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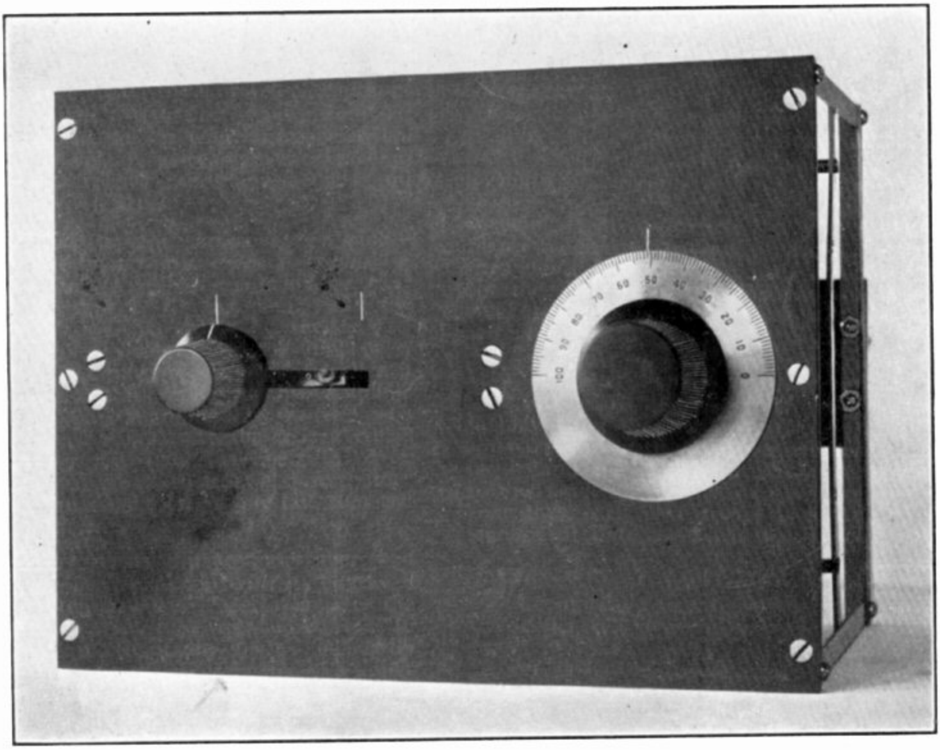

Fig 1. Two controls only are used to tune from 12,000 to 20,000 meters, covering the range of trans-Atlantic stations.

IN THIS ISSUE

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Edited by M. B. Sleeper

Published by The General Apparatus Company, Inc.

12,000 to 20,000 Meter Receiver

Long Wave Reception Is Coming Back, Not Only Because It Is Interesting and Good Code Practice, But Because It Affords Opportunity For Much Experimental Work.

By M. B. Sleeper

Suggestions on Long Wave Reception

BACK in the days when four-foot inductances gave a spectacular appearance to a receiving station and the controls were operated by yardsticks, long wave reception from foreign stations was quite popular, but it was dropped later as a temporary fad. Now, however, interest of a more permanent and serious character is reviving for several reasons. Long wave signals are the easiest to receive over great distances, so that the man with an indoor antenna or a small loop can get them. Stations are always transmitting, and at slow speed, giving better code practice than a practice machine whose records are soon learned.

For testing work long waves give a steady source of signals, comparatively free from erratic results obtained on short waves. Several stations can be heard at any time during the twenty-four hours.

The Set and Its Circuits

THREE views of a receiver for this purpose are given, showing the simplicity of the instrument and the wiring. To cut down the work and expense of the coils, a single circuit is employed, using a stationary coil of fixed inductance and a 0.0008 mfd. condenser in shunt in the antenna circuit, with a movable coil in the plate circuit. With an intenna of 0.0003 mfd. this receiver will tune from 12,000 to 20,000 m. In the first tests on the circuit, the conventional cross-wound concentrated coils were used, but, surprising as it may seem, signals were increased 50 to 75% when the layer-wound coils were substituted. One reason is that the D. C. resistance is much lower, and losses due to varnish are less because varnish is only applied to the outside layer.

The smooth and easy operation of the set and the fact that it picks up European stations on a single detector tube makes it a real pleasure to operate.

Panel and Supports

FIG. 4 gives the details of the 7½x10x3/16-in. panel at one-half scale. The only hard part is the slot which is made by drilling a row of holes and filling. No dimensions for the angle brass supports are given, as it is of the conventional type formerly described, measuring 7½ by 6 ins. A regular 10- by 2½- by ⅛-in. panel, carrying six binding posts, is secured at the rear. At each end are ⅜- by 1/16-in. strips carrying the tickler coil support rods. These should not be soldered to the frames, however, until the coils are completed.

Winding the Coils

IN Fig. 3 the coils are illustrated as they appear when ready to mount. A 3½-in. G-A-Lite tube, 6 ins. long, is used for the antenna coil. The winding is started ⅝ in. from one end. First, 44 turns are wound on then the wire is brought up between the 43rd and 44th turns, and 43 turns are wound back over the first layer. This is continued, winding back and forth until 11 layers have been put on, giving 44, 43, 42, 41, 40, 39, 38, 37, 36, 35, 34 turns per layer, or a total of 429 turns per section. At the end of the section the process is repeated until, with three sections, an inductance of 124.00 millihenries is obtained. The end of the winding is brought to a screw and lug ½ in. from the end of the tube.

A G-A-Lite tube 3 ins. long and 4½ ins. in diameter is required for the tickler. The winding is started ½ in. in, and made up in two sections of 7 layers, having 44, 43, 42, 41, 40, 39, 38 turns per layer. A light coat of Valspar varnish, baked in a gentle heat, will hold the wire permanently. Next come the angle pieces which slide on the 3/16-in. rods and the 3/16-in. rod by which the coil is moved, both of which are shown in Fig. 4. Flat head screws are used in all cases, with the heads inside the tube to give clearance over the antenna inductance.

It is necessary to set the antenna coil back from the panel quite a distance. Therefore, in addition to the regular GA-STD-14 coil mounting pillars, held to the tube by ½-in. 6-32 F.H. screws, two GA-STD-8 threaded posts are put over 1-in. 6-32 F.H. screws from the front of the panel, and the screws threaded into the coil mounting pillars.

Assembling and Wiring

WITH the parts ready, the supporting frames should be put on the panel, and the coils mounted, without cutting off the 3/16-in. rods to length. Then

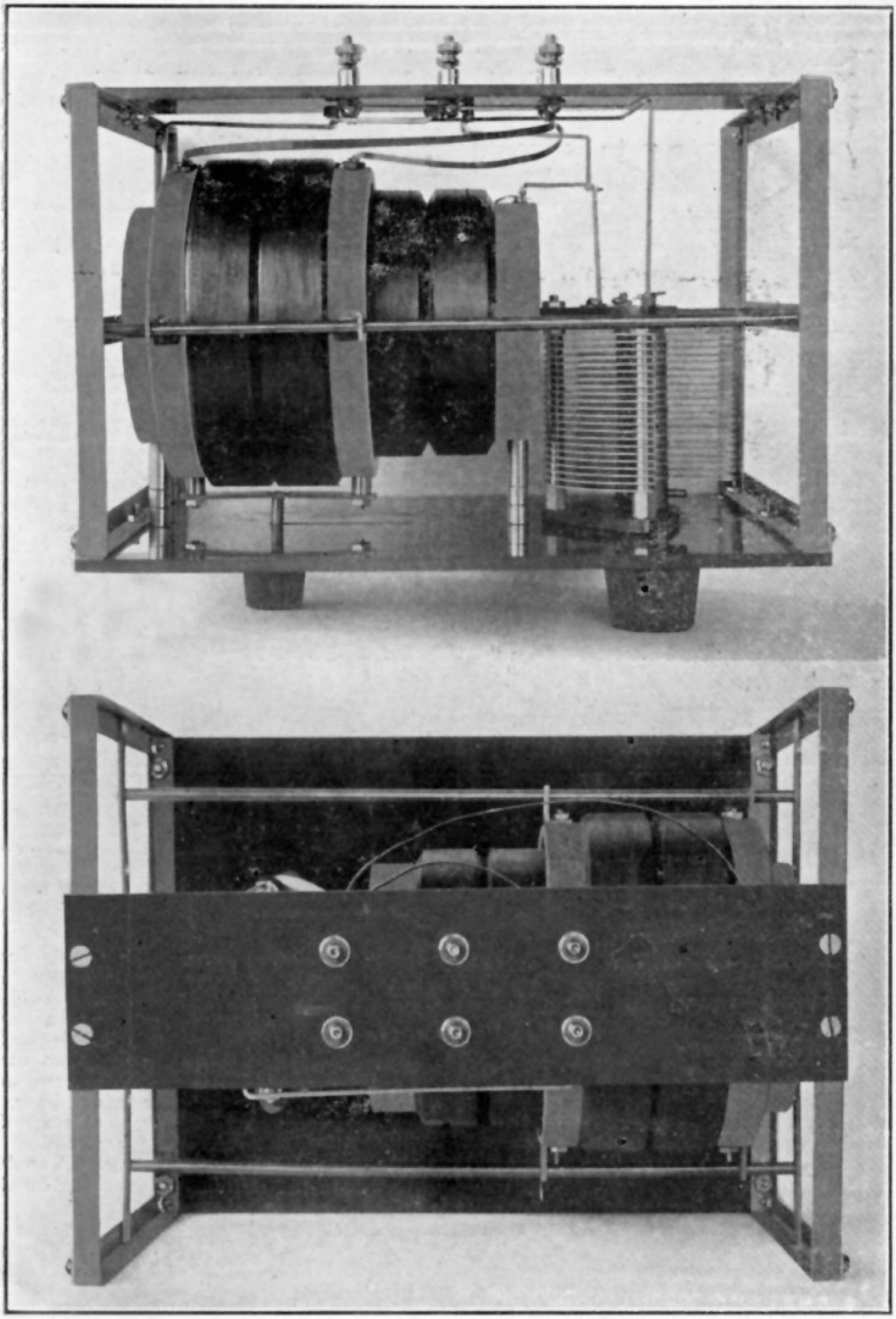


Fig. 2. Bottom and rear views of the long wave receiver, as fine a set as you ever operated. Suitable for general reception or experimenting.

comes the condenser, back panel with the binding posts already on, and the wiring. Two flexible leads of phosphor bronze strip are used between the tickler terminals and the corresponding binding posts. A diagram is given in Fig. 4.

Hints on Operating

TO wire up the receiver it is only necessary to attach the antenna and ground, run wires from the G and F posts to corresponding terminals on the detector, and to insert the tickler in the plate circuit. Reverse the tickler connections if the circuit does not oscillate. When an amplifier is added, put a 0.001 mfd. phone condenser across the transformer and plate battery of the detector; otherwise the set will not oscillate properly. With two or three steps of amplification foreign stations come in with extreme loudness.

Many experimenters have had excellent results with indoor loop antennas working on long waves. To use with this receiver a frame is suggested with 40 turns of No. 20 D.C.C. wire spaced ¼-in. apart. The terminals of the loop should be connected to the antenna and ground connections on the receiver. In addition a condenser such as the 0.0002 mfd. GA-STD-A15 is recommended.

The loop should be mounted so as to be swung easily on its axis in whatever direction signals are to be received. While a loop of this sort is not as efficient as a single wire antenna 30 ft. high and 200 to 300 ft. long, the size with which the set is expected to be used, long distance reception can be accomplished much more readily than on the short waves.

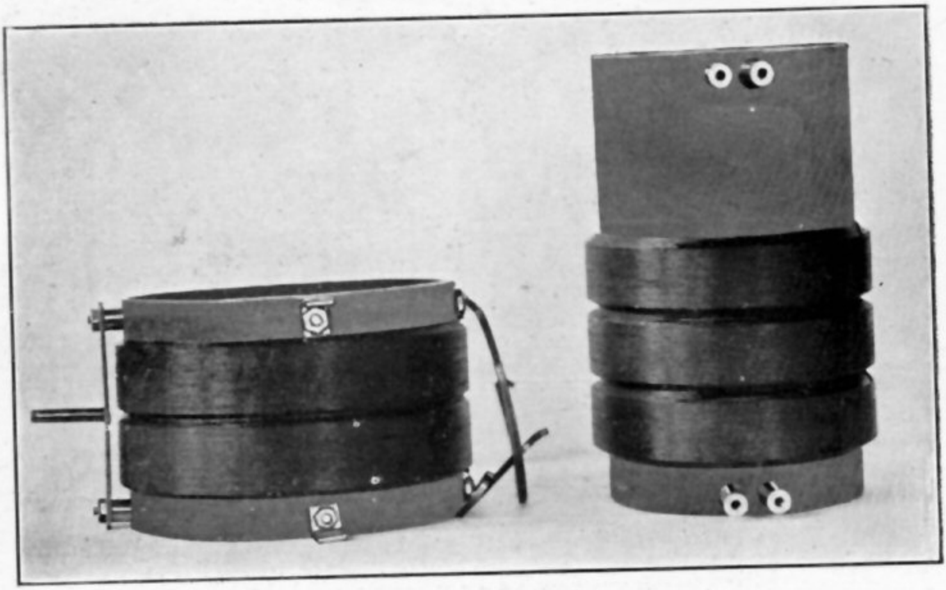


Fig. 3. Details of the completed coils, ready to mount on the panels, the tickler at the left and the antenna coil on the right.

Radio dealers can use the signals from long wave stations advantageously for demonstration purposes, attaching two or three stages of amplification and a loudspeaker to the receiver. This is better than depending upon the irregular short wave signals because the former transmit steadily, oftentimes hour after hour, a great advantage when the signals are depended upon to attract the attention of people passing by the store. A public code practice can also be furnished in this way.

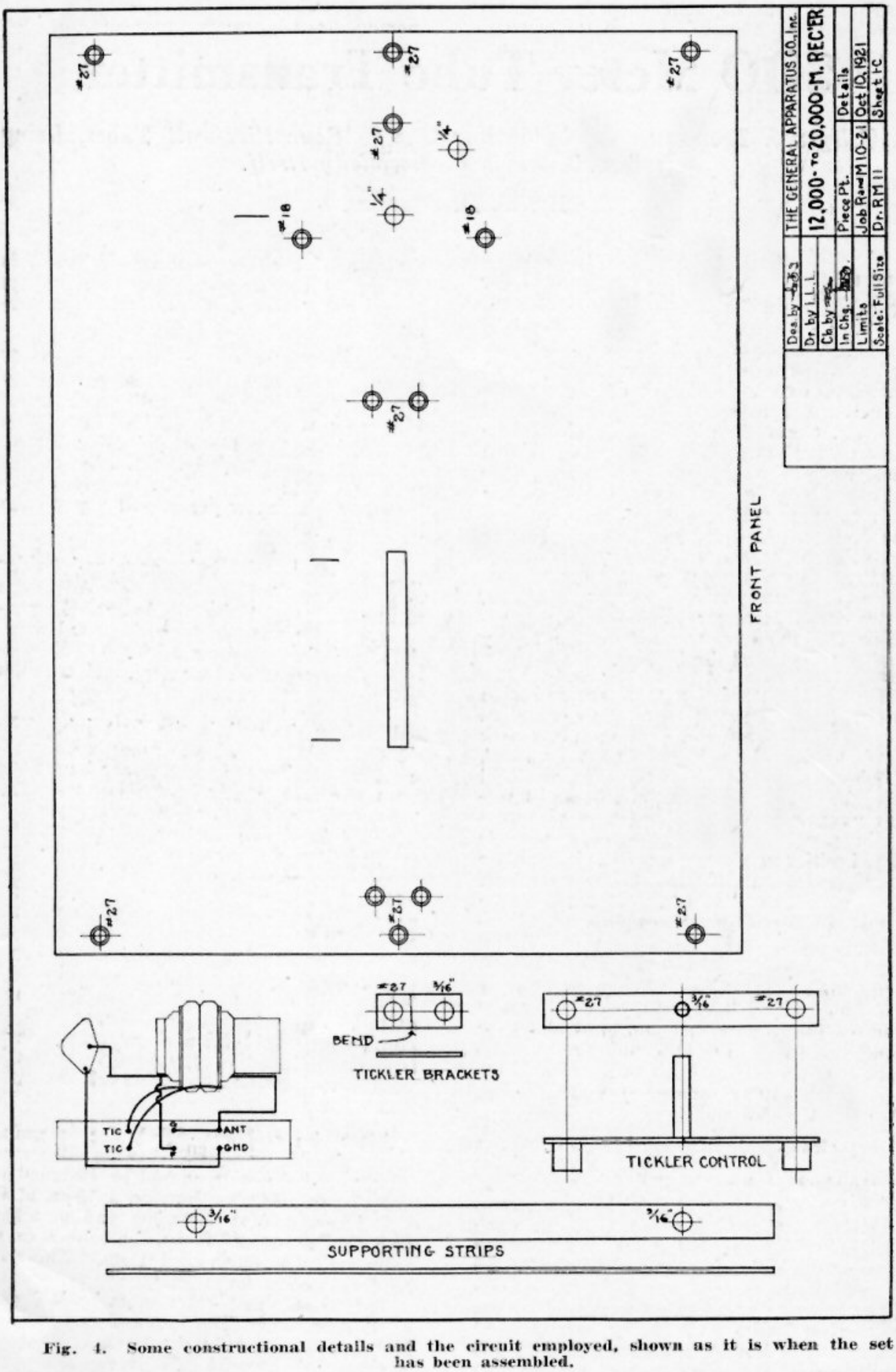


Fig. 4. Some constructional details and the circuit employed, shown as it is when the set has been assembled.

200 Meter Tube Transmitter

A Telegraph Transmitter Suitable For One to Four Five-watt Tubes, Using a Circuit Which Is Simplicity Itself.

By W. H. Bullock

General Description of the Set

THE man who is deciding about the make of automobile he is to buy has no wider range of choice than the experimenter selecting the circuit and details for his tube transmitter. Everyone at the G. A. had ideas and experimenters outside were consulted. The concensus of opinion is embodied in the equipment to be described. Tests made on this set showed the result to be excellent, with very little compromising of efficiency for cost, the cost reasonably low, and the conditions under which the set will function broad enough, in the matter of antenna capacity and resistance, to meet all ordinary circumstances. Moreover, any number of tubes, from one to four, can be employed, depending upon the current and voltage supply and the means of the builder.

On the front of the panel are radiation and plate current meters, a 6-ampere Shramco rheostat equipped with the new G. A. knob, and a grid coupling coil control. Looking at the set from the rear, you will see that there is an angle brass frame carrying the tube panel and supporting the main panel as well. The inductance is fitted with two sliders, on the left for plate coupling and at the right for wavelength control. In addition, a 0.01 mfd. Radio Corporation mica condenser is mounted under the tube panel, out of sight, and a grid leak and grid condenser. Binding posts on the front, for the telegraph key, are connected in series with the grid leak. Posts for a microphone are provided in case telephone modulation is added.

The Panel and Its Accessories

COMPLETE details of the circuit are shown in Fig. 2. When one or two tubes are used, a single rheostat and the arrangement given in Fig. 3 are required. For three or four tubes, however, two rheostats are needed, mounted at the same height as the one, but 3 ins. apart, center to center. Holes for the meters are 2 9/16 ins. in diameter, most easily made by drilling circles of small holes, followed by the use of a half-round file or coarse sand paper. The 0 to 1 ammeter and 0 to 100 milliameter are suitable for one or two tubes, but the scale readings for three or four tubes should be doubled. The cost is the same for either reading. When it is desired, a copper wire shunt can be put across the meters to allow for heavier currents.

All parts, including the inductance, should be mounted before frame or tube panel are put on. In fitting the small size lugs on binding post screws it will be found that the lug holes are too small. This can be corrected readily by putting the lug on the vise with the jaws slightly open. Two blows with a center punch will expand the hole nicely.

Coil and Tickler

THE inductance and tickler present the only difficulties about the whole set. Dimensions must be followed carefully and the details carried out with precision or mechanical or electrical troubles will result.

Winding the coil is the first job. The 4½-in. G-A-Lite tubing comes with sufficient length that the winding can be started near one end, and, after it is completed, turns taken off to give the correct number. The 100 ft. of No. 14 bare wire should be cut in half and one end of each length fastened to some steady object. Then the other ends must be secured to the tube near the end. Winding on the two wires as tightly as possible permits one wire to be removed, leaving the turns of the other wire accurately spaced. The G-A-Lite tube is just soft enough that no threading is required. A single coat of Valspar varnish on the wire and tube, dried in a gentle heat, fixes the coil permanently. It is advisable to varnish the inside of the tube also.

After the coil has dried, the irregular turns should unwound, leaving 31 turns. At one end the wire should be fastened to one of two soldering lugs on a ¼-in. R.H. 6-32 screw, and at the other end to a lug on a similar screw. Next, the tube is carefully cut to a length of 5⅝ ins. This can be done with a sharp knife.

The ¼-in. shaft holes must be laid out next, ¾ in. from the upper end and exactly 180° apart. Spring contacts should be put in place, held by 6-32 R.H. screws and nuts. The slider rods are mounted on GA-STD-8 posts, secured by 1-in. 6-32 screws and nuts,

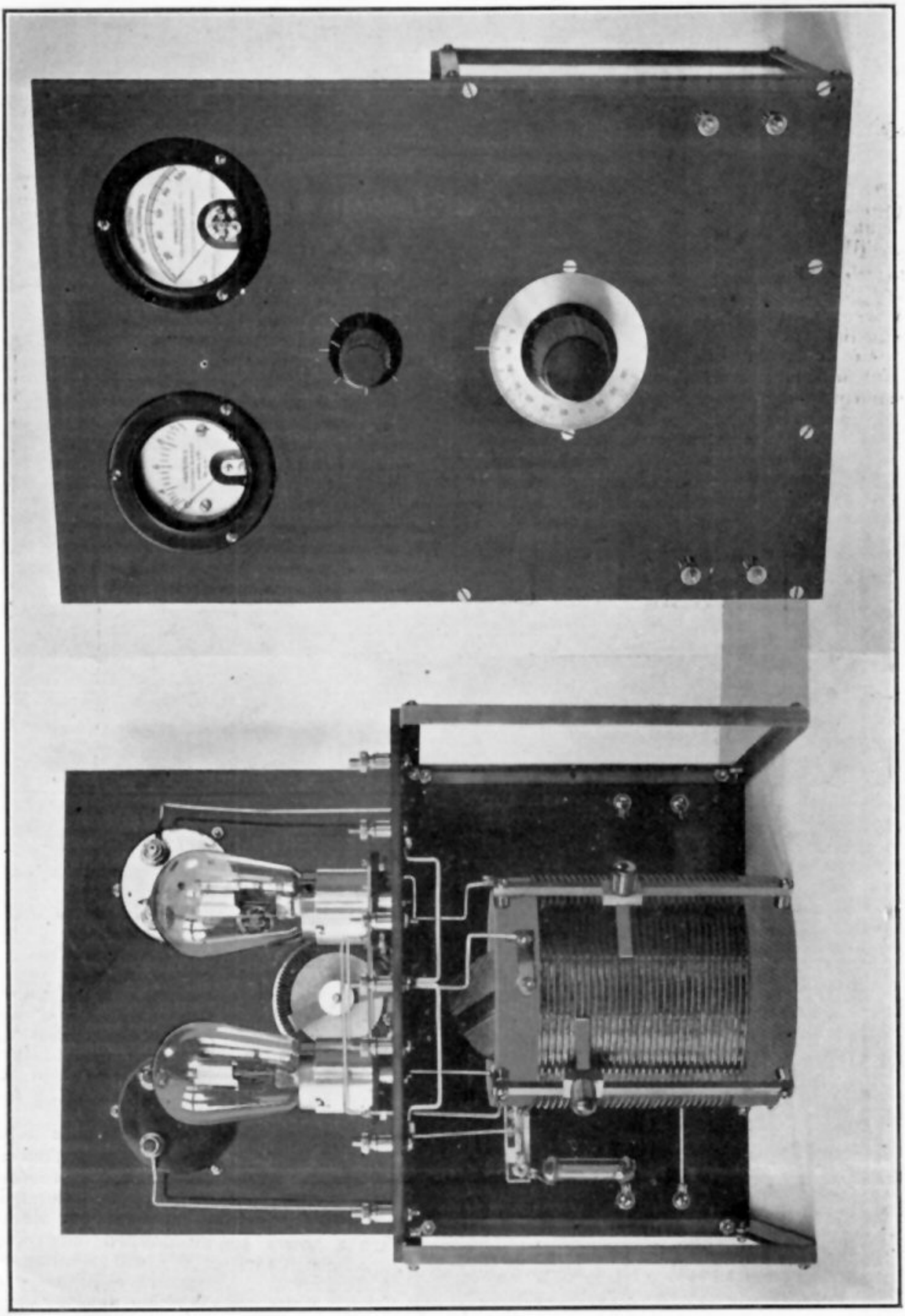


Fig. 1. Quite business-like is the appearance of this transmitter, and equally dependable in handling traffic.

fitted at the upper end with soldering lugs. They are located 45° each side of the rear shaft hole. An unusual feature of the GA-STD-A19 sliders is that no heat is applied to the contact arms during the assembly, so that the spring temper is not drawn. Moreover, the arms are locked in such a way that they cannot work loose.

Coil mounting pillars can be used to hold the inductance to the panel, but the arrangement in Fig. 2 gives greater mechanical strength. Brass strip, ⅜ by 1/16 in. is used for the supports, fastened to the tube with ½-in. 6-32 R.H. screws. The tickler ball is wound with No. 20 D.C.C. wire in such a way that the turns on both sides are in the same direction. Outside ends are soldered to the split shaft in the usual manner. Before the front part of the shaft is put in place, however, a brass washer is soldered to it 1⅛ in. from the forward end. This, bearing on another washer next to the panel, keeps the ball from moving forward, while the knob and dial prevent it from going backward. The inductance and tickler should be entirely completed before mounting on the panel.

Tube Panel Details

THE last part to be made, and the last to go on the panel, is the 5- by 10- by 3/16-in. L.P.F. panel which carries the sockets and binding posts on top and the 0.01 mica condenser beneath. Details are given in Fig. 3. If three or four tubes are used, it is only necessary to increase the number of sockets.

Holes are drilled as indicated to accommodate wires which would otherwise have to run for much greater distances.

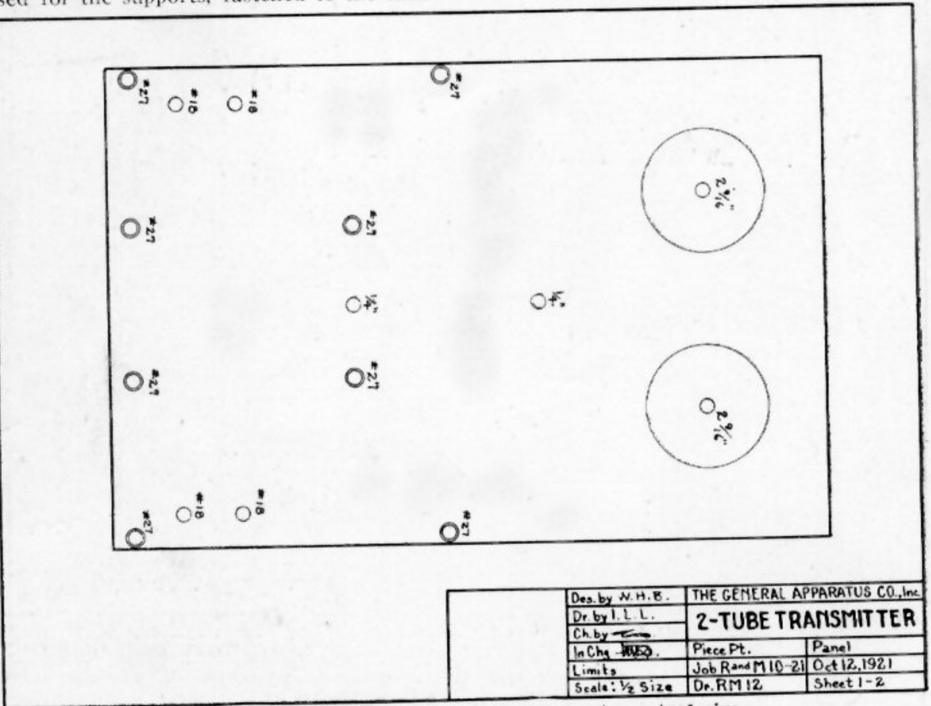


Fig. 3. The front panel reduced to one-quarter actual size.

Wiring The Set

NO. 14 square tinned copper wire is excellent for wiring apparatus because the tinning keeps the finish bright and the square wire, coming in straightened lengths, makes a neat job easy. Tinned wire is also very easy to solder. In making joints be sure the iron is hot enough that the solder flows freely. A wad of half-melted solder does not constitute a perfect joint. Never use Tinol paste.

Operating For Suggestions

SOURCES for plate potential and filament current will be taken up in a subsequent article, but general instructions are given for those who already have a power supply. When connections have been made, set the grid coupling coil at maximum, move the wavelength control slider, on the right looking at the rear of the set, one-third of the way down, and the plate slider two-thirds down. If no reading is shown on the hot-wire ammeter, turn the ball 180° and readjust the sliders for maximum radiation. With 350 volts on the plates the plate current should be 45 milliamperes per tube.

In the December issue of R and M you will find all the data for a power panel and rectifier for producing 350 or 500 volts and filament lighting power from 60-cycle 110-volt supply.

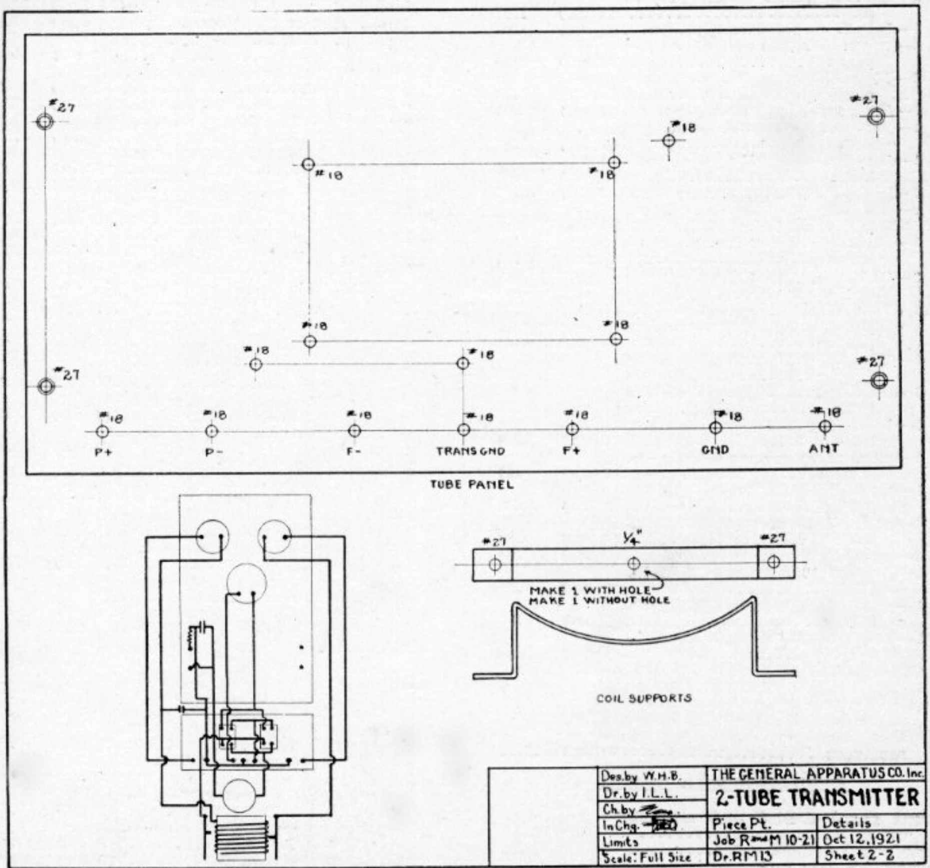


Fig. 2. Layout of the tube panel and coil supports, one-half size, with wiring diagram as it appears when looking at the rear of the set.

Notes on Soldering

By Richard North

A large percentage of the failures experienced with radio apparatus can be traced to defective soldering. Making perfect joints and neat joints is a very simple matter for the man who has the proper equipment and goes about the work in the right way. A careful experimenter does not need to envy those who make their wiring add instead of detract from the appearance of their instruments.

The materials needed for soldering are a good iron about 3/4 lb. in weight, some soft wire solder, not the rosin core kind and a can of nokorode soldering paste.

Of course, an electric iron is ideal, but the ordinary type, heated in a bunsen burner or gas stove flame, regulated to give a blue-white color, will suffice. The iron should be well tinned by filing it bright, rubbing it with a little soldering paste, and, when hot, enough solder to tin it thoroughly. Good work cannot be done when the iron is black, for the heat is not then transmitted readily.

The parts to be soldered must also be clean and bright. In some cases they can be tinned individually before they are soldered together, as in the case of switch points and connection wires. A very least amount of paste should be used and only enough solder to make a good joint. The solder must be heated until it flows freely and not left in irregular lumps giving the appearance of crystalization. If these few simple suggestions are carefully followed many of the unsuccessful experiments will turn out right the first time.

STANDARDIZED PARTS FOR THE 12,000- TO 20,000-METER RECEIVER

1—L.P.F. panel 10x7½x3/16 in.	(1 lb.)	1.97
1—L.P.F. panel 10x2½x⅛ in.	(8 oz.)	.45
6—12-in. lengths ⅜-in. angle brass	(12 oz.)	1.20
2—24-in. lengths square tinned copper wire	(2 oz.)	.12
6—GA-STD-A10 binding posts	(3 oz.)	.60
1—pkg. of 20 small soldering lugs	(1 oz.)	.25
1—GA-STD-A7 180° dial and knob	(8 oz.)	1.25
3—lb. No. 24 S.S.C. copper wire	(3 lb.)	6.75
1—GA-STD-13 rheostat knob, 3/16-in. hole	(2 oz.)	.40
2—12-in. lengths ⅜x1/16-in. brass strip	(12 oz.)	.26
2—12-in. lengths 3/16-in. brass rod	(8 oz.)	.18
10—GA-STD-8 threaded posts	(6 oz.)	.40
4—GA-STD-14 coil mounting pillars	(6 oz.)	.32
1—GA-STD-A17 variable condenser	(1 lb.)	4.30
1—9-in. length 3½-in. G-A-Lite tube	(6 oz.)	.38
1—9-in. length 4½-in. G-A-Lite tube	(9 oz.)	.46
1—pkg. of 10 screws 6-32 ¼-in. F.H.	(1 oz.)	.11
1—pkg. of 10 screws 6-32 ½-in. F.H.	(2 oz.)	.12
1—pkg. of 10 screws 6-32 1-in. F.H.	(4 oz.)	.14
2—pkg. of 10 nuts 6-32	(2 oz.)	.08
1—pkg. of 10 screws 6-32 ¼-in. R.H.	(1 oz.)	.11
1—pkg. of 10 screws 8-32 ½-in. F.H.	(3 oz.)	.14
2—12-in. length flexible conductor	(1 oz.)	.04

COMPLETE SET OF PARTS FOR THE RECEIVER

As listed above, ready to assemble, more efficient and less expensive than concentrated coil receivers	(8 lbs.)	19.89

SEMI-FINISHED PARTS

Front panel drilled and slotted, extra		$ .90
Rear panel drilled, extra		.30
Engraving, per letter		.09
Antenna inductance wound	(3 lb.)	4.75
Tickler inductance wound	(2 lb.)	4.15
Front panel with support frames, coils mounted, and condenser, finished except for wiring and real panel	(8 lb.)	23.87
Complete nickeled support frames, per pair	(12 oz.)	1.50

AUXILIARY APPARATUS

GA-STD-A5 Laboratory type detector control	(1 lb.)	$ 5.95
GA-STD-A6 Laboratory type amplifier control	(2 lb.)	13.95
GA-STD-A3 Phone condensers, 0.001 mfd.	(2 oz.)	.35
Radiotron UV200 detector tube	(8 oz.)	5.00
Radiotron UV201 amplifier tube	(8 oz.)	6.50
GA-STD-A11 plate battery, 22½ volts	(2 lb.)	1.75
GA-STD-A12 plate battery, 45 volts, 22½ volt tap	(4 lb.)	3.20
Witherbee 6-volt, 40-ampere-hour storage battery, charged and ready to use	(15 lb.)	15.00

STANDARDIZED PARTS FOR THE TUBE TRANSMITTER

1—L.P.F. panel 10x15x3/16 in.	(2 lbs.)	$3.93
1—L.P.F. panel 5x10x3/16 in.	(1½ lbs.)	1.31
6—12-in. lengths ⅜-in. angle brass	(12 oz.)	1.20
4—24-in. lengths square tinned wire	(3 oz.)	.24
1—Shramco 6-amp. rheostat	(8 oz.)	2.00
2—GA-STD-A1 sockets	(8 oz.)	1.60
11—GA-STD-A10 binding posts	(6 oz.)	1.10
2—pkg. of 20 small soldering lugs	(2 oz)	.50
1—GA special mica condenser	(1 oz.)	1.00
1—5,000-ohm Ward-Leonard resistance	(2 oz.)	2.00
1—GA-STD-A7 180° dial and knob	(8 oz.)	1.25
1—GA-STD-13 rheostat knob, ¼-in. hole	(2 oz.)	.40
1—GA-STD-11 mahogany coupling ball	(3 oz.)	.90
100—ft. No. 14 bare copper wire	(1½ lb.)	.94
25—ft. No. 20 D.C.C. wire	(2 oz.)	.20
1—12-in. length 3/16x3/16-in. brass rod	(6 oz.)	.11
2—GA-STD-A19 sliders complete	(4 oz.)	.60
1—12-in. length ⅜x1/16-in. brass strip	(6 oz.)	.13
1—12-in. length ¼-in. brass rod	(7 oz.)	.15
4—GA-STD-8 threaded posts	(4 oz.)	.16
1—Special 4½-in. G-A-Lite tube	(7 oz.)	.46
1—General Radio O-1 amp. hot-wire ammeter	(2 lb.)	7.75
1—Weston O-100 milliamp. ammeter	(2 lb.)	8.50
2—UV202 5-watt transmitting tubes	(1½ lb.)	16.00
1—0.01 mfd. Radio Corporation mica condenser	(8 oz.)	2.00
1—pkg. of 10 screws 4-36 ½-in. F. H.	(1 oz.)	.11
1—pkg. of 10 nuts 4-36	(1 oz.)	.08
1—pkg. of 10 screws 6-32 ¼-in. R.H.	(1 oz.)	.11
1—pkg. of 10 screws 4-36 1-in. R. H.	(1 oz.)	.11
2—pkg. of 10 screws 6-32 ½-in. F. H.	(2 oz.)	.12
1—pkg. of 10 screws 8-32 1-in. R. H.	(4 oz.)	.16
3—pkg. of 10 nuts 6-32	(3 oz.)	.24
1—pkg. of 10 nuts 8-32	(2 oz.)	.09
1—sheet 5x6 ins. No. 24 spring brass	(6 oz.)	.27
1—pkg. of 10 washers, ¼-in. hole	(3 oz.)	.10

COMPLETE SET OF PARTS

As listed above, everything except the power source	(15 lb.)	$52.82
As listed above, without tubes	(12 lb.)	37.90
As listed above, without meters	(11 lb.)	38.75
As listed above, without tubes or meters	(10 lb.)	23.25

SEMI-FINISHED PARTS

Front panel drilled, extra		$1.55
Tube panel drilled, extra		.75
Complete supporting frames, nickeled, per pair	(10 oz.)	1.50
Complete coil and tickler, ready to mount on panel, all parts polished nickel	(3 lb.)	9.90
Engraving, per letter		.09

L. P. F.

Panels of Standardized Dimensions

IN a report from the Bureau of Standards giving the results of tests on L.P.F the following data appears, telling the story of the material more conclusively than it can be told in any other way:

L.P.F., at 393 to 1877 meters: Power Factor 0.7, Phase Difference 0.4 degrees.

Average laminated phenolic panels same range: Power Factor **3.5**, Phase Difference **2.0** degrees.

In other words, the Bureau of Standards found, as the G. A. had claimed, that the power factor of the common materials used for panels is five times that of L.P.F.

FOR the benefit of those not familiar with this term it may be said that a perfect insulator for the high frequency alternating currents employed in radio work would have a power factor of 0.0%. Losses due to a high power factor give the effect of low resistance which, in a receiving set, particularly at short wavelengths, reduced the voltage on the grid and makes the tuning broad. In C.W. transmitters heavy losses result from the use of panels showing a high power factor.

WHEN the G. A. Company first brought out L.P.F. some difficulty was encountered thru the lack of mechanical strength and tendency to warp. By slightly changing the manufacturing methods, however, this has been overcome, and L.P.F. now sold is equal in strength to any of the common materials, is guaranteed against warping, and has a high, glossy finish which, if desired, can be sanded with oil to a smooth surface that will not show finger marks.

L.P.F. can be drilled, tapped, sawed, or filed without cracking or chipping. Accidental hammer blows, heat from the soldering iron, or unusual strains will not harm or affect L.P.F. Each panel is marked with a yellow label showing that it is the genuine material. L.P.F. is sold only in standardized sizes by the G. A. Company and its distributors.

NOTE the new series of sizes shown in the list below, planned specially for regenerative receivers and similar equipment. No panels can be cut to other than standardized sizes.

Thickness	Length	Width	Weight	GA-STD No.	Price
3/16 in.	5 ins.	2½ ins.	3 oz.	GA-STD— 1 P	$ .33
3/16 in.	5 ins.	5 ins.	6 oz.	GA-STD— 2 P	.66
3/16 in.	10 ins.	5 ins.	12 oz.	GA-STD— 3 P	1.31
3/16 in.	10 ins.	10 ins.	1½ lbs.	GA-STD— 4 P	2.62
3/16 in.	15 ins.	10 ins.	2½ lbs.	GA-STD— 5 P	3.93
3/16 in.	5 ins.	7½ ins.	½ lb.	GA-STD— 6 P	.99
3/16 in.	10 ins.	7½ ins.	1 lb.	GA-STD— 7 P	1.97
3/16 in.	15 ins.	7½ ins.	1½ lbs.	GA-STD— 8 P	2.97
3/16 in.	20 ins.	7½ ins.	2 lbs.	GA-STD— 9 P	3.94
⅛ in.	5 ins.	2½ ins.	2 oz.	GA-STD—10 P	.24
⅛ in.	10 ins.	2½ ins.	4 oz.	GA-STD—11 P	.45

CLASS 10-C

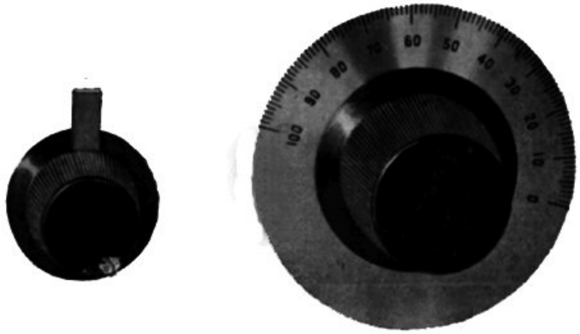
GA-STD

G.A. STANDARDIZED EXPERIMENTAL SUPPLIES

THE GENERAL APPARATUS COMPANY, Inc.

570 West 184th Street **New York City**

SWITCH DIALS KNOBS



IN every detail the new GA-STD knobs and dials are distinctly new, from the symmetrical design which gives controls on the panel an agreeable appearance to such features as the shielded dials and keyed switch arms.

YOU take up the parts one at a time—The switch and rheostat knobs are of the same size 1⅜ ins. in diameter at the base and 1 1/16 ins. high. On the switch is a 1-in. radius polished nickel arm set in a slot cut into the knob base, making it impossible to work loose. A smooth shaft is employed threaded 8-32 into the knob and held by a set screw as well as a nut. At the rear a collar and set screw hold the shaft in place. Contact can be taken from a spring under the collar or, better, a pig-tail soldered to the shaft.

YOU can't ask for anything finer than the rheostat knob with its engraved line on the bevelled edge to indicate the adjustment. Holes are supplied either 3/16 in. or ¼ in. to fit any shaft. The knob can be fastened securely by the long-bearing set screw supplied. Many other uses will be found for this type.

BEST of all, perhaps, is the knob and dial. The knob, 1⅝ ins. in diameter at the base and 1⅜ ins. high, appeals to the eye as well as the hand. Touched lightly it is silky smooth, but a little pressure of the fingers gives a positive grip. Two 6-32 screws 1 in. apart hold the dial to the knob. The dial itself is of solid German silver, beautifully polished, and will retain its finish long after nickeled or silvered brass dials have turned dark. A light brush contact thru a hole in the panel under the dial, connected the ground, will absolutely prevent hand capacity effects, making all panel shielding unnecessary. Since the center hole in the dial is larger than the shaft, it makes no contact with the receiving circuit.

THE exceptional finish and smoothness of these knobs has been achieved by the use of the finest grade of moulding material, which will not only withstand high temperature but can be drilled and threaded easily. And remember that each part comes packed in an individual-slide cover wooden box.

PRICES: GA-STD-A9 switch, complete, 1 in. radius, 5 oz. . . . . . $ .65
GA-STD-A12 rheostat knob, 3/16-in. hole, 3 oz. .40
GA-STD-A13 rheostat knob, ¼-in. hole, 3 oz. .40
GA-STD-A7 knob and 100-division dial, 9 oz. 1.25
GA-STD-A8 knob and 50-division dial, 9 oz. 1.25
GA-STD-4 dial knob only, 4 oz. 55
GA-STD-5 100-division dial only, 5 oz. 70
GA-STD-6 50-division dial only, 5 oz. 70

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