

*Radio*

# SERVICE DEALER

APRIL 1942

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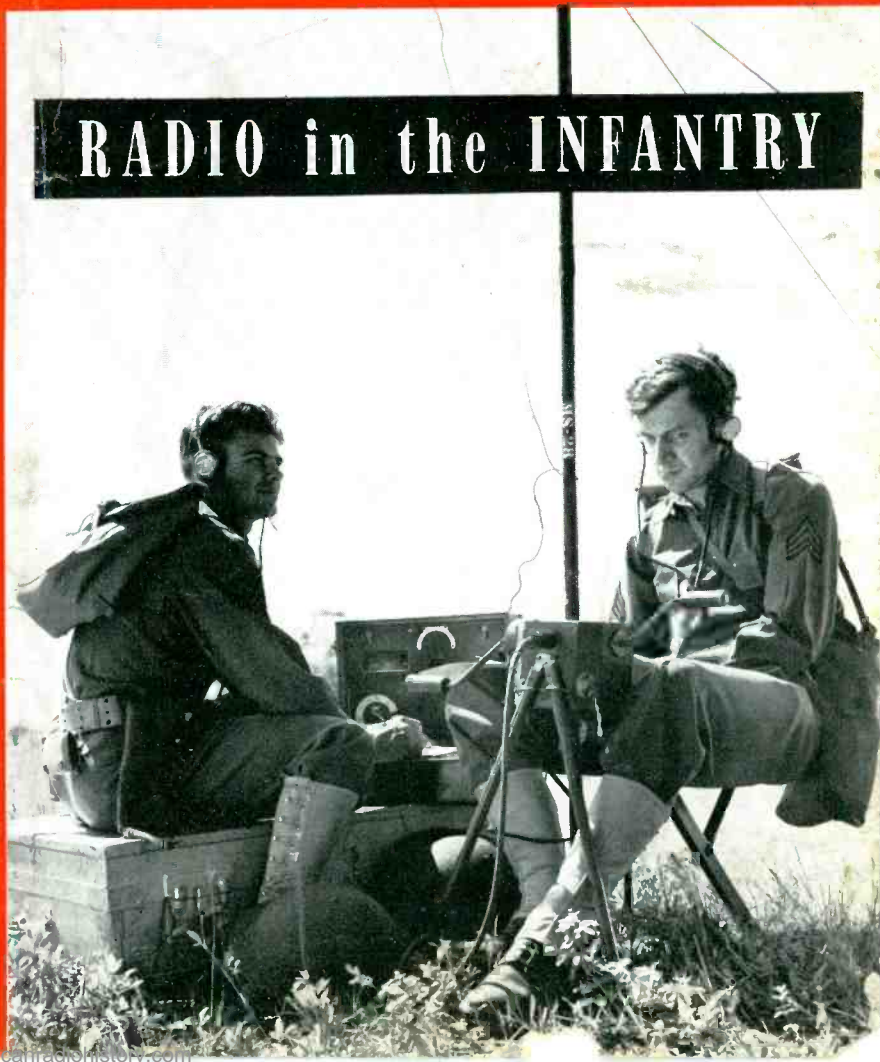
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## This, Too, Is In The Line Of Duty

The radio service engineer has a home front job. It is not spectacular. It involves more irritations than cheers. But it is all-important, this task of maintaining radio sets in good working order. It calls for knowledge, ingenuity and time-proven, standardized replacement parts.

Mallory appreciates the obstacles of material shortages and production restrictions that confront radio servicemen in wartime. Mallory is playing its role in war production, but Mallory likewise is doing its level best to keep you properly supplied with adequate parts—quality standardized parts—Mallory Approved Precision Products.

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# Radio SERVICE-DEALER

SOUNDMAN AND TROUBLE-DOCTOR  
Reg. U. S. Pat. Off.

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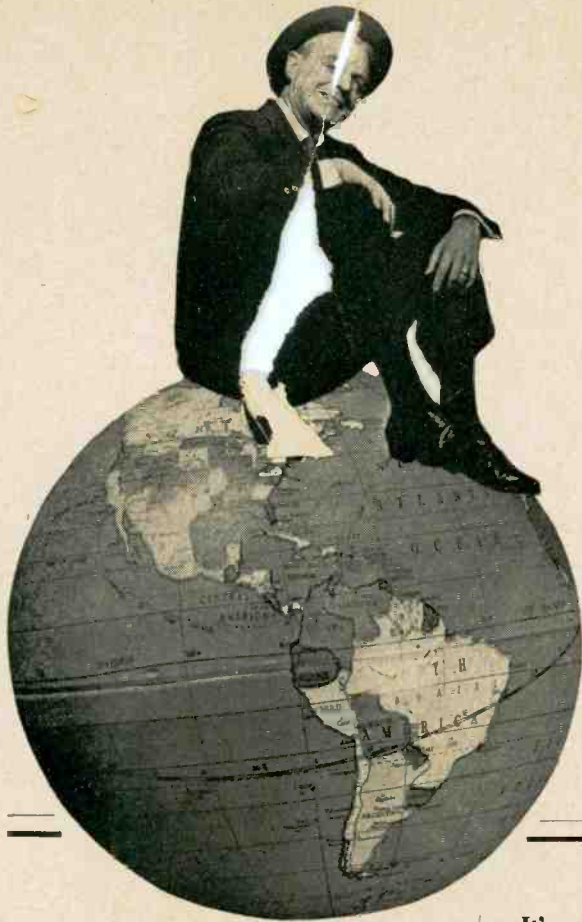
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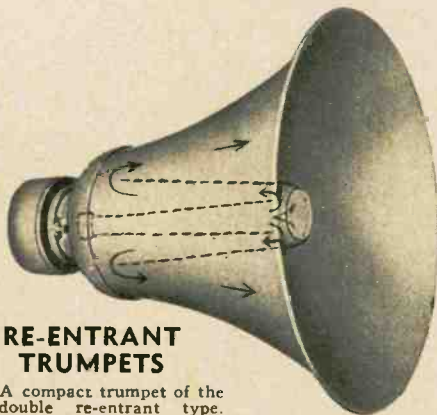
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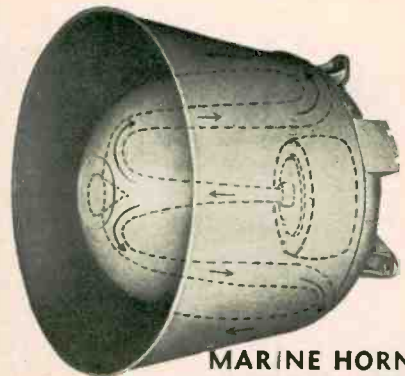
Types for high fidelity, giving even intensity sound projection over a circumference of 360° radially. Upper deflector made of heavy gauge aluminum, cone covering of steel, and lower deflector of RACON ACOUSTIC material storm-proofed for all weather conditions. Models for 5"-6"-10"-12" cone speakers.

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# TRIALS — THEN TRIBULATION

## OMINOUS SIGNS

RADIO SERVICE-DEALER is 3 years young today. Wonder what fantastic changes will take place in the world while we're growing another year older. Suppose you jot down your thoughts on the matter and send 'em in. Perhaps we will publish them in a coming issue. Say your piece!

On March 31st War Production Board ordered druggists not to sell new tubes of toothpaste unless the customer gives in return an empty tube, or its equivalent weight in lead, which material will be salvaged and reused in making new collapsible tubes. A new era in merchandising is born! Previously we suggested that Service-Dealers who replaced defective parts in receivers should return the old part to the customer when submitting the bill as it tended to create Good-Will and prove reliability. Now we emphatically urge Service-Dealers to *hold onto* all old parts regardless of their character as they probably contain salvagable materials. In the near future you *may* have to give your supplier a defective unit for each new one purchased. Rest assured, the old reliable replacement parts manufacturers will do everything in their power to maintain a steady flow of needed parts, even if they have to utilize reclaimed metals. But don't forget, you'll have to supply the old metals for them to reuse.

Close parallels between the Automotive and Radio Industries can be drawn, especially in regard to the way Priorities and restrictions have been imposed. First, production of new cars for civilian use was curtailed, then stopped entirely. Then stocks of cars on dealers' floors were "frozen." Immediately prices were pegged to prevent inflation. Repair and replacement auto parts were given a fairly worthwhile priority status, and practically every car, regardless of age or vintage can be kept in operation, if it has tires to run on. In like manner new civilian set production was stopped and prices were pegged. Don't you dare to ask a higher price for any receiver now in your stock than the selling price you had marked on it at midnight March 19, 1942. Violation can cost you \$10,000, and a stiff jail sentence. Be satisfied that you are allowed to sell what merchandise is still on hand.

## SILVER LINING

Service-Dealers and Jobbers will welcome the news that Jesse L. Maury, WPB's radio unit chief, has been closely collaborating with the recently formed radio replacement parts and repair committee in an effort to clarify the industry's actual replacement requirements so that a workable solution can be found whereby replacement parts manufacturers will be able to produce enough units so you can keep at least one radio in every home in operation for the duration.

Of prime interest is the new Committee itself. Chairman is J. J. Kahn; committeemen are O. Blake, H. E. Osmun, S. T. Thompson and R. F. Herr. Each of these men knows the jobbing and servicing fields' problems from A to Z and they are exceptionally competent to protect our mutual interests, i.e., a steady supply of replacements. Meanwhile, every time you buy a part to be used in any job that enjoys a priority rating, don't fail to let your jobber know so he, in turn, can assign a "rating" that will enable the parts manufacturer to obtain needed materials. Watch new priority assignments carefully for they change frequently. Not long ago replacements for airplanes were classified A-3, but now they are up in the A-1-j brackets. Possibly our Committee can work wonders like that for us. We're entitled to a "break" for what would America be like without radios in operation? We still believe an operating radio set affords more advantages than some deferred baseball players.

## SIGNAL CORPS

The change-over and "mortality" of radio servicemen was always  
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# Pledge

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These things I PLEDGE that our future may  
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# SOME AC-DC DESIGN PROBLEMS

John H. Potts

AS a result of the increasing needs for copper wire for apparatus being constructed for national defense, it appears likely that many receivers which now operate from power transformers may have to be redesigned to operate without a power transformer should the original ones fail. With the improvements which have been made in modern tubes designed for ac-dc operation it is often possible not only to restore original performance without replacing the defective power transformer, but even to improve the receiver. Further, for those individuals who desire better performance from the ac-dc receivers they now own, it is possible to install additional tubes which will provide greater power output and better fidelity. Because there has been little demand for such work in the past, many servicemen have not troubled to familiarize themselves with the design problems involved in jobs of this type. For them, and for the many newcomers who are beginning to fill up the depleted ranks in the service field, this article has been written.

## HEATER STRINGS

Although most servicemen are familiar with the arrangement of heaters in series with a resistor, shown in Fig. 1, there are a few points in connection with such arrangements which are often overlooked. Since the line voltage must be limited to a value such that the voltage across each tube heater is as shown in Fig. 1, the resistor  $R$

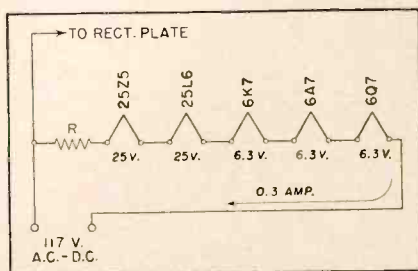


Fig. 1. Typical ac-dc heater string.

must be so chosen that the voltage across it is equal to the difference between the voltage across the tube heaters and the line voltage, assuming that all tubes require the same heater current, which is generally the case. In the example shown, the total voltage of the heaters is equal to  $25 + 25 + 6.3 + 6.3 + 6.3$  or 68.9 volts. Since the line voltage is 117, we must select a value for  $R$  such that the heater current, 0.3 amp., will produce a voltage drop of

117—68.9, or 48.1 volts. We apply Ohm's law:

$$R = \frac{E}{I} = \frac{48.1}{0.3} = 160.3 \text{ ohms.}$$

which is the required value of  $R$ .

Actually, it is of course not necessary for the value to be figured as closely as we have shown. If you are certain that the line voltage in the neighborhood where the receiver is to be used is never in excess of 110 volts, the resistance value may be from 125 to 135 ohms; where the line voltage is higher, say 125 volts, a resistor of 175 to 185 ohms may be employed. The tubes are designed to operate over a range of voltages without materially decreasing their life.

## PILOT LAMP PROBLEM

It seems easy to add a pilot lamp to such an arrangement, but actually this was a major problem in the design of earlier receivers. The reason is that the heaters of vacuum tubes have a low resistance when cold and therefore pass more current than when hot. While this is also true of pilot lamps, the filaments in the latter reach their normal operating resistance much quicker than vacuum tubes, so during the period while the vacuum tubes are warming up the pilot lamp receives excessive voltage. This often caused extremely short pilot-lamp life in early ac-dc receivers.

In Fig. 2 is shown a method of limiting the effect of excessive current. The resistor  $R_1$  is chosen to equal the hot resistance of the pilot lamp, 42 ohms. Then, when the pilot lamp is hot, the voltage across each is the same. However, during the warming-up period,

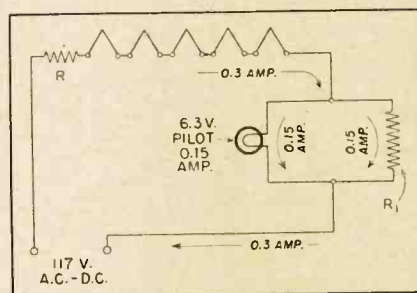


Fig. 2. Resistor  $R_1$  limits "starting" current.

the resistance of the pilot lamp is less than 42 ohms and therefore a greater current passes through the lamp than through the resistor. This condition is made still worse by the fact that all the heaters in series with the lamp are also operating momentarily at subnormal resistance and excessive current, although the limiting resistor  $R$  prevents the voltage across the heaters and lamp from rising to dangerous values.

A better arrangement is shown in Fig. 3. Here the pilot lamp is shunted across a portion of the heater of the 25Z5GT, which is especially tapped for the purpose. Since the heater resistance remains subnormal while the pilot lamp is heating, there is no danger of the sudden surge which weakens and so often burns out the pilot lamp.

An arrangement of this sort is definitely desirable. And if it seems that we have unduly stressed such an insignificant detail as a pilot lamp, remember that it is just such minor considerations which are most likely to be overlooked. And, in servicing, they cause call-backs and exasperation on the part of both the customer and dealer.

Note that no series resistor is shown in Fig. 3. The voltages of the various tube heaters add up to 118, so no series resistor is necessary. In making con-

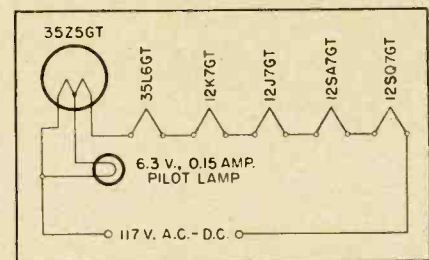


Fig. 3. Here heater voltage equals line voltage.

versions, every effort should be made to do away with the need for a series resistor or ballast by choosing tubes with heater voltages which will add up to somewhere between 115 and 125 volts, thereby avoiding the need for such voltage reducers.

## FLOATING POTENTIAL

In Fig. 4 is shown the usual arrangement of a half-wave rectifier and heat-

er supply, as connected to the line supply. It is well to fix this in mind, as it is necessary to check such connections constantly in ac-dc jobs, and once thoroughly understood, there should be no need to consult circuit diagrams. Particular attention is directed to the condenser *C1* and its shunting resistor, *R1*. In most ac-dc designs, the B minus lead is insulated from the metal chassis, and to avoid having the chassis develop a floating potential, B minus is often bypassed to the chassis by a condenser. When this is done, however, the alternating line voltage is applied through the condenser to the chassis. Often this causes a blocking effect, causing the receiver to become insensitive unless *C1* is discharged in some manner. By using the shunting resistor *R1* across *C1* this effect is avoided and normal operation results.

#### VOLTAGE DOUBLER

Often, in substituting a transformerless rectifier supply circuit, it is found that the maximum voltage output,

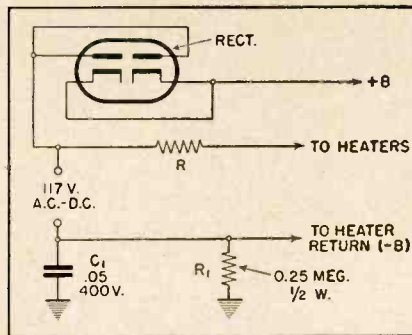


Fig. 4. B minus is insulated from chassis by *C1*.

detector-audio amplifier tube heater is always the last in line, one side of which connects to B minus. This should be kept definitely in mind. The purpose is to minimize hum. Since the power tube, as used in the receiver, is the last in signal line and is therefore not followed by any audio amplification, the hum from its heater will likewise not be amplified. So what little is present in this stage will not normally be noticed. But the detector-audio stage, shown as a 6SQ7 or 6Q7 in these dia-

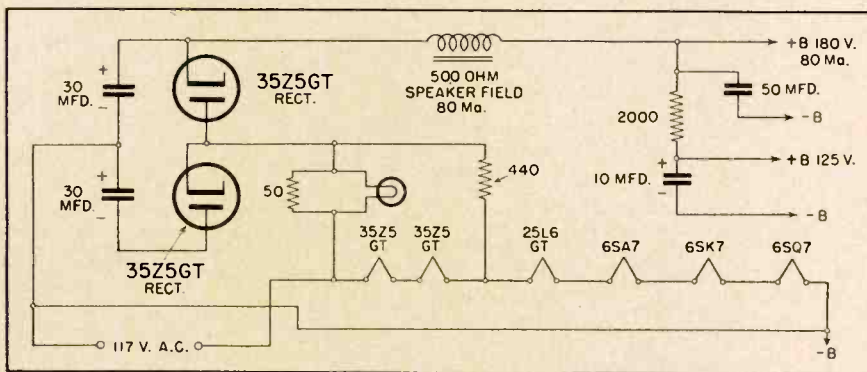


Fig. 5. Schematic diagram of typical voltage-doubler circuit.

about 125, is insufficient to operate the receiver at maximum efficiency. To avoid changing values of resistors in the set, it is often possible to obtain excellent performance from a voltage-doubler arrangement, such as is shown in Fig. 5. The values shown are chosen to provide 180 volts at 80 mils, which is adequate to operate most receivers with a single power tube. A 25L6GT was used in the receiver for which this diagram applies. Note that a choke-input type of filter is employed, using the 500-ohm speaker field. A single 50-mfd condenser filters the high-voltage output applied to the power tube. The 2000-ohm resistor and its associated 10-mfd condenser provide the additional filtration required for the r-f, i-f and audio stages.

Particular attention is directed to the arrangement of the heaters in this and in the preceding diagrams. Note that the power-tube heater is always next to the rectifier heater and that the de-

grams, is subject to considerable amplification in succeeding audio stages. Therefore its heater is kept as near ground potential as possible to minimize the amount of hum which must necessarily be amplified.

#### AC-DC PUSH-PULL AUDIO

In Fig. 6 is shown a phase inverter driving four 25L6GT's in push-pull parallel. This hookup will deliver 8 watts power output, which compares favorably with that obtained from the larger console straight a-c receivers. The power supply for such an output stage may be obtained from two 25Z5's operated in parallel in a conventional half-wave circuit. Since the total plate current of the 25L6's amounts to nearly 200 ma, two rectifiers are required. In substituting this amplifier for another in an a-c receiver, be sure that the B minus of the ac-dc amplifier does not connect directly to the chassis of the receiver to which it is joined. The .05-mfd blocking condenser is used to isolate the B minus in the hookup given.

In adapting a-c receivers for use with ac-dc amplifiers or power supplies the following points should be kept in mind:

1. Keep the number of changes to a minimum. Don't substitute different types of tubes for those already in the receiver unless absolutely necessary. In general, only the power and rectifier tubes in conventional receivers employing 6.3-volt-tubes need to be changed. If the receiver is so old that it still employs 2.5-volt tubes, better step aside gracefully and refuse to change it over. Altogether too much of a job.

2. Make certain that the ground connection of the receiver is not used. Better disconnect it entirely from the chassis and cover the back of the set so the chassis cannot be touched by inquisitive fingers, particularly if there are children in the home.

3. In case of trouble, compare the hookups of the set you are working on with that of an ac-dc receiver employing similar tubes in the r-f, mixer, i-f and a-f sections. If the values of resistors used differ widely from those in the receiver under test, make the necessary changes. In general, for ac-

(Continued on page 29)

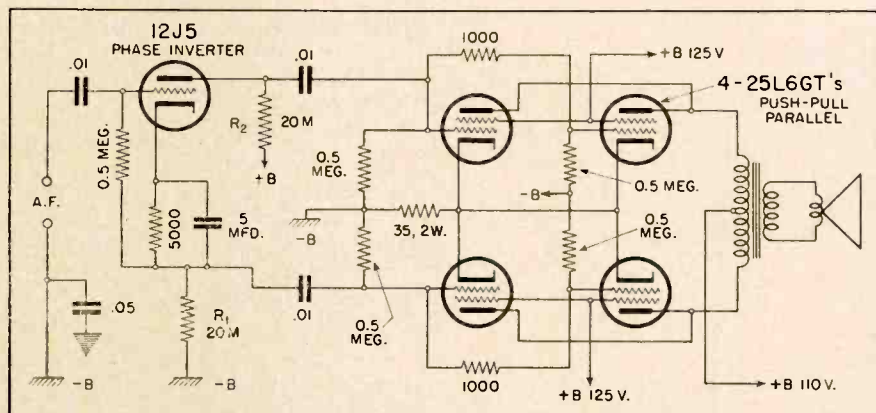


Fig. 6. Parallel ac-dc push-pull for output of 8 watts.





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### CONTROLS • SWITCHES RESISTORS CAPACITORS

# TECHNICAL SERVICE PORTFOLIO

## SECTION XVII

### TESTING AND ALIGNING F-M RECEIVERS

ALTHOUGH frequency-modulation receivers have been made and sold for more than two years, it is highly improbable that many of these sets have been in for servicing. This is normally the case with any new development in the field; there is always a definite time lag after the introduction of a new instrument before the effects of usage create a need for servicing. As a result, many of us who are inclined to wait until we are confronted with a problem before we learn the answer are now faced with the need to become familiar with the methods of testing and adjusting receivers of the frequency-modulation type.

Fundamentally, of course, the f-m receiver does not differ from other superheterodyne sets, used for amplitude-modulation reception. That is why it is possible rather simply to combine in a single receiver the means of receiving either f-m or a-m broadcasts. For each type of reception, using a superheterodyne circuit, a converter, i-f amplifier, detector, a-f amplifier and power supply are required. For f-m receivers, however, the detector is of a different type to that to which we are accustomed, the i-f amplifier operates at higher frequencies, and most sets of this type require one or more limiters. The broad band coverage needed in both r-f and i-f circuits (as compared with a-m circuits) and the fact that the type of signal to which the f-m receiver is designed to respond differs fundamentally from that which the average test oscillator is designed to supply, create problems in testing and aligning such circuits. Therefore we are going to devote most of our allotted

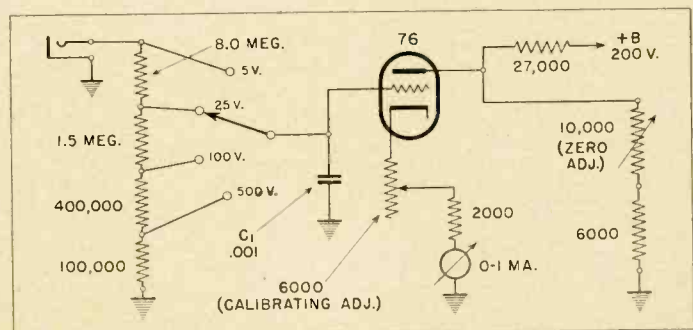
space to a consideration of methods of meeting such problems. It is not intended that any of the methods herein described shall supersede those outlined in service notes for any specific make of receiver; rather it is intended that this analysis should clarify many points which are but briefly touched upon in service notes or are omitted altogether. Further, alternative methods are described which are generally applicable to all receivers of the type discussed.

#### F-M TEST OSCILLATOR

Ideally, because an f-m receiver is designed to receive a frequency-modulated signal, that type of signal should be used in testing and aligning. But the frequency modulation used in broadcasting covers a far wider band than that available in any of the usual electronic wobblers so that the results when used with the cathode-ray oscilloscope are not what they should be. Not that the 'scope is unsuitable for the purpose. Far from it. In fact, if one cares to go to the trouble of building a special frequency-modulated test oscillator he will have, with the 'scope,

an ideal combination for f-m aligning. One simple way out is to use a motor-driven variable condenser — small in capacity, not to exceed 25 mmfd—in shunt with the tuning condenser on an all-wave oscillator. This will provide a small amount of frequency modulation, and, by using a harmonic of the resulting frequency-modulated signal, a wider band can be secured. The objection to using a larger capacity motor-driven condenser to provide a wider frequency-modulated band is that a straight-line frequency variation is necessary if the proper type of signal is to result, and this would require a difficult mechanical construction of the condenser and its bearings. Further, it would not provide perfect straight-line-frequency variation except with one fixed value of tuning condenser capacity. The tracings reproduced here in Fig. 8 were made with a frequency-modulated oscillator employing a standard type of test oscillator tuning condenser shunted by a midget straight-line-capacity condenser driven by a motor. It produced a 35-kc variation in frequency in the broadcast band. The

Fig. 1. A build-your-own circuit of a satisfactory vacuum-tube voltmeter.



third harmonic was used in most cases, thus securing a 225-kc variation at three times the fundamental frequency.

By using an electronic voltmeter in conjunction with an ordinary all-wave test oscillator capable of supplying a 400-cycle amplitude-modulated signal and fitted with a means of cutting out the modulation when it is not needed, all the requirements of proper alignment may be carried out.

For those who do not already own some type of electronic voltmeter, a suitable circuit is shown in Fig. 1. It will not be possible to buy a calibrated dial for this instrument, but one can be made up and lettered by hand. The ranges covered are 5, 25, 100 and 500 volts, either negative or positive, without reversing the leads. The meter is an 0-1 ma type and the resistances in the cathode circuit are so adjusted that the meter normally reads half-scale when the tube is operating and no external voltage is applied to the input circuit. This instrument is designed to be used with a shielded probe which plugs into the jack shown. The probe should be fitted with a 1-megohm resistor at its tip; the constants of the tube voltmeter circuit are so chosen that the ranges described are secured when the probe resistor is employed. This 1-megohm resistor will serve to prevent appreciable detuning of the circuit under test when the probe is connected to it.

**ALIGNING I-F AMPLIFIERS**

Aligning of f-m receivers, as with a-m types, starts with the i-f amplifier. A simplified i-f amplifier of an f-m receiver is shown in Fig. 2. To align, the probe of the electronic voltmeter is connected to point (d) on R2 and the test oscillator signal is fed to point (b), the grid of the preceding amplifier tube. The test oscillator signal frequency should be accurately adjusted to the specified i-f value and the audio

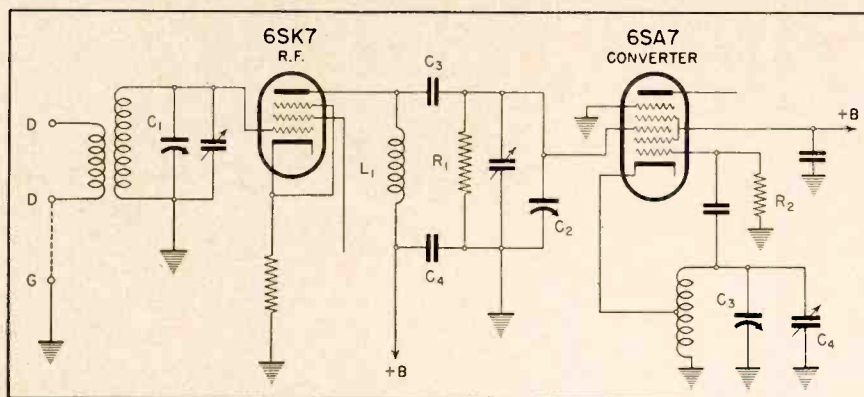


Fig. 3. The r-f amplifier and converter of f-m receiver.

modulation should be off. A strong signal should be used, which will cause the limiter grid to draw current, thus rectifying the signal and producing a pulsating d-c voltage across R2, which will be indicated on the electronic voltmeter. The voltmeter should be switched to its most sensitive range (5 volts) and the deflection will be negative, to the left of center scale. For aligning purposes, note that no calibration of the meter is necessary. We're simply interested in maximum readings. Once a reading is secured, reduce the signal level at the oscillator until a small deflection is secured on the output tube voltmeter, then peak trimmers C4 and C3. Then disconnect the test oscillator "hot" lead from point (b) and connect it to the r-f input grid of the converter. Without changing the signal frequency, reduce the signal level at the oscillator and adjust trimmers C1 and C2 until a maximum reading is secured on the electronic voltmeter. Don't readjust C3 and C4. If the set being aligned has more than one i-f stage, follow the same procedure. Align the last stage first, then the preceding stage, then the coupling transformer between the converter and 1st i-f grid.

**OSCILLATOR ALIGNMENT**

The oscillator section may quite

simply be tested for operation by placing the electronic voltmeter probe at point (a), Fig. 1. Note that the probe must be fitted with the 1-megohm isolating resistor mentioned previously; otherwise connecting the cable to the oscillator in this manner might stop oscillation. If the tube is oscillating, a negative voltage will be developed across R1 which will be indicated on the electronic voltmeter. If no voltage is indicated, the circuit is inoperative. The oscillation frequency is not revealed by this test, but this may be ascertained by feeding a test signal (unmodulated) of known frequency to the converter signal grid. This signal will beat with the set oscillator frequency to produce an i-f signal. If the i-f has already been aligned, as described above, then when the electronic voltmeter is reconnected at point (d), Fig. 1, the peak signal output will be readily indicated, and will be reached when the test oscillator frequency and the set oscillator produce a sum or difference frequency equal to the i-f signal frequency. Thus, if the i-f is 6 mc and the test oscillator frequency is 45 mc, the set oscillator must be functioning at either 39 mc or 51 mc. If it is operating at 51 mc, then retuning the test oscillator to 57 mc will likewise produce a difference frequency of 6 mc which will pass through the i-f amplifier and be indicated on the output tube voltmeter. If, however, it is operating at 39 mc, the 51 mc test oscillator signal will not produce the required 6-mc i-f beat and no signal output will result. It is assumed, of course, that the test oscillator frequency is accurately calibrated. This is essential for such tests as these.

**R-F ALIGNMENT**

Aligning the r-f section is quite simple. The test oscillator is connected to the antenna terminals of the receiver and the electronic voltmeter, as formerly, at point (d) in the limiter cir-

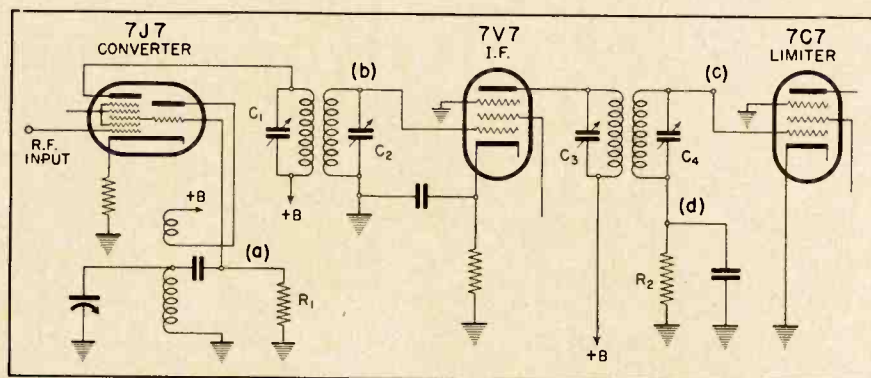


Fig. 2. Converter and i-f amplifier of f-m receiver.

cuit. The set dial is turned to the high-frequency aligning point and the oscillator trimmer *C4* is peaked. Then the r-f trimmers across *C1* and *C2* (Fig. 2) are adjusted for maximum output reading.

In some limiter stages there is no resistor in the grid return circuit, such as *R2* in Fig. 1. An example is shown in Fig. 4, in which two cascaded limiters are used. In such instances, the electronic voltmeter may be connected across points (a) and (b) as indicated in Fig. 4. This means that the voltmeter will be "up in the air," but if the probe end is connected to point (a) the potential at point (b), which is very low, will not cause trouble. When so connected, aligning operations may be connected as described before. The signal level should be kept sufficiently low to prevent the first limiter from leveling off the output.

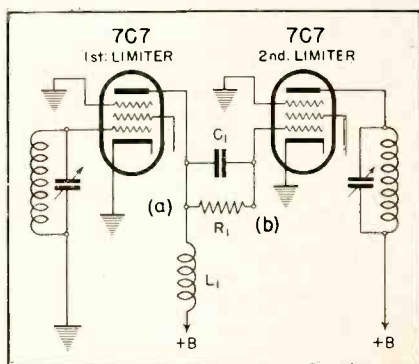


Fig. 4. Trick limiter with no grid return.

Still other cases exist where modifications in the point of connection of the indicating electronic voltmeter may be required. In such cases, the manufacturer's service notes will specify the most desirable point of connection.

**DISCRIMINATOR ALIGNMENT**

The detector-discriminator should never be aligned before the limiter and i-f stage alignment have been checked. A good plan is to leave the test oscillator connected to the converter grid—the last step in aligning the i-f stages—and after completing the required adjustments of the i-f trimmers, transfer the electronic voltmeter to the detector output. A representative circuit is shown in Fig. 5. Without changing the test oscillator signal frequency or output level, connect the electronic voltmeter across point (a) and ground (Fig. 5)—or connect probe to point (b) if more accessible than point (a)—and adjust *C3* until the voltmeter reads zero (mid-scale). When this adjustment is reached, the rectified voltage across *R1*

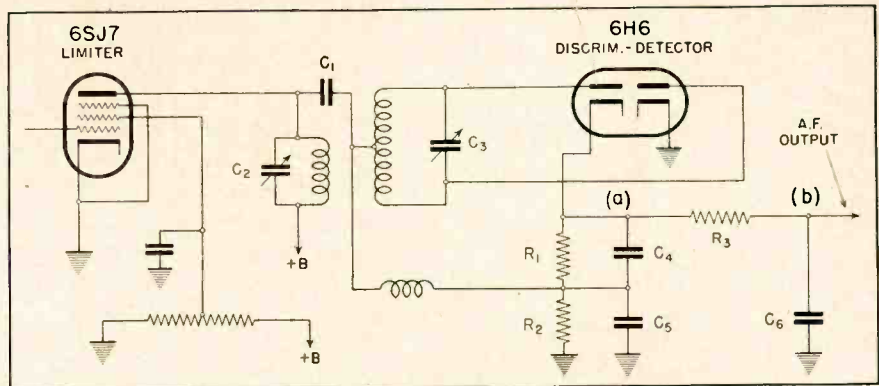


Fig. 5. Typical discriminator circuit. Alignment and operating data below.

is exactly equal and opposite to that across *R2*, which is the condition of perfect balance essential in the discriminator-detector circuit. This adjustment of *C3* is quite critical; an insulated screw-driver is imperative and care should be taken to keep fingers well away from the circuit to avoid detuning.

When adjustment of *C3* is completed, the primary tuning condenser *C2* may be tackled. It will be found far less critical in adjustment. To adjust, first detune the test oscillator 75 kc above the i-f signal frequency. That is, if it was previously adjusted to 6000 kc, it should now be adjusted to 6075 kc. The electronic voltmeter should remain connected across point (a) and ground, as described before. As the test oscillator is detuned, however, the reading of the electronic voltmeter will increase. Note the maximum reading obtained when the test oscillator is tuned to 75 kc above the i-f alignment frequency. Then readjust the test oscillator to a frequency 75 kc below the i-f alignment frequency. This reading may be greater or less than that obtained when the oscillator was detuned 75 kc in the opposite direction. Adjust the trimmer *C2* (Fig. 5) until the difference between the second reading and the first is about one-half that which was recorded. Then recheck the first reading by again tuning the test oscillator to 75 kc above the i-f value. The reading should now equal that secured when tuned to 75 kc below the i-f specified. If not, readjust *C2* until repeated readings balance. When completed, recheck the secondary trimmer setting, with the test oscillator readjusted to the exact specified i-f, and the job is complete. In some sets, a balanced diode circuit operates a magic eye which indicates proper adjustment of the discriminator. In such cases it will be unnecessary to use the electronic voltmeter—the magic eye will

serve as indicator for this portion of the aligning procedure.

**DISCRIMINATOR OPERATION**

Just what takes place during these adjustments may be comprehended from Fig. 6, which shows the typical output curve of a detector-discriminator. At resonance with the i-f signal frequency the voltage across the output load resistors (corresponding to *R1* and 2) in Fig. 5 is zero. As the signal frequency is detuned in one direction the output voltage is increased; when detuned in the opposite direction, the voltage is decreased—made negative. When the resulting curve is plotted, the line joining points (a) and (b) should be straight. This is the condition of no distortion. The length of the line a-b shows the amplitude of the output audio signal at the discriminator. This will vary in different designs and the actual readings indicated on the diagram, while found in one discriminator design, is not intended to be representative of all. Further, the straight line between points a and b is usually not realized in commercial receiver design, though the distortion actually found is very small.

**DE-EMPHASIZER**

You may wonder what the resistance-

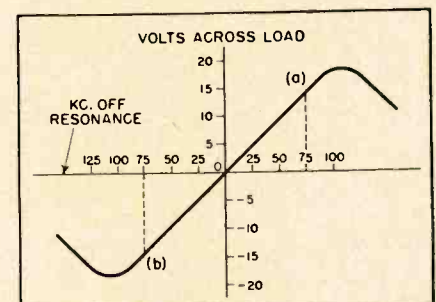


Fig. 6. Output curve of discriminator.

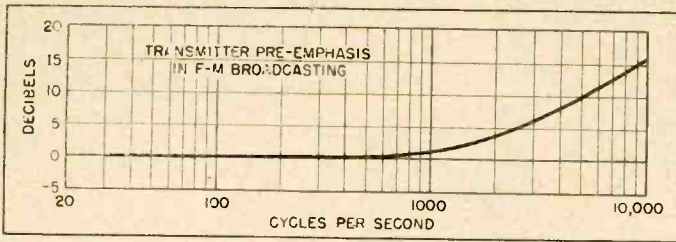


Fig. 7. This curve shows why a de-emphasizer is required in the f-m receiver.

capacity filter, *R3-C6*, in Fig. 5 is used for. Naturally it reduces the high-frequency response, just as a tone control does in an ordinary receiver. But, in spite of this, f-m receivers give remarkably fine high-frequency reproduction. The reason is that high frequencies are pre-emphasized at the transmitter. Instead of being flat from 30 to 10,000 cycles, which many have assumed as an ideal condition, the actual audio modulation characteristic at the transmitter is as shown in Fig. 7. Note that the curve starts rising at as low as 500 cycles; at 2,500 cycles it is up 5 db and at 10,000 cycles it has risen to more than 15 db above the 400-cycle level. This rise continues to 20 kc, where the output level is 20 db above that at 400 cycles. Practically, though, the response characteristic which we need to consider is that between 30 and 15,000 cycles.

Because of this rising high-frequency characteristic at the transmitter, it follows that these higher frequencies must be reduced in the audio amplifier, in order that proper balance may be restored. For that reason, resistance-capacity filters, and other high-frequency bypassing such as inevitably results when *C4* and *C5* (Fig. 5) are shunted across the discriminator load, have the effect of improving, rather

than injuring the overall response characteristic. This should be kept in mind when taking audio response curves of the a-f sections of f-m receivers. An ideal curve, assuming that the speaker had a flat response, should show a decrease in output level as the audio test frequency is increased. The amount of decrease in output should correspond with the amount of increase introduced at the transmitter.

The purpose of the pre-emphasis of higher frequencies at the transmitter is to override noise, which is always most objectionable in the higher frequency ranges. By boosting the highs at the transmitter and reducing them at the receiver, the signal-to-noise ratio is measurably improved. Unavoidable tube noises and hiss are likewise reduced in this manner.

CHECKING A-F AMPLIFIER

In checking the audio section of the f-m receiver, a setup such as is shown in Fig. 9 may be employed. The audio oscillator should be capable of operation over a frequency range of from 30 to 15,000 cycles with substantially flat output, or the output should be metered at the input to the oscillator attenuator. The output meter is connected to the load resistor as shown. The value of load resistance will vary with the type

of speaker employed, but should be equal to the voice coil resistance of the speaker.

Stage-by-stage testing may be done in the audio amplifier, just as in aligning. The signal is fed to the input to the last stage first, then moved to the next preceding grid, until the discriminator output is reached. In this manner troubles may be isolated and more readily located.

Take particular care in replacing leads exactly as you found them. In f-m receivers, just as in any other sets operating at ultra-high frequencies, very slight dislocation of critical leads may cause oscillation or at least regeneration which will adversely affect the quality of reproduction. This is especially noticeable in i-f circuits.

Examples of aligning results ob-

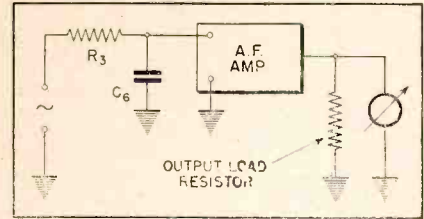


Fig. 9. Setup for checking the a-f amplifier of an f-m receiver. Output meter is connected across load resistor.

tained with a cathode-ray oscillograph and a frequency-modulated oscillator using a motor-driven sweep are shown in Fig. 8. In Figs. 8a to 8d inclusive are representative curves of the discriminator output. Fig. 8a shows proper adjustment. In Fig. 8b the sweep frequency is too narrow to show the full characteristic. Fig. 8c shows distortion, evidenced by curvature of the intersecting lines. In Fig. 8d the secondary trimmer is improperly adjusted. For all these traces, as well as those which follow, the 'scope was connected in the same position in the circuit as that indicated for the electronic voltmeter.

Figs. 8e to 8h show traces secured in aligning the i-f section. Proper alignment is shown in Fig. 8e. In Fig. 8f one trimmer is out of adjustment. In Fig. 8g the curve is sharp, showing either an open resistor across the secondary of an i-f transformer (required in most, but not all, receivers). In Fig. 8h the sweep frequency is not wide enough to show the true overall curve.

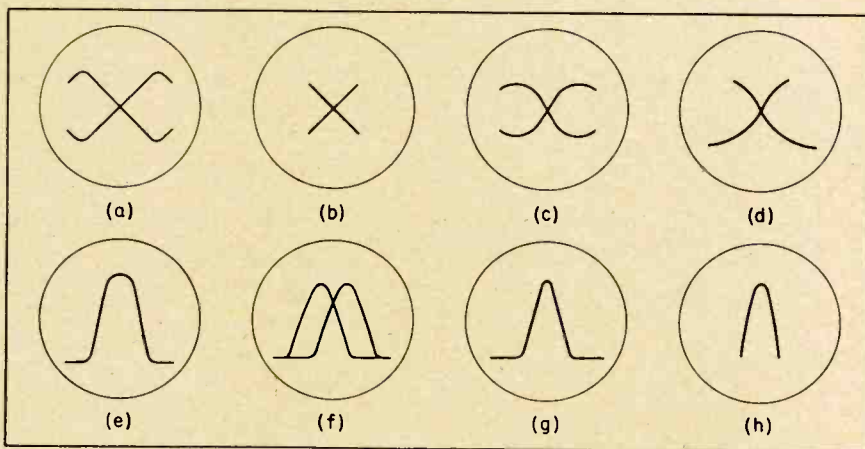


Fig. 8. Examples of aligning results obtained with a cathode-ray oscillograph and a frequency-modulated oscillator using a motor-driven sweep. The upper ones are representative curves of the discriminator output. The lower row of traces show i-f alignment, with proper alignment shown at e. See text for other examples.



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# CIRCUIT COURT

WITH the exception of a few companies that have been given additional time to complete the fabrication of civilian receivers from parts on hand, all such receiver production has ceased. Engineering designs are now frozen for the duration, and the reviews covered on these pages are just about the last that will come through.

Beginning next month, "Circuit Court" will cover the whys and wherefores of past designs in a more thorough manner. These are the very designs incorporated in the receivers that are coming up for servicing, and it will do none of us any harm to recover old ground and get down to fundamentals.

But, until then, let us take a gander at the late arrivals, some of which incorporate new ideas.

## MUSAPHONIC

The complete schematic diagram of *General Electric's* Model 35 "Musaphonic" receiver is shown on the following page. This baby employs a 14-inch speaker and has a maximum output of 12 watts—8 watts undistorted. The i.f. is 455 kc.

Having, as it does, a tuned r-f amplifier effective in all three (B, C and D) bands, the sensitivity, selectivity and AVC action are ample under all conditions. The wavetrapp, L6-C12, is in the antenna circuit, being connected directly across the A-G terminal strip.

It will be noted that push-button

automatic station selection is also provided, but in this case the r-f stage is bypassed. Station selection in both the antenna and oscillator circuits is accomplished by means of two groups (of 5 each) of adjustable capacitors.

The use of adjustable capacitors in

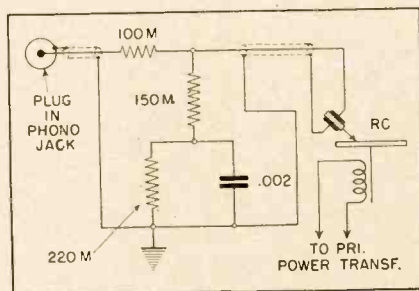


Fig. 1—Phono circuit for G.E. Model 35

the oscillator circuit is not ordinarily considered good practice, due to oscillator drift, but in the Model 35 this disadvantage has been nullified by two means; first, by the use of the 10-mmfd compensating capacitor C51, shunting the B section of the oscillator coil; and second, by broadening the resonance curve of the first i-f transformer L1. It will be seen that there are three windings on this transformer—the primary proper, and two secondaries. A section of the gang switch S4 allied with this circuit has two positions, manual tuning (Man.) and push-button

tuning (P.B.). In the manual position only the lower, main secondary is in circuit, and the selectivity is sharp. In the push-button position, however, the upper, closely-coupled secondary is connected in series with the lower secondary and the selectivity of the i-f transformer broadened. Hence, a change in i.f. due to oscillator drift makes negligible difference in the i-f stage.

The audio circuit is conventional, the phase inverter being of the self-balancing type. It is worth noting, though, that resistors R24-R27 and R23-R33 have dissimilar values in order to obtain better than 10-percent balance in the opposite-phase signal voltages.

Also note that the tone-control, governed by switch S2, is single-ended. Its influence, however, is overall, since any change in the response characteristics of the 6SF5 driver output also appears at the input to the 6J5G inverter.

And have you observed the absence of inverse feedback? In this circuit the high-frequency emphasis of beam-power tubes is reduced by means of the corrective filter (C74) across the primary of the output transformer.

Degeneration of another type does, however, appear in the audio circuit. Note that the output of the power supply bleeds through the a-f voltage amplifier cathode resistors R41-R42 via resistor R31. This develops an out-of-phase hum voltage in the grid circuit

(Continued on page 15)

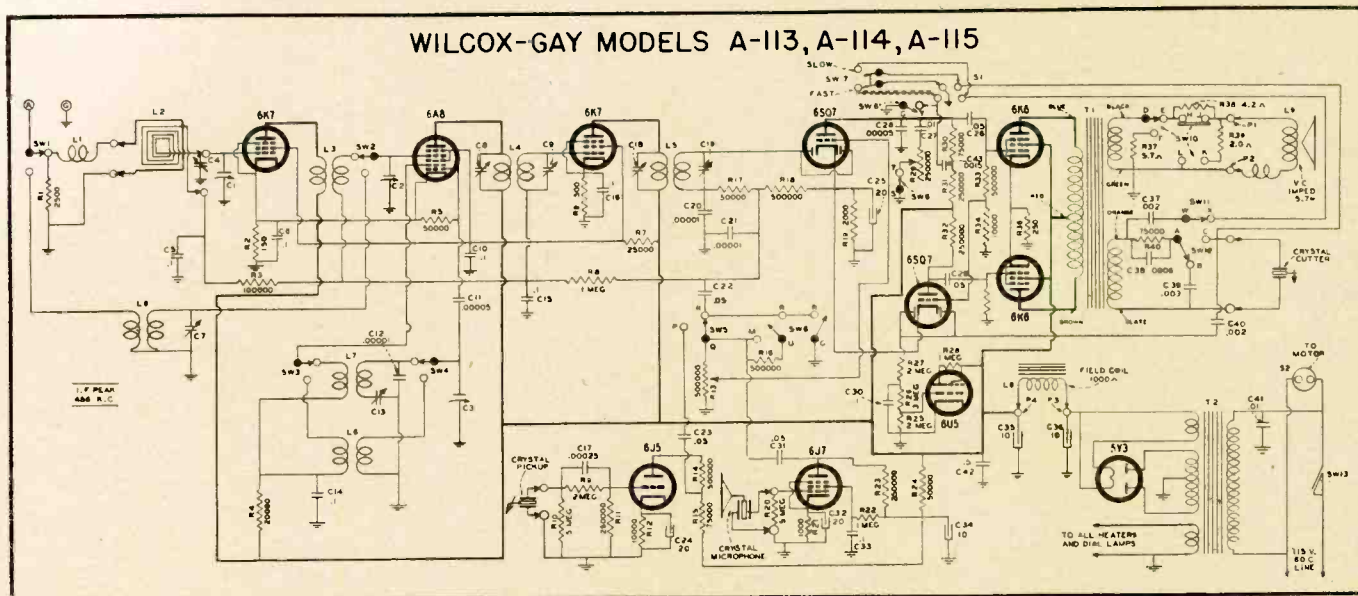
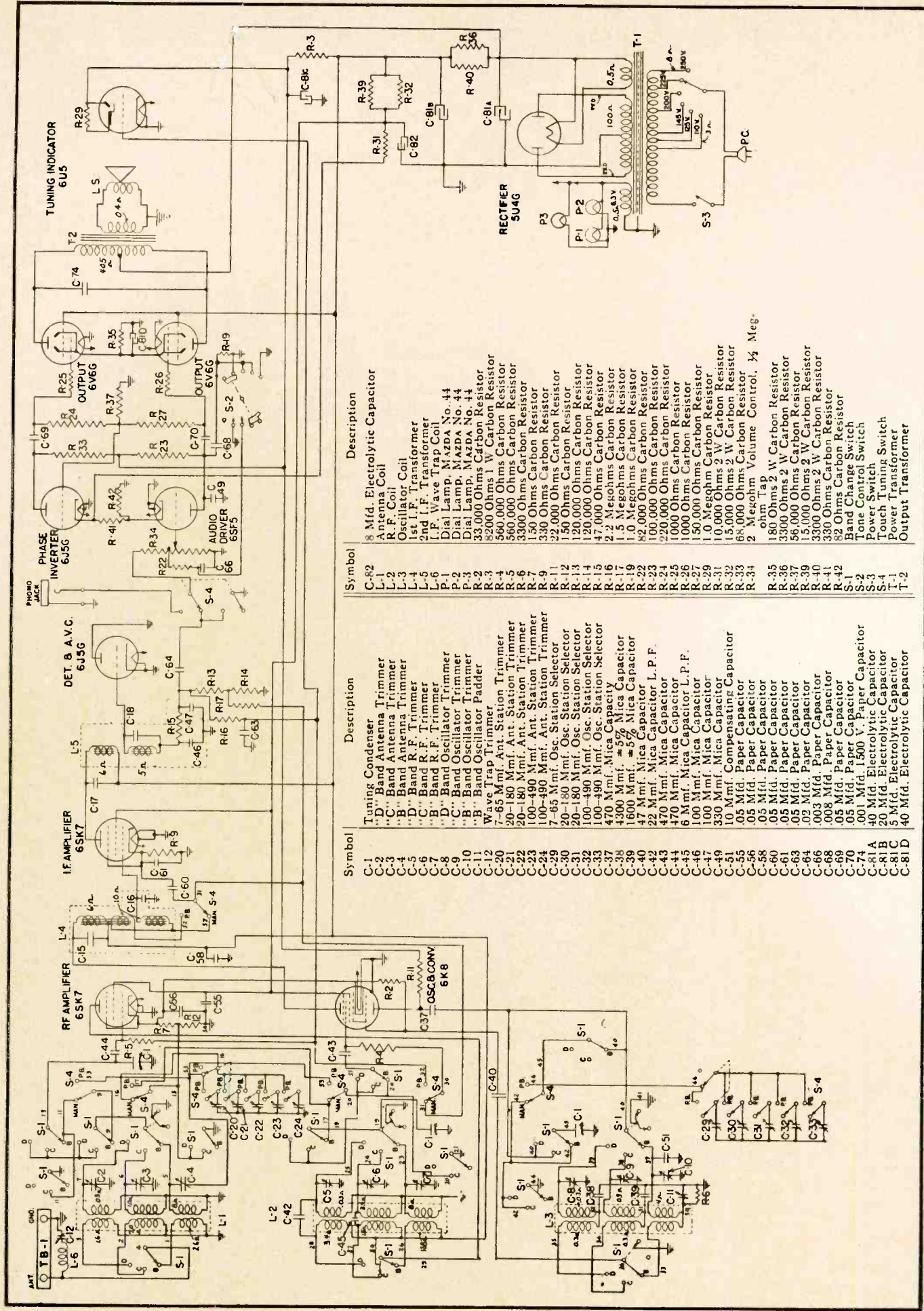


Fig. 2—Recordio has high-gain mike amplifier and low-gain pickup amplifier.



Symbol	Description
C-1	Tuning Condenser
C-2	"D" Band Antenna Trimmer
C-3	"C" Band Antenna Trimmer
C-4	"B" Band Antenna Trimmer
C-5	"D" Band R.F. Trimmer
C-6	"C" Band R.F. Trimmer
C-7	"B" Band R.F. Trimmer
C-8	"D" Band Oscillator Trimmer
C-9	"C" Band Oscillator Trimmer
C-10	"B" Band Oscillator Trimmer
C-11	"B" Band Oscillator Padder
C-12	Wave Trap Trimmer
C-20	7-65 Mmf. Ant. Station Trimmer
C-21	20-180 Mmf. Ant. Station Trimmer
C-22	20-180 Mmf. Ant. Station Trimmer
C-23	100-490 Mmf. Ant. Station Trimmer
C-24	100-490 Mmf. Ant. Station Trimmer
C-29	7-65 Mmf. Osc. Station Selector
C-30	20-180 Mmf. Osc. Station Selector
C-31	20-180 Mmf. Osc. Station Selector
C-32	100-490 Mmf. Osc. Station Selector
C-33	100-490 Mmf. Osc. Station Selector
C-37	470 Mmf. Mica Capacity
C-38	4300 Mmf. $\approx$ 5% Mica Capacitor
C-39	1600 Mmf. $\approx$ 5% Mica Capacitor
C-40	47 Mmf. Mica Capacitor
C-42	22 Mmf. Mica Capacitor L. P. F.
C-43	470 Mmf. Mica Capacitor
C-44	470 Mmf. Mica Capacitor
C-45	6 Mmf. Mica Capacitor L. P. F.
C-46	100 Mmf. Mica Capacitor
C-47	330 Mmf. Mica Capacitor
C-49	10 Mmf. Compensating Capacitor
C-51	.05 Mfd. Paper Capacitor
C-55	.05 Mfd. Paper Capacitor
C-56	.05 Mfd. Paper Capacitor
C-58	.05 Mfd. Paper Capacitor
C-60	.05 Mfd. Paper Capacitor
C-61	.05 Mfd. Paper Capacitor
C-63	.02 Mfd. Paper Capacitor
C-64	.02 Mfd. Paper Capacitor
C-66	.003 Mfd. Paper Capacitor
C-68	.008 Mfd. Paper Capacitor
C-69	.05 Mfd. Paper Capacitor
C-70	.05 Mfd. Paper Capacitor
C-74	.001 Mfd. 1500 V. Paper Capacitor
C-81 A	40 Mfd. Electrolytic Capacitor
C-81 B	20 Mfd. Electrolytic Capacitor
C-81 C	5 Mfd. Electrolytic Capacitor
C-81 D	40 Mfd. Electrolytic Capacitor
C-82	8 Mfd. Electrolytic Capacitor
L-1	Antenna Coil
L-2	Oscillator Coil
L-3	1st I. F. Transformer
L-4	2nd I. F. Transformer
L-5	I. F. Wave Trap Coil
L-6	Dial Lamp, MAZDA No. 44
P-1	Dial Lamp, MAZDA No. 44
P-2	Dial Lamp, MAZDA No. 44
P-3	33,000 Ohms Carbon Resistor
R-1	8200 Ohms 1 W Carbon Resistor
R-2	560,000 Ohms Carbon Resistor
R-3	560,000 Ohms Carbon Resistor
R-4	3300 Ohms Carbon Resistor
R-5	3300 Ohms Carbon Resistor
R-6	3300 Ohms Carbon Resistor
R-7	150 Ohms Carbon Resistor
R-8	330 Ohms Carbon Resistor
R-9	22,000 Ohms Carbon Resistor
R-10	150 Ohms Carbon Resistor
R-11	150 Ohms Carbon Resistor
R-12	120,000 Ohms Carbon Resistor
R-13	120,000 Ohms Carbon Resistor
R-14	120,000 Ohms Carbon Resistor
R-15	47,000 Ohms Carbon Resistor
R-16	2.2 Megohms Carbon Resistor
R-17	1.5 Megohms Carbon Resistor
R-18	1.0 Megohms Carbon Resistor
R-19	1.0 Megohms Carbon Resistor
R-20	82,000 Ohms Carbon Resistor
R-21	100,000 Ohms Carbon Resistor
R-22	220,000 Ohms Carbon Resistor
R-23	220,000 Ohms Carbon Resistor
R-24	1000 Ohms Carbon Resistor
R-25	1000 Ohms Carbon Resistor
R-26	150,000 Ohms Carbon Resistor
R-27	150,000 Ohms Carbon Resistor
R-29	1.0 Megohm Carbon Resistor
R-31	10,000 Ohms 2 W Carbon Resistor
R-32	15,000 Ohms 2 W Carbon Resistor
R-33	68,000 Ohms 2 W Carbon Resistor
R-34	2 Megohm Volume Control, $\frac{1}{2}$ Meg-ohm Tap
R-35	180 Ohms 2 W Carbon Resistor
R-36	3300 Ohms 2 W Carbon Resistor
R-37	56,000 Ohms Carbon Resistor
R-39	15,000 Ohms 2 W Carbon Resistor
R-40	3300 Ohms 2 W Carbon Resistor
R-41	330 Ohms Carbon Resistor
R-42	82 Ohms Carbon Resistor
S-1	Band Change Switch
S-2	Tone Control Switch
S-3	Power Switch
S-4	Touch Tuning Switch
T-1	Power Transformer
T-2	Output Transformer



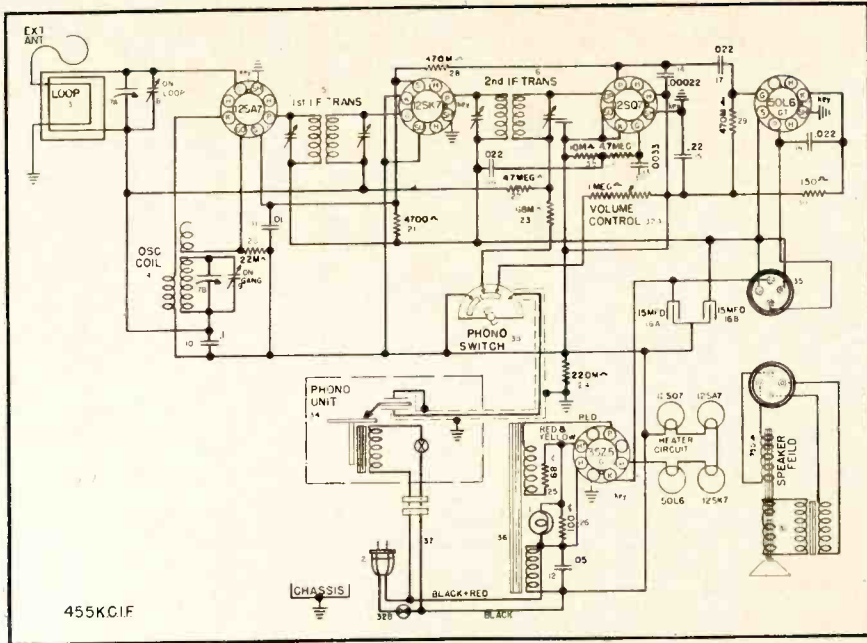


Fig. 3—Circuit of Crosley 52-TQ.

(principally) of the inverter tube, thus tending to reduce hum in the audio amplifier.

The receiver is also equipped with a 6U5 tuning indicator, connected in the usual manner.

A jack is provided for phono operation. The compensating circuit for the crystal pickup is shown in Fig. 1.

#### RECORDIO (FIG. 2)

Wilcox-Gay has been turning out some neat radio-phono-recorders, the circuit for the latest Models A-113, A-114 and A-115 being shown in Fig. 2. These are two-band jobs with a tuned r-f stage.

The first 6SQ7 is used conventional-ly—detector, avc and audio driver. The

second 6SQ7 has split functions. The triode section is employed as the phase inverter of the "grid pick-off" type, with no degeneration, while the diode section is used as a rectifier for developing voltage for the 6U5 volume-level indicator while recording.

The jobs are designed for recording at both 78 and 33 $\frac{1}{3}$  r.p.m. As a means of maintaining normal frequency response in either case, an equalizer is employed, with "Slow" and "Fast" positions, and controlled by switch SW7.

Note that separate pickup and mike amplifiers are used, the pickup amplifier being low gain and the mike amplifier high gain. Elaborate equalization and compensation are used in both circuits. Either one of these pre-amplifiers may be switched into the volume-

control circuit by means of switches SW5-SW6.

#### STRICTLY A.C. (FIG. 3)

The Crosley Model 52-TQ is of the ac-dc type, but designed strictly for a-c operation. The circuit is shown in Fig. 3.

Its departure from the straight type of ac-dc set rests in the inclusion of a simplified power transformer designed for a half-wave rectifier. All tube heaters are series-connected and shunt the primary of the power transformer 36. This arrangement provides good regulation.

The secondary of the power transformer feeds the plate of the 35Z5 half-wave rectifier and provides a slightly higher voltage than would normally prevail, thus supplying higher plate and screen voltages.

#### ELECTRIC PHONOGRAPH (FIG. 4)

Emerson has brought out a complete electric phonograph with some interesting features. The circuit is shown in Fig. 4. It may be used on either ac or ac-dc, depending upon the phono motor employed. See dotted portions for necessary alterations.

The power supply uses a two-section filter which feeds the 12SQ7 voltage amplifier and the 50L6 beam-power amplifier. Dual degeneration is employed in the output stage by feeding back a portion of the output voltage, via C2, to the cathode side of the unbypassed cathode resistor R5.

Unique is the low-pass filter R7-C9-R6 which feeds back a portion of the voice-coil voltage to the high side of the volume control R11. This eliminates motor rumble at high volume-control settings for, as the control arm

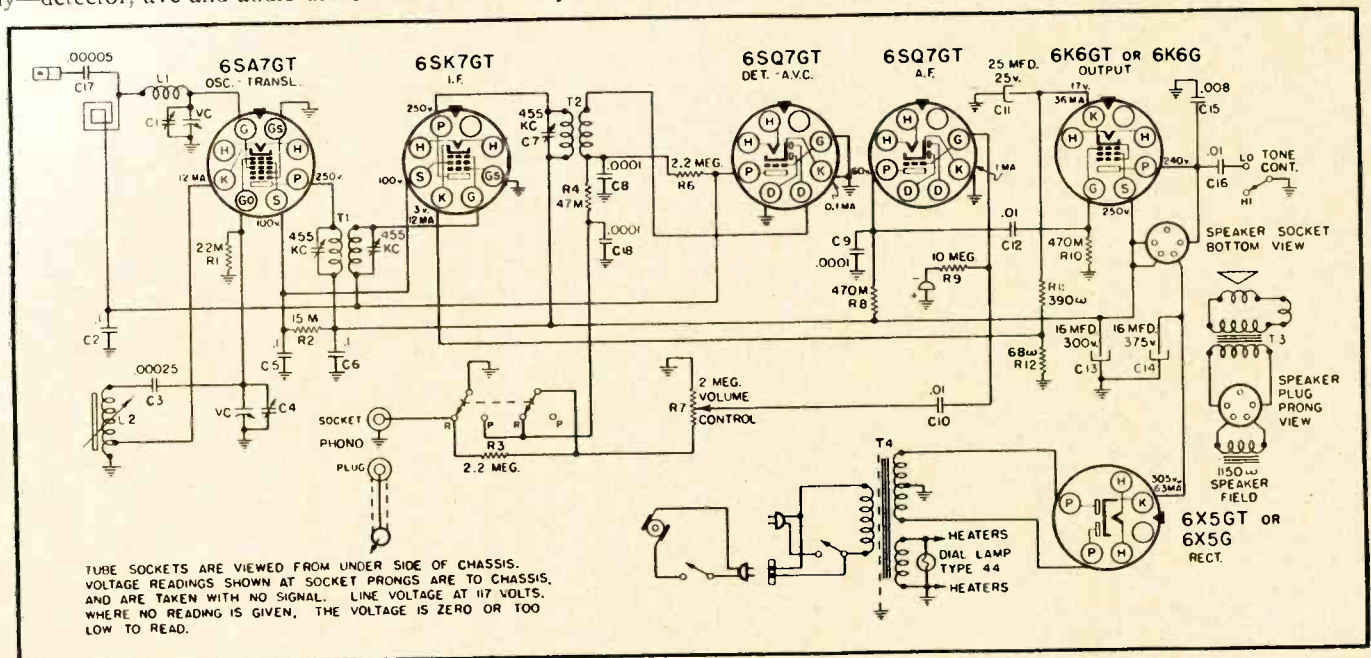


Fig. 5—Silvertone uses dual biasing in 6K6 cathode circuit.

is moved up, the degree of low-frequency feedback voltage on the grid of the 12SQ7 is increased, thus decreasing the (very) low-frequency response.

Low- and high-frequency pickup compensation is provided by resistor R4 and condenser C5.

**IF-AF BIAS (FIG. 5)**

In Fig. 5 is shown the schematic of the new Silvertone 101.660 chassis. Note that the oscillator coil in this job has an iron-core adjustment as well as a trimmer C4, the former being the 600-ke padder.

As in most of the late Silvertone receivers, a bias cell is employed for providing the negative voltage for the grid of the a-f voltage amplifier. This cell is in series with the 10-meg grid leak.

Of special interest is the source of the initial bias for the 6SK7GT i-f tube. The cathode of this tube returns to a voltage divider in the cathode circuit of the 6K6GT output tube. Bias for the power tube is developed across R11 and R12, while bias for the 6SK7GT i-f tube is developed across R12. The comparatively large current passing through these two resistors serves to maintain a constant bias for the i-f tube.

No degeneration is involved because both resistors are bypassed to ground by the 25-mfd electrolytic C11.

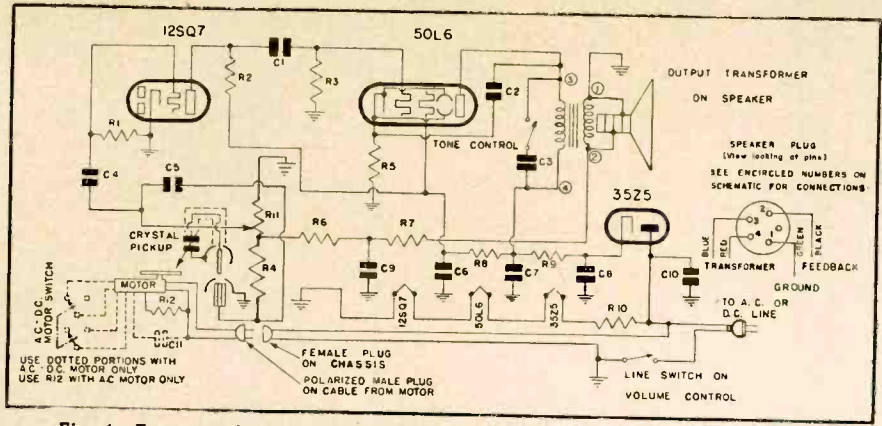


Fig. 4—Emerson phono-combination eliminates motor rumble by degeneration.

**HIGH-GAIN PORTABLE (FIG. 6)**

The recently introduced RCA Victor Model 26BP portable is a logical elaboration of the now-famous BP10. This latest in the miniature-tube line is a 3-way job, with a 117Z6GT providing filament and plate power when the receiver is operated from an a-c or d-c power line. The complete circuit is shown in Fig. 6.

Since the set is designed to provide satisfactory reception in practically any location, it necessarily has high gain. In this respect it is interesting to note that there are three manually-tuned circuits rather than the usual two in sets of this sort. The inclusion of a tuned r-f stage not only increases sensitivity appreciably, but provides the sort of selectivity loop sets require

when operated near powerful broadcast stations.

It will also be observed that regeneration is employed in the i-f stage, the "tickler" winding being in the screen circuit of the 1T4 i-f tube.

Both i-f transformers are permeability-tuned, and a permeability tuned padder is incorporated in the oscillator coil.

Means are provided for the use of a special external loop where reception conditions are unusually poor—such as on trains or planes. A pressure switch is used so that the internal loop is disconnected from the grid of the r-f tube when the external loop is plugged in to the socket provided for it.

The power-line cord and plug provide a safety feature. The receiver can-

(Continued on page 23)

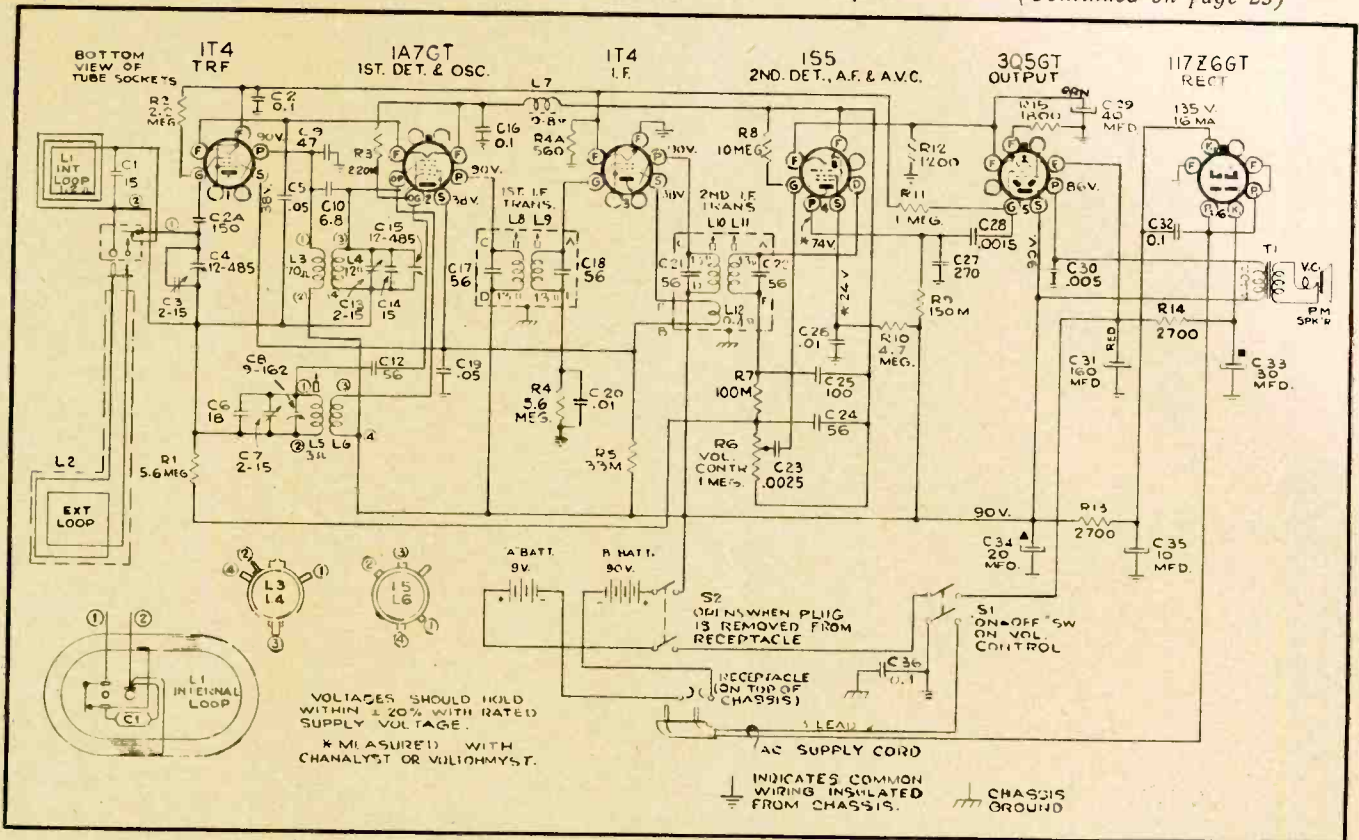


Fig. 6—RCA inaugurates 3 manually tuned circuits in latest Model 26BP.

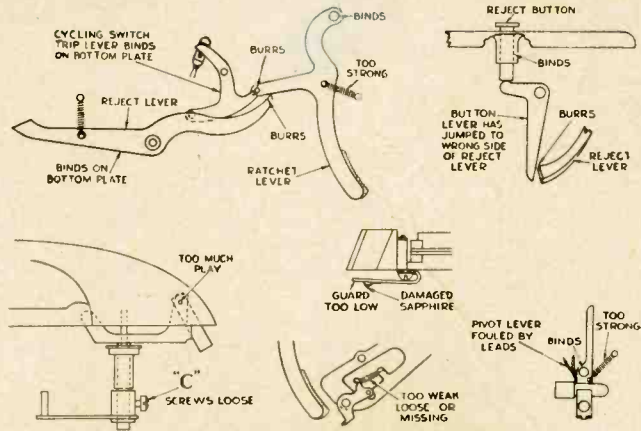
# Shop Notes

Card 2

## RCA RP-151 RECORD CHANGER

### Fails to Trip or Cycle

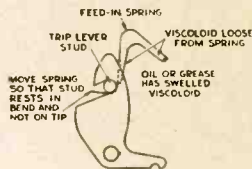
Eccentric groove on record is too shallow or discontinuous. Defective mercury switch, circuit, or motor. Other reasons illustrated at right, on Card 2 →



## RCA RP-151 RECORD CHANGER

### Incorrect Feed-In

The feed-in spring has no effect until just after the pickup has landed. It then springs back to its original position, pushing on the trip lever stud and moving the pickup toward the music grooves. When feeding in on the top side of a record the feed-in spring is assisted by the rotational force of the record; on the bottom side feed-in this force opposes the feed-in spring's action. The feed-in screw should be adjusted so that the sapphire does not jump grooves on top side feed-in and still accomplishes bottom side feed-in in less than ten seconds.

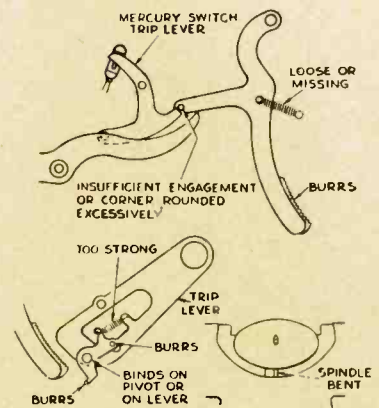


Other reasons: Instrument is not level; pickup cable binds.

## RCA RP-151 RECORD CHANGER

### Trips Early

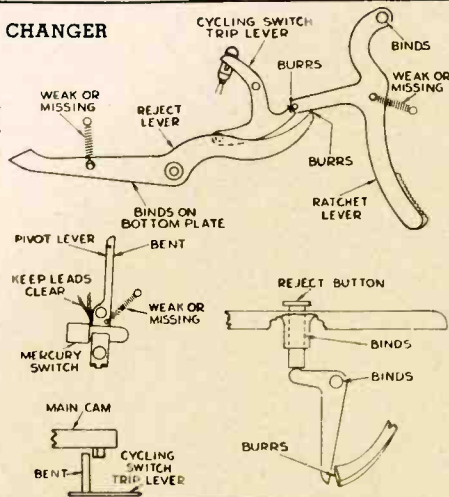
Off-center record. Trip pawl not aligned with ratchet lever teeth. Other reasons illustrated.



## RCA RP-151 RECORD CHANGER

### Trips Continuously

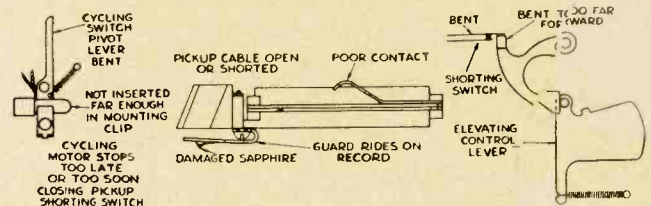
The common reasons for continuous trip are illustrated on this card.



## RCA RP-151 RECORD CHANGER

### No, Low, Distorted Output

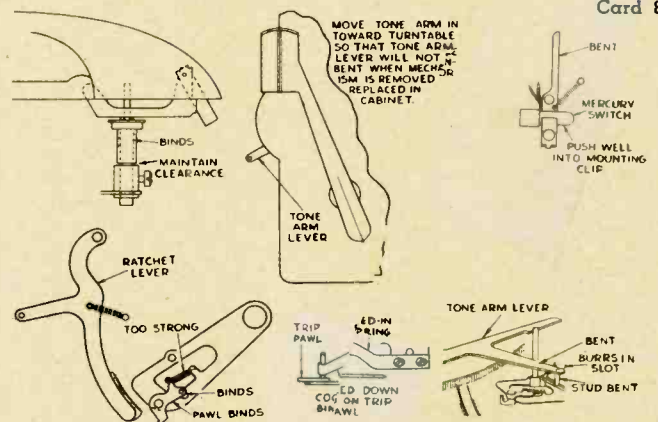
Defective crystal (s). Shield over terminal board is shorting to cable lugs. Sapphire strikes guard. Nut on sapphire holder shaft is loose. Other possible reasons illustrated.



## RCA RP-151 RECORD CHANGER

### Repeats Grooves

The mercury switch is operated to break the a-c supply to the cycling motor a few moments before all the cycling operations are completed. The "coast" of the mechanism should then bring the tone arm lever stud against the return lever latch and disconnect the return lever from the trip lever. If excessive friction anywhere in the cycling motor or its gear train reduces this "coast" the pickup will land and repeat grooves near the beginning of the record. Other causes for the repeating of grooves are shown on Card 8 →



Card 8

# The RADIOFRONT

KARL A. KOPETZKY

## Parts Curtailment

BY the time that this reaches you, the shutdown of the manufacture of radio sets will have taken place. The industry will be readying itself for an all-out conversion to war work throughout. In many factories the conversion is, at this writing, almost complete. Engineers are pouring over government blueprints of articles which the plants never thought they could, or would ever make. Having made a last stab at staving off the inevitable day of conversion as long as possible, the industry is, as everyone thought it would, now getting at the business of war work with a vengeance. What then of the parts business?

We have repeatedly stated that there would be curtailment in the parts industry. We have said this in the face of many and valued opinions to the contrary by those who claimed that they were in the know. We have also seen that the radio industry has closely followed the automobile trade in its treatment by the Government! There is in the offing,—may even be a fact by the time that you read these lines,—a complete shut down in the automotive replacement parts business. That might also be the story in the radio parts industry. If automotive repair parts production is completely stopped, . . . take it as a very strong hint that the radio replacement parts field might suffer the same fate.

Through our connections we have been hearing of the troubles of the expeditors. These men are charged with the procurement of parts for the manufacturers of war radio materials. There is no plenty in parts. War radio manufacturers are crying for condensers, for resistors, for volume controls, for panels, for speakers, for transformers. They are complaining to Uncle Sam that they are having a hard time getting the innards of the sets that the Armed Forces need for the winning of the War. And Uncle Sam is about to do something about it!

The trouble lies in the fact that there cannot be civilian as well as War radio manufacture at the same time! Those who say that the parts manufacturers can keep up with war orders and at the same time run some unit off their respective lines for the civilians, just do not know what they are talking about. The radio program laid out for the years 1942 and 1943 in war work

is staggering beyond all comprehension. And it does not admit that there is either time or material for the non-military market.

Thus we feel that we are doing the radio repairmen a service in advising them in all earnestness that the complete shutdown in the manufacture of replacement parts is likely. It is not a question of how great the shutdown will be. It resolves itself into a problem as to *when* the shutdown will come.

What, then, will become of the millions of radio sets which get out of

Joneses by one means or another. And even executives of the radio industry have never said that *all* radio sets would go blotto at one time!

## WITHOUT PARTS—WHAT?

So it is up to the serviceman to learn how to repair a set *without* replacing a defective part. Parts of a radio set are not quite like tires on a car. They do not irreplaceably wear out. Radio parts are usually subjected to overloads, and to mishandling. They have been treated with disdain because the public has always believed that it could go to the corner radio store and get a replacement. When the public realizes that there are no more replacement parts available, then it will take better care of its radio sets, and will not wait till the whole set goes up in smoke before calling in the serviceman.

It is well known among the engineers that many a part can be home-repaired. We mean just that—*home-repaired*. When a speaker-cone tears, it can be repaired by the serviceman. A replacement is better; but with none to be had, the cone can be patched with fairly good results. A transformer can be repaired and re-dipped in wax or paraffin. The section which is burned through can, if it is on the high-power side, be cut out, the wire spliced, the connection soldered and bound in ordinary writing paper and tape, and the finished results be within ten volts of the original value. A filter condenser can be removed and with a combination of "junk-box" resistors and some home-made work on the punctured condenser, the radio set can be made to operate. There may be some slight hum, but it will work. Sufficiently for the "President to be heard", at any rate.

## COMPETENT SERVICEMEN CAN SURVIVE

In one way the serviceman is just coming into his own. No longer will he have to compete with the large service establishment down the street with the big stocks on the shelf. If the serviceman has for himself a fair assortment of test instruments, plus a thorough knowledge of radio, he will be able to carry on a better business than the man who has been "doing replacing" every time a radio came to him for repair. Servicemen whose

(Continued on page 27)

## WANT A \$1. DEFENSE STAMP?

★ The stuff that usually helps are the practical "Shop Experiences"—the short-cuts and solutions to the problems you and other servicemen solve in your daily work. Such "Shop Notes" are mutually valuable and in order that they will come to the attention of all of our servicemen readers, we are offering a \$1. Defense Stamp for such previously unpublished "Shop Notes" or "kinks" that you send in and that we find acceptable for publication.

Here's a chance for all of you to earn and learn at the same time! Dig out those special shop notes and tricks of yours now and mail them in to "Shop Notes Editor", RADIO SERVICE-DEALER, 132 W. 43rd St., New York City. Sorry, unused manuscripts cannot be returned unless accompanied with stamped and addressed return envelope.

order each year? What about that story that, "President Roosevelt wants to keep contact with the people"? What about the story that, "Radio will be a propaganda means for our Government to sell war to its people"?

That the President *wants* to keep in touch with the people, is true. That he *insists* that Mr. Jones' set be in repair for that purpose, is *not*. He knows that should Mr. Jones' radio be out of order, and the talk he is about to give sufficiently important, that he can count on Mr. Jones going over to the local YMCA, or to a neighbors, or to his Mother-in-Law, or to his son's home to hear the President. What if the YMCA's set, and the neighbor's set, and the Mother-in-Law's set, and Mr. Jones' son's set are all out of order? What then? Well, the newspapers are still operating. So is the local "grapevine." The message will get to the

# Shop Notes

## SILVERTONE 7010 & 7034

### Chassis Changes

The first group of 100.363 chassis produced were equipped with a permanent magnet speaker and a six volt pilot lamp. Later chassis were produced with electro-magnetic speakers and 110 volt pilot lights. These later chassis are identified by 100.363-1 stamped on the identification plate.

## VIBRATOR NOTE . . . Coated Contacts

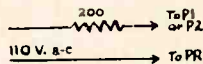
There are many instances reported wherein new vibrators just taken from stock will not start when first installed in a receiver. We find that a frequent cause of this trouble is a slight coating of oxide on the points when kept on the shelf over a period of time.

To correct this condition, it is only necessary to remove this oxide film, after which no further trouble will be encountered.

As shown in the diagram, connect 110 volts a.c. through a 200-ohm, 25- to 50-watt resistor to the reed (PR) and to either point P1 or P2 of the vibrator. Only one of the latter will draw current and actuate the reed. With the vibrator held so that the prongs face you, determine the location of the prongs connected to PR, P1 and P2 from the base diagrams (illustrated on page 16 of the Radiart Vibrator Replacement Catalog). It will usually require from one to ten seconds to start the vibrator running and to remove all oxide film from the points. This will not, in any case, damage the vibrator.

This method may be used to remove oxide film and start any make of shunt-type vibrator.

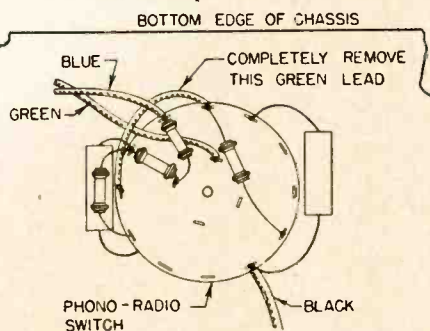
Submitted by Radio Supply Co.



## SILVERTONE MODEL 7069

### Improved Phono Operation

Chassis identified by 101.658 can be improved with respect to phonograph operation by cutting the green wire on the phono-radio switch as shown. Chassis which have had this change made in production are identified by suffix number -1 or a subsequent number.



## CROSLEY NP-358 RECORD CHANGERS

### Adjustments

**Keeps Repeating on Top of Worm:** Bend trip latch back slightly so trip spring does not exert so great a pressure on worm follower. It may be necessary to first loosen set screw on trip cam. If this does not correct trouble, check follower arm to make sure it is straight and bend slightly, if necessary.

**Keeps Repeating on Bottom of Worm:** Bend follower arm to straighten.

**Noise While Cycling:** This trouble is caused by the follower arm being bent out of position. Straighten arm.

**Fluttering Follower While Playing:** Check to see if follower arm is all the way up to top of worm; if not, bend arm slightly in toward worm to stop binding.

**Lift Pin Slides Off Follower Arm:** Bend follower arm to center it over lift pin.

**Follower Arm Binds:** Bend follower arm away from fulcrum at both sides of rivet.

**Does Not Cycle With Reject Button:** Check to see if trip latch is releasing follower. If trip latch releases cam follower but it will not center threads of worm, bend follower arm.

Continued on Card 16

## SILVERTONE 7017 & 7032-A

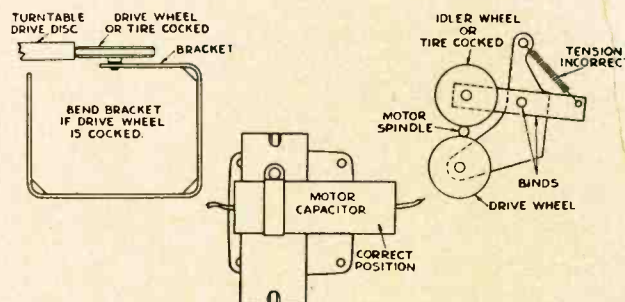
### Chassis Differences

The 100.381-1 chassis is the Underwriter's Listed version of the 100.364-1 chassis for which an R.L. has been issued. The electrical and mechanical specifications are the same as those for the 100.364-1 and can be obtained from the R.L. for that chassis. The 100.364-1 chassis uses the metal chassis pan as the B-return. The 100.381-1 chassis has a separate B-return but this return is by-passed to the chassis through C26 and C29. On the 100.381-1 chassis the avc is shunt-fed to the grid of the 14H7 through R18 instead of through the loop as on the 100.364-1. This means that the loop now connects to the chassis instead of the avc line. L4 has been moved to the other side of the loop. 100.381-1 has seven parts not used on the 100.364-1; they are: C26, C27, C28, C29, C30, R18, and R19.

## RCA RP-151 RECORD CHANGER

### Slow or Varying Speed

Motor support spring tension is incorrect. See illustrations for other causes.



## WILCOX-GAY A-105

### Loop Adjustment

In the event of loop-antenna replacement, the r-f alignment should be checked at 600 kc, and if necessary the inductance of the loop may be adjusted to bring about correct alignment of the dial at 600 kc by dressing the end of the inside loop turn to provide more or less inductance, as required.

An adjustment of the loop inductance should be followed by realignment of the r-f trimmers at 1400 kc.

Card 16

**Does Not Cycle On Center Trip:** Check adjustment of trip. If follower is being released, bend arm as above. If follower is not being released, readjust trip.

**Follower Jams:** Bend follower arm to straighten.

**Turntable Rubs:** Loosen set screw on worm with Allen wrench and raise spindle about 1/16".

**Motor Slows Down During Cycling:** Bend paddle end of follower arm down slightly or set ejector screw back a little.

**Improper Set Down on Record:** Loosen tone-arm crank screw and turn tone-arm slightly in proper direction if arm is 1/8" or more off. If only 1/16" out of adjustment, bend tabs on either side of index slide.

**Center Trip To Fast Or Slow:** Readjust trip screw.

**Record Drops On Tone Arm:** Bend back end of follower arm up slightly. Make sure ejector screw is adjusted properly.

**Will Not Drop Records:** Set ejector arm screw slightly higher. Always check on full stack of 10-12" records. Set screw so bottom record will just fall.

**Improper Adjustment of Ledge:** Adjust position of ledge so it is about 1/16" back of records by means of screw located under ejector housing.

**Short:** Remove switch cover and bend lugs so they do not touch cover.

**Crank Arm Bent:** Be sure crank arm is straight or set-down will be off on high stack of records.

# RSA NEWS



"Cooperation is not sentiment, it is an economic necessity"—Steinmetz

## GOOD NEWS FROM WASHINGTON

SERVICEMEN all over the country have pondered about the availability of replacement parts and tubes in the future. RSA now has re-assuring information for you servicemen directly from the War Production Board.

A recent statement from the WPB to RSA declares that, "Production of replacement parts and tubes should continue in sufficient supply to keep most sets in operation." WPB further states, "the board is now working on a number of programs to make available the continued supply of radio tubes and parts for replacement purposes, and will make every endeavor to obtain materials for these parts as long as they do not have to be taken away from direct war products".

And the board further urges the RSA, "that members of the RSA will be justified and will be doing a public service by re-assuring the public that everything possible is being done to assure the continued operation of most radio receivers."

In view of the above statement from the War Production Board let every RSA man act accordingly. Whether we serve with the armed forces (as many of us do, or will in a short time) or on the home-front, it is our job to contribute the best we know how, to winning this war. *Your Radio Job is Important!* WE-ALL are part of the Victory Program. Many of us must make important decisions shortly. Therefore, consider your plans in the light of the outline given above. Be strategic; choose tactics which make for execution of your plans! And remember, you can make better decisions with RSA, than without.

## UNCLE SAM MEETS RSA!

In co-operation with Army, Navy and Air Corps authorities, the RSA sponsored a number of meetings in widely scattered areas throughout the country for the purpose of introducing qualified radio men to representatives of our armed forces so they could present to RSA-men an outline of the many opportunities our Government has available to them in civilian and military capacities.

Many Chapters co-operated wholeheartedly. To them our sincere thanks.

Continue to do your stuff, Chapters! RSA can and must help Uncle Sam man the "Radio-Front!"

## INCREASE YOUR "NET" ON EACH JOB

All servicemen should sell service, many of us do, but there are still too many who just *think* they do. Considering that even the best of us are not super salesmen, but merely demonstrating a little better sales ability than the average, it would seem that the servicemen who fail to do this could at least be taught to aim at higher levels in their prices per job.

It is with this thought in mind that many a worthwhile plan was projected

for adaptation by those who lacked a plan of their own. By and large, these efforts had a wholesome effect and contributed to the improvement in the general price levels. It has been the policy of the RSA to continually try and study various ideas and plans which were proposed as a solution to this problem. After a long period of trial and error, we came to the conclusion that the successful selling of service depended a great deal on the servicemen's ability to get the customer to think in the same terms of service as the serviceman does. It's relatively simple.

## "Corrective Service"

The system which we of the RSA developed and put into effect some years

**DON'T JUST CALL A RADIOMAN—CALL AN R S A MAN!**

IN ACCOUNT WITH Name _____ Address _____ Phone _____		No. _____ Date _____ Mfr. _____ Model _____ Serial _____ Promised _____								
YOUR IMPRINT HERE										
Services or Merchandise										
<b>GUARANTEE</b> <small>We print this invoice as a Member of "Radio Servicemen of America, Inc." The service work completed on your radio as specified is guaranteed against defective workmanship and materials for 90 days from date of delivery, providing all charges have been paid in full. This guarantee is void if damage results from accidents or attempted repairs by anyone else.</small>										
Customer's Description of Trouble										
Estimate	<b>RADIO AND PHONO CHECKUP</b>									
	Antenna	Tubes	Tone	Selectivity	Changer					
	Speaker	Pickup	Motor	Reproduction	Sensitivity					
	Recommendations:									
Estimate Customer Agrees To	<b>RECORD OF PROFESSIONAL SERVICES</b>						Components	Re-design	Time	Statement
	Tubes									
	1	Restore to operating condition								
	2	Correction for hum								
	3	Correction for intermittent operation								
	4	Correction for noise and distortion								
	5	Correction for poor sensitivity								
	6	Correction for low volume								
	7	Correction for push button settings or alignment								
	8	Correction for faulty F.M. operation								
	9	Re-alignment of tuned circuits Band 1 2 3 4 I.F. Disc F.M.								
	10	Phonograph corrections								
	11	Mechanical corrections								
	12	Miscellaneous								
						Mileage				
						Acc't of Occupational Tax				
						<b>TOTAL</b>				
Signed									Service Engineer	
	Customer									

ago, is based on the idea of selling a "corrective service" in an easy step by step procedure, for the purpose of attaining that price, which a particular job should bring. The illustrated service form will help show you how the build-up is accomplished.

The idea is to correct hum instead of selling a filter, volume control, etc. If distortion is present, sell it as such and let its operation contribute its proper share to the final total price. Go on down the line and quote in the estimate column your price for each operation that this particular receiver calls for. If, for instance, hum and noise are due to the same defect, or defects, you can shade one or the other.

If, as does happen sometimes, the total appears too high to the customer, point out first that doing all these things gives him a thorough overhauling job with a guarantee of trouble-free operation for the entire set. However, if his objection cannot be overcome, make your recommendations as to which corrections are most urgent to return it to operating condition. In most cases you'll find that after some hesitancy you will get the total job anyway, and get it at *your* price.

Such are the results if this procedure is properly followed. Once you have gone that far, you will find the customer more amenable to reason. He will, without realizing it, become conscious of the fact that he too wants to get rid of the noise, hum, or whatever it is that interferes with his enjoyment of radio. No longer does he think in terms of "that" condenser he meant to buy from you, plus 50 cents or so for putting it in. He is now thinking about that noise or hum pretty nearly the same as you do. Now, even in his mind there is a great difference between getting rid of that noise, and his original idea of replacing "that" condenser. He is now considering buying your *service*, and that is what you want in order to close the deal on terms most favorable to you.

Please bear in mind that this procedure is not a cure-all in itself, but it does provide you with a prescribed line of approach towards that goal which all of us try to attain, namely, our price and legitimate profit.

An itemized and complete service form, such as the one illustrated, serves as a roadmarker to keep you on the right track during your negotiations. Try it. If concerted effort is put forth by individual members to attain proficiency in selling service *for what it is*, then and only then can a serviceman attain the professional level he should have. Further details as to this system and

a supply of these service forms may be obtained by writing to the "RSA Press Service," National Headquarters, Radio Servicemen of America, Inc., 414 Dickens Avenue, Chicago, Ill.

★

#### Chicago Chapter:

March was a month of great activity for the Windy City Chapter and the value of membership in RSA was clearly demonstrated. Servicemen in this area definitely know that our Country is at war and that radio men of all types are urgently needed by the armed and civilian defense services.

We met on Wednesday, March 11th, in the television studio of Balaban & Katz, 190 North State Street to hear about the Navy's need for men to operate and maintain Radar equipment. Lieut. Miles of the U. S. Navy spoke to the crowd of 150 men who attended about the radio training school the Navy is operating in Chicago, describing the opportunities that are afforded. Lieut. Eddy, U.S.N. (Ret.), the active head of the Chicago Radar School also discussed the school's activities, and he gave the boys something to think about regarding television and the study of high frequency equipment for the future. That the Naval officers were convincing speakers, and their subject of utmost interest is proven by the fact that the next day many men who heard them enlisted.

On Wednesday, March 18th, a meeting was held at the Stevens Hotel. Major F. M. McCormick, U.S.A. Air Corps, the featured speaker, presented a plan to the men whereby they might obtain commission in the Corps. It was stressed that the time for indecision has passed. Now every radio man must answer his country's call.

The Chicago Chapter is proud to be able to arrange meetings in collaboration with the Military forces so that our members can be kept fully acquainted with developments in which we can actively participate for our Nation's welfare. No doubt, soon many men from the Chicago area and the Chapter will leave to fill important positions in the war effort. We wish these men the best of luck in their efforts and hope they will achieve their goal of helping to knock the axis into oblivion.

Lowry E. Easley, Publicity

★

#### Pittsburgh Chapter:

Dr. G. A. Scott, Dean of the College of Electrical Engineering, University of Pittsburgh, will discuss "Radio Receivers and the Diagnosis of Troubles" at our April 9th meeting to be held in the Corporation Room of the Commonwealth Trust Company.

Using an RCA Dynamic Demonstrator board Dr. Scott will illustrate and graphically prove his points in a practical manner using but a minimum number of mathematical equations. Admission to this and future meetings will be restricted to RSA members and their guests. The March meeting which Dr. Scott addressed on "Radio and Electronics" was the best to date and we expect an *all out* attendance at the April meeting.

R. G. Devaney, Chairman of Publicity

★

#### Interstate Chapter:

The regular meeting was held at the home of L. H. Moorhead, 2601 Iowa Street, Davenport, Iowa on Friday, March 13th. President Gordon talked at length on the cooperation needed in this locality between Davenport, Rock Island, Moline and East Moline relative to civilian defense preparations for "blackouts" so that all activities can be coordinated for the most effective results.

Mr. Herkes, representative of Midwest Timmermann Co., spoke of the possible shortage of materials, especially condensers and volume controls. He mentioned that quite possibly certificates may be required before replacements can be purchased for installation in old sets.

Luncheon was served after the meeting. Then the group retired to Mr. Moorhead's shop where Dr. Harvalik, of St. Ambrose College, Davenport, presented a talk on "Oscilloscopes" and he demonstrated in his lecture quite a few tricks not usually obtained in normal educational programs.

A dinner, or stag party, is now being planned by the chapter to interest all servicemen in this locality in a membership drive soon to be inaugurated. In view of the critical times, our country's need of organized servicemen and the effective degree of cooperation RSA as a national organization can afford to recognized Government agencies, quite likely the benefits of RSA membership will be apparent to present non-members. President Gordon appointed a committee which will start functioning on the Membership Drive. Will report later.

Oscar W. Olson, Sec'y-Treasurer

★

#### Flint Chapter:

On March 20th we received a letter from the U. S. Navy, asking us to call a meeting of all RSA members, and others interested in Radio, for the purpose of listening to a Navy officer explain Radar, the new military development bearing on anti-aircraft detection.

The Flint Journal offered the use of their Auditorium for the meeting but only the evening of March 26th was

(Continued on page 29)

# A PRACTICAL PRICING METHOD

AT LONG LAST the radio servicer can now reach into his vest pocket and pull out an elaborate system of flat rates for quick pricing and estimating his jobs.\*

The weakest part of the radio service business has always been its lack of any definite schedule of prices that were high enough to make ends meet. Small operators have frequently tried to live on their gross income instead of their net profit because they did not know how to compute their actual costs of doing business. In some shops, the average repair charge was about \$3.50, whereas cost accounting studies showed that the cost of doing business and earning a fair salary for the owner was about \$4.50 plus the cost of parts. Now that we are involved in war, it is necessary for us to tighten our belts and not only earn a living but help the defense effort by buying defense bonds and savings stamps. Radio sets must be maintained for blackout service. The competent radio servicer is entitled to earn a living comparable with other skilled men, or he will quit his work and go into more remunerative fields. Definite prices are the only way to overtake costs. If a schedule of flat rates does not get you away from red ink, use a higher schedule. Forget competition. Put your own financial house on a paying basis.

## RATE SCHEDULES VARY

The cost of doing business is higher in the East than in the Mississippi Valley, and it is lower in rural communities than in cities. For this reason, one set of flat rates will not do for all radio shops. These variations are taken care of by different schedules. At present, eleven schedules are available, ranging from \$1.00 to \$3.50 per hour. The prices of merchandise and parts are about the same from coast to coast so the only part of the schedules that varies is the rate per hour for labor. The schedule that averages about \$1.50 per hour for such labor is known as the Number 150 Schedule. No. 200 and No. 250 are for \$2.00 and \$2.50 per hour. (See illustration.) Eventually it is planned to have schedules ranging from 100 to possible 600, if there is a call for them.

Over 225 different repair operations

\* These schedules have recently been placed on the market by The Radio Equipment Company of Minneapolis, Minn., who prepared this article especially for RADIO SERVICE-DEALER.

are covered in these schedules. Special care has been taken in wording these rates. The term "Condenser" has been avoided because it is too general in scope to carry significant meaning. Buffers, By-passes, Filters and Ripple Units are specific terms and many of these are narrowed down in their scope, such as: AF Cathode By-pass, AVC By-pass, Osc. Cct. By-pass, HV Dual Buffer Units, Dual LV Filter Units or Dual LV Ripple Units, etc. (Ripple Units remove the ripple in the "B"

all inclusive schedule is used as a basis of comparison. One servicer may charge \$2.75 for a By-pass installed. Another may charge \$1.75 for the same By-pass and a \$1.00 charge for Shop Checkup and Test. In both cases the same work is done, but the first one will not hold goodwill as well as his competitor because the competitor has a better pricing technique.

Usually a repair job involves several operations such as testing the receiver to determine cost of complete

Speaker Rep. Chges—Sched. 200		Speaker Rep. Chges—Sched. 250	
147	Speaker replacement Mounting & Matching Charge when unit fits chassis or support \$0.75 Terminal Connection Charge, ea. \$0.15 Material extra, listing at \$x.xx	147	Speaker replacement Mounting & Matching Charge when unit fits chassis or support \$0.95 Terminal Connection Charge, ea. \$0.20 Material extra, listing at \$x.xx
	Complete Speaker replacement Be sure to charge for each lead \$x.xx		Complete Speaker replacement Be sure to charge for each lead Shop Ckup & Test is additional \$x.xx
148	Speaker replacement Mounting & Matching Charge when unit does not fit chassis or old support but requires extra work \$1.50 Terminal Connection Charge, ea. \$0.15 Material extra, listing at \$x.xx	148	Speaker replacement Mounting & Matching Charge when unit does not fit chassis or old support but requires extra work \$1.90 Terminal Connection Charge, ea. \$0.20 Material extra, listing at \$x.xx
	Comp. Spkr. Fitting & repl. Be sure to charge for each lead \$x.xx		Comp. Spkr. Fitting & repl. Be sure to charge for each lead Shop Ckup & Test is additional \$x.xx
149	Speaker Voice Cct. repr. minor \$0.50 Minor corrections in leads	149	Speaker Voice Cct. repr. \$0.60 Shop Ckup & Test is additional Minor corrections in leads
150	Speaker Trans. repl. \$3.75 Material included listing up to \$1.75	150	Speaker Trans. repl. \$4.25 Material included listing up to \$1.75 Shop Ckup & Test is additional

Showing how basic charges differ according to the rate-per-hour schedule used.

supply.) By using these terms, it is possible to easily secure benefits that are identical to those realized by the Medics in prescriptions but without the need of studying Latin.

At present, these rates are not perfect, but they are far better than none. As time goes on, there will be many suggestions and revisions incorporated into them. They will be adjusted from experience with them in all parts of the country, and thus offer the trade a foundation for legal actions if they relate to charges. Recently, a service dealer went to court to collect a \$1.00 testing charge. If the trade in the locality were using one of these schedules, there would be good legitimate grounds to base such a claim. The general established practices of a trade are recognizable by the courts.

Many service associations have devoted countless hours of discussion to rates but what good are they unless an

repairs, alignment, replacement of each defective part, pickup, delivery and hookup. The break down of charges should be in accordance with what is actually done. In some cases, parts should be itemized separately; tubes, for instance, but in most cases they should be incorporated in the complete rate. In this way, it is possible to avoid petty arguments with the customer as to the cost of small parts.

## FREE ESTIMATES LOWER PROFITS

The practice of making free estimates, which involve a shop checkup and test, has a tendency to increase the cost of each job that is repaired. In order to compensate for lost jobs on which these checkups have been made, it is necessary to use a higher schedule that will yield about \$1.00 to \$1.25 more in the charges that are made. This is poor business because competition that makes the checkup charge is



better enabled to meet lower prices. A charge for the checkup is known as an anchor on the job. In one case there was a 55% loss of jobs on which free checkups were made. When this same shop changed to the checkup charge, the loss dropped to 5% and revenue was received on these. These figures were derived by analyzing a year's business before the change with a year's business after the change, so they are reliable and authentic.

If you are a servicer, it will pay you to have the right schedule in your vest pocket at all times when you are on the job. It will also pay you to encourage your competitor to do likewise. Every radio serviceman and radio service dealer should carry, or have available, one of these rate books at all times.

★  
**CIRCUIT COURT**

(Continued from page 16)

not be operated from the batteries unless the power plug is inserted into a socket at the rear of the chassis. This closes the common battery lead, as may be seen from the diagram. When the plug is removed and inserted into a wall receptacle, the battery circuit is opened. This is both a simple and convenient arrangement.

★  
**ADVERTISING TRENDS**

**A POINT WORTH MENTIONING**

Advertising copy directed to Service-Dealers has changed quite a bit lately. In the P.P. (prior-to-priority) days most advertisers used to tell you how much you could get for how little. Now those manufacturers are "all-out" in defense production . . . and to a large extent they can sell all the parts they can spare for jobbers without having to beg, through advertising, that you buy 'em. Most of the advertising running now-a-days is merely "institutional" . . . reminder copy to keep your Good-Will. There is more to it than this, though, for you can bet that the manufacturers who are still advertising are the ones who plan to stay in the replacement parts business, come what may. Perhaps you'll call us selfish when we ask you to patronize the manufacturers who are sticking by us now that the going is tough, but, if you analyze it carefully you'll find that those same manufacturers are quite likely to be the ones who will stick by you, too. And without them, you're just plain out of business. Savvy? (The Publisher of RSD)

# TWO IMPORTANT DATES



## Two Weeks Apart

### MOST IMPORTANT DATE IN THE HISTORY OF RADIO SERVICING

No new sets for the public means plenty of old ones for you. To your already heavy volume of repair work will now be added the rebuilding of millions of worn-out sets that ordinarily would be replaced by new ones. It is your responsibility to "keep 'em playing." As many of these sets will be five, eight, ten years old, you need all thirteen RIDER MANUALS.

Rider Manual Volume XIII was published on April 6, just two weeks before the halt of new set production. Swamped with work—operating short-handed—forced to improvise on many jobs—established service shops must increase their efficiency if they are to continue to serve their public. So—order Volume XIII and any other volumes you need—today!

### RIDER MANUAL VOL. XIII

JUST OUT • APRIL 6th  
1672 Pages • Price \$11.00

ORDER NOW—AVOID DISAPPOINTMENT

#### RIDER MANUALS

Volumes XIII to VII .....\$11.00 each  
Volumes VI to III ..... 8.25 each  
Abridged Volumes I to V .....\$12.50  
Automatic Record Changers and Recorders 6.00

#### FOR SPRING PUBLICATION

Inside the Vacuum Tube—complete elementary explanation of fundamentals of vacuum tubes.  
A-C Calculation Charts—146 charts covering A-C calculations from 10 c to 1000 mc.

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The Cathode Ray Tube at Work .....\$3.00  
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Servicing by Signal Tracing ..... 3.00  
Meter at Work ..... 1.50  
Oscillator at Work ..... 2.00  
Vacuum Tube Voltmeters ..... 2.00  
AFC Systems ..... 1.25

HOUR-A-DAY-WITH-RIDER SERIES—on "Alternating Currents in Radio Receivers"—on "Resonance & Alignment"—on "Automatic Vol. Control"—on "D.C. Voltage Dist." 90c each

### JOHN F. RIDER PUBLISHER, Inc.

404 Fourth Avenue New York City  
EXPORT DIVISION: Rocke-International Elec. Corp.,  
100 Varick Street, New York City. Cable: ARLAB



**YOU NEED RIDER MANUALS TO "CARRY ON"**

**FLAT RATES**

**SIMPLIFY YOUR SERVICE PRICING!!**

Eliminate labor losses  
Reduce price arguments  
Make estimating easier

Compact vest pocket volumes containing complete flat rates for radio service work from A to V. Includes instructions on pricing procedures showing examples, storage charges, disposal of instruments and guarantee. If your jobber doesn't have it, send 25c for a prepaid copy.

Specify the Schedule you want.

**RADIO EQUIPMENT CO.**

1215 Nicollet Ave.

Minneapolis, Minn.

Every serviceman should carry one.

Schedules for

\$1.00  
\$1.25  
\$1.50  
\$1.75  
\$2.00  
\$2.25  
\$2.50  
\$2.75  
\$3.00  
\$3.25  
\$3.50

per hour

**TUESDAY:** Sometimes I kinda get discouraged about life in general. Things happen to me that just simply *can't* happen, and yet they do. Well, it started at ten ayem this morning. I had been up bright and early, feeling like the little lamb that Mary nurtured, when the 'phone rang. It was just Mrs. Phinias T. Twaddle, the gal who lives on the other side of the tracks, where the Bankers and Brokers vie to see who can raise the purtiest Nasturtiums. Seems that her Philco 610 was fuzzing up a bit, and "It simply wouldn't play loud enough to drown out Mr. Phiff, the man who's Dalmatian took Blues at the Show, when he started snoring and we were trying our best to finish the last rubber of Contract, you know", says the Great Lady. "Please hurry over and bring all those nice boxes and things you use, you know, the ones that have wires, and glass bulbs, and everything . . . like you did when Mrs. Trench's radio stopped playing and you fixed it

so nicely last week", she added, and I surmised she meant by "boxes" my poor old Weston 669 VTVM, or was it my Triplett 1232-A signal generator? Ah, makes no difference!

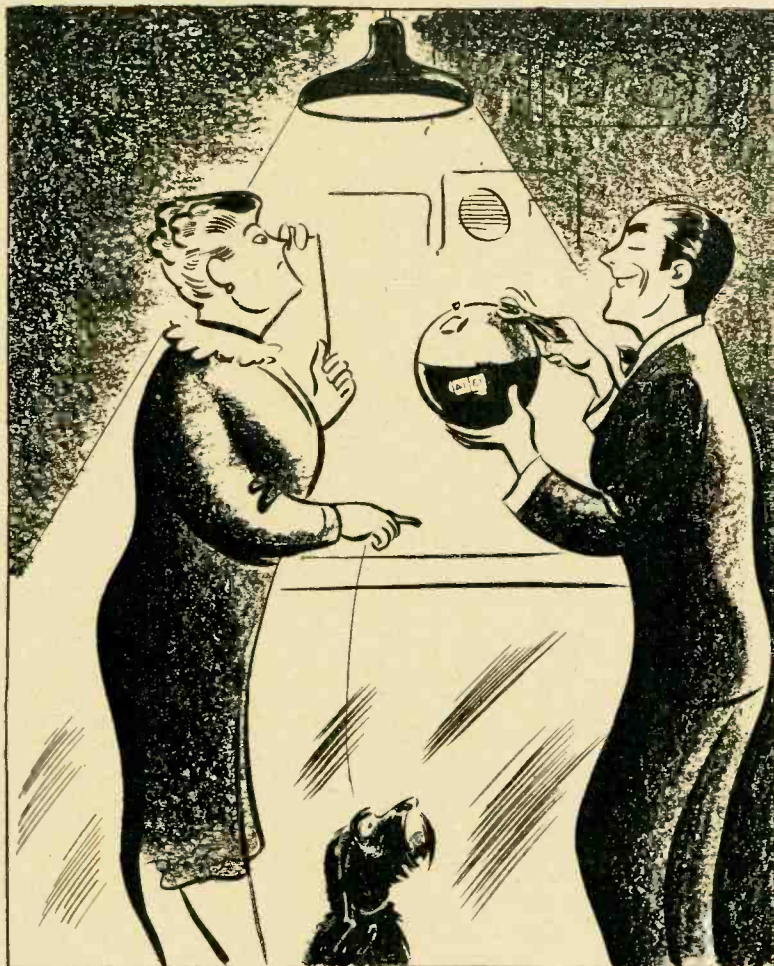
It only took me five minutes to get over to Madame Twaddle's and a fast look-see at the Philco told me that the 0.1-mfd decoupling condenser which is connected to the mid-point of the two 99,000-ohm resistors in the plate circuit of the type 75 tube needed replacing, so I did my stuff. In nice, twenty-two syllable words I told her what was wrong and she nearly swooned to think that *such* things could happen to *her* set. But, most important, she told me to go ahead and, "have everything fixed lovely so that the Duke of Yappshire can hear his favorite programs broadcast from the Middle, or is it Far East? next Thursday, when he drops in for the week-end, don't you know." So out came the chassis, and back to the shop we went. And that's when funny

things began to happen.

I barged into the shop, at just about 10, as I said before, with that chassis proudly held aloft for all and sundry, especially Jerry, to see, when I sort of noticed that the three guys sitting up close to Jerry's bench, and even Jerry himself, seemed to resent my intrusion. Gosh, they were intrigued with something. I laid the set down and meandered over to the crowd and saw Jerry fooling with "something". That's the best way I can describe it. It was a *something or other* that looked like a nice round bowling ball, or old style cannon ball like you see in small-town parks cemented down near the Civil War cannons. Black it was on one side, and shiny on the other. And all over the *thing* were little round holes, about the size of dimes.

"Hey, what's *that*" I asked and Jerry piped up, "Quiet, my friend, you are glancing at the world's greatest new invention". "Is it a time bomb, or do you just use fuses", I asked, just a bit worried as to whether or not I'd better get out of there in a hurry before she went off. "Nothing of the sort", replied Jerry, in a most condescending tone. "This is an 'all-directional, super-high-induction-pick-up radio receiver antenna' that'll bring in foreign programs *anywhere*, anytime, and LOUD, and on every kind of set" says Jerry. "See, the outer case, the ball-with-the-holes", he continued, "was once a housing for a 360° p-a speaker", he goes on, "but now, I've placed inside of it a small relay-operated gyroscope connected with a coil, or impedance-matching transformer. See?"

I didn't see—"And what is that mess supposed to do?" I countered, hoping that this nice balmy weather we're having hasn't affected poor old Jerry the same way. "Why man," says Jerry, "have you forgotten that the earth rotates and that foreign station signals get themselves pulled away from different points by the Heaviseide Layer, or things, and sometimes here in Shortville we can get programs from Australia and not from London when both countries are transmitting at the same time? And don't you realize that by having a fixed, or stationary ball of metal with 360° of surface area surrounding a continuously *moving* coil of wire properly insulated *within* will probably enable me to attract, like a magnet, all those stray waves that are supposed to come in . . . and thus we have a fool-proof, all-around-the-



"I'll buy one of those, young man."

world aerial" shouts Jerry.

But before I could collapse, up pipes Mrs. Twaddle, who had evidently followed me into the shop without being noticed, "I'll buy one of those, young man, and you can install it with my set when it's fixed". "But, Mrs. Twaddle", I started to say, when she cut me short with a nifty . . . "and I don't care if you do charge me Twenty Dollars for that, -er that . . . thing. I'll feel so much better when I know that the Duke of Yappshire can hear his favorite foreign programs any time", and out she went, feeling gay as a lark.

Now here is the rub! My conscience bothers me. I don't know if Jerry's *thing-a-ma-jig* works, and I don't suppose he does either. I just tuned-in the Twaddle set and she's perkin' on foreign stations like a little prima donna. Is it because the darn set is sympathetic to Jerry's "invention" or . . . ah, what's the use? Twenty bucks is twenty bucks, even for a gadget that *don't* work!

★

#### EDITORIAL

(Continued from page 3)

extremely high in comparison with other technical professions. It reached its zenith less than six months ago when draft boards and tempting high-pay industrial jobs cleaned out practically every part-time serviceman leaving none but the established and deferrable old-timers to carry on. Word now comes out of Washington that the Signal Corps needs and plans to get by *some method* over 1,000 radio trained men a month for an indefinite period. Only 15,000 really qualified technicians will remain in non-defense category so there is a limit to the Signal Corps' potential from the present crop. Mind you, the Signal Corps doesn't require that all men must join the Army and wear uniforms. They need men to do radio repair work, if not on a full-time basis, as part-timers, and with reasonable remuneration offered for such patriotic services. Not long ago only a few servicemen were in the bucks. Now we had better not forget that we can either volunteer to work as civilians for a fair stipend, or take a chance on being *ordered* to work for very little. We've done it before, and we will do it again because we *want* to do it this way. How about checking up with your local draft board to volunteer to do your bit! If they don't handle placements, they'll tell you who does in your community, or you can write to Captain C. O. Dunklee, Signal Corps Personnel Division, Temp. Bldg. A, Washington, D. C.



**WET** **DRY**

Same diameter as wets

Specially made to stand high voltage peaks

Handles AC ripples that standard 450 V. Drys cannot

**NOT A SUBSTITUTE!**

... It's a Super-Rugged Sprague "Dry" Specially Built to Do a Wet Electrolytic Job

**W**ARTIME restrictions make it difficult to supply wet electrolytic condensers because of their aluminum thread-neck cans—but, thanks to Sprague engineers, you can keep right on making wet electrolytic replacements, and do it with the same assurance as though you were using the finest wet electrolytic condensers ever built.

The answer is the new Sprague Type WR Replacement Capacitor—a tubular cardboard dry electrolytic of very high voltage formation. Not only will WR's stand the peak voltages often impressed on wet electrolytics, but they'll handle

the AC ripples that might cause standard 450-volt dry electrolytics to overheat to the point where they break down. The diameter of WR's is the same as that of standard wets so that they will fit the screw-type can mounting holes. Their metal feet can then be soldered to the chassis for firm mounting.

Sprague Type WR's are now available in three sizes—WR-8 which replaces wets from 4 to 8 mfd.; WR-16 to replace capacities from 12 to 18 mfd., and WR-25 to replace capacities from 20 to 40 mfd. Ask your Sprague jobber today!



**WARNING!** Don't be fooled! Although standard dry electrolytic condensers can sometimes be used as wet replacements, your safety margin is apt to be mighty thin. High surge voltages and AC ripples may cause trouble. That's why it pays to play safe by using the new Sprague WR Types. They're not substitutes. They're actually built to do a wet electrolytic job. They're the real thing as far as performance and durability are concerned.

**SPRAGUE WET REPLACEMENTS**  
(SPECIAL WR TUBULAR DRYs)  
SPRAGUE PRODUCTS COMPANY, North Adms, Mass.

### Install G. I. "Smooth Power"



Model CX Motor. One of the famous precision-built "Smooth Power" motors. Styles and sizes to fit your requirements.



The **GENERAL INDUSTRIES CO.**

DEPT. 17  
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Order Cutting and Play-back Needs from our affiliate, General Phonograph Mfg. Company, Inc., Putnam, Conn.

**Dependable Products of Leadership**

**O**UTSTANDING G. I. leadership—for years back—not only has developed and produced better phonograph motors, record changers and home recorders but makes them available today. Despite shortages of materials . . . despite prompt and effective G. I. participation in America's powerful industrial war effort . . . leading distributors have G. I. equipment for commercial demand—to meet your torque, quality and price needs. Order from your jobber. For handy catalog and price sheet, please write us.

# Interesting Items—

## SIGNAL CORPS RECRUITING TECHNICIANS

*Mission tours country:* to expedite procurement of urgently needed radio personnel for civilian positions with the Army Signal Corps, a special recruiting mission will visit the principal cities of the nation in a coast-to-coast tour during April and May, the War Department announces.

The group, representing both the Civil Service Commission and the Chief Signal Officer of the United States Army, will be headed by Colonel Fred G. Miller, Signal Corps.

The representative of the Civil Service Commission will be delegated to give the Commission's approval to appointment *on the spot*. Thus it will be possible to interview an applicant, hire him and assign him to his duties within a few hours. This procedure has been made necessary by the Army's urgent need for personnel to maintain and operate radio and telephone equipment.

The personnel needs of the Signal Corps and the types of jobs available will be explained at meetings held in the major cities, where talks will be given by officers representing the branches of the Office of the Chief Signal Officer and the Signal Corps laboratories. After the program is outlined, the meeting will be divided into small groups in which applicants will be able to discuss their qualifications with representatives of the Signal Corps. If found acceptable, they may be hired immediately.

The positions available carry pay ratings from \$1800 a year up. The exact rating will depend upon the individual's education and experience and the nature of the job for which he is accepted.

Communications and other companies in which men needed for Signal Corps engineering and technical work are now employed have been cooperative in releasing such men. At a preliminary meeting in Chicago last month, Mr. Leslie Atlas, Vice President of the Columbia Broadcasting System, encouraged every employee of his company who could be spared to apply immediately for jobs with the Signal Corps, and he promised that everyone who entered the service would have his job waiting for him upon his return. The meeting resulted in the employment in the Sig-

nal Corps of a number of highly qualified engineers.

Similar meetings will be held in the cities visited by the recruiting mission. Its itinerary includes Los Angeles, San Francisco, Denver, Dallas, New Orleans, Atlanta, Cincinnati, Pittsburgh, Boston, New York and Philadelphia.

The exact hours and dates of these meetings will be announced in local newspapers and over local radio stations. The mission started its tour April 12.

★

*The Front Cover Photograph*—which was supplied by the Signal Corps, U. S. Army, shows the model SCR-171 transmitter-receiver in field use with full equipment and standard crew of two men.

★

*Cinaudagraph Moves*—Paul Tartak, President of Cinaudagraph Speakers, Inc., announces that the task of moving all the office, machinery, and equipment to their new factory building at 3911-3929 South Michigan Avenue, Chicago, has been completed.

According to Mr. Jerome S. Gartner, Secretary of the company, this move was made in anticipation of the need of additional floor space for production of radio and electrical equipment for the Signal Corps and other branches of the government.

Mr. Gartner advises that their pres-

ent line of speakers will be available to Cinaudagraph Distributors as long as materials are available. Cinaudagraph Speakers, Inc., were formerly located at 921 West Van Buren Street in Chicago.

★

## Salvaging Old Records

*RCA Victor Offers New Records For Old*—Based on the results of a test campaign conducted in an Eastern city, RCA Victor is announcing nationally through its distributors and dealers a record-scrap-salvaging plan whereby the public may turn in old records for new.

Basically, the idea is to increase the supply of record scrap material which grows increasingly important as the drain on raw materials continues and increases. Under the RCA Victor plan, dealers will offer new records to the public in return for a specified number of old Victor, Bluebird and Decca records. The old records in turn will be sold to the RCA Manufacturing Company through its nationwide string of distributors.

RCA Victor's recommended schedule of trade-in values lists: 1 new Bluebird record for 10 old ones plus 17 cents, 1 10-inch Victor Black Label for 15 oldies plus 23 cents, 1 12-inch Victor Black Label for 25 oldies plus

(Continued on page 28)

## RSD RADIO QUIZ

SOMETIMES it's fun preparing this quiz, and sometimes it's a headache. Why don't you join the fun and profit at the same time? Send in your "Quiz Question" and the answer to it. If published you will receive a 25c Defense Stamp.

Now, let's see if this month's questions stump you. Give yourself 10 points for each question you answer correctly. 60 is Fair, 70 is Good, 85 is Excellent—and we'll bet you can't get 100. Let's go!

1. What do we mean by "conductivity"?
2. What metal shows greatest increase in d-c resistance with increased temperature? What metal is second?
3. What are the 6 usual requisites of

oscillators suitable for use in superheterodynes?

4. Some "Turnstiles" are coin-operated. Can you describe one that isn't?
5. What is "Backwash" and has it anything to do with Chinamen being late with the laundry?
6. What formula can be used for computing the dimensions of a half-wave dipole for frequency ranges above 40 mc?
7. Who is the oldest radio receiver manufacturer still in business?
8. What is a "Wag"?
9. An AFC system consists primarily of what 2 major component circuits?
10. In how many respects does FM differ from AM?

(Answers on page 31)

## RADIOFRONT

(Continued from page 18)

abilities lie in their cleverness in repair, in the aptitude to make their own repairs on the sets, will get fancy prices for their work. Such prices as "\$1.00 plus the cost of the parts" will go out. Radio servicemen are going to be judged by their skill. And they will be paid for their skill.

Nor will the successful serviceman be paid by the hour. It will take longer to repair a set with a burnt out transformer than with a rent speaker cone. And the skill is not the same. Nor the work. Prices should be charged in direct proportion to the type and amount of work. Much the same as a surgeon charges.

Since the overhead of a radio repair shop will be lowered by the lack of available replacement parts on the shelf, since there will be less and less to pay on the account of pick-up and delivery (remember the rubber tire situation) and since the income is to be measured by work, there will be a greater amount of net per serviceman. In other words, it will not be necessary to carry the stock one formerly required to stay in business. But it will be absolutely necessary to know plenty about radio.

So, servicemen had better reeducate themselves, and quickly. Get acquainted with radio theory. Know the function of every part of a radio set. Learn how to substitute, how to make home repairs. These things will be your stock in trade.

### ODDS 'N' ENDS

George W. Bailey, prexy of the ARRL, personally assured this columnist that the Government was prepared to return the ham's frequencies to them After It Is All Over. . . .

The U. S. Navy is seeking *expeditors*, in civilian capacity, for their radio department. If you think you can fill the bill write me care of this magazine, and give full information about yourself. . . .

The U. S. Army Signal Corps is seeking radiomen and servicemen. The requirements vary. If interested write me. . . .

Commissions are open to radiomen and servicemen with the proper training in both the Army and the Navy. Write George W. Bailey, Chairman of the Radio Section, National Research Council, 2101 Constitution Ave, Washington, D. C. . . .

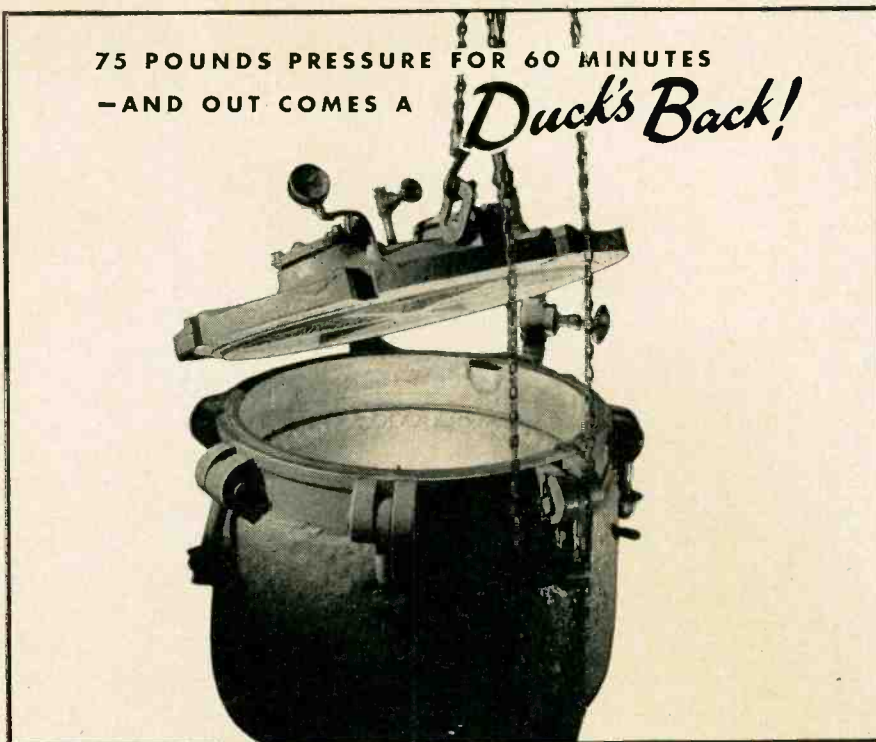
If drafted, be sure to stress your radio knowledge. It will help you financially, and it will help Make a Sap of a Jap! . . .

Several priority forms are no longer

75 POUNDS PRESSURE FOR 60 MINUTES

-AND OUT COMES A

*Duck's Back!*



**WITHOUT** moisture-resistance, ducks would be sunk—lack of resistance to moisture can "sink" transformers, too!



Utah transformers get their "ducklike" qualities in the Utah laboratories, where, encased in layers of specially made, moisture-resistant paper, they are heated under 29.4 inches of mercury vacuum pressure for 60 minutes. Consequently, all air is safely removed and all moisture evaporated. Molten wax is then forced into the tank and the empty cells of the insulating paper under 75 lbs. of pressure. This opera-

tion requires 60 minutes, but assures a longer life for the transformer.

Utah's extra precautions in the factory are insurance against transformer failure in the field. That is why Utah transformers keep right on performing efficiently day after day—even under severe conditions, when many other transformers would break down. Utah Radio Products Company, 836 Orleans Street, Chicago, Illinois. Office: 560 King Street, W., Toronto. In the Argentine: UCOA Radio Products Company, SRL Cable Address: UTARADIO, Chicago.

UTAH TRANSFORMERS are standard equipment in millions of receivers, all over the world. And there is a complete line of Utah replacement transformers.



**S P E A K E R S**

VIBRATORS • TRANSFORMERS • UTAH-CARTER PARTS

valid. For information see your local WPB office, or consult your suppliers. . . .

It has come to our attention that many of the servicemen have short-wave sets and are listening in to foreign broadcasts. There is neither a law against this, nor is there any harm in it. But do not spread stories of what you hear from other, and particularly the Axis, countries before you read or hear the U. S. version. One such instance of which we heard, was when a serviceman told of hearing that a whole part of the U. S. Navy had been annihilated. He told everyone he met.

But he failed to say that it had been a Tokio broadcast he had heard. As a result he told the story to some people whose sons were on the ships he said had been sunk. Nothing was further from the truth. And you can imagine the pain and agony he caused those parents with his big mouth. Not to mention the trouble he caused the Navy with their having to answer all the inquiries. And possibly give aid to the enemy by denying that the ships had been where the broadcast said they had been. Remember it is as important to the enemy to know what they have  
(Continued on page 32)

## RCA SALVAGES RECORDS

(Continued from page 26)

29 cents, 1 10-inch Victor Red Seal for 25 oldies plus 29 cents, and 1 12-inch Victor Red Seal for 35 oldies plus 35 cents. The last offer excludes the new Victor records No. 10,000 and 10,012.

Only Victor, Bluebird and Decca records can be accepted under this plan. The various laminated records cannot be used.

RCA Victor's test campaign proved that the public is willing and ready to exchange old records for new, and the trip to the dealer's shop invariably resulted in additional record sales. Wide-awake dealers in the tested area conducted local campaigns, employing newspaper advertising, stickers and streamers, spot announcements on the radio, customer letters and post cards, and direct phone advertising. The public was attracted, came, and exchanged.

## Television Aids ARP

*Air Wardens Attend Television Classes—*

Winning the war being the most serious business at hand, television has enlisted for the duration. Its first assignment is the training of some 54,000 air wardens in the New York, Philadelphia, and Schenectady-Albany metropolitan areas, which air wardens in turn will be better prepared to train hundreds of thousands of others.

"Because our organization believes firmly, and has always felt from the beginning of our television pioneering, that video broadcasting has tremendous educational possibilities, we are happy indeed to join NBC, RCA, G-E and Philco in the present television training course for air wardens," states Allen B. Du Mont. "We have installed Du Mont television receivers, in collaboration with the other organizations, so as to equip the 84 precinct classrooms in the five boroughs of Greater New York.

"From our own observations we have every reason to believe that television instruction is not only highly practical in saving much manpower and equipment, but it is the only feasible means whereby this excellent defense course, under the supervision of Commissioner Lewis J. Valentine and Deputy Commissioner John H. Morris, Coordinator of Police Department Civilian Defense, could possibly be made available to tens of thousands of air wardens scattered not only throughout the vast New York area, but likewise in Philadelphia, Schenectady-Albany, and doubtless other areas which will be brought into this television-instruc-

tion network shortly. Such training is uniform and simultaneous. It is fortunate that the television signals of the NBC station in New York can be picked up and rebroadcast at distant points with such satisfactory results.

"The television sessions at 10:30 and 11:30 A.M.; 3:00, 4:00, 8:00 and 9:00 P.M., on Monday, Tuesday and Wednesday each week, for six weeks beginning February 23rd, make it practical for air wardens to attend regardless of their bread-and-butter occupations. Certainly NBC deserves unstinted praise and thanks for the hard work and cost involved in putting on six sessions each day for eighteen sessions per week, with the necessary actors, scenery, actual bombs and other paraphernalia, diagrams and so on. Likewise the New York Police Department for assigning Lieutenants and Captains to head the lectures.

"I believe that this sort of instruction will grow in importance and scope during the war. Television classrooms constitute the simplest and only plausible means of providing urgent instructions for hundreds of thousands of scattered civil defense workers who must be trained in minimum time. Television receivers can be set up in police stations, schools, armories, Red Cross work rooms and elsewhere. One of our televisors installed in the 43rd Precinct Station in the Bronx, for instance, has been handling crowds of as many as 90 at times.

"The patriotic action of NBC, to be followed by other video broadcasters within the limitations of their facilities, insures the necessary video broadcasting facilities for training our civil defense workers via television. We of the Du Mont organization felt long ago that television has definite educational possibilities far beyond its usual entertainment features. This wartime development is the confirmation of our hopes," concluded Mr. Du Mont.

## NEWS

*Television Station Named For Baker—*General Electric's television station in Schenectady has been designated by the call letters WRGB, in honor of Dr. W. R. G. Baker, Vice President in charge of the G-E Radio and Television Department and one of the pioneers in the broadcasting industry. This has been announced by Robert S. Peare, G-E Manager of Broadcasting.

The call letters were assigned by the Federal Communications Commission, and are in tribute, Mr. Peare pointed out, to Dr. Baker's work for the industry, especially during the last year.

As television became more a reality, the F.C.C. ordered the industry to adopt definite standards before it would allow commercial telecasting. Dr. Baker served as chairman of the National Television Standards Committee which brought about this standardization.

The General Electric Company in securing the call letters WRGB was confronted with a problem. The F.C.C. allows broadcasters to request certain groupings of letters and in this case the call letters had to begin with W. After WRGB was decided upon it was learned that these letters were assigned the police transmitter at Wellsville, Ohio. G.E. contacted authorities there who readily consented to relinquish the call letters in order that they could be applied to the Schenectady television station.

## Engineer Does His Bit

*Thompson Teaches For Government—*Robert L. Thompson of Cedar Rapids, Iowa, the well-known radio engineer, is doing his part for Victory, by serving as instructor in the Government Training Program for Radio Technicians, now being conducted at Coe College in Cedar Rapids, Iowa.



ROBERT L. THOMPSON

As Chief Engineer of The Turner Co., pioneer manufacturer of Microphones and Microphone Equipment, Mr. Thompson is well qualified to explain down-to-earth facts about microphones, their construction, operation, limitations in control of frequency response, feedback problems and practical application for every broadcast purpose. Three hours, one night a week for 8 months, will be devoted to this service.

## AC-DC DESIGN PROBLEMS

(Continued from page 6)

dc operation, both plates and screens of pentode amplifiers may be operated at the same voltage, approximately 110 volts, or thereabouts. The screen voltage dropping resistor, common in a-c receivers, may be eliminated.

4. Be careful not to disarrange "hot" leads when making wiring changes. Otherwise oscillation or hum may result which will be difficult to track down.

5. If you haven't had much experience in servicing, don't attempt jobs of this type on a customer's set. And even if you are experienced, don't promise too much. One is always likely to run into some condition which cannot be foreseen and which may cause plenty of headaches. But if it's a question of making the set work or of junking it due to the unavailability of a replacement transformer of the proper type, then go to it!

6. Don't figure that you can put a small power transformer in to replace a big one and think it's going to be permanently satisfactory. When it goes up in smoke (as it eventually will) you'll be out the work, the transformer, and the customer.

7. Don't let anything which has been written above (except point 6) deter you from a desire to experiment and learn. In these days, resourcefulness is a quality of character which is well worth cultivating.

★

## RSA NEWS

(Continued from page 21)

available. Despite the very short notice, we had a fine attendance, over 150 men being present. Excellent newspaper publicity and much fine cooperation from the local broadcasting station WFDF was obtained.

The talk on Radar equipment was intensely interesting. In fact, Radar puts television in the shade insofar as potentialities are concerned for both war and post-war use. It was stressed that the Navy needs men for the Radar Division and commissions those joining as Petty Officers from the actual day of enlistment.

Wm. F. Lutes, Secretary

★

## RSA "PRESS & SUPPLIES SERVICE"

Elsewhere in this issue you will find a copy-print of the new RSA Service-Form. Its presentation is the inauguration of a new service to our members. We invite you to use it extensively and frequently, and that you

(Continued on page 32)

## "REPLACEMENT" FAVORITE

for Public Address, Inter-Communicating Systems and Recorder Sets



● Because of their high efficiency, practicability and relatively low cost, Astatic JT-Series Crystal Microphones are widely used and highly recommended for replacement installations. JT-Series Microphones are made in both voice and wide range models and come completely equipped with concentric cable connector, convenient wood handle, interlocking metal base and 15-ft. cable.

These models may be used for either desk or hand microphones or, with handle removed, on floor stand. Two tone finish.

SEE YOUR RADIO PARTS JOBBER

# ASTATIC

## THE ASTATIC CORPORATION

YOUNGSTOWN, OHIO

Licensed Under Brush Development Co. Patents

In Canada: Canadian Astatic Ltd. Toronto, Ontario

## Are You Moving?

Notify RSD's circulation department at 132 West 43rd Street, New York City of your new address 2 or 3 weeks before you move. The Post Office Department does not forward magazines sent to a wrong address unless you pay additional postage. We cannot duplicate copies mailed to your old address. Thank You!

# PROTECT that 40%

Now more than ever the jobber and service man must protect the standing which he has built. Condenser replacements account for about 40% of all radio repair jobs. Dependable condensers are therefore essential to the building of the utmost in customer satisfaction and in holding your clientele.

## CONTINUOUS, DEPENDABLE SERVICE

For 21 years the manufacturers of POLYMET electrolytic and by-pass condensers have striven to improve quality and service. Add to this a liberal and reasonable mark-up and the fact that no fly-by-night "bargain catalogs" can undersell you on POLYMET. You're protected, your customer is satisfied, your profits and volume increase, we're conserving vital defense materials by limiting sizes to those most universally used. These will serve practically every need, replacing larger electrolytics when proper capacity and voltage are used.

Complete listing of available types and prices will be forwarded upon request.



**POLYMET CONDENSER CO.**  
699 E. 135TH. ST., NEW YORK, N.Y.



MR. JOHN GEO. COLEMAN  
Radio Maintenance of Westchester  
110 Mt. Vernon Ave., Mt. Vernon, N.Y.

"NU products have always been of the highest quality. The NU plan has helped me get those much needed pieces of testing equipment"

WHERE YOU FIND  
**NATIONAL UNION**  
YOU FIND BETTER  
**RADIO SERVICE**

**PREMIUM**  
*Quality*  
**TUBES**



**BATTERIES**



**CONDENSERS**

also Transmitting tubes, panel lamps, cathode ray tubes, exciter lamps, sound equipment, photo electric cells, sound accessories, dry batteries, flash light bulbs.

NATIONAL UNION invites . . .

All radio service dealers to enjoy the benefits of the N. U. Shop Equipment Plan. The latest in tube testers and test equipment are available to you . . . prompt delivery. More than 60,000 completed deals prove the success of this plan. Investigate now.

Ask Your N. U. Distributor or Write



**NATIONAL UNION**  
**RADIO Corp.**  
57 STATE ST., NEWARK, N. J.

## Philco 030 Dynamic Tester

*Philco Tester Available*—A sensational new piece of radio test equipment, which will prove a boon to radio service men facing their busiest year in history, has just been announced by Philco, according to Charles E. Gerhard, manager of Philco's Parts Sales Division.



Known as the Model 030 Philco Dynamic Tester, this amazing Philco development will save the serviceman much valuable time on any type of radio repair job. The 030 tester, which locates trouble quickly and accurately in any kind of a radio circuit, utilizes an extremely simple process never before used in any other kind of test equipment and is simple and easy to operate. There are no confusing meters or indicating devices of any kind. It is small, light, portable and compact and can be placed anywhere in the serviceman's shop ready for immediate portability on outside jobs.

The tester weighs only 5¾ lbs., is 8¼"x5¼"x3" and lists for only \$19.95. For further particulars write C. E. Gerhard, Philco, Philadelphia.



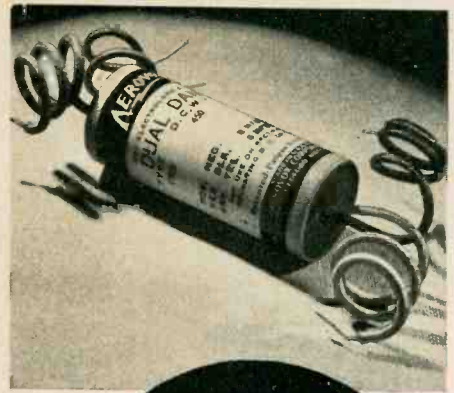
### LITTELFUSE INDICATOR LIGHT

This light goes on *only* when the circuit is broken.

This is the time, trouble, and money saving service rendered to remote control by an indicator manufactured by Littelfuse Incorporated, 4757 Ravenswood Ave., Chicago, Ill. It is listed as Littelfuse Panel Mounting, No. 1414.

The value and dependability of this indicator is evidenced by its wide use in railway signaling equipment and aircraft applications. But it is equally applicable to any circuits, circuit breakers, line switches, etc.

When installed at any convenient or desirable point in connection with re-



● Two dry electrolytics in minimum space and mighty easy on your pocket-book—that's the story of Dual Dandees. You'll find them mighty handy where two capacities have to be squeezed into a tight spot. And of course the Aerovox label insures Aerovox dependability.

**TYPE PRS-A DUAL DANDEES**  
Concentrically-wound dual sections. Three leads (one common). Center mounting strap. In 25 v. to 450 v. D.C.W. 8-8 to 20-20 mfd.

**TYPE PRS-B DUAL DANDEES**  
Separate dual sections. Four leads, permitting independent use of either section, and either common positive or common negative connections. In 150 v. to 450 v. D.C.W. 8-8 to 20-20 mfd.

● Ask your Aerovox jobber for Dual Dandees. Use them along with the well-known single-section Dandees. Ask for latest catalog—or write us direct.



## NEW CATALOG

OF SOUND AMPLIFYING SYSTEMS

AUDIOGRAPH Sound Systems represent the latest in Public Address equipment—a complete line plus pre-tested accessories.

**NEW LOWER PRICES**

Outstanding quality and performance at prices that help you meet any competition.

WRITE FOR YOUR FREE COPY

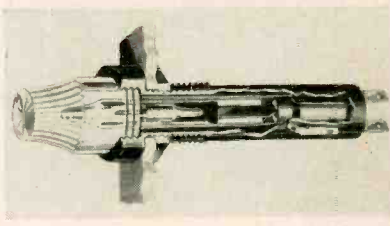
**AUDIOGRAPH**

THE FIRST NAME IN SOUND

John Meck Industries—1313 W. Randolph Street, Chicago, U. S. A.



mote motor control it works instantly, with a plainly visible signal to show "on" or "off." When the circuit breaker opens the light goes on.



Complete information on applications may be obtained from the manufacturer.

### COMPLETE BUSINESS RECORD SERVICE

★ Providing all Records for Federal, State, and Sales Taxes, Social Security and Workman's Compensation Reports. Complete System includes Permanently Bound Record Book and PREPARATION of Federal Income Tax Returns for TWO YEARS. \$12.50 Postpaid.

Frank E. Whedbee  
Seabrook, Maryland

### POLYMET LITERATURE

A new catalog and price sheet covering the complete line of Polymet electrolytic and by-pass condensers is available without charge. Write to the Polymet Condenser Co., 699 East 135th Street, Bronx, N. Y.

♦ *Sylvania's Free Adv. Service*—It is announced that a series of 1 and 2 column newspaper mats are now available to Sylvania radio servicemen. "Radios Need Inspection Too" is one of the themes that is illustrated several ways with a delightful touch of humor. Others are handled in radio quiz form, telephone dial, dramatization of late news bulletin reception and that old folksy saying, "One Rotten Apple Will Spoil a Whole Barrel."

Sylvania urges radio servicemen to promote their expert abilities aggressively, right now when new sets are disappearing from the market and the public can keep up their "radio contacts" *only* by having a serviceman repair broken down sets. For further particulars regarding this complete series of advertisements prepared for servicemen, address Hygrade Sylvania Corp., Dept. S-D, 500 5th Ave., N.Y.C.

★

### RADIO QUIZ ANSWERS

1. The quality or power to allow the passage of heat or electric current.
2. (1) Nickel. (2) Iron.
3. a. The voltage output must be sufficient for the existing medium.  
b. The voltage output or signal output must be substantially constant over the entire frequency band of the unit.  
c. The frequency adjustment must remain permanent, once made.  
d. The harmonic generation properties of the oscillator must be kept at a minimum.  
e. Minimum radiation from the components of the oscillator system.  
f. Proper tracking with associated apparatus.
4. A Turnstile radiator used with various types of ultra-high-frequency transmitters.
5. "Backwash" is the off-frequency signal of a C-W transmitter keyed by means of shorting a portion of the transmitter tank inductance.
6. Length of each half of dipole (in inches) equals 2770 divided by frequency (in megacycles).
7. Howard Radio Corp., Chicago, Ill.
8. In the RAF and RCAF the Wireless Air Gunner is called "Wag."
9. The discriminator and oscillator control stage.
10. Even the experts can't agree on the answer to this one, so why should we stick our neck out?

## THERE'S A DRAKE SOLDERING IRON FOR EVERY TYPE OF RADIO WORK

From that mighty mite



the Drake No. 400 to the high-speed production "honey"



the Drake No. 600 Special there is a Drake Soldering Iron "just right" for the job.

Drake Heat Controls and the Drake "Magic Cup" Stand are important soldering aids.



SEE YOUR RADIO PARTS JOBBER

**DRAKE ELECTRIC WORKS, INC.**  
3656 LINCOLN AVE. CHICAGO, ILL.

*New, Handy*



# UNIVERSAL REPLACEMENT

*capacitors*



Write for Catalog

**SOLAR MFG. CORP.,**  
Bayonne, N. J.

## BOOST Service Profits

LOWEST PRICES....  
FASTER DELIVERY at  
**RADOLEK**

Radolek stocks replacement parts to repair any radio—every type of tube, transformer, speaker, condenser, volume control, resistor, auto radio accessory—everything you need at rock bottom prices. And too, Radolek understands service problems—gets your order to you in double-quick time. Order from Radolek for complete satisfaction!

### RADOLEK REPAIR SERVICE

Let Radolek repair your damaged or burned out transformers, coils, speakers, test apparatus, etc. Guaranteed equal to new. Write for prices.



**FREE! BIG NEW RADIO SERVICE GUIDE!**  
Buying from Radolek means Greater Values, Better Service and More Profits. Send today for the big FREE Radolek Service Guide.

**SEND TODAY!** PASTE ON A POST CARD

RADOLEK CO., Dept. SD 65  
601 W. Randolph St., Chicago, Ill.

Please send the Big FREE Radio Service Guide.

Name .....

Address .....

DEALER  SERVICEMAN  SOUND ENG.

**SAVE AT RADOLEK**

**RADIOFRONT**

*(Continued from page 27)*

not done, as it is sometimes, what they have. *Keep your ears open, and your mouth shut!*

**THE ALIEN SITUATION**

Servicemen can also do their Government a service in reporting the shortwave sets they see, or repair, if they have good reason to believe that the owner of the set is an enemy alien. For your information, an "enemy alien" is one of German, Italian or Japanese parentage or extraction who has not yet obtained his or her second papers of citizenship. And in the case of the Japs, even if he or she has his second papers. There are still many who have shortwave sets, who are of German and Italian extraction who have only taken out their first papers. They are still enemy aliens, technically, regardless how patriotic they may seem to be. A real patriot obeys the law. And the law clearly says that these persons should not have in their possession any type of shortwave sets, cameras, guns, etc. . . .

When you disable a shortwave set for an alien, be sure to report the fact to your local police or FBI station. . . .

*Thought for the month:* Taxes can

beat the Axis. Defense Stamps can Beat the Japs. You can win this war right there at your store and home. Keep the Faith, and keep pitching! No man ever won a ball game by starting out with the idea that he was going to lose. If you can't fight for one good reason or another, help those who can by talking a good fight! Be a Government Booster. . . .

★

**RSA NEWS**

*(Continued from page 29)*

help us with your suggestions and ideas to find new applications. The RSA "Press & Supplies Service" will expand in scope as far as you yourself will permit. Only your use of this service can make it a success.

Other items now available are: Beautiful gold and blue RSA membership lapel pins at \$1.00; convenient leather pocket cardcases with stamped RSA insignia to carry your membership cards and business cards for 45 cents; RSA insignia printing cuts at 60 cents; extra decals at 15 cents each. Other items will be added to this list as soon as they are developed.

**BRANDEX**

This guide to concealed service data

on "private brand" sets is still available at 25 cents per copy. It is cross-indexed for Brand-name, Manufacturers outlet, Identification marks, etc. It's a most useful addition to any serviceman's library. Hurry before the supply is exhausted. Once they are gone there won't be any more.

★

**WALSCO CHEMICAL KIT  
OFFERED TO MANUFACTURERS**

*Walsco Offers Free*—A complete kit of samples and detailed description of chemicals and adhesives such as used by the radio and electronic trades is available free to manufacturers of radio and allied products, laboratories, government agencies, etc.

Described and sampled are chemicals to prevent contact oxidation and noisy operation, adhesives for many purposes such as Speaker Cement, Thermo-Plastic Cement, cement for fabrics and plastics, etc.; also coil dopes and special chemicals to increase friction such as used for dial drives, etc.

Requests should be mailed on company or official stationery to Walter L. Schott Co., Department 22, 5270 W. Pico Boulevard, Los Angeles, California.

**RSA AFFAIRS ARE YOUR AFFAIRS  
IN THIS TIME OF WAR!**

We have available a supply of RCA Victor service notes for 1938, 1939, and 1940. If you would like a set—over 225 pages of detailed service data—send 45c to cover postage and handling.

You know what Priorities are doing to your replacement parts supplies—

You have seen what tire rationing will mean to your business—

You will see many other restrictions that will make the conducting of normal business difficult or impossible—

Radio is an essential industry . . . but to insure essential ratings for YOU, Mr. Radio Serviceman, a strong National Organization MUST be representing YOU every minute in these war times.

**HELP RSA HELP YOU! JOIN RSA TODAY!**

**RADIO SERVICEMEN OF AMERICA, Inc.**



*"Reliable Service Assured"*

Alfred A. Kilian—Executive Secretary

Nat'l. Headquarters: 414 Dickens Ave., Chicago, Ill.

**It will pay you to join RSA:**

for besides membership in the national organization of the servicing industry, you will receive an RSA membership certificate, card, and decal to identify you with "Reliable Service Assured", and every month a magazine full of valuable technical data and news. All for only \$2.00.

**Is that value?**

Anyone of high ethics, legitimately engaged in the radio servicing profession, whether he owns his own business or not, is eligible for membership in the National Association of RSA.

**ACT NOW! CLIP AND MAIL TODAY**

**RADIO SERVICEMEN OF AMERICA, Inc.**  
414 Dickens Ave., Chicago, Illinois

I enclose \$2.00 for one year's national dues and apply for membership in RSA. (Membership in foreign countries and Canada, \$3.50 a year.)

Name .....

Address .....

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

RSD-4-42

# RAYTHEON TUBES

## Guard Against GAS SABOTAGE!



**NOTICE!** If you have not obtained RAYTHEONS Interchangeable Tube Chart, it is important to get one of those cards at once from your RAYTHEON jobber. Speeds up radio repair service and simplifies your tube stock by elimination of a large number of types.



**S**abotage! . . . that constant threat to our National Defense is no longer a menace to one of the largest natural gas distribution centers (name deleted for obvious reasons) . . . their operating plant is under twenty-four hour "Fotoelectric" protection installed by Worner Products Corporation of Chicago.

These long range anti-sabotage units cover the entire outside area surrounding the Gas Distribution Center. Breaking the invisible light beam at night, brilliantly spot-lights the intruder from whatever direction he enters, giving the armed guards the advantage of darkness. By day it automatically signals the exact location

of intruders entrance. The heart of the system is the amplifier operated by RAYTHEON TUBES.

This is only one of the many important defense uses where RAYTHEONS are depended upon to safeguard life and property. Service men and dealers know that RAYTHEON TUBES safeguard their business with long trouble-free operating life and that is why thousands of service men are replacing with RAYTHEONS. They know RAYTHEON TUBE quality never varies . . . they can always depend on RAYTHEON TUBES no matter what the operating circumstance.

There is a big extra advantage, too . . . yet you pay no more!

RAYTHEON PRODUCTION CORPORATION

New York • Chicago • Los Angeles • Atlanta • Newton, Mass.

**RAYTHEON**  
RADIO TUBES

WORLD'S LARGEST EXCLUSIVE RADIO TUBE MANUFACTURER



- Solid Walnut Cabinet
- 5" Electrodynamic Speaker
- 5 RCA Preferred Type Tubes
- Bu It-in Tuned Loop
- Gets Police Calls
- Superhet with AVC
- Large, Clear-Vision Dial

## The New RADIOLA Model 522 with SOLID WALNUT Cabinet!

Here's the latest addition to the great line of radios for *servicemen* to sell—a Radiola in a genuine *solid* walnut cabinet, beautifully shaped and finished! Take one along on your next service call, for extra business and extra profits. Features like these make it easy to sell:

Extra-large, high-Q, built-in tuned loop antenna brings in even weak signals with surprising strength. In all but a few locations, there's no need

for any other antenna. Your customers can carry this extra set from room to room—just plug it in and turn it on. There's an extra antenna-connection, too, for areas where signals are unusually weak . . . or for customers who like outstanding DX reception.

Best of all, the 522 costs no more than most sets—yet carries a full margin of profit for you. See your RCA Tube and Equipment Distributor today.

*All Radiola Models are Exclusively Equipped with RCA Preferred Type Tubes*



**Radiola Model 520**

For your service customers who are looking for plenty of radio value at rock-bottom cost—try the new Radiola 520! Solid wood cabinet, houses a five-tube superhet chassis with plenty of sensitivity and performance. Full-toned electrodynamic speaker and reserve-power audio system yield outstanding tonal performance, amazing in so compact a receiver!

# Radiola PREFERRED TYPE RADIOS

Made by RCA Manufacturing Company, Inc., Camden, N. J.