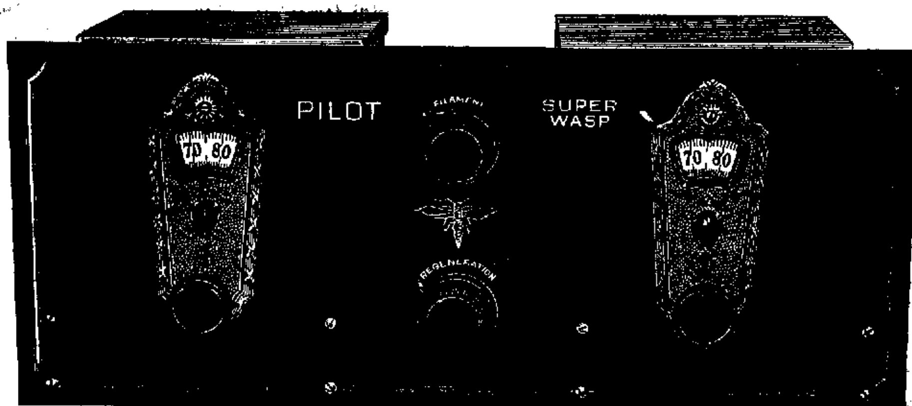
DATA SHEET No. 7
SUPER-WASP
BATTERY TYPE
Double-Duty Receiver
14-500 Meters

TRADE MARK

WORLD'S LARGEST RADIO PARTS MANUFACTURER

PILOT RADIO & TUBE CORPORATION, 323 BERRY ST., BROOKLYN, N. Y., U. S. A.



THE PILOT SUPER-WASP K-110 BATTERY TYPE

Double-Duty Receiver for Both Long and Short Waves.

By ROBERT S. KRUSE

Complete Super-Wasp Kit—No. K-110—Code ZWAGS

Includes drilled front and sub-panels, shield cans, ten special plug-in coils, all the parts listed in detail on pages 4 and 5 and full-size working blueprint.

WHEN the original Wasp receiver was being designed, the question arose as to whether we should merely add an audio amplifier or at once attempt a stage of radio-frequency amplification. Even a very brief analysis showed that it would be wise to defer the R.F. stage until several questions could be answered in better form than that represented by the short-wave tuners on the market. The Wasp therefore appeared with an audio amplifier, and it was exceedingly well received by short-wave broadcast listeners.

Having found the Wasp to be entirely satisfactory in the field as well as in the laboratory, we were encouraged to proceed with the original purpose of using a stage of tuned R.F. This has been done in the Super-Wasp, to the final form of which the entire Pilot staff has contributed in one manner or another. A considerable portion of the work was done simultaneously in New York, by John Geloso and Robert Hertzberg, and at the writer's home in West Hartford, Conn., so that independent information might be used to disclose any of those errors which happen too often when all work together at one place and become victims of an opinion.

The Super-Wasp as it now stands is unquestionably the best all-round short-wave receiver ever offered the listener. Its points of superiority are as follows: (1) Increased sensitivity and selectivity made possible by the TUNED screen-grid R.F. stage. (2) Universal wavelength range. Tunes from 14 to 500 meters. An excellent broadcast receiver as well as the finest of all short-wave sets. (3) Absolutely no "hand capacity" effects. (4) Completely shielded. (5) Easily assembled and wired from kit of parts. (6) Inexpensive. And last, but most important, (7) Ability to bring in short-wave broadcasting stations better than all previous short-wave receivers.

Build a Super-Wasp and experience the greatest of all radio thrills—hearing foreign broadcasting stations. The editor of RADIO DESIGN, while testing a Super-Wasp for a few minutes after dinner and then again before going to bed (location: New York), heard stations in Chelmsford, England; Manitoba, Canada; and Costa Rica, Central America! These were broadcasting voice and music, NOT CODE.

Beginning with the matter of shielding, one had at once the question of the material to be used and the thickness required. Aluminum has some evident advantages in that it does not tarnish readily, may be formed easily and is light. It was therefore used and a light gauge made possible by placing the R.F. shield and the detector shield at opposite ends of the set. The base-plate or "sub-panel" of the set was made of much heavier sheet aluminum so as to provide a zero-potential plane which would not be upset by currents flowing in it. For the same reason also the panel was made of heavier material.

There is not space here to discuss the reasons which led to the particular location of the wiring, the use of a ground at each socket, the series feed of the 222 plate supply through the tuned detector-feed circuit, or the rather unusual circuit arrangement inside the cans. We can say only that the R.F. amplification obtained has been so adjusted that it produces a very handsome improvement in performance (as compared with the Wasp) while at the same time assuring a gratifying freedom from "crankiness". Since the set is to be used with all sorts of antennas this obviously means that the R.F. gain cannot be pushed to extremes.

For this no apology is offered. On the contrary, I wish to assert that any materially greater gain would be worse than useless since the "useful selectivity" of the set would be ruined thereby, besides creating operating difficulties in the way of uncontrolled oscillation when the set is worked under improper conditions. The practical set for sale in kit form is the one which works when correctly assembled—not the one which works *if* everything is exactly and critically adjusted.

GOOD BROADCAST RECEPTION ON SUPER-WASP

In the broadcast region the Super-Wasp can be thought of as comparing very nicely indeed with other four and five-tube sets. Obviously one must not expect the same selectivity from two tuned circuits as from three or four, nor will a single 222 develop the same gain as a number of the same. It is therefore not pretended that seven-tube performance has been obtained. None the less, both the sensitivity and the selectivity are such as to permit good use of the set to be made in the normal broadcast band whenever the short waves are behaving badly. Similarly, when the normal receiver is struck by a "dead evening", the Super-Wasp need but be shifted to the short waves.

The first model Super-Wasp had been provided with R.F. coils carrying primaries, also providing for condenser feed from the antenna to the top (grid) end of the tuned circuit. This was the same arrangement that had been used in the original Wasp receiver. It was found that the condenser feed was not well suited for use in the broadcast region of 200-500 meters for the reason that satisfactory coupling could not be obtained unless the feed condenser was enlarged materially. When this was done the condenser was of a capacity which tuned the antenna as a series system and produced a condition of two-frequency response—a wholly inoperative condition.

AUTOMATIC AERIAL CHANGE-OVER

The user would find this out for himself, just as he had in the simpler Wasp receiver, but the shifting of the antenna is less convenient in the case of a shielded set of larger dimensions. It was therefore decided to use a device suggested by Mr. Geloso. This was a set of coils so connected that the 200-500 meter coil carried an antenna, or primary coil, while the others had none and were so connected that the feed-condenser was automatically connected in when they were put into the socket. Thus without any need for two antenna posts it was possible to use the primary coil in the 200-500 meter region while retaining the convenient feature of variable coupling through a small condenser at shorter waves.

Having arrived at this point, it was believed that the short-wave performance could be taken for granted, with the possible exception of the regeneration control. The broadcast-range response was again checked and the primary, or antenna coil adjusted so that the average receiving antenna will have somewhat more coupling than is strictly necessary. The proper value may then be obtained by putting into the antenna lead a "postage stamp" mica condenser whose value is to be found by trial. There is nothing critical about this and the proper value will be found by trying .0005, .00025 and .0001 mf., all of which are usually at hand. With smaller antennas the condenser is not needed.

It was not desired to strike any particular value of sharpness of tuning but rather to make sure that over the 200-500 range the sharpness compared decently with sets that have been found acceptable for regions in which battery-operated sets are used for broadcast reception. It was realized fully that one cannot, with two tuned circuits, obtain extreme selectivity except by the use of a small antenna. This does no harm, since the city-dweller can use such a 10-30 foot antenna with perfect satisfaction. It is effective on short waves and his 200-500 meter signals are strong because of their nearby origin, hence can also be received on such an antenna.

The comparison was therefore made as to both sensitivity and selectivity on the Super-Wasp, on a very popular set with a stage of 199-tube tuned R.F., on a set with an "untuned" 222, and on a set with a tuned 222 having its condenser ganged with that of the detector. All of the sets used a regenerative detector and two audio stages.

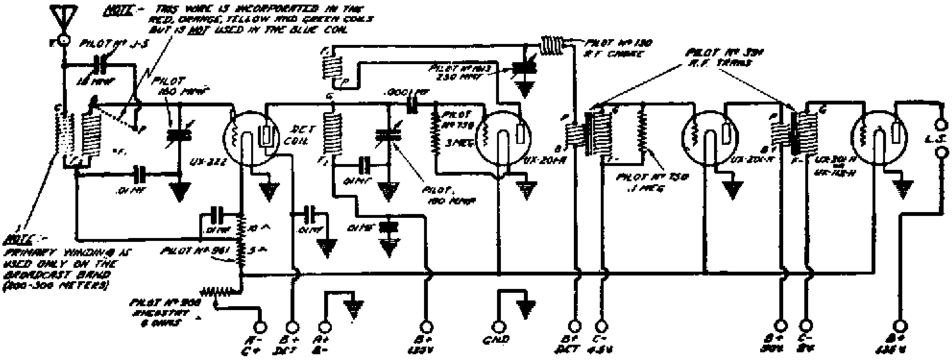
Next after the Super-Wasp the set with the 199 stage showed the best gain, likewise the best flatness of response over the 200-500 meter region. The Super-Wasp had a considerable advantage, however. The gang-tuned job was very uneven because the condensers did not run together, especially on the smaller coils. For this exact reason the Super-Wasp was made two-control.

REGENERATION CONTROL EFFECTIVE

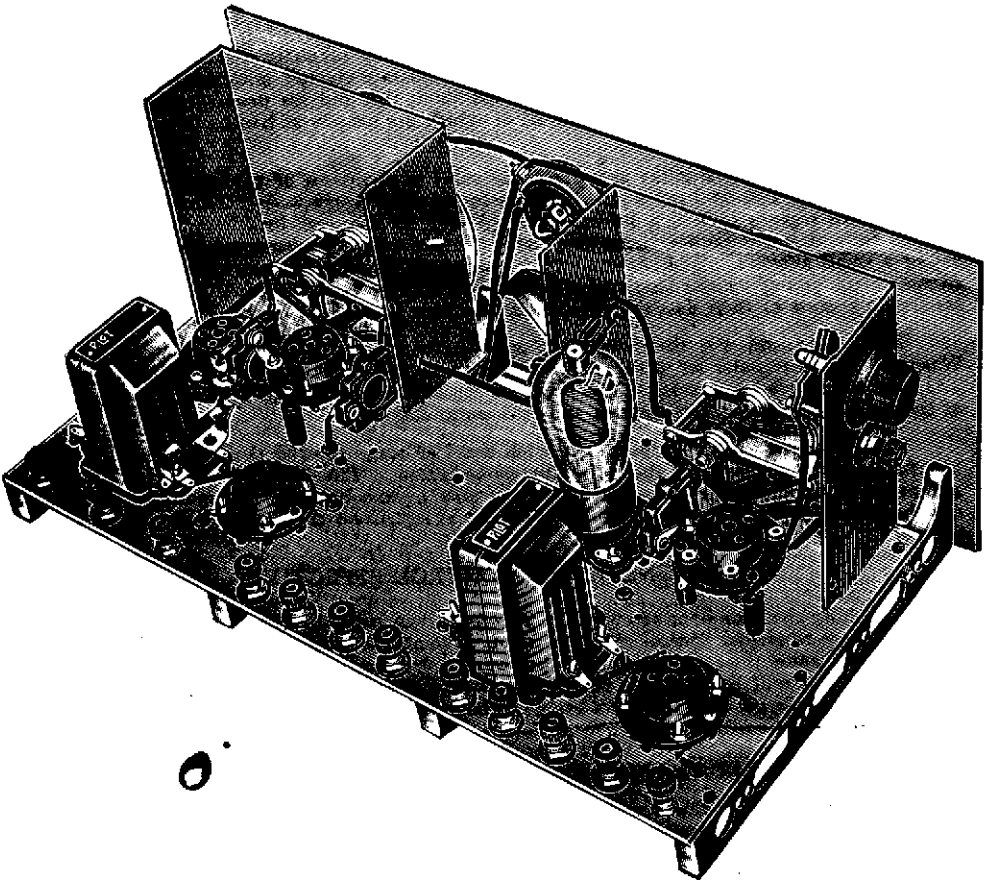
One thing that one does not want in a receiver is to have the regeneration control affect the tuning. Since condenser control of regeneration is being used, the suspicion naturally arises that a disagreeable amount of this effect will be found. In the broadcast (200-500 meter or blue coil) region this will be found to be entirely wrong, the tuning effect being exceedingly small. As the smaller coils are used the effect begins to be perceptible, though never very serious. When the smallest, or red coil is used it will be found that the antenna tuning is somewhat less sharp than before and one may therefore set it at about the right value, after which the regeneration control and the detector-tuning may be handled easily together.

When proceeding in this manner one does not become particularly conscious of the remaining tuning effect, while one does at the same time remain thankful for a control method that works on the smallest coil as well as the largest—which is not the least important manner in which the Super-Wasp differs from current practice.

Now that something has been told about the background of the Super-Wasp, we can proceed to a description of the final receiver as it is assembled from a complete kit of standardized parts made up by the Pilot company. The accompanying illustrations show a finished set made exactly in accordance with the following instructions. When you buy a kit you will receive with it a full-size blueprint which will greatly facilitate your work.



The complete schematic diagram of the Super-Wasp. The various ground symbols indicate connections to the metal chassis of the receiver.



An assembled Super-Wasp with the back halves of the shield cans removed to reveal the parts inside the cans. Notice how the sockets for the plug-in coils are elevated above the sub-panel by means of hard-rubber bushings.

It should not take you more than an hour and a half to assemble a Super-Wasp. Once you have mounted everything, you should be able to wire the whole outfit in another hour, or even less. The arrangement of the parts has been worked out so carefully that most of the connections are only an inch or two long; all the longer leads are part of the filament circuit, which is not critical as to length of wiring.

Before tightening up a single screw, take out all the parts from the box, unwrap them, and place them before you on the table. Study the illustrations and drawings very carefully, and identify each piece of apparatus. Don't rush right into the assembly work the minute you receive your kit; the few minutes you spend in studying the various parts will make up for themselves many times over when you start mounting sockets, condensers and transformers.

THE NECESSARY PARTS FOR THE SET

The following Pilot parts are used in the construction of the Super-Wasp:

1—No. 705 front panel, 7½ x 18 by $\frac{1}{16}$ inches, drilled and engraved.

1—No. 706 sub-panel, 8 x 17 by $\frac{1}{16}$ inches, drilled with all mounting and wiring holes.

4—No. 37 metal sub-panel brackets.

2—No. 1611 .00016-mf. variable condensers.

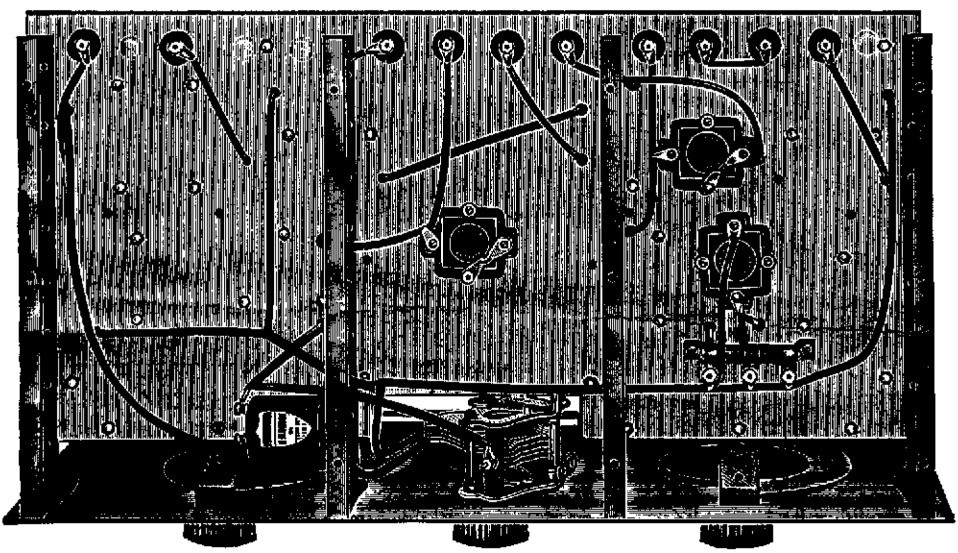
1—No. 1613 .00025-mf. variable condenser, with bakelite knob.
2—No. 1282 illuminated vernier dials.
1—No. 906 rheostat, 6 ohms.
1—No. 961 tapped resistor.
2—No. 600 special Super-Wasp shield cans.
1—No. J5 midget condenser, 5 plates.
2—No. 391 audio amplifying transformers.
2—No. 212 five-prong sockets (for plug-in coils).
2—No. 213 four-prong sockets (for audio tubes).
2—No. 206 four-prong shock-proof sockets (for 222 and detector tubes).
2—Pairs grid-leak clips.
1—No. 758 3-megohm grid leak.
1—No. 750 100,000-ohm grid leak.
1—No. 50B fixed condenser, .0001-mf.
5—No. 59 fixed condensers, .01-mf.
1—No. 130 R.F. choke coil.
2—Sets of plug-in coils, made especially for the Super-Wasp; Nos. 601A and 601D.
4—Packages of hardware, including thirteen binding posts, ten sets of insulating bushings for them, four lengths of spaghetti tubing, 12 feet of tinned copper wire, all necessary nuts, bolts and washers, Mueller clip for connection to screen-grid tube, and six special double-end lugs for mounting of fixed condensers.

STARTING THE ASSEMBLY WORK

The only tools you need in assembling the Super-Wasp are a screwdriver, a pair of long-nosed pliers, and a Spintite wrench to fit the small 6-32 nuts used throughout in the set.

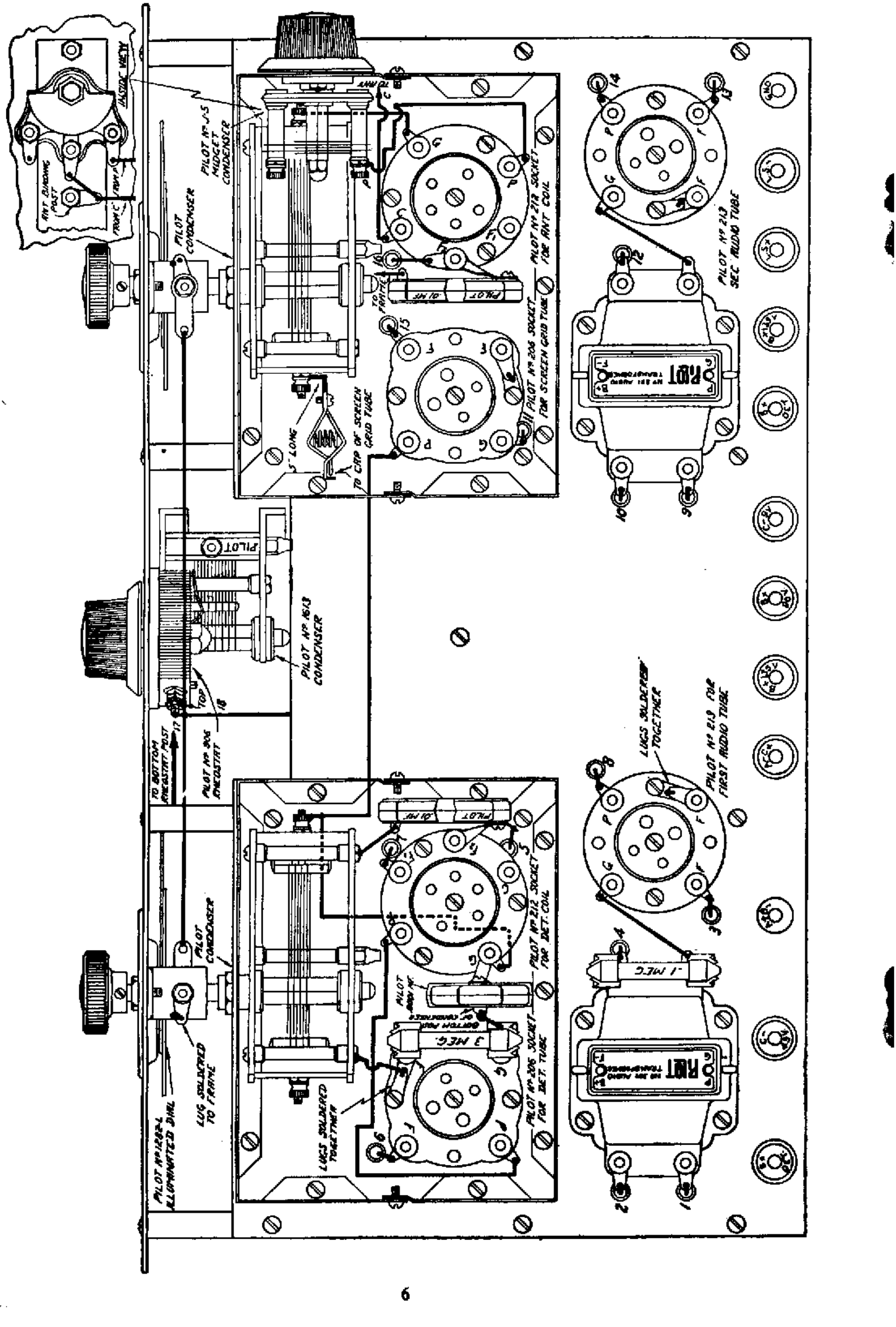
Commence by screwing the sub-panel to the four brackets. Put three 3/8 inch oval head screws through each, using a lock washer and a nut on the under side. The brackets are spaced uniformly along the sub-panel, and you cannot mount them incorrectly because of the accurate drilling of the holes.

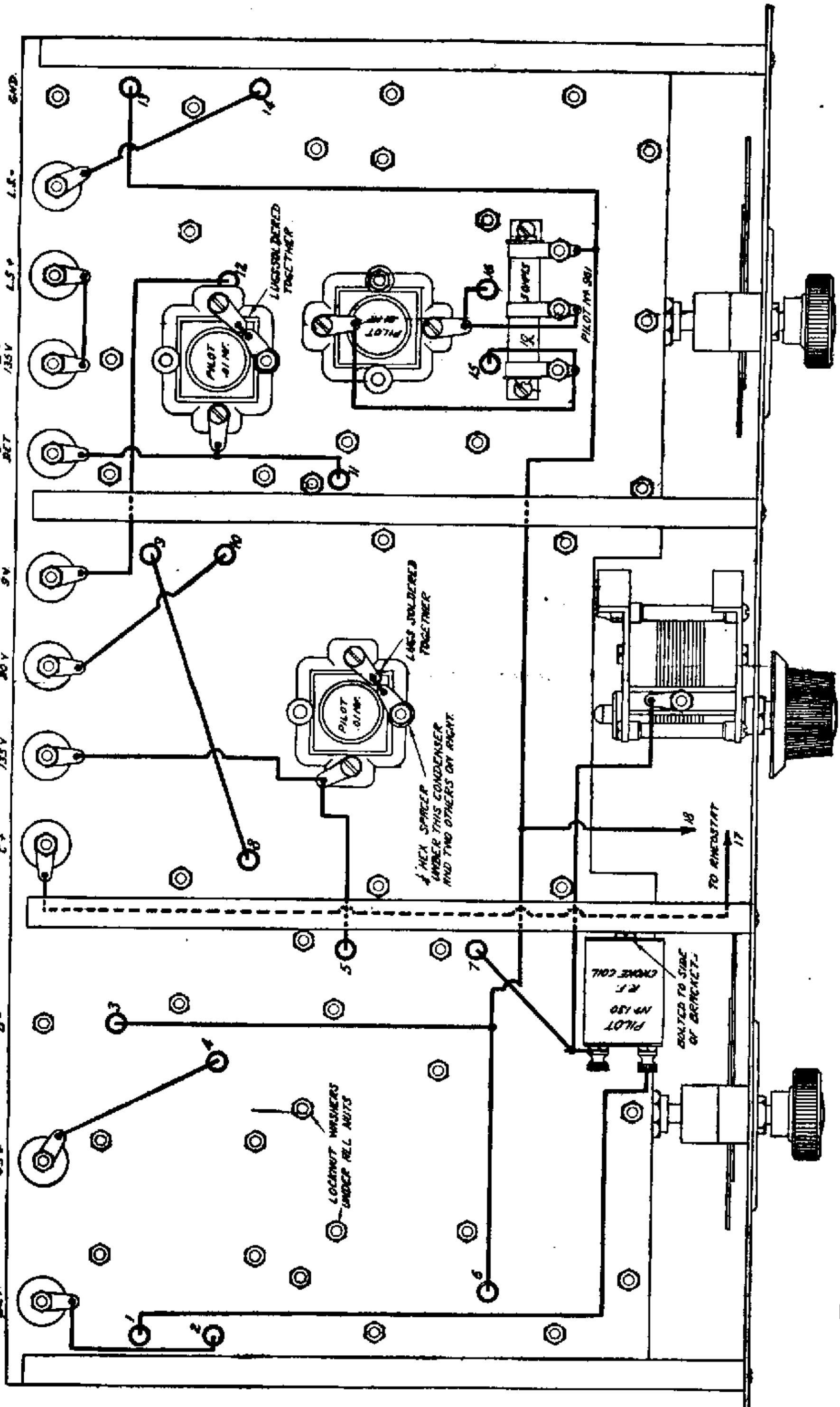
Now place the front panel against the upright feet of the brackets, and screw it in place with two nuts per bracket. Again do not fail to place lock washers under the nuts. The panel will now be straight and rigid, and you will be able to work on it comfortably.



What you see when you turn the Super-Wasp over.
Notice how little wiring there is.

FRONT AND SUB-PANELS ACCURATELY DRILLED





Top and bottom wiring diagrams, showing exact placement of all parts and wiring. Study the location of the parts very carefully before screwing them down; note particularly how the sockets for the plug-in coils are mounted. The blueprint furnished with the Super-Wasp kit shows these two drawings full size.

The first thing to mount on the front panel is the single No. 1613 .00025-mf. variable condenser, which is the regeneration control. This fastens with a single nut. Mount it upright, as shown, so that the rotor plates open out to the left. Put a soldering lug on the bottom stator binding post.

All directions as to right and left will be given with the understanding that the rear edge of the sub-panel is nearest you, as you will do most of the work from the back.

Next comes the rheostat, which fits directly above the regeneration condenser. Break through the two holes in the bakelite base, using a nail or a scriber, so that 6-32 screws ½ inch long can be pushed through. Mount the rheostat with a couple of these screws, keeping it spaced away from the back of the front panel by means of two of the special ¼ inch hex spacers slipped over the mounting screws. The idea of this spacing, and also of the large hole for the shaft, is to insulate the rheostat completely from the panel. Put one soldering lug on the lower binding post, and two on the upper post, one facing down and the other up.

HOW SHIELD CANS ARE MOUNTED

Take the vernier dials and mount them in accordance with the directions included in the packing boxes. Remove the slotted back pieces entirely, as they will not be used. Do not turn in the panel screws and nuts tightly until after you have mounted the variable condensers and the back sections of the shield cans. You will notice that the dial mounting holes in the front panel are slightly oval in shape, to allow the screws to be tightened in the best positions.

Put the covers of the shield cans and their back sections out of the way, as you will not need them until you have assembled and wired the whole set; the back sections will then slip nicely in place, and you will fasten them down to the sub-panel with a few screws.

Mount one of the No. 1611 .00016-mf. condensers on the inside of the shield can that has a small bakelite strip riveted to its right side. Use only the single large mounting nut, and twist the condenser so that the edges of the stator plates lie parallel with the top edge of the can. Mount the J5 midget condenser in the large hole in the bakelite strip, and an "Ant." binding post in the other hole.

Put the shield aside for a moment and mount the No. 961 resistor on the under side of the sub-panel, using two ¼-inch round head screws pushed through from the top side of the sub-panel. It is necessary to do this now because the variable condenser will cover the holes after the shield is mounted in place. These holes for the resistor are near the inside edge of the sub-panel, and you can locate them by studying the picture wiring diagrams closely.

Place the can on the sub-panel so that the shaft of the No. 1611 condenser slides into the mounting stud of the right dial. Screw the can down to the sub-panel using ¼-inch screws through the drilled feet. Turn the dial to 0, pull the condenser plates out until they are entirely unmeshed, and then tighten the set screw in the stud of the dial. Finally, tighten up the screw and the nut that hold the dial on the panel.

Repeat these operations, except for the detail of the midget condenser, with the other No. 1611 condenser and the other shield can. The mounting of the condensers is really half the work of the set, and if you follow the foregoing directions carefully you will have no trouble.

SPECIAL BUSHINGS FOR COIL SOCKETS

In one of the hardware packages you will find six long 6-32 screws and six hard-rubber bushings one inch long. These are for the mounting of the five-prong sockets, in which the plug-in coils fit. Study the picture wiring diagram closely, and note the way the sockets are placed as regards the binding posts. The actual mounting is easy enough. Simply pass the long screws through the sockets' holes, through the hard-rubber bushings, and then through the sub-panel, fastening them on the under side with lock washers and nuts. Hold the heads of the screws with the screwdriver, and tighten the nuts with the Spintite wrench or the pliers.

The long screw that passes between the two F posts on the five-prong socket for the antenna coils also holds, on the under side of the sub-panel, one of the .01-mf. fixed condensers, which is marked C1 in the blueprint. Slip a ¼-inch hex washer over the end of this screw, place the condenser over it, and then tighten with a nut.

Another of the .01-mf. condensers is fastened and connected directly to the variable condenser and to the F2 post of the five-prong socket in the right-hand can, which houses the components of the antenna or R.F. stage. Put a double-end lug under each terminal screw of the condenser. Bend one lug at right angles and tighten the free end over the short mounting stud on the back of the variable condenser, using a ¼-inch screw. Twist the other lug so that its free end will fit over the F2 socket post, with the condenser standing upright.

Proceed to the left can, and mount another of the .01-mf. condensers in the same manner. One lug goes under the F2 post of the five-prong socket, and the other under the nut that holds the right side of the condenser frame together. The .0001-mf. grid condenser is similarly mounted between the G post on the elevated socket and the G post on the No. 206 socket next to it.

This method of mounting the blocking and grid condensers practically eliminates wiring in the critical radio-frequency circuits, and is responsible to a great extent for the smooth operation of the Super-Wasp.

Proceed with the assembly work by mounting the three remaining tube sockets. Put a soldering lug under the head of one of the screws going through each socket, as shown in the picture wiring diagram; these lugs are soldered directly to other lugs fastened beneath the F posts, which are thus grounded to the aluminum framework of the set.

Mount the binding posts, using the insulating bushings for all posts except the "A" + "B" —, which is third from the left and "Gnd", which is all the way over on the right. Place soldering lugs beneath the mounting nuts on all the posts except these two, which automatically connect with the framework.

Fasten one pair of the grid-leak clips to the G and F posts of the detector-tube socket, which is in the left can, and the other pair to the G and F posts of one of the audio transformers. Do not mount the transformers yet.

HINTS ON WIRING

Before going any further, do as much wiring inside the shield cans as possible with the audio transformers out of the way. The wire between the P post of the No. 206 socket in the right shield can and the stator post of the variable condenser in the left can passes through holes in the facing sides of the shields. Of course use a piece of spaghetti over the wire to prevent it from short-circuiting against the metal.

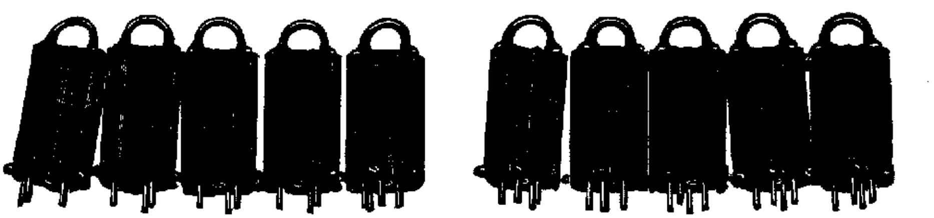
The wiring is so exceedingly simple that no detailed explanation of it is necessary. The three variable condensers are automatically grounded to the framework, as is one side of each of the tube sockets. The amount of wiring is thus reduced fully fifty per cent from what it would be with an unshielded set. Wherever a ground symbol is shown in the schematic diagram, it indicates a connection made to any part of the framework.

For the wiring, use the tinned copper wire and the fabric tubing ("spaghetti") furnished with the kit. Solder all connections with a clean, hot iron, and use nothing but rosin-core solder.

After you have wired the sockets and condensers in the shield cans, mount the audio transformers in place, putting the one with the grid leak clips on it in the left position—in back of the detector compartment. Use ½-inch screws through all the transformer holes except the one in the upper right hand corner of the right hand transformer—the one in front of the antenna shield can. Use a 1-inch screw here. Slip a ¼-inch hex washer over its end on the under side of the sub-panel, and then fasten down a .01-mf. condenser (C2 in the blueprint) by means of the same screw. Put a soldering lug under the fastening nut.

The last .01 condenser (C3 in the blueprint) is fastened by means of a separate ½-inch screw in the center of the sub-panel. After doing all this you can complete the wiring in short order.

You will notice that some holes in the sub-panel are fitted with eyelets, and that others are not. The bare holes are for mounting screws, while the eyeletted ones are for connections



The coils for the Super-Wasp. Left, antenna stage coils; right, detector stage coils. They are used in pairs, one in the left-hand can and one in the right.

that pass through the aluminum. The eyelets are not insulated, but provide smooth holes through which the spaghetti can be pushed without being cut.

You will also notice in the picture layouts that the wiring holes are correspondingly numbered in the top and bottom views. This is to help you in locating the holes when you are turning the set upside down during the wiring process.

With all the wiring finished, place the backs of the shield cans in place, and screw them down. Use the very short 6-32 screws for fastening the upright edges together. You are now ready to connect the set to the batteries and to start receiving signals.

However, first make certain that none of the binding posts except the "A" + and the "Gnd" is short-circuited to the sub-panel. Use the old battery-and-phones test.

TWO SETS OF COILS WITH KIT

Two sets of plug-in coils are furnished for the Super-Wasp, one set acting as antenna coils in the R.F. stage and the other as interstage coils between the plate of the screen-grid tube and the grid of the detector. The red, orange, yellow and green ring coils for the antenna position contain only one winding apiece; the blue ring coil, covering the broadcast range, has two windings, a primary above a secondary.

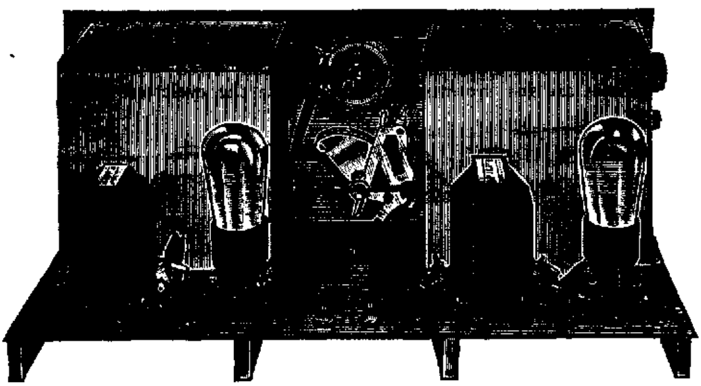
These coils are thus easily distinguished from the detector stage coils, all of which have two windings apiece, a grid winding above a tickler. The coils are always used in pairs; that is, if and orange ring coil is in the first can (the R.F. stage), the other orange ring coil must be used in the detector can.

The tuning ranges of the coils are as follows: Red; 14-27 meters, 21,420 to 11,110 kilocycles. Orange; 26 to 50 meters, 11,540 to 6,000 kilocycles. Yellow; 50 to 100 meters, 6,000 to 3,000 kilocycles. Green; 100 to 200 meters, 3,000 to 1,500 kilocycles. Blue; 200 to 500 meters, 1,500 to 600 kilocycles.

THE TUBES AND BATTERIES

A 222 screen-grid tube is used in the R.F. stage—in the left can. (You are now regarding the set from the front). Tubes of the 201A type are specified for the other positions, but you may also use a 200A as detector, with increased sensitivity by also increased noise level, and either a 112A or a 171A in the second audio stage. You will notice that separate "B" and "C" leads for the plate and grid return leads of both audio stages have been provided, so that you may use any of the three combinations with the correct plate and biasing voltages as specified by the tube manufacturers.

If you use 201A's, run one wire from the 90 volt tap of the "B" batteries to both the first "B" + 135 post (next to the L.S. post) and the "B" + 90 posts; similarly bridge the "C" — 4½ and "C" — 9 posts, and use 4½ volts on both. The "B" + Det. post next to the "C" — 9 post takes 45 volts for the screen-grid of the 222 tube, while the other "B" + 135 post takes this much voltage for the plate of the 222 tube.



A completely assembled Super-Wasp with the shield cans in place. Notice how the A.F. transformers fit behind the cans.

The tuning of the Super-Wasp is like that of any straight regenerative receiver, except that there are two tuning dials to handle instead of one. This sounds like a lot of work, but in reality it isn't. During the first few evenings you are bound to fumble a bit with the controls, and perhaps you won't bring in those foreign stations so quickly. Have a little patience; remember that it took you more than one day to learn how to drive your car.

REGENERATIVE ACTION IMPORTANT

The success of the receiver will depend to a great extent on how smoothly you can make the detector tube regenerate. In general, use as little plate voltage as possible. Start off by connecting the "B" + detector post on the extreme right to 22½ volts, and see how the set regenerates on the various coils. Operating conditions are just right when the set goes into oscillation at the high end of any pair of coils with the regeneration condenser (the center one) all the way in. Sometimes the regeneration is fine up to about 80 on the dials, but stops there. An increase in the detector "B" voltage from 22½ to 45 will invariably cure this, but with this higher value the regenerative action is likely to be too violent. Tubes vary a great deal, and if the particular ones you have seem to require some value between 22½ and 45, simply connect a PILOT Resistograd in the "B" + detector wire, with the latter running to 45 volts. By adjusting the Resistograd you will be able to strike a voltage that will be just right for your own tubes.

The two tuning dials will run more or less alike, except at the very high and very low ends of the scales. For the full 0-100 range on the detector condenser (the right hand one) the R.F. condenser will usually run from 10 to 90 or 95. The size of the individual aerial affects this relationship. It is virtually impossible to make the dials read exactly alike, because of the different capacities and inductances associated with the R.F. and the detector circuits.

The setting of the midget condenser (on the side of the left shield can) is a matter of experiment, and will be different for different aerials. It is also different for the different coils. The positions found best by trial can be marked right on the can with pencil lines.

In hunting for short-wave broadcasting stations, remember that the tuning is going to be very sharp, and you will skip right by many powerful stations if you do not proceed carefully. If you start listening some evening after 8.00 p.m., plug in the yellow ring coils first, as you can practice tuning by getting W8XK, the 63-meter short-wave transmitter of KDKA, which is an old stand-by. Set the right hand dial at about 20, the left at about 25, and turn up the regeneration condenser until you hear the tell-tale rushing sound indicative of regeneration. Move the dials up or down a degree at a time until you hear a loud whistle. Tune in the whistle as loud as you can, and then start backing down the regeneration condenser. Juggle the tuning dials back and forth a trifle at the same time, and eventually you will be able to clear the whistle and hear the voice or music. If the signals are very weak, you may have to "zero beat" them. This is the operation of throwing the detector into oscillation, obtaining the whistle, and then tuning the set so carefully that the voice comes through just as the whistle disappears. It will reappear if the detector condenser is turned either up or down. Zero-beating is a very effective method of bringing in weak broadcasting stations, although it requires some experience in tuning. You will be able to master the trick after a few evenings.

GETTING THE FOREIGN STATIONS

In going after foreign broadcasting stations, you must bear in mind the time differences between the United States and the other countries of the world. Station 5SW, in Chelmsford, England, for instance, signs off at 7.00 p.m. Eastern Standard Time, it then being midnight in London. Thousands of short-wave set owners tune in this station regularly week days, and use its programs as dinner music. Station PCJ, in Holland, the star short-wave performer, is likely to be heard almost any time, as it puts on special programs for different countries of the world. It usually starts at about 10.30 p.m. Eastern time, and comes in with fine loud speaker strength. For the Australian stations you have to be an early riser—or a victim of insomnia—for they roll in toward about five o'clock in the morning.

The Super-Wasp will bring in these stations, if you listen for them at the right time and tune for them carefully. Don't expect to hear them all at once during one hour of listening after supper. Give the set a chance, learn how to use it properly, and you will obtain a million dollars worth of sport out of it. When your neighbor boasts about hearing the West Coast or the East Coast with his seven-tube, $200 broadcast receiver, you will be able to smile at him in a superior manner and say, "Huh, that's nothing; I get Holland on a four-tube set that costs me only thirty dollars."

PLENTY OF STATIONS TO HEAR

SHORT-WAVE BROADCASTING STATIONS OF THE WORLD

(Figures on right are wavelengths in meters.)

Call	Location	Meters
	AFRICA	
AIN	Casablanca, Morocco	51.00
8KR	Constantine, Tunis	42.80
JB	Johannesburg, South Africa	32.00
7LO	Nairobi, Kenya	35.00
	AUSTRALIA	
2BL	Sydney	32.50
2FC	Sydney	28.50
2ME	Sydney	28.50
3AR	Melbourne	55.00
3LO	Melbourne	32.00
6AG	Perth, West Australia	32.90
6WF	Perth	104.50
	AUSTRIA	
OH[illegible]	Vienna	70.00
EATH	Vienna	37.00
	Vienna	22.20
	BELGIUM	
EB4AS	Brussels	42.00
	BRAZIL	
SQBE	Bahia	24.00
	Para	34.00
	CANADA	
CF	Drummondville, Quebec	32.00
CJRX	Winnipeg, Man.	25.60
VAS	Louisburg, N. S.	25.00
	COSTA RICA	
NRH	Heredia	[illegible]
	DANTZIG	
EK4ZZZ	Dantzig	40.00
	DENMARK	
D7MK	Copenhagen	32.05
D7RL	Copenhagen 42.12 and	84.24
	ENGLAND	
5SW	Chelmsford	24.30
2NM	Caterham	32.50
GBS	Rugby	24.40
	FINLAND	
	Helsingfors (Helsinki)	31.50
	FRANCE	
F8GC	Paris ("Radio LL")	61.00
F8AV	Nogent	80.00
Radio Vitus	Paris	37.00
Eiffel Tower	Paris (time signals)	32.50
YR	Lyons ("Radio Lyon")	40.20
	Agen	30.75
YN	Lyons	58.00
	Nancy	15.50
FW4	Ste. Assise	24.50
	GERMANY	
AFI	Konigswusterhausen	14.00
AFL	Hamburg 70.00 and	52.00
AFT	Konigswusterhausen	14.00
AFU	Konigswusterhausen	14.00
AFK	Berlin (Doberitz) 37.65	67.65
HEA	Nauen	11.00
AGC	Berlin	17.20
AGJ	Nauen	56.70
AGK	Nauen	11.00
LA	Langenberg	43.90
POF	Nauen	11.00
POZ	Nauen	18.10
	Stuttgart	41.00
	HOLLAND	
PCJ	Eindhoven	31.4
PCK	Kootwijk	16.00
PCL	Kootwijk	18.00
PCMM	Ymuiden	46.50
PCPP	Kootwijk	16.50
PCRR	Kootwijk	37.00
PCTT	Kootwijk	21.00
PCUU	The Hague	37.00
	ITALY	
I1AX	Rome 20.00,	40.00
IAY	Placenza 20.00,	45.00
	JAPAN	
JFAB	Taipeh, Formosa	39.50
JHBB	Ibarakiken (Hiraslo)	37.50
JIPP	Tokio	20.00
JKZB	Tokio	20.00
JOAK	Tokio, 30.00, 60.00, 35.00,	70.00
IAA	Iwatsuki	40.80

Call	Location	Meters
	JAVA	
ANE	Bandoeng 15.93,	31.26
	Surabaya	140
	MEXICO	
XC51	Mexico City	44.00
	MOROCCO	
AIN	Casablanca	51.00
	NORWAY	
LCHO	Oslo	33.00
LGN	Bergen 31.25,	30.00
	U. S. S. R. (RUSSIA)	
RDRL	Leningrad	28.50
RDW	Moscow	83.00
RFM	Khabarovsk (Siberia)	70.20
RFN	Moscow	50.00
RA19	Tomsk (Siberia)	37.00
	SPAIN	
EAM	Madrid	30.70
EAR58	Barcelona	
	SWEDEN	
SAS	Karlsborg	52.50
SAA	Karlskrona	44.40
	Motala	41.45
SAJ	Karlsborg	47.00
SMHA	Stockholm	41.00
	SWITZERLAND	
H9OC	Berne	32.00
H9XD	Zurich 85.00 and	32.00
	UNITED STATES	
KDKA (W8XK)	East Pittsburgh, Pa.	62.50
	W8XS, W8XP-portable	42.75
KEJK (W6XAN)	Los Angeles, Calif.	105.90
KEWE	Bolinas, Calif.	14.10
KFPY (W7XAB)	Spokane, Washington	105.90
KFQU W6XBH)	Holy City, Calif.	31.00
KFQZ (W6XBH)	Hollywood, Calif.	108.20
KFVD (W6XBX)	Culver City, Calif.	105.00
KFWB (W6XBR)	Los Angeles, Calif.	105.00
		40.00
KFWO (W6XAD)	Avalon, Calif.	53.07
KGER (W6XBV)	Long Beach, Calif.	48.86
KGB	San Diego, Calif.	65.18
KGDE	Barrett, Minn.	40.00
KGO (W6XAX, W6XN)	San Francisco, Calif.	10 to 40
KHJ (W6XAU)	Los Angeles, Calif.	104.10
KJBS (W6XAR)	San Francisco, Calif.	61.00
KJR (W7XC, W7XO)	Seattle, Washington	105.20
KMOX	St. Louis, Mo.	49.00
KMTR	Los Angeles, Calif.	108.20
KNRC (W6XAF)	Santa Monica, Calif.	108.20
KNX (W6XA)	Los Angeles, Calif.	107.10
KOIL (W9XU	Council Bluffs, Iowa	61.06
KWE-KEWE	Bolinas, Calif.	14.40
KWJJ (W7XAO)	Portland, Oregon	53.54
WAAM (W2XBA)	Newark, N. J.	65.18
WABC (W2XE)	Richmond Hill, N. Y.	58.50
WAJ	Rocky Point, N. Y.	22.48
WBRL (W1XY)	Tilton, N. H.	109.00
WBZ	Springfield, Mass.	70.00
WCEL	Chicago, Ill.	37.24
WCGU (W2XBH)	Brooklyn, N. Y.	54.00
WCSH (W1XAB)	Portland, Maine	63.7[illegible]
WCX	Pontiac, Mich.	[illegible]
WEAJ	Rocky Point, N. Y.	22.48
WEAO (W8XJ)	Columbus, Ohio	54.02
WGY (W2XAF)	Schenectady, N. Y.	31.40
(W2XAD)	Schenectady, N. Y.	21.96
		5.00
WHK (W8XF)	Cleveland, Ohio	66.04
WJR-WCX (W8XAO)	Pontiac, Michigan	32.00
WIZ	New Brunswick, N. J.	43.45
WJZ (W3XL)	New York, N. Y.	59.96
WLW (W8XAL)	Cincinnati, Ohio	52.02
WNAL (W9XAB)	Omaha, Neb.	105.00
WNBT	Elgin, Ill. (Time Signals)	35.50
WND	Ocean Township, N. J.	46.48
WOR (W2XAQ)	Kearny, N. J.	65.40
WOWO	Fort Wayne, Ind.	22.80
WRNY (W2XAL)	New York, N. Y.	30.91
WSM (4XD)	Nashville, Tenn.	31.45
WTFF	Mt. Vernon, Va.	56.00

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