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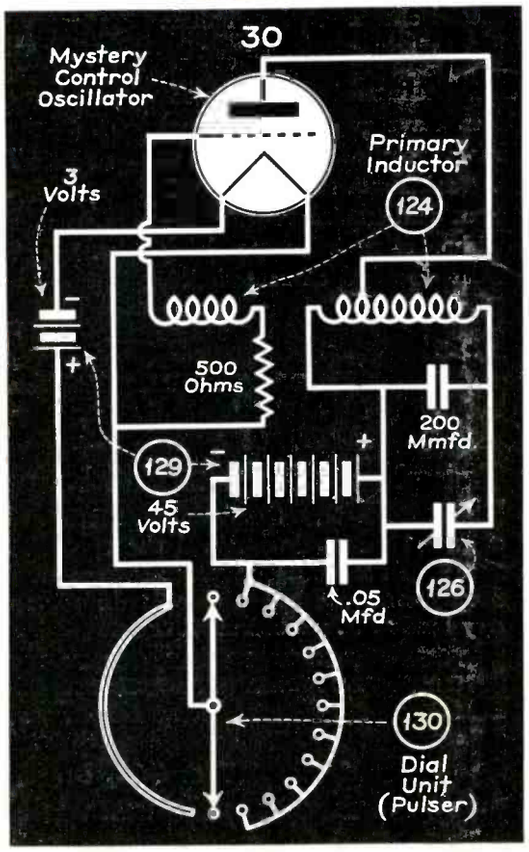

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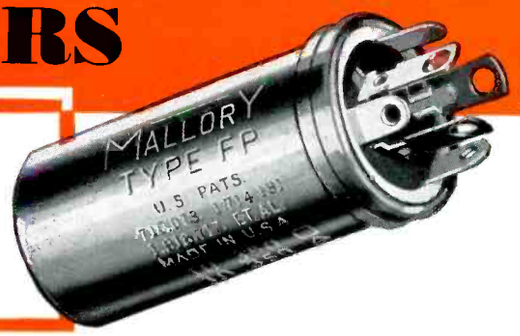

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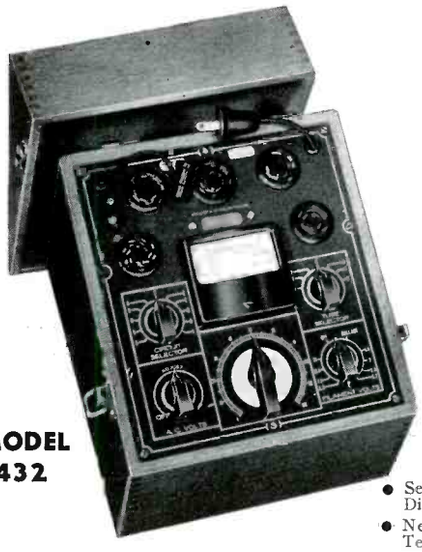

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EDITOR

OCTOBER, 1938 ROBERT G. HERZOG VOL. 7, NO. 10

EDITORIAL CONTENTS

BRYAN S. DAVIS, *President*
JAS. A. WALKER, *Secretary*

Published Monthly by the
Bryan Davis Publishing Co., Inc.
19 East 47th Street
New York City
Telephone: PLaza 3-0483

SANFORD R. COWAN, *Manager*
PAUL S. WEIL, *Advertising Manager*
A. GOEBEL, *Circulation Manager*

Chicago Office—608 S. Dearborn St.—C. O. Stimpson, Mgr.
Telephone: Wabash 1903

Wellington, New Zealand—Tearo Book Depot.
Melbourne, Australia—McGill's Agency.

Entered as second-class matter June 14, 1932. at the Post Office at New York. N. Y., under the Act of March 3, 1879. Subscription price $2.00 per year in the United States of America and Canada; 25 cents per copy. $3.00 per year in foreign countries; 35 cents per copy.

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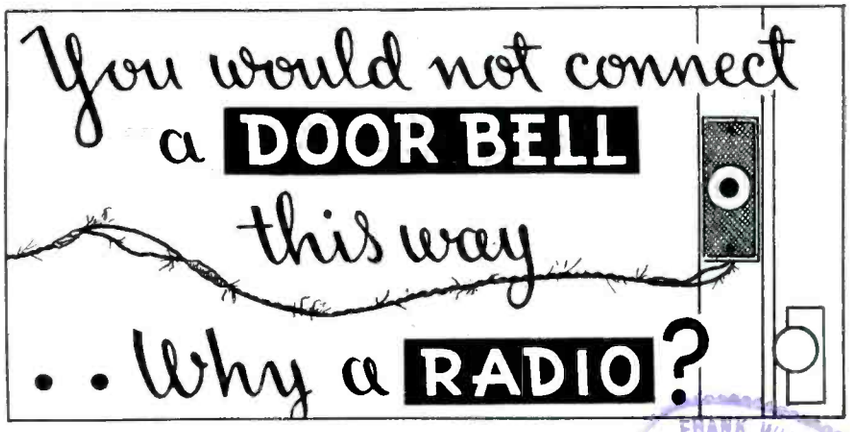

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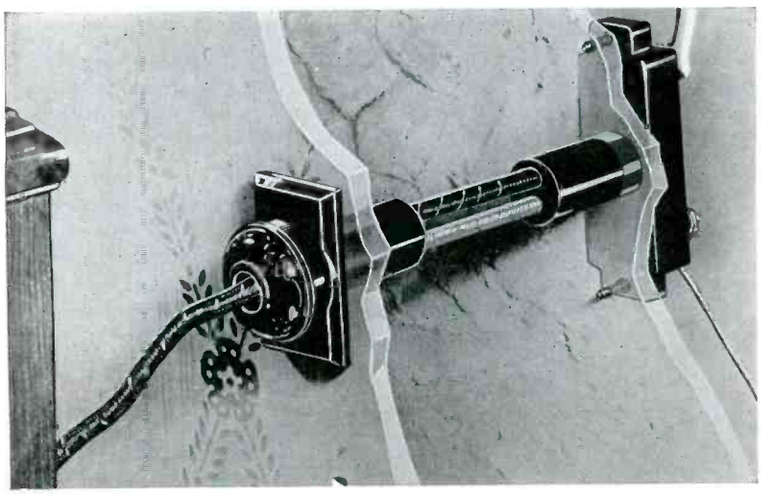

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The Antenna

TELEVISION

TELEVISION is still holding the spotlight. The long promised CBS Chrysler Building television station is finally under construction and will start transmissions shortly. RCA's Empire State Building transmitter will also resume broadcasts on a regular schedule in the very near future. Additional stations are promised by General Electric in New York City, Bridgeport and Albany.

The Radio Manufacturers Association television standards committee is making further progress toward suggested standards both in transmission and in receiver equipment.

Television kits and sets are available from several sources. Perhaps television has finally turned the proverbial corner?

IN THIS ISSUE

IT MIGHT be stated without fear of contradiction that in the last five years one of the most important contributions to better radio reception was the introduction of visual indicator tubes. To secure a state of exact resonance, especially in receivers employing avc, is something achievable only by the possessor of a highly trained ear. Inexact resonance results in side band cutting and this manifests itself to the listener in the form of distortion.

Are you making extra profits by installing a "magic eye" in those sets which lack this valuable aid? When you are persuading your customer to repair his old receiver, in the majority of cases you will be able to convince him regarding the addition of this gadget, especially since he can see it and play with it.

Tuning indicators can be installed in all types of receivers, even those which do not employ diode detection or avc. On pages 7, 8, 9 and 10, Mr. R. Lorenzen gives the theory and applications of some of these tubes. He will have more to say about them in an early issue.

THE INTRODUCTION of remote control devices which tune the receiver at a distance, without connection to it or to the power lines, has caused much discussion in the last few weeks. On pages 11 and 12 and on the front cover of this issue, we give the circuits and description of the device which one manufacturer uses to accomplish such control. We believe that this is the first publication of this information.

WE ARE continuing to present the circuit diagrams and alignment notes of some receivers in the form we introduced last month. May we again make the request (of those of you who have not already done so) that you take a good look at page 18 of this issue and tell us your opinion of it? We want a true criticism with suggestions for possible improvement.

ON PAGE 36 several pictures of television receivers, available here and abroad, are shown with the hope that they will give you some idea of the progress in this field.

SERVICE CHARGES

WHAT is a rightful charge? A very simple question but it requires a great deal of thought to arrive at the answer. We all agree that charges, in general, are too low at present, but let us review some of the problems.

We have several degrees of proficiency upon the part of the Service Man. Should all of these men charge the same fee? Upon an hourly basis, assuming that all the men can eventually effect the required remedy, the customer gains by employing the proficient man who can make the repair in the shortest possible time. On the other hand, the man who is not so proficient must take longer and thus it is apt to cost the customer more than he is willing to pay. Again, the less efficient man, who is confronted with the same problem as the man with many years of experience, cannot charge a low fee because it will not give him a living income.

There must be some division between the cost for checking the set when it is brought into the shop and when you travel to the home. What is the solution when the calls are nearby and when traveling involves quite a trip?

What basis of operation is satisfactory with respect to replacement parts? In this connection it is necessary to remember that thousands of receivers are purchased each year at cut prices, but the cost of the replacement parts for these receivers is based on the original list price of the receiver. Thus a small unit needed for a receiver may represent 10 or 15 percent of the total cost of the receiver.

We have our ideas. What is your conception of a proper basis for service charges? We want your thoughts. Suppose that you jot them down and let us have them.

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See How you trace the passage of the signal through the receiver and establish the points where signal exists, becomes distorted, fades, dies, takes on hum, without interfering with the normal operation of the receiver!

See How any and every check of the operation of the audio-frequency channel is made with the use of a single probe!

See How the Electronic Voltmeter enables you to measure all d-c voltages in any part of the receiver by the use of only one probe in conjunction with a common ground.

See How you can conduct any and every test in the RF and IF channel, easily, quickly and accurately!

See How the oscillator channel is checked by placing the proper probe in contact with any portion of the oscillator tuned circuit and resonating the channel to the frequency of the signal being generated by the oscillator.

See How the Intermittent Problem is solved with the Rider Chanalyst . . . How you can, in effect, divide the receiver into five separate sections, and definitely localize the trouble as being in a certain part.

See The multitude of other tests you can conduct with the Rider Chanalyst. It involves no unknown principles of radio!

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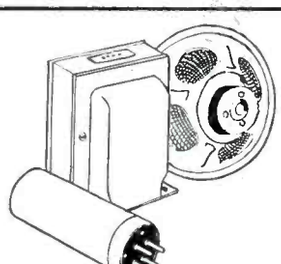

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FOR OCTOBER, 1938

VISUAL INDICATOR TUBES

By R. LORENZEN

MANUAL tuning when accomplished by ear possesses certain disadvantages. Fortunately the advent of visual indicator tubes eliminates the necessity for aural tuning. Exact resonance can be obtained through visually observing the shaded pattern on the fluorescent screen of these tubes.

Types

At the present time there are 3 main types of visual indicators:

(1) The type having what is variously known as an *angular pattern*, a *wedge-shaped pattern* or a *shaded sector pattern*. In this type the shaded pattern generally varies from almost 0° to about 90°. Representative of this type are the 2E5, 2G5, 6AB5, 6E5, 6G5, 6N5 and 6U5.

(2) The *annular ring type*, wherein the doughnut-shaped pattern varies in diameter. The 6T5 is the only tube of this type. Except for the shape of its pattern it is identical to the 6G5 in electrical characteristics. Its applications are similar to those for the shaded sector types.

(3) The *dual-indicator type* (which is sometimes erroneously called the *twin-indicator* type), wherein there are two separate shaded angular patterns. The two patterns vary together or independently, depending upon how the tube is connected. The 6AD6G and 6AF6G are representatives of this type.

Angular Pattern Type

These tubes are comprised of two parts, one part consisting of a triode, and the other part of a special type of cathode ray tube. The cathode (K) extends upward and is common to both the triode and cathode ray tube. (See Fig. 2.) A cathode shield (CS) is so located as to prevent any direct light from the hot cathode being visible. The ray-control electrode (V) consists of a small thin metal vane which is interposed between one side of the cathode and the target. This controls the shadow angle opening. It is connected internally to the triode plate (P). The fluorescent target (T) is inclined at an angle with respect to the cathode.

Fig. 1. Visual indicator tube characteristics. The chart is complete for all visual indicator tubes released up to this date.

— SERVICE —

TYPE	HEATER VOLTS	HEATER AMPS	TARGET VOLTAGE	TARGET CURRENT (MA.)	PLATE-TARGET RESISTOR (MEG.)	TRIODE-GRID VOLTAGE FOR SHADOW ANGLE 0°	TRIODE-GRID VOLTAGE FOR SHADOW ANGLE 90°	RAY-CONTROL ELECTRODE VOLTAGE FOR SHADOW ANGLE 0°	90°	100°	135°	PLATE CURRENT FOR ZERO GRID VOLTAGE (MA.)	TRIODE GRID TYPE	BASE	MAXIMUM OVERALL DIMENSIONS (INCHES) SMALL	LENGTH	DIA.	SHAPE OF BULB	SHADOW PATTERN ZERO GRID BIAS	SHADOW PATTERN NEGATIVE GRID BIAS	BOTTOM VIEW OF SOCKET	TARGET CURRENT LIMITING GRID AROUND CATHODE	NOTES	PATTERN	TYPE
2E5	2.5	0.8	100	4.5	0.5	-3.3	0					0.19	Uniform	6-Pin	4 3/16		1 9/16	ST12				No	Not made by all tube manufacturers	Shaded Sector	2E5
			200	4.5	1.0	-6.5	0					0.19													
			250	4.5	1.0	-8.0	0					0.24													
2G5	2.5	0.8	100	4.5	0.5	-8.0	0					0.19	Variable mu	6-Pin	4 1/4		1 9/16	ST12				No	Not made by all tube manufacturers	Shaded Sector	2G5
			200	4.5	1.0	-16.5	0					0.19													
			250	4.5	1.0	-22	0					0.24													
6AB5	6.3	0.15	135	4.0	0.25	-7.5	0					0.5	Variable mu	6-Pin	4 1/4		1 3/16	T9				Yes	Low heater power drain	Shaded Sector	6AB5
6AD6G	6.3	0.15	0° 90° 135°					45 0			-23		Octal 7-Pin	2 7/8			1 5/16	T9				Yes	To be used in conjunction with 6AE6G control tube	Dual Angle	6AD6G
			100 1.5 1.0 0.8					75 8			-50													
			150 3.0 2.0 1.2																						
6AF6G	6.3	0.15	100	0.9				60		0			Octal 7-Pin	2 1/4			1 3/16	T9				Yes	To be used in conjunction with 6AE6G control tube	Dual Angle	6AF6G
			135	1.5				81		0															
6E5	6.3	0.3	100	4.5	0.5	-3.3	0					0.19	Uniform	6-Pin	4 3/16		1 9/16	ST12				No	Earliest of visual indicators	Shaded Sector	6E5
			200	4.5	1.0	-6.5	0					0.19													
			250	4.5	1.0	-8.0	0					0.24													
6G5	6.3	0.3	100	4.5	0.5	-8.0	0					0.19	Variable mu	6-Pin	4 1/4		1 9/16	ST12				No	Similar to 6U5	Shaded Sector	6G5
			200	4.5	1.0	-16.5	0					0.19													
			250	4.5	1.0	-22	0					0.24													
6H5	6.3	0.3	100	1.5	0.5	-8.0	0					0.19	Variable mu	6-Pin	4 3/16		1 9/16	ST12				Yes		Shaded Sector	6H5
			200	3.5	1.0	-10.5	0					0.19													
			250	4.5	1.0	-22	0					0.24													
6N5	6.3	0.15	135	4.5	0.25	-12.0	0					0.5	Variable mu	6-Pin	4 1/4		1 9/16	ST12				Yes	Low heater power drain	Shaded Sector	6N5
6T5	6.3	0.3	200	4.5	1.0	-18.5	0					0.19	Variable mu	6-Pin	4 1/8		1 3/16	T9				Yes		Annular Ring	6T5
			250	4.5	1.0	-22	0					0.24													
6U5	6.3	0.3	100	4.5	0.5	-8.0	0					0.19	Variable mu	6-Pin	4 3/16		1 3/16	T9				Yes	Similar to 6G5	Shaded Sector	6U5
			200	4.5	1.0	-18.5	0					0.19													
			250	4.5	1.0	-22	0					0.24													

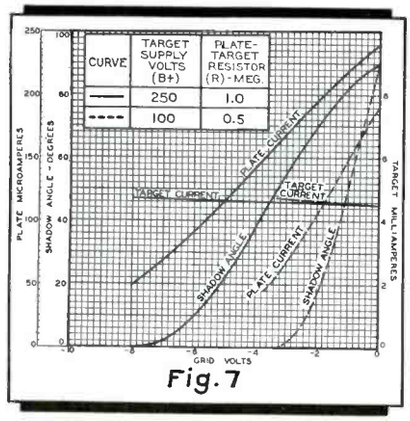


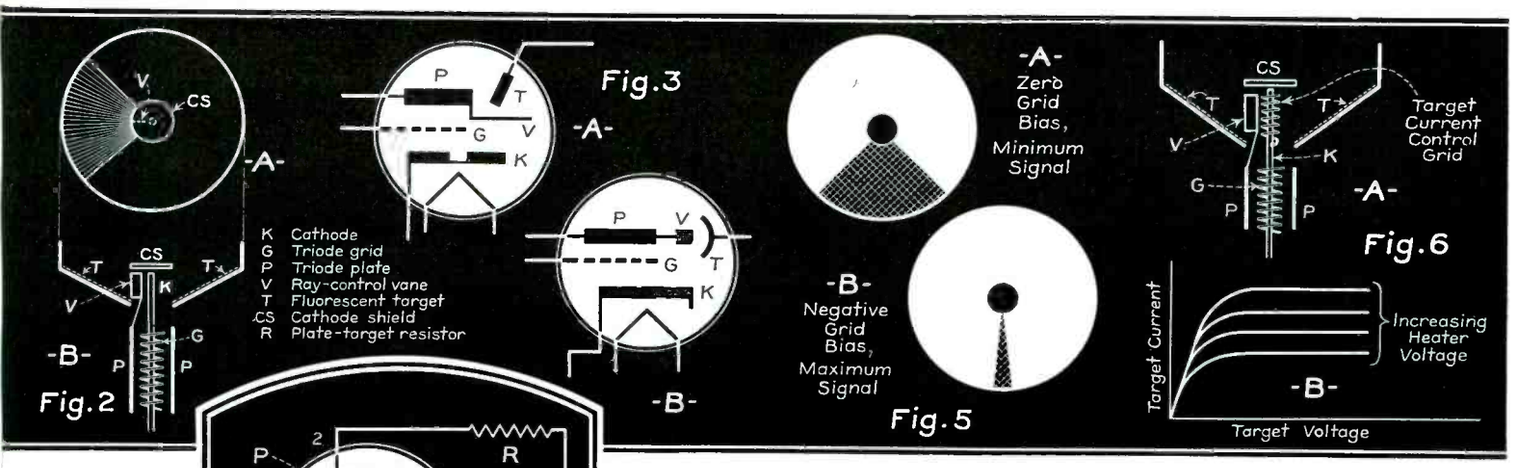
Fig. 7. Characteristic curve for the 6E5.

A resistance (R) is connected between the triode plate and the fluorescent target (Fig. 4). The target is connected directly to B+ and is always at this potential. The plate voltage, and, therefore, the potential of the ray-control vane is less than the supply voltage by the amount of the voltage drop in the plate-target resistor. The voltage drop in the plate-target resistor is dependent upon the plate current of the triode.

Resonance

The triode plate current is, in turn, dependent upon the triode grid potential, namely, the avc voltage. When the triode grid is biased to plate current cutoff, that is, when the grid has so high a negative potential that no plate current flows, there will be no voltage drop across the plate-target resistance. Consequently the triode plate, and therefore the ray-control vane also, will have the same potential as the fluorescent target. Such a condition exists when the set is exactly tuned to the carrier frequency of the transmitting station, for this results in a maximum negative avc voltage which is applied (Fig. 4) to the triode grid.

The hot cathode (Fig. 2) is emitting electrons in all directions and since the fluorescent target is positive with respect to the cathode, the target draws these electrons to it. Since the target is coated with a fluorescent substance it becomes illuminated when subjected to this electron bombardment. When the ray-control vane is at the same potential as the fluorescent target there is no obstruction to the free passage of electrons to the target and the whole area of the target is illuminated except for a very narrow shaded line caused by the mechanical obstruction of the ray-trol vane. Consequently, when a station is exactly tuned to resonance a small shaded angular pattern (Fig. 5B) will result.



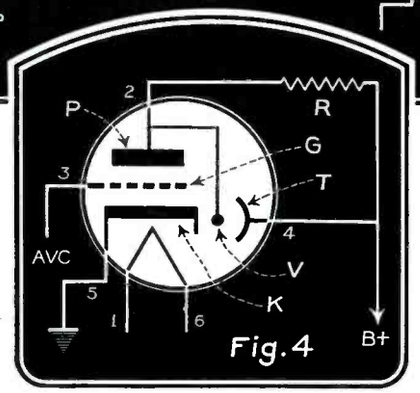


Fig. 2 is a sketch of a typical angular pattern type visual indicator tube showing the location of the tube elements. Figs. 3A and 3B show two schematics for these tubes. The preferred schematic is given in Fig. 4, together with the external circuit. The shape of the shaded pattern is shown in Fig. 5. Fig. 6 shows the constructional details of the types which use an additional grid connected to the cathode to limit the target current to safe values.

Summarizing, when a station is tuned to exact resonance a large negative avc voltage occurs which is applied to the triode grid of the visual indicator tube. This prevents plate current from flowing and hence no voltage drop in the plate-target resistor. The ray-control vane is therefore at the same potential as the fluorescent target. A very narrow shaded wedge-shaped pattern results.

Off Resonance

The opposite extreme occurs when the set is tuned so as not to receive any signal. Under these conditions there will be no avc voltage and, consequently, zero volts will be applied to the triode grid (Fig. 4). Plate current will flow and a considerable voltage drop will be developed across the plate-target resistor. Since the triode plate voltage, and therefore the ray-control vane voltage, is the target voltage minus the voltage drop in the plate-target resistor, the ray-control vane is at a much lower positive potential with respect to the cathode than the target, or, the ray-control vane is negative with respect to the target.

To get a better picture of the situation, consider a 6G5 visual indicator tube under normal operating conditions, wherein 250 volts are applied to the target and the plate-target resistor is 1 meg. When zero volts are applied to the triode grid a plate current of 0.24 ma will flow. The voltage drop in the plate-target resistor will be:

$E = 0.00024 \times 1{,}000{,}000 = 240$ volts.

The ray-control vane, which is connected to the triode plate, will therefore have a potential of $250 - 240 = 10$ volts with respect to the cathode. But, with respect to the target, the ray-control vane is 240-volts negative.

When the ray-control vane is negative with respect to the target (Fig. 2) an electrostatic field exists of such nature that the ray control vane exerts a repelling effect upon the electrons emitted by the cathode. There is therefore produced a 90° shaded sector (Fig. 5A) where electrons do not strike the target.

Summarizing, when no signal is tuned in, zero avc voltage is obtained, and zero volts are applied to the triode grid. Plate current flows, thereby resulting in a large voltage drop in the plate-target resistor. The ray-control vane becomes highly negative with respect to the target and repels the electrons from the cathode, in consequence of which a 90° shaded wedge-shaped pattern appears on the fluorescent target.

It has been mentioned that when a station is tuned to exact resonance that the shaded sector would become very narrow, approaching a line. This, however, is not necessarily the case, for the narrowness of the shaded wedge-shaped pattern depends partly upon the strength of the received signal when the avc action does not supply sufficient control. This is of no particular importance, for a state of exact resonance is attained when the shaded sector has a minimum area. The shaded angle increases in value with an increasing off-resonance condition.

Mounting

The tube may be mounted in any position, although, for convenience, it is usually mounted horizontally. External light reflections may be minimized by placing a small hood over the dome and fluorescent target.

The shaded sector occurs on the same side of the tube as pin 5, in a visual indicator with a 6-pin base.

Precautions

Precautions should be taken to eliminate the a-f component from the avc voltage that is impressed upon the triode grid, or there will be a tendency for the edges of the shaded sector to become blurred on strong modulation peaks. However, the resistance-capitance a-f filter should not have too great a time constant, for the lag of the avc voltage applied to the triode grid would then be so large that the response of the shaded sector to tuning variations would become too sluggish.

Adequate ventilation should be provided for visual indicator tubes for under certain conditions these tubes become extremely hot. In the 6E5 and 6G5, for example, the target current was limited only by cathode saturation, that is, by the maximum emission of the cathode. Due to age of the tube or to variations in the line voltage this emission sometimes ran to excessively high values, resulting in the destruction of the tube. This difficulty was overcome, as exemplified by the 6H5 and 6U5 for example, by placing a grid around the cathode and connecting this grid to the cathode within the tube (Fig. 6A). In Fig. 6B are given a set of curves relating target current to target voltage when such a target current control grid is employed. Such construction limits the target current to safe values. In consequence of this target current limiting grid there appears a fixed 90° shadow on the side of the target opposite the controlled shaded sector. This fixed shadow should not be mistaken for the controlled shaded angular pattern. Where this special grid is employed the schematic occasionally shows this by representing it as a grid which is internally tied to the cathode.

The cathode is never absolutely smooth, but rather has a somewhat irregular surface. Such irregularities sometimes manifest themselves as cathode indentations, from which there is little or no electronic emission. Since the electronic emission from the cathode to the target occurs in practically straight lines, no fluorescence will occur on those spots on the target which lie directly opposite such non-emitting points on the cathode. Black, unilluminated spots will be manifest on the target, but these do not indicate a defective tube.

When a visual indicator tube is added to a receiver, where additional heater drain is undesirable, an on-off toggle switch may be used in the heater circuit of the tube. Since this tube is used only when a station is being tuned, it is unnecessary that this tube consume power once the tuning-in process has been performed.

Except for certain special circuits it is preferable that the cathode of a visual indicator tube be connected to ground even when the diode load is not directly connected to ground. In certain receivers the cathode current of the visual indicator tube may flow through the bias resistor of another tube. Due to age or other causes the cathode current of the visual indicator tube may change and thereby produce variations in the bias voltage of the other tube. To avoid difficulties of this sort it is advisable to connect the cathode of the visual indicator tube directly to ground.

Variation in sensitivity of the 6E5 with variation of plate current is shown in Fig. 9. A resistor, such as R_3 in Fig. 10, inserted between the triode grid and cathode decreases the sensitivity of the tube. Figs 11A and 11B show various other methods used to vary the sensitivity of the tube. Fig. 12 gives a circuit which will open the shadow to a maximum of 180°.

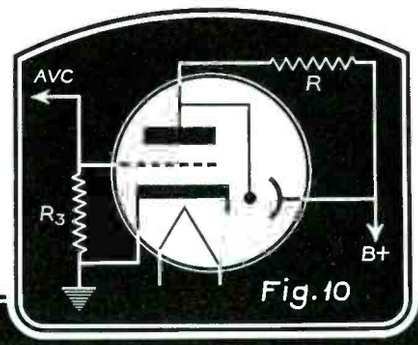


Fig. 10

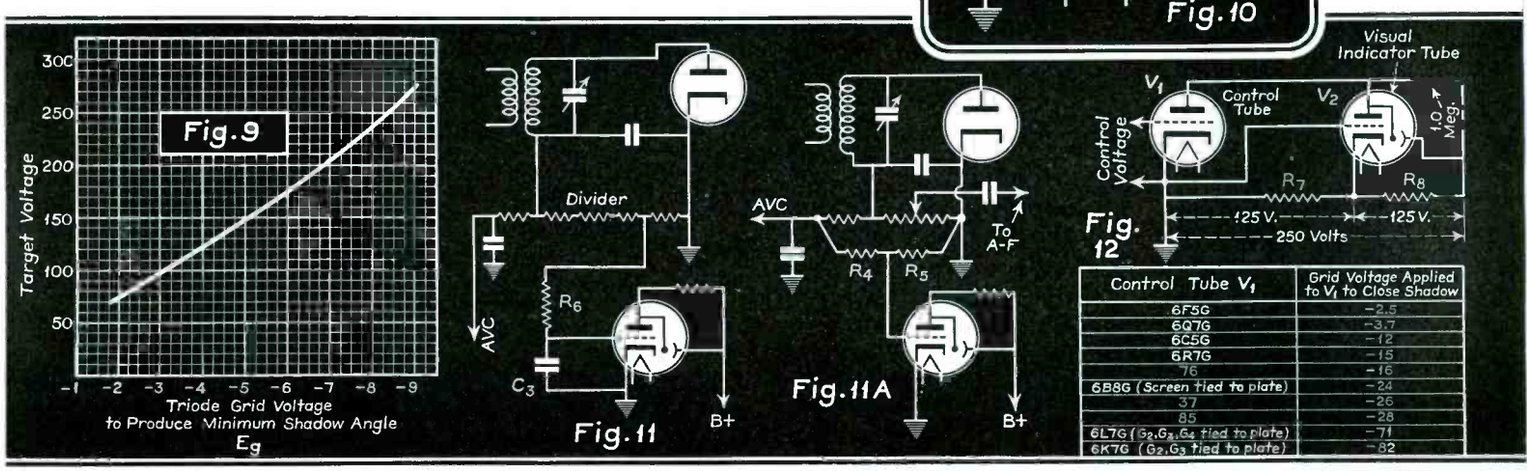


Fig. 9 Fig. 11 Fig. 11A Fig. 12

Control Tube V_1	Grid Voltage Applied to V_1 to Close Shadow
6F5G	-2.5
6Q7G	-3.7
6C5G	-12
6R7G	-15
76	-16
6B8G (Screen tied to plate)	-24
37	-26
85	-28
6L7G ($G_2G_3G_4$ tied to plate)	-71
6K7G (G_2G_3 tied to plate)	-82

Fig. 8. Characteristic curves for the 6G5.

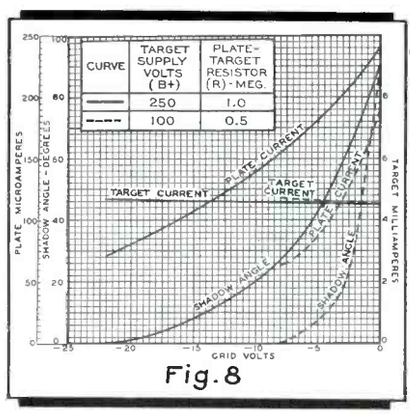


Fig. 8

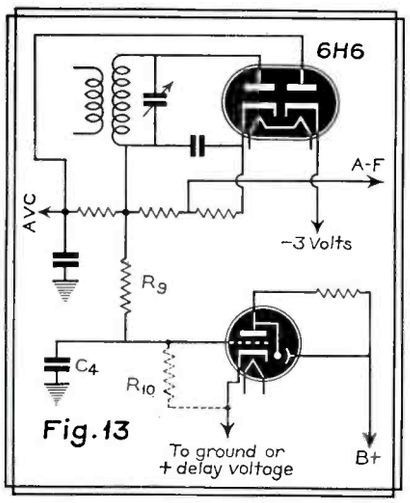


Fig. 13

The characteristic curves of the 6E5 and 6G5 visual indicator tubes are given in Figs. 7 and 8. Two sets of operating conditions are given in each case, one with a target voltage of 250 volts and a plate-target resistor of 1.0 meg; the other with a target voltage of 100 volts and a plate-target resistor of 0.5 meg. The 6E5 triode plate current is reduced to very low values when the triode grid has —7 volts applied to it. The 6G5 requires a triode grid voltage of —22 to reduce the triode plate current an equivalent amount, assuming a target voltage of 250 volts in each case. When operated with 100 volts on the target and a plate-target resistor of 0.5 meg, the 6E5 cuts off at about —3.3 volts on the triode grid, while the 6G5 requires —8 volts applied to the grid.

Due to the difference in the cut-off voltage of the 6E5 and 6G5 it might, at first glance, appear a simple matter which tube should be used.

There are, however, many qualifying circumstances, and about the only general rule which is approximately correct is that the 6E5 is generally suitable for use in receivers having a large number of tubes under avc control, for in this case there is generally developed only a small avc voltage in the diode circuit. The 6AB5, 6G5, 6H5, 6N5 and 6U5 possess a variable mu triode unit which enables the avc voltage to appreciably affect the shadow angle on weak signals and also prevents, within limits, the complete closure of the shadow angle prior to the proper tuning of a strong signal.

When the strongest carrier received by the receiver is tuned to resonance, there are three effects which might occur: (1) The shaded sector does not close sufficiently at resonance; (2) The shaded sector closes to a narrow line at resonance; (3) The shaded sector closes before a state of resonance is reached, that is, at resonance the edges overlap.

The second condition indicates proper action on the part of the visual indicator tube. Conditions (1) and (3) may be due to the choice of a tube having an incorrect cut-off for the purpose in hand. Assuming, however, that this is not the case, or, even if it were, how can the tube be made to act properly?

In delayed avc circuits the visual indicator should be operated from the detector diode as shown in Fig. 13. Where detection and avc are separate functions it is generally advisable to operate the visual indicator from the detector diode, as indicated in Fig. 14. A visual indicator may be employed on receivers without avc by means of the circuit shown in Fig. 15.

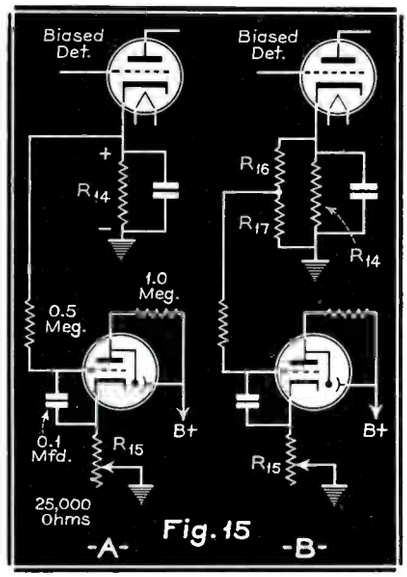


Fig. 15

Fig. 9 shows the triode grid voltage which will produce a minimum shadow angle in a 6E5 for various voltages applied to the target. This curve shows that the sensitivity of a visual indicator tube becomes greater as the target voltage is decreased, and that a decrease in sensitivity occurs as the target voltage is raised. In other words, when the target voltage is decreased, a smaller value of avc voltage need be applied to the triode grid in order to close the shaded sector. Conversely, when the target voltage is increased a larger avc voltage is needed to obtain a minimum shadow angle.

Thus, if the shaded sector does not close sufficiently when the strongest carrier the radio will receive is tuned to exact resonance, reduce the target voltage, either by connecting the target to a point of lower potential on the chassis or by inserting a series resistor between the target and its present source of potential. Similarly, if the shaded sector closes before a state of exact resonance is reached when the set is tuned to the strongest carrier it will receive, connect the target lead to a point of higher potential on the chassis. However, the target potential should not be less than 80 nor more than 275 volts.

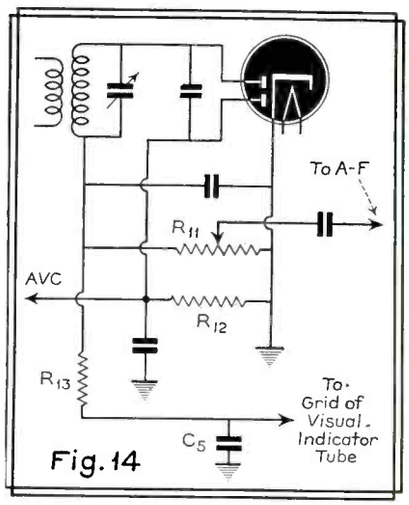


Fig. 14

A somewhat different method of altering the sensitivity of a visual indicator tube is available. This method requires changing the resistance value of R (Fig. 4) and also the target voltage. For minimum sensitivity R should be 1.0 meg and the target potential 250 volts. For maximum sensitivity apply 100 volts or less to the target and reduce the plate-target resistor to 0.5 meg. For sensitivities lying between these two extremes use intermediate values of target potential and plate-target resistance.

Another method of decreasing the sensitivity of a visual indicator tube to prevent the shaded sector from closing before a station is tuned to resonance is shown in Fig. 10. This method requires the insertion of a resistor R_3 between the triode grid and cathode. The resistance value of R_3 to be used should be determined with the set tuned to exact resonance with the strongest carrier that will be received. If, however, the resistance of R_3 is so low that the avc voltage has been appreciably reduced this method will have to be abandoned.

When all other methods of decreasing the sensitivity fail, recourse may be had of the method shown in Fig. 11A. A voltage divider comprised of R_4 and R_5 is connected between the avc supply and the diode cathode. So as not to interfere with the correct operation of the diode load proper, the sum of R_4 and R_5 should amount to 5 to 15 meg. The triode grid of the visual indicator tube is connected between R_4 and R_5. The smaller the resistance of R_4 as compared with R_5, the greater the avc voltage applied to the triode grid. Conversely, the lower the resistance of R_5 with respect to R_4, the lower the avc voltage applied to the triode grid. While this method prevents premature closing of the shadow angle for strong signals it also results in reduced sensitivity on weak signals. This latter difficulty can be

(*Continued on page* 28)

MYSTERY CONTROL

(*See Front Cover*)

SEVERAL of the current Philco receivers employ a novel type of remote tuning called Mystery Control. These receivers can be tuned automatically to any one of eight stations, and the volume adjusted to any desired level, from a remote box (Fig. 1) which is about 6 by 8 by 4 in. This control box is entirely self contained; there are no wires to it from the receiver or from the power lines.

To tune a station (once the receiver is turned on manually, and the band switch set to "remote") it is only necessary to spin a telephone type dial to a stop and then release it. Within 15 seconds the receiver will retune itself to the station dialed. If the volume is too loud or too soft, soft and loud positions are provided on the dial. The set can also be turned off from the remote box.

Control Box

The control box is, essentially, a battery-operated oscillator (Fig. 2 on the front cover). It is designed so that it is normally off and is turned on only during the dialing operations. The molded dial has ten positions; eight station and loud and soft volume positions. This dial is connected to a pulsing mechanism which times the return of the dial so that connection is made to the several dial points at regular intervals.

As soon as the dial is rotated the filament of the type 30 oscillator tube is connected to its supply. As the dial returns the oscillator grid return is connected, intermittently, to the filament. This will set up an oscillation or pulse in the primary inductor (Fig. 2) for each contact on the pulser mechanism. As the dial comes to rest it again disconnects the tube's filament supply. Thus, for any particular position dialed, a given number of pulses are radiated from the primary inductor (Fig. 2).

To increase volume, the position at the extreme right is dialed and the end stop depressed until the volume reaches the desired level. The dial returns to its original position and, as it does so, sets up two pulses in the primary inductor. Depressing the end stop keeps the oscillator functioning and maintains the signal in the primary inductor on the second pulse.

To reduce volume, the second position from the right is dialed and the end stop held depressed until the volume reaches the desired level. This maintains the signal in the primary inductor on the third pulse. If the end stop is held down for a longer period the set will turn itself off.

Control Amplifier

A large coil or loop is located at the bottom of the receiver cabinet (secondary inductor, Fig. 3). This coil is tuned to the frequency of the oscillator in the control box by means of a trimmer located inside a cylindrical cardboard box in one corner of the loop. This loop or secondary inductor acts as the antenna to receive the pulses from the primary inductor in the battery operated control box.

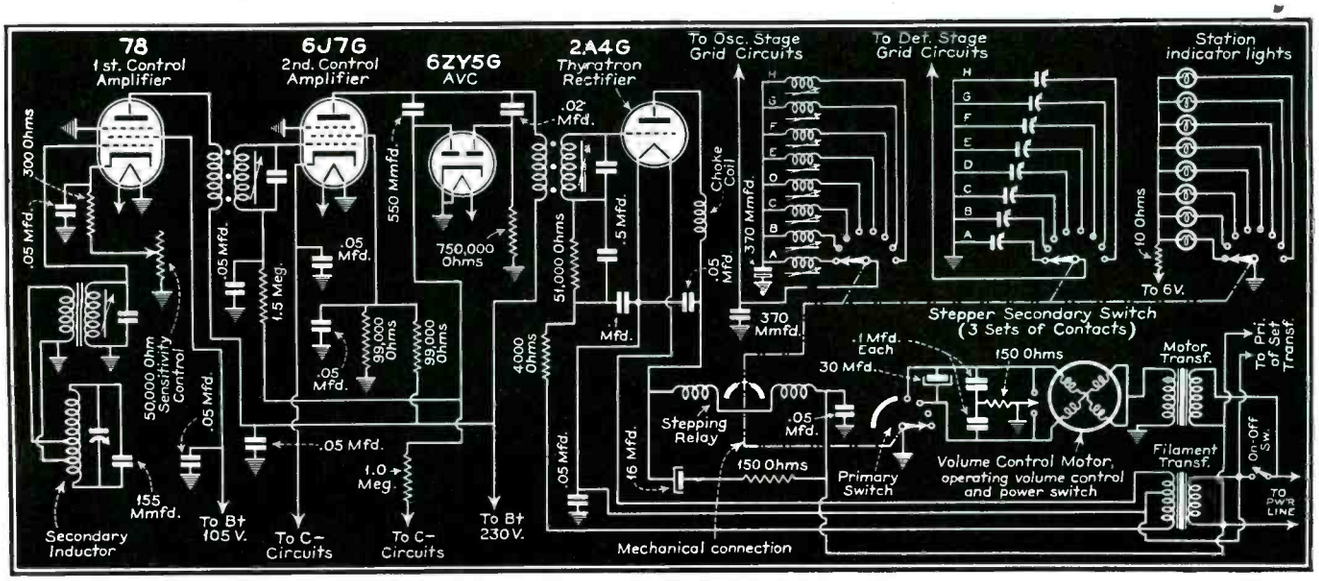
These pulses are amplified first by a type 78 and further by a 6J7G tube (Fig. 3). A 6ZY5G diode is used as avc tube to maintain an even input, to the 2A4G thyratron rectifier output stage, throughout a wide range of signal strength. The second diode is used as a limiter to dampen strong peaks, which might cause the thyratron tube to continue firing over too long a period.

The output stage of the control amplifier is an argon-filled thyratron rectifier. This tube is similar to a conventional gas-filled rectifier into which a grid has been placed. A rectifier passes current during the entire portion of the a-c cycle in which the plate is positive with respect to the cathode. A grid inserted between the plate and the cathode would permit current flow only during that portion of the cycle in which the grid has the proper bias. If both grid and plate voltages are taken from the same a-c source their phase difference could be arranged so that the grid would permit current flow during the entire half cycle in which the plate is positive with respect to the cathode, so that no plate current would flow, or somewhere between these limits.

A type 2A4G thyratron rectifier is used in the Philco control amplifier. The characteristic curve of this tube is given in Fig. 4. Ratings and other characteristics follow:

Filament voltage	2.5 v
Filament current	2.5 amp
Maximum anode current	
Forward	200 v
Inverse	200 v
Maximum voltage between any 2 electrodes	250 v
Maximum anode current	
Peak	1.25 amp
Average	0.10 amp
Maximum averaging time	45 sec.
Tube voltage drop	15 v
Cold starting time	2 sec.

Fig. 3. The Philco Mystery Control amplifier and station selector located in the receiver.



The grid bias for the 2A4G, used in the control amplifier (Fig. 3), is taken from the secondary of the tube's filament transformer. The plate supply is taken directly from the a-c lines. With the plate and grid voltages thus out of phase, no plate current will flow until the signal from the control amplifiers is sufficient to overcome the bias and supply the proper potential to fire the tube. Once operation has begun it is characteristic of this tube to continue firing throughout the remaining portion of the a-c cycle in which the plate is positive with respect to the cathode, regardless of any change in the grid voltage.

The plate current of the 2A4G flows through and energizes the holding relay and permits operation of the stepping relay as discussed below.

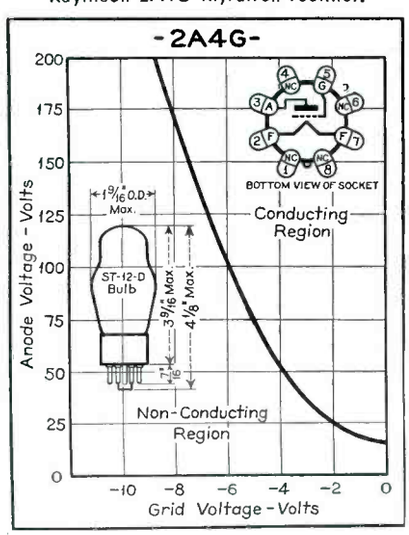
Stepper Assembly

The stepper assembly (Fig. 5) houses a holding and a stepping relay. When the thyratron lights, the holding relay closes and the stepping relay pushes a ratchet as many times as the pulses sent out by the pulser in the control box.

There is a primary and a secondary ratchet. The stepper relay operates the primary ratchet which is connected to the primary switch. This switch controls the volume control motor and shorts the voice coil to ground in the station selecting positions. A muting switch, which connects the plates of the output tubes together is closed during the station selecting operation. The set, of course, is playing during changes in volume, but is muted as the secondary ratchet returns to its home position, and climbs to the station dialed.

The station selecting switch assembly is located beneath the chassis but is driven by the stepper assembly. There are three groups of contacts operated by the switch. One group switches the oscillator coils, the second group switches the antenna padding condensers and the third group of switches lights the pilot lamps indicating the station dialed.

Fig. 4. E_g—E_p characteristic of the Raytheon 2A4G thyratron rectifier.



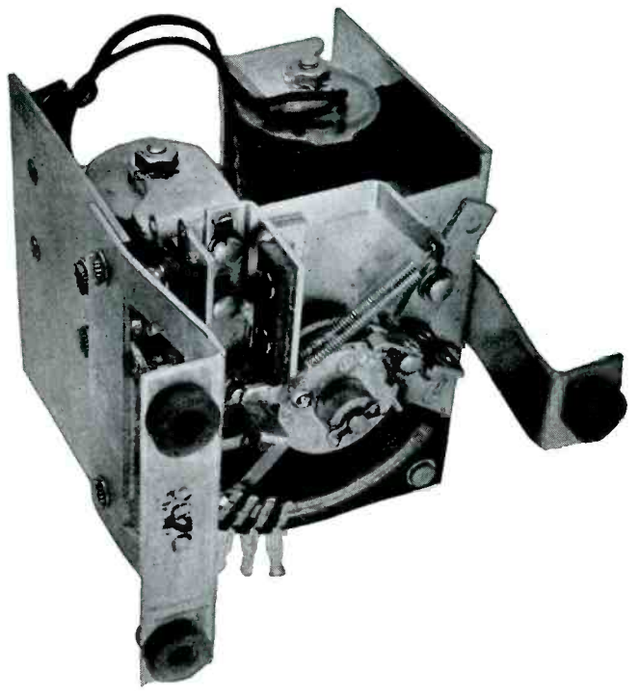


Fig. 5. The stepper assembly which operates the station selector switch and volume control. Both holding and stepping relays are shown.

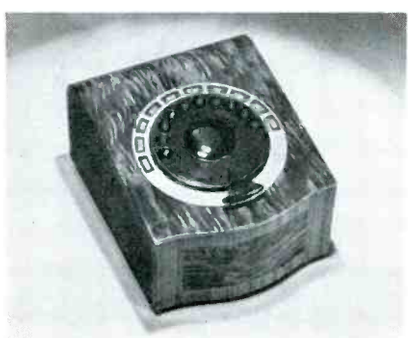


Fig. 1. The Philco Mystery Control unit. The battery operated oscillator and pulser mechanism, shown on the front cover, are located in this box.

Volume Control

The volume control and on-off switch are motor driven. The motor has an automatic clutch which releases and drops back as soon as the volume control is released by the stepper primary switch. This prevents over-shooting when changing volume and stops the gear train, which drives the volume control, immediately when the end stop is released on the control box. There is also a clutch in the volume control itself, so that the mechanism will not jam if the volume control lever is held down after the set is shut off.

The primary switch is a single-pole, double-throw switch which connects the desired winding in the volume control motor to increase or decrease volume. In parallel with this switch there is a single-pole, double-throw switch connected to the manual volume control. This switch is mounted directly below the receiver dial bezel.

Range

The normal range of the Mystery Control is within a circle of the receiver with a radius of about 25 feet. A sensitivity control is provided in the cathode of the 78 control amplifier, however, to fit a wide range of operating conditions. Normally, sufficient precautions are taken in the amplifier and remote control circuits to greatly reduce the possibility of electrical interference. There is little possibility of interference affecting the receivers if the sensitivity control is kept down to the first half of its total movement.

In some installations, however, owing to the presence of large metal objects around or near the receiver chassis, it will be necessary to increase the sensitivity of the control frequency amplifiers owing to the absorption of the metal surfaces. When this occurs, it will very likely be found that the same metal objects are shielding the receiver from excess static which would normally interfere with the control circuits in high setting of sensitivity control.

Control Frequencies

Mystery Control receivers are designed to operate on a control frequency somewhere between 350 and 400 kc. The purpose of a variety of control frequencies is to assure freedom from interference between the circuits of two sets operated in close proximity to each other. A 20-kc difference is recommended between control frequencies of sets that are operated in the same room.

In homes or apartment houses the distance between receivers will deter-

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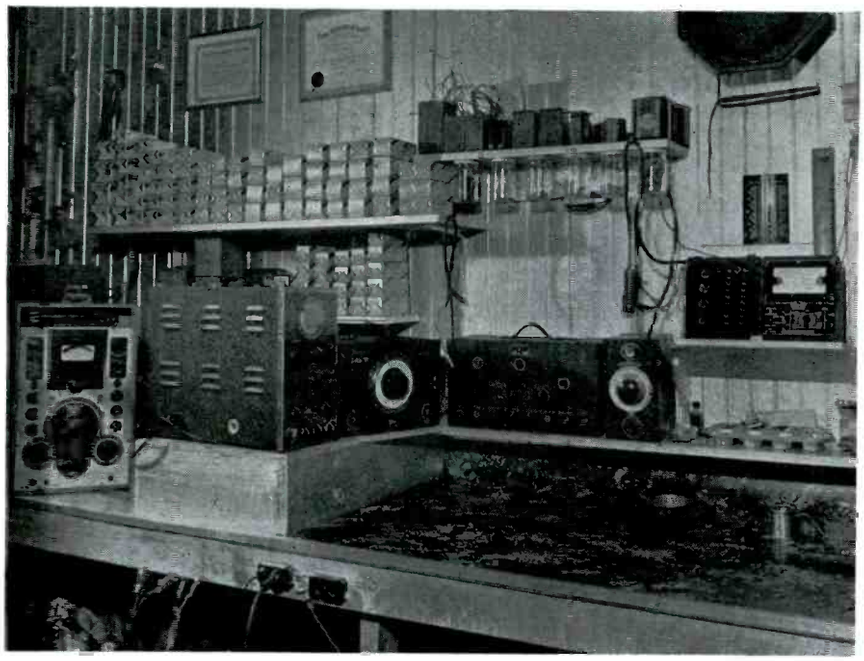


Fig. 1. A corner of "The Shop That Jack Built" showing the workbench and some of Jack's equipment.

SERVICE YOUR

By JOHN H. POTTS

NO service shop is completely satisfactory to its owner, no matter how good it may appear to others. As a result, most shops are constantly being altered or re-arranged for greater convenience and efficiency. Often more equipment is needed, but the amount of business done may not justify the additional expenditure. Again, since limitations may not permit desired expansion, but much can be done at little or no expense with a given amount of space, tools and apparatus if a layout is made in accordance with a well-thought-out plan.

The best shop layout is the one which enables its owner to turn out the best possible work with the least possible effort. If the layout happens to look attractive to customers, and most likely it will, so much the better; but this is, or should be, a secondary consideration. Good work likewise creates a favorable impression and the memory lingers longer.

No single shop design can be devised which will be universally ideal for all types of service work. Too much depends upon the volume and type of work, space available, skill of the operator, and such seemingly minor things as his height, weight and even his disposition. Some fellows can't sit still a minute. A bench which is of the right height for a short person will give a tall person a backache. No two Service Men go at a job in precisely the same way . . . all these things have to be considered in designing a shop for best service.

Do you find you can work better while standing rather than sitting? Perhaps the workbench stool is of the wrong height. It should be high enough to keep the head at the same level as when standing. If too high or too low (and an inch makes a lot of difference!) one tires quickly. There should be plenty of leg room under the bench. Tools should be where they can be reached without getting up and needed apparatus should be conveniently at hand. Meters should be at eye level or lower so neck muscles do not become cramped. Bending and lifting should be minimized by keeping sets being handled on shelves at waist level.

Some compromise between ideal conditions and practical limitations is of course necessary. It is better to keep the bench clear of instruments when a wide variety of work is being handled and the average time spent on each set is relatively small. But apparatus most frequently used can be most conveniently placed and some meters, at least, may be kept at eye level.

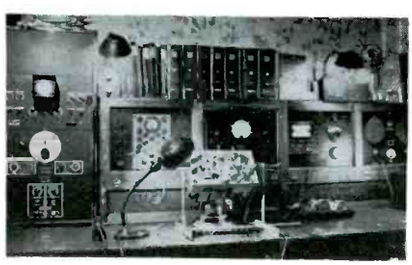
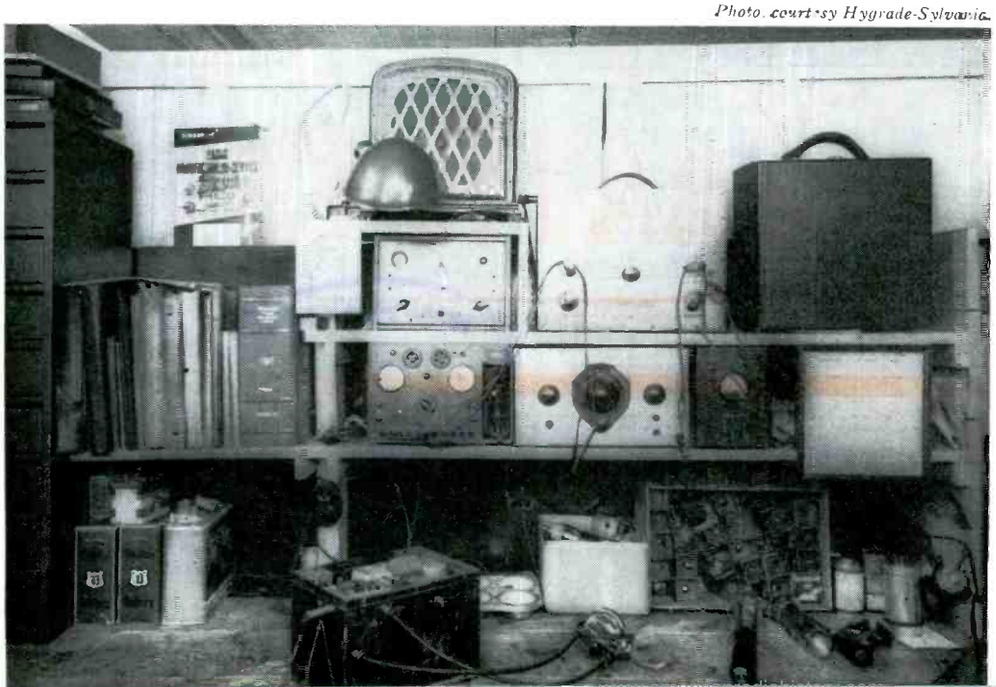


Fig. 3. The service bench and test rack of the Acme Sound Systems, Southbridge, Mass.

The service bench of the Elmgren Radio Service, Cloquet, Minn., before the owners decided to modernize. Bench after modernization is shown on opposite page. What a difference in appearance and efficiency! Can you do as well, or better?

Photo courtesy Hygrade-Sylvania



For a topnotch service business doing much modernizing and rebuilding, the layout shown in

THE SHOP THAT JACK BUILT

has worked out very well. Jack Livingstone has his service shop in Ossining, New York, home of that peculiarly exclusive institution made famous by Warden Lawes, Sing Sing Prison. Livingstone specializes in the maintenance of high-fidelity receivers and custom construction and rebuilding of other sets to give high-fidelity performance. He is set up to take overall fidelity curves of any receiver and frequently does so, reporting the result to the customer and recommending improvements. This often leads to orders for extensive work on the set, installing new speak-

SERVICE SHOP

ers and acoustical labyrinths. He can do a lot with negative feedback and higher-grade components in the audio channel. His shop is arranged with this idea in mind and he is one of the few who have made a success of modernization work. It pays.

In the photograph of Livingstone's service bench, Fig. 1, each instrument most frequently used is at eye level and conveniently at hand. On the raised stage, from left to right, a 3-inch oscilloscope, beat-frequency oscillator, signal generator and frequency modulator, all of Clough-Brengle manufacture, and a personally-constructed vacuum-tube voltmeter are shown. A Triplett set tester and a tube checker complete the equipment in view.

Jack has a reputation for high-grade work which has recently brought him a contract for an elaborate two-way police-

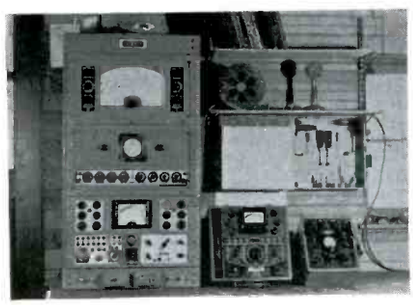


Fig. 4. Radio Dept. of the Baltimore Electric Light Co., Baltimore, Md., another relay-rack job.

radio system, covering both installation and maintenance. He is shown at his desk in the photograph, Fig. 2.

A General Service Shop

A nice shop for a more varied, less specialized, type of service work is that of Acme Sound Systems, of Southbridge, Mass. A photograph of this layout is shown in Fig. 3. Roland K. Patrick, who operates this shop, writes us:

"The equipment is, left to right, a Clough-Brengle service laboratory, complete with oscillator, modulator and cathode-ray oscillograph. The first panel contains a Weston tube checker with a pre-heater. The second one has an audio oscillator and an amplifier which can be used separately if desired, together with a complete voltage supply for servicing farm and auto radios and a cathode-ray

Fig. 2. Another corner of Jack Livingstone's shop, Ossining, N. Y. Jack is shown at his desk.

tube output meter. The third panel holds a Triplett volt-ohm-milliammeter and another r-f oscillator. The last panel, at the extreme right, is fitted with a universal speaker and a six-volt rectifier with an ammeter for auto-radio work.

"Convenient to the bench is a one-hundred drawer cabinet for small parts. An additional Clough-Brengle 20,000-ohms-per-volt multi-range volt-ohm-milliammeter, not shown in the photograph, completes the equipment."

This business consists mainly of radio and sound servicing, with allied sidelines of sound installation, sound-truck rentals, and talking-movie rentals and service.

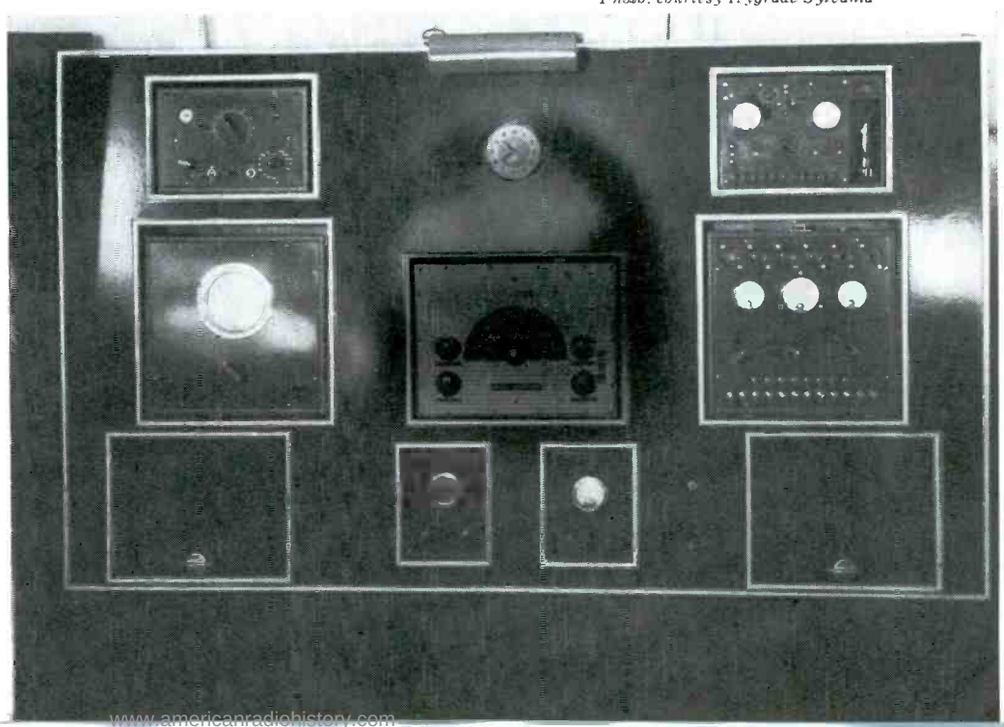
A Rack-and-Panel Assembly

N. Blake, of the radio department of the Baltimore Electric Light Company sends a photograph (Fig. 4) which illustrates the modern trend toward space-saving assembly of test apparatus. The equipment shown comprises a Jackson Model 600 service laboratory, consisting of an all-wave oscillator, with both audio and frequency modulation available, and beat-frequency audio, all in the top panel section. An oscillograph is installed in the middle section, while the bottom panel contains the tube tester of the dynamic output type and the set tester. The chart on the second shelf is for tube checking reference.

The portable instrument in the center on the bench is a DayRad model 20C tube tester and at the right is another tube checker, a Readrite model 430.

How's this for a startling example of improvement brought about by modernization of the service bench of the Elmgren Radio Service? The view shown here, after modernization, covers the same space as that shown on opposite page and practically the identical equipment.

Photo, courtesy Hygrade-Sylvania



General Data

STEWART-WARNER 97-56

THIS chassis employs one stage of i-f amplification. The i-f transformer is adjusted to 465 kc and is tuned in the usual manner. In addition to the two trimmers used in tuning the windings to their proper frequency, this transformer has mounted on it an additional trimmer condenser which is used to feed back a portion of the signal appearing in the plate circuit of the 6J7G tube. This signal is introduced into the grid circuit through a coupling coil, which is a part of the secondary coil. This regeneration increases the amplification and selectivity and makes the performance of this set comparable to that which is obtained from a set employing an additional i-f stage.

Specifications

Cabinet: Table
Tuning: Manual and push-button
Range: 540-1720 kc
Power supply: 115-125 volts, a-c or d-c
Power consumption: Approximately 50 watts
Speaker: Electrodynamic, field resistance 450 ohms

Service Notes

When aligning the i-f amplifier, the output of the signal generator is set at 465 kc and is coupled to the grid of the 6A8G tube in the customary manner. The primary and secondary windings are tuned by adjusting trimmer screws No. 1 and No. 2 until a maximum deflection is obtained on the output meter. If the set has a tendency to oscillate when adjusting these trimmer screws, turn trimmer screw No. 5 to the left (counter-clockwise) until the oscillation ceases. The signal generator is next coupled to the antenna lead, and trimmers No. 3 and No. 4 are

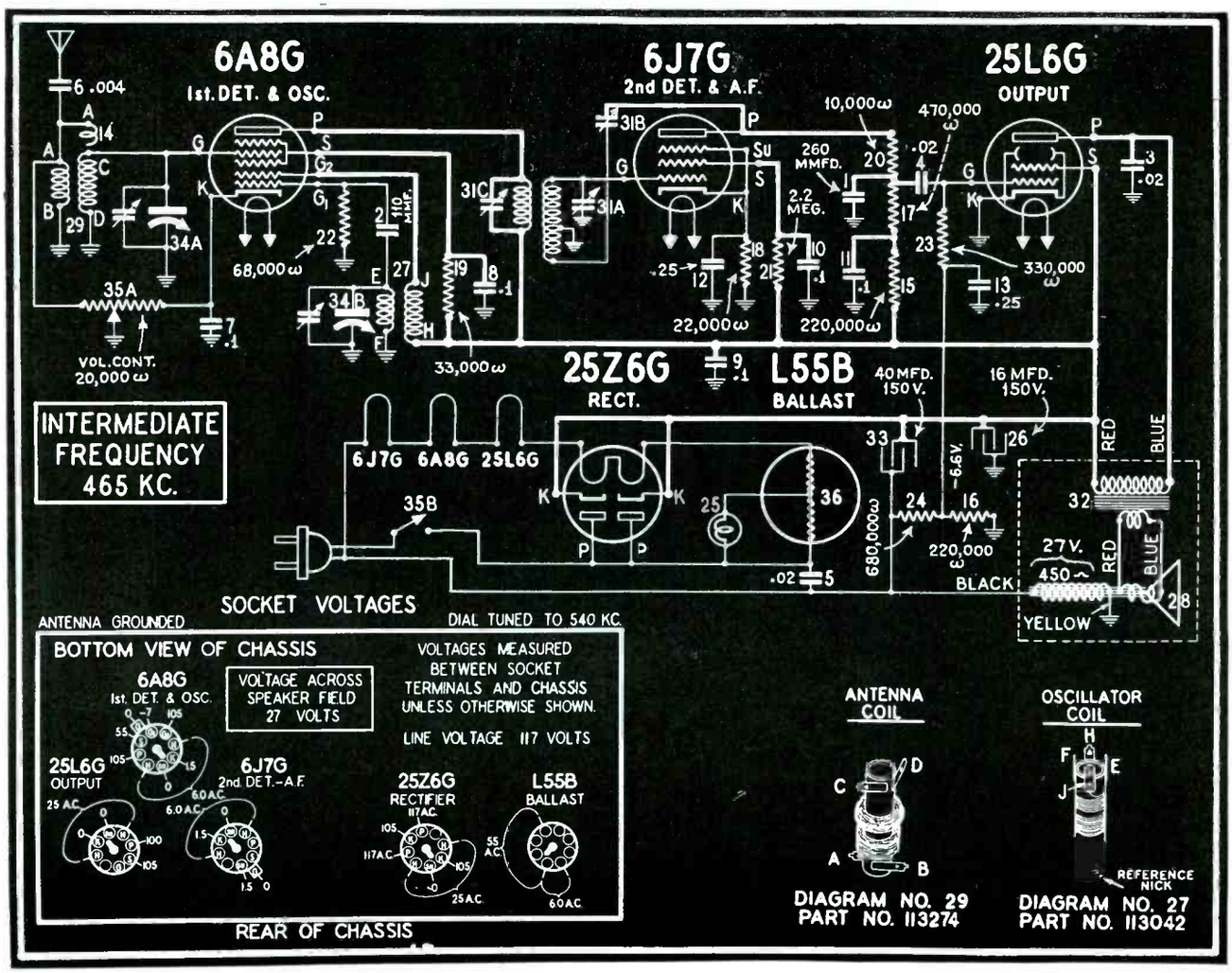
(*Continued on page* 20)

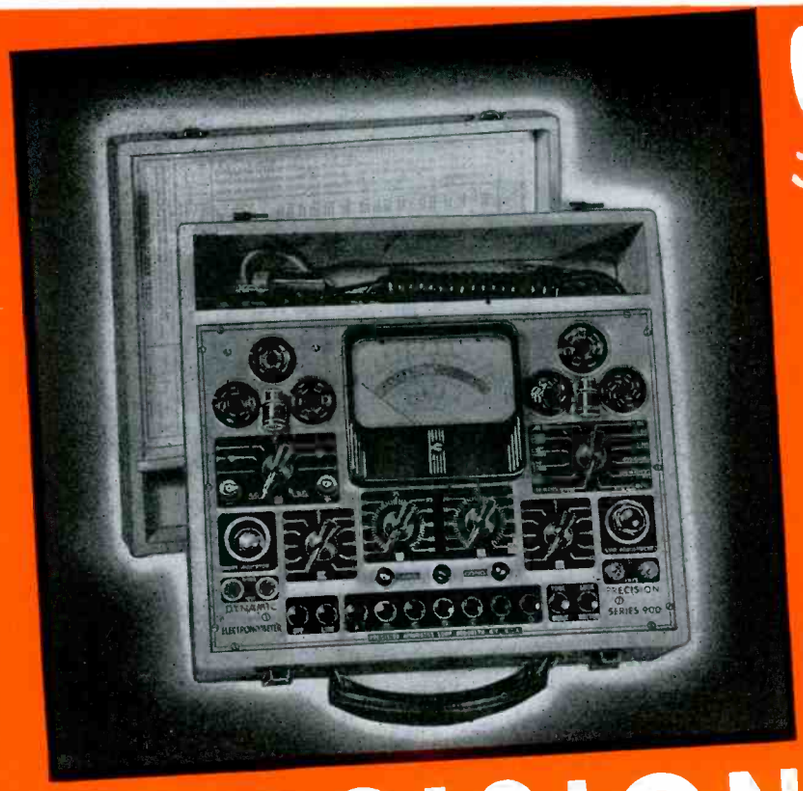
STEWART-WARNER 97-56 ALIGNMENT OPERATIONS

Connect Generator to	Dummy Antenna	Generator Frequency	Dial Setting	Peak Trimmer
6A8G Grid	0.1 mfd	465 kc	540 kc	1, 2
Antenna	200 mmfd	1500 kc	1500 kc	3
Antenna	200 mmfd	1500 kc	1500 kc	4[1]
Antenna	50 mmfd	See text	.....	5
6A8G Grid	0.1 mfd	465 kc	540 kc	1, 2

[1]*Rock dial while making this adjustment.*

Stewart-Warner 97-56 circuit diagram. The new RMA symbols make this diagram easily understandable.





What's in the name "PRECISION"

It is more than the identification of a manufacturer's product. . . . It is a symbol of the integrity, honesty and responsibility of the concern behind the product. . . . It embodies all the skill and knowledge that is essential in the construction of "PRECISION" test equipment. . . . *WHO* makes it is as important as *WHAT* it is.

PRECISION TEST EQUIPMENT

Standard of Accuracy

"PRECISION" DYNAMIC ELECTRONOMETER Series 900

A MODERN "push-button" operated dynamic mutual conductance tube tester . . . combined with a 25 multi-range A.C. and D.C. volt-ohm-decibel-milliammeter . . . plus a ten ampere range for complete point to point set analysis . . . includes ballast test facilities. . . . Ability to accommodate FUTURE tube releases . . . telephone cabling . . . wire wound shunts and matched metallized multipliers of 1% accuracy . . . each tester INDIVIDUALLY calibrated and checked against laboratory standards to maintain CLOSE ACCURACY.

SET ANALYZING FEATURES

FOUR A.C. AND D.C. VOLTAGE RANGES at 1000 ohms per volt: 0-10; 0-50; 0-250; 0-1000 volts. FIVE D.C. CURRENT RANGES: 0-1; 0-10; 0-50; 0-250 MA; and 0-10 AMPERES. FOUR RESISTANCE RANGES: 0-400 ohms (20 ohms center) SHUNT METHOD. 0-100,000 ohms (800 ohms center). 0-1 MEGOHM (8000 ohms center). 0-10 MEGOHMS (80,000 ohms center). All ohmmeter ranges powered by self-contained supply. A 4½ volt battery powers the low, medium and 1 Megohm ranges. FOUR DECIBEL RANGES FROM —10 to +55DB: ODB; +14DB; +28DB; +40DB. FOUR OUTPUT RANGES: 0-10; 0-50; 0-250; 0-1000 volts. PAPER CONDENSER LEAKAGE TESTS. NEON METHOD. PROVISION for measuring leakage of all types of electrolytic condensers directly on the meter in terms of current.

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SEE *this "900," as well as any of the 12 "PRECISION" models at your local jobber. . . . Ask him to open a "job" and note the "PRECISION" construction and the painstaking care it represents. It is your insurance of "freedom from troubles." . . . If there is no jobber near you, write for catalog No. S-38.*

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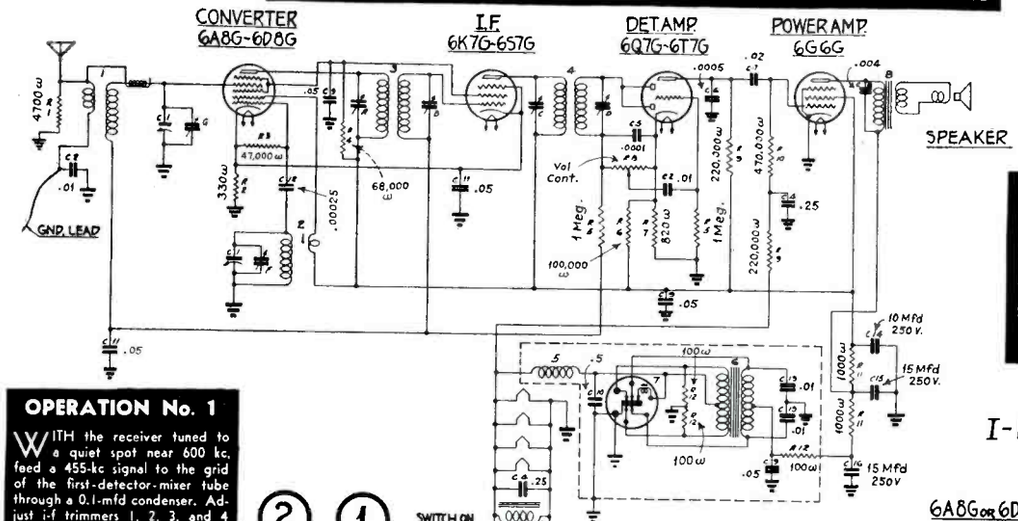
PRECISION *Apparatus Corporation*

821 EAST NEW YORK AVENUE BROOKLYN, NEW YORK

ZENITH 4B-313, 4B-355 (CHASSIS 5410)

CIRCUIT DIAGRAM AND ALIGNMENT OPERATIONS

MODEL	SPEAKER
4-B-313	49-262-5"
4-B-355	49-282-8"



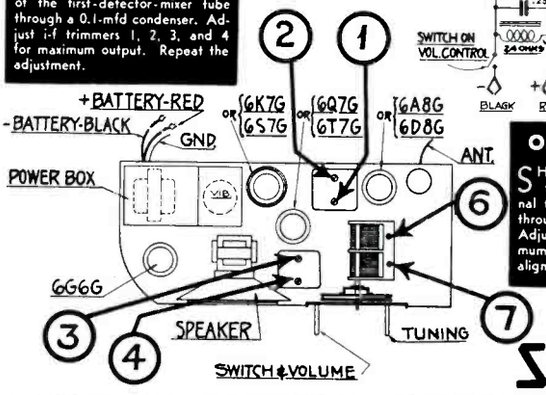
SPECIFICATIONS

Tuning: Push-Button.
Range: 540 to 1600 kc.
I-F Peak: 455 kc.
Power Supply: 6-Volt Storage A.
Power Consumption: 2.3 Amp. at 6.2 Volts.
Speaker: Model 4B313, 5-In. Electrodynamic; Model 4B355, 8-In. Electrodynamic; Field: 24 Ohms.

I-F = 455 Kc.

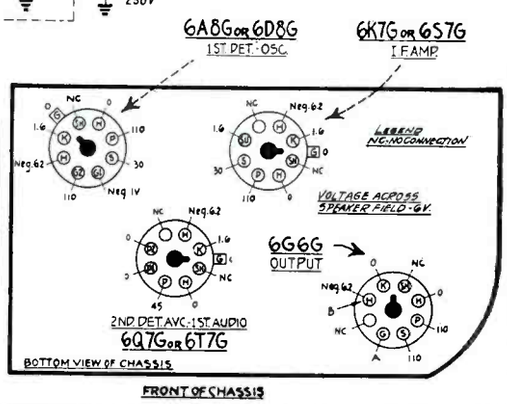
OPERATION No. 1

WITH the receiver tuned to a quiet spot near 600 kc, feed a 455-kc signal to the grid of the first-detector-mixer tube through a 0.1-mfd condenser. Adjust i-f trimmers 1, 2, 3, and 4 for maximum output. Repeat the adjustment.



OPERATION No. 2

SHIFT the generator frequency to 1500 kc and feed this signal to the receiver antenna lead through a 200-mmfd condenser. Adjust trimmers 6 and 7 for maximum output. Repeat the entire alignment for greater accuracy.

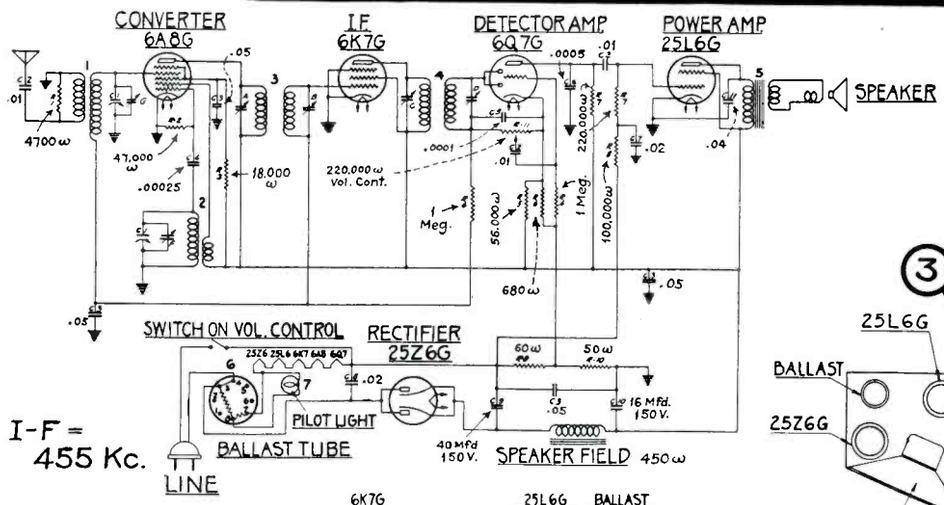


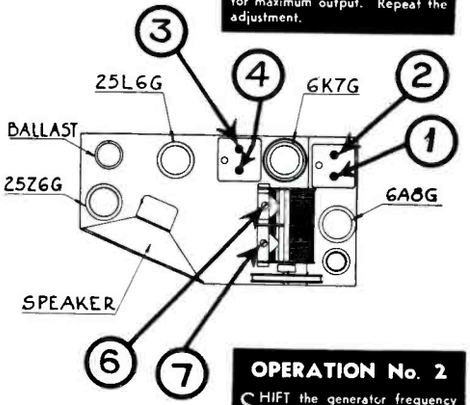
SERVICE

ZENITH 6D302, 6D311, 6D326, 6D336, 6D360 (CHASSIS 5646)

CIRCUIT DIAGRAM AND ALIGNMENT OPERATIONS

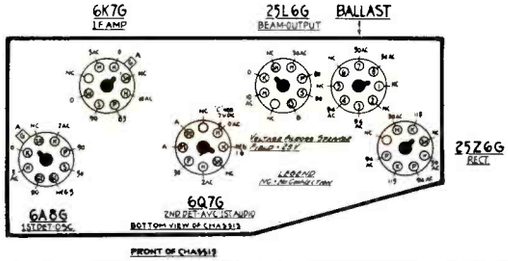
SPEAKER	MODEL
49-237-5 INCH	6D-311
49-237-5 "	6D-326
49-237-5 "	6D-336
49-241-6 "	6D-360





SPECIFICATIONS

Tuning: Manual
Range: 540 to 1600 kc.
I-F: 455 kc.
Power Supply: 105 to 130 v. a-c, d-c.
Speaker: Electrodynamic; Field Resistance: 450 ohms; Size: 5 or 6 in.
Pilot Light: No. 44.



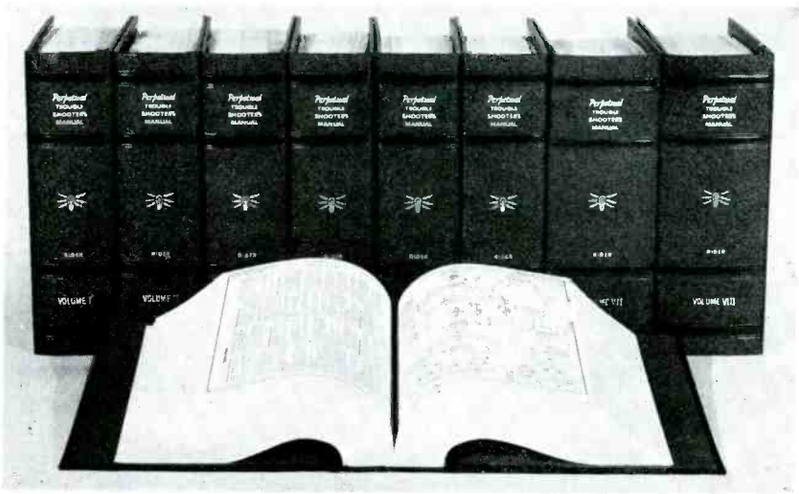
OPERATION No. 1

WITH the receiver tuned to a quiet spot near 600 kc, feed a 455-kc signal to the grid of the first-detector-mixer tube through a 0.1-mfd condenser. Adjust i-f trimmers 1, 2, 3, and 4 for maximum output. Repeat the adjustment.

OPERATION No. 2

SHIFT the generator frequency to 1500 kc and feed this signal to the receiver antenna lead through a 200-mmfd condenser. Adjust trimmers 6 and 7 for maximum output. Repeat the entire alignment for greater accuracy.

Order Now THE GREAT NEW RIDER MANUAL VOL. IX



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One of the most important volumes of Rider Manuals will be published within the next few weeks, Volume IX, supplying authorized service data on 1938-39 American-made radio sets, will contain 1650 pages. Like its predecessors, it is supplemented by a 140-page easy-to-find index covering all *nine* volumes, now containing a total of 11,270 pages.

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In addition to the Index, Volume IX is supplemented with a 60-page section entitled "How It Works." This supplement explaining the operations peculiar to the newer, more complicated sets was one of the most popular features of Volume VIII last year. This year it has been entirely revised and makes clear by practical explanations how to solve the baffling service problems you will have to cope with in the newer receivers.

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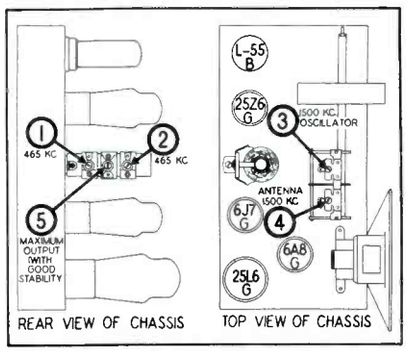
STEWART-WARNER 97-56

(*Continued from page* 16)

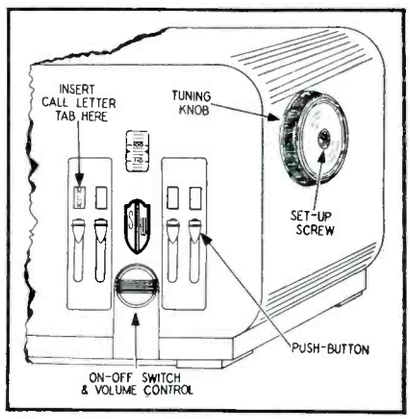
aligned for maximum output, using a generator frequency of 1500 kc. Now connect the set to the customer's antenna and tune in a station on the low frequency end of the dial. The regeneration control, trimmer No. 5 is now adjusted to give maximum output of the set, consistent with good stability and tone quality. After changing the setting of trimmer No. 5 it is necessary



Stewart-Warner 97-56 chassis views showing tube and trimmer locations.

to re-adjust trimmers No. 1 and No. 2, as their setting will be found to have changed slightly. The output of the signal generator is set at 465 kc and is coupled to the grid of the 6A8G tube through a 0.1=mfd condenser and trimmers No. 1 and No. 2 readjusted.

To permit easy testing or replacement of coils, the circuit diagram shows



Stewart-Warner 97-56 push-button tuning.

a picture of each type of coil used with all the terminal lugs plainly labelled to correspond to similar labels in the circuit diagram.

Setting Up Push-Buttons

(1) Select 4 nearby stations. Be sure to select powerful stations. Any station may be set on any button.

(2) The large tuning knob at the side of the set has a screw located in the center. Grasp this tuning knob firm-

(*Continued on page* 22)

Still THE SHORTEST PATH TO Good Control

Still—through the years Servicemen are staying superbly satisfied with the smooth performance of Centralab's Standard Replacement control. Still—the shortest path to good volume control is this wall type resistor strip which hugs the inner circumference of the bakelite housing.

- Maximum resistor length for case diameter
- Close uniformity between resistors
- Accurate tapers
- Lower specific resistance and attendant low noise level
- Better power dissipation
- Longer life

CENTRALAB: Div. of Globe Union, Inc., Milwaukee

Centralab
RADIOHM

As usual always available in standard and special replacement types. The new 1938-39 Volume Control Guide (available at your jobber) lists thousands of recommended replacements for all current and older receivers.

ly and turn the screw counter-clockwise not more than two whole turns.

(3) Push one of the four buttons all the way down.

(4) Holding the push button down firmly, turn the tuning knob until the desired station is received. Be sure to tune the stations correctly by tuning to a point where the program is heard with the least hiss or distortion and not the point of greatest volume.

(5) Release the push button. None of the push buttons can be used to tune stations until the screw in the tuning knob is retightened, otherwise the set up of stations will be destroyed.

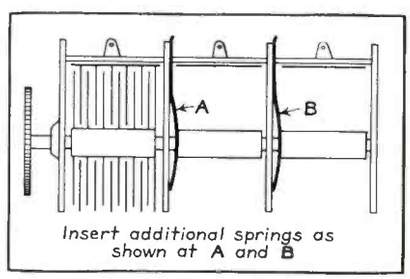
(6) Proceed to set up the remaining push buttons in a similar manner.

(7) After all of the buttons have been set up retighten the screw in the tuning knob. Grasp the knob firmly and use a small screwdriver to tighten the screw securely.

(8) The push buttons should now be labelled with their proper call letters.

ARVIN 19, 29, 39

Elimination of tuning noise: Dust and dirt collecting in the bearings of the tuning condenser in Arvin Models 19, 29, and 39, will cause a rasping noise when tuning between stations. This



Insert additional springs as shown at A and B

may be eliminated by installing two additional ground wiper springs in each condenser. These may be inserted in extra slots provided in the condenser rotor shafts as follows:

(1) Loosen the serial number plate mounting screws and remove the number plate bracket.

(2) Remove the 6K7G and 6A8G tubes along side of the tuning condenser.

(3) Disconnect the three ground clips off the edge of the case and lay the tuning condenser back in a position so that additional springs may be inserted.

(4) Slip two springs into the slots, as shown in the accompanying diagram.

ARVIN 32, 42

Elimination of hum and vibrator noise: Hum and noise may arise in these models. It may be eliminated as follows:

(1) Remove the ground clip and lead which grounds the end of the tuning condenser nearest the gearing to the outside case.

(2) Disconnect the volume control

ground return lead from the lug on the oscillator coil to which it was originally connected. Extend this lead and ground it to the ground lug of the 6X5G rectifier tube located in the power pack.

(3) Replace the 6Q7G cathode bypass condenser with one having a rating of 10 mfd, 25 volts.

ARVIN 42

Distortion when used with separate case E9, E10 speakers: Most cases of rattle and distortion are caused by the 6N7G tube which becomes unbalanced from a standpoint of output of the two triodes. Replacement of this tube will in most cases clear up the distortion. Occasionally, the nuts which hold the name plate in place in the speaker grille become loose and cause rattles.

Walter E. Peak
NOBLITT-SPARKS INDUSTRIES, INC.

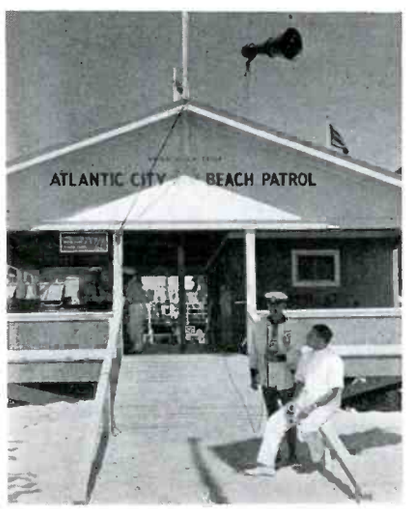
BEACH SOUND SYSTEM

A SOUND amplification system utilizing a new type of speaker has been installed on Atlantic City's beach to police the bathing areas, direct life saving operations, and to locate straying children and wandering husbands.

The system is set up at the central beach patrol station. Sixty-watt speakers have been mounted atop beach tents on swivels so that they can be turned in any direction to cover the beach for distances exceeding a half mile north and south of the station or offshore. The amplifiers and microphones are installed in the beach tents.

The system is frequently used to warn bathers who venture too far into the sea and to make other announcements. Phonograph records are also played for the entertainment of crowds on the beach.

Since the system was installed early in the season, many lost children have been located and returned to their worried parents by announcements over the system. The average of children located is between two and three a day.



Sound Service

OPERADIO 425-GG (AMPLIFIER 1025)

THIS model is a 4-stage, 7-tube amplifier with push-pull beam power output capable of delivering 30 watts to 2 pm speakers. Push-pull operation of the output tubes is accomplished through phase inversion.

SPECIFICATIONS

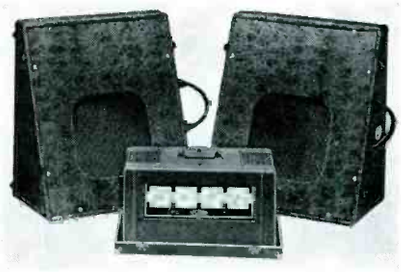
Finish: Durable baked gray wrinkle.
Controls: 2-input controls for microphones, 1-input control for phonograph, 1 treble tone control, 1 base compensator, provision for mixtrolor (remote control).
Microphone input gain: 135 db.
Microphone input impedance: 2½ meg.
Phonograph input gain: 82 db.
Phonograph input impedance: 2½ meg.
Power supply: 105-125 volt, 50-60 cycles.
Power consumption: 110 watts.
Output impedances: 4, 8, 250, 500 ohms.
Power output: 30 watts.
Distortion: 5 percent total.
Residual noise: 63 db below rated output.
Speakers: Permanent magnet dynamic, 12 in.; voice coil impedance: 8 ohms.

DESCRIPTION

The Operadio Model 425-GG is a portable public address unit which incorporates the 1025 amplifier (in an individual case) and a pair of 12-in. permanent magnet dynamic speakers. The speakers are mounted in a flexible, split case which incorporates the "infinite baffle" principle.

Three independent input channels are provided for electronic mixing of one or two microphones and a phonograph pickup. In addition a remote unit (Mixtrolor) can be connected for remote mixing of these sources.

Provisions for headphones, meter and auxiliary monitoring are also incorporated.



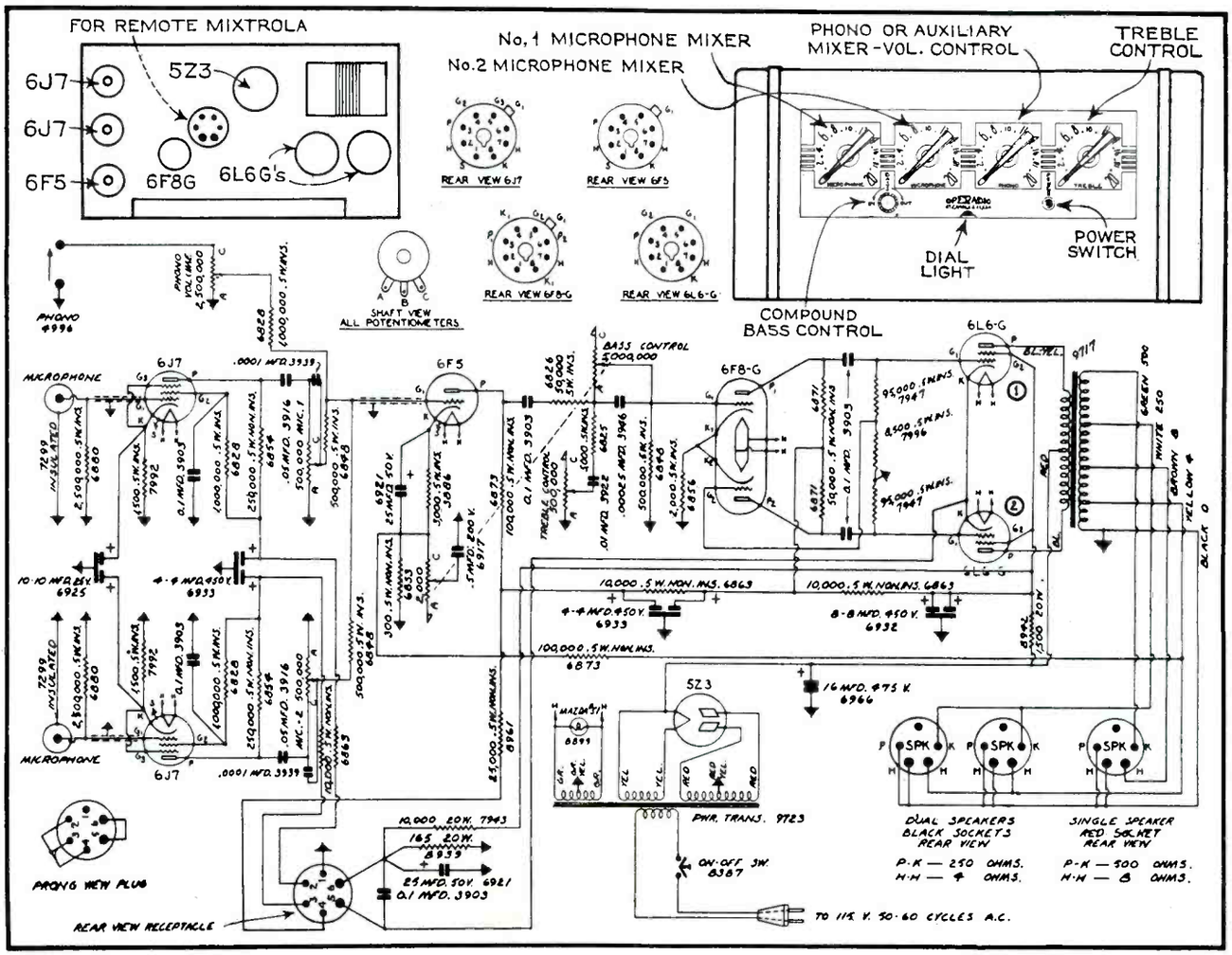
Operadio 425-GG (amplifier 1025). Circuit diagram is given below.

COMPETITION

COMPETITION is the horny headed ogre of the service, p-a installation and p-a rental business. Strangely enough, it is this same monster that is more and more placing these lines of endeavor on a business basis, with efficiency—an increasingly important factor in success.

Efficiency means getting the most for the least; turning out a given product

(*Continued on page 26*)



The AMPERITE

ACOUSTIC COMPENSATOR

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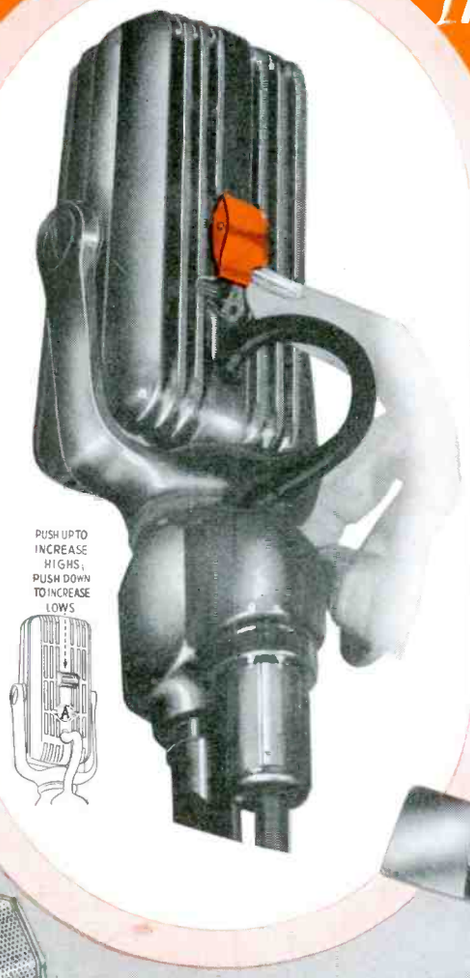
gives you

HIGH OR LOW PITCH

WITH THE SAME MICROPHONE



BIGGER PROFITS To be ahead of competition, and realize a larger profit on each job, you must offer added value in new features. Realizing this, Amperite gives you *The Acoustic Compensator . . . at no extra cost to you!*

This is an exclusive feature which enables you to *(1) lower or raise the response of the microphone; (2) adjust for close talking or distant pickup; (3) adapt microphone to varied conditions.*

THESE 4 MODELS HAVE THE ACOUSTIC COMPENSATOR

MODEL RBHk (hi-imp); RBMk (200 ohms) Frequency range 40 to 11000 CPS. Output –65 db. . . . . Chrome or Gunmetal . . $42.00 LIST

NEW! MODEL RSHk (hi-imp); RBSk (200 ohms) Frequency range 60 to 8000 CPS. Output –68 db. . . . Chrome or Gunmetal . . $32.00 LIST

All of the above are complete with Acoustic Compensator, Switch, Cable Connector, and cable.

NOTE: Roth Sound Service writes. . . . *"Your mikes are certainly rugged. I've used them in rain, wind, and on the hottest days, but they've always stood up perfectly".*

IMPROVES ANY "LOW-COST" INSTALLATION ON 4 COUNTS!

P.A. Men, you can improve those "price" jobs by using the popular Amperite Model RAH (or RAL). You will get better results because: (1) it is excellent for both speech and music; (2) has flat response without undesirable peaks; (3) reduces feedback; (4) *stands up under rain, wind, heat, and rough handling . . .* Frequency range 60 to 7500 CPS. Output –68 db.

MODEL RAH (hi-imp); with 12' of cable; MODEL RAL (200 ohms) with 8' of cable. . . . . $22.00 LIST

MAKE EXTRA SALES WITH CONTACT MIKES...$12.00 LIST

Professional and amateur musicians are delighted with the Amperite Contact Microphone. It "makes an ordinary violin sound like a Strad" . . . gives a small piano the tone of a grand. And yet, there is *no distortion. No unnatural effects. No "fingering noises".* . . . Frequency response 40 to 9000 CPS. Output –40 db. 20' of cable.

Models listed below can be used on most radio sets since 1935 and on all P.A. Systems. They operate with either high or low gain amplifiers. *Installation is simple . . . no changes in strings or instruments . . . attached without tools.*

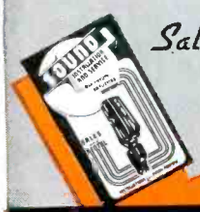
MODEL SKH (Hi-imp); SKL (200 ohms) . $12.00 LIST
SKH or SKL with foot-operated volume control . . . . . $20.00 LIST
Professional Model KTH (or KTL) . . . . . $22.00 LIST

A COMPACT VELOCITY for hand or stand

Though only a little larger than a match box, this Amperite Velocity has the features of the larger microphones. Good for speech and music. *Designed for use on stand, but also makes an excellent hand microphone with comfortable pistol grip.*

Frequency response 60 to 7500 CPS. Output —70 db. Complete with switch, cable connector, and 25' of cable.

MODEL ACH (hi-imp); or ACL (200 ohms) . . . . . $25.00 LIST



Sales Aids for the P. A. Man Amperite offers the following co-operation to P.A. Men.

(1.) FREE Window Decal advertising your Sound Service. Size 5¼ x 9¼, finished in 4 striking colors. (2.) FREE Window Display, 11 x 17. (3.) Special Sound Equipment Letterheads. Samples and prices on request. (4.) FREE use of cut for printing business cards, etc.

Write for these valuable sales helps, and new Illustrated Bulletins, today!

"Better Systems Specify Amperite"

AMPERITE Co. 561 BROADWAY, N. Y. U.S.A. CABLE ADDRESS ALKEM, NEW YORK

VELOCITY **AMPERITE** MICROPHONES

VIBRATORS

Troubles and testing: A large percentage of auto-radio troubles seem to be found in tubes or vibrators, and a quick check method for these is desirable. Use an a-c pack to replace the vibrator—two leads with test clips serve to connect the pack to the set. Put the plus clip on the cathode of the rectifier tube and the negative clip to ground.

Most tube failure is apparently due to vibration loosening the elements and causing noise which may not show on the tube checker.

RCA Service Tip File

COMPETITION

(*Continued from page 24*)

or service with the least expenditure of time, effort and money.

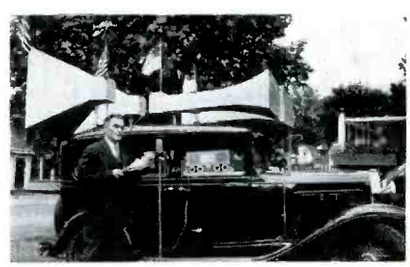
In a small city there are two men, both are after the business afforded by the coming election campaign. Both are asked to quote hourly rental rates on equipment suitable for (1) music reproduction for a car or truck in motion displaying banners; (2) voice reinforcement and music reproduction for street-corner meetings; (3) the same for several indoor meetings to be held in a local auditorium.

When the quotations are submitted John Smith finds himself the favored bidder and when the campaign gets under way, he gets all of the business that he can handle while Bill Jones, his competitor, gets only the leftovers.

John Smith got the job solely for the reason that his business was better organized. He could underquote his rival without sacrificing his profit.

Smith couldn't turn out a better job of sound reproduction than Jones; in fact, Jones' equipment was capable of 100-watts output, but 100 watts is no better than 30, if 30 can satisfy the requirements. But Smith had planned his equipment carefully to enable him to do almost any kind of p-a rental job that might come along, yet do it with the least cost to himself. As a result he could underquote Jones on 90 percent of the jobs found in their city.

It doesn't necessarily follow that



Rev. Chas. H. Berry, pastor and superintendent of the Independent Gospel Assembly, Bath, Me., in action. A 6-volt, 110-volt system used in the automobile could also serve at church sermons.

everyone in the p-a rental game should rush right out and try to emulate Smith, but his experiences certainly indicate the wisdom of studying the local market and planning your efforts and equipment accordingly. Whether you dignify such planning with the name efficiency or just plain good business, it amounts to the same thing. Then you don't have to worry about the competition because you are the competition.

If equipment such as Smith's fits your needs, the Lafayette Model 334 is a typical example. Weight of logic favors equipment such as this because it is capable of the same results from 110-

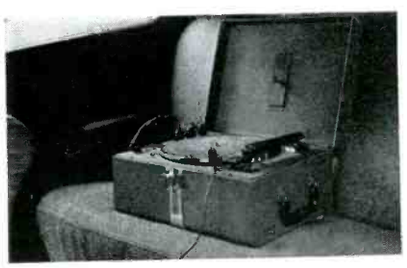
volt a-c power lines or from a 6-volt storage battery.

SPECIFICATIONS

Controls: 2-input gain controls, tone control, power and changeover switches.
Microphone input gain: 122 db.
Microphone input impedance: 150,000 ohms.
Phonograph input gain: 87 db.
Phonograph input impedance: 150,000 ohms.
Power supply: 115-120 volts, 50-60 cycles or 6 volts, d-c.
Power consumption: 125 watts on a-c, 18 amperes on 6.3 volts.
Frequency characteristic: 2 db, 50 to 10,000 cycles.
Output impedances: 2, 4, 8, 16, 250, 500 ohms.
Power output: 30 watts.
Harmonic content: 7 percent.
Hum level: —58 db below rated output.
Speakers: Permanent magnet dynamic, 12 in.
Tubes:
Preamplifier: 6J7.
Mixer: 6N7.
Amplifier: 6N7.
Driver: 6E6.
Power amplifiers: 79 (4).
Rectifier: 83.

DESCRIPTION

The system consists fundamentally of the 30-watt amplifier with phono turntable and pick-up built into a steel carrying case, as shown in the illustration.



The Lafayette Model 334 mobile amplifier.

With the hinged cover removed, the phono equipment is disclosed and arrayed around the turntable are the various controls: tone, volume, faders, off-on switch, phono switch, stand-by switch, 6-110-volt switch and plug receptacles for speakers, microphone, 6-volt supply and 110-volt supply. Beneath this control panel are the amplifier and the 6-volt genemotor.

By Harry Paro,
LAFAYETTE RADIO MFG. CO.

RCA 9K

No voltage on r-f and i-f screens: This is often caused by an open 22,000-ohms section of the candohm resistor assembly mounted to the rear of the underchassis. Replace with a 20-watt wire wound resistor.

George Nakao.

VISUAL INDICATOR TUBES

(*Continued from page* 10)

overcome, however, by using a visual indicator tube which employs a variable mu triode, such as, for example, the 6G5, 6H5, or 6U5.

In sets wherein the diode load is divided into a number of separate sections in order to supply different values of avc voltage to the various stages, the sensitivity of a visual indicator tube is easily altered. If the shadow angle closes on strong signals before a state of resonance is reached, the triode grid should be connected to a point on the diode load which is nearer the diode cathode. On the other hand, if the shaded sector does not close sufficiently when a strong carrier is received, the triode grid should be connected to a point on the diode load further away from the diode cathode. To prevent blurring of the edges of the shadow angle, due to a-f modulation peaks, the visual indicator tube should be supplied with its own audio filter (R_6 and C_3 as shown in Fig. 11B).

Wide Angle Indication

A circuit for obtaining an increased shadow angle is shown in Fig. 12. Under normal operating conditions a visual indicator tube has a shadow angle which varies from 0° to 90°. With the circuit shown it is possible to increase this range from 0° to 180°, although for angles greater than 150° the edges of the pattern are not as sharp as they are for smaller angles. Despite the fact that it is unlikely that this circuit will have any extensive use in receivers, it should be kept in mind when considering a visual indicator tube as a service tool in virtue of the fact that the control voltage range varies from —2.5 to —82.0 volts, depending upon the control tube that is used.

When a high negative potential is placed on the grid of the control tube no plate current will flow and the voltage drop across the 1.0 meg resistor will be negligible. Since the ray-control vane will then be at the same potential as the target the shadow angle will close completely for reasons already given. When zero volts are impressed upon the grid of the control tube a sufficiently large plate current will flow so as to result in a voltage drop of approximately 125 volts across the 1.0-meg resistor. The ray-control vane will then be about 125-volts negative with respect to the cathode of the visual indicator tube. The electrons will be strongly repelled by the ray-control vane and a 180° shadow angle will result on the target.

The voltage divider network comprised of R_7 and R_8 should be so chosen that R_7 and R_8 total about 15,000 ohms. Assuming that any of the following visual indicator tubes are used, 6AB5, 6E5, 6G5, 6H5, 6N5, 6U5, the grid voltage required to close the shadow angle is dependent on the control tube used as shown in the table given in Fig. 12.

Delayed AVC

When delayed avc is employed the visual indicator tube, if connected directly to the avc circuit, will not become operative until the signal voltage at the diode exceeds the delay voltage. Such a condition is undesirable as the visual indicator tube should function constantly in order that the strength of the incoming signal be known. To avoid this difficulty the visual indicator tube should be actuated directly from the diode load circuit through an audio filter comprised of R_9 and C_4 as shown in Fig. 13. If the shadow angle should close before resonance is attained on a strong signal the resistor R_{10} may be placed between the triode grid and cathode in order to reduce the controlling voltage applied to the grid of the visual indicator tube. The value of R_{10} may vary over wide limits.

Separate AVC, Detection

Some receivers employ diode circuits in which the detector action and the avc action are separate and distinct operations (Fig. 14). In the diagram R_{11} represents the audio-diode load and R_{12} the avc resistor. Because the range of signal voltage applied to the detector anode is considerably reduced due to the avc action on the r-f and i-f stages, it will generally be found preferable to connect the triode grid of the visual indicator tube to the audio diode load rather than to the avc circuit. It is necessary to employ the filter comprised of R_{13} and C_5 to prevent blurring of the edges of the shadow angle on strong modulation peaks. Occasionally

(*Continued on page* 34)

TRIPLETT

NEW 1939 SERIES *Push Button* TUBE TESTER

$39.00

MODEL 1610

- ★ Tests All Receiving Tubes and Has Ballast Tube Continuity Test.
- ★ Separate Plate Tests on Diodes and Rectifiers.
- ★ Uses Approved Emission Circuit Constructed to RMA Load Requirements.
- ★ Neon Short Test.

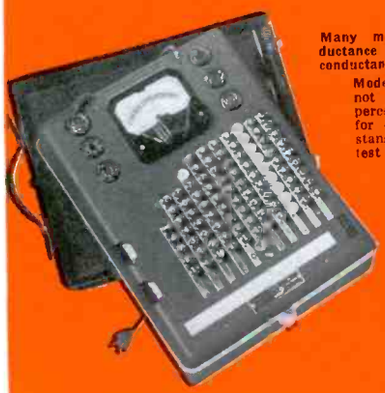
$39.00 Net

★ Illuminated Dial or Bad-Good Scale.

Beautiful metal case, black velvet electro finish with chrome fittings. A tester you will be proud to operate and proud to show.

This new push-button tester catches the eyes of everyone. Compact in size, light in weight and sturdily built with all wiring in orderly cable form, it can be handled easily and safely. The new black velvet finish case with chrome fittings and the attractive colored buttons create an atmosphere of distinction and ultra modernness whether the tester is used on the counter, in the shop or on call in the home.

TRUE DYNAMIC MUTUAL CONDUCTANCE TUBE TESTERS



Many misleading names indicate a Dynamic Mutual Conductance Circuit. . . . Triplett's is a true dynamic mutual conductance tester in every sense of the word.

Model 1615—Dynamic Mutual Conductance Tube Test shows not only GOOD and BAD on illuminated dial, but the percentage of mu to 100. Diodes and rectifiers are tested for emission according to the latest approved engineering standards. Ballast tube continuity test and gas test included. In same case as 1610. Net Price **$63.34**

Model 1616—Same as 1615, but includes push-button Volt-Ohm-Milliammeter readings: D.C. Volts 0-10-50-250-500-1000 at 1000 ohms per volt; D.C Milliamperes 0-10-50-250; Resistance .2 to 500 ohms—300,000 ohms. 1.5 megohms and 3 megohms; A.C. Volts 0-10-50-250-500-1000 at 400 ohms per volt. Decibel chart permits readings against volts to 42 decibels. Uses plug-in type rectifiers. Net Dealer Price.. **$76.34**

Model 1510

Model 1510 is a Dynamic Mutual Conductance Tube Tester only. Same as Model 1511 less Volt-Ohm-Milliammeter. Net Price **$49.67**

Model 1511

Is same as Model 1616 but is in a standard 1500 series quartered-oak case with selector switch controls. Net Dealer Price **$59.67**

MODEL 1610

Model 1610 is Triplett precision built. GOOD-BAD illuminated meter. The approved emission type circuit used is constructed to RMA load requirements and is conclusive. All types of receiving tubes including ballast tubes can be tested, push-button settings for each tube being given under each row of buttons on the scroll at bottom. Line voltage adjustment also controlled by push-buttons. Model 1610 Complete. Net Price **$39.00**

MODEL 1611

Combines push-button Volt-Ohm-Milliammeter with Tube Tester of Model 1610 in same type case. Readings: D.C. Volts 0-10-50-250-500-1000 at 1000 ohms per volt; D.C. Milliamperes 0-1-10-50-250; low ohms shunt type circuit ½ to 500; 300,000 ohms, 1.5 and 3 megohms, series type circuit; A.C. Volts 0-10-50-250-500-1000 at 400 ohms per volt. Uses plug-in type copper oxide rectifiers. Model 1611. Dealer Net Price **$49.50**

MODEL 1212 TUBE TESTER

Emission type tube tester circuit as used in Model 1610 but unit has selector switches instead of push-buttons and is installed in popular master case. Net Dealer Price **$22.00**

Be Sure To Enter Triplett's

$500.00

Radio Service Puzzler Contest! Get Entry Blank From Your Local Jobber!

THE TRIPLETT ELECTRICAL INSTRUMENT CO.
1710 Harmon Dr., Bluffton, Ohio

Please send me more information on:

☐ Model 1610 ☐ Model 1611 ☐ Model 1615
☐ Model 1616 ☐ Model 1510 ☐ Model 1511
☐ Details on Radio Service Puzzler Contest.

Name .....
Address .....
City ..... State .....

Test Equipment

AEROVOX 75 BRIDGE

MOST Service Men are familiar with the Wheatstone bridge as a precision method for measuring resistance. Such a bridge is easily operated and requires but one adjustment to attain zero current flow through the galvanometer. The same is true when the bridge is operated on a-c and all four arms are pure resistances. However, when it becomes necessary to measure capacity or inductances, two balances are required. First, the galvanometer or indicator should connect two points of equal potential; second, the alternating potentials at the two points must be in phase with each other. This can be stated still another way. In a-c bridges containing reactance, balance is obtained only when two different conditions are satisfied, first, the usual balance of all resistance components, and second, a balance between reactances as well as resistances.

Description

Errors in bridge measurements may be traced to a variety of sources. The accuracy and constancy of the individual components determine the accuracy of the bridge. Errors can be introduced by residual reactances in resistance units, coupling between elements, and stray capacitances across individual arms.

Coupling between elements can be avoided by careful shielding of the bridge, as well as shielding of the power source and the detector. Stray capacitance is a much more difficult problem. The wiring of the bridge units and the terminals will always have some capacity to ground. Similarly, the capacity between detector and ground or between power source and ground may be in effect across one of the bridge arms, thus causing errors. But by careful design, as well as precise construction, these can be neutralized as well as minimized.

The several prerequisites just mentioned have been met in the Aerovox capacity and resistance bridge. With a single, self-contained, simple, relatively inexpensive portable instrument, the characteristics of any type of condenser can be determined. Resistance measurements are also possible. Finally, the instrument provides a choice of several meters for external applications, quite in addition to the bridge functions.

To qualify as a complete, self-contained instrument, the Aerovox bridge has its own built-in power supply. A 45 tube is used as a grid-controlled rectifier. The plate of tube is connected to provide a two-element rectifier, while the grid is connected to the movable arm of a high-resistance potentiometer across the transformer secondary.

With three transformer taps available, any voltage between 15 and 600 volts may be obtained for use either in the bridge proper, or externally. Limiting resistance protects the equipment. The instrument is rated at 105-130 v, 60 cycles, 30 watts at 130 v. It is fused for 2 amperes.

The tube complement of the bridge consists of a 6C8G audio amplifier and grid-leak detector, a 1V rectifier, and a

Aerovox 75 capacity and resistance bridge circuit.

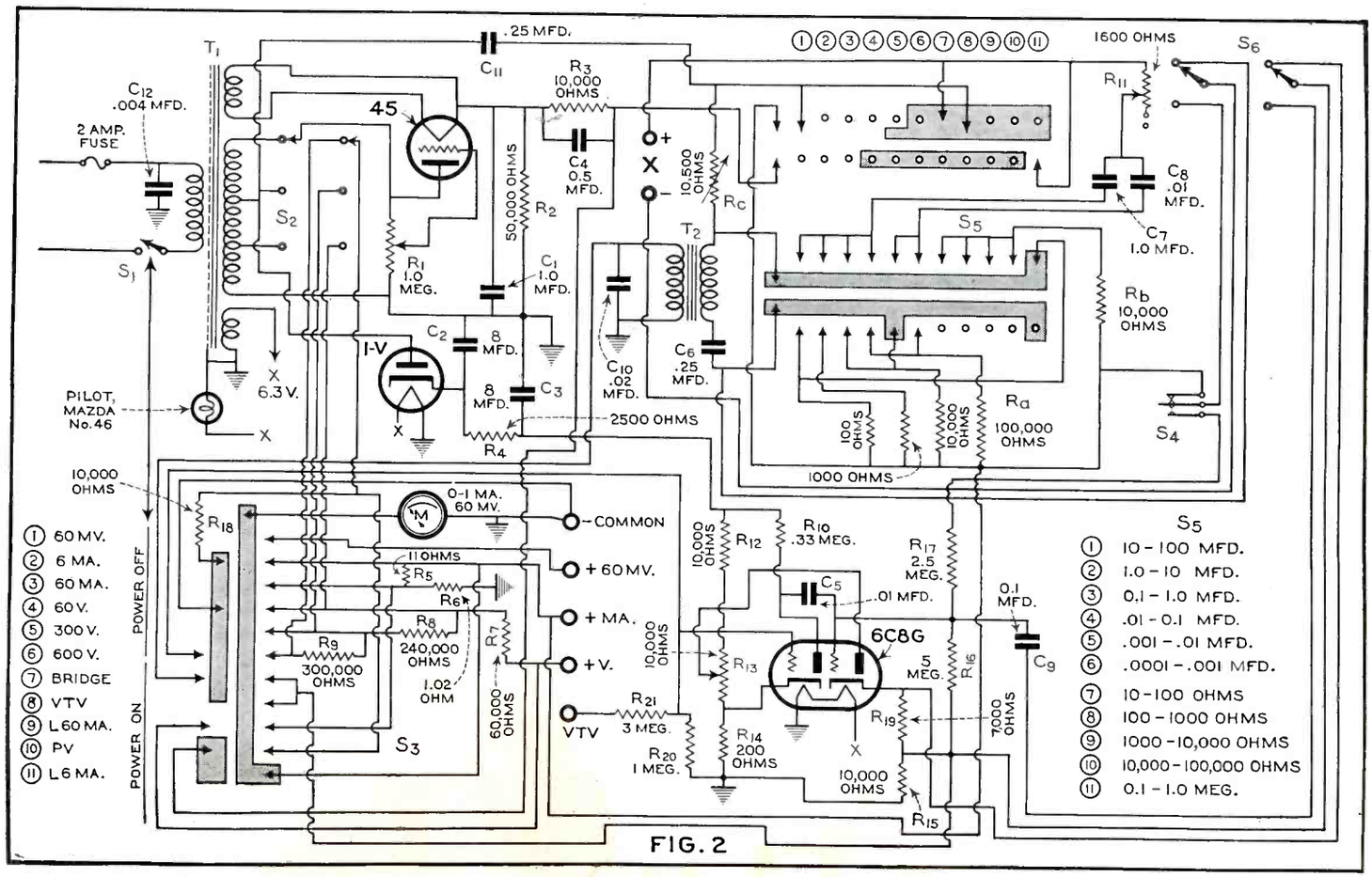


FIG. 2

TWO GUARANTEES

It takes two guarantees to insure a profitable tube sale. Guarantee of quality protects the customer, but that's only half of it. The dealer, too, must be guaranteed against unnecessary investment, dead stock, obsolescence, cut price competition, all of which make losses instead of profits.

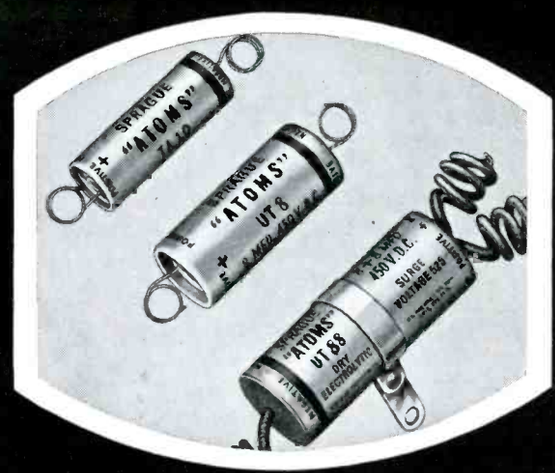
Dealers, who have qualified, know that the Tung-Sol Consignment Plan insures their continued profits just as Tung-Sol Tubes insure their customers' continued satisfaction.

Any Tung-Sol jobber or branch office will gladly give you details.

TUNG-SOL
Tone-flow Radio Tubes

TUNG-SOL LAMP WORKS, INC.
Radio Tube Division
Dept. D

Sales Offices: Atlanta • Chicago • Dallas • Denver • Detroit
Kansas City • Los Angeles • New York • *General Offices:* Newark, N. J.



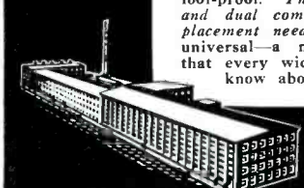
What about those SMALL CONDENSERS?

TO all who have written to ask us "what about those new midget dry electrolytics so many manufacturers are talking about?"—we are glad to make this statement:

Sprague Atoms are beyond question the finest condensers yet produced in small size. We recommend them unreservedly for all ordinary replacements—especially where space is limited or where you need a really reliable condenser at a rock-bottom price. ATOMS will save you time, money and space. They will not let you down.

But do not confuse Sprague ATOMS with *ordinary* small dry electrolytics. For years, Sprague has led the way toward making *better* condensers in smaller sizes. ATOMS represent the ultimate of all that Sprague leadership in this direction represents.

ATOMS are made by an exclusive etched foil process, pioneered and perfected by Sprague. "Blowouts" are positively prevented by a Sprague design feature that other manufacturers are only just now beginning to copy. Extremely low leakage avoids overheating. Quick build-up and high surge voltage make them practically fool-proof. *They are made in both singles and dual combinations covering every replacement need.* They are, in short, truly universal—a modern Sprague development that every wide-awake radio man ought to know about—and use regularly.



SPRAGUE

GOOD CONDENSERS—EXPERTLY ENGINEERED—COMPETENTLY PRODUCED

SPRAGUE PRODUCTS CO., NORTH ADAMS, MASS.

45 grid-controlled rectifier. These tubes, which are furnished with the instrument, are mounted on a shelf and placed in an open-top compartment to one side of the instrument proper, to dissipate the heat. In fact, all components that might be affected by heat are located as far away as possible from tubes, transformers and the bleeder resistor.

The operating controls are as follows: (1) Meter range switch. (2) Polarizing voltage (concentric) control. (3) Power factor adjustment. (4) Bridge range switch. (5) Zero adjustment. (6) Insulation resistance push button. (7) Bridge arm. These controls are arranged on the panel board as shown in Fig. 1. A combination meter serves for quantitative readings. Binding posts on the panel are insulated with XXX bakelite spacers, and accommodate banana plugs, spade terminals, phone tips or bare wires.

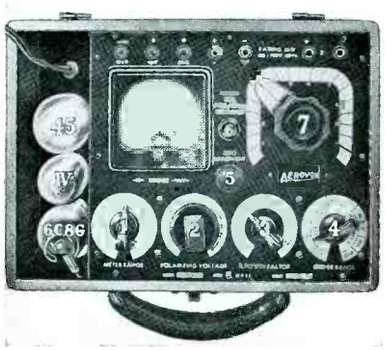


Fig. 1. Panel arrangement of the Aerovox Model 75 capacity and resistance bridge. (1) Meter range switch. (2) Polarizing voltage control. (3) Power factor adjustment. (4) Bridge range switch. (5) Zero adjustment. (6) Insulation resistance push-button. (7) Bridge arm.

Applications

Originally designed to provide a means of ascertaining condenser characteristics and quality out in the field, the Aerovox bridge serves a wide range of functions.

Capacity bridge: Measuring capacity, leakage, power factor and other characteristics of condensers under actual working conditions. Measures capacity values of from 100 mmfd (0.0001) to 100 mfd, in six ranges. For checking intermittent condensers, the condenser in connected for capacity measurements and, if there is an intermittent open, the meter needle will fluctuate violently when the meter range switch is in the bridge position.

Resistance bridge: Measures resistance values of resistors, electrical equipment and circuits, from 10 ohms to 1 meg in 5 ranges.

Insulation resistance: Measures insulation resistance in condensers and other devices. Meter is calibrated directly in megohms. Reads up to 10,000 meg.

Vacuum-tube Voltmeter: Consists of amplifier stage and grid-leak detector.

Voltmeter: Available for voltage readings both internally and externally. Ranges: 0-60 v, 0-300 v, and 0-600 v, at 1000-ohms-per-volt.

Millivoltmeter: Meter terminals are brought out directly. Range of 60 mv at 60 ohms or 1 ma, can be used with external shunts.

Milliammeter: Meter can be read in milliamperes. Range: 0-60 ma and 0-600 ma. May be used externally.

Variable Power Supply: Available directly at terminals and supplies between 15 and 600 volts continuously variable over entire range.

Other Uses: The bridge may be used for measuring the impedance of voice coils, phones, magnetic speakers and microphones. Likewise for measuring transformer ratios. The vacuum-tube voltmeter is a handy tool for tracing hum. It can be used to determine whether a transformer picks up hum. Its best position for minimum hum pick-up is then easily determined. The bridge can be used for neutralizing a transmitter, when connected in series with a test coil which is coupled to the tank circuit of the stage to be neutralized.

The Engineering Dept.
AEROVOX CORP.

Special 6-Tube P.A. Tuner

Wire It Yourself!

Here is the special-purpose job you have been looking for. It is a T.R.F. circuit designed just for P.A. work. Provided with a dual audio-output channel, so that one channel may be used for monitoring purposes without giving, in the P.A. channel, any indications of the switching done in the monitoring circuit. The absence of oscillators makes this tuner absolutely non-interfering regardless of the number that may be grouped together in a multiple-channel P. A. system.

$23.25

This P.A. Tuner is supplied in complete kit form including all coils, 4-gang variable condenser, power transformer, fixed condensers, resistors, sockets, knobs, dial and escutcheon, punched and drilled heavy steel chassis, miscellaneous small parts, hardware, pictorial and schematic diagrams and clearly written detailed instructions for assembling, wiring and operating. (NOT including Panel, Cabinet or Tubes.) And it is GUARANTEED to work satisfactorily or the Meissner Manufacturing Company will fix it for you—even supplying a shipping carton for returning it to the factory!

Tuner is designed so that two of them can be mounted side by side in one relay-rack panel. (8 3/8" x 8 3/8" x 12 1/2".) Also making it small enough for portable use. Contains its own power supply. Operates from 110-volt line. Black crystal front panel 75 cents. Black crystal cabinet $2.85. ASK YOUR PARTS JOBBER.

Special Features

- 530 to 1600 KC Coverage
- Four Tuned Circuits Using Ferrocart (Iron Core) Shielded R.F. Transformers
- 4-Gang Precision Tuning Condenser
- High-Q Coils—Enormous Gain and Selectivity
- Full Automatic Volume Control
- Audio Gain and Tone Controls
- Works with Any Amplifier Input
- Self-Contained Power Supply

SERVICE PARTS | VIBRATORS | ADAPTER KITS | TUNING UNITS | COMPLETE RECEIVER KITS

MT. CARMEL, ILLINOIS

Meissner

"A FAMOUS NAME FOR TWO DECADES"

VISUAL INDICATOR TUBES

(*Continued from page 28*)

a receiver will be found in which better action of the visual indicator tube is obtained when it is connected to the avc circuit rather than to the audio diode load.

Without AVC

It is quite feasible to utilize a visual indicator tube in sets which have neither avc nor diode detection. Fig. 15A shows a visual indicator tube employed in a set having a cathode biased detector.

The triode grid of the visual indicator tube is connected through the audio filter, comprised of a 0.5-meg resistor and a 0.1-meg condenser, to the cathode side of the detector bias resistor. Assuming no incoming signal, the detector plate current causes a voltage drop in the bias resistor equal to the no-signal bias, which makes the cathode side of this resistor positive, as indicated in the diagram. The triode grid of the visual indicator tube is therefore positive, in consequence of which the shadow angle opens up. The variable resistor R_{15} is adjusted until the shadow angle is a minimum. This will occur when the voltage drop across R_{14} exceeds the voltage drop across R_{15} by the cut-off value of the particular visual indicator tube used.

When a signal is impressed upon the detector grid the plate current will increase, and when the receiver is tuned to exact resonance the voltage drop across the bias resistor will be a maximum. This will cause the shadow angle to open to a maximum.

It should be noted that this action is just opposite to that which occurs when an avc voltage is applied to the triode grid of the visual indicator tube. This is not particularly disadvantageous, however, it is merely necessary to remember that a state of maximum resonance is indicated by a *maximum opening* of the shadow angle.

If the shadow angle should open to its maximum before a state of resonance is reached on the strongest signal to be received, this can be easily remedied. The voltage divider network (Fig. 15B) comprised of R_{16} and R_{17} should be placed across the detector bias resistor and the triode grid voltage of the visual indicator tube obtained from a tap between them. Instead of R_{16} and R_{17} a potentiometer may be used with the moveable arm connected to the triode grid.

The value of R_{15} in Figs. 15A and 15B is for a 6E5. The resistors R_{16} and R_{17} should total 250,000 ohms or more, or a 250,000-ohm potentiometer may be used. Except for R_{15}, the values given in Figs. 15A and 15B will hold for any visual indicator tube that it is desired to use.

More on this topic in an early issue.

RCA 8M3

Intermittent or inoperative: The plating on the adjustment screws of the antenna trimmer C-3 may become chipped, and will cause the trimmer to be short-circuited. In order to correct this condition, remove the screw entirely, see that the metallic chips are cleaned from the trimmer plates, and clean the burrs from the threads of the screw. Replace the screw and realign the trimmer at 1400 kc.

Dial slippage: The following procedure is suggested to overcome slippage of the dial drive, resulting from the dial scale rubbing against the case.

(1) Remove the three nuts which hold dial in place and take dial off dial drive drum.

(2) Loosen two set screws on hub of dial drive drum. Move drum as far as possible toward chassis, allowing just enough clearance to prevent its scraping against the two brass screw heads.

(3) Replace dial and make sure that the dial scale is concentric with the shaft before tightening the dial mounting nuts.

(4) Mount chassis as far back in case as possible.

(5) Mount chassis so that dial is centered from left to right with respect to the case.

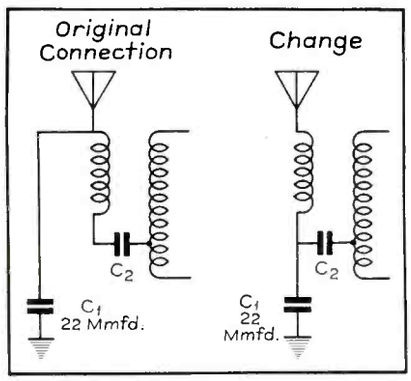
(6) If dial scale is loose in its mounting, slightly crimp edge of brass mounting with diagonal cutters.

(7) See that rubber grommets are in place in shaft holes of case.

(8) Mount the case end as far forward as possible.

RCA 8M3, 8M4

Noise filter change: It is occasionally advantageous on the auto-radio models 8M3 and 8M4 to have the 22-mmfd antenna shunt capacitor C-1 connected between the output end of the



antenna filter coil L-1, instead of between the antenna end and chassis as shown in the schematic. Later production sets incorporate this change. It is to be noted also on these same instruments, that secure electrical contact is required between the vibrator transformer and the chassis in order to minimize internal noise induction.

RCA 8M4

Vibrator interference: Noise or hum interference may develop when the local-distance switch is operated in the local position, if there are poor grounds at the car battery or insecure contact between various members of the car chassis. The interference can be eliminated by installing a 500-ohm resistor, preferably a flexible pigtail type, in series with the *black* lead to the local-distance switch on the control head assembly.

WESTINGHOUSE WR-342

Electric tuning operation faulty: This often occurs when the chassis projects too far forward toward the front of the cabinet. Check the small pulley on the motor shaft and make sure it is tight and that there is no play. Inspect the dial drive cable, see that it is still on the pulley and is operated by the lever arm and controlled by the front panel knob designated as manual-electric.

Willard Moody.

Television

Photo courtesy National Union Radio Corp.

Above is a photograph of a German projection television image. The photo was made from the moving picture screen, not from the tube end. The projected image was 10 by 12 feet. Television receivers of this type are on sale for about $1,000.

Photo courtesy National Union Radio Corp.

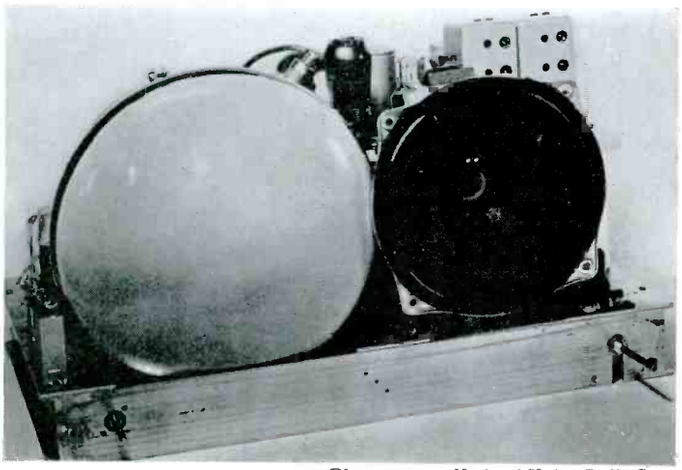
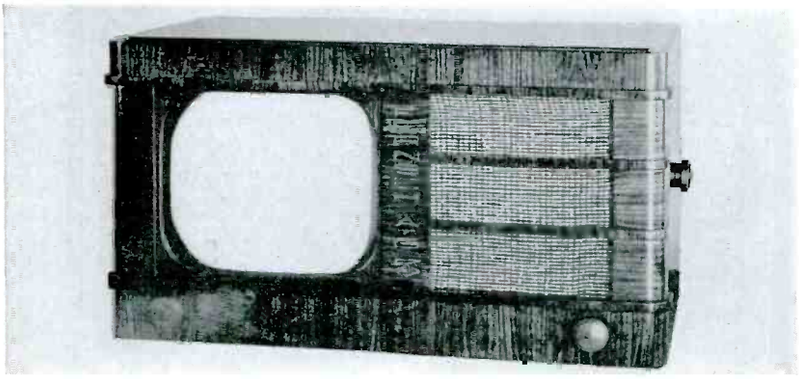
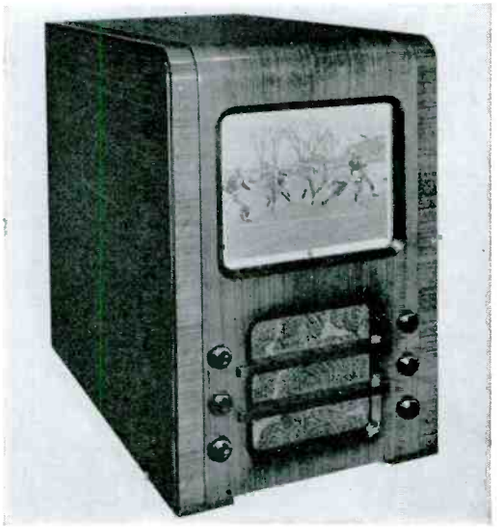


Photo courtesy National Union Radio Corp.

A mantel type all-wave sight and sound receiver shown at recent Berlin Exposition, is illustrated above. The same receiver in its cabinet can be seen to the left. This model is promised for the fall market to sell for about $225.

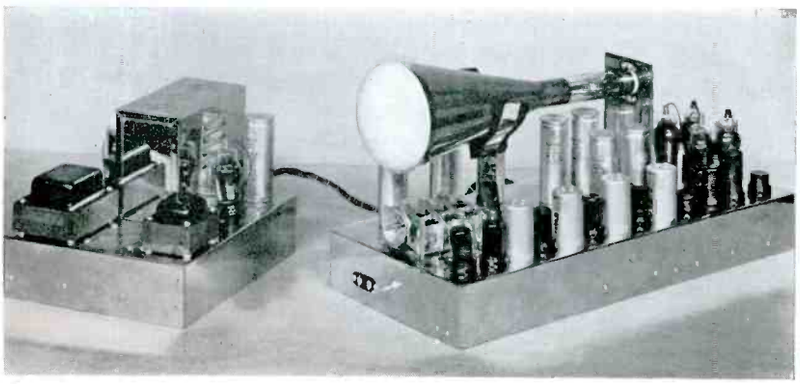


The Garod Model 100 television receiver is shown below mounted in a console together with an all-wave sound receiver. The Television receiver is on sale in kit form for about $100.



The DuMont Model 180 television receiver is shown to the right. The set features a 14-in. cathode-ray tube with 8- by 10-in. black and white pictures. The complete receiver for sight and sound sells for about $400.

Below is shown a television receiver constructed from the Garod Model 100 kit. The set uses a 5-in. cathode-ray tube and provides pictures 2¾ by 3¼ inches. A complete description and circuit diagram of this receiver was given in SERVICE for September, 1938.



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Eight major airlines make 100 scheduled take-offs and landings each day at the "Busiest Airport in the World". The Dispatcher in the Control Tower at the Chicago Municipal Airport must have constant communication on thirteen radio frequencies. All the equipment is the finest, so it is no wonder that years ago SUPREME instruments were selected for the difficult job of keeping those 13 receivers "perking" every hour of every day and night, week after week, month after month!

SUPREME was selected for the same reasons that *more radios are tested each day with SUPREME instruments than with any other kind!* It is the supreme tribute to QUALITY! The instruments shown ready for instant use are the Model 582A Push-Button Signal Generator, the 546 Oscilloscope, and the lightning-fast 592 Push-Button Speed Set-Tester.

Your Parts Jobber sells SUPREME instruments on the lowest terms in radio history!

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Signal Generators - Oscilloscopes
SPEED Instruments

Name.....

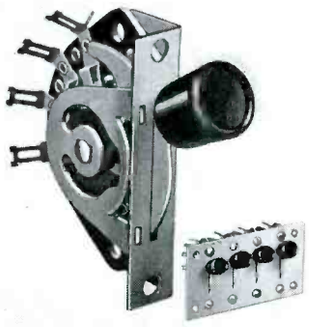
Address.....

City..... State.....

The Manufacturers

CENTRALAB SWITCH

The illustration shows the Centralab low-capacity lever-action switch. These switches are availab.e singly or can be



Centralab switch.

ganged by means of a mounting plate.

Form 628 and 694, available from *Centralab,* 900 E. Keefe Ave., Milwaukee, Wis., describe the switches and mounting plates. SERVICE.

THORDARSON AMPLIFIER

A 60-watt amplifier, illustrated, has been announced by Thordarson. Three high-gain input channels are provided as well as two phonograph channels. Four 6L6s are used in the output stages.

Additional information may be obtained from *Thordarson Electric Mfg. Co., Amplifier Division,* 500 W. Huron St., Chicago. SERVICE.

WARD AERIAL

Ward Products have introduced the aerial illustrated for use with household receivers. It is made of nickel plated bronze tubing and extends 12 feet.

Additional information may be obtained from *Ward Products Corp.,* Cleveland, Ohio. SERVICE.

MECK TUBEMASTER

From the laboratories of John Meck Instruments comes the announcement of a new Tubemaster.

The basic features of dynamic mutual conductance and power output are combined, in this tube tester, into a single reading, it is said. Simplified operation is claimed through the use of a 10-in roll chart for test data and the use of 4 selector switches for operation. These selectors, the roll chart and good-bad meter are illuminated from below the panel.

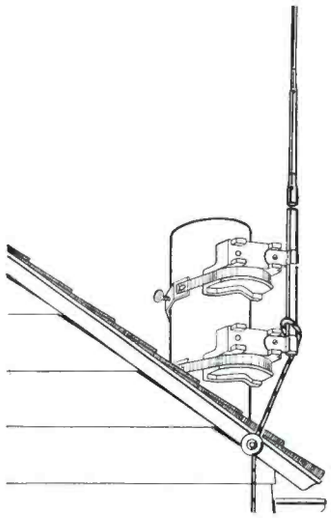
Descriptive literature is available from *John Meck Instruments,* 164 N. May St., Chicago. SERVICE.

SOLAR MINICAP

Solar has extended the utility of its Minicap dry electrolytic capacitor to practically all values commonly used in radio receiving circuits.

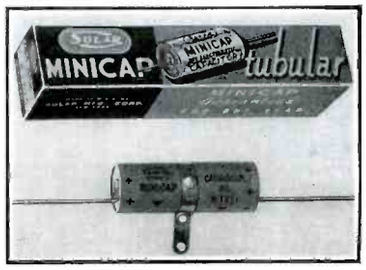
Complete literature describing and illustrating Minicap and other Solar products may be obtained from *Solar Mfg. Corp.,* 599 Broadway, New York City. SERVICE.

Thordarson amplifier.



Ward Products aerial.

John Meck Tubemaster.

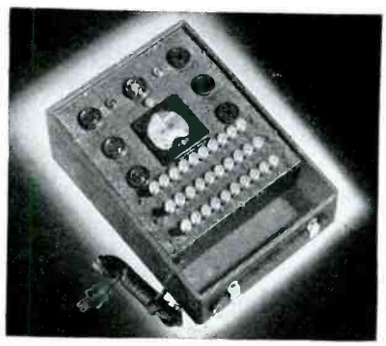


Solar Minicap.

MILLION TESTER

The Million Model MOP push-button tube tester is shown in the accompanying illustration. It can be obtained in counter or portable styles.

Additional information can be obtained



Million tester.

from the *Million Radio & Television Labs.,* 685 W. Ohio St., Chicago. SERVICE.

TILTON RESISTOR KIT

Tilton Electric Corp. are offering a six-drawer steel cabinet, free with the purchase of 250 Ex-Stat insulated resistors.

Complete details of the offer can be obtained from the *Tilton Electric Corp.,* 15 E. 26 St., New York City. SERVICE.

RADOLEK P-A SYSTEM

Radolek Co. are featuring a complete 25-watt portable p-a system which affords 130-db gain with dual microphone input, phonograph input mixing and fading facilities, record player, microphone, demountable floor stand and speaker all housed in a single carrying case.

Additional information can be obtained from *Radolek Co.,* 601 W. Randolph St., Chicago. SERVICE.

RADIO CITY PROD-LITE

The Prod-lite, a device designed to aid Service Men in repair work, clamps on to any test prod to illuminate the area tested. The Prod-lite is manufacturer by *Radio City Products Co.,* 88 Park Pl., New York City. SERVICE.

CLOUGH-BRENGLE UNILYZER

The Clough-Brengle Unilyzer 285 combines two complete instruments: A plug-in socket analyzer and a point-to-point Unimeter, with a complete set of accessories for each.

Used either as a Unilyzer or Unimeter, 29 ranges, including capacity and output in a-c volts or db, are available through 2 switches. Safety test buttons isolate the meter at all times except during measurement.

Additional information may be obtained from *Clough-Brengle Co.,* 2815 W. 19 St., Chicago. SERVICE.

(Continued on page 40)

MANUFACTURERS

(*Continued from page* 38)

NATIONAL UNION 9-IN. VIDEOTRON

National Union Radio Corp. announces the addition of an electro-magnetic deflection type videotron (type 2109) with a 9-in. medium persistence screen. The new tube will reproduce pictures in black and white.

Complete characteristics can be obtained from *National Union Radio Corp.*, 57 State St., Newark, N. J. SERVICE.

FLERON AERIAL CONNECTOR

M. M. Fleron & Sons, have introduced the aerial and ground connector illustrated. The base brings doublet and ground leads to one point. The cap permits a connection to the receiver which may be easily removed.

Additional information may be obtained from the manufacturer, *M. M. Fleron & Sons, Inc.*, 113 N. Broad St., Trenton, N. J. SERVICE.

TACO ANTENNA

Technical Appliance Corp., has announced the Taco 165 peak-band antenna. The antenna is designed for reception in the 10, 20 and 40 meter bands. The 80 meter and standard broadcast bands are also covered but not peaked.

Additional information can be obtained from *Technical Appliance Corp.*, 17 E. 16 St., New York City., SERVICE.

RCA INTERFERENCE GENERATOR

The RCA interference generator, illustrated, is used to demonstrate the effectiveness of the RCA Victor master noise

eliminator without an antenna system.

Complete information may be obtained from *RCA Manufacturing Co., Inc.*, Camden, N. J. SERVICE.

SPRAGUE PAPER CONDENSERS

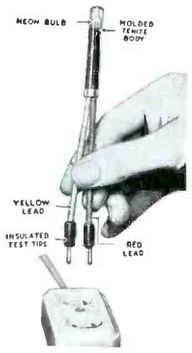
Sprague type DR paper capacitors, with the appearance of standard electrolytics (although the capacity runs from ½ to ⅓ that of the electrolytic of the same size),

are available in capacities of 4, 8, 4-4, and 8-8 mfd.

Additional information may be obtained from *Sprague Products Co.*, N. Adams, Mass. SERVICE.

LITTELFUSE TATTELITE

Tattelite, illustrated, tests for live or open circuits, blown fuses, defective condensers and resistors, indicate a-c or d-c,



grounded lines and approximate voltage.

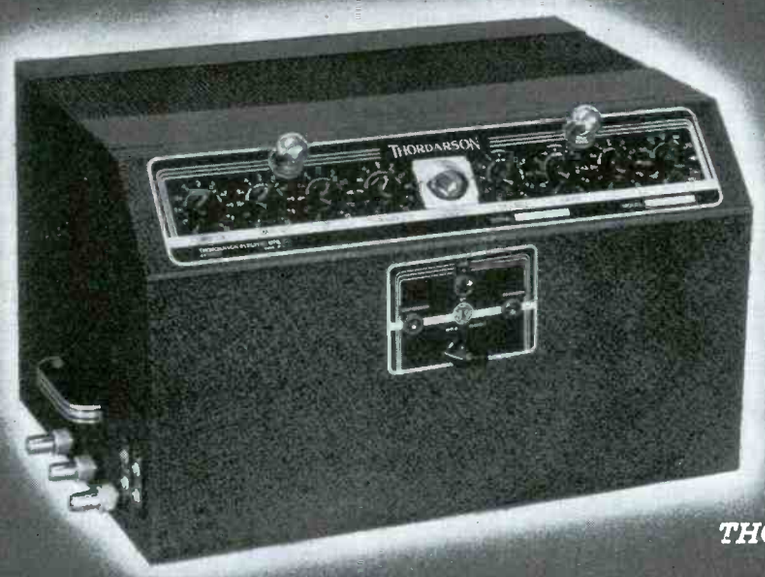
Additional information may be obtained from the manufacturer, *Littelfuse Labs., Inc.*, 4238 Lincoln Ave., Chicago. SERVICE.

(*Continued on page* 42)

AMPLIFIERS

By THORDARSON

Built to Meet Need — Not Price



Model No. T-20W60

Peer of a Distinguished Line
The 60 WATT

Tone control permits attenuation and accentuation at both high and low frequencies by separate controls. • Expander-Compressor circuit with two separate channels. • Three high impedance high gain microphone channels. • High impedance phono channel (two may be arranged by almost instantaneous conversion of one microphone channel.) • "Magic eye" volume indicator. • Control panel positioned for maximum convenience and illuminated for easy readability in dark installations. • Uses four 6L6's with inverse feedback. • Extreme flexibility makes it choice amplifier for large installations using a large number of loud speakers and microphones. See your jobber or write factory for catalog No. 600.

THORDARSON ELECTRIC MFG. CO.
Amplifier Division
500 W. HURON ST., CHICAGO, ILL.

A GOOD NAME GOES A LONG WAY

The wise service man uses "good name" parts for necessary repair work. The dependability of Ken-Rad Radio Tubes is known the world over.

KEN-RAD TUBE & LAMP CORPORATION
Owensboro, Ky.

KEN•RAD

DEPENDABLE RADIO TUBES

BRUSH *introduces a high level mike with* PRICE *appeal*

This new Brush H. L. microphone is sure to gain popular appeal. It's ideal for use with public address systems, amateur radio transmitters—in fact, any place where an inexpensive and high level microphone (minus 46 db) is needed.

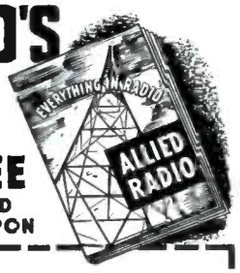
The Vari-swiv mounting is another feature. It enables the mike to be used in an upright position or tilted to any angle. Mike obtainable with three prong male plug assembly if specified.

Write for details. Complete with 25 feet of cable—$23.50.

THE BRUSH DEVELOPMENT COMPANY

3317 PERKINS AVENUE
CLEVELAND, OHIO

Ready Now! ALLIED'S *1939* Catalog



Servicemen! You need this big guide to Everything in Radio at lowest prices! Over 14,000 exact duplicate and replacement parts; all leading lines of new Test Equipment: new Rider's Chanalyst, new Push-Button Testers, etc.; new Sound Systems—8 to 65 watts; new books, tools, kits, Amateur Gear; 62 new 1939 Knight Radios—4 to 16 tubes—ideal price-leaders as low as $6.95! 180 pages of real values—this new ALLIED Catalog for 1939 is Radio's Biggest Book! Write for your copy today!

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ALLIED RADIO

EICOR, INC.

Just announced but already set up and ready to do business is Eicor, Inc., with plant and offices at 515 S. Laflin St., Chicago. Heading this company is Mr. Joe Nader, President and Chief Engineer, while the office of Vice-President and Sales Manager is held by R. D. Wright. Both have had many years' experience in the field of dynamotors, converters, gas electric plants and other rotary electrical apparatus in which the firm will specialize.

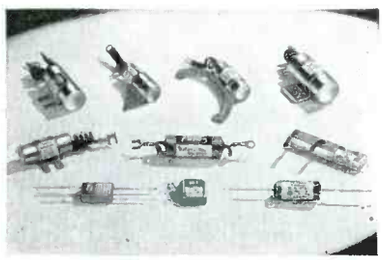
BERNARD TEST EQUIPMENT

H. J. Bernard, managing editor of Radio World for 14 years, has entered the test equipment manufacturing business with a line of multimeters and tube checkers, etc.

H. J. Bernard is located at 319 Third Ave., Brooklyn, N. Y. The export business is handled by Pan-Mar Corp., 1270 Broadway, New York City. Literature will be supplied upon request. SERVICE.

C-D AUTO FILTERS

Cornell-Dubilier have introduced a line of auto filter units. The mechanical design



of these capacitors are said to be identical to those supplied the majority of auto set manufacturers.

This entire series is described in Catalog No. 161, available from *Cornell-Dubilier Electric Corp.*, South Plainfield, N. J. SERVICE.

CLAROSTAT RESISTORS

Clarostat announces a line of adjustable wire-wound power resistors. The coating is an inorganic cement solidified with very low heat treatment. The unit may be operated at red heat without blistering, cracking or deteriorating, it is said. Units are available in 10-, 25-, 40-, 60-, 80-, 100-, 160- and 200-watt ratings, and in any resistance value from 1 to 100,000 ohms.

Additional information may be obtained from *Clarostat Mfg. Co., Inc.*, 285 N. 6 St., Brooklyn, N. Y. SERVICE.

WEBSTER-CHICAGO AMPLIFIER

The Webster-Chicago Model 4L35 amplifier, illustrated, is a 5-stage, 12-tube, 35-watt system, said to be adaptable to critical installations. Control facilities permit the use of up to 3 microphones and phonograph.

Additional information can be obtained from *Webster Co.*, 5622 Bloomingdale Ave., Chicago. SERVICE.

NASH RECORD CLEANER

The Nash Record cleaner is a companion product to the Nash record-lube. It removes dust dirt and particles from phonograph record grooves.

Additional information may be obtained from *Nash Radio Products Co.*, 5437 Lisette Ave., St. Louis, Mo. SERVICE.

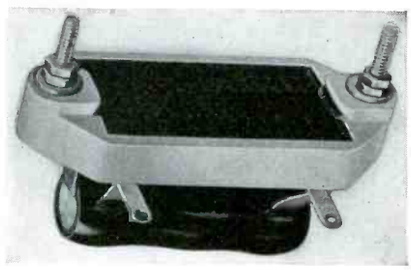
PARASITIC SUPPRESSOR

Parasitics are undesirable oscillations, usually of very high frequency, that reduce operating efficiency and output at the desired radio frequency.

Parallel or push-pull operation of two tubes often will form a tuned-grid-tuned-plate oscillating circuit which will be resonant at from 3 to 6 meters.

Parasitic oscillations of this type can be prevented by connecting a Ward-Leonard 507-622 parasitic suppressor in one of the grid or plate leads.

These parasitic suppressors are described in the new circular 507 obtainable from



Ward Leonard Electric Co., Mt. Vernon, N. Y. SERVICE.

(*Continued on page* 46)

BOOK REVIEWS

TELEVISION CYCLOPAEDIA, *by Alfred T. Witts, published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York City, printed in Great Britain, first edition,* 1937, 151 *pages, price* $2.25.

The advent of television has enormously increased the number of words and phrases that the Service Man will have to add to his vocabulary. Since the Service Man could hardly be expected to have followed a subject as highly specialized as television during its developmental period, it is more than likely that he will find himself floundering in a sea of obscurity when he runs across terms such as: amplitude filter, contrast sensitivity, deflectional sensitivity, echelon, framing frequency, implosion, interlaced scanning, keystone distortion, raster, stixograph, velocity modulation, and Wehnelt cylinder.

The possessor of a copy of the alphabetically arranged *Television Cyclopaedia,* however, need feel no qualms of terror when he encounters the new television terminology, for he can find the meaning of the unfamiliar word in the Cyclopaedia and then continue his reading in an intelligent manner.

Several mistakes occur in the Cyclopaedia but these are, fortunately, only of minor importance. A much more serious criticism is the inadequate treatment of modern synchronizing techniques.

Despite the author's sins of omission, *Television Cyclopaedia* is highly recommended, in fact, the present reviewer would go so far as to state that it is a book that *must* be on the shelf of anyone interested in television. R. L.

WIRELESS SERVICING MANUAL, by W. T. Cocking, published by Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S. E. 1, England, fourth (revised) edition, 1938, 288 *pages, price* 5/- *net, by post* 5/5.

Although the author did not consistently adhere to his policy, he has, in general, arranged the material according to the symptomatic manifestations of defects rather than in the traditional way of describing the functional operation of various circuits and listing the possible defects that may occur therein. This arrangement results in a book of unusual utility to the Service Man. It is to be hoped that other authors in this field adopt a similar plan of arrangement.

This book should prove of interest not only to the Service Man but also to the engineer who is interested in the radio export trade, for, among other things, it gives a listing of American, British, and Continental vacuum tube bases.

In using the same diagram for both the British octal and the American octal base the author tends to give the impression that British and American octal tubes of equivalent types are interchangeable. His brief statement, "Actually, the pin spacing and size of the spigot are slightly different," would dispel any such illusion from an Englishman's mind due to the large amount of publicity this point has received in England.

Tabulated in one of the appendices are inductance, capacitance, and resistance values which may be used in various circuits as a first approximation when specific information regarding the correct value for a particular receiver is lacking.

The author devotes a chapter to a description of defects that may occur in television receivers. R. L.

MYSTERY CONTROL

(*Continued from page* 12)

mine the difference in frequencies that is necessary. When the control frequencies are 10 kc apart, receivers will not interfere with each other so long as their remote control cabinet is kept a minimum of 10 feet away from the second receiver. By having the control frequencies differ by 20 kc, the second cabinet can be placed anywhere even on top of the first cabinet.

The procedure for setting up stations on the Mystery Control receivers is similar to the procedure followed in setting up Philco electric-automatic tuning models. The eight stations, however, are automatically dialed by the remote unit instead of by push buttons.

Association News

RADIO SERVICEMEN OF AMERICA

RSA IS working out a guarantee service plan covering the work and the material rendered by individual members. The RSA feels that a great step has been taken which will result in a large increase in business for its own members as well as be of inestimable value to the industry and to the consuming public.

The Board of Directors announces that the annual membership dues, as of Jan. 1, 1939, will be $3.00. In addition, there will be $1.00 initiation fee. The increase in dues was voted after long deliberation in order to insure the independence and self-support of the RSA. Applicants are urged to send in their applications before Jan. 1, 1939 in order that they may take advantage of substantial savings in membership costs.

Allentown, Pa. and Hartford, Conn., have voted to affiliate with the RSA. Final details of the affiliation are being carried out as rapidly as possible.

Alton

A dinner meeting was held by the Alton Chapter on Sept. 13. Local charter was presented by Joe Marty, Jr., executive secretary of the RSA. A. G. Mohaupt of the National Speakers Bureau of the RSA gave an interesting lecture on "Test Instruments and Their Uses." Several reels of movie film were also shown about how nice it is not to be a cowboy.

Binghamton

Binghamton Chapter has spent most of the last month planning for the fall season. A ladies night and supper meeting is planned for early in November. The whole group will travel to Scranton, Oct. 4 and will spread the RSA idea to Dahl Mack's customers there. At one of the September meetings Stahlman of Ithaca explained the operation and advantages of Rider's Chanalyst.

Chicago

Chicago Chapter held the most successful meeting in its history on Sept. 28, at which time all manufacturers who were displaying test equipment participated in a Round Table Discussion. Fifteen test equipment manufacturers, including such figures as John Rider, Paul Jackson, John Meck, displayed their latest test equipment. This show was unique in that there was no charge to the manufacturers for displaying this equipment. All of the local jobbers in Chicago cooperated by sending out invitations to their Service Men lists. This Test Equipment Show will become an annual feature of the Chicago Chapter. Sixteen questions of a general nature concerning test equipment had been prepared in advance, and a Round Table Discussion was held between the members and the manufacturers present. More than 350 men attended this meeting and everybody came away enthusiastic. More of this type are planned for the near future.

Cleveland

Cleveland Chapter's huge annual picnic has passed into history. It was held on Sept. 25 and many of the local boys are still recovering from the effects. An interesting meeting was held on Sept. 21. Bill Akers of the local Philco distributors gave a complete story of the Philco Mystery Control. The Cleveland Chapter has planned for the early fall a large number of interesting meetings. The first of these will be a talk on Rider's Chanalyst by two of the local group.

Dallas

Dallas has held several very worth while meetings in the last two weeks and are rapidly getting their chapter into shape to take full advantage of the fall program offered by the national organization. Under the leadership of T. P. Robinson (who is also national president of the RSA) Dallas is all set to enjoy one of the best seasons it has ever had.

Danville

Danville Chapter held an educational discussion on "Automatic Frequency Control" lead by Mr. Cummings. Considerable deliberation and a great deal of information was uncovered at this meeting.

Duluth

Duluth Chapter held its Jamboree and get-together at a dinner meeting at the Hotel Spaulding, Sept. 24. Service Men within an area of one hundred miles attended Duluth in great numbers. Among the guests present at the Speakers' Table was the Mayor of Duluth, the Executive Secretary of RSA, John Potts, and A. G. Mohaupt. Immediately following the dinner, the evening was given over to lectures and talks. The Duluth Chapter charter was presented and the evening ended in the small hours of the morning. Valuable prizes were won by the Service Men attending.

Freeport

Subject of a chapter library was brought up and discussed and plans laid for such an addition to the regular chapter at the Sept. 27 meeting. Dale Foy, one of our own members, gave a talk on the Philco Mystery Control, followed by a demonstration at the local Philco dealer in Freeport.

Green Bay

On Sept. 23 the Green Bay Chapter received its charter from the National Office. A. G. Mohaupt gave an informative lecture on the signal generator. More interesting meetings are planned for the near future.

Holyoke

At a recent meeting, the Holyoke Chapter received its charter from the National Office and laid plans for a very active fall.

Metropolitan New York

At a recent joint meeting of the five local chapters of RSA in the metropolitan area charters were presented by Joe Marty, Jr., executive secretary of RSA. John F. Rider spoke at the same meeting and emphasized the value of the RSA, the necessity for backing up the officers and urged complete cooperation. Problems of servicing and selling were discussed at length and plans were laid for a membership drive, under the direction of Art Rhine.

At a meeting held September 19 the following committees were appointed: Membership Committee: A. E. Rhine, chairman; Grievance Committee; E. McD. Bendheim, chairman; Education and Technical Committee; E. P. Mandeville, chairman; Special Relations Committee; Charles H. Yocum, chairman; Library Committee; Fred Horman, chairman.

The Governing Board was completed by election of Sidney Bloch, Frank Cassidy, Vincent Campbell and Joseph Breyer.

Peoria

Peoria Chapter scheduled its first fall meeting for Thursday, Oct. 6 and had a large turn-out. John Stoll, of the local chapter, held a successful radio show in his place of business on Sept. 29.

Southern New Hampshire

An enjoyable outing was had by both amateurs and Service Men at Lake Sunapee. Games, swimming, contests, boat races, etc., were held. Cash prizes were given each winner. An unusual feature in connection with the outing was that liquor was conspicuous by its absence. A new meeting place was decided upon at the library in Manchester. Local dues were reduced to 25 cents a month.

INDEPENDENT GROUPS

CALIFORNIA

A general Motors program of motion pictures was shown at the Oct. 3 meeting of the Radio Service Association of California, Inc. They are always good and we are always glad to see them come around again.

About time we were getting back to normal again after all our vacations, picnics, special meetings and what not. Maybe Al will have a new tube for us occasionally?

Last meeting, Dr. Lester Reukema was with us with a preview of the lecture course on Television.

We didn't get a chance to report on the picnic in our last bulletin. It's ancient history, perhaps, but we can't help thinking of. . . . The sharp-shootin' Rayment boys fixing the old man up with a month's supply of smokes. . . . Little Andy's one-man foot race. . . . Al Grabau getting away with the big prize. . . . Those Swedish cookies from Berkeley. . . . The kids rooting for pennies. . . . And, bless his heart, Ye Olde Scarecrow who took his customary beating from the wives. . . . And Harlan, who posed beside Ye Scarecrow and dern near got eradicated when his Mrs. came to bat.

THE REPRESENTATIVES

At a meeting held Sept. 13, the following officers were elected for the year 1938-1939: Dan R. Bittan, president; John Forshay, vice-president; David Sonkin, secretary-treasurer; Perry Saftler, chairman, Board of Governors.

SPOKANE

The Associated Radio Technicians of Spokane are planning an educational program. It's a good one, because Frank Dunnigan, vice-president of ART, is the instructor.

SEATTLE

We hear that Ben Hamlin, Service Instructor, Edison Vocational School and president of the Seattle Servicemen's Union, had his house painted. Ben is back with his classes now, from a trip east. Walt Omalanz, one of Ben's students, also had his house painted. It must be contagious.

Our Hat's in the Ring!

● Those new green - finished CLAROSTAT wire - wound power resistors are cement-coated. But it's an entirely different kind of cement. Based on years of search for the ideal coating, the results are simply astounding.

Try this Test . . .

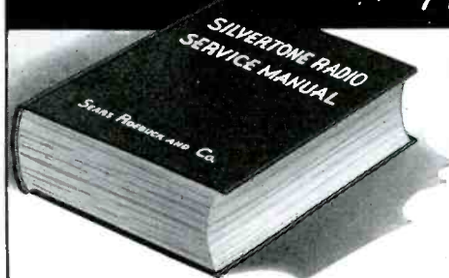
Take one of these units. Run it at twice, three times, four times rated wattage. Get it red hot. Dip in cold water. Test for resistance value. Look for cracks. Then try the same test on any vitreous-enamel or other type resistor. Just try it!

Free MANUAL . . .

Write for descriptive data. Also pocket-sized 208-page service manual. Meanwhile, ask your jobber for these *green* power resistors.

CLAROSTAT *Manufacturing Co. Inc.*
285-287 NORTH SIXTH STREET
BROOKLYN, NEW YORK, U.S.A.
• OFFICES IN PRINCIPAL CITIES •

SERVICE MEN! GET THIS BIG SILVERTONE SERVICE MANUAL
—Will Pay for Itself



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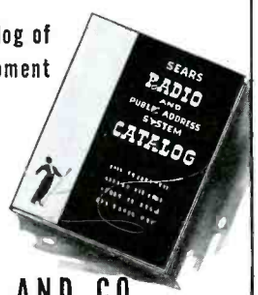

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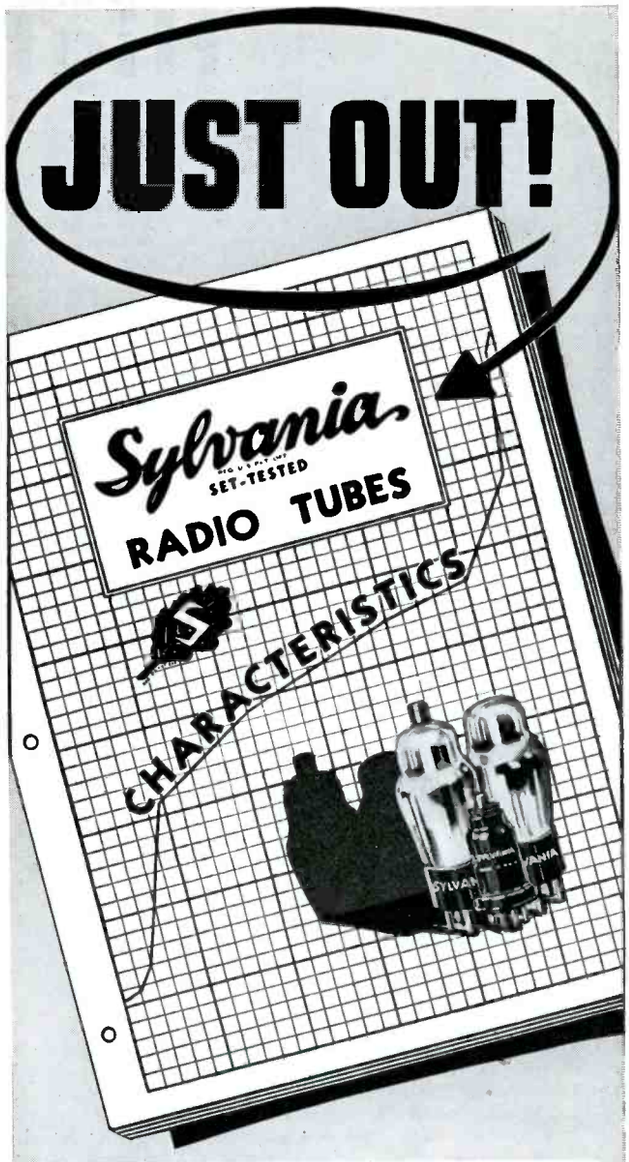

SERVICEMEN — don't miss this FREE OFFER! Send for your copy of the new, revised Sylvania Characteristics Sheet. It contains complete listings and base diagrams for all Sylvania tubes, including the latest types. Fits 3-ring binder, or can be folded to pocket size. Mail the coupon NOW!

Also Makers of Hygrade Lamps

SYLVANIA
Set-Tested Radio Tubes

HYGRADE SYLVANIA CORP. S-108
Emporium, Pa.

Please rush me — FREE — a copy of your new Characteristics Sheet.

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☐ Dealer ☐ Serviceman
☐ Amateur ☐ Experimenter

Name of Jobber .....

Highlights

TRIAD DISPLAYS

The Triad Manufacturing Co. has available for distribution to the trade 3 die-cut displays printed in red, yellow, blue and black.

The group of displays is included with each order shipped from the factory. Triad dealers and Service Men may obtain them by addressing Sales Promotion Dept., Triad Mfg. Co., Pawtucket, R. I. SERVICE.

JENSEN CATALOG

Jensen has issued a 16-page speaker catalog for the trade. An effort has been made to classify the items so that the Service Man can easily select the speaker best suited to his needs.

Copies may be obtained from Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago.—SERVICE.

MECK BOOKLET

The engineering staff of John Meck Instruments, 164 N. May St., Chicago, have prepared an 8-page booklet called "Test Standards for Condensers."

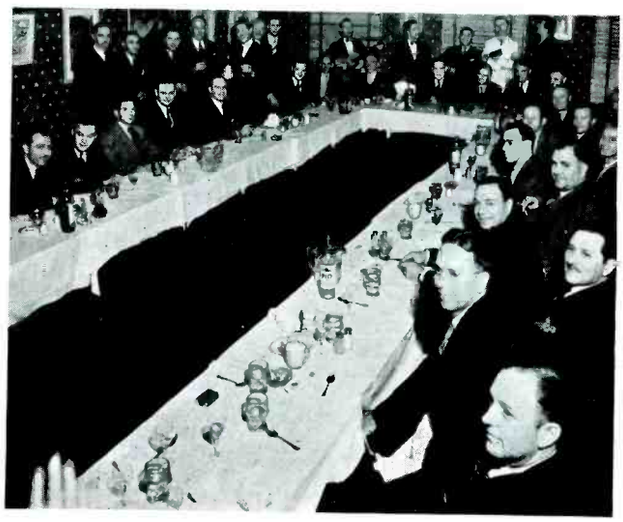
Copies may be obtained directly from John Meck Instruments. SERVICE.

UNIVERSAL CATALOG SHEETS

Universal Microphone Co., Ltd., Inglewood, Cal., have issued a series of illustrated loose-leaf sheets depicting their line of microphones.

Copies may be obtained directly from Universal. SERVICE.

V. Hamilton, of Hamilton Associated Industries tendered a banquet to local radio engineers and purchasing agents. Seated from left to right: J. Jacone, A. R. McLellan, R. Jones, L. Crawford, H. W. Blakeslee, R. Dooley, R. Yoder, W. E. Kemper, W. Addison, H. Meineman, Joe Erwood, John Erwood, J. E. Carlson, R. Nielsen, E. Bradshaw, A. Shoup, L. Hubbard, J. Clark, D. Hayworth, H. Krissman, H. A. Hutchins, G. W. Borkland and J. E. Ruder. Standing from left to right: R. Beckware, A. Mydill, K. Hassell, W. Hurtienne, V. Hamilton, P. E. Wiggin and G. Gustafson.
Mr. Hamilton is the man standing at the back with the bottle in his hand.



UNITED TRANSFORMER CATALOG

A catalog with complete listings of the entire line including the Duncer series, Varitran voltage control units, transmitter and amplifier kits, etc., is offered by United Transformer Corp., 72 Spring St., New York City. Copies may be obtained from the manufacturer. SERVICE.

SHAFER DEAD

Henry Shafer, in charge of the distributers division of the General Transformer Corp., 1250 W. Van Buren St., Chicago, for more than 5 years, died August 24 at his home. He was 66 years old.

MEISSNER MANUAL

The latest Meissner "How to Build Radio Receivers" has been released. It contains 120 pages of information and circuits on 20 Meissner Kits.

Copies may be obtained from Meissner Manufacturing Co., Mt. Carmel, Ill., for 50c. SERVICE.

BRACH CATALOG

The annual Brach Radio Parts Catalog No. 1038-R is ready for distribution. The catalog describes home and multiple antenna systems and accessories.

Copies may be obtained from L. S. Brach Mfg. Corp., 55 Dickerson St., Newark, N. J. SERVICE.

KEN-RAD WINDOW DISPLAY

Ken-Rad Tube and Lamp Corp., Owensboro, Ky., is distributing a series of point of sale advertising display material to jobbers and dealers. This series includes four window cards, a window trim set consisting of three streamers and four other pieces of small size and different designs, lithographed in color. SERVICE.

AEROVOX CATALOG

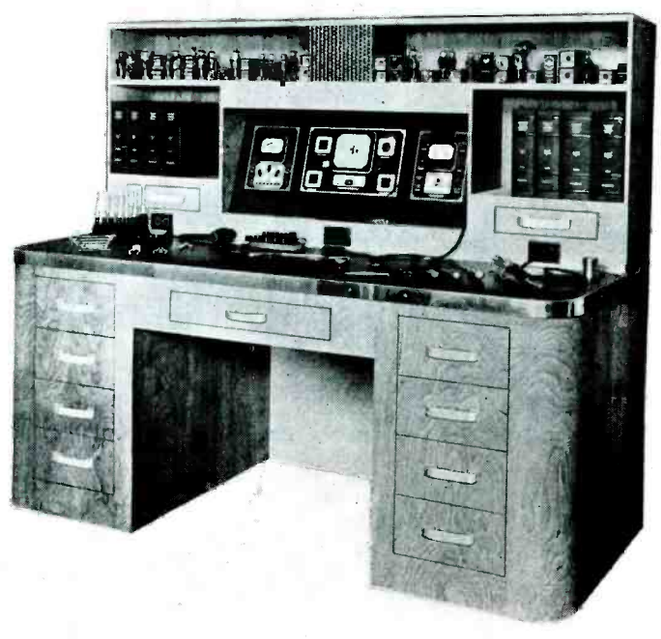
Listings of all standard items of the Aerovox condenser line, with the most popular types of carbon and wire-wound resistors, are provided in the Aerovox condenser catalog. Containing the same general pages as those provided through United Catalog service, the new catalog also features 3 pages of exact-duplicate replacement condenser listings and 2 pages of exact-duplicate motor-starting capacitor replacements. A copy may be had directly from Aerovox Corp., 70 Washington St., Brooklyn, N. Y. SERVICE.

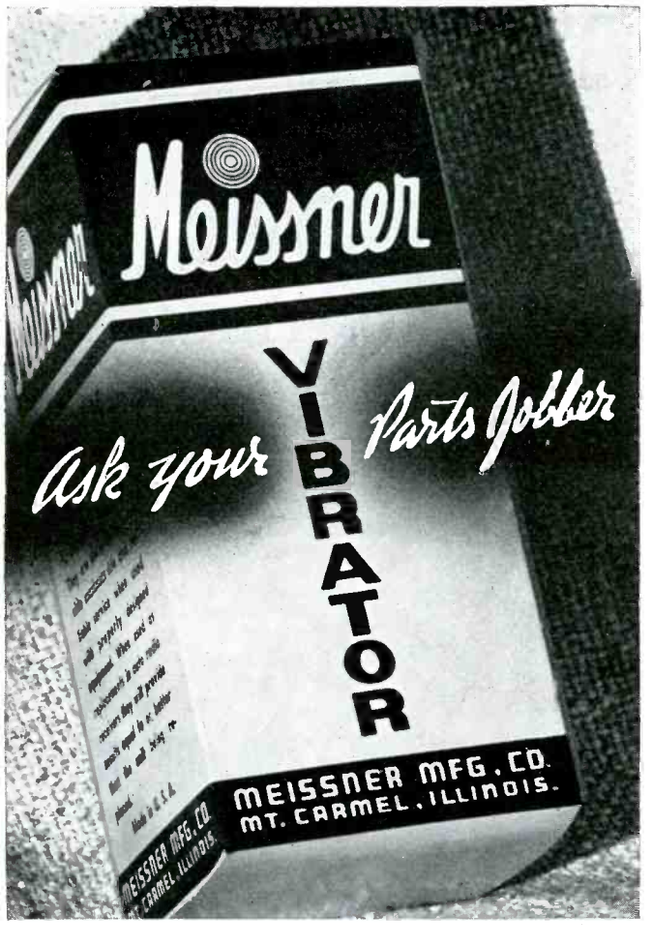
INDIANAPOLIS TELE. CLUB

An amateur television club has been organized by the Indianapolis, Ind., Y. M. C. A. The group has the distinction of being the first ham unit to successfully build and operate its own video transmitter and receiver.

The equipment was constructed from data and information supplied by Marshall P. Wilder, television engineer of the National Union Radio Corp.

The complete test bench shown above was given to Alfred Kilian, Chicago, as first prize winner in the Weston 50 Anniversary Contest. The second prize, a Weston analyzer and a tube checker was awarded to Francis Troiani, Jamaica, L. I. Harl O. Piety, Lampasas, Texas, won a Weston 776 oscillator as third prize. There were 25 prizes in all. The judges of the contest were: Leon Adelman, sales manager, Cornell-Dubilier Corp.; Robert G. Herzog, Editor, SERVICE magazine and H. L. Olesen, assistant sales manager Weston Electrical Instrument Corp.





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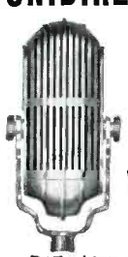

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D9T, List $37.50, High Imp., 25' Cable
D9, List $35.00, High Imp., 25' Cable

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AMERICAN MICROPHONE CO., INC.
1915 S. Western Ave. Los Angeles, Calif.

B9 CRYSTAL
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Everything you need in radio. It's all in this New 1939 RADOLEK RADIO PROFIT GUIDE. Every repair part for every receiver. Newest radio receivers. New 1939 model public address amplifiers. Test instruments. Technical books. Complete new line of radio receivers, "Ham" sets and transmitters. Power tools. Electrical appliances, etc. Every item guaranteed.

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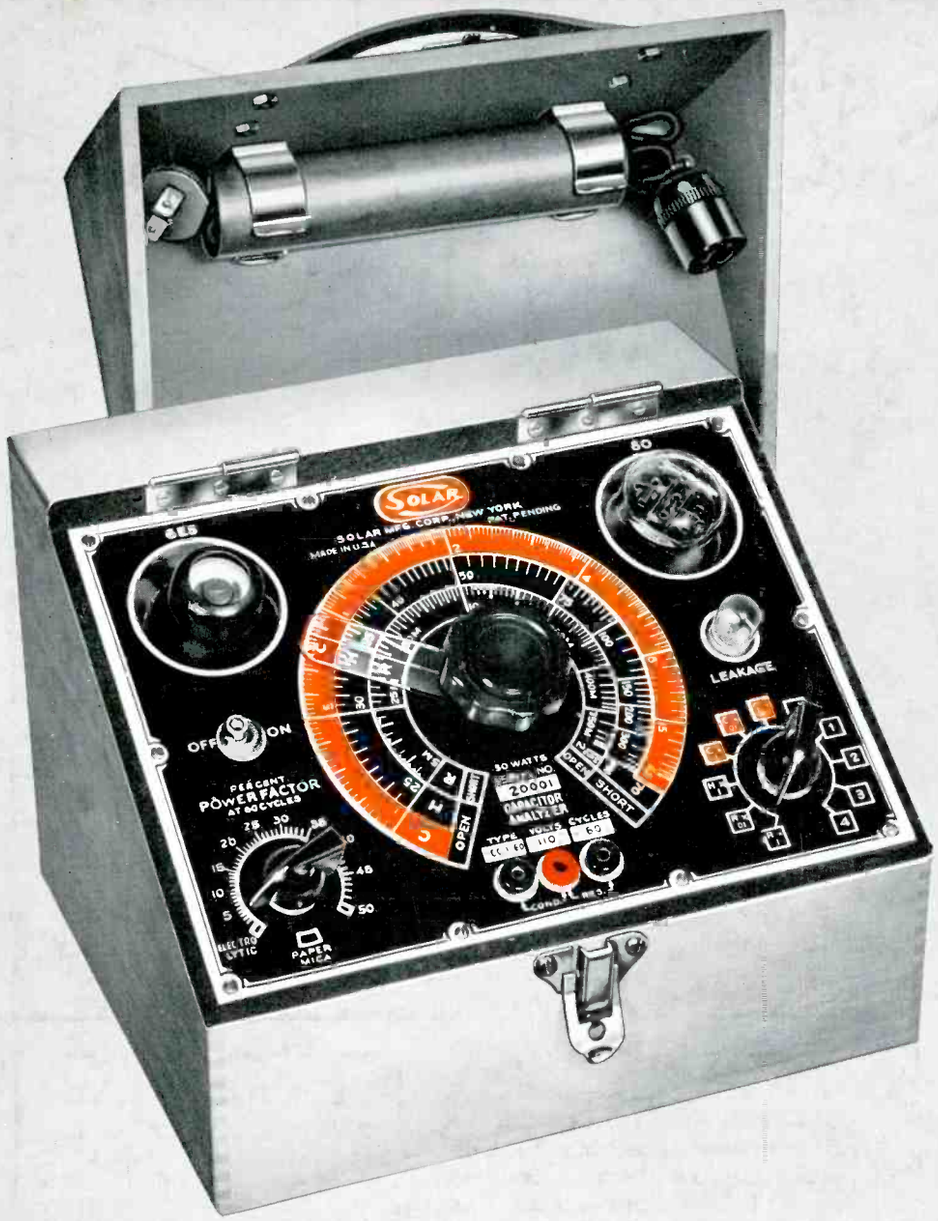


MODEL CC

SOLAR

CAPACITOR ANALYZER AND BRIDGE

INCORPORATES
MODEL CB FEATURES
plus
HIGH CAPACITY SCALE
HIGH TEST VOLTAGE
SIMPLIFIED SCALES
SLOPING PANEL

NEW . . . Destined to prove even more popular than our famous CB Model . . . because more useful. This is what it does: Measures Capacity .00001 to 800 mfd., including motor starting condensers; measures Power Factor 0 to 50%, including motor starting condensers; measures Resistance 50 to 2,000,000 ohms; measures Insulation Resistance to 1000 megohms, using test voltages to 600 D.C.; detects leakage and intermittents. A.C. operated

Catalog No. CC-1-60, for 110 volts
60 cycles operation, less tubes

YOUR COST . . . $24.90

Order through your jobber

SOLAR MFG. CORP., 599-601 Broadway, New York, N.Y.

EASY TO READ

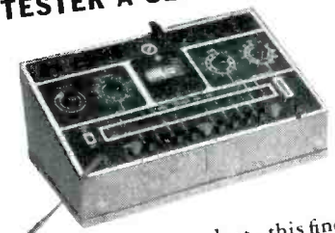
NEW STYLING

ALL CONTROLS ON FRONT PANEL

LIGHTER IN WEIGHT

New RCA 3" OSCILLOGRAPH Brings You Many New Features at a Popular Price!

NEW RCA RADIO TUBE TESTER A SENSATION!



RCA's newest product—this fine new tube tester which is available for counter or portable use! Easy to operate, it tests all standard receiving tubes (including 1½ volt battery tubes), ballast tubes, cathode ray tubes, Magic Eye tubes and voltage drop on all types of gas tubes. It shows line voltage up to instant of actual test, has easily-read figures on roll chart, with a spare switch section and socket which minimize obsolescence. Counter Model Stock No. 156-A, net price $37.95. Portable Model Stock No. 156, net price $39.95. See your distributor.

Over 325 million RCA radio tubes have been purchased by radio users . . . In tubes, as in parts and test equipment, it pays to go RCA All the Way.

HERE'S a 3" cathode ray oscillograph you'll call a real value! Has all the fine qualities incorporated in previous RCA oscillographs—*plus* other features.

This instrument uses the RCA 906 3" tube and offers a large, clear image without expensive accessory equipment as required for larger tubes. All the controls, including the spot centering controls, are on the front panel. They are of the bar type, easily adjusted. Smaller size and lighter weight greatly increase the portability of this instrument. And its new styling, flexibility of operation and finer performance make it unusually attractive.

SPECIFICATIONS

Radiotrons . . . 1 RCA 906 (improved type), 2-6C6, 2-80, 1-884—Total 6 • Sensitivity . . . Without amplifier—20 volts (RMS) per inch deflection. With amplifier—0.5 volt (RMS) per inch deflection • Amplifier: Response . . . Flat, 20-90,000 cycles—Gain 40 • Timing Axis . . . 15-22,000 cycles • Controls . . . Front panel for all operations, including centering • Power Supply . . . 110 volts, 50-60 cycles • Input Power . . . 50 watts • Dimensions . . . H-15", W-8", D-14" • Finish . . . Blue-gray baked wrinkle lacquer—streamlined handle.

$63.95 Net. Stock No. 155

RCA presents the "Magic Key" every Sunday, 2 to 3 P. M., E. S. T., on the NBC Blue Network

RCA Test Equipment

RCA MANUFACTURING CO., INC., CAMDEN, N. J.
A Service of the Radio Corporation of America