

January

1941

Radio

SERVICE DEALER

This Month

F-M AERIAL SYSTEMS

PROFITS IN MIDGETS

MIKES AND PICKUPS

DIRECT MAIL HELPS

HOME RECORDER DOPE



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Not only is the RCA Junior VoltOhmyst one of the handiest, most versatile and amazingly efficient instruments on the market today... Not only does it pave the way for faster, more accurate resistance and both a-c and d-c voltage readings... Equally important, special protective features remove much of the danger of a costly meter burnout should you grab hold of more voltage than you had expected or accidentally check a "hot" resistor. Extremely rugged meter construction also guards against mechanical damage. This means that, besides giving you more for your money in the first place, this sensational little instrument *protects your investment*. What's more, the Junior VoltOhmyst will quickly pay for itself in the time it saves on a wide variety of jobs.

A LONG-TIME INVESTMENT IN BETTER, FASTER WORK

The RCA Junior VoltOhmyst is a "junior" in price alone. In actual use it is an instrument that does a man's-size job *plus*. Costing only a little more than you'd pay for an ordinary volt-ohmmeter, it gives you Electronic Push-Pull operation with all the time- and trouble-saving features of the famous Rider VoltOhmyst circuits and with the addition of an isolated A-C Rectifier-type Voltmeter with 1000 ohms per volt sensitivity.

It measures d-c voltages with constant meter impedance of 11,000,000 ohms on all ranges. *This means a sensitivity up to 3,666,666 ohms per volt!* Yet it is extremely stable! It will not disrupt operation of sensitive circuits.

It has six full scale voltage ranges from 3 to 1000 volts and measures resistances from 0.1 to 1,000,000,000 ohms! It eliminates time-taking shorting of leads and zero re-settings when changing ohmmeter scales. One wide-spread ohms scale assures extreme accuracy and easy readability. In brief, the RCA Junior VoltOhmyst provides you with a quick, accurate and easy-to-use means of checking every conceivable A.V.C., A.F.C., FM discriminator circuit, or Oscillator Grid Voltage; *with the signal present*, checking bias cells or insulation resistance, obtaining practically any needed resistance and d-c voltage reading... as well as handling any a-c voltage checking job that might pop up in your work—at an absolute minimum price.

See it at your nearest RCA distributors—or write for bulletin. It is an instrument that no wide-awake technician can afford to miss! Sooner or later, why not now?

RCA Junior
VOLT OHMYST

\$34.95

Net Price Complete, Stock No. 165

SOMETHING TO REMEMBER WHEN YOU BUY TEST EQUIPMENT

Although moderately priced, RCA Test Equipment is not built down "to a price." Instead, it is built up to a standard of efficiency—the highest in the field today. It is designed in the firm belief that the "cheapest" equipment any service technician can buy is the equipment which is quickest to pay for itself in the time it saves him, plus the extra jobs it permits him to handle. Moreover, RCA Test Equipment is built around the famous and pioneer Rider "Signal Tracing" system which replaces old-style, hit-or-miss service methods with a quick, systematic course of procedure. "Signal Tracing" has proved its tremendous value, not only to leading technicians, but to leading laboratories and manufacturing plants as well. It is your safest, surest road to faster, more accurate work with consequent greater profits—and the RCA-Rider Chanalyst, that originally made this system possible, is your "Open Sesame!" to its many benefits.

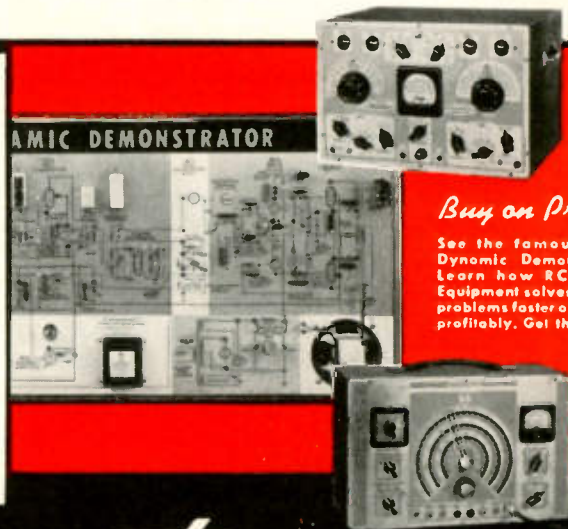
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Radio

SERVICE-DEALER

SOUNDMAN AND JOBBER

Reg. U. S. Pat. Off.

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Cover Photo



★ Inside shot of the Mansfield Radio Service, Brooklyn, N. Y., shown on front cover; owned and operated by Nelson Nyborg (left) and Rolf Hardenberg. Note RSD Certification Seal on door, just below the store number. Is your Seal up yet?

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VOL. 2 No. 1 ★ JANUARY, 1941

**PHEW! AIN'T
IT AWFUL?**



... a true but sad story:

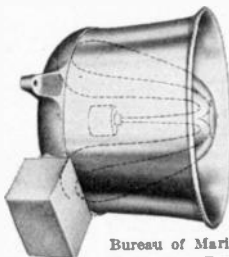
Recently a radio dealer in a small mid-western city learned that the local church contemplated buying a sound installation for about \$300. He said he could do the job for that sum, quickly bought a fine, powerful amplifier and several good mikes, investing \$135. Then, to keep his costs down he bought six speakers for \$48 and completed the installation. "How do you like it!" he asked the Committee. To a man they replied, "Phew, ain't it awful!"

To protect his investment the puzzled dealer consulted a nearby Racon distributor who discovered quickly that the six cheap speakers simply "couldn't take it", despite their sleek appearance and power ratings. When four Racon Speakers costing only \$84 were substituted the committee praised the installation and voted to pay \$25 more than the original quotation specified.

Be guided by that case. Remember that usually fewer Racon Speakers will provide much greater sound distribution, finer tonal quality and peak efficiency. Experience proves that sound installations employing Racon Products bring higher prices, greater profits and more satisfaction to everyone concerned.

RACON—the oldest, largest and foremost manufacturer of air-column speakers in the world produces speaker and horn units of all types for every kind of sound installation. It is the only complete line made. Ask your jobber for a new catalog or write direct to the main office in New York.

MARINE HORN SPEAKERS



Re-entrant type speakers using horn type units for marine and general P-A applications — may be used as loud-speaker or as a microphone. Miniature and regular sizes approved by the

Bureau of Marine Inspection and Navigation, Department of Commerce, for marine work. In all sizes, miniature, midget, regular and bull, handling from 5 to 50 watts.



**Super
Giant
P. M.
Horn Unit**

Operating capacity 12-15 watts. Other P.M. units available, from "baby unit" of 5 watts to "bull unit" with an operating capacity of 50 watts. Efficiencies of the highest order obtainable with the finest magnetic material and steel utilized.



PAGING HORN

A small, extremely efficient 2-foot trumpet speaker, for use where highly concentrated sound is required to override high noise levels, such as in factories, outdoors, etc. Uses a small, very efficient Permanent Magnet unit. Particularly adaptable for paging systems, hotel lobbies, trucks, etc.

**Re-Entrant
Trumpets**



A compact trumpet of the double re-entrant type. Occupies but a small space, nevertheless has a long air column enabling it to deliver highly concentrated sound of the greatest efficiency over long distances. Base and inside cone arm made of aluminum castings, outside bell of heavy gauge aluminum spinning, center section of RACON ACOUSTIC material to prevent resonant effects. Available in 6", 4½", 3½", and 3' air column units.

RACON ELECTRIC CO. 52 EAST 19th ST. NEW YORK, N. Y.

Transients

NEW YEAR . . . This is the time for each man to take stock of himself and his business. Here are some pointers well worth consideration:

Make your place of business attractive. Having it neat and tidy is not enough—dress it up so it will catch the eye. Your wife or your girl friend will tell you how important that is.

Keep track of your business. If you can't keep books or dislike that phase of your profession, hire a local book-keeper or accountant to keep track of your business for you. It will cost mighty little and save you a lot of headaches.

Get out more, or hire someone to make the rounds for you. In this day and age, a better mouse trap is no guarantee that people will beat a path to your door. If you want the business, you'll have to scratch for it. Reverse the time-honored proverb and beat a path to your customer's door.

Advertise yourself and your business. Advertising always did pay and always will pay. You will have to determine for yourself which type pans out the best in your own locality: Make some test mailings, try space in the local newspaper, and give door-to-door campaigning a fling. Check results closely so you can decide what type of advertising to use in the future.

Expand your business, but don't make the mistake of going overboard on this. Over-expansion is worse than no expansion at all. But, if you don't carry a line of midget receivers, start in now. Get into local p-a work, go in for improvement of expensive but out-of-date phonoradio jobs. Take a crack at electronic servicing if your locality is an industrial center. Look around you and determine what opportunities exist, then make the most of them.

Give thought to your servicing equipment. Is there any one unit that is slowing up your work? If so, replace it. Time saved is money earned.

Take a long-range view of things. Play square with yourself and your customers now as a means of insuring your business future.

★

PART-TIMERS . . . In this modern Babel, words and phrases seem no longer to convey their proper meanings. We

have, for instance, heard a great deal of "the American Way", and the meaning should be clear, but some of the definitions put forth are absolutely fantastic.

On the occasions we have referred to part-timers in the radio servicing field, we took it for granted that no exact definition was required. We were sadly mistaken.

It seems that far too many electrical supply houses, music dealers, etc., who maintain perfectly legitimate radio service departments have arrived at the conclusion that our accusing finger is pointed at them. Moreover, many new-comers, supported by completed radio courses and anxious to make their way in this business, feel that the policy of this publication is detrimental to their interests.

All of which is cockeyed. When we speak of part-timers, we are referring to men who are otherwise engaged, dabble in servicing for no other purpose than to make a few extra dollars, have no intention of entering the profession and as a consequence do not subscribe to the ethics by which the full-time man makes his way upward. In other words, the part-timer is the man who does not have an established radio servicing business and never intends to have one. Broadly and figuratively speaking, he is a man without a Union Card—a gate crasher.

As for students, there is no more justification for their entering into servicing work previous to graduation than there is for the student dentist or barber to ply his trade before he has completed his training.

Though the idea of untrained men serving apprenticeships no longer seems to be in favor in many trades, we believe that it would be a good thing for the radio student. It is an ideal way of gaining practical experience—and possibly a partnership in some well-established radio service organization. In any event, the student should not crash the gate. He should enter the field with the equivalent of what the commercial radio operator calls a "ticket".

★

1941 PARTS JOBBING . . . We take pleasure in publishing a highly important statement made by *Charles Golenpaul* of the Aerovox Corporation, since it highlights a responsibility the parts jobber

must assume for the sake of the national defense program. The statement follows:

"Shortage—that will be the greatest problem facing the radio parts trade in 1941, if I read all signs correctly. This will be a new and puzzling situation for most jobbers who have come into this field during the past decade or so, but it will simply be history repeating itself for those recalling the good old days when parts were scarce and prices were based on take-it-or-leave-it selling.

"A year ago I warned jobbers not to overstock. It was too early in our re-armament activities to worry about over-taxed production facilities. And the past twelve months showed no signs of a shortage. But now the picture is different. Many radio parts plants are already loaded up with Government orders. Still more orders can be anticipated as our nation prepares to back the British to the very limit in their fight on our first line of defense.

"Already jobbers, here and there, are reporting shortages and delays. Certain large jobbers are buying a three-months' supply at a time, instead of the former thirty-days supply. Of course there is also the price-increasing possibility, but that seems secondary at the moment. The main thought is an adequate stock on hand. Here at the Aerovox plant, we still maintain a huge jobber stock for prompt and complete shipments. However, in the face of increasing Government business, which must receive priority, our jobber stock may dwindle. Therefore, I say again, increase your orders and stock!"

Reading between the lines of the above statement, it is evident that manufacturers may soon arrive at the point where they can no longer handle the small-orders-by-telegram which has been a jobber's privilege in the past. The press of Government business will leave the manufacturer no alternative but to discontinue this practice until such time as conditions again warrant its resumption. It will be up to the jobber to assume this much of the burden by maintaining a satisfactory inventory.

★

CABINETRY . . . What started it we do not know, but there is now, at long
(Turn to page 28)



HERE'S A BIG SAVING

for Any Serviceman Who Makes Frequent Volume Control Replacements

WHAT IS IT?

This IRC Master Radiotrician's Control Kit, factory packed with 18 Type D Universal Controls, 6 switches and 5 extra shafts of special design (1) Enables you to give better, faster service; (2) Saves time and cost by eliminating frequent need for ordering special controls; (3) Avoids frequent trips to your jobber; and (4) Helps systematize your shop by supplying a good-looking container that enables you to tell at a glance just what controls should be re-ordered. *You can actually meet from 60% to 75% of your replacement needs with this Kit!*

CAN I AFFORD IT?

No serviceman who uses controls frequently can afford to be without it. You pay only the standard net price of the controls, switches and shafts. The All-Metal Cabinet (worth \$2.50) is included free.

DOES IT CONTAIN THE CONTROLS I NEED?

The carefully selected control assortment is based on a nation-wide survey of servicemen's needs. It includes only popular controls, widely universal in application, thanks to the Tap-in Shafts. If you find by experience, however, that, due to some local predominance of certain sets, you would prefer any other IRC Type D Universal Controls, your jobber will gladly make the exchange *at any time.*

HOW WILL I KNOW WHAT CONTROLS TO USE?

Included free with your Cabinet is the latest IRC Volume Control Guide. This indicates exactly what controls to use for practically all sets you may be called upon to repair.

WHAT ABOUT OBSOLESCENCE?

The only things that *could* become obsolete are the shafts and, as fast as new shaft styles are required, IRC will have them—of Tap-in design and constructed for use with the Type D Controls contained in your cabinet.

ARE "MIDGET" CONTROLS ANY GOOD?

Don't call IRC Type D Universal Controls "Midgets"! Actually, they are small-size replicas of the larger IRC Type CS Controls—the only small controls that are exact mechanical reproductions of a manufacturer's larger controls. You can use them satisfactorily wherever Type CS or old-style larger controls have been used in the past.



WHAT ABOUT TAP-IN SHAFTS?

IRC Tap-in Shafts make controls easier to install in a crowded chassis by obviating the necessity for removing other parts. They won't pull or vibrate loose. A variety of special shafts enables you to make the 18 Controls handle an amazing variety of jobs, standard and special.

WHY HURRY?

Well, why postpone getting your Cabinet and starting to collect dividends on a good-paying investment? And don't forget the re-allocation of broadcast station wave lengths! Countless customers will want you to re-adjust their push-button tuning. Carry your IRC Control Cabinet on these jobs. You'll be surprised how many control replacement jobs you can also sell—and do the work right then and there!

WHAT'S THE BAD NEWS?

There is none! Your total investment is only \$14.97 net (List, \$24.95). This equips you for the big majority of control replacements—and you get the \$2.50 Cabinet free. Many IRC jobbers are glad to extend easy terms and otherwise cooperate in making your IRC Control Kit actually pay for itself in the time, money and effort it saves during the first few months you own it!

See it at your IRC jobber's today, or write to us for folder.

INTERNATIONAL RESISTANCE COMPANY
401 North Broad St., Philadelphia, Pa.

TYPE D UNIVERSAL VOLUME CONTROLS

WITH TAP-IN SHAFTS

FREQUENCY-MODULATION ANTENNA INSTALLATIONS

By G. S. GRANGER

WITH the commercialization of frequency-modulation broadcasting, we may anticipate an increased activity in this field. Sales of f-m receivers will move upward and the serviceman will be in line for the special antenna installations usually required for satisfactory f-m reception.

Though, on the whole, the same reasoning applies to f-m antennas as to a-m antennas, there are some exceptions, and the serviceman will escape a lot of headaches if he keeps these differences in mind.

Contrary to much that has been said, it is not necessary to exercise the same precautions in the installation of an f-m antenna in a noisy location that would necessarily apply were the installation for a-m reception—all other factors being equal. The logic is simple:

In an a-m installation in a noisy location, we know that unless the antenna is erected outside of the noise field, or signal level is of sufficient amplitude to induce optimum AVC action or over-ride the noise level, then man-made interference will result; the degree of the interference depending upon the relative amplitudes of the signal and noise. As a result of this, a good antenna installation is required; first, to reduce noise pickup and, second, to increase signal pickup. This calls for a noise-reducing antenna system with the signal collector or antenna proper strung as high as practical above ground or the building on which it is erected.

NOISE IN F. M.

An f-m installation in the same locality might well offer noise-free reception with nothing more than a few feet of wire thrown out the window or strung along the moulding inside the room. The fact that the antenna may be situated in the very center of the noise field is no drawback *providing* signal level is adequate. Outside of extremely severe noise interference, reception will be noise-free so long as the signal level at the input of the limiter tube is sufficient to drive that tube to saturation. This is an important point because it indicates that even though the antenna may have poor pickup, noise-free reception can still be obtained if the gain of the receiver is high. The greater the gain, the larger the amplitude of the signal at the limiter, and it is the ratio of signal to noise at the limiter that

counts the most—not the signal-to-noise ratio at the receiver input.

In an f-m installation, then, we may count on noise-free reception irrespective of the type of antenna used and its location, providing that signal field strength, antenna pickup or receiver gain is sufficient individually or together to deliver a strong signal to the grid of the limiter tube. Beyond that we need not worry except in extreme cases.

ANTENNA CHARACTERISTICS

Conversely, though any old antenna may do for a frequency-modulation receiver, it is far from good practice to disregard the improvements that are easily obtained by giving consideration to dimensions, rigidity, impedance matching and low-loss transmission lines. Whereas an a-m antenna for the standard broadcast band is substantially aperiodic, an f-m antenna is not. It is distinctly a tuned affair and gain can be considerably increased by cutting it to the proper dimensions. Moreover, though the average dipole has an impedance of approximately 72 ohms at its center at resonance, the impedance will be considerably higher if the dipole is operated too far off frequency. This results in a mismatch and

a considerable loss in signal voltage if a 72-ohm line is used. Hence, common sense calls for some care in the design of an f-m antenna.

From the foregoing, it may be generally said that, in the name of efficiency, one should provide a good antenna system even in neighborhoods where f-m signal levels are high, but the same care need not be exercised in placing the antenna outside of the local noise field. To this end, an indoor antenna of proper dimensions may be adequate. The author has used straight and folded doublets in a first-floor apartment with good results. Rather severe local noise that raises havoc with a-m receivers cannot be heard in the f-m receiver. However, the signal level of two of the four stations within range is too low for distortionless reception. Moving the receiver and indoor antenna up two floors resulted in a considerable increase in signal level and the two stations previously unsatisfactory had sufficient level to saturate the limiter and eliminate the amplitude distortion. The use of a high outdoor doublet with low-loss transmission line gave a further improvement in signal level but did not improve the quality of the received signals. Hence, the additional gain provided by the more efficient antenna was of no practical value. Theoretically the signal-to-noise ratio was considerably improved, but the receiver was noise-free with the less elaborate antenna.

ANTENNA REQUIREMENTS

Naturally, such conditions do not prevail in all localities and a rather elaborate antenna system may be required where the receiver is some distance from the transmitter. Outside of cities, where steel buildings cause reflections, a serviceman can generally determine after making one or two installations, just how elaborate antenna systems need be in his neighborhood. A simple indoor or outdoor doublet may be satisfactory for all prevailing conditions. At distances greater than 10 or 15 miles from a 1-kw transmitter, a high and properly directed dipole will more than likely be required; at distances greater than 25 miles, a reflector may be needed to increase gain in one direction.

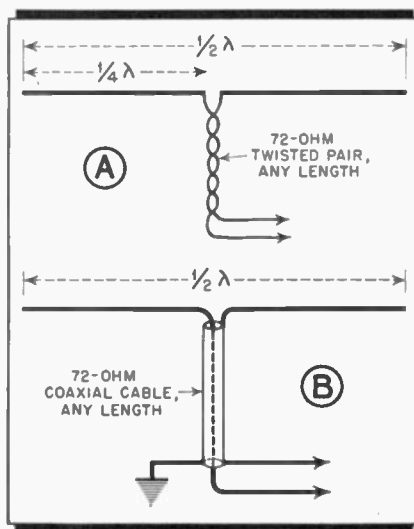


Fig. 1. (A)—Half-wave doublet with twisted-pair transmission line. (B)—Similar doublet using the more efficient coaxial cable which is particularly advantageous where a long feed line is required.

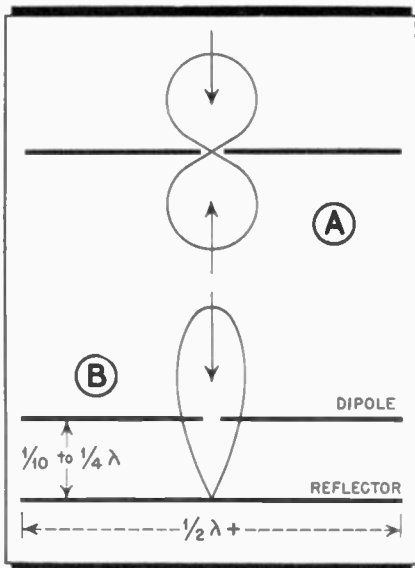


Fig. 2. (A)—A doublet is directional at right angles to its plane; hence is bi-directional. (B)—It can be made uni-directional, and its gain increased, by the addition of a reflector, as shown. Field patterns shown are merely representative of conditions.

Of the types of f-m antennas available, the simple half-wave dipole with twisted pair lead-in is both efficient and economical. As shown at A in Fig. 1, this consists of two horizontal wires of equal length with their inner ends insulated from each other and connected to a downlead composed of two twisted wires of any length.

The efficiency of this dipole or doublet is dependent upon the dimensions of the two horizontal wires for any given frequency, the insulation, the direction of the horizontal wires with respect to the direction of the desired signal, and the electrical characteristics of the twisted-pair lead-in.

Each half of the dipole should be a quarter-wave in length; that is, it should equal one-quarter of the wavelength of the signal it is desired to receive. This is easily calculated by the formula

$$L = \frac{2770}{F}$$

where

L = each half of dipole in inches
 F = frequency in megacycles

Thus, if the desired station operates on a frequency of 43.8 mc, then the length for each half of the doublet would be 5 feet 3.2 inches, or approximately 10½ feet total for the complete doublet.

In actual practice, where there is more than one station within range of the receiver, it is customary to either cut the doublet to operate in the middle of the f-m band of 40 to 50 mc, or cut it to resonate at the frequency of the weakest station. In any event, a doublet tuned to the middle of the f-m band is broad enough for all general purposes, and the degree of off-frequency impedance mismatch is small.

DIRECTIONAL CHARACTERISTICS

The directional characteristics of a typical dipole in free space is shown at A in Fig. 2. The arrows indicate the directions from which the signals arrive when the antenna is strung in the direction for maximum gain. This bi-directional characteristic of the doublet is advantageous in cases where signals of different strength arrive from different but not opposite directions, for the doublet may be turned so as to favor the weakest of the two. It may prove to be a disadvantage if the signals are close in frequency and arrive from opposite directions, as there is some possibility of the stronger of the two taking over the limiter action.

In such a case—or where additional signal gain is required—the doublet may be made uni-directional and have its gain in one direction considerably increased

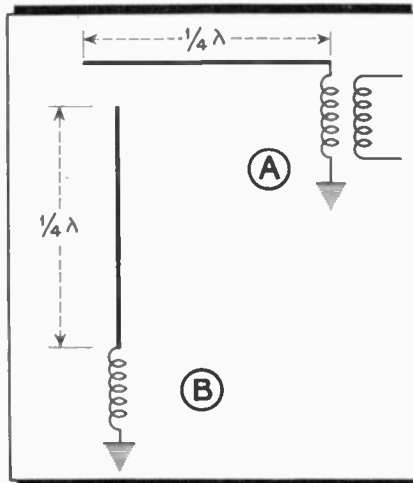


Fig. 3. Horizontal or vertical Marconi antennas may also be used with f-m receivers, with good results.

by the addition of a reflector, as shown at B in Fig. 2. The reflector is a single wire a little over a half-wave long and spaced from the doublet by about one-tenth to one-quarter wave-

length (this spacing is not critical and may be 5 feet in most cases). No connections are made to the reflector.

The length of the reflector may be computed from the formula

$$L = \frac{5760}{F}$$

Practically all f-m antennas employ a 72-ohm transmission line. The transmission efficiency of the antenna system is dependent upon the efficiency of the cable used. The cheaper twisted pair cables introduce considerable loss, particularly in wet weather, and should not be used if a long transmission line is necessary. The losses sustained may well offset the gain resulting from a high antenna.

If the transmission line is to be long, use EO-1 cable or its electrical equivalent, or a coaxial cable, as shown at B in Fig. 1. The latter introduces negligible loss and is ideal for ultra-high-frequency purposes.

Good results may also be obtained from a horizontal Marconi antenna, as shown at A in Fig. 3, or from a vertical Marconi if the desired signal is vertically-polarized (such as the signal of W2XOR in New York City). This type is shown at B in Fig. 3 and may consist of a copper or aluminum tube or rod of the proper dimensions.

INDOOR ANTENNAS

The doublet and Marconi antennas may also be used indoors, either strung out as shown in Figs. 1 and 3, or folded as shown in Fig. 4. A folded Marconi is shown at A. If the cabinet housing the receiver is large enough, this antenna can be strung around the inside or secured to the rear edges of the cabinet. Or it can be run along a moulding.

One type of folded doublet is shown at B in Fig. 4. It has the same dimensions as a regular doublet but assumes the form of a single-turn loop with open ends. Naturally, it does not have the

(Turn to page 27)

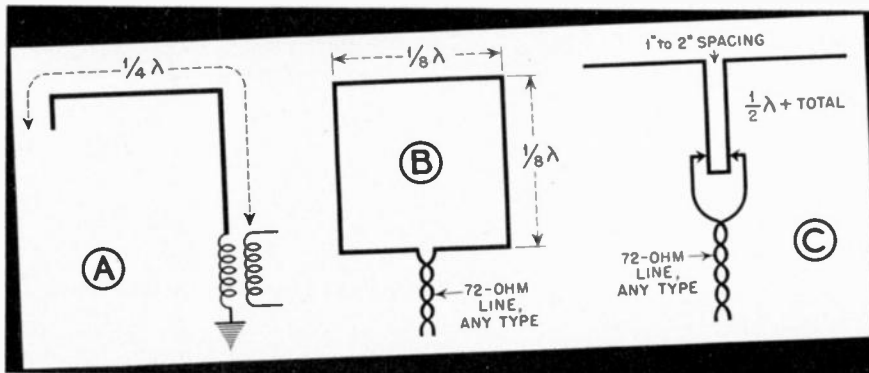
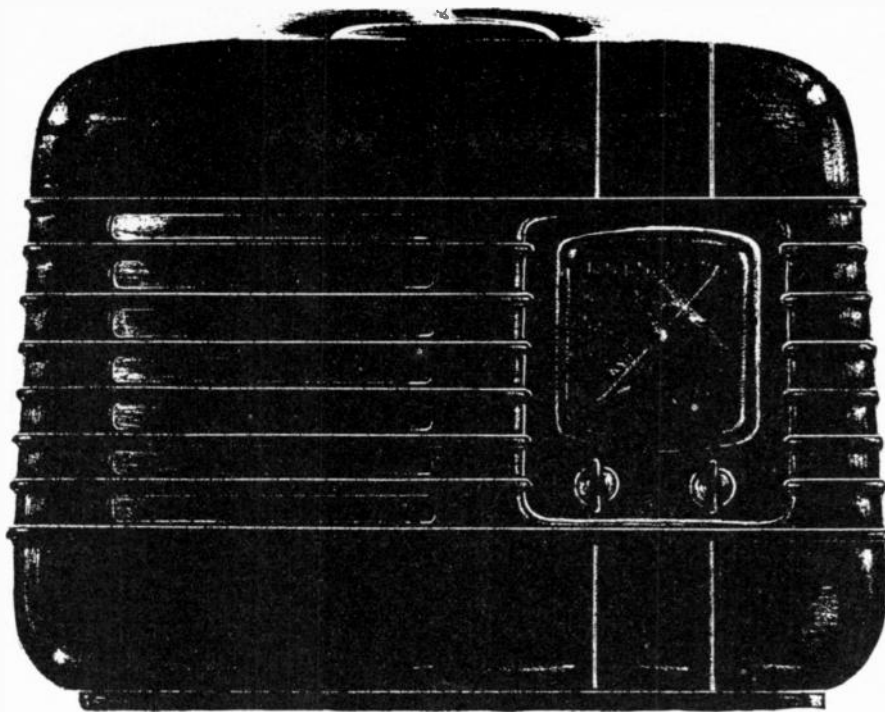


Fig. 4. Three types of folded, indoor antennas that work well with f-m sets. The folded Marconi can assume most any shape. The folded doublets, (B) and (C), are more critical, but offer some flexibility.



THE MIDGET SET SITUATION IS A DARK PROBLEM

THE CASE OF THE MIDGET

ONE day last Summer a friend of mine returned from a round of calls with nine repair jobs, and he was completely disgusted with his rotten luck. Now, half this number of jobs would ordinarily be considered a pretty good haul for a single trip during the dull season, but when each and every one of the nine jobs was an ac-dc midget of the cigar-box variety, at least five of which could not be fixed profitably at a price the customer would pay, the reason for his disgust becomes evident.

Yet, year after year the proportion of midgets to consoles sold increases, and in turn the problem of handling repairs on these midgets becomes increasingly difficult. Some servicemen and dealers try to solve the problem by ducking it, and by trying to sell the customer another set when only a minor repair is required. Others go to the other extreme by wasting endless hours on sets with obscure troubles, and on those which really are not worth fixing. But many have found ways and means of handling such sets which, if not invariably profitable, at least serve to reduce to a minimum the more usual "headaches" associated with these jobs.

SERVICE CHARGES

Let us consider some of these methods. Some have found that a charge of fifty cents to one dollar for an examination and estimate on the cost of repairs is resented by customers who bring in the set to the shop, though this charge is accepted when the examination is made in

Some Light on the Subject of Servicing and Handling Midget Receivers, and Notes on Trouble-Shooting

the home. For shop examinations, the waste of "free" estimates is often avoided by telling the customer frankly that a thorough examination often requires considerable time, and suggesting that, while the set is dismantled and the components being checked, there is a saving in having the repair made at the same time. Since, almost invariably, the customer wants to know what it's going to cost before authorizing repairs, the serviceman can establish a tentative price limit, with the understanding that if he finds that more extensive repairs are required, the customer will be notified before any repairs at all are made. Jobs undertaken on such a basis are usually handled with the understanding that there will be no charge to the customer if the examination shows the cost of repair will be greater than the original tentative estimate, and the customer decides not to have the set repaired.

QUICK TESTS

A high percentage of the sets brought in for repair will require replacement electrolytics. When a customer brings in such a set, complaining that the set hums and "motorboats", open or dried-out filters should be immediately suspected and can be quickly checked. If the set is dead, and all the tubes light, the first thing to look for, of course, is a shorted first section filter condenser. Usually a

breakdown in this section also wrecks the rectifier tube, so if the customer brings in such a set, asking, as he invariably will, that the tubes be checked, check the rectifier tube first. If it's shot, there's no use in checking the others until the filter condensers have been checked, since it would be disastrous to sell the customer a replacement rectifier tube without first making certain that it won't be wrecked as soon as it is put in the set. Yet this often happens. To avoid arguments, many servicemen also take the precaution of warning the customer who drops in with tubes, but no set, that replacing a bad rectifier tube is likely to lead to trouble unless the set is also tested.

Frequently a customer will come in, plant the set down on the show-case, and tell you he's quite sure it needs a new set of tubes because none of the tubes light. You know, of course, that such is extremely unlikely to be the case. To save time, check the tubes with an ohmmeter (just the heaters, of course). This test will locate any tube with an open heater, or will quickly eliminate the tubes as the source of the open circuit.

Most to be undesired are those repairs of ac-dc sets which operate intermittently, or sets which are low in sensitivity though the tubes check satisfactorily. In the latter case, the cause is frequently

(Turn to page 27)

Serviceman's Diary

By J. P. HOLLISTER

WEDNESDAY—When you first pick up a customer who makes a hobby of radio, you never can tell just how he's going to turn out. Sometimes you find yourself stuck with a "db slinger" who hangs around the service bench, poisoning the air with a lot of technical blah, and acts as if he were doing you a favor by talking to you. You humor him along, as we do, knowing you'll never make a dime on him, but hoping he'll put in a good word for you to prospective customers. And he does. He sends in trade. But usually they turn out to be chiselers or, worse, they have lousy "intermittents" which have already been batted around to every other shop in town.

But Archibald was different. He spent money with us. Sure, he had the same high-sounding technical prattle as the others, so we knew he must be either a brand-new "ham" or a phony, or both. Practically the only things you can ever get a real radioman to talk about are (1) blondes, (2) "hot spots" and (3) what he did after he got soused last night. Actually, Archibald had tried to become a "ham," but could never learn

to get above a speed of 5 words per minute in code, so he couldn't pass the test. So he made up for it by taking up record changers, special amplifiers and speakers as his particular hobbies. Which, with the exception of the amplifier, we sold him.

Archibald first entered my life—and our radio shop—about two months ago. He had a turntable with a lot of "wow" in it, so badly balanced that it wasn't worth working on. We persuaded him to take a Beats-All record changer and, after a couple of visits to his home, and plenty of fast talking to him and to his wife, I got the job of installing the speaker in the wall. All of which worked out very nicely for all concerned. In other words, he got results and we got paid. And we saw him no more. That is, until this morning.

When I opened the door, I found him already there, draped over the showcase and giving Jerry an earful, though it was not yet nine o'clock. Archibald is big and fat and usually jolly. But now he looked all hot and bothered.

"I've been waiting for you," he

called out as soon as he saw me. "Come along with me over to the house. I want you to do some more work on my amplifier."

"What now?" I asked. After all, I had installed inverse feedback, equalized the pickup and put in an automatic bass booster in the volume-control circuit.

"Trouble," he answered. "Plenty of it! My wife's brother is visiting us and he thinks he knows radio. Worse, my wife thinks so too. He tried to improve the amplifier and now it's got a bad hum. He claims the hum was always there but that you had spoiled the low-frequency response when you worked on the amplifier and now that he has made the low-frequency response right, the hum in the amplifier is being brought out. So he wants more filtration and will tell you how to put it in. I've got everything for you to work with. Just jump in the car and come along."

"Wait," I told him. "I don't feel dressed for a service call unless I have at least my tube checker and a set of replacement tubes. I'll get them together first." So I picked them up from stock and went out to his car with him.

On the way over he told me not to get into any arguments with his brother-in-law, a young squirt who worked in the publicity department of a broadcasting station and who therefore, according to Archie's wife, must know all about radio.

He met us at the door, looking me over rather sharply.

"You needn't have brought all that paraphernalia along," he remarked. "I shan't require much of you—merely want you to install an extra 8-mfd electrolytic filter condenser in the second section of the amplifier filter. You see, I'm sorry to say, I have had to open the negative feedback circuit which you installed; it reduced the low-frequency response of the amplifier. I have everything ready for you to work with. I could have done the job myself but I don't want to take the trouble to check over all the leads in case something should become disconnected while working on the job. I have no key to the color coding of the leads."

I felt like poking him in the jaw, but I had promised Archie not to cause any trouble.

I switched on the amplifier and listened. There was plenty of hum, much more than the amplifier had had before I put in the feedback circuit. I momentarily reconnected the feedback lead which he had disconnected and noted that it did not correct the hum, although

(Turn to page 28)



Archie's self-satisfied brother-in-law acknowledged congratulations from the family, but . . .

20 YEARS OF SERVICE

DELIVERED BY
RAYTHEONS
 IN POLICE
 COMMUNICATIONS



In Operation for 20,000 hours
 ... equivalent to 20 years of service as measured by standard tube guarantees!

That's the record of RAYTHEON Tubes in one of the receiving sets used in the Police Communications System operated by the Sheriff's Office, San Joaquin County, California.

These tubes had to withstand the jarring and jolting of highway police patrol cars driven at high speed. They had to function perfectly at all times, for the briefest breakdown in service might prove disastrous. From every standpoint, they had to be the very best that engineering genius had yet devised. That's why RAYTHEONS were chosen. And they delivered in the most gruelling service imaginable.

This unusual service is typical of the plus satisfaction RAYTHEONS are giving in all types of installations everywhere. And the reason is

that they are the product of the foremost tube engineers ... leaders in their profession who devote their time exclusively to the making of better tubes, and to the pioneering in new radio circuit fields.

Little wonder that servicemen and dealers by the thousands are making money on RAYTHEON replacements. Satisfied customers build your business for you. They tell others ... and that means more customers. Volume grows. So does profit. More profit, too, because of faster turnover on a smaller investment in stock, for you need carry only ONE line. For RAYTHEON makes them all ... and they cost no more! Your RAYTHEON Distributor has an unusual tube deal for you. See him without delay.

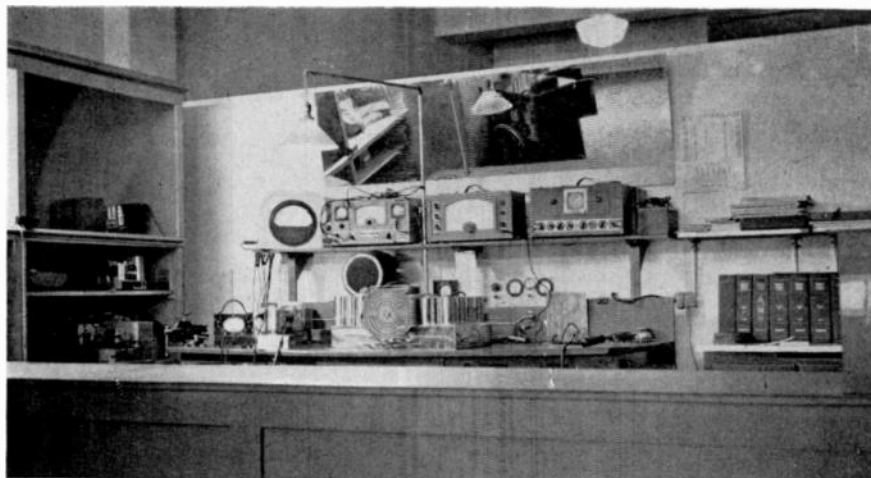
Raytheon Production Corp., Newton, Mass., New York, Chicago, San Francisco, Atlanta.



Reading from left to right: Harvey Blackwell, District Supervisor, California Highway Patrol. John E. Warmen, Radio Technician, San Joaquin County Sheriff's Office. Harvey M. O'Dell, Former Sheriff, San Joaquin County. Captain Leland S. Drais, San Joaquin County Detail.



WORLD'S LARGEST EXCLUSIVE RADIO TUBE MANUFACTURERS



Sam Tagart has his neat work bench in full view. Customers watch him work. Note "rear view" mirror on wall which spots the front of the shop.

DIRECT MAIL UPS BUSINESS



Telling testimony are these photos. Above—before Tagart went to town on direct mail. Below—after Tagart found it necessary to expand his business.

DIRECT mail has helped Sam Tagart, owner of Tagart Radio Service, 37th & W. North Ave., Milwaukee, build a very profitable service business.

In fact, direct mail helped Tagart to move from his small service shop in an old store building to a fine new modern store, because business increased rapidly. In his new location, Tagart says he gets 40 per cent more walk-in business alone.

Tagart started out with direct mail four times a year, mailing out 250 postcards on service to radio set owners, and an occasional mailing to radio dealers.

To his home-set owners Tagart got about a 10 per cent return to begin with, and on successive mailings worked up the return to 20 per cent. This year he has increased his mailings to 1200 each time and finds that a return of about 22 per cent has been secured on three mailings in 1940.

Tagart encourages people to come into his store and watch him work on the sets. There are no partitions to cut off the front of the store from the service department, and many people wander back to watch the service operations. Tagart says he has made many a regular customer out of an inquiring prospect merely by letting people watch him work.

Tagart has a spic and span modern service department. Equipment includes a modern oscillograph, test oscillator, signal analyzer, etc. He also operates a fine truck with his name, address and telephone number on it. Tagart says numerous people have called him saying they saw his truck and wanted him to do their radio service work.

Mr. Tagart is also the exclusive dealer and servicer in Milwaukee for Scott Custom-built Radios.



Set of the Month—

SILVERTONE MODEL 6491-A

THE Sears, Roebuck Silvertone Model 6491-A (Factory No. 110.410) is representative of one trend toward a receiver design offering the advantages of physical compactness plus a higher degree of performance than is available from the average ac-dc receiver. Sets of this type are certainly to be favored in ac districts.

The frequency range of this Silvertone set is 535 to 1700 kc. The power consumption is 50 watts. A 6½" permanent-magnet dynamic speaker is employed, and the output of the receiver is 2.5 watts undistorted, 3.75 watts maximum—more than ample for a set of this size. Though essentially loop-operated, external antenna and ground connections are provided.

THE CIRCUIT

With respect to the latter, it should be noted from the schematic that external pickup coupling to the loop con-

sists of a single turn, in series with which is an antenna loading coil, L2.

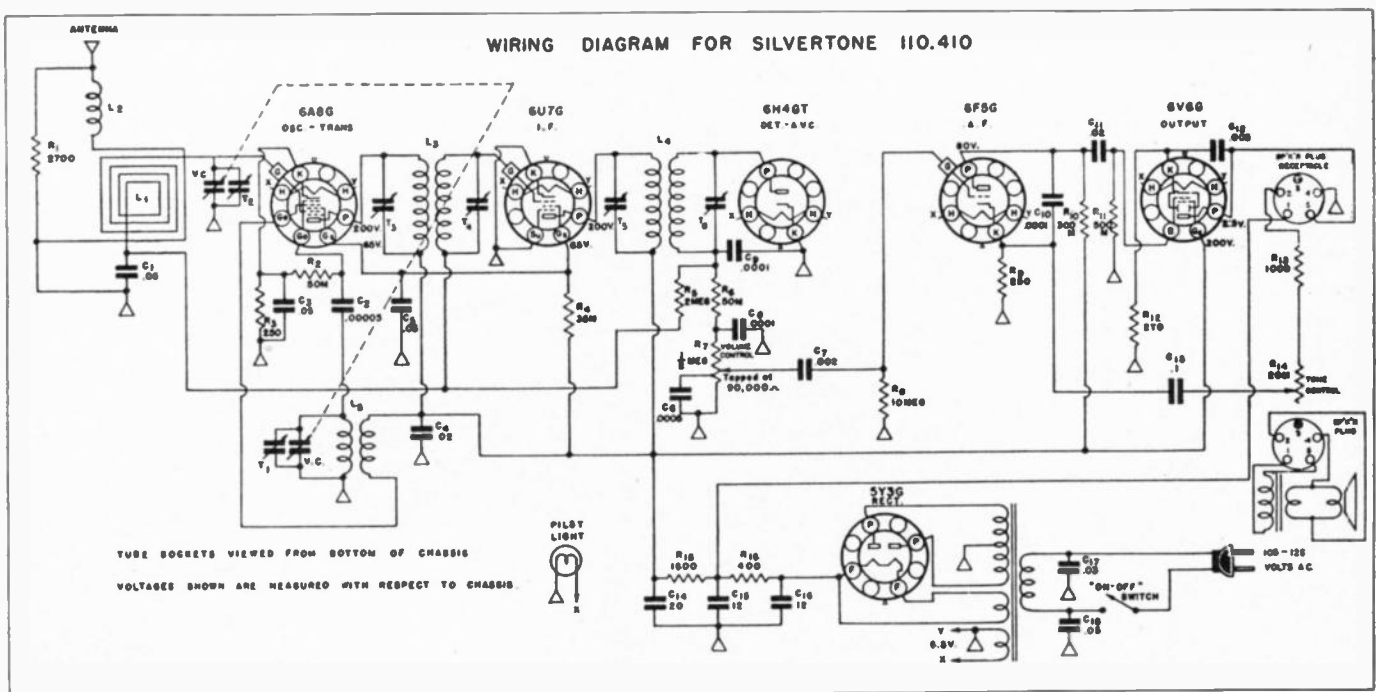
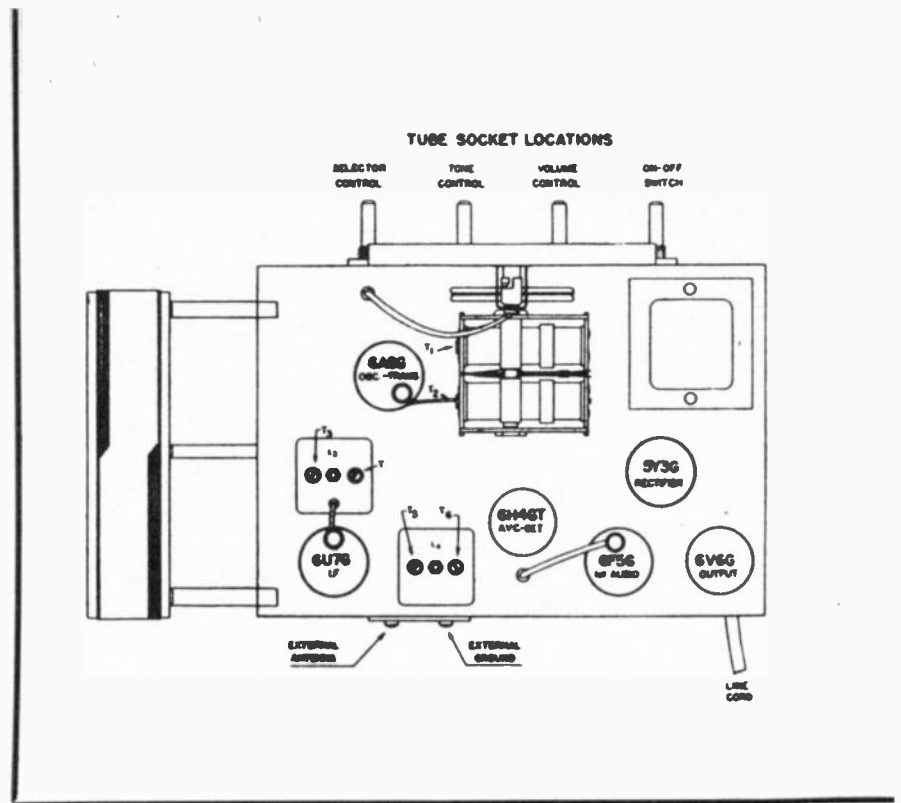
The oscillator-modulator and i-f circuits are conventional. The modulator section of the 6A8G derives its initial bias from the cathode resistor R3. Automatic control bias is derived from the avc line. The 6U7G i-f tube has a grounded cathode and is biased only by means of the signal-induced voltage in the avc line.

An individual diode rectifier—the 6H4GT—is employed as detector and avc source. The load circuit consists of the resistor R6 and the volume control R7. The resistor R6 and the condensers C8 and C9 constitute an i-f filter. The volume control is tone compensated by

means of the condenser C6 connected from the 90,000-ohm tap to ground.

The 6F5G a-f voltage amplifier and the 6V6G power amplifier are degenerated. In both instances the cathode resistors are unbypassed. In the power tube, inverse feedback is from plate to cathode through condenser C12. Additional feedback is provided from the speaker voice coil to the cathode of the 6F5G. This two-stage feedback loop includes the tone control R14 which, in conjunction with condenser C13, provides tone compensation. The degree of overall feedback is controlled by R14; the amount of feedback at any one frequency for a given position of R14 is

(Turn to page 32)



CERTIFICATION PLAN

SWINGS INTO HIGH

IT GIVES us pleasure to announce that the RSD Certified Service-Dealer plan has gone over with a bang. Requests for the decalcomanias are pouring in from all parts of the country. We have been flooded with letters of commendation. Needless to say, the spontaneous approval and acceptance of the plan by the field at large has served to strengthen our conviction that the radio servicing profession was in need of a certification set-up. Every effort will be made on our part to insure its success and continuation. We are looking for the day when the public will recognize and have complete confidence in any serviceman or service organization displaying the Certification Seal.

WHAT THEY SAY

We have reproduced on the opposite page a few of the many fine letters received from well-known figures in the radio field. Read what they have to say.

Roy Davis, of Roy Davis Co., San Diego, Calif., says, "We want to go on record with the statement that we like your promotion on the 'Certified Service-

Dealer' plan. The writer has had in mind a plan similar to this for the local servicemen for some time, but believes you are in a better position to put it over. . . . If there is any way we can be of assistance to you, count on us."

Charles Golenpaul, of Aerovox Corporation, said, "More power to you! I like your 'Certified Service-Dealer' campaign. I believe you can put it across, even though similar schemes in the past have fallen by the wayside. I am counting on your ingenuity, your enthusiasm, your sincerity, and your stick-to-it-iveness to see this thing through to a lasting success.

"We all appreciate the need for some identifying means whereby the puzzled public can tell to whom it can entrust its sets for servicing. Also, we all realize how important it is to dignify the radio serviceman with some distinguishing sign of title or degree. Furthermore, we all know how suspicious the public must be of the average serviceman, through so many sad experiences with the fly-by-nighters.

"We are 100% with you, here at Aerovox, in your commendable efforts.



Bud (Santa Claus) Muhleman holding the first batch of RSD Certification Seals which were put into the mails just before Christmas. Additional batches have been leaving the office each day since.



Alan Radio Lab., Brooklyn, N. Y., in candid pose. Certification Seal is on door.

If you will carry out your plan unflinchingly; if you'll be sure to award Seals only to those servicemen whom you can unhesitatingly recommend to the radio public; if you'll promptly recall or cancel any Seal whose objects and implications have been violated; if you'll keep this campaign on the highest plane, and quite free of any mercenary tieup with any publication or commercial interests—well, fellows, you've got the real thing which servicemen and public are looking for."

We're considerably flattered, and at the same time put on our good behavior, by a statement issued by *Victor Mucher*, of Clarostat Manufacturing Co., Inc. Said Vic, "If the 'Certified Service-Dealer' campaign were proposed by anyone else than by those old-timers, Bud Muhleman and Sandy Cowan, I'd just consider this another perishable bloom among radio's perennials. Time and again we have had these certified servicemen's campaigns, but they have all died in short order.

"This time, however, I for one feel that the idea is in sound hands. It's to the interest of RADIO SERVICE-DEALER, the youngest and consequently the most ambitious serviceman's publication, to establish a mark in the servicing game. And certainly no better job can be done for everyone concerned than to identify the honest, capable, career serviceman.

"My only suggestion, or might I say *admonition*, is that you play the game *plenty tough*. Grant your Seal only to servicemen who can fully qualify and continue to qualify. Ruthlessly cancel the certification of fellows who fall short of the mark, subsequently. Make this campaign stand on its own feet without the slightest suggestion of commercialization or selfish interest. That will make it tick. And we of the radio parts in-

(Turn to page 30)

E. J. MAGNOLI
RADIO
SALES & SERVICE

20th Anniversary Year

December 2, 1940.

Mr. S. R. Cowan,
New York,
N. Y.

My dear Mr. Cowan:

I am indeed very glad that you have afforded me the opportunity of commenting upon the "Certification Plan" which you have newly inaugurated. As a matter of fact, it had been my plan to write to you voluntarily, as a consequence of the impression your announcement has made upon me.

Needless to say I, and all Radio Technicians Guild Chapters throughout the country are heartily in accord with your program and its implications. It is just such a program of ethics that we have for years, and are still pursuing, and that we are anxious to endorse and encourage.

I have taken the liberty to enclose a copy of our "NEWS". My editorial comment will convey to you, I believe, what we stand for. You will also find a copy of our "AD" as it appears in the currently issued Boston Telephone Directory. Both, I think you will agree, are self-explanatory.

It so happens that only a few days ago, I entered my subscription with you for "Service-Dealer". No doubt it will receive prompt attention.

Thank you for this opportunity of greeting you, are assured that we are always eager to cooperate in any program designed to raise the professional status of the service engineer.

Sincerely,
E. J. Magnoli

Free. Boston Chapter R. M.



SPRAGUE PRODUCTS COMPANY
QUALITY ELECTRICAL AND RADIO DEVICES
NORTH ADAMS, MASSACHUSETTS

December 3, 1940

Mr. S. R. Cowan
RADIO SERVICE-DEALER
Cowan Publishing Corporation
11 West 42nd Street
New York, New York

Dear Sandy:

You have hit on a swell plan for assisting the dealers and servicemen to gain and maintain the confidence of the consumers. If we were to stop an individual on the street and ask him who he would recommend to repair a receiver, it might surprise all of us if he couldn't refer us to a qualified dealer or serviceman.

The idea of using a decalcomania will naturally help eliminate the "hit or miss" method most consumers use in calling on radio specialists.

Sincerely yours,

Harry Kulker
SPRAGUE PRODUCTS COMPANY
Harry Kulker, Sales Mgr.

HK/AL

COMMISSIONERS
JAMES LAWRENCE FLY, CHAIRMAN
PAUL A. WALKER
NORMAN B. CASE
T. A. M. CRAVEN
GEORGE HENRY PATNE
FREDERICK I. THOMPSON
THAD N. BROWN
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C.

Mr. S. R. Cowan
RADIO SERVICE-DEALER
11 West 42nd Street
New York, N. Y.

Dear Mr. Cowan:

I have read about your "Certification Plan" which appeared in the November issue of the RADIO SERVICE-DEALER. It is a very commendable undertaking and, if carried out as described, should prove to be of great benefit to the owners of radio receiving sets and the servicemen who perform reliable service to the public.

Sincerely yours,

James Lawrence Fly
Chairman

BURGESS
Battery Company

December 2, 1940

Mr. S. R. Cowan
Radio Service Dealer
11 West 42nd Street
New York, New York

Dear Mr. Cowan:

During the few short months since I had the privilege of reviewing the prospectus of the Radio Service Dealer with you at the 1940 Radio Parts Show in Chicago, I have followed each issue of your publication with interest.

I have been gratified to note your efforts to improve the status of the legitimate service dealer, your assistance to these men through the many timely editorials and educational articles.

Following the footsteps of your program to provide a service magazine exclusively for service dealers, we are happy to note your announcement of the "Seal of Certificate" plan.

The "Certified Dealer" program is worthy of the endorsement of radio manufacturers, jobbers, dealers, and servicemen from coast to coast and will be welcomed and supported by Mr. Q. Public.

Best wishes for its complete success.

Cordially yours,

E. C. Nickerson
Distributor Sales Manager

Farnsworth
FARNSWORTH TELEVISION & RADIO CORPORATION

MARION
December 6, 1940

Mr. S. R. Cowan
Publisher
RADIO SERVICE-DEALER
11 West 42nd Street
New York, New York

Dear Mr. Cowan:

Thank you very much for your nice letter of November 28th calling our attention to your "Certification Plan" as covered in the November issue of Radio Service-Dealer....I had previously read this article with a great deal of interest.

Your analysis of the service problem which has been with us since the advent of radio broadcasting is most correct. The solution which Radio Service-Dealer are undertaking is fundamentally sound basis on which to attack the problem, and should ultimately benefit the thousands of set owners requiring service.

You are to be congratulated on your efforts in sponsoring this forward step and we are certain that radio manufacturer's as a whole will heartily endorse your program.

In closing, may I assure you of complete support and cooperation of the Service Department of the Farnsworth Television & Radio Corporation in carrying on with your "Certified Service-Dealer" program.

Very truly yours,

W. B. O'Connell
Service Manager

FBO:hb

SEARS, ROEBUCK AND CO.

CHICAGO

Shop at Sears and Save

December 6, 1940.

Mr. S. R. Cowan, Editor
Radio Service Dealer
11 W. 42nd St.
New York, N.Y.

Dear Mr. Cowan:

Your plan to identify the competent radio service dealer is excellent. It is as important for the qualified individual who has invested his time and money in a radio business to have a recognized endorsement as it is for an automobile dealer to identify himself with a motor car manufacturer. It lets the public know where to go for the right kind of service.

The competent radio man can render a definite public service, but he cannot render this service efficiently or effectively if the irresponsible and unqualified are allowed to hamper him by resorting to practices which are unprofitable and which would be frowned upon by other professions. Acquainting the public with the local serviceman's qualifications will do much to correct his condition.

We at Sears have long desired to see a campaign of this kind. As you know, our customers are located in all parts of the country and maintaining the millions of receivers we have sold is therefore a problem, especially in some rural communities where a service man is not available. This usually means a return to our mail order stores to have the repairs made. When the Institute of Radio Service Men conducted its campaign Mr. Hathaway cooperated with us by preparing a list of service men who could be used as a part of our field service program. Since their endeavor has been discontinued there is no reliable clearing house for this type of information and as a result we have not been able to handle field servicing as we would like too. Now that you are conducting a similar campaign, we shall be pleased to extend our cooperation in the same manner if such a list is made available.

With every good wish for the success of your program, we are,

Yours very truly,

SEARS, ROEBUCK & CO.

B. Wixson - Dept. 687
Service Engineer

BW:ds

Sound Equipment
WEBSTER-CHICAGO CORPORATION
1022 - 8660 BLOOMINGDALE AVENUE
CHICAGO, ILLINOIS
December 6, 1940

Mr. S. R. Cowan
Cowan Publishing Corporation
11 West 42nd Street
New York City, New York

Dear Mr. Cowan:

The "Certified" Service Plan inaugurated in your November issue should, if aggressively and persistently promoted, result in a real step forward for the radio industry. The means you are using to accomplish the objectives of your plan seem to be simple, yet adequate. You should have the hearty support of all radio set and parts manufacturers.

We shall be much interested in learning from future issues of RADIO SERVICE DEALER what response has been received from dealers, and what results have been accomplished.

Yours very truly,

W. A. Pearce
General Manager

General and Sales Offices
COLUMBUS, INDIANA
December 3, 1940.

Mr. S. R. Cowan,
Cowan Publishing Corporation,
11 West 42nd Street,
New York City, New York.

Dear Mr. Cowan:

You are to be commended for your conscientious efforts to inject certain so-called "ethics" into the radio servicing industry by the "Certified Service Dealer" plan, announced and explained in the November issue of "Radio Service Dealer".

Surely this worthwhile undertaking will have the wholehearted support of every responsible and qualified serviceman who, alone, stands to gain added prestige in his own community and, with it, increased earnings.

Your method of attacking this ever present problem seems sound, and with its administration in your very capable hands, a high level of execution is assured. Let us hope that the true meaning and importance of the identification "Certified Service Dealer" isn't allowed to drift into obscurity.

It is by helping to promote this educational program as well as by maintaining his own high standards, that the responsible serviceman will benefit. This fact will, I'm sure, be realized by the majority.

Congratulations to you for this forward step and best wishes for its complete success.

W. A. Pearce
Arvin Division.

MOBLITT-SPARES INDUSTRIES, Inc.

W. A. Pearce:RT
CAR HEATERS ARVIN CAR RADIOS

READ WHAT THEY SAY

Reproduced on this page are a few of the many fine letters we Certification Plan. These letters serve to reflect the general re-have received regarding the RSD action in the radio field—a reaction that has been almost unanimously favorable.

In cooperating with us to make the campaign successful, you have the assurance that not only our support, but the support of the field as well is behind you. The letters, we feel, make this clear.

Of special significance are the letters from J. L. Fly, Chairman of the F.C.C.; B. Wixson, of Sears, Roebuck & Co.; and E. J. Mag-noli, President, Boston Chapter,

RECORDING TECHNIQUE

Servicing and Operating Data on RCA Victor VHR-202,-207,-407 Recorders

WITH the increasing use of home recorders, it is important that the serviceman have a knowledge not only of the necessary adjustments that are occasionally called for, but also a clear understanding of recording technique. Failing in the latter, he will find it extremely difficult if not impossible to make proper adjustments, since recording technique and adjustment of the recording mechanism are inter-related.

At the present time the majority of home recorders employ crystal cutters and recording mechanisms of a more or less standard pattern. Hence, data applying to one type is, with minor variation, applicable to other types—particularly insofar as technique is concerned. For this reason, the following data on the home recorder mechanism employed in the RCA Victrola Models VHR-202, VHR-207 and VHR-407 is of special interest.

CUTTING STYLUS

The cutting point of the stylus must be in perfect condition in order to make good recordings.

The condition of the stylus point can not be determined by ordinary visual inspection. If the recordings are noisy or poor in quality, first try a new stylus.

The stylus cutting point can be ruined by dropping the cutter on the record, by cutting into the base metal of the recording blank, or by cutting into the paper label on the blank.

Always stop the recorder before it

reaches its inner limit as it will repeat in the last groove and may wear into the base metal, thereby ruining the stylus point.

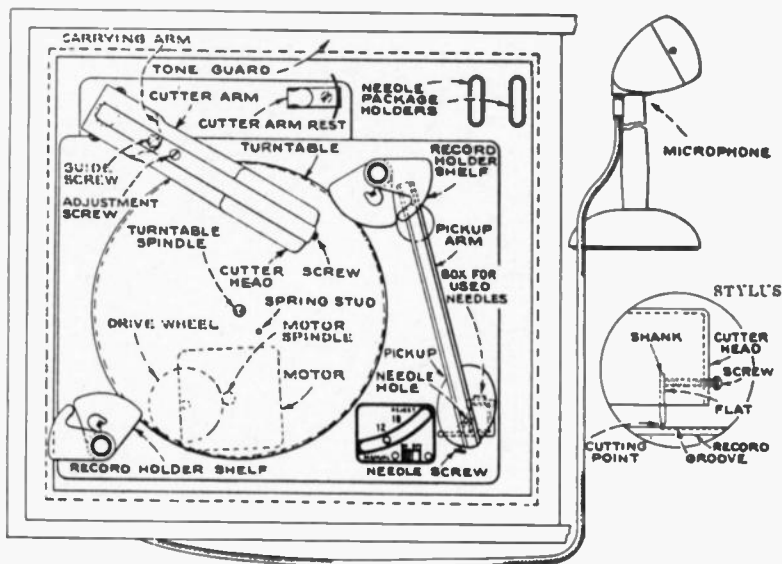
CUTTING ADJUSTMENTS

To insert or change a stylus, lift the recorder arm, loosen the stylus screw, and insert the stylus as far as it will go in the hole at bottom of cutter head, with the flat on the shank of the stylus toward the screw. Tighten the screw against the flat on the shank. Retighten the screw before making each recording. Do not use pliers or wrench.

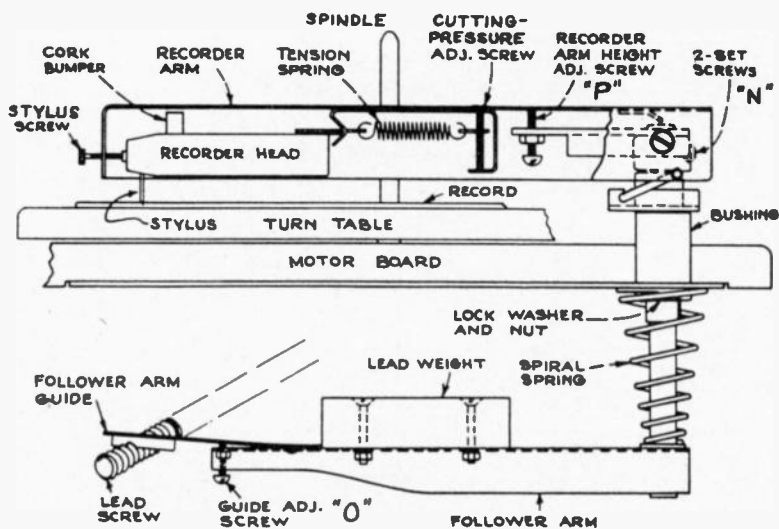
To adjust the stylus pressure for the correct depth and width of cut, the best procedure is to cut some "blank" grooves in a recording disc of the type that will be used: The stylus pressure can be regulated, by means of the adjustment screw on top of the cutter arm, to produce the correct thickness of the hair-like cuttings. The procedure is as follows:

1. See that the phonograph pickup is on its rest, the turntable cleared of records, the record-holder shelves rotated back away from the turntable, index lever at "manual," a perfect stylus correctly inserted in the cutter head, and the stylus screw firmly tightened.
2. Place the blank recording disc on the turntable, with the spring stud that protrudes from the turntable engaged with one of the three holes at inside of the disc. This prevents the disc from slipping during recording.
3. Turn on power-bass control and turntable switch. Turn radio-phonograph and microphone volume controls fully counter-clockwise.
4. Lift the cutter arm well up and move it over so the stylus is about $\frac{1}{4}$ -inch inside the recording disc and lower gently on to the disc.
5. The stylus will begin to cut, and the cuttings should collect toward the center of the recording disc. If they collect toward the outside, the stylus is not correctly inserted, and must be adjusted by removal and re-insertion. If

(Turn to page 29)



Line sketch of RCA Victor recorder and automatic record player.



Points of adjustment on RCA Victor recording head.

TECHNICAL SERVICE PORTFOLIO

SECTION VII

MICROPHONES AND PICKUPS

DURING the past two years, interest in radio-phonograph combinations and public-address systems has increased tremendously. As a result, far more of these units have come into use than would be expected from a normal rate of increase in sales. Yet there are many cases where satisfactory performance cannot be obtained from the apparatus unless some special attention is given to the installation or to the instruments associated with the amplifiers and speakers. Sometimes simple "tricks of the trade", known to sound specialists, serve to make the difference between satisfactory operation and complete failure. This applies particularly to public-address and home-recording apparatus, where microphones are involved, and, to a lesser extent, in the use of pickups. In this installment of the Portfolio we will review the various types of mikes and pickups and present some of the more useful practical ideas which have been applied in overcoming problems encountered in the field.

For most of us, our acquaintance with mikes begins with the simple single-button carbon type, usually acquired by grace of momentarily relaxed vigilance on the part of some telephone company employee. From this type we may graduate to the double-button carbon model, thence to crystal, velocity or condenser types. Each of these types has certain advantages and disadvantages, and some of the problems we have to contend with in sound work may be handled more easily if the characteristics of each type of mike are kept in mind. We refer particularly to their susceptibility to hum pickup, noise and acoustic feedback—subjects which are seldom given attention in academic treatises—but which, from a

practical standpoint, are of much greater importance than minor variations in fidelity of reproduction or sensitivity.

CARBON MIKES

The single-button carbon mike, while infrequently used in modern public-address systems because of its relatively high hiss level, is still employed in many of the home-recording systems used in radio-phonograph combinations, where the high sensitivity of this mike is particularly desirable. The double-button type, though somewhat less sensitive, provides more uniform output over a wider audio-frequency range.

The single- and double-button carbon mikes are somewhat similar in design. The hookup of a typical double-button type is shown in Fig. 1. In operation, contact from the terminals *a* and *b* to the diaphragm *c* is made through carbon "buttons," which are small, hollow, cylindrical cells filled with finely ground carbon (actually, the carbon is nothing more nor less than good, old anthracite coal). The diaphragm is usually of duralumin, and the section at the center with which the carbon buttons make contact is often coated with a thin film of sputtered gold, to assure good contact.

Current flows from the battery through each button to the diaphragm and back into the battery circuit. The current in each button circuit is usually held to 10 to 20 ma, and should preferably be approximately the same in each button circuit. If the current is too high, it usually means that the carbon granules have become packed together, and the sensitivity drops. This trouble often occurs. It may be corrected by gently tapping the mike, with the current off.

The resistance of the carbon button depends on the pressure on the carbon granules. When sound waves strike the diaphragm, the pressure on the carbon buttons varies at the frequency of the sound waves. Since this causes the resistance of the carbon buttons to vary in like manner, the current in each button circuit also varies. This variation in current occurs at an audio-frequency rate which may be amplified and reproduced.

Because the output impedance of the carbon mike is low—usually less than 1000 ohms—a microphone transformer is ordinarily employed to couple the mike to the grid of the first tube. This transformer provides a voltage step-up of the order of 15 to 1, and when it is used the average two-stage audio amplifier provides plenty of gain for such mikes. However, in some p-a amplifiers which have far more gain than is needed for mikes of the high sensitivity of the carbon type, it is the practice to omit the mike transformer. The sacrifice in voltage step-up is, from a practical standpoint, more than offset by the fact that

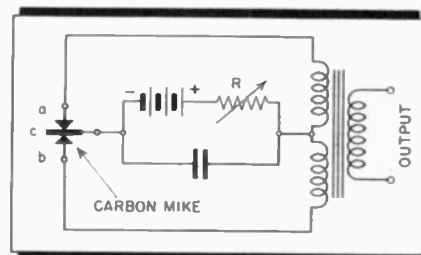


Fig. 1. Connections for a double-button carbon mike. Variable resistance *R* is used for adjusting the button current.

induction hum, normally picked up through coupling of the mike transformer to power transformers, a-c circuits, etc., is eliminated.

CONDENSER MIKES

A circuit employing a condenser mike is shown in Fig. 2. This type of mike is seldom used in public-address work, though its excellent frequency characteristics make it most useful in laboratory applications. As in the carbon type, voltage must be applied to the mike. However, the principle of operation differs. The condenser consists of two plates, one of which is movable and the other fixed. When sound waves are impressed on the movable plate, it vibrates and the capacity existing between the two plates varies. A high voltage is applied through *R2* across the condenser mike, forming a charge on the condenser plates. When the capacity is varied, the voltage across *R2* varies correspondingly and these voltage variations are impressed on the tube grid through the coupling condenser *C2*.

In the circuit shown, *R1-C1* form a resistance-capacity filter. *R2* must be high in resistance—usually 10 megohms or more—as must *R3*. The capacity *Cd* represents the distributed capacity in the circuit. Note that the distributed capacity is in parallel with the mike capacity. Since the sensitivity of the mike is based on the amount of variation in capacity in its circuit which can be obtained, and since the distributed capacity cannot vary, it is seen that the distributed capacity must be kept low if high sensitivity is to be obtained. Usually this is accomplished by building the first amplifying stage (termed the “head” amplifier) directly in the microphone head, thus keeping the leads short.

The frequency response is affected by *R2* and *R3*. If these are too low in resistance, the low-frequency response will

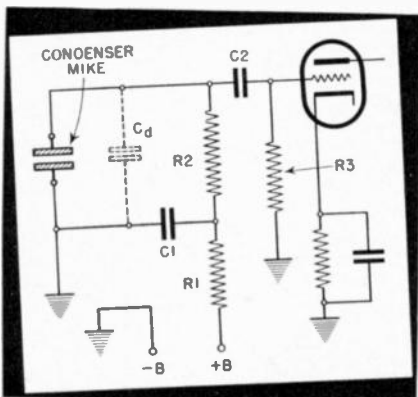


Fig. 2. A condenser mike requires a “head” amplifier to keep distributed capacity at a minimum and to provide additional gain.

fall off, and in servicing, leakage across mountings of *R2* and *R3*, and insulation resistance of wiring should be checked if the low-frequency response is below par. Gassy tubes, leakage in *C2*, moisture absorption in the condenser mike assembly or in the amplifier—these are common causes of unsatisfactory performance of such equipment. Some noise may arise due to noisy resistors, particularly *R1* and *R2*, which must be carefully selected. These may be checked by disconnecting the mike and noting the noise level in the amplifier output.

The output of a condenser mike is low. The gain required in an amplifier for a condenser mike is about 100 times that required for a double-button carbon type, or equal to one additional pentode stage.

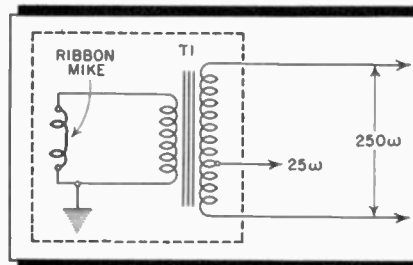


Fig. 3. Because of its low impedance, a ribbon mike is used in conjunction with a step-up transformer in the same case, as indicated by the dotted lines.

VELOCITY AND DYNAMIC MIKES

In the velocity, or ribbon, mike, a metallic ribbon is suspended between the poles of a permanent magnet where the magnetic field is strongest. Sound causes movement of the ribbon, creating an audio-frequency current by induction. This current is fed to an amplifier by means of a self-contained step-up transformer, shown as *T1* in Fig. 3. The dotted lines in the figure represent the microphone case. The transformer must be kept close to the ribbon because the impedance of the ribbon is extremely low and therefore long leads would cause a large voltage drop which would reduce the sensitivity of the unit. Usually the 250-ohm output is employed, though for some applications the tapped portion of the secondary, designed to match a 25-ohm line, is employed. These values apply to the studio type of velocity mike. For p-a work, such instruments are also available with an output impedance of 2000 ohms, designed to work directly into a tube grid.

This type of mike, as made for studio use, is low in sensitivity, though somewhat better than the condenser mike in this respect. It is characterized by an

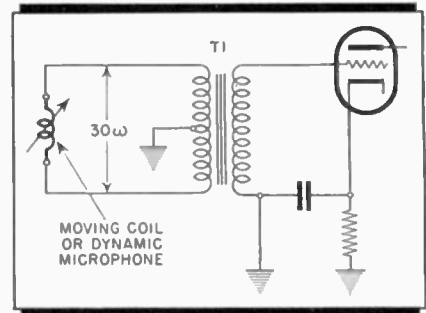


Fig. 4. A dynamic mike has a higher impedance than the ribbon type; hence the transformer may be mounted externally.

exceedingly uniform frequency response over the entire audio-frequency range.

In the dynamic mike, operation is somewhat similar to that of a permanent-magnet type dynamic speaker. A thin ribbon coil is attached to a diaphragm and the coil is arranged to move in the field of a permanent magnet. The vibration of the diaphragm resulting from impressed sound waves causes the coil to move in the field of the permanent magnet. In cutting the lines of force, a current is induced in the coil. This audio-frequency current is fed to the coupling transformer, as shown in Fig. 4. Note that the primary impedance is greater than that of the ribbon mike because of the higher impedance of the moving coil. The transformer therefore may be mounted external to the mike. This is essentially a studio mike, well known for its uniform response over a wide frequency range.

In the inductor mike, which is essentially a dynamic mike in which the moving coil is replaced by a straight piece of aluminum wire fastened to a diaphragm, the voltage induced in the wire is coupled to a built-in transformer and stepped up, as in the case of the ribbon mike. The transformer is included in the mike case because of the low impedance of the moving conductor. Its sensitivity is of the order of that found in the moving coil dynamic type, about -81 db.

CRYSTAL MIKES

We have discussed these latter types rather sketchily since, with the possible exception of the velocity type, they are not commonly encountered in p-a work. By far the most widely used type in this field is the crystal mike. In this device, the action of sound waves on crystal slabs, usually made from Rochelle salt, causes slight bending of the slabs, as shown in the dotted lines of Fig. 5-A. This bending produces a voltage across the crystal assembly which corresponds in frequency to that of the sound wave causing the bending. Such a unit as

shown in Fig. 5-A is called a "sound cell." This drawing should not be taken to represent the commercial design, but does serve to illustrate the principle of operation and general assembly.

Since the output of a single sound cell is low, the usual commercial crystal mike of this type is made of several sound cell units assembled in series parallel, as illustrated in Fig. 5-B. Because the individual crystal slabs in each sound cell are close, they have high internal capacity. When connected in series parallel, as shown, the output is increased but, when assembled in units of four, the capacity is not increased. Some are available with a much larger number of sound cells.

There is another type of crystal mike in which a diaphragm is coupled to the crystal. Such microphones are more sen-

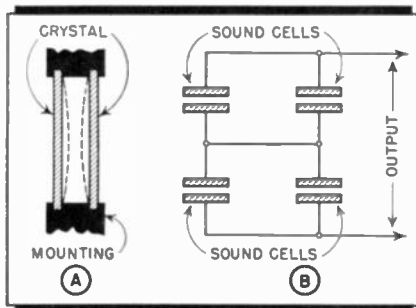


Fig. 5. A sound-cell crystal mike, and the general cell connections.

sitive than the sound cell type, but the frequency response is not so uniform. Typical mikes of this variety are rated at around -60 db, while those of the sound-cell type range around -70 db or lower. These are in general more sensitive than the velocity or ribbon types, and represent a classification intermediate to the low-sensitivity studio types and the high-sensitivity carbon mikes.

The simplicity of the crystal mike, and the fact that, due to its high impedance, no input transformer is required, tends to remove some of the difficulties which arise with other types of mikes. In the ribbon and others in which a transformer is built into the mike, care must be taken to avoid placing the mike near any a-c generators or power transformers, since hum will then be picked up and fed into the circuit.

However, due to the high impedance of the crystal mike, when using long transmission lines, there are times when hum may be picked up in the line. Also, there is some loss due to the shunting effect of the capacity of shielded transmission lines. In such cases, it is occa-

sionally advisable to use a pre-amplifier, coupling to a 200 to 500-ohm line, as illustrated in Fig. 6.

DIRECTIONAL CHARACTERISTICS

With the exception of the carbon and crystal mikes, most mikes are directional to a greater or lesser extent. Sometimes this directional effect is an advantage, particularly when acoustic feedback tends to limit the amount of gain which may be used in a given installation, or when the mike cannot be so placed that sound waves from the speaker do not reach it. Also, there are times when surrounding noises tend to blanket the voice or music we desire to pick up. Methods of making a non-directional mike directional, and of shielding the mike from undesired sounds, are shown in Figs. 7 and 8.

In Fig. 7, the mike is placed inside a parabolic reflector. This reflector need not necessarily be of the shape shown; a megaphone or other similar device will likewise serve the purpose, at the cost of somewhat poorer frequency response. Such reflectors act as amplifiers, increasing the sound input from the desired source to which it is directed often by as much as 10 db. Devices of this nature are used in picking up voices out of a crowd, when the mike remains in position, usually on a stage.

In Fig. 8, a crystal mike is installed within a sound-insulated box, made by packing rock wool and celotex around the mike, leaving a single channel to an opening at one end of the box. An arrangement of this type proved the answer in an installation of a p-a system in the press box at a football stadium. No facilities such as a glass-enclosed studio were available, but this simple arrangement served to exclude the cheering and yelling and permit announcements to be made without interference. Speakers were installed close to each small group of listeners and a sufficiently high level was used to override the noise level. No

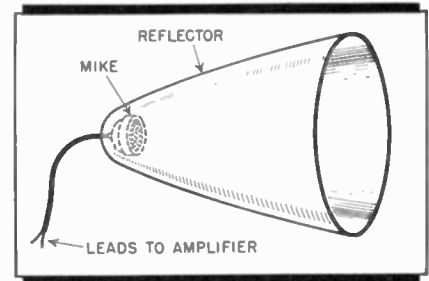


Fig. 7. A "sound telescope" which will increase sound input from any given direction.

acoustic feedback resulted, even though the loudspeakers were only a few feet away, when talking close to the opening in the box.

While both of these methods were applied to crystal mikes, there is, of course, no reason why other mikes may not likewise be used. Those of the velocity and dynamic types are directional, but not to the extent obtained with these auxiliary devices.

In severe cases of hum and noise pickup, special mikes should be used. This is the case in aeroplane installations, for which special mikes have been devised which have a sharp cut-off for frequencies below 700 cycles. Alternatively, the mike amplifier may be modified so that the response is made poor at low frequencies. This may be done by the use of high-pass filters, or, more simply, by reducing the capacity of coupling condensers and the grid leak resistors in resistance-coupled amplifiers. Although this may render the amplifier unsuitable for musical reproduction, it will still serve very well when the sole need is to reproduce speech intelligibly.

SPEAKER-MIKES

Any device which may be used as a loudspeaker or telephone receiver may also be employed as a microphone. In fact, one of the early broadcast stations got along very well with only a cheap, magnetic speaker serving as a micro-

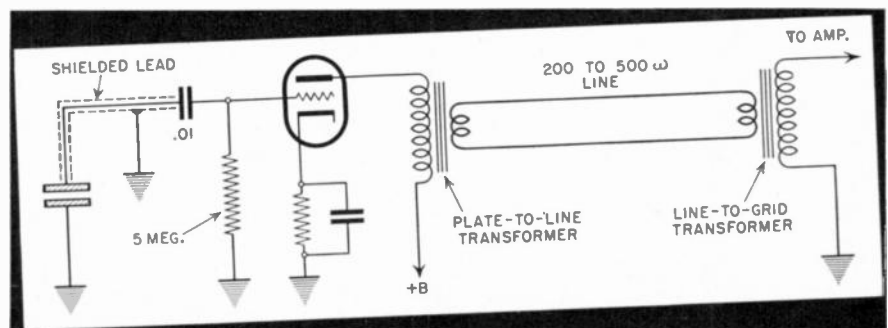


Fig. 6. Due to high impedance of crystal mike, a long transmission line will introduce losses occasioned by its shunting capacity. This is obviated through the use of a pre-amplifier and line-matching transformers.

phone. True, the broadcast quality was poor as compared with the results which may be obtained from even inexpensive microphones, but such equipment can be made to serve in a pinch.

A hookup for a speaker used in conjunction with an amplifier is shown in Fig. 9. It will be necessary, of course, to keep the output speaker well away from the speaker connected to the input circuit. In one store, an old Western Electric cone speaker serves as a microphone. It hangs on the wall and is connected to a two-stage amplifier, the output of which feeds another speaker on another floor of the store. By simply pressing a switch and talking a few feet from the loudspeaker, the sound is amplified and reproduced at the output station.

Dynamic speakers may be employed as mikes. In such cases, the usual output transformer feeding the voice coil remains in position, but the primary is used as a secondary to feed the input of an amplifier.

Needless to say, the quality or frequency response obtained from speakers used as microphones is none too good. And it is not to be assumed that such makeshift methods are recommended. But there are times when no mike is at hand, yet results must be secured. In such event, these improvised methods serve the purpose.

PICKUPS

The variety of pickups in common use is not as great as that of mikes. And the problems which are associated with pickups are more particularly due to the nature of their application rather than to the design of the pickup itself. Essentially, a pickup operates on the same principle as the loudspeaker or the microphone. But the fact that the sound

vibrations which actuate the pickup are derived from a grooved record usually accounts for the difficulties encountered in such devices rather than to any specific limitations in the devices themselves.

Insofar as equipment in the hands of the general public is concerned, most pickups are of the crystal type. The suitability and consequent wide adoption of this type of pickup is in large measure due to its light weight, simplicity in design and excellent sensitivity. Not that it is impossible to make a magnetic pickup which also has these advantages, but it is more difficult to do so. The light weight of such crystal pickups (the needle pressure is often of the order of only one-half ounce) means that the wear on records is negligible. In fact, it is because of this light pressure that some of the higher grade crystal pickups are now fitted with a built-in sapphire stylus, so that needle replacement is eliminated. A further advantage is that the pickup arm and other components of the assembly may be made lighter.

In connection with the characteristics of pickups, it should be mentioned that the ideal frequency response is not necessarily a perfectly flat output. The reason for this is that recordings are not made at uniform frequency response. When the record is cut, over a portion of the audio frequency range the amplitude of the cut is made proportional to the amplitude, or strength, of the audio signal, as it should be. But, over other portions of the audio range, the amplitude of the cut is dependent upon the velocity, or inversely proportional to the frequency of the signal. In practice, cuttings are usually made at constant amplitude up to about 300 to 800 cycles, and at constant velocity above the 300-cycle or 800-cycle point. This corresponds to a condition where a perfectly faithful reproduction would show flat output up to the transition point of 300 or 800 cycles, and a falling off in output at frequencies above the transition point.

Recordings were originally made this way because the early mechanical pickups gave constant output from constant velocity recordings. The only reason that constant velocity recording was not used over the entire frequency range was because the amplitude of the cut would become so great at very low frequencies that fewer grooves could be employed in a given record area.

To compensate for this condition, using modern electrical pickups which give a response proportional to amplitude rather than the velocity of recording, present-day pickups are equalized. That is to say, they are designed to give a somewhat greater output where the amplitude of the recording is too low and

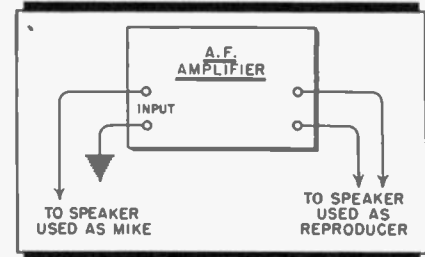


Fig. 9. Hookup for speaker-mike used in conjunction with a standard audio amplifier.

less output where the recorded amplitude is too high. Unfortunately, since there is no uniformity of practice among record manufacturers with regard to the amplitude of the cut at various frequencies, it is found that a pickup which is equalized perfectly for the product of one record manufacturer will not give proper response from records made by another. This variation is particularly evident at higher frequencies, in the neighborhood of 1000 to 3000 cycles, where some manufacturers switch from constant velocity to constant amplitude, with a consequent increase in high-frequency amplitude which is reflected in the reproduction.

The surface noise so frequently noticed in record reproduction is largely due to grit which is mixed with the material from which the record is pressed. The purpose of the grit is to grind the steel needle to fit the record groove and thus reduce wear during reproduction. In all probability, it is likely that with more widespread use of the new light-pressure pickups, causing negligible groove and needle wear, the need for this means of grinding the needle to shape will diminish to the extent that this protective process may be omitted in record manufacturing.

Rumbling noise is present to a greater or lesser extent in any record reproducing system. This is caused by mechanical vibration in the turntable, which is transmitted to the pickup. In high grade turntables, this trouble is a minimum but, in other installations, it may make the difference between a system which is satisfactory and one which is objectionably bad.

We are emphasizing these points, which have no concern with the characteristics of the pickup itself, because in many cases the pickup is blamed for faults which have their origin elsewhere in the system.

Recently there has been introduced a pickup employing a light beam variation as a means of reproducing records. This has already been discussed in a previous issue and is therefore omitted here.

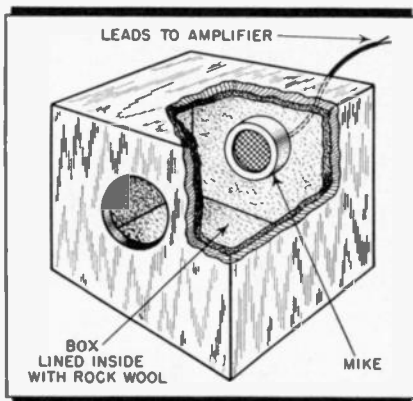


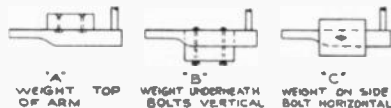
Fig. 8. Mike enclosed in a sound-absorbing box to exclude outside noises, such as cheering at a football game.

Shop Notes

RCA VHR-202, 207, 407

"Rumble"

Any instrument with the sensitivity and tone response of these home recorders is capable of picking up the mechanical vibration of the motor. However, due to many preventives incorporated in the design of these instruments, rumble will not be recorded if the following precautions are observed:



Leveling—See that the instrument is perfectly level.

Freedom—Be certain that the motorboard and mechanism is "floating" free from the cabinet. All four mounting springs should be at approximately equal tension.

Follower Arm Damping Weight—See that the lead weight is in place attached to the follower arm underneath the motorboard.

Stylus—Make sure that a perfect stylus is tightly inserted in the cutter-head. Because both stylus and retaining screw are of hard steel there is a tendency towards loosening during cutting. Tightness should be checked before each cut.

Input Level—Set for sufficient input level so that the "Magic Eye" just closes on modulation peaks.

Tone Control Settings—During recording, the power-bass control should be set for maximum lows, just beyond the click of power switch. The treble tone control setting will depend on the degree of potential rumble present. For extreme cases, it should be set for minimum highs during recording only, in order that the low frequencies in the selection or voice may have a full chance to mask any possible rumble.

Depth of Cut—During recording, the shavings should be directed towards the spindle and prevented from obstructing the cutter path. The thickness of these shavings should be about that of human hair, or approximately .003 inch. An additional check on depth of cut is to inspect the recording under a magnifying glass. The groove width should approach but not exceed the distance between grooves. Depth of cut may be varied by means of the cutting-pressure adjusting screw at the top of cutter arm.

Turntable Drive—If rumble persists, inspect the idler wheel (between motor spindle and turntable) for possible runout, flat spots, and scraping against bottom of turntable.

Recording Discs—Due to variations in material composition and hardness among different types of discs, the same cutting-pressure adjustment will not give an equal depth of cut on all types. Thus, it may be necessary to change the adjustment previously set for one type of disc, when recording on a different type.

Follower-Arm Weight

Two other methods, besides the one shown in the Service Notes, have been used in attaching the lead weight to the

recorder follower arm. These are indicated in the following sketches. All three provide similar results, "C" being the method used in latest production.

The weight is packed separately for methods "A" and "B" and must be mounted as shown when the instrument is installed in the consumer's home. Excessive "rumble" occurs when the weight is not in place.

Pickup Arm Starting Spring

The pickup arm starting spring in RP-155 mechanism in the home-recorder models is Stock No. 36278.

Motorboard Mounting Spring

Change Stock No. of Mounting Spring from 31470 to 37878 (4 required).

RCA VHR-207, 407

12K7-GT Burnouts

When shooting trouble or when testing Models VHR 207, and VHR 407 do not under any circumstances short the +B to ground with screwdriver or any other tool as a test for plate voltage.

A +B short will burn out the filament of the 12K7-GT microphone pre-amplifier tube. Always test for +B voltage on the chasses with a voltmeter and not with a screwdriver.

RCA RIM-DRIVE TURNTABLES

Replacement of Rubber Tires

Remove old tire by stretching and pulling over drive disc edge.

Thoroughly clean drive disc to remove burrs or foreign particles.

Place new tire over the drive disc. Avoid any twisting or excessive stretching of the tire.

Roll disc and tire on a flat clean surface while simultaneously applying a slight downward pressure on the disc shaft. This will allow the tire to seat itself properly in the "V" shaped groove on the drive disc and take up for any uneven stretching of the rubber tire.

Clean rubber tire with carbon tetrachloride (Carbana).

RCA 7QB

Transformer Polarity

On some production receivers, the leads from the primary winding of the output transformer are color-coded in a manner reverse to that shown in the RCA Service Notes wiring diagram. That is, the red lead and the black-with-red tracer lead are interchanged.

STEWART-WARNER XTAL PICKUPS

Soldering Leads to Crystal Cartridges

Crystals used in phonograph pickups and recorder heads are permanently damaged if they are subject to temperatures above 130° F. even for a very short interval of time. This makes it essential to use extreme care when soldering leads to crystal cartridges, so that they are not over-heated and ruined. The following precautions must be observed to do a good soldering job.

1. Use a hot iron. If the iron is not hot enough, it will be necessary to hold it against the soldering lug for a relatively long time before the solder will flow. This long contact will permit heat to flow to the crystal, raising its temperature beyond the safe limit.

2. Be sure the connecting wires are thoroughly clean. If the connecting wires are old or dirty, the solder won't take immediately. The continued heating and application of solder may easily ruin the crystal. It is always a good idea to clean and tin the wire first so you will be sure the solder will take properly.

3. Be sure your soldering iron tip is clean. A heavily corroded soldering iron won't melt and flow solder properly.

4. Work quickly. If the iron is hot and clean, and the terminal wire properly tinned, all you need for a good job of soldering is a quick touch of iron and solder to the connection. Take the iron away just as soon as you see the solder flow.

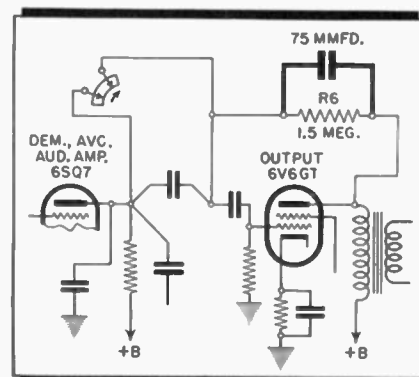
5. Never solder a lead to the case of the crystal cartridge to serve as a ground. This will invariably raise the cartridge temperature above the safe limit.

STROMBERG-CARLSON 520

Reducing Highs

In accordance with requests to eliminate some of the reproduction of high frequencies internally and thus eliminate the necessity for using the tone control to minimize surface noise in the reproduction of phonograph records, Stromberg-Carlson has added a capacitor to the circuit of all 520 PS, PN and PG Models manufactured after November 12, 1940.

This is a 75-mmfd capacitor (P-29359) located across the 1.5-meg resistor R6, as shown in the accompanying diagram. The capacitor is physically connected from Terminal No. 3 of the 6V6 Output Socket to the single point terminal block located on the mounting support bracket of the variable capacitor.



The effect of this capacitor is to increase the amount of inverse feedback voltage at the higher frequencies, thus causing an attenuation in the upper frequency response of the power amplifier.

If the customer desires greater fidelity of reproduction of phonograph records, this capacitor should be removed.

SALES HINTS FOR

AS discussed last month, the average radio service-dealer sold 1250 replacement radio tubes and repaired 1850 defective receivers during 1940. A three-man organization, to be classed as average, sold 3750 replacement tubes, repaired 5550 receivers. Now, let us determine ways and means whereby an aggressive campaign may be launched which will boost sales and servicing volume with correspondingly greater gross income and net profit.

Every radio set located within reasonable limits of your shop and every radio set owner represents potential income. Many sets require servicing but their owners do not realize it. Many sets require servicing but their owners don't know who to entrust the work to. Many sets are operating with partial efficiency and with slight, inexpensive correction, such as new tubes or realignment, will afford perfect reception. Many sets are lying idle because they need minor repairs but the set owner is simply too lazy or lax to attend to it. A service-dealer who *goes after* business will find innumerable instances where jobs *should* be given to him, *and will be* if he conducts his selling attack properly.

ADVERTISING

The dictionary defines the word Advertising thusly: "To make known publicly a fact or facts". Literally speaking, you *must* advertise if you want to in-

crease your volume and income. You simply cannot afford to wait for business to come to you. Whether you pay to have your advertising sales message appear in local newspapers or make personal calls upon potential customers, it is advertising. The location of your store, the manner in which your store window is dressed, the method in which you display your stock of tubes, parts and test equipment are all a part of your advertising overhead. To make these investments pay for themselves is a vitally important factor in every service-dealer's daily routine.

Unquestionably spot announcements made at frequent intervals by your local radio station would prove to be the most potent type of advertising possible to obtain. But the cost is prohibitive in most instances for individual service-dealers. You don't mind if we do a little wishful thinking? Not entirely wishful thinking, though, for members of the Radio Servicemen of America, the largest association of radio servicemen, are obtaining just that type of invaluable advertising through the good offices of the National Association of Broadcasters.

The next best type of advertising is personal selling. There are two types; one, when a customer comes into your store, two, when you call upon a customer either by invitation or self inclination. In either case, remember that personalities differ, first impressions are lasting, and you can either win confi-

dence and good will for yourself at the time you make your opening remark, or you can give the customer a very poor impression which will lock the cash register drawer forever despite your technical ability, financial stability or exceptionally high code of ethics.

CUSTOMER RELATIONS

Every customer who enters your shop subconsciously feels that his particular problem or purchase is the most vital in the world. It doesn't cost you a thing to let him enjoy that sensation fully. Give him your smiling attention the instant he enters the door, whether you are waiting on someone else or not. At least you can smile and say, (if you are serving someone) "I'll be with you presently." That word "presently" is important, for it doesn't indicate to the customer you are dealing with that he must hurry up and scam, as he might—and take a sale with him—if you were to say "I'll be with you in a second". This gives the old bum's rush impression.

Most service-dealers assume that their customers know very little about the inner workings of a radio receiver. You can capitalize upon it if you use discretion. Yours is a highly technical profession. Like a doctor, your bedside manner is important. You know more than the patient and should try to make him realize that he must pay you for the time, trouble and years of labor you have devoted in an effort to reach your present station. It is a question of cold cash business each and every time you talk to a customer, diagnose the complaint and prescribe a remedy. Does this sound far-fetched and silly? Don't be too hasty in deciding it is, that is, if you really want to make more sales, better sales and earn a higher income.

Visualize yourself and an average set owner. He is a penny saver. His set isn't perking just right so after being annoyed by fuzzy, fading reception for six or eight months he takes the tubes out, puts 'em in his pocket and barges into your shop to have them tested. He fears he is going to get bad news. He feels that a tube or two, or—heaven forbid—maybe three are shot. It's going to cost him money. He is almost angry because he simply can't fix a weak tube himself, and he must have the dern thing or his set will drive him nuts entirely. So Mr. Chip-On-The-Shoulder lays his tubes on your counter and tells you his sad, sad story. You could, of course, keep silent and test the tubes without a peep. Meanwhile Mr. Chips sees his life earnings



Neat "lobby" of Mansfield Radio Service, Brooklyn, N. Y. The counter signs indicate that one dollar is charged for auto-radio testing and a 50-cent "bench charge" for testing and estimating on a home receiver.

SERVICE-DEALERS



Nelson Nyborg, left, and Rolf Hardenberg, "Certified Service-Dealers", of Mansfield Radio Service on the job. Note fluorescent lamp over bench.

Second of a Series on the Certified Service-Dealer Plan

sets he owns are sour too. That's the time to give him, in a round-about way, an idea that it wouldn't cost him any more for tubes if you went over to his house sometime pretty soon to check up on the other sets. You can sell yourself solidly if you will just take the time and proper means of doing so. First thing you know, Old Man Chips will be so sold on you and your ability that he'll be bragging to his friends during lunch or poker games that *his* serviceman is the world's champ and *no* sets will perk properly until *you* have had a chance to examine them in person and bring them up to par. The average human is conceited—likes to brag about his accomplishments. Get customers to cherish doing business with you. Recommendation advertising like this cannot be beaten because the new customers do not have a chip on their shoulder when they call you in.

Incidentally, such carefully managed salesmanship pays in another way: No specialist is ever forced to resort to cut-price tactics. His merchandise brings a premium. From now on let List Prices be the watchword and despite corner drug store cut-price competition, you'll get your prices and a good profit margin.

TUBE-TEST CHARGE

That brings to mind another factor that comes under the heading of advertising and salesmanship. At some time in his career every service-dealer must decide whether he should charge a nominal sum for testing tubes or do this work "on the cuff." Store rent, lights and fixtures cost money. So do instruments. Overhead is a necessary evil but is less so when it can be made to help pay its own way. The better your store location the more rent you pay, but the greater are chances of picking up transient business to offset the extra cost. In like manner better test equipment, while more costly at the outset, can be made to pay for itself plus a profit if properly merchandised in your customer dealings. Don't hide your test equipment. Display it prominently and don't be ashamed to let your customers know that it is Deluxe and absolutely reliable. He'll never question its readings and will credit you with being a better workman because you possess and use better tools. He'll pay higher prices for such accommodation.

Whether you should charge for testing tubes when no replacement is re-

quired or sale consummated is debatable. Your local conditions can help you decide on what policy is best, but once a policy is decided upon abide by it. We have always believed that tube testing is *not* like minor car adjustments and for that reason should be charged for. Tools for auto adjusting do not become obsolete quickly and nothing more than experience and labor is involved in such operations. But radio test equipment does have a limited useful life, costs a great deal, and should be amortized in the shortest possible time so that more modern equipment may be bought on occasion.

Just as test equipment can be used to dress up a store besides its utility value, so can it be used to excellent advantage as an advertising medium. We have recently studied the service shop advertising which appears in the telephone company classified directories throughout the country and find that nearly all larger service-dealers feature their modern, up-to-date test equipment. In like manner these service-dealers conduct direct mail advertising campaigns showing how their equipment is used to the customer's advantage.

Every little detail about your organization and facilities which can be used to create confidence in your work should be utilized whenever possible. You already own the equipment, and it costs no more to let that fact be known in the places where it will do you the most good, thus bringing a cash return on your investment.



The new RSD Certification Seal—a distinctive six-inch decalcomania in red, white, blue and gold, which will help your business. Ask for yours now.

pouring into your cash register because you are doing nothing to calm his ruffled feelings, and every tube you lay aside, to him, is another dip into his pocketbook. By the time you have tested six tubes, found three weak, and figure that Old Boy Chips is stuck for three bucks, he is almost a bitter enemy and you'll need grappling hooks to keep him from running out of the store to some other shop around the corner where, perhaps, *they* may find that only two tubes are shot and the penalty of enjoying some replacements will only come to two dollars.

On the other hand, you could make a life-long pal of Mr. Chips if right from the outset other tactics were employed. Let him tell his tale of woe. Spend three minutes in diagnostic conversation with him before you even glance at his tubes. Then pick 'em up gently, study their age code markings and keep talking about his receiver and things in general. Try to make him feel kinda good that he don't own a 19-tube Super-Duper which would really be a headache when tube-trouble time arrives. Give the old boy some personality and sympathy salve while testing the tubes and by the time you've tallied the score you will find that he is greatly relieved to know that he *only* has to spend three bucks for another generation of good radio reception. A study of the age markings oftentimes makes it easy to sell a whole tube complement rather than just a few replacements.

Incidentally, during your questioning conversation with Mr. Chips you might be able to find out how many of the other

Circuit Court

VOLUME COMPRESSION

MORE AND MORE records are being made—and ruined. And, in home recordings, one cause of occasionally unsatisfactory results has been lack of automatic control of the volume range which actuates the cutter. If the volume becomes excessive, the record is cut too much, often causing the reproducing needle to jump the groove. At very low volume, insufficient cutting results, causing weak reproduction and a relatively high noise level. In studio recordings these faults are avoided by employing automatic volume compression in the amplifier, and now we find that this feature has also been made available for home recording in the RCA VHR-407 chassis.

A partial schematic of the circuit employed in this chassis is shown in Fig. 1. For simplicity, only those circuits which are essential to the operation of the volume compression system are shown.

Volume compression is obtained by reducing the gain of the 12K7GT microphone amplifier tube when the input sound level is excessive, and by increasing the 12K7GT gain as the input volume level is reduced. These actions are secured by automatically varying the grid bias of the 12K7GT tube. On high volume, a portion of the output audio voltage is applied to one section of the 6H6 control rectifier in such manner that the control-grid bias of the 12K7GT is increased, thus reducing the amplification, and likewise the output volume. As soon as the output audio voltage is thus lowered, the audio voltage applied

to the control rectifier is correspondingly reduced, the bias on the 12K7GT is reduced and the gain of the microphone amplifier is increased. Thus these two actions tend to oppose each other within limits and the peak output level is maintained relatively constant by decreasing the gain on strong signals.

The initial grid bias for the 12K7GT is obtained from the two bias cells shown in series with R1 and R2. Though the resistors R3, R4, R5 and R6, which compose the balance of the return circuit, terminate at a point on a voltage divider which is negative with respect to ground, this additional negative bias does not get to the 12K7GT grid because a positive bucking voltage, applied through the 8.2-meg resistor to the diode plate at the junction of R4 and R6 causes a slight current flow which nullifies the added bias voltage under no-signal conditions.

When the mike is in operation, this situation is radically changed. The amplified audio signal appearing across the tapped portion of the a-f output transformer secondary is applied across R7, causing the cathode potential of the biasing section of the 6H6 diode to become alternately positive and negative at an audio-frequency rate. Over the half-cycle when the cathode is positive with respect to the diode plate, no diode current flows in the bias network section and the added bias of the voltage divider circuit is applied to the 12K7GT grid through the resistor network. While the positive voltage is still being applied through the 8.2-meg resistor, since the

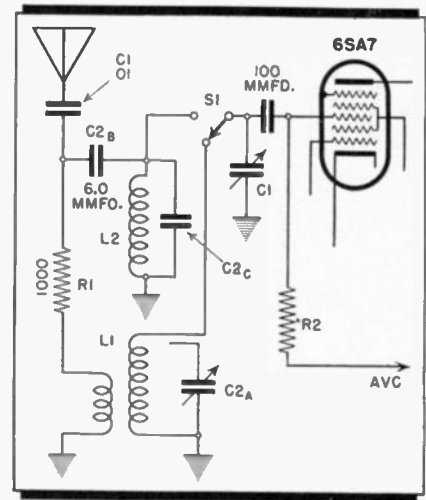


Fig. 2. Drifting trimmer in G.E. J-62 receiver.

resistance of the diode plate in the remaining 6H6 diode section is lower than that in the biasing section, because its cathode is at ground potential, current flows only in the former section.

During the interval when the added bias is thus applied to the 12K7GT grid, the 0.5-mfd condenser from the diode plate to ground receives a negative charge which it holds over the negative half-cycle of the a-f control voltage applied to the diode circuit. This prevents the control action from being neutralized over the negative half-cycles, and also serves to filter out the ripple.

The negative voltage appearing in the control rectifier circuit during the operation of the amplifier and mike is also

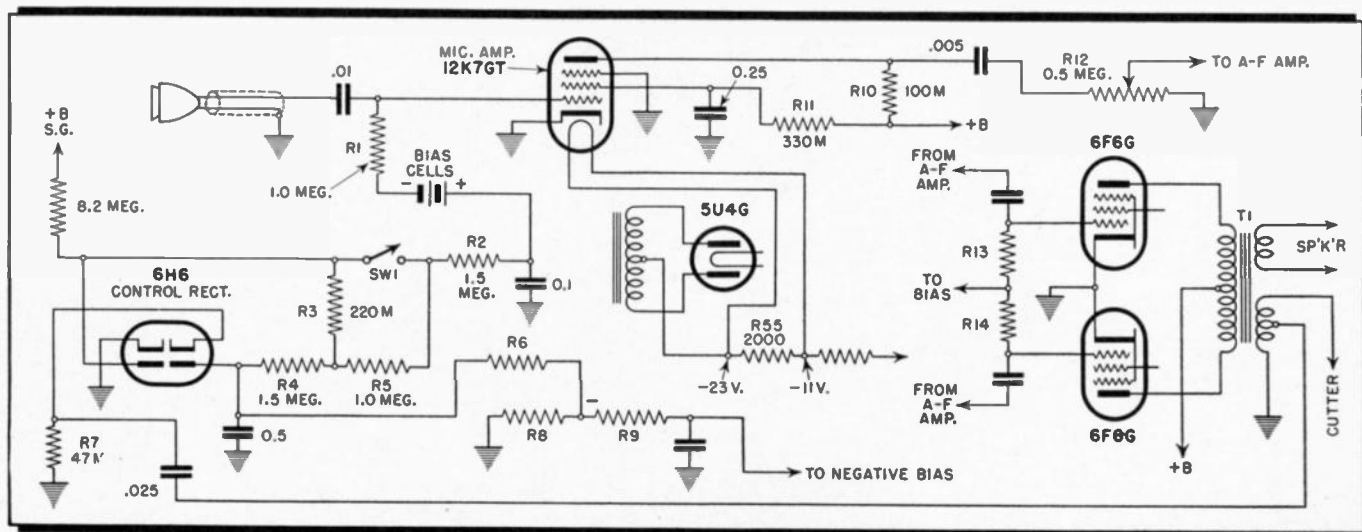


Fig. 1. Volume-compression circuit used in RCA-Victor VHR-407 radio-phono-recorder.

used to actuate a monitoring magic eye, which indicates the average volume level. The switch, *SW-1*, is used in conjunction with the monitoring circuit.

Note that the heater of the 12K7GT is energized by the current in the B-supply circuit, the heater being in the negative leg of the power supply.

★ TRIMMER ADRIFT

WE'VE HAD capacity coupling between coils serving to substitute for grid condensers in oscillator circuits. Now comes a trimmer condenser circuit in which the "high" side does not make contact with the coil which it supposedly shunts.

This is shown in the circuit, Fig. 2, representing a partial schematic of the *General Electric J-62* receiver. Note that the lead from *C24* merely runs parallel with that of the "high" side of *L1*. This forms capacity coupling which is in series with the capacity of the trimmer. Result: the trimmer is not nearly so critical in adjustment.

★ FEEDBACK WINDING

IN THE SAME *J-62* receiver, a separate secondary winding on the output trans-

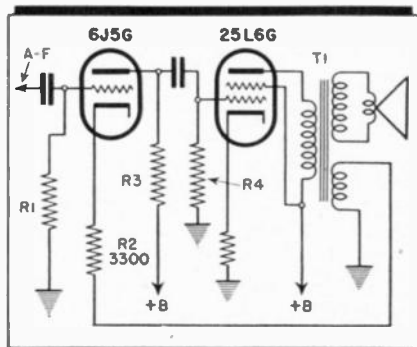


Fig. 3. Output-transformer feedback winding in G.E. J-62 receiver.

former is reserved for the exclusive use of the inverse feedback network. This, as you see in Fig. 3, is obtained by returning the cathode of the 6J5G through *R2* and the aforementioned winding.

Better be watchful of such circuits. If the output transformer goes west and somebody—not you, of course—gets the idea that any old replacement transformer ought to do the trick, even though it has but one secondary, trouble may result. These inverse feedback circuits won't stand much abuse. With the slightest provocation, they're likely to burst into howls. And putting in an output transformer which doesn't provide proper feedback is more than enough to exasperate any modern negative feedback circuit. So, if you get stuck on some such job, consider and take heed.

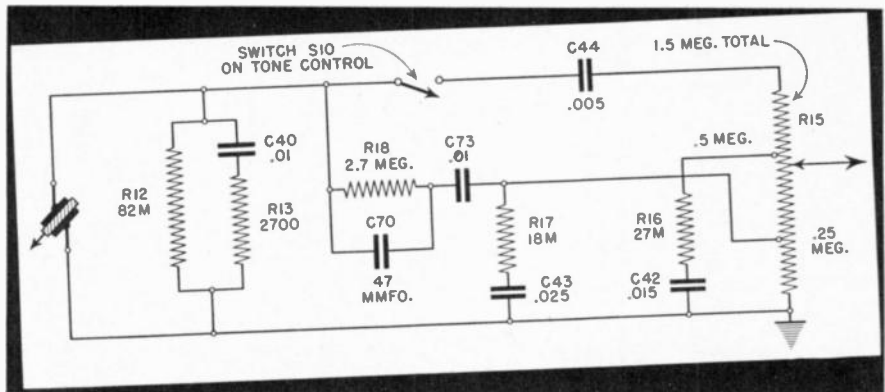


Fig. 4. Frequency-compensated phono pickup circuit used in the RCA Victor V-300-model radio-phono combinations.

PHONO RESPONSE

IN THE MORE expensive *RCA Victor* console model Victrolas, great pains have been taken to provide the optimum in record reproduction. Mechanical noise has been reduced to a negligible quantity through the use of the "Tone Guard", which prevents direct needle and pickup-arm noise from escaping into the room by killing it in a mechanical filter, and motor noise through the use of a sound-absorbent motor enclosure.

To further reduce extraneous noises, such as motor rumble and needle scratch, the frequency response of the audio system is restricted to what, in present practice, amounts to the "usable" range, or 50 to 5000 cycles. There is sharp cutoff at both ends—at 50 cycles to eliminate motor rumble which falls below that frequency; and at 5000 cycles to eliminate needle scratch or surface noise, the major portion of which is above that frequency. Part of the cut-off is mechanically derived in the loudspeaker which is of special design.

To insure optimum results at all volume levels, a special pickup circuit is employed. This is shown in Fig. 4, and is used in Victrola Models V-300, V-301 and V-302. This circuit uses a tone-correction network, an equalizer, and a dual bass-compensated volume control. Added to this is a switch which provides "low tone" reproduction.

In the figure, the resistors *R12*, *R13* and the condenser *C40* serve to control pickup output and attenuate the bass response so that it will not be accentuated at high volume levels. This filter also bypasses low-frequency motor rumble transmitted to the needle through the motor shaft and turntable.

Resistor *R18* and condenser *C70* form the equalizer which provides a flat response over the range of 50 to 5000 cycles. This prevents the masking of one frequency by another, as would be the case if any substantial peaks were present.

Bass boost at low volume levels is accomplished through the use of two bass-compensation circuits associated with

the 1.5-meg tapped volume control, *R15*. Maximum compensation occurs when the volume-control arm is at one or the other of the taps, one of which is at 250,000 ohms and the other at 500,000 ohms. The values of each compensation circuit are such that the larger degree of relative bass boost occurs at the lower tap, and a lesser degree at the 500,000-ohm tap where less bass boost is required due to the higher volume level.

It should also be noted that the equalizer feeds the lower tap on the volume control, with the result that, as the control is advanced beyond the first tap, an attenuation of the higher frequencies occurs, due to the added resistance in the circuit. This attenuates surface noise that would otherwise be audible at higher volume levels if the response band were "wide open".

The condenser *C44*, cut in and out of circuit by the tone-control switch *S10* (only a portion of which is shown) serves to bypass the equalizer when in circuit and increase the low-frequency response.

★ WAVETRAP

A SECTION OF the r-f circuit of the *Emerson Model FA-408* receiver is (Turn to page 28)

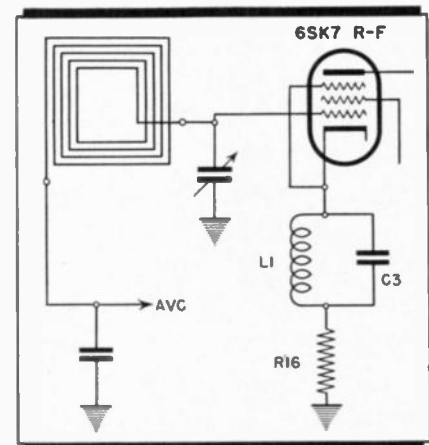


Fig. 5. Cathode wavetrapp in Emerson Model FA-408 receiver.

SPRAGUE

Interference Locator—Model IL-2, a highly sensitive and rugged portable device for the location and isolation of radio inter-

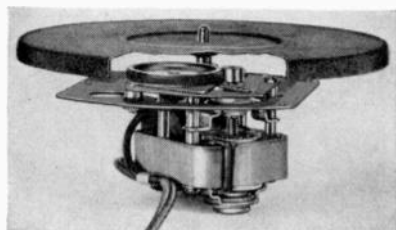


ference. Operates either from self-contained batteries for portable operation, or directly from a 115-volt ac or dc line. Equipped with a directional loop antenna mounted on top of the cabinet when in use, or carried within a cover recess. An extensible pole antenna is also provided, a special input circuit for the latter providing sensitivity of a high order.

Tuning ranges, selected by a switch, are 500 to 1700 kc; 1.7 to 5 mc; and 15 to 32 mc. An input signal of less than 2 microvolts will produce a deflection of 10% on the output meter scale. In addition to a loudspeaker, the Locator is equipped with a two-range calibrated output meter. Headphones may be used in locations where high extraneous noise levels exist. A calibrated volume control may be used with the output meter to measure interference suppression devices. Loop antenna can be switched to audio input as a search coil for a-f interference pick-up or for use as a pipe finder. By Sprague Products Co., North Adams, Mass. RADIO SERVICE-DEALER.

ALLIANCE

Phono Motor—Model K-800, designed specifically for 25-cycle operation. Phonomotor performance is obtained on 25-cycle current comparable to that of 60-cycle motors. The new 25-cycle motor is adapted to the standard Model 80 friction-drive assembly, thus allowing interchangeability in mounting.



Model K-800 is available for 110 or 220 volt 25-cycle current in 8 or 9-inch turntable sizes. By Alliance Mfg. Co., Alliance, Ohio. RADIO SERVICE-DEALER.

RCA

Portable Sound System—Type PG-180 portable p-a system has 15-watt output for sound reinforcement applications for indoor audiences of up to 2000 persons.

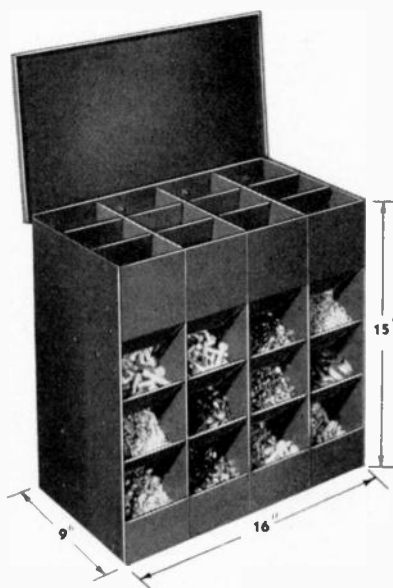
The two loudspeakers are 10 $\frac{1}{4}$ " permanent field types; the mike a Junior Velocity type mounted on table stand. Two separate input circuits with individual volume controls are provided for high-impedance inputs.

Improved, longer cables are employed, designed to withstand abnormal wear.

The whole unit packs into a case measuring 21" by 16 $\frac{3}{4}$ " by 11" and weighing 43 pounds. Finished in black fabric. By Commercial Sound Division, RCA Manufacturing Co., Inc., Camden, N. J. RADIO SERVICE-DEALER.

LYON METAL

Parts Bin—Assembler's Bench Bin concentrates a large supply of 12 different small parts on a bench space of only 16" by 9". Compartments arranged in three capacity groups of four compartments each, afford-



ing larger capacities for the bigger or more frequently used parts. Loading compartment openings at the top of the bin are each 4 by 3 inches, and the hopper front openings 4" wide by 3" high. By Lyon Metal Products, Inc., Aurora, Ill. RADIO SERVICE-DEALER.

RECOTON

Two-Speed Stylus—New cutting stylus of hard stellite inserted in a duraluminum shank. Has two edges; one cutting and the other polishing. Stylus may be re-sharpened. Several hours recording at either 33 $\frac{1}{3}$ or 78 rpm. Particularly advantageous at 33 $\frac{1}{3}$ rpm. By Recoton Corp., 178 Prince St., New York, N. Y. RADIO SERVICE-DEALER.

PRECISION

Tube & Set Tester—Series 954, combination dynamic mutual-conductance type tube tester and 37-range ac-dc set tester in one unit. Sensitivity of 20,000 ohms per



volt including ranges of 6000 volts ac-dc; 60 micro-amperes; 12 amperes and 60 megohms. Available in 4 models, complete with batteries and extra high voltage test leads—954MCP open type portable; 954C counter type; 954PM standard panel for rack mounting; and 954P in walnut finish portable type carrying case with removable cover and tool compartment. By Precision Apparatus Co., 647 Kent Ave., Brooklyn, N. Y. RADIO SERVICE-DEALER.

WALSCO

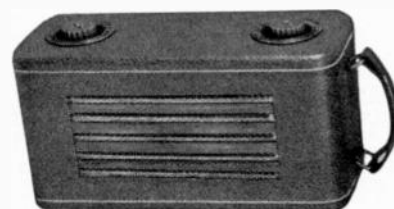
Staple—To be used in Walsco Staple Driver, the new staple is so tough that it can be driven into extremely hard surfaces, such as brick, mortar and even soft and medium hard concrete.

Free samples of this type of staple are available for test purposes to owners of Walsco Staple Drivers. By The Walter L. Schott Co., Los Angeles, Calif. RADIO SERVICE-DEALER.

DEWALD

Miniradio—Model 410 "Companionette" miniature receiver, weighing approximately 4 pounds, in streamlined simulated cowhide case.

Battery superhet, with 4 tubes and p-m speaker. Built-in loop antenna, easy vision tuning dial, avc. Tuning range from 1700



to 540 kc. By DeWald Radio Mfg. Corp., 436 Lafayette St., New York, N. Y. RADIO SERVICE-DEALER.

Announcement:

On and after FEBRUARY 1st, 1941
 RADIO SERVICE-DEALER'S 1 year
 subscription rate will be \$2.00
 2 year subscriptions will be \$3.00

Until Feb. 1st we will accept subscriptions at \$1.00 for 12 issues — \$2.00 for 24 issues
PAID SUBSCRIBERS MAY EXTEND THEIR PRESENT SUBSCRIPTIONS.
 Simply send \$1.00 for a 1 year or \$2.00 for a 2 year extension.

When RADIO SERVICE-DEALER was first conceived it was our opinion that the obligation of a radio service magazine to its readers should include a sincere effort to improve and strengthen the field in all ways. Subsequently we have published more and better text material than any other contemporary publication.

Our staff, working in close contact with the field will continue to give our subscribers just the type of authoritative, exclusive and timely data needed and not obtainable through any other trade paper.

Now RSD helps better progressive full-time radio servicing organizations win public recognition and a larger share of business through



A distinctive six-inch decalcomania lithographed in four colors (red, white, blue and gold) which will help your business, available FREE to all subscribers classified as independent radio service dealers on request.

our nation-wide Certification Plan. Our distinctive, four-color "Seal of Certification" is available without charge to any independent servicing organization which meets the rigid requirements but RSD subscribers whom we classify as "service-dealers" automatically qualify, for we, at our expense, confirm their eligibility before accepting their subscriptions.

It is a mark of distinction—it pays—to be numbered amongst RSD's paid subscribers. You cannot afford to miss the technical data we will publish or the active campaign now under way for Certified Service-Dealers. Take advantage of the money-saving offer still in effect. Send your check and become a paid subscriber today.

(TEAR OUT AND MAIL TODAY)

WORTH \$1.00—MAIL NOW!

Regular \$2.00 ANNUAL SUBSCRIPTION TO RSD COSTS BUT \$1.00 with this coupon. Good until Feb. 1, 1941.

RADIO SERVICE-DEALER, SOUNDMAN & JOBBER
 11 West 42nd Street, New York, N. Y.

Sirs: Enclosed herewith is my check (or money order) for \$..... Please enter my annual subscription order (12 issues) at \$1.00 for 1 year or \$2.00 for 2 years, (24 issues)—1/2 the regular price. Foreign subscriptions are \$2.00 yearly. I believe the information given below is accurate. IF MY SUBSCRIPTION IS REJECTED I EXPECT TO RECEIVE IMMEDIATELY A REFUND IN FULL FOR THE AMOUNT ENCLOSED HEREWITH.

Name (print carefully)

ADDRESS FIRM NAME Est. 19.....

CITY STATE YOUR POSITION

Please check whether firm is

- An independent servicing organization
- An independent service-dealer (engaged primarily in service work)
- A service-dealer (does servicing, but is primarily interested in retailing)
- Selling, renting or servicing Sound Equipment
- Jobber Any other classification
- Manufacturer (State it)

I belong to a serviceman's organization Yes No

We stock the following checked items:

- TUBES
- PARTS
- RECEIVERS
- BATTERIES, etc.
- SOUND EQUIP.
- ELEC. APP'L'S.

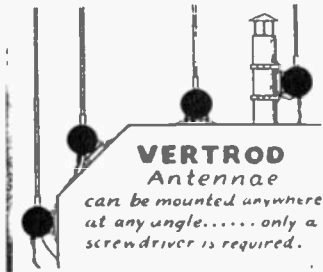
We own the following instruments:

- V-T Voltmeter
- Tube Checker
- Analyzer
- Oscillator
- Signal Generator
- Volt-Ohm Meter
- Others
- MANUALS

New Products

VERTROD

Antenna—Vertical-rod antenna of the noise-reducing type, with special iron-core antenna and receiver transformers. Only 4 inches required for mounting. Antenna proper is a 9-foot solid duraluminum rod.



Model 101 covers a frequency range of 500 kc to 22 mc. Model 102, for f.m., covers a range of 500 kc to 60 mc. By Vertrod Manufacturing Co., 132 Nassau St., New York, N. Y. RADIO SERVICE-DEALER.

SOLAR

Plug-In Electrolytics—Dry electrolytic capacitors in metal cans of the plug-in type to fit standard octal sockets. Known as Type DO.

This mounting is recommended where quick servicing may be a factor, as in amplifier and transmitter installations.

Straps are available, assuring rigidity of mounting under conditions of vibration.



All usual ratings can be furnished, including multiple units. By Solar Manufacturing Corp., Bayonne, N. J. RADIO SERVICE-DEALER.

GENERAL CEMENT

Cleaning Kit—No. 777 Contact and Attenuator Service Kit for cleaning noisy attenuators, switches, variable contacts, etc.



Kit consists of special contact cleaner and special corrosion resistant lubricant. By General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill. RADIO SERVICE-DEALER.

GENERAL

Pen-Oscil-Lite—A completely self-contained, self-powered, fully shielded oscillator of the multi-vibrator type which generates a-f, i-f and r-f frequencies for circuit tracing, trouble shooting, alignment, checking sensitivity, etc. Entire unit about the size of a fountain pen. Uses a single small flashlight cell. Drain is about 20 ma, providing several months' battery life.

Radiation is from the probe tip only, and is directional, thus permitting coupling to a desired circuit without undesired coupling to adjacent circuits. Because of its waveform, there is no need of tuning the receiver under test to any specific frequency. By General Test-Equipment Co., 213 Crosby Ave., Kenmore, N. Y. RADIO SERVICE-DEALER.

BELDEN

Soldering Irons—Three new soldering irons provide a range of sizes to take care of



practically all radio service jobs. All three irons are of sturdy construction, and each has baffle plates to keep the handle cool. Hexagonal shape of these baffle plates prevents the iron from rolling when laid on a flat surface.

The 80-watt iron, 8110, for light jobs such as wire connections, has a $\frac{3}{8}$ " tip. The 100-watt, 8113, for medium light service, also has a $\frac{3}{8}$ " tip. Each of these irons comes supplied with stand including tip cleaner. The 150-watt heavy duty iron, 8116, comes with stand only and has a $\frac{1}{2}$ " tip.

The irons have Nichrome heating elements. The machined copper tips extend into the element for faster heating. By Belden Manufacturing Co., 4689 W. Van Buren St., Chicago, Ill. RADIO SERVICE-DEALER.

TURNER

Push-Pull Vibrators—Employ an equal amount of magnetic power to push then pull the reed and its contacts, rather than a springing action, resulting in a harder and faster swing of the reed. This provides a cleaner more positive contact. Piling and chattering are eliminated and hash reduced. Contacts are micro-adjusted at the factory.

New design eliminates stack assembly. The vibrators offer a 100 percent closed dual magnetic path with resulting increase in efficiency.

Come in factory-sealed carton with open terminals for testing the vibrators without removing them. By The Turner Co., Cedar Rapids, Iowa. RADIO SERVICE-DEALER.

PHILCO

Philcophone—A new two-way communicating phone for inter-room conversation, complete with the master station unit and one remote station. The master station, in a compact plastic cabinet, has five push-button controls so that four additional remote stations may be used.

The remote stations are housed in a small metal casing. Each unit comes with fifty feet of 3-wire cable.

The master control has a sixth push-button marked "Quiet". In normal operation the master control is left on with the volume turned up and the "Quiet" button depressed.

In this position no sound can be heard from any of the remote stations until the person operating one of these stations pushes the "Talk" button on the remote unit. The user of the master control can then push the button for that particular station. The remote station operator then does not have to use the "Talk-Listen" button. By Philco Corporation, Tioga and C Streets, Philadelphia, Pa. RADIO SERVICE-DEALER.

SHURE

Communications Mike—The "Stratoliner" 708SH crystal type communications microphone for amateur and commercial applications. Output level 29.7 db below 1 volt per bar for 10 bar speech signal. Built-in r-f filter protects against burn-outs. Bimorph crystal. Built-in cable connector. Streamlined die-cast case finished in iridescent gray with chrome bars. Standard $\frac{5}{8}$ "-27 thread for stand mount-



ing. Diameter is $2\frac{1}{2}$ ", length $4\frac{1}{2}$ ". By Shure Brothers, 225 W. Huron St., Chicago, Ill. RADIO SERVICE-DEALER.

WEBSTER-CHICAGO

Dynamic Mike—The "Super-Dyne" microphone, designed to give high level output with response of 40 to 10,000 cycles. Has wide-range pick-up and freedom from atmospheric or climatic effects. Utilizes a new design of Alnico magnet to give highest flux density per unit gap, dural diaphragm, and edge-wound flat wire voice coil.

Finished in gun-metal with polished chrome bars. Directional baffle is available to improve the directional effect and decrease feedback and room noise pickup. Snaps on to front of mike. By The Webster Company, 5660 Bloomingdale Ave., Chicago, Ill. RADIO SERVICE-DEALER.

(Turn to page 36)

F-M ANTENNAS

(From page 6)

efficiency of the straight doublet in free space, but it is still a satisfactory arrangement in areas of high signal level. It may be used in either a horizontal or vertical plane.

Another type of folded doublet is shown at C in Fig. 4. It consists of a single folded wire slightly over one-half wave in length (about the length of a reflector). The spacing between the paralleled wires should not be less than one inch and preferably two inches. The length of the "fold" or paralleled wires should not be more than 50 percent of the total length of the entire antenna—preferably less. The more wire in the horizontal sections, the better.

The 72-ohm transmission line is clipped on to the bottom of the "fold" and the clips moved up along the parallel wires a bit at a time until maximum signal is obtained, after which the terminals of the transmission line should be permanently connected.

TRIAL TESTS

In making an installation it is important to keep in mind the fact that the desired signals may not arrive from the direction anticipated. Temporarily secure the antenna in such a manner that it can be turned around so that you can determine the direction offering maximum signal strength.

The same applies to indoor antennas. Moreover, reflections caused by steel girders, etc., may result in a very weak signal in one part of a room and a strong signal at some other location in the same room. The best position for the antenna can be determined only by trial.

Where outside antennas are concerned, it is hardly worth while to construct them especially for each job. There are a number of good f-m antenna kits on the market which have sufficient flexibility in design to meet practically all requirements.

HANDLING MIDGETS

(From page 7)

due to corrosion of r-f ground connections to the chassis, and the repair involves cleaning and tightening of all joints, condenser wiper contacts, etc. As for intermittents, the dangers associated with the servicing of such conditions are too well known to warrant extensive comment, at least insofar as the servicing of cheap ac-dc midgets is concerned. In each of these cases, if the set has been

in service for a reasonable length of time, it is usually good policy to recommend without hesitation the purchase of another set.

TRADE-INS AND LOANERS

No matter how small your service business is, it is a good idea to handle at least one line of midget receivers, or to have a satisfactory working arrangement with a jobber or dealer so that you can sell midgets at a profit. Don't hesitate to take trade-ins, provided that the trade-ins also are midgets, since the resale value of a midget is far greater, in pro-

portion to its original cost, than that of a console. Don't allow more than a couple of dollars for the trade-in; remember, if the customer thought the midget worth much of anything, he wouldn't get rid of it.

If you have to hold a midget repair job for any length of time (while waiting for an ordered part, for instance) lend your customer a set in the meantime. Often you'll make a sale you didn't expect; always you'll build good will. Give particular attention to the midget brought in by the customer who has a large, expensive console. Remember, if

FOR COMPLETE DYNAMIC Signal Analysis

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THE MODEL 560-A is a basically different dynamic test instrument using a high frequency 3" scope; 3 stage, wide range, high gain, television, video, vertical amplifiers; multi-range, multi-function, push button controlled, vacuum tube AC, DC ohm and megohmmeter; super-sensitive R.F. meter; broadcast, I.F. and oscillator variable tuning section; push button controlled multi-probe input circuit. The Model 560-A Vedolyzer used with the 561 Signal Generator is radio's finest and most complete signal tracing set-up.



Or Use Model 562 Audolyzer With Model 561 Combination Signal Generator

THE MODEL 562 is the simplest and most logical signal tracing and dynamic tester available. Servicemen everywhere are recommending its use because it will start "paying off" an hour after it reaches your shop. It is not necessary to "take out" a few days and learn to operate your new instrument. ONE HOUR with the AUDOLYZER, a test oscillator, and a receiver, and you can tear into those repair jobs you have pushed aside to REST for a while. The AUDOLYZER contains a five inch dynamic speaker for its primary indicating device; a meter to monitor R.F., I.F., A.F., A.V.C., A.F.C., and DC voltages; a two stage tuned amplifier to check frequencies from 95 KC to 14.5 MC; a vernier and step attenuator to control signal level reaching speakers; a vacuum-tube voltmeter to check DC volts from 0 to 1000 volts in seven ranges; an ohmmeter to check resistance from .1 ohm to 20 megohms in 5 ranges; a single probe to be used in any type circuit; dual probes for intermittents.






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SUPREME

MODEL 571 SIGNAL GENERATOR

THE MODEL 571 is the most economical R.F. Signal Generator for those who have a limited amount to invest and yet desire the features and quality incorporated in the higher priced units. It is capable of providing six types of signals with high stability and accuracy. Other features found only in the expensive generators are double shielding, ladder type attenuator, repeating scales, two modulation levels, illuminated dial, speedy and simple operation which makes an ideal economical set-up for dynamic signal tracing and analysis when used with the Model 562 Audolyzer.

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you quote too high a price on the repair of the midget, he'll go to your competitor. There, in all probability, he may get the repair done below cost, the serviceman figuring that he'll make it up the next time he is called to service the larger set.

Try and find out what troubles are epidemic in midgets in general use in your locality. Here's a case where your local servicemen's organization can help. If you don't belong to one, join one. If there isn't any, form one. Tell the others what troubles are prevalent in the midgets you work on; and they'll do likewise for you. Try it and see.

TRANSIENTS

(From page 3)

last, a demand for radios in cabinets of period design. This is something the manufacturers have tried to put over time and again without success. On the whole, radio cabinetry has stunk, most people said it stunk, but the market for something better simply did not exist. Now, for no apparent reason, it does.

Period designs are not cheap. Owners will be loath to part with them for years to come. Hence, as time marches on, the

chassis will come in for a whale of a lot of servicing—and eventually the serviceman is going to have the opportunity of installing modern chassis in exquisite cabinets that owners will part with only over their dead bodies.

SERVICEMAN'S DIARY

(From page 8)

it did reduce it slightly. So the trouble was somewhere else and it was my job to fix the trouble without letting the brother-in-law know he was wrong. It sounded tough, but I had a hunch.

"Would you mind bringing me one of those cardboard-type electrolytics in place of this metal one?" I asked. "It will be easier to install."

While he went downstairs to the basement for the replacement I tipped Archie a wink and did a little quick troubleshooting. Then I reconnected the negative feedback circuit so the amplifier was back the way I had it originally. I switched on the amplifier again. The hum was gone.

When he returned with the condenser I installed it as requested. Then we tried the outfit. It played perfectly. While Archie's brother-in-law was acknowledging congratulations I slipped out and hopped into Archie's car. A moment later Archie joined me.

"Listen," he grinned, "I'm not so dumb. I saw you reconnect that feedback circuit and noted that it still hummed. But then you pulled a sleight-of-hand trick that took out the hum, before you put in the condenser. What was it?"

"You owe me for a 2A3," I told him. "One of the two in the push-pull output circuit had an open filament, due probably to rough handling by your esteemed brother-in-law. So I changed it. As I told you, I never feel dressed for a service call unless I have a tube checker and a set of replacement tubes."

"You might also bill me for removing interference," he laughed, "because I'm going to see that he never touches my amplifier again!"

So I did. And he paid.

CIRCUIT COURT

(From page 23)

shown in Fig. 5. The 455-kc wavetrap L1-C3 is in series with the cathode of the 6SK7 r-f tube (which is resistance-coupled to the oscillator-modulator). This is effectively the same as placing the trap in series with the plate, since the cathode is a portion of the plate circuit.

Note also that the cathode resistor is



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unbypassed. This introduces a small amount of degeneration in the r-f stage.

★

PHONO CONNECTION

IN A NUMBER of the RCA Victor ac-dc receivers, a phono jack is included for use with an external record player having its own volume control. The phono circuit of the Model 10X is shown in Fig. 6.

The jack is of the open-circuit type. No connections in the receiver are or need be opened or closed when the pickup is plugged in. The grid resistor *R3* serves as the pickup load across which the audio voltage is developed.

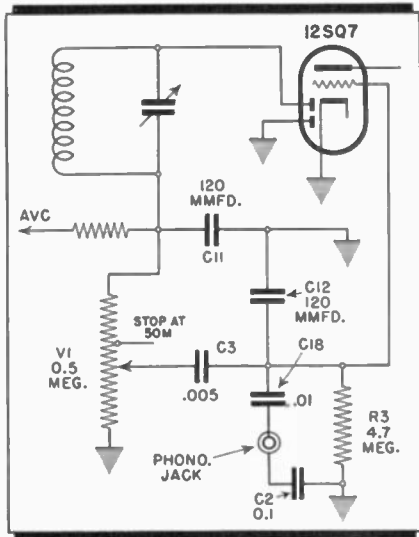


Fig. 6. Phono circuit of RCA Model 10X.

The receiver volume control *V1* is turned down when the record player is in use so that no radio signal will reach the grid of the 12SQ7. Under these circumstances, the grid blocking condenser *C3* is shunted across the pickup output. The effect of this shunt capacity is to slightly decrease the pickup output and slightly decrease the high-frequency response. By virtue of the latter, the receiver volume control serves as a tone control within the range of its resistance from ground to the point where the radio signal emerges.

The resistance of the volume control beyond the stop, and the 120-mmfd condensers *C11* and *C12* serve as an i-f filter to keep r.f. out of the audio circuit.

RECORDING NOTES

(From page 14)

the threads continue to collect toward the outside, use a new stylus.

6. When the stylus is correctly inserted, with the cuttings collecting to-

ward the center of the disc, lift the cutter, place it on the cutter rest, and stop the turntable. Then examine the cuttings and the grooves in the disc.

The cuttings should be even, thin, hair-like threads about three-thousandths of an inch across or approximately the diameter of a human hair.

The groove width should almost equal, but not exceed, the distance between grooves. A magnifying glass is helpful in examining the grooves. If the grooves are too shallow, the phonograph needle will slide over them on play-back. If

the grooves are cut too deep, rumble will be excessive.

After examining the cuttings and the groove width, adjust the cutter pressure as required by means of the adjustment screw on top of the cutter arm. Turn this clockwise to increase pressure and increase size of cuttings. Turn counterclockwise to decrease pressure and decrease size of cuttings.

Check the new adjustment by running more blank grooves.

Check the cuttings and groove width each time a new stylus is inserted, and

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IT may be difficult to avoid some obsolescence in tube testing equipment—BUT—a set tester represents an investment as basic and permanent as any tool in your shop or kit!

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that it became your trusted helper on every service job. The instruments illustrated cover a wide range of individual needs, but they have two great attributes in common—the life-time accuracy that is based squarely on the superlative Simpson Meter, and the precision craftsmanship that is reflected in every detail of assembly.

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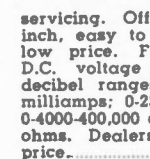
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MODEL 320 (below)—Giant tester with 9-inch illuminated meter. Has 50 ranges—nine A.C. and nine D.C. voltage ranges; six milliamperage ranges; five resistance ranges; four capacity ranges; seven decibel ranges. Entirely A.C. operated. All voltage ranges have resistance of 1000 ohms per volt. Test leads included. Rack mountings available. Dealers net price..... **\$37.50**



MODEL 260—The outstanding value in a high sensitivity set tester for television and general servicing. Ranges to 5000 volts, both A.C. and D.C.—at 20,000 ohms per volt D.C. and 1000 ohms per volt A.C. Resistance readings from 10 megohms down to 1/2 ohm and five decibel ranges from -10 to +52 D.B. Also 3 milliamperage and 1 microampere range. Dealers net price **\$27.50**

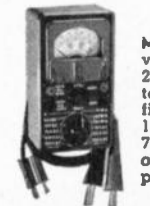


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MODEL 240—A remarkable value in a pocket size (5 1/4 x 2 7/8 x 1 3/4") 3000 volt, self-contained tester. Four A.C. and five D.C. voltage ranges at 1000 ohms per volt; 0-15, 150, 750 milliamps; 0-3000, 300,000 ohms. Dealers net price..... **\$14.75**

MODEL 230—Smallest A.C.-D.C. instrument on the market, yet has ranges of 0-10, 250, 1000 volts A.C.; 0-10, 50, 250, 100 volts D.C.; 0-10, 50, 250 D.C. milliamps; 0-1000, 100,000 ohms. Dealers net price..... **\$14.25**



SIMPSON INSTRUMENTS THAT *Stay* ACCURATE

whenever a different type of recording disc is used.

The stylus pressure, when adjusted for correct cutting, is approximately $1\frac{3}{4}$ ounces, measured at the end of the stylus screw.

Always lift the cutter-arm well up while moving it into cutting position, and while moving it back to the rest. Failure to do this will cause the follower-arm guide to drag across the lead screw under the motorboard.

RUMBLE

1. Excessive cutting pressure will

cause rumble. The width of the groove should almost equal, but not exceed, the distance between grooves.

Check the groove width each time a new stylus is used, and each time a new disc is used.

2. When recording, use the maximum bass response, by turning the power-bass control to "full" (just past the click of the power switch).

3. On play-back, use the least bass response, by turning the power-bass control to "speech" (full clockwise).

4. Be certain that the motor board

and mechanism is "floating" free from the cabinet.

RECORDER ADJUSTMENTS

"N" Recorder Arm Stop.—An extension on the cross-bracket under the motorboard limits the inward movement of the follower arm. In this stop position, the stylus screw should be $1\frac{1}{2}$ inches from the spindle.

The correct distance can be obtained by loosening set screws "N," moving the recorder arm in the required direction, and tightening the set screws.

"O" Follower-Arm Guide Adjustment.—When the recorder arm is lifted, the follower-arm rises up so that the follower-guide will clear the lead screw and permit the recording arm to be moved inward or outward.

Adjust the set screw and locknut "O" so that the guide clears the lead screw when the bottom-front edge of recorder arm is 3 inches above record.

"P" Recorder-Arm Height Adjustment.—With the recording stylus resting on a metal-base recording disc, and adjusted for correct cutting pressure, the stylus screw should be approximately in the center of the hole in the recorder arm, and the cutter head should be free to move up and down. Adjust the recorder-arm height adjustment screw and locknut "P" to obtain these conditions.

If the arm is too low, the cork bumper on top of the cutter head will hit the inner top of recorder arm.

If the arm is too high, the stylus screw will hit the lower edge of the screw hole.

Also check to see that the stylus screw does not scrape against the side of the screw hole.

CERTIFICATION

(From page 12)

dustry will be under tremendous obligation to you. Meanwhile, we're from Missouri. Nevertheless, the best of luck!"

Thanks, Vic and Charlie and the rest of you. And watch the Seals bloom in your neighborhood!

EXCEPTIONS

We have naturally received some letters commenting on the certification plan which reflect a note of pessimism. But, the one and only criticism made is that of our ability to select the good servicemen from the bad without giving each and every man a personal examination. It is a point well put, and one that should be nailed down.

The answer is that perhaps we may select some bad ones. That's inescapable; but we think we'll catch up with them in the end. Our own system is



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Stop racing the clock. Stop working on your nerves. Stop trying to "outguess" faulty receivers. KNOW what the manufacturer puts into every set that comes to your bench. Start all your jobs right—locate trouble quickly—reach for your Rider Manuals. Successful service shops all over the world depend on them for data on alignment, I-F peaks, operating voltages, parts lists and value, voltage ratings of condensers, wattage ratings of resistors, coil resistance data, gain data, and all essential information that servicemen need for quick, easy, profitable trouble shooting.

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unworkable only in the event that the percentage of bad ones is large. If we can keep it down to 1 or 2 percent the first year—and we believe we can—then, on the whole, our plan will be of value to the good servicemen and to the public. As time passes, we should be able to weed out all but a very few of the unrelia- bles.



Another roving shot of a "Certification Sealer"—Budd Radio Service, Brooklyn, N. Y.. The decalcomania is on the door at eye level and near the right edge.

We grant that the scheme is not perfect, but we insist that it is better than nothing at all. And we also insist that such faults as the plan may now have, can and will be corrected. What the faults may be we can learn only through experience, just as a set manufacturer determines some receiver faults after field tests, and corrects them in later production runs.

One critic of the certification plan states that "it cannot work because the set-owning public will have the impression that RSD guarantees every bit of work a 'certified' serviceman does, and of course you are not giving any such guarantee." No, but the American Medical Association does not guarantee the work of a doctor; neither does the university from which he graduated. By the credentials they supply they serve only to indicate to the public that a doctor is (1) properly trained and (2) in good standing. They do not and cannot guarantee that the doctor will, for instance, make a perfect diagnosis or perform a successful operation.

We are not trying to do the impossible. In effect, we are telling the public through our Certification Seals that radio serviceman John Doe has been looked into and has been found to be in good standing. To that extent we stand behind John Doe. Beyond that he is his

own keeper, just so long as he remains in good standing. The value of our guarantee lies in the fact that if John Doe gets out of line, his seal is revoked.

How do we know John Doe is in good standing? Because his jobbers have said so, because John Doe has filled out a lengthy questionnaire which provided us with an insight into his character and business. If he is running a successful business—and his jobbers' recommendations indicate that—then the chances are ten to one that he is a reliable serviceman. Successful men are invariably reliable.

We're up to our neck meeting the flood of requests for Seals that have and still are pouring in. The first batch went out just before Christmas. Additional batches have been put into the mails each day since.

We hope you fellows will get them on display as soon as you receive them—and let us know what the public reaction is. It may take a bit of time for the Seal to sink in, but eventually people are going to recognize it and take a second look to see what it says.

More next month. In the meantime, keep the ball rolling.

SERVICING by SIGNAL SUBSTITUTION*

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 Question: **COSTLY?** Answer: **NO!**

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★ Series 954 Combination Dynamic Mutual Conductance Type Tube Tester and 20,000 ohms per VOLT Multi-Range AC-DC Set Tester

A complete service laboratory answering the demand for a compact unit with every facility for accurate, reliable solutions of all tube test and measurement problems (A.M., F.M. and Television). A single master rotary range selector permits simple, rapid measurements in troublesome stages, quickly localized through "Servicing by Signal Substitution."

954 MCP—in open face portable metal case (illustrated for Series E-200). Complete with battery and extra high voltage test leads **\$61.95**

954 P—(illustrated above) Hardwood case. Complete **\$65.95**
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FREE A 120 page text book "Servicing by Signal Substitution" describes this simplified approach to receiver adjustment problems. Furnished FREE with every PRECISION Series E-200. Also available at leading distributors or directly from factory at 35c — Write for it today!

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Model 1620 also features four additional "quick change" non-obsolete features, including the above switching section. RED ● DOT Lifetime Guaranteed Instrument panel may be returned for replacement or repairs, in case of accidental damage . . . Speed Roll Chart complete with mechanism can be replaced, in the case of new factory releases, by removing only four screws from front of panel . . . New socket panel to meet future radical tube changes which present spare socket cannot accommodate will be available at nominal charge upon return of old panel . . . Switching section with power supply also can be replaced should unanticipated changes make it necessary. Gracefully proportioned wood case, natural finish. Beautiful two-tone Brown-tan sloping panel; polished metal chrome trim with inlaid color. Model 1620 Counter Tube Tester. . . Dealer Net Price . . . \$37.84.

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A Complete Pocket Size Volt-Ohm-Milliammeter with AC-DC Voltage ranges: 0-10-50-250-500-1000 at 1000 ohms per volt; DC Milliamperes 0-1-10-50-250; Low Ohms, 1/2 to 300; High Ohms to 250,000 with provisions for higher readings by external batteries. Molded case and panel. Dealer Net Price \$14.00



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THE TRIPLET ELECTRICAL INSTRUMENT CO.
Bluffton, Ohio

SILVERTONE 6491-A

(From page 11)

dependent upon the reactance of the condenser C13 at that frequency.

In the absence of a speaker field, and in the interests of compactness, the power supply employs a dual-section resistance-capacity filter. This is practical because of the low B-current drain of the receiver. Since the 6V6G is a beam-power tube, good plate filtering is not necessary. Hence, plate supply for this tube is derived from the output of the first filter section. For the remainder of the tubes, where better filtering is required, both sections of the filter are used. The filtering action of the second section is superior to that of the first section because of the larger shunt capacity and the permissible use of a resistor of higher ohmage where the current drain is less than in the first section.

ALIGNMENT

In aligning this receiver, the output meter should be connected across the primary of the output transformer, the volume control set full clockwise, and the signal generator modulated approximately 30% at 400 cycles. Signal generator ground should be connected to the receiver chassis. Always keep the output from the signal generator at its lowest possible value. As the sensitivity of the receiver is increased by alignment, the generator output should be reduced correspondingly.

Align in the following order: Short oscillator section of gang condenser, tune signal generator to 455 kc and feed the signal to the grid of the 6A8G. Adjust i-f trimmers T3, T4, T5 and T6. Their locations are shown in the accompanying sketch of the chassis.

Next set receiver dial pointer at 1500 kc, tune the signal generator to that frequency, then run a wire from the signal generator output near to the receiver, but make no direct connection. Adjust the oscillator and r-f trimmers T1 and T2 on the gang condenser.

It is advisable to repeat the entire alignment procedure in the original order to insure greater accuracy.

NEWS

RSL Moves—F. J. Wessner, of Radio Service Laboratory, has announced the removal of their Bangor, Maine, branch to new and commodious quarters at 45 Haymarket Square, the heart of the Bangor wholesale district.

Clarostat-Kennedy Sales—The appointment of the Kennedy Sales Co., 2362 University Ave., St. Paul, Minn., as sales representatives, is announced by Clarostat Mfg. Co., Inc., of Brooklyn, N. Y. The Kennedy

240

PAGES, LISTING

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RECEIVER MODELS, MADE BY

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SET MANUFACTURERS

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Fourteen pages of solid information give the most complete data ever published on the various types of I-F Transformers, their peculiarities of construction, problems met with in servicing and replacing them, elimination of undesirable oscillation and regeneration, and a thorough discussion of all kinds of service problems concerning the I-F Channel. Together with other pages of useful tables and data, this book contains 240 pages in all! It is truly a MANUAL of indispensable information for the serviceman—a tool no modern worker can afford to be without!

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organization will cover the States of Minnesota, North and South Dakota, and a part of Wisconsin.

SMC Elects—At the last meeting of the Sales Managers Club, Eastern Group, held recently, the following officers were elected for 1941: *Dan Fairbanks*, Chairman (International Resistance Co.); *W. F. Osler, Jr.*, Vice Chairman (Cornish Wire Co.); *W. W. Jablon*, Secretary (The Hammarlund Mfg. Co., Inc.).

Clarostat-Olsen—From his Pittsburgh residence where he has long been identified with Clarostat and other radio parts lines, *John O. Olsen* has moved to 1456 Waterbury Road, Lakewood, Cleveland, Ohio. Rep. Olsen will henceforth represent the Clarostat line out of his new Cleveland headquarters, covering Ohio and adjacent territory. The Virginia territory has been taken over for Clarostat by *J. E. McKinley*, working out of 519 North 33rd St., Philadelphia.

Permo Adds—Permo Products Corporation have started construction on an addition to their plant in Chicago. The new building, when completed, will increase their production by fifty percent and double their present factory floor space.

NEW LITERATURE

Xcelite Catalog—Complete new catalog on Xcelite tools for servicemen just issued by Park Metalware Co., Inc., Orchard Park, N. Y.

Phono Motor Catalog—New loose-leaf catalog, bound in a heavy blue, silver and black cover, and presenting a complete line



of electric and spring-driven phonograph motors, automatic record changers and home recording units, has been issued by the motor division of the General Industries Co., Elyria, Ohio.

Shure Catalog—No. 153, a 12-page catalog of the complete line of microphones, mike stands, vibration pickups, phono pickups and recording heads manufactured by Shure Brothers, 225 W. Huron St., Chicago, Ill.

Walsco Catalog—No. 41-X, covering all Walsco products, including the new Staple Driver and the complete line of Refinishing Materials, Dial Cables, Scratch Removers and Cements. Available by writing *Walter L. Schott Co.*, 5264 W. Pico Blvd., Los Angeles, Calif.

Sheets covering the Walsco line will soon be available from the United Catalog Publishers, Inc., 230 Fifth Ave., New York, N. Y., to jobbers handling the line.

Sprague X Manual—Now available at a net price of 25 cents is the new fully revised 1941 edition of the Sprague Manual of Radio Interference Elimination, issued by the Sprague Products Company, North Adams, Mass.

New material includes interference elimination from fluorescent lighting, use of the new Model IL-2 Interference Locator and various new filter procedures for modern requirements.

The Manual is a complete guide and is based on practical rather than theoretical experience.

Stancor Hammanual—Fifth Edition, containing 47 pages of dope on Ham transmitter design and construction. Low and high-power jobs are covered. Also uhf transmitters and transceivers, mobile units, multi-band rigs, straight c.w., and a number of modulators and power amplifiers. Issued by Standard Transformer Corp., Chicago, Ill. Net price 15 cents.

Meissner Catalog—New 1941 General Catalog of 31 pages. Includes new Meissner Phono-Recorders, F-M Chassis and Parts, the new Analyst, the Signal Calibrator, and new replacement parts and accessories. Available from the Meissner Manufacturing Co., Mt. Carmel, Ill.

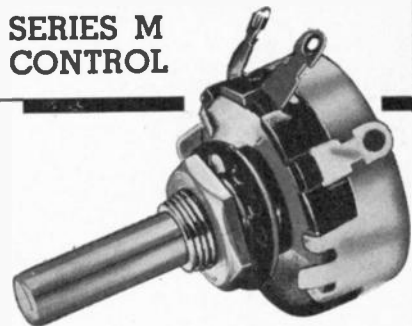
Montgomery Ward—The 1941 Radio Catalog Supplement of 48 pages covering latest receivers, test equipment, p-a units and equipment, recorders and intercom systems. Available from Montgomery Ward, Chicago, Ill.

Jensen H-F Speakers—Data Sheet No. 119 covering the new Jensen dual loudspeaker with extended range, high-fidelity reproducers with bass reflex and individual speakers of the p-m type for high-fidelity applications. Available from Jensen Radio Mfg. Co., 6601 South Laramie Ave., Chicago, Ill.

Vibrator Replacement Chart—A 12-page Vibrator Replacement Chart and Guide, indexed and cross-indexed for convenience. Covers 2, 4, 6, 12 and 32-volt vibrators. Available from James Vibrapower Co., Inc., Chicago, Ill.

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- ★ Yes, this midget Clarostat composition-element control has just what you want—accuracy, stability, long life, quiet, smooth rotation, correct shaft, dust-proof housing, and the Ad-A-Switch feature. And why not? After all, it's backed by that outstanding experience gained in producing millions of controls these past 20 years of specialization.
- ★ Also, to make sure of its correct use, this control is backed by servicing data right up to date. This insures the *right type* and the *right application*.
- ★ Try a Clarostat for that next job. You be the sole judge. Ask jobber for latest Clarostat Service Manual—or write to Dept. SD-1, 285-7 N. 6th St., Brooklyn, N. Y.



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- Amperite Regulators are equipped with a patented Automatic Starting Resistor which prevents initial surge and saves pilot lights.
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WRITE FOR REPLACEMENT CHART "S"

AMPERITE Co. 561 Broadway, N. Y. C.

AMPERITE

RSL Catalog—New catalog of over 200 pages, just released by Radio Service Laboratory, 1191 Elm St., Manchester, New Hampshire. Contains up-to-the-minute radio parts and sound equipment data.

◆
"Radio's Moving Day"—Preparation for the radio serviceman's red letter day (March 29, 1941, when all U. S. frequency channels above 730 kc are to be re-allocated) is well under way at RCA's Tube and Equipment Division, from whence comes an informative booklet being supplied to radio servicemen and dealers.

Entitled "Radio's Moving Day," the booklet outlines what RCA is doing to assist service-dealers to take full advantage of the opportunity to get into 10,000,000 homes to re-set automatic push-button receiver controls—and to sell such other things as complete check-up, alignment, new tubes, new antenna, a second receiver, etc.

Also announced is a booklet showing the frequency ranges of push-buttons on many popular receivers, etc. There is a direct-mail campaign to be provided to sell the services of the individual service-dealer. Finally, it is revealed that RCA is considering plans to place consumer advertising on the radio and in national magazines directing attention to the necessity of having the resetting service performed by a competent serviceman.

◆
R.C.P. Catalog—No. 124, listing over forty-five models of test equipment. Has 16 pages. Radio City Products Co., Inc., 88 Park Place, New York, N. Y.

◆
Raytheon Booklet—Attractive dealer and service helps booklet containing invaluable aids to Raytheon Tube dealers.

The booklet illustrates a multitude of dealer helps, including window displays, counter and shelf displays, window and door identification decals, service shop tags, tube stickers, etc. Also valuable technical information.

Available to all tube dealers through their Raytheon Distributor or from any Raytheon branch office.

◆
Mallory Supplement—Supplement No. 11 to the 3rd Edition of the Mallory-Yaxley Radio Service Encyclopedia has 26 pages and covers superheterodyne first detectors and oscillators.

◆
RCA Manual—A 480-page bound volume of service notes, including more than 500 illustrations, covering all RCA Victor 1939 and a number of the 1940 models of radio and radio-phonograph combinations. Over 150 circuits included.

The volume also contains complete instruction books on new RCA test equipment, a new index for all bound RCA Victor service notes, and a special supplementary data section for receiver and equipment models covered in the 1939 and preceding volumes.

The new 48-page edition of the RCA Rider Chanalyst instruction book is included in the bound volume.

Net price to Service Dealers is \$1.50.

◆
Job Record Card—Hygrade Sylvania has announced a new job record card for servicemen and dealers which has a customer's receipt stub for claiming radios left at the service shop. A guarantee appears on the



Look for those
NEW ITEMS

● Yes sir, Aerovox now "flags" those new items so you can't miss them on your jobber's shelves. Each new-item carton carries a bright red label on front and sides (see above). A glance at the Aerovox stock tells you what's new and worthy of your special attention, for better, quicker, more profitable servicing.

New CATALOG . . .

Ask your local Aerovox jobber for our latest general catalog, listing many new and vital items right up to date. Ask about those red-label new items on his shelves. Or write us direct for catalog.

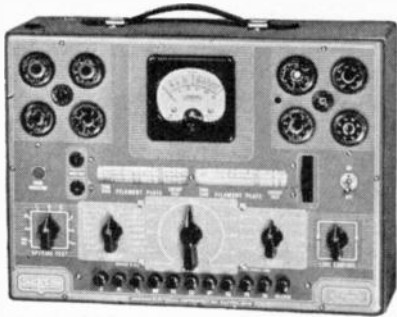
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Model 636 B

The Jackson *Dynamic* Tube Tester Is More Accurate!

Unbiased tests show Jackson Dynamic Tube Testers are up to two times as accurate as ordinary testers. Frequently a Jackson finds "poor" tubes which have passed for "good" in other testers! You need a Jackson to improve service and boost profits. Complete from built-in roll chart to sockets for latest tubes and "spares."

Price \$29.95 net.

FREE! Write today for full information and name of nearest distributor.

The Jackson Electrical Instrument Company, Dayton, Ohio

JACKSON



back of the set owner's warranty. Lower half of card is a form on which is written in all data in reference to the set.

C-R Tube Designations — To specify its many types of cathode-ray tubes, and also to simply type-number designations, Allen B. Du Mont Labs., Inc., 2 Main Ave., Passaic, N. J., has issued a special bulletin covering this data. Copy on request.

Sun Catalog — A 24-page public-address catalog covering all types of amplifiers and sound systems, and accessories such as mikes, speakers, pickups, etc. Copy upon request addressed to Sun Radio Co., 212 Fulton St., New York, N. Y.

Crowe Catalogs — New 16-page Bulletin No. 240, covering Crowe components for receivers, transmitters, television, sound equipment and experimental work.

Also Bulletin No. 232 on remote controls for auto radios. Includes panel kits for all cars from 1935 to 1940 inclusive. Also flexible shafting and accessories.

Either or both bulletins from Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago.

Hickok Catalog — Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio, have issued a new Radio Service Equipment Catalog of 12 pages covering their new line of testers, tube checkers, signal generators, etc. Copy on request to manufacturer.

Worner — Worner Products Corp., 1019 W. Lake St. Chicago have made available a new catalog covering their line of photo-electric-operated relays for the electric and radio jobber. Copy on request.

Also available, a three-color display card featuring the Model No. 601 Announcer, suitable for use in windows, on counters or on walls. Card being distributed to jobbers.

Electronic Labs — Electronic Laboratories, Inc., 122 W. New York St., Indianapolis, Ind., have issued new literature on their line of Electronic Converters. Previous converter models in which improvements have been made, carry new model numbers.

S-S Servicing — A new 120-page book, "Servicing by Signal Substitution", presents a novel simplified method of dynamic receiver analysis, illustrating the extended applications of basic test equipment to the solution of daily service problems using only the tube tester, multi-range meter and signal generator.

Included in this book are individual chapters devoted to special alignment and adjustment problems as encountered in f-m receivers, etc.

Published by Precision Apparatus Co., 647 Kent Ave., Brooklyn, N. Y. Price 35 cents at radio parts distributors or direct from company.

Universal Mike — Universal Microphone Co., Inglewood, Calif., has issued Catalog No. 172. Fully illustrated, it contains complete data on professional and laboratory sound recording equipment and accessories, including master wax and instantaneous recorders, chassis assemblies, lead screws, cutting heads, arms, blanks and needles.

DON'T LET ONE OF THE *400 STUMP YOU!



They don't seem to faze him at all!

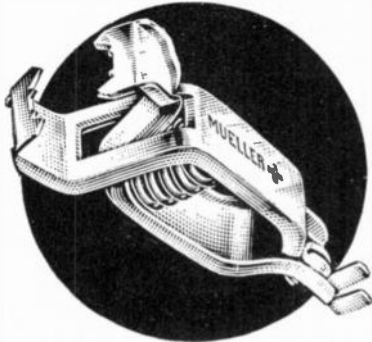
No matter whether it's Mrs. Twiddleby-Gottrocks, with her "Imperial-Splendid", or Gertie McSczytovarisch, with her "Week-end Six-fifty Special", Homer G. Snoopshaw, B. R. S., (Battery Replacement Specialist), can solve the battery problem. It's his job. He's the Replacement Adviser in Bud's Radio Shop. Of course, it may take him a week or two, but he finally gets 'em. His employer has learned to rely on Homer—and last week made him Vice-President-In-Charge-of-Replacements.

*Over 400 portable radios are listed in the replacement guide. See your local distributor or write Burgess Battery Company, Freeport, Illinois.

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For 32 years Mueller Clips have been recognized as the best. THE ORIGINAL AND ONLY COMPLETE LINE.



Alligator Clip with Red & Black Insulated handles.



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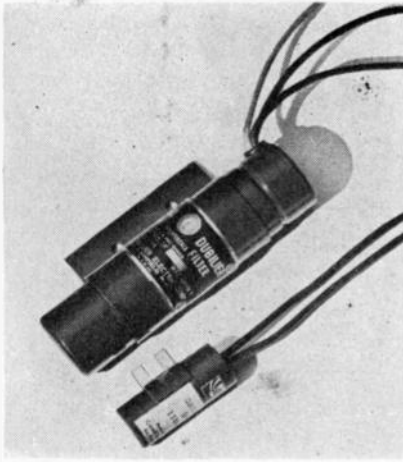
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53 West Jackson Boulevard • Chicago

NEW PRODUCTS

(From page 26)

HICKOK

Set Tester—Model 133 portable unit, featuring meter with 40-microampere range. The 5-inch meter has large scale opening and a 4-color scale. Ranges are: 40-500 d-c microamperes; 5-50-500 ma; 2.5-10-50-250-500-2500 volts a.c. and d.c. with sensitivity of 25,000 ohms/volt d.c. and 1000 ohms/volt a.c.; 0-30-10,000-1 meg-10 meg resistance, and db. All ohmmeter ranges operate from self-contained batteries. Battery tester for checking all popular size cells up to 135 volts. Leatherette-covered carrying case has removable cover and lead compartment. By The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio. RADIO SERVICE-DEALER.



Type IF-25, for 220 ac or dc, is 3½" long by 1½" in diameter, and is completely sealed in a heavier casing. It has an additional ground or frame lead and provides a 2-hole mounting. By Cornell-Dubilier Electric Corp., South Plainfield, N. J. RADIO SERVICE-DEALER.

CORNELL-DUBILIER

Noise Filters—Compact "Quietone" filter units with a spade type mounting lug designed to slip under the head of any convenient screw on the casing or frame of a home appliance. Two insulated leads connect across the supply line, either inside the appliance or at the point where the line enters. This provides a minimum path-length for the interference by-pass circuit.

Type IF-24, for 110 ac or dc, is 2" long by ¾" in diameter, and entirely sealed in metal. Underwriters Approved.

UNIVERSITY LABS

Radial Trumpet—Model RSH, compact high-power radial 360° trumpet; maximum height 20", bell diameter 15". Acoustically equivalent to a 3-foot exponential horn. Gives uniform distribution with no "hot spots."

Comes complete with universal mounting bracket and two non-resonant rubber rims. By University Laboratories, 195 Chrystie St., New York, N. Y. RADIO SERVICE-DEALER.

ELECTRO-VOICE

Cardak Mike—Model 725, has wide frequency range and constantly variable sound pick-up pattern.

Screw driver control allows the mike to function as a true cardioid for elimination of rear sound, or as a bi-directional unit for elimination of sidewall reflected sound. It is adjustable for any combination of reflected sound direction, thereby correcting unusual feedback or reverberation conditions.

Response substantially flat from 30 to 10,000. Average level, 1 volt/bar:—52 db. Finished in Butler chromium. Built-in on-off switch. Tilttable for non-directional



use. Available in all impedances (low impedance balanced to ground). By Electro-Voice Mfg. Co., Inc., 1239 South Bend Ave., South Bend, Ind. RADIO SERVICE-DEALER.

Important Announcement To All Servicemen! NOW YOU CAN JOIN THE NATIONAL RSA For Only \$1.00 a Year!



Every Serviceman can have a voice in his destiny in his own industry! The RSA extends its services and makes it possible now for all Servicemen to enjoy the advantages of membership in this national organization for only \$1.00 a year.

Yes—for as little as 2c a week you get the RSA Membership Certificate and receive the RSA House Organ. You have access to the RSA Technical Helps Bureau, and you are able to participate in all

the other functions and benefits which the RSA offers.

As rapidly as local chapters are formed, protected territories will be established for them. Applicants in present chapter areas will be referred to the local chapter.

This is your opportunity. Don't let it slip away. Join now with thousands of your fellow Servicemen in this great organization—the organization that's doing things for you!

Fill out the coupon, attach a \$1.00 bill and mail it now!

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RADIO SERVICEMEN OF AMERICA
304 S. Dearborn Street
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City State

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Complete
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\$10⁵⁶



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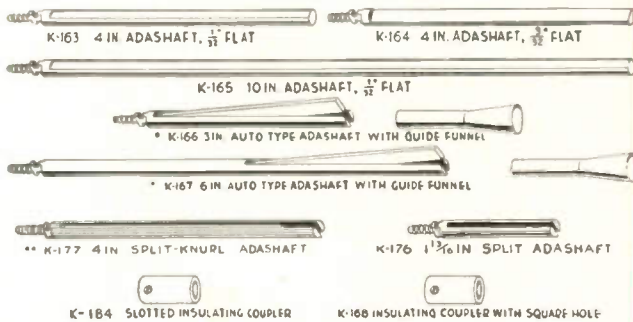
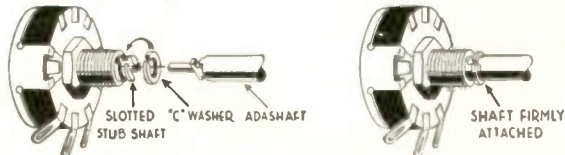
Adashaft Kit

You name the set and it's a hundred to one that you can do a replacement job right out of our PORTABLE Adashaft Kit . . . mighty good business sense . . . owning one of these kits . . . The strong steel case is 12" x 5" x 1 1/2" . . . you can even carry it in your coat pocket (note Old Man Centralab above) and you pay for the controls only . . . we give you the case "FREE".

Any shaft and control can be combined in a moment without special tools. Yet the RESULT is just as STRONG and RELIABLE as a ONE PIECE SHAFT.

Then replace the controls from your jobbers stock as they are used. Buy that ADASHAFT KIT today . . . you need it.

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**INCLUDED IN THIS ADASHAFT KIT
ARE THE FOLLOWING CONTROLS:**

| 1 EACH OF | | CURVE |
|-----------|------|--------|
| 10,000 | ohms | 3 |
| 25,000 | ohms | 3 |
| 50,000 | ohms | 6 |
| 250,000 | ohms | 6 |
| 500,000 | ohms | 6 |
| 1 MEG | ohms | 6 |
| 2 MEG | ohms | 6 |
| 3 MEG | ohms | 6 |
| 250,000 | ohms | tapped |
| 500,000 | ohms | tapped |
| 1 MEG | ohms | tapped |
| 2 MEG | ohms | tapped |

SHAFTS

| | |
|---|------|
| 3 | K163 |
| 2 | K164 |
| 1 | K165 |
| 1 | K166 |
| 1 | K167 |
| 1 | K176 |
| 3 | K177 |

COUPLERS

| | |
|---|------|
| 1 | K184 |
| 1 | K188 |

SWITCH COVERS

| | |
|---|-----------|
| 5 | K155 SPST |
| 1 | K157 DPST |

Centralab



Over 50,000 pieces of test equipment given away **FREE**

A CROSS SECTION OF NATIONAL UNION'S Honor Roll of Service Dealers

RALPH H. BOLICK, Bolick Bat. & Elec., Newbo, Mo.—Have had 20 equipment agreements during the past 7 years. I like to do business with N. U. for I find N. U. products and promotion helps outstandingly.

20 Contracts



41 Contracts

LOUIS E. CONNER, Radio Serv. Manager, Piper & Telf. Seattle, Wash.—After using thousands of N. U. tubes during the past seven years we find that we have had fewer replacements than on any other make. Most of our equipment has been secured the N. U. way.



15 Contracts



14 Contracts

J. G. COONEY, Cooney Radio Co., St. Louis, Mo.—Thanks to N. U. Equipment Deals my shop is one of the most completely equipped testing laboratories in the city. I find N. U. products are the quality products in the industry and continually recommend them to other dealers.



E. J. MACINOT, Denton, Minn. 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.



CLARENCE E. ESTELL, The Fruit Shop, Lima, Ohio—I believe N. U. equipment deals are the biggest contribution any manufacturer has ever offered to the radio service profession. In spite of cut-throat competition I sell at full list price because I can offer more for the money.

15 Contracts



15 Contracts

VERNON H. HOOK, Barra, Vermont—N. U. has something in Free Equipment Deals that no other manufacturer can offer—One of the largest items of expense to the dealer is up-to-date test equipment—What way could be easier than selling N. U. products?



29 Contracts

MATHEW J. BERLOWITZ, Juneau 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.

23 Contracts

J. E. STAGE, Longview Radio Sales & Service Co., Longview, Wash.—Think your Free Equipment Plan great—Have signed 23 N. U. Equipment Deals—have been using N. U. program 9 years. N. U. tubes all check alike—rarely have to make replacements.

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