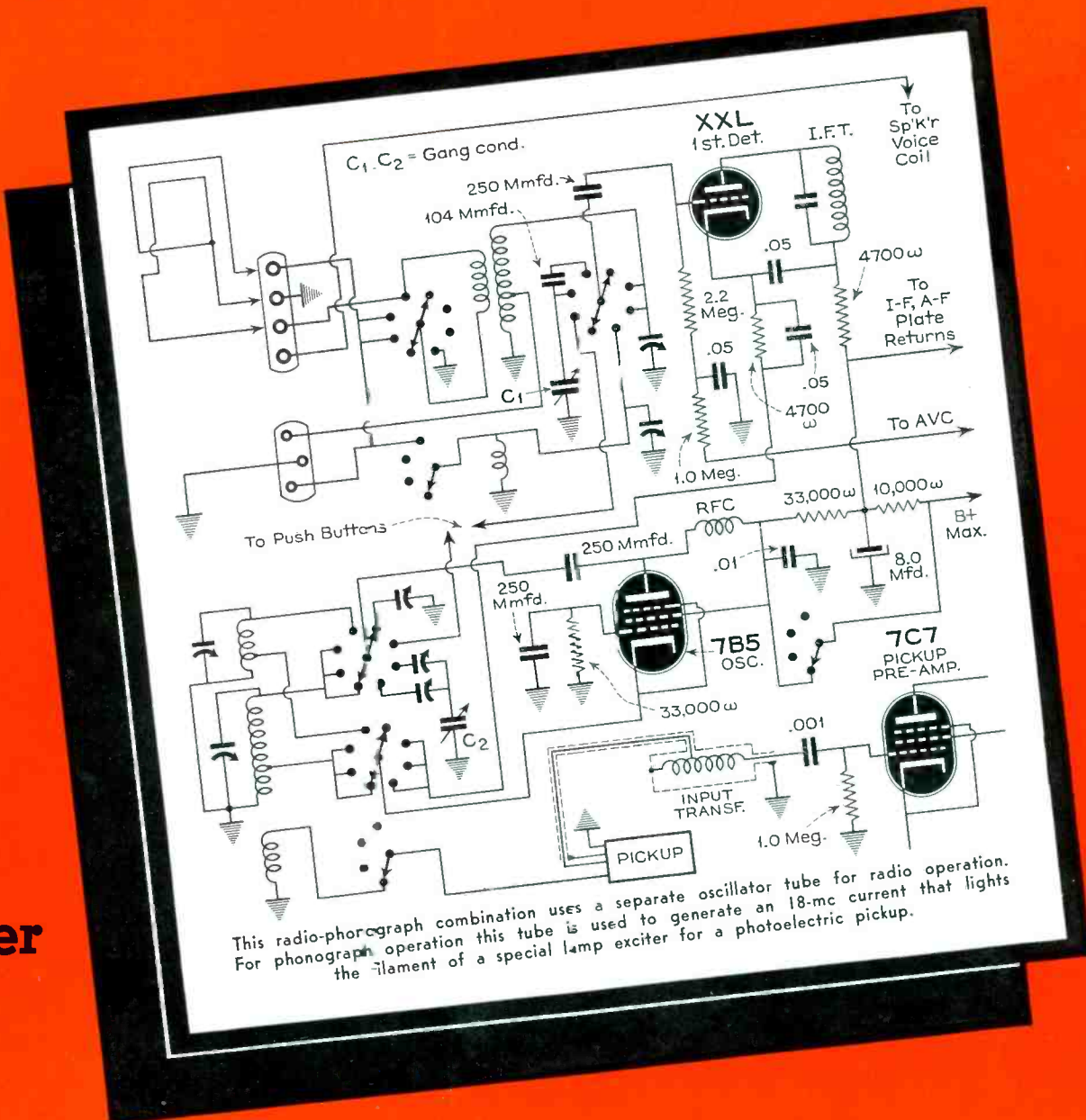


SERVICE

James S. White



September
1940

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P. R. MALLORY & CO., Inc.

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You can be absolutely sure of exact replacements, and thorough coverage of every condenser need because the Mallory line of Replacement Condensers has been specifically developed around an exhaustive study of millions of condensers in *all* makes and models of standard radio receivers.

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MULTIPLE PUSH BUTTON SWITCHES • RESISTORS
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*Your General Purpose
Public Address Projector*

When the new Type "S" Peri-Dynamic Projector was introduced at the June Trade Show, immediate and wide acceptance throughout the public address industry was prophesied. All of these predictions have now materialized with even greater emphasis than was prophesied. High power handling capacity (15 to 25 watts), low cost and outstanding ability to reproduce both speech and music with a crisp clean cut quality fully justifies sustained leadership in this new product. Public address dealers and engineers who are not familiar through experience with this new product will do well to place their orders immediately. A steady increase in factory production permits prompt delivery.

Dealers' price, Type "S" Peri-Dynamic Projector (No. SPH-81) complete with Permanent Magnet Speaker installed, \$31.20 Net (mounting standard extra). Dimensions: 24-inch by 30 inches overall length.

by

Jensen
6601 SOUTH LARAMIE AVENUE • CHICAGO
CABLE ADDRESS: JEPAR, CHICAGO



IT SEEMS that in the field of television we are destined to have something better before we have something just good. Within the last few weeks several different types of television in natural color have been announced, and at least one of these systems has been successfully demonstrated.

It is claimed that the addition of color to television will not make a wider transmission channel necessary. In fact, practically all sources agree that there is much to be gained in the way of better definition, with the present 6-megacycle band width, through the introduction of color. The demonstrations seem to prove this contention.

An investigation of several of the color methods indicates that the price of television receivers capable of reproducing the color pictures will be about ten percent higher than similar receivers without the color facilities, under present manufacturing conditions.

The utmost in flexibility can be provided for without complication, since black and white receivers are capable of reproducing the color pictures (in black and white) and the color television apparatus can do the same for black and white transmissions.

There seems nothing in the way to prevent the adoption of color as one of the television standards when such standards are finally adopted.

ONCE again SERVICE is on top. The Radio Technicians Guild (RTG) has just completed a readership survey among their members. In answer to the question, "What trade papers do you read regularly?" SERVICE rated 90%. The nearest second publication rated 40%. Thanks fellows!

CONTENTS

	Page
Circuits. <i>By Henry Howard</i>	8
Display	19
Modern Multitesters. <i>By S. Gordon Taylor</i>	10
Replacement Batteries for Portables	30
Replacement Parts for 1940-41	16
Servicing Recorders. <i>By C. J. LeBel</i>	5
Sound News	21, 22
Steps to Success. <i>By Wesley F. Dickinson</i>	12
Television in Natural Color	28
Associations	34
Book Reviews	29
Catalogs and Bulletins	35
Circuits	
Audio Oscillator and Gain Set Block Diagram	6
Ammeter Section RCP Model 803	11
A-C Voltmeter Section RCP Model 803	11
Distortion Meter Block Diagram	7
D-C Voltmeter Section RCP Model 803	10
Gain Sets	7
Philco 41-608, 41-609 R-F and Oscillator	Front Cover
Phono-Radio-Recorder Block Diagram	5
RCA 14BT1, 14BT2, 14BK Battery Saver and Tone Control	9
RCA VI02 Antenna Input	8
Silvertone 6541 Antenna Input	8
Stromberg Carlson 500 Filter Circuits	9
Tube Tester Section RCP Model 803	10
Cover Diagram	
Superhet Oscillator-Photoelectric Lamp Exciter (Philco)	8
Highlights	21, 26, 28, 29, 35
Index to Advertisers	36
Manufacturers	16, 21, 22, 26, 27, 32, 33
On the Job	
Alignment Hint. <i>By R. G. Chrouch</i>	9
Belt Static	26
Profits in Home Recording. <i>By R. C. Powell</i>	26
Rolindex Tube Tester Chart	26
Sell Complete Service. <i>By Martin Francis</i>	15
Public Address	
Servicing Recorders. <i>By C. J. LeBel</i>	5
Sound News	21, 22
Service Helps (Case Histories)	
Philco AR5	31
Philco 40-195, 200	31
RCA K105. <i>By Willard Moody</i>	31
Television	
Television in Natural Color	28
Test Equipment	
Modern Multitesters. <i>By S. Gordon Taylor</i>	10
New Test Equipment	27
Rolindex Tube Tester Chart	26

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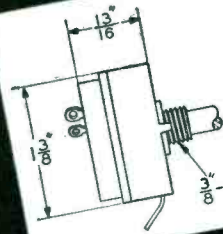
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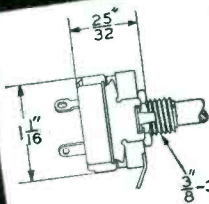
The CENTRALAB Family

of VOLUME CONTROLS



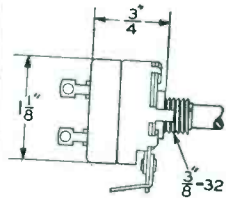
STANDARD

Long famous for the reliability of Centralab's non-rubbing contact and long wall type resistor. Available plain, or with one, two, or three taps, and with SPST, DPST, or SPDT Underwriters Approved switches.



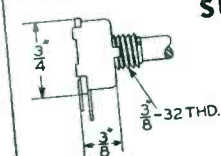
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Small in size, but large control efficiency due to the long straight path of the wall type resistor. Fits well in crowded chassis as solder lugs do not project far beyond the control radius of 17/32". Available single, dual, or triple, plain, or tapped, with SPST, SPDT, DPST, and a special dial lite push switch for battery sets.



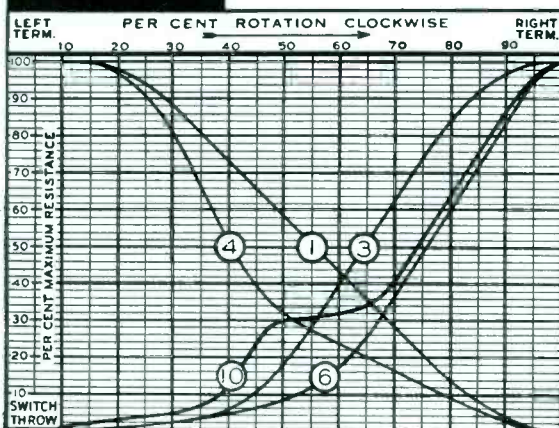
MIDGET FLATOHM

A simple, inexpensive control of sturdy reliability for the not too critical circuits. Shallow depth economizes space behind the panel. Has flat circular resistor, and Centralab's rocking disc contact. Available without taps only in single plain, or with SPST, or DPST switch.

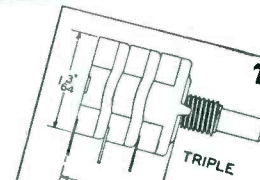


SUB-MIDGET

The smallest diameter reliable control. Long wall type resistor gives low noise level. Rapid Transfer of heat from resistor to metal shell gives maximum load rating of 1 1/2 watts. No switch or taps. Available as grounded or insulated rheostat or potentiometer with solid or tubular shaft.



The resistor curve of a volume control is more important than its overall resistance... that is why Centralab controls are furnished with the variety of curves shown here. Curve six is most widely used for high resistance radio grid and diode controls. Curve 1, or 4, are best for C bias, and Curve 3 for antenna C bias. Curve 10 is used on tapped controls.



TWIN AND TRIPLE CONTROLS

Two or three sections assembled in tandem for special purposes. Each section fully shielded and has independent connections. All variable contacts attached to a single shaft. Twin controls also available with concentric shafts; one inside the other. Supplied with or without Underwriters Approval snap switches.

Centralab

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A Division of GLOBE-UNION INC. Cable Address: Centralab Milwaukee

SERVICING RECORDERS

By C. J. LABEL

AUDIO DEVICES, INC.

THE success of a few manufacturers last season has started an avalanche and at least a score of inexpensive home recorders will be on the market this fall. The purchasers of these units are, in general, inexperienced in a field that requires considerable technique. The manufacturers themselves, in most cases, have a relatively new mechanism with but little experience. The result will undoubtedly be an enormous boom in servicing. Probably a considerable portion of the service calls will involve consumer education rather than repair, but this should not trouble the properly prepared Service Man. As a matter of fact, getting good recordings is about 90% in

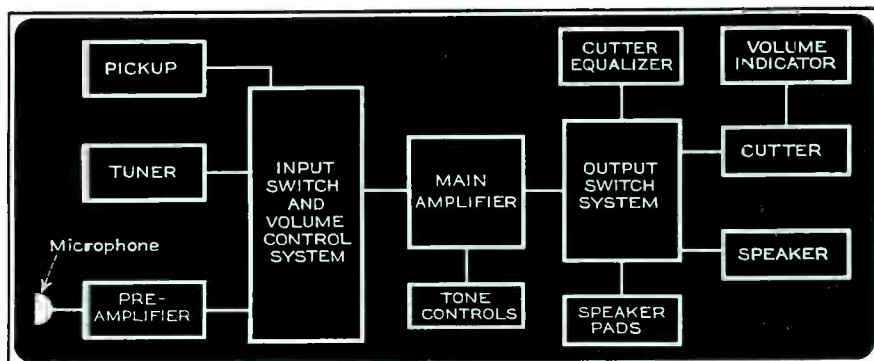
The recorder presents a new mechanism with which the average Service Man has had little or no experience. The consumer, too, is confronted with an unfamiliar complicated mechanism.

the recordist and 10% in the machine. Your tool kit should contain a simple book on how to make good recordings, to sell to the customer.

The Problem

Part of the problem of servicing recorders lies in the greater complexity

Fig. 1. The greater complexity of the phono-radio-recorder is not all because of its novelty but also because there are more things to go wrong.



of the typical radio-phonograph-recorder. Fig. 1 illustrates this in block form. There are more things to go wrong.

Another part of the problem lies in the tendency of some faults to double up. For example, a minor loss (say at high frequencies) in the main amplifier affects the record in making. When the record is played back through the same amplifier the same loss reoccurs. To the ear, a 4-db amplifier loss becomes an 8-db-actual loss. While 4-db change is not very prominent to the ear, 8-db is much more annoying.

Besides this, there is another aspect. Many components can develop faults which sound alike. For example, a rattle can occur in amplifier, cutter, pickup, or speaker. The sound may be the same, or it may not be.

And, then again, the customer has paid a good price for his equipment and may complain about faults that would pass unnoticed under other circumstances. You must learn to look for defects more critically than you have in servicing receivers and amplifiers in the past. You must also remember that your service test instruments are tools and not authorities. Your instruments may say that the device is good, but if

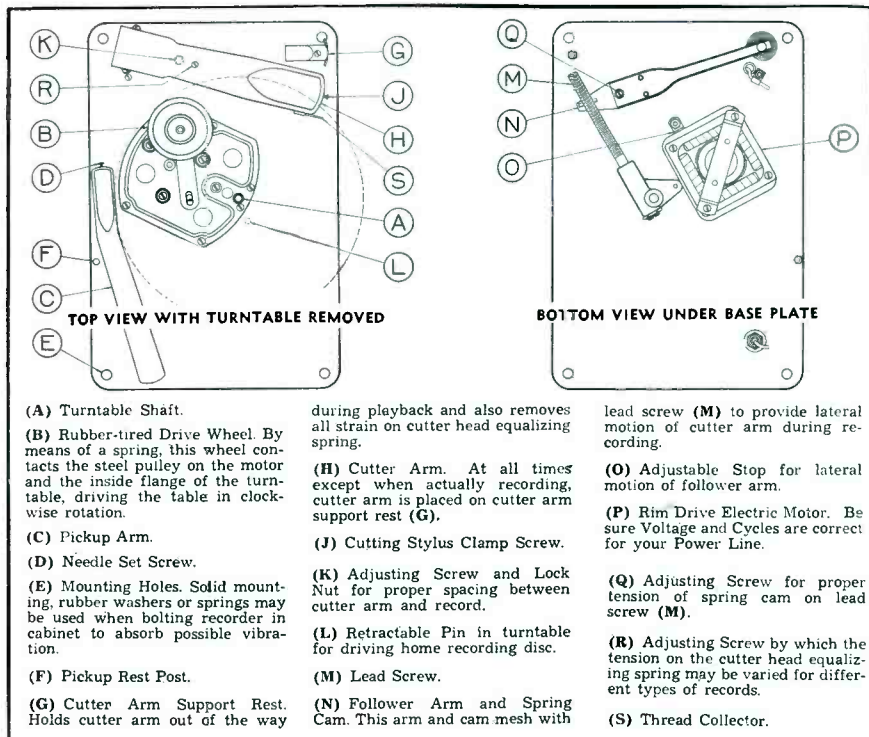


Illustration courtesy General Industries

the ear says the record produced is bad, the record is bad and the repair job is not complete.

Cutting Technique

A great deal of trouble can be caused by faulty handling of the machine. If the cutting angle is wrong, scratch may become excessive, and the point may even develop a tendency to bounce. As a matter of fact, the angle is altered by a change in stylus length in all commercial machines, and so a machine set correctly once will not necessarily remain so. The correct angle can best be obtained by looking at the cutting edge and its reflection on the record surface. See Fig. 2. Some records work best with the edge exactly vertical. Others work best with a slight drag—5° off vertical. While theoretically the vertical angle leads to less distortion, practically it is more important to sacrifice a little on distortion for the sake of less scratch, if the disc is of the kind that calls for a drag angle. Don't regard a few degrees as a trifling matter. It is easy to correct the angle if necessary in any of the good commercial units. Likewise, watch the needle pressure. Too shallow a groove means a record which will not track in playback, too deep a groove means echo, distortion, and possibly cutover between adjacent grooves. Between 50 to 40 and 60 to 40 groove width to land width is considered optimum. Don't rely on your unaided eyes—use a good quality well corrected 15-power magnifier.

Disc Characteristics

This fall will see a good many makes of discs on the market. Some will be good, some bad. In general, however, discs are blamed for sins not of their committing, and praised for characteristics which are often bad. Use care and judgment, therefore, in picking discs.

There are soft coatings and hard coatings. Any manufacturer can adjust the hardness of his coating dope by adding more or less softening material. The actual hardness produced depends very much on judgment. As most formulae are softened, surface noise is decreased somewhat, but durability decreases very rapidly and high frequency response drops greatly. For example, in one case a drop of a few db in surface noise is accompanied by a drop in life from 200 down to 15 playings, and

response at 3000 cycles drops 14 db—enough to seriously injure the intelligibility of speech. On the other hand, the hard coating must have a stylus in fairly good condition, and with correct angle, while cutting the soft coating need not be so critical.

With respect to mechanical details of coating, various makes differ greatly. Some have a coating of even thickness, others have thin and thick patches. Some are of uniform thickness from inside to outside, while others are very thin near the center. Some are uniformly cured while other manufacturers have cut corners and produced a coating of nonuniform curing—hard in some spots and soft in others. Some coatings have been carefully filtered on expensive equipment, producing a coating absolutely free from grit (the few small specks remaining are usually soft lint from the filter medium). Other coatings are full of large gritty particles—for the manufacturer owns no filtering equipment at all! Incidentally, if a customer complains of short stylus life, there are two possible causes: He may be using a very gritty blank, or he is cutting into the metal base. The latter can result very easily if the coating thins excessively. It can also result if the cutter is dropped too hard. Even a momentary cut through is likely to take off the stylus tip. A cut through often leaves aluminum on the stylus tip. Thin patches can be proved by stripping the coating with a sharp knife and measuring its thickness with a micrometer. Grit is easily visible as large specks in the coating.

Finally, we come to the question of fireproof versus non-fireproof records. As usually stated, this is incorrect. Any metal base record, regardless of coating, is fireproof due to the metal. For that matter, even the ordinary cardboard base coated with nitrocellulose is not particularly inflammable—but little more so than the cardboard alone. This is caused by the large amount of non-flammable and slow burning ingredients added to make the material soft enough to cut. Actually, only the cut thread is quite inflammable. If lit by a match, it will burn fairly fast, like excelsior, due to the large exposed surface.

A number of the recorder manufacturers have called for non-inflammable thread. Pressure from the Underwriters has been a strong factor. As a

result many of the disc manufacturers will bring out a second, non-inflammable thread line this fall. There is only one trouble with this situation: In so far as we know, no one has yet developed a non-inflammable or slow burning thread formula which is quite as good as the present good formulas. In general, all have much higher surface noise and much shorter life. Most have so short a playing life that they are not practical. The distortion is high—for the groove is torn out in part, rather than cut. It is our feeling that non-inflammable thread needs at least a year more in the laboratory before it will be ready for release. In spite of that, it will be released this fall if it hasn't been released already. In the meantime the writer suggests using a good nitrocellulose coating of the present type, and keeping the waste thread in an old tin can full of water prior to throwing it into the refuse can.

The Gain Run

In checking up on the condition of any recording system it is very convenient and often essential to make sure first that the audio amplifier is functioning properly. This involves a gain run, particularly.

Gain runs have been used for many years by broadcast stations and professional recording studios. While they have used expensive equipment, you can assemble your own gain set for very little, and will find it quite satisfactory.

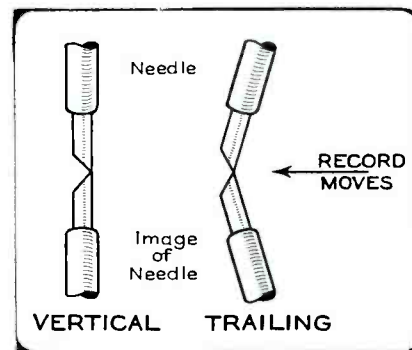


Fig. 2. The correct cutting angle can best be obtained by looking at the cutting edge and its reflection on the record surface.

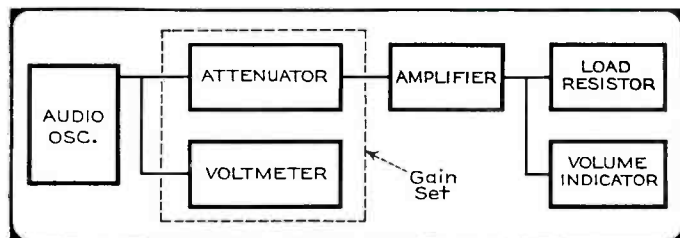


Fig. 3. The combination of an audio oscillator and a gain set is the a-f equivalent of the r-f signal generator. The audio amplifier can be checked by taking a gain run using the setup indicated.

The general setup for a gain run is shown in Fig. 3. It can be seen that the combination of audio oscillator and gain set is the audio frequency equivalent of the r-f signal generator. A measured, constant voltage of adjustable frequency is applied to the amplifier input and the voltage across a resistance load is measured on a voltmeter with a db scale.

The audio oscillator is likely to be of the beat frequency type. Be sure to pick one which drifts as little as possible. There is an enormous difference be-

tween various makes in the low price class. Avoid the ultracompact light weight unit—temperature change is excessive. A bad design of that type may drift 1000 cycles in five minutes after a half hour of warming up, while a good design will drift four cycles in five minutes after only five minutes of warming up. Of course a broadcast station unit is still more stable—a drift of five cycles in 30 minutes from switch on (cold) is common, but is not needed for service work, whereas the extra cost and weight are excessive. It is easy to check drift. After five minutes of warming up, set the oscillator dial to 60 cycles and use the zero adjustment padder knob to get zero beat with the 60-cycle power line. After five more minutes reset the dial to get zero beat again. The shift in dial reading is an

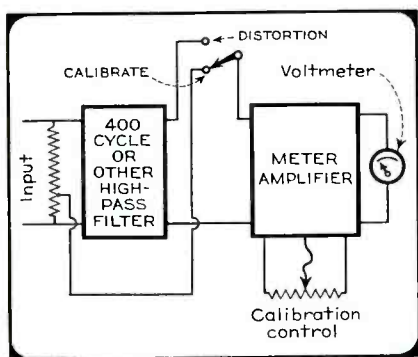


Fig. 5. The input to the distortion meter is connected to the output of the amplifier to be tested and a specific sine-wave signal fed to the amplifier input terminals.

indication of the amount of drift. Drift of over a few cycles is enough to make an oscillator unfit for recording work.

The Gain Set

Fig. 4 illustrates two forms of gain set, ranging from the very cheap to the rather precise. 4a illustrates the simplest form. This will not present constant input and output impedances, but it will do for most work. 4b shows an engineer's variety, with constant input and output impedance. If the variable pad is inexpensive, it can be of the delta T type made for public address mixers. If more money is available, use a T or bridged T pad of the type made for broadcast mixers. Avoid the ladder pad if possible. Use any type of resistor you wish. 1/2 watt wire wound or carbon will do. Precision wire-wound instrument resistors, while more accurate, are not required unless you aim for professional studio servicing as well.

The technique of operating a gain set is as follows: Connect the input to the proper taps on the audio oscillator. Con-

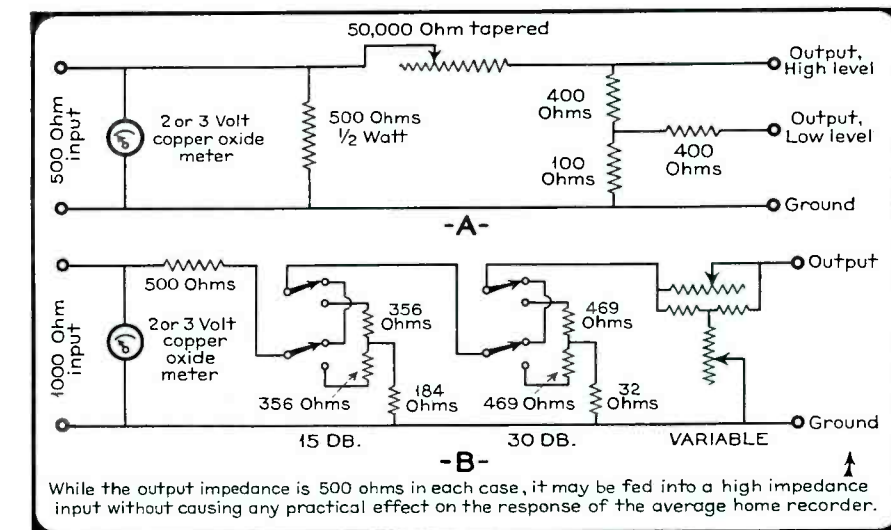


Fig. 4. While the gain set shown at B will be more precise, the type shown at A will be sufficient for work on home recorders.

nect the output to the appropriate input point on the amplifier. A convenient place to pick is often the microphone jack. Set the gain set for *minimum* output, then adjust the oscillator (warmed up and at 1000 cycles) to give an even, easily read indication on the meter. The easiest and best place to connect the output load resistor is in place of the speaker voice coil. Set the switching for public address, set the output meter multiplier for 0 db range or less. Of course, the actual output level is much higher than 0 db; it reads less, however, because the circuit impedance is a few ohms rather than the 500 ohms for which the meter calibration is adjusted. The error is a constant value which would be added to the meter readings if it were important.

Actually we are interested not in the absolute gain (total amplification), but in the relative gain (how much the amplification at any frequency, is deviating from the 1000 cycle value). This permits us to ignore such constant corrections and simplifies the job greatly.

Turn on the amplifier and set the volume control at the usual operating point, and set tone controls for flattest response. Decrease the gain set loss until the output meter reads 0. Set the oscillator to 50 cycles, adjust its volume control till the gain set input meter reads the same as before. Write down the reading of the output meter. Repeat at other frequencies up to 7000 to 8000 cycles. Plot the result. To make the graph look to the eye as a result sounds to the ear, use a 3-cycle, semi-log paper, 10 to the inch ruling. The linear ruling can be used for db, 10 db to the inch.

When you have plotted the curve, don't be too disappointed. If it is not down more than 3 or 4 db at 70 cycles and not over 2 or 3 db down at 5000 cycles, the unit probably is working well. In some cases the response may be up several db at 5000 cycles, which

is a good thing. Up and down, of course, are with respect to the 1000 cycle output. Keep on file any curves you plot; another machine may be in next week, and the data can be useful.

Distortion Meter

The basic principle of a distortion meter is shown in Fig. 5. The input to the meter is connected to the output of the amplifier to be tested. A signal of the desired frequency, say 400 cycles, is fed to the amplifier with the switch in the calibrate position, and the calibration control adjusted till the meter reads 100%. With the switch in distortion position, a filter removes the fundamental, and the remaining harmonics operate the meter. The latter is usually calibrated in percent distortion.

From this it may be noted that to measure distortion can be a 30-second task. Under 2% at normal output (using the built in indicator as a guide) usually means satisfactory operation.

Be sure to use a load resistance equal to the voice coil impedance.

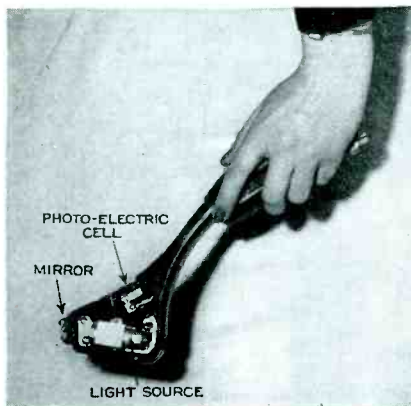
Optical Pattern

Having established that the amplifier is working satisfactorily, the next step is to check the cutter characteristics. Actually, as a matter of convenience, we usually check amplifier, cutter, and coupling circuits as a unit, then subtract out the amplifier characteristics if they are bad enough to be a factor. To do this without involving the characteristics of the pickup, its needle, and the reproducing amplifier, recourse is had to the *optical pattern*. This phenomenon was discovered by Buchmann and Meyer and reported by them in 1930. It has since proved a very useful tool, (Continued on page 24)

CIRCUITS

See Front Cover

By HENRY HOWARD



THE Radio Manufacturers Association is cooperating with the Underwriters' Laboratories in an investigation toward the elimination of the noncombustible material between the chassis and wood cabinet now required in a-c, d-c sets. It has been found that, with proper precautions, the fire-proof material may be omitted without constituting a serious fire hazard. This may be okay so far as the manufacturer is concerned but irresponsible Service Men may easily commit a breach of Underwriters' etiquette by simply using a cheap, unprotected condenser or resistor where the rules demand a protected unit. It looks like it will be up to the Service Man's own high moral standard to see that the regulations are honored and that no fires result from his carelessness or indifference.

Philco 41-608, 41-609

Philco Models 41-608, 41-609 are radio-phonograph combinations with a nine-tube chassis and automatic record changer featuring the novel light-beam reproducer. They also incorporate a bevy of interesting kinks and unusual circuits which we hope you'll remember.

Let's start with the tube lineup which is most unusual. The loop works right into a triode first detector—which reminds us of Western Electric, or Bell Laboratories very early superheterodynes where triodes were always used because of low conversion noise. A separate 7B3 oscillator tube feeds the Type XXL converter. The 7B7 i-f stages follow with only the first i-f transformer having double tuning. A Type 7C6 serves as second detector, avc and first audio. Separate diodes are used for detection and avc, the latter are applied to the converter and first i-f stages only. A pair of 41s with screen phase inversion handles the output. A pentode preamplifier, Type 7C7, is used in connection with the photocell pickup. (See front cover.)

Next, we have a most unusual phonograph which has had a good deal of publicity lately.¹

¹"Philco Photoelectric Phonograph", SERVICE, July 1940, p. 22.

A photoelectric cell, a light source and a tiny mirror comprise Philco's latest development in record reproducing equipment. (Left)

The pickup consists essentially of a floating jewel (which replaces the needle) connected to a tiny mirror, a light source and a photoelectric cell.

As the floating jewel moves along the curve of the record groove, the mirror swings from side to side on its axis, flashing the beam of light on and off the photoelectric cell. Since the

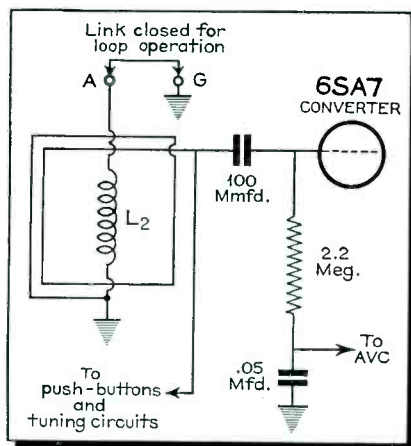


Fig. 1. RCA VI02 utilizes a high-impedance coil coupled to the loop for external antenna connection.

photoelectric cell translates light into electrical energy the flow of current generated in the photoelectric cell varies in proportion to the amount of light flashed in the cell as the mirror is swung by the jewel.

To minimize the amount of energy required for the jewel to swing the mirror, it was necessary to utilize a paper-thin mirror specially designed for use in galvanometers. This is silvered with a vaporized aluminum and mounted on a tiny block which swings on an axis that floats on two flexible bearings.

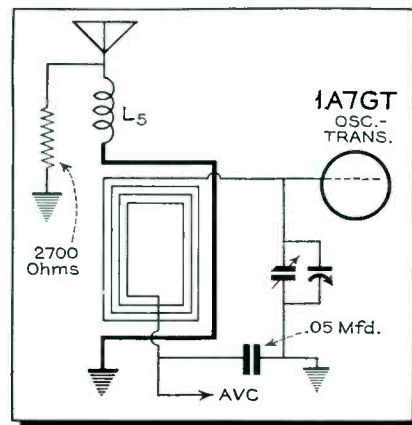
To meet technical requirements as to size and weight a tiny bulb filled with gas to increase the life of the filament was designed. It is also necessary that the beam of light at its source have no waver or flicker as this would register on the sensitive photoelectric cell in addition to the music and result in a hum in the speaker.

The 7B5 oscillator which serves the XXL noise-reducing converter in radio

position is relieved of this job in favor of a transmitter-sized job of supplying the power to light the photocell exciter lamp. This r-f source of power completely eliminates the hum troubles that would be encountered if the use of filtered rectified a-c had been attempted. The frequency is so high that none of it gets through the input transformer to the preamplifier and the effect is the same as if battery supply had been used. To do this job, the plate and screen voltages are raised from 27 to 185 volts, the grid bias automatically jumping from 7 to 47 volts. The oscillator circuit features shunt feed, keeping the high voltages off the coils and condensers. The cathode is run hot, being tapped part way up the coils.

For converter use, the oscillator cathode is tied to the XXL converter cathode. For phonograph, the converter cathode is open-circuited leaving the first detector dead. Another switch leaves the i-f cathodes open, conserving the power supply for the power oscillator. The negative-bias voltage divider is shunted to correct for additional drain. This divider has a first audio tap 26 ohms from ground; a tap for first detector bias 54 ohms from ground and the full voltage for the power stage grids at 322 ohms from ground. In phonograph position a 780-ohm resistor shunts the 322 ohms. Voltage is derived from the oscillator for the lamp by means of a pickup coil, closely coupled and untuned. The voltage is varied by compensator (11B) which is called the lamp intensity adjustment. Under or-

Fig. 2. Silvertone 6541 employs an antenna loading coil in series with a coupling turn on the loop.



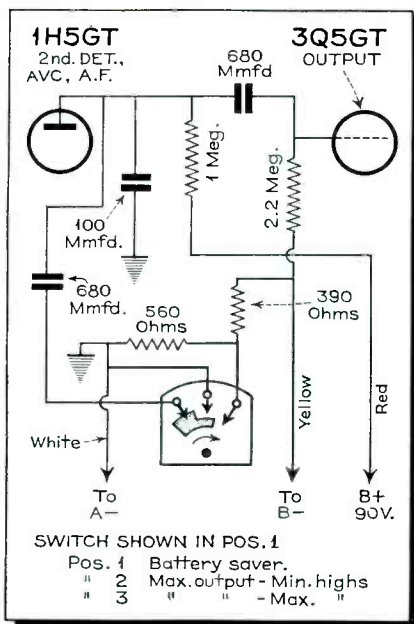
dinary circumstances, no adjustment will be necessary, but, when a reproducer or lamp is replaced, there may be a tendency towards microphonic feedback. In this case, the compensator is turned in the direction necessary to eliminate the feedback. This adjusts the level of the photocell output, the output being proportional to lamp intensity.

The volume control is switched from detector to the plate of the preamplifier. A 0.001-mfd coupling condenser with an R/C filter preceding it is employed. The volume control is fitted with bass compensation and is tied into the tone control in such a way that a change in level due to cutting highs is restored through the volume control. This eliminates the necessity of the operator making a volume adjustment to keep a fixed level after making a tone adjustment. Provision is made for adjusting the receiver inside of the cabinet. A real service aid is shown in bringing the hot side of the output transformer to a post on the loop terminal board so that an output meter may be easily connected from this post to chassis. A socket is also provided for plugging in a home recording unit.

Loop Sets—RCA V102, Silvertone 6541

Many loop receivers are using a new method of connecting an external antenna whereby the latter is coupled by means of a high impedance coil coupled to the loop. An external link is provided to ground the antenna post, thereby short circuiting this coupling coil when the loop alone is used for pickup. This eliminates dead spots due to resonance

Fig. 3. RCA 14BT1, 14BT2, 14BK have a combination battery saver and tone control switch.



within the coil itself. Fig. 1 shows the RCA Model V102. Silvertone has an antenna loading coil in series with a coupling turn on the loop. To give flat pickup over the entire range when using an external antenna, a 2700-ohm resistor is shunted across the input circuit. See Fig. 2 which shows the Silvertone battery portable Model 6541.

RCA 14BT1, 14BT2, 14BK

Fig. 3 shows RCA battery Models 14BT1, 14BT2 and 14BK combination battery saver and tone switch. For power tube bias, a 390-ohm resistor is used from B minus to ground. The battery saver cuts in an additional 560-ohm resistor to over-bias the 3Q5GT. The B drain is cut from 11.8 ma to 7.3 ma in swap for half the power output.

Stromberg Carlson 500

With p-m speakers replacing the old

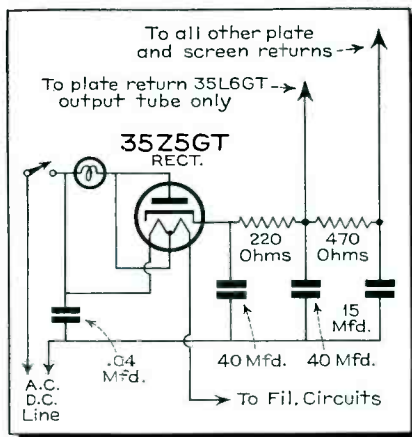


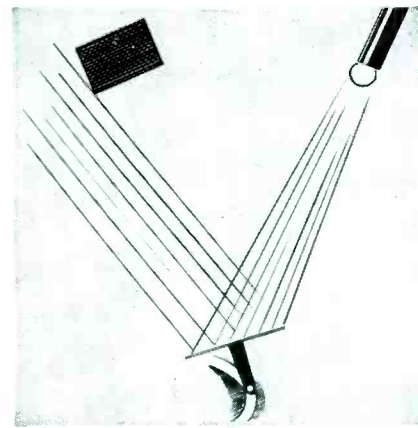
Fig. 4. Stromberg Carlson 500 uses a dual resistance-capacity filter in place of the filter choke.

electro-dynamics, double-section resistance-capacity filters are being used, for there is no field coil to do double duty as a filter choke. As resistance values must be kept low, especially in a-c, d-c sets, we find very large filter condensers. Fig. 4 shows Stromberg Carlson's Model 500. Note that the output tube's plate draws power from the first section but that its screen grid, along with the other tubes, is connected to the second section. This represents the optimum compromise between maximum output and minimum hum.

ALIGNMENT HINT

A POINT that is usually overlooked during alignment is that the input capacity of most tubes varies noticeably with bias voltage. With the small tuning capacities used in i-f amplifiers this can cause detuning of these circuits, if they are at all critical.

To appreciate this point it is only necessary to make a close alignment of a good sharp tuning set under the usual conditions, the minimum signal input specified



A 1.8 mc oscillator lights the filament of the special bulb in Philco's photoelectric phonograph reproducer.

by all alignment instructions, then increase the signal input and note the change in the picture on the oscilloscope. It will be found in most cases that a perfect alignment job with a very low-signal input will make a very poor showing at strong-signal input. If the set is to be aligned for maximum sensitivity this condition is immaterial. However, where we are trying to align for maximum selectivity, as is usually necessary, a decided improvement in operation and customer satisfaction will be found if we align at normal or slightly stronger than normal signal level; customary instructions notwithstanding. The accompanying method of alignment has proved very satisfactory and is easily accomplished. After a roughly correct alignment on a set I put it on the air and with a vtvm determine the approximate avc voltage on normally strong signals, at the avc end of the decoupling resistor. I then apply as near this voltage as convenient, (slightly less rather than more) with a C battery and proceed to put the finishing touches on the alignment. If no vtvm is available tune in a strong station signal and using the oscilloscope as an output meter clip in various bias voltages until one is found that gives the smallest change in signal output, and proceed with alignment.

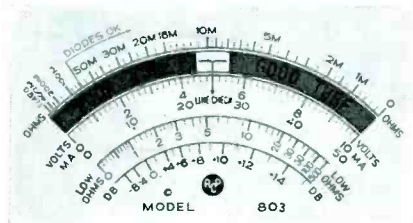
The reasoning behind this method is that we need our best possible alignment in separating the stronger stations, which sometimes apply a surprisingly high control voltage, and resulting mis-alignment. Detuning on the weaker stations caused by the lack of this strong control voltage will be less serious as the chances of adjacent station interference is much less, and the loss of tone quality is also less serious, both because customers expect poorer tone on weak stations, and since the stronger stations are more frequently used.

The only additional time required is in establishing the approximate usual control voltage, and the ease of killing the avc action this way much more than makes up for that. We do get improved customer satisfaction.

Now that you have the avc killed use your oscilloscope and frequency-modulated signal for both low and high frequency r-f alignment, at normal signal levels. Just leave the oscilloscope controls set and run the input signal up or down until you get about the same size picture on the scope. It's surprising how quickly and easily a superior alignment at r-f can be made; superior because in those sets that apply avc to the translator tube a large detuning effect will be found. R. G. Chrouch

MODERN MULTITESTERS

By S. GORDON TAYLOR



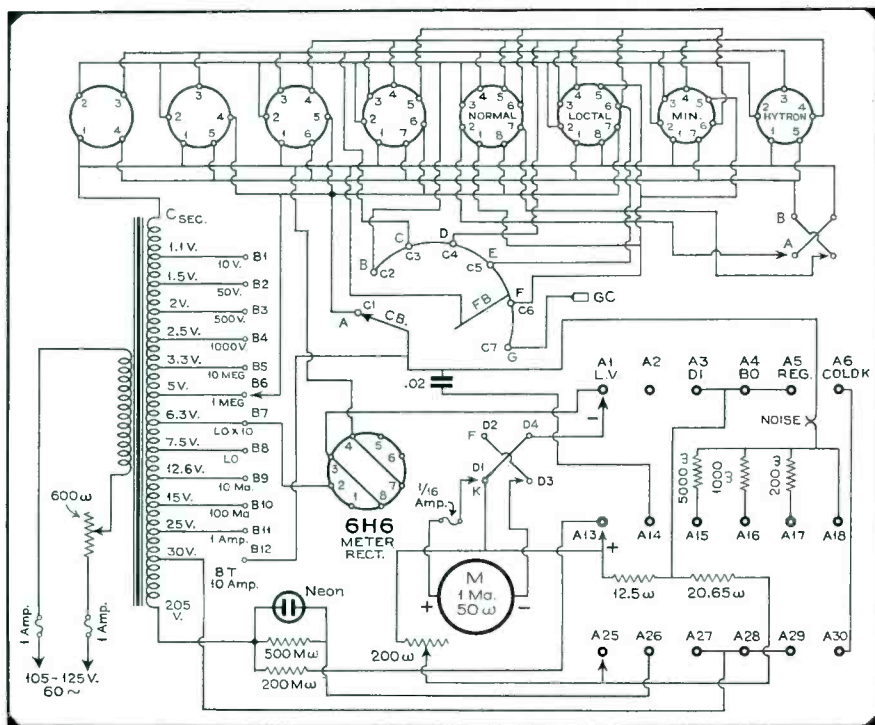
The dial face of a modern multitester is often printed in several colors and carries at least one scale for each separate function of the instrument.

THERE was a time in the not too distant past when a meter which would provide three or four d-c voltage measuring ranges was considered a highly versatile instrument. Different meters were used for current measurements, a-c voltages, etc., and oftentimes different ranges were taken care of by the use of a separate meter for each.

Today it is common practice among Service Men to employ only a single meter to take care of not only d-c and a-c, but voltage, current and resistance measurements in a wide variety of ranges. Thus it is not unusual for a single modern test instrument to perform the functions of twenty-five or thirty separate meters, providing the choice of range and measurement type through the simple flip of a switch or two.

This has not been accomplished with-

Fig. 1. The tube tester section is designed to give readings of poor, weak or good, on a three color scale of the same meter that is used for other functions of the instrument.



out complications for the designers and manufacturers of such equipment, as indicated by the fact that in the combination set-and-tube tester illustrated here the switches employed involve a total of over 100 contacts, but are so ganged in design that the movement of two knobs on the control panel not only sets up the tester for a desired type of measurement, but a for specific range as well. The net result is that modern equipment not only represents rock-bottom economy so far as meter cost is concerned, but contributes speed, compactness and portability to modern servicing.

While thousands of Service Men are using such instruments as this today, there are many who have only a general understanding of exactly how they function. Just as the switching circuits were complicated to design, so are they complicated to trace, either in the instrument itself or in its schematic wiring diagram. In general, there is the feeling that as long as the instrument "does its stuff" in the intended manner, why worry about the intimate details of its circuits. There may come a time,

however, when something goes wrong; when through carelessness the owner manages to damage the instrument in spite of delicate fuses incorporated for safety. Or perhaps the owner may wish to alter one or more of the ranges. It will be a lot easier to do if he has developed familiarity with the circuits.

Because of the widespread popularity

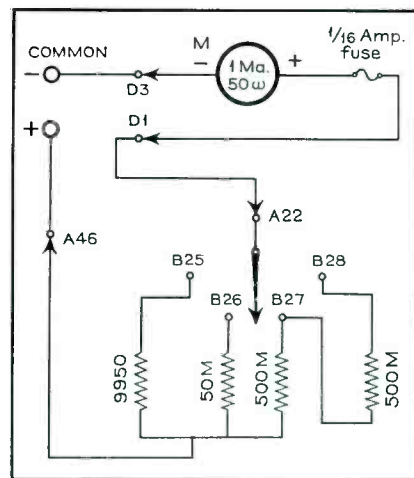


Fig. 2. The voltmeter provides for several ranges through the use of individual multipliers for each range. In this instrument the meter is fused for protection against accidental overload.

of instruments of this general type, it is believed that there will be interest in the analysis of a typical circuit. It is therefore the purpose of this article to present such a circuit, broken down into its individual functions.

Thus in Fig. 2, for instance, we have the quite usual circuit of a 4-range d-c voltmeter employing a 1 ma meter and multipliers. But also included are the numbered switch contacts by means of which this circuit is set up.

The circuits presented here are of the Radio City Products, Model 803 combination tube and set tester. The tube tester portion of the circuit is shown complete in Fig. 1 and no attempt is made to break it down schematically. It might be pointed out, however, that the 4-deck, 6 position gang switch shown is actually only half of this switch; another six positions are used for the selection of different meter

functions. Likewise, the single-deck, 12 position switch by means of which filament voltages are selected, is only a part of a 3-deck switch in which the other decks provide for selection of the desired voltage, current or resistance range during other functions of the instrument.

In an early issue, the complete schematic circuit of this instrument will be presented with all switch terminals numbered. By comparing the numbered contacts of the accompanying functional circuits with those of the main circuit the two can be readily related.

Fig. 3 presents the set-up obtained when the function-selecting switch "A" is set for direct current. This makes four contacts, A11, A23, A35 and A47. Of these there are no connections to points A11 and A35. The other two

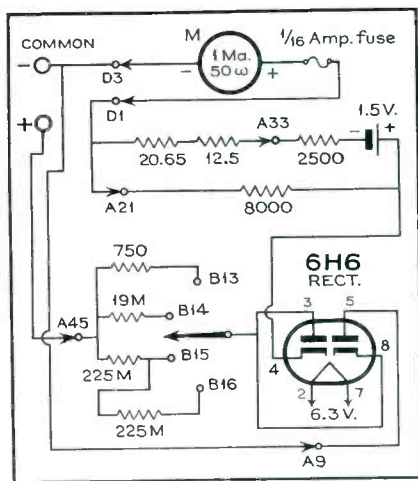


Fig. 4. A-c measurements are made on the d-c instrument through the use of a type 6H6 rectifier and another series of multipliers. A small flashlight cell and a network of resistors counterbalance the tube's contact potential.

close circuits as indicated. Switch terminals B21, B22 and B23 provide for the selection of any of the three current ranges. A fourth current range (10 amperes) is obtained through a separate pair of its own.

The six resistors shown in Fig. 3 are always in the meter circuit during current measurements, regardless of the range being employed. They constitute a current-dividing network. For any setting of the range-selector switch, the resistors between that switchpoint and the negative (common) prod terminal (through the meter circuit) are in series with the meter. All on the other side of this switchpoint constitute a shunt across this series portion of the circuit.

With the range switch in the 10 ma position, for instance, the series circuit consists of the 188-ohm resistor, the 50-ohm internal resistance of the meter

The Model 803 tube and set tester incorporates a roll-type tube chart which lists the various switch settings for each tube. A single meter is employed for all the functions of the instrument. Over 100 switch contacts are used to make possible the many tasks. The switches are so ganged, however, that the movement of two knobs on the control panel not only sets up the tester for a desired type of measurement, but for a specific range as well.

movement and 5 ohms in the fuse—a total of 243 ohms. Shunted across this is the total of the 5 low-value resistors, amounting to 27 ohms. The current will, of course, divided between the meter and shunt circuits in accordance with the ratios of their resistance. In this instance, therefore, only one-tenth of the total current will flow through the meter and nine-tenths through the shunt. Thus a total current flow of 10 ma will just drive the meter to full scale. Another way of figuring this is to consider the ratio of the shunt resistance to that of the total series value of all resistors combined. This ratio for the 10-ma range is 27 to 270, giving a range of 10 times normal. For the 100 ma position the ratio is 2.7 to 270, etc.

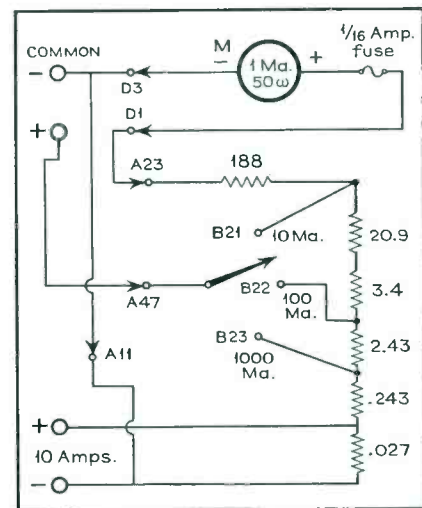
In the a-c voltmeter functional circuit, Fig. 4, it will be noted that a 6H6 tube is employed as the meter rectifier. This makes a highly effective and inexpensive rectifier, which is stable and impervious to moisture and temperature change, etc. Of extreme importance, the use of the 6H6 results in linear meter response, allowing both a-c and d-c to be read on the same meter scale. As employed here, one section of the 6H6 serves as the meter rectifier. The other section is employed to by-pass current on reverse peaks. If this were not done, the inverse voltage built up across the non-conducting rectifier on the higher ranges would likely damage the tube.

With a half-wave rectifier in series with a meter, the value of the d-c meter reading is only approximately 45% of the actual applied a-c. For a-c voltage measurements, therefore, the effective



meter sensitivity drops to about 450 ohms-per-volt. Multipliers must be proportioned accordingly, and in addition must take into consideration the series resistance value of the rectifier and the current balancing circuit (comprised of the 8,000-ohm resistor, the 1½-volt cell and the miscellaneous resistance values in the closed network shown in Fig. 4.) This balancing circuit is an ingenious one employed by this manufacturer to overcome the small contact potential of the 6H6 when no voltages are applied.

Fig. 3. A simple ring network insures proper operation of the ammeter circuits by placing the work terminals across a portion of the ring circuit and the meter across the whole circuit. The switch contacts (D1 and D3) are thus in series with the meter and not the current. Special terminals are provided for heavy current work to entirely eliminate switching of these circuits.





STEPS TO SUCCESS

By WESLEY F. DICKINSON

Olympic Radio & Television Corp., established eight years ago by brothers Burnell and Wesley Dickinson, is located in Ballard, a business district about six miles from downtown Seattle. Along nearby roads and highways colorful signs, such as the one shown at the left, call attention to Olympic which is now "Ballard's Largest Radio Service."

THE difference between good and very good is something that cannot readily be put into words. Quality of workmanship is determined by the spirit which goes into each and every operation. Practiced methods may be ethical and orthodox . . . but there must be more. There must be an eagerness to take pains and do just a little better, to use only the very best of material, to make that wire connection a degree more solid, to make all adjustments more precisely.

The result is a receiver decidedly better in giving true enjoyment . . . and a satisfied customer who not only returns for future service, but tells his friends and neighbors.

Good Will

Good will is a prime asset amongst the trade, as well as in the community. It is built up through reputation, personality, fair play, consideration, and a sincere desire to confer a benefit upon the other party to a transaction as well as yourself.

We should all belong to a Service Men's organization and help in the co-operation among the members. Less criticism and knocking of one another, exchanging of ideas and methods, etc., helps to build up the prestige for the entire service industry of which we are members.

Membership in a commercial, business or community club will also produce good will.

Business Control

The necessity of adequate business control systems are as indispensable as the charts of the seven seas to a sea captain. Every business regardless how small needs some systematic method of keeping records so that information con-

cerning costs is easily obtainable.

Bookkeeping, job records, and stock control are essential. The things to strive for is to be able to obtain all information necessary with a minimum of time involved for upkeep.

Advertising and Publicity

Of all the advertising methods tried, used or discarded, the only methods which have proved of any value to us are those which conveyed our message only and not along with countless others. It has been our experience that all advertising must be continued over a period of time and not spasmodic splashes.

Large 6-foot circular signs in bright colors placed at strategic points in and around the district have proved of great value. Tire covers were very effective, but have played out because of the new design in cars. Handbills distributed on cars or to the home are very good, but must be placed out regularly. Postal cards are an inexpensive means of transmitting your message. We send out 50 every week. Newspaper ads in weekly district papers are effective. The size is not as important as carrying them every issue. The type of telephone book advertising that has worked for us has emphasized the district.

Chassis and tube labels have been successful, as well as copy on the back of receipts. Trade-marks and slogans are also effective.

Our name and trade-mark ties in with the mountains of the same name, of which we use a scenic view. We have used the slogan "Guaranteed Radio Service" for years and recently since modernizing used "Ballard's Largest Radio Service" to advantage.

Appearance

A major factor in producing results, both in the mind of the customer and the attitude of the Service Man, is appearance. Appearance is something which you must continually strive to improve. Neat appearance to the eyes of the customer instills confidence in your ability and adds to your prestige and influence and increases your standing in the community. In addition a neat personal appearance and cleanliness creates a mental state of self-respect and pride which is reflected by cheerfulness, kindness and poise.

Physical appearance exemplifies initiative, which is respected by most everyone. The general appearance of your place of business is your best advertisement to the public. The outside and inside arrangements are vital advantages. Window displays, merchandise displays, arrangement of test equipment, tools, service notes, and jobs being repaired can create a profitable result.

On the outside we use a neon sign which we light day and night; a 30-foot tower designed after broadcast stations; a sign to identify auto-radio drive-in; and a sign to tie in with 6-foot road signs. Inside our modernistic test panel with the latest of equipment is so placed to be the outstanding attraction. All of the tools and a full set of service notes are conspicuously displayed, as well as other work benches, cases, and fixtures.

Yes, appearance has played an important part in increasing our business over 50%. We're proud of our equipment and the results obtained. Definitely, you do more and better work. Charges are not questioned as much; you come closer to receiving what your

Special low deposits on all N. U. Triplett Deals to November 30th

TRIPLETT
TUBE TESTER
Model 1620
\$12.50
DEPOSIT

and it's Yours
on N.U. DEAL

**TRIPLETT TUBE TESTER
MODEL 1620**

Has new lever-type flexible switching giving individual control for each tube prong . . . Filament voltage switching from 1.1 to 110 takes care of present and future tubes with filament voltages up to 117-volt types . . . Giant 6-inch scale RED•DOT lifetime guaranteed indicating instrument . . . Neon short test . . . Separate line voltage meter . . . Speed Roll Chart can be spun from one end to the other in less than four seconds . . . Housed in wooden case of graceful proportions with sockets, knobs and markings in ivory.



TRIPLETT
MODEL 1620
Regular Dealer
Price \$37.84

YOU TOO CAN HAVE THE
"Best Equipped Shop in Town"

Get it the National Union way . . . you deposit \$12.50, immediate delivery is made on Triplett Model 1620 Tube Tester. You sign agreement to purchase 1275 points over a 2 year period. On completion you receive bill of sale and your deposit is refunded as a merchandise credit.

☆☆☆

National Union purchase points can be taken in Tubes, Condensers or Batteries. All products the finest in quality, thoroughly guaranteed and competitively priced.

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Ask Your Jobber or Write to

NATIONAL UNION RADIO
57 STATE STREET, NEWARK, N. J. Corp

National Union Radio Tubes are known as the radio service dealer's tubes because they are used by more service dealers than any other make.

☆☆☆

You too can have the best equipped shop in town, just get your equipment the easy "N. U. Way" — Remember National Union has the finest sales helps and promotional pieces to help you sell yourself to your community and make more money.

☆☆☆

Special low deposit on all Triplett Testers until Nov. 30th, 1940.

Over 50,000
completed deals
your guarantee
of complete
Satisfaction



J. E. STAGE, Longview Radio Sales & Service Co., Longview, Wash. Think your Free Equipment Plan great—Have signed 20 N U Equipment Deals—have been using N U program 9 years. N U tubes all check alike—rarely have to make replacements.



MATHEW J. BERLOWITZ, Juncau Radio Shop, Milwaukee, Wisconsin. I find in checking my records I signed 29 contracts. There is no better way for a serviceman to painlessly acquire good service equipment. In my 10 years of exclusive dealing with N U their products have always been satisfactory.



E. J. MAGINOT, Boston, Mass. In my opinion, and in the opinion of many other service engineers with whom I am associated, N U enjoys a prestige which needs no apology. Modern radio sets demand modern testing equipment. N U supplies it the easy way.

The Best Equipped
Shop in Town
Gets the Business

OLYMPIC RADIO SAYS



Is your radio
an old grouch

Does it grunt and growl and splutter?
For curing radio grouches... bring you
for an ESTIMATE.

'DOCTOR' for sick radios



WHEN YOUR RADIO IS SICK, CALL THE RADIO DOCTOR
JUST AS YOU WOULD YOUR FAMILY PHYSICIAN FOR REAL
ILLNESS. LET AN EXPERT DO IT!

We can make it work like new.

LET US CHECK YOUR...
Auto Radio



NOV

- You have your battery checked
- You have your transmission checked
- You have your tires checked
- You have your engine checked
- You have your oil checked

EVER HAD YOUR CAR RADIO CHECKED?

SPECIAL
Rustproof hinge
aerial
65c



2001 Market St.

Hemlock 0200

WE SERVICE all RADIOS

Ballard's Radio Service Experts

If so, bring your set in for an ESTIMATE...
we can put it back on it's feet again.

Let us check it over from A to Z, and find out
what it needs to ---

"BRING IT BACK ALI

OLYMPIC RADIO SAYS...



RADIOS, TOO,
HAVE BIRTHDAYS

And every year brings old-age ills nearer. Maybe they are only growing-pains, but whatever they are... bring it in and let us check it over and find out exactly what is the matter?

FREE estimates on any job,
FREE tube testing & checking,
... when brought in our shop.



20th & MARKET HEMLOCK 0200

Ballard's Radio Service Experts

OLYMPIC RADIO SAYS...

HAS YOUR RADIO THE
WHOOPING-COUGH?



just "wear off" like some minor ills. It needs a complete
n and the standard cleaning and adjusting operations that
lio requires from time to time.

Your Radio Dead or Dying?



BY TO "BRING IT BACK ALIVE". END THE JUNGLE
RADIO COMPLETE FROM A TO Z.
THIS IS THE QUICKEST, CHEAPEST WAY TO MAKE YOUR RADIO
PLAY LIKE NEW, MAKE IT LIVE AGAIN.

Call us At Once.

OLYMPIC RADIO SA



FROGS TAKEN
FROM RADIOS

No it's not magic but expert service. If your Radio sounds as if it
had a "Frog In It's Throat"... bring it in and let us check it over
and find out exactly what is the matter?

DON'T FORGET
your
AUTO RADIO



Ever Had Your Car Radio Checked?

CAR RADIOS NEED TO BE CHECKED. DUST AND DIRT ATTACK
VITAL PARTS OF THE RADIO. DAMPNES AFFECTS THE
SPEAKER; TUBES WEAR OUT. CRITICAL ADJUSTMENTS AND
CONNECTIONS ARE JARRED LOOSE.
RESULT: NOISE, WEAK SIGNALS, DISTORTION.



2001 Market St.

Hemlock 0200

Ballard's Radio Service Experts

HEMLOCK 0200



taken FOR HOME SERVICE CALLS

RADIOS

Come In... Visit Us Today!

1 year old or more, very likely it
radio develops bad tone in time,
ced occasionally.

Service Men often complain that their advertising efforts don't bring results. By means of original
throw-aways such as those pictured here, Olympic Radio & Television Corporation, Seattle, Wash., has
proved that consistent advertising pays.

time is worth and make a fair wage.

Complete Service

If you are in the radio service business you should do a complete job. By doing all types of repairs you create a reputation for really knowing your business. We have obtained the largest percentage of the business in our community because of the fact that we could do something that others turned away.

In addition to repairing the conventional home radios we service auto radios, portables, direct-current 6-, 32-, and 110-volt sets. We rent, sell and repair sound equipment, having installed the largest jobs in the district. We do special jobs. Rebuilding audio systems, adding or changing short-wave bands, direction finders for marine use, and radiophones are some of our regular work.

Modern Equipment

The day is past when a Service Man could get by with a screwdriver, pliers and one meter. The advantages of modern equipment need not be stressed. The better work done in shorter time and the added prestige bring real results and above all provide profits.

The flexibility of your test equipment is very important as a time saver. Having all equipment within easy reach, the ability to make all coupling, and interconnections, enables you to go about your work systematically.

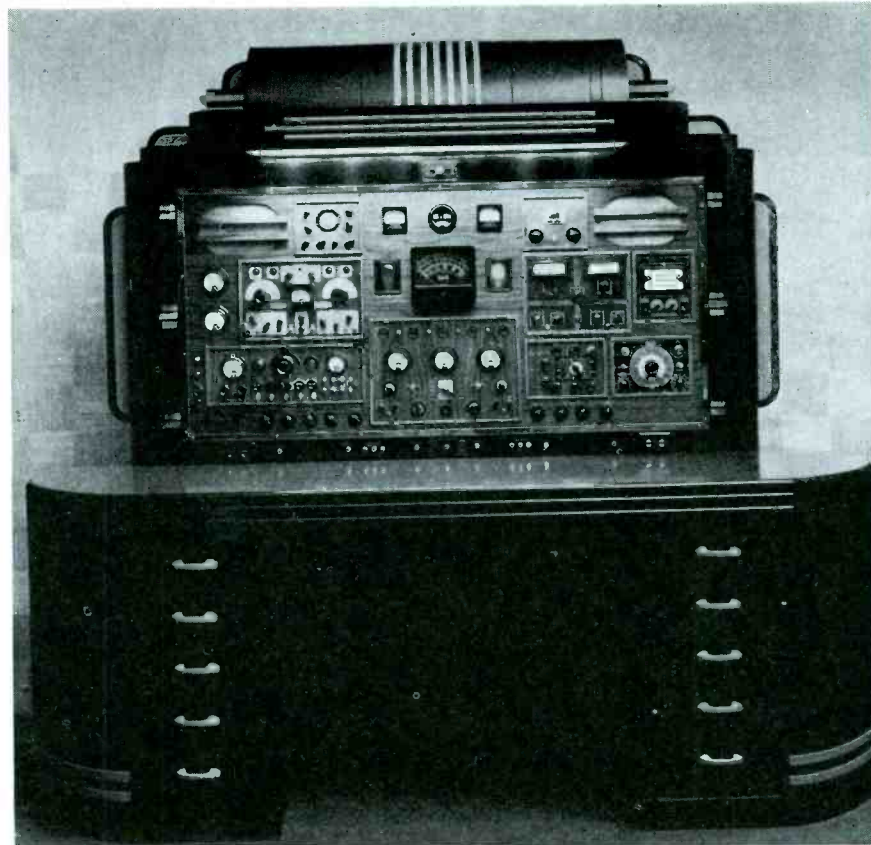
We use regularly such built in features as—shielded aerial and ground; test speakers for all types of applications; all voltages for a-c supply; 6-, 32-, 110-volts d-c; plate-voltage supply; resistance substitution for line cords and ballast tubes; resistance substitution 100 ohms to 1 meg, in 100-ohm steps; condenser substitution; continuity up to 200 meg; a-c voltage through a transformer, for isolating a-c—d-c sets to allow a ground and the use of the chanalst; a-c ammeter to detect overloads.

Material Used

There should be no compromise on the quality of tubes, parts and materials used for replacements. The very best is none too good. The loss of time, energy and prestige aren't worth the use of inferior material. The better parts usually have sufficient safety factor.

Ability and Methods

Your ability must be three or four fold . . . a business man, technician, salesman and, we might add, student. Keeping up to date is something we



can't take lightly because results are dependent upon our advance knowledge.

As a business man your success or failure is in your own hands. You must formulate the policies and the practices. As student and technician you must not only study continuously to keep abreast of the times, but you must also prepare for the future. The lack of a working knowledge of test equipment and its uses, for instance, is a fault found in many Service Men.

Every one of us needs to be a good salesman. Sell yourself . . . sell your ability . . . sell results, but by all means use reason and back up your arguments.

SELL COMPLETE SERVICE

C. J. SCHUBER, Truetone Radio Service, San Antonio, Texas, makes certain that the customer is thoroughly satisfied and sells him all the parts



Although a large majority of the test equipment incorporated on the panel is standard, the bench itself was built in the Olympic shop. It is finished in hand rubbed black trimmed with red. The back panel is polished walnut with chrome trim. Three degrees of indirect lighting are used. The panel is built for show, but features many ingenious circuits and tests.

that are needed to put his receiver in tip-top shape.

"When a call comes in for service," declares Schubert, "the chances are nine out of ten that the trouble isn't just tube trouble. It means that the Service Man has a chance to make more money. Even if the set has defective tubes, if it isn't a brand new one, it needs a lot of extra repairs: new volume control, alignment, etc. if the customer is to get maximum performance from it.

"I invariably go to the trouble of trying to sell these other needed repairs. In many instances where I have prevailed upon a set owner to spend a few more dollars to put his receiver in good shape, it has brought me lots of new business. Such set owners have been so satisfied with the way their set played, that they told their friends to patronize me whenever their sets went wrong, as I sure knew my business. It paid me to try to over-sell, if you can call it that. I can size up these various jobs and talk to the set owner right in his own home. The average Service man need never canvass for business if he takes full opportunity to get the most out of his regular customers."

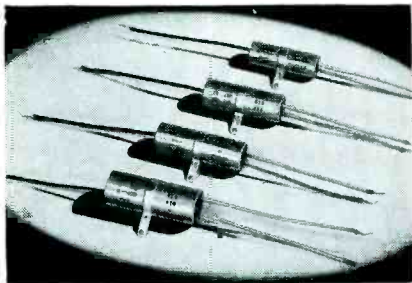
Martin Francis

C. J. Schubert (left) makes sure that he has sold his customer all the repairs that her set requires. He feels better able to extend his guarantee under such circumstances.

REPLACEMENT PARTS FOR 1940-41

TUBULAR CAPACITORS

A new line of dry electrolytic tubular capacitors has just been announced by Cornell-Dubilier. This new Type BRH capacitor is available in capacities ranging up



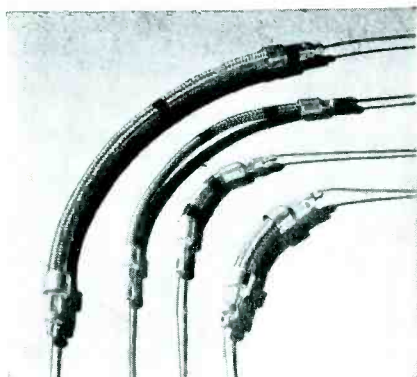
to 500 mfd at 25 volts, 1000 mfd at 15 volts, and 2000 mfd at 6 volts. The BRH capacitors are similar in physical appearance to the standard Type BR. They are enclosed in vented aluminum containers over which a varnished cardboard tube is drawn for protection. Dimensions vary from $\frac{5}{8}$ " x $1\frac{1}{8}$ " for the smaller sizes, to 1" x $2\frac{1}{2}$ " for the higher capacities. A choice of either pigtail or lug terminals is provided. Cornell-Dubilier Electric Corp., South Plainfield, New Jersey.

AMPERITE BALLAST TUBE

Amperite has introduced a smaller ballast tube for use with a-c, d-c receivers. The starting resistor feature of the Amperite ballast is said to limit the voltage applied to the filaments to 80 volts which increases to 110 volts after 4 seconds. The ballast is equipped with a fuse in the base that automatically burns out if the socket prongs are tied in to the 110-volt line. A stock of 4 types of these ballasts will permit replacement of about 90 percent of the 1,500 odd types of plug-in resistors now on the market, it is said.

CLAROSTAT GLASOHMS

Clarostat Glasohms or fibreglass power resistors and heating elements are now available for the use of Service Men, experimenters, radio amateurs and others, announces Clarostat Mfg. Co., Inc., 285-7



N. 6 St., Brooklyn, N. Y.

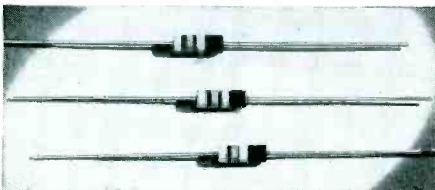
Wattage ratings of Glasohm resistors are stepped up several hundred percent through the use of fibreglass cores and braided coverings, it is said. These Glasohms can be operated even at red heat. There is

nothing to burn, char, deteriorate.

Additional information may be obtained directly from Clarostat.

MOLDED RESISTORS

Erie Resistor Corporation announces a new molded type resistor designed to carry $\frac{1}{2}$ watt load at 40° C., indefinitely. Designated as Type 523, this unit is compact, measuring but $\frac{3}{8}$ " long x .143" diameter. Wire leads $1\frac{1}{2}$ " long are parallel to the axis of the body. This wire has a specially developed alloy-coated surface that resists oxidization and retains its excellent solder-

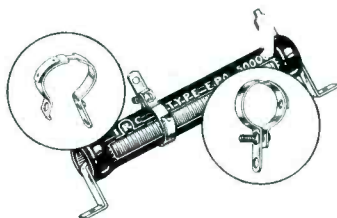


ing characteristics for a long period of time. Samples of the new Type 523 will be sent on request by writing Erie Resistor Corporation, 640 West 10th Street, Erie, Pa.

IRC CONTACT BAND

A new type of band for adjustable tubular power resistors developed by International Resistance Co., Philadelphia, Pa., eliminates annoying problems frequently met with in using units of this type.

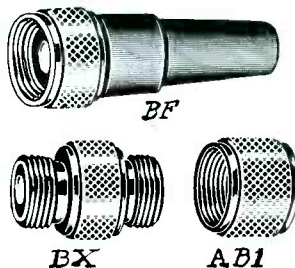
The design and construction of the new



IRC adjustable band are such as to assure positive pressure at all times, without danger of wire breakage or damage and without oxidation or corrosion at point of contact, it is said. The band is designed and tempered for temperatures above those met in resistor operation.

BRUNO CONNECTORS

Bruno Baby connectors are of the locking type and are designed for output or speaker connections. They are equipped with $\frac{1}{2}$ in. 27 thread to prevent inadvertent mixing



with the input cables. Complete literature on these and other Bruno products by writing to Selectar Mfg. Corp., 30 West 15th St., New York City.

NON-INDUCTIVE RESISTORS

To take care of the applications calling for non-inductive resistors capable of handling appreciable power, the new Clarostat Series Z resistors are offered by Clarostat Mfg. Co., Inc., 285-7 N. 6 St., Brooklyn, N. Y. Claimed to have the least inductance of any presently available non-inductive resistors, they are available in these wattages and resistance ranges: 10-watt, maximum resistance 3,000 ohms; 25-



watt, 7,500 ohms; 50-watt, 12,500 ohms; 100-watt, 25,000 ohms. For one-half these power ratings, multiply the maximum resistance available by four.

LOUDSPEAKER

Representing an important improvement in loudspeaker design, a new type of "accordion edge" loudspeaker has been developed by the RCA Manufacturing Co., Inc., Camden, N. J., to reproduce low frequencies with a small speaker in a small cabinet. Although only 7 inches in diameter, the new instrument has a frequency response of from 80 to 7,000 cycles. The new loudspeaker makes effective use of a folded or "accordion edge" cone support principle which permits the cone to move more freely when driven by the permanent magnet speaker mechanism. The cone was developed by Dr. H. F. Olsen in the RCA Radio Research Laboratories at Camden.

VARITRANS

New design changes have been made in the UTC Varitran units to increase their ruggedness and improve reliability. In addition to glass insulated wire throughout all sizes, multiple contact units now employ ballast coils for uniform contact loading. The Varitran units are available for 115 or 230-volt service with respective output voltages of 0-130 and 0-260 volts. United Transformer Corp., 150 Varick Street, New York, N. Y.

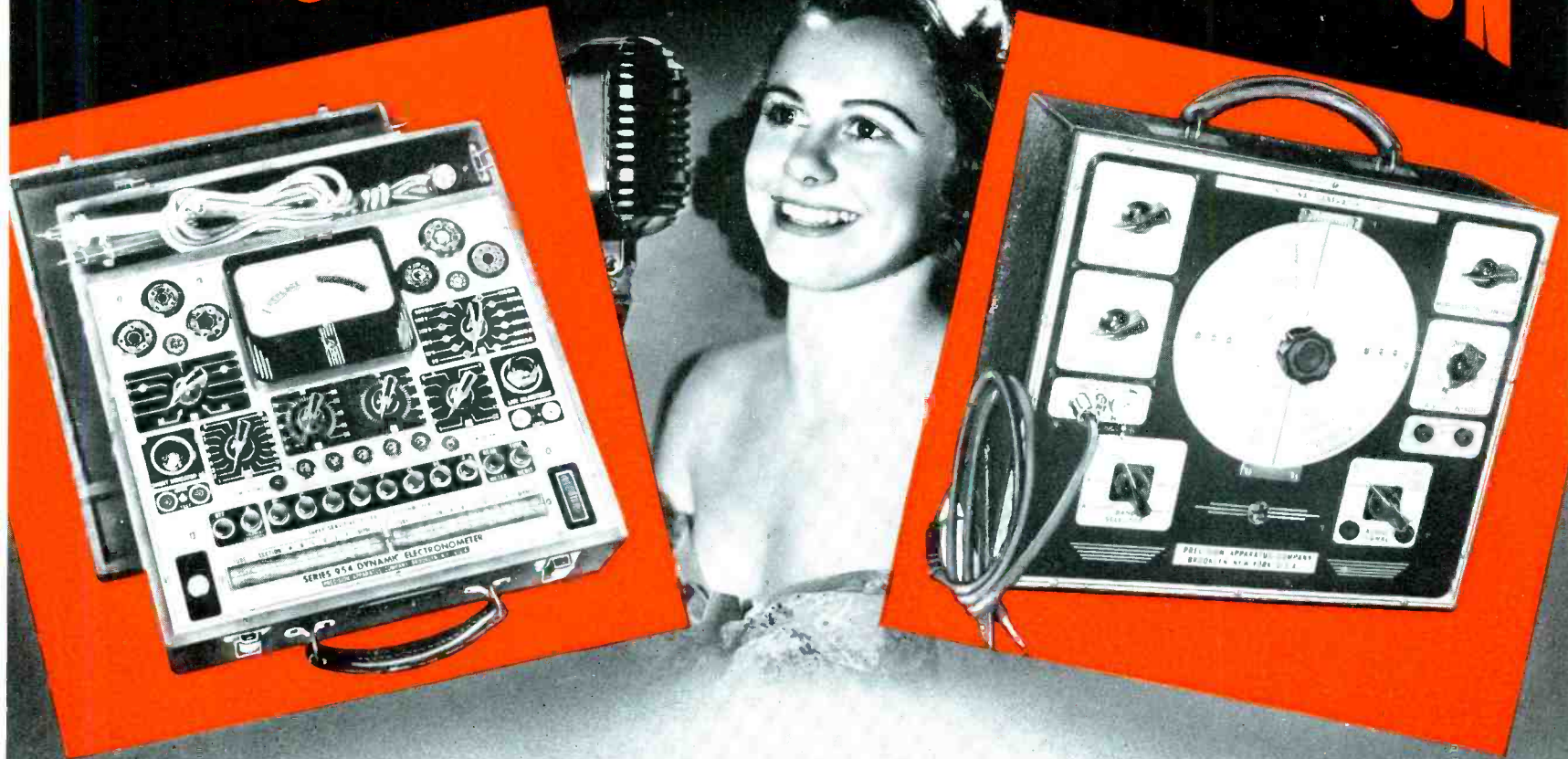
HIGHER VOLTAGE ELECTROLYTICS

To meet the higher voltage requirements



encountered in some applications, three new types of wet electrolytic condensers are now announced by Aerovox Corp., New Bedford, Mass. These units are available in 4, 8 and 16 mfd capacities, with a 600-volt d-c surge rating. Can sizes are $1\frac{3}{8}$ and $1\frac{1}{2}$ inch diameter, and $3\frac{1}{8}$, $4\frac{1}{8}$ and $4\frac{1}{2}$ inches high.

They're all Swinging to SERVICING by SIGNAL SUBSTITUTION*



MODERN SERVICING WITH Modern BASIC TEST EQUIPMENT

A COMPLETELY MODERN SUPER-SENSITIVE service laboratory for all A.M., F.M. and Television requirements need consist of a combination of ONLY TWO BASIC TEST INSTRUMENTS (such as PRECISION Series 954 and E-200) . . . Yet it provides every necessary facility for the rapid localization and adjustment of receiver troubles through "Servicing by Signal Substitution" . . . the new, simplified method of Dynamic Receiver Analysis.

"S-S-3" requires NO EXTRANEIOUS APPARATUS! There's NOTHING COMPLEX TO LEARN!

FREE A new 120 page illustrated text, "Servicing by Signal Substitution", is now furnished absolutely FREE to all registered present owners and future purchasers of the Series E-200 Signal Generator . . . Also available at your favorite distributor or directly from the factory at only 35c.

Series 954 Combination 20,000 OHMS PER VOLT multi-range AC-DC Set Tester and Dynamic Mutual Conductance Type Tube Tester

37 AC-DC set testing functions including: ● 6,000 VOLTS (20,000 ohms per volt DC . . . 1,000 ohms per volt AC) ● 60 MICROAMPS ● 12 AMPS ● 60 MEGS ● 70 DB ● large 4 3/8 inch, 50 microampere meter. ● PLUS a complete modern Dynamic Mutual Conductance Type Tube Tester with easy-reading, double-window roll chart.

Series 954-MCP in open-face portable cabinet, complete with battery and high voltage test leads . . . **\$61.95**

Series 954-P (illustrated above) in hardwood case, complete . . . \$65.95

Series 954-PM in standard panel mount, complete . . . \$65.95

Series E-200 Modern Laboratory Type Multi-Band Signal Generator

Not only an unsurpassed laboratory type Signal Generator for the obvious purposes of receiver alignment, but SPECIFICALLY DESIGNED as the heart of "Servicing by Signal Substitution" . . . Nevertheless, it is priced within the easy reach of every progressive radio service engineer.

Series E-200 (illustrated above) in open face, heavy gauge metal cabinet, complete with tubes, coaxial output cable and FREE copy of "Servicing by Signal Substitution" . . . **\$35.95**

Series E-200-PM in standard panel mount, complete . . . \$39.95

More than 40 models in the New PRECISION 1941 LINE . . . 21 Dynamic Mutual Conductance Type Tube Tester and Set Tester models ranging in price from as low as \$29.95 . . . 16 Multi-Range Tester models from as low as \$14.95 . . . Signal Generators from \$35.95 . . . See them at your local distributor . . . Ask or write for the PRECISION TEST EQUIPMENT 1941 CATALOG.

* "Servicing by Signal Substitution" Copyright 1940 by Precision Apparatus Co., Brooklyn, New York.

PRECISION TEST EQUIPMENT

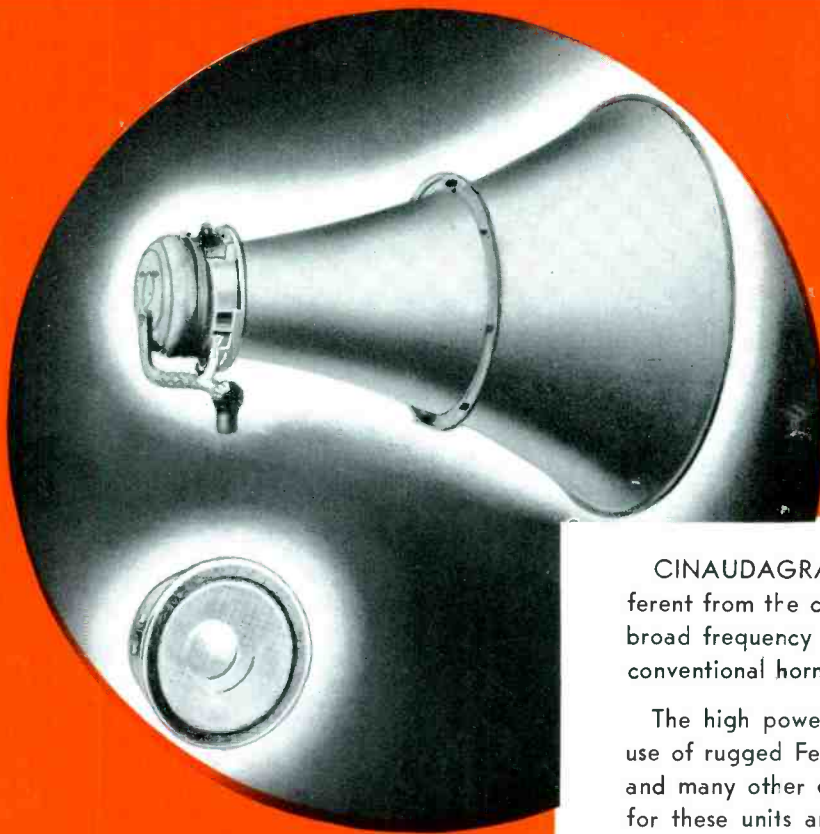
Standard of Accuracy

SEE THEM AT YOUR JOBBER

PRECISION APPARATUS COMPANY • 647 KENT AVENUE • BROOKLYN, NEW YORK
Export Division: 458 BROADWAY, NEW YORK CITY, U. S. A. Cable Address: MORHANEX

CINAUDAGRAPH SPEAKERS

Air Column Sound Projectors



UTC Air Column models are made to withstand the rigorous conditions imposed by weather and rough handling out-of-doors. The composition of the tough and pliant weatherproof cone, eliminates failures due to the crystallization of the flexing portions of the conventional brittle metal diaphragms.

The ribbon voice coil is made of specially treated Acim possessing unusual strength and high voltage breakdown properties, as well as rigidity with a minimum of weight. Being non-hygroscopic, and having a negligible coefficient of expansion, the voice coil is unaffected by either moisture or excessive variations of temperature caused by the high power surges encountered in the operation of exponential units.

CINAUDAGRAPH SPEAKER Air Column Sound Projectors are entirely different from the conventional exponential horn unit. Their high efficiency and broad frequency response overcome the various deficiencies and failures of conventional horn speakers.

The high power construction of these units is made possible through the use of rugged Fernalnic magnets, ribbon voice coils, Acim voice coil support and many other design refinements developed in our laboratory. The horns for these units are spun aluminum in two sections; easy to transport. The telescopic stand and cast steel bracket are finished in black crackle.

★ The CM-25 is a new addition to the Air Column type speaker horn assemblies. This unit combined with the "X" type Exponential horn will handle normal and undistorted peak loads of from 20 to 25 watts continuously. As a sound projection unit, it has no equal for its power and size.

★ The CM-30XF Air Column sound projector assembly replaces the previous FYAX unit. This new sound projector assembly will handle from 25 to 30 watts continuously. This unit is ideal for medium power service due to its wider projection angle and extended frequency range.

★ The CM-40UH or CM-40WH Air Column sound projection assemblies replace the previous HWAU and HWAW models. The CM-40UH is adaptable for indoor installations, while the CM-40WH is better used for outdoor installations. Both models will handle 40 watts of power continuously. These speaker units are equipped with 2 1/2" Acim voice coils, and will withstand the high power surges frequently encountered in PA operation.

★ The CM-60US and CM-60WS Air Column speaker assemblies are the most powerful and efficient sound projection speakers. These units are entirely different from the conventional exponential horn, inherently affording a much wider frequency range, better high frequency definition, and wider angle of coverage. They replace the previous SUAU and SUAW models. These heavy duty speaker assemblies have an extra large voice coil of 3 1/2" in diameter. They will handle 60 watts of power continuously. The use of Fernalnic permanent magnet makes possible trouble-free installations with an economy of wiring and low upkeep costs.

COMPLETE ASSEMBLY INCLUDING AIR COLUMN UNITS with EXPONENTIAL HORN, HANDLE and SUPPORTING BRACKET (No Stand)

Type No.	Undistorted Peak Watts	Undistorted Normal Watts	Peak Power Watts	Voice Coil Dia.	Voice Coil Ohms	Bell Diameter	Overall Length	Weight Lbs.	List Price
CM-25XF	25	20	30	1 1/4	6-8	24"	28"	10	\$55.50
CM-30XF	30	25	35	1 1/2	6-8	24"	28"	12	66.50
CM-40UH	40	35	45	2 1/2	6-8	24"	20"	37	85.00
CM-40WH	40	35	45	2 1/2	6-8	32"	30"	37	113.50
CM-60US	60	55	65	3 1/2	6-8	24"	20"	45	121.75
CM-60WS	60	55	65	3 1/2	6-8	32"	30"	45	150.25

AIR COLUMN UNITS

Type No.	Undistorted Peak Watts	Undistorted Normal Watts	Peak Power Watts	Voice Coil Diameter	Voice Coil Ohms	List Price
CM-25	25	20	30	1 1/4	6-8	\$20.00
CM-30	30	25	35	1 1/2	6-8	31.00
CM-40	40	35	45	2 1/2	6-8	56.00
CM-60	60	55	65	3 1/2	6-8	91.50

EXPONENTIAL HORNS for AIR COLUMN UNITS and HANDLE with SUPPORTING BRACKETS

Type No.	Bell Diameter	Overall Length	Cutoff	List Price	Type No.	Description	List Price
X	24"	28"	150 c.p.s.	\$32.00	F	Handle and supporting bracket for X horn	\$3.50
U	24"	20"	200 c.p.s.	24.50	H	Handle and supporting bracket for U horn	4.50
W	32"	30"	150 c.p.s.	53.00	S	Handle and supporting bracket for W horn	5.75
					B	Black crackle adjustable stand with cast base	17.50
T-1	Outdoor transformer up to 40 watts, 500, 1,000, 1,500 ohms			12.00	T-2	Outdoor transformer up to 60 watts 500, 1,000, 1,500 ohms	15.00

NO FINER SPEAKER MADE IN ALL THE WORLD

CINAUDAGRAPH SPEAKERS

2 SELLECK STREET ★ STAMFORD, CONNECTICUT

EXPORT DIVISION: 100 VARICK STREET NEW YORK, N. Y. CABLES: "ARLAB"

DISPLAY

THE chief ingredient of a good window display is timeliness. Timeliness, however, cannot be described or explained, but the lack of it would discourage the attention for which the display is meant. A look at the contents of any of the magazines in your home will reveal that their circulation, if at all worth mentioning, is attained because the larger part of their contents is tuned to the times.

We can determine, more or less, what people are interested in at the moment. However, it is not so easy to work out what they will be interested in tomorrow. Service Men should change their window displays often and keep them keyed to the phase which seems most popular during the particular week under consideration. A tie-up with even minor items such as a song whose words are catchy, a book or author currently popular, a local sport or even a perfume or flower design will very often bring the desired results.

It is not enough to time and plan your display on a current fad. Carbon copies may not always attract attention. What you must give them is a display which relates the radio service work which you are merchandising to these subjects that form the nucleus of the display. And too, you must not forget that every other merchant along your street has a window display in competition to yours.

As we mentioned above, you should change your display frequently, even once a week, but never permit one to remain for more than a fortnight. If your display features something different, passers-by will subconsciously stop each time in the hope of seeing something interesting or learning something new. However, if your display has not been changed they will notice this at a mere glance and will gradually get the habit of passing by your shop. The first aim of your display must be to attract the attention of others.

As a secondary and equally important function your window display should perform the task of bringing the customer inside your shop. This can only be done by arousing her interest on the outside and persuading her that something worthwhile is on the inside.

Your window display should not be just a month-eaten collection of second hand tubes, or a few panels and displays which any service shop, hardware shop, etc., might get from the manufacturer. While many of these units can be used to help your display, local affairs will

Winter scene shown is typical example of timeliness applied to Christmas window of an enterprising Service Man. Constant attention to his window has produced remarkable results.



undoubtedly arouse greater interest. If your display features some method

Radio Serves the Nation
LISTEN..
... before you
VOTE

Check Your Newspaper for Time!

The National Association of Broadcasters is cooperating with local Service Men's organizations to assist individual Service Men in presenting better window displays. The poster shown is currently supplied by NAB.

wherein the onlooker can take some part, either actively or passively, it will prove most effective.

Radio broadcast stations exist in or near almost every village and hamlet throughout the land. Talking to local station managers may reveal unexpected tieups between merchants, stations and Service Men. Today, networks provide, for the asking, pictures of famous radio stars, up to the minute news of new programs, and what have you. If you cannot afford elaborateness, you can at least place in attractive sequences, a dozen or more photos of current county favorites.

With the advent of the football and baseball seasons sports should play the prominent part in the display theme. An effective display can be made showing

two opposing teams with the players made of cardboard cutouts. Selection of well known players for the first team will enhance the display. Over each cardboard identify the player as Tom Resistor, Dick Condenser, Harry Speaker, etc. Give each player his place on a cardboard diamond or gridiron. Over the first team feature a banner reading "This Team Has a Record for Excellent Tone Quality, Noiseless Reception and Good Volume." Over the opposing team the banner should read, "This Team's Record Shows Poor Volume, Noise, Fading and Distortion." The center of the window should ask the question, "On Which Team Does Your Radio Set Play?"

This window can be followed up a few weeks later with another that uses the same cardboard cutout characters. This time the two teams are set up in groups. The banner over the first team can read: "Teamwork Is the Secret of Success—Each Part Must Do Its Share." Over the other team: "This Team Is Not in Perfect Playing Condition Because One Member Is Crippled." A crutch under the cardboard arm of one player, together with a few bandages or cornplasters, will illustrate his injuries. The center theme can be: "Let Us Check Your Radio Receiver and Make Sure That Each Part Is Doing Its Share."

These same cutouts can be used again and again even in a single season, and if carefully preserved, they can be salvaged from year to year. A little ingenuity will enable you to think up dozens of novel displays so that you can change them around each week with little extra expense.

The super sleuths such as Sherlock Holmes or Philo Vance always arouse interest, and can be used to liven in-between times displays. A large cardboard or metal Holmes bending over a typical set with the ever present magnifying glass at his eye, exclaiming to his companion Watson, "There's mys-

(Continued on page 23)

"OOMP!"

You can't find it in the dictionary but you can find it in **TODAY'S SIMPSON LINE**



If you saw Simpson Instruments at the show you saw something that ordinary words can't describe. In Hollywood they call it "oomph" . . . today's fast way of saying "more of everything".

The Model 400 Tube tester (opposite) is typical of these Simpson Testers that have more of everything . . . more class, more precision, more engineering against obsolescence. We studied your right-now testing problem; then solved it all the way in an instrument as modern as tomorrow.

Right down the line Simpson Instruments have been designed by and for your needs. A few leaders in the 1940 Simpson hit parade are briefly described here. All are covered by the handsome new catalog.

Ask for your copy

SIMPSON ELECTRIC COMPANY
5216-18 Kinzie Street, Chicago, Illinois

**MODEL 310
SIGNAL GENERATOR**

• Reports from independent laboratories prove this to be the most stable and accurate direct-reading signal generator ever offered at a price you can pay..... **\$37.50**

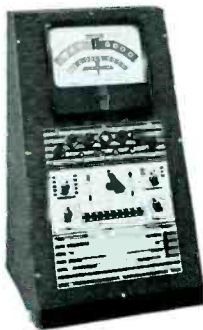


See them at your jobber

SIMPSON

Instruments that STAY accurate

↑ **MODEL 400 TUBE TESTER**



Model 500

NEVER before have so many advanced features been combined in a tube tester. These features include:

UNIT DESIGN—the socket panel and the roll chart can be individually removed. Replacement units can be ordered for those needing reconditioning or replacement while you keep right on using the tester. Obsolescence effects only individual units—not entire tester. Old units can be returned for credit so that you can keep the tester up to date at low cost.

SPARE SOCKETS—Two spare sockets (one large and one small) are provided in addition to sockets for 4, 5, 6, 7 and 8-prong tubes, loctals, bantams, midgets and miniatures.

VISUAL GUIDE—Note guide lines that "tie in" roll chart with switches, preventing errors.

THREE-WAY SWITCHING—Each toggle switch has "off" position so that any prong can be left open. Valuable in testing tubes like ILNG or tapped filament tubes like 35Z5; also various sections of multipurpose tubes in present or future groupings.

SPEED ROLL CHART—Smoother, better operation than ever before. In addition to regular listing has numerical index which speeds up reading. Also has window for writing data for at least 50 new tubes on blank portion of roll chart. Entire chart easily and inexpensively replaced.

YOUR NAME ENGRAVED ON THE PANEL—Simply send us the plate. No charge whatever.

Your price on Model 400..... **\$36.00**
MODEL 500. Same instrument in display cabinet with big, 9-inch meter (see illustration)—a remarkable tube merchandiser..... **\$43.00**



Model 450

**MODEL 450
"TEST MASTER"**

• Service men have called it more for the money than any all-service tube and set tester on the market. Has new Simpson 3-way switching as described above; sockets for 4, 5, 6 and 7-prong tubes, loctals and bantams. As set tester has 8 A.C. voltage ranges; 5 resistance ranges; 5 milliamp ranges; 5 Decibel ranges. Your price only..... **\$39.75**

SOUND NEWS

UNIVERSAL RECORDING DISCS

Universal Microphone Co., Inglewood, Cal., announced a new paper base, non-inflammable, heavy acetate-coated disc in sizes from 4 to 12 in, double faced. It is packaged in bristol board envelopes, quantities varying with the size of the disc. Minute-Blanks, a second new item in the same line, are 4-in double faced discs for brief, personal messages. It can be used by dealers for demonstrations or in home recording. It mails in an ordinary envelope at a minimum of cost. It also uses a paper base and is non-inflammable.

SHURE STRATOLINER MICROPHONE

The Shure Stratoliner Series 508 dynamic microphone is a general purpose unit of the moving conductor type. The die-cast case is finished in satin chrome. The Stratoliner is available in 50-ohm, 250-ohm and in high-impedance types.

Additional details and prices may be



obtained directly from Shure Brothers, 225 W. Huron St., Chicago.

NATIONAL SOUND WEEK

National Union Radio Corp., 57 State St., Newark, N. J., in conjunction with Erwood Sound Equipment Co., 224 W. Huron St., Chicago, have organized a National Sound Week.

Each cooperating distributor has agreed to maintain, during this week, a representative display of sound equipment and accessories, and to have adequate personnel in attendance to properly demonstrate and explain to all individuals whom dealers and Service Men bring in or send in.

National Union furnishes complete display and sales promotion material, including admission cards printed with the distributor's name and address, with space left for the dealer's imprint. These admission cards can be personalized further by writing in the name of the individual whom the dealer has invited to this Sound Show.

The Erwood Sound Equipment Co. is giving away, free, a 28 watt mobile system to the dealer bringing in the oldest amplifier (nationally) and one automatic record changer to the runner-up (nationally). Cooperating distributors are offering prizes for both largest attendance and oldest models.

SHURE BROTHERS APPOINTMENT

Shure Brothers, 225 W. Huron St., Chicago, have announced the appointment of Ben B. Bauer as chief engineer. Mr. Bauer has been development engineer for Shure for a number of years.

RECORD PRICES REDUCED

New prices for Victor Red Seal and Victor Black Label records of all classifications, running from one-half to one-third lower than former prices, have been announced by Frank B. Walker, vice president in charge of record activities for the RCA Manufacturing Co. The new prices are effective immediately.

MICROPHONE SWITCHES

A new series of Amphenol microphone switches for crystal, dynamic and velocity microphones is announced by the American



Phenolic Corp., 1250 W. Van Buren St., Chicago. The No. 1 MC1S crystal microphone switch is a part of the MC1 group of microphone connectors, and couples directly to the microphone. Two and three contact switches fit the MC2 and MC3 series of microphone connectors which are used on dynamic and velocity microphones.

WEBSTER-CHICAGO MICROPHONE

Webster-Chicago Corp., 5622 Bloomingdale Ave., Chicago, have introduced a new



dynamic microphone which is designed to give high level output at from 40 to 10,000 cycles. The unit is said to have a wide range pickup and freedom from atmospheric or climatic effects making it suitable for general all around public address work. Utilizes a new design of alnico magnet, dual diaphragm, and edge wound flat wire voice coil.

Assembly is in a streamlined case, finished in gunmetal with polished chrome bars. A directional baffle is available for adding to the Superdyne to improve the directional effect and decrease feedback and room noise pickup. It snaps on to front of microphone.

Catalog No. 440 describes this new microphone. Write for it today.

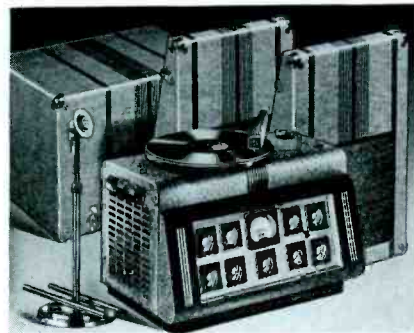
Webster has recently changed its name to Webster-Chicago Corp. They were formerly known as The Webster Co.

TARTAK-UNITED TELEPHONE

Paul H. Tartak, president of Oxford-Tartak Radio Corp., has acquired a substantial interest in the United Telephone Corp., speaker manufacturers, located in Stamford, Conn.

ALLIED P-A SYSTEM

Allied Radio Corp., 833 W. Jackson Blvd., Chicago, have announced a 50-watt deluxe Knight p-a system. The system contains such features as: dual tone equalizers, inverse feedback, lighted control



panel, power driver, 6 input channels, electronic mixing, master control speaker selector, beam-power output, universal output silencer jacks, "safused" speakers, headphone jacks, etc. The control panel is slanted for convenience and inset for protection. Optional equipment, such as phono top, remote control, and V I meter and monitor, is also available.

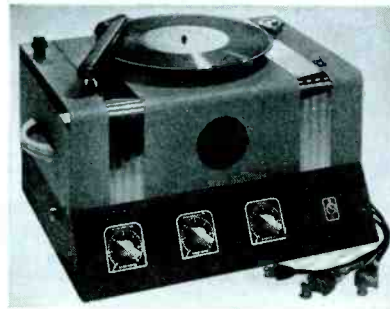
TELESCOPE TRANSFORMERS

The Kenyon Transformer Co., Inc., 840 Barry St., New York City, has announced the addition of two new types to their line of telescopic shielded humbucking transformers, as follows:

Type P204 has a primary of 500/333/250/200/125/50 ohms and secondary of 50,000 ohms (single Class A grad). Type P205 has a primary the same as P204 and a secondary of 100,000 ohms to P. P. grids.

AUDIOGRAPH MOBILE AMPLIFIER

The Audiograph Model AMR15C is a 15-watt amplifier with built-in phono top that operates from either 6-volts d-c or



110-volts a-c. Optional equipment includes a 2-piece leatherette carrying case which houses the 2 p-m speakers and all accessories. A descriptive bulletin is available from John Meck Industries, 1313 W. Randolph St., Chicago.

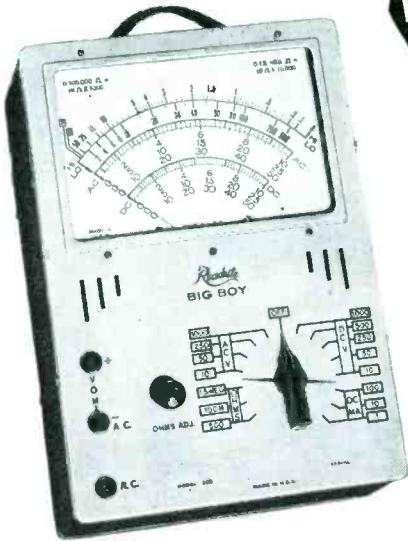
MONITOR SPEAKER

Stromberg-Carlson announces its No. 35 monitor speaker. This reproducer employs a new dual loud-speaker system which has an exceptionally wide frequency range, it is said. Both speaker units are of the direct radiator cone type, the small high-frequency speaker being mounted coaxially with the low-frequency speaker and within the hollow of its cone, the two thus closely simulating a unit source. Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

Readrite
RANGER

BIG BOY

BIG IN VALUE
BIG IN PERFORMANCE \$17.85
SENSATIONALLY PRICED AT



Here is an AC-DC Volt-Ohm-Milliammeter with all the ranges you want . . . easily readable on the large 7" instrument with extra-long 6" scale . . . in a new up-to-the-minute three-tone case you will be proud to use in your panel, bench or calls to the home. Check Readrite Big Boy's adaptability for your requirements; DC V. 0-10-50-250-500-1000 at 1000 ohms per volt; AC V. 0-10-50-250-1000 at 400 ohms per volt; DC Ma, 0-1-10-100; Resistance ranges: 0-500 ohms shunt type circuit; 0-100,000 ohms and 1.5 megohms. Maroon case with cream panel, attached handle . . . Dealer Net Price . . . \$17.85.

MODEL 739

VOLT-OHM-MILLIAMMETER

AC-DC Pocket Volt-Ohm-Milliammeter with Selector Switch . . . Molded Case . . . AC and DC Volts 0-15-150-750-1500; DC MA 0-1.5-15-150; High and Low ohms scales . . . \$9.90 Dealer Net. Model 738 DC Pocket Volt-Ohm - Milliammeter . . .

\$7.50

Dealer Net.



MODEL 432-A TUBE TESTER

The Outstanding Tube Tester Value Checks all types including Loctals, Single Ends, Bantam Jr., and 1.4-volt Miniatures, gaseous rectifier, Ballast, High Voltage Series, etc. Filament Voltages from 1.1 to 110 volts. Direct Reading GOOD-BAD Meter Scale. Counter or Portable Case with roomy compartment for tools, etc. \$18.85 Dealer Net. In case less compartment \$17.85. Model 432-A-742 Combination Tube Tester (432-A) and Volt-Ohm-Milliammeter with 16 Ranges . . .

\$27.85

Dealer Net.

FOR CATALOG WRITE—
SECTION 620 COLLEGE AVE.



READRITE METER WORKS, Bluffton, Ohio

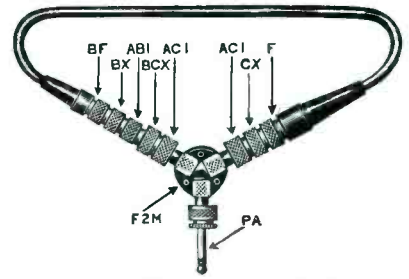
PREPAREDNESS!

National defense means preparedness! Profitable "sound" sales also need preparedness. Prepare now with Clarion superior sound equipment.

Wire or write for Clarion 5-point preparedness plan for increased P.A. sales and profits.

Clarion PUBLIC ADDRESS Equipment

TRANSFORMER CORP. OF AMERICA • 69 WOOSTER ST., NEW YORK



Bruno cable "Connector" kit by Selectar Mfg. Corp., 30 W. 15th St., New York City.

CLARION PORTABLE AMPLIFIER

The Transformer Corp. of America announces Clarion Model CS46, 31-watt portable amplifier system. Push-pull parallel 6L6Gs are used in the output stage. Microphone gain is said to be 118 db, frequency response, 40 to 12,000 cycles, and hum level, minus 20 db. Output transformer is tapped at 2, 4, 8, 16 and 500



ohms. Four inputs, two microphone and two phono are provided, as well as a master gain control and a bass and treble equalizer. Indirect lighting on the corners of the amplifier adds to its appearance.

WEBSTER-RACINE CUTTERS

Webster Electric Co., Racine, Wis., have introduced a new series of cutting heads. The R83 has a frequency range from 30 to 7000 cycles, requires an input power of 1 watt and is available in any one of 8 different impedance values from 1 to 5000 ohms. The R84 has a range from 30 to 8500 cycles, also requires an input power



of 1 watt and is available in 2 types with impedances of 8 or 500 ohms respectively. Both the R83 and R84 are housed in dust-free die-cast cases.

UNIVERSAL PICKUP SCALE

Universal Microphone Co., Inglewood, Cal., have announced a new weight scale for Service Men to enable the determination of the weight of pickups and cutters on the needle or stylus. The instrument reads in ounces and has a hook for attachment to the pickup head.

DISPLAY

(Continued from page 19)

tery afoot, my dear Watson, you can depend upon it. We must remove this to our laboratory and step by step retrace the crime. We'll find the cause of the fading signals and excessive noise and you may lay to that." As a tie-in sign a large banner across the top of the window reading "When your set develops mysterious troubles call us; we have never lost a case." The display may be made more effective by using a troubleshooting chart which lists a dozen or more common ailments, and at the bottom "If one of these crimes has been committed in your own radio set, call us at once . . . there is no time to lose!"

Another good theme for an in-between display is Mr. Radio Tube. Three cardboard cutouts, variously colored, each made to represent a different state in the tube's age from youth to old age. These can be labelled with signs which lead to the effects of old age. Under the first, made up to look young and vigorous, "Mr. Radio Tube in His Youth Feels Fit as a Fiddle and Ready to Work Day and Night to Bring You Entertainment." Under the second cutout, made to look middleaged: "Mr. Radio Tube Puts on Weight, but Is Still Able to Bring You Enjoyment from the Four Corners of the Earth." Under the last cutout the sign can read "This Tube Should Be Retired and Replaced with Another in His Youth, Able to Perform His Functions with Vim and Vigor." Other signs in the display can tie-in with such statements as "Some Tubes Have Gas Attacks and Should Be Replaced Early in Life," etc. . . .

A novel display, designed to catch the attention of the more technically minded in your community, can be made with cardboard cutouts of the various parts in the receiver or even with the parts themselves. The parts can be placed in a neat arrangement in the window, with a streamer tied to each one. The other ends of each streamer should be fastened to small circular signs pasted to the window or set up near the front of the window. The signs can be used to describe the functions of the various parts as simply and as briefly as possible. Of course, each explanation should emphasize the necessity of periodic checkup and the importance of expert service when things go wrong.

Manufacturers' material can prove very helpful in creating attractive window displays, but, as mentioned above, they should be used only as a help and not, generally, as the whole display. As often as possible you should tie your own display up with some particular instance or theme which is of special local interest at the moment.



DON'T TELL ME—LET ME GUESS!

AND SO, FAR INTO THE NIGHT!

"THERE'S THAT CUSTOMER CALLING AGAIN!"



Don't Guess—KNOW!

No serviceman can live up to his delivery promises unless he can locate *all* troubles easily and quickly. And no serviceman *CAN* locate trouble accurately and speedily unless he *knows exactly* what is in *every* receiver. Still there are *some* servicemen who continue to depend on memory and guesswork and thus waste time and turn out haphazard jobs. Most damaging of all, however, is the broken delivery promise—the dissatisfied customer to whom he has to apologize.

It's foolish for a serviceman to risk the loss of a customer when he can have complete, authoritative data on *every* radio receiver right at his fingertips at the trifling cost of less than a nickel a day!

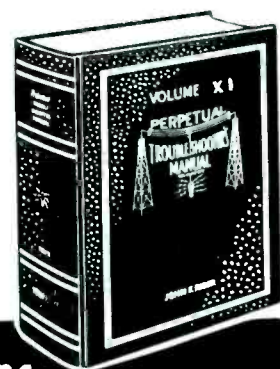
Remember—"Every Successful Service Shop is equipped with a complete set of RIDER MANUALS," for RIDER MANUALS are the only source of complete servicing data, all in one place, on every make and model of receiver that you may be called upon to service. They give you data on alignment, I-F peaks, operating voltages, parts lists and values, voltage ratings of condensers, wattage ratings of resistors, coil resistance data, gain data, and a wealth of other vital information, with easy-to-use tables, diagrams and charts.

End guesswork in *your* shop with a complete set of RIDER MANUALS. You'll soon discover that they are the most valuable investment you ever made. They are often the only difference between success and failure—be sure you have the complete set.

You Need All Eleven Rider Manuals

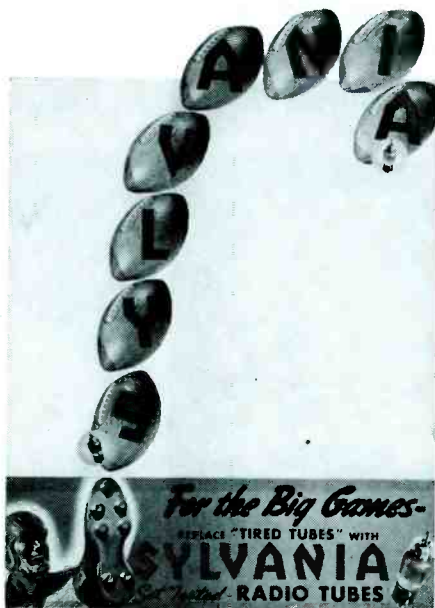
Check over this list . . . make sure your set is complete!

Volume	Price	Covering	Volume	Price	Covering
XI	\$10.00	Up to May 15, 1940	VI	\$7.50	1935-36
X	10.00	1939-40	V	7.50	1934-35
IX	10.00	1938-39	IV	7.50	1933-34
VIII	10.00	1937-38	III	7.50	1932-33
VII	10.00	1936-37	II	7.50	1931-32
			I	7.50	1920-31



JOHN F. RIDER, Publisher, Inc.
404 FOURTH AVENUE, NEW YORK CITY
 Export Division: Rocke-International Elec. Corp., 100 Varick St., N. Y. C. Cable ARLAB

More Than 25 Proved Sales Promotion Services Help You Sell



WHEN you stock Sylvania Radio Tubes, you get the most comprehensive and effective merchandising service that ever helped a dealer to bigger profits. Look over the partial list below. Many are free. Others are available at satisfying savings. All help you sell.

Write Hygrade Sylvania Corp., Dept. S90, Emporium, Pa., for samples of these selling aids and full information about the Sylvania way to bigger profits.

Sylvania Helps . . . That Help You Sell

1. Big store displays
2. Window displays
3. Counter displays
4. Electric Clock signs
5. Electric Window signs
6. Outdoor metal signs
7. Window cards
8. Counter cards
9. Personalized postal cards
10. Imprinted match books
11. Imprinted tube stickers
12. Business cards
13. D o r K n o b Hangers
14. Newspaper mats
15. Store stationery
16. Bill heads
17. Service hints booklets
18. Technical manual
19. Tube base charts
20. Price cards
21. Sylvania News Sheets
22. Characteristics
23. Interchangeable tube charts
24. Tube complement books
25. Folding stock boy cabinets
26. Floor model cabinet
27. Large and small service carrying kits
28. Customer card index files
29. Shop coats
30. 3-in-1 business forms
31. Job record cards (with customer receipt)

SYLVANIA

SET-TESTED RADIO TUBES

Also makers of Hygrade Lamp Bulbs and Miralume Fluorescent Light Fixtures

SERVICING RECORDERS

(Continued from page 7)

used by every professional recordist.

The general idea is that a record viewed under certain conditions will show a light pattern, and that the width of that pattern is virtually directly proportional to the groove velocity (volume) at that point. Fig. 6 shows the general setup. The record is placed on a bench, and illuminated by parallel light. This can be provided by a spotlight, or by a lamp, as far from the record as possible. The writer prefers a 100-watt unfrosted lamp at least 10 feet from the record. Stand directly over the record, at least at arm's length away. Raise the lamp till a distinct pattern is seen, sharp at all the edges, as in Fig. 7. Measure the pattern width directly with a steel scale, or, better yet, use a pair of vernier calipers. Make a table of pattern widths at various frequencies, then compute the relative width as referred to 1000 cycles. Using the voltage ratio column of a db table, convert these relative widths to db. The following table is a good example of

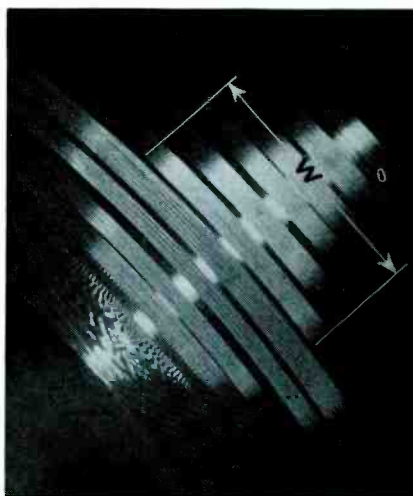


Fig. 7. The width (W) of the light pattern on a record which is viewed under certain light conditions is virtually proportional to the volume at that point. In the case shown the volume has been purposely increased beyond normal to illustrate the type of pattern obtained.

how the thing can be done easily:

Frequency	Measured Pattern Width	Relative Width	DB
1000	0.60 in	1.0	0
3000	0.85 in	1.41	+3
5000	1.08 in	1.78	+5
6000	0.53 in	0.88	-1
7000	0.30 in	0.50	-6

The easiest way to cut a pattern record is to feed the gain set output into the amplifier input. Adjust input and gain till the volume indicator reading is about half of normal recording level with the oscillator at 1000 cycles. If the cut is to be made outside-in, shift to 7000 cycles and start cutting. Slowly turn the oscillator knob, decreasing fre-

quency at a constant rate. At 6000 cycles interrupt tone for about two revolutions of the turntable, then continue sweeping. Interrupt similarly at 4000, 3000, 2000, 1000, 700, 500, 300, 100, and 50 cycles. The 1000-cycle break should be double length. During all this sweeping keep the gain set input voltage constant and pay no attention whatever to the volume indicator (save to disconnect it if it goes off scale).

This is a sweep pattern. The expert can look at a pattern and tell immediately whether it is satisfactory. The learner had best translate into db and thence into a graph. A pattern usually looks rather alarming to the novice because his eye is linear, not logarithmic; hence the desirability of plotting on a db basis. Note that all cutters drop off in response in the bass. The dropoff point is often called the turnover. It occurs between 500 and 700 cycles in most instantaneous cutters. All cutters have a peak somewhere in the high frequencies, the higher the better. A cheap cutter will peak between 3500 to 4000 cycles; better ones will peak between 8000 and 9000 cycles. Above the peak frequency the response drops off very rapidly.

In cutting, avoid pattern widths of over an inch or so—they denote probable overload and false readings in the

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average home unit.

Phonograph pickup testing can be done by playing a test record into a good amplifier. There are several good test records on the market, and a visit to your jobber will soon give you enough information to pick the handiest.

Conclusion

Home recording is the most interesting development in the radio industry from the profit angle. It is the first razor blade type of product radio has seen—where the customer must come

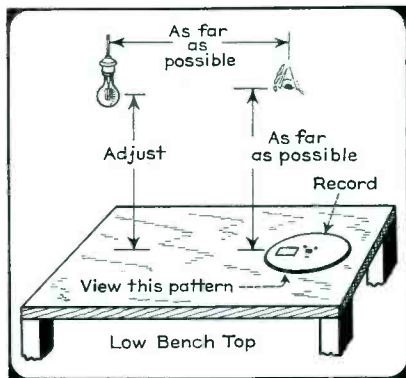


Fig. 6. The general setup for obtaining a light pattern can be made on the Service Man's bench. A little experience and the pattern will tell at glance the quality of the recording system.

back weekly for more. Its success is squarely up to the Service Man, who on most service calls will have to educate the customer rather than fix his machine. Poor servicing and dissatisfied customers will wreck this promising development before it is firmly established. Satisfied customers will open up realms of profit (for accessories) never thought possible outside of the camera field. Finally, the Service Man who becomes a skilled recordist has a chance to enter the professional recording field—comfortable, pleasant, and well paying.

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F-M needs You— and You need this Complete Line



The immediate future of Frequency Modulation lies in the energetic efforts of the Radio Jobbers, Dealers, and Servicemen—the technical men who know what it's all about. Here, then, is YOUR opportunity to get in on the ground floor of this promising new phase of the radio industry!

In order to do this successfully, however, YOU must be prepared—with full information on the subject—with a complete line of sets and parts to meet every demand.

Meissner places this material "right in your lap." The beautiful, walnut-finish Table Model F-M set shown is 22 $\frac{3}{4}$ " wide, 12 $\frac{1}{4}$ " high and 11" deep. Has full-quality, 8" P-M dynamic speaker; five-position tone control provides choice of output response. May also be connected as a converter to feed the audio system of a larger receiver if desired.

CONSOLE MODEL

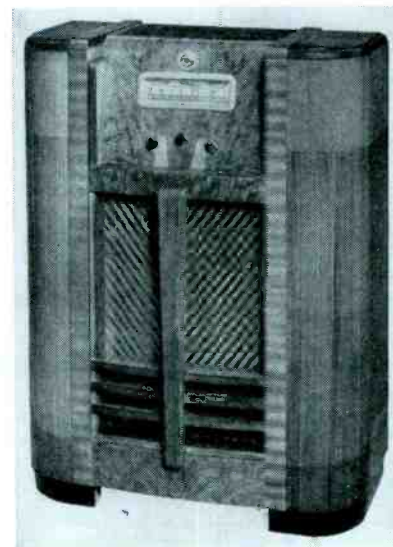
For highest-quality, noiseless, static-free reproduction of F-M Broadcasts, this big Console Receiver is the finest obtainable. Its powerful, 12-tube chassis, with built-in super-sensitivity, together with a special high-fidelity P-M dynamic speaker in the large bass-reflex tone chamber, assure the discriminating listener of maximum satisfaction. The walnut-finished cabinet is 41" high, 30 $\frac{1}{4}$ " wide and 15 $\frac{1}{2}$ " deep. Rich, two-toned veneers provide a beauty seldom seen except in the highest-priced receivers.

CHASSIS AND PARTS

The same 12-tube chassis used in both of the receivers described above, is available separately for use in "Custom-Built" installations. Requires 110 watts at 117 volts, 60 cycles; 6 watts undistorted output; 170-kc selectivity; 10-mv sensitivity. Special 4.3-mc I-F and Discriminator Transformers, as well as complete RF-Mixer-Osc. Tuning Assembly, covering 42 to 50 mc, are also available for those who build their own.

FREE SALES HELPS

New counter literature describing the Meissner F-M Receivers is now ready. Order a quantity now and be prepared for early fall sales. New 1941 General Catalogs will be ready soon. Write at once for your supply.



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Every Dealer-Serviceman needs this up-to-date listing of the entire line of Meissner receivers, kits, replacement coils and hundreds of other daily requirements. Send a postal card TODAY for your free copy.

ADDRESS DEPT. S-9


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MT. CARMEL
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"A FAMOUS NAME FOR TWO DECADES"

"MARVELOUS, ME EYE!", SAID PROFESSOR OSWALD SQUEEGEE

PROFESSOR OSWALD Z. SQUEEGEE, Ph.D., ABC, P.D.Q., etc., turned an austere eye on the eager, upturned faces of his class in industrial engineering. Then, in the simple dignity becoming to a great man (which everyone, including himself, admitted he was) the Professor spoke:

"Listen, you dimwits," he thundered. "If there's one thing I want to do to your thick skulls, it's simply this: The easiest way of doing any job is generally the complicated way. The hardest way is to keep plugging along until you've developed the simple way. That takes time. It takes patience and—ahem!—it takes brains."

Here the Professor paused, reached for the glass of water on his desk, got the ink by mistake, and sipped it calmly. Then he cleared his throat and continued:

"Some of the world's greatest inventions have been so simple that everyone wondered why Noah hadn't thought of them while he was sitting in the Ark."

"What, for instance, was more logical than putting an eraser on the end of a pencil? What was more logical than the safety razor? What was more logical than, instead of making nuts to fit the wrench, to make the monkey fit the nuts. I mean—ahem—the monkey wrench."

Fishing through the pile of notebooks, overshoes and chewing gum wrappers on his desk, Professor Squeegee found a Sprague Koolohm Resistor and held it up.

"Now here is a practical example of simplified improvement," he bellowed. "One of you clucks brought this resistor in and told me how marvelous it was."

"Marvelous, me eye! The only thing marvelous is that some resistor manufacturer didn't do it sooner—that it took a condenser manufacturer to figure out how much simpler it would be to insulate the wire itself, instead of trying to insulate the resistor after it is wound without shorting a lot of turns, or without having a coating that will crack, chip or maybe even peel like a banana. Now hand me that crowbar and cold chisel and I'll show you something real."



After 15 minutes' hard work and 3 skinned knuckles, the Professor pried the outer ceramic shell of the Koolohm. "There it is," he beamed, "a practical example of a little simple simplification that meant a whale of a big improvement. Larger wire. No danger of shorted turns. More resistance in less space. So moisture-proof a duck's back would turn green with envy. So well designed it runs cooler than any other resistor of equal size and rating. The only resistor with an automatic overload indicator and the first..."

Just then the phone rang. It was the Professor's wife telling him he was already three hours late for lunch. Without even waiting to bid his class goodbye, he laid a handkerchief carefully on his head, crammed his hat into a pocket, shut the door and walked calmly out through the open window.

SPRAGUE PRODUCTS COMPANY
North Adams, Mass.

P.S.—See Koolohms at your Sprague jobber's. Free catalog on request.

FOR YOUR OWN PROTECTION

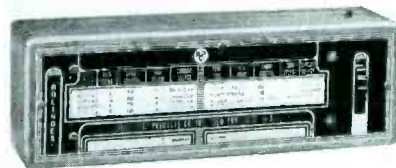
It has been called to our attention that a party answering the description given below is soliciting subscriptions to SERVICE at reduced rates. Money given to him is wasted since he has no connection with this office.

Uses name—A. B. Gillis
Gives addresses: 205 Central Ave. or 311 Hamilton St., in Albany, N. Y.

He is about 45 years old, weighs 170 lbs., and is about 5 ft. 10 in. tall. He has a light complexion with bulging blue eyes and blondish hair that shows signs of becoming grey and thin.

ROLINDEX TUBE-TESTER CHART

Illustrated is an interesting tube tester accessory just introduced by Radio City Products, 88 Park Pl., New York City, to enable tube tester owners to modernize through the substitution of a mechanical roll-type tube chart for the old separate chart sheets. Driven by a knurled disc which projects edgewise through the panel



and operating through the medium of a brass-gearing mechanical movement, the chart moves beneath a window on which is engraved a hairline to direct the eye across the row of control-setting figures.

Mounted in a hardwood case, this unit may be used on the counter or attached directly to the case of the tube tester. The chart can be replaced and new charts will be made available by RCP as the introduction of new tubes requires. The charts now available contain complete up-to-date



tube listings for use with a number of older RCP tube testers, and for newer models which do not include the Rolindex as a built-in feature.

The size of the cased instrument is 11 x 3 3/4 x 3 in. It is available in two models: No. 101, as described, and the No. 2, identical except that internal illumination is provided.

BOOK CATALOG

The new 1940 catalog of technical and scientific books of the Chemical Publishing Co., Inc., 148 Lafayette St., New York City, N. Y., contains many new titles. Books in nearly all technical and scientific fields have been added to the previous works.

BELT STATIC

STATIC electricity on fan belts of automobiles, refrigeration equipment and the like, aside from its generally dangerous nature and interference with radio reception, is apt to give unpleasant shocks when metal parts are touched. The friction which is the cause of the static electricity, however, may be reduced by means of a mixture of glycerine and graphite, applied at the points of friction.

The glycerine-graphite mixture is also an excellent lubricant, is insoluble in most organic solvents and retains its activity at very low temperatures and extremes of weather. Being non-toxic, glycerine alone or in combination with graphite, may safely be employed as a lubricant for food-treating equipment. *Glycerine Facts.*

PROFITS IN HOME RECORDING

EVERY large scale manufacturer is featuring a home recording attachment in the sets offered this fall. Only a few, however, are planning to make or sell blank discs except for those supplied

with the set. This means that thousands of people who will be looking for a source for recording blanks and needles to explore the fascinating entertainment possibilities of home recording. Here is a made-to-order business for the aggressive Service Man.

Up to now these set buyers have never bought home recording blanks. They have no fixed buying habits. They will be attracted by good window displays and advertisements that tell them where to buy. Home recording is the most talked about feature of radio sets this season.

Many will order discs by mail if you make it convenient by distributing disc order cards having a business reply address on the reverse side. These cards, which are supplied free by the disc manufacturer, are already being sent out with monthly statements and direct mailings by dealers who are beginning to notice the new demand for home recording accessories. Discs and needles are the money making end of the home recording business.

R. C. Powell,
PRESTO RECORDING CORP.

A return mailing card, such as that shown on the left, will help set the disc buying habits of thousands of new owners of home recording equipment. An early start will insure a steady stream of buyers to your shop. Tie in with a window display stressing the numerous home recording aids which you carry. Put time to work on your side to corner a portion of this new market.

Kindly send in the following Presto supplies: C. O. D. Charge our account

PRESTO ORANGE SEAL DISCS (Double Faced, Aluminum Base)			PRESTO BLUE LABEL DISCS (Double Faced, Light Aluminum Base)			PRESTO MONOGRAM DISCS (Double Faced, Composition Base)		
SIZE	Playing Time per side	PRICE per Carton of ten (Write Quantity)	PRICE per Carton of ten (Write Quantity)	PRICE per Carton of ten (Write Quantity)	PRICE per Carton of ten (Write Quantity)	PRICE per Carton of ten (Write Quantity)	PRICE per Carton of ten (Write Quantity)	PRICE per Carton of ten (Write Quantity)
6"	1 min. (s)	\$4.00	\$2.50	\$2.50	\$4.00	\$4.00	\$4.00	\$4.00
8"	2 "	5.50	4.00	4.00	6.00	6.00	6.00	6.00
10"	3 1/2 "	8.00	6.00	6.00	6.00	6.00	6.00	6.00
12"	4 1/2 "	10.00	6.00	6.00	6.00	6.00	6.00	6.00

PRESTO CUTTING and PLAYING NEEDLES

Sapphire cutting needle, average cutting life 5 hours, each	\$6.00
Stellite cutting needle, average cutting life 2 hours, each	1.25
Note: Sapphire and Stellite cutting needles can be resharpened about 10 times. Cost of resharpening Sapphire \$2.50; Stellite 65¢. Cutting life after resharpening same as new needle.	
Steel cutting needles, average cutting life 20 minutes, Package of 3	1.00
Sapphire playing needle, average playing life 1,000 hours, each	1.25
Red Shank steel playing needles, package of 25	.25
Discblue-record preservative, 2 oz. can	.48

NAME _____
STREET _____ CITY and STATE _____

NEW TEST EQUIPMENT

JACKSON AUDIO OSCILLATOR

Jackson Model 652 audio oscillator provides an audio frequency voltage developed at its fundamental frequency. The basic design of the instrument is entirely differ-



ent from the beat frequency type of audio oscillator. For complete information and for the special features of this unit, write The Jackson Electrical Instrument Co., 122 Wayne Ave., Dayton, Ohio.

SIMPSON TEST INSTRUMENTS

The Model 400 portable tube tester, the Model 500 counter type tube tester, the Model 450 Test Master tube and set tester, and the Model 310 signal generator are recent items that have been added to the Simpson test equipment line for the Service Man. These instruments are illustrated and described in the latest Simpson catalog available directly from Simpson Electric Co., 5216 Kinzie St., Chicago.

ELECTRONIC BRIDGE

This new Hickok instrument, besides being used as a conventional bridge, can be used as a percentage bridge and also as a synchronometer. It permits electrical triangulation not possible with conventional



bridges. The circuit, which is shielded, features a cosine galvanometer, has built-in standards and provisions for external standards. The galvanometer cannot be injured by unbalance of the bridge, it is said. A-c power is used for operation. Despite the fact that it operates on a-c, the electronic bridge has null balance the same as all standard d-c bridges. Measurements include capacity, resistance, inductance, impedance, power factor and frequency. For complete information write the maker, The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio.

Insure Customer Satisfaction with
CRYSTAL
Equipped Recorders

• *Let* this be a prophecy! You'll find *Crystal Equipped* Recording Sets setting the sales pace for 1940-41. Why? Because Crystal Recording Heads, Crystal Microphones and Crystal Pickups do such a swell job . . . are so thoroughly dependable and have been so universally adopted by a majority of leading manufacturers as standard parts of these new modern recorders. Be on the safe side! Make sure that the line you take on . . . the stock that you invest your money in . . . is crystal equipped.

• *Many* thousands of these new recording sets will come completely equipped with Astatic's high quality Recording Heads, Microphones and Pickups. Every single one of these parts is a product that has proven its performance and merits your complete confidence. No new "didos" to fuss with . . . no adjustments necessary . . . no worries to mix up with the business of selling. Crystal Equipped Sets reduce sales resistance and raise sales volume.

• *Astatic* CRYSTAL RECORDING HEADS give you these features: Fool-proof design. Rugged construction. Low wave form distortion. High internal stiffness for accurate groove cutting. Finest performance on all types of record blanks. Ample power reserves for peaks of volume.

ASTATIC CRYSTAL MICROPHONES provide wide range response with high output. Light weight, compact construction. Adaptable to modern design. High impedance simplifies input connections. Available in a variety of responses to meet different requirements.

ASTATIC CRYSTAL PICKUP CARTRIDGES give excellent response with high output. Input connections simplified by high impedance. Fundamentally simple construction. No adjustments necessary.

All these features and many additional are inherent in crystal devices and together insure performance that means unqualified customer acceptance and satisfaction.

ASTATIC
ASTATIC MICROPHONE
 IN CANADA: CANADIAN Astatic Ltd., TORONTO, ONT.
 YOUNGSTOWN OHIO
Laboratory Inc.
ASTATIC CRYSTAL PRODUCTS LICENSED UNDER BRUSH DEVELOPMENT CO. PATENTS

for GOOD POWER PACKS



- For those heavy-duty power packs which must stand up month in and month out, year after year, just remember these Type —10 Aerovox oil-filled filter condensers.
- No larger than usual electrolytics. Inverted screw mounting with grounded can. Or can may be insulated with washer.
- An ideal filter condenser at an attractive cost.

AEROVOX Type-10		
600 v. D. C. Working—Type 610		
Cap. Mfds.	Size—Ins. Dia. x High	List Price
2.0	1½ x 3½	\$2.75
3.0	1½ x 4½	3.25
4.0	1½ x 5½	3.75
1000 v. D. C. Working—Type 1010		
1.0	1½ x 2½	2.50
2.0	1½ x 4½	3.25
1500 v. D. C. Working—Type 1510		
.5	1½ x 2½	3.00
1.0	1½ x 4½	3.25

Get Our CATALOG . . .

- You'll find these oil-filled jobs listed in our latest catalog. Also other oil-filled condensers for operating voltages up to 7500. Ask local jobber for catalog—or write us direct.



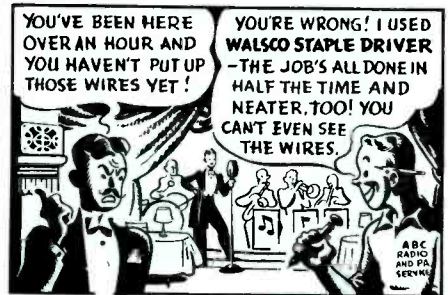
TELEVISION IN NATURAL COLOR

IN the past, the transmission and reception of television in natural color by electronic means, that is, the transmitter employing photoelectric pickup tubes and the receiver cathode-ray tubes, was complicated and expensive. Several pickup tubes were needed at the transmitting end, and, worse still, several cathode-ray tubes were needed at the receiving end. In addition, either separate channels were required for the transmission of the differently colored images, or else, where but a single channel was employed there were required mechanically operated switching devices. Actually, the case against color television was even more serious, for even assuming that the foregoing handicaps had been overcome there still arose the question of the type of transmission which was employed. This problem is analogous to the one existing at present in the transmission of black and white pictures, except that for color it would have been necessary for two separate standards of transmission to be set up.

In Patent No. 2,200,285, which was issued to R. Lorenzen on May 14, 1940, and which is entitled Television in Natural Color, means are described whereby it is possible to transmit and receive pictures in natural color as easily as black and white images. One of the features of this new system is that no change is necessary in either the transmitting or receiving station, with the single exception of the photoelectric pickup tube at the transmitter and the cathode-ray tube at the receiver. External to the existing transmitting or receiving system are the mirrors or prisms which effect the superposition of the separately colored images into a single picture.

Several methods are described whereby the colored images are each separately scanned in toto or else the separate colors are scanned sequentially line by line. No additional frequency bandwidth is necessary for the psychological effect of color upon the eye is such that even for a considerable decrease in detail when the picture is in color the eye apparently sees more detail than it would in a black-and-white picture having much greater detail. In the case of the present invention the effect of color is believed to counterbalance the greater detail of a black-and-white picture where both use the same width of channel.

One of the important features of this invention is the fact that only a single cathode-ray beam is utilized for the purpose of scanning the television picture at both the transmitter and receiver. In other words, the essential constructional details of existing photoelectric pickup tubes at the transmitter and the cathode-ray tube at the receiver are unchanged. The only modification of these tubes are the separation of the sensitive photoelectric surface of the photoelectric pickup tube into either two or three separate areas, and a similar division of areas in the case of the cathode-ray tube used at the receiver. When the primary color system is employed these separate areas may either have a coating sensitive to red, green and blue, respectively, or else may utilize a uniformly coated screen which responds to each of the three primary colors. In this latter case it is obvious that the change needed to adapt existing pickup tubes and receiving cathode ray tube is but a minor matter. Furthermore, even the necessity for external color filters may be dispensed with when, as is suggested by the inventor, the glass en-



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velope of the tube be colored so as to act as a color filter. In this latter event the only additional auxiliary equipment needed at the receiving end to receive colored images instead of the usual black-and-white images is the external attachment of a simple mirror or prism system to cause the superposition of the variously colored images. The problem, therefore, of the transmission and reception of television images in natural color becomes almost as simple as that for black-and-white, and, since this system requires none of the expensive complications inherent in colored moving pictures, it would appear that natural color will become a practical reality in the field of television sooner than will be the case for the cinema despite the fair degree of success that has been experienced in this latter field. It also remains within the realm of possibility that this new television system may be slightly modified to adapt it to lowering production costs of colored moving pictures.

SYLVANIA WINDOW TRIM

An 8-color football window display for the fall season is now being distributed by Sylvania to Service Men and dealers throughout the country. It consists of a large window streamer 36 x 11 inches and 8 individual cutout footballs with letters spelling Sylvania. Footballs and the streamer are gummed, permitting them to be mounted directly on the window. Placing the cutout footballs in a semi-circle or arc over the streamer simulates the effect of a football having been kicked by the full-back illustrated on the streamer.

Additional information may be obtained directly from Hygrade Sylvania Corp., 500 Fifth Ave., New York City.

BOOK REVIEWS

CHARACTERISTICS DATA CHART, 13 Edition, prepared by the Raytheon Production Corp., 55 Chapel St., Newton, Mass., 1940, 28 pages, 8½ by 11, self covers, free to readers of SERVICE.

This publication has been completely revised and with much new material added includes information on all Raytheon receiving tube types.

Base connection diagrams have been redrawn and new ones added. A complete set of tube outline drawings is included to show dimensions and physical characteristics. The table of interchangeable types has been supplemented by many additions. A page of panel lamp data has been included.

This new chart contains 28 pages showing characteristic data for 331 receiving tube types, 56 plug-in resistors, and 16 pilot lamps. It includes 121 basing diagrams, 52 outline drawings, and table of 194 interchangeable types. R. H.

AN INTRODUCTION TO FREQUENCY MODULATION, by John F. Rider, published by John F. Rider Publisher, Inc., 404 Fourth Ave., New York City, 136 pages, price \$1.00.

This book is intended to introduce frequency modulation to the service man. The author confines his attention largely to the receiver, although a graphic picture of what happens at the transmitter and the limitations of ultra-high frequencies are also given.

In addition to covering the most pertinent fundamentals of frequency modulation, the author discusses receiving antennas and the servicing of f-m receivers. Some 32 pages are devoted to the latter subject. Since the art is new and both transmitters and receivers few, the material is necessarily general. It is believed, however, that the data on f-m receiver servicing is covered in sufficient detail to permit the service man to give a good account of himself in this regard until further specific information becomes available.

This book is recommended to all who are interested in the subject of frequency modulation. R. D. R.

RCA HAM GUIDE, prepared by the Commercial Engineering Section, RCA Manufacturing Co., Inc., Harrison, N. J., 48 pages, 8½ by 11 in, paper covers, price 15c.

The RCA Ham Guide, as its name implies, is intended primarily for the great fraternity of radio amateurs. In its pages are given authoritative technical data on RCA's amateur transmitting tubes, circuits for utilizing them to best advantage, and helpful information on the design and operation of amateur transmitters. Detailed descriptions with illustrations for constructing two complete amateur transmitters are shown on pages 29-47.

The book is recommended to amateurs and to anyone else who is desirous of obtaining information on low power transmitters and associated equipment. R. H.

AN INTRODUCTION TO VECTOR ANALYSIS, by B. Hague, published by Chemical Publishing Co. of N. Y., 148 Lafayette Street, New York City, 1939, 118 pages, price \$1.50.

The Service Man can ill afford the time necessary to study three hundred to five hundred pages, mainly devoted to the geometrical and mechanical applications of vector analysis, in order to obtain some comprehen-

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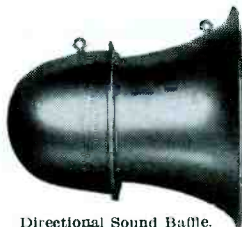
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MI-6247A.



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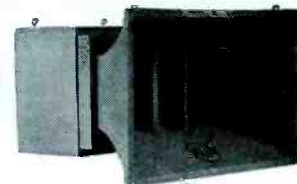
High Output—High Quality! 15" Permanent Field Dynamic. MI-6237.



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Commercial Sound

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sion of its significance with regard to electricity and radio engineering. The present book, therefore, is ideally suitable in enabling him to acquire a knowledge of vector analysis in the minimum of time for, except when the author is describing the underlying mathematical principles, he restricts himself almost exclusively to their application to electrical phenomena.

The author's name is familiar as the author of "Alternating Current Bridge Methods," which is the generally accepted standard on this subject. As painstaking and authoritative a work as his book on a-c bridges is, it must nevertheless be confessed that it is written in a very dry and pedantic style. The reviewer calls this to attention in order to contrast it with the beautifully lucid and interesting style which Professor Hague offers in "An Introduction to Vector Analysis." For, not only

does he write with unusual clarity but he is also very careful to point out possible sources of confusion to the reader. Whereas most authors on vector analysis take for granted that their readers will have no difficulty with the non-commutative nature of vector products, Professor Hague carefully calls this, as well as other sources of confusion, to the attention of the reader.

For either those who are unfamiliar with vector analysis or those who wish to review the subject this book is highly recommended. R. L.

SHALLCROSS BULLETIN

A new bulletin is now available from the Shallcross Mfg. Co., Collingdale, Pa. This bulletin is devoted to a discussion of the electrical and mechanical specifications of the various standard and special Shallcross non-inductive wire-wound resistors.

REPLACEMENT BATTERIES FOR PORTABLES

Model	Acme	Advance	Bond	Bright Star	Burgess	Eveready	Gen-eral	National Union	Philco	Rayo-vac	Usalite	Wil-lard	Win-chester
TROY (Troy Radio & Television Co.)													
940, 949.....1A	118	147	4829	860	8F	741	8F1	A833	P96	P96A	635	8F1	4819
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
951, 953.....1A	...	2476	...	646	F4P1	...	4F4	...	...	P694A	639	4F4	...
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
952.....1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
BP140.....1AB	460-15	411	...	...	5DA60	...	60A2L	...	...	...	AB665	...	...
BP550.....1A	118FM	547	...	865	8FL	745	8CF1	...	...	P98L	645	...	...
.....2B	830	284	...	30-33	M30	482	...	B861	...	P5S30	640	...	...
BP640.....1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
TRUETONE (See Western Auto Stores)							WESTERN AIR PATROL (See Wells-Gardner)						
WARWICK (Warwick Manufacturing Co.)													
0-407, 0-411, Craft, 1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
Crane, 40, 945.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
0-461, 0-464.....1A	118FM	547	...	865	8FL	745	8CF1	...	...	P98L	645	...	...
.....2B	830	284	...	30-33	M30	482	...	B861	...	P5S30	640	...	...
0-501, A-C, D-C.....1A	118S	817	...	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
0-531, 0-532, 0-533, 1A	...	2476	...	646	F4P1	...	4F4	...	...	P694A	639	4F4	...
0-534, 0-535, 0-539, 0-558.2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
9-457, 948, Clark.....1A	118	147	4829	860	8F	741	8F1	A833	P96	P96A	635	8F1	4819
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
WATTERSON (Watterson Radio Manufacturing Co.)													
415.....1AB	460-15	411	...	...	5DA60	...	60A2L	...	...	...	AB665	...	...
PB.....1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
WESTERN AUTO (Western Auto Stores) (All model numbers include entire series)													
D937, D938.....1A	118	147	4829	860	8F	741	8F1	A833	P96	P96A	635	8F1	4819
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
D939.....1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
.....2B	430	...	...	30-55	A30	...	V30A	...	...	430P	621	V30A	...
D940.....1A	...	...	...	561	G5	...	5H5	...	...	P85A	687	...	...
.....2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
D1680.....1A	...	2476	...	646	F4P1	...	4F4	...	...	P694A	639	4F4	...
.....2B	430	...	...	30-55	A30	...	V30A	...	...	430P	621	V30A	...
WINDSOR (See Wells-Gardner)							WOR (See Wells-Gardner)						
WINGS (Goodyear Service Stores)													
1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
2B	330	267	3017	30-03	B30	762	V30B	B860	P305	P5303	624	V30B	6218

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PHILCO AR5

Installation: The AR5 has single push-button tuning. The tuning knob is used for manual tuning and also for the push-button tuning. The push-button portion of the control is coupled to the receiver by means of a flexible shaft which engages in the large, rubber coupling on the receiver.

Switching within the radio set is accomplished by means of a wafer switch which is turned by a flexible shaft. In order to synchronize the control and the receiver, the wafer switch can be locked in the dial position by releasing a screw in the end of the receiving housing. In fact, the receivers have been shipped from the factory with the wafer switch locked in the dial position.

If the AR5 is first tested on the bench, there is a possibility that the control might be damaged unless all instructions are carefully read and followed. If the control shafts are coupled to the radio and the control is then picked up and turned around, it is possible to bend back the phosphor bronze holding spring in the top of the control unit and make it inoperative. The control should be fixed in place before the push-button tuning flexible shaft is connected to the receiver.

When installing the set in the car, the flexible shafts must be clamped securely in place before the final adjustments are made and before the shafts are coupled to the radio. The least movement of the shafts after the radio and the control have been synchronized will throw them out of adjustment.

Wafer Switch Contact Out of Alignment: There are two minor conditions which may prove troublesome on the first installations of the AR5. After the set and control are installed in the car and the adjustments have been made and all the flexible shafts connected to the radio, it may be that the push-button control will not tune in the dial tuning position correctly. If this is encountered it is due to a contact on the oscillator section (rear) of the wafer switch having been thrown out of alignment by the dress of the silver mica condensers. The red silver mica condensers on the wiring side of the subbase are connected to one of the contacts of the oscillator section and are dressed down close to the subbase. In doing this the contact may have been moved.

To correct this condition simply raise the wiring end of the contact with a screwdriver and this will realign the contact.

The location of the condensers has been changed in recent production to eliminate all possibility of the contact being moved.

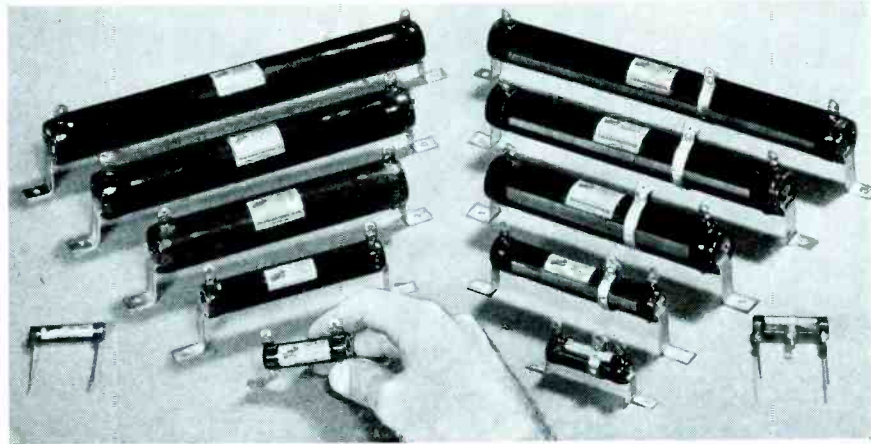
Coupling the push-button tuning shaft: When the push-button tuning flexible shaft is coupled to the rubber coupling in the receiver and the cap on the flexible shaft casing is seated, quite a bit of pressure is exerted on the switch and there is quite a bit of friction set up between the shaft and the casing. Then, when the dial tuning indexing mechanism is released and the push-button is operated, the drag on the shaft will cause a lag on the first rotation of the shaft and the switch contacts will not line up properly.

Before the cap on the shaft casing is seated, push the spline on the flexible shaft deeper into the rubber coupling, using a small screwdriver and then seat the casing. This frees the flexible shaft and eases the pressure on the wafer switch. The push-button operation will be much easier and there will be no lag.

Clamps for the flexible shaft: Fasten the two clamps supplied with the receiver over

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You get the benefit, with the Utah wire wound resistors, of more than a decade of experience in the development of resistance units—starting with the first 10- and 20-Watt types made by the Carter Radio Company and followed by years of competent engineering which has kept abreast of all industry developments.

Double protection is provided by the two, separately fired coats of porcelain enamel applied by the wet process. The hard, glassy enamel adheres permanently to the porcelain tube core, resistance wire and terminals. Dangers of corrosion from salt spray, moisture, acids and alkalis are avoided. The added strength eliminates the possibility of sharp tools piercing the coating. Utah terminals cannot tear loose, bending of soldering lugs will not break the

wire. The junction of wire and terminal is silver-soldered for perfect conductivity.

Utah-Carter Vitreous Enamel Resistors are available in a full range of sizes and types, from 5 watts to 200 watts. The adjustable types have dependable accuracy of Utah fixed resistors. In the exposed area the wire is protected and securely anchored by the enamel which lies between the turns. The cadmium-plated steel adjustable terminal can be set at any desired value along the resistor and clamped in place. The wattage which may be safely dissipated at fractional settings is proportional to the effective length of the section being used. Complete information is contained in the new 36-page Utah catalog. Write for your free copy today.

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VOLUME CONTROLS—Wire-wound type, Improved Carbon Type - POTENTIOMETERS - RHEOSTATS - PLUGS - "T" and "L" PADS - LONG AND SHORT JACKS - IMPJACKS - JACK-SWITCHES - PUSH-BUTTON SWITCHES - D. C. RELAYS

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the A leads, tone control lead and flexible shafts. These clamps must be placed near the middle of the shafts. This is highly important since the least movement of the shafts after the receiver and control have been synchronized will throw them out of adjustment.

Philco RMS Service Note

PHILCO 40-195, 200

Intermittent: Intermittent troubles in a number of these models have been traced to the first i-f transformer. The suppressor winding is grounded through a threaded bushing and screw to the shield can, which in turn is grounded to the sub-base. The resistance between the bushing and the screw varies due to wax, dirt, etc., and in some cases the connection is open entirely

between the threaded bushing and the ground lug. This construction is not used in future production and in cases of intermittent trouble on Models 195 and 200, check the first i-f transformer assembly for this trouble.

Philco RMS Service Note

RCA K105

No B Band reception: The oscillator for this band can cease to operate if its trimmer touches the paper casing of the 16-mfd electrolytic (C41) in the 6SA7 screen circuit. Separation of trimmer and electrolytic restores operation.

Tunable hum: Tunable hum can result from a broken lead to the A and B primary loop.

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DRAKE SOLDERING IRON

Drake Electric Works, Inc., 3656 Lincoln Ave., Chicago, have introduced a new industrial soldering iron that utilizes an element which can be replaced in 30 seconds, it is said. Five different sizes are avail-



able with various tip sizes. Additional information may be obtained directly from Drake.

SPRAGUE VERTICAL MOUNT CONDENSERS

Sprague Products Co., N. Adams, Mass., have introduced a line of Atom-type dry electrolytics known as type LM. These condensers are provided with feet for ver-

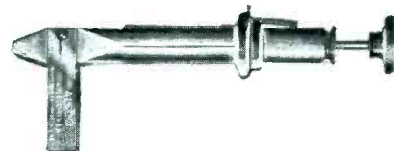


tical mounting soldered directly to the chassis or for bending through chassis holes.

LMs are available in nine types in a selection of voltages and single and dual capacities.

WALSCO STAPLE DRIVER

Walter L. Schott Co., 5264 W. Pico Blvd., Los Angeles, Cal., have introduced their Walsco staple driver for use in stapling wires. It staples in corners, behind



pipes, into moldings and other places not easily accessible with an ordinary hammer, it is said.

STANCOR PACKS

Standard Transformer Corp., 1500 N. Halsted St., Chicago, have introduced a series of packs for the operation of 1.4,



2 and 6 volt sets from the a-c power lines. A telephone pack and an electric train pack are also a part of the series. Filtered d-c is available at the rated voltages and sev-



eral models are featured with different current ranges. A catalog describing the packs is available directly from the manufacturer.



WEBBER TUBE TESTER

The Earl Webber Model 200MM tube tester features a 4½-inch square type meter and has an illuminated roll chart. The tube reading shows the effect of mutual conductance, power output and emission on the same scale. A descriptive and illustrative bulletin on this and other Earl Webber test equipment for the Service Man is available from Earl Webber Co., 4348 W. Roosevelt Rd., Chicago.

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A genuine Phillips Screwdriver with an XCELITE . . . all in *one* unit.

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XCELITE products save time and labor. If your parts jobber cannot supply you, write for catalog and prices.

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So! that's why RADIART VIBRATORS

are Guaranteed
1 YEAR



THE RADIART CORP.
CLEVELAND · OHIO

RECHARGEABLE CELL

A rechargeable flashlight battery cell of the 1 1/4 in., D size has been announced by the Ideal Commutator Dresser Co., 4035 Park Ave., Sycamore, Ill. Design is such that the unit is spill proof.

A small charger is available for operation from the 110-v, a-c lines. The average cost per charge is said to be about a tenth of a cent.

MALLORY COLOR-CODED CONDENSERS

All Mallory tubular paper condensers now bear a colored label bearing the RMA code. A bottom band of color properly



coded to RMA standards gives the voltage rating as well.

The color-code band goes completely around the condenser so that it may be readily seen and the voltage identified no matter how the condenser is placed in the set. Construction remains unchanged; the labels are merely applied over the customary cardboard tube and wax coating.

Additional information may be obtained directly from P. R. Mallory & Co., Inc., Indianapolis, Ind.

BELDEN LINE FILTERS

The 8100 power-line filter, announced by Belden Manufacturing Co., 4689 W. Van Buren St., Chicago, contains 2 dual-condenser sections and 2 dual-choke coils. Ground is provided by a 3-wire power



cord. The unit has a rating of 3 amp, 115 v.

A standard power line filter, 8105, is also available. It has a dual high-capacity, low-inductance condenser section and is otherwise similar to the 8100.

CERAMIC TRIMMER CAPACITOR

The fixed plate of the Centralab ceramic trimmer is bonded to the ceramic base, eliminating the usual variable air film. The



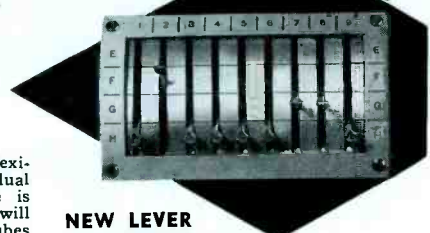
variable plate rotates on a ground ceramic surface. The unit is said to be equally stable for all settings. Provides negative temperature compensation of 0.0006 mmfd/mmfd/°C. Power factor less than 0.1%. Capacity change with humidity or temperature cycling less than 0.5%.

Additional information may be obtained directly from Centralab, Milwaukee, Wis.



TRIPLET

MODEL 1183



NEW LEVER SWITCHING

Combining simplicity of operation with absolute flexibility, Triplet's new lever switching permits individual control for each tube element—yet test procedure is simple and quick. The switch setting shown above will permit tests of 45 commonly used different type tubes without change of position of the levers. Many tubes require only two lever switch settings—more than half, only three settings.

Model 1183 is truly a Non-Obsolescent Tube Tester, combined with a Volt-Ohm-Milliammeter and Free Point Tester . . . three fundamental testers that you can use for many years. Volt-Ohm-Milliammeter Ranges: 0-10-50-250-500-1000 AC and DC Volts; DC at 10,000 Ohms per volt; AC at 2,000 ohms per Volt. DC Milliampers 0-1-10-50-250; Resistance 0-500 Low Ohms; 0-15,000 Ohms; 0-1.5 and 0-15 Megohms. Complete Free Point Tester with sockets for all tubes, including new Midgets. Tube tester has new lever type switch, Speedex Roll Chart, removable from panel as separate unit. . . . Dealer Net Price . . . \$49.84.

MODEL 1182—Tube Tester—
Same as Model 1183 but has no Volt-Ohm-Milliammeter or Free Point Tester.
Dealer Net . . . \$34.84

MODEL 1184 — Volt-Ohm-Milliammeter and Tube Tester.
Same as Model 1183 but has no Free Point Tester.
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PORTABLE TUBE TESTER

This is a portable tube tester, lever-switch operated. Four "quick change" non-obsolete features, including RED DOT Lifetime Guaranteed Instrument, Speed Roll Chart, New socket panel and Switching Section. . . . Each can be replaced should unanticipated changes make it necessary. . . . Dealer Net Price, in carrying case, \$39.84



MODEL 1621

WIDE RANGE APPLIANCE TESTER

Five Wattmeter Scale Ranges to 4000 Watts . . . Four Alternating Current Scale Ranges to 25 Amperes . . . Two AC Voltage Scale Ranges . . . 130 and 260. Model 1270 is an advanced electrical circuit analyzer that shows the wattage consumption, amperes and line voltage of ALL household appliances including electric ranges under actual operating conditions. Dealer Net . . . \$29.83.



MODEL 1270

Write for Catalog on complete line of test equipment. Triplet also manufactures electrical measuring instruments in more than 25 case styles. Section 179 College Avenue.

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Bluffton, Ohio



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Owensboro, Kentucky

KEN-RAD
DEPENDABLE RADIO TUBES

ASSOCIATIONS

Sales Manager's Club

The Sales Manager's Club, Eastern Division, and the RMA Eastern Credit Committee held their annual golf tournament and outing at the Green Meadows Club, Harrison, N. Y., July 25, 1940.

Business meetings by each group were held at 10:30 a.m. until noon. After luncheon was served a round of golf was enjoyed. Prizes were presented in the evening after dinner.

Walter Jablon

Cleveland RSA

The Seventh Annual Radio Industry Picnic sponsored by the Cleveland Chapter, RSA was held at Wiegands Lake, Sunday, Aug. 25, with all local branches of the radio industry participating. The usual picnic routine, swimming, dancing, games for young and old, refreshments galore and ball games between several local distributors teams and the RSA Gang was the order of the day and evening.

L. Vangunten

Westchester, RSA

The Westchester Chapter of the RSA held a very successful clambake, in Port Chester, N. Y., on August 25. Robert Jones headed the clambake committee, and was assisted by Phil Brigante, Ed. Donaldson, Joe Hanasik, and Arthur Hinkelbein. Bob really went to town as a cook, the sauce he made had the ladies begging for the recipe. Plenty of clams, chicken, fish, corn, watermelon, etc., not to mention that amber colored fluid that comes out of a keg.

Jack Livingstone, chapter president, was the only casualty of the day. Jack apparently was the victim of mass production, he attended in a sky blue summer ensemble

which his very generously padded bulk strained to the utmost. While playing baseball he stooped for a grounder, and we discovered that he is addicted to lavender shorts. A butcher's apron borrowed from one of the committee, and put on backwards, enabled him to continue in the game. We'll long remember Jack pounding around the bases, with a canopy floating in the breeze behind him.

Henry Lutters

Local Union B1085, N. Y.

Meetings of Local Union B1085 of the IBEW, A F of L, are held the first Wednesday in each month, at the Hotel Abbey, 149 W. 51 St., New York City at 8 p.m. All officers and members are connected with the radio industry. Membership is open to any radio service or sound man. Dues and fees are nominal.

Interested Service Men can obtain further information from Jerry Newman, business manager, 4155-53 St., Woodside, L. I.

Jerry Newman

Spokane Get-Together

The Spokane Radio Co., Spokane, Wash., recently completed a 3-day convention at its Spokane headquarters. It was a get together for the entire organization. The meetings were devoted to sales and technical discussions pertaining to the various products distributed by the company.

Among those in attendance from outside the organization were Earl Dietrich, Chicago general sales manager of Raytheon; R. C. James, Jr., factor representative for a number of lines handled by the company, and Don Burcham, Portland, Oregon, Raytheon's northwestern representative.

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Catalogs & Bulletins

One of the best methods of keeping up to the very minute in this rapidly changing industry is through the pages of latest catalogs from the various manufacturers. Write for them now.

• • • • General catalog with 212 pages illustrating and describing receivers, public-address equipment, test equipment, parts, tools and books for amateur, Service Man and experimenter. Write to Allied Radio Corp., 833 W. Jackson Blvd., Chicago.

• • • • Numerous bulletins covering American dynamic and crystal microphones. No. 36 describes Models VR2 and D9 dynamic microphones; No. 37, the RC crystal and the D5T, 6T, 7T, 8T and D9T dynamics. The American Microphone Co., Inc., 1915 S. Western Ave., Los Angeles, Cal.

• • • • Pocket size brochure on Federal recording radios. 12 models illustrated, in portable, table and console types. Federal Recorder Co., Inc., 50 W. 57th St., New York City.

• • • • Hickok's Catalog No. 120 is a 12-page booklet which illustrates and describes their latest test equipment for the Service Man. As a special feature, the catalog describes the Hickok Model 60 Show Lab Illuminated Service Panel. Lab is complete service laboratory mounted on attractive modernistic panel. Copies may be obtained from Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio.

• • • • 42-page general catalog of parts, tools and accessories for Service Man, amateur, and experimenter. Copies may be obtained from Insuline Corp. of America, 30-30 Northern Blvd., Long Island City, N. Y.

• • • • Lafayette's 20th Anniversary catalog (No. 82) contains 196 pages which illustrates (in full color) and describes receivers, public address equipment, tubes, test equipment, parts, tools, books, etc., for the Service Man, amateur and experimenter. Copies may be obtained from Lafayette Radio Corp., 100 Sixth Ave., New York City.

• • • • 12 pages of instrument talk "behind the scenes" of Precision test equipment is available from Precision Apparatus Co., 647 Kent Ave., Brooklyn, N. Y.

• • • • An up-to-the-minute, 12-page vibrator guide is available from Meissner Mfg. Co., Mt. Carmel, Ill. Handy, easy to read chart, lists operating voltage, shape, circuit, dimensions and list price of each type, is a special feature of the guide.

• • • • A 4-page supplementary bulletin from Radio City Products Corp., 88 Park Place, New York City, covers new pieces of test equipment which have been added to the RCP line.

• • • • A 4-page folder illustrating and describing Rek-O-Kut Professional recorder components. Motor assemblies, feed screw mechanisms, monitor meters and matching transformers are shown. Copies from Rek-O-Kut Corp., 173 Lafayette St., New York City.

• • • • Information on refinishing kits and materials, radio cements, lacquers and paints can be found in 8-page Walsco catalog obtainable from Walter L. Schott Co., 5264 W. Pico Blvd., Los Angeles, Cal. Walsco

staple driver is also illustrated and described in the catalog.

• • • • 4-page circular describes, in full detail, features of Solar Model CE Capacitor Exam-eter is available from Solar Mfg. Corp., Bayonne, N. J. The Exam-eter is an instrument for quick check tests on condensers of all types. The functions of a capacity and resistance bridge are also included together with those of a vtvm.

• • • • Solar's bulletin AC is 6-page replacement guide of a-c motor starting capacitors. Copies available from Solar Mfg. Corp., Bayonne, N. J.

• • • • Sprague Products Co., N. Adams, Mass., have issued their latest catalog of condenser and allied items. The Sprague Interference Locator and Sprague Tel-Ohmike condenser tester are also described and illustrated.

• • • • Complete transformer catalog or 24 pages that lists the numerous chokes, transformers and power packs that comprise the Stancor line. Copies available from Standard Transformer Corp., 1500 N. Halsted St., Chicago.

• • • • Stancor's Service Guide is a compilation of replacement transformers and chokes for hundreds of receivers together with condensed catalog of Stancor products. Readers of SERVICE may obtain free copies from Standard Transformer Corp., 1500 N. Halsted St., Chicago.

• • • • "Packs" is an 8-page, 2-color bulletin illustrating and describing some 16 different types of power packs. Copies from Standard Transformer Corp., 1500 N. Halsted St., Chicago.

• • • • The "Red Book of Instrument Value" is an 8-page, 2-color bulletin from Earl Webber Co., 4348 W. Roosevelt Rd., Chicago, which describes their 1941 line of test instruments for the Service Man.

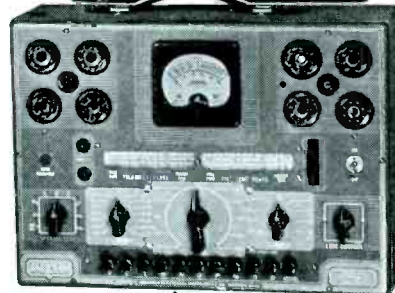
RADIOSONDE TECHNICIANS SOUGHT

In connection with the National Defense Program the United States Civil Service Commission has announced an examination to secure radiosonde technicians for Government Service. The salary of the position is \$2,000 a year, less a retirement deduction of 3½ percent.

Persons appointed will have responsibility for the installation, inspection and maintenance of radiosonde ground equipment at new stations in Alaska, the continental United States, and the Caribbean area. Applicants will be rated on their experience as shown in their applications, and on corroborative evidence. While experience in the installation, maintenance and repair of radio equipment forms the greater part of the requirement, applicants must have had at least six months of experience in the installation, maintenance and repair of radiosonde ground receiving and recording equipment. It is anticipated that it may be difficult to secure sufficient qualified eligibles because of this specialized requirement and the fact that this field of activity is new. The Commission will, therefore, rate applications as they are received at the Washington office until further notice. Applicants must not have passed their sixtieth birthday.

Further information regarding the examination is contained in the formal announcement, which with the proper application forms may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

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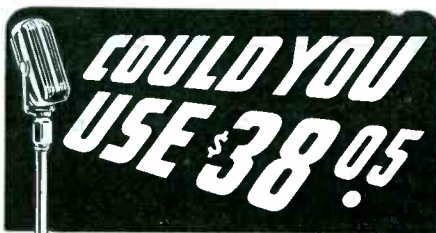
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Index to Advertisers

	Page
A	
Aerovox Corp.	28
Allied Radio Corp.	24
Amperite Co.	36
Astatic Microphone Lab., Inc.	27
C	
Centralab	4
Cinaudograph Speakers	18
H	
Hygrade Sylvania Corp.	24
J	
Jackson Electrical Instrument Co., The	35
Jensen Radio Mfg. Co.	1
K	
Ken-Rad Tube & Lamp Corp.	34
L	
Lafayette Radio Corp.	36
M	
Mallory & Co., P. R., Inside Front Cover	
Meissner Mfg. Co.	25
Micamold Radio Corp.	36
N	
National Union Radio Corp.	13
O	
Ohmite Mfg. Co.	32
P	
Park Metalware Co., Inc.	32
Precision Apparatus Co.	17
R	
RCA Mfg. Co., Inc.	29, Back Cover
Radiart Corp., The	32
Radio Amateur Call Book, Inc.	36
Radio City Products Co., Inc.	36
Inside Front Cover	
Radio Servicemen of America, Inc.	30
Readrite Meter Works.	22
Rider Publisher, Inc., John F.	23
S	
Simpson Electric Co.	20
Schott Co., Walter L.	28
Solar Mfg. Co.	34
Sprague Products Co.	26
T	
Transformer Corporation of America	22
Triplet Elec. Inst. Co., The.	33
U	
Utah Radio Products Co.	31
W	
Weston Electrical Instrument Corp.	3
Wilcox-Gay Corp.	33
Y	
Yaxley Mfg. Division.	Second Cover

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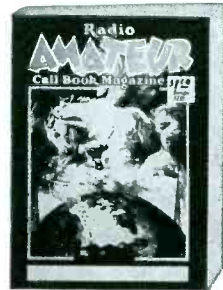


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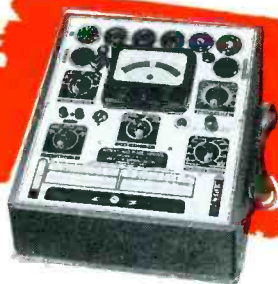
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All quality from its rotary selector switches (speeding operation) to the heavily silverplated contacts (for low loss). Completely modern in circuit design, operation and efficiency. Has newest "Rolindex" brass-gear, mechanically-operated, roll-type tube charts. Insures smooth, positive, speedy operation. Tests every type of tube. Separate tests for noise, hum, intermittents and bad connections. Spare socket for future tube developments. Hot interelement short and leakage tests between all individual elements. Hot cathode leakage tests. Continuously variable adjustment for operation at any line voltage from 105 to 135 volts. Line voltage directly indicated on D'Arsonval meter—far more accurate and reliable. Net price

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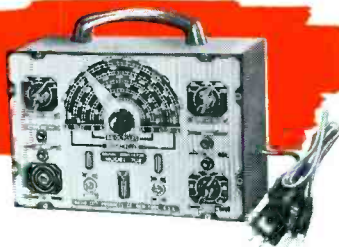
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Dependable RCP Model 411 SUPERTESTER

Most comprehensive compact tester ever devised. Provides accurate measurements in ranges never before available in small instruments. 5 AC and 5 DC ranges 0/10/100/250/1000/5000 volts. Six AC and DC ampere ranges to 25 amps. 4 ohmmeter ranges reading from 0.05 ohms to 4 megohms. DC milliamps 0/10/100. DC microamps from 0 to 200. AC milliamps 0-300. 33 individual instruments in one! Net price

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Test Equipment

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