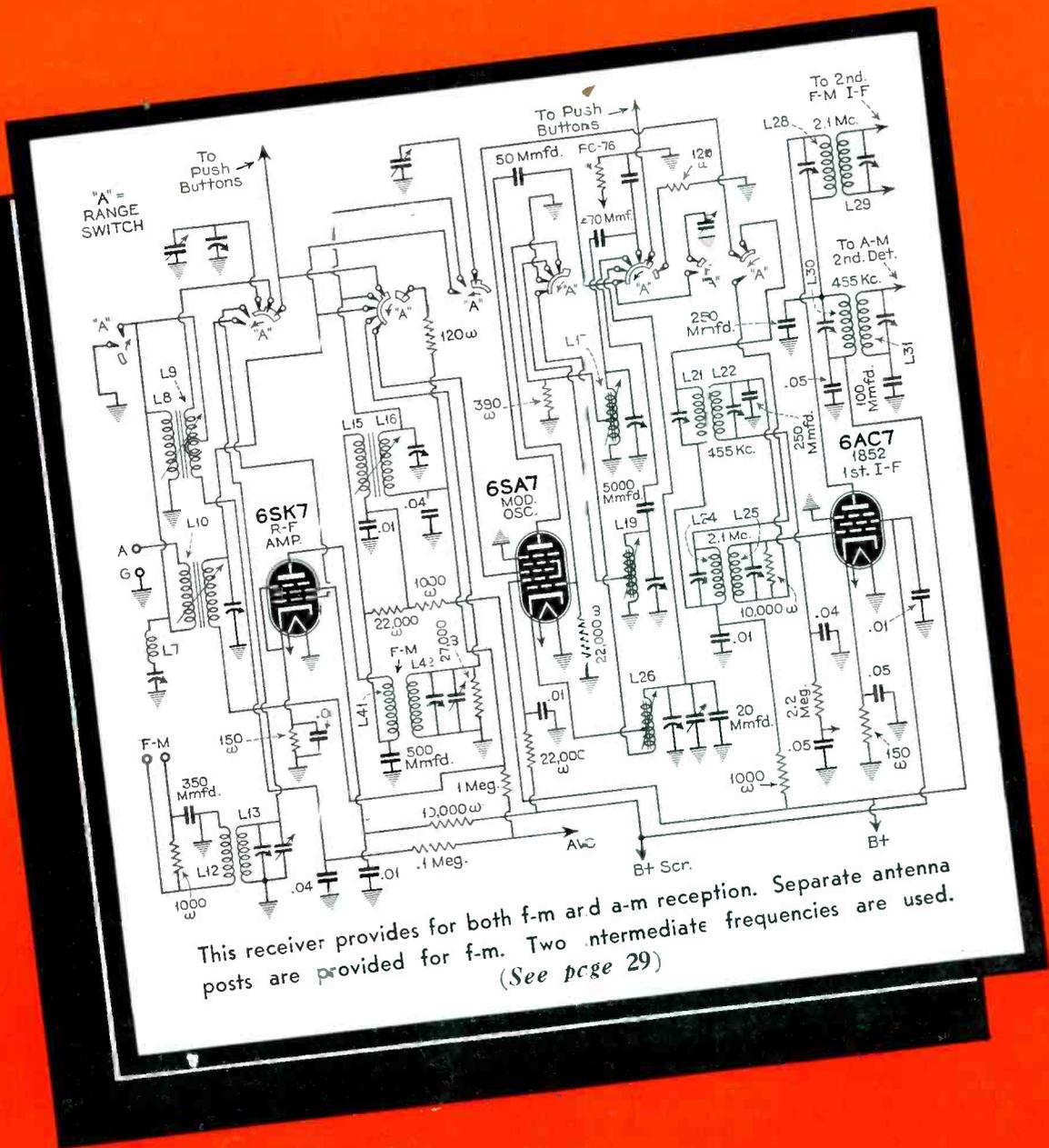
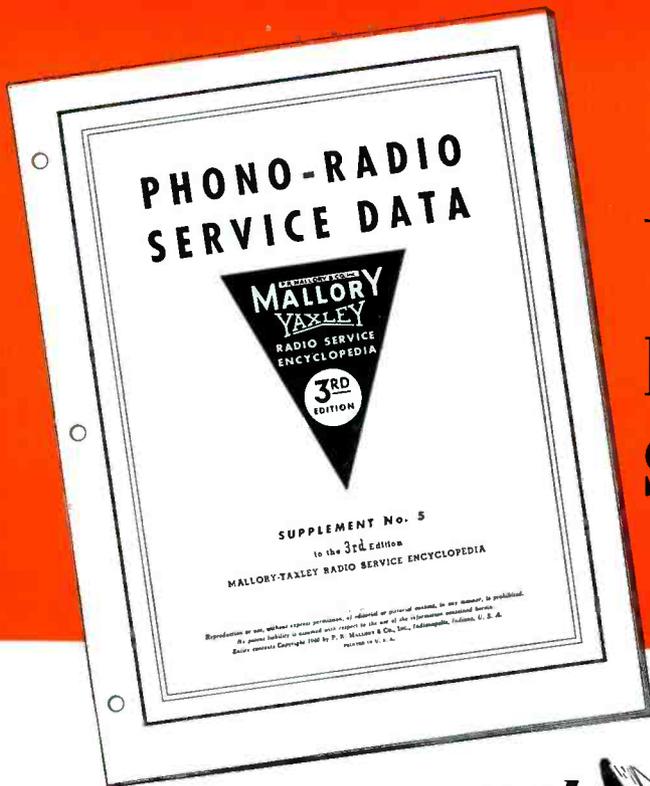


# SERVICE



This receiver provides for both f-m and a-m reception. Separate antenna posts are provided for f-m. Two intermediate frequencies are used. (See page 29)

April  
1940



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**H**URRY! Hurry! Hurry! There are only three weeks left for you to send us your Service Success Story. Remember there are 12 prizes offered. All you have to do is tell us just what makes your business successful, in your own words. Literary style is not important, it's the merit of the ideas that will sway the judges opinion. See the announcement on the opposite page.

The contest closes at midnight on May 15. Mail a photograph of your service bench or store front along with your entry.

**T**HIS is the season for auto-radio sales. Are you getting your share? Talk auto radio to every one of your service customers . . . It will boost your service work, too.

Technical features and specifications for practically every 1940 auto-radio set are given on pages 14 and 15 of this issue. These should not only prove valuable as a source of service information, but should also enable you to discuss the new lines intelligently during your sales efforts.

**T**HE average sound system is subjected to almost continuous use. It would, therefore, require more frequent replacement than a radio receiver. If you consider, along with this fact, that present day systems by far out-class those installed more than two or three years ago, then you can readily appreciate that an active canvass, with accompanying demonstrations of modern equipment, would uncover a large and profitable replacement sound market in your own community.

**D**ESPITE the recent much criticized action of the Federal Communications Commission, in suspending limited commercial licenses and calling for new hearings, there is considerable other television activity of late.

It is expected that application for permission to erect a radio relay system for inter-connecting television broadcasting stations in New York and Philadelphia will be filed shortly with the FCC. This action will be a natural follow up to the filing, by the National Broadcasting Company, of applications for permission to erect television broadcasting stations at Philadelphia, Washington and Chicago. If and when this relay system is completed, permission will undoubtedly be sought to extend to Washington and then to Boston with the eventual hope to serve the entire nation by television networks similar to those used in sound broadcasting.

The new relay system was recently tested with a series of centimeter wave radio relays between New York and Riverhead, L. I. From all indications the results of these experiments were highly satisfactory.

**A**BOUT this time each year radio manufacturers are completing plans for their exhibits at the trade show in Chicago. Approximately 160 have taken space at the Stevens Hotel this year. We urge every Service Man, distributor and sound man to attend.

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YOU DO NOT need to be a writer. You will NOT be judged on your prose, grammar or writing ability.

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- 3—All manuscripts become the property of Service Magazine, and we reserve the right to edit and change them when necessary before publication.
- 4—Two or more service men may collaborate in preparing one article, but in

- this case they may qualify for only one prize, the same as though the article were prepared by one writer.
- 5—Winners' names will be announced at the RSA convention in June and published in June SERVICE.
- 6—Winners will be notified personally before June 1 and prizes mailed not later than June 5.
- 7—In case of ties, tying contestants will each receive the full amount of the award.
- 8—The decision of the judges is final.

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# S I G N A L T R A C I N G

By JACK AVINS

**T**HE use of the signal in servicing is probably as old as radio itself. However, it is only recently that signal-tracing equipment has become available which makes it possible for you to take full advantage of this powerful method of servicing.

## • • • early methods

You are all familiar with the early ways in which the signal was used to simplify troubleshooting. Probably there is not one among you who has not used the simple finger test to determine quickly whether or not an oscillator was working. True, it didn't tell us whether the oscillator was working at the right frequency, what its output voltage was, or how uniform the output was over the band, whether there were dead spots, and so on, but it did give us some important information in a comparatively short time. For all of its shortcomings you'll agree that it was a great deal easier than checking all of the parts and connections in the oscillator circuit.

Checking oscillators has gone a long way since the old finger test was used. We now have signal-tracing equipment available which rapidly tells us everything we want to know about an oscillator circuit without in any way interfering or reacting on the circuit. If any doubt arises as to whether the oscillator is doing its job, you need only place your signal-tracing probe across the stator lug of the oscillator section of the tuning condenser and you immediately know whether the oscillator is

operating, the frequency at which it is operating, and the amount of output voltage which is developed.

Signal tracing is a fundamental approach to troubleshooting that many men tried to use in one form or another even when the equipment available was almost hopelessly inadequate. For example, many of you will recall having used a crystal detector and a headset to see whether there was any signal reaching a particular point in a receiver. For all of the basic soundness of the method, there were probably times when you doubted the method because you didn't get consistent results. Well you might doubt it, because the first signal-tracing instrument was so primitive that it is almost a miracle that it worked at all. But it did help to localize the trouble, and often made it unnecessary to check a great many resistors, condensers and connections.

The modern instrument for signal tracing overcomes the deficiencies of the early crystal detector and phones. Whereas the early method resulted in a considerable amount of detuning of the circuit being measured, this is prevented in the modern signal-tracing instrument through the use of a special shielded probe with a small isolating condenser built into the probe directly adjacent to the probe point. (See Fig. 2.) To

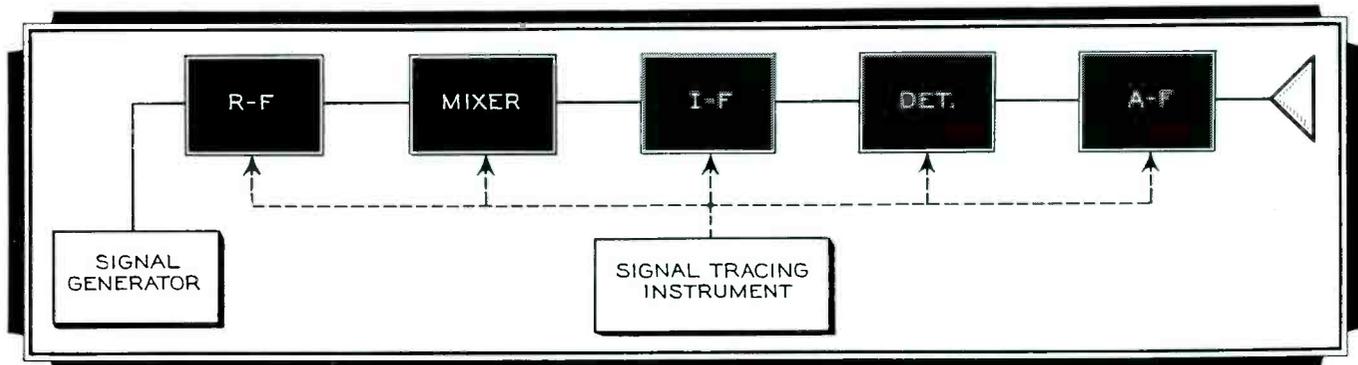
overcome the poor sensitivity of the crystal detector and phones, the modern signal tracing instrument uses a multi-stage tuned amplifier to provide enough gain so that the signal level can be checked at any point from the antenna post of the receiver right through the r-f and i-f sections.

We could cite many other attempts to use the signal as an aid to the localization of trouble—methods with which all of you are familiar. Putting your finger on the grid of the first a-f tube and noting the response, is essentially servicing by means of the signal. In this case the injection of the signal by means of the stray pickup of the hand provides an index of whether the a-f amplifier is operating at all or is completely dead.

Another early method of using the signal as an aid in troubleshooting is one that is familiar to all of you—that of pulling out each of the tubes in turn, and noting whether or not a click is obtained each time a tube is pulled. In its day this crude method of troubleshooting helped to localize faults. But the sets of today are hardly to be compared in complexity with the simple sets of several years ago. While the method of pulling out tubes was undoubtedly useful in its day and still has a certain amount of utility, no one would seriously say that this method is of much value in serious systematic troubleshooting on the more complex modern receivers.

The thing to note in all of these early

Fig. 1. In the signal tracing method of localizing trouble in a receiver, a generator signal is applied to the antenna input and is traced through the receiver until the defective condition is found.



attempts to localize trouble, is that they all attempted to use the signal as a basis rather than a check of the various parts and circuit connections. That these methods did not early develop into something more dependable and accurate is largely attributable to the relative simplicity of the early receivers.

As improvements in receiver design took place, as new automatic circuits were developed and added to the receiver, the problem of troubleshooting became considerably more difficult than it used to be. Not only does a modern receiver have a great many more component parts, but in addition there is more opportunity for interaction between these circuits and for confusing symptoms. It goes without saying that all this made the job of troubleshooting considerably more difficult.

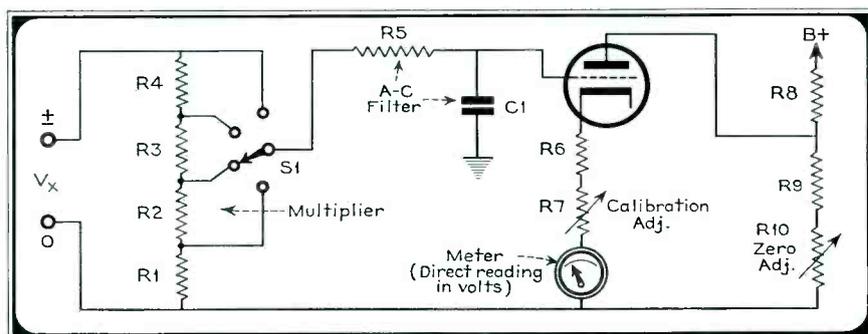
### • • • modern instrument

From the early beginnings which we have briefly described, has come the modern signal-tracing instrument.

Specifically, a signal tracing instrument enables the localization of trouble in a receiver by giving you the means whereby you can go into, or probe at any point and answer the following questions: (1) Is the signal reaching this point, or is it blocked because of some defective condition ahead of the point at which I am checking? (2) How strong is the signal at this point? Is there a gain or a loss contributed by the preceding stage? (3) Is the signal distorted at this point? Is there excessive noise or hum? Having an instrument which will answer all of these questions for you with a minimum of effort and time is a decided advantage. (See Fig. 1.)

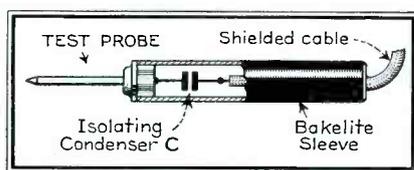
The modern signal-tracing instrument answers the above questions without disturbing the action in the receiver. This means that if you are checking an intermittent receiver, then the receiver can be left in operation with the several

Fig. 6. Most signal tracing instruments include an electronic voltmeter which enables the measurement of the actual operating and control voltages even at points where a signal is present. The circuit of a typical electronic voltmeter is shown below.

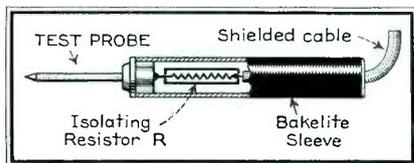


channels or probes connected to the receiver so as to monitor the signal at several key points. Naturally the fact that the reaction on the receiver is negligible in a properly designed instrument means that the actual signal voltages present will be measured. In this respect the advantages of the signal-tracing instrument over the crystal detector and phones are quite obvious.

In its search for complete information as to just what is taking place in a receiver, the signal-tracing instrument has made it possible not only to measure the signal at any point in the receiver, but it has also provided means for measuring the actual operating voltage at any point. (See Fig. 6.) On the face of it, this does not seem to be much of an achievement since we have always had voltmeters for measuring voltages. However, the contribution of the sig-



Figs. 2 and 3. A small condenser (above) permits signal tracing at any point without disturbing the set's operation. The resistor in the voltmeter probe (below) enables voltage measurements during operation.



nal-tracing instrument is that it makes possible the measurement of the actual voltages under dynamic operating conditions. Regardless of how high the resistance of the circuit is, or whether or not a signal is present at the point, the electronic voltmeter contained in signal-tracing instruments makes possible the measurement of the actual operating voltage. A complete discussion of the electronic voltmeter has already appeared in a previous issue of this magazine<sup>1</sup>, so that it will not be necessary to

<sup>1</sup>"Voltage Measurement," by Jack Avins, *SERVICE*, Nov. 1939, p. 511.

consider it in detail in this article.

To appreciate the advantages of signal tracing, it is helpful to briefly consider how the signal-tracing instrument developed. We previously mentioned that one of the earliest methods of using the signal was to place one's finger on the grid of a tube and to note whether or not there was any response. This was superseded by the use of a test oscillator or signal generator which provided a more reliable source of signal than stray body pickup.

### • • • signal generator method

With the aid of Fig. 4 you can readily see the contribution which the signal generator made to servicing. In using this method of attack you start troubleshooting at the speaker end of the receiver. The first step is to feed a signal into the last a-f stage, and to note on the output meter whether the signal is normal. If it is, then this, of course, indicates that there is no trouble in this stage. To check the preceding stage you use the same procedure, merely advancing the signal generator connection to the grid of the preceding stage. If a reduced value of input signal will not produce the same output as before, then of course this indicates that something is wrong with the stage.

Unquestionably this method of using the signal was an important step forward. But it was not the last word as we have already seen. Something was missing, and that something was the ability to actually be able to tell what was taking place at any point in the receiver. This was supplied by signal tracing. The contribution of the signal-tracing instrument, as we have said before, is that it makes it possible for you to measure the signal at any point in question as the signal progresses through the receiver.

You will readily understand that signal tracing is in reality an extension of the signal generator method in that both go hand in hand. Normally, in signal tracing you supply a signal to the antenna posts of the receiver and trace the signal from that point until you locate the trouble. However, there is nothing to prevent you from feeding your signal to any other point in the receiver and then using your signal-tracing instrument to trace the signal from that point which is not necessarily located at the antenna.

For example, it is often desirable to establish the section of the receiver which is at fault. This can readily be done by feeding an a-f signal to the first a-f stage and noting whether the output at the voice coil is normal. If it isn't, then the signal-tracing instrument enables you to check the signal any

place in that amplifier—across the transformer windings, at the grid, plate, cathode, etc. With just an ordinary output meter, the number of places where you could check the signal would be very limited because the output meter would react on the receiver, whereas with a signal-tracing instrument, the reaction is eliminated. Although in this illustration we have used the a-f section of the receiver as an illustration, it is clear that the same comments apply equally well to the r-f and i-f end of the receiver.

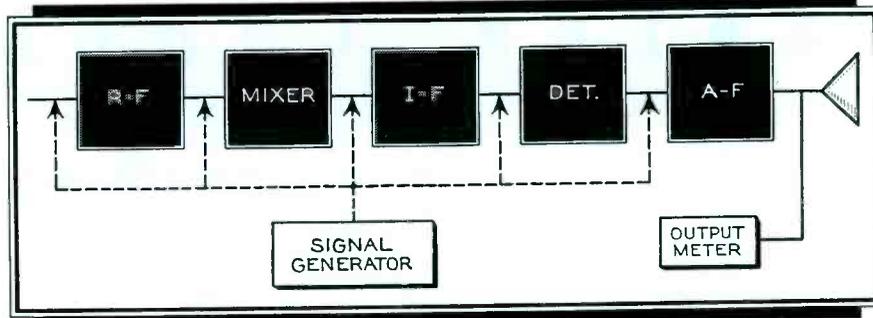
The added contribution of the signal-tracing instrument is nowhere more clearly illustrated than in the case of handling intermittent receivers. Here any one or all of the various channels in the signal-tracing instrument can be simultaneously connected across the various key points in the receiver. These channels can be connected at the same time to monitor the operation of the receiver because of the negligible reaction of the signal-tracing instrument. When the set fails or fades, the signal-tracing instrument provides the necessary information about how the signal is affected in the various sections of the receiver.

#### • • • typical tests

Within the space limitations of this article it is impossible for us to go into detail as to the many tests which can be performed by signal tracing. However, it should be sufficient for us to consider just a few representative illustrations of what can be done with signal tracing.

**Noisy i-f stage:** Suppose we consider the problem of locating the source of trouble in a receiver which shows an excessive amount of noise. In a case of this sort the problem of course is to find where the noise is originating. With a signal-tracing instrument available, it is only necessary for you to trace the signal so as to find the point at which the noise is introduced in the signal.

In a particular case with a signal generator connected to the antenna of the set, let us say that the output at the speaker is noisy. Is the output across the diode detector noisy? To answer this question we take our signal-tracing instrument and listen to the signal at the diode load. Yes, it does show the same kind of noise. Therefore, we know at once that the trouble is being introduced ahead of the second detector. A check of the i-f signal at the mixer plate with the r-f, i-f channel of the signal-tracing instrument shows that the signal at this point is free from noise. Thus you can see this means that the trouble is introduced after the mixer plate. We now know that the trouble lies between the mixer plate and the



second detector.

Further narrowing the region in which the trouble must be located, a few additional straightforward checks of the signal show that the signal is noisy at the i-f plate but not noisy at the i-f grid. This step definitely localizes the trouble in the i-f stage. From this point on it is merely a matter of checking the components and connections in

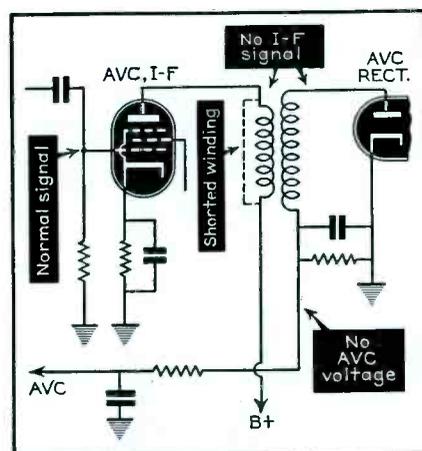


Fig. 5. A check of a receiver with a defective avc circuit quickly discloses the fault as being due to a shorted primary winding in the avc i-f stage. The signal tracing instrument showed normal signal at the grid of the avc i-f tube but no signal at the plate, thereby isolating the trouble.

the i-f stage. Clearly the saving in time arises because the trouble is quickly localized to one small section of the receiver.

**Defective avc circuit:** The flexibility of the signal-tracing instrument in troubleshooting is illustrated by the following case history. The customer complained of distorted reception and a preliminary examination showed that the receiver overloaded even on signals of only medium strength. On weak signals the receiver operated perfectly.

A check of the avc voltage with a medium signal applied to the antenna showed that no voltage was developed by the avc rectifier. We should mention here that this receiver (an RCA C15-3) used a parallel avc circuit; in other words, a separate i-f stage and rectifier was used solely to supply the avc voltage. With the electronic voltmeter

Fig. 4. In the roving generator method of isolating faults in radio receivers the output of the generator is applied to each of the stages in turn, working back from the voice coil, until the defective stage is found. The receiver output is noted on an output indicating device or meter during these operations.

of the signal-tracing instrument it took only a moment to establish that no avc voltage was developed at the rectifier, although the signal was of course reaching the second detector.

The next step was to check the i-f signal voltage at the avc diode plate. No signal was found at this point, although a check at the grid of the avc i-f tube showed that a strong signal was present at the grid. A check at the plate showed that no signal was present, thus localizing the trouble in the avc i-f stage. A supplementary check of the components in the stage showed that the plate winding of the self-tuned avc i-f transformer was shorted. (See Fig. 5.)

Of course we will grant that this trouble could have been found with an ohmmeter in the first place. But the point is that the signal-tracing instrument tells us where to look for the trouble so that it is only necessary to check a few components and connections out of the hundreds which are present in the receiver.

## MEASURING PLATE CURRENT

**T**O FIND the plate current of an output tube turn the set off and measure the d-c resistance across the primary of the output transformer. Turn the set on and measure the drop across the winding. (A 1000-ohm-per-volt meter will do.) Dividing the voltage by the resistance will give the plate current in amperes. Multiply by a 1000 for milliamperes.

For example: Suppose the d-c resistance of the output transformer is about 150 ohms and the voltage drop measured is 7.5 volts. The current, therefore, would be 7.5 divided by 150 or 0.05 amperes. Multiplying by 1000 gives 50 ma.

This is much quicker than hunting up a plate-break adapter. I keep a slide rule on the bench for such figuring and the whole thing takes less than a minute. This gives a rough check of the condition of the coupling condenser and grid bias where a vtvm isn't available.

R. G. Chrouh

# DEALER COOPERATION

By MARTIN FRANCIS

*By giving prompt and complete installation service to the customers of the local furniture and radio dealers, David Shoss obtains all of the dealers' service work and incidentally becomes acquainted with the customers. His shop is one of the busiest in Texas, and he writes up plenty of profit, too.*

*Furniture and radio dealers in your community would undoubtedly welcome similar cooperation on your part. Profitable clients can be obtained through this method.*

A SYSTEM for cooperating with radio dealers, who do not wish to maintain their own service shops, has been worked out by David Shoss, owner of Paramount Radio Service Co., 4619 Harrisburg Avenue, Houston, Texas. This arrangement, which has been in effect for well over a year, has worked out well for Shoss and the three big furniture stores for which he works.

Under Shoss' plan the dealer signs an agreement to turn over to Paramount Radio all calls for service work which may come into his establishment. This service work is considerable, because the stores sell many new and used radios annually.

Shoss on the other hand agrees to go to the home of every person who buys a radio from a dealer and to supervise the installation of this set, check it carefully and to explain its operation to all members of the family. He also guarantees to service this set free for 90 days. For each radio thus installed, Shoss charges the dealer only a dollar.

Naturally, this is not so profitable in itself for him, but Shoss puts his card in every radio, and tells the family that if they want service or tubes to telephone to him. Naturally this idea builds a fine list of service customers for Shoss, in addition to the regular work which he gets on his own accord, and also that which the three large dealers turn over to him.

"This idea has worked out well from my standpoint," says Shoss. "It puts

me in direct contact with people who sooner or later are going to spend money for tubes, parts and service. It works out well for the dealer, too, because the customer is impressed when he sees that a special Service Man is on hand to see that the set is properly



David Shoss, Paramount Radio Service Co., Houston, Texas, personally checks each set before it leave his shop. His helpers respect his advice but are fully competent themselves.

installed and inspected, and its operations explained to all members of the family."

Shoss states that he will frequently spend a half hour with the family where a new set has been purchased and installed just to make certain they know how to operate the set. After explaining operation, he will ask certain members of the family to tune various stations for him, and in this way he can make certain they will get satisfaction from their set and not call him for trifles.

"This sort of explanation is very important, especially concerning short

wave," said Shoss. Very few dealers apparently explain short-wave bands to customers, for some cannot dial in stations on this band. I recall one service customer who had a new set for eight months, and when I asked him how the short wave was operating he looked at me very blankly, and said he didn't know what I meant. I got London for him and he was absolutely delighted, for he had no idea his set was so equipped."

Shoss points out that he thinks it very important for dealers to show customers how to operate the sets they buy, and get all possible advantages from such sets. Not to do this may incur ill will in numerous instances.

In recent months Shoss has also been building amplifying sets for people who are hard of hearing. Prices on this work run from fifteen to fifty dollars and more, depending upon the degree of deafness and the amplification needed. One satisfied customer in this field will send others and thus a favorable amount of business is assured. This is a profitable sideline for any service shop, Shoss believes, for it makes valuable contacts with people who may want other service work. Shoss has also recently gone after theatre sound equipment work in this area, and is already doing quite a bit.

He also plans to issue circulars over a large area in Houston, offering to service a radio for a year for from a dollar fifty to two dollars. This service charge would be exclusive of parts, of course.

# Engineer's Report

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# CIRCUITS

By HENRY HOWARD

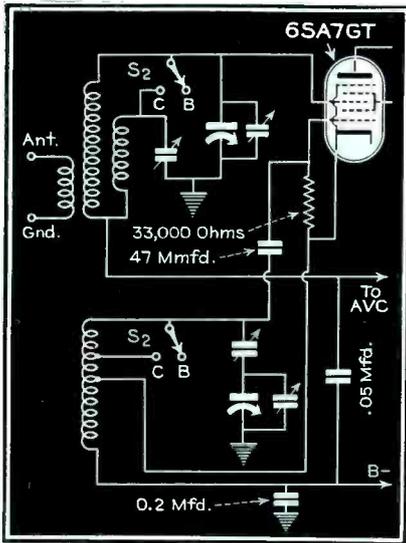


Fig. 2. In the G. E. HJ612 the antenna input transformer is shifted by paralleling the two secondary windings while part of the oscillator inductance is shorted.

FRONT panel control of the Beama-scope antenna and dual alnico p-m Dynapower speakers are being featured in the General Electric HJ receiver series. Fig. 1 shows the circuit of the Models HJ1205, RHJS1205. These are three-band, twelve-tube superheterodynes. In addition to the two speakers (one 6½ and the other 14 inches) a novel form of degeneration is employed. The feedback loop takes voltage from the high side of the output transformer secondary and feeds it to the cathode of the 6J5G driver stage, taking in the inverter and push-pull power stage. Note also the 5-position,

Fig. 1. G. E. Models HJ1205 and RHJS1205 have resistance i-f, a 4 point tone control (which also varies the selectivity), and employ an unusual inverse feedback loop.

wide-range tone control system, which includes changes in the i-f band width and changes when switching wave bands, in addition to the usual shunt condenser in the a-f amplifier. There are two i-f stages, resistance coupling being used between them. The input transformer to the first i-f stage and the output transformer to the 6H6 diode detector are varied in the tone-control switching. The first three positions allow sharp tuning and cover the bass and mellow ranges, while the last two positions switch to broad tuning to bring in the highs. A second deck of the tone control switch provides for shunting the high side of the volume control with 1,000 mmfd in the first position and with 470 mmfd in the second position. The other three positions of this deck are open. The third part of the control is tied in with the wave-band switch and the bass-compensation circuit, allowing widest response on the broadcast band only.

## • • • G.E. HJ612

While dealing with G.E., let's look at Fig. 2, taken from Model HJ612, a two-band, 6-tube a-c, d-c compact. This is an interesting method of shifting bands, permitting a very simple wave-change switch. The antenna input transformer is shifted by paralleling the two secondary windings while the oscillator is shifted by shorting out a part of the oscillator inductance. A simple double pole, double throw switch is sufficient.

## • • • Crosley 549

The next item of interest comes from Crosley in Chassis 549. This is a battery portable with provision for a-c or d-c line operation utilizing a 117Z6GT full-wave rectifier and a relay for automatic switching from batteries to line operation. The rectifier is used for dual-half-wave duty, one half supplying the B voltage and the other supplying the relay and filament circuit. The B filter consists of a dual 16-mfd condenser

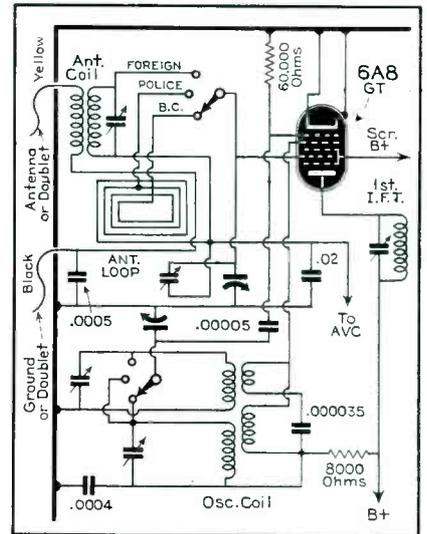
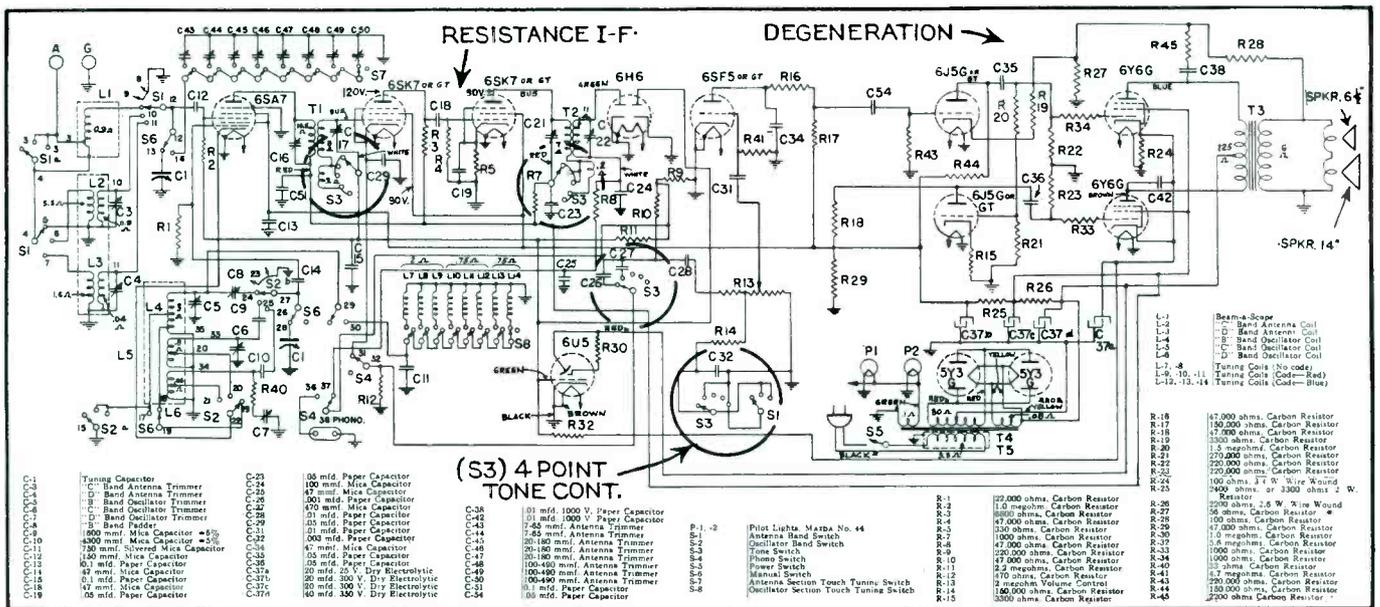


Fig. 4. Crosley 729 makes use of the image frequency to cover the police band. Note that the oscillator coil remains unchanged for this band.

and 2,600-ohm resistor. The A filter is much more unusual. The first section







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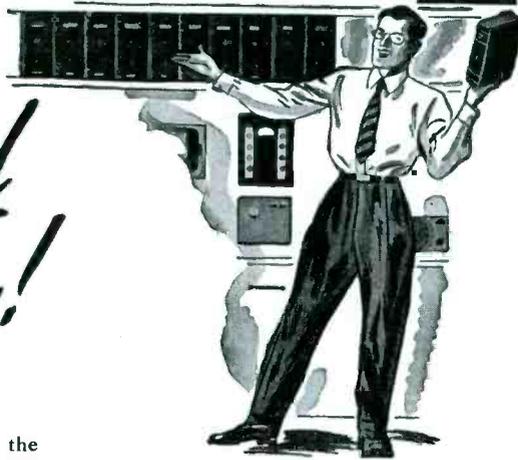
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## RCA SOUND SYSTEM UNITS

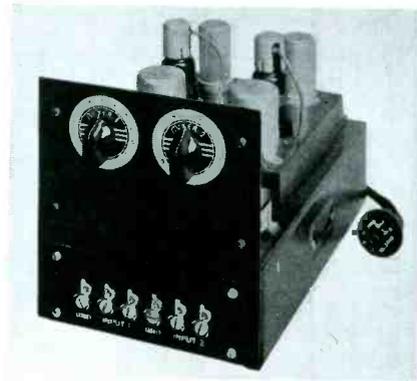
Three new units for use in sound amplification and reproducing systems—a 25-watt amplifier, a two-position mixer, and a 20-watt speaker mechanism—have been announced by the RCA Commercial Sound Section.

The new 25-watt amplifier (Model MI12205) incorporates advances in circuit design which reduce hum, it is said. Pro-



vision for using and mixing up to four microphones is included. The amplifier is available for two types of power supply: 105-125 volt, 50-60 cycles and 110-220 volt, 25-60 cycles.

The two-position mixer (Model MI12208) was designed primarily for use with the new amplifier, when additional mixer inputs are necessary but has applications



with many other types of apparatus as well.

The 20-watt speaker mechanism (MI-9430A) is an 8-inch cone, p-m type similar to the one developed for the electric Storytone piano and the RCA Proscenium speaker. The mechanism is being made available as a separate unit for use where conditions require a large, flat baffle area. It has a flanged bell which permits it to be attached to a small diameter opening in a wall or baffle.

Additional information on these and other RCA sound reproducing equipment may be obtained directly from RCA Commercial Sound Section, Camden, N. J.

## MICROPHONE STAND

Eastern Mike-Stand Co., 56 Christopher Ave., Brooklyn, New York, announce a new type microphone stand with a hollow base. This base is made of die-cast metal to which a highly polished chromium finish is applied without the medium of a metal shell as applied over the usual iron casting. The edge of the base is fitted with a rubber ring which acts as a base guard and shock absorber.

# 1940 SOUND

## ELECTRONIC MUSIC

By NATHAN L. DANIEL

REFERRING to the violin as an instrument which is played by scraping the hair of a horse across the intestines from a cat, Benjamin F. Meissner, the holder of numerous patents pertaining to electronic musical instruments, infers<sup>1</sup> that our entire system of making music is extremely primitive. It does seem strange that in an era which boasts tremendous scientific advances in every field there has been no significant change in our musical instruments for hundreds of years.

There is, in general, little controversy among sound engineers as to the merits of producing music by electronic means. The musicians who are to use these instruments require convincing, however. They have the notion that the electrical instruments sound tinny and mechanical. They also believe that one musician with an electrical instrument will replace four or five musicians with acoustical instruments. There is little basis for either of these objections.

Several years ago, when an amplifier and its associated speaker was considered "wide-range" if it could reproduce four octaves, the electronic musical instrument did sound tinny and somewhat mechanical. Today, with the great improvement in speakers, amplifiers and pickups, the electronic instrument can do practically everything that an expensive original can and, of course, has advantages in providing more volume and greater control.

As for unemployment problems, we need only point to the two electronic instruments which have already enjoyed some widespread popularity, to show that this new form of music is creating new positions rather than eliminating old ones. The electric guitar, either Spanish or Hawaiian, is

now used in a great many orchestras, whereas guitarists in such places were rarities previously. The electric organ, likewise, has created many new positions for organists. Few churches, theatres, broadcast stations, halls and homes could afford the expense and excessive space required for an organ. The electric counterpart, however, has found wide acceptance.

### technical aspects

Low hum level, low percentage of distortion, high output and complete absence of buzzes and rattles as well as compact size and light weight are important features that require special consideration in amplifiers built for use with electronic musical instruments.

Hum must be below audibility for all settings of the volume control, a few feet from the speaker, with the in-

strument connected and ready to play.

If the instrument is to be used chiefly to play chords, the distortion limits are the same as those required for high fidelity radio reproduction. However, if only one note can be played at a time greater distortion is allowable. It is often possible to take advantage of this fact and obtain changes in tone character by purposely introducing harmonic distortion.

An amplifier may sound quite loud when it is used with a tuner or phonograph pickup but will seem only moderately loud when used with an electronic musical instrument. This is more noticeable if the instrument is used in an orchestra where the reproduction will be drowned out if it hasn't sufficient power. It is for this reason that high power output is an important essential for these types of amplifiers.

Buzzes and rattles must be completely absent at all frequencies even at maximum volume. This means that the speaker must be capable of handling the full power of the amplifier. It also means that every part on the amplifier case and chassis must be securely fastened.

Electronic musical instruments, with the exception of the piano and organ, are generally portable devices. Their accompanying reproducing equipment must, therefore, be light in weight and compact in design.

In addition to the contact microphone (Fig. 1), which is used essentially to convert a regular musical instrument, there are at least three types of pickups in general use in present day commercial electronic musical instruments. These are shown in the accompanying illustrations (Figs. 2, 3 and 4) and are described below:

### magnetic pickup

In the magnetic pickup (Fig. 2) a

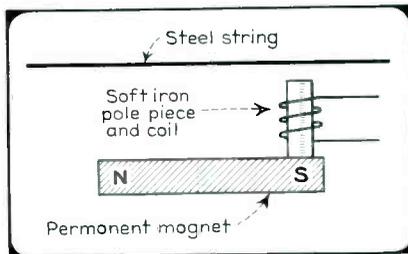


Fig. 2. Magnetic pickup.

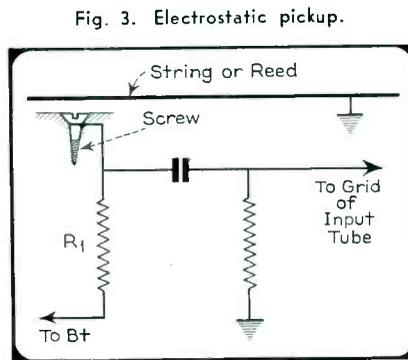


Fig. 3. Electrostatic pickup.

<sup>1</sup>"Electronic Music and Instruments", by B. F. Meissner. *Proc. IRE*, Nov., 1936, p. 147.

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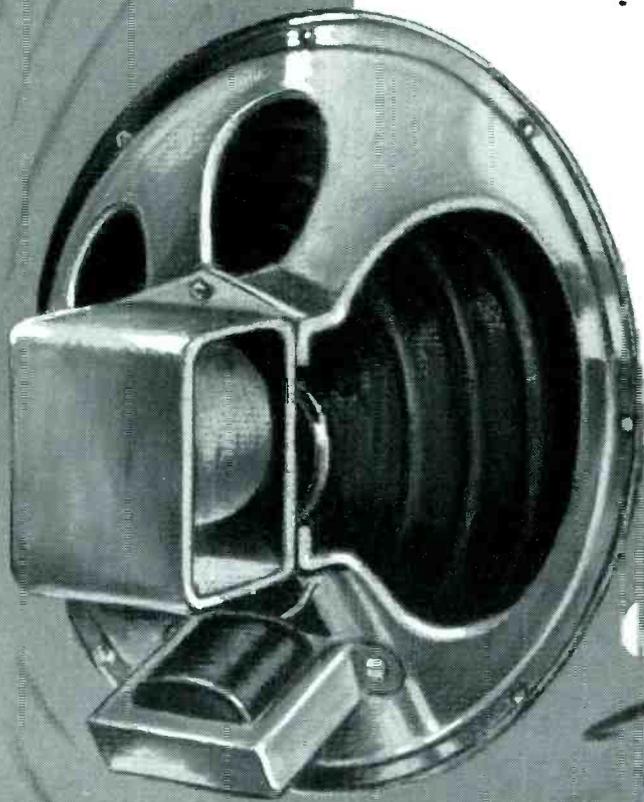
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permanent magnet is so placed as to magnetize the steel string of the instrument. A soft iron pole piece, with an associated coil wound over it, is mounted close to the string. As the string vibrates, at any given frequency, it induces a voltage of corresponding frequency across the coil. In electric guitars and mandolins the pole piece is wide enough to fit under all the strings.

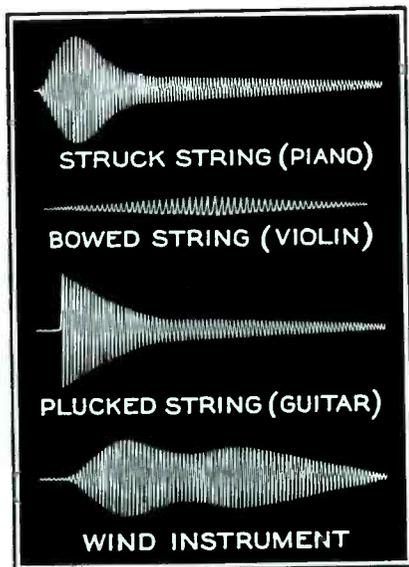
There are many variations of this pickup in use. Some manufacturers employ slotted pole pieces. One uses an adjustable screw under each string to obtain correct balance of output. Another eliminates the permanent magnet, using instead, a switch that sends d-c through the pickup coil whenever it is necessary to remagnetize the strings.

An adaptation of the magnetic pickup is being used on a small scale for wind instruments. Instead of the steel string a tiny steel slug is cemented to the reed.

#### electrostatic pickup

In the electrostatic pickup, generally employed in pianos and vibrating reed organs (see Fig. 3), a screw or other small conducting object is mounted near the string and insulated from it. The screw and string form the plates of a small condenser. A polarizing voltage is applied to each screw through a separate filter consisting of a high resistance and a small capacity. As the string vibrates the capacity of the condenser (formed between the screw and the string) varies accordingly. This varying capacity is converted to a varying voltage, as in a condenser microphone, and fed to the grid of an amplifier tube. This is a simple flexible pickup around which clever circuit innovations have been built to make a piano take on new tones.

Fig. 5. The tone envelope for various musical instruments.



The sound from a piano starts as soon as a hammer strikes a string. The sound, slightly damped until the hammer leaves the string, starts off strong and decays slowly to inaudibility. (See Fig. 5.) Sound from a plucked string, such as a guitar, starts as soon as the finger or pick releases it. The tone starts very loud, decays rapidly at first and then more slowly to inaudibility. (See Fig. 5).

Organ and other wind instrument tones (reed or pipe) start when the player begins to blow. However, the vibration of the reed or air column starts off weak and builds up to full strength. Thereafter the sound continues on an even level unless the wind is increased or decreased. (See Fig. 5).

The envelope of the tone from a piano which uses the electrostatic pickup, can easily be varied. An envelope selector switch can be so wired that in one

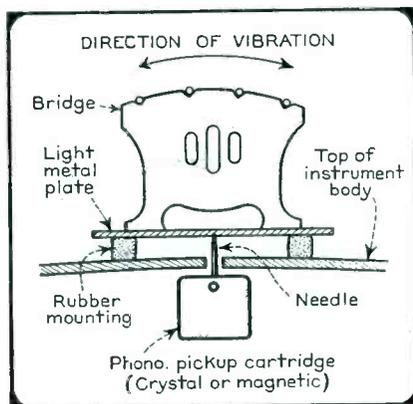


Fig. 4. Vibration pickup.

(organ) position there is no polarizing voltage on the screws until a key is struck. This action connects the voltage to the filter network for the screw associated with that key. As the capacity of this little filter charges up to full voltage, the screw in turn becomes charged and transmits its signal to the amplifier. Thus, instead of starting immediately as in an ordinary piano, the sound builds up slowly like that from an organ.

The piano can, similarly, be made to sound like a harpsichord by connecting another position of the envelope selector switch so that a very high starting voltage is applied to the screws until a key is struck. Thus the sound starts off very loud, decays rapidly at first as the filter condenser discharges to normal voltage, then decays slowly as the vibrating string dies down.

An ingenious method for changing the harmonic content of the output is employed in electronic piano. If the pickup screws are placed near the middle of the strings, rather than close to one end, very little second or other



Photo courtesy Amperite

Fig. 1. Edgar Stanstreet points to the Kontak unit on his instrument.

even-order harmonics will be present, since the center of a string is a node for all even-order harmonics. Other positions of the pickup would discriminate against different harmonics.

Instead of using one set of pickup screws, two are used. By proper positioning, each set favors its own series of harmonics. With this arrangement four completely different tones can be obtained at will, by using one set alone, the other set alone, both sets in phase or both sets connected out of phase.

#### vibration pickup

The electrostatic pickup was tried on instruments played with a bow (violin, cello, etc.) without much success. This led to the development of the pickup shown in Fig. 4. A light metal rubber-cushioned plate is mounted under the instrument's bridge, as shown in the illustration. A phonograph pickup, with a needle securely in place, is fastened under the plate with the needle and plate making mechanical contact. When the strings are bowed there is a strong horizontal component of the string vibration which is transmitted through the bridge to the phonograph pickup.

It should be noted that in instruments which employ strings mounted over a bridge, the string vibration is also transmitted through the bridge to the body which acts as a sounding board to reinforce the sound. Electronic instruments which employ the pickup just described, therefore, sound more like the original instruments than they would if the vibrations were taken directly from the strings.

# SOUND IDEAS

By S. GORDON TAYLOR

THE editors report wide evidence of interest in the special section of the February issue, in which the advantage to sound men of "keeping their ears to the ground" as a means of keeping up with the parade was emphasized. There were described a number of modern sound installations, with some discussion of trends.

It is the purpose of this article to present a number of other installations which have recently come to attention. These have been selected to include in almost every case some feature of novelty.

One of the first that comes to mind is the sound installation in a trailer church employed by the Catholic Diocese of Richmond, Va., to carry The Gospel to the remote mountain communities where churches are the exception rather than the rule.

The sound equipment was installed during construction of the trailer which is special principally in that the



rear end is reserved for the altar and pulpit, the latter formed by the rear wall when opened, as shown in the Fig. 1. This equipment is mounted in a wall cabinet just behind the altar.

Included in the rack is a standard 30-watt amplifier, record player, radio tuner and monitor speaker. Microphone, phono and radio inputs provide for speech reinforcement; recorded musical accompaniment for hymns, chimes, etc., and the radio input serves to bring in educational and religious lectures for distribution through the external loudspeakers. These loudspeakers are built into the roof over the pulpit, with a cover over the open ends which protects the speaker units from dust while travel-



Photo courtesy University Laboratories.

Fig. 3. (Above.) Jimmy Lynch uses a 60-watt mobile sound system with three horns to ballyhoo for his Death Dodgers at the New York World's Fair.

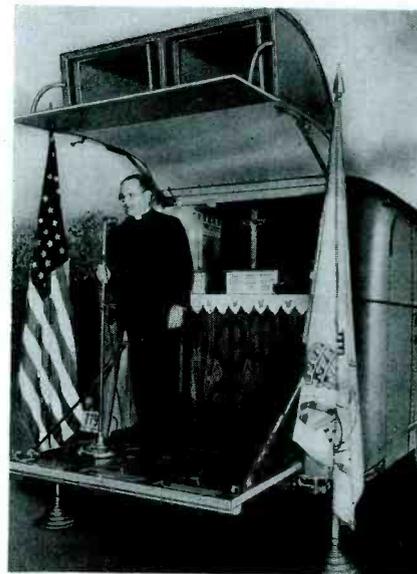
Fig. 1. The Catholic Diocese of Richmond, Va., employs the sound equipment (left) installed in the trailer church (right) to carry the Gospel to remote mountain communities that are without permanent churches.

Photo courtesy Lafayette.

ing and drops down to form an acoustic screen between speaker openings and microphone when the trailer is in service as a chapel.

Power not only for the sound system but also for the main lighting is obtained from a 110-volt gas-driven generator located in place of the rear seat in the coach which serves as the tow car. This system is fully automatic, with the result that when the sound system or main lights are turned on the generator starts itself, and cuts off when the equipment is turned off. This generator also charges an auxiliary storage battery which supplies power for the ordinary internal needs of the trailer. Provision is also made for operating the entire system from an external 100-volt a-c source when in trailer camps or other locations where line supply is available.

Contrasting with this rather pretentious job is the one shown in Fig. 2. This represents a new type of equipment just introduced which converts



any car into a sound car, yet is no more cumbersome than the ordinary car radio. As shown, the amplifier mounts under the dash with its controls within easy reach of the driver. The miniature but



Fig. 2. Any automobile can be converted as a sound car with equipment that is no more cumbersome or conspicuous than the ordinary auto-radio receiver. The miniature marine type speaker is mounted under the hood, but can be mounted on the outside of the car if desired.

Photographs courtesy Lafayette.



highly efficient marine type speaker may be mounted under the hood as shown, or on the outside of the car if preferred.

A novel feature of this equipment is that although its rated normal output is only 5 watts, its effective output is said to be equivalent to that of a standard 12-18 watt system. The speaker design contributes materially to this but also important is the amplifier design which cuts off frequencies below 250 cycles. The relatively large proportion of the power normally dissipated in the reproduction of these low frequencies is thus concentrated in the normal voice and higher frequency ranges with their

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Everywhere the Clarion Plan protecting profits has won over Sound distributors — just as unmatched performance made Clarion an overwhelming choice with the public. Now Clarion offers another great sales *exclusive*—Individuality of design! New, streamlined design so different, so original that *anyone* can recognize a Clarion installation. Today, more than ever, your No. 1 Profit Opportunity lies with Clarion!

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Clarion A95T — Brand new and designed for fast selling! 71 watt super power. Six simultaneously operated channels with every modern amplifier feature. Complete with phono attachment, tubes and built-in monitor speaker. List only \$174.90.



Clarion A41T — Compare the value! 25 watt, 4 channel, new sloping panel—brown finished panel and matching case. Complete with tubes in cabinet. List only \$61.50.

*"You are doing us fellows in the field a favor. You have just what I've been looking for a long time."  
"Last year was our most successful year in Public Address thanks to your co-operation."  
"You have one of the finest lines of Public Address we have ever heard or used."*

TRANSFORMER CORPORATION OF AMERICA  
69 WOOSTER STREET, NEW YORK CITY, N. Y.



Fig. 6. An installation, made by the New York City sound engineers at LaGuardia Airport, presented the specialized requirements of a vast crowd that numbered over 100,000 persons. Three 100-watt standard amplifiers were used with 8 heavy duty dynamic units and horn type baffles mounted on stands above the huge crowd.

Photo courtesy Lafayette.

much greater carrying range.

Equipment such as this is destined to find many applications as mobile ballyhoo equipment, in police and safety crusade cars, as a street announcement system in busses, and perhaps even in private passenger cars whose drivers yearn for some means stronger than mental telepathy for transferring their thoughts to slow moving pedestrians who take delight in holding up traffic while they amble across street intersections against the lights.

Another mobile system of more than passing interest is one installed by John H. Brown of the All-State Distributing Co., Omaha, Nebr., in the ballyhoo car of Jimmy Lynch's Death Dodgers. (Fig. 3.) Although installed in a standard passenger car, the system is capable of 60-watts output for reproduction of voice or records through three large horn units on the roof. Power is supplied from a 600-watt gas driven generator mounted in the car trunk. The speakers are mounted on adjustable brackets which permits them to be trained in any direction during operation, but are so positioned that when not in use the horns do not extend beyond the width of the car and can even be folded back if desired when travelling.

Fig. 4 offers a highly practical suggestion to sound men who have occasional calls for sound car rentals, but not often enough to warrant tying up amplifier and generator equipment in a permanent truck installation. When this small delivery truck of the Will County Radio Service, Joliet, Ill., is required as a sound car the 30-watt combination amplifier-phono unit shown on the step is mounted inside in a twinkling and draws all operating power from the car battery through the medium of the dual 6/110-volt built-in power supply. At all other times the amplifier is available for

normal indoor rental jobs, operating from the 110-volt light lines. The amplifier provides a sufficient variety of inputs and outputs to meet practically any rental requirements. Thus it combines real economy with diversity in application, doing its bit to keep "ol'



Photo courtesy Clarion.

Fig. 4. A 6-volt, 110-volt unit offers a versatile system for the sound man who has only occasional calls for a sound car. At other times the unit is available for indoor use.

man overhead" on a perpetual reducing diet.

Turning from mobile applications, attention is directed to what is believed to be one of the most comprehensive paging systems of modern times, recently installed by the Langevin Co. at New York's new LaGuardia Airport.

Fig. 5. Announcements of plane arrivals and departures are made through any one of 15 microphones over 85 speakers located throughout the airport at LaGuardia Field. A push-to-talk button on each microphone makes the system available to any one of them at a time, eliminating interruptions and interference.

Photo courtesy Western Electric.



Through 15 microphones and 85 loudspeakers announcements of plane arrival and departure times are carried to every part of the great field where passengers and their friends congregate. From the control tower (Fig. 5), which is in constant touch with planes headed for the field comes information as to the arrival times, departures are announced from the ticket desks of the different airlines and from microphones at the gangways which also are used to call taxis and porters for incoming passengers.

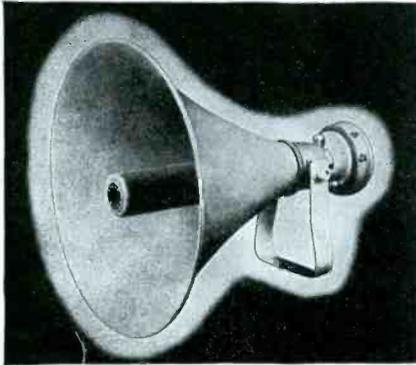
A unique feature of this installation is the push-to-talk button on each microphone which makes the entire loudspeaker system available to but one microphone at a time and thus eliminates interference and interruptions. Seven amplifiers are used in all; four of them power amplifiers to provide the driving power for different speaker groups.

Another system at this airport on the occasion of its dedication is of interest as representing an application of standard equipment to the specialized requirements of a vast crowd of well over 100,000 visitors, a small portion of which is shown in Fig. 6. The installation was made by the New York City sound engineers, who have the happy knack of doing big jobs in a simple way. The setup consisted of three 100-watt standard amplifiers (one of which was for reserve use) and eight heavy-duty dynamic units in horn baffles raised above the crowd on telescoping stands. Four speakers were operated from each amplifier and the speakers alternated in position so that should anything go wrong with one amplifier complete coverage would still be obtained, although at decreased level.

The pick-up of speakers' voices was obtained through the microphone of WNYC, the city's own broadcast station, which was one of the battery of several surrounding the speakers' table.

#### ATLAS SPEAKER

Featured in the new line of Atlas Sound "Morning Glory" type double-re-entrant projectors is the Model DR42 with a 3½ foot exponential air column. The DR42 has a frequency cut-off at 140 cycles, and a projection angle of 80°. Overall length 17½", bell opening 21". Model PM3 "Dyna-Flux" compression speaker unit used with



the DR42 is a permanent magnet type with a power rating of 18 watts. Atlas Sound Corp., 1448 39th St., Brooklyn, N. Y.

#### TERMINAL CATALOG

In the Terminal Radio Corp's public-address catalog, many items are listed, including complete p-a systems, amplifiers, tuners, microphones, speakers, record players and accessories. A free copy may be obtained by writing to the Terminal Radio Corp., 68 W.45th St., New York City.

#### UNIVERSAL MICROPHONE BULLETINS

Universal Microphone Co., Inglewood, Calif., recently issued three new leaflets for the trade. One is the annual issue of the microphone catalog and another for recording machines and accessories. Both are in loose leaf form and contain many new items since the 1939 publication. The third leaflet (No. 165) is on recording and playback turntables that can be mounted in cabinets, cases, desk or table. This includes four types of recording chassis and also a synchronous playback and turntable assembly.

#### MILLION BULLETIN

A recent bulletin issued by Million Radio & Television covers their line of amplifiers and portable p-a equipment. Also listed in the publication are microphones, speakers, speaker baffles, etc. To secure a copy write to the above organization at 685 W. Ohio St., Chicago.

#### UNITED TELEPHONE BULLETIN

The United Teletone Corp., 150 Varick St., New York City, have recently issued a bulletin devoted to UTC Cinaudograph speakers. Considerable data is given on p-m and electrodynamic speakers as well as on air column sound projectors. Copies of the bulletin may be secured by writing to the above organization.

#### CLARION CATALOG

The Transformer Corp. of America has announced a new Clarion p-a catalog for 1940. This book contains amplifiers and complete sound systems ranging in power from 7 to 100 watts, mobile systems, recorders, school systems, musicians' sound equipment, record changers, transcription players, intercommunication systems, microphones, speakers, etc. Copies may be had by writing to the above organization at 69 Wooster St., New York, N. Y.

## SOUND TIPS ABOUT THE SOUND THAT'S TOPS



**I**N THE MOVIES, he-men like the one above mean dollars to exhibitors. They have public acceptance.

RCA offers *you* public acceptance in the sound business. And any man using a product with this vital advantage is well on the way to new business every time he approaches a prospect.

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Complete line of microphones, recording machines, blank discs, needles, lead screws, cutting heads and accessories.



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# Auxiliary DUAL TONE CONTROL



A simple circuit gives you an effective tone compensating system to boost or attenuate the bass and treble frequencies independently of each other. It may be incorporated in your present amplifier or receiver.

It is the same system used in the finest THORDARSON Amplifiers. All you need is a T-14C70 choke, 4 resistors, 5 condensers, 2 THORDARSON R-1068 tone controls, and a 6C5 tube.

Complete details and instructions are available in the THORDARSON AMPLIFIER GUIDE 346-D.



## AMPLIFIER GUIDE

A 32-page Guide giving, in addition to the Dual Tone Control, diagrams and instructions on 10 Amplifiers and other information of considerable value. Available at your THORDARSON Distributors for 15¢.

# THORDARSON

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## KNIGHT AMPLIFIER

A new Knight 30-watt amplifier has recently been announced by the Allied Radio Corp., 833 W. Jackson Blvd., Chicago. This unit features a record changer which operates from 6 volts or 100 volts a-c.



There are four input channels, two for high-impedance mikes, each with individual volume controls. Two tone controls are used for treble and bass response. Complete information may be secured from the above organization.

## SETCHELL-CARLSON AMPLIFIER

Setchell Carlson, Inc., 2233 University Ave., St. Paul, Minn., have announced their Model RA50, a two channel p-a unit which features a built-in push-button radio tuner. Each channel provides 25 watts of power output. Push-pull 6L6s are used.



3 microphone and 1 phonograph inputs are provided. Numerous output impedances are available. Additional information on this and other Setchell-Carlson products may be obtained directly from the manufacturer at the above address.

## THORDARSON AMPLIFIER

Thordarson announces a new addition to its line, the Tru-Fidelity studio amplifier. Noticeable among the many features of this new amplifier is said to be the audio-frequency equalizer, a refinement of the



Thordarson dual tone control circuit. Complete specifications and technical data are available in Bulletin SD443 by writing the Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago.

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MAKE BETTER RECORDINGS

- Because
- Diamond-dust Polished
  - Absolutely Uniform
  - Swedish Steel Alloy

Write for price list also ask about our Sapphire Cutting Needle.

# RECOTON CORPORATION

178 Prince St. New York, N. Y.



30 ohms  
list  
\$60.00

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## 10 SUCCESSFUL YEARS OF "MIKE" PRODUCTION

... because CARRIER has the looks and the QUALITY. Shown above, dynamic No. 702-D, with exclusive CARRIER "Acoustic Equalizer" that insures amazingly wide range; Hepco locking type cable connector; magnetic shielding; sealed; response  $\pm 2\frac{1}{2}$  db. 30 to 10,000 cycles; output level -60 db. Other models, professional in looks and performance, widely preferred by veterans in broadcasting, recording, reinforcing. Truly, any CARRIER model's a mike you'll like!

Send for complete catalog 10-B

**CARRIER  
MICROPHONE CO.**

439 So. LaBrea Avenue  
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**RADOLEK P-A SYSTEM**

The accompanying illustration shows a Radolek 30-watt portable p-a system. It consists of a triple-input amplifier, microphone with de-mountable floor stand that



fits into carrying case and 2 heavy-duty 12-inch p-m speakers. Further information can be obtained from Radolek Co., 601 W. Randolph St., Chicago.

**WEBSTER-CHICAGO AMPLIFIER**

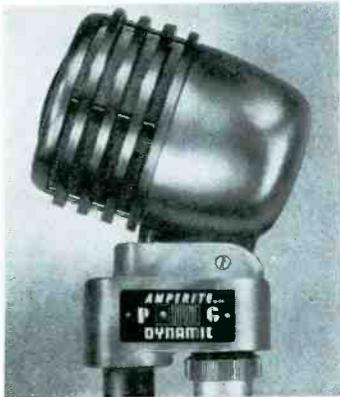
Webster-Chicago announces the addition of a 60-watt amplifier to their standard line. The unit, housed in a modern wrinkle finish case, incorporates such features as electronic mixing of two high-gain microphone inputs, multi-stage inverse



feedback, voice coil and line impedance outputs, no-glare illuminated glass panel and locking type input plugs. Further information may be secured from the Webster Co., 5622-5660 Bloomingdale Ave., Chicago, Ill.

**AMPERITE P.G. DYNAMIC**

The Amperite P.G. (pressure gradient dynamic) is shown in accompanying illustration. Mechanical sound due to diaphragm peaks is said to be eliminated resulting in natural reproduction over the audio range from 40 to 10,000 cycles. It



has an improved elipsoid pickup pattern which reduces back pickup. The combination of the elipsoid pickup pattern and the flat response results in a microphone that will give an unusual amount of volume before feedback, it is said. Amperite Co., 561 Broadway, New York City.



**"HE SAYS THEY SHOULD HAVE USED UTAH SPEAKERS"**

Three of the 90 different models of Utah speakers . . .

The heated words of thousands of politicians are being added to the normal output of the nation's sound equipment systems. New public address facilities are being installed in increasing numbers. And the demand is growing by leaps and bounds.

Sound equipment men know that the profit possibilities are big IF the system is "right". One way to be sure of maximum profit is to standardize on Utah's high-fidelity speakers specially engineered for high power public address systems.

Utah public address system speakers give you, in addition to many others, these outstanding features:

1. Special Utah phenolic resin cement treatment provides an extra sturdy voice coil assuring maximum safety under EXTREME OVERLOADS.
2. Completely dust-proofed.
3. All cementing operations completely cured before final test, assuring perfect centering, made possible by THE MODERN METHOD—use of THERMO-PLASTIC cements throughout.
4. Rugged formed-steel cone housing for maximum strength and rigidity—rust-proofed, aluminum finish.
5. All diaphragms are lacquer treated to assure minimum moisture absorption.
6. Cone and spider assembly selected for maximum power handling and tone quality and minimum distortion and break-up.

There is a Utah Speaker for every original equipment or replacement requirement

Write for catalog and complete information. UTAH RADIO PRODUCTS CO., 816 Orleans Street, Chicago, Illinois. Cable Address: "Utaradio", Chicago. Canadian Sales Office: 560 King Street West, Toronto, Ont., Canada.



G-1210



H-15P



F-12P



**SPEAKERS**

VIBRATORS • TRANSFORMERS • UTAH-CARTER PARTS

A sales factor that has received less attention in the sound field than in many others is eye appeal. The amplifier of today is in appearance fundamentally that of several years ago. That at least one manufacturer is giving this matter serious attention, however, is indicated in accompanying photo of executive staff of TCA, called in special session by Prexy Hubert L. Shortt (standing). As a result of these deliberations the new Clarion line has been completely redressed. It is felt that improved eye appeal will aid the Sound Man in merchandising sound and particularly in extending sound applications.



# I N P U T H U M

By JAY SHAWN

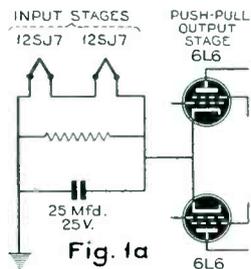


Fig. 1a

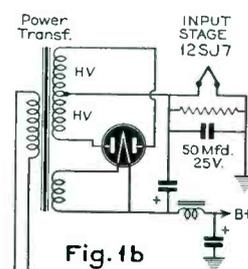


Fig. 1b

ONE of the more frequent difficulties encountered in high-gain public address amplifiers is input hum. In servicing amplifiers of this type much time can be wasted only to find that the trouble appears to be centered in the input stage. Shorting the input grid to ground does not clear up this condition, in some cases the hum actually becomes worse. . . . This indicates trouble after the grid, but when the plate supply is opened up the hum stops.

Several considerations are involved: the first lies in the choice of input tube types, the second in filament supply, a third in general wiring layout, and a fourth in the relations of the various circuit returns.

In order to simplify wiring and possible trouble due to top deck grid leads, single-ended pentodes and triodes are sometimes used as input tubes. The proximity of grid and filament terminals in these latter tubes often induces hum. To check such a condition, remove both filament leads quickly so that the cathode remains hot long enough for the tube to function for a few moments . . . the hum should be appreciably reduced.

In larger amplifiers, it is possible to use single-ended tubes to advantage by heating them with d-c. In this case it is well to select 12-volt, 150-ma tubes. Fig. 1 shows two circuits designed for this type of operation. In Fig. 1a two 12-volt tubes provide bias for a pair of 6L6s. Fig. 1b shows a specially filtered circuit which can be connected in the B return.

When a-c heater supply is used with overhead grid types, hum in the filament wires can be reduced by removing the transformer center-tap from ground and

grounding one side instead. Precaution should be taken to keep the a-c filament leads as far as possible from input wires and parts. In this connection, the practice of laying the filament leads along the bend of the chassis should be reversed in the case of input tubes to avoid proximity to the input jacks.

The fourth consideration, that of circuit returns, is more complex than the foregoing, and the reasons for correction less apparent, although just as important. To establish a basis for understanding, the following simple experiment may be tried. In series with the grid return lead and ground insert a single turn loop of wire with leads of eight or ten inches (Fig. 2a). Rotating this loop in different locations will show widely varying magnetic fields by producing varying amounts of hum in the different positions and at various angles. This proves the existence of hum fields of unpredictable strength and direction at points far removed from their sources, such as the power transformer, filter chokes, and a-c leads.

Nobody would knowingly wire into a high-gain amplifier a loop which would pick up these fields and amplify them, yet such loops occasionally exist, although they are not apparent. Consider Fig. 2b where two unintentional loops exist similar to the experimental loop in Fig. 2a. The first loop is from ground "A" through cathode network, cathode, to grid, grid lead, grid resistor, ground "B" and back to ground "A." Consider-

ing that all leads are kept as short as possible, a dangerous element exists in the possibility of a small a-c potential between the two ground points A and B. Returning the grid resistor to the point A would eliminate the chance of this, but would leave another loop from A to C, the a-c voltage across which would be coupled to the grid by the capacity of the shield. The shielding then should be insulated from the chassis and grounded only at A.

Carrying the same practice further, it is generally found necessary to insulate the input jacks from chassis and returning them to ground at the same point A previously mentioned. (Fig. 3.) (It is important that all signal carrying leads have their ground return paralleling them through their entire length. In this case the shortest lead is not the best. In Fig. 3 a short lead from A to B is not proper. The ground should be made through the shield as shown.) However, a new problem arises here that has nothing to do with hum but that must be considered. It is that a circuit resonant to r-f is usually built up, with the capacity to ground of the jack and leads as condenser—the inductance of the leads forming a low Q tuned circuit. A New York program received in this manner is that of the CBS television sound channel, with excellent reproduction. In order to tune out this h-f signal the simplest method is to wire in a small condenser, about 0.0005 mfd, from ground side of the jack to chassis at the point where the jack is mounted. This will shunt the r-f but is too small to carry 60 cycles. An extremely high-gain amplifier may require a series resonant tuned trap at this spot to com-

(Continued on page 31)

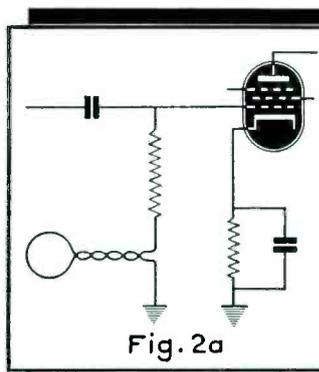


Fig. 2a

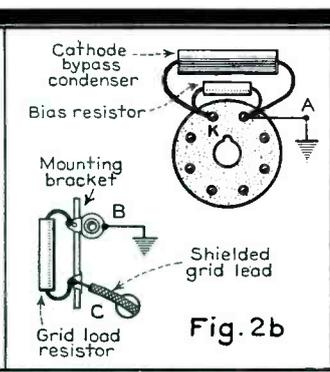


Fig. 2b

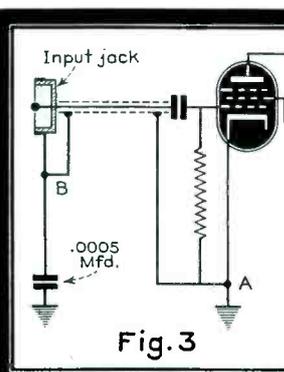


Fig. 3

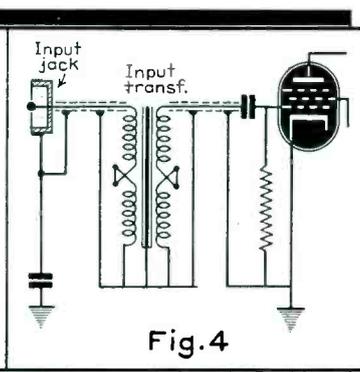


Fig. 4

Here's The 'COMBINATION'  
Turn Left To 920... Turn Right To E-200



**"Servicing by Signal Substitution" with the combination of the Precision Series 920 tube and set tester and the Series E-200 Signal Generator, will solve your problems with new, amazing, speed and simplicity.**

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TUBE TESTER AND SET TESTER**

An indispensable single compact instrument for both field and service laboratory ★ 33 AC-DC set testing functions ★ AC-DC voltage ranges to 3000 volts ★ DC current ranges to 12 amperes ★ Resistance ranges to 10 megohms ★ Decibel readings from -10 to +64 DB ★ Output ranges to 3000 volts ★ Electrolytic and paper condenser leakage tests ★ All on large, easy reading, 400 microampere, 4 1/2" square type bakelite cased meter. A Single Master Rotary Range Selector permits simplified, rapid check of voltage, current, resistance, etc., in troublesome stages, quickly localized through "Servicing by Signal Substitution."

Series 920 P etc. illustrated above..... **\$53.95**

Series 920 and Series E-200 available panel mounted, complete with attractive type 212 Laboratory Rack, overhead lighting, A. C. outlets, etc. Complete Net Price **\$110.85**

Now in preparation, and FREE (as soon as off the press) to all present owners and future purchasers of Series E-200, a new illustrated test describing this amazingly simplified speed approach to receiver adjustment problems, "Servicing by Signal Substitution."

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# CINAUDAGRAPH SPEAKERS

## Air Column Sound Projectors



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

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

UTC air column sound projectors are entirely different from the conventional exponential horn unit. Their high efficiency and broad frequency response overcome the various deficiencies and failures of conventional horn speakers.



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

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

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

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

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

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

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

### AIR COLUMN UNITS

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

### EXPONENTIAL HORNS for AIR COLUMN UNITS and HANDLE with SUPPORTING BRACKETS

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

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# FREQUENCY MODULATION

## STROMBERG-CARLSON 455 RECEIVER

(See Front Cover)

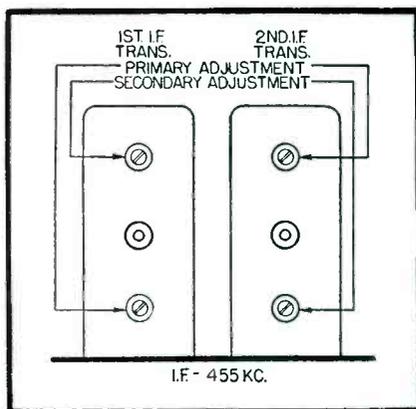
EVERY Service Man should be familiar with the new models which feature ultra-short-wave frequency-modulation reception, in addition to the usual bands for amplitude modulated signals.

While there are differences of opinion in professional circles as to the degree of superiority of frequency modulation (f-m) over amplitude modulation (a-m), even the following few undisputed facts point out the Armstrong f-m system as an outstanding development in the progress of radio communication.

- 1) Reception is much more static-free; both natural and man-made static being greatly reduced.
- 2) Tube and set noises present in ordinary a-m receivers are considerably reduced.
- 3) Elimination of extraneous noises permits high-fidelity, wide-band reception.
- 4) Reception is interference free; two stations cannot be received at the same time unless they are both of almost identical strength—probably a very rare occurrence.

There are many fine points in servicing a receiver of this type. The job should certainly not be tackled by a screw-driver mechanic. Special equipment is used at the factory for aligning

Fig. 4. Adjustment of the 455-kc i-f transformers is made from the side of the can.



f-m receivers. The limitations of ordinary test equipment, possessed by even the more advanced Service Men are such that alignment in the field should not be attempted unless it is absolutely necessary. If alignment is attempted, the manufacturer's instructions should be followed to the letter.

The receiver has two intermediate frequencies: 455 kc for the standard

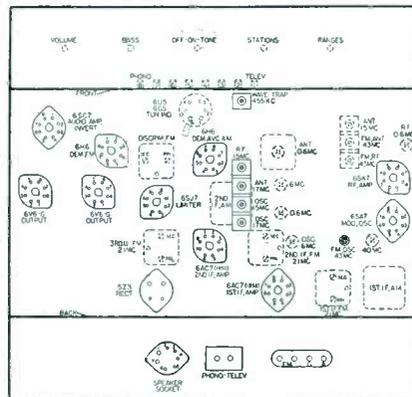


Fig. 3. If alignment is attempted the manufacturer's instructions should be followed to the letter.

broadcast (540 to 1700 kc) and short-wave (5.8 to 18 mc) bands, and 2,100 kc for the f-m (40 to 44 mc) band. Twelve tubes are used. (See Fig. 1.)

Separate antenna posts are used for a-m and f-m (Fig. 2), permitting the use of a variety of antenna arrangements. A special Stromberg-Carlson antenna (No. 6) has been designed to provide improved pick-up on both a-m and f-m. If desired, two antennae may be used, the f-m antenna deserving the choice location. A horizontal dipole with two arms approximately five and a half feet in length is recommended. This will exhibit a marked directional effect; hence, it should be oriented to receive a maximum signal and should be erected as high as possible.

Eight button, capacitor type, automatic tuning is provided for setting up six stations; the other two buttons be-

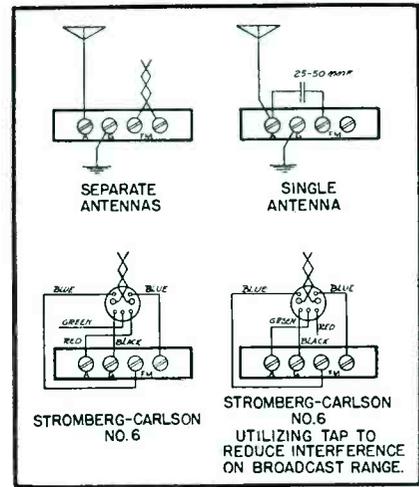
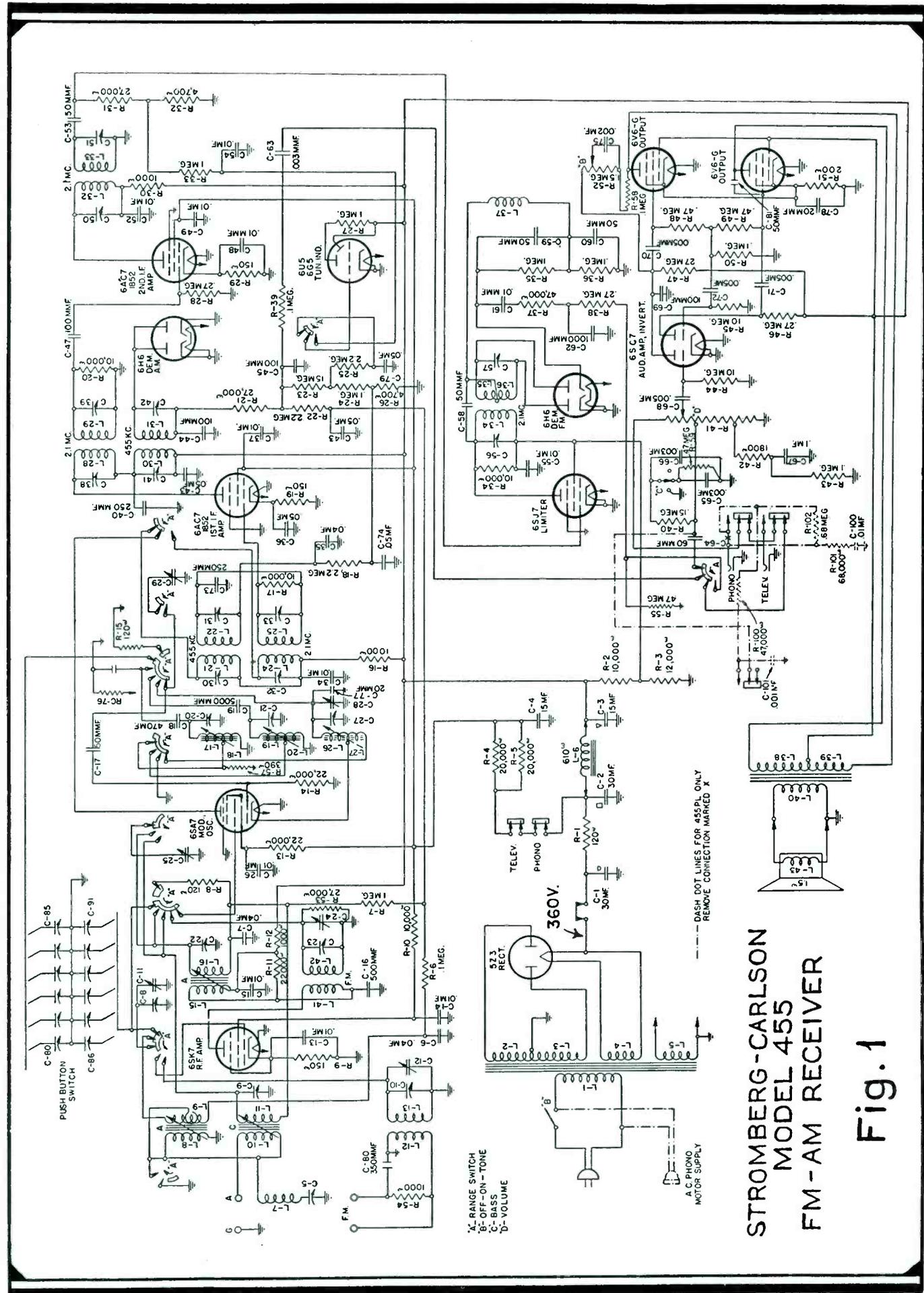


Fig. 2. Separate antenna posts are provided for a-m and f-m antennae in the Stromberg-Carlson Model 455 combination receiver.

ing for phonograph and television sound. Provision is made for a record player to be used with all models not already equipped with a phonograph mechanism, without additional wiring. The buttons for phonograph and television open the anode-grid supply of the converter tube, stopping oscillation and positively preventing any signal from leaking through. Clear visibility without glare is provided by an edge-lighted slide-rule dial. Provision is made for adjusting the pilot light socket so that the filament is exactly opposite the edge of the glass—an important adjustment likely to be neglected. A tuning indicator having two apertures, one for strong signals and one for weak signals is used. The weak signal aperture will close with a signal of approximately 100,000 microvolts, while the other will not close even with a two-volt signal.

Iron-cored coils are used for oscillator, r-f and detector stages on both the broadcast and short-wave bands for high gain and greater accuracy of alignment. The switching of this type of receiver is obviously complicated. (See Front Cover.) The r-f stage is used for f-m and the broadcast band only, not on the a-m short waves. The plate of the r-f tube feeds both interstage transformers in series, no switching is required here, thanks to the great difference in frequency between the broadcast and u-h-f bands. The input to the 6SA7 is switched, however, because the a-m short-wave band comes in here. The 6SA7 output is switched to either i-f channel. The secondaries of the i-f transformers feed the first i-f amplifier grid in series, again no switching is needed because of the wide difference in the two intermediate frequencies. The first i-f amplifier feeds the two channels in series, the 2.1-mc f-m channel going through a second i-f stage to the 6SJ7 limiter, to the 6H6 demodulator,



STROMBERG-CARLSON  
MODEL 455  
FM-AM RECEIVER

Fig. 1

through the audio switch to the audio amplifier. The 455-kc channel, however, goes directly to the demodulator diode in the usual superheterodyne arrangement. The tuning eye is switched from the AVC circuit to the grid circuit of the limiter tube for i-m reception.

A resistance-capacity filter consisting of a 120-ohm resistor between two 30-mfd electrolytics is used in the plus high-voltage lead ahead of the speaker field, which is incorporated in a second section filter. Even with the hum balancing features of the push-pull output stage the hum voltage must be kept very low because of the faithful bass response which includes the hum frequencies. High fidelity requires extending the range at the low end as well as the high end.

### INPUT HUM

(Continued from page 26)

pletely eliminate the unwanted h-f programs. When an input transformer is used, different grounds may be employed for the primary and secondary circuits. However, one common ground is always advisable (see Fig. 4). Another item to keep in mind is that the metal case of the input transformer should be insulated from chassis and grounded along with the grid return or other ground lead. In this connection examine the outer case of the input transformer to make sure that the bottom, sides and top are making good electrical contact.

As a last point, determine the angle at which the input transformer is best mounted before drilling the chassis to receive it.

When building a new amplifier with a gain up to 150 db, no trouble should be experienced with input hum if all of the foregoing is adhered to. However, it does not necessarily follow that a deviation from this procedure will always produce hum, as unpredictable conditions of balance and unbalance always exist.

In tracing hum of this class in a completed amplifier it may be a waste of time to completely rewire the input circuits. Hence, first check for the portion of the circuit causing trouble by lifting all grounds and connecting them by temporary leads to a common point, and then one by one remaking the original connections while noting any change.

### NEELY INVITES ENGINEERS

Over one hundred engineers attended a technical meeting held by Norman B. Neely in Hollywood on Thursday, March 21. A paper entitled, "Square Waves and their Application" was delivered by Bill Hewlett of the Hewlett-Packard Co. of Palo Alto, California.



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Pittsburgh's "Radio Christsmas" was so successful that additional space in the basement of the Grant Building was required to enable checking and repairing of the many sets donated.

# THE SERVICE MAN AND THE BROADCASTERS

By **ARTHUR STRINGER**

JOINT RADIO PROMOTION CAMPAIGN

**T**HE story is told that during the first world war a skipper of a German freighter was quietly cruising in African waters when a British destroyer opened fire upon it. After several unsuccessful shots, the German skipper emerged, red-faced, shaking a fist: "You fools!" he bellowed, "another shot and you might have hit the boat!" He naturally changed his tone, however, after it was explained to him that a war had been in progress for several months between his fatherland and the attacking vessel's country.

Can you imagine anything like that happening today? Isn't it hard to believe that so short a time ago, vessels journeying into unfrequented waters might just as well have travelled into the great void, so cut off were they from all contact with the world. The difference, we needn't be told, is due to radio.

Yet, what would be the result today if the same freighter, fully equipped with the latest radio devices, suffered an accident which impaired the usefulness of these same devices, and had no qualified technician on hand to repair them?

In the United States, there are about 50 million sets in homes and automobiles throughout the country. Every set has an average of two or three listeners, so that practically every man, woman and child in America is a listener. Just think of it! A 100 percent medium of communication which the world has dreamed of for years.

It is no wonder, then, that to keep this colossal market listening, commercial sponsors and broadcast stations spend sums that would beggar Croesus—\$400,000 daily.

It is obvious, of course, that set purchasers buy programs, not a combination of tubes and circuits. The American system of broadcasting is the only system in the world organized to give, absolutely free to the listener, programs

of the highest artistic merit, expressions of every viewpoint, unhampered by censorship. It is Democracy's true mouth-piece and safeguard.

Yet the best programs are lost, and so are the philosophical and selling messages, when transmitted to inoperative and imperfectly operating sets. Nevertheless, a recent survey has shown that nearly 35 percent of the receivers in the United States are not operating at full efficiency.

Broadcasters have always realized their dependence upon the Service Man. Recently, a great many stations have taken definite steps to organize a program of cooperation. The National Association of Broadcasters urges cooperation with local Service Men and in about 35 cities chapters of the Radio Servicemen of America have instituted the guaranteed service plan. Greater cooperation will definitely follow.

The objectives of the tie-up are as follows:

(1) To increase circulation, by increasing the number of listeners and hours of listening and the number of properly operating receivers.

(2) To inculcate appreciation for our American Program Service and the American System of Broadcasting.

It is the phrase "number of properly operating receivers" that indicates the important role of the Service Man in such cooperation. It is his job to keep the gateways to the greatest market in the universe open. The Service Man also has actual contact with the individuals that make up this tremendous market. He alone has entree into the homes of the nation. He is the guide and counsellor on all radio matters.

In Danville, Illinois, the members of the local RSA not only succeeded in selling the local broadcast station, WDAN, to listeners, during servicing operations, but made valuable surveys of listening frequency and preferred programs.

What does the NAB do for the Service Man in return? For one thing it sends out bulletins suggesting promotional ideas. Radio Christmas, so successfully initiated in several cities, including Pittsburgh and Cleveland, was an idea which originated at NAB.

In Cleveland the "give-a-radio" campaign was sponsored by station WGAR. In Pittsburgh the campaign had the support of the entire enthusiastic community and was sponsored by the Post-Gazette, the local RSA, stations KDKA,

---

"For some time I have been obsessed with a desire to undertake a survey for the purpose of actually proving how many radio receivers in the United States are in need of repair, and I've always wanted to find out at first hand, how much extra parts and tubes business can be had by the application of some selling sense, a lot of shoe leather and willingness to lean on door bells.

"My incompleting plan was something like this: I would take two typical American cities . . . and contact the local radio stations. To them would be unfolded my plan of seeing what could be done about putting the 35% of all receivers which are out of order in an operative condition again.

"Because listeners are the life blood of any radio station, it would be a very simple thing to secure their cooperation. This cooperation would take the form of several announcements daily for the period in which I conducted the survey.

" . . . I would obtain lists of set owners. I'd break these down into income brackets. I'd work out a typical cross section of the population. Then, I'd hire the best Service Man in town to call on these people with me.

"They would already be aware of the campaign I was conducting, through the radio announcements. These announcements would assure them that we merely wanted to check the radio, reception conditions in the neighborhood, and their program preferences. The fact that we had nothing to sell was stressed. Also stressed, was the fact that we would give them an honest report of the working condition of the radio if they wanted it, and would also put them in touch with a reliable Service Man if they so desired. . . ."

*Charlie Farrell in PARTS Magazine*

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WWSW, KQV and WJAS. The lobby of the Grant Building was taken to repair the gift sets and funds were collected to hire unemployed Service Men to perform the necessary work. Over 700 radio sets were donated.

Many NAB stations, in intervals of broadcasts, suggest that in order to enjoy the program in full, listeners' sets should be kept in perfect operating condition, and give the telephone number of the local RSA Chapter. The Cleveland Chapter reports many hundreds of telephone calls as a result. One station (WDAN, Danville) announced a free check-up by the local RSA Chapter and brought a great deal of business to its membership. Right now many stations are suggesting that auto-radio sets be put in first-class condition, and there are about eight million of these. The Curtain Raiser promotion never failed to call attention to the necessity of periodic, reliable service for full radio enjoyment.

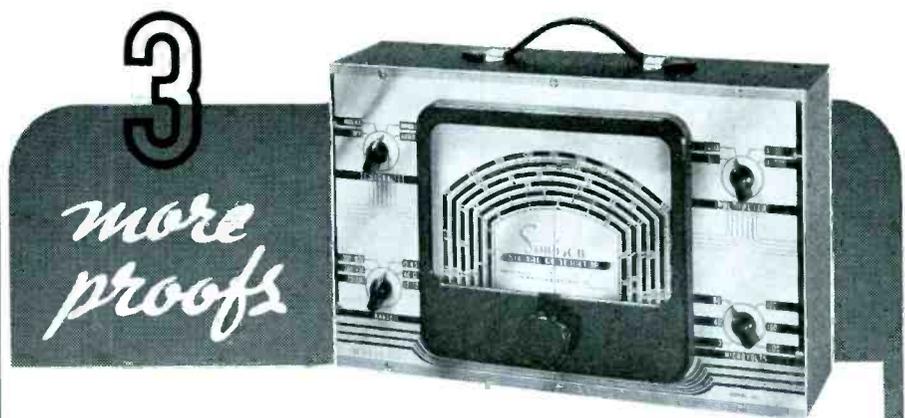
Window displays are a feature by which the parts jobbers cooperate, with both the local RSA Chapters and the local broadcast stations. Recently in Danville, Illinois, there were as many as fifteen prominent window displays.

Jobbers frequently sent out their salesmen to persuade dealers to lend their windows for the purpose, offering prizes for the best displays. Naturally the exhibits featured the merits of the local broadcast station, the RSA and the dealers' own wares, but they were educational, too, inasmuch as they stressed the advantages of the American System of Broadcasting, and what constitutes, as well as the desirability of, a properly operating set.

And, it is the educational feature that NAB emphasized in the Curtain Raiser, in newspapers, trade papers, addresses to business groups and civic leagues and in radio broadcasts.

When it lauds the American System of Broadcasting, the NAB is, of course, on solid ground. It points out that the United States is the only country whose inhabitants enjoy radio programs without the direct payment of a single cent, that nearly \$400,000 is spent daily for the best talent in the world, that America has the only uncensored radio, making the American people, as President Roosevelt declared, "the best informed people in the world."

We have, of course, space for only a few examples of the NAB's work in behalf of the Service Man. At present, the radio industry theme, "Listen before you vote," promises a lot of work. Other campaigns, like "Give-a-Radio," which has proved so successful, are on their way. One is called "Spreading Radio Sunshine," which in spite of its evangelic sounding name, promise excellent



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# SIMPSON

INSTRUMENTS THAT STAY ACCURATE

results. Another, "National Radio Festival," will be observed from coast to coast (June 3 to 8 inclusive).

As Joe Marty, Executive Secretary, RSA says for the Service Man, "We have just begun to cooperate." Cooperation, like marriage, doubles one's joys and halves one's sorrows.

#### MUELLER FACTORY ADDITION

Mueller Electric Co., 1583 E. 31 St., Cleveland, Ohio, makers of Universal clips, are building a 6,000 sq. ft. addition to their present plant. Modern equipment is being installed for the efficient handling of materials, it is said.

#### RCA NOISE METER

The RCA Type 312 radio noise meter is designed in accordance with the recommendations of the Joint Committee from the Edison Electrical Institute, the Radio Manufacturers' Association, and the National Electrical Manufacturers' Association, it is said.

Fundamentally, the meter is a super-heterodyne receiver provided with a small vertical antenna and containing an output metering system which is equipped with an integrating network giving quasi maximum indications on a direct reading meter. The instrument employs a self-contained calibrating source.

Additional information may be obtained directly from RCA Manufacturing Co., Inc., Camden, N. J.

# O U T D O O R A N T E N N A E

By JULIUS G. ACEVES

AMY, ACEVES & KING

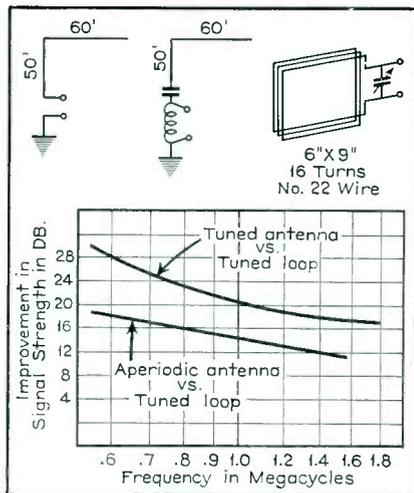


Fig. 1. Both the tuned and the untuned types of outdoor antennae will definitely deliver considerably more signal to the input posts of a radio receiver.

You are losing some of your bread and butter every time a good set with built-in loop or antenna is sold in your neighborhood. Also, the buyer of that set is not getting his money's worth in matters of program choice, tone quality, and freedom from background noises. If we but get the facts before set-owners and buyers, which we can all help do, we can get back our antenna trade once more, and give our local listeners better entertainment.

## • • • built-in loop

Why the built-in loop? How is it sold to the public? What does it accomplish? Does it really replace the outdoor antenna?

The loop is a compact signal interceptor. It can be concealed inside the smallest radio cabinet, even in the portable job. It is very directional in character, particularly if it is shielded. It is possible to get maxima and minima by rotating the loop in space, thereby differentiating between two waves coming from different directions. One may be the desired station; the other, a source of interference such as a defective neon sign, diathermy apparatus, or some other variety of old-style spark transmitter. This directive quality, in addition to the self-contained, complete, ready-to-operate appeal, has put over the built-in loop feature. The fact that the Service Man is done out of an installation fee is also a sales point scored. These are powerful arguments. The public likes them. But are these advantages always justified? Let us see.

In theory, the loop can be directed so as to reduce man-made static or inductive interference from a single source. The loop receives the desired program signal and turns its back on background-noise sources. But does it always? What if the noise source is in the same direc-

tion as the signal or if there are several noise sources in the vicinity of the receiver?

In most households we are surrounded by noise-producing devices. There are small motors flashing their commutator brushes. There are switches, thermostatic contacts, bells, dial-phones, elevator contactors and so on, not to mention that arch terror, diathermy equipment. Outside, there may be gas-tube electric signs or even incandescent-lamp signs with flashers. A trolley line passing near by doesn't help matters; neither does a high-tension transmission line radiating interference from leaky insulators or transformers.

What is the result? In most spots the inductive interference is all around, and more or less continuous. You can turn the loop this way or that and, despite its directional selectivity, you cannot eliminate all noises at the same time when noises are faced in all directions.

Meanwhile, it is well known that the induced voltage in a loop is rather weak in comparison with the electromotive force from an open type antenna, even of the indoor model. Therefore, when receiving stations other than locals, tube noises will be more prominent. Also, unless the receiver is extremely sensitive, the automatic volume control cannot take care of fading.

## • • • indoor antenna

As for the indoor antenna, that few feet of flexible wire tucked into the cabinet of the midget receiver, it is often worse than the loop. It's more susceptible to interference pickup as fed through the power-line connection, and, not being directional, it cannot be ori-

ented against a strong source of interference.

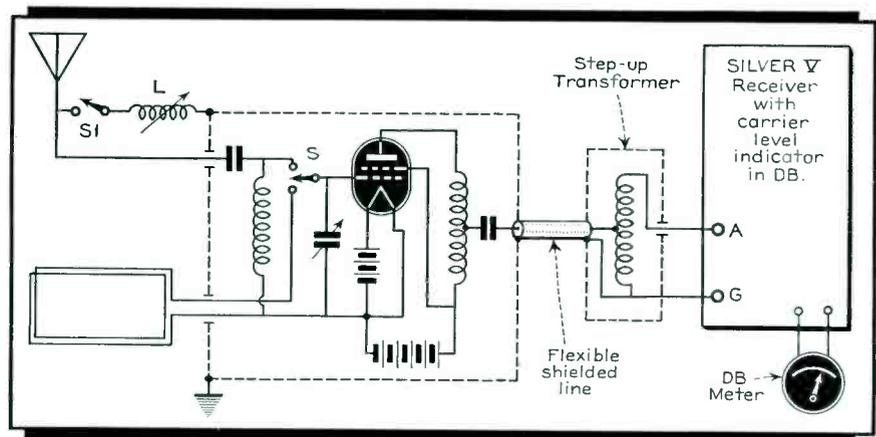
However, economically speaking, there's no argument but that the built-in antenna or loop is justifiable in midget sets selling for \$10 or less, for who's going to pay several dollars extra for an outdoor installation? And who is critical of performance from such a radio gallery seat?

Therefore, loops and built-in antenna alike are very limited in their signal pickup, yet they are wide open for man-made static, because of their location, close to sources of interference.

## • • • noise-free antenna

We can, however, install antennae that will furnish a good signal while reducing the background noise considerably. We can definitely show a marked improvement in reception by their use over loop- and indoor-antenna pickups. The Service Man really has something to sell the average set-owner. Unfortunately, "noiseless" and "noise-reducing" as applied to antenna systems, cannot be safeguarded by copyright or otherwise, for they are generic—free-for-all terms. During the past half-dozen years, the market has been flooded with antenna kits. Fantastic claims of noise-reducing properties have ap-

The method used to determine relative levels of signals from a loop of more or less standard dimensions and from an antenna with download of open type, about 75 feet in total length. Switch S serves to connect either loop or antenna and standard input circuit (for the broadcast band). Switch S1 serves to connect inductance L to tune the antenna at input of the receiver.



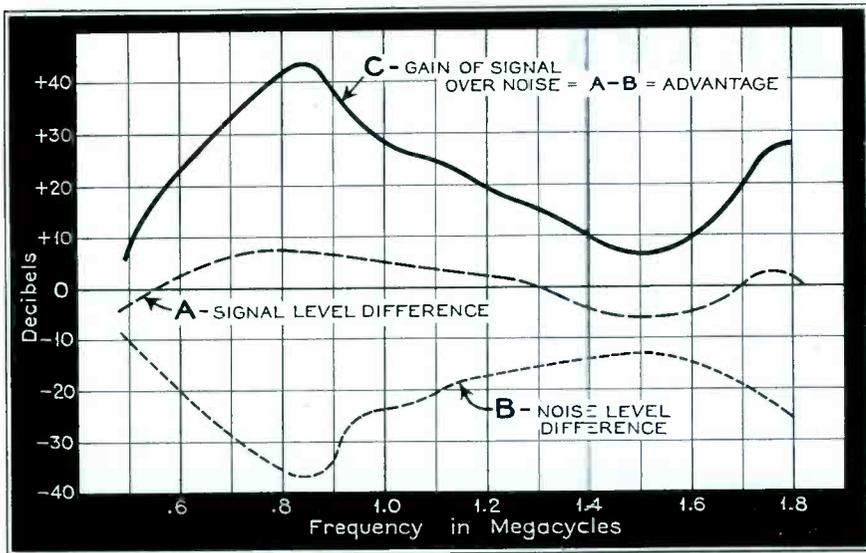


Fig. 3. Noise reductions as high as 15 db at most frequencies are obtained for a good noise reducing antenna kit as compared to an open type antenna and downlead of the same dimensions.

peared. Yet it is safe to guess that a large portion of such antenna kits did not reduce noise in direct comparison with ordinary wire jobs. Many such kits have been, frankly speaking, phonies. The result has been to give this whole antenna-kit business a black eye—with the public as well as among Service Men.

But there are a few well-engineered antenna kits, and master antenna systems, which have recently been improved in design and which are the product of years of study and research

in the ways by which interference is picked up or introduced into receivers. All that these antenna installations require, from an installation standpoint, is to have the actual pickup structure, be it a doublet, T or simple vertical rod of proper height, in a noise-free location, in order to effect an amazingly



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1. Saves hours by finding those "hard to locate" troubles quickly—Jackson DYNAMIC\* Signal Analyzers are ACTUALLY SIMPLE TO USE.
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Before you buy any signal tracer, ask your Jobber for free demonstration of Jackson Dynamic\* Analyzer.

The Jackson Electrical Instrument Co.  
\*Trade-Mark Reg. DAYTON, OHIO

# JACKSON

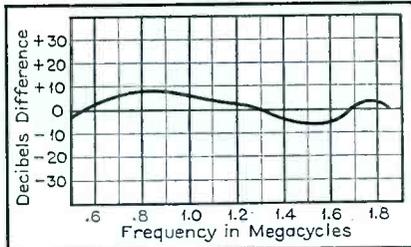


Fig. 2. A properly installed antenna of the noise reducing type will deliver an average net gain in input signal level over an antenna of the same dimensions without noise reducing transformers.

high degree of interference reduction. This reduction is accomplished in a two-fold manner:

- (1) By an increase in signal strength, due to elevation or other favorable location of the antenna proper for maximum pickup.
- (2) By the neutralization of interference pickup from the transmission line that connects the antenna proper with the receiver, and likewise the prevention of the passage of spurious currents from the power line into the antenna system and back through the input circuit of the set.

• • • comparisons

Getting down to technical facts and figures, an illustration of relative signal levels from a tuned loop versus outdoor  
(Continued on page 38)



## Still more uses for the L-C CHECKER



• Yes, this "miracle instrument" is proving still more valuable to servicemen day by day. The L-C Checker does a score of things—checks condensers for effective capacity, opens, shorts, intermittents; checks inductances and circuits; aids in aligning r.f. and i.f. stages; tunes traps; checks chokes, antennae, r.f. transmission line, etc.

And with accessories constantly being developed and added to the L-C Checker at very modest cost, you can measure capacity and inductance; check frequency of quartz crystals; check "Q" of circuits, etc., etc.

Thus the L-C Checker is a sound, permanent, mighty wise investment for any live-wire serviceman.

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# AEROVOX

CORPORATION  
NEW BEDFORD, MASS.  
IN CANADA: AEROVOX CANADA, Limited, Hamilton, Ont.

# SERVICE HELPS

## RCA AUTOMATIC RECORD CHANGER

**Adjustments, etc.:** The crystal in the phonograph pickup can be ruined if the tone arm misses the record at the beginning of the automatic record changing cycle and strikes against some portion of the record playing mechanism. A damaged crystal should be replaced. The new unit must be resoldered with as little heat as possible, to prevent partial fusion of the delicate crystal.

The throw of the tone arm is adjusted by loosening or tightening a small copper colored screw at the end of the copper wire of the tone arm. Usually, it is necessary to take up some of the slack in the copper wire. The adjustment is made by first loosening the nut on the screw (which, if frozen, may be first worked loose by an application of machine oil), then the screw is adjusted for a tighter adjustment of the copper cable and locked in position by means of the nut.

The adjustment should be made so that the tone arm hits the record at the starting point of a selection. It should also be made so that the tone arm end does not hit the bottom of the last record, as it lifts up for the reject.

The moment of starting of the cycle is determined by the setting of the small screw which tightens up on a collar beneath the deck of the record changer or underside (a screw located near the rejection lever). To adjust this screw allow the tone arm to reach the end of the record, when the adjustment may more easily be made for the reason the screw is then in a more accessible position.

Tightening this screw has the effect of causing the cycle to renew or repeat. If the screw is too tight, rejection will start in the middle of a record; if too loose, it may not start at all even when the end of the record is reached. A mean should be found by trying various settings, turning the screw a little bit at a time.

Practically all of the RCA models use this record changer, and even some other manufacturers have used it with slightly different modifications. The above adjustments are often needed and may be made in the field without great difficulty.

Willard Moody

## STEWART-WARNER HUDSON DB40, SA40

**Low sensitivity:** In cases of low sensitivity not traceable to weak tubes or defective parts, check the setting of the antenna trimmer. If the set has been aligned using any dummy antenna other than the 80-mmfd condenser recommended, the setting of this condenser will be off considerably.

In all cases, the trimmer should be adjusted to the regular car aerial. Install the set in the automobile and connect it to its antenna. Do not mount the control unit, but place it in some accessible place. Tune in a weak station, near 1400 kc, remove the plug button covering the antenna trimmer from the case, and adjust this trimmer for maximum volume.

Another possible cause of low sensitivity is mis-alignment of the i-f transformers caused when the upper and lower units are aligned at different times, since one i-f trimmer is on the control unit and the balance are in the lower unit. To correct this, realign both units of the receiver.

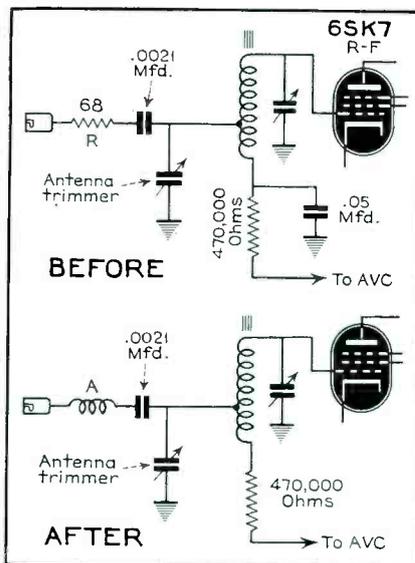
**Replacing tubes in control head:** Remove the two Phillips screws at the bottom of

the instrument panel grill. Lift out the grill. Remove the four machine screws holding the speaker plate. Insert a screw-driver blade in the slot in the front of the control head and pry off the lower cover. This will give access to the 6A8 and 6SK7 tubes.

**Hum:** A possible source of hum difficult to trace is caused when the lower end of the volume control accidentally becomes grounded in the control unit, in addition to the ground which is made in the lower radio unit. Removing the accidental ground in the control head will clear up this difficulty.

**Ignition noise:** If ignition noise is excessive, first make sure all the proper installation operations have been performed.

Additional bonnet grounding strips may be helpful in further reducing ignition interference. The best location for these can be determined by grounding the hood to the body at various points with a knife. If the grounding strip is located at a point 10½ inches from the center of the car,



install an additional strip at a point 23¾ inches from the center.

A change has been incorporated in the radios now being built to reduce ignition noise. This change can be made in the field if excessive noise is still encountered after following all previous instructions.

The antenna choke (A) is a single layer choke coil wound on a ceramic body which looks like an insulated resistor. It is to be installed inside the control unit in place of the resistor connected in series with the antenna lead on early sets. Later sets already have the choke.

Remove the top cover of the control unit. Check whether a resistor (R) or a small choke connects to the blue antenna lead. If it is a choke wound on a resistor body, the change has already been made. If you find a plain, insulated resistor connected to a terminal lug to which the blue wire from the antenna socket is connected, proceed with the change. This resistor has a value of 68 ohms and can be identified by its blue body, grey end and black dot.

Remove the resistor and the two screws holding the antenna socket to the case.

The antenna trimmer must now be connected to a different terminal on the antenna coil. This trimmer is the one which

can be adjusted through the side of the case. A bare wire runs from the antenna coil terminal through the top trimmer lug to the control grid in the 6SK7 tube.

Disconnect this wire from the antenna coil terminal and from the trimmer terminal. Slip a piece of spaghetti tubing over the wire and reconnect it to the same lug on the antenna coil. Connect the trimmer condenser to the antenna coil terminal nearest the corner of the chassis. This is the terminal to which the antenna series mica condenser connects. Replace the antenna socket. Solder the choke to the terminals from which the resistor was removed. Check to see that the wiring of the unit has not been pushed over so that it interferes with the dial-drive cord.

After this change has been made, it is absolutely essential to realign the antenna trimmer. This must be done with a signal generator and an 80-mmfd condenser in series with the antenna lead and the generator. If any other capacity is used, the adjustment will be incorrect.

The antenna trimmer, however, can and should be aligned to the regular car aerial. Connect the receiver in the case so that it will operate but without mounting the control unit in place on the instrument panel. Tune in a weak station near 1400 kc and adjust the antenna trimmer for maximum output.

## STEWART-WARNER 07-51, 07-51H

**Speaker cone replacement:** There were two different types of speaker supplied under a single part number for the Campus models 07-51 and 07-51H. These two types require different cone and voice coil assemblies, although our service manual shows only a single part number for the replacement cone.

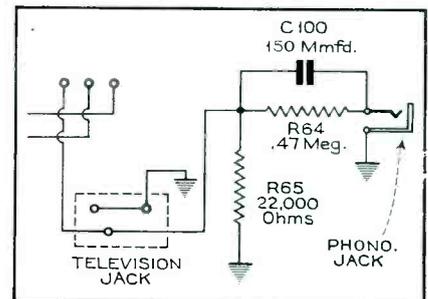
When ordering a replacement cone for either speaker be sure to specify whether the cone assembly uses a bakelite spider with two mounting holes or if the cone and voice coil assembly has a round spider made of material similar to the cone itself.

M. J. Schinke

SERVICE DEPT. STEWART-WARNER CORP.

## STROMBERG-CARLSON 470PF

**Service data:** The service information given in the No. 370 data book may be used for the No. 470 receivers. The aligning



information, diagrams and general instructions are essentially the same.

A volume control motor is installed in the 470-PF chassis and a remote control unit is supplied with each receiver. This unit permits the operation of the receiver at a remote point. An automatic record changer is used which plays and shifts either 10 or 12-inch records.

Additional phonograph compensation has been added as shown in the diagram.

J. E. Ward, Service Dept.  
STROMBERG-CARLSON TELEPHONE MFG. CO.

## LOKTAL CONTACT PINS

IN ORDER to supply additional support for the electrodes, in the construction of loktal tubes, it is sometimes desirable to employ one of the otherwise unused pins for additional strength. Since this pin extends through the glass base, as do the other contact pins, the result is that two base pins are common to one element.

This duplication of contact pins should in no way cause any difficulty. However, for the convenience of those who might wish to make measurements at the socket, the standard or usual connections should be used in wiring, leaving the duplicate pin free. This will also be advantageous in case of future tube replacements in the event of any changes in tube structure eliminating this double connection. Such changes in tube design may dispense with the extra pin entirely.

The following loktal tubes have two contact pins common to one electrode at the present time:—

Loktal type	Common electrode	Pins to which connected	Pin to be used (usual connection)
7B6	Cathode	4 and 7	7
7C6	Cathode	4 and 7	7
7E6	Cathode	4 and 7	7
14B6	Cathode	4 and 7	7
1LN5	—Filament	5 and 8	8

It will be noted from loktal basing diagrams that pin 7 is the usual cathode connection and pin 8 is the usual connection for one side of the filament or heater.

*Engineering News Letter*  
HYGRADE-SYLVANIA CORPORATION.

## BOOK REVIEWS

**RADIO HANDBOOK, Sixth (1940)**  
Edition by the Editors of Radio, published by Radio, Ltd., 1300 Kenwood Road, Santa Barbara, Calif., 1940, 600 pages, 6¾ by 9½ in., paper cover, price \$1.50.

The 1940 edition of the Radio Handbook is a reference manual on the theory, construction and operation of amateur radio equipment. Much of the text of previous editions has been rewritten. Two new chapters have been added: Introduction to Amateur Radio and Transmitter Construction. The chapter order has been changed and gives a more satisfactory progression from fundamental theory through more advanced material. Certain chapters containing related material, presented separately in previous editions, have been combined in this edition.

The chart of receiving tube characteristics, as in previous editions, is merely a reprint of RCA's. Tubes not made by RCA, but available from other manufacturers will, therefore, not be found here.

The book should be especially useful to anyone contemplating the construction and operation of low power transmitting equipment. R. H.

**RADIO SERVICE TRADE KINKS, by Lewis S. Simon, published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York City, 1939, 269 pages, 9 by 12 in., price \$3.00.**

While the book is intended to be a reference manual of common radio ailments, it is in reality merely a collection of the service jobs encountered by the author in the several years of his service career. About 750 sets are covered in all and over

three quarters apply either to receivers too old to be worthy of repairs or are entirely impractical solutions of simple service problems. In many instances the solution given applies only to the particular set under repair and has no value as a general case history. Almost as often the receivers discussed are rarely encountered in the field.

Further criticism can be given to the method of presenting the material. For example, in the kink applying to Arvin 7, on page 9, the author speaks of replacing defective units but does not give the values of these units. Again in the kink for Arvin 16, on page 9, instructions are given only "for those who have diagrams of the receiver." The same kink for the Radiola 80 given on page 181 is repeated on page 182.

It is this reviewer's opinion that the book is not worth the price asked, when considered from the standpoint of the material contained therein. R. H.

**CAPACITOR MANUAL FOR RADIO SERVICING, published by Cornell-Dubilier Electric Corp., 1626 Hamilton Ave., S. Plainfield, N. J., 256 pages, 5½ by 7½ in., paper covers, free of charge to readers of SERVICE.**

The data in this handy manual is tabulated so as to give instant information on the capacity and working voltages of the various by-pass and filter units for thousands of receiver models as well as the Cornell-Dubilier part number for a suitable replacement. An additional column is provided which indicates, in most cases, the page number in Rider's manuals on which circuit information may be found and another which gives the set manufacturers' original part number.

Following the tabulation there are 18 pages devoted to filter and by-pass condenser circuits which are referred to in the compilation. Over 150 different circuits are pictured.

The usefulness of the Capacitor Manual will be quickly recognized by the Service Man. It is highly recommended. L. M.

**THE 1940 RADIO AMATEUR HANDBOOK, seventeenth edition, by the headquarters staff of the ARRL, published by the American Radio Relay League, Inc., West Hartford, Conn., 1939, 456 pages plus 120 page catalog section, paper covers, 6½ by 9½ in., price \$1.00.**

The seventeenth handbook, like its predecessors, is a comprehensive and authoritative manual on amateur radio. There are 2 introductory chapters, 4 on principles and design, 14 on construction and adjustment of amateur equipment, 5 on antennae, and 5 on ultra-high frequency.

The tabular data on vacuum-tube characteristics is probably the most complete compilation to be found anywhere. If previous history is to be a guide these tables will be found to be more complete than any manuals that may be issued in the near future by the tube manufacturers. As far as the Service Man is concerned, however, the use of the tables is rendered somewhat more difficult because the tubes are first divided into separate tables according to function, instead of a simple numerical order by type numbers. A few typographical errors also mar the excellence of these tables. In listing the characteristics the title heads call for the output in watts yet for the low power battery series the number given is actually milliwatts. The plate and screen current ratings for the type 6W7G are interchanged in the listing as shown. R. H.



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MILLIAMMETER**

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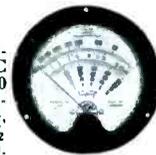
Model 1200-A has separate AC and DC instruments in tilting twin case, accuracy of each within 2%. This exclusive Triplet feature permits adjustment of twin instrument to angle in direct alignment with reader's line of vision. DC Volts 0-10-50-250-500-1000 at 2000 ohms per volt; DC MA. 0-1-10-250; low ohms, 1/2-500; 1500 ohms; 1½ and 3 megohms. AC Volts 0-10-50-250-500-1000. Has two RED•DOT Lifetime Guaranteed Instruments. . . . Sturdy metal case with black suede enamel finish. Etched panel is silver and red on black. Net Price . . . . . \$23.84

Model 1200-C. . . . Same as 1200-A but reads: DC 0-10-50-250-500-1000 Volts at 5000 ohms per volt; 0-250 microamperes; 0-1-10-50-250 milliamperes; low ohms ½ to 500; 1500 ohms. 1.5 and 7.5 megohms. AC 0-10-50-250-500-1000 volts. . . . Dealer Net Price . . . . . \$26.84

Model 1200-E. . . . Same as 1200-A but reads: DC 0-10-50-250-500-1000 volts at 25,000 ohms per volt; 0-50 microamperes; 0-1-10-50-250 milliamperes; low ohms, ¼ to 1000; 40,000 ohms, 4 and 40 megohms. AC 0-10-50-250-500-1000 volts. Dealer Net Price . . . . . \$31.17

**Model 521**

This is a 5-inch round foundation instrument reading: DC Voltage 0-10-50-250-500-1000 at 1000 ohms per volt; 0-1-10-50-250 milliamperes; Resistance, low ohms, backup circuit, ½ to 500; high ohms to 100,000. Additional resistance measurements by using additional batteries. One of 23 different electrical measuring instrument case styles manufactured by Triplet.



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**T**ODAY'S outstanding tube tester value—a guaranteed quality portable tester at a price you can afford to pay. Checks Loctals, Single Ends, Bantam Jr., the 1.4 volt miniatures, Gaseous, Rectifier, Ballast, the High Voltage Series (including 117Z6G) and others recently announced. Direct Reading GOOD-BAD meter scale. Positively will not deactivate 1.4 volt or other type tubes.

WRITE FOR CATALOG  
 SECTION 417 COLLEGE AVENUE

**READRITE METER WORKS, Bluffton, Ohio**

**OUTDOOR ANTENNAE**

(Continued from page 35)

antenna of tuned and untuned types, are shown in Fig. 1. Fig. 2 shows the relative signal levels from an outdoor antenna equipped with noise-reducing units versus the same antenna without these units and with an open downlead, of the same dimensions.

The most important feature, noise reduction, is illustrated by tests with a good noise-reducing antenna kit, as follows:

The noise level difference (Curve B, Fig. 3), signal level difference (Curve A), and combined effect (Curve C = AB—signal-to-noise logarithmic ratio) for this antenna kit, as compared to an open type antenna-and-downlead of the same dimensions, are illustrated in Fig. 3. Noise reductions as high as 15 decibels are obtained at most frequencies.

You know what 15 decibels mean in difference in loudness. It means the approximate effect of adding or suppressing a stage of audio amplification. Or about 30 times increase or decrease of signal energy.

• • • worth while

From the above example, and numerous other tests, it is obvious, of course, that a noise-reducing antenna system is

worth while. Any set-owner whose investment in a receiver is something above the midget-set bargain-basement level, can easily be shown that a few dollars for better signal pickup and noise-reduction, will bring him a greater range with more choice of stations and freedom from background noise. With the recent advent of ultra-high-frequency broadcasting at very low-noise levels, he is going to be more conscious of the imperfections of his reception and more inclined to listen favorably to a noise-reducing antenna job.

What can you do about it? Simple enough. Begin by installing very carefully a genuine noise-reducing antenna system in your store or shop. Be very sure to follow exactly the instructions for its installation. Demonstrate it to your customers. When they doubt the value of this job, invite them to drop in at your place and hear the results for themselves.

When you're fully sold on the proposition and know how to put up one of these jobs for the very best results in any locality and for any building, then go so far as to sell on a satisfaction-guaranteed-or-no-pay basis. You can't go far wrong on that proposition, because your installations *will make good*. Needless to say, the extra dollars to be made by you are not to be sneezed at these hard-tack days.

**Mr. Serviceman:  
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**The Only National Organization of Servicemen**

Servicemen, broadcasters, manufacturers, jobbers, trade associations and trade journals, all have contributed their share toward making the RSA the fine organization it is today.

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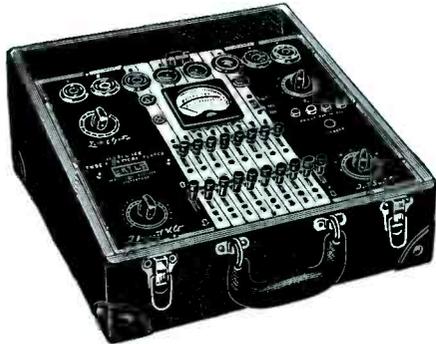
I am enclosing \$4.00 for National dues and initiation. Covers dues up to Jan. 1, 1941.....

(Does not include Local Chapter dues where Local Chapters are organized.)

S440

### RTL TUBE TESTER

The Radiotechnic Laboratory Model 120 tube tester is designed to accommodate any possible combination of heater and control elements of all existing sockets, it is said. Space is provided for additional sockets for



future types. Tubes of all types including gas rectifiers may be tested as well as pilot lamps and Christmas tree lights. Three ranges are also provided for testing batteries and d-c power supplies. The instrument is available in counter or portable models. Additional information and prices may be obtained directly from Radiotechnic Laboratory, 1328 Sherman Ave., Evanston, Ill.

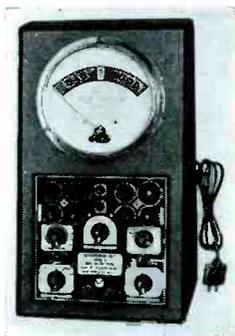
### SPRAGUE DUAL ATOMS

Three new dual-capacity midget dry electrolytic condensers with separate positive and separate negative leads have been added to the Sprague Atom line. These are adapted as duplicate replacements for auto radio receivers and common positive condenser requirements, it is said. The new units include 20-20 mfd, 150 volts; 16-16 mfd, 250-volts and 8-8 mfd, 450 volts.

A folder listing the entire Atom line can be obtained directly from Sprague Products Co., N. Adams, Mass.

### RADIO CITY TUBE TESTER

The Model 308 Series D tube tester announced by Radio City Products Co., 88 Park Place, New York City, incorporates



a 9-inch meter. The Dynoptimum test circuit is utilized and provision is made for testing all tubes including the new miniature types it is said. In addition there are spare large and miniature sockets to take care of new tube types as they make their appearance. Pilot lamps, headlights, miniature bulbs and all ballast tubes are also provided for with all heater and filament voltages up to the full line voltage. The tester is available in counter and combination counter and portable models.

### RAYTHEON CHARACTERISTICS CHART

Raytheon Production Corp., 445 Lake Shore Drive, Chicago, have issued their latest Characteristics Data Chart. The 28-

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**CAUTION:** Improper installation or a shorted radio circuit will exhaust any battery very quickly. If you are not sure—play safe—have your dealer install batteries. Also, have him test your set occasionally.



**LONG LIFE BATTERIES  
COMPLETE RENEWALS  
FULLY GUARANTEED  
COUNT ON N. U. DEALS**



page chart lists characteristics for 331 receiving tube types, 56 plug-in resistors and 16 pilot lamps. It includes 121 basing diagrams, 52 outline drawings and a table of 194 interchangeable types.

Readers of SERVICE may obtain copies of the chart at the above address without charge.

### AEROVOX MIDGET ELECTROLYTICS

For applications calling for high capacity values at low voltages, seven values and voltage ratings are offered in the midget metal-can electrolytics by Aerovox Corp., New Bedford, Mass. The capacities range from 1000 to 3000 mfd, with working voltages of 6, 12 and 15 d-c. The metal can is protected and insulated by the paper sleeve extending for the full length and rolled over the can edges, to preclude



shorting of leads on the can. Units are supplied with mounting straps, except for a larger can size unit which has a standard mounting ring.

# ASSOCIATIONS

## RSA

### • • • Binghamton

At the meeting on March 20, Mr. Sloan, electronics instructor of North High School, Binghamton, gave a preview of a demonstration which he intends to present at a later date. Considerable interest was aroused, and I'll bet that we'll have to hang out the "standing room only" sign when he does give that demonstration in full.

Wayne Shaw administered the first lesson of the long awaited Television Course (which finally arrived from Chicago) April 2. He will continue the course, a lesson at a time from now until it is finished.

*Earl L. Pittsley, Publicity*

### • • • Jersey City

Charles Wolf, chairman of the entertainment committee, reported that the recently conducted dance was a financial (and we all know that it was a social) success. Bigger and better affairs are planned for the future.

Instructive technical meetings featuring leading personalities from the radio industry have been arranged for the very near future.

*T. Anthony, Publicity Director*

### • • • New Hampshire

The Third Annual Banquet and Election of Officers for the Southern New Hampshire Chapter was held at the Elms in Goffs Falls, N. H. An excellent steak dinner was enjoyed. Arthur B. Sandborn was toastmaster and introduced the speakers of the evening: Glenn Browning and "Chick" Evans, manager of station WFEA, Manchester. Moving pictures were presented by Eldon Murray of the New Hampshire Fish and Game Department.

Mr. Evans announced that his station was ready and willing to cooperate with the local chapter and will give us a half-hour program each week to further the Joint Promotion Campaign.

Arthur Sandborn was elected chairman; Thomas Swist, vice-chairman; George Lefebvre, secretary-treasurer; and Homer Sawtelle, chairman of the service bench. About 40 guests and members were present.

Further details of the Joint Promotion Campaign were discussed on March 19 and the Guarantee Service Plan inaugurated.

*George P. Lefebvre, Secretary-Treasurer*

### • • • Williamsport

On the first Thursday in March, the regular monthly meeting of the Williamsport Chapter was held in the meeting room at the YMCA. Programs for summer meetings

were planned and financial affairs adjusted. After the business portion, a round table discussion on frequency modulation was held. Its application to this territory was particularly stressed during the discussion.

*William L. Mosteller, Secretary*

## RTG

### • • • Lawrence

At the March 18 meeting the first issue of the Lawrence Chapter News (edited by John Sestini) was presented to the boys.

The Industrial School Radio Class sponsored by our chapter for the betterment of Service Men has concluded its first year with outstanding success.

*James A. Mulligan*

### • • • New Bedford

A regular meeting of the Whaling City Chapter of the Radio Technicians Guild was held in Labor Temple on Wednesday, March 20. Plans were inaugurated to form a physics class. Various effects of frequency modulation were discussed. Mr. Maginot, president of the Boston Chapter spoke on organization and informed us of future plans. Al Saunders, also of the Boston Chapter, explained differences in manufacturers ratings for gain in tubes from actual practice and also made suggestions as to possible methods of increasing gain. Other members of the Boston Chapter were also present.

RCA presented their Signal Tracing demonstration using the famous Dynamic Demonstrator and the Chanalyst, at the New Bedford Vocational School, on April 1.

*James L. Shepley, Secretary*

## PRSMA

### • • • Philadelphia

South Philly must have lots of money to pay for their radio service just now. We notice one of the members of the board flashing around in a new car.

Our new advertiser "Sprague" came to town April 2 with a subject that we all have been waiting for: "Man-Made Radio Interference—Its Cause and Suppression." Mr. Podolsky, who has been here before, was the speaker.

Overheard in one of the Parts distributor's houses by yours truly: "I know how to fix the filament in pilot lamps quicker and cheaper than putting in a new lamp." We are glad to say that this so-called ser-

vice man does not belong to PRSMA.

Thanks to Wilcox-Gay Corp. for those service notes which we received at our last meeting.

Confucius say a lot of wise things, but here is a wise thought put in words to the wise members of 1939: Some of the members of 1939 know that to drop out of the association now will be very unwise, for if they want to get back in the association it is going to cost them real money. So your good man Monday say: "Pay your dues now and stay in this far-reaching association." Nuf sed!

Do you have anything for sale that some other member may want? Put it in the "News" free to members: 25c per line to non-members.

Will some one donate a high chair for our vice chairman of the board? It's all in fun, Schmitt!

Learn who your different committees are and all members can be a great help with any suggestions or ideas they have. Voice them in the meeting, not on the corner's outside.

Did you see the write-up the Philadelphia Inquirer gave us on Wednesday, February 14? Thanks!

*PRSMA News*

## NRIAA

### • • • New York

Irving Gordy was elected chairman of our New York Chapter of the National Radio Institute Alumni Association, recently. On March 7, F. E. Wenger of Triplett spoke on measuring equipment. He also presented motion pictures of the Triplett plant in action.

We have made arrangements with SERVICE to have their Editor, Robert G. Herzog, speak at the April 18 meeting. The subject of his talk will be "Circuit Tolerances."

*L. J. Kunert, Secretary*

## OTHER GROUPS

### • • • California

The April 8 meeting featured motion pictures of scientific interest as well as a talk on signal tracing by Milton Weeks. Milt had plenty of tricks and shortcuts that help cut down time in trouble shooting.

Meanwhile we're waiting anxiously for Family Nite to arrive. Rumor has it that an RASC orchestra is in the throes of formation (if you play any instrument, see Andy or Babe Eastman, but don't tell anyone else). Also, you quiz program fans will have a chance to work out during the evening's entertainment.

*William Appleton, Secretary*

This annual meeting of the New Jersey Radio Technicians, held in Paterson, N. J., was addressed by George C. Connor, Hygrade-Sylvania commercial engineer, on the timely subject of frequency modulation. The meeting was sponsored by Dale Radio Company, Sylvania New York distributors.

### • • • Salem

The DeMambro Radio Supply Company of Boston presented Glenn Browning, April 1, at Eagles Hall, Salem, Mass. Mr. Browning spoke on frequency modulation and also demonstrated some of the latest f-m equipment.

### • • • Hartford

On March 12 the Institute of Radio Technicians of Hartford, Conn., held their first meeting under the newly elected officers of the organization: J. H. Smith, Jr., president (reelected); G. Miller, vice president; H. R. Griswold, secretary and K. Anderson, treasurer (reelected.) After the usual business of reports, etc., discussion of the RSA service plan in cooperation with the local broadcasting stations was continued. Progress was reported to the effect that the plan was ready for operation. So that members participating would receive service calls through a telephone service company, such a number would be mentioned by the broadcast station while recommending RSA members.

A committee consisting of J. Smith, J. Ottenberg and E. Augsten was appointed to call on the stations and make the final arrangements and put the plan into operation immediately.

On April 9, President Smith announced his appointments to the various committees to carry on the work of the club for the next year. G. Miller entertained with sound movies.

*H. R. Griswold, Secretary*

## TRADE SHOW

Following is a general schedule of organization meetings to be held during the week of the Radio Parts National Trade Show, at the Stevens Hotel, in Chicago, June 11 to 14, 1940.

The Sales Managers Club, Eastern and Western Groups, will hold its annual joint meeting at 3:00 p. m., on Monday, June 10.

Radio Manufacturers Association, 16 Annual Convention, Tuesday, June 11, Wednesday, June 12, and Thursday, June 13.

The National Radio Parts Distributors Association will hold a dinner meeting for members, at 7:00 p. m., on Thursday, June 13.

A general meeting for members and non-members at National Radio Parts Distributors Association will be held at 10:00 a. m., Friday, June 14.

Radio Parts Manufacturers National Trade Show will hold its annual luncheon meeting for Member-Exhibitors at 12:30 p. m., Friday, June 14.

The Representatives will hold their annual meeting at 10:00 a. m., Friday, June 14.

Radio Servicemen of America will conduct its 3 Annual Convention on Friday, June 14.



**RADIO CITY CATALOG**

Radio City Products latest test equipment catalog (No. 122), featuring 16 models, can be obtained without charge from Radio City Products, 88 Park Place, New York City.

**LAFAYETTE SPRING CATALOG**

Radio Wire Television, Inc., (formerly Wholesale Radio Service Co., Inc.) their 124-page Spring edition of the 1940 catalog. The catalog lists the new line of Lafayette receivers and phone combinations, public address equipment and numerous other features of interest to the Service Man. Copies may be obtained directly from Radio Wire Television, Inc., 100 Sixth Avenue, New York City.

**CLOUGH-BREngle REPRESENTATIVE**

Spector Sales Associates, 17 E. 42 St., New York City, have been appointed sales representative for Clough-Brengle Co., 5501 Broadway, Chicago, manufacturers of test instruments. Territory includes New York, New Jersey, Delaware, Maryland, District of Columbia, New England and Pennsylvania, east of Altoona.

**NORDEN VICE-PRESIDENT**

L. S. Brach Manufacturing Corp., Newark, N. J., manufacturers of antenna kits for radio and television receivers, announce the appointment of Alexander Norden, Jr., as vice president.

**ALLIED SPRING CATALOG**

The Allied Radio Corp. 172-page 1940 Spring catalog contains a 32-page section devoted to new Knight receivers, 36 pages of public address equipment as well as numerous other sections devoted to the Service Man's needs. Copies may be obtained directly from Allied Radio Corp., 833 W. Jackson Blvd., Chicago.

**SYLVANIA PUZZLE TAG**

A green puzzle tag is now offered by Hygrade Sylvania to their dealers and Service Men. Dealer imprint appears on the front of the tag together with problem directions which are appended with dealer copy aimed to lure customers into the store. The cost of imprinting is: 100 tags, \$2.25; 250, \$4.25; 1,000, \$13.00. Additional information may be obtained directly from Hygrade Sylvania Corp., 500 Fifth Ave., New York City.

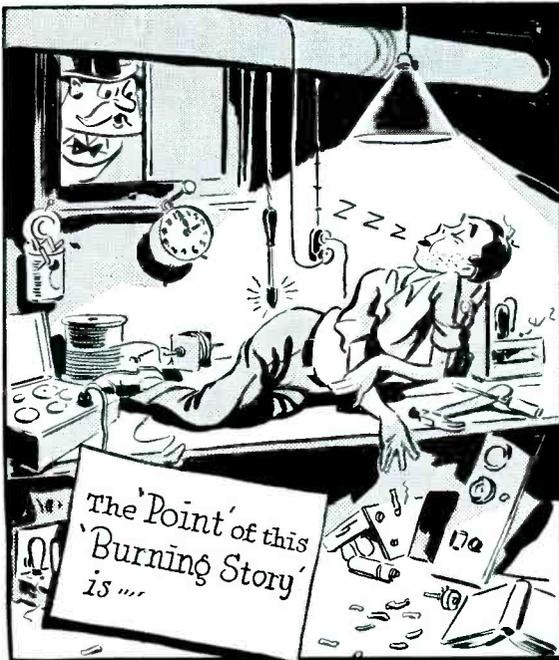
**WARD AUTO-RADIO ANTENNA**

Ward Flex-Angle auto-radio antenna is single mounting and can be adjusted to a vertical position on any automobile body contour without the use of special parts for angle compensation, it is said. Additional information on this and other Ward aerial products may be obtained directly from Ward Products Corp., Cleveland, Ohio.

**TRIPLETT METERS**

Triplet Electrical Instrument Co., Bluffton, Ohio, has introduced their Models 725 and 735 7-inch portable meters; obtainable in standard and special ranges. The instrument has a 6-inch mirror scale and knife-edge pointer. Accuracy within 1%, it is said. Available in microammeters, milliammeters, thermo-ammeters, ammeters, voltmeters and millivoltmeters in single and multiple ranges.

Additional information and prices directly from Triplet.



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With fingers weary and worn the poor lad probes for trouble in the shape of some nice noise, sarcastic shorts, "lousy" leaks and open circuits.

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It gives you complete data and tube diagrams for 374 types of tubes all now listed in numerical-alphabetical order for quicker reference. Operating conditions, characteristics and circuit applications for Standard Glass tubes, "G" types, "GT" types, Loktal, Metal, Majestic and Special types. Full information, too, on Sylvania's complete line of Panel Lamps.

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**NEW! By JOHN F. RIDER**  
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**THE CATHODE RAY TUBE AT WORK**

By JOHN F. RIDER

This is the most complete and practical book ever written on the subject—the only one prepared especially for the radio serviceman. New applications of the cathode ray tube during the past five years require that servicemen know its operation. 336 pages—over 450 illustrations—\$2.50.

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Export Div.: Rocke-Int. Elec. Corp., 100 Varick St., N. Y. C. Cable: ARLAB

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#### RCA TUBE CHART

RCA Manufacturing Co., Inc., Harrison, N. J., have issued their latest Receiving Tube Characteristics Chart (1275B).

The new chart gives characteristics data on all RCA glass, glass-octal, octalox and metal types in numerical alphabetical order.

Readers of SERVICE may obtain copies without charge from the RCA Commercial Engineering Section, at the above address.

#### SPEAK-O-PHONE ENLARGES

Speak-O-Phone Recording and Equipment Co., 23 W. 60 St., New York City, have recently enlarged their quarters. The newer additions include soundproof studios for test and demonstration purposes.

#### SIMPSON MICRO-TESTERS

Simpson Electrical Co., have introduced a series of companion testing instruments

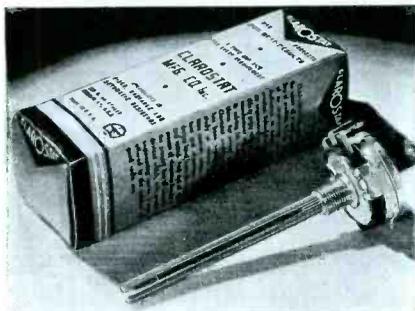


which it is said can be combined in sets of three to measure current, voltage and resistance for almost every requirement. 8 different models are available in various current, voltage and resistance ranges.

Additional information and prices are available from Simpson Electric Co., 5214 Kinzie St., Chicago.

#### SERRATED-SHAFT CONTROLS

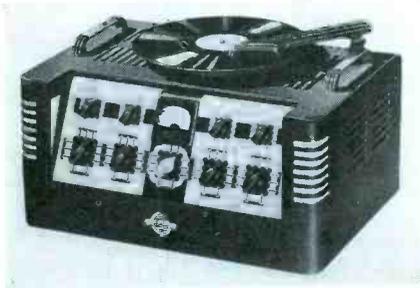
Volume controls with serrated shafts, for replacement of controls having the



knurl and slot shafts, are announced by Clarostat Mfg. Co., Inc., 285-7 N. Sixth St., Brooklyn, N. Y. These Series KS controls are of the Clarostat midget type and permit replacements without having to replace the slip-on knobs as well. Series KS units are available in various resistance values.

#### CLARION AMPLIFIER

The Transformer Corp. of America, through its sound distributors, the Clarion Institute of Sound Engineers, has announced a new line of sound equipment for 1940. The Model A-95, 71-watt unit illus-



trated is said to have a peak wattage of over 100, facilities for 4 microphones, 2 phono inputs. Write to the above organization at 69 Wooster St., New York City, for further information.

#### ED. DENIKE ADVANCED

G. Ed De Nike, who has been advertising manager for National Union Radio Corp., Newark, N. J., for many years, has been appointed sales manager for New York State. His new headquarters are at 76 Monroe St., Geneva, N. Y.

#### KENYON PLUG-IN TRANSFORMERS

Kenyon Transformer Co., Inc., 840 Barry St., New York City, have announced a new series of plug-in transformers in both standard and submersion proof types. Cases are of alumilite, 2 3/8 by 1 1/2 in. in diameter and are provided with an 11-prong base similar to the octal type. 21 types are available to cover a wide variety of applications. Additional information and prices may be obtained directly from Kenyon.

#### MALLORY VIBRATORS

Mallory has added two new vibrators to their replacement line. The 863, an in-



terrupter type with the same base connections employed in the General Motors receivers and the 264, a synchronous type recommended for replacement in Sonora, Allied (Knight) and Firestone receivers. The 863 is specifically recommended for replacement in Oldsmobile and Pontiac car sets. Special characteristics of both units are the short container length and the unusually short prongs.

Additional information on these and other Mallory vibrators may be obtained directly from P. R. Mallory & Co., Inc., Indianapolis, Ind.

#### N. U. BATTERIES

National Union Radio Corp. announced from their Newark, N. J. headquarters the availability of a complete line of National Union replacement radio batteries. The new batteries are for sale exclusively by Service Men in the replacement field and have been specially priced with this channel of distribution in mind.

## DEALERS AND SERVICEMEN

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ON  
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AERIAL LINE**

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at NO EXTRA COST

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- High-Q, low capacity, low loss, waterproofed, non-kink leads.
- Tri-mount model with extra brackets for Underhood - Alligator - Hinge.
- Time-saving installations with Ward's new EZ-IN plug, silver-to-silver contacts.
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A new Dealer display by Ward that is a truly efficient silent salesman. Also the most complete catalog in the trade.

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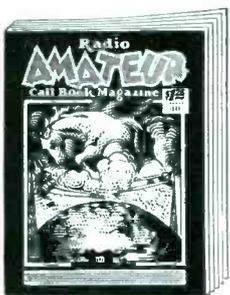
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- 4 STANDARD TYPES of Amperite Regulators replace over 200 types of AC-DC Ballast Tubes now in use.
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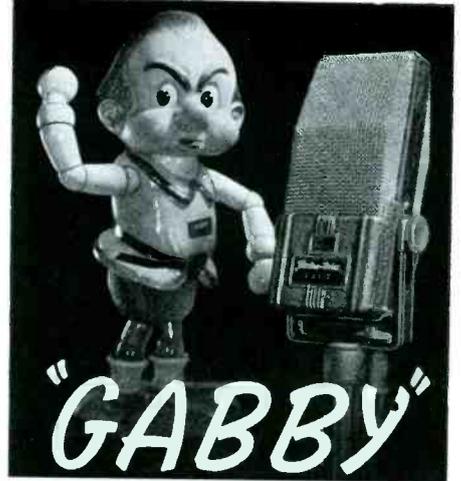
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This colorful, laughable, lovable town crier of Paramount's full length, technical color cartoon motion picture romance, "GULLIVER'S TRAVELS," is a vibrant personality.

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may not, in themselves, be "alive" . . . but they possess clean, crisp highs . . . real vibrant lows . . . true reproduction qualities for precise inflections that convey easy-to-listen-to, pleasing personalities over the air waves.

Have you tried one?

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QUICK AS A WINK . . .

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**SPOTS BAD ONES** *while set is operating*

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**Model BQC** — for 110 v. 60 cycle operation, complete with tubes, ready to use

**YOUR COST \$15.75**



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If you already own a reliable capacity bridge, buy this unequalled service help — for DYNAMIC checking only. Embraces all features of Model BQC but omits the Wien Bridge. An instant story of condenser quality, whether the unit is in the circuit, partially connected, paralleled with other components or entirely separate. Handles all types of condensers, including electrolytics.

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**CHECK  
CONDENSER QUALITY  
DYNAMICALLY  
FOR GREATER  
Profits  
Profits**

*Immediate Deliveries . . .  
See Your Jobber, or Write for Bulletin Q. C.*

**SOLAR MFG. CORP., Bayonne, New Jersey**

**IT'S RCA ALL THE WAY... IN PROFITABLE SERVICE BY SIGNAL TRACING**

**From the Source of the Signal with the RCA SIGNALYST...**

**RCA SIGNALYST**

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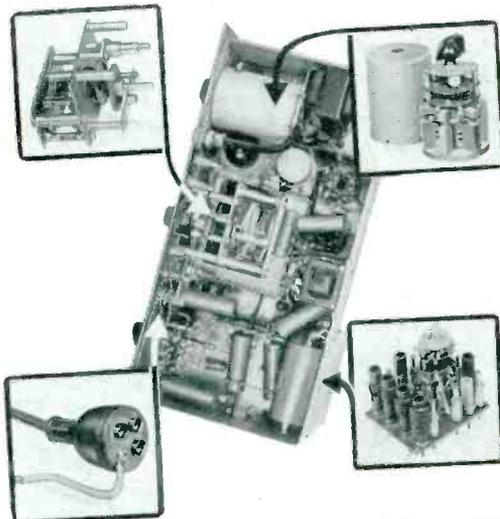
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Positive tuning control. Split-gear system eliminates all backlash. 4-gear, ball-bearing reducer with dual controls on main shaft provides tuning ratios of 60:1 and 12:1.

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Fully shielded, these 10 band magnetite-core coils and air-trimmer capacitors make possible excellent accuracy and stability of dial scale calibration.

**Your work is quickly done without disturbing any circuit constants!**

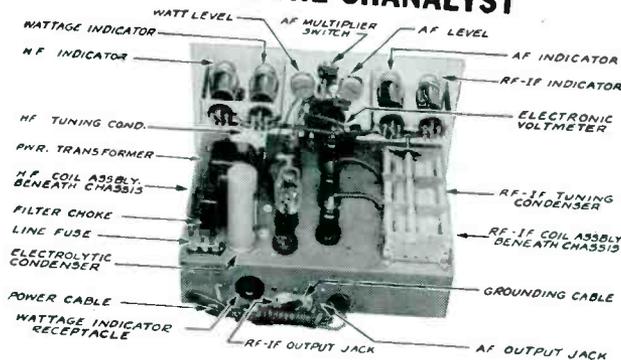
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With the RCA Signalyst providing a metered signal of known value...you can then follow that signal through the radio you are testing with the RCA Rider Chanalyst without disturbing any circuit constants. And in short order, you'll find the source of the trouble. Remember the Chanalyst was the first instrument of its kind. It revolutionized servicing. And it's still the top instrument. Dollar for dollar, it offers you more utility, greater flexibility, higher degree of stability, and greater freedom from complicated circuits.

The man who uses both the RCA Rider Chanalyst and the RCA Signalyst for signal tracing finds it pays to go RCA All the Way from the source of the signal to the source of the trouble.

**To the Source of the Trouble with the RCA RIDER CHANALYST**

**INSIDE THE CHANALYST**



**RCA RIDER CHANALYST**

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