

October

1940

*Radio*

# SERVICE DEALER

*This Month*

**SERVICING CHANGERS**

**SOUND EFFECT DISCS**

**DYNAMIC INDICATORS**

**TUBES AND CIRCUITS**

**SERVICING CONTACTS**

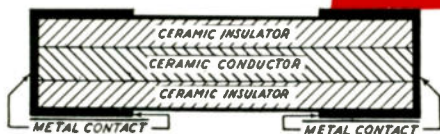
*Price*

25¢



# AXIAL LEAD

# RESISTORS



**Magnified cross section showing the important and exclusive Centralab features:**

Note center core of resistance material surrounded by a dense shock-proof ceramic providing strength and protection against humidity.

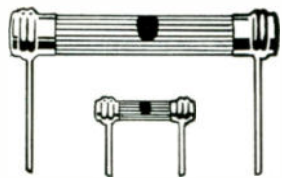
Both core and jacket are fired together at 2500 degrees F. into a solid unit . . . hard and durable as stone.

Pure copper covers the resistor ends for contact.

## AXIAL LEAD RESISTORS

*Completely insulated*

Designed to fit into limited space without danger of shorting to the chassis or other parts. Same resistor bodies are used as in Radial Lead units, millions of which are now in use . . . only difference is in method of making end contact. End leads brought through bakelite insulation. Will withstand five times rated load without permanent change.



## RADIAL LEAD RESISTORS

*90% Insulated*

The ceramic body of all Centralab resistors is in itself an insulator of the highest quality. Only the radial leads where attached to the body are un-insulated. Electrical characteristics of the Axial and Radial lead types are identical.



Old Man Centralab continues to score a bulls eye with the millions of Fixed Resistors that are doing duty in new and replacement jobs the country over. Manufacturers, experimenters, hams and service men continue to believe (and justly so) that Centralab's unique method of uniting the resistance material with the ceramic body makes for a resistor of unusual strength and efficiency under any and all conditions. Available in either Radial or Axial Lead . . . color coded (R.M.A.) in convenient sizes and ratings.

Always insist on CENTRALAB.

CENTRALAB: Division of Globe Union Inc., Milwaukee, Wis.

By

# Centralab

*Radio*

# SERVICE-DEALER

**SOUNDMAN AND JOBBER**

Reg. U. S. Pat. Off.

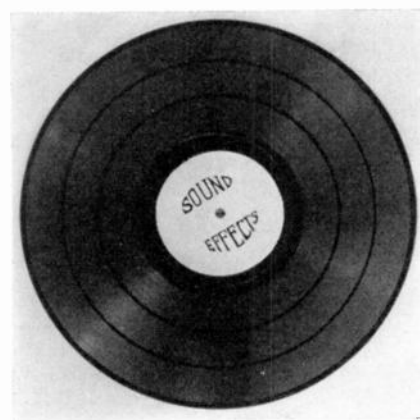
## Ad Index

<b>Brach Mfg. Corp., L. S.</b> . . . . .	28
Auto & Home Antennae	
<b>Burgess Battery Co.</b> . . . . .	28
"A" and "B" Batteries	
<b>Centralab</b> . . . . .	2nd Cover
Axial Lead Resistors	
<b>General Industries Co., The</b> . . . . .	28
GI-C120 Record Changer	
<b>International Resistance Co.</b> . . . . .	23
Type D Universal Controls	
<b>Jackson Elec. Inst. Co., The</b> . . . . .	26
Model 636 Dynamic Tube Tester	
<b>Lafayette Radio Corp.</b> . . . . .	28
New 1941 Catalog No. 82	
<b>National Union Radio Corp.</b> . . . . .	4th Cover
Tube Tester & Tubes	
<b>Ohmite Mfg. Co.</b> . . . . .	26
Ohm's Law Calculator	
<b>Racon Electric Co.</b> . . . . .	2
Cone & Horn Speakers	
<b>Raytheon Production Corp.</b> . . . . .	15
Tubes at Soldier Field, Chicago	
<b>RCA Manufacturing Co., Inc.</b> . . . . .	3rd Cover
Radiola Receivers	
<b>Rider, John F.</b> . . . . .	27
Rider Books	
<b>Simpson Electric Co.</b> . . . . .	25
Tube & Set Testers	
<b>Supreme Instrument Corp.</b> . . . . .	22
Model 562 Audolyzer	
<b>Triplett Elec. Inst. Corp.</b> . . . . .	27
Model 1600-E Ultra Sensitive Tester	

## Contents

<b>Transients (Editorial)</b> . . . . .	3
<b>Go On Record With Sound Effects</b> . . . . .	5
<b>Indicators For Signal Tracers and Analyzers</b> . . . . .	6
By Harper Johnson	
<b>Set of the Month—</b> <b>Setchell Carlson Model 411 Dor-</b> <b>A-Fone</b> . . . . .	8
<b>Technical Service Portfolio: Section VI, Part I—Tubes and Circuits</b> . . . . .	9
<b>Servicing Contacts</b> . . . . .	13
By R. C. Ellis	
<b>Serviceman's Diary</b> . . . . .	14
By J. P. Hollister	
<b>Horace (Cartoon Strip)</b> . . . . .	14
<b>Circuit Court:</b>	
Compensated Feedback . . . . .	16
F-M Tricks . . . . .	16
F-M "Band Spread" . . . . .	16
<b>RCA Victor Record Changers RP-152, RP-153</b> . . . . .	17
<b>Shop Notes:</b>	
Emerson 8MT-574 Phono Motor Converter . . . . .	19
General Electric J501,-W, J502,-W Changes . . . . .	19
Philco 610—Distortion . . . . .	19
Philco Transitone PT45—Dead . . . . .	19
Philco 40-110—Pushbutton Failure . . . . .	19
Philco 40-124—Dead . . . . .	19
Philco Transitone PT25—Noisy . . . . .	19
Philco 41KR—Hum . . . . .	19
RCA Phono Motors . . . . .	18
Record Playing Sequences . . . . .	18
RCA Power Transformer Replacement . . . . .	19
Stromberg-Carlson No. 509 Servicing Data . . . . .	19
<b>New Products</b> . . . . .	20-21
<b>Unique Radio Hospital</b> . . . . .	23
<b>It Beats the Band</b> . . . . .	25
<b>News</b> . . . . .	27
<b>Appointments</b> . . . . .	27
<b>Literature</b> . . . . .	28

## Cover Photo



★ Servicemen, dealers and soundmen can profit by using, selling and renting sound-effects records. They're ear-catchers in p-a work, ideal for background effects in instantaneous recording, attractive to consumers who go in for home movies and model railroading. These records are available for use on standard record players. See page 5.

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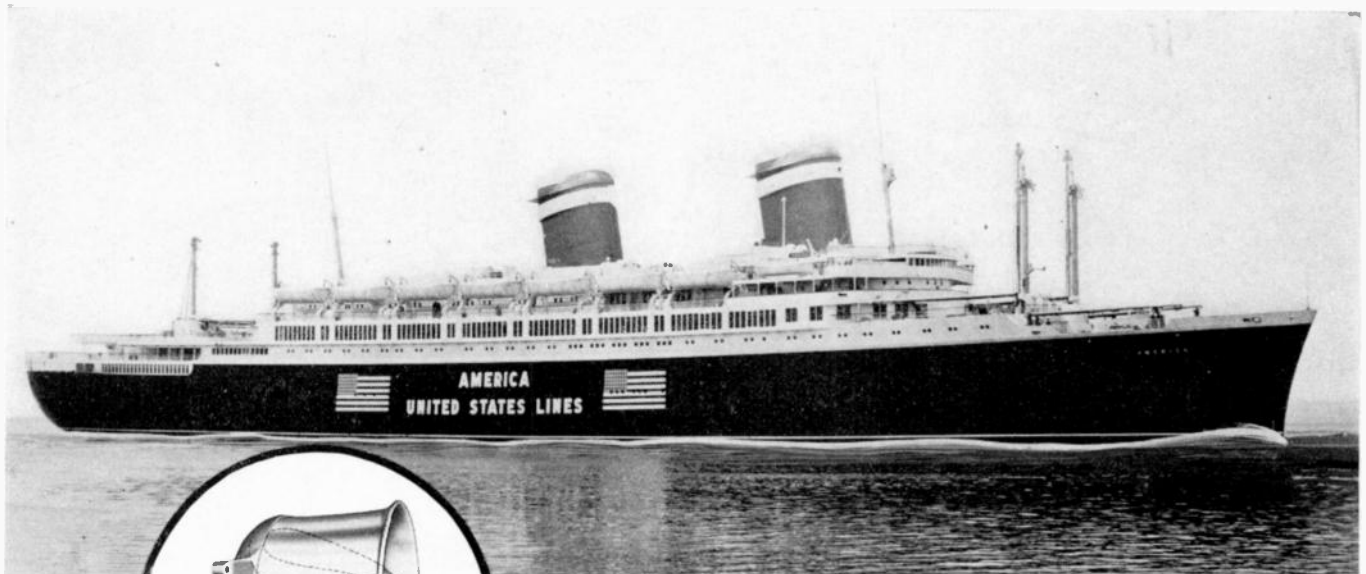
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**M. L. MUHLEMAN, EDITOR**

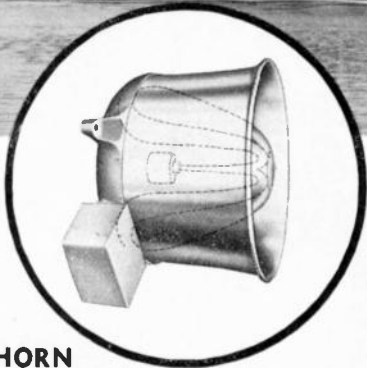
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VOL. 1 No. 7 ★ OCTOBER, 1940



Photograph  
Courtesy  
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### MARINE HORN UNIT SPEAKERS

Re-entrant type speakers using horn type units for marine and general P-A applications—may be used as loudspeaker or as a microphone. Miniature and regular sizes approved by the Bureau of Marine Inspection and Navigation, Department of Commerce, for marine work. In all sizes, miniature, midget, regular and bull, handling from 5 to 50 watts.

## Every Field Has One Leader In Reproducers It Is Racon

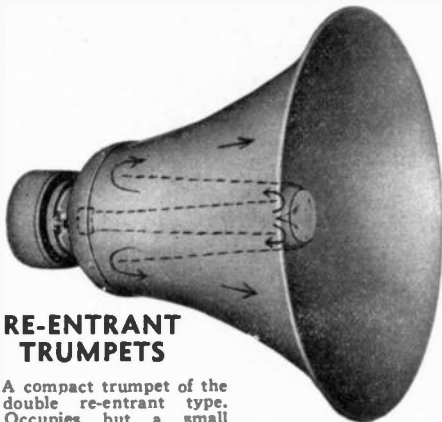
The AMERICA is the largest and finest liner ever built in the U.S.A. It is equipped with RACON Marine Speakers and driving units as are over 300 other fine ships. RACON Marine Speakers have been approved by the Bur. of Marine Inspection and Navigation, Dept. of Commerce.

Where human lives are at stake there can be no compromise with quality. Likewise, leading P-A and Soundmen do not jeopardize the life of their business. They specify and use RACONS, the finest, most efficient and dependable reproducers available . . . the leaders for 20 years. Send for complete catalog.

## RACON ELECTRIC CO.

52 East 19th Street

New York, N. Y.

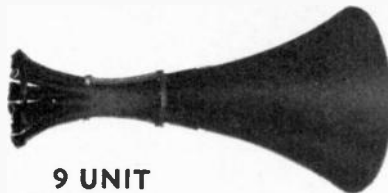


### RE-ENTRANT TRUMPETS

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

### Super Giant P. M. Horn Unit

Operating capacity 12-15 watts, peak 25 watts. Other P.M. units available, from "baby unit" of 5 watts to "bull unit" with an operating capacity of 50 watts. Efficiencies of the highest order obtainable with the finest magnetic material and steel utilized.



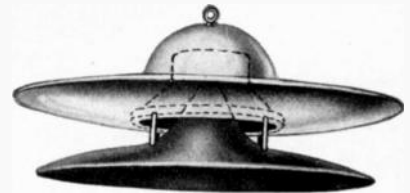
### 9 UNIT AEROPLANE HORN

A super powerful and efficient Public Address Horn for extreme long range projection. (3 mile ground projection capacity.) Made of patented RACON ACOUSTIC storm-proof material. Bell 30" dia., 54" long overall. 4 unit model also available.



### PAGING HORN

A small, extremely efficient 2-foot trumpet speaker, for use where highly concentrated sound is required to override high noise levels, such as in factories, outdoors, etc. Uses a small, very efficient Permanent Magnet unit. Particularly adaptable for paging systems, hotel lobbies, trucks, etc. Horn made of RACON ACOUSTIC storm-proof material with a beaded edge around the bell. Cast aluminum tone arm. Unit covered with aluminum case. Bell diameter 12"; overall length 29".

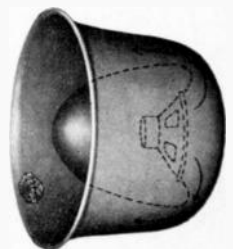


### RADIAL CONE SPEAKERS

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

### MARINE CONE SPEAKERS

Re-entrant type speakers of the marine type using cone type driving units for indoor and outdoor applications. Bell made of heavy aluminum, cone mounting made of aluminum casting, and center bullet of RACON ACOUSTIC material to prevent resonant effects. Material stormproofed for all weather conditions. Baby size for 2" or 3", miniature for 5", regular for 8" and giant for 12" speakers.



**RACON—The Oldest, Largest and Foremost Mfr. of Air Column Speakers in the World**

# Transients

**DEFENSE . . .** The time will soon come—as it had to come—for many of us to set aside the tools of our profession and turn to the more important job of preparing the nation's defenses. It is the only possible way of making the country secure.

It is for the Government to decide what part each of us shall take, but for all of us there will be some duty. Whatever it may be, we must do it well and with spirit.

Some of us will be called for military training; others will be asked to remain at their trades or professions. All of us will be important to the nation in our own way, probably in our own field. No one will be unimportant, for war or the security against war is no longer the sole responsibility of the military. Today, the home front shares the responsibility equally.

As a radio serviceman, the chances are that you will be called upon to exercise your specialized knowledge, if not fortify it, wherever the Government sees fit to place you (or leave you). There are not anywhere near a sufficient number of you to go around.

Communications plays a highly important part in all branches of the service. Thousands of men will be required to fabricate the equipment, other thousands to operate it, and as many more thousands to keep it in working order. Broadcasting is vital to the home front, and the millions of receivers throughout the country must be kept in repair. It is necessary, should an emergency arise, that the ears of the nation be on tap.

Because there are nowhere near enough of you to go around, more radio men must be trained. It will fall to the best of you to train them, and to train them rapidly and well.

There is no question but that the national defense program will influence the lives of all of us in one way or another. Some men will have their careers tem-



(Photo courtesy Allen Du Mont Laboratories)

**Radio in all its branches will play a vitally important part in the national defense program. Radio men are at a premium.**

porarily suspended; others will have them cut short; many will find new careers or return to old ones they gave up through necessity during the black years. From 1929 through 1939, men from all walks of life—engineers, clerks, factory workers, expert machinists, chauffeurs—turned to radio servicing for a livelihood. Others merely used radio servicing as a subsidiary means of earning extra cash. These were and are the part-time men.

Today the Government and Industry needs engineers, clerks, factory workers, expert machinists and chauffeurs, to name but a few. The part-time radio serviceman, always a fish out of water, now has before him a fresh opportunity in the field of his original choosing. There is no longer the need for him to scratch for his dollars. For the good of the radio servicing field, and for his own good, we hope that he does not permit the opportunity to slip through his fingers.

Needless to say, there are with us a large number of fellows who came to us from other fields and have come to stay. These are the men who did not look upon radio servicing as a carry-over, but a profession well suited to their

inherent abilities and a profession in which they found a real interest. They have become a part of the field just as the field has become a part of them.

The national defense program will directly influence the radio servicing field itself. There probably will be a distinct increase in the repair business, but whether this takes place or not, there will unquestionably be less competition from part-timers; hence the probability of profit in all phases of servicing work.

★

**COMMERCIALIZED F.M. . . .** Come the first of the year and the nation's frequency-modulation stations will drop their experimental call letters containing an "X" (which marks the spot of an unknown quantity) and take on commercial station designations. So announces the FCC. Thereafter, the f-m stations will be free to sell air space just like their contemporaries in the a-m band.

Mark this time as a turning point for f.m. Watch for f-m receiver sales campaigns and a growing interest in "staticless radio" in your community. And prepare for servicing and alignment work, to say nothing of special antenna installation jobs.

## TO THOSE CALLED TO SERVICE . . .

★ To those of our subscribers who are called or volunteer for duty in any of the military or naval services of the United States Government, and for this reason may wish to have their subscriptions temporarily suspended, we will be pleased to declare a moratorium.

Upon receipt of such a notification, we will discontinue the mailing of copies until the subscriber's return, at which time the subscription will be resumed and carried through to its expiration period.

To you who go—good luck!

S. R. Cowan, Publisher



*“One if by night and two if by day” saw Paul in the dawn upon his way—*

## DOES ADVERTISING PAY?

One would think from what we hear  
Our land was saved by Paul Revere.

That Paul himself upon his steed  
Awoke 'em all in the hour of need.

Not he alone, in seventy-five  
Galoped along on his midnite drive.

One road he took, upon his quest  
While others rode north, east and west.

But Paul was “sold” by the poet’s pen,  
*What were the names of the other men?*

Paul’s deed in type, is still alive,  
Though he rode way back in seventy-five.

The others, along with Sonny Jim,  
Are lost, their fame is faint and dim.

To all who read and who are wise:  
**“IT CERTAINLY PAYS TO ADVERTISE!”**

★ ————— ★

Every progressive radio service-dealer should advertise to potential customers in his locality, making his name and occupation known by using economical “flyers”, direct mail, 'phone and personal calls. Jobbers should do likewise—stimulating sales by GOING AFTER business instead of waiting for it to come in. Last but not least, manufacturers of radio replacement parts, sound and test equipment and accessories should keep the country's 20,000 leading service-dealers and jobbers (the readers of RADIO SERVICE-DEALER) acquainted with their new products . . . for consistent advertising pays!

**RADIO SERVICE-DEALER ★ ★ 11 West 42nd St., New York, N. Y.**

*The technical monthly having by far the largest circulation amongst the country's leading radio service dealers, sound men and parts jobbers.*

# GO ON RECORD WITH SOUND EFFECTS

**W**ILL stalwart Ethelbert arrive in time to save the ravishing Hortense from the foul clutches of J. Standing Sideburn? Nobody cares, but it's fun listening to the sound effects.

The plane engine is idling. In the distance one hears the approach of a car. The noise of its exhaust grows louder against the tick-tick of the plane engine. The car comes to a skidding stop with brakes screeching. There is a muffled scream (feminine) followed by a mumbled curse (masculine). The plane engine comes to life with a roar. There it goes down the field—slow, at first, then faster, the sound of its engine receding. It's going to take off!

No . . . wait a second. What's that other noise? A machine gun! Ethelbert is taking pot shots at the prop! He's going to shoot it right off the plane! Hell—Hortense is saved.

It can be done, and often is, with sound-effect records. Many of the platters are special stuff, but you can obtain 10-inch discs cut laterally at 78 r.p.m., for standard record players, from Victor, Columbia and Speedy-Q. With the right discs you can stage a personal war, with air-raid sirens, zooming planes, anti-aircraft guns and exploding bombs. Or you can put on an animal act, a horse race, a military parade, or most anything else you can think of, including (of all things) the sound of a person walking through mud!

So what? Well, if you're a serviceman, a dealer, a soundman or a recordist, there's money to be made with these sound-effect discs. Let's figure it out.

## FOR P-A WORK

If you're in the business of renting out p-a equipment and service, or of selling aural advertising through the medium of mobile sound installations, you're naturally interested in attention-compelling schemes that will catch and hold an audience. You've been doing it with popular music which is fine for interludes, but hardly an innovation. It carries no punch.

But suppose you were to work on the curiosity of your potential audience, using the element of surprise. Not by playing a sound-effect record that might cause panic by virtue of its subject matter, but, say, the song of the nightingale (Columbia YB-19), boos and hisses (Victor SE9), or something like the sailing of an ocean liner (Speedy-Q 7848B). Those

aren't sounds one expects to hear on a crowded thoroughfare or a residential street. You'll have them packing to find what in the name of heaven is up.

Once you get 'em, you can hold 'em with other sound effects thrown in between speeches or commercials, depending on what you're selling. Effects such as the departure of the Southern Pacific "Sunset Limited" (Speedy-Q 7822B), an orchestra tuning up, followed by applause from the audience (Victor SE33), or mowing a lawn (Columbia YB-26) which should bring a laugh.

## THE DEALER'S END

Dealers in discs have a real opportunity in selling sound-effect records to owners of home movie equipment with sound-reproducing attachments. The records can be used to provide ideal sound backgrounds that match the subject matter on the film—crying babies, barking dogs, cheering crowd, street traffic noises, aeroplane effects, as instances of records that are available.

Phonograph owners are suckers for sound-effect records having a relation to the owners' hobbies. Train records, for instance, will sell well to members of model railroad clubs.

## SOUND-EFFECTS SERVICE

The serviceman has a unique rental opportunity lying dormant in the ranks of his home-recordist clientele. There is

no end to the neat work a home-recordist can do through the use of sound-effect records for dubbing, background for the recording of short skits, etc. It's easily done with a separate record player which the serviceman can rent along with such sound-effect records as are required for the occasion. Most phonograph-records are so designed that two inputs can be fed through the amplifier to the cutter. If the only available input aside from the mike is via the radio, a wireless record player can be used.

For precise work where it is desired, say, to start, run, or stop an automobile at will, with split-second accuracy, one can use a single 78 r.p.m. turntable with two pickups and separate volume controls. By then fading from one pickup to the other on a single recorded side, any section of the disc can be made to immediately follow the section playing, or the section playing can be terminated abruptly at some desired point and another section simultaneously cut in.

## FOR RECORDING STUDIOS

The professional recordist, catering to the general public, will find sound-effect records a worthwhile addition to his equipment. He can use them in the same manner as the commercial photographer uses backdrops, special lighting effects, etc. Though to re-record such records in whole or part in any form for  
(Turn to page 26)



Two choo-choo train sound-effects records—a Victor and a Speedy-Q. The index card for the Speedy-Q record lists the cue points, playing time and the nature of the subject matter covered by each section of the recording.

# INDICATORS FOR SIGNAL

**T**HE various types of indicators used on the modern dynamic testers have aroused the serviceman's curiosity to the point where he is asking questions. Most of these questions are on the order of, why does one manufacturer use one type of indicator, such as the electron-ray tube, and another use a meter, a speaker or an oscillograph? Some of the commercial testers use several indicators of one particular type while another may use several types on a single instrument. For those servicemen who have delayed their purchase of this type of testing apparatus, the number of different types of indicators present a problem of selection and they often wonder if the manufacturer chose a particular type or combination for sales appeal or for some basic technical reason.

## PREFERRED INDICATORS

In order to find out the preferred types of indicators, we should review the fundamentals of dynamic testing. This method of testing a receiver is not a radically new system; it has won much favor only since it was made available to the serviceman by test equipment manufacturers in a convenient manner at reasonable cost. The modern form of dynamic testing was introduced as "Signal Tracing" which is the reverse of "Signal Injection." The signal tracer proved to be extremely effective in locating many defects which were very difficult to find with static testing instruments such as the volt, ohm or capacity meter and free point analysis systems. But the signal tracer fell short in making an efficient dynamic tester due to its inability to indicate the condition of the signal as well as the relative amplitude, and thus the dynamic analyzer was introduced to meet the requirements of the serviceman.

It is important to understand the difference between the *Dynamic Signal*

\* Service Engineer, Supreme Instruments Corp.

Indicator Type	Relative Cost	POSSIBLE TYPES OF INDICATION	
		Amplitude, Gain, Etc. (Quantity)	Hum, Distortion, Etc. (Quality)
Neon Glow Lamp	Inexpensive	Fair	None
Electron-Ray Tube	Inexpensive	Excellent*	None
Shadowgraph	Inexpensive	Excellent*	None
Speaker-Phones	Medium Priced	Fair†	Excellent
Meter	Medium Priced	Excellent	None
Oscillograph	High Cost	Excellent*	Excellent

\* Excellent when used as a reference level indicator in conjunction with an input control system such as an attenuator or multiplier.

† Fair yet not ideal as an amplitude indicator due to the inability of the human ear to differentiate between sound levels at high amplitudes. Instruments using a speaker as an indicator should also have one of the other type indicators listed above for this purpose.

*Tracer and the Dynamic Signal Analyzer.*

Any device whose indicators reveal the presence of a signal, the relative amplitude of the signal, and the frequency of the signal may be termed a dynamic signal tracer. However, for an instrument to be termed a dynamic signal analyzer it must not only incorporate facilities for indicating the function of the signal tracer but it must also contain an indicator which will determine the *quality* of the signal. In other words, the primary purpose of dynamic signal tracing is to determine the presence or absence of the signal at its proper points and indicate its relative amplitude and frequency. Dynamic analysis not only reveals to the operator the presence, amplitude, and frequency of a signal but it also reveals the *quality* of the signal.

In general all of the indicators used on commercial equipment fulfill the requirements as amplitude monitors. As to whether it should be an electron-ray tube (indicator type), speaker, phones, meter, shadowgraph, oscillograph or whatnot depends upon whether the unit is to be used only for signal tracing or if it is to include dynamic analysis. The accompanying table illustrates six popular types of indicators with respect to their cost and application in conjunction

with the dynamic analyzer.

After examining the merits of these indicators as presented in the table, we find that the neon glow lamp, the electron-ray tube (indicator type or tuning eye), the shadowgraph tuning indicator, the meter and the oscillograph have approximately the same characteristics as far as indicating the presence of the sig-



An "Audolyzer" which uses a meter and speaker as indicators.

nal. These indicators may also be used to measure the increase or decrease of the signal in terms of the relative amplitudes at consecutive points by means of a calibrated attenuator network. Of course, the meter may be calibrated directly in microvolts; however, such types of measurement are not essential to radio servicing in that its application as a reference-level indicator will obtain the desired results and make the testing procedure much faster.

This is illustrated in Fig. 1, which shows the indicators, the neon glow lamp, shadowgraph, meter and oscillograph, used to measure the gain of an amplifier as a level indicator. The dynamic tester is placed at the input of an amplifier and the attenuator is set to some point which can easily be relocated on the indicator.

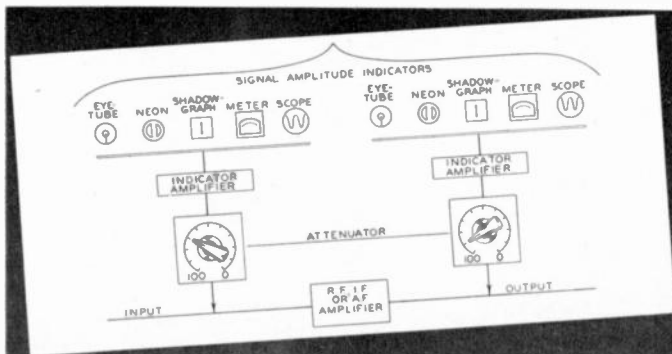


Fig. 1. The electron-ray tube, neon glow lamp, shadowgraph, meter and oscillograph as reference-level indicators for measurements in signal tracing and gain checks.



# TRACERS AND ANALYZERS

By HARPER JOHNSON\*

The measurement is then made at the output of the amplifier and if the amplifier shows a gain or loss, it will be necessary to adjust the attenuator to a position that will bring the indicator to its former reading. The gain or loss can be easily read as the ratio of the two settings of the attenuator control. Here we have used the indicators for locating the signal and its relative amplitude. To make this same measurement with a calibrated voltmeter would not result in a greater accuracy inasmuch as the needle deflection of the uncalibrated measuring device depends upon the amplifier which precedes the indicator.

From Fig. 1 it is seen that all the different types of indicators listed serve efficiently in dynamic signal tracers where *quality* is not considered. Let us now study the complete function of a dynamic signal analyzer and determine if any one of these indicators may be utilized to serve more than one purpose.

## DYNAMIC SIGNAL ANALYZERS

Practically all dynamic signal analyzers are equipped with a multimeter which can be used to investigate the static operating conditions such as voltage and resistance measurements. This voltmeter should be of such design that it can be used in high-impedance circuits for measuring avc and bias voltages. This meter may also be used by means of switching for monitoring outputs of respective channels or sections measuring relative amplitudes and gains. In some instances electron-ray tubes are used instead of the meter but offer no advantage from a standpoint of cost since the meter is necessarily incorporated as part of the tester for the other purposes just mentioned.

The cathode-ray tube is usually incorporated purely from a quality angle. However, amplitude indications can be made by using the cathode-ray tube. It cannot be injured by overload and has good frequency characteristics.

We mentioned previously that the speaker (or phones) is a very poor indicator of amplitude and could hardly be recommended as a reference-level indicator. The human ear has individual characteristics, thus making a reset almost pure guesswork. Sometimes we are able to distinguish between sound levels in aligning receivers by ear provided we keep the output of the signal at a very low value. Most servicemen prefer a

visual amplitude indicator such as the conventional output meter or cathode-ray oscillograph.

## INDICATORS OF SIGNAL QUALITY

The final discussion regarding these indicators is to classify them according to their ability to indicate the quality or condition of the signal under test. Re-



A "Vedolyzer" which uses a meter and oscillograph as indicators.

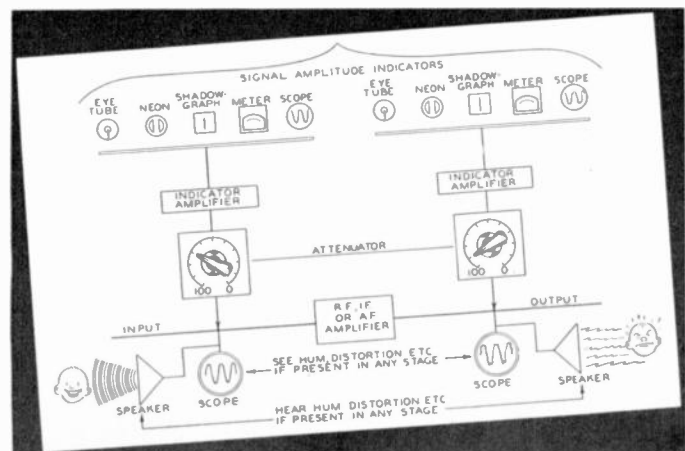
ferring to the extreme right hand column of the table, it is noted that the speaker, or phones, and the cathode-ray tube are the only types which perform the necessary functions of indicating quality. Fig. 2 illustrates the use of the indicators as amplitude monitors and also the speaker and oscillograph for checking the quality of the signal. In this case, we are able to track down hum or distortion and at the same time note the relative amplitude. Suppose that the receiver or amplifier has a distorted or muffled tone. Evidently something is happening to the signal between the antenna and speaker or input and output. It may be caused by excessive hum, or a faulty tube, however our amplitude test may show the gain normal. In order to locate the cause of this dis-

tortion, we must have an indicator such as the speaker or oscillograph. Some manufacturers list these items as auxiliary equipment while other manufacturers include them in the original design.

Considering the audio reproducer and the cathode-ray oscillograph from the standpoint of maintenance and initial cost, we find a high-grade speaker or earphones to cost approximately one-third that of the cathode-ray tube. A high-grade cathode-ray tube is guaranteed for at least 1000 hours of constant service and usually its life is considerably longer. The selection of the oscillograph or speaker should depend upon the previous experience of the operator and the initial investment which he desires to make. Of course, for those who are not familiar with the cathode-ray "scope" and do not feel that they have the time to learn about it, the speaker would be much more preferable. The audio reproducer will indicate the distortion, hum, extraneous noises and general condition of the signal, although it does not have the ability to classify the trouble as well as the oscillograph. Such factors as frequency of the hum, and type of distortion offer valuable information which aid in localizing the trouble. Furthermore, manufacturers' instructions on frequency-modulation and television alignment data specify the cathode-ray oscillograph system of visual alignment in making the adjustments.

Concluding, we find that it is necessary for an instrument to have an indicator which will determine the *quality* of a signal before it can be classified as a complete dynamic signal analyzer. Whether one selects a speaker or a cathode-ray tube will depend primarily upon the amount to be invested and the use to which it is to be put.

Fig. 2. Application of speaker and oscillograph for hum and distortion measurements in conjunction with signal amplitude indicators.



# Set of the Month—

## SETCHELL CARLSON "DOR-A-FONE"

**S**ETCHELL CARLSON, who have a capacity for turning out unusual radio receivers with wide adaptability, have rung the bell again with the "Radio Dor-A-Fone"—a combined Radio and Inter-Call System for the home, the office or the industrial plant.

Aside from its interest as a logical and practical merging of two personal services into a single, compact unit with a simplicity of design, it is a sales natural for dealers and servicemen who really get around. Its installation offers no complications, the only wiring necessary being that for the external "speaker-microphone."

The Radio Dor-A-Fone is nothing more elaborate than an ac-dc super-heterodyne receiver equipped with an additional pm speaker with 50 feet of cable, an additional "two-way" input transformer, and a three-position switch for "Radio", "Talk" and "Listen" connections.

With the switch in the "Radio" position, programs are available from the built-in speaker alone or, by closing a switch at the rear of the chassis, from the built-in speaker and the external speaker. With the main switch in the "Listen" position, the external speaker serves as a microphone and the built-in speaker as a speaker. With the switch

The Setchell Carlson Dor-A-Fone together with its external speaker-microphone. The control switch has three positions — Radio, Talk and Listen.



in the "Talk" position, the roles are reversed; the built-in speaker serving as a microphone.

### THE CIRCUIT

The simplicity of the arrangement is evidenced from the schematic diagram, shown on this page. The receiver employs a 12A8 mixer-oscillator, a 12K7 i-f amplifier, a 12SQ7 diode detector-avc and first audio amplifier, a 50L6 beam-power output tube, and a 35Z5 rectifier, with a resistance-capacity filter network.

The on-off switch *SW1* is coupled to the volume control. The switch *SW2*, which permits the external speaker to be used for program service, is located at the rear of the chassis. Switch *SW3*, the

main control, and operated from the front of the receiver, is of the three-gang triple-throw type. The output transformer *O-411* and the input transformer *D1* are switched by *SW3* to provide "Radio" or "Intercall" service.

With *SW3* in the upper or "Radio" position, with the arms on contacts *R*, the output transformer is connected to the built-in speaker and the triode grid of the 12SQ7 is connected to the arm of the volume control. With *SW3* in this position, the external speaker is out of circuit, unless switch *SW2* is closed, in which case the external speaker is connected in shunt with the built-in speaker.

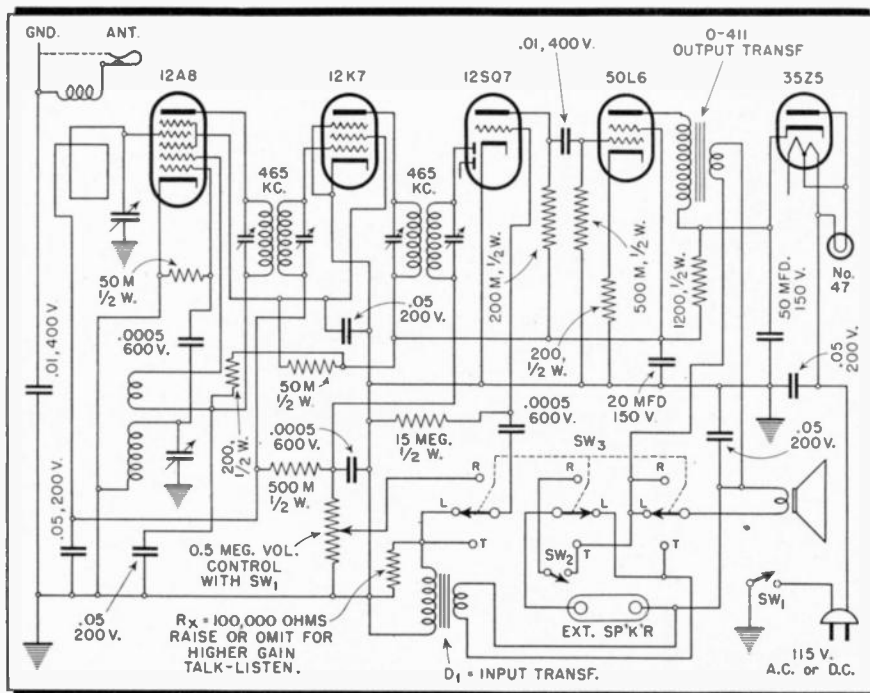
With *SW3* in the mid or "Listen" position, with the arms on contacts *L*, the built-in speaker remains connected across the output transformer, but the external speaker is connected to the input transformer *D1* by the middle section of the switch, and the secondary of the input transformer connected to the grid of the 12SQ7 by the left section of the switch. The external speaker may then be used as a microphone, using the 12SQ7 and the 50L6 as the audio amplifier.

With *SW3* in the lower or "Talk" position, with the arms on contacts *T*, the built-in speaker is connected to the primary of the input transformer *D1* and the external speaker connected to the secondary of the output transformer *O-411*, so that the roles are reversed; with the built-in speaker now functioning as the microphone and the external speaker as a speaker.

It will be noted that the external speaker connections are isolated and are free from ground except through an .05-mfd bypass condenser for r-f purposes.

The resistor *R<sub>X</sub>* in shunt with the secondary of the input transformer can be raised in value, or omitted altogether, if an increase in sensitivity or gain is

(Turn to page 22)



Schematic diagram of Setchell Carlson Model 411 Dor-A-Fone. Neat switching permits radio or intercom service.

# TECHNICAL SERVICE PORTFOLIO

## SECTION VI—PART I TUBES AND CIRCUITS

**A**MPLIFIER tubes do not amplify, detector tubes do not detect, nor do oscillator tubes oscillate; each of these actions results from the type of circuit with which the tube is associated. If the coupling circuit is unsuitable for the action desired, we may get a loss instead of a gain in a circuit which is designed to amplify. Oscillation may result when amplification is desired or audio rectification when we want detection. Because tube action is so intimately associated with circuits, it seems logical that both should be considered together.

### GAIN VALUES

In modern servicing procedure, the performance of tubes and their associated circuits may be directly measured. But the user of such modern equipment is frequently handicapped by a lack of knowledge as to how well a given stage should perform. In amplifying stages we need to have an idea as to how much the amplification should be before we can determine whether or not the stage is functioning normally. To this end we have published, in the first two sections of the Portfolio, data on the average gain-per-stage values to be expected with various tubes and circuits. These tables show a broad range of stage gain and do not cover all types of tubes. Often it is possible to calculate simply just what the gain should be in any given stage with any type of tube, once the circuit values and the tube characteristics are known. Further, by studying the formulae and noting the factors which influence tube performance, it is often possible to predict the cause of obscure troubles when the performance is below normal. And there are many occasions when it is desired to build amplifiers for special

purposes, to improve the performance of receivers which have become obsolete, where a knowledge of just what results may be expected from a given tube and circuit are essential.

Despite the fact that there are now some 600 types of tubes listed in various manuals, only a few dozen of these types are in general use. The remainder represent some tubes which have been superseded by more efficient types, some which differ from others merely because of size, base design or placement of element terminals, others which consist of two or more standard tube types within a single envelope. And, of course, the long list of tubes which are similar in characteristics but differ in heater voltage.

### GAIN FACTORS

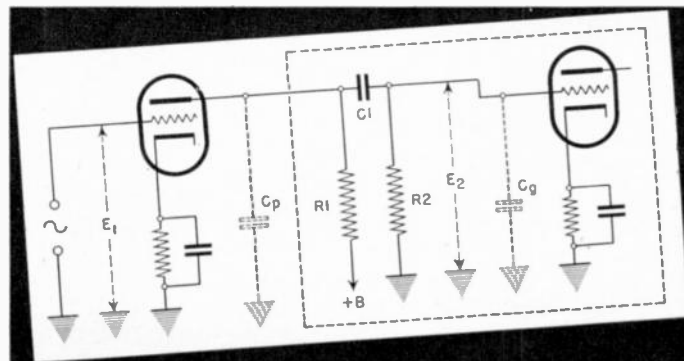
In amplifier tubes the principal characteristics in which we are interested are the amplification factor, the plate resistance and the mutual conductance. In fact, as we shall see, in many types of amplifiers employing pentodes, the mutual conductance is all we need to know about the tube in order to determine

what the gain should be. And since more pentodes are used than any other tube type, this makes the formulae even more valuable.

The formulae which we are going to discuss represent simplifications and we have intentionally left some of the hard parts out. This does not interfere with their usefulness; rather, as we shall see, the approximate results thus obtained are often extremely close to the results obtained from more complex formulae which involve laborious calculations. And when we remember that no two tubes are precisely alike in characteristics, even though they may be similar in type, made on the same machines and bearing identical ratings, some simplification in formulae is permissible. The same normal variations in the values of resistors, condensers and other receiver components also cause variations in gain in amplifying stages, so utmost accuracy need not be looked for no matter how the results are arrived at.

Tubes which are designed for use in amplifying stages comprise the largest number of listed types. These may be divided into two broad groups: voltage and power amplifier types. Fundamen-

**Fig. 1. Typical resistance-coupled amplifier circuit used as an example in calculating stage gain.**



tally these two classifications are the same, but power amplifier tubes are high-current types which are designed to provide large current variations in their associated load and therefore large power variations in the load. Voltage amplifier tubes may be considered as light-duty types, designed to produce large voltage variations in their associated load, which is usually much higher in impedance than the load used in conjunction with power amplifier tubes.

**RESISTANCE-COUPLED STAGES**

A typical voltage amplifier stage employing resistance coupling is shown in Fig. 1. This shows a triode type of tube, and the same circuit applies equally to all types of triodes, whether of the high-mu or low-mu type. The signal voltage  $E_1$  is applied to the control grid and the amplified output voltage  $E_2$  is delivered to the following tube grid.

For medium audio frequencies up to about 2000 or 3000 cycles, the influence of the tube capacities  $C_p$  and  $C_g$ , shown in dotted lines, may be neglected because the reactance of these small condensers is very high in comparison with the load. Our formula reads:

$$Gain = \mu \frac{R_L}{R_L + R_p}$$

In this formula

- $\mu$  is the amplification factor
- $R_L$  is the load resistance
- $R_p$  is the plate resistance

The amplification factor and plate resistance of the triode may be obtained by consulting any tube manual. The load resistance  $R_L$  represents every component which is connected to the plate circuit of the tube. Practically, we can assume the plate load to be represented by the portion of the stage shown in dotted lines. Note that this includes the grid leak and input circuit of the following tube. At low audio frequencies we do not have to take the tube capacities into account and we can assume also that the coupling condenser is sufficiently large in

capacity so that its reactance is negligible in comparison with  $R_2$ .

Let us calculate the gain of a typical tube and circuit. For the 6F5 high-mu triode, the rated amplification factor, according to the tube manual, is 100, the plate resistance 66,000 ohms and the recommended load resistors for the plate circuit and grid circuit are 250,000 ohms and 500,000 ohms respectively. With a plate-supply voltage of 250 and a cathode bias resistor of 3000 ohms, the rated gain is 60.

With this information, we are now able to apply the formula. The load resistance  $R_L$  is composed of  $R_1$  and  $R_2$  in parallel and since  $R_1$  becomes 250,000 ohms and  $R_2$  500,000 ohms, in parallel the resistance figures out as 166,000 ohms. Since the rated plate resistance is 66,000 ohms, the formula will work out as follows:

$$Gain = 100 \times \frac{166000}{166000 + 66000} = 100 \times 0.71 = 71$$

The actual gain obtained in practice is 60. The reason for the discrepancy between the calculated and measured values is because the characteristics as given in the tube manual are based on a plate voltage of 250. Since the voltage actually applied to the plate is less than that, due to the fact that the 250,000-ohm plate resistor is in series with the plate-supply voltage, the plate resistance of the tube under dynamic operating conditions is higher than 66,000 ohms. Also, when the cathode resistor is 3000 ohms, the grid bias is -1.3 volts instead of -2 volts. This tends to offset somewhat the change in the plate resistance of the tube due to the lowered effective plate voltage. The difference between the calculated value of 71 and the rated gain of 60 is not great so that, for all practical purposes, the formula is most useful. All we need remember is that the calculated gain under such conditions will be somewhat higher than the actual gain, for the reasons mentioned.

The type 75 tube has approximately

the same characteristics as the 6F5, and the rated gain is likewise 60. With the same values of plate and grid resistors, let us figure the gain of the circuit. The tube manual shows that the plate resistance of the 75 is 91,000 ohms instead of the 66,000 ohms shown for the type 6F5. With this change, then, the formula figures out as follows:

$$Gain = 100 \times \frac{166000}{166000 + 91000} = 100 \times 0.64 = 64$$

So we see that the calculated gain in this case is very close to the rated gain. In most receivers it will be found possible to use these tubes interchangeably, provided that the proper socket is used and, in some amplifiers, proper shielding around the type 75 glass bulb. Of course, the shield may be omitted if the 6F5 is substituted for the 75.

Computing the gain of pentode resistance-coupled audio amplifiers is complicated by the fact that both plate and screen voltages are altered by the use of high resistances. The result is that the tabulated characteristics do not correspond to the actual values obtained under dynamic operating conditions, so that the calculated values of gain differ widely from those calculated on the basis of such data. However, there are very extensive tabulations of approximate gain for various common pentodes with different values of voltage supply and coupling resistors and these are convenient for guidance.

**R-F AND I-F STAGE GAINS**

Recently resistance coupling has come into use in r-f and i-f stages of receivers. Since the values of plate load resistors used are very low in comparison with those in a-f circuits, the tube operates at voltages which closely approximate those given in tables of characteristics. Under such conditions, the gain can be computed with reasonable accuracy, depending upon the shunt capacity in the circuit.

Referring again to Fig. 1, you will note the capacities  $C_p$  and  $C_g$  in dotted lines. These we ignored in considering audio gain, but we cannot do so when we calculate the gain in an r-f or i-f circuit. These capacities shunt the plate and grid resistors and serve to bypass a portion of the signal current. If the total shunt capacity, consisting of  $C_p$ ,  $C_g$  and the wiring and stray capacity in the circuit amounts to 30 mmfd, (which is a reasonable figure) the reactance of the shunt capacity will be about 5000 ohms at 1000 kc and therefore, no matter how high the resistance in the plate circuit, the impedance of the load will always be

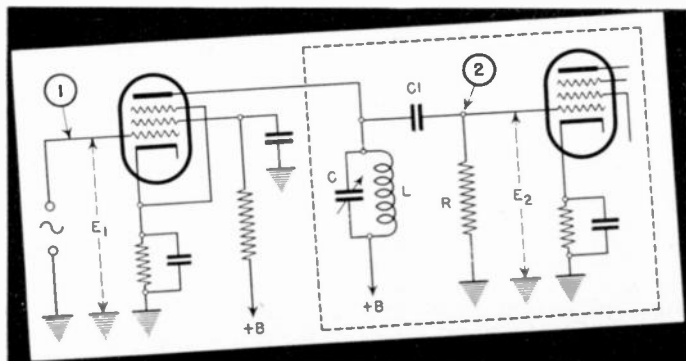


Fig. 2. It is more difficult to calculate the gain of an impedance-coupled stage, though it may be approximated by assuming values.

less than 5000 ohms at 1000 kc. Since the gain increases as the impedance of the load increases, it stands to reason that the gain of such resistance-coupled stages is bound to be low.

Assuming that a pentode instead of a triode is employed in the circuit of Fig. 1, the formula for gain is as follows:

$$\text{Gain (pentode)} = G_m \times Z_L$$

In this case  $Z_L$  is assumed to be the impedance which results when the plate resistance of the tube, the load resistances  $R1$  and  $R2$  and the shunt capacities are all connected in parallel. When the load resistances are relatively high compared with the reactance of the shunt capacity, we can simplify the calculations by considering only the reactance of the shunt capacity. If this is 5000 ohms at 1000 kc, and the mutual conductance of the tube used is 1650 micromhos, corresponding to that of the 6K7, the gain is:

$$\text{Gain} = G_m Z_L = 1650 \times \frac{1}{1,000,000} \times 5000 = 8.25$$

In the above solution, you will note that the fraction  $1/1,000,000$  is used. This is done because the mutual conductance is expressed in micromhos and in order to convert it to mhos we must divide by one million.

Thus the maximum gain in such a stage at 1000 kc would be less than 8.25 since the shunt resistances will reduce the value below that figured. At frequencies higher than 1000 kc, the gain will be proportionately less because the reactance of the shunt capacities will be lower. At lower frequencies the gain will increase somewhat because the shunt reactance will be higher. Note that the gain is very low in comparison with that obtained in audio stages.

In i-f stages the method of computing the gain is the same as that just described. At 465 kc the shunt reactance will be about twice as great as at 1000 kc so the gain will be nearly twice that at 1000 kc.

Of particular importance in such amplifiers is the lead dress. If connecting leads are disarranged, made too long or too close to the chassis, the shunt capacity will be increased and the gain will decrease.

To obtain more uniform amplification over the frequency range, some manufacturers use a value of plate load resistor which is low in comparison with the reactance of the shunt capacity in the circuit. For instance, in the RCA Model V-205, the plate load resistor is 1500 ohms. Since this value is relatively low in comparison with an estimated reactance at 1000 kc of 5000 ohms, we

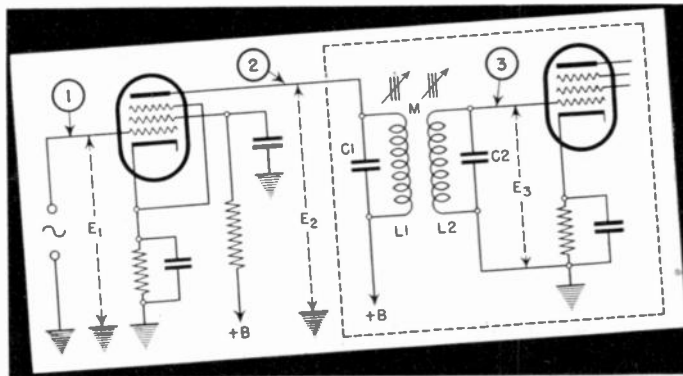


Fig. 3. Typical i-f stage, with high-gain transformer. Certain values may be assumed and the gain approximated.

may calculate the approximate gain by merely considering the resistance load, just as in an a-f amplifier. We need not consider the grid resistor nor the plate resistance of the tube since both of these are far higher in resistance than 1500 ohms. With these simplifications, taking the mutual conductance of the 6SK7 as 2000 micromhos, the gain figures as

$$\text{Gain} = G_m Z_L = 2000 \times \frac{1}{1,000,000} \times 1500 = 3.0$$

The average measured gain has been found in practice to be 3.0 at 600 kc, so we see that even with these simplifications we have calculated the actual gain.

Note that these gains are figured on the assumption that the avc is not working. Operation of avc will always reduce the gain because the increased negative control-grid bias reduces the mutual conductance of the tube. This should always be taken into account when measured values vary widely from expected gain.

#### IMPEDANCE COUPLING

While the same formula for gain in resistance-coupled pentodes also applies to impedance-coupled circuits, such as that shown in Fig. 2, we are faced with the fact that we don't know what the impedance is. To obtain the impedance, we have to know the inductance of the coil  $L$ , the capacity of  $C$  and the r-f resistance of the coil. The latter is the hardest to determine. In practice, these factors regarding the coil and circuit are expressed in terms of the coil  $Q$  which is determined by the formula

$$Q = \frac{6.28 f L}{R}$$

where  $R$  is the coil r-f resistance,  $f$  is the frequency for which the  $Q$  is desired.

The average  $Q$  of coils used in the broadcast band of radio receivers ranges from about 50 to 100 and the inductance about 300 microhenries. Expressing the

formula for gain in terms of  $Q$ , and for an impedance-coupled circuit, it becomes

$$\text{Gain} = G_m 6.28 f L Q$$

At a frequency of 1000 kc, assuming a  $Q$  of 50 and an inductance  $L$  of 300 microhenries, the gain figures as follows, using a 6K7 or other pentode with a  $G_m$  of 1650:

$$\text{Gain} = \frac{1650}{1,000,000} \times 6.28 \times 1,000,000 \times \frac{300}{1,000,000} \times 50 = 15.7 \text{ (approx.)}$$

Which is about the average gain realized in practice. Note that the factors which are likely to change during service are the  $Q$  of the coil (due to moisture absorption or other effects of this nature), the mutual conductance of the tube, because of changes in applied voltages due to changes in resistance of resistors in the screen or cathode circuits, and other changes which affect the tube voltages, in addition to losses in the condenser caused by corrosion (which will affect the circuit  $Q$ ). Bad ground connections in tuning condensers connecting to ground will likewise affect the gain by changing the circuit  $Q$ .

#### HIGH-GAIN I-F STAGES

The circuit of Fig. 3 represents that of a typical high-gain i-f stage in a modern receiver. The i.f. employed is 450 kc. Here we have a coupled circuit which is ordinarily extremely complex to calculate. By making a few general assumptions, such as we have in the preceding formulae, we can obtain a simple method of computing the gain of such a stage.

First, let us assume that the signal voltage  $E3$  developed across the secondary is the same as  $E2$  across the primary. This is the case in most interstage i-f stages except when feeding a diode detector, which usually loads the secondary circuit to the extent that the voltage is reduced to about one-half that of the primary circuit. By assuming the mutual

inductance between the coils  $L1$  and  $L2$  to be 0.3 millihenry, the shunt capacity across each coil to be 120 mmfd (this doesn't enter into the calculations but serves to identify the type of transformer to which these figures apply) and a  $Q$  of 100, which is easily obtained in modern i-f transformers, the gain for any type of pentode may be obtained from the formula

$$\text{Gain} = G_m 6.28 f M Q$$

in which  $M$  represents the mutual inductance of the coils  $L1$  and  $L2$ .

The 6SK7, or any other tube with a mutual conductance of 2000, serves to represent good commercial practice for application in such a circuit. Using this value of mutual conductance as a basis, and the other values specified above, the gain figures as follows when the i.f. is 450 kc:

$$\text{Gain} = \frac{2000}{1,000,000} \times 6.28 \times 450,000 \times \frac{0.3}{1000} \times 100 = 170$$

The average measured gain in just such a circuit as has been described has been found to be 150. Some of the assumptions applying to this circuit will be modified in the case of over-coupled i-f transformers, or when two or more i-f stages are employed, because the gain in the latter case is purposely made low to avoid oscillation and to obtain better band-pass action. But in single-stage i-f circuits employing high-gain i-f transformers, particularly of the iron-core type, the assumptions made will serve to provide a useful approximation of stage gain.

**POWER AMPLIFIERS**

Now let's consider the power amplifier. Usually this is confined to the output stage, except for the few receivers which employ drivers for Class B output stages. The method of calculating gain is somewhat simplified in output stages by the fact that we may consider

the output transformer, when connected to its voice coil load, as a resistive load.

Before we go into the calculation of gain in such stages, let us get clear the reason why a transformer used in an output stage may be considered to have the properties of a resistance, in that the impedance of the load remains substantially constant over the audio frequency range. Actually it does vary somewhat, but for all practical purposes it may be considered constant, particularly at the lower frequencies.

Let us refer to Fig. 4, which represents a typical power amplifier stage employing a pentode tube. The output transformer secondary is connected to the speaker voice coil, which forms a load on the secondary which remains essentially constant throughout the lower audio-frequency range. This is because the voice-coil impedance is largely resistive and therefore its impedance varies little with frequency.

Since the voice coil load changes little with frequency, the impedance of the output circuit which it shunts cannot rise as would normally be expected when the frequency increases. Since the secondary of the output transformer is closely coupled to the primary, it maintains a constant load on the primary which accomplishes the same result of limiting the increase in impedance which normally results when the signal frequency applied to an inductive circuit is raised. Thus, when the load is specified as 10,000 ohms, and an output transformer designed to supply this value of load is employed, it is understood that this only applies when the transformer is connected to a voice-coil load of the proper rating, or to an equivalent resistance substituted for the voice coil.

The choice of the output transformer to match a given tube is based on the maximum undistorted power, not just on maximum power output. If we wanted to get the maximum power output from a pentode power amplifier tube, regardless of distortion, the load would have to be very much higher than that customarily used in practice. For instance, for

the 6F6 tube, used in a single-ended output stage, the recommended load resistance is 7000 ohms and the plate resistance of the tube is more than 10 times as great, 75,000 ohms. Yet, for maximum power output the load resistance would have to equal the plate resistance, 75,000 ohms. By using a low value of load resistance, some sacrifice in output power is made, but the distortion is greatly reduced.

For triodes, maximum undistorted power is obtained when the load resistance is about twice the plate resistance of the tube. A simple and convenient way to figure the approximate required load for maximum undistorted power in triode circuits is simply to take two-thirds of the amplification factor and multiply by 1000, for Class A operation. This value is modified slightly when Class A1 operation is used, but may readily be obtained from tube manuals.

Assuming that the tube and output transformer are properly loaded, we may calculate the gain for a pentode stage by means of the following formula, which you will note is similar to that employed for impedance-coupled pentode stages:

$$\text{Gain} = G_m Z_L$$

in which  $Z_L$  is the impedance of the load.

For a 6F6 single-ended output stage, when the tube is operated at 250 volts on the plate and screen and -16.5 volts grid bias, the mutual conductance is 2500 micromhos. The recommended load is 7000 ohms. The gain then figures as:

$$\text{Gain} = \frac{2500}{1,000,000} \times 7000 = 17.5$$

which represents the average measured gain obtained in practice.

Note that this is the voltage gain from grid to plate, as represented by the ratio of  $E2$  to  $E1$  in Fig. 4. Of course, there is a step-down in voltage from the primary circuit to the secondary which is equal to the turns ratio or to the square root of the impedance ratio of the primary to the secondary when loaded. If the primary is 7000 ohms and the 10-ohm secondary is connected to a 10-ohm voice coil, (as an example) the impedance ratio is 700 to 1 and the voltage step-down is the square root of this; about 26 to 1. Therefore the voltage  $E3$  will be but 1/26 that of  $E2$  across the primary. In practice the actual voltage will be still less, since there are losses in the transformer which reduce the power transfer from primary to secondary.

Triode power amplifier stage output may be calculated in the same way as for a resistance coupled stage, using the formula applying to Fig. 1.

(To be continued)

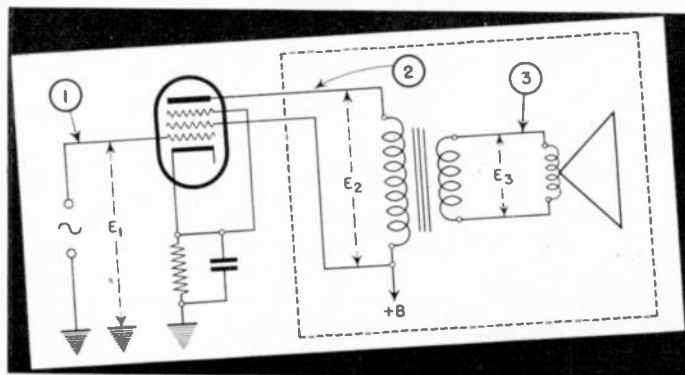


Fig. 4. Typical pentode power output stage. The gain is easily calculated by means of a simple formula.

# SERVICING CONTACTS

**New Liquid Cleaners and Lubricants Make the Job Easy**

OUR radio is noisy all the time—it stops playing—there must be a loose connection."

How often the serviceman hears these words. The customer does not realize that he is really pointing out one of the serviceman's most common and often most difficult jobs—poor contacts. Customers do not understand the difficulties encountered, and therefore do not always feel justified in the service bills they receive for such repairs.

## CHEMICAL AIDS

Often these troubles are much easier to locate than they are to service, and here is where chemicals come to the aid of the serviceman. Chemical compounds are now available that will both clean and eliminate future corrosion on contacts and switches. The new type compounds are greatly improved over previous types and do not contain any graphite which can change the electrical characteristics of the parts to which it is applied.

In some of the newer sets the most common causes of noise are the push-button tuner switch, the volume control, tone control, all-wave switch, and tube sockets. These can often be treated in a very short time by the use of the above mentioned type of chemical compound.

In the push-button tuners poor circuit contacts can often be determined by the operation of the various buttons. The same holds true for waveband and phono-radio-recorder switches. These

\* General Cement Mfg. Co.



A contact and attenuator service kit, for cleaning noisy volume controls, push-button and waveband switches, etc.

By R. G. ELLIS\*

switches are often much easier to discuss—and cuss—than to service. To cut production costs the parts of a push-button switch are often riveted together and almost impossible to take apart for cleaning. Even when the units can be dismantled, there are so many connections to be removed that the serviceman is discouraged before he starts. With the mentioned compounds, all of this work is made unnecessary.

## APPLICATION

All that one has to do is to apply a very small quantity of the chemical to the contacts and push the switch buttons several times and the job is done—except, of course, in cases where the contacts are out of shape or have lost their temper. In the application of this chemical it should be used sparingly.

Pipe cleaners, tooth picks, and even fine wire are especially desirable as the applicators when treating push-button tuners, or, in fact, most all contacts. They should be thrown away, or thoroughly cleaned after each job, so that they will not accumulate dust or dirt which would be thoughtlessly applied to the next set of contacts serviced, and to prevent contaminating the compound and eventually minimizing its effectiveness.

A case was brought to the attention of the writer in which a serviceman was called upon to service a noisy push-button tuner in an auto radio. The customer naturally was impatient to have the repair made as soon as possible so that he could be on his way. The serviceman realized what his trouble was and visualized quite a job. He promised the set for his customer within an hour and a half and then wondered how in the world he was going to do it in that time. Shortly after receiving the okay for the job, the salesman from his radio parts jobber called on him and suggested the use of the chemical compound for the job. The serviceman was glad to try anything that would eliminate the necessity for unsoldering numerous connections crowded into a small space. Merely by the application of the chemical compound the service job was completed in less than 15 minutes. For a cost of around a few cents the serviceman had saved himself more than an hour of estimated time (and possibly more) and had enough of the compound left to take care of many future jobs.

## TREATING VOLUME CONTROLS

Volume controls are very often a source of noise and signal cut-off. While most of the new sets use carbon type resistor strips, there are many wire-wound types in use. One of the chief sources of trouble in these types is the accumulation of dust, dirt and grease between the two contacts and the result is a very noisy or intermittent-acting volume control.



A complete kit containing service cement, scratch polish, dial oil, dial drive cement, contact cleaner, etc.

When it is possible to take the control apart a more satisfactory repair can be made because it is often difficult to apply any compound to the contacts, especially if they are concealed. If there is a heavy accumulation of dirt or grease at the contacts, these should be cleaned thoroughly with a special liquid contact cleaner which easily removes the heavy residue and then an application of the chemical compound mentioned before should be made to the contacts and to the inside of the bearing through which the shaft passes. The tension of spring contacts should be tested and the tension increased if necessary. If the control is a wire-wound type, the resistance element should also be cleaned and the compound applied before the control is assembled.

In cases where a satisfactory repair can be made in this manner, the serviceman is saving his customer money and can obtain greater remuneration for his actual services because he has not had to figure in the cost of a new control.

Tone-control switches, tube socket contacts and circuit switches of all types can be easily repaired in the above mentioned manner.

(Turn to page 22)

# Serviceman's Diary

By J. P. HOLLISTER

SATURDAY—I had just grabbed the three calls off the hook to knock them over early before the afternoon rush when the old tinkle-box rang. I picked up the phone, hoping it might be another call in the same location as the others. No such luck—it was Doc G.

"Listen," he said, "I'm in trouble again. And I want you to help me."

"Sure," I told him. "What's wrong now?" The Doc's a swell guy; but awfully nervous.

"Cats," he moaned. "Big ones. Cats with eyes like headlights on a subway train. They get in the cellar and yowl. For three nights we haven't slept!"

"Think no more of it, Doctor," I assured him. "If there is anyone who understands cats better than Jerry, I haven't heard of him. Jerry got you the big alley-cat you wanted to mop up the rats in the cellar. Now he'll tell you how to get rid of the cats. . . . Take it away, Jerry!"

Jerry needed no invitation—he would have grabbed the phone out of my hand anyway—whenever he hears his name mentioned, he's all ears. And he was getting madder and madder while I was talking. He asked the Doc to hold the wire, then he covered up the mouthpiece and turned to me.

"Listen, smart guy, I know what you're trying to hand me, and don't think you're going to get away with it. You were in on the cat business at the start; you're going to be in it at the finish, too!" Then he started talking to the Doc.

I suppose he was right, when you get it straight. But I hadn't known that the cellar of the old Colonial house which the Doc bought was infested with rats. So when I sold him the record-changer and amplifier and installed them in the

closet under the stairway, it seemed simpler to run a twisted pair transmission line through a hole in the floor and across the cellar to get to the loudspeaker which we built into the wall at the far end of the room. When the rats chewed off the insulation and shorted the line, Jerry got the idea of picking up the alley-cat and sealing the cellar door so the cat had to go to work or starve. It didn't starve.

But that was only one cat. Where he got the others, I wouldn't know. Maybe it was the wrong kind of cat—I didn't investigate. Maybe it just passed the good word around to its friends in the neighborhood.

Jerry didn't look so sore when he hung up the phone. In fact, he seemed kind of tickled.

"Mister," he announced. "We're going on a shooting party tonight."

So that was it! He never misses a chance for target practice since he got his pistol permit. But I didn't like the idea of shooting tame cats, and told him so.

"But these aren't tame ones . . . they're wild! The Doc shoved a bulldog down the stairs last night to get the cats out and the last they saw of the dog it was running down the road with its tail digging a ditch along the street! And they only show up at night . . ." Now Jerry wanted the job.

After dinner Jerry went home and got his Colt .45 and a box of cartridges. He wanted to load the automatic before we got in the car, but it makes me nervous to hang around a loaded gun. I always think it might drop out of the holster and go off. So he agreed to wait until we got to the Doc's house before loading up.

The Doc lives in a rather deserted

neighborhood. There aren't any street lights and no other houses for nearly half a mile. I wondered where all the cats he talked about could come from. It sure was quiet when we pulled up in front of the house.

He was wearing a dressing gown when he let us in. He held a finger to his lips.

"Don't make any noise," he whispered. "The biggest one is in the cellar now." He turned to Jerry. "Are you sure you can shoot straight?"

"Don't worry about that, Doctor," Jerry answered confidently. "The last time I was at the pistol range, I put nine out of ten in the bull's eye."

"Some bull," I murmured softly to Jerry. He gave me a hard look, but didn't answer. Instead he pulled out the gun and loaded it. Both the Doc and I watched him, a little nervously.

Doc tiptoed over to the cellar door and opened it slightly.

"Down there!" he whispered excitedly. "See those great green eyes gleaming?"

We crowded close. He was right. And they looked as big as saucers. Jerry lifted the gun and aimed.

"Shoot between the eyes," I whispered breathlessly—and waited.

I must have jumped when the gun went off. It sounded ten times as loud as it did in the open air.

We opened the door wider and looked down. The green eyes were still gleaming. They looked even brighter—and mad.

"It's still there!" I yelled. I couldn't help it.

"You're telling me!" Jerry muttered. And he aimed again.

It didn't seem so loud this time when it went off. We gathered together at the door to see the results, as soon as the

(Turn to page 25)

## HORACE—





# A REAL JOB FOR TUBES!

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## NO WONDER

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runs out of customers. The solid businessman gets bigger and bigger.

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# Circuit Court

## COMPENSATED FEEDBACK

WELL, JUST ONCE MORE—then maybe we'll lay off inverse feedback for a while (until something else comes along and catches our fancy).

This time it's a degenerative phono circuit, used in the new *Emerson DV-364* Radio-Phono-Recorder. The portion of the circuit involved is shown in Fig. 1.

Looking at the output transformer *T*, note first that the secondary is tapped, the impedance of the entire winding matching the cutter; the tapped portion matching the impedance of the speaker voice coil.

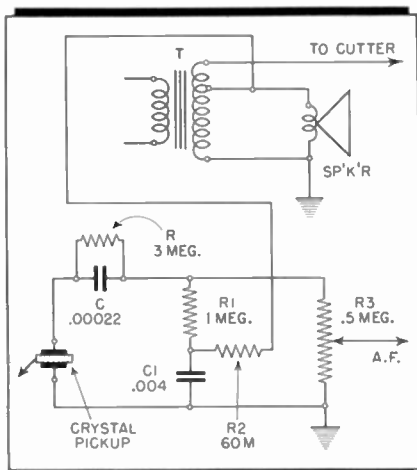


Fig. 1. Compensated feedback phono circuit.

Feedback voltage is taken from the tap and introduced into the crystal pickup circuit. Hence, the pickup voltage and the out-of-phase feedback voltage appear across the volume control *R3*.

The resistor *R* and the condenser *C* form an equalizer, used for the purpose of flattening the pickup response curve. The resistor *R1* and the condenser *C1* form a load across the pickup. The resistor *R2*, and again condenser *C1*, form a voltage divider across the voice coil of the speaker.

The feedback voltage developed across the volume control *R3* at any given frequency is dependent upon the reactance of condenser *C1*. For instance, this condenser, which has a value of .004 mfd, has a reactance of approximately 1 meg at 40 cycles, 100,000 ohms at 400 cycles, and 8500 ohms at 5000 cycles. Therefore the feedback voltage across the volume control will be greater at the lower frequencies (where the reactance of *C1* is high) and much less at the higher frequencies. Conversely, the audio gain, due to the degenerative effect, will be considerably less at low frequencies, greater

at the higher frequencies.

This appears to be rather a ridiculous arrangement, since the low frequencies are attenuated on records, and the high frequencies are emphasized. But the purpose of the circuit is not to alter the recorded frequency response, but to attenuate motor rumble mechanically transmitted to the pickup. This rumble usually occurs at a frequency below the lowest recorded frequency, and the values for *R2* and *C1* are selected to provide attenuation in this region.

## F-M TRICKS

STROMBERG-CARLSON HAS some interesting innovations in their new Frequency Modulation Receiver and Converter No. 505. Of particular interest are changes in the r-f section, shown in Fig. 2.

Note first that a bandpass filter is employed in the antenna circuit. By the use of close coupling between *L1* and *L2* and the load resistor *R30* across the grid coil *L25*, the gain is made substantially uniform from 42 to 48.5 megacycles. No gang tuning condenser is employed. The gang condenser is a two-section unit, *C1* tuning the modulator circuit and *C2* tuning the oscillator circuit.

Capacitive coupling is used between the primary and secondary of the modulator r-f transformer, providing a wide pass-band without the necessity of employing resistive loading. A larger voltage build-up at the grid of the modulator tube is obtained by using a secondary coil having a greater number of turns and reducing the effective capacity of the gang condenser *C1* by means of the series capacity *C49*.

The oscillator, it will be observed, is electron coupled for frequency stability.

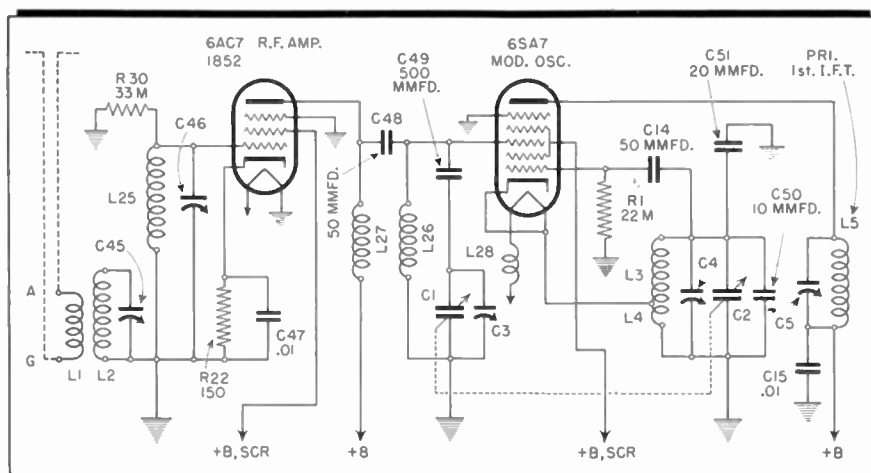


Fig. 2. The r-f section of Stromberg 505. Note that antenna circuit is not gang-tuned.

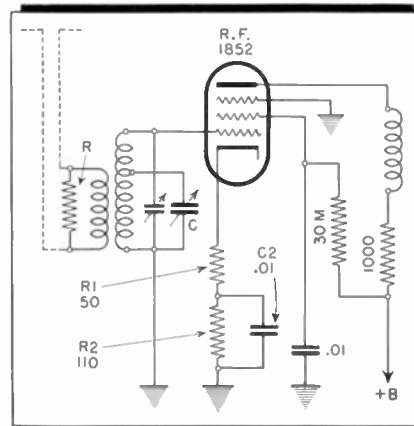


Fig. 3. Meissner degenerative r-f amplifier.

The portion *L4* of the oscillator coil *L3-L4* functions as the tickler, and is in series with the cathode of the 6SA7 tube. Since the cathode operates above r-f ground potential, and by virtue of the fact that the heater is grounded through the same circuit, an r-f choke, *L28* is placed in series with the high side of the heater so as to isolate the cathode which would otherwise be grounded through the heater. The heater itself is isolated in the same manner as the cathode so as to make the heater-cathode capacity ineffective.

## F-M "BAND SPREAD"

WELL, IT REALLY isn't band spread in the true sense of the word, but *Meissner* uses the electrical band spread system long associated with Ham receivers, in their *Model 9-1021* Frequency Modulation Receptor, but for a different reason.

It will be seen in Fig. 3 that the (Turn to page 22)

# RCA VICTOR RECORD CHANGERS

## Service Data On Types RP-152, -A, -B, -C, -D, -J and RP-153

**T**HE RP-152 and RP-153 automatic record changers are very similar in design and construction. Most of the parts and adjustments are identical on both. The RP-153 turntable is driven through a worm gear in the motor housing while the RP-152 turntables are driven through a friction drive disc mounted under the turntable.

On Models RP-152 it is important that the drive motor spindle, and rubber tires on main driving disc and idler pulley be kept clean and free from oil, grease, dirt, or any foreign matter at all times. Any quick-drying naphtha is satisfactory for cleaning these parts. The drive motor bearing is lubricated from an oil well filled and sealed at the factory. It should not require lubrication in the field.

The rubber-tired drive disc on Models RP-152 is not removable from the spindle. The turntable is fastened to the driving disc by three bolts. If necessary to remove these parts the spindle drive gear set screw should first be removed. The driving disc, turntable and spindle assembly can now be lifted upward from the motorboard. If this is done, great care should be taken not to bend the spindle.

To remove the turntable and spindle on the RP-153 type it is necessary to first remove the tapered pin in the turntable drive arm assembly. The turntable and spindle can then be drawn up through the motorboard bearing.

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pushing the index lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

When a record has been played the pickup moves out, another record is dropped down, and the needle is fed automatically into the starting groove of this record. If the needle fails to enter the starting groove, raise the right-hand side of the cabinet by inserting thin spacers under the feet on that side. If the needle slides over a few grooves, raise the left-hand side of the cabinet in a similar manner.

The 10- and 12-inch records must be absolutely flat for smooth operation.

A pickup shorting switch, located under the motorboard, operates when the pickup is moved outward to the pickup rest.

### SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual misadjustments will enable ready adjustment in most cases. (See Fig. 1.)

1. For any irregularity of operation, the adjustment of the main lever 15 should be checked first as in A.

2. Needle does not land properly on both

10- and 12-inch records—Make complete adjustments D and E.

3. Needle does not land properly on 12-inch record but correct on 10-inch—Effect adjustment E.

4. Failure to trip at end of record—Increase clutch 5 friction by means of screw B. Also, see that levers 7 and 12 are free to move without touching each other.

5. Pickup strikes lower record of stack or drags across top record on turntable—Adjust lift cable per adjustment C.

6. Needle does not track after landing—Friction clutch 5 adjustment B may be too tight; bind in tone arm vertical bearing; levers 7 and 12 fouled; or pickup output cable twisted.

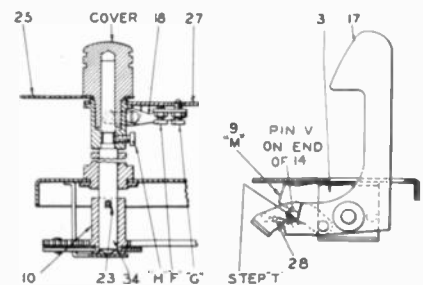


Fig. 2. Details of record-separating knife and holder, and adjustment positions.

7. Cycle commences before record is complete—Record is defective, or adjustment B of friction clutch 5 is too tight.

8. Wow in record reproduction—Record is defective; or instrument is not being operated at normal room temperature; oil, grease, dirt, or other foreign matter on motor spindle, main driving disc or idler pulley rubber tire. Clean with any quick drying naphtha.

9. Record knives strike edge of records—Records warped; record edges are rough; or knife adjustments F and G are incorrect.

10. Record not released properly—Adjust record shelf assemblies in respect to shaft by means of adjustment H.

11. When playing both types of records mixed and needle either lands in 10-inch position on 12-inch record or misses record entirely—Increase tension of mixed record discriminating lever spring M.

### ADJUSTMENTS

**A. Main Lever.**—This lever is basically important in that it interlinks the various individual mechanisms which control needle landing, tripping, record separation, etc. Rotate the turntable until the changer is out-of-cycle; and check rubber bumper bracket A. The roller should clear the nose of the cam plate by approximately 1/16 inch.

**B. Friction Clutch.**—The motion of the tone arm toward the center of the record is transmitted to the trip pawl 22 by the trip lever 7 through a friction clutch 5. If the motion of the pickup is abruptly accelerated or becomes irregular due to swinging in the eccentric groove, the trip finger 7 moves the trip pawl 22 into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction

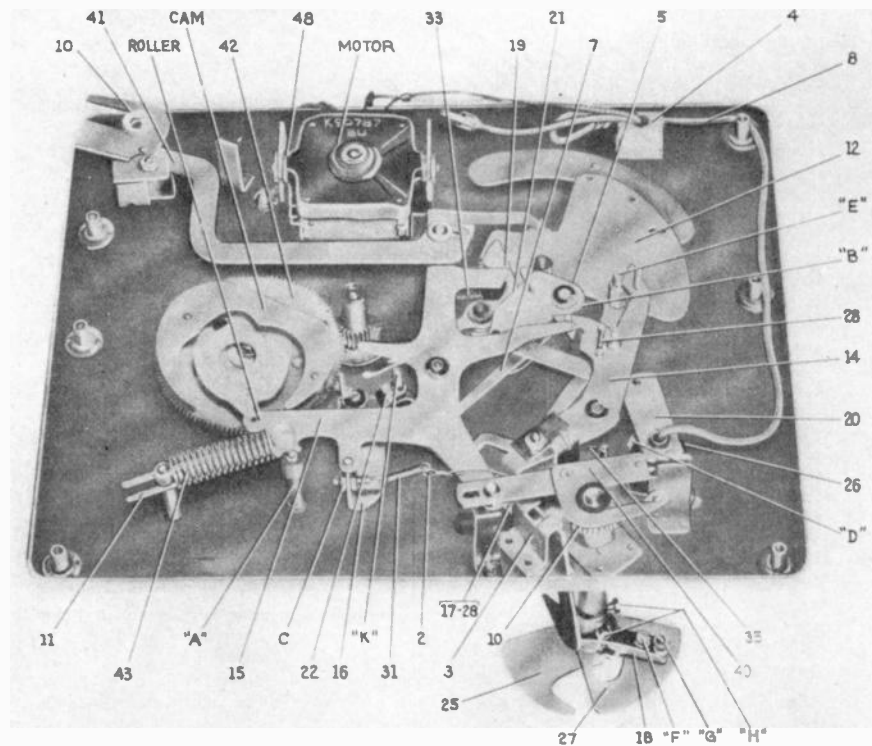


Fig. 1. Bottom view of RP-152, -A, -B, -C, -J Record Changer. RP-153 mechanisms are similar to above but have flexible coupling turntable drive, and automatic switch. RP-152-D mechanisms are similar to above but include automatic switch. In the above illustration, numbers refer to parts, letters refer to adjustments.

clutch 5 occurs when movement of the tone arm causes positive movement of the trip pawl 22 without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by means of screw *B*. If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will not occur at the end of the record.

**C. Pickup Lift Cable Screw.**—During the record change cycle, lever 16 is actuated by the main lever 15 so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer "in-cycle" at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknuts *C* to obtain 1 inch spacing between needle point and turntable top surface.

**D. & E. Needle Landing on Record.**—The relation of coupling between the tone arm vertical shaft and lever 20 determines the landing position of the needle on a 10-inch record. Position of eccentric stud *E* governs the landing of the needle on a 12-inch record; this, however, is dependent on the proper 10-inch adjustment.

To adjust for needle landing, place 10-inch record on turntable; push index lever to reject position and return to the 10-inch position; see that pickup locating lever 17 is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on the record; then see that pin *V* on lever 14 is in contact with step *T* on lever 17. (see Fig. 2.) The correct point of landing is  $4\frac{1}{8}$  inches from the nearest side of the turntable spindle; loosen the two screws *D* (Fig. 1) and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers 14 and 17. Leave approximately  $1/32$ -inch end play between hub of lever 20 and pickup base bearing, and tighten the blunt nose screw *D*; run mechanism through several cycles as a check, then tighten cone pointed screw *D*.

After adjusting for needle landing on a 10-inch record, place 12-inch record on turntable; push index lever to reject and return to 12-inch position; rotate mechanism through cycle until needle is just ready to land on the record; the correct point of landing is  $5\frac{3}{8}$  inches from nearest side of spindle. If the landing is incorrect, turn stud *E* (Fig. 1) until the eccentric end adjusts lever 14 to give correct needle landing. The eccentric end of the stud must always be toward the rear of the motor-board, otherwise incorrect landing may occur with 10-inch records.

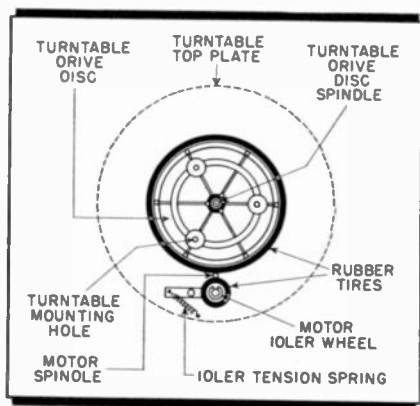


Fig. 3. Motor drive details on RP-152. *A*, *B*, *C*, *D*, *J*.

**F. & G. Record Separating Knife.**—The upper plate (knife) 25 on each of the record posts serves to separate the lower record from the stack and to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record shelf 27 be accurately maintained. The spacing for the 10-inch record is nominally .058 inch, and for the 12-inch record is .078 inch.

To adjust, rotate the knife to the point of minimum vertical separation from the record shelf and turn screw and locknut *F* (Figs. 1 & 2) to give .055—.058 inch separation. Screw *G* must not be depressed during this adjustment. After setting screw *F*, adjust screw *G* so that when its tip is depressed flush with top of record shelf, the vertical spacing between the knife, in its lowest rotational position, and the shelf, is .075—.078 inch.

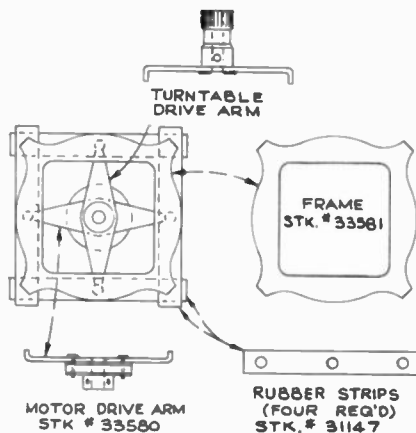


Fig. 4. Details of the motor coupling on RP-153.

**H. Record Support Shell.**—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and rack coupled to the main lever 15, and it is necessary that adjustment be such that the record is released from both shelves at the same instant. To adjust, place a 12-inch record on the turntable, rotate mechanism into cycle to the point where both separating knives have turned clockwise as far as the mechanism will turn them; lift record upward until it is in contact with both separating knives. Then loosen screws *H* (Figs. 1 & 2) and shift record shelves 27 so that the curved inner edges of the shelves are uniformly spaced approximately  $1/16$ -inch from the record edge. Some backlash will be present in the rotation of these shelves. They should be adjusted so that the backlash permits them to move away from the record but not closer than the approximate  $1/16$  inch specified above. Tighten the blunt tipped screw *H*, run mechanism through cycle several times to check action, then tighten cone tipped screw *H*.

If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

**J. Tone Arm Rest Support** (not shown).—When the changer is out-of-cycle, the front lower edge of the pickup head should be  $5/16$  inch above surface of motorboard. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in the required direction.

**K. Trip Pawl Stop Pin.**—The position of the trip pawl stop pin *K* (Fig. 1) in relation to the main lever 15 governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

**Lubrication.**—Petrolatum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers and pulleys on underside of motor-board.

Do not allow oil or grease to come in contact with rubber bumper or rubber parts of the mechanism.

#### MOTOR SERVICE DATA

On the RP-152 drive motors a 0.014-inch feeler gage is recommended for centering the rotor in the field bore.

The field coils can be disassembled and reassembled if care is used in reassembling the field lamination block in a manner so that the dove tail joint will not be sprung.

When disassembling the rotor or rotor shaft bearing only, the field stacking should be held in a clamp to prevent the field springing when the bolts which hold the assembly together are loosened.

#### RCA PHONO MOTORS

##### Identifying Colors

In order to facilitate identification in respect to frequency, phonograph motors are marked either on the bottom or side with a large spot of paint as follows:

60 cycles .....no mark  
50 cycles .....green  
25 cycles .....white

#### RECORD PRESSINGS

##### Playing Sequences

Victor and Columbia now produce album sets in three distinct coupling sequences. the albums with the set number preceded by the letter *M* being for manual operation, *AM* for the throw-off type of record changer, and *DM* (Victor) or *MM* (Columbia) for the drop type of record changer.

In a 4-record set, for instance, the couplings are arranged as follows:

Record	<i>M</i>	<i>AM</i>	<i>DM-MM</i>
No. 1	Side 1 Side 2	Side 1 Side 5	Side 1 Side 8
No. 2	Side 3 Side 4	Side 2 Side 6	Side 2 Side 7
No. 3	Side 5 Side 6	Side 3 Side 7	Side 3 Side 6
No. 4	Side 7 Side 8	Side 4 Side 8	Side 4 Side 5

The *AM* and *DM-MM* couplings are so arranged that the records need not be restacked after they have been played through the upper sides, but may merely be turned over as a group and placed back on the spindle for automatic playing of the reverse sides in proper sequence.

When testing or servicing a record changer in the home, determine the sequence of the album set used for test so that the customer won't have to tell you what the stacking order is.

# Shop Notes

## EMERSON 8MT-574 PHONO MOTOR CONVERTER

### Installation—Servicing

The 8MT-574 dc to ac phono motor converter is of the synchronous vibrator type with a capacity of 20 watts maximum. It may be connected to the Emerson Model EM Radio-Phonograph Combination for operation in a dc district.

To install, locate the three mounting holes for converter, and large mounting hole for switch, in the motorboard. If these holes are not in the motorboard they must be drilled as shown in Fig. 1.

Remove motorboard from cabinet by taking out the seven screws along the outside edge of the board. Turn motorboard over, place converter so that holes in brackets line up with the three 5/32" diameter holes in motorboard. Slip cup washers on screws, insert screws through motorboard and brackets, slip lockwashers over screws and tighten unit in place with nuts.

Insert ac-dc toggle switch in 1/2" diameter hole, being careful to locate key slot as shown in Fig. 2. Slip ac-dc plate over bushing so that key fits in slot in bushing, and fasten. Edges of ac-dc plate should be parallel with sides of cabinet.

Disconnect two black motor leads; one from the on-off switch and one from the chassis. Wire converter and ac-dc switch leads as shown in Fig. 2. Leads which must be connected, indicated by cross hatching in Fig. 2, are as follows:

Solder green lead with coil to side of combination motor switch and tone control.

Solder green lead without coil to clamp which holds leads in place on motor.

Solder two black motor leads to same terminals as brown leads on ac-dc switch.

Solder blue with white tracer lead from ac-dc switch to terminal on combination motor switch and tone control.

Solder black with white tracer lead from ac-dc switch to rear of chassis.

The interconnections in schematic form are shown in Fig. 3.

Do not plug receiver into house outlet until you have first ascertained the position of the ac-dc switch. It should be in

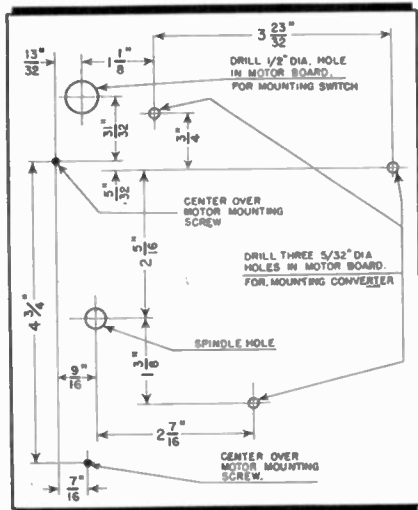


Fig. 1. Emerson Converter.

the position corresponding to the house supply.

The converter should not be turned on while the radio is in use, as the vibrator noise will make the receiver unusable.

## GENERAL ELECTRIC J-501, J-501W, J-502, J-502W

### Changes—Additions

These are late production models, with receiver serial numbers from 10,000 to 50,000.

For 50-60 cycle receivers connect X to Y and short out R11. For 25-cycle receivers connect X to Z and insert R11 (13 ohms carbon). (See Fig. 4.)

Models J-501 and J-501W have B minus grounded to chassis, no wiring being required. Models J-502 and J-502W have a separately wired B minus system which is not grounded to chassis.

These models were built using either a 12B7 or 12SK7 i-f tube. The tubes are not interchangeable because of the dissimilar socket connections.

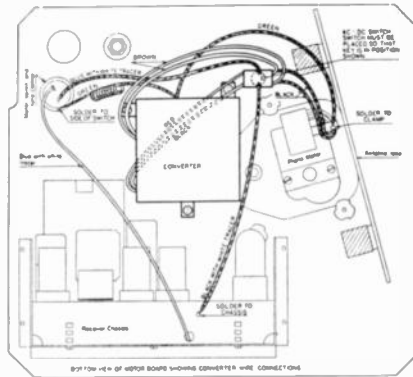


Fig. 2. Emerson Converter.

## PHILCO 610

### Distortion—Weak

Replace the 0.1-mfd decoupling condenser which is connected to the mid-point of the two 99,000-ohm resistors in the plate circuit of the type 75 tube.

## PHILCO TRANSITONE PT45

### Dead

If the receiver is dead but the pilot light flickers, bend the plate contact of the socket accommodating the 35A5 tube.

## PHILCO 40-110

### Pushbutton Failure

If a pushbutton fails to tune, replace the 370-mmf condenser across that particular pushbutton oscillator coil.

## PHILCO 40-124

### Dead

If the receiver is dead and considerable hum is present with volume control in full-on position, replace the control. Trouble is due to volume control arm shorting to shaft.

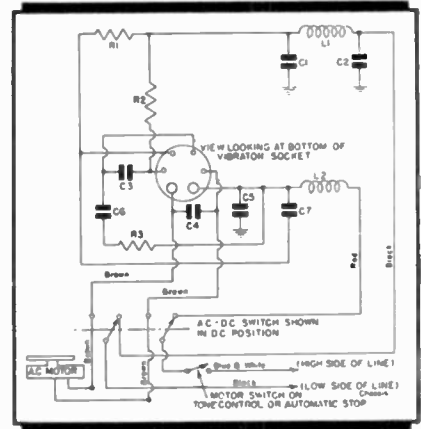


Fig. 3. Emerson Converter.

## PHILCO TRANSITONE PT25

### Noisy

Inspect carefully and make sure that the rubber insulation on the antenna lead where it runs through the chassis is okay. The difficulty is usually due to a microphonic short at this point.

## PHILCO 41KR

### Hum

Sounds like extremely loud modulation hum. To eliminate, take out the loop antenna and solder the break caused by the staple cutting into the loop as it was driven in.

## RCA REPLACEMENTS

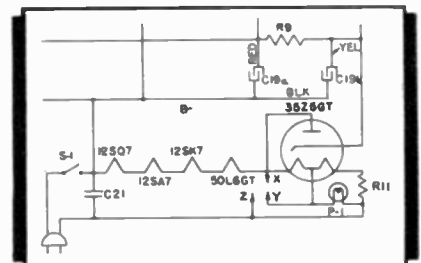
### Power Transformers

Replacement transformers for recent models will be stocked without end covers. It will therefore be necessary to retain the covers of the original transformer for use in mounting the replacement unit. In cases where the bottom cover is mounted by lugs, it will not be necessary to remove it from the chassis.

## STROMBERG-CARLSON NO. 509 RECEIVERS

### Servicing Data

These receivers employ the same circuits as the No. 410 except for improved tone and phonograph compensation circuits. The location chart, aligning information, voltage readings, continuity test and dial lamp adjustment instructions are the same as for the No. 410 receivers.

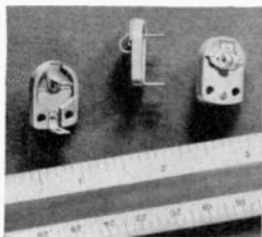


# Presenting —

## NEW PRODUCTS

### CENTRALAB

**Ceramic Trimmers**—Fixed plate bonded to the ceramic base, eliminating the usual variable air film. Variable plate rotates



on a ground ceramic surface. Equally stable at all capacity adjustments. Provides negative temperature compensation of .0006 mmfd/mmfd/°C. Power factor less than 0.1%. Capacity change with humidity or temperature cycling less than 0.5%. Available capacity ranges 2 to 6 mmfd, 3 to 12 mmfd, 7 to 30 mmfd, 60 to 75 mmfd. By Centralab, Milwaukee, Wis. RADIO SERVICE-DEALER.

### OXFORD-TARTAK

**Miniature Speaker**—Model 3ZM-CA permag Cabinet Speaker, measuring only 4½" x 4" x 1⅞". Case is walnut bakelite and is closed in back by strong fibreboard. Spring steel clips are provided for ease in attaching voice-coil connections. A wall mounting bracket is supplied.

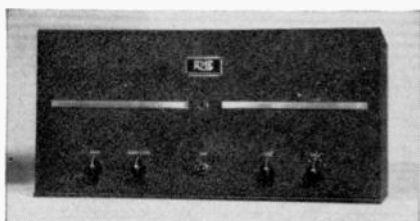


A second unit, Model 3ZM-CM, designed for use as a microphone, is equipped with a special shielded transformer. Has excellent voice frequency response. By Oxford-Tartak Radio Corp., 915 W. Van Buren St., Chicago, Ill. RADIO SERVICE-DEALER.

### RME

**Communication Receiver**—The SPD-11 is a fixed-tuned job having 10 tubes, crystal control on any of 5 frequency channels selected from 2 to 3 megacycles. Has two tuned r-f stages and incorporates a qvc circuit for standby quietness. Has high sensitivity and image ratios.

Any one of the 5 channels is selected by a switch which has a sixth position for

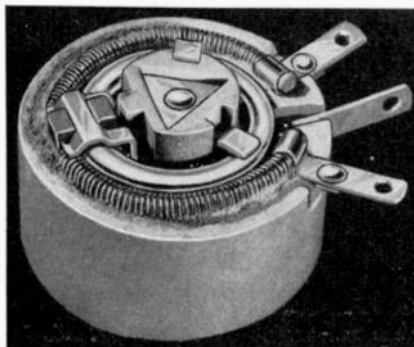


incorporation of an additional frequency channel.

The unit may be adapted for other ranges up to and including the ultra-high-frequency police bands. By Radio Manufacturing Engineers, Inc., Peoria, Ill. RADIO SERVICE-DEALER.

### CLAROSTAT

**Power Rheostat**—Features mechanical and electrical sturdiness. Resistance wire is wound on an insulated aluminum core. Resistance element is bent round, placed in the slot of the ceramic shell, and firmly imbedded in a cold-setting inorganic



cement similar to that used in the Clarostat Greenohm power resistors.

A graphited-copper contact shoe rides the brass third-rail ring and the winding, with a positive, smooth-sliding contact. The tripod type rotor provides three-point support on the brass contact ring and the winding. Rotor is insulated from metal shaft by a center ceramic insulator.

The rheostat may be mounted in any position with regard to its terminals and knob rotation, by means of an adjustable locking pin and disc.

For the present, only a 25-watt size is available, but larger sizes will follow. By Clarostat Mfg. Co., Inc., 285 N. Sixth St., Brooklyn, N. Y. RADIO SERVICE-DEALER.

### MALLORY

**Color-Coded Condensers**—All Mallory Tubular Paper Condensers—Types TP (wax-impregnated, wax-filled), OW (oil-impregnated, wax-filled) and OT (oil-impregnated, oil-filled)—now bear a brilliantly



colored label which gives better visibility to capacities, and instant recognition of voltages by means of a bottom band of color properly coded to RMA specifications.

The color-code band goes completely around the condenser so that it may be readily seen and the voltage identified no matter how the condenser is placed in the set. Construction remains unchanged; the labels are merely applied over the customary cardboard tube and wax coating. By P. R. Mallory & Co., Inc., Indianapolis, Ind. RADIO SERVICE-DEALER.

### OHMITE

**Deter-Ohm**—The Deter-Ohm Resistance Box is now available in two new ranges, one



of 1 to 9,999 ohms and the other of 10 to 99,990 ohms. These sizes are in addition to the 100 to 999,900-ohm range box previously available.

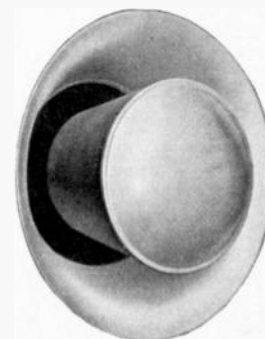
The resistance element is made up of wire-wound resistors which are connected to tap switches. Box may be connected directly in any circuits which do not cause the instrument to dissipate more than one watt for each tap in the circuit.

Chief use is determination of replacement resistors in radio sets. It may also be used as a voltmeter multiplier or, with auxiliary apparatus, as an ohmmeter or resistance bridge circuit. By Ohmite Mfg. Co., 4835 Flournoy St., Chicago, Ill. RADIO SERVICE-DEALER.

### WRIGHT-DECOSTER

**Donut Horn**—New design exponential horn. Due to the annular shape of the mouth, it has the ability to spread the high frequencies over a far greater angle than conventional types. All surfaces are deadened with a special "ex" material and the speaker housing is damped with thick felt so as to eliminate any tendency toward objectionable resonances.

There is no sound radiated from the back of the horn and, therefore, feedback to a microphone is reduced to a negligible value.

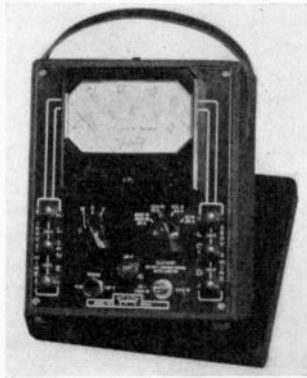


Overall diameter 22", total depth 13½". By Wright-DeCoster, Inc., St. Paul, Minn. RADIO SERVICE-DEALER.

## New Products

### TRIPLETT

**Circuit Analyzer**—Model 1270, measures wattage consumption, amperes and line voltage. Power used by small motors and appliances is checked on a low-range scale of 0-20 watts, fused to prevent damage from accidental overload. Other scale



ranges make it possible to test electric refrigerators, washers, radios, ironers, etc., including electric ranges operating on 220-volt, 3-wire systems.

Testing facilities of Model 1270 are: Watts, 0-20-500-1000-2000-4000; a.c., 0-260 ma and 0-6.5-13-26 amps; a.c., 0-130-260 volts. All switches and leads are ample to carry full load current continuously. By The Triplett Electrical Instrument Co., Bluffton, Ohio. RADIO SERVICE-DEALER.

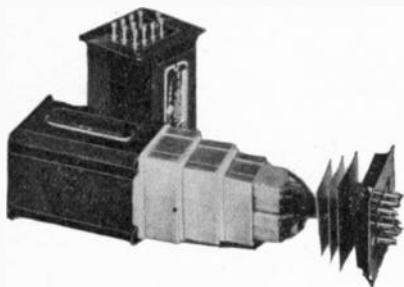
### RCA VICTOR

**Home Recorder Discs**—The "Phonogram", a new 6½-inch home recording blank. Features low price, fully flexible paper core, slow-burning shavings, low surface noise. Finished in blue with buff label.

Available with discs are envelopes of heavy cardboard-backed, craft paper with cover ruled for addresses, for sending through mails. By RCA Victor, Camden, N. J. RADIO SERVICE-DEALER.

### KENYON

**Hum-Bucking Transformers**—Types P204, and P205 telescopic shielded hum-bucking transformers for wide-range audio appli-



cations. The transformers are annealed after complete construction to remove all bending and shearing strains brought about during manufacture. This assures maximum permeability of the electromagnetic shields.

Type P204 has a primary of 500/333/-250/200/125/50 ohms and secondary of 50,000 ohms (single Class A grid). Frequency response plus or minus 1 db from 30 to 20,000. Shielding, 90 db.

Type P205 has a primary the same as P204 and a secondary of 100,000 ohms to push-pull grids. Frequency response and shielding is same as for P204. By The Kenyon Transformer Co., Inc., 840 Barry St., New York, N. Y. RADIO SERVICE-DEALER.

### AEROVOX

**H-V Wet Electrolytics**—To meet the higher voltage requirements encountered in some applications, three new types of wet electrolytic condensers are now announced by Aerovox Corporation, New Bedford, Mass. These units are available in 4, 8 and 16 mfd capacities, with a 600 volt d.c. surge rating, as compared with 350 and 500 volt ratings heretofore available. Can sizes are 1¾ and 1½ inch diameter, and 3 7/16, 4 7/16 and 4 15/16 inches high.

The ability of these "wets" to withstand higher surge voltages, and to reform if momentarily broken down by excessive voltages, and to operate at higher voltage under steady operating conditions, makes



them most desirable in circuits subject to violent surges. RADIO SERVICE-DEALER.

### WALSCO

**Scratch Remover**—Shaped like a fountain pen and has clip for convenient carrying. Unbreakable plastic construction.



Cap on one end covers the liquid used for light scratches. Cap on the other end covers the stain filler which matches standard radio cabinet finishes. By Walter L. Schott Co., Los Angeles, Calif. RADIO SERVICE-DEALER.

### SPRAGUE

**Vertical Atoms**—The "Atom" type condensers are now available with "feet" for



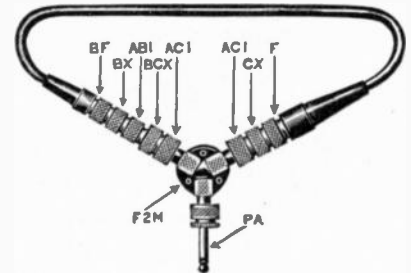
vertical mounting. Feet may be soldered to chassis or inserted through chassis holes and bent over for fastening.

Known as Type LM, the Atom vertical electrolytics are available in nine types in

a selection of voltages, both single and dual. By Sprague Products Co., North Adams, Mass. RADIO SERVICE-DEALER.

### SELECTAR

**"Connectar Kit"**—Universal connector kit, assembled for servicing convenience, consisting of ten gadgets for making rapid speaker, microphone and chassis connec-



tions; also for splicing and phone jack connections. Literature available from Selectar Mfg. Corp., 30 West 15th St., New York, N. Y. RADIO SERVICE-DEALER.

### AUDAK

**Cutting Head**—A new high-fidelity cutter having a flat response to over 9000 cycles and negligible distortion factor. For use



with instantaneous recording equipment. By Audak Company, 500 Fifth Ave., New York, N. Y. RADIO SERVICE-DEALER.

### CORNELL-DUBILIER

**Compact Capacitor Decades**—A new series of compact capacitor decade boxes introduced by Cornell-Dubilier. Each is 3¼ x 5 x 3 inches in size yet provides a wide variety of capacity standards. The CDA-5 box provides values of .0001 to .011 mfd in steps of .0001 mfd or a total of 100 different capacity combinations through the medium of its two 10-position switches. The Model CDB-5 is similar except that its range is .01 to 1.1 mfd. The CDC-5 with a range of 1.0 to 10.0 mfd has a single switch which provides steps of 1 mfd. These boxes may be used singly or in combination. The three in combination provide a range of .0001 to 11.1 mfd in steps of .0001, or a total of 100,000 different capacitor values. RADIO SERVICE-DEALER.

## SERVICING CONTACTS

(From page 13)

### PRECAUTIONS

You will note that we refer to a liquid contact cleaner in the previous paragraph. This is fine to use wherever practical, but no liquid should be used where it can penetrate into the surrounding insulation and possibly cause a breakdown. Use liquids only where they can be easily controlled and the excess can be wiped away. Also, never use graphite type compounds to service contacts of any sort. Leakage may result in tube

sockets, switches, etc. from such applications.

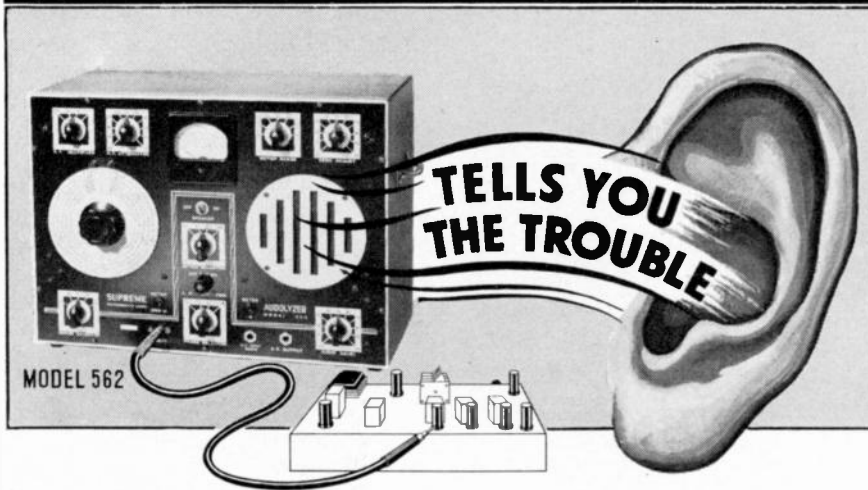
Another compound is now on the market for servicing carbon-type volume controls. It is the same basic material in liquid form as the carbon material on the volume control strip. To eliminate the scratchy noise resulting from the control action, apply a very thin coat of the compound to the surface of the carbon strip. After allowing this to dry, the control can again be placed in use in as good-as-new condition. (Naturally the previous suggestions on servicing volume controls should also be considered.) The

serviceman should vary the thickness of the application on the carbon strip with consideration of the intended resistance of the strip. In most cases only a very thin coat is required to supply a better contact between the strip and the moving contact.

Sets that are noisy or intermittent in operation should be thoroughly "chemically treated" so as to eliminate possible troubles through contact sources. Even in cases of intermittent trouble where the contacts, controls, switches, etc., are apparently okay, trouble has been eliminated by such methods.

Naturally the serviceman must determine if parts are worth servicing at all. If parts are badly worn they should be replaced because otherwise no repair job could give lasting service. Servicemen, through their experience, can readily determine if parts are worn beyond the point of practical service to the customer.

# The AUDOLYZER



What could be easier than have an instrument which you hook to any part of a radio receiver and have it immediately TELL YOU THE TROUBLE? By using one probe, you can test all circuits from antenna post to the speaker by listening to the signal in the AUDOLYZER. You will hear the signal in the AUDOLYZER'S speaker until you reach the dead stage. Then, no sound from AUDOLYZER means trouble at this point. You can use the AUDOLYZER'S vacuum tube volt meter to measure all D.C. voltages without disturbing receiver's normal operation. 7 D.C. voltage ranges of 0/1/3/10/30/100/300/1000 at 15 megohm input. Meter is center-reading type with "plus" and "minus" readings to each side of center, eliminating reversing test leads for polarity changes. Next, you can check receiver's oscillator. Connect probe to set oscillator's output and watch meter. If oscillator cuts out or is weak when receiver dial is rotated AUDOLYZER meter immediately indicates it. To determine unknown frequency of oscillator, I.F. or R.F. signal, use tuning portion of SUPREME AUDOLYZER and AUDOLYZER'S V.T.V.M. as frequency meter. For receiver's oscillator place probe on oscillator output and tune AUDOLYZER for greatest meter swing. Read frequency on AUDOLYZER'S direct-reading dial. For R.F. determination, connect your signal generator to receiver's input and place AUDOLYZER probe on output of R.F. stage under test. Adjust signal generator and AUDOLYZER to same frequency. Adjust receiver trimmer until receiver dial reads correctly. To determine actual signal fed to I.F. stages, connect AUDOLYZER probe to first Det. output, feed a signal into receiver and adjust AUDOLYZER dial until you get maximum swing of its meter needle. Read actual I.F. signal's frequency on AUDOLYZER. Receiver is not materially de-tuned by these tests. Relative gain or loss of signal strength in any stage.

tube or transformer can be determined. You can check A.V.C. circuits for correct applied voltage under actual operating conditions because you have a Vacuum Tube Voltmeter in the AUDOLYZER which instantly indicates this voltage at any place in the set—and its variation under different applied signals—without upsetting the correct operation of the set. You can adjust A.F.C. circuits in the same manner. Distortion is easily noted by ear. Most distortion occurs in the second detector or audio output stages. By placing the probe at any place where the audio signal is normally present, you can hear the signal and instantly determine where the distortion originates. This is also true of any R.F. or I.F. stage. If you have a scope, you can connect it to the AUDOLYZER and see the demodulated audio signal as well. Leaky, shorted or open condensers can quickly be found without unsoldering them from the circuit. Because the SUPREME AUDOLYZER can be electrically divided into two sections, you can use two probes at a time for checking intermittents, working from the second detector's input and output toward the antenna and loudspeaker, or vice versa. The AUDOLYZER can be used to check antenna efficiency, as it is a fine field strength meter. You can check high impedance pick-ups, microphones and other input devices. You can make dozens of other tests with the SUPREME AUDOLYZER which will astound you by their rapidity, simplicity and their ability to find the trouble in the shortest time. You can check the receiver's loudspeaker against that in the AUDOLYZER for distortion. You need the SUPREME AUDOLYZER in your service shop. It will quickly pay for itself and return you a handsome profit in saved time, which means added profitable hours of servicing.

CASH PRICE.....\$78.50  
Or \$8.50 Cash and  
12 Monthly Payments  
of \$6.49

## SUPREME

## CIRCUIT COURT

(From page 16)

tuning condenser shunts only a portion of the r-f transformer secondary. This is practical just so long as the entire frequency band can be covered in this manner. The f-m band is not extensive, so the scheme is okay. The arrangement permits the use of secondaries with a greater number of turns—therefore a higher impedance and a larger voltage build-up at the tube grids. Result: higher gain in the r-f circuits where gain is hard bought in any circumstance.

Another stunt is used in the r-f stage—the use of degeneration (did we say degeneration again?) in the cathode circuit of the 1852 tube. The out-of-phase voltage is developed across the unby-passed resistor *R1*. This tends to stabilize the input conductance of the tube and reduce the input capacity.

## DOR-A-FONE

(From page 8)

required on the "Talk-Listen" positions. However, this will also increase the tendency toward feedback; hence a greater gain may not be practical unless the speakers are isolated from each other.

It will also be noted that the volume control is effective only in the "Radio" position. It is out of circuit in the "Talk" and "Listen" positions.

The receiver is equipped with a loop antenna, but provisions are made for the use of an additional, external antenna. If only the loop is used, the antenna and ground terminals should be connected together so as to short the antenna coil, as indicated by the dotted line. Otherwise there will be a dead spot.



## UNIQUE RADIO HOSPITAL



The "Radio Hospital" and the "Ambulance" used to bring "patients" into the institution. The personnel is attired in white uniforms.

**A** REALISTIC, and profitable, approach to the problem of "dressing up" a radio service shop has been achieved by Ernest C. Augsten with a unique "Radio Hospital" at Hartford, Conn.

Its personnel attired as doctors, internes and nurses, and its "patients" brought from customers' homes in an ambulance, the Radio Hospital is complete with nurses' quarters, operating rooms, wards, etc. Located on a through New York-Boston highway, it is visited each year by thousands of tourists from all over the country.

The Hospital is at 716 Main Street, a trim whitewashed brick building with a spick and span appearance and a business-like atmosphere. The latest RCA service and test equipment is used throughout the plant.

Mr. Augsten launched the Radio Hospital idea as a one-man venture in 1935. Headquarters were a small back room. Business was so good that he soon hired an assistant (he became Chief of Staff, the title he still holds on the Hospital letterhead). It got better, so he called in Mrs. Augsten to handle the book work. During the first year they repaired 4,653 radios (an average of 90 per week) and installed 2,861 new auto radios (55 per week). Sales of tubes, parts and sets increased until it was necessary to seek the present large quarters.

In launching his original idea Mr. Augsten says he felt that radios, like people, get really sick now and then.

"When people are seriously ill they generally go to a hospital," he said. "Therefore, why not send sick radios to a hospital? Some of the patients in the Radio Hospital are treated for laryngitis (can't speak clearly), others show symptoms of a ruptured appendix (ruptured condenser), while still others have high blood pressure (high current drain) and other ailments.

"At the present time Radio Hospital employs five doctors and two nurses. When a call comes in to get a radio patient in the field, a uniformed interne driving a white radio ambulance leaves the Hospital and removes the radio from the home on a stretcher."

### BEWARE OF GILLIS!

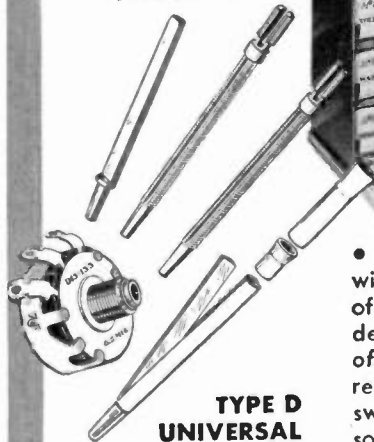
If a man going under the name of Gillis or J. J. Gillis attempts to sell you a subscription to RADIO SERVICE-DEALER, call the police. He is a fraud.

When last heard from, he was operating in New York State and in New England, and passing himself off as a representative of the National Trade Service—an ethical subscription-selling organization. This organization does not solicit subscriptions to RADIO SERVICE-DEALER and does not purport to.

Receipts tendered by Gillis are worthless and will not be honored. Have him arrested if he calls on you. Then advise us, and Gillis will be prosecuted to the fullest extent of the law.

## THE FIRST REAL MOVE TOWARD VOLUME CONTROL STANDARDIZATION

*The Control  
You Need...  
When You  
Need It!*



### TYPE D UNIVERSAL CONTROLS

Small enough to fit almost anywhere—large enough for real dependability. Type D's have every construction feature of the larger IRC Type CS Controls PLUS the added advantage of Tap-in Shafts which make them practically universal in application. Just select the needed control, tap in the proper shaft and the job is done—easier, quicker and with the same assurance of quality performance.

• These 18 IRC Type D Universal Controls with 6 switches and 5 extra tap-in shafts of special design equip you for quick, dependable service on from 60% to 75% of all replacements! • You pay only the regular net price, \$14.97, for the controls, switches and shafts! • You get the handsome IRC All-Metal Cabinet complete with cover, at not one cent of extra cost! • You have the controls you need when you need them—and the Cabinet makes it easy to keep your stock always complete!

... That, in brief, is the story behind this latest IRC development—one that makes it possible to handle the big majority of service calls from a small stock of controls at an absolute minimum investment. You save time—you speed up work—you frequently avoid the need for more costly specials—you give your customers the utmost in volume control dependability. See this Cabinet at your jobber's, or write for details.



**INTERNATIONAL RESISTANCE CO.**

401 North Broad Street, Philadelphia, Penna.



# HEADACHES RELIEVED

All radio servicemen, dealers and soundmen suffer from headaches on occasion, generally from business troubles. But the top notch service-dealers who read RSD every month suffer less as they obtain exclusive information that keeps them ahead of competition

# Rx

RSD's editorial staff, like a physician, is constantly examining current happenings in the field to ascertain what business and technical problems confront those 20,000 key service-dealers who account for 90% of the nation's annual radio servicing and replacement parts and sound equipment business.

Since its inception 7 months ago RSD has been constantly "scooping" the field—publishing more technical data on radio's newest developments (FM, home recording devices and the use of test equipment) than all other radio publications combined. Dozens of our subscribers say that the authoritative data published in one issue alone is worth the year's subscription price.

You service-dealers are in this business to make real money. Our job is to help you do just that. Follow this suggestion—subscribe to RSD now while the introductory 1/2 price rates are still in effect and the \$1.00 you pay for the next 12 issues of RSD will prove to be one of the soundest investments you've ever made.

*Foreign subscriptions \$2.00 annually. Subscriptions from students in accredited Radio Training Schools \$2.00 each for 12 issues.*

(TEAR OUT AND MAIL TODAY)

## WORTH \$1.00—MAIL NOW!

Regular \$2.00 ANNUAL SUBSCRIPTION TO RSD COSTS BUT \$1.00 with this coupon.

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11 West 42nd Street, New York, N. Y.

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

NAME (print carefully) .....

ADDRESS .....

CITY ..... STATE .....

FIRM NAME ..... Est. 19....

YOUR POSITION .....

*Please check whether firm is*

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

I belong to a serviceman's organization... Yes  .... No

We stock the following checked items:

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

We own the following instruments:

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

## IT BEATS THE BAND—

**E**NTERPRISING service-dealers can make money selling sound accessories in many out-of-the-way places. Not long ago a serviceman repaired a set in the Hotel Pennsylvania, New York City. When leaving the hotel he heard Russ Morgan, the nationally known orchestra leader, rehearsing his band. This sales-minded serviceman borrowed several contact type microphones, went back to the Hotel and during a "break" in rehearsals started a casual chat with the musicians. One thing led to another and soon the music makers were *trying* the contact mikes. Things happened! They bought half a dozen.

When you hear "Music In The Morgan Manner" those contact mikes are part of the performance.

There are two hundred thousand musicians and more than ten thousand dance bands in the U. S. A. Only a few are now using contact mikes, though hundreds own and use standard microphones and amplifiers. Try a little salesmanship. Strike up a casual conversation with some of the band leaders and musicians in your vicinity. They are potential customers. Their amplifiers may need new tubes or modernization; the mike cables may be frayed or worn; they may like the sound effects made possible through the use of contact mikes. If they do, they'll need amplifiers and speakers too. They have money and will spend it if you see 'em.

### SERVICEMAN'S DIARY

(From page 14)

smoke cleared. The green eyes were still shining.

Jerry was sore. The perspiration was coming out on his forehead. He waved us back and let go four shots in rapid succession at the gleaming eyes.

We looked again. Now only one eye shone.

"Well," I remarked. "He seems to be winking at us."

Jerry shoved his gun back in its holster.

"There's something screwy about this set-up," he growled, "and I'm going to find out what it is!" He reached inside the doorway and switched on the cellar lights. The gleaming eyes were gone and there was not a cat in the place.

We went down and explored thoroughly. At first, there seemed to be no place where the cats could get in or out, but when we looked in the coal bin we found a narrow opening in the chute which the Doctor had overlooked. We covered this up and returned upstairs. Jerry looked pretty sheepish.



Photo courtesy the Amperite Co

Russ Morgan making "Music in the Morgan Manner" with contact mikes.

# If you recognize the finer things in instruments—

**T**HE word "quality", is used more in advertisements than any other . . . and yet we all know that the place to look for it is not in advertisements, but in PRODUCTS!

You who have used testing instruments for a number of years recognize quality—or the absence of it—the moment you get your eyes and hands on testing instruments. Indeed Simpson Testers owe their meteoric rise to the fact that so many service men DO recognize the FINER THINGS in instruments.

If you know testing equipment you owe it to yourself to inspect Simpson instruments like those briefly described here. That is all we ask. The rest we leave to the instruments!

A handsome new catalog covers the advanced Simpson line. Ask for your copy.

**SIMPSON ELECTRIC CO.**  
5216 Kinzie St., Chicago, Ill.



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



**MODEL 400**—Never before have so many features been combined in a tester. "Unit design" guards against obsolescence; visual guide ties in speed-roll chart with switches; three-way switching broadens scope. Your name engraved free on panel. Dealers net price ..... \$36.00



**MODEL 300**—A handsome, precision tube tester at a remarkable price. Filament voltages of 5 to 120 V. Tests locals, single ended tubes, hantams, midjets, miniatures, ballast tubes, gaseous rectifiers, Christmas tree bulbs, etc. Has neon short check; "good" and "bad" markings; percentage scale; tube charts in cover. Dealers net price ..... \$26.50



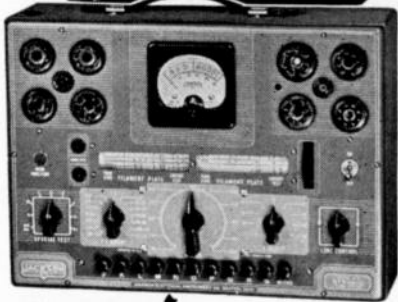
**MODEL 320**—Giant tester with 9-inch illuminated meter. Has 50 ranges . . . nine A.C. and nine D.C. voltage ranges; six milliamperage ranges; five resistance ranges; four capacity ranges; seven decibel ranges. Entirely A.C. operated. All voltage ranges have resistance of 1,000 ohms per volt. Test leads included. Rack mountings available. Dealers net price ..... \$37.50



**MODEL 240**—A remarkable value in a pocket size (5 1/4 x 2 7/8 x 1 3/4") 3,000 volt, self-contained tester. Four A.C. and five D.C. voltage ranges at 1,000 ohms per volt; 0.15—150—750—milliamps; 0.3000—300,000 ohms. Dealers net price ..... \$14.75

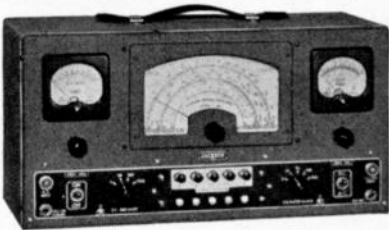
# SIMPSON INSTRUMENTS THAT Stay ACCURATE

It takes  
a JACKSON  
to test tubes  
accurately!



**Dynamic**  
method doubles ac-  
curacy, boosts profits

Tests prove that Jackson Dynamic Tube Testers are more accurate! Frequently a Jackson finds "poor" tubes which might pass for "good" in ordinary testers. Model illustrated is the 636. Has built-in roll chart, full range filament selection marked directly in volts, high voltage power supply, sockets for latest tubes and additional "spares." Price \$29.95 net.



**SIGNAL ANALYZERS**

Testing with Jackson Signal Analyzers is direct, positive and easy. Measures the signal itself, tracing its path through the receiver to the exact point of the trouble. It shows ALL results instantly on direct reading meters. Model 660. Price complete \$79.50.

**OSCILLATORS** Jackson Audio-Oscillators operate on a new basic principle — audio frequency voltage is developed at its fundamental frequency. Sets new high standard for this type of instrument performance.

**FREE!** Write today for this vitally important folder — "Learn the Truth About Dynamic Tube Testers."

**THE JACKSON ELECTRICAL INSTRUMENT CO., Dayton, Ohio**



"Well," I said consolingly, "you scared the cat away anyhow. And he can't come back." But this didn't satisfy him.

As we stood at the head of the cellar stairs, he switched off the lights and took one more look into the cellar.

"Look!" he shouted. "It's still there!" He pointed into the cellar.

Sure enough. The single eye flashed up through the darkness, as bright as ever. Jerry reached in and switched on the lights, keeping his eyes fixed on the spot where the gleaming eye shone.

"I've got it now!" he yelled. "Look at that black dress!"

That was it . . . a discarded black dress tossed in a corner of the cellar. Big green glass buttons reflected the light shining down the stairs, like the reflector jewels on roadways. But we couldn't see it when all the cellar lights were on.

We went downstairs again and picked up the dress. Jerry held it up. One glass button had been shot to pieces and there were five bullet holes near it.

"Count the holes!" he grinned triumphantly. "Did I shoot straight?"

"Yeah," I answered. "If you could put that many holes in every dress we could open a dry-cleaning establishment!"

P.S.—SUNDAY—Doc called up at home. No cats last night. Ho-hum, that's life!

**SOUND EFFECTS**

(From page 5)

resale as sound effects is prohibited by the manufacturer, the use of the records for the purpose of supplying backgrounds for instantaneous recordings would conform with the spirit and the letter of the licensing agreements.

**RECORDS AVAILABLE**

The Victor Sound Effect Records are listed on pages 368 and 369 of their general catalog; those of Columbia on pages 205 and 206 of their general catalog.

By far the largest listing of such records is to be found in the Speedy-Q catalog. These records are unique in that the majority of them carry visual cues that eliminate guesswork or pencil marking (the name Speedy-Q being a contraction of "speedy cue").

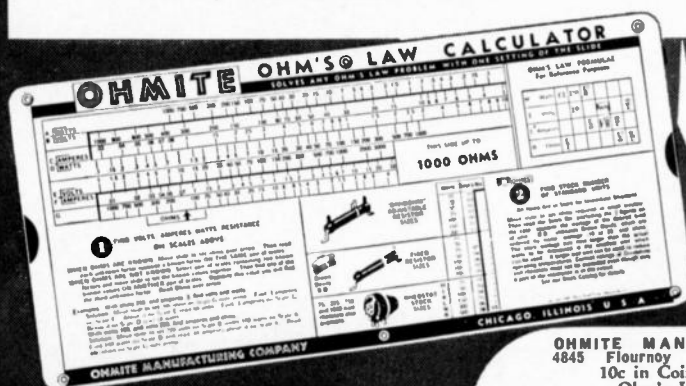
A descriptive index card comes with each record. Each card bears the data relative to cue positions, etc. The time in seconds preceding the detailed description is the "dead" line or blank groove time at 78 r.p.m. The other times given are from the first groove to that particular point in the action. Whenever the action of a particular recorded side is not a continuous sequence the number of separate cuts is given, such as, "4 cuts", "7 cuts", etc.

**OHMITE Ohm's Law Calculator**

Solves any Ohm's Law problem with one setting of the slide

Here's the handiest Ohm's Law Calculator you've ever seen! Specially designed for you by Ohmite Engineers. Gives the answer to any Ohm's Law problem in a jiffy, with one setting of the slide. No decimal points to worry about because all values are direct reading. Simple as can be. Does not require any knowledge of a slide rule to operate. Nothing else like it. Smaller than any such calculator

ever available. Size 4 1/8" x 9". Covers the range from .1 ohm to 10 megohms, also the range of currents, wattages, and voltages commonly used in radio and commercial work. A setting of the slide also tells the stock number of resistor or rheostat you may need. Available to you for only 10c to cover handling cost. At your Jobber, or send 10c in coin now.



It's  
NEW  
It's  
Complete

OHMITE MANUFACTURING CO.  
4845 Flournoy St., Chicago, Illinois  
10c in Coin enclosed. Send  
Ohm's Law Calculator.

Name .....  
Address .....  
City .....  
State .....

Radio Ser. Dealer—Oct.

Be Right with OHMITE  
RHEOSTATS • RESISTORS • TAP SWITCHES



## A TOUGH SELLING JOB

The serviceman who fails to keep up with the new developments in radio and servicing soon finds himself in the position of the unhappy fellow above. He'll have a tough job selling his services if he can't handle the new sets and hasn't mastered the new servicing methods. There is only one way to insure your future success in the radio service business: Start now to learn about the important new developments. A few minutes every day with these authoritative Rider Books will help you to reap the benefits of the new opportunities ahead. Your jobber can supply you. Order them today!

### FREQUENCY MODULATION by John Rider

The most talked of subject of the moment, Rider offers this introduction to frequency modulation with special attention to F-M receivers and the problems they will present to the serviceman. Get this now—be ready. 138 pages—Only \$1.00.

### SERVICING BY SIGNAL TRACING

Use the system of servicing which is proved and endorsed, fastest - most modern, the system you can apply to all receivers regardless of age, type or make. Servicing by Signal Tracing operates independently of every limiting factor heretofore encountered. In this new book you learn how all receivers are brought to a common servicing level. Learn how components receive a functional check! This is the most definite and positive form of trouble localization! Over 380 pages - hard covers - only \$2.00.

### OSCILLATOR AT WORK by John Rider

Don't guess - KNOW! This new book tells all about A.L. oscillators. Explains theory by means of simple illustrations, diagrams and curves. Gives you practical facts. Make certain to get your full money's worth from the test oscillator or signal generator you now are using. Get your copy TODAY! 258 pages - illustrated - \$1.50.

### AUTOMATIC FREQUENCY CONTROL SYSTEMS

With Automatic Frequency Control Circuits in most new higher priced models, knowledge of "AFC" means money in your pocket! Learn the practical facts from these easy-to-understand explanations. Get your copy today. Cash-in on profitable "AFC" work. Hard covers - 144 pages - \$1.00.

### HOOR A DAY WITH RIDER BOOKS

On Resonance and Alignment . . . On Automatic Volume Control . . . On D-C Voltage Distribution in Radio Receivers . . . On Alternating Currents in Radio Receivers. 80c each.

JOHN F. RIDER PUBLISHER, Inc.

404 Fourth Avenue, New York City

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100 Varick St., New York City. Cable: ARLAB

Read RIDER BOOKS

A typical cue reads as follows: (SQ) (01")—Whistle to 08" (SQ)—Sound of exhaust as engine approaches and passes mike @ 42" . . . and then sound of escaping steam to 1' 09" and fadeout.

The "SQ" in parenthesis indicates a cue point. The times are in minutes and/or seconds. The description covers the action between each cue point.

### SCARE-PANTS

You may have read the account of the man in Westchester, New York, with a large estate, who had speakers installed at various points on his property. Visitors threading the driveway to the house were greeted by the growling of dogs, the howling of wolf packs and other assorted noises calculated to put their hair on end. Which it did.

Well, that's another use for sound-effect records. Got any practical jokers in your neighborhood?

### NEWS

**Oxford-Teletone**—Mr. Paul H. Tartak, president of Oxford-Tartak Radio Corp., Chicago, has acquired a substantial interest in the United Teletone Corp., makers of Cinaudagraph Speakers.

The two organizations will operate independently, with Teletone continuing the manufacturing of Cinaudagraph Speakers in the Stamford, Conn. plant.

**Du Mont Line**—The Du Mont line of cathode-ray oscillographs, etc., is now listed in the United Catalog. Catalog sheets covering the line are available from the United Catalog Publishers, Inc., 230 Fifth Ave., New York, N. Y., to jobbers handling the equipment.

**Permo Magnifier**—The Permo Products Corp., 6415 Ravenswood Ave., Chicago, have available a 10-power magnifying glass, mounted in a protecting rubber holder, which is useful for inspecting recording and playback needle points, record grooves, etc. Sent to all engineers, manufacturers and jobbers writing to above address on their letterhead and enclosing 10 cents to cover the handling and mailing cost.

**Connor Address**—New tube applications, what to look for in new circuits, and how to correct possible trouble that may be encountered was discussed recently by George C. Connor, Hygrade Sylvania Commercial Engineer, before the Jersey City Radio Servicemen's Association in Arion Hall.

Martin Seel, president of the Jersey City group, conducted the meeting. The sponsoring distributor, Dale Radio Company of New York, was represented at the meeting by Jack Unger, Norman Leeb, Rene Jacobs, Bob Terman and Dean Ellner.

### APPOINTMENTS

**Atlas-Erickson**—Atlas Sound Corp., Brooklyn, N. Y., announce the appointment of Mr. Herb Erickson as their new South-eastern sales representative, calling on radio parts jobbers in North and South Carolina and Tennessee.

Mr. Erickson is located at 14 Biltmore Ave., Asheville, N. C.

TRIPOLET

Ultra Sensitive  
TESTER



MODEL 1600-E  
DEALER NET PRICE \$2100

DC scales of the instrument read: Voltage 0-10-50-250-1000 (25,000 ohms per volt); 0-1-10-50-250-500 milliamperes; Resistance, low ohms, backup circuit, 1/2 to 500 high ohms, 20,000-200,000 ohms and 2 and 20 megohms. Batteries included for all ranges but 20 megohms. 22 1/2 volt battery for that range can be mounted inside the tester case; brackets provided. AC Voltage 0-10-50-250-1000 at 1000 ohms per volt. A plug-in copper-oxide rectifier, easily replaced in case of overload, is used to obtain AC readings. Model 1600-E, less case for mounting in panel. . . . Dealer Net Price . . . \$21.00. In case with handle for portable use . . . Dealer Net Price . . . \$25.50



MODEL 1612

Impressive Counter Tube Tester. . . . RED • DOT Lifetime Guaranteed Instrument with 6" GOOD-BAD Scale. Illuminated Speed Chart . . . Sockets include Locals, Bantam Jr. and new Midjets. Provision for tubes with filament voltages from 1.1 to 117 volts. . . . Dealer Net Price . . . \$29.84

Write for Catalog—Section 4710, Harmon Drive

THE TRIPLET ELECTRICAL INSTRUMENT CO.  
Bluffton, Ohio



# BRACH Antennae

Automobile  
Home — All types  
F-M Systems  
Television  
Police • Marine  
Multiple Systems  
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Accessories

Made by World's Oldest and Largest  
Manufacturers of Radio Aerial Systems

**L. S. BRACH MFG. CORP.**  
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# SAVE MONEY WITH THIS Free Book




**RADIOS**



**PARTS**



**P.A. EQPT.**



**TEST EQPT.**

Servicemen, Sound Specialists — this book is your "baby"! A radio catalog so packed with values, it takes 196 newsy pages to describe 'em! Here, for quick easy reference, arranged so you can compare brands, is every possible radio part and tool. Plus a big P.A. section presenting Lafayette's new complete line for 1941. Everything priced low in this great guide to thrifty buying. Send for your FREE copy of Catalog 82 today. Just tear out and mail the coupon.

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NEWARK • BRONX, N. Y. • JAMAICA, L. I.

**LAFAYETTE RADIO CORP.**  
DEPT. 81J — 100 SIXTH AVE., NEW YORK, N. Y.  
Rush FREE Catalog No. 82

NAME.....  
ADDRESS.....  
CITY..... STATE.....

**Shure-Bauer**—Shure Brothers announce the appointment of *Ben B. Bauer* as Chief Engineer. Mr. Bauer has been Development Engineer at Shure for a number of years and in that capacity has been responsible for the development of the Uniphase principle used in the Shure Uniplex and Unidyne mikes.

**Jensen-Glover** Jensen Radio Mfg. Co. announce the appointment of *Ralph P. Glover* to their sales promotion staff where he will coordinate the technical and sales aspects of an expanded sales promotion campaign.

**Triplett-Patterson**—The appointment of *M. B. Patterson*, Allen Bldg., Dallas, Texas, as factory representative in Louisiana, Mississippi and part of Arkansas is announced by The Triplett Electrical Instrument Co., Bluffton, Ohio.

**SMC Officers**—New officers for 1941 have just been named by the Sales Managers Club of the Radio Parts Industry—Western Group.

The new Chairman is *John Robinson* of Crowe Name Plate, who succeeds *Herbert W. Clough* of Belden. The new Vice-Chairman is *Win Hartford* of Thordarson. *Helen Staniland* of Quam Nichols continues as Secretary and Treasurer.

### LITERATURE

**New Sprague Catalog**—A new and enlarged Condenser Catalog has just been announced by the Sprague Products Co., North Adams, Mass. Copy sent free on request to Sprague, or may be obtained from any Sprague jobber.

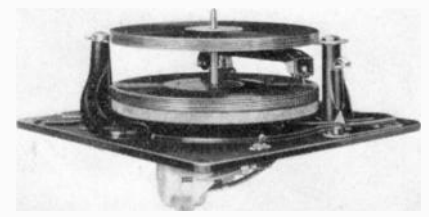
**Audax Folder**—New folder covering the Audax Microdyne Compensated and Relayed-Flux Magnetic Pickups, Audax Cutting Heads and Audax Jewel Points for cutting and playback purposes.

**Oxford Catalog Sheet**—Bulletin 400, of 4 pages, covering the Oxford line of Public Address and Replacement Speakers, and the Junior Series of ED and PM units. Copy free on request to Oxford-Tartak Radio Corp., 915 W. Van Buren St., Chicago, Ill.

**National Union**—National Union Radio Corp., Newark, N. J., have issued a 40-page Radio Tube Handbook, containing data on the characteristics, interchangeability and tube-base connections for over 600 tube types. Pocket size. Price 10 cents. Also a Battery Replacement Guide showing the proper N.U. battery for replacement in 95 makes and 367 models of battery-operated sets.

**Planograph Service**—United Catalog Publishers, 230 Fifth Ave., New York, N. Y., announce the inauguration of a complete planograph service for jobbers in addition to its regular letterpress catalog service, which is participated in by enrolled manufacturers in the radio parts and equipment industry.

# NEW GI-C120 Easy-Playing Changers Sell Sets



**SURPRISINGLY** more and more sales of record changer installations and modernization jobs are being made with the new GI-C120 Record Changer. Are you showing your customers this new, simplified, easy-to-operate, fine-looking changer?

They like its *one-lever* adjustment for changing from one size record to another and for manual playing.

They like its streamlined, extra-smart appearance. And they like, especially, its efficiency and reasonable price.




Built for convenience, and highly satisfactory playing under all service conditions. Made by the world's largest phonograph motor manufacturer. Delivered ready to install. Order today, for testing.

The **GENERAL INDUSTRIES CO.**


DEPT. 447

ELYRIA, OHIO

# IT STANDS OUT



## LIKE A SORE THUMB!



Burgess No. B30 "B" Battery and No. 4F "A" Battery fit more than 90% of the portable radios now used. To solve the replacement problem on the other types, a detective would be a valuable addition to your sales force.

A simpler way, of course, would be to rely on your copy of the Burgess Replacement Guide\*

**"IT'S FREE"**  
See Your Burgess Distributor or write Burgess Battery Company, Freeport, Illinois

**BURGESS**  
The Complete Replacement Line

HOMER G. SNOOPSHAW, B. R. S.  
(Battery Replacement Specialist)  
Now at liberty.

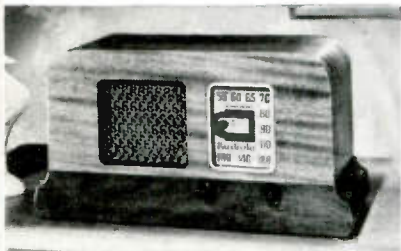
*It's the Greatest News in Years!*



**THE HOTTEST SMALL-SET  
LINE YOU'VE EVER SEEN!**



**Radiola Model 510**—AC-DC operation. Beautiful molded mahogany plastic cabinet with matching rear-drop knobs. 5 RCA Preferred Type Tubes. A. V. C. Superheterodyne, with beam power output, built-in tuned loop!



**Radiola Model 512**—AC-DC operation. De luxe modern cabinet, newly styled, with top and ends of striped mahogany. 6 tuned circuits. 5 RCA Preferred Type Tubes. Built-in tuned loop antenna. Large, easy-reading dial. A. V. C.



**Radiola Model P-5**—3-way operation. AC-DC and battery Sensitive Superheterodyne circuit with large tuned loop. 5 RCA Preferred Type Tubes. Permanent magnet dynamic speaker. Tunes 540 to 1720 kc. Extremely sensitive on either self-powered or line operation. A real seller!

**Plus Many Other Fast Moving Numbers**

Equipped exclusively with  
RCA Preferred Type Tubes!

## A Grand Old Name... a Great New Line!

*Preferred Type* **SETS FOR SERVICEMEN TO SELL!**

Here, at last, are sets specifically designed for *servicemen* to sell!

Backed by a great name—an old and honored name—the new RADIOLA line is feature-packed to sell and *sell* and **SELL!** Light enough for servicemen to carry on calls... to leave with customers while their sets are in the shop... these new Radiola models are real self-sellers. They meet today's trend toward

*extra* radios—with extra features for extra radio enjoyment... and *extra* profits for you!

No wonder servicemen everywhere are shouting the good news: "Radiola's back!" See *your* distributor this week. Get in on the ground floor of the new profit opportunity that will bring thousands of extra dollars to servicemen the country over.



# Radiola Preferred Type Radios

Made by RCA Manufacturing Co., Inc., Camden, N. J., U. S. A.

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

**TRIPLETT  
TUBE TESTER  
Model 1620**  
**\$12.50**  
**DEPOSIT**

**TRIPLETT TUBE TESTER  
MODEL 1620**

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



**TRIPLETT  
MODEL 1620**  
Regular Dealer  
Price \$37.84

*and it's Yours  
on N.U. DEAL*

*Over 50,000  
completed deals  
your guarantee  
of complete  
Satisfaction*



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



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



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

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

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

★ ★ ★

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

★ ★ ★

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

★ ★ ★

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

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

*Ask Your Jobber or Write to*

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*The Best Equipped  
Shop in Town  
Gets the Business*