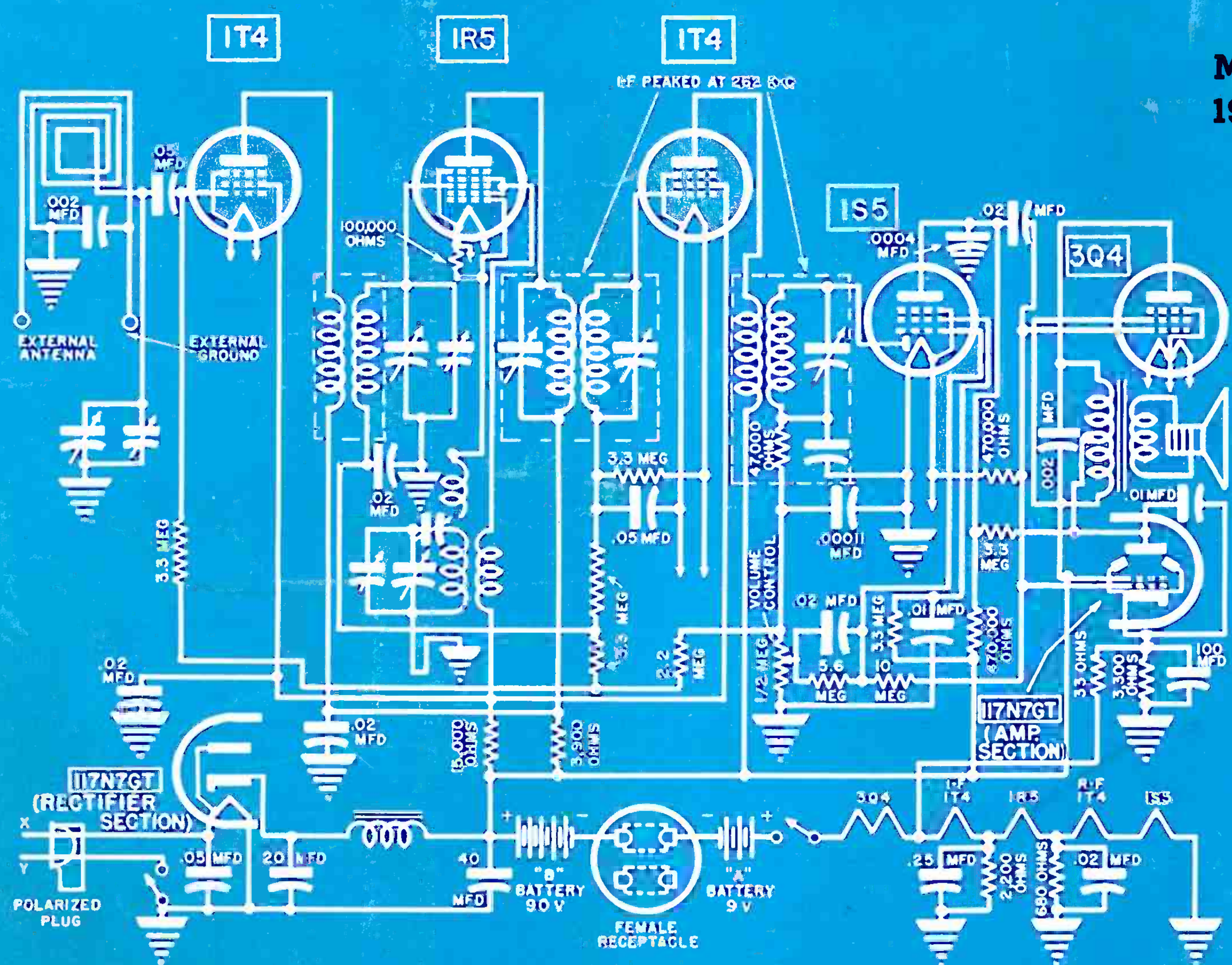
RADIO · TELEVISION · ELECTRONIC

SERVICE

May
1946



Battery a-c/d-c six-tube superhet using a 117N7 as a combination rectifier and beam-power amplifier.
(See page 45.)

THE TECHNICAL JOURNAL OF THE RADIO TRADE

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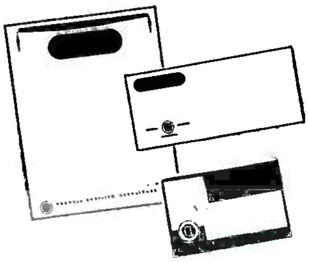

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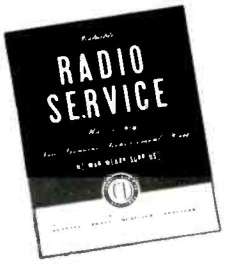

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EDITORIAL

THE HIGHEST PRODUCTION LEVELS ever experienced in the parts industry were forecast for 1946 by H. W. Clough, president of the Radio Parts Show, during the recent convention in Chicago. He said that a business of $150,000,000 at the consumer level may be expected. This is $25,000,000 more than the industry earned in 1945. And for 1947 he predicted a business of $200,000,000 for the industry.

Sounds good!

OVER 150 COMPANIES have already received OPA price approvals on receivers, with about half of the models priced in the $20 to $35 table-model class.

Many television models have also been priced by OPA. And reports indicate that around 100,000 receivers will soon be moving off the production lines and will be available for delivery in August or September.

UNFORTUNATELY MANY SERVICE SHOPS are not ready for the tremendous television receiver installation and maintenance job that is in the offing. As a result, several manufacturers have decided to install receivers themselves. One manufacturer has stated that he didn't feel that the neighborhood Service Shop was capable of installing television receivers at this time. The neighborhood Service Shop should, of course, be in a position to install these receivers. It's a job that the Service Shop can do and do well, if they'll prepare for this work . . . prepare by study and actual practice.

Many Service Shop groups have organized training units to familiarize themselves with television construction. Others have enrolled in schools. Reading of all of the technical articles on television, such as those appearing in SERVICE, have become *musts* on all programs.

The manufacturer would welcome the cooperation of the neighborhood Service Shop in installing and maintaining television receivers. Several manufacturers are now planning to introduce classes to teach neighborhood Service Shops how to install and maintain their equipment. Here again, we repeat that basic fundamental knowledge gained from books and technical articles will be imperative to expedite such training.

Television receivers will be available *soon*, and the consumer will look to the neighborhood Service Shop for expert help in installation and maintenance. Don't disappoint your neighbor. Start your television training now!

CONGRATULATIONS TO William O. Schoning upon his re-election as president of NEDA, and A. D. Davis and Aaron Lippman upon their re-election as vice president and treasurer, respectively. They have done a grand job for the radio parts industry!

RADIO TELEVISION ELECTRONIC

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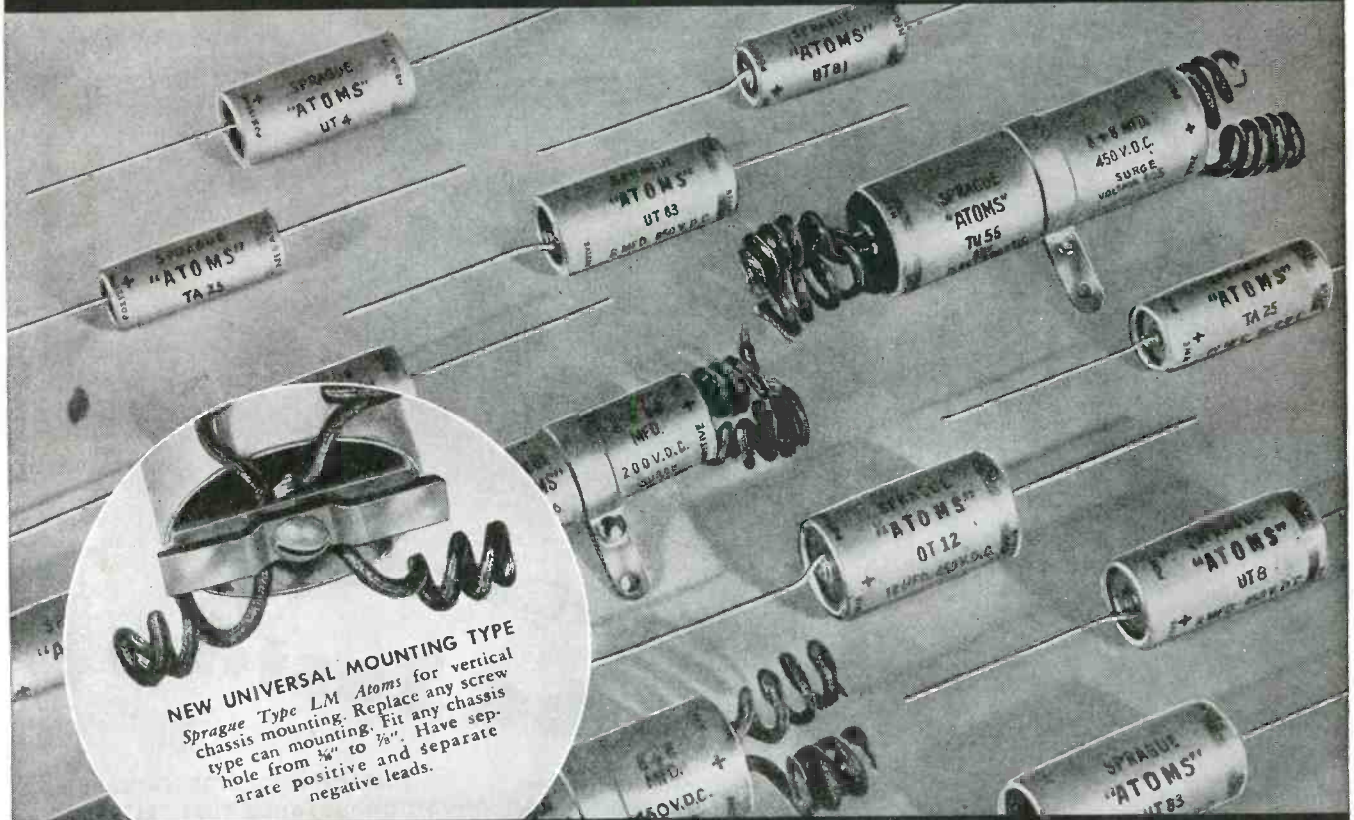

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SYLVANIA NEWS
RADIO SERVICE EDITION

MAY *Prepared by* SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946

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Helps customers understand your repair problems

"HELPFUL HINTS" BOOKLETS FOR RADIO SERVICING

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Characteristics of Sylvania tubes and panel lamps, with tube base views

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CAPACITOR SERVICE INSTRUMENTS

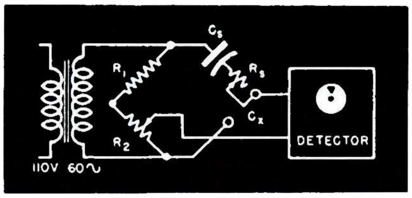
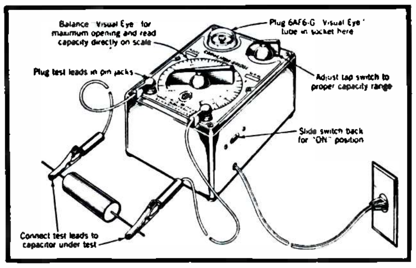


Fig. 1. A bridge arrangement with a 60-cycle signal-voltage input supplied through a stepdown transformer.

Fig. 2. Commercial bridge-type capacitor tester.



by WILLIAM M. ROBINSON

Assistant Chief Engineer
Industrial Capacitor Division
Cornell-Dubilier Electric Corp.

SOME RADIO COMPONENTS show deterioration of electrical properties both in active use and when they are not operating. Time and humidity conditions are factors that affect the shelf life of these components, especially those which are not fully hermetically sealed or depend upon electrochemical action to perform their designated functions. These factors are supplemented by voltage stress and extremes of temperatures when the circuit parts are placed in operation.

Among those components that are affected by humidity, we have field coils, unpotted transformers, i-f coils, and certain types of capacitors. There is generally a slow penetration of moisture into the active elements of these parts, depending largely on the condition of the atmosphere where they are stored. It is thus important to store these components and allied electronic equipment in dry locations, where temperature variations are at a minimum to avoid this type of deterioration.

Capacitors cause their share of service problems along with the other radio components. Engineering and manufacturing techniques are such that capacitors can be made to outlast any other part of a radio receiver. However, when the cost of such capacitors is considered, such procedure is found to be far from practical.

The day has passed when an a-c continuity tester or an ohmmeter are considered adequate capacitor service instruments. Receivers use capacitors with values ranging from a few mmfd in mica and ceramic types to the multi-tapped electrolytic types running to many mfd. The range of voltage ratings for these capacitors is generally between 10 volts d-c and something above 500 d-c. Leakage failure of capacitors found frequently in the older receivers, requires the use of a more complex measuring instrument.

Class of Capacitor	*Short Circuit*	*Open Circuit*	*Intermittent Circuit*	*Off Capacity*	*High Power Factor*	*High Leakage*
Paper	*	*	*	—	—	*
Mica or Ceramic	*					
Electrolytic ...	*	*	*	*	*	*

Table 1
Defects most frequently found

Defects Usually Found

Defective capacitors can be classified according to the most frequent troubles found; table 1. Aside from mechanical failure, the defects shown in the table comprise the main causes of practically all fixed-capacitor troubles.

There are many capacitor service meter instruments available. Some are simply radio-frequency continuity testers that indicate impedance or measure a very limited range of capacity. Although such instruments are convenient to use because some of the capacitors tested do not have to be disconnected from the circuit, the tests are far from complete. There are other instruments which depend upon the power line voltage for capacity measurements. These are not too ac-

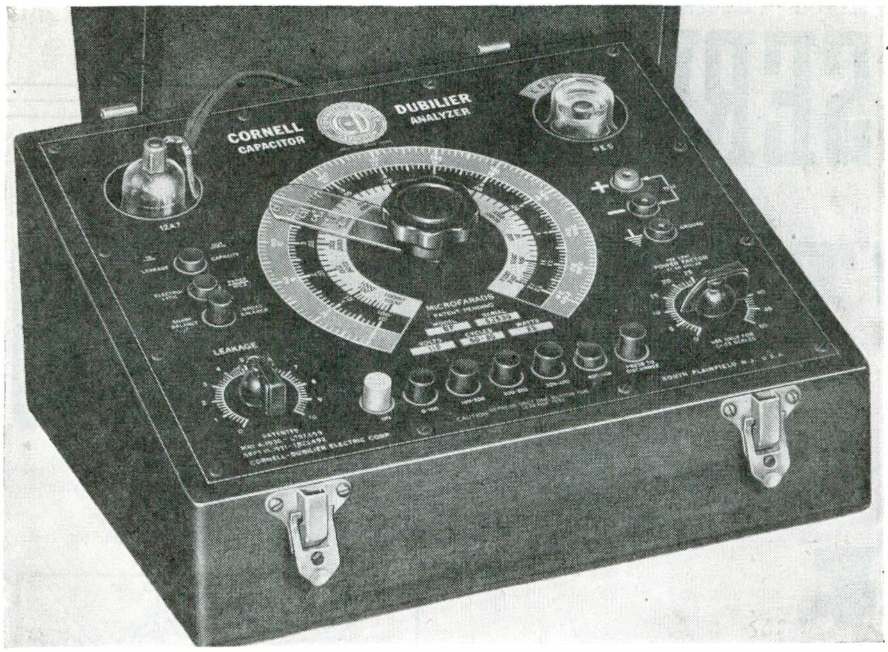


Fig. 3. Capacitor analyzer using a capacity bridge and adjustable d-c power supply.

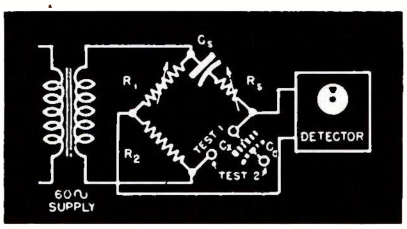
curate and do not indicate the true quality of capacitors.

Bridge Instruments

The most popular and reliable method of measuring capacity employs an a-c bridge. By this method the capacity readings are entirely independent of line-voltage variations. An adjustment of the bridge circuit to determine capacity is generally supplemented by a similar operation to determine the power factor, the both readings taken simultaneously.

One basic capacity-bridge arrangement is that which provides logarithmic scale readings. The circuit consists of a potentiometer utilized as two arms of the bridge with a standard resistor, and the unknown capacitor composing the other two. Fig. 1 shows this bridge arrangement with the signal voltage, generally 60 cycles, supplied through a step-down transformer, applied across the potentiometer R_1 R_2. The center tap of the potentiometer and the junction of the capacitor standard, C_x, and an unknown capacitor, C_x, are connected to a sensitive null detector. A rheostat, R_s, introduced in series with the capacitor standard, provides the means of balancing the phase differential in the bridge components.

Fig. 4. Circuit of analyzer bridge, showing ratio of R_1 and R_2 as linear over a full rotation of R_1.



The potentiometer is calibrated over its full rotation with scale markings corresponding to values of capacity connected across C_x. Several capacitor standards are generally used to provide a number of ranges for capacity measurements so that readings may be taken quite accurately. Power factor calibrations are made on the rheostat in series with the main capacitor standard.

One advantage of the above bridge arrangement is that four common capacitor defects may be determined in approximately the same number of seconds. The insertion of a capacitor across the test position will result in a balance of the bridge which will indicate the true capacity and power factor, as well as short and open-circuited defects and some intermittent operation types.

A commercial instrument that performs the testing operations described above is illustrated in Fig. 2. The power to the instrument is provided through the regular 110-volt a-c circuits. A 12A7 dual-purpose tube is used as a half-wave rectifier and as a pentode amplifier for the bridge signal. The bridge balance of capacity and power factor, as well as indications of limited types of defective capacitors, is made by the use of a 6AF6G cathode eye tube.

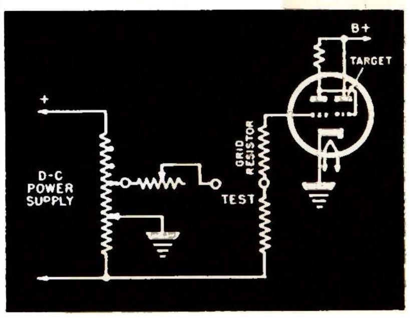
The capacity measurement is made by connecting a capacitor across the test terminals, then adjusting the bridge control knob after the proper range has been selected. When the shadow angle of the eye tube reaches its maximum opening, the capacity is read directly from the scale calibration under the knob. The shadow angle for capacitors with low power factor will be approximately 90°. As the magnitude of the power factor is found to be higher on the various capacitors, the angle will be smaller, reaching 0° at approximately 50% power factor. Electrolytic capacitors that show no shadow angle for any bridge control setting, are generally considered unsatisfactory for use.

Capacitor Analyzer

While this instrument finds great utility in service work, it does not provide a leakage test for paper and electrolytic capacitors. A larger, slightly more complex meter, generally classified as a capacitor analyzer (Fig. 3) is used for measuring all the properties of capacitors. The analyzer consists of a capacity bridge plus an adjustable d-c power supply with a means of measuring values of leakage current from less than a microampere to several milliamperes. The analyzer illustrated employs a bridge circuit that has linear scale calibrations for all ranges of capacity. This is accomplished by using a rheostat as one arm of the bridge with a standard resistor, standard capacitor, and the capacitor under test composing the other arms.

Fig. 4, illustrating this type of bridge circuit, shows the ratio of R_1 and R_2 to be linear over the full rotation of rheostat, R_1. This compares with the logarithmic relationship of R_1 and R_2 in Fig. 1. The uniformly-spaced capacity-scale calibrations of the analyzer simplify the readings considerably and provide greater accuracy of measurements. Standards in the bridge circuit are arranged for continuous capacity readings on six ranges from .00001 mfd to 240 mfd. The upper limit may be extended indefinitely, if the occasion arises, by using any large capacity in position, C_s, and applying a formula;

Fig. 5. Biasing of 6E5 so that a zero-degree shadow angle will correspond to substantially zero-leakage coverage.



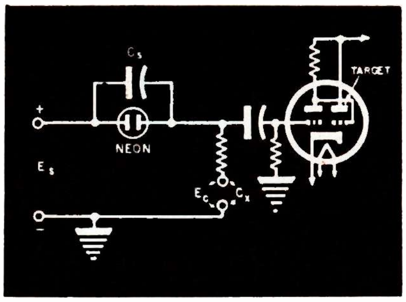


Fig. 6. Relaxation oscillator used for leakage tests of paper and mica capacitors.

this formula may also be used to extend the range of the previously described capacity bridges:

$$C_x = \frac{C_s C_r}{C_s - C_r}$$

where: C_x = microfarads of capacitor being tested
C_s = microfarads of series capacitor
C_r = reading of bridge in microfarads with C_s and C_x in series

Power factor measurements of electrolytic capacitors are made by adjusting R_s, connected in series with capacitor standard, C_s, as shown in Fig. 4. The rheostat is calibrated to scale calibrations over a power factor range of from 0 to 50%. An adjustment of the rheostat during the bridge balance provides a reading of the exact power factor of the capacitor. This refinement is somewhat superior than that obtained with the use of the capacity bridge previously discussed, where the power factor readings have to be made on a comparative basis.

Leakage tests with the analyzer can be made at voltages close to the rating of electrolytic capacitors, and at a fixed value of 450 volts d-c for paper or mica dielectric types. The power supply has two means of adjustment; steps of approximately 100 volts by a selector switch connected to a bleeder resistor, with the intermediate points obtained by adjusting a rheostat in series with the test capacitor. On tests of electrolytic capacitors, the voltage starts out at a low value building up as the leakage current drops until full rating is reached. This limits the aging current so that the electrolytic capacitor will not be affected adversely. The 450 volts d-c applied to paper or mica capacitors during the leakage test is not considered harmful to good capacitors. Defective units may frequently fail when the voltage is applied even before a leakage measurement can be made.

The leakage current of capacitors is determined by two methods because of the extreme range of values. Current through electrolytic types is returned to the power supply through a resistor which sets up a bias voltage across a 6E5 cathode-eye tube. The movement of the shadow angle of the 6E5 is fairly linear over practically its entire range with respect to the bias voltage applied. Therefore, the leakage current is roughly, directly proportional to the number of degrees of the shadow angle. In the analyzer under discussion it was found most convenient to bias the 6E5 so that a zero-degree shadow angle would correspond with substantially zero leakage current, with the 90° angle calibrated for approximately 5 milliamperes; Fig. 5.

Leakage tests of paper and mica capacitors require a more involved circuit arrangement, since the magnitude of the current is about one microampere or less. For this purpose a relaxation oscillator is provided to obtain the initial signal voltage. The capacitor under test is charged through a neon bulb shunted by a capacitor. When the test capacitor voltage reaches a certain optimum value, the cut-off point of the neon bulb causes the current to stop flowing. Then the capacitor discharges through its internal shunt resistance until the striking voltage of the neon is reached; $E_s - E_c$, Fig. 6. The circuit functions on the principle that there is a difference between the cut-off and striking voltage of the neon tube. The result of the operation of the circuit is a series of saw-tooth voltage impulses across C_x, the frequency and amplitude depending upon the capacity of C_s, voltage E_s, capacity and shunt resistance of C_x. While the neon tube glows on each successive charge of C_x, the indication is unreliable for measuring purposes. Therefore, the voltage fluctuations across C_x are connected to the input of the 6E5 cathode-eye tube. While the leakage current of the capacitor is being measured, it is convenient to express the result in terms of the shunt resistance of the capacitor. By counting the frequency or time between flashes of the 6E5, the shunt resistance of the capacitor may be determined by applying the expression:

$$R = 50N$$

where: R = insulation resistance in megohms
N = number of seconds interval between flashes.

Working Voltages	D-C Leakage in MA
Dry Electrolytic Capacitors	
25 50 100	0.01 MA per mfd. plus 0.5 MA
150 200 250 300	0.02 MA per mfd. plus 0.5 MA
350 400 450 500	0.03 MA per mfd. plus 0.5 MA
Wet Electrolytic Capacitors	
25 50 100	0.02 MA per mfd. plus 0.9 MA
150 200 250 300	0.03 MA per mfd. plus 0.1 MA
350 400 450 500	0.05 MA per mfd. plus 1.0 MA

Table 2
Leakage currents of wet and dry electrolytics.

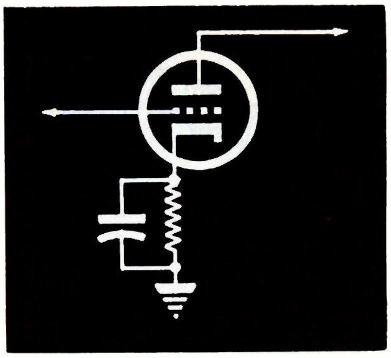


Fig. 7. Paper dielectric bypass in circuit with a cathode-bias resistor across it. Resistor does not effect operation because of capacitance resistance.

This capacitor analyzer shows one flash of the 6E5 per second for a capacitor with a shunt resistance of 50 megohms. The shunt resistance is directly proportional to the interval of time between flashes so that one flash every 10 seconds would result for a value of 500 megohms.

It is obvious that open or short-circuited capacitors of all types should be replaced. Other defective units must be considered carefully with respect to their effect on circuit operation and expectant life before being removed from a receiver. Some capacitors far below usual standards of quality may give entirely satisfactory service for a long time. Circuit requirements differ to the extent that some defective capacitors may be removed from critical circuits and located in a different circuit, where they may operate without interfering with the performance of a receiver. Low-internal shunt resistance, off capacity, and

(*Continued on page* 30)

Communications-Receiver Single-Channel
REMOTE CONTROL

by E. B. MENZIES

For maximum receiving efficiency, communications receivers are usually located at remote points. In some of these installations, multi-channel control is necessary. In others, we have single-control frequency operation. The former requires rather complex-control equipment, while the latter used in aircraft procedure, can employ less involved control methods. (It has become standard practice to use a separate receiver to monitor each of the bands used in aircraft work.)

While single-control methods have been simplified, they still provide an exact-control service. And the circuits being used will serve as the basis of many control systems that the Service Man will see in the future.

Thermal drift, after some hours of operation, and line-voltage fluctuations cause slight frequency shift. Slight frequency drift at the lower frequencies would not be so serious but at the higher frequencies (a few megacycles or more), with c-w signals, a drift of two or three kilocycles can make reception very difficult. With several crystal-controlled transmitters operating on the same frequency crystals are rarely if ever close enough to produce the same frequency of beat note in the receiver. In some cases, frequency difference can be large enough to warrant retuning the receiver, especially if the signals are weak.

It becomes obvious that for remote operation, receivers must either be provided with an operator at the remote point for tuning checks, or some small tuning range, controllable over the remote lines, must be used. This feature may be effectively applied to the standard communications receiver, by using a system of automatic frequency control, except of course that in this case the frequency control is not automatic, but controllable.

Fig. 1 shows a more or less standard circuit employing the reactance tube. This circuit is not recommended since it involves substantial modifications to the receiver.

Fig. 2 shows a system which appears to operate well and can be used since it involves no change to the oscillator circuit in the receiver, other than realignment of the oscillator trimmer.[1] Neither system can, of course, give anything but a few kilocycles of tuning range. However, in many communications receivers the selectivity of the stage or stages preceding the first detector is not great at the higher frequencies, and unless a crystal filter is in use, the i-f selectivity is not so great that the oscillator cannot be swung two or three kilocycles either way, without seriously reducing sensitivity. Providing the oscillator is not swung far enough to produce a beat outside the bandwidth limits of the i-f channel, the system appears to operate quite satisfactorily. From one actual case an oscillator swing of several kilocycles was employed with safety.

In Fig. 2 it will be noticed that *C* and the plate resistance of the control tube shunt the oscillator tuned circuit. Since the tube plate resistance is variable with grid bias, the effective reactance of the combination is effectively varied by changes in the control voltage. Since the reactance of *C* must be similar numerically to the plate resistance, *C* must obviously be small (a 30-mmfd trimmer opened well out) was used in the test. Consequently the capacitive shunt which appears across the tuned circuit is small, and thus the control tube should be one which shows a low value of output capacitance; a 6J5 would appear suitable. The effect of this lumped capacitance can generally be compensated for by reducing the capacity of the trimmer already in the circuit for alignment purposes. It is obvious that in fitting the tube into the receiver, attention must be paid to its position, in that the lead from the oscillator grid coil to *C* will contribute additional capacitance. It should not therefore be longer than an inch or two.

It will be noted that the control tube plate load consists of a choke and resistor in series. The resistor was included to eliminate any undesirable choke resonance which may be present and also to effectively limit plate current, as the control tube may operate for lengthy periods with little or no

(*Continued on page* 44)

[1] Henney, Radio Engineering Handbook; 1941.

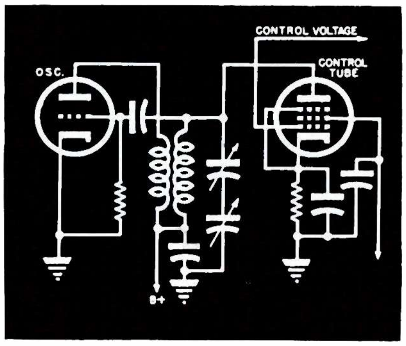


Fig. 1. Reactance-tube automatic-frequency control system.

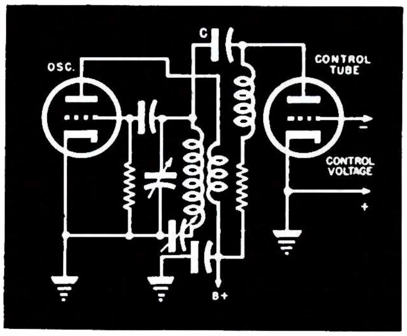
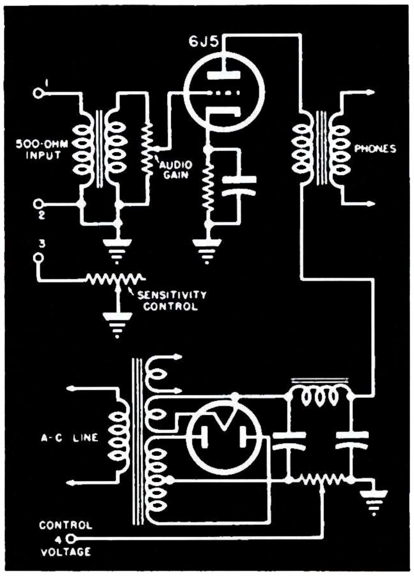


Fig. 2. Frequency-control system that is excellent for communications receiver use.

Fig. 3. Amplifier used at listening point for headphone operation.



FIXED ATTENUATORS

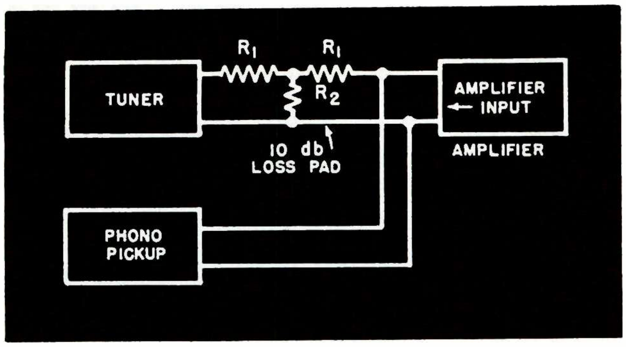


Fig. 1. Attenuation system used to bring level of tuner down to level of another tuner or phono pickup.

OFTEN it is necessary to design an attenuating network to work between equal impedances. For instance, it may be necessary to provide a 10-db loss in a radio tuner circuit, to bring the level of the tuner down to the level of another tuner or a phonograph pickup; Fig. 1. In this case, the output impedance of both sources is 500 ohms and, therefore, the net *Z* value is 250 ohms. To get a match the amplifier input, *Z*, must be 250 ohms. A *T* pad, which gets its name from the fact that the arrangement of resistors looks like a *T*, is used to cut down the tuner output level. The value of R_1, for the pad, can be obtained by using a simple formula, and similarly the value of R_2 can be calculated.

$$R_1 = Z\,(X^k)$$

$$R_2 = 2\,Z\,(Y^k)$$

The values of X^k and Y^k, for various decibel losses, are given in Fig. 2. The *Z* values are the input and output impedances; 200 ohms for a typical audio line, etc.

In the example given, the output, *Z*, of the pad is 500 ohms, while the source, *Z*, is the same value. Therefore,

$$R_1 = Z\,(X^k)$$

For a 10-db loss, from Fig. 2,

$$X^k = 0.519$$

Then,

$$R_1 = 500 \times 0.519 = 259.5 \text{ ohms}$$

Also

$$R_2 = 2Z(Y^k) = 2 \times 500 \times 0.351 = 351 \text{ ohms}$$

It will be noted that the *T*-pad form consists of two equal R_1 elements in series, with an R_2 value in the middle. To convert to a simple *L* pad and make the source see the correct *Z* value, we may double the value of R_1 and keep R_2 constant. This is shown in Fig. 3. Obviously, however, this will not allow us to match the amplifier input impedance and, therefore, the *T* pad is considered better.

In some cases we may use a balanced *H* pad. Then, each R_1 value is halved and the R_2 value is kept constant. This is shown in Fig. 4. The series elements would be rated at 130 ohms, but the exact arithmetical values are shown. Commercial tolerances would be less accurate than the calculations.

It can be seen that if the calculations are made for the *T* pad, values can readily be transformed for *L* or *H* requirements. In microphone and input circuits in general, the powers are usually so low that small 1-watt carbon resistors can do the job. In

db loss	X^k	Y^k
2	0.115	2.135
4	0.226	1.036
6	0.333	0.669
8	0.430	0.473
10	0.519	0.351
12	0.597	0.268
14	0.667	0.207
16	0.723	0.162
18	0.776	0.127
20	0.818	0.101
22	0.853	0.079
24	0.880	0.063
26	0.904	0.050
28	0.923	0.039
30	0.938	0.031
32	0.950	0.025
34	0.960	0.019
36	0.967	0.015
38	0.975	0.012
40	0.980	0.010

Fig. 2. Values of X^k and Y^k for various db losses.

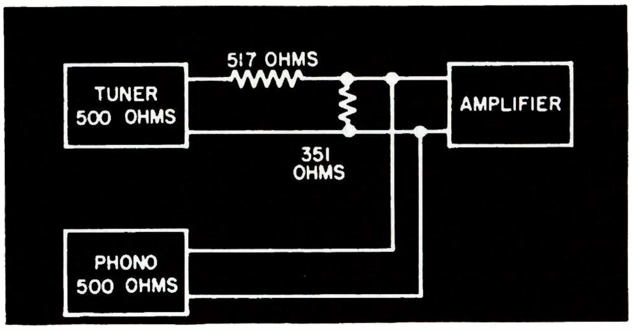


Fig. 3. Conversion of simple *L* pad by doubling the value of R_1 and R_2 (from Fig. 1).

output circuits or wherever considerable amounts of power are in use, the powers in the resistive elements may be calculated or experimentally determined.

If the proper *R* values are used and the test units are heavy-duty types capable of handling large amounts of power, the source may be connected to the load through the pad elements, as shown in Fig. 5, and the actual powers can be measured indirectly. That is, the power in R_1 is

$$P_1 = \frac{E^2_A}{R_1}$$

and in R_2 it is

$$P_2 = \frac{E^2_B}{R_2}$$

For a given assumed power input to terminals *1* and *2*, the voltage in 500 ohms or whatever the input impedance chosen, is

$$E = \sqrt{PR}$$

With a known voltage across *1* and *2*, the current in R_1 and the voltage across R_1 can be calculated. That is,

$$I = \frac{E}{R_1 + \left(\dfrac{R_2 Z_L}{R_2 + Z_L}\right)}$$

The power in R_1 is

$$P_1 = I^2 R_1$$

The voltage across R_1 is

$$E_A = I\,R_1$$

Hence the load voltage must be

$$E_B = E - E_A$$

For Public-Address Systems

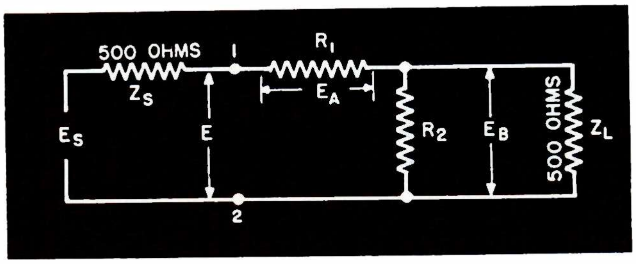


Fig. 4. Use of *H* pad where R_1 (Fig. 1) is halved and R_2 (Fig. 1) is kept constant.

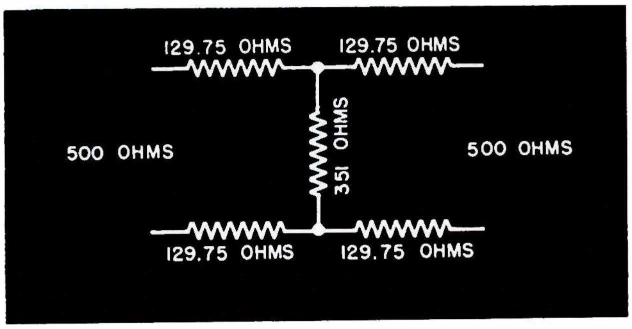


Fig. 5. Connecting source to a load through pad elements to provide measurement of powers indirectly. This is used where test units are heavy duty types capable of handling large amounts of power.

by WILLARD MOODY

The power in R_2 is, then

$$P_2 = \frac{E_B^2}{R_2} = \frac{(E - E_A)^2}{R_2}$$

These are the conditions for an *L* pad.

For a *T* pad, Fig. 6, for a given power level at the input, the voltage across terminals *1* and *2* is

$$E = \sqrt{PR}$$

where R is the resistive input, *Z*, and *P* is the power in watts. The current is

$$I = \frac{E}{R_A + \left[\dfrac{R_C (R_B + Z_L)}{R_C + R_B + Z_L}\right]}$$

However, assuming that the input and output *Z* values are the same, the line current at the input is simply E/Z which gives the value of current in R_A. Then

$$P_A = I^2 R_A = \left(\frac{E}{Z}\right)^2 R_A$$

$$E_A = I\,R_A = \frac{E}{Z} R_A$$

Since

$$R_A = R_B, \quad I^2 R_A = I^2 R_B$$

and

$$P_A = P_B.$$

As

$$E_C = E - E_A,$$

$$P_C = \frac{(E - E_A)^2}{R_C} = \frac{E_C^2}{R_C}$$

In the *H* pad, in Fig. 7, the values

(*Continued on page* 38)

Fig. 6. Conditions for a *T* pad where for a given power level at the input, the voltage across terminals *1* and *2* is $E = \sqrt{PR}$, where *R* is the resistive input, *Z*, and *P* is the power in watts.

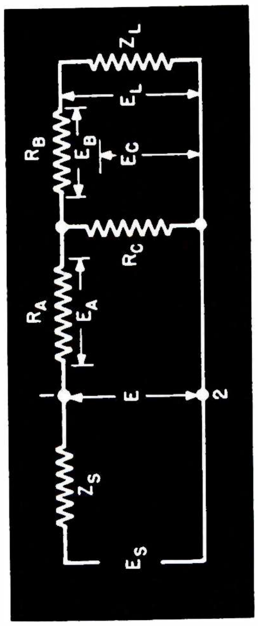


Fig. 7. A *H*-pad arrangement where the values of R_A in each series element are one-half of the *T*-pad values. Therefore, one-half of the voltage develops across each element.

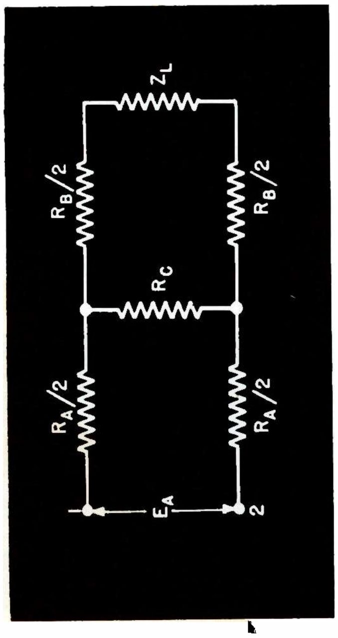
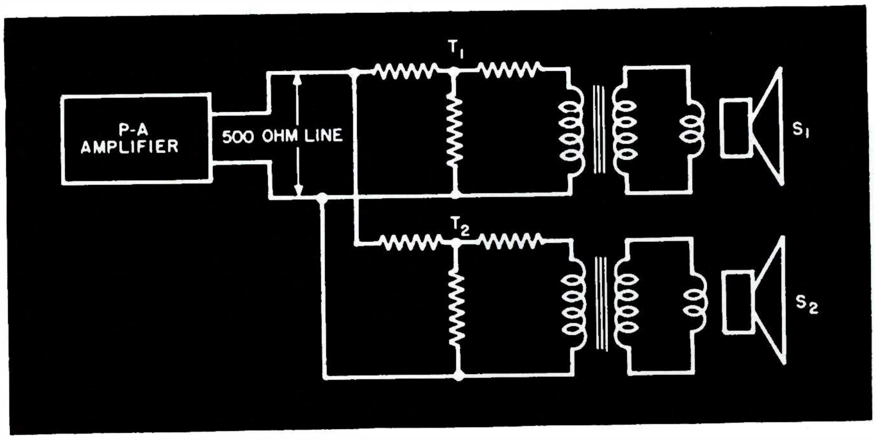


Fig. 8. Use of *T* pads for attenuation of signal powers and control.



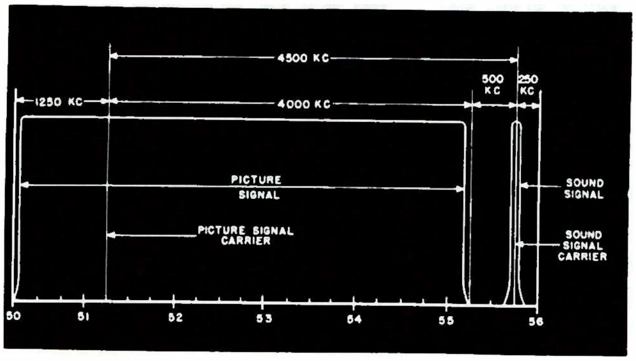


Fig. 1. Bandwidth and construction of a television signal.

Television Receiver

R-F and MIXER STAGES

by R. B. CARWOOD

IN THE TELEVISION RECEIVER, the r-f and mixer stage serves a dual purpose, in that it is used to amplify and select both the audio and video signals. To understand the problems associated with the repair and alignment of this portion of the television receiver, some knowledge of the design incorporated into this stage is necessary.

Because transmitting distances are short, and antenna signal voltages high, most receivers do not use a separate r-f stage, but feed the signal directly into the mixer tube, so that the r-f portion referred to is the circuit between the antenna and the mixer. Receivers are usually designed for a signal, at the antenna input, of approximately 500 microvolts, or .0005 volt. Since noise is an important factor, this high signal level is necessary to maintain a high signal-to-noise ratio.

In Fig. 1 we have the bandwidth and makeup of a television signal. The entire signal covers a frequency bandwidth of 6 mc, encompassing both the video and audio signals. This necessitates an r-f stage preceding the mixer tube that has a band acceptance of 6 mc, much wider than that necessary for the reception of f-m signals.

The r-f stage may be considered as an adjunct to the television-signal transmitter, since its primary function is to produce a signal at its output which is identical to the signal at its input, in every detail, except its amplitude. Therefore, the first design problem is to achieve some gain in the amplitude of the broad signal, without changing its characteristics.

In another sense, the r-f stage is also selective, since its function is to discriminate between the desired signal and other undesired signals. This qualification is a refinement of its amplification duties. That is, if it can be designed to amplify a particular signal, other signals will not be amplified. This can be considered a form of rejection.

In the broadcast receiver, these two characteristics go hand in hand, and high amplification of desired signals is usually accompanied by better selectivity. However, in the televesion receiver, a very wide band of frequencies must be amplified, as shown by Fig. 1. For this reason, special techniques are required in the design of the *LC* circuits for the r-f section, so that uniform amplification of the signal spectrum may be accomplished. This uniformity of amplification is necessary to maintain the character of the original signal.

A simple parallel tuned circuit is shown in Fig. 2. At the resonant frequency, the voltage induced in the circuit is at a maximum, with rapidly decreasing voltages for adjacent frequencies. The response curve in *a* is typical of this type circuit. It can be seen that for a tuned circuit, if uniform input voltage is supplied to the circuit, at frequencies close to the resonant frequency, a non-uniform output will result.

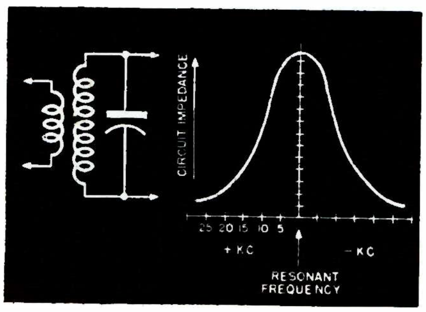


Fig. 2. Parallel-tuned circuit. In *a* we have the response curve of this circuit.

Fig. 3 shows an ideal response curve for a television r-f section. Here, it will be noted that the circuit amplifies all the desired frequencies uniformly and attenuates the unwanted signals. In actual practice it is impossible to attain this optimum condition, so that some compromise is necessary to expand Fig. 2*a* to Fig. 3.

One reason why a resonant circuit develops the greatest voltage at its resonant frequency, is that it attains its greatest reactance at resonance. Where a primary and secondary are involved, voltage gain is a function of turns ratio. In a similar sense, this may also be expressed as a reactance ratio, since the winding with the greater number of turns will have the greater reactance. Where a tuned circuit is used for a secondary, the greatest reactance ratio will therefore be at resonance. A resistor, however, has no such characteristic, since its reactance or resistance is independent of frequency. Therefore, if a resistor were placed in parallel with the tuned

(*Continued on page* 34)

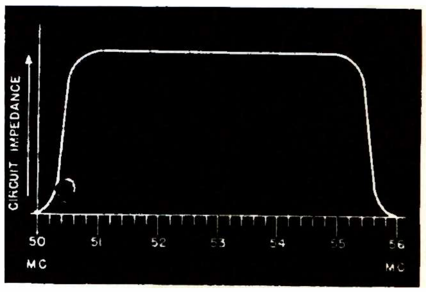


Fig. 3. Ideal response curve for a television r-f system.

TOOLS and ACCESSORIES For the NEW SERVICE SHOP

by

ALFRED A. GHIRARDI

Advisory Editor

(PART II: BASIC TOOLS)

Fig. 1. Using screwdrivers in servicing. Since screwdrivers are the most often-used tools in the Service Shop, they should be chosen very carefully. (*Courtesy U. S. Army Signal Corps.*)

SERVICING present-day radio equipment, much of it very intricate and complex, involves a considerable amount of mechanical work. Since a well-selected complement of good tools is necessary for, and helps to speed up, this work those who plan to open new Service Shops should choose their tool equipment carefully.

The previous article of this series discussed the selection and use of a recommended *basic* group of tools that the Service Man should consider buying for the new shop. The tools on this list represented a practical *minimum* equipment with which he can expect to tackle the *ordinary* mechanical work he is likely to encounter. The selection, use, and purchase of the vise, hammer, mallet, keyhole hacksaw, soldering iron, hand drill, portable electric drill, and twist drills was discussed in some detail. The balance of the tools on the *basic* list will now be considered.

Taps and Tap Wrench

A set of the more commonly used sizes of taps (such as the 4-36, 6-32-8-32 and 10-32 sizes) is very handy for cutting the screw threads in holes that need to accommodate the corresponding sizes of machine screws. These holes are tapped by hand, using the type of tap wrench illustrated in Fig. 3, to turn the key in the hole. The end of the tap away from the threaded portion has a square head designed to fit into the tap wrench.

The tap number corresponds to the gauge number and threads-per-inch of the screw it is designed to tap the hole for. Thus, a tap marked 6-32 will cut the proper spiral thread in a hole. so that a No. 6 screw having a pitch of 32 threads-per-inch may be screwed into it.

The first step in making a tapped hole is to drill a hole of the proper size, so that it is just the right amount smaller to begin with, than the outside diameter of the screw to be used in it. This is necessary so that there will be enough material provided into which the threads can be cut by the tap. The drill used for this operation is known as the *tap drill*; the size drill to use is referred to as the *tap drill size*. The proper tap drill sizes to employ for the machine screws commonly employed in receivers are listed in table *A*.[1] The tap drill size to use is important for,

[1]SERVICE; April, 1945.

(*Continued on page* 28)

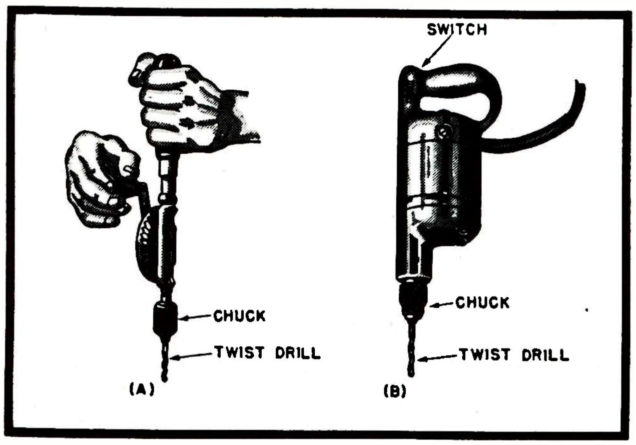


Fig. 2. Hand and electric type drills. In (*a*) we have a hand drill of the *egg-beater* type. Note the twist drill inserted for general drilling operations. A portable electric drill is shown in (*b*). This is used for auto radio installation work.

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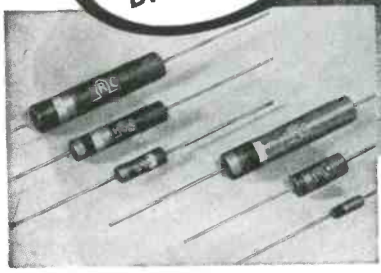

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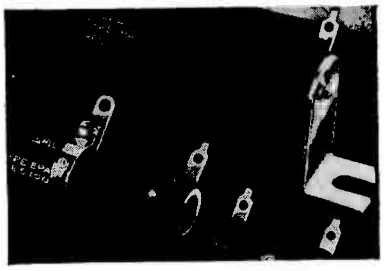

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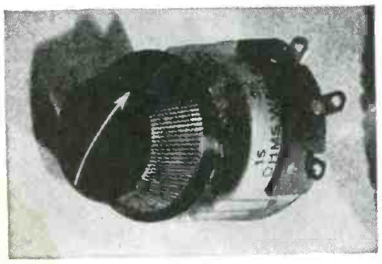

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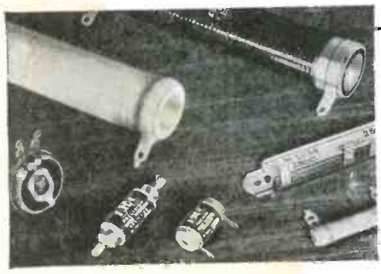

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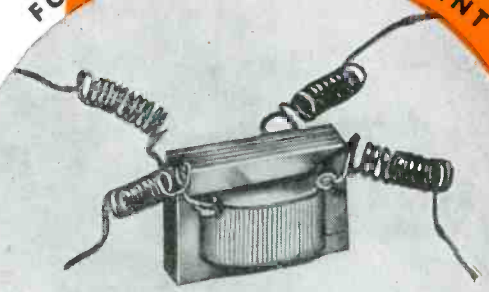

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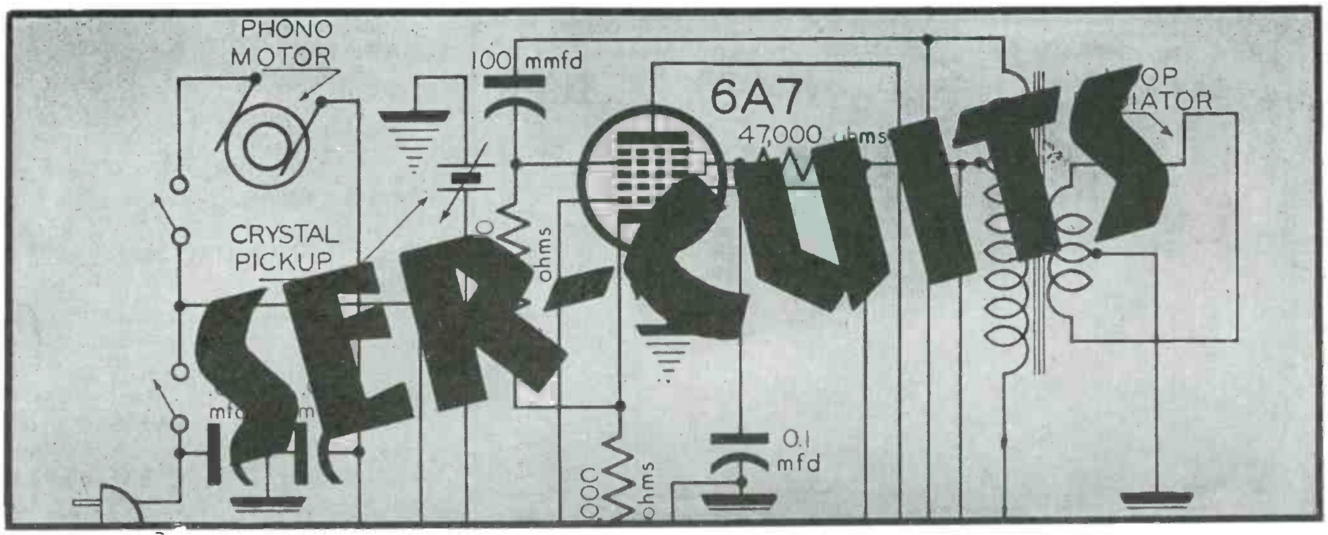


by HENRY HOWARD

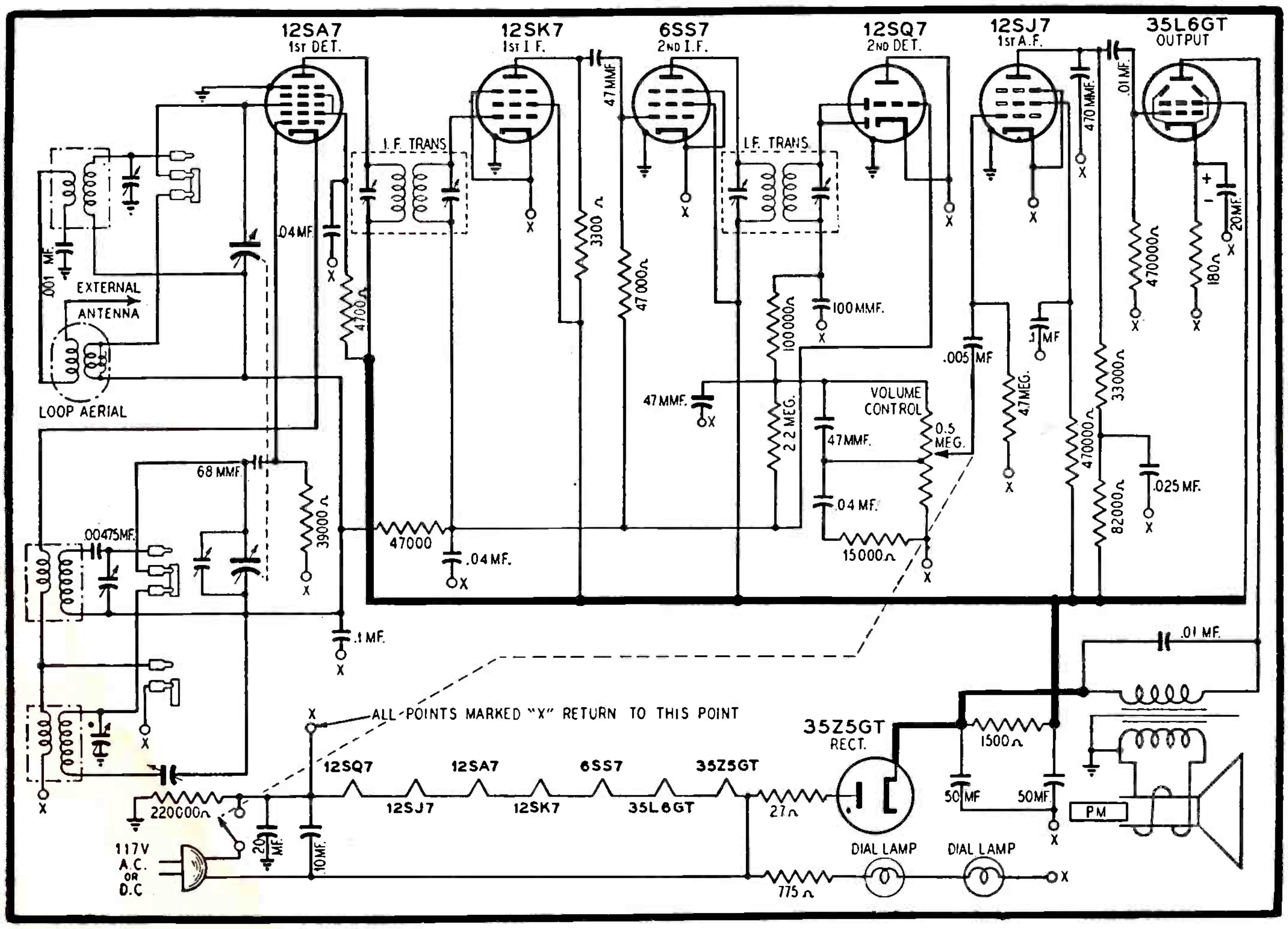
A NEW SERIES of postwar models—a-c/d-c table types, portable record players, automatic phono units and beam-power types—are analyzed in this month's discussion of circuits.

A two-band 6-tube plus rectifier a-c/d-c receiver, Wells Gardner 37D14-600 (also Truetone D2630), is shown in Fig. 1. In this model the broadcast loop primary, with leads, serves as the short-wave antenna when no external antenna is used. The loop or short-wave transformer is switched to the signal grid of the 12SA7 by a simple s-p-d-t switch. The oscillator grid is similarly switched from b-c to s-w oscillation transformers. The cathode, however, runs through the b-c and s-w feedback windings to ground, the b-c winding being shorted in the s-w position.

There are two i-f stages. The first uses a 12SK7. This is resistance coupled to a 6SS7, a 150-mil 6.3-volt pentode. The coupling components consist of a 3,300-ohm plate load, 47-mmfd coupling capacitor and 47,000-ohm grid leak. The second detector is a 12SQ7 diode, the triode plate element being grounded while the grid is used as an initial source of bias for the avc bus, the bias being derived from the normal static electron flow. The detector load resistance is composed of 100,000 ohms in series with a ½-megohm vol-

(*Continued on page 24*)

Fig. 1. Wells-Gardner 37D14-600, 2-band and rectifier a-c/d-c model with a 12SK7 and 6SS7 i-f stage.



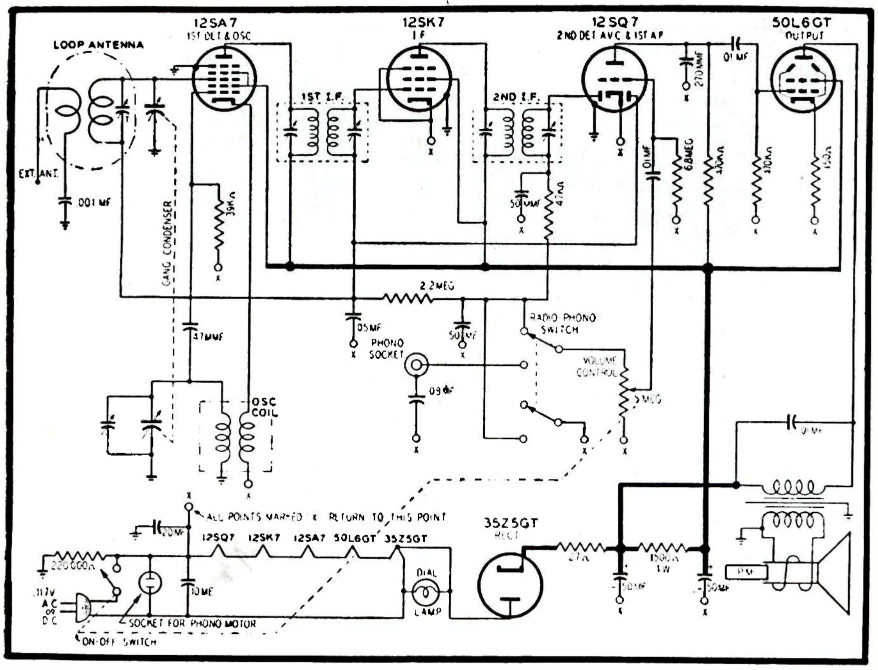


Fig. 2. Ward 54WG-2007A, 4-tube plus rectifier receiver using a 12SK7 diode for detection and avc.

ume control, tapped for tone compensation. A 100-mmfd detector capacitor, with a resistor-capacitor combination of 100,000 ohms and 47 mmfd at the high side of the volume control, constitute an efficient i-f filter.

The first a-f stage is a 12SJ7 pentode operated with a low plate load, only 33,000 ohms. The screen-voltage dropping resistor is 470,000 ohms. An *R/C* isolating filter consisting of 82,000 ohms and .025-mfd appears in the plate supply. A 4.7-megohm grid leak is used. The power stage is a conventional 35L6 supplied directly from a 35Z5 rectifier output driving a p-m speaker. A bias resistor of 180 ohms is shunted by a 20-mfd capacitor.

A pair of No. 47 dial lamps are independently operated directly from the line through 775 ohms, no connection being made to heater terminal *3* of the rectifier tube.

Ward 54WG-2007A

A small single-record-playing combination, 4-tube plus rectifier receiver, Ward's Airline 54WG-2007A, appears in Fig. 2. This one has a standard tube lineup—12SA7, 12SK7, 12SQ7, 50L6 and 35Z5. The crystal pickup jack is connected to *B*– through a .08-mfd capacitor. A phono-radio switch throws the volume control from the receiver detector to pickup and shorts the detector output. One 12SQ7 diode is used for detection and avc, the other for initial avc bias for the first and second tubes. The first a-f grid leak is a 6.8-megohm unit. The *B*– is connected to the chassis through a 0.2-mfd capacitor and a 220,000-ohm resistor in parallel.

Ward 54WG-2700A

Fig. 3 shows a 2-band/6-tube and rectifier a-c automatic phono model, Ward 54WG-2700A. A 6SJ7 first detector is driven by a separate 6J5 oscillator through cathode-to-cathode coupling and through a 2,200-ohm bias resistor, bypassed by .02-mfd capacitor. On s-w additional coupling is obtained by a small capacitor from the oscillator plate to the input grid. A 12-contact, 2-section bandswitch also takes care of phono switching. Section *1* of this switch is used for the oscillator and the detector-pickup, while section *2* handles the first detector input switching. It also voids first detector operation in *phono* position.

Two 6SK7 i-f stages are used with resistance coupling between them, the components being a 2,700-ohm plate load, 10-mmfd coupling capacitor and a 1-megohm grid leak. The cathodes are grounded; screens are tied together but there is a plate-supply decoupling filter between them, 220 ohms and .02 mfd. The 6SQ7 stage is conventional, feeding a 6V6 output. Bias for the 6V6 is obtained from the drop across the speaker field through a voltage divider-filter network composed of a 620,000-ohm series resistance, 91,000-ohm parallel resistance and a 0.25-mfd capacitor across the latter.

Westinghouse H-130, H-122

A push-pull a-c/d-c model (with and without phono) using 300-mil tubes to provide an undistorted output of 3 watts on radio, 3.5 watts on phono and 5 watts maximum, is shown in Fig. 4; Westinghouse library model H-130 and phono model, H-122.

A 6SF7 is used in the i-f and detector-avc. A 6SC7 dual triode serves as a first a-f and inverter.

The radio/phono switch opens the plate supply to the first two tubes in phono position, increasing the *B* voltage on the audio end for a boost of ½ watt in power output.

The first audio stage has a 10-megohm leak. Inverter excitation is derived from the drop across a 82,000-ohm resistor, connected between the

(*Continued on page 26*)

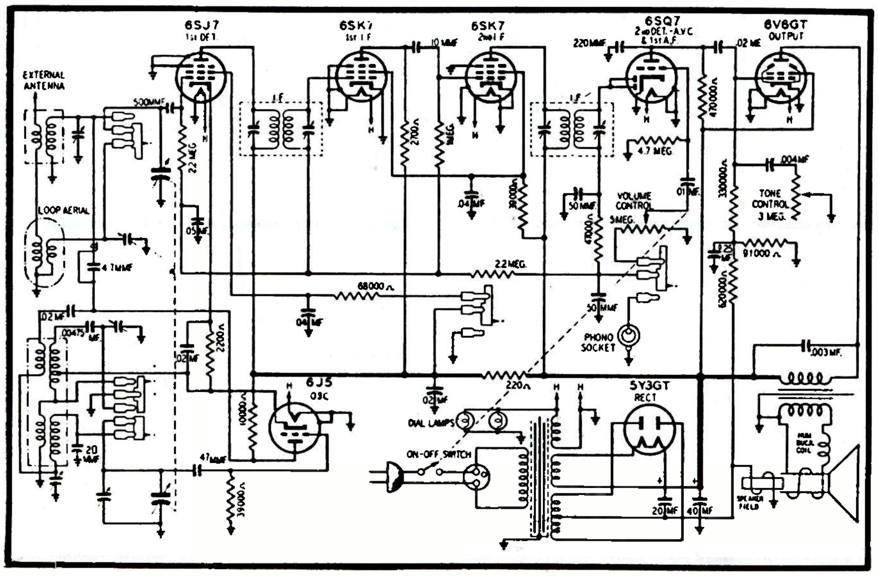


Fig. 3. Ward 54WG-2700A, 2-band/6-tube and rectifier a-c automatic phono model.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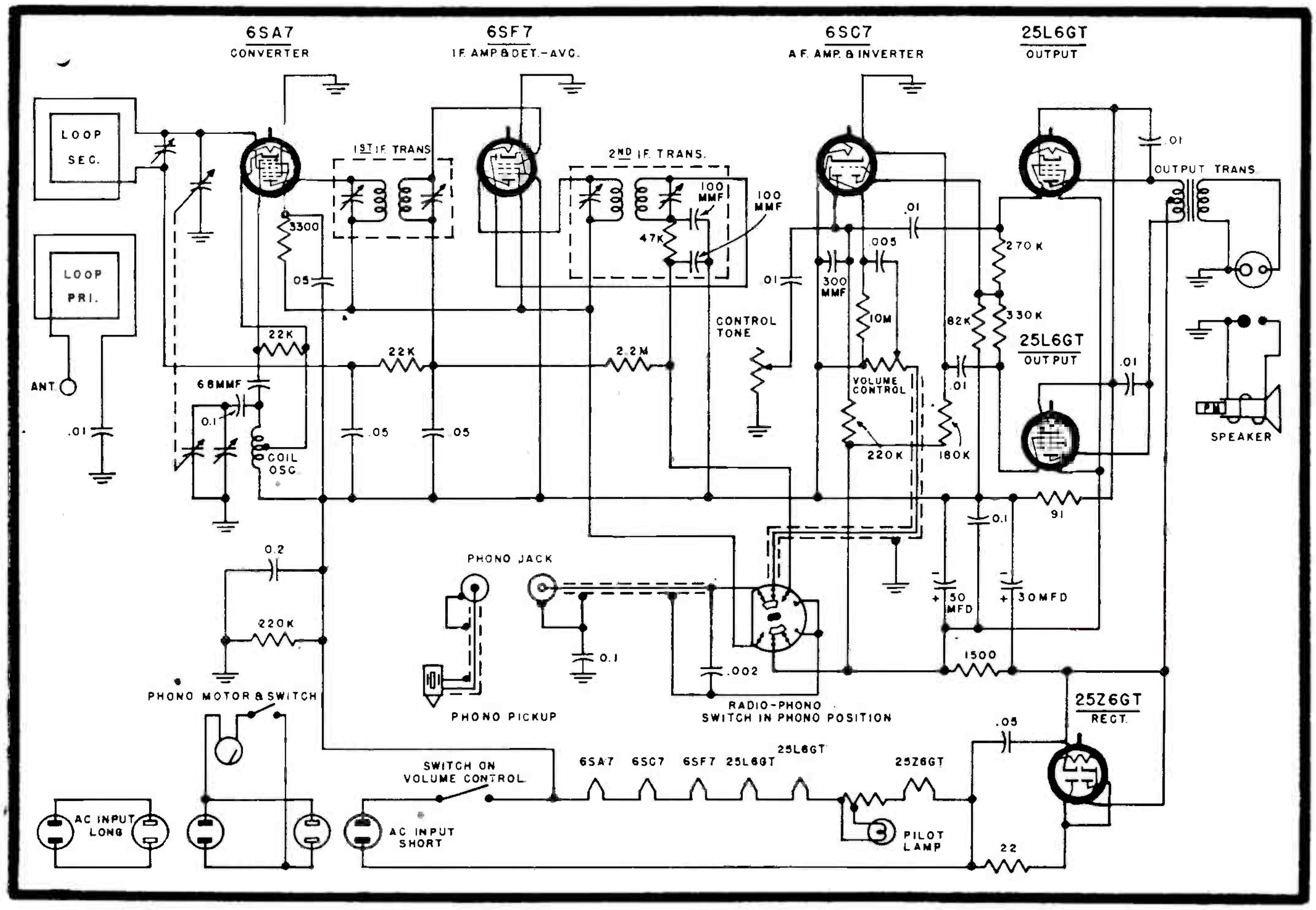


25L6 grid leaks (330,000 and 270,000 ohms) and *B*–. A tone control is connected to the first a-f output. A 91-ohm resistor supplies bias for a pair of 25L6s.

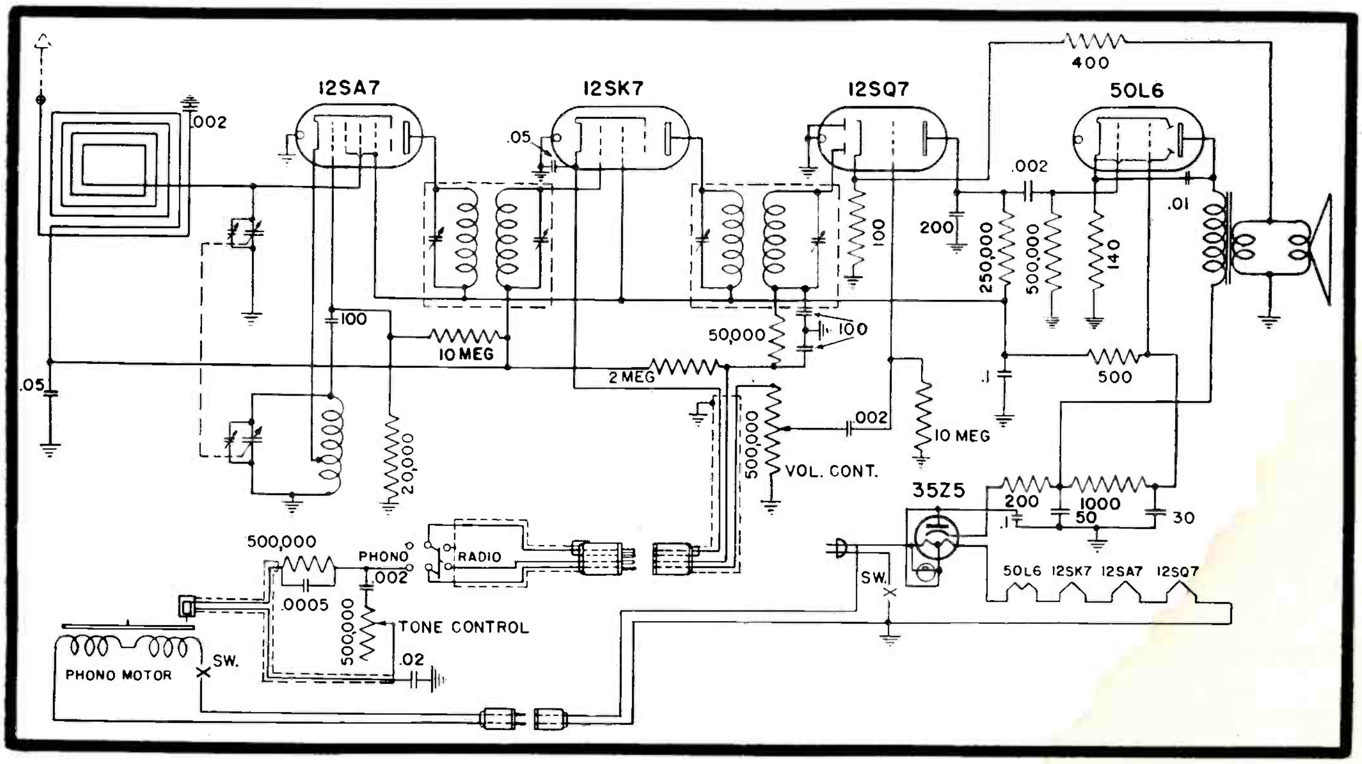
A 72-ohm ballast lamp with a tap at 12 ohms for the pilot lamp is connected in the filament string.

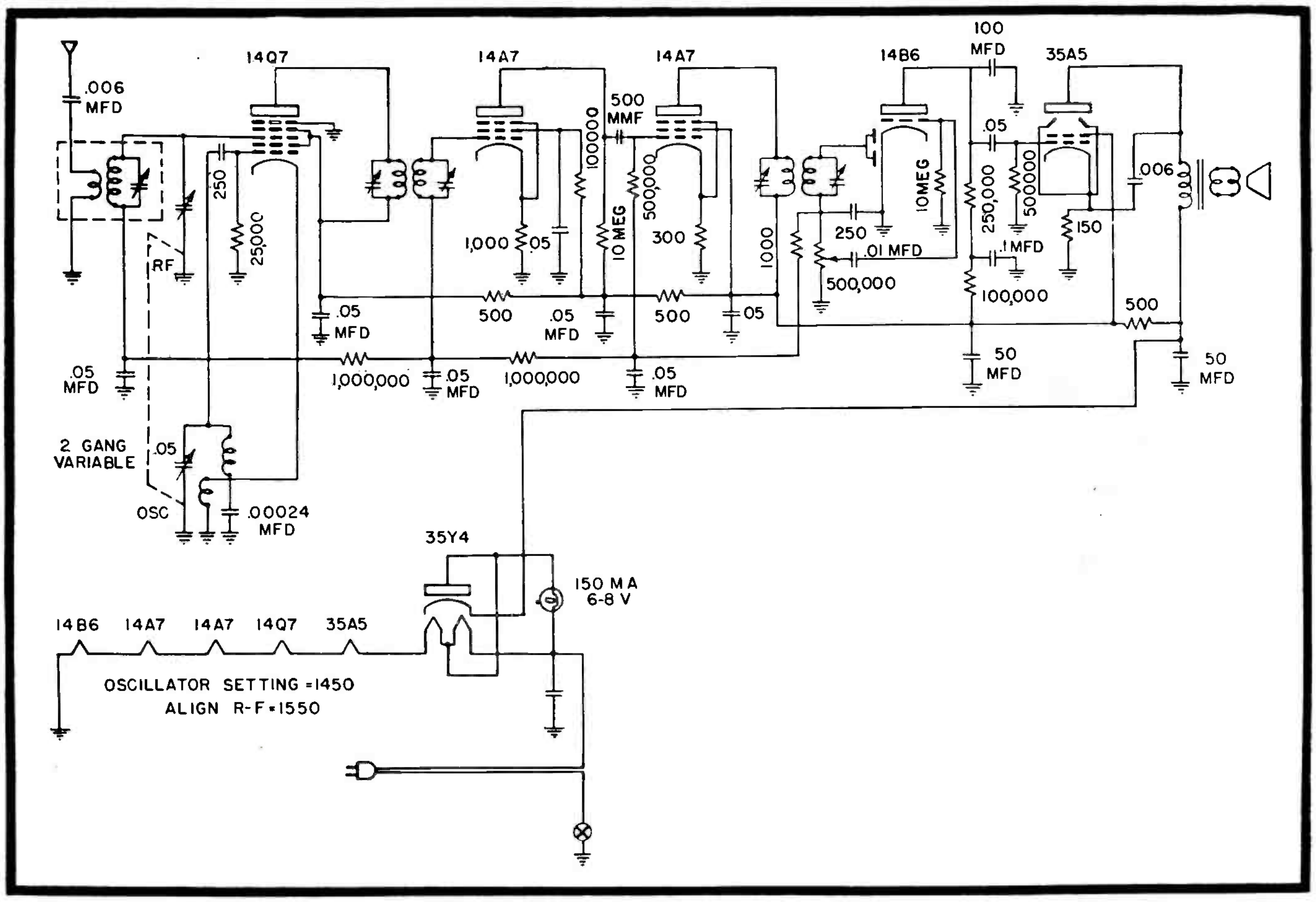
Electromatic 512

A 4-tube and rectifier phono model, Electromatic 512, with some interest-

Fig. 4. Westinghouse H130/H122 pushpull a-c/d-c receiver using 300-mil tubes, providing a maximum output of 5 watts.

Fig. 5 Electromatic 512, 4-tube and rectifier phono model. The avc bias is obtained from oscillator section of 12SA7 converter through a 10-megohm resistor.





ing innovations is shown in Fig. 5. In this model initial avc bias is derived from the oscillator section of the 12SA7 converter through a 10-megohm resistor. The i-f amplifier cathode runs to the phono/radio switch, where it is opened in phono position to kill any radio signals. A .05-mfd i-f bypass at the socket limits the amount of coupling from the switch lead. The 12SQ7 is conventional except for the

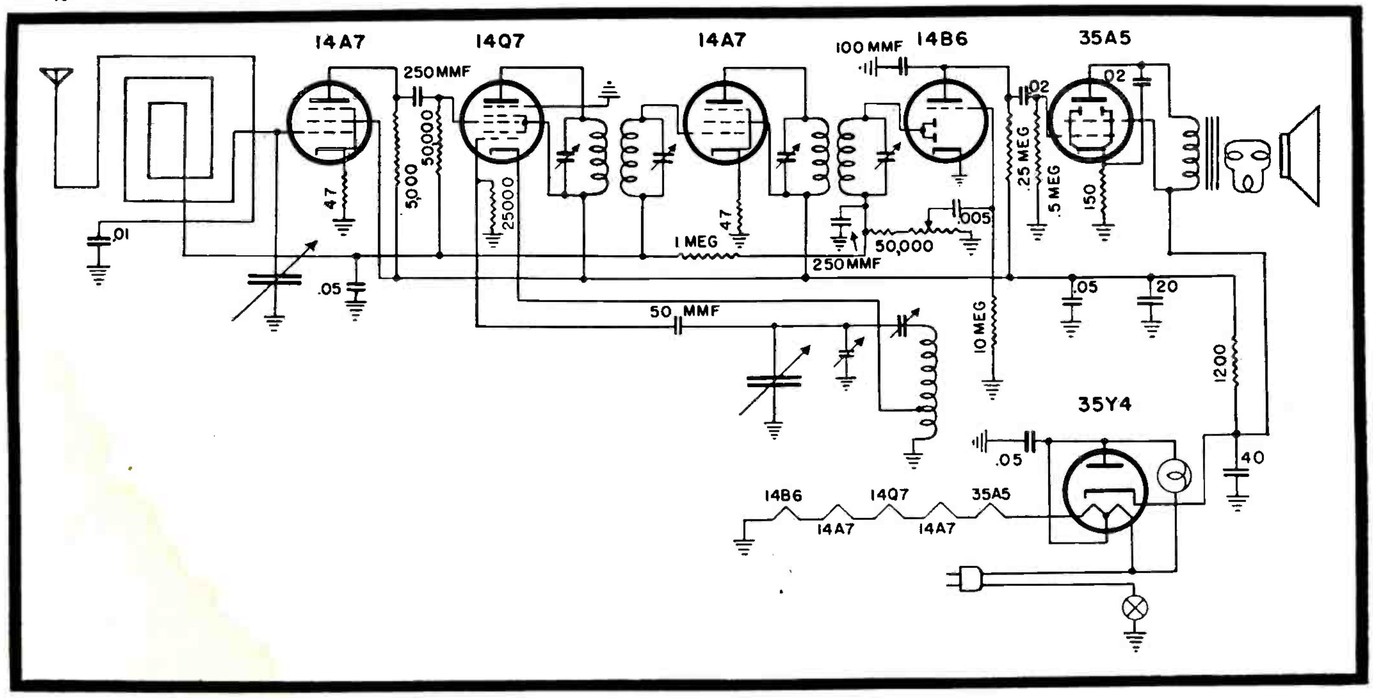
Fig. 6. Ultradyne L-46 5-tube model using lock-in tubes.

bias and audio-feedback arrangement which feeds the voice-coil voltage thtrough 400 ohms, applying it to the cathode. There is also a 100-ohm resistor to ground which shunts this feedback voltage.

The phono circuit contains a series equalizer and shunt tone control. The equalizer consists of a ½-megohm resistor and 500-mmfd capacitor in parallel; the tone control, a ½-megohm rheostat in series with a .002-mfd capacitor. The low-potential side of the pickup is isolated from the line and chassis by a .02-mfd capacitor. The rectifier filter has a 20-ohm surge-limiting resistor. Other components

(*Continued on page* 33)

Fig. 7. Globe Electronic 6U, 5-tube and rectifier receiver with lock-in tubes.



TOOLS

(*Continued from page 20*)

if the hole is too small the tap will bind and probably break off in the hole; if it is too large, the threaded hole will be a loose fit for the machine screw. Reference to the table of *tap drill sizes* shows that, if a tapped hole for a 6-32 machine screw is to be provided, a No. 36 tap drill should be employed. If an untapped hole large enough for the 6-32 screw to slide through freely is to be drilled, a No. 28 drill (*clearance drill*) should be used instead.

The three common forms of taps are illustrated in Fig. 3. The *taper* and *plug* taps taper toward the point so that the cuts are made gradually deeper by the successive threads. If the hole goes entirely through the material, a taper tap is used for the entire operation if it can be run entirely through the work. To thread a hole that does not go completely through the stock, the thread is started with a *taper tap*. When this tap has struck the bottom of the hole, it is backed out and the hole threaded with a *plug tap*. This is in turn removed and the threads are cut to the bottom with a *bottoming tap*. In soft materials the use of the plug tap is not necessary and the hole may be threaded in two steps.

Since most of the holes that the Service Man is called upon to tap go right through the material, only a set of taper taps is necessary for the *basic tool* equipment. Plug and bottoming taps may be purchased later if a need is found for them.

Pliers

Many types and sizes of pliers are made, each specially designed to best perform a certain task. They are classified according to their overall length and by the shape of their jaws. A skilled Service Man does not attempt to use one pair of pliers for all purposes. A sufficient variety should be on hand so that only the type intended for a given task should be used.

The three types of pliers used most frequently are: diagonal side-cutting, long nose and electrician's side-cutting. These, illustrated in Fig. 4, should be purchased as basic plier equipment.

Diagonal side-cutting pliers are equipped with cutting jaws set at an angle of about 15° with the face of the tool. They are used principally for cutting off wire of small gauge, *skinning* insulation, cleaning wire before soldering, etc. Their advantage over the electrician's side-cutting pliers lies in the fact that since their cutting edges extend to the very end of the rounded nose they can cut a wire off closer to its point of attachment, since the cutting edges do not extend down this far. The 6" plier is the size most commonly used by the Service Man. The type shown in Fig. 4, having a wire-skinning notch cut in the jaws and a return-spring between the handles, is recommended.

Long-nose pliers have long, slender jaws flat on the inside. These jaws are usually scored on the inside, near the end. Some are made with side cutters, others do not have them. Long-nose pliers are used primarily for light gripping and holding operations. They are useful for reaching and holding wires, screws, nuts and other small parts in hard-to-reach places not readily accessible to the hand. They are also useful for shaping purposes, forming small wire loops for terminal connections, holding wires while they are being soldered to terminal strips, placing washers on screws, etc. They may also be used for skinning the insulation from small wires by sliding the base of the jaws down along the wire while squeezing down on the handles. The 6" size of long-nose plier is recommended—either with, or without side cutter.

Electrician's side-cutting pliers, sometimes called *linemen's* pliers, have blunt jaws equipped with a scored gripping surface; above the gripping surface are powerful side cutters and sturdy handles. The design is such that when the blades of the side cutters meet, the gripping jaws are still open a few thousandths of an inch so as not to interfere with the cutting action. Some are provided with a wire-stripping notch in the cutters, as shown in Fig. 4. These pliers are sturdy and are useful for insulation crushing (use the heel back of the joint), insulation stripping (do not permit the jaws to touch the bare wire), gripping, wire cutting, and bending light metal stock. The 6½" size is recommended for radio use.

Screwdrivers

The Service Man's screwdrivers are perhaps the most often-used tools in the shop. As this constant use subjects them to hard wear, it is important to purchase only those of good quality made with alloy steel blades *hardened throughout their full length* and fastened securely so they will not turn in the handles. The 10-cent-store variety, equipped with soft blades, should be avoided.

Screwdrivers are classified according to length, purpose, type of handle,

(*Continued on page 46*)

CAPACITOR UNITS

(*Continued from page* 13)

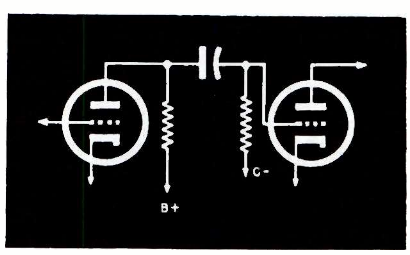
high-power-factor units should be considered from this angle.

Low resistance in a paper or mica capacitor is generally an indication that the capacitor will not give top quality performance. If the capacitor is operated at rated voltage, it will not have a long useful life. Values below 100 megohms at room temperature for fractional capacities are generally considered to be unsatisfactory depending, of course, on the circuit requirements. Measurements of shunt resistance made at room temperature are to be divided by a factor of *20* if the capacitor operates at 150° F, or by *60* if at 185° F, as is the case in some receivers, especially auto-radio types. Since the capacitor operates above room temperature, the working shunt resistance at that temperature should be considered when determining the effect on circuit operation.

Paper and mica dielectric capacitors have a shunt resistance of many megohms, often well into the thousands of megohms. Where such units are shunted by a resistor of only a few thousand ohms, it is obvious that the capacitor resistance alone will not affect the operation of the circuit. A capacitor in such a location may not have to be replaced if it has an internal resistance of only a few megohms, providing it is operating on less than half-rated working voltage. Figure *7* shows a paper dielectric bypass capacitor in such an application connected across a cathode bias resistor. Some discretion must be observed when operating a low-resistance capacitor in this and in other circuits.

Fig. 8 shows a circuit where the shunt resistance of a paper or mica capacitor may be critical. In the plate-to-grid coupling application, a low-capacitor resistance in the order of a few megohms at operating temperature may change the bias on the final tube. Since the grid resistance is in series with the capacitor across the plate voltage of the first tube, it acts as part of

Fig. 8. In this circuit the shunt resistance of a paper or mica capacitor is usually critical. Therefore, capacitor replacement may be necessary.



a voltage divider with the voltage across it bucking the normal bias. This is a frequent cause for capacitor replacement.

The bypass capacitor in Fig. 9 generally receives a voltage close to its rating, including a large alternating-current ripple in the audio stages of a receiver. The conditions under which the capacitor must work are such that low internal shunt resistance indicates an early failure due to the capacitor becoming short circuited. It is generally advisable to replace such capacitors if the resistance falls below 250 megohms.

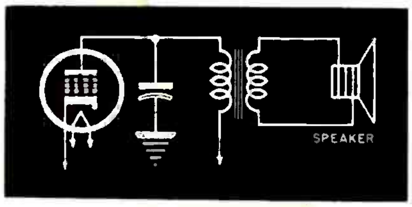
The capacity of paper and mica capacitors remains substantially unchanged regardless of how long they are in service. It is safe to say that most receiver design engineers select capacitors with stability consistent with the circuit requirements. Very infrequently a mica capacitor may lose capacity because of some of the internal elements becoming disconnected. Reference to the service manual for a description of the part, and the effect of *off* capacity on the circuit will generally determine if the capacitor should be replaced.

Electrolytic capacitors being electrochemical in nature are somewhat different than the types just described. When such a capacitor remains inoperative for a long time, there is a deformation of its insulating medium causing high initial leakage current when it is placed in service. Under this condition the capacitor should be permitted to remain connected to the analyzer for five minutes or more, before passing judgment on its quality. If the capacitor is satisfactory, the leakage current will slowly drop to an acceptable value. Dry construction electrolytics take less time on this aging operation than do the wet electrolytic types.

Non-polarized electrolytics found in some types of midget receivers should be checked for leakage in both directions of polarity. This is accomplished by testing the capacitor by the usual

(*Continued on page* 32)

Fig. 9. Bypass capacitor application where the capacitor receives voltage close to its rating, as well as a large a-c ripple in the a-f stages. It is, therefore, necessary to watch the capacitor replacement in this instance very carefully.



(*Continued from page* 31)

method. After readings are taken, the connections should be reversed and the process repeated. Alternating-current electrolytic capacitors do not require a d-c leakage test. The electrolytic capacitor may develop high leakage as a result of continued operation, especially at high temperatures. Chemical decomposition of the element may take place. This may cause the capacitor to become defective because of high leakage current, a condition that may cause a change of circuit voltages due to the increased current through the various resistors.

After adequate aging time on the analyzer the leakage current should be less than the values shown in table 2. Some discretion should be observed when replacing a high-leakage electrolytic capacitor, as the effect on circuit operation must be considered. If the capacitor is operating at a voltage far below its rating, an allowance should be made for this factor, as compared with a unit operating at full voltage. Leaky capacitors in low-resistance circuits do not affect the operation of receivers as much as when working in the higher-resistance circuits. Where a capacitor has been in continuous service for a long time, it is expected that the leakage current should be quite low. High leakage indicates chemical decomposition or a defect in the preliminary stages. Therefore it is safe to replace the capacitor to be assured that the receiver will remain in operation. The chemical decomposition may also result in the internal connecting leads of the electrolytic capacitor to become open circuited. A further trouble is that high leakage current may develop between elements of a multi-tapped capacitor. It is not infrequent that high leakage conditions lead to the capacitor becoming short circuited.

Other types of defects likely to develop in an electrolytic capacitor are low capacity and high power factor. Exceptionally high capacity in this type of unit is not unusual, generally causing improved performance of the receiver. Low capacity and high-power factor on the other hand reduces the effectiveness of the bypass and filtering action and are frequently cause for replacement of electrolytic capacitors.

Intermittently open or short-circuited capacitors are somewhat difficult to detect. This is equally true of such conditions in other components, and for circuit connections as well. The bridge measurement is an effective means of identifying intermittent operation capacitors. When the bridge circuit is in complete balance, slight jarring or movement of the capacitor will generally cause the shadow angle of the eye to be erratic. The angle may vary only a few degrees or may close entirely. With an intermittent-operation capacitor the power factor setting may have to be adjusted to obtain the bridge balance or in some cases the capacity knob will balance as open or short, depending upon the type of intermittent defect. A great deal of patience is required to locate all intermittent faults.

Capacitors to be tested by the capacitor bridge or capacitor analyzer do not have to be removed from a receiver. It is only necessary to disconnect one lead of the capacitor from a circuit, preferably the high-potential lead. Before making connections between the instrument and the capacitor, it is advisable to disconnect the receiver from the power line, antenna and ground, to obtain maximum accuracy of measurements, as well as to eliminate the possibility of damage to the equipment or shock to the operator.

After a defective capacitor has been identified, it is essential that the replacement be of satisfactory quality. If the new unit has borderline characteristics because of extended storage, the receiver may not give top performance or may become inoperative at an early date. All replacement capacitors should be measured for electrical properties before being used.

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SER-CUITS

(Continued from page 27)

are: 50 mfd, 1,000 ohms, 30 mfd, 500 ohms and 0.1 mfd. The power-tube plate is supplied after the surge resistor, and power-tube screen, after the 1,000-ohm section. Balance of the receiver receives its supply from the entire filter. This circuit attenuates the ripple to such an extent that less than 10 millivolts of hum are observable across the output transformer secondary.

Ultradyne L-46

A 5-tube (lock-in type tubes) and rectifier, Ultradyne L-46 (Regal Electronics), is shown in Fig. 6. In the power supply and avc filtering system de-coupling is used. A 35Y4 rectifier feeds the power plate (35A5) directly from 50 mfd. The 14B6 first a-f has a separate filter of 100,000 ohms and 0.1 mfd; the first i-f, another filter of 500 ohms and .05 mfd; and the 14Q7 converter another 500 ohms and .05 mfd. The avc bus has a 1-megohm resistor and .05-mfd capacitor to isolate all three tubes supplied. The bias resistors for the i-f stages are of 1,000- and 300-ohm values. The second i-f resistance coupling stage uses a 10,000-ohm plate load, 500 mmfd and ½-megohm grid leak.

Globe Electronics 6-U

Another 5-tube and rectifier model with lock-in tubes, Globe Electronics 6U, is shown in Fig. 7.

A 14A7 r-f stage is followed by an untuned 14Q7 converter, conventional 14A7 i-f, 14B6 detector-audio and 35A5 beam output.

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TWO-WAY POLICE UNIT

Two-way radiotelephone-equipped police car using recently developed Kellog koiled kord. *(Courtesy Galvin Manufacturing)*

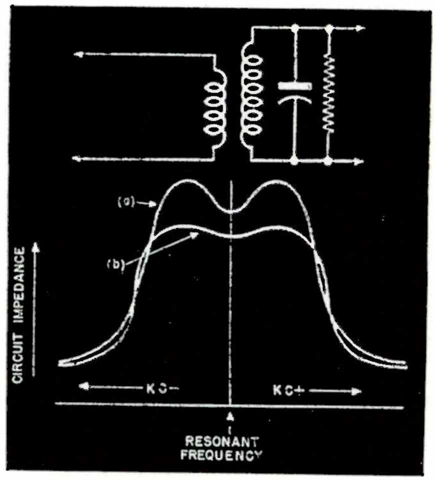


Fig. 4. Overcoupled r-f stage for broadened response, provides a curve as shown in this plot.

TELEVISION

(*Continued from page 18*)

circuit, the total reactance would be a function of the two reactances in parallel. The maximum reactance of the circuit would then be limited by the value of resistance used. This, then, would tend to flatten the curve of Fig. 2*a*, and approach that of Fig. 3, depending on the value of resistance used.

However, since the reactance ratio has been reduced, the voltage gain of the circuit would be materially reduced. Therefore, this method would achieve a broad frequency response at a sacrifice in stage gain.

Another method for broadening the response of an r-f stage is by over-coupling. This results in the curves shown in Fig. 4, where the degree of over-coupling determines the dip in the center of the response curve. By combining the resistor method and the overcoupling method, a still broader frequency response may be obtained.

Wide-band r-f transformers have very slight gain. To achieve some stage gain, tubes with high amplification factors must be used. Special television amplifier tubes have been designed to accomplish this. Tubes such as the 1852 and 1853 have very high amplification factors. Thus, a portion of the gain lost in the r-f transformer may be realized in the tube.

Typical R-F Mixer Stage

A typical television receiver r-f mixer stage is shown in Fig. 5; DuMont 180. The 1852 is used here as a mixer stage, with the antenna feeding directly into it, very much as is done in midget broadcast receivers. A 5000-ohm resistor has been placed across the tuned secondary of the antenna transformer to broaden the fre-

AT THE REPS' ANNUAL NEW YORK DINNER

Forty members and two hundred guests attended the annual dinner of the New York chapter of The Representatives at the Hotel New Yorker, recently. Manufacturing groups represented included General Electric, Emerson, Teletone, RCA and others from New York City.
In photo above, on the dais: Leo Freed, president of The Reps; Sam Egert, vice president; William Gold, secretary-treasurer; and the past presidents of the chapter.

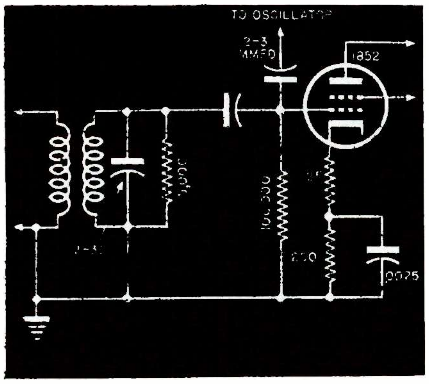
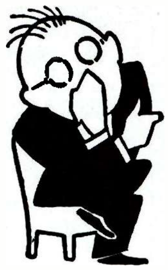


Fig. 5. A typical r-f television receiver mixer stage (DuMont 180).

quency response. Since the input capacitance of the tube represents an appreciable portion of the tuning capacitance across the antenna transformer, any variations in this capacitance, may cause a sufficient variation in the resonant frequency to seriously detune the stage. Tube input capacitance is a function of the electron stream, and since the electron stream will vary with the amplitude of the received signal, variations in received signal will cause the resonant frequency of the r-f transformer to vary. It has been found that a small amount of negative feedback, such as that practiced in audio amplifiers, will reduce this input capacitance variation to a minimum. In the mixer circuit shown it will be noted that a 25-ohm resistor in the cathode circuit is unbypassed. This small amount of feedback is all that is necessary to prevent frequency variation.

Since the frequencies involved are in the v-h-f band, component size and value will be found to be much smaller than in conventional receivers. Tuning capacitances are on the order of 3 to 30 mmfd. The stray capacitances involved in the wiring therefore assume a greater importance.

The gain of an r-f stage, as shown in Fig. 5, is approximately 1.5:2 for the transformer, and 2:4 for the converter tube. Here again, since the gain will be a function of the bandwidth acceptance of the circuit, one point should be noted. We have stated that a broad signal is used in the amplifier and it is necessary to amplify such a broad signal uniformly. These characteristics are essential because the sharpness of the received image is a function of the received signal. Receivers using small diameter c-r tubes do not require as sharp an image as a larger tube. Therefore, for receivers using small c-r tubes, the selectivity of the circuits will be found to be sharper, approaching band-acceptance widths of 5 and 4 mc.



OLD TIMER'S CORNER

by SERVICER

THE PHONE JANGLED nervously at my elbow. I put down the soldering iron with which I was lighting my cigaret and reached for it.

"This is Cal," came over the wire, "want to help me with a job this evening?"

"Depends on what it is," I answered. "If it's to swell that already big repair business of yours, Cal, you can include me out," I concluded.

"Now don't get angry because I have a bigger business than yours," Cal said. "It's just that I have been at it a great deal longer, and I see the opportunities better than you do, even if you are a real old timer!"

"Well," I grunted, "spill it!"

"Suppose you get here at about 5:30 this evening and I'll tell you all about it," Cal said.

I knew that Cal was one of the brightest stars in the radio repair firmament. Furthermore, he did not get that way just by sheer luck. He had his share of hard times and hard knocks just like the rest of us. But among the old timers in the town, Cal rated at the top of the heap. Specially when it came to figuring out how to make an extra dollar here and there, which by the end of the year added up to sizeable profits.

So it was with real curiosity that I hied myself to his shop that evening to hear the latest in "How to make an extra dollar from the Service Shop business."

I found Cal busy in the back of the store loading his truck with a heavy recorder and associated amplifying equipment. When he saw me, he motioned me to assist him. Each piece had to be covered with a section of the long canvas wadding he had provided, and it seemed that he had a definite order of placement where each article was to go. This, he explained later, was so that it would be unloaded in correct order not to make any unnecessary muss at the location of use.

"What's this all about, Cal?" I asked.

"Well, as you know, the radio set situation has not yet come up to the expectations foretold for it by the solons of the radio industry. It seems that we are still waiting for that fateful day when we shall have many sets for sale. The repair business you know all about. We get the most in this burg. In fact we cannot take on any more for the next month or so, we're that jammed up. And I was not in the mood to sell trinkets to swell the exchequer. So I finally hit upon the idea of these recordings.

"Almost every household has some person in it who makes a speech, does a turn at amateur theatrics, has a guest at the home or has some special occasion that they want to get recorded for a later date. Only they don't know it. You have to sell them.

"Last week, one of my customers told me that there was going to be a celebration at her home. Her mother and father were going to hold their 50th wedding anniversary dinner there. All the children and the grandchildren were going to attend. You may well imagine that I did not have a hard time in selling her the idea of letting us make a recording of a part of the proceedings. I had the mother and father talk and then each one of the children and grandchildren. Even recorded the voice—if you can call it that —of a single great-grandchild that turned up.

"So that they can play the record back on the average home phonograph, I make the recordings on 12-inch discs at 78 rpm. Then I tell them that the recordings are delicate and that they should not be played back too often as they will wear out. I furnish a cactus needle—and often a needle cutter—for this. The whole evening grossed me about $50. Out of that I had to pay for the discs and only my time. That's not bad, now is it?

"The day before yesterday, one of the youngsters in the town had a birthday party and I recorded it. It will make interesting listening say, twenty years from now. I got $10 for that one record made in the home.

"Quite a few doctors have hired me to make recordings of talks they plan to give before the county medical society. They want to hear how it sounds. I know that I made at least six for one doctor. He would listen and then correct his words to be more forceful or to diminish the emphasis in spots. Because he came here to make the recordings at night, I only charged him $5 for each record.

"Miss Tee, the voice teacher, has contracted with me to make recordings of every one of her students. She teaches voice, you know. She makes a recording of the pupil when he or she starts with her, and when they finish the course. The improvement is so obvious that for the most part the students let their friends listen to both records and that brings a lot of new pupils to Miss Tee. I make those recordings at her studio and charge her $7.50 for each one.

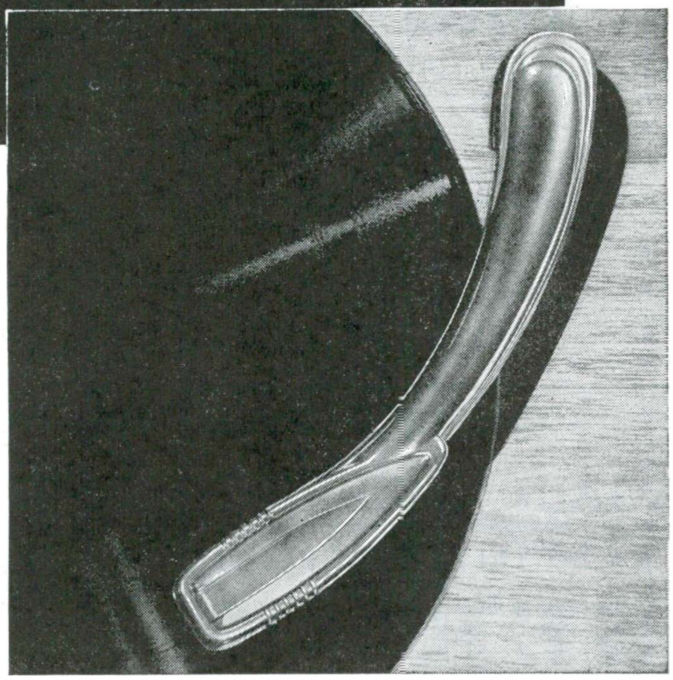
"Quite a number of the younger set have come in here to 'write' a record to their sweethearts abroad. Since I am somewhat of a softie, I do that cheap. Especially when it only involves a tiny recording disc. Charge is $1.00.

"Take a look at this schedule. It shows that I have about 15 recordings to make the next seven days. I started with one recorder. Made it myself from odds and ends around the shop, plus a fine cutting head and mechanism I had put away for just such a time as this. Well I booked that machine so solid, that in order to take on more business I had to get another. That one I bought from a radio ham who wanted to use the money to buy some new gear. Then I booked that one up solid, letting my partner Bill run it. Now we have so much business that I have just gotten my hands on this new machine. Only I have nobody to run it for tonight. So I thought of you. I know you have the experience, and that you can do a swell job. Want it?"

"Sure," I said. "But only just this time. I am going to look into this thing myself and do some of it too."

"There's room enough for both of us,"

(*Continued on page* 38)



ATTENUATORS

(*Continued from page 17*)

of R_A in each series element are one-half of the *T*-pad values. Therefore, one half the voltage develops across each element. Thus

$$P = \frac{1}{2^2} = \frac{1}{4} = \text{the power.}$$

Using the *H* construction, lower wattage resistors in the series elements may be employed. The same principle is applied with respect to the R_B values.

The use of the *T* pads for attenuation of signal powers and control is shown in Fig. 8. Suppose speaker S_1 was to receive 10 db more power than S_2, but the power input to S_1 was to be cut 3 db for some reason. Then, the loss of T_1 must be 3 db, while the loss of T_2 must be $10 + 3$ or 13 db, to make the level of S_2 10 db below S_1. As the pads are designed to work between equal impedances, if each speaker is equipped with a 500-ohm line matching transformer and the output impedances of the pads looking into the line are 500 ohms each, the amplifier output, *Z*, must be 500/2 or 250 ohms to get a match, since the pad output impedances of 500 ohms each are in parallel.

OLD TIMER'S CORNER

(*Continued from page 37*)

Cal rejoined with a chuckle. "But there is one thing that might stop you."

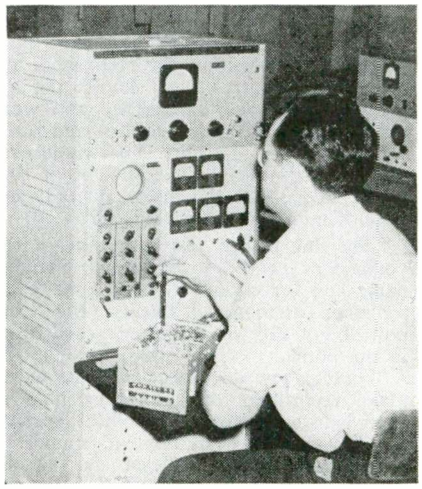
"What are you grinning at?" I asked tersely.

"Where—oh where are you going to get the equipment, son?" Cal whispered.

He had me there for a moment. However I recalled that I had some odds and ends around too, that could be whipped up into a amplifier and recorder.

And now I'm in the business too, waiting to buy a commercial unit or two, as soon as they're ready. For now I have also more business than I can handle.

PERSONAL PLANE RADIOS



Twelve-pound two-way 3-control personal plane radiotelephone developed by GE, on a test bench. Operates from a fixed wire antenna.

CHERTOK NAMED SOLAR AD MANAGER

Sidney L. Chertok, has been appointed advertising manager of the Solar Manufacturing Corporation. Mr. Chertok, who has been manager of Solar's technical service bureau, will also act as advertising manager of the Solar Capacitor Sales Corporation. He succeeds S. A. Wolin, resigned.

* * *

BEN WAXLER NOW CHIEF ENGINEER OF GLOBE ELECTRONICS

Ben Waxler, formerly chief radio engineer of David Bogen Company and Regal Electronics Corporation, has been appointed chief radio engineer of Globe Electronics Corporation, N. Y., N. Y.

* * *

HOWARD SAMS RADIO ENCYCLOPEDIA SERVICE

A radio encyclopedia service, to be issued periodically in the form of "PhotoFact" folders, each folder containing schematics, identified lists of parts and suitable replacements plus detailed engineering data and voltage-resistance analysis, has been announced by Howard W. Sams & Co., Inc., 2924 E. Washington

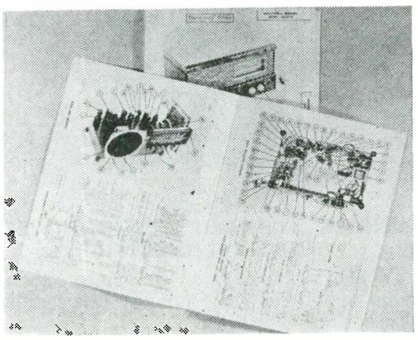
NEWS

St., Indianapolis, Ind. The folders will vary in size from 4 to 12 pages.

The folders will be distributed in folios of 30 to 50 at frequent intervals and as rapidly as new receivers are placed on the market. The complete service folder on a new receiver will be delivered to subscribers within 90 days after the set goes on sale.

According to Mr. Sams, a sample of every new receiver, immediately after it goes into production, will be analyzed, components will be checked and listed, and resistances and voltages will be recorded.

PhotoFact folders will cover all receivers placed on the market after January 1, 1946.



Each folder will contain photographs of the chassis taken from various angles.

Subscribers to the service will hold membership in the Howard W. Sams Institute, which will be headed by servicing specialists. This board will help members to solve their problems in connection with servicing, parts selection, shop operation, promotion, accounting, etc.

Howard W. Sams, who heads the new organization, was formerly with P. R. Mallory & Co., Inc., Indianapolis, Ind.

Howard W. Sams

* * *

WESTON ENGINEERING DATA

The first issue of a publication entitled "Weston Engineering Notes," was recently published by the engineering laboratories of the Weston Electrical Instrument Corporation.

Featured were articles, "The Galvanometer and the Bridge" and "Copper Oxide Rectifiers as Used in Measuring Instruments."

John Parker is editor.

* * *

RIDER NAMED RCA TEST EQUIPMENT CONSULTANT

Lt. Col. John F. Rider has been retained by the RCA Victor Division as a consultant on test equipment. Col. Rider will

(*Continued on page* 40)

NEWS

(*Continued from page 39*)

work in cooperation with the test and measuring equipment section.

* * *

ELECTRO-VOICE CARDAX CARDIOID BULLETIN

A 4-page bulletin describing the model 950 Cardax cardioid unidirectional crystal microphone has been issued by Electro-Voice, Inc., 1239 South Bend Ave., South Bend 24, Indiana. Frequency response curves, specifications and application information are offered.

* * *

NEWS OF THE REPRESENTATIVES

John P. Ludgate, 345 4th Ave., Pittsburgh 22, and P. A. Boyd, 434 Biddle Ave., Pittsburgh 21, Pa., have become members of the Buckeye chapter.

H. E. Walton has been elected president of the Wolverine chapter. J. P. Davenport is now vice president and R. C. Nordstrom, secretary-treasurer.

Norman B. Neeley, J. T. Hill, Herb Becker, Emmett N. Hughes and Harry A. Lazure were delegates of the Los Angeles chapter at the national convention held in Chicago.

Charles D. Southern, who operates as the Southern Sales Co. has moved his office to 1135 Lincoln Tower, Ft. Wayne, 2, Ind.

* * *

WOLIN JOINS PYRAMID ELECTRIC

Sylvan A. Wolin, formerly with Solar Manufacturing Corp., has become associated with the Pyramid Electric Co., 415 Tonnele Avenue, Jersey City, N. J. The company manufactures electrolytic capacitors and radio noise eliminators.

* * *

PREISMAN NOW CREI V-P

Albert Preisman has been elected vice president, in charge of engineering, of the Capitol Radio Engineering Institute, 3324 16th Street, N.W., Washington, D. C.

Mr. Preisman has been associated with the institute for three years, where he has been in charge of radio engineering activities, lesson text revision and development of new lesson material.

* * *

McKNEW TO HEAD WESTINGHOUSE HOME RADIO SERVICE

W. H. McKnew has been named service manager of the Westinghouse home radio division, Sunbury, Pa.

Mr. McKnew, a lieutenant commander in the U. S. N. R., served from 1942 to 1945 as Resident Inspector of Naval Material at the Westinghouse industrial electronics and X-ray divisions in Baltimore.

* * *

CONCORD RADIO CATALOG

A 112 page catalog with data on receivers, amplifiers, components, accessories, etc. has been released by the Concord Radio Corporation, 901 W. Jackson Boulevard, Chicago 7, Illinois.

* * *

SOLAR SYSTEM BULLETIN

The first issue of the *Solar System*, a bi-monthly, devoted to capacitor developments, was recently published by the Solar Manufacturing Corporation, 285 Madison Avenue, New York 17, N. Y.

The initial issue contained articles on the proximity fuze, RMA color codes, Army-Navy color codes, capacitor-type a-c follow-up motor, etc.

S. L. Chertok is editor of the new publication.

* * *

CLEVELAND INSTITUTE BOOKLETS

A 24-page booklet describing technical training today, has been published by the Cleveland Institute of Radio Electronics, S-5 Terminal Tower, Cleveland 3, Ohio.

The Institute has also issued a booklet telling how to pass FCC license examinations. Both booklets are available gratis.

NEW PRODUCTS

SIMPSON A-M/F-M SIGNAL GENERATOR

A signal generator, model 415, for a-m and f-m has been announced by the Simpson Electric Company, 5208 W. Kinzie St., Chicago 44, Ill.

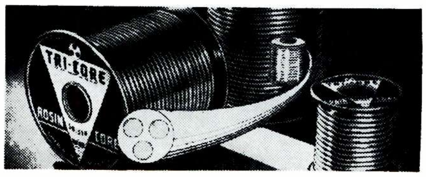
Features control of r-f output through entire range. The r-f output voltage is also said to be practically constant throughout the frequency range.

Modulation from 0 to 100% uses either 400-cycle internal sine wave or an external source; high-fidelity modulation up to 100% from below 60 cycles per second to over 10 kilocycles per second.

* * *

ALPHA METAL 3-CORE SOLDER

A solder with three independently filled cores of rosin flux, Tri-Core, has been announced by the Solder Development Division, Alpha Metals, Inc., 369 Hudson Ave., Brooklyn 1, N. Y.



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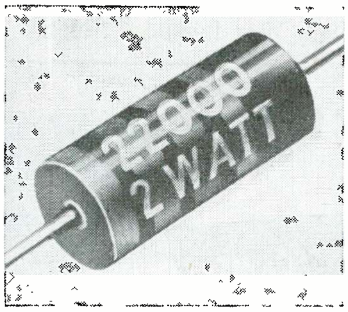
OHMITE MARKED LITTLE DEVIL RESISTORS

Individually marked "Little Devils" have been announced by the Ohmite Manufacturing Company, 4835 Flournoy Street, Chicago 44, Illinois.

Markings include resistance value and wattage rating, in addition to RMA color coding.

Resistors made in ½-watt, 1-watt, and 2-watt sizes: ½-watt is ⅜" long x 9/64"

(*Continued on page 42*)



NEW PRODUCTS

(*Continued from page* 41)

diameter; 1-watt, 9/16" long x 7/32" diameter; 2 watt, 11/16" long x 5/16" diameter.

Available in RMA standard values (10% tolerance) from 10 ohms to 22 megohms.

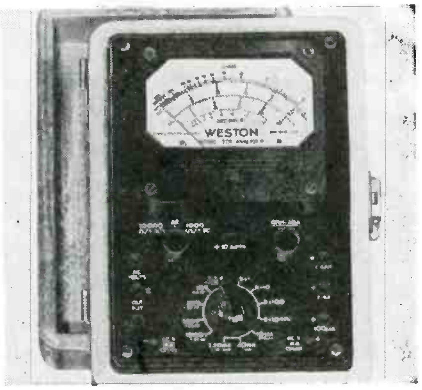
* * *

WESTON BROAD-RANGE ANALYZER

An analyzer, model 779 (6⅜" x 9⅛" x 4⅞"), with five overlapping a-c and d-c voltage ranges, seven d-c current ranges, four d-c resistance ranges, and five decibel ranges, has been announced by the Weston Electrical Instrument Corporation, Newark, N. J.

D-c voltage ranges available at a dual sensitivity of 1,000 or 20,000 ohms per volt.

All readings are taken on a standard 4" rectangular 50-microampere instrument. A-c measurements made through a temperature-compensated full-bridge copper-oxide rectifier designed so that all a-c readings are made on a single scale arc.

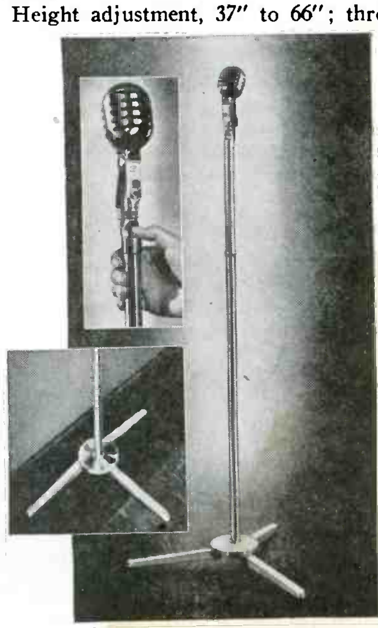


* * *

ELECTRO-VOICE MICROPHONE FLOOR STAND

A microphone stand, E-V floor stand, model 425, that raises, lowers and locks with one-hand operations, has been developed by Electro-Voice, Inc., 1239 South Bend Ave., South Bend 24, Indiana. By pressing a button with one finger, the microphone shaft is raised or lowered; locked into position by releasing the button.

Height adjustment, 37" to 66"; three-



leg spread, 17"; net weight, 7½ pounds.

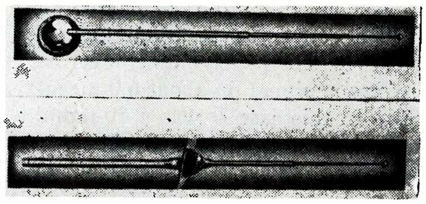
* * *

SNYDER AUTO ANTENNAS

Two automobile radio antennas, the "Cosmopolitan" and the "Hemisphere," have been announced by the Snyder Manufacturing Company, Philadelphia.

The "Cosmopolitan" is for fender or top cowl with concealed installation. Made in four sections with a closed height of 8". Said to be self-aligning with a 33° angle adjustment for all body and fender contours.

The "Hemisphere" is a swing angle antenna, adaptable to all cowl or fender contours. Made in four sections, extends to 66" and closes down to 22".



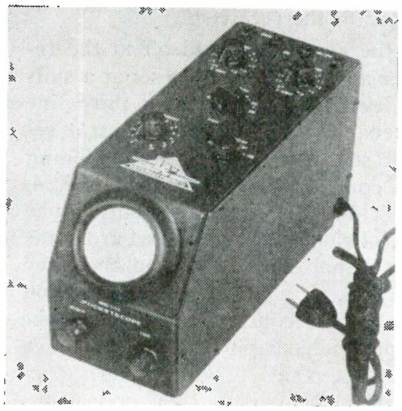
* * *

WATERMAN MINIATURE OSCILLOGRAPH

A 6⅜" x 3¾" x 10" oscillograph, the "Pocketscope," has been announced by Waterman Products Company, Inc., Philadelphia.

Unit incorporates a cathode-ray tube, vertical and horizontal amplifiers, linear time base oscillator, synchronization means and self-contained power supply.

Cathode-ray tube is magnetically shielded. The time base oscillator uses a double triode, tube connected as a multivibrator, producing a substantial linear trace from 10 cycles to 50 kc.



* * *

ACA DIRECT-COUPLED AMPLIFIERS

Direct-coupled amplifiers, type 100 DC, have been developed by the Amplifier Co. of America, 398 Broadway, New York 13, N. Y.

Features a signal self-balancing and current drift-correcting direct-coupled output circuit, and non-frequency discriminating scratch suppressor. Response is said to be 20 to 20,000 cycles ± 1 db; develops 23 watts with less than 1% total distortion, overall gain, 96 db; hum and noise level, −40 vu.

Two independent inputs (each of 500,000 ohms) are provided. Balanced output terminals are provided for 4/8/16 and 500 ohms. In-between terminals provide the

(Continued on page 47)

REMOTE CONTROL

(*Continued from page* 15)

bias. If the bias control is so designed that at the mid-point, the tube is operating at the middle of the straight portion of its E_g-I_p curve, at one extreme the control voltage reduces to zero, and at the other extreme it is equal to twice the value at the operating point. Thus quite a range of plate resistance is available.

In the particular case checked, using a 76 control tube, and controlling a 6A7 in a conventional circuit, it was possible to completely tune over a fairly strong signal on about 6.0 megacycles. In this case *C* was a 30-mmfd trimmer adjusted fairly well out.

In placing the receiver at the remote point, lines must necessarily be run to the operating or the listening point. Since level is generally restricted over such lines, it will be necessary to use some simple form of amplifier at the listening point. Since it will be for headphone operation a single 6J5 should be sufficient, as in Fig. 3. The power supply for this unit can also conveniently supply the control voltage for the receiver. Neglecting the use of a power-line ground return as an undesirable source of line noise, a pair of lines should be used to carry the receiver output to the listener's amplifier, and the control voltage from the listener to the receiver.

If the avc is switched off at the receiver and the audio gain set at a suitable level the addition of a third line will enable the listener to control receiver sensitivity, one line functioning as a common return circuit; Fig. 4. The grid of the frequency control tube must obviously be decoupled from the audio signal on the line, but the filter R_1, R_2, C_3, C_4, should not have such too large a time constant or there will be an appreciable lag in the control voltage when it is varied. The blocking capacitors C_1 and C_2 should show no leakage. Their capacity can be selected to provide substantial low-frequency cutoff, such as is generally required for communications purposes. R_3 in Fig. 4 should have sufficient resistance to prevent leakage of the low impedance of the control voltage supply source across the 500-ohm line.

Actual values of parts have not been included as almost every case will be different. The application is quite interesting, since it provides audio gain control, sensitivity control, and a few kilocycles of tuning range over the operating channel.

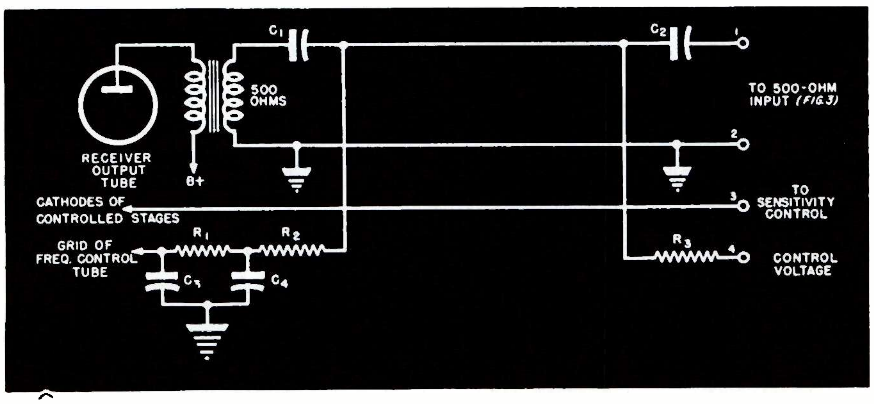
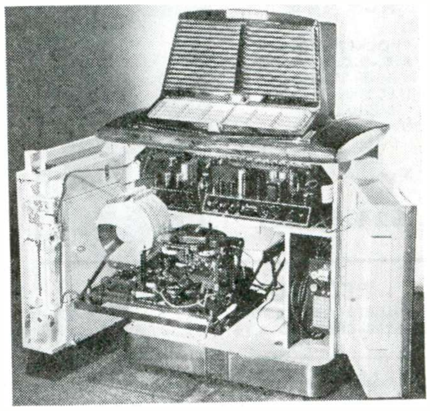
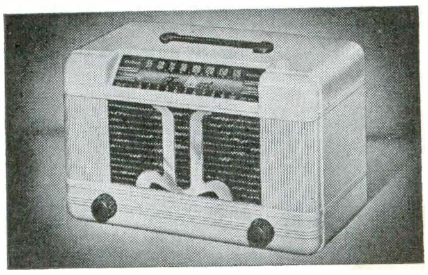


Fig. 4. Third-line addition in two-line system to permit receiver sensitivity control.

NEW MODELS



Above, Aireon automatic phonograph with noise monitoring device. A microphone (placed anywhere in the room where the phonograph is located) plugs into a small 4-tube amplifier and provides a bias, for the main amplifier, which varies in accordance with the background noise. The phono-amplifier uses five tubes, two 6L6s driving a 15" dynamic speaker, with provision for feeding four wall speakers. . . . Below, Farnsworth six-tube a-c/d-c single band model, ET-065. Uses one 6SS7 r-f amplifier, one 12SA7 converter and oscillator, one 6SS7 i-f amplifier, one 12SA7 avc and audio, one 50L6GT output and one 35Z5GT rectifier.



TANTALUM WELDING

Spot welding tantalum grid wires, of .007" diameter, to tantalum sleeve of transmitting tubes at Amperex Electronic Corporation.

5-TUBE BATTERY-ELECTRIC RECEIVER

(See Front Cover)

A 5-TUBE battery a-c/d-c model, using a 117N7 as a combination rectifier and beam power amplifier, Emerson 505, appears on the cover, this month.

Selectivity and sensitivity is better than average because of 3-gang tuning with a tuned r-f 1T4 amplifier and an i-f of 262 kc. A 1R5 converter is standard except for a grid capacity winding on the oscillation transformer which replaces the grid capacitor.

A 1T4 i-f stage feeds a 1S5 detector-first audio. Here a 47,000-ohm resistor at the detector output serves as an i-f filter and anti-loading resistor. An avc-voltage-dividing potentiometer delivers full avc bias to the r-f amplifier through a 3.3-megohm grid leak, reduced proportional bias to the 1R5 first detector and further reduced bias to the i-f amplifier. The main series filter resistor is a 2.2-megohm type, followed by a 3.3-megohm resistor and a .02-mfd. capacitor to the detector, 3.3 megohms to the i-f and 3.3 megohms shunt to ground.

The audio amplifier merits special study. The 1S5 pentode section feeds the 3Q4 battery-power tube and the 117N7 line-power tube in parallel, with a .47-megohm grid leak returning to the 1S5 filament. A 10-megohm degeneration resistor connects the grids back to the first a-f grid. A 5.6 megohm grid leak in the first audio is connected across a .02-mfd blocking capacitor, instead of from grid to filament. The output transformer is tapped for matching the 117N7 amplifier, the entire primary being a match for the higher impedance 3Q4.

A polarized line plug provides line to battery switching when plugged into a socket at the rear. The plug carries the *B* connection to the negative terminals of the *A* and *B* batteries, which goes to the receptacle. The filaments of the battery tubes are connected in series for both battery and line operation. They are in the cathode bias circuit in series with a 33-ohm resistor and shunted by a 3,300-ohm resistor and a 100-mfd cathode bypass of the 117N7 amplifier section. Equalizing resistors and bypass capacitors balance the filament voltages and prevent undesirable filament feedback.

A filter choke and 20- and 40-mfd units provide the main filter which supplies the i-f plate, first a-f plate and screen, and power amplifier plate and screen. An additional R/C filter, 3,900-ohm resistor and a .02-mfd capacitor supplies r-f and converter plates while a second filter with a 15,000-ohm resistor and .02 mfd capacitor is in the screen circuit. This is excellent for there is little chance for feedback via the plate supply.

Another interesting feature of this model is the use of miniature series of tubes in place of the common GT series ordinarily used in combination battery-line receivers.

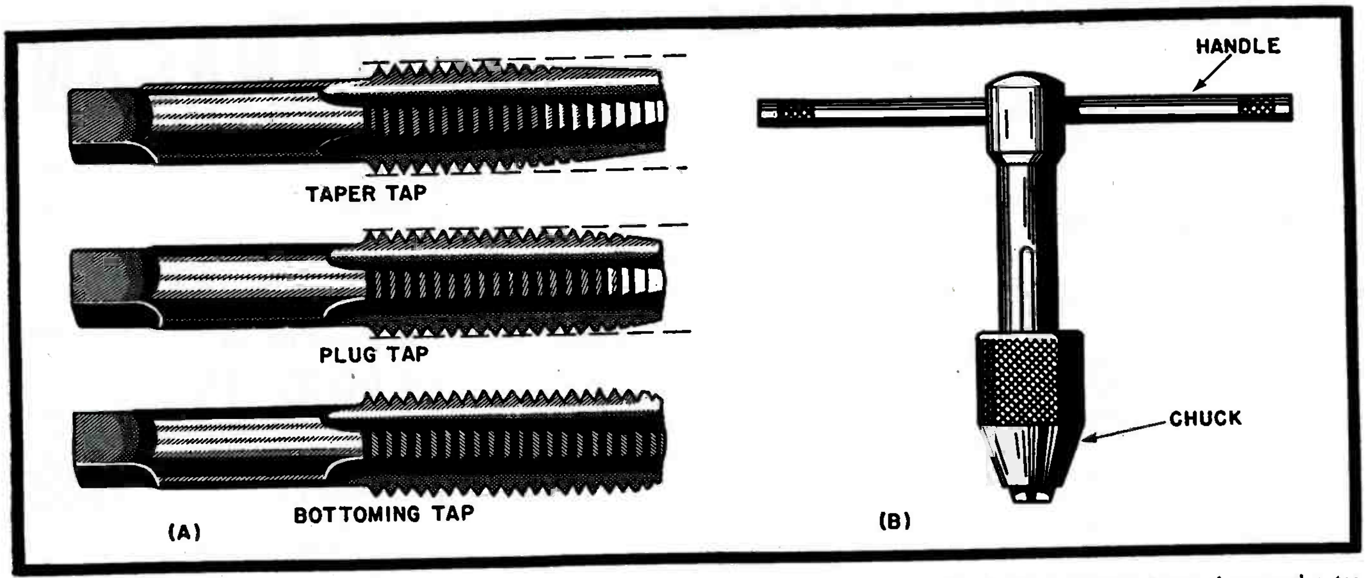


Fig. 3. Three common forms of taps and a tap wrench used to turn the taps. The taps are shown in (*a*), while the tap wrench is shown in (*b*).

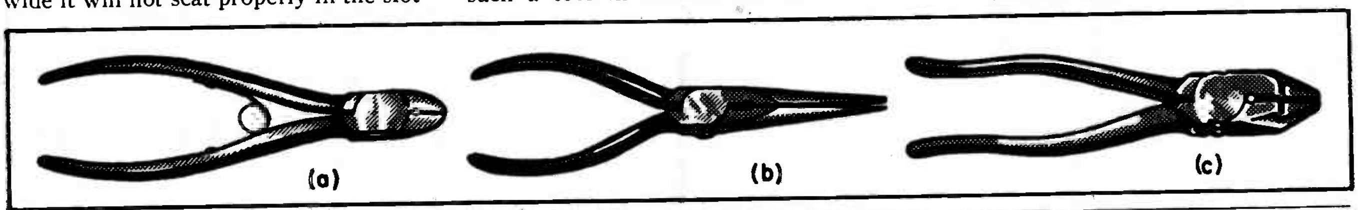
TOOLS

(*Continued from page 29*)

etc. A wide variety of types and sizes are available. It is important to have a sufficient variety of screwdrivers on hand so that one of the right size is always available for a job. The length of the slot in the screw-head and the width of the screwdriver blade should be as nearly alike as possible. If the blade is too narrow it will be twisted when the screw is tightened; if it is too wide it will not seat properly in the slot and the screw head is likely to be burred and the work scratched. It should be remembered that the thickness of the blade varies with the width. For best results the blade should fit the slot snugly for its full width. The length of blade to use is determined chiefly by the accessibility of the work. If too large a screwdriver is used, there is danger of applying too much leverage and shearing off the screw when it is tightened.

A single screwdriver no longer serves all of the many requirements for such a tool in modern service work. For light-duty work such as setting the set-screws of dials and knobs, variable tuning capacitors, etc., a small screwdriver with ⅛" x 3" blade and provided with a pocket clip is recommended. Many Service Men make a habit of wearing one of these.

Fig. 4. Three basic types of pliers for the Service Man: (*a*), diagonal side-cutting type with stripping notch; (*b*), long nose type; (*c*), electrician's side-cutting type with a stripping notch. (*Courtesy Kraeuter Tool Co., Inc.*)



NEW PRODUCTS

(Continued from page 43)

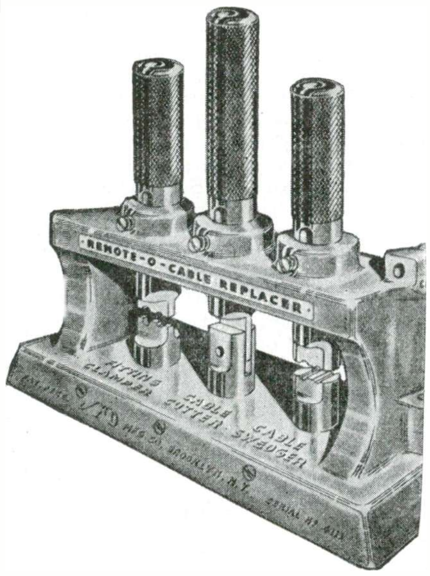
following additional output impedances: 1/2/6/10/12/83/100/125/150/166/175 ohms.

Uses two 12SC7, two 12SK7, two 6SC7, two 6SJ7, two 6L6G, one 5U4G, one 5V4G and one ballast.

* * *

JFD REMOTE-O-CABLE REPLACER

A remote-o-cable replacer for swaging shafting to prevent unraveling, cutting shafting to exact length, and replacing old and new fittings on new shaftings, has been announced by J. F. D. Manufacturing Co., 4117 Fort Hamilton Parkway, Brooklyn, N. Y.



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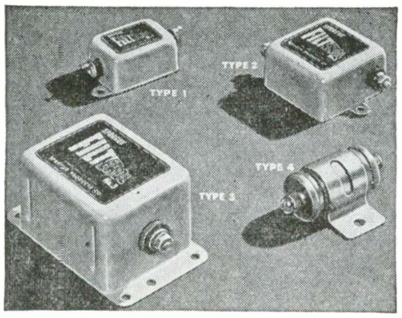
SPRAGUE INTERFERENCE FILTERS

Filterol radio interference filters have been announced by the Sprague Products Company, North Adams, Mass.

Designed for installation in series with the power line or interfering device. Basic circuit is a three-terminal network of which the can is one terminal. Four availables types include 115 volts a-c or d-c ratings from 1 to 35 amperes, and one unit for 220 volts a-c or d-c is rated at 20 amperes.



JOTS AND FLASHES

The Recent OPA tube pricing policy providing a 20% increase to manufacturers and requiring Service Shops to absorb the increase, has prompted many service organizations and Shops to ask for either a modification or relaxation of the ruling. Service Shops have indicated that there should be an adjustment of the price schedule to provide an equitable profit. . . . A condensed chart of graphical symbols has been published by Sun Radio and Electronics Company, Inc., 122-124 Duane Street, New York 7, N. Y. . . . Harry Gawler and Walt Knoop, formerly with Du Mont, have formed an engineering sales service, with offices at 1060 Broad Street, Newark, New Jersey. . . . George Mucher, chief engineer and vice president of Clarostat Manufacturing Co., Brooklyn, New York, delivered a talk on carbon volume controls recently before a meeting of the Rochester Technicians Guild. . . . Cinaudagraph speakers are now being made in Slater, Missouri. Cinaudagraph is a division of Aireon. . . . Harold Montgomery has been named credit manager and assistant treasurer of the Aerovox Company, New Bedford, Mass. . . . Two 40-page booklets covering receiving tubes of G.E. and Ken-Rad types have been published. They are available from the G.E. tube division at Schenectady. . . . Paul J. Reed has been named assistant to the sales manager of Bendix Radio. . . . Joseph L. J. O'Connor was promoted to the post of sales promotion manager of Bendix. . . . K. G. Morrison is now assistant radio sales manager of the Graybar Electric Company. . . . E. Ralph Haines has resigned as assistant manager of distributor sales of the Raytheon Manufacturing Company, Newton, Mass. . . . Garrard Mountjoy has become president of the Electronic Corporation of America. . . . Samuel J. Novick is now chairman of the board. . . . The ECA plant has been moved to 170 53d Street, Brooklyn, New York. . . . Captain John L. Reinartz, with the U. S. Navy for the past seven years as communications and electronics officer, has returned to RCA. He will be in charge of amateur activities at the Lancaster tube plant. . . . RCA has purchased the Lancaster tube plant from the U. S. Navy for over $4,000,000. . . . G. F. Metcalf is now manager of the G.E. Electronics Laboratory. . . . L. M. Leeds has been named consulting engineer of G.E. . . . Edgar Stanton is now sales service manager of Belden. . . . Fred A. Parnell has been appointed advertising and sales promotion manager of the G.E. receiver division. . . . A 12-page booklet describing antennas for f-m and television, store demonstrations, and noise reducing systems has been prepared by the Technical Appliance Corporation, Flushing, New York. . . . Don G. Mitchell has been elected president of Sylvania Electric Products, Inc., succeeding Walter E. Poor, who is now chairman of the board. Mr. Mitchell was formerly executive vice president. . . . Julius Haber has been appointed advertising and sales, promotion manager of the tube department of RCA Victor. He was formerly director of publicity. He will be located at Harrison, N. J.

ADVERTISERS IN THIS ISSUE

SERVICE INDEX—MAY 1946

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