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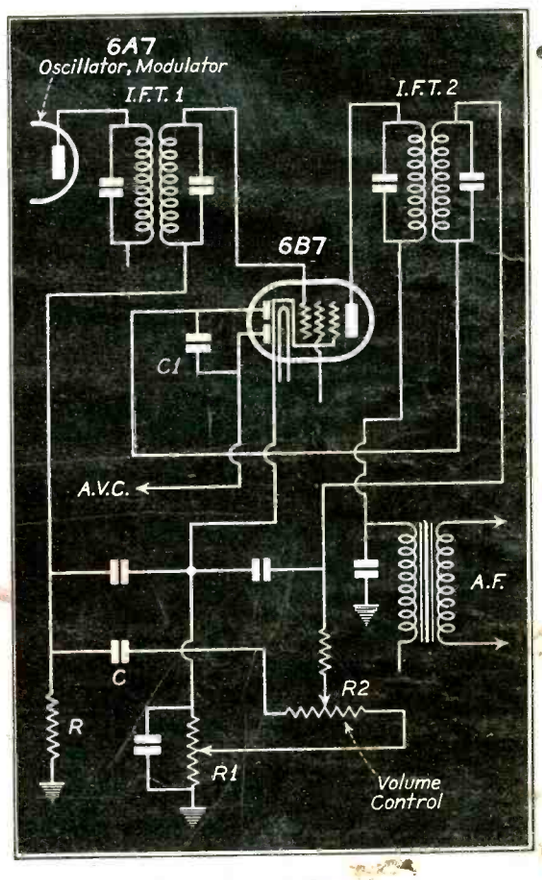

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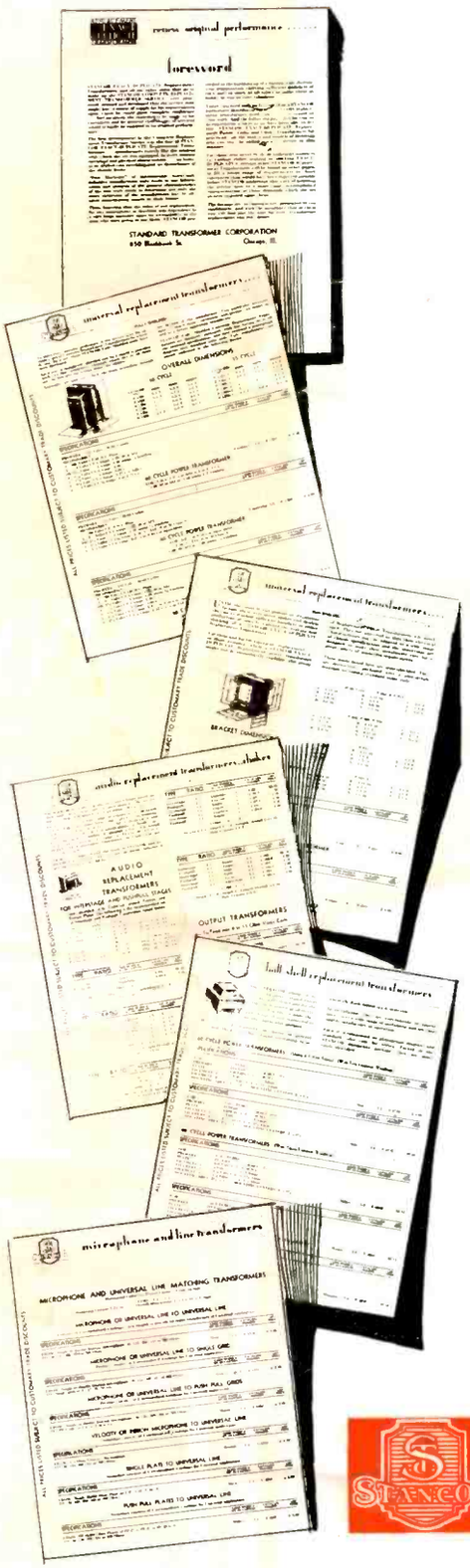

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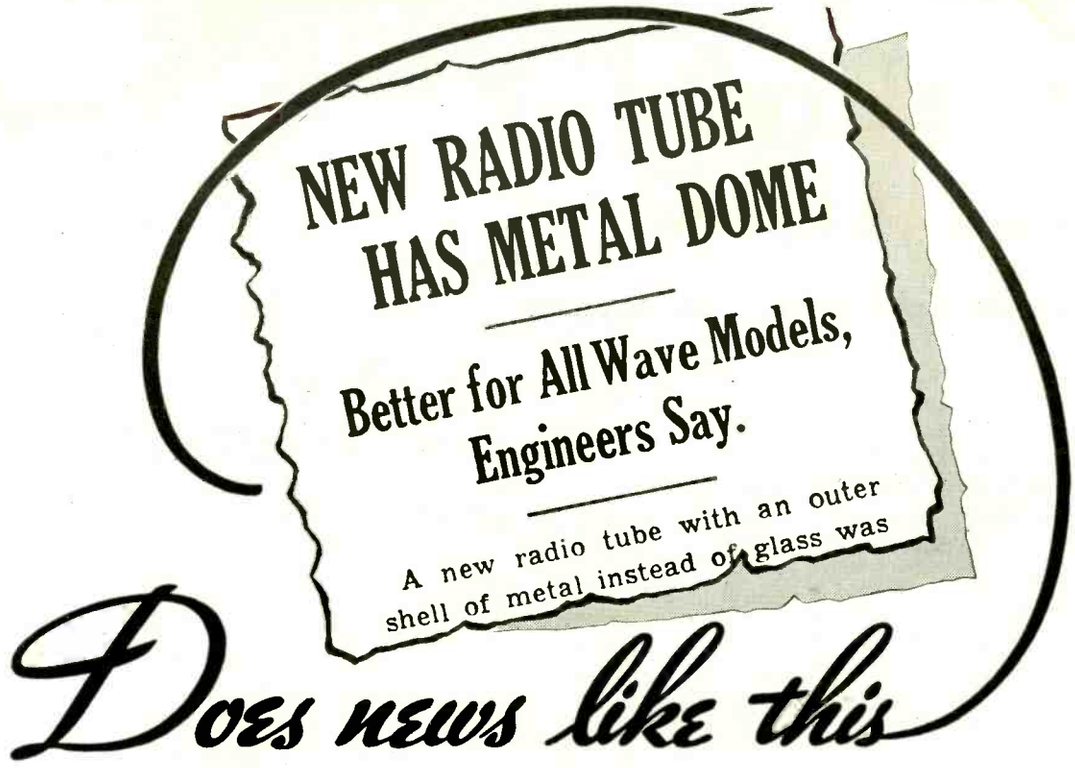

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THE ANTENNA . . .

Auto Radio

WE believe that tribute should be paid to the engineers who have burned the midnight oil to make auto radio what it is today . . . and to the "forgotten man"—the car owner, who, having sufficient interest and sporting blood to suffer along with the early auto-radio monstrosities, has done his part in hastening the remarkable advances made in this new branch of the radio industry.

It is a far cry from the first auto-radio recivers to the modern compact and efficient units we have today. Most of the progress can be attributed to the simplification of the equipment and to the immense increase in operating efficiency. For that matter, many modern auto-radio receivers put to shame some of our home broadcast sets when it comes to downright results.

Tribute should be paid to the design engineer because, through his efforts, auto-radio has been made as simple as "falling off a log." Because it has been made that simple, sales have increased tremendously, and the end or saturation point of this public buying is not yet in sight. Moreover, there are today such a large number of auto-radio receivers in use that there is an ever-growing field for the Service Man—a field that will become more profitable with the passing of time.

Most Service Men have taken a crack at the auto-radio business at one time or another. Many have given it up as a bad proposition. This has been due to the fact that in many, if not most, cases, the work has been profitless—or, if not profitless, much too difficult an undertaking to make it worth the while so long as there is plenty of work to be done on home receivers. But, let's review the picture as it is today and see if conditions haven't changed considerably.

Consider first the modern auto receivers themselves. They are sturdily constructed and either of the single- or two-unit type. In either case, installation is comparatively simple and takes little time. The receiver circuits have been highly developed with the result that sensitivity is much greater. Marked improvements have also been made in the automatic volume control systems so that uniform reception may be had under most conditions. Audio output has also been increased.

Of major importance, however, are the rapid advances being made in simplified filter systems, *built into the receivers,* which, under average conditions obviate the necessity of employing suppressors, filters, condensers, and special shielding in the electrical system of the car. Thus, one of the Service Man's worst problems—that of hunting down and eliminating noise interference—is practically licked.

Now consider the cars. They are made nowadays so that radio may be installed without ripping open roofs, drilling holes for antenna leads or otherwise tearing up the car for the sake of providing what at best is a makeshift job. Today, cars are built for radio, and radios are built for cars. The headaches are practically over.

Some thought should also be given to the psychology of a car owner when it comes to auto radio. Firstly, it has been our observation that a man is more reasonable in connection with the servicing of his car radio than he is with his home radio. Possibly this is due to the fact that he is used to paying regular service charges on his car, and happens to feel the same way about anything which is a part of his car—or possibly it is due to his belief that a radio in a car—which stands punishment—has a perfect right to break down, whereas his home radio, which does not stand punishment in his eyes, ought to keep going indefinitely without any servicing whatever. In any case, the audio-radio owner seems willing to listen to reason.

Remember, too, that a man will buy a set for his home and hang on to it like grim death . . . and the longer he has it, the better he likes it. But a man will buy a car with radio installed, or have one installed later, yet very seldom does he attempt to retain the radio when he trades in the car. Good reason, too . . . the layman's interpretation of the functioning of a radio is purely a mechanical one, with the result that he is apt to believe that when his car reaches the coughing stage his radio is also pretty well shot. Or, if he feels that the radio is still good, he soon learns that to rip it out of his old car and have it installed in his new car, is a penny-wise, pound-foolish move. So, he gets a new car *and* a new radio.

If the above is true in the average case—and we believe it to be—the auto-radio receiver has a high obsolescence factor. This means that the early type noise boxes should pass out of existence as fast as do the old cars—which is much faster than a home radio—and make way for the new auto sets which are easy to install and easy to service in comparison.

We know that many Service Men are making good profits out of auto radio these days. We believe that any good Service Man will find it well worth his while to enter the auto-radio business in a big way. If you have given it up as a bad proposition, give it another fling and learn for yourself that conditions have changed considerably.

Even though the auto receivers have been greatly simplified, it still takes a good man to make a proper installation job. Now that the headaches have been eliminated, why let this phase of the business go to outsiders? Start your own auto-radio service station, or hook up with a local radio or auto dealer, or auto service station. Advise your regular clients that your shop is completely set up for the installation and servicing of auto radios—and get your shop set up for the business.

If you are in a position to do so, go into the business of selling auto-radio receivers. After all, a large number of your clients own cars. Each one is a good prospect. And who is there better than you to recommend a receiver for road use? If you have gained the confidence of your home-radio clients in your dealings with them, they will turn to you with their auto-radio questions and problems.

Every auto owner is a prospect for two radios—one for his home and one for his car. Every owner of two radios represents twice the potential amount of servicing business to be had.

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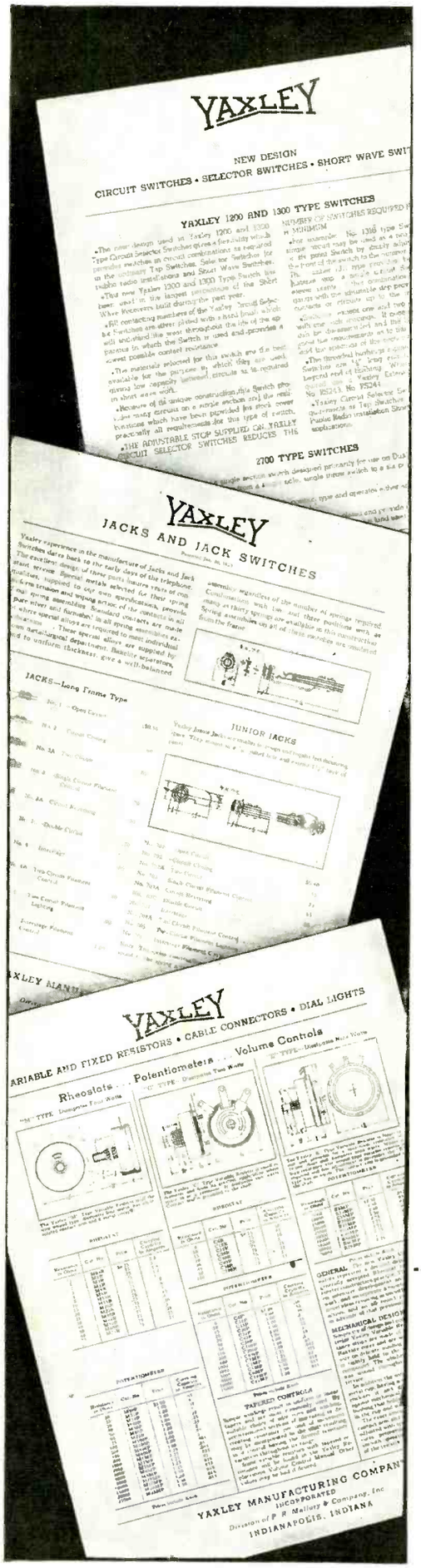

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SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR MAY, 1935

VACUUM-TUBE VOLTMETER APPLICATIONS

By KENDALL CLOUGH*

Though the vacuum-tube voltmeter is by no means a new instrument, it has, until recently, like the cathode-ray oscilloscope, remained a laboratory device. Now, with more precise measurements required in connection with modern receivers, the vacuum-tube voltmeter is finding a place in the Service Man's shop.

Though most Service Men are acquainted with the functioning of the vacuum-tube voltmeter, very few realize the extensiveness of its application to everyday testing procedure. Mr. Clough outlines its many uses in the accompanying article.

MEASUREMENTS which may be carried out with a good vacuum-tube voltmeter fall into three general classifications.

1. Measurement of rms or effective voltages.
2. Determination of peak voltages.
3. Measurement of dc voltages.

The distinguishing feature of the three above measurements is that no appreciable power is consumed from the circuit under test by the vacuum-tube voltmeter. In addition it will be noted, from the diagram of Fig. 1, that in the construction of the instrument the tube and its bypasses have been placed on a cable, which permits bringing the grid connection into close association with the circuit to be tested. Thus the measurement is not complicated by the capacity of long test leads.

Measurements of RMS Voltage

The scale of the instrument shown in Fig. 1 is calibrated directly in rms or effective voltage with a full-scale reading of about 3.5 volts. This is the full scale of the instrument with the multiplier switch on the tube box set at X1, or with the regular grid lead disconnected, and the grid connection made directly from the circuit under test to the grid of the tube. (To be discussed in a later paragraph.)

With the regular grid connection, the range may be extended upward by turning the selector switch to X5 or X20, giving full-scale readings of about 17.5 and 70 volts respectively.

It is absolutely necessary that the tube be operated with a grid circuit that is conductive of dc current. Be certain that the grid circuit of the instrument is always closed, either through the resistors within the instrument (with the regular grid cap in place) or through a conductive external circuit when the internal connection is not used. If the power is turned on with the grid circuit open, the grid may accumulate a charge that will cause damage to the meter.

*Chief Engineer, The Clough-Brengle Co.

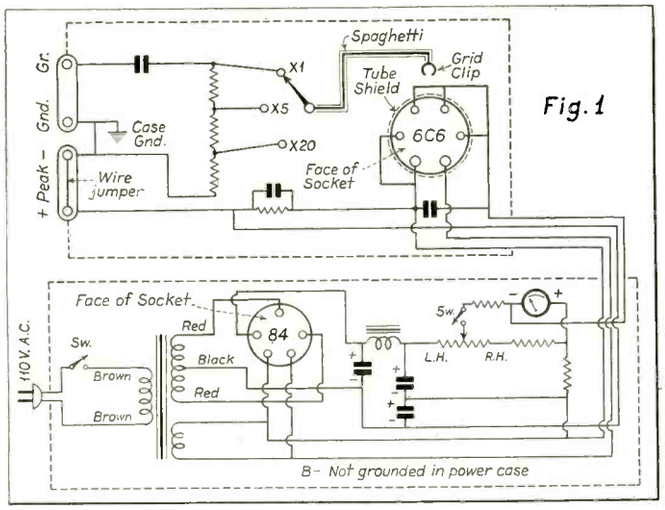


Fig. 1

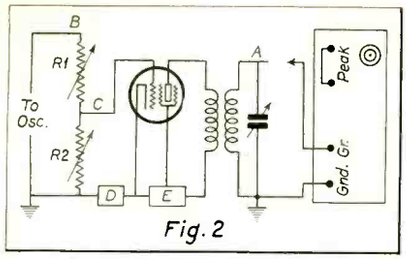
Diagram of typical vacuum-tube voltmeter, with separate power-supply unit, referred to throughout this article.

Input Impedance

While the vacuum-tube voltmeter consumes so little power that it may be neglected in most measurements, it may be necessary to consider the input impedance under some circumstances. As normally used with the self-contained grid lead, a 5-megohm resistance is present across the input circuit with any range in use. This will be appreciable only when using it across circuits having very little capacity and when the frequency is fairly low. Precisely the resistance introduced into a tuned circuit across which the voltmeter is connected may be calculated from $R = 1/(197\ F^2\ C^2 \times 10^6)$, where F is the operating frequency and C is the capacity across the circuit.

In addition, there will be introduced a capacity—the input capacity of the voltmeter of 20 mmfd.

In the event that capacity and resistance are too great for special problems, the meter may be used in its basic range



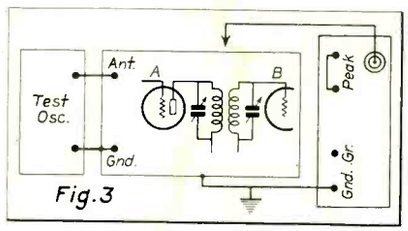
Set-up for making gain measurements.

(3.5 volts full scale) by eliminating the self-contained voltage divider and running the extra grid lead provided directly from the cap of the tube to the circuit under test. Under these conditions the shunt resistance will be so high as to be negligible under all test conditions, and the input capacity is reduced to that of the tube itself—4.2 mmfd.

In doing this, the conditions outlined under "Measurements of RMS Voltage" should be met in detail.

Gain Measurements

The general set-up is illustrated in Fig. 2. A test oscillator, which can be adjusted to the proper frequency, is connected across two adjustable resistors, R_1 and R_2. For audio- and low-frequency i-f measurements, these may conveniently be small commercial units. For higher i-f frequencies, as well as broadcast and short-wave frequencies, it may be necessary to use resistors of special construction, where inductance and capacity effects have been eliminated. In any event, the suitability of the resistors selected may be checked by observing the voltages at B and C with the vacuum-tube voltmeter and comparing the ratio of these voltages with the supposed resistance



Set-up for measuring receiver gain.

ratio. If these values are in agreement, then the resistors are suitable.

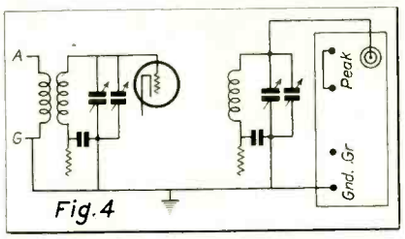
The biasing and battery circuits associated with the tube are not known in any detail in the circuit, so these will be set up in accordance with the actual conditions of operation in each case. In the same way, a tuned r-f transformer is shown, which in practice might be a dual-tuned i-f transformer or an audio transformer, as required.

Be certain that the lowside of the vacuum-tube voltmeter marked GND is connected to the ground side of the circuit. The high side of the test circuit will connect to the post marked GR, or to the grid of the tube itself, in accordance with the conditions stated under the heading "Input Impedance."

Now, with the vacuum-tube voltmeter connected to A, observe the voltage when tuned to resonance. The voltmeter can now be transferred to B, and the voltage again observed. The actual gain, or amplification, may be evaluated in one of two ways. First, the values of the resistors may be adjusted until the two observed voltages, A and B, are equal, in which case the gain is—

$$\text{Gain} = (R_1 + R_2) / R_1$$

In the event that it is undesirable to vary the value of the resistors, they may be left fixed and the two observed volt-



Arrangement used for checking and aligning pre-selectors.

ages used in the computation of the gain, thus—

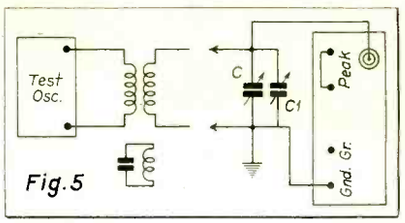
$$\text{Gain} = \frac{R_1 + R_2\,(A)}{R_1 \qquad (B)}$$

Checking Gain in Receiver Assembly

In checking receivers it is not always convenient to remove the inter-stage transformer or coupling unit from the receiver in order to check its gain. In this case let us suppose that it is an i-f transformer, the operation of which is in doubt, and which is indicated diagrammatically in Fig. 3. Connect a test oscillator to the antenna and ground posts of the receiver and the vacuum-tube voltmeter to the grid of the tube preceding the transformer in doubt, as at A in Fig. 3. Tune the receiver to the test signal and adjust the input on the attenuator of the generator until a small reading, say .5 volt, is obtained on the voltmeter. If the receiver has avc, care should be taken to perform all operations at a signal level that is below the actuating voltage of the avc circuit, in order that it will not come into effect and cause error in the gain determination.

If the point A connects to a tuned circuit in the receiver, it may be necessary to touch up the compensator slightly to counteract the small capacity of the voltmeter.

Now transfer the voltmeter to the



Arrangement used for matching coils.

point B and adjust the trimmers on both circuits A and B until the greatest voltage is produced. The ratio of this voltage to the voltage originally set up at A is the gain of the amplifier stage under test.

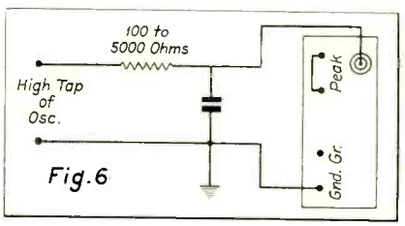
In some cases it may be inconvenient to get sufficient ratio of voltages to make a careful determination. In such cases, the input from the test oscillator may be reduced when the voltmeter is transferred to B, and the amount of such reduction will be a measure of the gain of the stage.

Checking Pre-Selectors

In lining up high-gain superheterodynes, it is difficult sometimes to be absolutely certain of the performance of the pre-selector or tuned r-f stage due to the complications of the oscillator and i-f amplifier. This is particularly true when attempting to correct the alignment to agree with a printed dial scale. Under this condition it is often possible to adjust the i-f amplifier and oscillator in such manner that the dial reads correct frequencies; yet the pre-selector does not track, and sensitivity is low with high noise level when the receiver is put on the air.

This sort of situation can be handled by connecting the test oscillator to the antenna and ground posts of the receiver in the usual way, and connecting the vacuum-tube voltmeter (preferably with separate connection directly to the grid), to the tuned circuit which normally connects to the grid of the first detector or frequency-changer tube (see Fig. 4). To avoid complications, it is well to short-circuit the grid coil of the oscillator.

It will now be found that the pre-selector or first r-f stage may be handled as one would deal with an ordinary t-r-f receiver; and alignment procedure such



Set-up for testing short-wave condensers.

as trimming, adjusting coils, and matching tracking of the circuits to the printed dial can be made without complications from the oscillator or the high gain and selectivity of the i-f amplifier.

In case the coils appear to be mismatched after making this test, they may be removed and tested separately.

Matching of Coils

The circuit set-up is shown in Fig. 5. A small coil, consisting of about ten bundled turns of about the same diameter as the coils to be tested, is made up and connected to the high-output tap on the test oscillator. This is for coupling to the coils under test. C is a condenser of the usual construction used in radio receivers and has connected in parallel to it a small vernier, C_1, of the midget type. The latter should be equipped with a pointer and dial, reading zero at half capacity. If a three- or four-plate condenser is used, it will have a range of roughly 10 mmfd each way from the half-capacity setting, making it possible to distinguish easily 1 mmfd each way.

The coil under test is connected to the oscillator and the small condenser C_1 set at zero (half capacity). The circuit is now tuned to resonance with the condenser C, as indicated on the voltmeter. The coil is now removed and a second coil substituted disturbing the location of the leads as little as possible. The condenser C is now left set and resonance obtained by adjustment of condenser C_1. Since the variation of this is

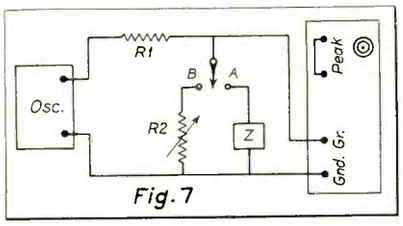


Fig. 7

With this arrangement it is possible to check the impedance of various devices.

very fine, small discrepancies between the two coils may be detected and corrected. If the inductance of the coil is high, it may be lowered by separating a few of the last turns in the usual way with the thumb-nail.

One precaution is necessary in order to avoid false results. In testing an antenna coil, for example, the presence of the primary winding may upset the inductance unless closed through a capacity similar to that which is present in the actual circuit. Such a circuit should have a condenser connected across it of the same size recommended as a dummy antenna when testing the receiver for alignment—about 100 to 250 mmfd. In the same way, if it is an inter-stage transformer, there should be

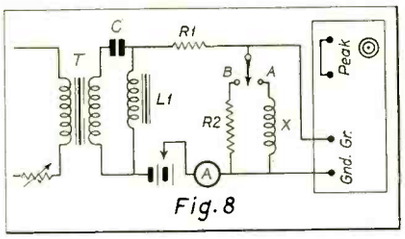


Fig. 8

Circuit for measuring the inductance of chokes.

a small capacity equivalent to the tube connected across while resonating it.

Testing of Condensers for Short-Wave Use

While most modern bypass condensers are of the short-path or non-inductive construction, most of them still possess sufficient inductance to reduce their bypassing effect at the very high frequencies. Condensers may be tested for this effect with the circuit of Fig. 6. An oscillator is used which is capable of about 5 volts output over the range of frequencies of the test.

With the circuit set up as shown, the frequency of the oscillator may be varied over a range of frequencies, watching meanwhile the reading of the vacuum-tube voltmeter. At such frequencies that the condenser effectively bypasses, there will be no voltage indicated on the voltmeter, but at other frequencies where the slight inductance of the unit resonates with the internal capacity, there will be sharp rises of voltage, as indicated on the voltmeter.

Impedance Checking

It is frequently necessary to check the impedance of various devices such as chokes, condensers, voice coils, etc. The general set-up for doing this is shown in Fig. 7. The oscillator is arranged to supply voltage of the frequency at which it is desired to know the impedance Z of the unit under test. The resistor R_1 should be equal to or somewhat greater than the probable impedance of the device. With the switch in position A, the voltage across the unknown impedance is noted. The switch is then thrown to position B, and the resistor R_2 is adjusted until the same voltage is noted. The value of R_2 is then the impedance of the unknown device.

If the impedance Z is a condenser, then a very close measure of its capacity may be obtained by substituting in—$C = 1/(6.28 \times f \times Z)$, where f is the measuring frequency.

If the impedance is a coil, then the inductance may be found approximately by the expression—$L = Z/(6.28 \times f)$.

When the impedance of a device is desired at line frequency, it is apparent that the oscillator in Fig. 7 may be replaced by a transformer operating from the power line.

Chokes Carrying Direct Current

It is frequently necessary to measure the inductance of chokes carrying direct current in actual operation. By a modification of the basic circuit of Fig. 7, shown in Fig. 8, this can be accomplished. Here, the test voltage is supplied from the line through a transformer T. A condenser C of 10 mfd isolates T from the dc circuit. The choke L_1 should be of generous proportions and preferably several times larger in inductance than the choke to be measured.

The dc in the circuit is adjusted by

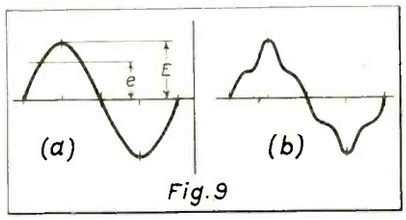


Fig. 9

Illustrating relations of peak voltage to rms voltage.

means of the battery and the ammeter A. The procedure for measurement and calculation of the inductance is the same as in the previous circuit.

Peak-Voltage Measurements

The sinusoidal voltage graphed in Fig. 9a has a peak voltage E, but an effective or rms voltage of only e. In the case of a pure sine wave, these two values are related by $E = 1.41\ e$, so that if the effective value e is measured on an ordinary voltmeter, the peak value may be calculated.

Fig. 9b illustrates a wave that is distorted in shape and the peak voltage is no longer related to the effective voltage by any such simple relationship. In such cases, it is necessary to measure the actual peak value of the wave.

The Measurement

Fig. 10 shows the manner in which the equipment might be set up for measuring the peak ac voltage across the first filter condenser in a power-supply circuit. The jumper is removed from the binding posts marked PEAK and a bat-

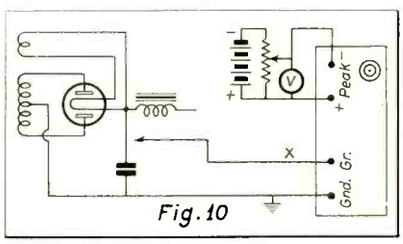


Fig. 10

Set-up for measuring peak voltage.

tery or power supply of about the same voltage available as the peak voltage to be measured is connected to it with designated polarity. A voltmeter or unimeter is used at V to measure the impressed voltage. The zero adjustment on the power box is turned to the extreme left until the switch connection is broken. At the same time, the voltage, as indicated at V, is increased until the plate current, as indicated by the meter, is reduced *just to zero*. Let the reading of the meter V then be E_1. The source of peak voltage should now be turned off and the voltage at V reduced until the plate current, as indicated in the plate meter, is again *just zero*. Call this voltage E_2. The peak voltage of the circuit under test is then the difference between E_1 and E_2.

It should be noted that when measuring with the connections suggested that the peak value of the ac component is measured. The actual voltage on the condenser in the illustrative test is

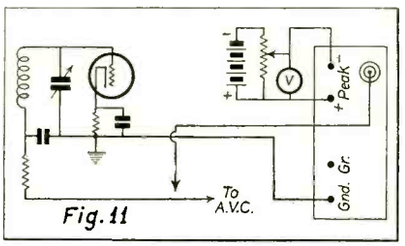


Fig. 11

Set-up for measuring dc voltage in high-resistance circuits.

actually the sum of the peak voltage, as measured above, and the dc voltage, as measured with an ordinary dc voltmeter. The total peak voltage (sum of the dc and alternating components) may be measured directly if desired by removing the lead X (Fig. 10) from the post GR and running directly to the grid of the tube of the vacuum-tube voltmeter. In this case, more voltage will be required from the battery or power supply for the slide-back circuit, and no more useful information will be obtained.

Measurement of DC Voltages

It is often necessary to measure voltages from circuits which have very high resistance and where the application of a conventional voltmeter would reduce the actual circuit voltage, due to the current consumed by the voltmeter. Such a case is illustrated in Fig. 11, where it is desired to know the actual voltage in the avc circuit without consuming any power. This measurement is made in the same manner as a peak-voltage measurement, the result being the difference in the two voltages at V in Fig. 11, necessary for zero meter deflection.

It will be noted that in using this circuit for dc measurements, external circuit connection *must* be made directly to the grid of the vacuum-tube voltmeter tube, rather than to the post GR, which is contrary to the procedure described for obtaining the peak or crest value of an ac wave, in section entitled "Peak-Voltage Measurements."

REFLEXED 6B7 CIRCUIT

(*See Front Cover*)

A number of midget receivers put out in the last 12 months have used to advantage the full possibilities of the 6B7 tube. Though great care is required in the design of a reflexed circuit, to prevent distortion and undesired couplings, it is possible to make the 6B7 provide i-f amplification, detection, a-f amplification, noise suppression and avc! Such a circuit arrangement is shown on the front cover.

It will be seen that a 6A7 oscillator-modulator tube feeds through the first i-f transformer, the secondary of which is connected to the control grid of the 6B7. The i-f amplification is obtained in the pentode portion of this tube. The cathode bias resistor, R-1, provides self-bias to the pentode section.

The amplified i-f signal in the plate circuit of the pentode is fed back to one diode in the usual manner. The second diode, which is fed through condenser C-1, provides avc in the usual manner.

The a-f component of the signal is picked off the volume-control potentiometer, R-2, and fed back to the control grid of the pentode section of the 6B7 through the condenser C. R is the grid resistor. The amplified a-f voltage then appears across the a-f transformer, the primary of which is in series with the primary of the second i-f transformer.

Noise suppression is provided by varying the detector diode bias. Since resistor R-1 provides variable bias for the diode detector, varying degrees of suppression may be obtained. The pentode plate current flowing through R-1 produces a voltage drop which is not variable in so far as the pentode itself is concerned, because current flows through the entire resistor irrespective of the tap position. However, the diode plate returned to cathode through the movable arm on R-1 may be made more or less negative with respect to the cathode by utilizing any desired part of the drop. Movement of the tap thus controls the rectifier cut-off and in consequence provides adjustable noise-suppression.

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Fada 10, 11, 30 and 31

The tuning control frequently slips in these receivers. This difficulty may be readily corrected by removing the large drum from the end of the condenser shaft, filing about 1/16th inch from the die-cast hub, reinstalling the drum, and forcing its rim deeper into the friction pulley on the tuning-control knob shaft.

These receivers are characterized by a high hum level, due chiefly to electromagnetic coupling between the first a-f transformer and the power transformer or filter chokes. This difficulty was removed and the tone and controllability of the receiver greatly improved, as follows: Substitute a type 56 for the type 27 detector; remove the gridleak and condenser; insert a 30,000-ohm resistor shunted by a 1-mfd condenser between detector cathode and ground; connect detector plate to plate terminal of second a-f transformer after disconnecting plate of first a-f tube; leave heater of first a-f tube connected to prevent excess heater voltage on other 2.5 volt tubes. This arrangement will prove very satisfactory for suburban use; if more gain is required, resistance-capacity coupling should be substituted for the first a-f transformer, leaving the transformer in the receiver to improve the appearance of the job from the top.

The volume control, a special Electrad Type R-147 (25,000 ohms) can readily be replaced with a standard Electrad Type 280 and a standard ¼-inch by 4-inch extra extension shaft, at a slight saving in cost.

A. R. Hodges.

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Fada Models 25 and 25Z

Loud frying noise cured by replacing first audio transformer. Original transformer looks like push-pull input and possibly it is, with only one half of the secondary used.

This model Fada hums more with the ac input plug in one direction than it does reversed. This is normal for this set but it is a good thing to bear in mind when you are delivering the set to the customer.

The dial on this model Fada is notorious for slipping. An extra long shaft with stiff bearings is responsible for part of it. In other words, there is a tremendous load on the vernier. Oiling the condenser bearings helped some but did not entirely eliminate slipping. Holes in the chassis were enlarged so that the vernier bracket could be slipped over and clamped closer, making the discs engage more of the drum. Improvement but not perfect. I did not have any powdered rosin on hand (which I knew from experience would provide traction) so I used ordinary table salt! Result—perfect grip. If you want to hold radio dials, put salt on their tails!

Jim Kirk

General Data . . .

Wurlitzer Model 454

The circuit of the Model 545 is shown on this page together with detail drawings of the chassis and a table of voltage readings.

The receiver uses a 6A7 as mixer-oscillator, with dual-wave coils in mixer and oscillator grid circuits, and converts the signal to 370 kc. A 6D6 is used in the i-f amplifier stage and this feeds the parralleled diodes of the type 75 tube. The diodes are returned to the cathode of the 75 and are therefore not biased.

The avc voltage is fed to the mixer and i-f tubes through the filter resistor J. All tubes in the receiver are self-biased. Bias for the control grid of the 75 triode is developed across resistor D in the cathode circuit.

A reading of the notes given below will supply the necessary data for servicing.

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Philco Model 16 (Code 126 & 7)

Effective January 10 shadowmeter shunt resistor (78), was changed from Part No. 5310 (5000 ohms) to Part No. 7775 (2500 ohms). This will prevent the shadow from becoming too wide.

This change will not be made in Code 125; it will however be made in Model 500, Code 122, and 501, Code 122.

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Colonial Model 654 Volume

If difficulty is experienced in sufficiently reducing volume from local stations, with the Model 654, the condition can be remedied as follows: Connect a lead from the unused lug of the Volume Control to the point where the .001 mfd mica condenser is connected to the primary of the antenna coil.

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Improving the Selectivity of Early Sparton Models 65 and 66

In some locations it has been found that the addition of a tuned circuit in the early Sparton Models 65 and 66 will improve selectivity.

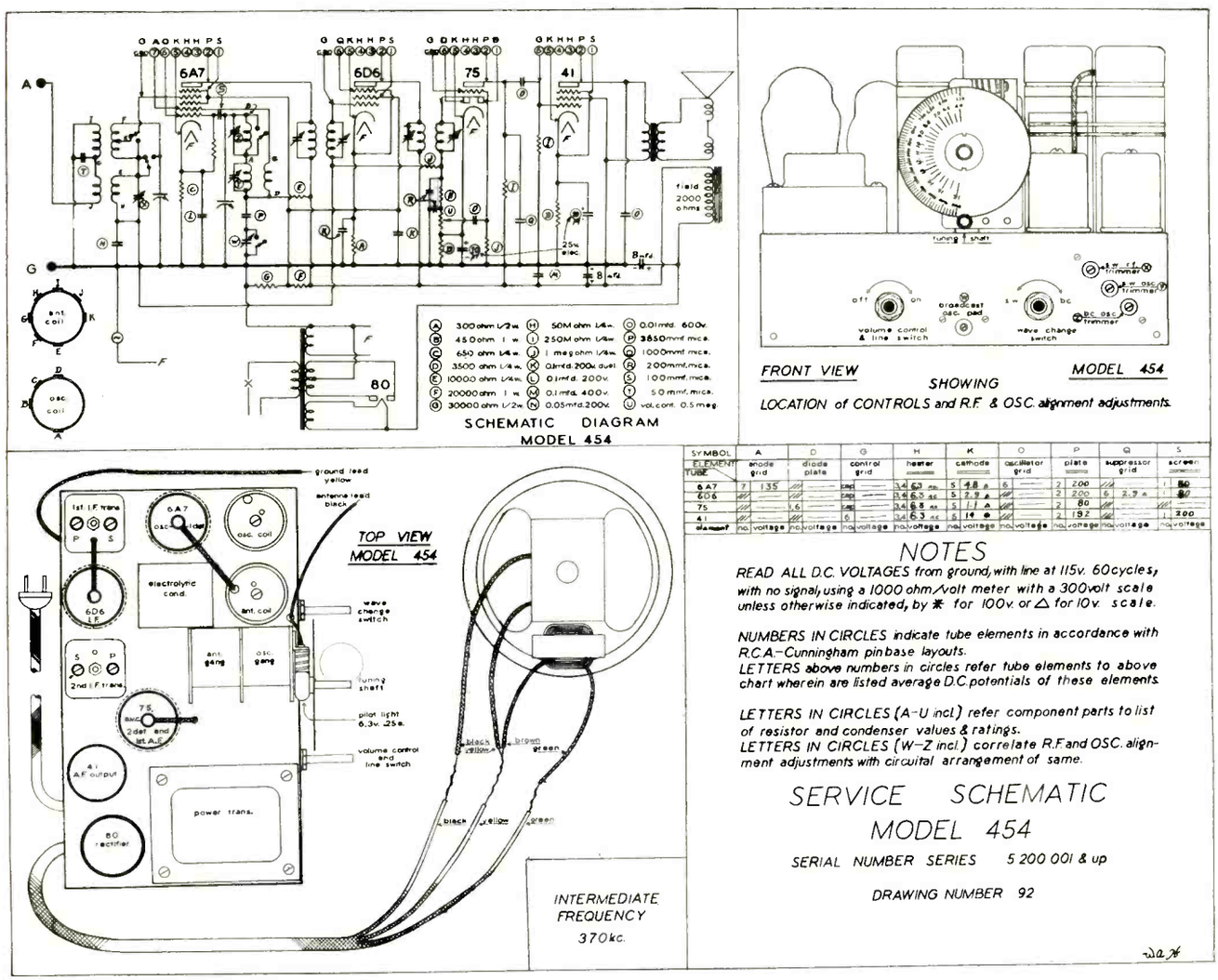
It will be noted in the schematic diagram that only the secondary of L-5 i-f transformer is tuned.

The following changes will permit the tuning of the primary also:

Remove L-5 (Part A-11041) and install new L-5 (Part A-11535). Remove C-3 (Part A-10973) and install new C-3 (Part A-11474). Connect one condenser of C-3 across the primary and connect the other condenser across the secondary of L-5.

Remove resistor R-11 (Part B-5243-34) and install Part B-5458-1, 2,200 ohms, .25 watt.

Remove resistor R-15 (Part B-5458-33) and install Part B-5458-31, 50,000 ohms, .25 watt.



Schematic and data on Wurlitzer Model 454

Auto-Radio . . .

MORE AUTO-RADIO FACTS

By ARTHUR H. LYNCH*

New receivers, more carefully designed, better ignition suppression systems and improved aerial systems are simplifying auto installations. Better performance is creating greater consumer acceptance with increasing sales and more profit for installation and service organizations.

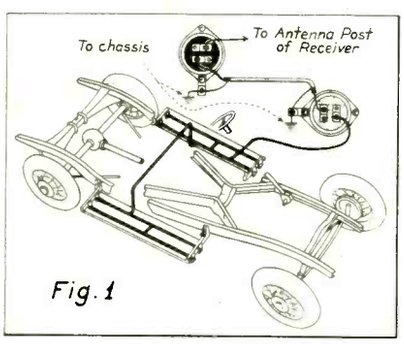
A FOUR-THOUSAND-MILE trip through the Middle West, by car and plane, has unearthed some information which should be of interest and possible assistance to those who are just as interested in radio as we are, but who do not "hit the road."

Some time ago your present reporter was invited to address a group of radio Service Men, in Chicago, under the auspices of Federated Purchaser, Inc. Mr. O. Roy, the manager of the company's Chicago branch, kindly arranged to have him "billed" a couple of days before the Chicago Convention of the I. R. S. M. so that two birds could be killed with one stone.

Auto-Radio Talks

John Rider was slated for a talk the same night. Maybe that's why Federated had such a wonderful turnout. In any event—Rider, Lynch, or both, being the reason—there were more than 800 men in the main auditoriums, while four additional, large rooms, fitted with loudspeakers, accommodated the overflow of the several hundred more. It is most gratifying to report that the intelligence of the men in attendance was very high. This became very evident from the character of questions they asked. Furthermore, the great majority of them had the appearance of being successful business men.

* President, Arthur H. Lynch, Inc.



Details of improved type running-board antenna with impedance-matching transformers and transmission line.

A few days later, under the auspices of the I. R. S. M., it was your reporter's pleasure to be billed on another program, along with several gentlemen representing other noise-reducing antenna makers. Here, again, the caliber of men in attendance was way above average and they seemed to get quite a kick out of the "battle royal" which those who prepared the program had been pleased to call "a symposium on noise-reducing aerials."

Manufacturing Activity

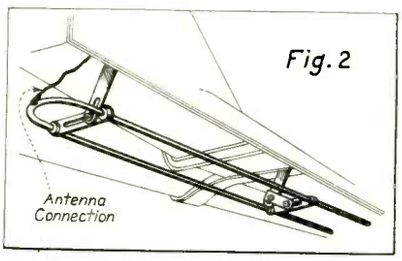
Out in Columbus, Indiana, Noblitt-Sparks Industries, makers of Arvin Car Radios, are just about as busy as any place we've seen since war time. And Crosley is going at a fast clip with their own auto receivers, as well as running special production lines for Chevrolet, Pontiac, G. M. and others. In Chicago, Motorola, Belmont, Silver Marshall, Inc., and Hallicrafters are going to town with their auto jobs. Jobbing outlets in Indianapolis, Columbus, Dayton, Akron, Cleveland, Toledo and the Twin Cities are, to paraphrase Brother Crawford, "Very happy." Most radio service stations are reporting much more business than they can handle.

And all this is, to quote Captain Henry, "Only the beginning." What we started out to do was to report a few technical and practical pointers gleaned from our visits with Service Men. It is so good to be able to say a word about business without having it begin with L and end with Y, that we feel your reporter's exuberance will be pardoned.

But, to get down to cases, let's see what's happening. It is, of course, beyond the scope of a yarn like this to cover the whole field or to cover a single portion of it, like auto aerials, in adequate fashion. We can summarize all the remainder of the field by saying that auto-radio receivers for this year are beginning to show some signs of really intelligent engineering. Also, they are selling very fast.

Receivers which make the use of suppressors unnecessary are here. In most instances they work at least as well as the older receivers did with suppressors. Even though manufacturers of what are considered reasonably efficient, low resistance, spark-plug filters, we take off our hats to the engineers who have made them unnecessary and thus put a crimp in our market. *However, the dealer and Service Man should remember that the suppressorless receivers are only to be had in the higher price class.* We are grateful for this, because we won't have to go out of business altogether.

The elimination of chassis pickup is another welcome improvement found in the better receivers this year, and it has gone a long way toward increasing the



Details of the auto doublet antenna—a newcomer.

number of installations one can make in a day. The mechanical installation of the old set was fairly simple, but getting rid of the "bugs" has always remained a real job—and one for which it has always been difficult to collect. A given type of receiver put in one car by one service crowd might be one of those rareties which clicked. The same type receiver put into another car might require half a day to get rid of racket. If the two customers compared notes, it is reasonable to assume that they would agree that the first crowd was on its toes and the other boys were "clucks." If the first customer had his receiver installed "free" by the people who sold it to him and the second customer paid a fair charge for installation and taking out the bugs, the latter, not being aware of the facts, would feel that he had been given a thorough trimming.

Receiver Performance

Fortunately the cheap set is becoming less and less popular with the customer, who realizes that he can now have nearly as good reception in his car as he can get at home. In fact, some of the modern auto sets are actually better performers than many of the moderate-priced home sets. Some receivers are so highly developed, and their makers have become so far-sighted, that all the Service Man has to do is follow some reasonably simple directions and a good

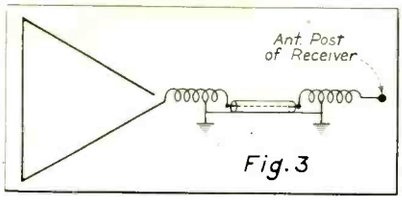


Diagram of the coupling system shown in Fig. 1.

job is done, on almost any car, in a short time.

This is a step in the right direction; it seems good business this year. But it may well be interpreted as the handwriting on the wall. We believe the auto-radio receiver will soon become "original equipment," just like the spare tire, the wind-shield wiper or the bumpers. This is already so in a few cars.

On the other hand, it is reasonable to suppose that the cheaper cars will be fitted with low-priced receivers and we will always have the customer who will insist on his radio being nothing but "the best." The present "proof of the pudding" may be had by observing the number of moderate-priced cars fitted with special wheels and tires, as well as the number of high-priced receivers going into moderate-priced cars. "So-o-o," as Ed Wynn would say, "we won't have to look for the end of the world just yet."

Buying Psychology

As long as human nature remains human nature, and there is no indication of any immediate change, we are always going to have folks who want the most for the least. That is a condition for which accessory manufacturers and service organizations should be grateful. There are any number of owners of moderate-priced cars who take seriously the claims made for some of the lower-priced receivers, or who read the claims made for the better receivers and just assume that they apply to receivers of more moderate cost. After the purchase has been made, they find it necessary to buy additional filter condensers, more substantial or lower resistance suppressors, "A" line filters, etc. They generally find that the solid metal running-board aerial which came with their receiver will work, but that another type of aerial would work better.

There is hardly a receiver, now on the market, regardless of price, which cannot be made to produce better results by applying a few simple antenna improvements. This subject was covered in a general way, in Service for February. Since that time, many new types of auto-radio aerials have made their appearance and some confusion has resulted.

The Car Antenna

One auto-radio maker, at least, has realized that the antenna is a very important part of his entire assembly and that its ultimate satisfactory performance requires an impedance-matching arrangement between the antenna and the transmission-line, as well as a similar match between the line and the receiver input circuit. However, even this manufacturer does not attempt to do this on any but his most expensive receiver. Therefore, we come back to the idea that the average receiver may be improved by using a suitable coupling system between the receiver and the under-

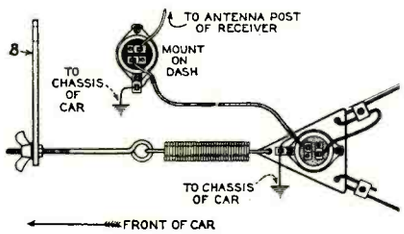


Fig. 4. Triangular type under-car antenna with impedance-matching coupling system.

car aerial, or the roof aerial, for that matter.

Some of the auto-radio manufacturers are now supplying under-car aerials, which are attached to the running boards. They are a very great improvement over the older type of running-board aerial, since two of them are employed, in parallel, with a tie wire between, as shown in Fig. 1. In our former article we mentioned the fact that the shielded transmission-line and impedance-matching transformer, suitable for use with any roof aerial or with the large, triangular type of under-car aerial, would not show any real improvement with the ordinary type of running-board aerial. *The newer double running-board type, because it more nearly approaches the performance of the triangular under-car aerial, can be used to advantage with the impedance-matching coupling units,* as shown in Fig. 1.

The intelligent radio designer and the competent auto-radio Service Man have come to realize that a good antenna system will make even a poor receiver perform well and a good receiver perform wonders.

Auto "Doublet"

The antenna shown in Fig. 2 is a novel adaptation of the running-board type. It is called a "doublet." It is claimed to have a resonant effect at seven meters, which, the makers say, is the approximate wavelength of many auto ignition systems. This resonant effect is said to quench out the car interference. In our own experience on short waves, we have found that most car ignition interference occurs between 15 and 25 meters and that there is but little at 7. Just how the U-shaped tube may be considered a doublet, since both ends are actually part of the same portion of the aerial system, is not understood. Reports from a number of installations indicate that this type of antenna is simple to install and that it performs reasonably well *with the receiver for which it was designed.* The addition of the impedance-matching transformers and transmission-line, shown in Fig. 1, will not improve its performance.

Coupling System

The coupling system shown in Fig. 1 is shown diagrammatically in Fig. 3. It functions in exactly the same manner

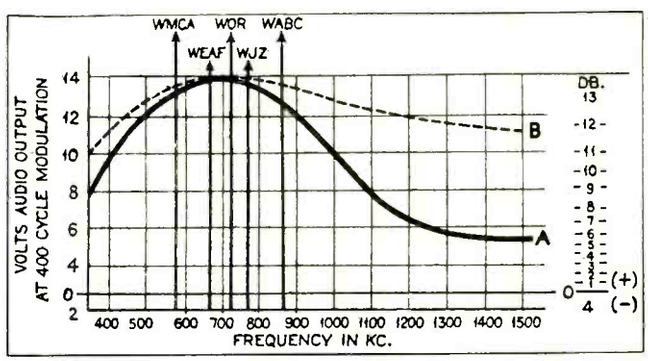


Fig. 5. Showing the effect of adding an impedance-matching coupling system to an auto antenna.

as the No-Stat system which has been so successful in improving home reception in the broadcast band and which has been thoroughly covered in past issues of SERVICE*. The essential difference lies in the physical and electrical design of the coupling transformers. These have been designed to match the regular, triangular, under-car aerials, shown in Fig. 4. *They will improve the performance of any roof antenna* in about the same way that they improve the overall performance of the under-car triangle. It will be seen from Fig. 5 that the radio receiver, attached to the car aerial, in the ordinary way (whether roof, double running board or under-car triangle) will produce the signal strength shown by the zero line. When the lead is shielded in the ordinary manner a drop of 4 db, shown by the line at the base of the graph, results. By the simple addition of the impedance-matching transformers, we secure the gain shown by the curve "A," when measured by a signal generator and suitable output recording device. However, when we consider that most auto-radio receivers are regenerative in certain frequency ranges, we actually bring about the condition shown in curve B.

The improvement in the operation of many thousands of auto-radio receivers, after this system has been installed, is ample proof of its effectiveness.

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Fada Model 166 Motoset

The Model 166 Fada Motoset employs six tubes, has a three-gang shock-mounted condenser, 6-inch dynamic speaker mounted in the new type metal "drum" case with the receiver chassis, and uses the remote type tuning and volume control which may be mounted on the steering column or on the panel. The metal housing is in three pieces which facilitates installation and servicing.

THE CIRCUIT

The complete circuit, with parts values, is shown on the opposite page. Starting at the antenna, there is a stage of tuned r-f using a type 78 tube. Both the input and output r-f transformers employ inductive and capacitive coupling, the capacitive coupling being provided by the single-turn wire loops electrically connected to the transformer primaries and mounted in proximity to the secondary windings. This combination of inductive and capacitive coupling provides uniform sensitivity over the entire broadcast band, the inductive coupling being effective at the low broadcast frequencies and the capacitive coupling being effective at the high broadcast frequencies.

The output of the 78 r-f tube is fed to the control grid of the 6A7 pentode, this section of the tube being used as the mixer or modulator. The triode section of the 6A7 tube is used as the oscillator, the coils for which are shown in the diagram below the 78 r-f tube. The 175-kc output of the 6A7 mixer is amplified in a single i-f stage using a type 78 tube. The output of this stage feeds the diode plates of the 75 tube, in which the upper diode functions as the rectifier and the lower diode, fed through condenser (28), as the avc.

AVC SYSTEM

The avc voltage is developed across resistor (8). This voltage is supplied to the 78 r-f tube and the 6A7 mixer section through the filter resistors (9) and (1). The initial bias for the 78 r-f tube and 6A7 mixer is supplied by cathode resistors (55) and (57) respectively.

Self-bias for the 75 tube is supplied by the cathode resistor (6). Since the upper or rectifier diode is returned directly to the cathode of the 75 tube through the secondary of the second i-f transformer, this diode is at zero bias with respect to the cathode. The lower, or avc diode, however, is returned to ground through resistor (8) with the result that this diode plate is negative with respect to the 75 cathode by an amount equal to the voltage drop across the cathode resistor (6). This negative or cut-off bias on the lower diode therefore provides a delayed avc action with the result that there is no avc voltage placed on the r-f and mixer tubes when weak signals are being received. Consequently the sensitivity of the receiver is at maximum for weak signals, and is reduced only when the signal voltage on the avc diode is sufficient to overcome the delay bias, at which time the avc system goes into action.

THE AUDIO SYSTEM

The 75 triode functions as a voltage amplifier. The control grid of this triode connects to the arm of the volume-control potentiometer, the signal voltage on the grid therefore being dependent upon the position of the control arm. The output of the 75 triode is resistance coupled to a type 41 power pentode which is self-biased by the resistor (56) in the cathode circuit. The output of the 41 feeds the dynamic speaker. A continuously variable tone control, consisting of condenser (43) and variable resistor (37), is located in the plate circuit of the 41 tube.

POWER SUPPLY

The power supply employs a plug-in type vibrator unit which interrupts the current through the primary of the step-up transformer (23). The simulated ac output voltage from this transformer is impressed on the plates of the type 84 full-wave rectifier tube. The filter in the rectifier circuit consists of the choke (22) and the condensers (24). The voltage divider at the output is made up of resistors (12) and (13).

No spark-plug suppressors are required in a car using this receiver. It will be noted from the diagram that interference filters are included in the "A" leads. The filter in the positive lead consists of the resonant choke (21) and condenser (32), and the filter in the negative lead of the resonant chokes (19) and (20) and the condenser (45). Choke (21), the spark-plug filter, is shielded, as indicated in the diagram.

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De Wald Model 605

The De Wald Model 605 is a six-tube superheterodyne with full automatic volume control. The speaker and eliminator are assembled in the same case as the receiver, permitting simple installation. Tone modulation is obtained by turning the knob on the right side of the receiver.

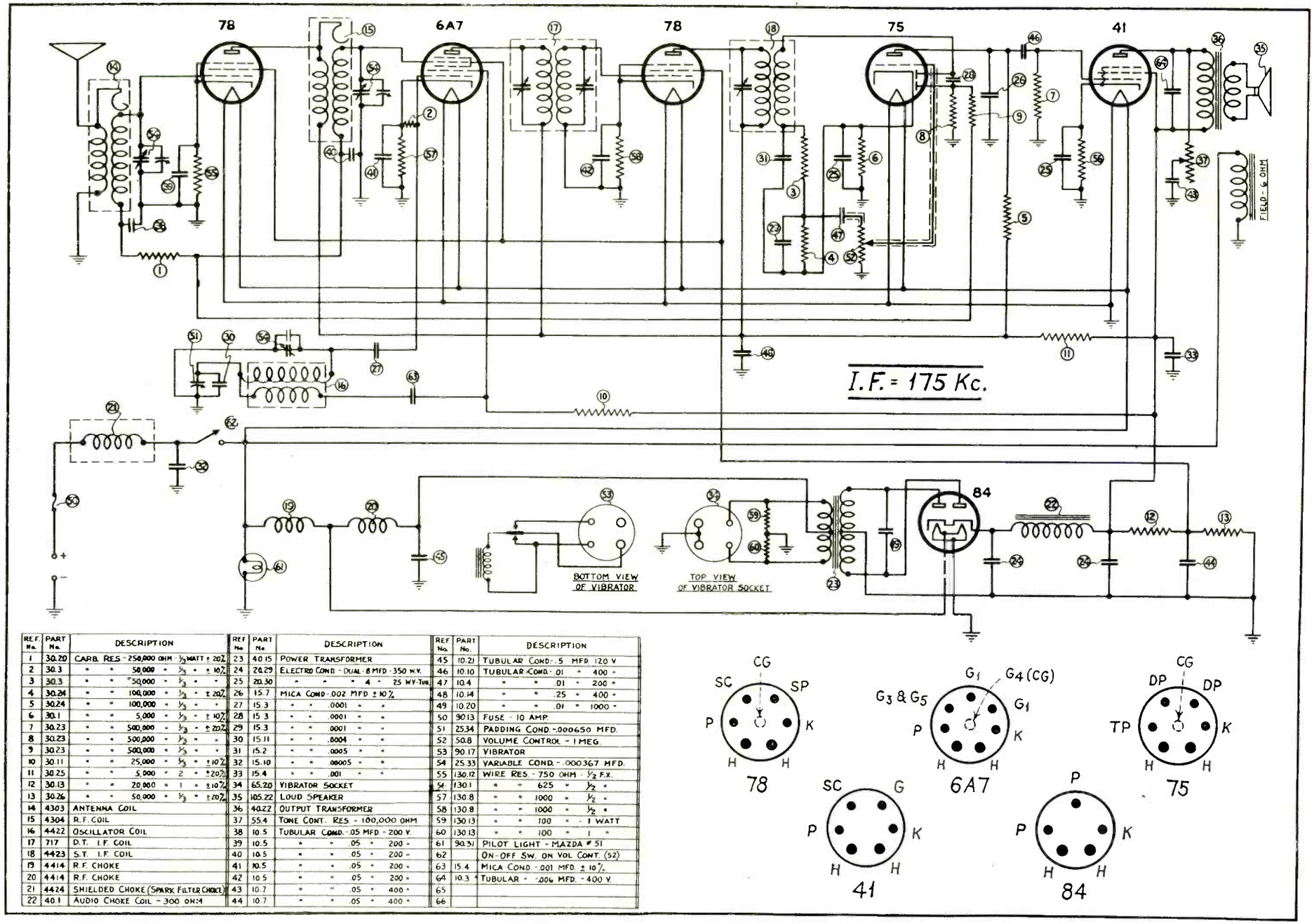
THE CIRCUIT

A study of the accompanying circuit shows that there is a stage of r-f, using a 6D6 tube, having r-f transformers with both capacitive and inductive coupling, to provide uniform sensitivity. The 6A7 tube functons as mixer and oscillator and the 175-kc output of this stage is amplified in the single i-f stage using a 6D6 tube. The output of this stage is impressed on the paralleled diodes of the 75 tube, where rectification takes place. A portion of the diode voltage is fed back to bias the r-f, mixer and i-f tubes. Since the diode plates are returned to ground through the 260,000-ohm resistor, they are negative with respect to the cathode which is positive by an amount equal to the drop across the 4500-ohm cathode resistor. Thus, both detector and avc action are delayed to an equal degree.

With respect to the initial bias for the r-f, mixer and i-f tubes, it should be

(*Continued on page* 212)

*SERVICE: pp. 91, March, 1934; pp. 327, Sept., 1934; pp. 461, Dec., 1934; pp. 68, Feb., 1935.



REF. No.	PART No.	DESCRIPTION
1	30.20	CARB. RES. - 250,000 OHM - ½ WATT ± 20%
2	30.3	" " 50,000 " ½ " ± 10%
3	30.3	" " 50,000 " ½ " "
4	30.24	" " 100,000 " ½ " ± 20%
5	30.24	" " 100,000 " ½ " "
6	30.1	" " 5,000 " ½ " ± 10%
7	30.23	" " 500,000 " ½ " ± 20%
8	30.23	" " 500,000 " ½ " "
9	30.23	" " 500,000 " ½ " "
10	30.11	" " 25,000 " ½ " ± 10%
11	30.25	" " 5,000 " 2 " ± 20%
12	30.13	" " 20,000 " 1 " ± 10%
13	30.26	" " 50,000 " ½ " ± 20%
14	4303	ANTENNA COIL
15	4304	R.F. COIL
16	4422	OSCILLATOR COIL
17	717	D.T. I.F. COIL
18	4423	S.T. I.F. COIL
19	4414	R.F. CHOKE
20	4414	R.F. CHOKE
21	4424	SHIELDED CHOKE (SPARK FILTER CHOKE)
22	40.1	AUDIO CHOKE COIL - 300 OHMS

REF No.	PART No.	DESCRIPTION
23	40.15	POWER TRANSFORMER
24	20.29	ELECTRO COND. - DUAL - 8 MFD - 350 W.V.
25	20.30	" " " 4 " 25 WV-Tubs
26	15.7	MICA COND - .002 MFD ± 10%
27	15.3	" " .0001 " "
28	15.3	" " .0001 " "
29	15.3	" " .0001 " "
30	15.11	" " .0004 " "
31	15.2	" " .0005 " "
32	15.10	" " .00005 " "
33	15.4	" " .001 " "
34	65.20	VIBRATOR SOCKET
35	105.22	LOUD SPEAKER
36	40.22	OUTPUT TRANSFORMER
37	55.4	TONE CONT. RES. - 100,000 OHM
38	10.5	TUBULAR COND. - .05 MFD. - 200 V.
39	10.5	" " .05 " 200 "
40	10.5	" " .05 " 200 "
41	10.5	" " .05 " 200 "
42	10.5	" " .05 " 200 "
43	10.7	" " .05 " 400 "
44	10.7	" " .05 " 400 "

REF No.	PART No.	DESCRIPTION
45	10.21	TUBULAR COND. - .5 MFD 120 V
46	10.10	TUBULAR COND. - .01 " 400 "
47	10.4	" " .01 " 200 "
48	10.14	" " .25 " 400 "
49	10.20	" " .01 " 1000 "
50	90.13	FUSE - 10 AMP.
51	25.34	PADDING COND. - .000650 MFD.
52	50.8	VOLUME CONTROL - 1 MEG.
53	90.17	VIBRATOR
54	25.33	VARIABLE COND. - .000367 MFD.
55	130.12	WIRE RES. - 750 OHM - ½ F.X.
56	130.1	" " 625 " ½ "
57	130.8	" " 1000 " ½ "
58	130.8	" " 1000 " ½ "
59	130.13	" " 100 " 1 WATT
60	130.13	" " 100 " 1 "
61	90.31	PILOT LIGHT - MAZDA # 51
62		ON-OFF SW. ON VOL CONT. (52)
63	15.4	MICA COND. - .001 MFD. ± 10%
64	10.3	TUBULAR - .006 MFD. - 400 V.
65		
66		

Circuit of Fada Model 166 Motoset.

noted that all three tubes obtain this bias from a single 240-ohm resistor in series with the cathode of the r-f tube.

The Audio System

The a-f component of the signal is picked off the 500,000-ohm volume-control potentiometer and fed to the control grid of the 75 triode. This triode, which is self-biased, is resistance coupled to a type 41 power pentode, also self-biased. This tube in turn feeds the dynamic speaker. The plate circuit of the 41 contains a two-point tone control, consisting of a switch and a .015-mfd condenser.

The Power Supply

The power supply consists of a vibrator unit, a step-up transformer and a type 84 full-wave rectifier. The filter in the output of the rectifier circuit consists of a choke and two 8-mfd condensers.

It should be noted that the "A" circuits are well filtered to eliminate ignition interference. These filters consist of 35 mh r-f chokes and 0.5-mfd condensers.

Noise Suppression

This receiver has been designed to operate without the use of either spark-plug or distributor suppressors. If the ignition system is faulty, or if the set is installed in an old model car where the ignition system radiates badly, it may be necessary to place a suppressor at the distributor in series with the main high-tension lead. If spark-plug interference is still noticed, it may also be necessary to place a suppressor on each plug.

It is important that all items and connections in the electrical system of the car be in good condition. If excessive noises are present it may be well to examine the following points:

(1) *Ignition Coil*: In cases where noise is originating from the ignition coil, it may be overcome by placing a copper shield around the coil and grounding it.

(2) *Storage Battery*: Battery may be run down or have a poor cell.

(3) *Battery Cables*: May be corroded at the battery and are making imperfect contact. Keep all battery cables and wires away from the high-tension system. It may also be of advantage to place a choke coil of about 50 turns of No. 18 wire in series with the main battery lead to the set.

(4) *Distributor Cables*: Cables may be leaking due to poor or burned insulation. In some installations it may be necessary to shield the high-tension leads with copper braid. If ignition cables are insulated with plain rubber insulation it is not advisable to place shielding directly over the wire. In this case the wire should be first covered with a varnished composition covering or loom. The battery lead from the ammeter to the distributor coil and the battery lead to the generator should be shielded.

(5) *Dome Light Wire*: If dome light wire is radiating it may be necessary to shield this wire. A single 0.5-mfd condenser, or a double 0.1-mfd condenser and choke, connected at the point where the dome light wire enters the upright post, will clear up this trouble.

(6) If noise is still heard after the above tests it may help to ground the "far" end of the antenna shield.

Alignment

Connect test oscillator to grid of 6A7 and ground, and peak the i-f transformers at 175 kc. Ground the stator of the oscillator condenser during this operation.

For r-f alignment, connect test oscillator to antenna and ground. Set dial at 1500 kc and align trimmer condensers on variable gang condenser for maximum signal. For low-frequency adjustment set dial at 600 kc and rock padder to match variable condenser setting of r-f and first detector.

•

RCA Victor Model M-101

The circuit diagram of this auto receiver is shown in Fig. 1. In sequence, there is an r-f stage, a dual first detector-oscillator stage, a single i-f stage, a second detector-a-f amplifier-avc stage, and a pentode output stage. Five tuned circuits operate upon the desired signal, thus insuring freedom from interference.

(*Continued on page* 214)

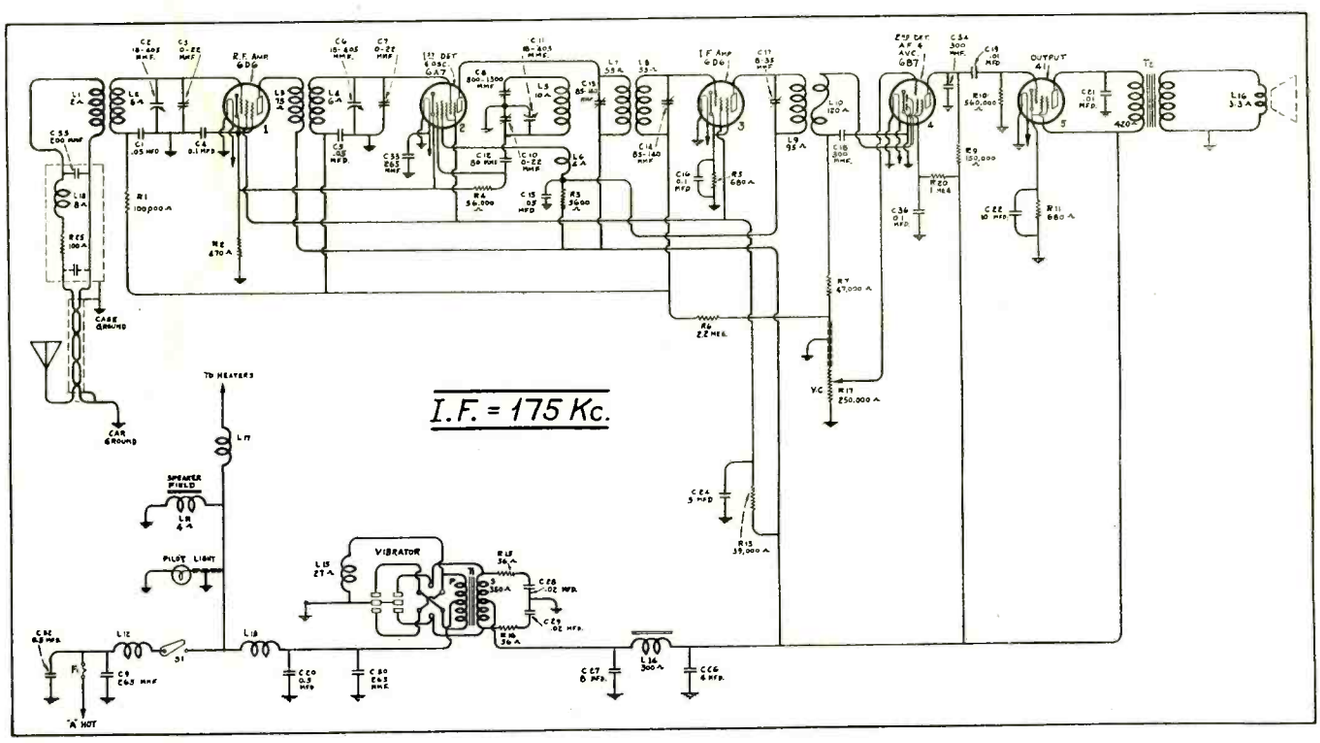


Fig. 1. Diagram of RCA Victor Model M-101.

ASSOCIATION NEWS . . .

INSTITUTE OF RADIO SERVICE MEN REPORTS

NEW YORK AREA

The Executive Committees of all the Chapters in the New York metropolitan area, including those in New Jersey, have held two joint meetings to make preparations for regional expansion and taking up the activities incidental thereto. The first of the meetings held during April was adjourned until May 3.

CLEVELAND CHAPTER

The Cleveland Chapter reports aggressiveness in the matter of technical lectures and general activities of the Chapter. Clark Quinn, Chairman of the Technical Papers Committee, collaborating with the other members of the group, has prepared and is delivering a series of lectures on the subject of the "Cathode-Ray Oscillograph." The talks will all be of a technical nature with a view to the practical applications of the apparatus. The Technical Papers Committee at Cleveland has been very active for months. The members design and then construct the equipment that is used to demonstrate the lectures that follow.

An announcement comes from Edward Dey, Secretary of the Cleveland Chapter, telling that the meeting on May 6 will be held at the factory of the Shelburne Radio Manufacturing Company and that the members will be the guests of the company on that night.

MILWAUKEE CHAPTER

Mr. Sam Snead, formerly head of the Radio Department of the University of Wisconsin Extension Division in Milwaukee, delivered a lecture on the "Otoflex" at a meeting held April 16. The "Otoflex" is a device to aid the deaf to restore their hearing, a piece of apparatus on which Mr. Snead has worked for several years. The presentation of this lecture brought forth the information that devices such as the "Otoflex" will require the attention of qualified radio Service Men, so that in the future physicians and others will be prospective customers for the men who are capable of handling the service on special electronic apparatus.

An announcement from Milwaukee also states that Edward Pehoski, Treasurer of the Chapter, has expanded his activities and has moved into more commodious quarters.

CHICAGO CHAPTER

The Executive Committee of the Chicago Chapter held a meeting on May 1 to make preparations for expansion of Institute affairs in the Chicago area. Members of the Committee include: Walter Marsh, Chairman; B. F. Zinser, Membership; Walter Bennett, Arrangements; Edward Pawlak, Papers; and Russ Jimieson, Entertainment; Louis Gamache and S. A. Gazinski will collaborate as Chairmen of the Fellowship Committee. The entire group as aforementioned is in addition to the elected officers of the Chapter, J. B. Durham, Chairman; Tom Hogan, Vice-Chairman; Worden Mann, Secretary, and R. L. Easterbrooks, Treasurer.

Among the various plans that were discussed were those having to do with the Regional activities for the area incorporating parts of Illinois, Indiana, and Wisconsin. Other Chapters in the Region are to be communicated with for the purpose of selecting the Regional officers and the working out of a collaborative program in which all Chapters will participate.

20TH REGION

Arthur Lynch, President of Arthur H. Lynch, Inc., made a tour covering most of the Chapters of the 20th Region during the month of April. Communications received from Mr. Lynch contain highest commendations for the members and other Service Men in the area which he has just visited. The tour was arranged by the Regional Committee of the 20th Region.

The 20th Region added another Chapter to its ever-growing list during the last month when the Service Men in Cortland, N. Y., joined the Institute's ranks. John Rose, Chairman of the 20th Region, and his fellow officers are determined that the 20th Region shall be most completely organized before the end of the year so that the Service Men there can more effectively carry out the principles of the Institute, advance the service profession and insure the continuing welfare of the radio industry.

ROCHESTER CHAPTER

The Rochester Chapter announces that arrangements have been completed for the Convention and Trade Show to be held in conjunction with the Rochester Exposition the first week in September. The Exposition is an established affair and is visited annually by over 100,000 people. More about this later.

CERTIFICATION OF SERVICE MEN

Although the Committee on Professional Status had intended that the final information should go to the members of the Institute for their approval during the month of May, the work connected with the entire plan has been too great to permit full correlation of all data. Consequently, the submitting of the plan to the membership will necessarily be held over until June.

The response of the membership on a semi-final presentation of the Certification Plan about sixty days ago showed that better than 99 percent of the members are in favor of the program in general. Comments received from members were of such a nature as to enable the Committee to make adjustments that would serve to make the plan more effective from the start. Those who voted any objection of any sort did so in a constructive manner, and their objections were minor, and easily adjusted.

Recent investigations have showed that, generally speaking, the radio set manufacturers are vitally interested in the Certification Plan. They see in it, at last, a definite and comprehensive way to insure the most satisfactory and most intelligent service on the radio sets of the nation.

NORTHWEST RADIO SERVICEMEN'S CONVENTION

The largest Service Men's Convention ever held in the Northwest, and sponsored by the Northwest Radio Servicemen's Association, the Minnesota Radio Servicemen's Association and other allied organizations, took place May 5, 6 and 7 at the West Hotel, Minneapolis, Minn. Service Men from Minnesota, Northern Iowa, North Dakota, South Dakota and Western Wisconsin attended.

Mr. W. J. Kantenberger, of Dallas, Texas, publisher of the *National Technician,* made a special trip across country to be on hand at the gathering of the boys from the Northwest. His speech with regard to the future of the servicing profession was well received. Mr. Kantenberger advocated training in business ethics, the removal of the untrained Service Man and general cooperation in the profession so that the public may be guaranteed a square deal—if not an entirely new deal, for that matter.

Speakers for the three days included John Burgess, W. J. Kantenberger, Walter Jones, Charles Herbst, F. E. Wenger, Ralph Schnaber, Boyd Phelps and Robert M. Karet. Mr. John Rider, who was scheduled for a talk on Monday evening, was unfortunately unable to attend. The plane he took was forced down twice—giving up entirely the second time.

More than $10,000 worth of equipment was on display during the Convention. There were prize drawings Tuesday afternoon, after which visits were made to places of interest in the Twin Cities.

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RADIO TECHNICIANS ASSOCIATION

April 13, 1935, was a red-letter day in Cleveland, for this day the new radio Service Men's group was granted a charter bearing the name of "Radio Technicians' Association" with the following officers: Elmer Myers, 10023 Madison Ave., Chairman; J. Robinson, 1385 West Blvd., Secretary; Gus Rosell, 1130 E. 113 St., Treasurer. The officers and members wish to extend their sincere thanks for the wonderful cooperation manufacturing and service associations have given them.

Closed meetings for members only are held the second and fourth Mondays of each month, where business of the association and the radio servicing problems of the city are discussed.

•

R. T. G. MEMBERSHIP

The Radio Technicians' Guild of Massachusetts is increasing its membership and effectiveness here in Massachusetts. Any active Service Man is eligible provided he has real experience or is a graduate of a recognized school. That its organ is worthwhile is proven by the fact that other radio magazines are taking its cue on what really is of interest and help to the service industry. Several smaller local organizations have asked admittance as members.

Our meetings are held on the fourth Monday of every month, generally at the Hotel Lenox, Boston. Any further information may be secured by writing to the Secretary.

(Continued on page 228)

Summertime is PROFIT TIME *for Servicemen who feature these Lafayette* SALES BUILDERS!

This great Spring and Summer Catalog points the way to Summer Profits for the alert Service Man. Its 128 pages are filled with timely merchandise . . . the kind that's most in demand during the warm weather months.

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Vacuum Tubes and Their Applications

The fourth of a series of thumb-nail sketches on the characteristics and functions of vacuum tubes and how they are applied to modern radio-receiver circuits. . . . THE EDITOR

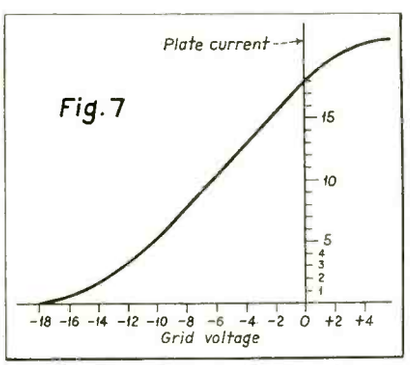
In March we were considering the three-element tube and its use as an oscillator. The tube was connected as shown in Fig. 10 and biased as in Fig. 8-B, i.e., functioning as an amplifier. Hence any variation in microphone current would be transformed into voltage applied to the grid of the tube. This voltage would be amplified and transferred back into the grid circuit. This second and larger voltage applied to the grid would repeat the process, so that the pulse of voltage would continue to be conducted around the circuit.

Now, suppose that the microphone of Fig. 10, were disconnected and headphones inserted in its stead. We would then hear a tone which is generated by the vacuum-tube circuit of Fig. 10. In other words, we have a vacuum-tube oscillator or generator. We need not have started the action of the oscillator by means of a microphone. Any shock to the circuit, such as the closing of a switch in the circuit or the jarring of a tube, would have started oscillation, the natural frequency of which would be determined by the constants of the transformer and of the tube.

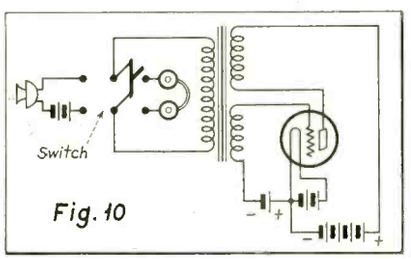
It is evident, that the three functions of a vacuum tube, that is, amplification, detection and oscillation, are readily obtainable in a three-element vacuum tube. Only one of these functions is readily possible with the two-element tube . . . detection.

Positive Grid Bias

Now let us see what would happen if the grid of a triode tube were to be driven positive with respect to the cathode. It will be noted from the curve of Fig. 7, that the rate of change of plate current with grid potential is very great for potentials negative with respect to the cathode or filament. However, this is not the case when the grid is driven positive with respect to the cathode. This flattening off of the curve with positive grid potential is not due so much to actual saturation, which has been previously explained, as to the fact that grid current begins to flow as soon as the grid becomes positive. Most of the surplus current is therefore taken by the grid circuit. Now, of course, the grid-current flow is of no benefit and as it will be shown later, may be very harmful indeed. Moreover, if the potential of the grid were increased still further a point would eventually be reached at which the grid would glow, due to the large flow of current in the grid circuit. Of course, any heating of the grid of a tube is dangerous to the tube in that it may permanently deform the grid and thus alter the characteristic of the tube. Moreover, for very large grid currents the amplification of the tube would be very seriously reduced. For these two reasons it is customary in all but a few special circuits to bias the grid negatively and to see to it that the voltage variations of the grid in a positive direction never reduce the instantaneous grid potential to zero.

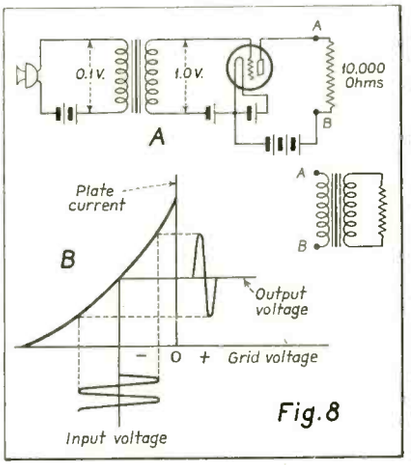


Typical plate current - grid voltage characteristic of three-element tube.



Circuit used for illustrating triode used as an oscillator.

Inspection of the curve of Fig. 8-B will indicate that the steeper the characteristic the greater the amplification. Now the characteristic curve of the tube may be made steeper either by decreasing the spacing between the grid and the cathode or by inserting more wires in the grid so that the openings between the wires are smaller. Either of these changes will increase the control exercised by the grid on the electron stream. The slope of the characteristic curve is proportional to the amplification factor or mu of the tube.



A shows mike connected to grid circuit of tube. This is an amplifier arrangement. Resultant input and output voltages shown at B.

Plate Impedance

Another important characteristic of a vacuum tube is its plate impedance or plate resistance. This is determined largely by the separation between the plate and the cathode. Of course, the plate impedance varies with grid potential; that is, when the grid is very negative the plate impedance is very high, and when the grid is only slightly negative the impedance is relatively low. The dc plate resistance may be obtained from Ohm's law by dividng the plate voltage by the plate current. In the usual triode tube operated as an amplifier the ac plate resistance is about half the dc plate resistance. This is a fact which should be kept in mind, since it serves as a useful rule by which the characteristics of strange tubes may be evaluated. Likewise, the amplification constant of the vacuum tube may be evaluated by dividing the plate-voltage change by the grid voltage necessary to produce it. Thus, if a 1-volt change in grid voltage produces a 10-volt change in the tube plate circuit the amplification or constant of the tube is 10. This is readily seen from a study of the tube characteristics.

(To be continued)

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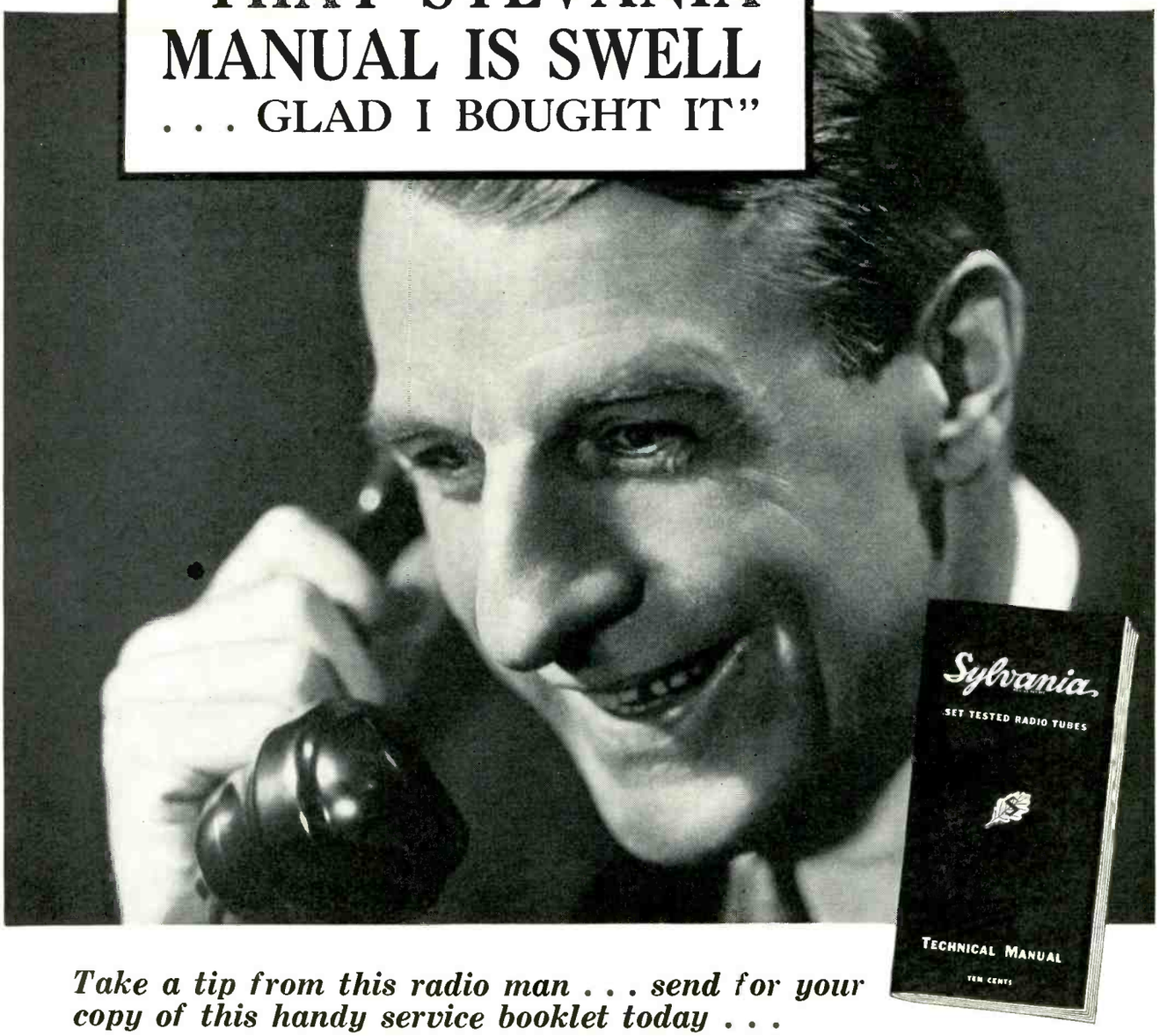

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however, are conventional and require a regular output transformer. This has the usual low and medium impedance secondaries for voice-coil and line connections.

The filaments of the tubes run directly off the car battery. Plate supply is furnished by a dynamotor, fitted with a filter system to eliminate commutator ripple.

General Details

The whole amplifier, including the dynamotor, is contained in a steel box measuring only 12 by 7¼ by 7½ inches, which is readily mounted under the dashboard. On the front panel are the main batery switch S-1, the tone-control resistor and a pilot light. The driver of the car can easily reach for these and turn them on or off when he starts or stops the car.

The gain control R-1 and the dynamotor switch S-2 are also mounted on the amplifier panel, but are cable-controlled from the steering column. This arrangement permits the tubes to remain lighted (once S-1 has been closed), and at the same time allows the driver to cut off the dynamotor when the microphone is not actually being used. The car's battery is thus relieved of the heavy load of the dynamotor during idle periods.

For AC Operation

The amplifier as described is complete for six-volt service. For ac operation, a separate little power pack is supplied. This consists merely of a power transformer, 83 rectifier and filter, with a separate filament winding for the tubes in the amplifier. A plug-and-cable arrangement (omitted from the diagram so as not to complicate the latter) enables the Service Man to shift from battery to ac operation in a few seconds. The plug connections are so fixed that the plus lead from the high-voltage dynamotor is opened when the ac pack is used; otherwise, of course, the dc from the power pack would make the dynamotor run backwards, generating six volts on the input side!

Characteristics

The technical characteristics of the amplifier are as follows:

Peak output: 18 watts.

Maximum output into plate impedance: 15 watts.

Maximum output into 500-ohm line: 12 watts.

Harmonic content at rated maximum outputs: 6 percent.

Gain: 104 db.

Power consumption: 84 watts (14 amperes from six-volt battery).

The high gain of 104 db allows the use of crystal microphones without the bother of pre-amplifiers. The output of 12 watts means that the system will fill the average hall or meeting place with plenty of reserve.

Although the ac pack is intended for fixed indoor service, there is nothing to prevent the Service Man from carrying it in the car and plugging it in if the car is to stop at some street corner and an ac line can be strung quickly into a nearby store.

Indoor Use

When the amplifier is to be used indoors, the two flexible cables are unhooked at the panel end, the battery and speaker leads pulled out, and the whole case lifted off its single mounting bolt. Regular knobs are put on the R-1 and S-2 shafts, and the amplifier is all set for further service. The control unit may be left permanently on the steering column.

The Loudspeakers

The loudspeakers required for a sound amplifier of this kind may also be of the convertible type. They should be designed for six-volt field operation, so that they can be used directly on the car's battery for portable work and on a simple 110-volt power pack, giving rectified dc at six volts, for ac work. The whole system is thus truly "convertible", and the Service Man who uses it will be able to shift it around easily and conveniently.

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RCA VICTOR MODEL M-101

(*Continued from page 214*)

should be set for maximum, while C-14 and C-13 should be roughly adjusted for maximum and then carefully trimmed so that a flat-topped response is obtained. This may be checked by shifting the test oscillator frequency through a range 2 kc each side of 175 kc and noting whether or not the receiver output remains substantially constant.

R-F Adjustments: Connect test oscillator to antenna and ground and tune to a frequency of 1400 kc. Also tune receiver to same frequency.

Adjust oscillator trimmer, C-10; detector trimmer, C-7; and r-f trimmer, C-3, for maximum.

Set test oscillator and receiver to 600 kc and adjust the oscillator trimmer C-8, simultaneously rocking the tuning condenser slowly through the signal until maximum output is obtained. This adjustment should be made irrespective of dial calibration.

Recheck the adjustment of the 1400-kc oscillator trimmer to correct any reflective errors.

Circuit Voltages: Voltages are given in Fig. 2. Values given should hold within plus or minus 20 percent.

Speaker Cone Alignment: In the event the voice coil becomes misaligned, it will be necessary to correct its position by an adjustment provided on the speaker assembly. A small round-head brass screw installed on pole piece adjacent to the terminal strip is used to clamp the cone coil mounting. To center the cone, loosen the screw and insert a small 1/16-inch rod or nail into the hole next to the screw and pry the coil mounting into the position giving normal speaker operation. Retighten screw.

•

RCA Models 60-66 Volume-Control Action

I have had many problems of volume control confront me here in this Chicago area of high-power stations.

Many sets using type 24 tubes will mush when turned to low volume on these strong signals and others will not turn them down at all. This usually shows up when new tubes are purchased.

I submit a cure for RCA Models 60-66, and similar receivers: Remove the cathodes of the first r-f and i-f tubes from the old wiring and insert a 25,000-ohm volume control between cathode and ground, using an antenna short arrangement.

If this still permits a strong station to come through on "off" position, place a 300,000-ohm resistor from cathode to B plus r-f. This cures the mush on low volume position in these sets and permits gradual control of volume. Also, place a 500-ohm resistor across the old volume control position.

In other sets using type 24 and 35 tubes, a cathode-to-ground volume control will usually cure the trouble. When more volume-control action is needed, bleed a little more current through the control by placing a resistor from cathode to B plus r-f of the correct size to raise the voltage drop in the control the required amount, as shown in Fig. 2.

C. L. Fairchild.

•

Crosley 124

Intermittent reception. Set would go completely dead for minutes or hours, then come on again. I finally located the trouble in a small bathtub type can containing four condensers. As this can is underneath several other units and hard to get at, it probably would be the last thing to be tested.

J. Ralph Steen

Public Address . . .

PROFITS FOR THE SERVICE MAN IN PORTABLE SOUND SYSTEMS

BY HUBERT L. SHORTT

IN conducting a course of technical instruction on sound systems for a large group of radio Service Men during the past winter, the writer had the opportunity to question many practical, independent service specialists, and learned some interesting things about their use of portable p-a amplifiers in the field.

It seems that most auto amplifiers are used only a few weeks during the year, usually for ballyhoo purposes around election time, and that they gather dust the rest of the time. Occasionally a ballyhoo job for a merchant running a sale will turn up, but in the main, election time is the real "season". The Service Men's complaint is that an amplifier for this irregular amount of business represents a considerable investment and that it takes a couple of years to pay for itself.

Greater Flexibility

What are needed, say these men, are sound systems of greater flexibility. They should not be limited in application to automobiles alone, but should be capable of ac operation as well, so that they can be used indoors during the winter for lodge meetings, card parties, dances, and similar affairs. Thus the income from these rentals will help pay off the cost of the apparatus very quickly, and everything from then on is so much "velvet".

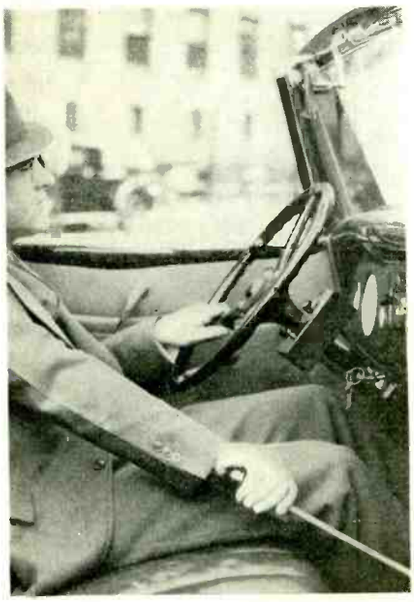
Convertible Amplifier

Very fortunately, the growing standardization of the 6.3-volt type of tubes has made the design and construction of fully convertible amplifier systems altogether practicable. A technical description of one such system, designed by the writer, may be of interest to Service Men who like to keep informed on developments relating to their business.

The primary idea was to make the system a one-man outfit, suitable for easy installation in the family "bus", which serves as transportation for the majority of Service Men. Simplicity of control was another important consideration, as the Service Man must be able to drive the car while the amplifier is blasting away.

Tube Complement

Good use has been made of the newer combination tubes, particularly the 6A6 and the 6B5. As the diagram shows, the circuit comprises one 6C6, one 6A6 and two 6B5's, which are actually the full equivalent of *seven* ordinary tubes. The hookup is easy to follow.



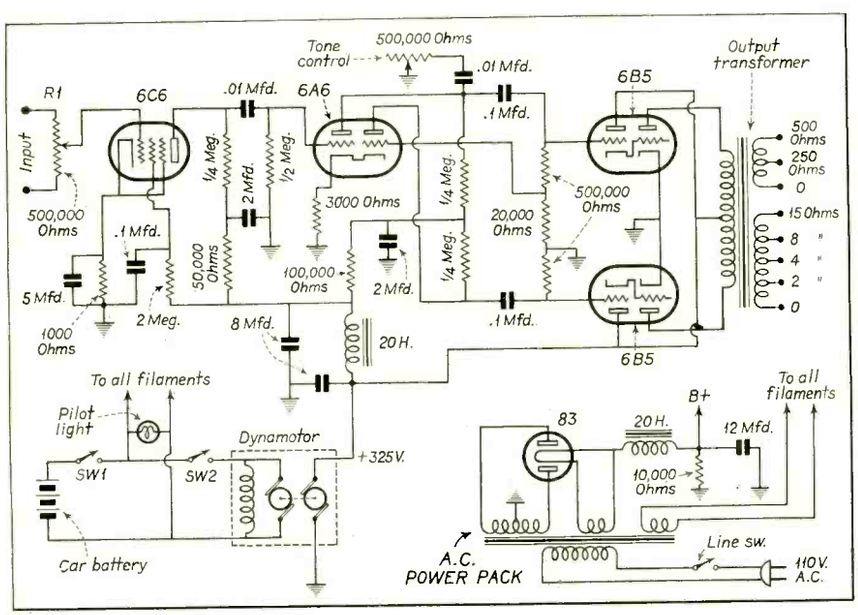
The author at the wheel of a car equipped with a convertible sound system. Note the control unit on the steering column.

The microphone (the crystal type is recommended) is connected across a 500,000-ohm potentiometer, which is the "gain" or volume control of the system. The arm of the pot goes to the control grid of the 6C6, which functions as a straight pentode amplifier, resistance-capacitance coupled into a 6A6 double triode.

Phase Inverter

The 6A6 works as a phase inverter to give all the advantages of push-pull amplification without the use of interstage transformers, which are costly and notoriously subject to hum pickup and coupling troubles. The trick in phase inverters of this kind is the tapping of the grid-leak resistor of the first tube following the inverter, with the tap run back to the control grid of the second triode section of the 6A6. This simple connection results in the grids of the driven tubes (the 6B5's) being operated 180 degrees out of phase, the condition necessary for real push-pull amplification.

The 6B5's comprise, in effect, four tubes. The triode sections consisting of the floating cathode, grid and plate are driven in push-pull by the 6A6, and they in turn drive the second triode sections in push-pull. No coupling transformer is needed between the two sections because of the unique internal construction of these tubes; that is, the cathode of the first triode section is internally connected to the control grid of the second section. The plates of the first sections are connected directly to B plus. The plate circuits of the second sections,



Complete circuit of the convertible auto amplifier described in the article.

Current is obtained from the 6.3-volt car battery. This current is filtered through several chokes which are bypassed to ground by a number of condensers. These filter elements provide a great reduction in the amount of interference conducted into the r-f circuits.

Antenna Noise Filter

Beginning at the antenna circuit, there is a special transmission line and noise filter circuit, which, in conjunction with the tuned input system, acts selectively to the entire broadcast range and drastically attenuates signals and interference outside the limits of the band. These properties of the filter circuit and minimizing of primary-to-secondary capacity coupling in the first r-f transformer cause a considerable reduction of the ignition noise present when the car is in operation. The ground of the input coil does not appear at the usual point on the chassis frame, but instead is extended as part of the antenna transmission line lead-in to the outer termination of the shield, where it grounds to the frame of the car. This arrangement prevents r-f disturbances which are circulating in the car frame (ground) from becoming mutual to the receiver input. The characteristics of the transmission line section of the antenna lead-in wire are such as to favor the operation of the noise filter. Its distributed capacity due to length, conductor sizes, insulation, etc., is of such value as to operate with the inductance and capacitance elements of the input system to obtain a band-pass filtering effect. The filter has an acceptance band between 540 and 1600 kc, and sharply defined cut-off below and above these two limits. It is generally possible, because of this input arrangement, to dispense with the usual spark-plug and distributor suppressors without encountering excessive ignition interference on the latest types of cars.

Receiver Circuit

The signal input from the antenna feeds a 6D6 tube in the r-f stage. This tube is transformer coupled to the 6A7 mixer-oscillator where the signal is converted to 175 kc. The signal is then amplified in the single i-f stage and finally impressed on the parelleled diode plates of the 6B7 tube. The signal is rectified in the diode circuit and a portion of the voltage developed across resistors R-7 and R-17 is used for automatically biasing the r-f, mixer and i-f tubes. Initial bias for the r-f and mixer tubes is supplied by the cathode resistor R-2, while initial bias for the i-f tube is supplied by the cathode resistor R-5.

The biasing arrangement in the circuit of the 6B7 tube is slightly different. The cathode of this tube is directly grounded, as are, also, through resistors, the diode plates and the control grid of the a-f pentode section of the 6B7. Consequently, under no-signal conditions, there is no bias present on either the paralleled diodes or on the pentode control grid. In so far as the diodes are concerned, this absence of bias merely means that there is no delayed action of either rectification or avc. In so far as the control grid of the a-f pentode is concerned, it is at zero bias under no-signal conditions, in which condition plate current would be excessive were it not for the current-limiting resistor in the plate circuit. This resistor—the usual plate resistor employed in a resistance-coupled circuit—prevents excessive plate current from being drawn.

As soon as a signal appears on the diode plates, a voltage is developed in resistors R-7 and R-17. Since there is no blocking condenser in series with the volume-control potentiometer arm and the control grid of the a-f pentode, there is a biasing voltage impressed on this grid, the extent of the voltage depending upon signal strength and the position of the potentiometer arm. In any event, this dc voltage applied to the grid prevents overload as the volume control is advanced. In other words, good, old diode biasing or audio-frequency avc.

Synchronous Rectifier-Vibrator

High voltage for plate and bias supply is generated by inversion, transformation and mechanical rectification; these three functions occurring in the synchronous rectifier-vibrator. This vibrator is adapted for convenient removability by having its base constructed for plug-in mounting. Simple means are provided for correcting the vibrator input to agree with the ground polarity of the car by having the vibrator reversible. The vibrator may be inserted in two possible positions. As normally shipped, it is plugged in to operate with positive car ground. On a car having negative ground, it will be necessary to withdraw the vibrator, rotate the unit 180 degrees and re-insert into the new position.

Service Data

Dial Calibration: The tuning-condenser flexible shaft operates the dial pointer through a gear mechanism within the control unit. To adjust their mechanical relations so that accurate scale calibration obtains, rotate the station-selector knob until the variable tuning condensor is at full mesh, which will carry the dial pointer to its minimum frequency position; then remove the tuning knob, loosen the set screw in the bushing and rotate the bushing until the pointer sets exactly opposite the last radial line at the low-frequency end of the scale.

I-F Adjustments: Three trimmers are provided in the i-f system, two on the first transformer and one on the second transformer. Their locations are shown in Fig. 2.

Tune test oscillator to 175 kc and connect its output to the first detector control grid and ground. Tune receiver to point where no signals are received. Then adjust trimmers C-17, C-14 and C-13, in order. (See Fig. 2). C-17

(*Continued on page 216*)

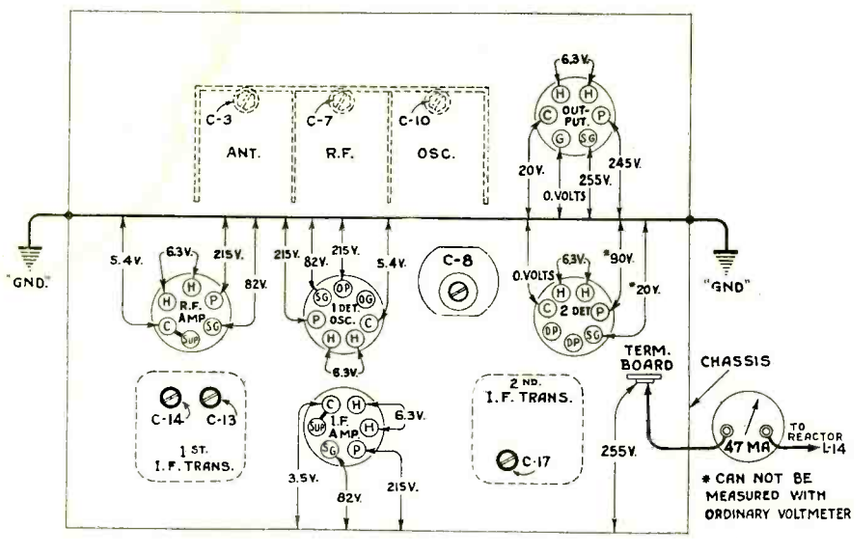
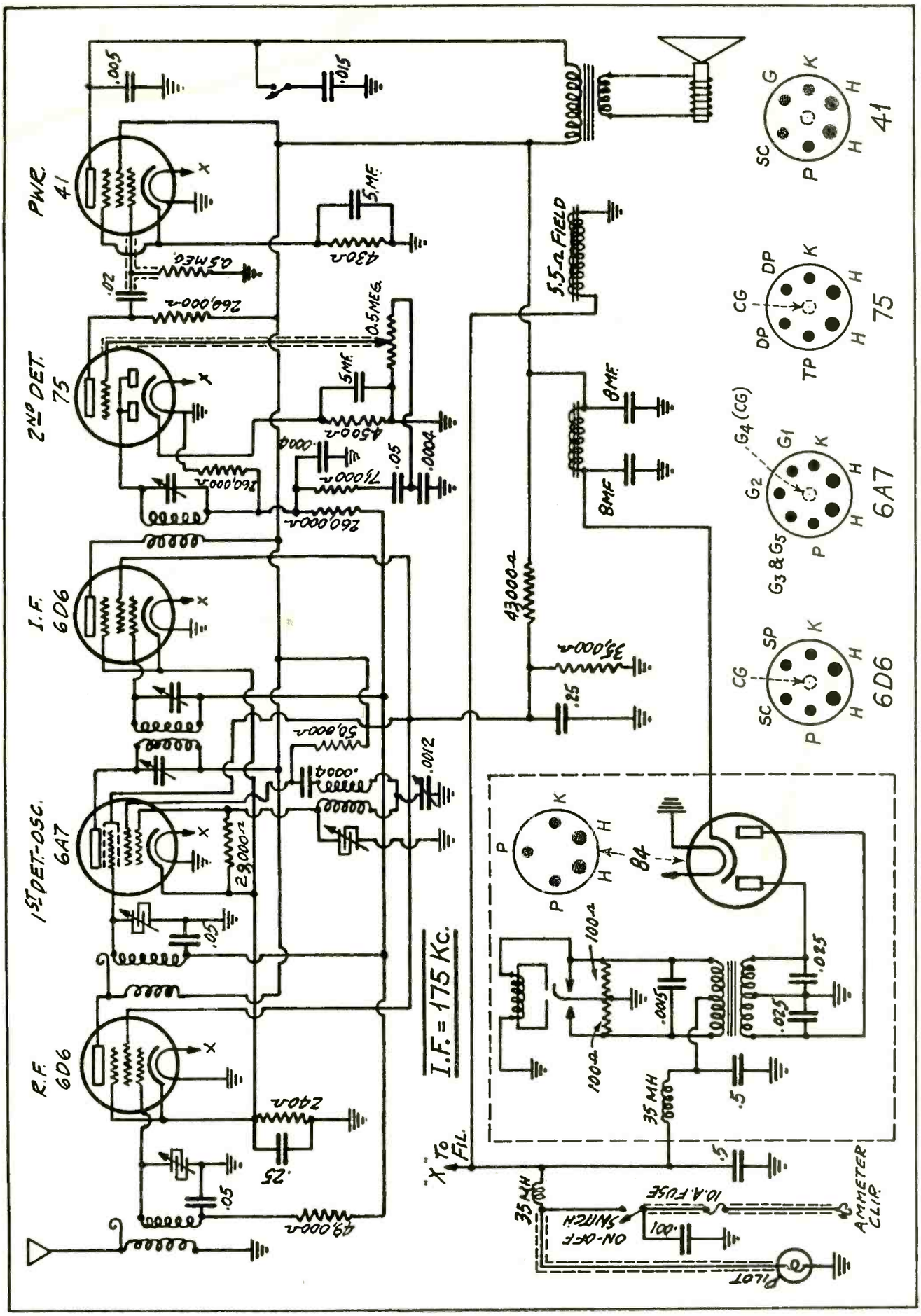


Fig. 2. Chassis of RCA Victor Model M-101.



Schematic Diagram for De Wald Model 605.

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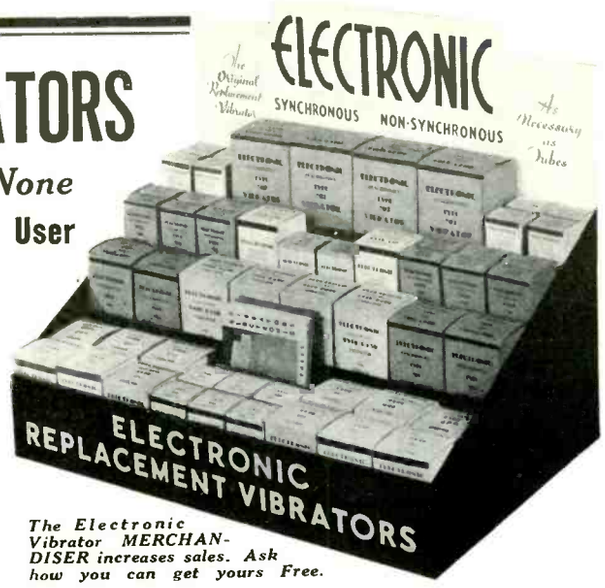

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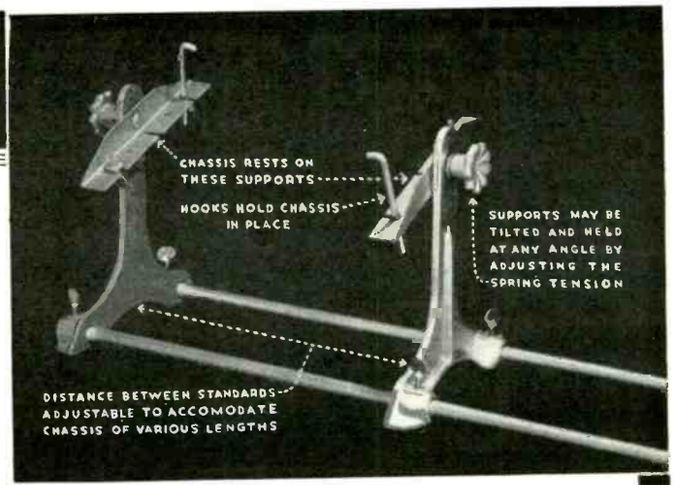
5. Prevents breakage of dial or bending of same.
6. Prevents condenser assembly frame from being bent out of alignment.
7. Prevents solder from dropping in sets by incorrect position of set.
8. Prevents insufficient light to parts by incorrect angle.



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THE FORUM . . .

THE SERVICING GAME

Editor, SERVICE:

You will have to excuse the pencil and stationery, but I am laid up in the hospital for several months and this is the best I can do. However, while here I have had plenty of time to read and think, and have spent considerable time pondering on the problems of the radio Service Man. I have been a radio Service Man ever since there were radios to service, having been in the "game" continuously since 1913 in some capacity or other.

I think that the cut-rate artist has an argument. He has nothing else to sell except prices. He knows it, puts on the best front he can and tries, in the only way he knows how, to get business. Of course, as is usually the case, he over-charges on parts to make up for what he should have charged on service. It is his only alternative, as he *has to make a profit,* even if he is posing as a cut-rate Service Man.

The radio service game is what might be called a border-line profession. That is, Service Men can hardly rate professionally with the doctors, and, on the other hand, the good Service Man rates professionally above the plumber and the electrician. Whether or not the service profession in the future will tend to more nearly deserve to be called a true profession or not is still a question in my mind, but it will depend, to a large extent, upon the success of such organizations as the I. R. S. M. plus possible legislation, which is rather impossible (the legislation, I mean).

One of our chief problems is that we include in our personnel men of very wide extremes in training, age and experience. I know Service Men who are university graduates, fine appearing, highly ethical, and with years of experience. I know others who possibly are 17 or 18 years old, never went beyond sixth grade in school, but like to "monkey" with electricity and radio, and have set themselves up in the radio service business. It is really asking a lot to expect two men of these extremes to work in the same locality on the same professional plane, even if they are both fine, reasonable fellows. Their outlook is different and they go at things in a different way, even with the best of intentions. Incidentally, it would be extremely difficult for either one to drive the other out of business. Each would have his own clientele. I have seen things work out this way.

There is another peculiar angle: Isn't it rather a joke to call in a highly trained radio service engineer with his oscilloscope and what-not to fix a $9.95 super bloop-a-doop? There is something incongruous about the whole affair. Yet, it may often take such a man to fix such a wreck, and sometimes he can't do it for a charge less than the price of the set if his costs are figured correctly. What to do?

Well, what's the answer to all this? I do not believe that there is an answer at the present time. Things will eventually work out, of course, as they always do. We can, however, as professional Service Men do many things to help along. We can support the I. R. S. M. in its program, unless we are sure we have something better. We can keep our own house in order. We can keep our prices up to the point where, with a reasonable amount of work, a net profit will be shown, and this means from $1.00 to $2.00 a call minimum, depending on local factors.

All you kids who read this, learn what a professional attitude is, and then *get that way yourself.* Raise your own standard by studying and observing, and you will be more respected in your community and make more money. Join the I. R. S. M., the local Rotary or Kiwanis and the local Association of Commerce. Get that hang-dog look off your face. Act like a professional man, proud of his profession, and you will be treated as such. Take off the overalls and dress up. Buy modern equipment and Service Manuals, and keep your prices high enough to pay for them. How will you ever get them if you don't? Remember, you will need new service equipment every year, and the car won't last forever. Advertise consistently and continually, but never mention price. You don't know the price, anyway, until the job is done, so don't make too much fuss about it before hand.

Further, get together with that cut-rate artist down the street and bring him up to your level, and don't drop to his. It will be better for both of you and also for the grand and glorious profession of radio servicing.

G. W. VAN SLYCK,
Ironwood, Mich.

•

"THE BUNK"

Editor, SERVICE:

I think case histories are the bunk. I have read quite a few and as yet have never found a case where they apply in actual practice. Even if I should find one, I would have a difficult time finding the particular magazine in which a record of the case was reported.

What I would like to have is fundamental theory. Then I could apply it to whatever problem might develop. For example, the article on Standardized Alignment Methods is both educational and well written.

I can't understand why you waste so much space in SERVICE by giving the aligning data for each individual receiver, as the procedure is much the same for all of them. Also, receivers seldom need aligning unless some one tampers with them, and in the event that such information is needed, Rider's Manuals cover them quite thoroughly.

My suggestion would be this: As new receivers are developed, start at the antenna and go through each stage up to the final output, telling us why each part is put in the receiver, how it functions, and what might happen if it went bad. Too, I think it would be interesting to quite a few of us to know how to correctly and easily put a tuning drive cable on receivers that use that method of rotating the tuning condensers. Again, some understandable information on how these new-type rectifier tubes operate, how to figure the resistance of a line cord in these little ac-dc receivers and how to operate tubes in series, having filaments requiring different voltages, should be of interest.

I have often read that a receiver quits operating because the 6A7 stops oscillating (or something of that sort). It would be a good idea when writing something of that nature to tell us how to determine that the tube has quit oscillating. I have noticed that in quite a few of your notes you are not complete. We are informed that the receiver went wrong because this or that happened, but we don't learn the method of determining this particular fault. I don't know whether I'm in the ABC class or not, but I read SERVICE trying to get information . . . if I can't learn anything by it there is not much use of wasting my time.

F. B. GUTHRIE,
Philadelphia, Pa.

(*We believe you have missed up on some of the data published in past issues of* SERVICE, *for many of the questions you ask have been answered time and again. Nevertheless, we appreciate your letter and will attempt to carry out some of your suggestions.*—EDITOR.)

•

RIGHTO!

Editor, SERVICE:

Personally, I haven't a technical education and I am not at all interested in "receiver design," "radio engineering" or any of that stuff, though I haven't a thing in the world against anyone who does go in for it. However, I am interested in putting receivers in good working condition, *if they are worth it,* and naturally appreciate *intelligent* receiver case histories.

I haven't anything against the "kid next door," either, but why take so much pains to put everything in one-syllable words just for his benefit?

In other words, why accept articles that try to show how to go into the radio business with nothing more than a dry-cell tester?

FRED JEFFREY,
Martinsburg, Mich.

(*Keep an eye on us. We expect to make some worthwhile changes, but it will take a few months to get things running smoothly.*—EDITOR.)

•

SOCKO!

Editor, SERVICE:

I agree with the Mr. Wolven quoted in the April issue of SERVICE.

While I have taken SERVICE since the first issue, I have about made up my mind that there is not enough in it to pay me to take it any longer. *Radio Retailing* in three or four pages has more of practical use than all of SERVICE.

I know that a great deal of the "case history" dope is foolish to the average Service Man, such as shorted filters and open circuits that anyone will find quickly, but there are peculiar traits in some makes (such as intermittent reception) that is of value.

I buy Rider's Manuals and do not give a whoop for the diagrams in SERVICE. I think the magazine ought to be edited for Service Men and not engineers.

IRA N. FAUROT,
Smith Center, Kansas.

(*Sorry we're losing you—but there is an urgent demand for the type of data we publish. Most Service Men seem to find it of value.*—EDITOR.)

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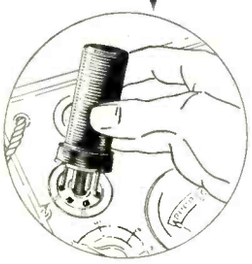
. . . TO TEST THE NEW METAL TUBES!



THE tube situation has changed. Metal tubes are here! Will you be prepared to test the new Octal metal tubes when you are called upon to do so—or, will you have to tell your customer: "Sorry, Mr. Jones, my equipment is not capable of handling the new tubes"?

Be prepared! See the new Readrite Model No. 430 Tube Tester . . . at your jobber's. It has been especially designed to handle every type of tube—both with metal or glass envelope . . . accurately and speedily. Constructed with sloping panel and removable cover for either counter or portable use.

The model No. 430 has five sockets, that are flush with the panel. One socket is equipped to test the new 8-prong Octal metal tube. Another feature of this new tester is the shadow-type line voltage meter . . . located directly above the moving-coil type instrument used for testing Good and Bad tube values. Direct reading. Controls are simple and positive in action. This new all-type tube tester makes every inter-element short and leakage test, which is instantly convincing to the customer.

•

F. E. Wenger, Radio Engineer of the Readrite Meter Works, says: *"The question of servicing the new type Octal metal tube is important to every service man. Readrite tube testers, now in service, can easily be adapted for the new Octal tubes."*

Simply get in touch with your jobber, or communicate directly with the Readrite Meter Works for full information of this newest testing equipment.

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Gentlemen: Send me literature on your new Readrite Tube Tester No. 430.

Name.....

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(*Continued from page 226*)
panel. This unit also features a built-in spark-filter to eliminate spark-plug suppressors.

The Fada Motoset, which is shown in the accompanying illustration, is capable of 3 watts output. It measures 9¼ by 7⅜ inches, and the shipping weight is 24 pounds.

•

TRIUMPH 8-PRONG ADAPTER

The Triumph Manufacturing Company, 4017-19 West Lake Street, Chicago, Illinois, have just announced their 8-prong tube adapter for testing the new metal tubes. This adapter is for use with their

Model 400 Tube Tester which is shown in the accompanying illustration. This adapter will test the metal tubes the same as present type tubes, and it does not require any rewiring of the tester.

Present users of the Model 400 may write to the factory for test chart data and an eight-prong adapter free.

•

NEW TUBULAR CONDENSERS

Newly designed paper dielectric tubular condensers have just been made available by the Tobe Deutschmann Corporation, Canton, Mass., through its wholesale parts distributors. Features of this new series of condensers are:

Metal end discs are soldered to the condenser terminals to provide a path for quick radiation of solder iron heat. (A very important detail, it is said, as this prevents "Opens" and "Intermittent" condenser operation.)

Dual impregnation of the entire condenser assembly to prevent moisture absorption; extra-heavy, double-tinned wire-lead terminals; the outside foil terminal is plainly marked. (It is important in short-wave use that this terminal be at ground potential); and compact physical sizes.

It is claimed by the manufacturer that the new condensers are priced extremely low consistent with high quality of materials used, true voltage ratings, and the care taken in manufacture.

•

CONFIDENCE CONDENSER TESTER

The Confidence Condenser Tester, Model T-10, is a condenser testing device manufactured by the Apparatus Design Company, Inc., Little Rock, Arkansas. This instrument tests condensers from .00005 to .05 mfd on the neon glow lamp and from .1 to 16 mfd on the meter.

The meter in this tester has not been confined to a use for which the device was assembled. The one mil scale of the meter is independent of the condenser tester so that any range of multipliers or shunts can be installed to make a multimeter. Six pin jacks have been incorporated for this purpose and room has been left for additional future pin jacks. Voltmeter multipliers are 1000 ohms per volt.

Quantities of condensers can be tested quickly without the probe leads by holding the condenser terminals against two nickel-plated touch plates.

The Model T-10 Condenser Tester is a portable unit. For further information write for forms No. 108 and 109.

•

RADOLEK PRE-AMPLIFIER

The Radolek Company, 601 West Randolph Street, Chicago, have announced a new all-electric pre-amplifier for adapting crystal or ribbon microphones to power amplifiers designed for carbon microphones or phonograph-pickup input.

The pre-amplifier is said to be perfectly quiet and free from hum, although its "B" supply is an integral part of its chassis. Surprising gain is claimed for the circuit which utilizes the triode portion of a 75 tube followed by a new arrangement of the elements of a 77 to resemble a triode circuit but with high gain and low plate impedance. The overall gain depends upon the impedance of the input and the output load. With a crystal microphone and using the high "Z" capacity coupling to a succeeding grid circuit, approximately 70 db is said to be obtained. A ribbon microphone and 200-ohm output line may reduce the gain to 50 db, which is still ample to overload the usual type of power amplifier designed for a carbon microphone input, it is stated.

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ASSOCIATION NEWS

(*Continued from page 220*)

At our last meeting Mr. McGaughey, RCA Engineer, discussed and demonstrated the further uses of the oscillograph. His treatment of the subject made it very interesting and clear.

A Guild has been formed in the State of Rhode Island along our lines. If there is any other group who would like our help in organizing such a Guild, we would gladly help them in any way possible.

John Goss, Secretary.

•

P R S M A NEWS

The business part of the meeting was rather uneventful up until the time some one opened a discussion on tube prices. From there on things got pretty hot, with denunciations coming from all sides, and no feelings spared. Due to the recent fluctuations which ended in a drop (that ended with a gruesome squish reminiscent of the Service Men's profits going fft!) there is very little volume of profit per unit of sale and so it seems even more necessary to prevent price cutting as is prevalent among the auto chain stores in this city.

Two plans were presented; one which advocated a boycott of the manufacturers who do not fulfill their obligation of seeing that list prices are maintained. The other plan was to use the organization as a center to buy tubes in huge quantities and get the big discounts as the chain stores do in order that the Members might be able to meet the cut prices. These two plans, however, are in violation of our present code of ethics, so further discussion was out of order. The problem is now in the hands of a committee who will have several plans to offer at the next meeting.

After the business meeting, Mr. Ed. Ward, of Strawbridge & Clothier, gave a talk on aerials of the all-wave and noise-reducing types. Mr. Ward's message was particularly interesting due to the fact that he supervised and often worked on the erection of over 1500 aerials during the past year. That's a helluva lot of wire, and obviously Mr. Ward knew what he was talking about since he spoke from practical experience and was familiar with every type of problem. There was more information packed in one hour of his time than there was in all the time on end that I have spent listening to speakers who conversed on theory and design alone.

Eight all-wave aerial kits were given as door prizes which were donated by Elliot-Lewis, Strawbridge & Clothier, Motor Parts Co. and Raymond Rosen Co.

H. R. De Long.

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AFFILIATED RADIO SERVICEMEN'S ASSOCIATIONS

On Saturday evening, April 13, 1935, a group of Presidents and Secretaries of six leading independent Radio Service Men's organizations, in the east, gathered at a round-table conference in the Penn-Harris Hotel, in Harrisburg.

This gathering, under the chairmanship of Mr. Paul Ziesmer of the Philadelphia Radio Servicemen's Association, was held to formulate and propagate plans for the betterment of those engaged in radio service. Organizations represented at this meeting were: Anthracite Radio Service Men's Association, of Nanticoke, Pa.; Radio Servicemen's Association of Pittsburgh, Pa.; Radio Servicemen's Association of Philadelphia, Pa.; Radio Servicemen's Association of Wilmington, Del.; Radio Servicemen's Association of Maryland, Inc.; and Associated Radio Servicemen of Williamsport, Pa.

The name tentatively adopted by this group of progressive servicemen is "Affiliated Radio Servicemen's Associations." As previously mentioned, the object and aims of this group of organizations is to promote and co-ordinate a better understanding, and to weave a closer contact with kindred organizations engaged in radio service. Let it be stated here that it is in no way, shape or form the object of the Affiliated Radio Servicemen's Associations to dictate to nor to interfere with the functioning of its member organizations.

The chairmanship of this organization shall rotate alphabetically among member organizations, for each meeting. At this meeting a permanent secretary, Mr. Frank J. Weipert, 408 Calvin Ave., Baltimore, Md., and a permanent treasurer, Mr. Leonard L. Jezorek, Nanticoke., Pa., were chosen. It was also decided to hold the next meeting on June 15 in the Penn Alto Hotel, in Altoona, Pa. The chairmanship of this round-table conference will be under the auspices of the Radio Servicemen's Association of Pittsburgh. Any organization desiring to participate in this meeting or desiring further information regarding this organization, kindly contact the secretary, Mr. Frank J. Weipert, 408 Calvin Ave., Baltimore, Md., and information will be forwarded. Hoping to see you all in Altoona.

Frank J. Weipert, Secretary.

SERVICE DEALERS!
✓ Check this List ✓

ACCURACY SUPERIORITY — THE SIGN OF EFFICIENCY — NATIONAL UNION RADIO TUBES — ALL RADIO REPAIR WORK GUARANTEED

Pick out what you need to bring your equipment up to the minute. You can get all of these items free with National Union radio tube purchases. Find out how—Check items you want. Paste the list on a penny post card or slip it in an envelope and mail it now!

HOW CAN I GET:

A Tube Tester	☐	A Set Analyzer	☐
Service Manuals	☐	An Oscillograph	☐
An All Wave Oscillator	☐	A Frequency Modulator	☐
A Signal Generator	☐	A Tube Carring Case	☐
A Multirange Meter	☐	A Coverall Work Coat	☐

S535

Name_____

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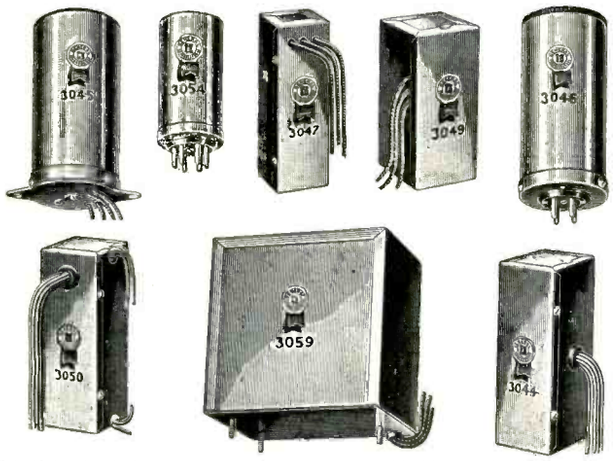
City_____ State_____

Check—Clip—Mail to
NATIONAL UNION RADIO CORPORATION of N.Y.
570 Lexington Avenue, New York, N. Y.

AUTO-RADIO
"General" Quality Vibrators
for 90% OF SETS IN USE:



To insure the most permanent and dependable service General Full-wave Vibrators are provided with the highest grade Swedish spring steel reed and with oversized tungsten contacts—assuring long life.

MAIL THIS TODAY

General Transformer Corporation
502 S. Throop St., Chicago, Ill.

Send me without charge a copy of Vibrator Guide with name of nearest distributor.

Name .....

Address .....

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

Free for the Asking!

Auto-Radio vibrator Guide listing 220 models of radios on which you can replace the vibrator with one of 22 General Units.

General Transformer Corp.
502 S. Throop St., Chicago, Ill.

ALL-WAVE ANTENNAS

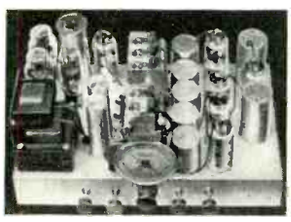
Buy results, not mere claims! Three years' pioneering experience goes with these three new TACO antenna systems: ● V Triple Doublet (Type 70). ● Double Doublet (Type 80). ● Single Doublet (Type 90). Factory wired and soldered, in complete kits, ready to string up. ● Also famous H-F antenna kit, all-wave line noise filter, noise rejector, etc.

Send for DATA: New 1935 catalog describing TACO line is yours for the asking. See your local jobber about these profit-making accessories—or write us direct.

TACO

TECHNICAL APPLIANCE CORPORATION
27-26 Jackson Avenue Long Island City, N. Y.

SERVICE MEN! Make money by replacing obsolete chassis . . . . . .



11 Tubes, 6-gang tuning condenser, Electrical band spread, high quality direct coupled audio amplification, short wave portion provided with separate tuning condenser, tubes, coils, and oscillator, thus providing better alignment.

Many owners want to keep present cabinets, but can afford to modernize if *you* will tell them about the

SHELBURNE
Replacement Chassis
(Standard and Short Wave)

Right now—make a list of prospects you know of; write us for an illustrated circular for each. Then call and you will be surprised at how many will turn into orders.
Regular dealers' discount to Service Men.
Specially designed for replacement—fits any cabinet.

SHELBURNE MFG. CO.
1814 E. 40th St., Cleveland, O.

Ken-Rad
Radio Tubes
DEPENDABLE LONG LIFE

Ken-Rad Radio Tubes are made to give clear, dependable reception. They satisfy customers and build good will for dealers. Write for full information.

THE KEN-RAD CORPORATION, Inc., Owensboro, Ky.
Division of The Ken-Rad Tube and Lamp Corporation
Also Mfrs. of Ken-Rad Incandescent Electric Lamps

22% Greater Signal Strength Efficiency!

WITH THE **WARD** *Magic Super* **Auto Antenna**

ESPECIALLY DESIGNED FOR TURRET TOP CARS

Approved for all Turret Top Cars and many others.

The ordinary type of under-car antenna gives only 60% Signal Strength Efficiency.

The WARD Magic Super Antenna gives 82% Signal Strength Efficiency!

To further insure Perfect Auto Reception use WARD No-Loss SUPPRESSORS

DEALERS! JOBBERS! SERVICEMEN!
Write for Illustrated Catalog!

MFGD. BY THE WARD PRODUCTS CORP. WARD BLDG. 2135 SUPERIOR AVE. CLEVELAND, OHIO, U. S. A.

HIGHLIGHTS . . .

RIDER'S AUTO RADIO MANUAL, VOL. II

We have received, fresh from the press, Rider's new Specialized Auto Radio Manual, Vol. II. These Manuals continue to improve—and continue to get larger, too. For example, there are 416 pages in the new Specialized Auto Radio Manual, which is considerably in excess of the number of pages in Vol. I of the same series.

Volume II takes up where Volume I left off. There is no duplication of material in the two volumes, but considerably more valuable data in the new book . . . much more actual installation data, for example.

The new Volume is right up-to-date, containing the dope on receivers released as late as April 15.

All in all, it's a swell Manual and a credit to Rider. The price is $3.50, and you ought to have it.

•

ROCKE INT. ELEC. CORP. REPORTS BRISK BUYING ABROAD

Arthur Rocke, President of the Rocke International Electric Corp., reports intense interest abroad in the new Franklin Flush-Type Radio-Tube Socket, announced recently.

Because of the easy soldering position of the lugs, the insulation disc and the bull-dog grip of the tapered brass contact, the new Franklin Flush-Type Socket is said to be meeting with hearty response where engineers want a socket that resists vibration. This is particularly true of the automobile receiver set, which is subject to harder usage than the home receiver set.

Mr. Rocke represents the Albert W. Franklin Manufacturing Corp., in Latin America, Australia, Great Britain, Continental Europe, South Africa and the Far East.

•

TURNER BULLETINS

The Turner Company of Cedar Rapids, Iowa, have available a number of technical bulletins covering their different products in the sound-equipment field.

Bullet No. 1A covers the Turner MC-16 Class A Amplifier and the Turner MC-50 Amplifier (Class B), both being high-gain units with inputs for crystal microphones. Bulletin No. 2A deals with the Turner S-16 Portable Public-Address System and their Line Amplifier (ac operated), while Bulletin No. 3A covers Pre-Amplifiers. Bulletin No. 4A and B gives data on the C-100, M-16 and M-8 Amplifiers in addition to specifications for a Field Supply unit. Also available is literature covering their new "Dia-Cell" Microphones and the Type "G" Crystal mike.

•

WHOLESALE HAS NEW BRANCH STORE

Another large branch store of Wholesale Radio Service Co., Inc., whose main offices and warehouse are at 100 Sixth Avenue, New York, was opened on April 1, 1935, at 542 East Fordham Road, in the Borough of the Bronx, N. Y.

Occupying more than 2500 square feet of floor space, this new establishment is decorated in blue and silver and is laid out to afford comfort and convenience to customers. A large supply of replacement parts, tubes and accessories is kept in stock, and operating samples of various Lafayette auto- and home-radio receivers and sound amplifiers are on display along the side walls.

Located only a short distance from the Boston Post Road and the Bronx River Parkway to the East and the Grand Concourse to the West, the new store is convenient to Service Men, dealers and amateurs of the Bronx, Westchester and Connecticut. It is already enjoying excellent business, according to Jack Strong, its manager.

•

NEW CONSOLIDATED CATALOG

The latest edition of the Consolidated Catalog is just off the press. The number of pages has been increased, and a great many new items of interest to the trade have been added.

Of particular interest to the auto-radio field is the new Meshtenna running-board antenna, the matched-impedance triangular cable antenna, new noise suppressors and other auto-radio accessories. The home

radio has in no way been slighted; for this field Consolidated has released a newly-engineered all-wave variable antenna coupler, a larger variety of insulators, window lead-in strips and other items.

Aside from this large selection of merchandise, there are a number of tables and data that will prove useful for reference. This catalog is sent free upon request and is available to those in the radio and electrical field. Address Consolidated Wire and Associated Corps., Peoria and Harrison Streets, Chicago.

•

BELL SOUND SYSTEMS MOVE

Bell Sound Systems, Inc., of Columbus, Ohio, have announced that due to a large and continued increase in business they have been forced to move to larger quarters at 61-63 East Goodale Street.

Their new quarters will enable them to set up more complete facilities for manufacturing their line of portable and permanent public-address systems. Orders will not in any way be delayed by this change, it is stated.

•

TACO CATALOG

Various methods of increasing signal-strength pickup on broadcast and short-wave bands alike while at the same time reducing background noises to a minimum, are dealt with in the new 1935 catalog of Taco products just issued by Technical Appliance Corp., 27-26 Jackson Ave., Long Island City, N. Y. This literature describes the latest forms of double-doublet and single-doublet all-wave noiseless antenna systems, a variable impedance coupler for use between a doublet antenna and set, a store-demonstrator antenna system and an all-wave line filter. A copy of the catalog may be had on request.

•

BIRNBACH AUTO-RADIO BULLETIN

The Birnbach Auto-Radio Accessory Bulletin lists the new Birnbach Auto-Radio Antennas and a line of equipment for the suppression of auto-radio interference.

Included are the Birnbach Ignition Filters. These ignition filters have a copper-wound wire inductance of 120 ohms which eliminates ignition interference when placed in series with spark plugs. Listed also is the Birnbach Master Filter which eliminates ignition interference without the necessity of having a separate filter for each spark plug. This unit is available in two types: The distributor type for easy insertion into the distributor head, and the cable type to be placed into the distributor lead when it is impossible to insert in the distributor head.

All popular sizes of auto-radio copper-shielded strap, both bare and tinned, auto-radio shielded lead-in, shielded loom, shielded high-tension cable, shielded battery cable, and a complete line of auto noise filters are listed.

•

SPRAGUE CONDENSER FOLDER

A new folder, "Facts You Should Know About Condensers," has just been issued by Sprague Products Co., North Adams, Mass.

In this folder particular attention has been paid to determining the quality of dry electrolytics through the following four factors: Power factor, leakage, capacity and voltage. Actual tests are detailed.

The folder is prepared in a concise, easily understandable style. A request to the above organization will bring a free copy.

•

NATIONAL UNION MOVES OFFICES

New York City headquarters of the National Union Radio Corporation were moved on Saturday, April 27, from the quarters which they have occupied since 1929 at 400 Madison Avenue to larger space at 570 Lexington Avenue, New York City.

At the new location, National Union has, in addition to more floor space, quarters which are air-conditioned and scientifically lighted.

•

AUTO-RADIO SERVICING COURSE

The Radiart Corporation, Shaw Avenue at East 133 Street, Cleveland, Ohio, are offering a six-month correspondence course on "The Theory, Design and Practical Servicing of Auto-Radio Power-Supply Circuits" at a cost of twenty-five cents. This course is said to cover 90 percent of all auto-radio servicing. It has been specially prepared by Radiart Engineers for the Service Man.

ENROLL NOW!

A Complete Six Month Course of Instruction At Our Expense

"The Theory, Design and Practical Servicing of AUTO-RADIO POWER SUPPLY CIRCUITS"

Radiart

Manufacturers of

The ORIGINAL Complete Line of Exact Duplicate Replacement Vibrators

Offers You a Golden Opportunity—

Radiart engineers have prepared a complete six months' correspondence course on auto radio power supply circuits which covers 90% of all auto radio servicing. To all authorized radio service men the cost of this course is only 25c to cover the cost of mailing and handling.

An entirely practical course of instruction designed to help you make more money servicing auto radios; everything fully explained and illustrated, chock-full of diagrams and clever service hints. Nothing like this has ever before been offered to the service man. Enroll now and learn to earn more.

Mail This Coupon Now!

THE RADIART CORPORATION

SHAW AVE. at E. 133rd St.
CLEVELAND, O.

I enclose 25c to cover the cost of mailing and handling. Please enroll me in your correspondence course on auto radio servicing. I understand that this is a complete six months' course.

Name .....

Street .....

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

My Jobber Is .....

C-D ELECTROLYTICS

He thought he saved 20¢ *but did he?*

He bought a *"bargain"* — an 8 MFD electrolytic for 37c. After several hours operation the condenser shorted.

Net Result . . .

Burnt out transformer which had to be replaced.
Second service call.
Loss of good customer.
Loss of reputation.

C-D 8 MFD 450v with lugs or leads..... **57c**
—at the nation's leading distributors.

ARE CHEAP CONDENSERS RUINING YOUR SERVICE BUSINESS

OR ARE YOU ON TOP WITH C-D?

Your Guarantee

Write for the C-D 1935 catalog.

CORNELL-DUBILIER
CORPORATION
4375 BRONX BOULEVARD
NEW YORK

"BROWN DEVIL" Resistors Stop "Call-Backs"

NOTHING is quite so discouraging as to get a call on a set you have repaired, and find that the resistor WHICH YOU REPLACED has gone "sour" again. It takes away your profit —and doesn't do your reputation any good.

Protect yourself! Count on "Brown Devils" to keep your service jobs in top working order. They are wire-wound units coated with a vitreous enamel which is moisture-proof. At rated wattages they are guaranteed not to deteriorate, and to maintain constant resistance value.

"Brown Devils" can be used in almost any radio circuit. Solidly anchored 1½" tinned lead wires make for easy installation. Made in resistance values through 100,000 ohms in 10 and 20 watt sizes. Ask your jobber or write for Ohmite Catalog No. 11

OHMITE MANUFACTURING COMPANY . . . .

627 N. Albany Avenue Chicago

MAIL TODAY!

Name .....

Address .....

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

THE MANUFACTURERS . . .

"THE PROFESSIONAL SERVICER"

For the Service Man who wants his equipment for testing and aligning receivers in one carrying case, Clough-Brengle

engineers have just announced the new Professional Radio Servicer.

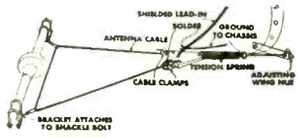
This latest addition to the line of service and laboratory instruments manufactured by the Clough-Brengle Co., of 1134 W. Austin Ave., Chicago, Illinois, is comprised of a Model OC All-Wave R-F Signal Generator and a Model UE Multi-Range Volt-Ohm-Milliampere-Output, carried in a sturdy metal case fitted with heavy handle and shock-proof instrument cushions.

Complete descriptive literature may be secured by writing the manufacturer.

•

ANTENNA FOR TURRET-TOP CARS

The Birnbach Auto-Radio Antenna is designed for signal pickup without interference, and to eliminate the disadvantages of the running-board antenna. It is suspended underneath the car between the flywheel housing and the shackle bolts of the



rear springs, as shown in the accompanying illustration, and consists of a specially-designed high conductivity, 42-strand copper cable possessing great tensile strength. It is supported by bakelite insulators connected to brackets and a threaded eye bolt and tension spring. The threaded eye bolt has a wing nut which permits the proper tension adjustment to prevent the cable from sagging or touching any part of the car.

The unshielded lead-in has proven to be one of the greatest causes of noise pickup. Repeated experiments have shown that when an unshielded lead-in is replaced by a shielded lead-in considerable ignition interference is eliminated. The type of shielded lead-in used should have an extremely low capacity between the shield and the conductor, or the signal will be bypassed to ground.

NEW NON-INDUCTIVE RESISTORS

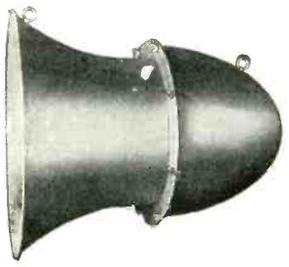
The Ohmite Manufacturing Company, 636 North Albany Avenue, Chicago, have recently announced their new non-inductive resistors. These are wire-wound, vitreous enameled units which may be used at their full wattage ratings; and they are said to have very little inductance even on frequencies as high as 2000 kc. This makes them suitable for the entire radio-broadcast band.

These new non-inductive resistors may be secured in the same sizes as standard Ohmite resistors and with the same wattage ratings. The Ohmite Manufacturing Co., will welcome inquiries concerning these new units.

•

MACY DIRECTIONAL BAFFLE

The Macy Engineering Company of 1451 Thirty-Ninth St., Brooklyn, N. Y., has just released a new model all-metal aluminum baffle. Its use permits a more even sound distribution and very effectively reduces bothersome feedback difficulties, it is stated. It is further stated that its use has been found to increase the efficiency of a cone speaker by as much as forty percent. It is weatherproof, light in weight and free from any metallic resonance conditions. It is demountable and is joined to-



gether with special wing nuts holding the felt-insulated sections together. Mounting loops are supplied for use in hanging the baffle unit to bracket or ceiling support. Back pressure relief is obtained by openings located on the under side of the cone housing. The finish is a brilliant aluminum lacquer. The model MB-10 is supplied for use with all models and sizes of speaker cones up to 12 inches overall size, bell 17 inches, length 20 inches. All hardware for mounting the cone speaker in baffle is supplied.

•

MB-253 SOUND SYSTEM CHANGE

The Gates Radio and Supply Company announce a slight change in their MB-253 sound system for automobile operation using now a 2A6 first-stage amplifier, a 6A6 second-stage amplifier and a 6A6 Class B output tube. The change does not affect the operation other than a lower battery current drain is brought about by the different tube complement.

"TURRET PROJECTOR"

An interesting new type of reproducer, known as the Turret Projector, has been announced by the Racon Electric Company, Inc., 52 East 19 Street, New York City. This is said to be a complete high-fidelity, high-efficiency loudspeaker. As supplied standard for public-address service, it consists of the new broad-band electro-dynamic cone speaker, which is mounted within an

all-steel acoustically-damped bullet back, it is stated. This is coupled through a heavy aluminum casting, through an especially designed all-aluminum bell section. A special mounting bracket provided with a pipe socket fitting is integral with the throat casting, and the complete assembly is balanced at the mounting bracket so that the projector can be mounted in practically any position. The complete unit is compact, durable, weatherproof, and is said to have a remarkably high efficiency in terms of audio input versus sound output. It is suited for all types of outdoor public-address service, and the single-unit construction makes it easy for public-address operators to set up on temporary installations.

•

MODEL 166 MOTOSET

The Fada Radio and Electric Company, Long Island City, New York, recently announced their Model 166 Motoset. This automobile set employs a six-tube superheterodyne circuit and is said to feature the following: Delayed automatic volume control, three-gang shock-mounted condenser, six-inch full dynamic speaker, variable tone control, plug-in vibrator unit, full power supply from storage battery connected at meter, and tuning cables and leads connected externally.

Three-piece housing facilitates installation and service. An illuminated, aeroplane-type remote-control dial is furnished for mounting on the steering column or under

(*Continued on page 228*)

Fada Model 166 Motoset.

MORLEN

Announces the 4 A

with the new *"Power-Driven"* class AB audio system, described in *Radio Engineering* for April. Tubes used: 1-6C6, 1-50 (class A), 2-50 (class AB), 1-5Z3. Power output: 30 watts (+37DB), gain 86DB. The 4A, with the famous MORLEN 30 Points-of-Merit, is unquestionably the finest single-chassis p.a. amplifier available. More watts—more quality—more service per dollar.

Catalog describing the 4A and 15 other p.a. amplifiers gladly sent upon request on your business letterhead.

MORLEN
ELECTRIC COMPANY, INC.
100 FIFTH AVE., NEW YORK, N. Y.

"E. H. Rietzke SPEAKING!"

Mr. E. H. Rietzke, President of CREI and originator of the first thorough course in Practical Radio Engineering.

. . . . . Service Men Find their earnings increasing when they become SERVICE ENGINEERS

One good service job nets more actual returns in one hour than a half-dozen petty repairs can net in six. It's all in knowing "how, when and where."

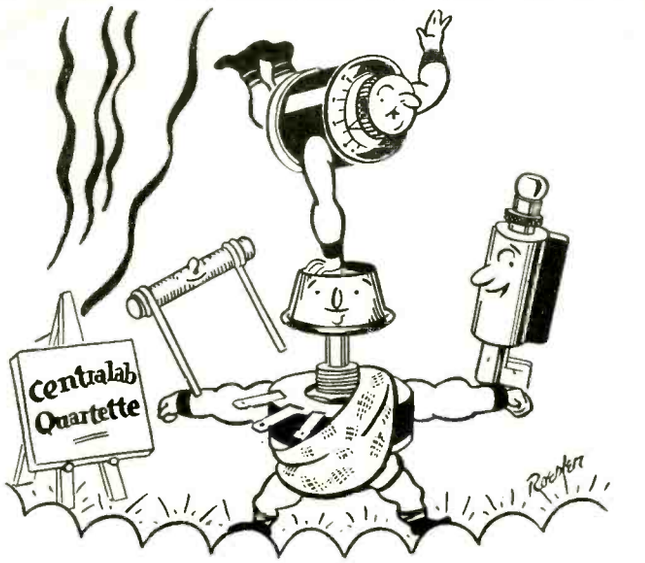
ARE YOU READY . . . For BETTER BUSINESS?

You may be busy now . . . you may be running so hard all day to keep pace with your work, that you couldn't squeeze in another "tube replacement" call. If that's true you're at the peak of your present earning capacity. Let CREI Training show you how to make an eight-hour day pay better than your old twelve-hour grind . . . the first few lessons will make you wish you'd started studying years ago.

FREE!
44-Pg. Catalog

. . . illustrates the 3 convenient Residence, Home-study and combination Residence and Home-study Courses offered by CREI. Explains what you get, how you get it and the easy payment terms. Write for Catalogue, NOW!

Capitol Radio Engineering Institute
Dept. S-5
14th & Park Rd., N.W., WASHINGTON, D. C.



Here's a "Troupe" that *Wows 'Em!*

Four husky boys, these, that have been on most of the world's best circuits.

Fathered by old man Radiohm himself, he and his three sons, Kid Suppressor, Kid Resistor and the new member of the team, Big Boy Sound Projection Control, are in the spot light of popularity with servicemen and experimentors everywhere.

How these boys can work! It's a pleasure to watch 'em . . . smooth, efficient, noiseless and each performance as reliable as the next.

Note: Mr. Trouble Shooter . . . stock up with Centralab Replacement parts . . . the cheapest in the long run.

Centralab
Division of Globe-Union Mfg. Co., Milwaukee

Centralab

RADIOHMS
SUPPRESSORS
RESISTORS

CORWICO

"NOISE-MASTER" ANTENNA . . . .

Goodbye, "man-made" static! For clear, pure, NATURAL reception on both broadcast and shortwave bands. "NOISE-MASTER" makes every radio a better radio. Service men . . . INVESTIGATE!

"TRAVEL FIRST CLASS," our new folder, sent free . . . write for your copy at once.

CORNISH WIRE CO.
30 CHURCH STREET, NEW YORK CITY

Service Men *Profit* Through Motorola

SOUTHTOWN RADIO & ELEC. SERVICE
6613-15-17 South Halsted Street
CHICAGO

Mr. E. H. Wavering,
Galvin Manufacturing Corp.,
847 West Harrison Street,
Chicago, Illinois.

Dear Mr. wavering.

Since I have handled your Auto Radio, I have sold and installed 516 Motorolas. I am so well pleased with the satisfaction they have given my customers, and with the profit earned for me, that I feel I should congratulate you on the quality of your product and the money-making opportunity it offers service and installation men.

Yours very truly,

SOUTHTOWN RADIO & ELECT. SERVICE
Tom Hogan

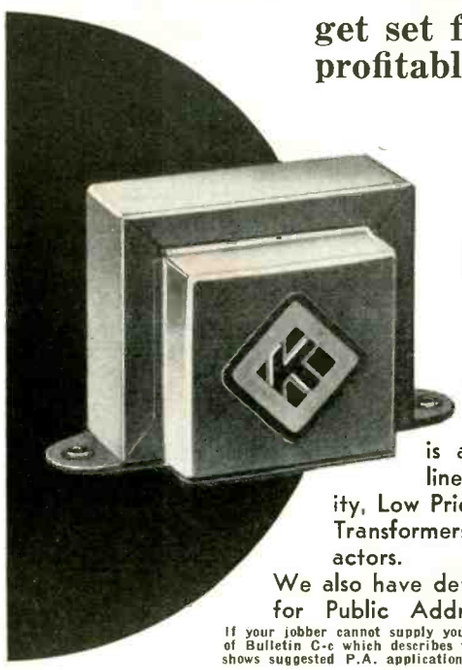
Tom Hogan

Read WHAT TOM HOGAN Says ABOUT *Motorola*

America's finest Auto Radio

Public Address Season is here!

get set for a profitable summer



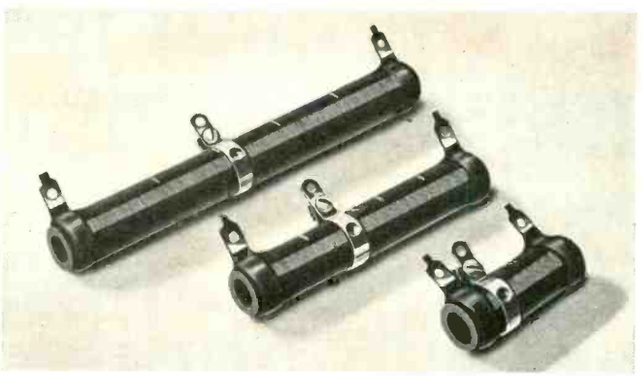
The KENYON "SILVER GROUP"

is a complete new line of High Quality, Low Price Audio, Power Transformers and Filter Reactors.

We also have developed new kits for Public Address technicians.

If your jobber cannot supply you write direct for a copy of Bulletin C-c which describes these units in detail and shows suggested P.A. applications.

KENYON TRANSFORMER CO., Inc.
840 BARRY STREET NEW YORK CITY



SLIDE RESISTORS

Quality wire . . . crack-proof refractory tubing . . . precisely wound.

●

Wire ends brazed to lugs . . . handy soldering tab terminals . . . sliding contact band . . . vitreous enamel coating.

●

In 10, 30, 50, 100 and 200 watts . . . 1 to 100,000 ohms. All units provided with horizontal mounting brackets.

When exact resistance required is unknown but must be arrived at by experimental adjustment . . . and even changed occasionally . . . use AEROVOX Slide Resistors. Install them . . . adjust them . . . lock contact band . . . forget them. They'll stay put until a different resistance value is required.

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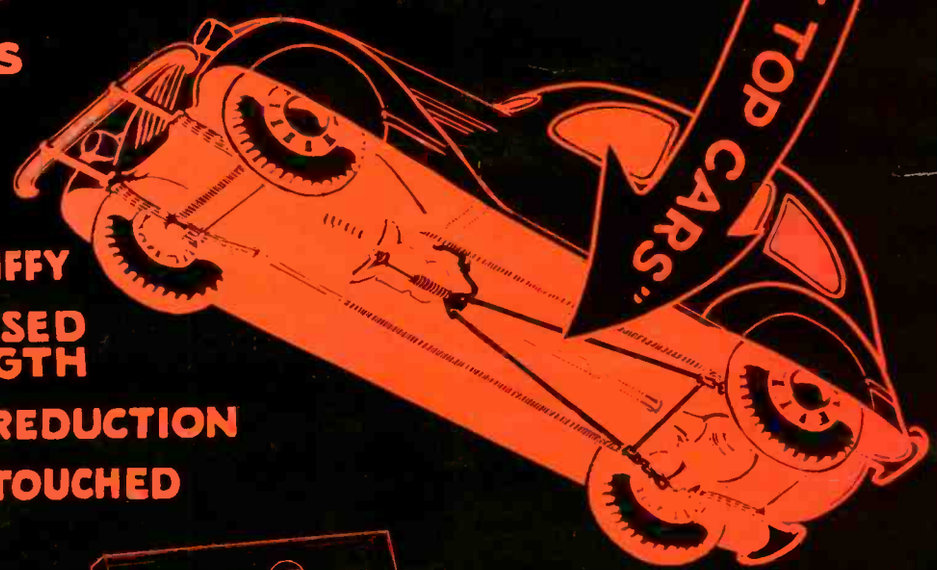

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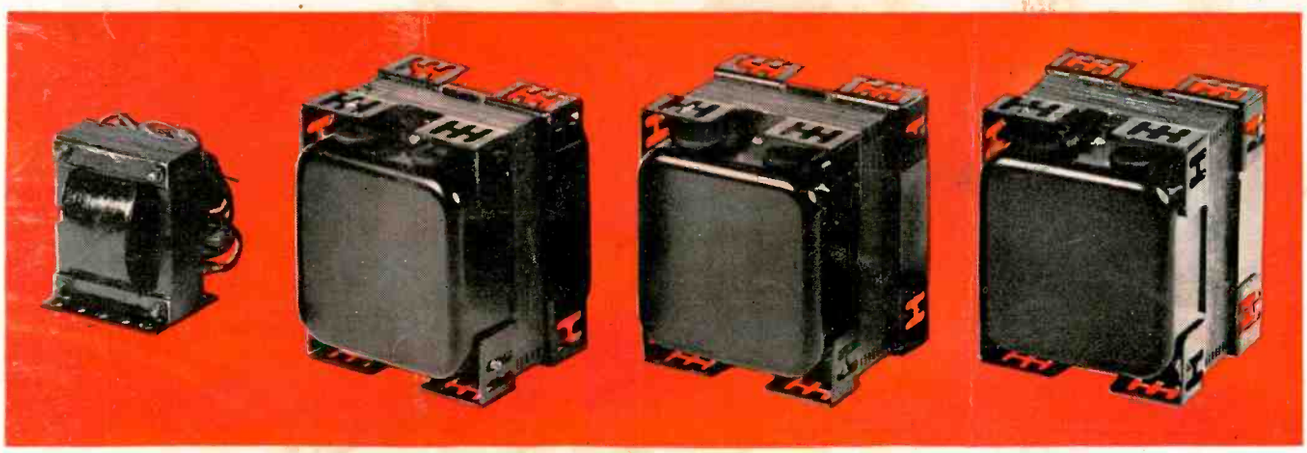

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