may be taken off by measuring the distances on the

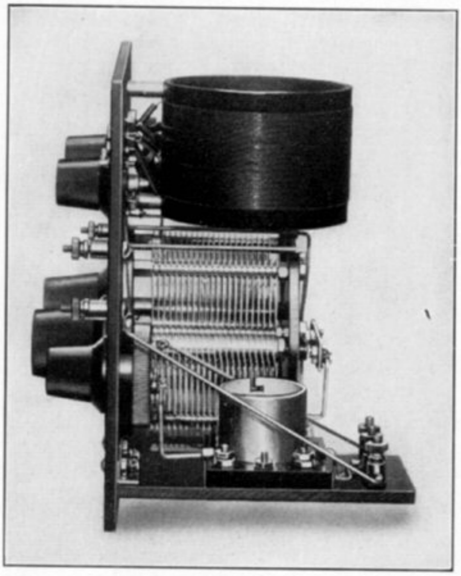

Fig. 3. A side view showing the details of the base panel

drawing with a pair of dividers and, doubled, transferred to the panel. The 3/16 in. L. P. F., measuring 7½ x 10 ins., is a standard size and can be purchased cut exactly to dimensions. Since the corners are perfect right angles it is easy to lay out the holes by crossed lines made with a scriber and combination square. Each hole should be started by a center punch so as to locate the drill accurately. Drill sizes are indicated by numbers on the drawings. Two concentric circles call for counter sinking to take flat head screws. Where the outer circle is dotted the counter sinking should be done from the other side.

L. P. F. panels are furnished with one side highly polished. However, some experimenters prefer a dull finish, made by rubbing the panel with fine sand paper and oil.

Winding the Coil

Details of the plate inductance are given in Fig. 7. An L. P. F. tube 2½ ins. long and 3½ ins. in diameter is wound with No. 24 B. & S. gauge, S.S.C. wire (No. 22 S.W.G.). The winding is started 13/32 in. from one end of the coil, with taps taken off at the 19th, 29th, 46th and 74th holes. No. 27 holes are drilled 3/16 in. from each end of the tube to take the 6-32 screws which fasten the tube to the mounting pillars.

Assembling the Wiring

Instructions for assembling and wiring the receiving set are given in step by step form. These instructions and the picture diagram in Fig. 6 were prepared with great care after the set had been actually built to prevent the awkwardness sometimes experienced when one part interferes with the handling of another. A schematic diagram is also given to show the circuit in the conventional way.

1. Take apart the four binding posts, numbers, 1, 4, 13, and 24 in Fig. 6, clipping a soldering lug between each washer and screw-head, and mount them so as to have the posts on the front of the panel. All lugs are indicated by short heavy lines, and should point in the directions shown in the layout.

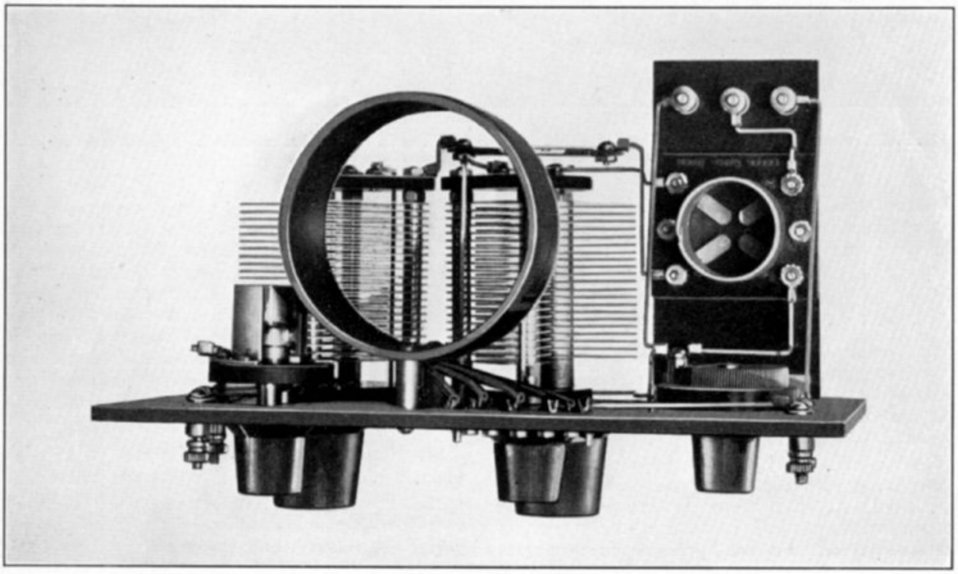

Fig. 4 Looking down on the set you can see the vernier condenser and the mounting of the various parts

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2. Fasten the two stopping points in the end holes marked X.

3. In the remaining five holes of that group insert the contact points, with their lugs, as shown. Tighten the nuts to avoid loose connections.

Note:—Put a little solder on the ends of the lugs before assembling. See suggestions on soldering at the end of these instructions. Remove surplus paste on lugs with an old tooth brush or cloth.

4. Put the switch arm in place, and tighten

to the front panel, but it is drawn in the same plane, in Fig. 6, to show connections properly.

8. Connect 1 to 2, 3 to 4, 4 to 5. To do that, first fit a piece of square tinned wire from 1 to 2, running it as directly as possible, with right angle bends, but avoid contact with any intermediate metal or wire. Then solder the terminals neatly. For all other connections use this fitting and soldering process.

9. In the following order, connect 6 to 7, 8 to 9, 10 to 11, 12 to 13, and 14 to 15.

10. Now mount the inductance coil support

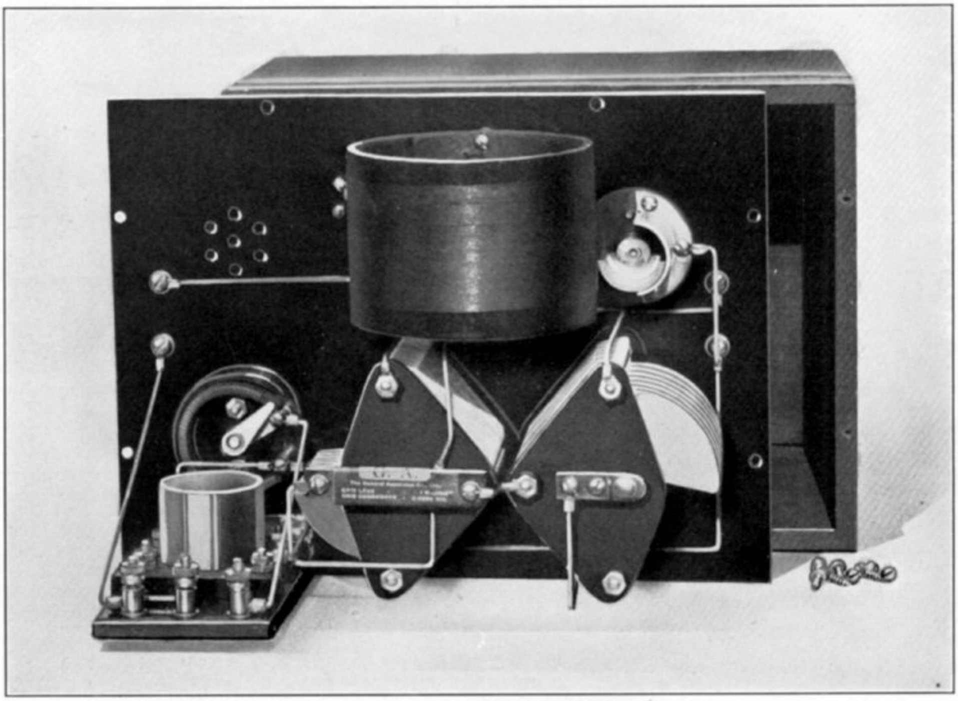

Fig. 5. The rear of the receiving set and the cabinet on which the front panel is mounted. A front strip across the top of the cabinet prevents warping

the rear collar on the shaft, making sure that firm pressure is obtained between the switch arm and the contact points.

5. Mount the rheostat with the screws furnished, and the two variable condensers with ⅜-in. 8-32 F. H. machine screws.

6. Next, attach the vernier condenser as shown, slipping a spacing washer over the screws, these being placed between the back of the panel and the circular disc of the vernier. These can be seen in Fig. 4.

7. Fasten the 2½ x 5 in. base panel to the front panel with the two angle brackets, using ⅜-in. 6-32 R. H. machine screws on the front panel, and ⅜-in. 6-32 F. H. machine screws on the base panel. This small panel is at right angles

pillars on the front panel with ⅜-in. 6-32 R. H. machine screws. Then, with similar screws, fasten the coil on the pillars. Run the end of the winding of the coil nearer the top of the panel to lug 15. Cut off a piece of spaghetti tubing long enough to cover the lead from coil to lug, and slip it over the wire. Scrape off enough insulation to permit the soldering of the lead to the lug and solder it. Bring the next lower tap to lug 16 and continue the process to 17, 18, and 19.

11. Fasten the socket to the base panel with ¾-in. 6-32 F. H. machine screws and nuts.

12. Fasten the three binding posts in place on the rear panel as shown, placing the lugs between the washers and the posts.

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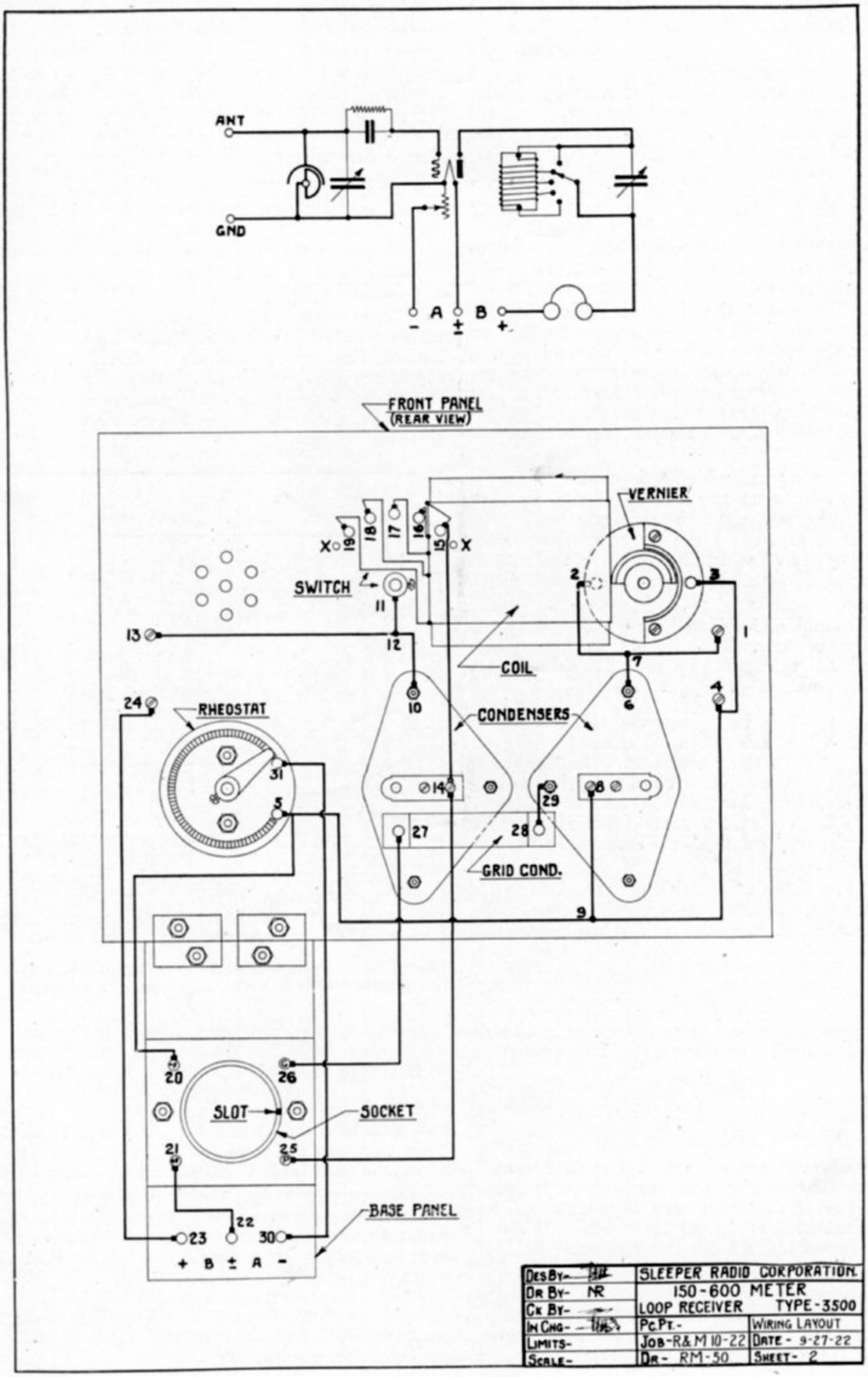

Fig. 6. Schematic and picture diagrams of the loop receiving set. By following the numbers on the terminals, referred to in the instructions, you can hardly make a mistake in the wiring

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13. Connect 20 to 5, 21 to 22, 23 to 24, 25 to 14, 26 to 27, 28 to 29, and 30 to 31. Warning—Use the least possible heat when soldering to the grid condenser terminals.

14. Attach the knobs and dials to the variable condensers so that the 100 degree points on the dials coincide with the engraved lines on the front of the panel when the rotating plates are wholly interleaved with the stationary plates. Tighten the set screws in the knobs.

15. Fasten the knob on the vernier shaft so that the lines on the knob and panel coincide when the rotating plate is half way out of the stationary plate.

16. To mount the rheostat knob, shift the contact arm of the rheostat around to the bare end of the resistance element as shown in Fig. 6, and set the white line on the knob to coincide with the line on the panel. Make sure a firm pressure exists between the contact arm and resistance winding, then tighten the set screw in the knob.

17. Use a small soldering iron. Clean the tip well, by filing away any scale or old solder. After heating the iron, clean the tip again and tin it, that is to say, cover the tip of the iron with soldering paste and a thin smooth coat of solder. Keep the iron clean by wiping it frequently with a cloth.

When making a soldered joint, have the parts cleaned or scraped thoroughly. Apply just enough flux to cover the parts. Use only enough solder to make a good joint.

The Loop untenna

It is important that the loop antenna be constructed to have the proper constants. One very loud complaint on the super-regenerative circuit came from a man who was using a loop so large that its natural period was far above the wavelength of the stations he wanted to receive.

We have been using, with very good results, a loop made up of two crossed wooden strips carrying small L. P. F. pieces to hold the wire. The loop measures 28 ins. diagonally, or 24 ins. on a side. Four turns of No. 20 B. & S. gauge, S.C.C. wire (No. 18 S. W. G.) are wound on a half-inch apart, then a space of 1⅜ ins. and four more turns one-half inch apart. Detailed drawings have been shown separately.

Operating the Set

In New York City we have been able to hear nearby broadcasting stations with somewhat greater signal strength than obtained with a crystal receiving set and a regular antenna. Adding a 2-step amplifier, however, an ordinary loud speaker actuated by a telephone receiver produces signals louder than is necessary to fill an ordinary room. The Murdock phones we used for testing were considerably overloaded.

To adjust the receiving set when it is used either with or without the amplifier the inductance coil and plate condenser are roughly adjusted, the vernier set at its center point and the loop condenser adjusted until the whistle of a telephone or C. W. station is heard. Another way to get rough tuning is to set the inductance switch on the first point which cuts out the plate tuning altogether. When signals are heard they should be brought as nearly as possible into the O whistling point and a final control obtained with the vernier. A further adjustment of the plate condenser and inductance is then necessary and a final setting of the vernier. Usually signals are heard with maximum intensity when the greatest amount of plate inductance is used with a minimum amount of capacity. The adjustment of the detector rheostat is also very important.

In experimenting with this set we found a number of tricks connected with its operation, of such a nature that they must be learned by experiperience for they are difficult to describe. This experience is very necessary, for, with greater familiarity with the adjustments, we found the signals far greater in strength than we were able to obtain at first.

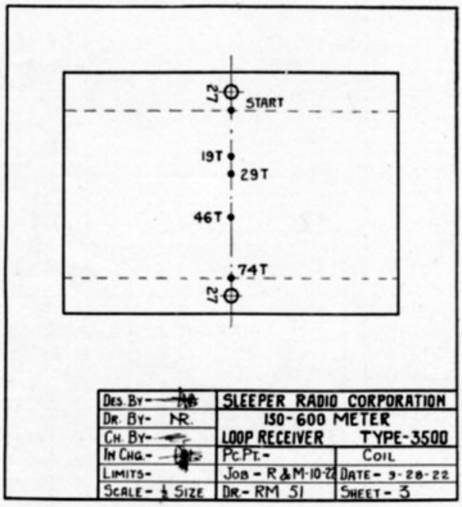

Fig. 7. One-half scale drawing of the inductance tube showing the turns at which taps should be taken off

There are various interesting experiments which can be made with this loop receiving set. For example, we tried different auxiliary antennas, obtaining considerable increase in signal strength when a bed spring was connected to the upper loop binding post. A radiator pipe wired to the lower post also improved the signals. The total absence of static or tube noises was very marked.

Rearrangements of the tuning circuits were also tried, a report on which will be presented later. Altho Experimenters have done comparatively little with loop reception, it offers a field for interesting development work. This includes the possibilities of regenerative, superheterodyne, and superregenerative circuits, of which the latter present wide possibilities to the ingenious and patient Experimenter.

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EDITORIAL

SO many articles are appearing nowadays under such titles as "Will Radio Come Back?", "Is the Amateur Doomed,' and "What Does the Future Hold?". These questions are purely rhetorical, thought up merely for the purpose of displaying the author's cleverness at solving problems that do not exist. Why explain the process for capturing sea serpents when there are no serpents in the sea?

The American Radio Relay League is stronger and more influential now than it has ever been. Its members will continue to route messages across the country. They will always suffer from tongues made sore by burning the midnight tobacco.

Experimenters are working away in their kitchen table work shops, making deeper daily the burns in the oil cloth where the soldering iron slipped off its perch on the potato masher. It's just a matter of time before enameled ware manufacturers will put out a table top with a tool rack at the rear.

Listeners are criticising the broadcasting—and still listening just the same. Everyone criticises the theatres, if only to show his ability as a judge of good plays, yet the attendance increases every year. People always will kick about broadcasting as long as they are interested enough to listen to it.

The number of motor cars is growing steadily. Traffic is uncomfortably congested. If a street is only two cars wide only two cars can pass on it. The capacity of the street can only be increased by making the cars smaller. That's a serious limitation—a physical saturation point. Still, I haven't seen any signs of legislating out the larger cars. Ford isn't asking the Government to clamp down on motor trucks. Motor trucks may not show much consideration for side cars, but they don't complain because they run in the streets.

Why, then, should we be so upset about the air? Suppose it is crowded. So are the excursion boats on holidays. Relay men, experimenters, and listeners have their troubles in crossing crowded streets, but still they get across. They have no alternative than the use of their legs, either.

In radio, however, they have a decided advantage—that of using more selective apparatus for receiving, and more sharply tuned sets for sending. At a meeting of the Standardization Committee of the Institute of Radio Engineers the term "decremeter" came up for definition. In the discussion that followed the point was made that a decremeter does not necessarily indicate the ease with which a transmitter can be tuned out. That is particularly true of phone and interrupted continuous wave transmitters. It is not enough to convict a set of interference when several receiving stations report difficulty in hearing thru it.

Some of our broadcasting stations are so broad that, with a selective receiver adjusted for 2,500 meters, they cannot be tuned out. The relay men and experimenters experience as much interference from phone stations as the listeners from spark transmitters. Often times, too, interference is the result of poorly designed receiving sets.

What we need is an instrument which will show whether or not any type of transmitting set is radiating waves of such pureness as to cause no unreasonable interference at a receiving station of approved design. The design of a "wave analyzer" is simple. An agreement must be made between our radio engineers and the Bureau of Standards. as to acceptable characteristics.

With such an instrument to guard the air, a complaint against interference can be readily settled. It will not then be possible for a spark transmitter to justify itself on the strength of measured decrement. If its signals exhibit unreasonably interfering characteristics it must be retuned. On the other hand, the plaintiff may be found to require sharp tuning from a receiving set which has poor tuning characteristics.

Perhaps we shall find the Kolster decremeter replaced by a Kolster wave analyzer.

With this issue of R & M we have increased the space for articles by fifty per cent. The net result, by comparison, may not be striking, tho, in justice to R & M, I believe you will agree that in no other magazine is as much or as complete construction data given for the real radio Experimenter who builds his own equipment.

I want to thank you for the support given us by your subscription and those of others which you have sent in, which has made it possible for us to increase the number of pages in R & M.

M. B. SLEEPER,
Editor.

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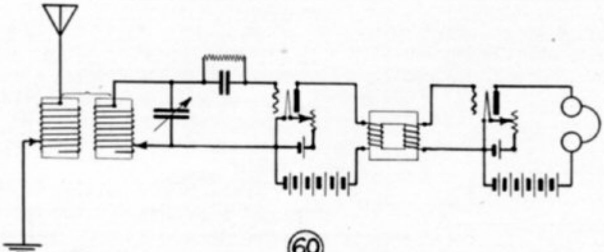
101 Receiving Circuits

Seventh Installment



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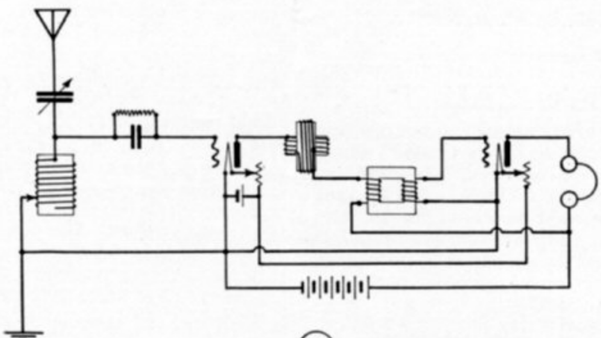
60. An audio frequency amplifier is shown wired to the output of a vacuum tube detector in this diagram. The tuner and detector circuits are the same as those previously considered but in the plate circuit the primary of an amplifying transformer is given the place formerly occupied by telephones. The secondary of the transformer is connected to the grid and filament of a second tube which includes telephones in its output circuit. The amplifying transformer is usually of the iron core type having windings of a step-up ratio so that the voltage impressed upon the amplifier tube is several times greater than the potential variations in the plate circuit of the detector.

The vacuum tubes used for amplification purposes are exhausted to a greater degree than those employed for detectors. The "soft" tube, or detector, is usually critical in its adjustments while the "hard" tube is not.



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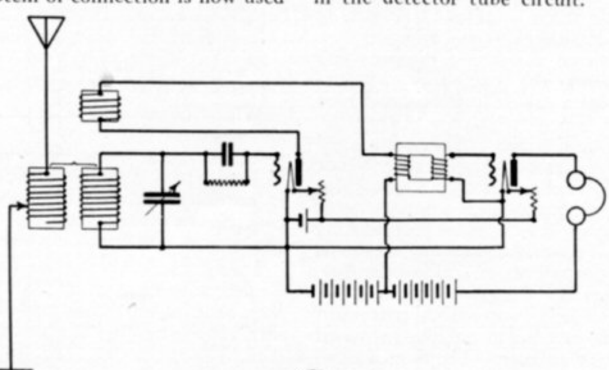
61. The principal difference between this circuit and the preceding one is that one set of batteries is employed for both the detector and amplifier. This system of connection is now used almost exclusively. Regeneration is obtained in the same manner as would obtain if no amplifier were used, that is, the plate variometer is wired in the detector tube circuit.



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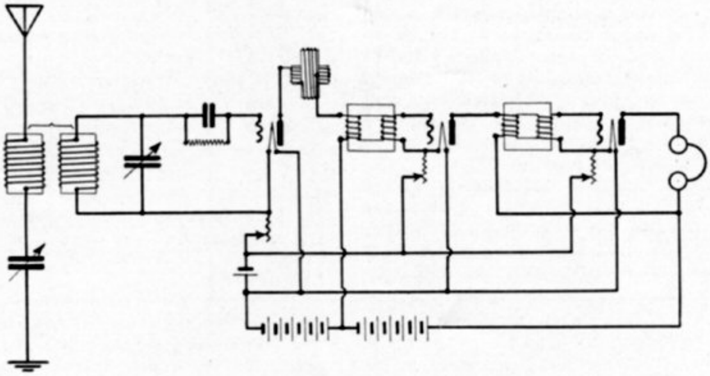
62. Owing to the fact that most detector tubes are designed to operate on plate potentials lower than that required for the best operation of amplifier tubes, it usually becomes necessary to employ a B battery which permits more than one voltage to be taken from it. In this circuit a plate battery is shown supplying the detector with half of its maximum potential and the amplifier with its full voltage. Detector tubes are ordinarily given 22½ volts on their plates while amplifiers are supplied with 45. These are convenient potentials since B batteries are regularly furnished in 22½ and 45 volt units. Where a loud speaking telephone is used the amplifier plate voltage should be in the order of a hundred volts.



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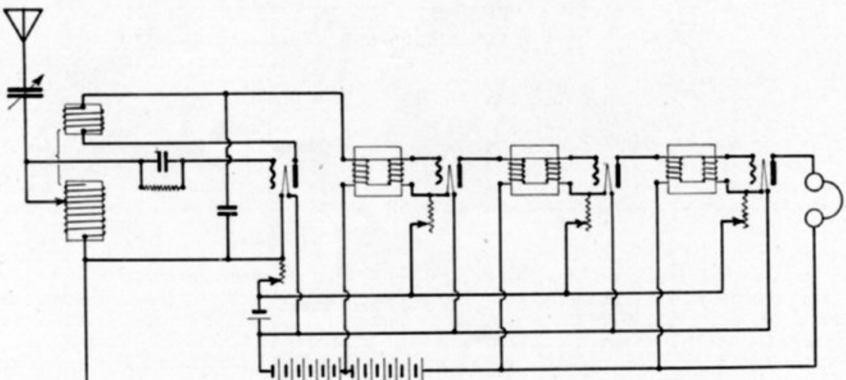
63. This diagram gives the hook-up employed where a two-stage audio frequency amplifier is used in connection with a regenerative tuner. It will be noted that both amplifier tubes are supplied with the same plate potential while the detector receives a smaller amount. The secondary of each transformer should be wired to the negative side of the filament.

The fixed condenser in the plate circuit of a detector, used as a by-pass for high frequency currents, should be of 0.001 mfd. Sometimes in regenerative circuits such a condenser is not required. Usually, however, a by-pass condenssr is inserted as a first aid when a set does not oscillate or regenerate freely.



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64. The wiring of a three stage audio frequency amplifier follows the system used for single and two-step circuits. In this diagram a fixed condenser is connected across the primary of the first transformer and the B battery to act as a radio frequency by-pass from the tickler coil to the filament. This often assists in obtaining the desired degree of feed-back.

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Wavelength, Capacity Meter

Part 1—An instrument needed in every experimental laboratory for testing and design work

The Instrument and Its Uses

For the various measuring and testing work in the laboratory we needed a simple, portable instrument of reasonable accuracy to measure antenna and condenser capacities and to measure wavelengths from 150 to 400 meters. We had, of course, various calibrated coils and condensers, as well as a wavemeter, but we wanted a compact and handy instrument which could be set up and operated quickly.

The apparatus shown in operation at Fig. 1 was worked out for that purpose. With it, as will be explained, we can measure antenna capacities up to 0.0005 mfd., calibrate condensers up to 0.001 mfd., and measure short wavelengths. The latter feature is particularly useful in designing loops for 200-meter or broadcast reception. This testing set is not intended of course, for general wavelength measurements but most Experimenters' problems can be solved by using a low range meter. Our instrument can be depended upon for an accuracy of 3%. The errors in a set copied from the original should not be out more than 5%, a matter of 10 meters at 200 meters. This error can be reduced if the directions are followed exactly.

Importance of Antenna Capacity

When you are designing a receiving or transmitting set the antenna capacity must be known in order to determine the amount of inductance needed in the antenna circuit. This is particularly true when a series or parallel tuning condenser is employed. To illustrate the importance of this factor, suppose a primary inductance of 40,000 to 350,000 cms. is designed on the assumption that the antenna capacity is 0.0003 mfd. That would give a wavelength range of 200 to 600 meters. If, however, the capacity is actually 0.0004 mfd., the resultant range would be 240 to 700 meters, and the set could not be tuned down to 200 meters. It might be assumed, then, that the set is inefficient on 200 meters when it gives poor results on that wavelength only because it is not correctly designed. The error thus introduced is 20% at the lowest wavelength.

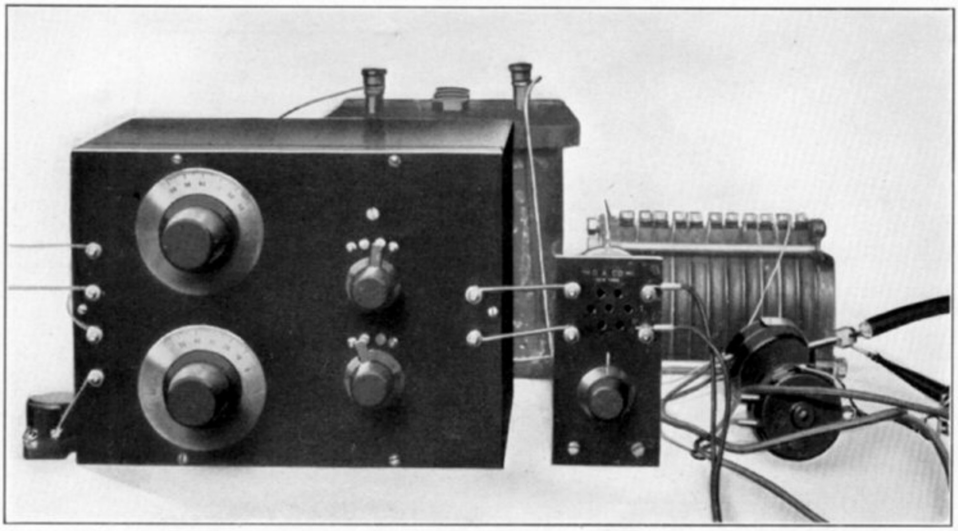

Fig. 1. The meter set up for measuring the capacity of an antenna. Note the Radiobat B battery

Method of Measurement

The method of measuring the antenna capacity is very simple. The antenna and ground are connected to a calibrated condenser shunted around a fixed inductance. This circuit is excited by a buzzer, and the signals radiated are tuned in on another circuit. When that adjustment has been made, the antenna is disconnected and the capacity of the calibrated condenser is increased until the signals are again audible in the second circuit. Obviously the necessary increase in capacity of the calibrated condenser is equal to that of the antenna.

Errors in Measurement

Because the antenna has inductance as well as capacity, the increased reading of the calibrated condenser is not the true antenna

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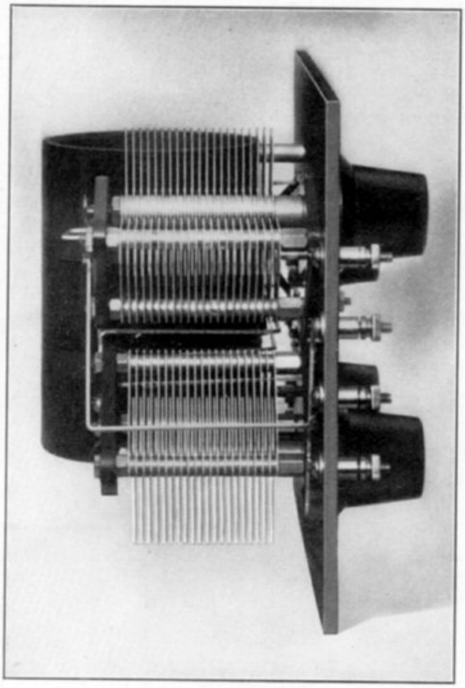

Fig. 2. Side view of the completed meter

capacity. Fortunately the error introduced is very slight since the preponderant factor is the capacity, and the inductance is generally small compared to that in the tuner. The capacity value found by this method is usually termed the "effective antenna capacity"; this factor is used in all design specifications.

Construction of the Set

Two Sleeper Radio Standardized variable condensers of 0.001 mfd., two coils wound on the same tube, and two switches, with the necessary binding posts, comprise the set. These parts are mounted on an L. P. F. panel 7½ by 7½ ins., ⅜ in. thick, secured to a hinged-cover mahogany cabinet. A scale drawing of the front panel and coil tube, exactly one-half size, appears in Fig. 4. Dimensions can be scaled off with a pair of dividers, doubling each measurement to get the full size. Drill sizes are given by numbers. Concentric circles indicate countersinking for flat head screws.

The coil must be wound with great care, for any change in the spaces occupied by the coils or in the number of turns will throw out the calibration. Each coil has 20 turns of No. 24 S. S. C. wire, B. & S. gauge (No. 22 S. W. G.) which should occupy 0.48 in., wound on a 5-in. length of L. P. F. tubing 3½ ins. outside diameter and ⅛-in. wall. The first coil is started 1¼ ins. from one end of the tube; the other 1¾ ins. from the other end, as in Fig. 5. It is advisable to wind the wire very tightly so that no varnish will be needed to hold the turns. Nickeled mounting pillars are provided to support the coils.

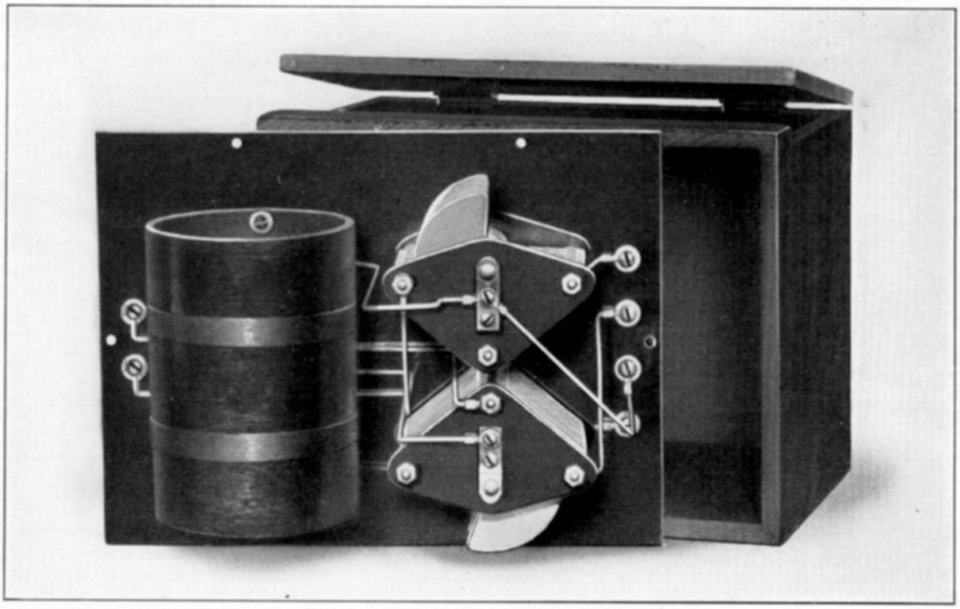

Fig. 3. Rear view of the meter removed from its mahogany case

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Assembling and Wiring

1. Take the eight binding posts apart, slip a soldering lug between each washer and screw-head, and mount them so as to have the posts on the front side of the panel. All lugs are indicated by short heavy lines, and panel, and lugs in the rear as shown, tightening up on the nuts to avoid loose connections.

4. Mount the two switches and tighten the rear collars on the shafts, making sure that firm pressure is obtained between the switch arms and contact points.

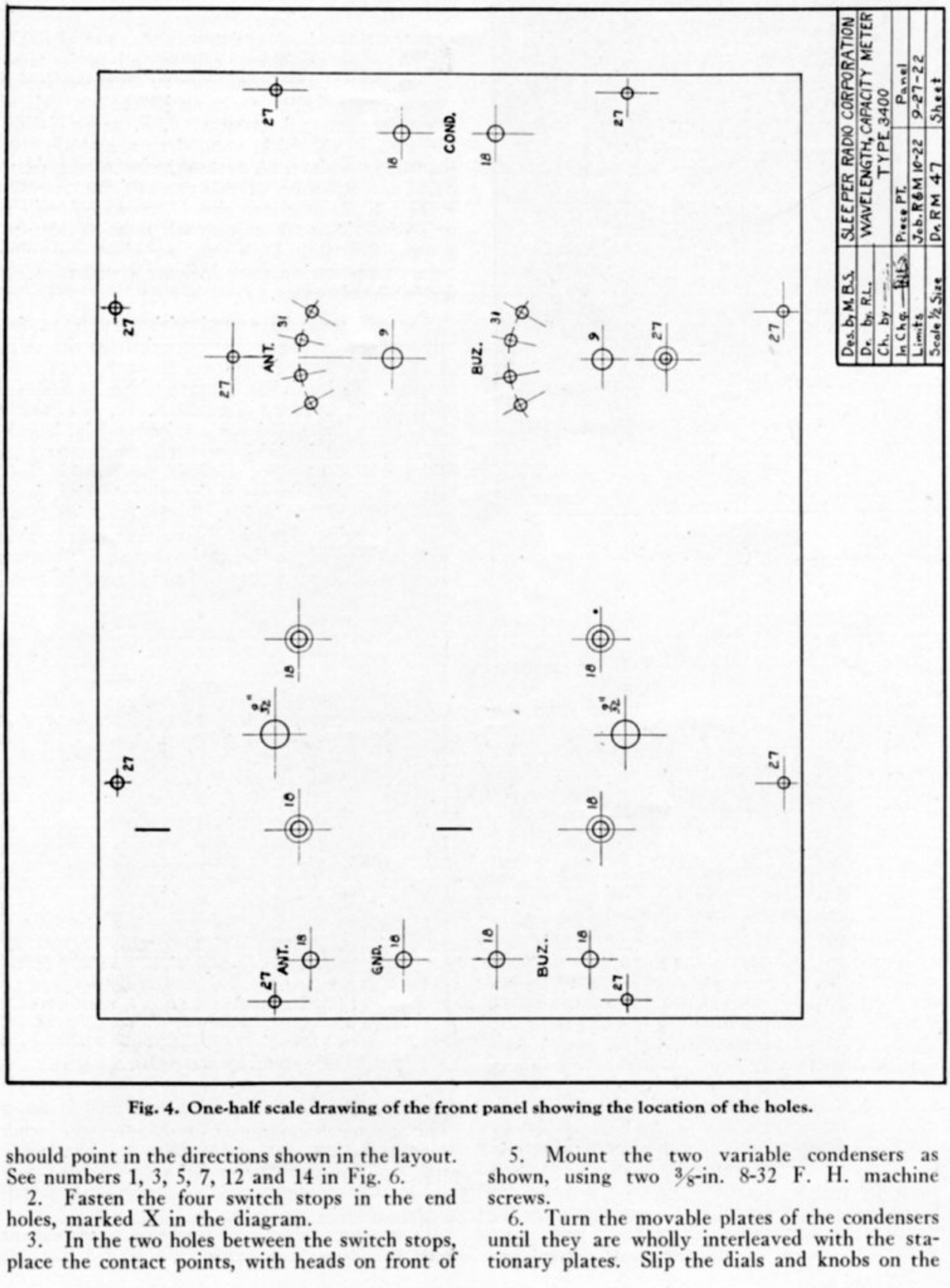

Fig. 4. One-half scale drawing of the front panel showing the location of the holes.

should point in the directions shown in the layout. See numbers 1, 3, 5, 7, 12 and 14 in Fig. 6.

2. Fasten the four switch stops in the end holes, marked X in the diagram.

3. In the two holes between the switch stops, place the contact points, with heads on front of

5. Mount the two variable condensers as shown, using two ⅜-in. 8-32 F. H. machine screws.

6. Turn the movable plates of the condensers until they are wholly interleaved with the stationary plates. Slip the dials and knobs on the

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shafts so that the 100 degree line of each dial coincides with the white lines on the panel. Tighten the set screws in the knobs.

7. Connect in the order mentioned, 1 to 2, 3 to 4, 5 to 6, 7 to 8, 8 to 9 (bend wire to clear coil when placed in position), 10 to 11, 12 to 13,

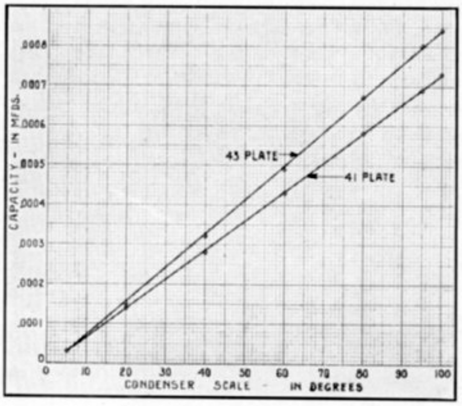

Fig. 7. Calibration of both types of condensers

14 to 15. To do that, first fit a piece of the square tinned wire from 1 to 2, running it as directly as possible with right angle bends but avoid contact with any intermediate metal or wire. Then solder the terminals neatly. For all other connections, similar fitting and soldering processes are used.

8. Now fasten the coil mounting pillars to the panel with 3/8-in. 6-32 F. H. and the coil to the pillars with 3/8-in. 6-32 R. H. machine screws.

9. Solder the ends of the windings, after slipping a piece of spaghetti tubing over leads, to points indicated in Fig. 6. On the top winding, the upper end goes to lug 9 and lower end to lug 11; on the bottom winding, the upper end goes to bus wire at point 16 and lower end to point 17.

Measurement of Antenna Capacity

When you are ready to measure the antenna capacity connect the antenna and ground to the posts marked for that purpose, put a high-tone buzzer and one dry cell across the posts indicated as BUZ, and run a short lead from the upper right hand post to the grid of an audion detector. If an audion is not available, connect that post to one side of a crystal detector and shunt a pair of phones around the detector posts. This unilateral connection helps to sharpen the tuning.

Put both switches in the ON position, and left hand condenser at 10 degrees. Now vary the other until the buzzer can be heard in the phones. When a sharp adjustment has been obtained, leave the condenser right at that point. Now open the switch marked ANT and increase the first until the signals are again tuned in. Refer to the capacity curve in Fig. 7 and determine the capacity at the first and second settings of the left hand condenser. Their difference is the effective antenna capacity.

For example, the first condenser setting is 10 degrees and the second is 40 degrees. Fig. 7 shows that the corresponding capacities are 0.00007 and 0.00032. Their difference, 0.00025, is the effective antenna capacity. The value thus determined can be used in designing the inductance of the primary circuit.

Series and Parallel Condenser

If, however, a variable condenser is shunted around the coil, the total capacity in the circuit is that of the antenna plus that of the condenser. A condenser of 0.0001 to 0.001 mfd. in shunt with antenna of 0.0002 mfd. gives an actual capacity range of 0.0003 to 0.0012 mfd. A series condenser, on the other hand, gives a total capacity value less than that of the antenna. To save you the trouble of calculations, a table of resultant capacities has been worked out in the explanation for using the inductance, capacity, wavelength tables. In the left

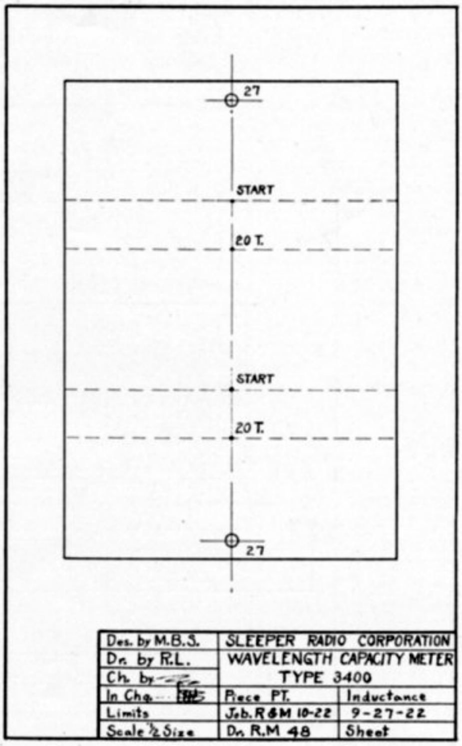

Fig. 5. One-half scale drawing of the coils

hand column are various values for the series tuning condenser, and at the top of the other columns various antenna capacities. Remember that the minimum value of a series condenser should not be taken as much less than one-half of the antenna capacity.

To determine the total capacity in the circuit with an antenna of 0.0004 mfd. and a variable

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condenser of maximum 0.001 mfd., first locate the column headed by 0.0004 mfd. Run down until you are opposite a value in the left hand column of one-half the antenna capacity, or 0.0002 mfd. The value thus located is 0.00013 mfd. Go down still farther to the number opposite 0.001 mfd., the maximum condenser capacity. This value is 0.00028 mfd. Therefore the actual variation of capacity in the circuit is 0.00013 to 0.00028 mfd.

The greater experience an Experimenter has with the simple measuring instruments which can be made without special calibration or much expense the more satisfactory are his results and the more intelligent his attitude toward radio design and construction. One of the greatest drawbacks in the success of Experimenters who go into radio work as a profession is their superficial knowledge of the fundamentals on which apparatus design is based, and it often happens that a man is called upon to do such work with which he should be familiar. In a busy laboratory or shop there is not the time to learn these things which anyone can grasp by experimenting at home.

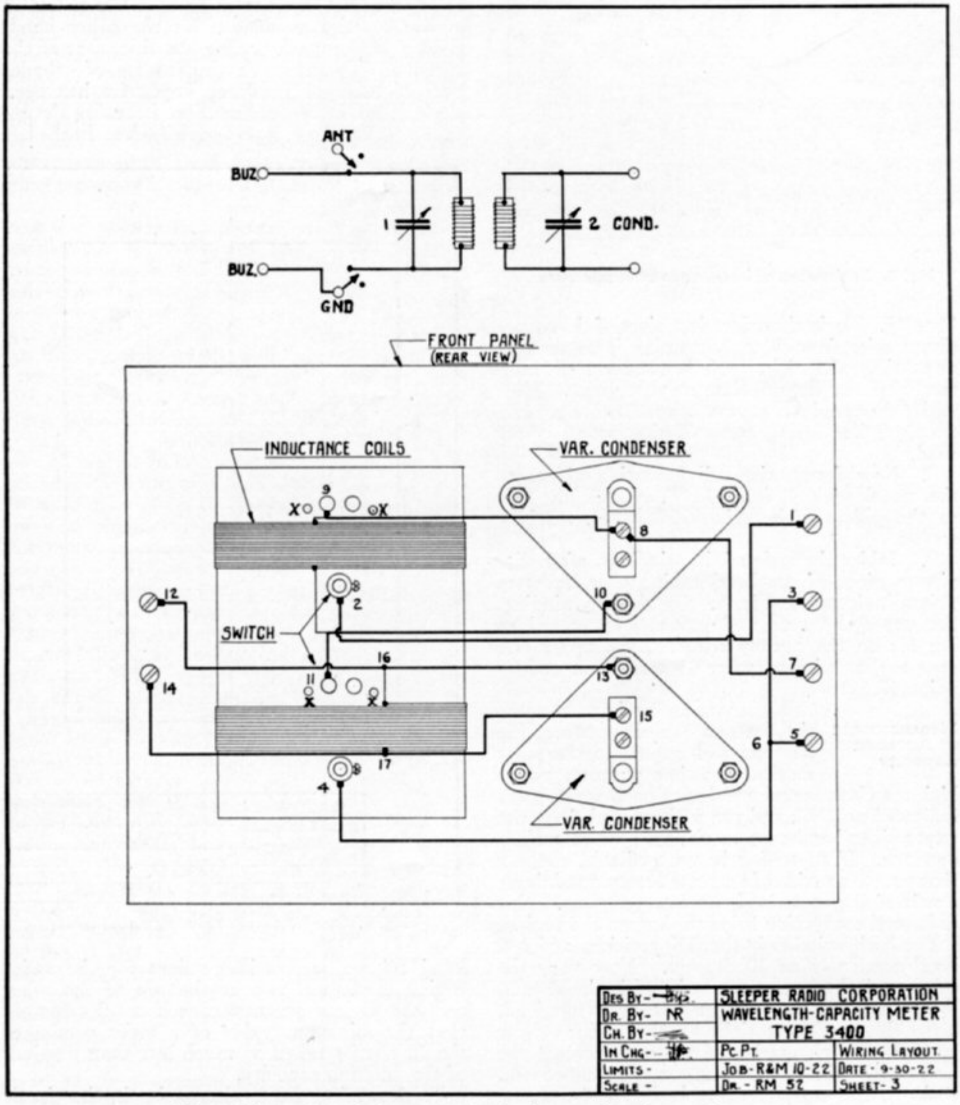

Fig. 6. Schematic and picture circuits for the wavelength, capacity meter

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Wavelength, Capacity, Inductance Tables

By means of these direet-reading tables you can determine the capacity and inductance required for any wavelength, on the resultant wavelength for a given combination of inductance and capacity.

ONE of the greatest stumbling blocks to the success of an experimenter who designs his own radio equipment is the difficulty in determining exactly the values of inductance and capacity required to give the wavelength ranges he expects. It is a lengthy and usually unsatisfactory process to attempt the individual calculations from various and decidedly complex equations. Therefore, the Wavelength, Capacity, Inductance Tables have been worked out to use with the table of resultant antenna circuit capacities and the direct reading Inductance Tables. The first two of these tables are presented here and the Inductance Tables will be given subsequently.

Let us suppose, for example, that we want to design a receiving set for 200 to 3,000 m. By means of the capacity meter we have found the effective capacity of our antenna to be 0.0004 mfd. At that point, however, we are stopped because we have no ready means for determining the inductance to be used in the primary and secondary circuits or to determine the windings to give the inductance values when found.

We will go through here the process of finding the necessary inductances and capacities and later, in the explanation of the use of Inductance Tables, the method for finding the dimensions of the windings necessary. When a fairly long wavelength range is required it is not advisable to use units and tens switches because of the losses that the many connections involve. Therefore, a series condenser is needed, preferably of 0.001 mfd. capacity to give the greatest possible wavelength range per step of inductance. The minimum value of the series condenser should not be less than one half of the effective antenna capacity. Therefore, the condenser capacity range is 0.0002 to 0.001 mfd. The resultant capacity table shows that, with the 0.0004 mfd. antenna the actual variation capacity is 0.00013 to 0.00028. These are the values to be used in the wavelength inductance capacity tables and not the actual minimum and maximum of the variable condenser capacity.

Referring to the latter table, there is no value for 0.00013 but it will be safe to take 0.00012. Following across horizontally from that value in the left hand column we find a wavelength of 196 meters in the column headed 0.09. This indicates that, with an inductance of 0.09 millihenry the wavelength will be 196 meters. Since there are 1,000,000 centimeters in one millihenry, the value 0.09 mh. is equal to 90,000 cms.

There is no value in the tables for 0.00028 mfd. but the value 0.00025 may be taken since, owing to the inductance of the antenna, the effective capacity found by the capacity meter is somewhat higher than the true capacity of the antenna. In the column headed 0.09 the wavelength opposite 0.00025 mfd. is 283 m. It is always advisable to allow a slight wavelength overlap between taps. In this case we will allow 5%. This means that the minimum wavelength of the next inductance step must be 5% lower than the maximum of the previous step. Therefore, we shall deduct one twentieth from 283 m. so that the minimum of wavelength at the next step should be 269 m.

Going back to 0.00012 and following across horizontally, we find 261 meters in the column headed 0.16. This value will give us a safe margin. At 0.00025 mfd. the wavelength with this inductance is 377 meters. Deducting 1-20 from 377, the minimum wavelength of the next tap should be 368 m. The nearest value is 358 m. with 0.30 mh. inductance. At 0.00025 the wavelength is 516 m. This process is continued until the inductance steps required for tuning from 200 to 3,000 m. have been found.

If the receiving set is to be of the single circuit type this data is all that is required. On the other hand it is necessary to work out a table of inductances for the secondary circuit if loose coupling is employed. The capacity values for the secondary condenser should be taken at about 5 degrees and 95 degrees on a 100-degree scale instead of using the minimum and maximum values. Therefore, on a well designed condenser the capacity may be assumed to be 0.00005 to 0.0009 mfd. since there are no other capacities to consider, as in the case of the antenna circuit, the data can be worked out quite readily. With a capacity of 0.00005 and an inductance of 0.20 M.H. the wavelength is 189 m. Increasing the capacity to 0.0009 the wavelength is 800 meters. With an allowance of 5% for the overlap the minimum wavelength at the next tap should be 760 meters. A capacity of 0.00005 and an inductance of 3.0 mh. or 3,000,000 cms. gives a wavelength of 730 m., and at 0.0009 mfd., 3097 m. Therefore, only these two taps are necessary on the secondary to give the wavelength range.

Sometimes in working out this data it will be found that one taps falls a little bit short of the maximum wavelength required and the next tap goes away beyond it. Then the process should be worked the other way. That is, an inductance value should be found which will give the maximum wavelength at full capacity and the next steps arranged in order down to the lowest wavelength required.

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C	0.02	0.025	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.20
0.00001.......	27	30	33	38	42	46	50	53	57	60	65	71	75	80	84
0.00002.......	38	42	46	53	60	65	71	75	80	84	92	100	107	113	119
0.00003.......	46	52	57	65	73	80	86	92	98	103	113	122	131	139	146
0.00004.......	53	60	65	75	84	92	100	107	113	119	131	141	151	160	169
0.00005.......	60	67	73	84	94	103	112	119	126	133	146	158	169	179	189
0.00006.......	65	73	80	92	103	113	122	131	139	140	160	173	185	196	207
0.00007.......	71	79	86	100	112	122	132	141	150	158	173	187	200	212	223
0.00008.......	75	84	92	107	119	131	141	151	160	169	185	200	213	226	238
0.00009.......	80	89	98	113	126	139	150	160	170	179	196	212	226	240	253
0.00010.......	84	94	103	119	133	146	158	169	179	189	207	223	238	253	267
0.00012.......	92	103	113	131	146	160	173	185	196	207	226	244	261	277	292
0.00014.......	100	112	122	141	158	173	187	200	212	223	244	264	282	299	315
0.00016.......	107	119	131	151	169	185	200	213	226	238	261	282	302	320	337
0.00018.......	113	126	139	160	179	196	212	226	240	253	277	299	320	339	358
0.00020.......	119	133	146	169	189	207	223	238	253	267	292	315	337	358	377
0.00025.......	133	149	163	188	211	231	249	267	283	298	326	353	377	400	421
0.00030.......	146	163	179	206	231	253	273	292	310	326	358	386	413	438	462
0.00040.......	169	188	206	238	267	292	315	337	358	377	413	446	477	506	533
0.00050.......	188	211	231	267	298	326	353	377	400	421	462	449	533	565	596
0.00060.......	206	231	253	292	326	358	386	413	438	462	506	546	584	619	653
0.00070.......	223	249	273	315	353	386	417	446	473	499	546	590	631	669	705
0.00080.......	238	267	292	337	377	413	446	477	506	533	584	631	674	715	754
0.00090.......	253	283	310	358	400	438	473	506	536	565	619	669	715	759	800
0.00100.......	267	298	326	377	421	462	499	533	565	596	653	705	754	800	843
0.00110.......	280	313	342	395	442	484	523	559	593	625	685	740	791	839	884
0.00120.......	292	326	358	413	462	506	546	584	619	653	715	772	826	876	923
0.00130.......	304	340	372	430	481	526	569	611	645	680	744	804	859	912	961
0.00140.......	315	353	386	446	499	546	590	631	669	705	772	834	892	946	997
0.00150.......	326	365	400	462	516	565	611	653	690	730	800	864	923	979	1,032
0.00160.......	337	377	413	477	533	584	631	674	715	754	826	892	954	1,011	1,062
0.00170.......	348	389	426	491	550	502	650	695	737	777	851	920	983	1,042	1,099
0.00180.......	358	400	438	506	565	619	669	715	759	800	876	946	1,011	1,073	1,131
0.00190.......	367	411	450	520	581	637	687	735	780	822	900	972	1,041	1,102	1,162
0.00200.......	377	421	462	533	596	653	705	754	800	843	923	997	1,066	1,131	1,192

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C	0.25	0.30	0.40	0.50	0.60	0.7	0.8	0.9	1.0	1.2	1.4	1.6	1.8	2.0
0.00001	94	103	119	133	146	158	169	179	189	207	223	238	253	267
0.00002	133	146	169	189	207	223	238	253	267	292	315	337	358	377
0.00003	163	179	207	231	253	273	292	310	326	358	386	413	438	462
0.00004	189	207	238	267	292	315	337	358	377	413	446	477	506	533
0.00005	211	231	267	298	326	353	377	400	421	462	499	533	565	596
0.00006	231	253	292	326	358	386	413	438	462	506	546	584	619	653
0.00007	249	273	315	353	386	417	446	473	499	546	590	631	669	705
0.00008	267	292	337	377	413	446	477	506	533	584	631	674	715	754
0.00009	283	310	358	400	438	473	506	536	565	619	669	715	759	800
0.00010	298	326	377	421	462	499	533	565	596	653	705	754	800	843
0.00012	326	358	413	462	506	546	584	619	653	715	772	826	876	923
0.00014	353	387	446	499	546	590	631	669	705	772	834	892	946	997
0.00016	377	413	477	533	584	631	674	715	754	826	892	954	1,011	1,066
0.00018	400	438	506	565	619	669	715	759	800	876	946	1,011	1,073	1,131
0.00020	421	462	533	596	653	705	754	800	843	923	997	1,066	1,131	1,192
0.00025	471	516	596	666	730	789	843	894	942	1,032	1,115	1,192	1,264	1,333
0.00030	516	566	653	730	800	864	923	979	1,032	1,131	1,221	1,306	1,385	1,460
0.00040	596	653	754	843	923	997	1,066	1,131	1,192	1,306	1,410	1,509	1,599	1,696
0.00050	666	730	843	942	1,032	1,115	1,192	1,264	1,333	1,460	1,577	1,686	1,788	1,885
0.00060	730	800	923	1,032	1,131	1,221	1,306	1,385	1,460	1,599	1,727	1,846	1,959	2,065
0.00070	789	864	997	1,115	1,221	1,320	1,410	1,496	1,577	1,727	1,866	1,995	2,116	2,230
0.00080	843	923	1,066	1,192	1,306	1,410	1,509	1,599	1,686	1,846	1,995	2,133	2,262	2,384
0.00090	894	979	1,131	1,264	1,385	1,496	1,599	1,696	1,788	1,959	2,116	2,262	2,399	2,529
0.00100	942	1,032	1,192	1,333	1,460	1,577	1,686	1,788	1,885	2,065	2,230	2,384	2,529	2,665
0.00110	988	1,083	1,250	1,398	1,531	1,654	1,768	1,875	1,977	2,165	2,339	2,500	2,652	2,795
0.00120	1,032	1,131	1,306	1,460	1,599	1,727	1,846	1,959	2,065	2,262	2,443	2,612	2,770	2,920
0.00130	1,075	1,177	1,359	1,520	1,665	1,798	1,922	2,039	2,149	2,354	2,543	2,718	2,883	3,039
0.00140	1,115	1,221	1,410	1,577	1,727	1,866	1,995	2,116	2,230	2,443	2,639	2,821	2,992	3,154
0.00150	1,154	1,264	1,460	1,632	1,788	1,932	2,065	2,190	2,308	2,529	2,732	2,920	3,097	3,264
0.00160	1,192	1,306	1,509	1,686	1,846	1,995	2,133	2,262	2,384	2,612	2,821	3,016	3,199	3,372
0.00170	1,229	1,346	1,554	1,737	1,904	2,056	2,198	2,332	2,457	2,692	2,908	3,108	3,297	3,475
0.00180	1,264	1,385	1,599	1,788	1,959	2,116	2,262	2,399	2,529	2,770	2,992	3,199	3,392	3,576
0.00190	1,299	1,423	1,643	1,837	2,012	2,174	2,324	2,465	2,598	2,846	3,074	3,286	3,485	3,674
0.00200	1,333	1,460	1,686	1,885	2,065	2,230	2,384	2,529	2,665	2,920	3,154	3,372	3,576	3,770

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C	2.5	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
0.00001.......	298	326	377	421	462	499	533	565	596	653	705	754	800	843	942
0.00002.......	421	462	533	596	653	705	754	800	843	923	997	1,066	1,131	1,192	1,333
0.00003.......	516	566	653	730	800	864	923	979	1,032	1,131	1,221	1,306	1,385	1,460	1,632
0.00004.......	596	653	754	843	923	997	1,066	1,131	1,192	1,306	1,410	1,509.	1,599	1,686	1,885
0.00005.......	663	730	843	942	1,032	1,115	1,192	1,264	1,333	1,460	1,577	1,686	1,788	1,885	2,108
0.00006.......	730	800	923	1,032	1,131	1,221	1,306	1,385	1,460	1,599	1,727	1,846	1,959	2,065	2,308
0.00007.......	789	864	997	1,115	1,221	1,320	1,410	1,496	1,577	1,727	1,866	1,995	2,116	2,230	2,493
0.00008.......	843	923	1,066	1,192	1,306	1,410	1,509	1,599	1,686	1,846	1,995	2,133	2,262	2,384	2,665
0.00009.......	894	979	1,131	1,264	1,385	1,496	1,599	1,696	1,788	1,959	2,116	2,262	2,399	2,529	2,827
0.00010.......	942	1,032	1,192	1,333	1,460	1,577	1,686	1,788	1,885	2,065	2,230	2,384	2,529	2,665	2,980
0.00012.......	1,032	1,131	1,306	1,460	1,599	1,727	1,846	1,959	2,065	2,262	2,443	2,612	2,770	2,920	3,264
0.00014.......	1,115	1,221	1,410	1,577	1,727	1,846	1,995	2,116	2,230	2,443	2,639	2,821	2,992	3,164	3,526
0.00016.......	1,192	1,306	1,509	1,686	1,846	1,995	2,133	2,262	2,384	2,612	2,821	3,016	3,199	3,372	3,770
0.00018.......	1,264	1,385	1,599	1,788	1,959	2,116	2,262	2,399	2,529	2,770	2,992	3,199	3,392	3,576	3,998
0.00020.......	1,333	1,460	1,686	1,885	2,065	2,230	2,384	2,529	2,665	2,920	3,154	3,372	3,576	3,770	4,214
0.00025.......	1,490	1,632	1,885	2,108	2,308	2,493	2,665	2,827	2,980	3,264	3,526	3,770	3,998	4,214	4,713
0.00030.......	1,632	1,788	2,065	2,308	2,529	2,732	2,920	3,097	3,264	3,576	3,863	4,129	4,379	4,617	5,161
0.00040.......	1,885	2,065	2,384	2,665	2,920	3,154	3,372	3,576	3,770	4,129	4,460	4,768	5,057	5,331	5,960
0.00050.......	2,108	2,380	2,665	2,980	3,264	3,526	3,770	3,998	4,214	4,617	4,987	5,331	5,654	5,960	6,663
0.00060.......	2,308	2,529	2,920	3,264	3,578	3,863	4,129	4,379	4,617	5,057	5,462	5,840	6,192	6,529	7,299
0.00070.......	2,493	2,732	3,154	3,526	3,863	4,172	4,460	4,731	4,987	5,462	5,900	6,306	6,693	7,052	7,885
0.00080.......	2,665	2,920	3,372	3,770	4,129	4,460	4,768	5,057	5,331	5,840	6,306	6,741	7,152	7,539	8,429
0.00090.......	2,827	3,097	3,576	4,000	4,379	4,731	5,057	5,364	5,654	6,192	6,693	7,152	7,587	7,996	8,940
0.00100.......	2,980	3,264	3,770	4,214	4,617	4,987	5,331	5,654	5,960	6,529	7,052	7,539	7,996	8,429	9,423
0.00110.......	3,125	3,424	3,953	4,420	4,842	5,230	5,591	5,930	6,251	6,848	7,396	7,909	8,386	8,810	9,880
0.00120.......	3,264	3,576	4,129	4,617	5,057	5,462	5,840	6,192	6,529	7,152	7,724	8,261	8,761	9,233	10,320
0.00130.......	3,398	3,722	4,298	4,805	5,264	5,685	6,109	6,449	6,796	7,444	8,040	8,594	9,119	9,611	10,750
0.00140.......	3,526	3,863	4,460	4,987	5,462	5,900	6,306	6,693	7,052	7,724	8,344	8,922	9,459	9,973	11,150
0.00150.......	3,650	3,998	4,617	5,161	5,654	6,109	6,529	6,902	7,299	7,996	8,637	9,233	9,794	10,320	11,540
0.00160.......	3,770	4,129	4,768	5,331	5,840	6,306	6,741	7,152	7,539	8,261	8,922	9,536	10,110	10,660	11,920
0.00170.......	3,885	4,256	4,915	5,495	6,020	6,502	6,949	7,373	7,771	8,511	9,196	9,828	10,420	10,990	12,290
0.00180.......	3,998	4,379	5,057	5,654	6,192	6,693	7,152	7,587	7,996	8,761	9,459	10,110	10,730	11,310	12,640
0.00190.......	4,108	4,500	5,196	5,809	6,365	6,872	7,384	7,796	8,215	9,000	9,721	10,410	11,020	11,620	12,990
0 00200.......	4,214	4,617	5,331	5,960	6,529	7,052	7,539	7,996	8,429	9,230	9,973	10,660	11,310	11,920	13,330

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C,	30.0	40.0	50.0	60.0	70.0	80.0	90	100	120	140	160	180	200
0.00001	1,032	1,192	1,333	1,460	1,577	1,686	1,788	1,885	2,065	2,230	2,384	2,529	2,665
0.00002	1,460	1,686	1,885	2,065	2,230	2,384	2,529	2,665	2,920	3,154	3,372	3,576	3,770
0.00003	1,788	2,065	2,308	2,529	2,732	2,920	3,097	3,264	3,576	3,863	4,129	4,379	4,617
0.00004	2,065	2,384	2,665	2,920	3,154	3,372	3,576	3,770	4,129	4,460	4,768	5,057	5,331
0.00005	2,308	2,665	2,980	3,264	3,526	3,770	3,998	4,214	4,617	4,987	5,331	5,654	5,960
0.00006	2,529	2,920	3,264	3,578	3,862	4,129	4,379	4,617	5,057	5,462	5,840	6,192	6,529
0.00007	2,732	3,154	3,526	3,863	4,172	4,460	4,731	4,987	5,462	5,900	6,306	6,693	7,052
0.00008	2,920	3,372	3,770	4,129	4,460	4,768	5,057	5,331	5,840	6,306	6,741	7,152	7,539
0.00009	3,097	3,576	4,000	4,379	4,731	5,057	5,364	5,654	6,192	6,693	7,152	7,587	7,996
0.00010	3,264	3,770	4,214	4,617	4,987	5,331	5,654	5,960	6,529	7,052	7,539	7,996	8,429
0.00012	3,576	4,129	4,617	5,057	5,462	5,840	6,192	6,529	7,152	7,724	8,261	8,761	9,233
0.00014	3,863	4,460	4,987	5,462	5,900	6,306	6,693	7,052	7,724	8,344	8,922	9,459	9,973
0.00016	4,129	4,768	5,331	5,840	6,306	6,741	7,152	7,539	8,261	8,922	9,536	10,110	10,660
0.00018	4,379	4,057	5,654	6,192	6,693	7,152	7,587	7,996	8,761	9,459	10,110	10,730	11,310
0.00020	4,617	5,331	5,960	6,529	7,052	7,539	7,996	8,429	9,230	9,973	10,660	11,310	11,920
0.00025	5,161	5,960	6,663	7,299	7,885	8,429	8,940	9,423	10,320	11,150	11,920	12,640	13,330
0.00030	5,659	6,529	7,299	7,996	8,637	9,233	9,794	10,320	11,310	12,210	13,060	13,850	14,600
0.00040	6,529	7,539	8,429	9,233	9,973	10,660	11,310	11,920	13,060	14,100	15,090	15,990	16,860
0.00050	7,299	8,429	9,423	10,320	11,150	11,920	12,640	13,330	14,600	15,770	16,860	17,880	18,850
0.00060	7,996	9,233	10,320	11,310	12,210	13,060	13,850	14,600	15,990	17,270	18,460	19,590	20,650
0.00070	8,637	9,973	11,150	12,210	13,200	14,100	14,960	15,770	17,270	18,660	19,950	21,160	22,300
0.00080	9,233	10,660	11,920	13,060	14,100	15,090	15,990	16,860	18,460	19,950	21,330	22,620	23,840
0.00090	9,794	11,310	12,640	13,850	14,960	15,990	16,960	17,880	19,590	21,160	22,620	23,990	25,290
0.00100	10,320	11,920	13,330	14,600	15,770	16,860	17,880	18,850	20,650	22,300	23,840	25,290	26,650
0.00010	10,830	12,500	13,980	15,310	16,540	17,680	18,760	19,770	21,650	23,390	25,000	26,520	27,950
0.00120	11,310	13,060	14,600	15,990	17,270	18,460	19,590	20,650	22,620	24,430	26,120	27,700	29,200
0.00130	11,770	13,590	15,200	16,650	17,980	19,220	20,390	21,490	23,540	25,430	27,120	28,830	30,390
0.00140	12,210	14,100	15,770	17,270	18,660	19,950	21,160	22,300	24,430	26,390	28,210	29,920	31,540
0.00150	12,640	14,600	16,320	17,880	19,320	20,650	21,900	23,080	25,290	27,320	29,200	30,970	32,640
0.00160	13,060	15,090	16,860	18,460	19,950	21,330	22,620	23,840	26,120	28,210	30,160	31,990	33,720
0.00180	13,460	15,540	17,370	19,040	20,560	21,980	23,320	24,570	26,920	29,080	31,080	32,860	34,750
0.00180	13,850	15,990	17,880	19,590	21,160	22,620	23,990	25,290	27,700	29,920	31,990	33,720	35,760
0.00190	14,230	16,430	18,370	20,120	21,740	23,240	24,650	25,980	28,460	30,740	32,860	34,850	36,740
0.00200	14,600	16,860	18,850	20,650	22,300	23,840	25,290	26,650	29,200	31,540	33,720	35,760	37,770

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Frequently experimenters ask about designing regenerative circuits using variometers because they do not know the maximum and minimum inductances of their variometers. Such circuits are rather difficult to work out because, in a secondary tuned by a variometer, the distributed capacity of the variometer and the capacity of the tube replace the shunt condenser ordinarily used. To these values is added the capacity of the circuit which is difficult to determine, so that it is usually necessary to actually assemble the circuit and measure the wavelength.

Sometimes an experimenter wishes to divide the inductance between two coils. For example, it is advisable to split the secondary inductance just discussed into a coupling coil and loading coil. Perhaps the coupling coil will be of such construction as to have an inductance of 0.1 M.H. Then the first tap on the secondary loading inductance will be at 0.10 mh. and the full value of the coil 2.90 mh.

There is no fixed rule for determining the inductance of a tickler coil. This is a factor which must be worked out by experiment.

C_{tuning}	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
0.0001	0.000050	0.00006	0.00007	0.00008	0.00008	0.00009	0.00009	0.00009	0.00009	0.00009
0.0002	0.000060	0.00010	0.00012	0.00013	0.00014	0.00015	0.00015	0.00016	0.00016	0.00017
0.0003	0.000075	0.00012	0.00015	0.00017	0.00019	0.00020	0.00021	0.00022	0.00023	0.00023
0.0004	0.000080	0.00013	0.00017	0.00020	0.00022	0.00024	0.00025	0.00026	0.00027	0.00028
0.0005	0.000083	0.00014	0.00019	0.00022	0.00025	0.00027	0.00029	0.00030	0.00032	0.00033
0.0006	0.000086	0.00015	0.00020	0.00024	0.00027	0.00030	0.00032	0.00034	0.00036	0.00038
0.0007	0.000088	0.00015	0.00021	0.00025	0.00029	0.00032	0.00035	0.00037	0.00039	0.00041
0.0008	0.000089	0.00016	0.00022	0.00026	0.00031	0.00034	0.00037	0.00040	0.00042	0.00044
0.0009	0.000090	0.00016	0.00023	0.00027	0.00032	0.00036	0.00039	0.00042	0.00045	0.00047
0.0010	0.000091	0.00017	0.00023	0.00028	0.00033	0.00038	0.00041	0.00044	0.00047	0.00050
0.0011	0.000092	0.00017	0.00024	0.00029	0.00034	0.00039	0.00043	0.00046	0.00049	0.00053
0.0012	0.000092	0.00017	0.00024	0.00030	0.00035	0.00040	0.00044	0.00048	0.00051	0.00055
0.0013	0.000093	0.00017	0.00024	0.00031	0.00036	0.00041	0.00045	0.00050	0.00053	0.00057
0.0014	0.000093	0.00018	0.00025	0.00031	0.00037	0.00042	0.00046	0.00051	0.00055	0.00058
0.0015	0.000094	0.00018	0.00025	0.00032	0.00038	0.00043	0.00047	0.00052	0.00057	0.00060

STANDARDIZED PARTS FOR THE LOOP RECEIVER
TYPE 3500

No.	Description	Wt.	Price
38	1—Panel 7½ x 10 x ⅜ ins.	16 oz.	$1.97
29	1—Panel 2½ x 5 x ⅜ ins.	12 oz.	.33
A17	2—43-plate variable condensers	2 lbs.	8.60
174	1—L. P. F. tube 3½ ins. dia. 2½ ins. long	8 oz.	.75
40	1—¼ lb. spool No. 24 S. S. C. wire	5 oz.	.75
A-9	1—Switch	3 oz.	.65
A95	1—Vernier condenser, complete with knob	6 oz.	1.75
A1	1—Socket	4 oz.	.80
7	5—Switch points	2 oz.	.20
A20	2—100° knobs and dials, ¼ in. hole	16 oz.	2.50
93	2—Switch stops	1 oz.	.10
22	2—1 in. angle brackets, 1 right and 1 left	2 oz.	.20
A22	1—Rheostat complete with knob	5 oz.	1.00
14	2—Coil support pillars	3 oz.	.16
58	1—Pkg. small soldering lugs	1 oz.	.25
A10	7—Binding posts	6 oz.	.70
A2	1—Grid condenser	2 oz.	.35
47	2—Lengths of sq. tinned copper wire	2 oz.	.10
91	1—Length Empire tubing	2 oz.	.40
141	1—Pkg. ⅜ in. 6-32 R. H. machine screws	2 oz.	.12
77	1—Pkg. ¾ in. 6-32 F. H. machine screws	3 oz.	.13
196	1—Pkg. No. 6, ⅜ in. R. H. wood screws	2 oz.	.13
A6	1—Cabinet, 7½ x 10 in.	3½ lbs.	5.98
3500	Complete set of unfinished parts, as listed above for the loop receiver a saving of $.82	9 lbs.	$27.10

STANDARDIZED PARTS FOR THE WAVELENGTH CAPACITY METER
TYPE 3400

No.	Description	Wt.	Price
38	1—Panel 7½ x 10 x ⅜ ins.	16 oz.	$1.97
A6	1—Cabinet 7½ x 10 ins.	3½ lbs.	5.98
A17	2—43-plate 0.001 mfd. variable condensers	2 lbs.	8.60
18	1—L. P. F. tube 3½ in. dia., 5 in. long	8 oz.	1.48
40	1—¼ lb. spool No. 24 S. S. C. wire	5 oz.	.75
A10	6—Binding posts	5 oz.	.60
58	1—Pkg. small soldering lugs	1 oz.	.25
A9	2—Switches	6 oz.	1.30
7	4—Switch points	3 oz.	.16
93	4—Switch stops	2 oz.	.20
A20	2—100° dials complete with knobs	1 lb.	2.50
14	2—Coil mounting pillars	3 oz.	.16
141	1—Pkg. ⅜ in. 6-32 R. H. machine screws	2 oz.	.12
71	1—Pkg. ⅜ in. 6-32 F. H. machine screws	2 oz.	.12
196	1—Pkg. No. 6 wood screws, ⅜ in. R. H.	2 oz.	.13
47	2—Lengths sq. tinned copper wire	2 oz.	.10
91	1—Length Empire tubing	2 oz.	.40
3400	Complete set of unfinished parts, as listed above, for the wavelength capacity meter (a saving of $.89)	8 lbs.	$23.03

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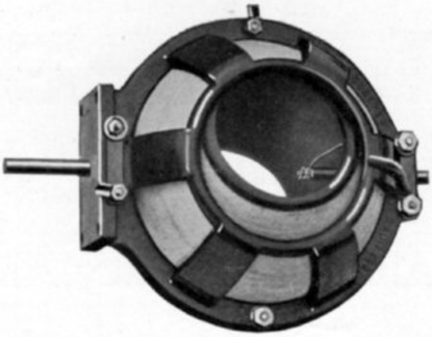
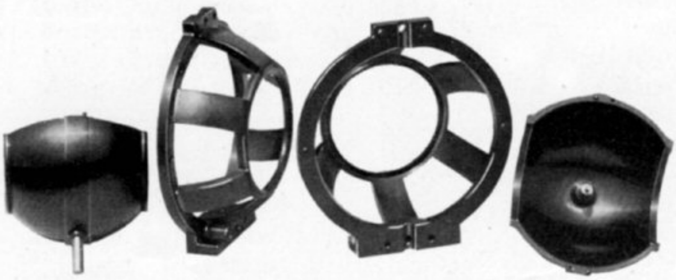


Sleeper Variometer

THERE'S a real surprise in store for you if you haven't seen the Sleeper Variometer. It's just the sort of clever design that you would expect M. B. to turn out. In addition, it has the splendid electrical characteristics, adaptability of construction, strength, and permanence which you require of a variometer that you would endorse without qualification.

Mr. Sleeper's aim, in designing the A-101 variometer was to produce a type which would not have the high losses characteristic of moulded variometers. This was accomplished, with no sacrifice of mechanical strength, by using a cage stator and a shell rotor. The total molded material can be contained in a cube 2 ins. on a side, weighing 10 oz. Unlike others, too, this variometer is designed to withstand unusually rough use.



The construction of the rotor is interesting, for it introduces an entirely new method of assembly. The wall is only $\frac{3}{32}$ in. thick, except for the shoulder which supports the shaft. It is impossible for the shaft to run out of line because it is moulded in place. Long bearings make the rotor turn true and smoothly, permitting the clearance between the coils to be reduced to $\frac{1}{16}$ in. The A-101 variometer measures $4\frac{7}{8}$ ins. in height, $5\frac{1}{4}$ ins. in length, and $3\frac{3}{4}$ ins. in width with the rotor fully out. Mounting is accomplished by four screws whose centers form a rectangle 2 ins. high by $1\frac{1}{8}$ ins. wide, with the $\frac{1}{4}$-in. shaft in the center. The inductance is 70,000 to 840,000 cms., or 0.07 to 0.84 mh. Screws conveniently located permit the attachment of an inductance for a single circuit regenerative receiving set.

Sleeper Variometer, type A-101, weight 2 lbs $7.50

Sleeper Radio Corporation 88 Park Place, New York, N. Y.

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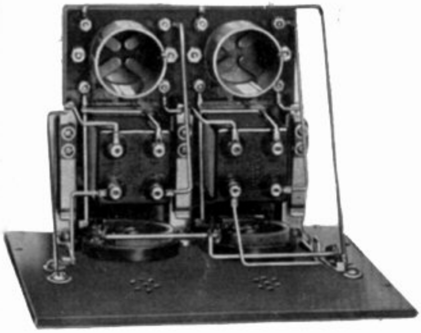
SLEEPER
Radio
CONSTRUCTION SETS

2-Step Audio Frequency Amplifier

The way the type 3100 amplifier amplifies signals which cannot be heard at all in the detector makes a fellow think that there's some radio frequency amplification in it, but really it's two steps of audio, put thru transformers actually designed for the work they are to do, and a circuit planned to do justice to the transformers.

As an example of the work this type 3100 amplifier does—signals on the loop receiver, described in this issue of R and M, which were just audible with the detector alone were amplified sufficiently to overload a Deveau Silvertone Loud Speaker. Radiotron U. V. 201 tubes with only 45 volts were used in the amplifier.

The L. P. F. panel measures $7\frac{1}{2}$ by $7\frac{1}{2}$ ins., mounted on a hinged-cover polished mahogany cabinet $6\frac{1}{2}$ ins. deep. Jacks are provided for connection to the detector alone or one or two steps of amplification.



For strong, undistorted signals, Type 3100
Amplifier as shown, ready for operation, weight 7 lb. $44.75
Complete construction set, panels drilled and engraved, can be assembled with a screw driver, pliers, and soldering iron, packed with full instructions in a handsome display box, weight 7 lbs. $28.00

Sleeper Radio Corporation — **88 PARK PLACE NEW YORK CITY**

In the center of New York's radio district. Dealers coming to the City are invited to make this their headquarters. Every courtesy and convenience is at their disposal

English agents: Melchoir, Armstrong & Dessau, 111 Gt. Portland St., London

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