

THE CATHODE-RAY TUBE AS A SERVICEMAN'S TOOL

Introduction

by John F. Rider

(Editor's Note: Beginning with this issue, we start upon a complete discourse of the cathode-ray tube used in an oscilloscope and intended for the service industry. It is our intention to devote at least a page each month to this discussion and to cover the subject from the theoretical, as well as the practical angle, with major emphasis upon how the tube can be used to best advantage to perform whatever functions are within its scope, related to radio receiver and amplifier servicing.)

A GREAT deal of attention has been focused upon the cathode-ray tube oscilloscope as a brand new development for the radio service field. To give credit where credit is due and to correct certain incorrect opinions, which the writer has heard at servicemen's meetings, this tube unit has been in use for many years. However, it is true that for these years past, it was employed primarily as a laboratory device and by some receiver manufacturers on their receiver testing line.

That it should become a part of radio servicing equipment is natural, for the function it performed in the receiver manufacturing plant is one of the functions which must be completed by servicemen working on radio receivers. It might also be well to state that recent developments have enabled the production of such devices within a price range which is inside the limits of the service industry's pocketbook.

One of the prime questions, which arises in connection with the cathode-ray tube, is whether or not it is going to replace all types of servicing equipment now in use. In our estimation the answer is negative. The cathode-ray oscillograph will become an extremely vital unit in the hands of the serviceman. It may in time replace certain existing testing units, but it will not replace all units. Such operations as the measurement of voltage, current and resistance in static values, are not very well adapted to the cathode-ray tube of the type which is suitable for service use. Consequently, voltmeters, current

meters and ohmmeters will no doubt be in use for very many years to come. The same may be said to be true about tube testers of various kinds. While it is possible to perform an extremely great number of operations with the cathode-ray tube, one of which is the development of visual tube characteristics, and the requirements of the service industry are such that the cathode-ray tube will not displace the tube tester or tube checker from the position it now occupies.

In the service shop, the cathode-ray tube will replace some units, which now are used in connection with alignment and possibly the testing of the condition of condensers, inductors and resistors, exclusive of electrical values. Defects in condensers, while determinable with existing equipment, will without doubt be more accurately located with the cathode-ray tube. Defects in core material, now located with difficulty, if at all, will be easily determined with the oscilloscope. Noisy resistors and other units in receivers likewise will

be easily determined with the oscilloscope. Its primary and most important service to the servicing industry lies in its ability to indicate the exact state of alignment during the process of alignment. It will further serve as a superior means of determining the existence of distortion and the degree of regeneration present in the receiver or amplifier system, by bringing to light the exact waveform of the signal fed into the receiver. Such distortion and regeneration tests are seldom if ever made upon a receiver with modern servicing apparatus.

Thus it is evident that the cathode-ray oscilloscope is destined to be another unit required by the service technician as a means of enabling him to cope with the more intricate receivers and to render superior service. However, it would not be just to conclude this introduction so abruptly. It must be

said that the versatility of the cathode-ray tube is extremely great and, as a result, the serviceman will find this tube to be of greater utility and value than anything which has as yet been presented to him. This tube has very many applications, all of which will raise the standard of servicing.

As to what units related to alignment will be eliminated, it is difficult to say, because the cathode-ray tube is really not a portable tool. In the shop, the output meter, in whatever form it now appears, will find little application, because the cathode-ray tube will not only indicate all that the present output meter indicates, but in addition, much more information than ever can be gleaned, as a result of the use of the output meter. Test oscillators will be even more valuable with the cathode-ray tube, than they are today.

(To be continued)

Be on Your Guard Against Swindlers

Upon several occasions we have published warnings against buying Rider's Manuals from a man who calls himself J. H. Brown or Nelson, who has been illegally representing himself as our agent and has been swindling servicemen out of money. This man Brown has been operating in Texas, California, Nevada, Utah, Montana, Minnesota and North Dakota. . . . Where he will operate next, we do not know. . . . However, this is his description as received from a man in Hollywood, California, who had been duped.

The said J. H. Brown is about 27 years old, about 150 pounds in weight, sandy hair and light complexion; dresses well. The last time seen, he wore a brown coat, grey trousers, tan shirt and tie to match. Below is shown his signature, as it appears upon sales slips handed out by him and as he endorsed a check in Glendive, Montana, which he received from a serviceman in that town.



Signature of J. H. Brown

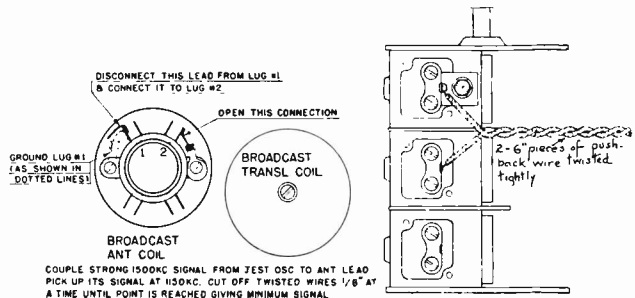
Be On Your Guard Against This Man —And All Supposed Agents!

We do not have any deals which involve a cash payment and the balance C. O. D. If any one approaches you with any proposition where you can buy Rider Manuals at ridiculously low prices and where you pay a cash deposit and pay the balance when the manual is shipped—REFUSE THE MAN. . . . MAKE HIM DELIVER THE MANUAL BEFORE YOU PAY OUT A PENNY.

We Employ No Agents!

It is realized that all servicemen in the United States do not read "Successful Servicing" and so have missed this and previous warnings about Brown. . . . Please make it your business to tell your friends and so protect them against

A method is here illustrated for reducing the trouble due to image frequency response of Silvertone Models 1805-A and 1826-A



being robbed. . . . Buy your manuals from your distributor and from people whom you know definitely to be honest. . . . If you belong to a servicemen's association bring this warning to the attention of the members.

Heed This Warning . . . It Will Save You Money!

Sears-Roebuck 1805-A, 1826-A.

If trouble from image frequency response is experienced, try the following suggestions received from the manufacturer. These notes are dated 1/24/35. These receivers are shown in the various issues of Rider's Volume V on pages 5-33 and 5-34.

1. Reverse the connections to the primary of the broadcast antenna coil as follows: Remove the shield can from the broadcast antenna coil. Unsolder the ground connection from lug 2 of the broadcast antenna coil primary. (See illustration.) Unsolder the lead that runs to lug 1 and solder it to lug 2. Run a ground connection to lug 1.

2. Solder a 6-inch length of push-back wire to the trimmer stators of the two sections of the variable condenser nearest the dial. (See illustration.) Twist these two pieces of wire together. Take care that the wires do not become bared at their ends and touch each other.

3. Couple a test oscillator to the antenna lead of the receiver and adjust the test oscillator to supply a strong signal of approximately 1500 kc. Leaving the test oscillator at this setting, tune the receiver to a frequency 350 kc. lower. The response heard at this point is the "image" of the 1500 kc. signal. Now cut off the twisted wires about 1/8 inch at a time, until the point that gives the weakest response is reached. If, in making this adjustment, a little too much wire is cut off, it can be compensated for by twisting the two wires together more tightly.

4. After the adjustment has been made, re-peak the broadcast antenna and translator trimmers at 1400 kc. as described in the manual. A further slight adjustment of the two twisted wires after the trimmers have been re-peaked is advisable.

These instructions also apply to the models 1808-A and 1841.

Chevrolet Model 364,441

There has been quite some confusion concerning the similarity between this receiver and another bearing the name and model number of United Motors Service. We have been successful in securing this and some other data pertaining to Chevrolet auto radio receivers. The remaining information will be presented at some future time.

The schematic wiring diagram of the Chevrolet model 364,441 auto radio receiver is shown herewith. It is significant to note the following changes which have been made: In receivers below serial number 1,255,182, either the old or new C-13 condenser block may be used for service; in receivers above serial 1,255,182, condenser block number 1,207,901 MUST be used exclusively. When a new condenser block number 1,207,901 is used for replacement in a receiver below serial

1,255,182, the connecting wire from the cathode of the i-f. tube socket to the cathode of the r-f. tube socket should be removed. The new block has two white leads, both connected to the same section inside the condenser, and one of these leads should be connected to the i-f. cathode and the other to the r-f. cathode. Either lead may be connected to either cathode.

All receivers bearing serial numbers higher than 1,292,774 have a five-ampere fuse in the 6-volt side of the vibrator circuit, between the switch and the L-1 choke. The fuse block is mounted on the trans-vibrator assembly.

Voltage Chart

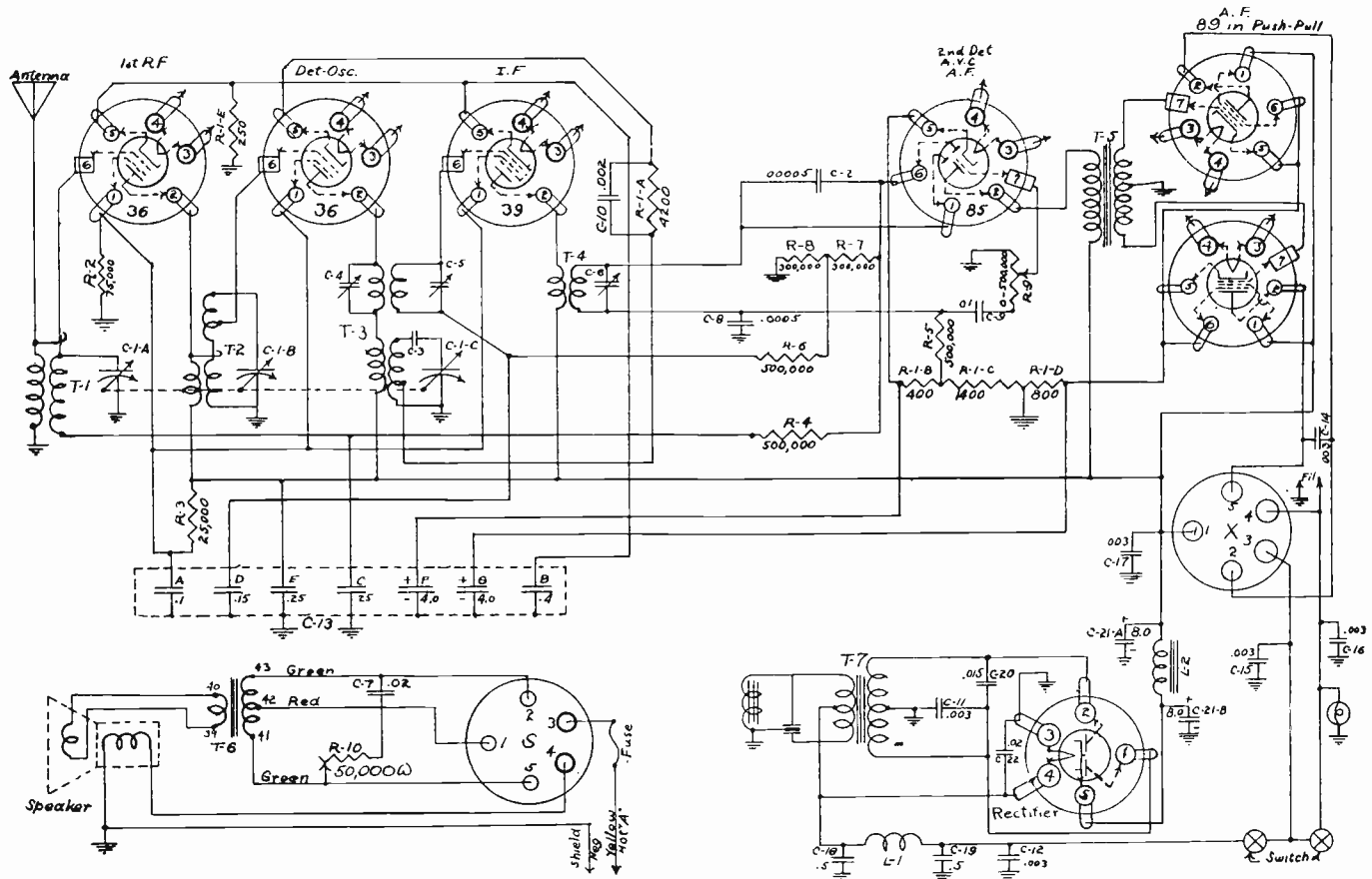
The voltage readings given herewith are measured between the respective tube contacts upon the sockets and the chassis.

Tube	Screen	Plate	Heater	Heater	Cathode	Sup. Grid
#1	#2	#3	#4	#5	#6	#6
RF	100	175	0	6	2.5	
Osc.	100	150	0	6	7.5	
I-F	100	175	0	6	2.5	
Det	2 Det	165	6	0	10.5	O-AVC
AF	175	175	0	6	19.5	19.5
AF	175	175	0	6	19.5	19.5
Rect.			0	6	190.0	

The receiver is peaked at 262 kc.

Philco Designations

Certain suffix letter designations are used in the Philco line. It might be well if you familiarized yourself with the fact that these suffix letters indicate the type of cabinet used. Thus the letter "B" means "Baby Grand," the letter "C" means Compact, etc. The exception to cabinet types is the letter "A," which indicates the all-dry battery model in contrast to the wet battery or storage battery model. In the case of AC operated receivers, the letter "A," signifies the 25-cycle chassis.



The six-tube Chevrolet Model 364,441 schematic diagram

Worldwide—and Then Some

Wherever American receivers go, Rider's Manuals go too. They are accepted in foreign lands as standard by servicemen and radio laboratories, just as they are in this country. In checking over the countries to which Rider's Manuals have been shipped in the year just past, it was found that the servicemen of the following countries have found them to be as invaluable as you have:

Argentina	India
Australia	Italy
Belgium	Japan
Bermuda	Manchukuo
Brazil	New Zealand
Canada	Nicaragua
Chile	Northern Rhodesia
China	Norway
Colombia	Palestine
Costa Rica	Persia
Cuba	Peru
Czechoslovakia	Portugal
Denmark	Roumania
Dominican Republic	Russia
Dutch East Indies	Siam
Dutch West Indies	Spain
Ecuador	Sweden
Egypt	Switzerland
El Salvador	Tibet
France	Turkey
Great Britain	Union of South Africa
Guatemala	Uruguay
Hungary	Venezuela
Iceland	

Truly it can be said that the sun never sets on Rider's Manuals—the absolute peer of all manuals.

300 Servicemen Wanted

We have been requested to secure for a manufacturer and distributor of recording equipment the names of three hundred servicemen who reside in cities of over 25,000 population, and who are familiar with the servicing of recording apparatus. We offered the pages of SUCCESSFUL SERVICING free for this purpose, because we felt that such a connection would be of benefit to servicemen, who could qualify to do this work, as it would give them an entree to many sources of new business.

Men for whom this manufacturer is looking *must* be familiar with the servicing of small motors, pick-up devices, recording cutters and power amplifiers in general. If you are interested and believe yourself competent to do such work, send us your name and address together with a short, concise statement of your experience and we will forward it to the manufacturer.

RCA Model RE-17

The model RE-17 has the radio receiver equipment of the R-15 with the reproducing equipment of the RE-57, without the home-recording portion. See Rider's Manuals, pages 1-14, *521 and 1787 for the R-15 and pages 1-30, *524 and 1856 for the RE-57.



Warning to Motorists

Passenger: Honey, what's that light I see shining in your eyes?

Driver: That, sir, is my stop light.

Voice over phone: Please tell me where I can get hold of Miss Stewart.

PBX Operator: Search me; she's mighty ticklish.

How to Do It

"Just Nuts" in December included an arithmetical problem. The solution is as follows:

Add the sum and difference of the two numbers and divide by 2. Then subtract the sum and difference given and divide by 2. You now have the two required numbers. Didja work it out yourself?

Soprano (after broadcasting): That last note I sang was D flat.

Announcer: I thought so, too, but I wasn't going to mention it.

Just Like a Poker Game

Did you know that my wife had a twin sister?

Gosh, no! How do you tell 'em apart?

I don't bother; sister has to look out for herself.

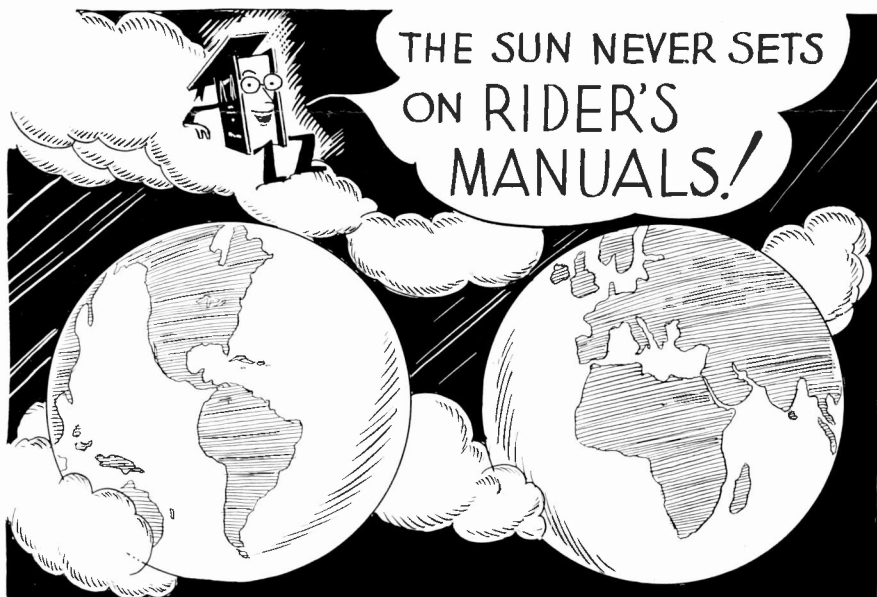
Saleslady: This evening dress is forty-three dollars.

Shopper: Don't you think you could cut that a bit?

Saleslady: Well, madame, I think you'll find it quite décollete as it is.

Misnomers

The word rheostat contradicts itself. *Rheo* is Greek for flow; *stat* for standing still. . . . A soldering iron is really a soldering *copper*. . . . An *amateur spark* is a ham fireman, according to a *Boston Post* article. . . . A radiophone is an apparatus for producing sound by the action of heat or light rays. . . . A tester is a coin which once was worth thirty-six cents.—*Courtesy Q. S. T.*



Successful SERVICING

Dedicated to financial and technical advancement of the radio service man.

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Vol. I January, 1935 No. 5

That Taint of Being In Business

A correspondent asks, "Why taint the service profession by all this talk about business and business tactics?"

Is it possible that the many thousands of independent service technicians, who are running their own establishments, have been doing so for a long time without realizing that they actually were in *business* for themselves? . . . They were in business the moment they hung out their shingle over the porch, garage or opened the doors of their store.

What else but business, in every sense of the word, is the buying and selling of radio tubes, resistors, condensers, tone controls, speakers and even receivers? Does business differentiate between the location of the spot where the transaction is made? Not by a long sight. Business, as we understand the term, does differentiate between the man who is completing the transaction for his personal gain or for his employer. The man who sells for some one else is not in business for himself, but nevertheless he is engaged in a commercial enterprise, even if the sale is only a part of the reason for exacting a certain amount of money from the customer.

What else but business is the advertising carried on by service organizations in local newspapers and the classified telephone books? What else but business is the mailing of direct-mail literature to secure customers for the store—

to secure service calls? What else but a business effort is the free service call or the establishment of the minimum charge for an examination? What else but a business step is the contract which is signed by the service technician to purchase a certain number of tubes on contract and thus secure any one of a number of premiums, and then to sell these tubes to the customer? What else but business is the demand on the part of the service technician that he secure the dealer's discount on part and accessory purchases?

The past two years has witnessed a great deal of agitation about list price and net price catalogs. The prime reason for whatever has been said about these catalogs, is the supposed curtailment of income from the sale of the replacement parts used in the equipment which was repaired. . . . Is it possible to deny then, that these parts are sold to the customer and that the serviceman is complaining about the fact that the net price catalog is interfering with the income and profits of his business? Servicemen working for themselves are in business—have been in business and always will be in business—as long as the establishment exists.

The correspondent, who asked the question which heads this story, wrote his communication upon a letterhead which stated that in addition to general receiver service, he serviced, sold and installed public address systems, electrical phonograph equipment, etc. Here is a man in business, who does not know it.

John F. Rider.

NOTICE

Every owner of Rider's Manuals should be receiving **SUCCESSFUL SERVICING**, so that he can keep these important servicing tools up to the minute. There are other servicemen who have not yet bought Rider's Manuals and who would like to be abreast of the times. Inquire among your friends to see if they receive **SUCCESSFUL SERVICING**. Tell them to let us know about sending it to them. Remember, it costs them nothing and we will be only too glad to see that it is mailed to them monthly. Thanks for your cooperation.

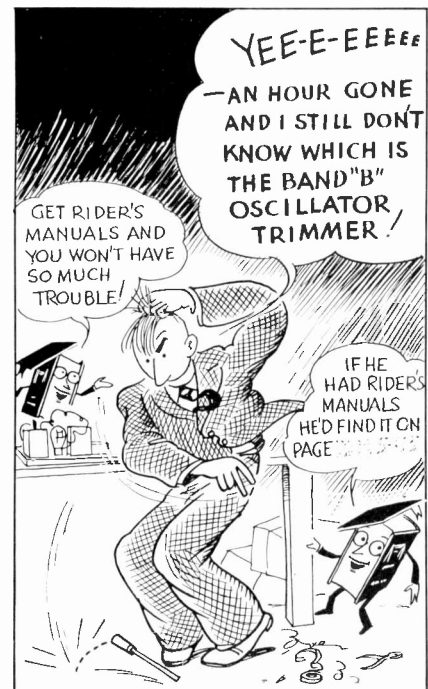
Did You Know That

Discounting surface irregularities, the **Earth** is an ellipsoid and is not a perfect sphere. The diameter of the Earth at the equator is 7,926.7 miles, whereas the diameter through the poles is less, being 7,900 miles.

The planet **Mars** has two satellites, known as *Deimos* and *Phobos*, discovered by Hall at the U. S. Naval Observatory in 1877. The satellite *Deimos* is only 5 miles in diameter and the satellite *Phobos* is only 10 miles in diameter. Contrast this with the Earth's satellite, the Moon, which is 2,160 miles in diameter.

Distance employed in connection with the study of Astronomy involves such prodigious figures, particularly in connection with the distance of stars from the Earth, that the term "**light year**" is used. A light year is the distance traversed by light in one year, the velocity of light being 186,284 miles per second. The number of miles in a light year is 5,875,197,199,704. This is based upon a solar year of 365 days, 5 hours, 48 minutes, 45.51 seconds.

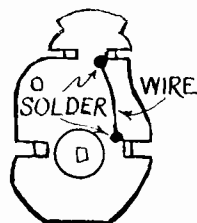
Adventures of HAP HAZARD



Philco Volume Controls

Two general types of volume controls are used in the current Philco models and these can be distinguished by the switch on the back of the control. On one of these the on-off switch is black molded bakelite on which is stamped "CTS CO." On the other type, the bakelite is entirely round and is stamped at the bottom "SC CO." This last type is the one being supplied at the present for replacement purposes. If difficulty has been experienced with the first type, it is suggested that the last type be replaced in sets.

Rear view of Philco volume controls, showing the two points between which No. 36 wire is soldered



Another comparatively simple method for correcting noise in the CTS type control is to solder a fine wire, No. 36, between the two points indicated in the accompanying illustration. The wire should be tight enough so that it does not sag over against the shaft in the center, and yet sufficiently loose so that it does not bind the contact shoe and thus prevent free movement of this contact element. This work can be easily done by removing the back casing of the volume control by bending back the retaining lugs. It will be unnecessary to unsolder the wires which are connected to the control terminals. The installation of this wire insures better electrical contact between the contact shoe and the center point connection.

Philco Model 38 (Code 123)

Effective with run No. 9 a change in the volume control will be made. The value of the new volume control, which is Part No. 33-5094, is the same as before, i.e., 20,000 ohms; however, the lead from the antenna series condenser (40) will be connected to the arm of the control instead of the upper end, which now will be open. Also a by-pass condenser, Part No. 6287K (0.15

mf. bakelite block) will be added from the lower end of the volume control to ground. These changes produce quieter operation of the set. See schematic on page 4-22 of Rider's Manual.

Sparton Model 36

To protect the life of the vibrator in the Sparton model 36 auto radio receiver, add a 0.01 mfd condenser, rated at 1,600 volts, across the secondary winding of the power transformer in the eliminator unit.

Install this condenser in every one of these receivers you may be called upon to service, adding the cost of the condenser and installation to the customer's service charge.

*He who has a thousand friends
has not a friend to spare.*

—Omar Khayyam.

Sears-Roebuck 1857

A unique form of volume control is used in this receiver and we feel that it deserves mention. The schematic is shown upon pages 5-47 in the various issues of Rider's Manual Volume V. The output i-f. transformer is equipped with variable coupling between the primary and secondary windings. The variation in signal transfer between these two windings, as a consequence of the change in coupling, is the volume control. Incidentally, the i-f. coupling unit, employed between the i-f. amplifier tube and the demodulator or second detector, is resistance-capacity coupling. Only the input and output i-f. coupling units are of the transformer variety.

Certain instructions pertaining to the increase of "high" audio response has been furnished by the manufacturer. Connect a 15-mmfd. condenser between the plate terminal of the input i-f. transformer primary and the grid terminal of the input i-f. transformer secondary. This condenser can be mounted inside the i-f. transformer shield can, atop of the Isolantite base. It will be necessary to re-peak the i-f. transformer at 175 kc.

Zeke's Tool Chest

Once upon a time there was a Young Fellow who decided he would be a Carpenter. He stowed his spare pennies and nickels in an old Tomato Can on a shelf in the tool house, for he was going to buy a Tool Chest, so he could Ply his Trade. When he had Four Dollars he went to the town hardware store and interrupted the checker contest the Merchant was waging.

"I want a Tool Chest," said Zeke.

"Look 'em over," said the Merchant, the which Zeke did.

After painful deliberation Zeke decided to buy a shiny red Tool Chest which contained seventeen tools, against the advice of the Merchant, who said that the seven-fifty Chest had thirty-four tools, which he knew Zeke would need. But Zeke Knew Better and lugged home the red Chest.

The Family were properly awed by the grand display and Father suggested that Zeke install the new lock on the front door. Zeke discovered that he didn't have a one and a quarter inch bit to bore the hole. That one was in the more expensive Tool Chest, so he had to worry the hole through the door, as best he could with a smaller bit, a round file from the shelf in the Barn, four skinned knuckles and two Tons of Elbow Grease. He didn't enjoy his labors nor his sire's caustic comments on the length of time he had taken on the Job and the Appearance of the job.

On several other Jobs Zeke found that he was Handicapped because the Tools in his Chest were not Just Right and he began to have Bitter Regrets that he had not followed the Merchant's advice that he save a few more Pennies and Nickels and buy the other Tool Chest, for he was losing Money and Jobs. He decided he would buy one or two other Tools at a time as he needed them, but this Cost a lot more Money than if he had bought them in one Chest. So he finally Decided to stop all this monkey business, get rid of his red tool chest and buy the one which had the Tools he Needed.

MORAL: Tool Chests and Manuals are a Lot Alike.

Voltage Data for Arvin Model 16

Below will be found the voltage data for Noblitt-Sparks Model 16, which will be found on Arvin page 5-19 of Rider's Volume V. Plus or minus 20% on all voltages is acceptable.

Tube	Plate	Screen	Cathode	Suppressor
78	230	100	4.5	0
6A7	240	100	4.5	—
78	240	100	7.0	0
75	85	—	1.5	—
41	235	240	18.5	—
84	235 (AC)	—	235	—

At 1,500 kc. the anode grid and oscillator grid of the 6A7 should have readings of 180 and from 5 to 10 volts, respectively. All heater voltages are 6.0 volts.

Philco Model 29 and Model 45

Starting with Run No. 16, the cathode resistor (8) will be Part No. 33-3010 (300 ohms) instead of Part No. 7217 (200 ohms), which was formerly used. This change improves the set's stability. See schematic diagrams on page 5-14 and 5-26 of Rider's Volume V, respectively.

Philco General Change

In Models 18, 60, 66, 89, 118, 144, 200 and 201, the wiring to the type 78 tubes has been changed in order to make use of the European tube, type 78-E, interchangeably with standard 78 tubes. The suppressor grid is now being connected direct to ground instead of to the cathode. The cathode circuit otherwise is unchanged. The schematics for the above models will be found on

the following pages in Rider's Manuals: Model 18, page 4-15; 60, page 4-32; 66, page 5-32; 118, page 5-36; 144, page 5-41; 200, page 5-45.

Service Talks

John F. Rider will address the servicemen in the following cities on the dates indicated: Elmira, N. Y., January 22nd; Hackensack, N. J., January 24th; Waterbury, Conn., January 25th; Boston, January 28th, and Youngstown, Ohio, February 11th.

Notice

Starting with this issue it is our purpose to print as much of the technical material that you might want to clip and paste in your Rider's Manuals, in such a way that it is not backed up by any items of like nature. Please excuse us if technical material is backed up by similar information . . . sometimes it just can not be avoided.

Sparton Model 35

The i-f. peak of this receiver is 172.5 kc. Please make a note of this on the schematic diagram, which will be found on page 3-5 of Rider's Volume III, and on page 2245 of the Radiotron-Complete edition.

Colonial Model 39, 125

The schematic diagram of this receiver, found on page 1-18 of the revised edition, *208-B of the early edition of Volume I and on page 574 of the Radiotron-Complete edition, does not agree with the chassis wiring diagram supplied by the manufacturer. The chassis wiring diagram will be found upon pages 2-13, 208-B9 and 575 of the respective editions of Rider's Manuals mentioned above. The connections of the rectifier tube in the schematic diagram are correct. The connections to the 8.0 mf. condenser, 5758-A, are incorrect in the chassis wiring diagram. A lead is shown connecting one side of this condenser to the upper plate terminal of the 280 socket. This lead should go to one of the filament terminals.

Colonial Model 47, 48

On page 2-26 of Rider's revised Volume II, page 208-F of the early edition, and on page 588 of the Radiotron-Complete edition, correct the total plate current to read .075 amp. in the voltage table for 60-cycle operation instead of 1075 amp.

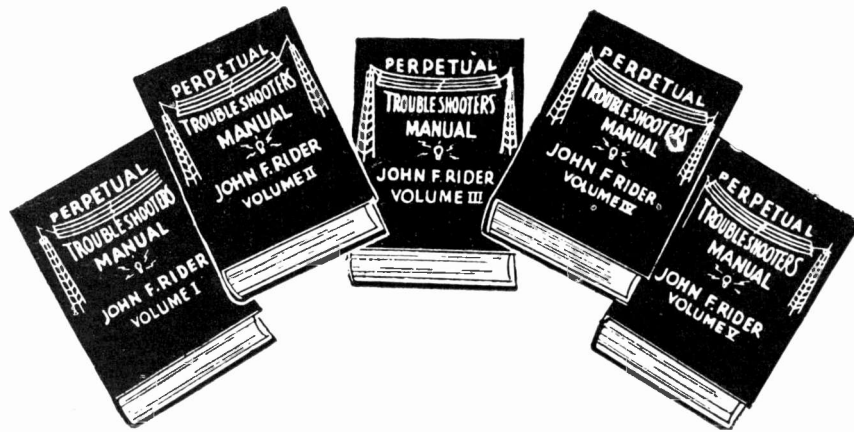
Philco 200, 200-X

The Philco model 200 and 200-X are the same. The suffix letter X, denotes that the chassis is mounted in the sloping baffle type of cabinet. Accordingly, these two models are covered in the Rider Volume V, although the index refers only to the model 200.

THE QUINTUPLETS Work for EFFICIENT JOE



MAKE 1935 PROFITABLE



*Rider's Manuals are
Guaranteed the World's Finest*

Volume V

In the past various manuals have been offered to the Radio Servicing fraternity, but never before has such a stupendous compilation of technical servicing material been collected between two covers. . . . It is true that Rider's Manuals have established a standard for details which are invaluable to the Serviceman, but even this standard has been surpassed in Volume V. . . . No details were too minute—nothing was deemed too trivial to be omitted, if that information would aid in any way whatsoever a Serviceman in doing his job. . . . The thought of expense was thrown aside in making Rider's Volume V all-embracing in its scope and coverage. . . . All the essential servicing details of over 940 models are presented in a manner that requires superlatives in its description. . . . The new receivers of 1935 have complications galore—not only in their circuits, but in the mechanical features as well and because of that, it is abso-

lutely necessary to have every bit of available information at your finger tips when you need it. . . . And this information is easily found by means of the separate 64-page Index that lists exactly what appears on every page in all five volumes. . . . Everything is simplified to the greatest possible extent for your convenience, so that waste motion can be eliminated with a resulting increase in your profits. . . . Never before has any single manual been offered to the servicing field that contained 1200 pages and that covered the products of 112 manufacturers. . . . These facts are all-important when you are in the market for a manual. . . . Do not take our word for anything—step into your dealer's today and prove to yourself that Rider's Volume V is without doubt the servicing sensation of the year—better than any other manual—THE ABSOLUTE PEER!

1200 pages, \$7.50

Volume IV

Receivers manufactured up to March 1934 are included in this volume. Herein will be found the more complicated superheterodynes with QAVC, noise gates, flasher tuning indicators, duo-diode pentodes used two and three times in reflex circuits, half-wave and full-wave detectors, automatic tone control, bucking bias voltages, electron-

coupled oscillators and all the other refinements that were introduced in this period. The manufacturers and trade names in Volume IV assure you of a real coverage of the radio field. A Special Section of 24 pages explains some of the more complicated receivers. A 40-page Index covers Volumes I, II, III and IV.

1060 pages, \$7.50

Volume III

From the middle of 1932 to June 1933. The Superheterodyne was introduced in this period and these sets are to be found in Volume III.

1070 pages, \$7.50

Volume II

This volume covers the period between early 1931 and the middle of 1932. Some early sets are found in this volume that were unavailable when Volume I was published.

800 pages, \$6.50

Volume I

This volume covers the period between 1919 and early 1931. The great majority of the old sets are to be found in this volume.

1000 pages, \$7.50

Servicing Superheterodynes

A comprehensive and easily understood explanation of the superheterodyne, which every serviceman should own. The thoroughness of the subject's coverage and the practical service hints given will mean dollars in your pocket in time saved in analyzing trouble. 288 pages, \$1.00

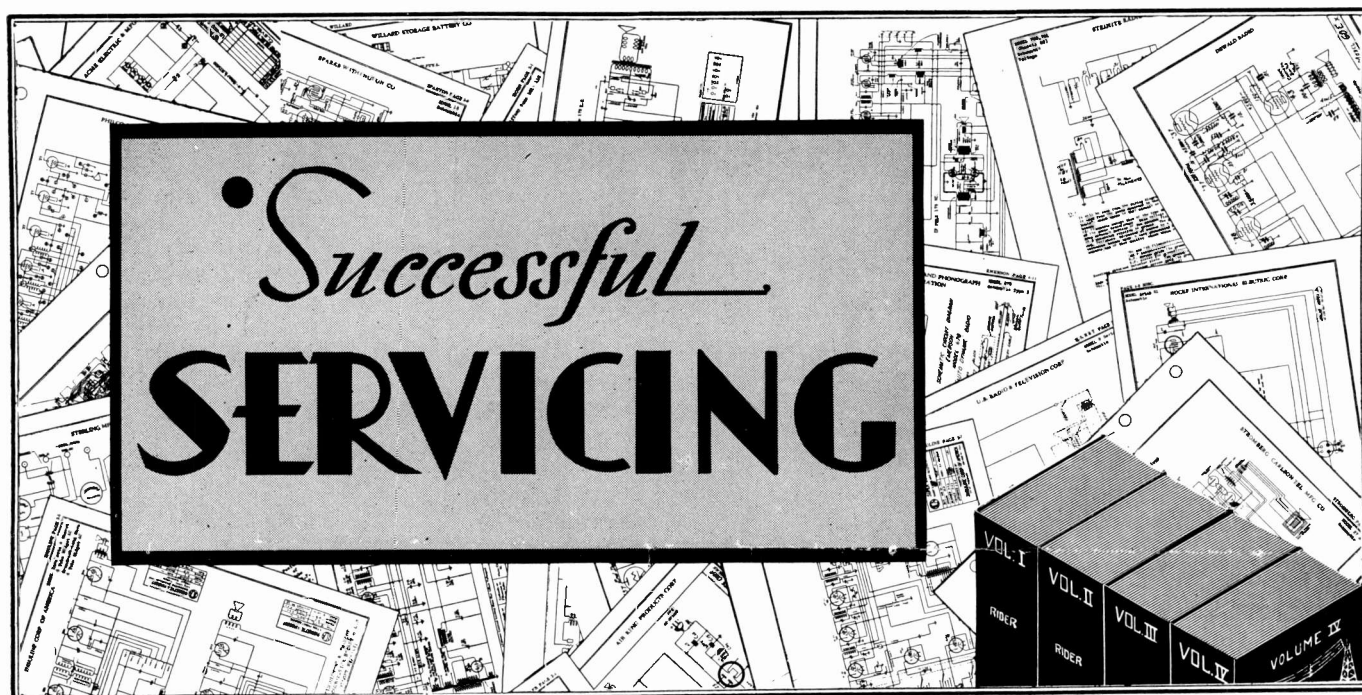
RIDER'S MANUALS HAVE more schematics . . . more i-f. peaks . . . more alignment data . . . more circuit descriptions. . . . MORE EVERYTHING THAN ANY OTHER MANUALS.



JOHN F. RIDER, PUBLISHER

**1440 BROADWAY
NEW YORK, N. Y.**





RIDER'S *SUCCESSFUL SERVICING* LABORATORY

What It Will Do and Why It Was Founded

It is seldom that a book publisher maintains a laboratory for the purpose of investigating the field covered by his books—but such is the case with us. . . . We have equipped a research laboratory wherein research work will be conducted along radio and public address lines and in conformity with whatever developments or trends become associated with the service field or industry.

Several months of intense work have been carried on in connection with the cathode-ray tube as applied to radio service, public address amplifiers and the "ham" field. . . . This, plus the work which John F. Rider carried on for many years, will constitute the background for two books devoted to cathode-ray tubes, which will be published sometime during the month of April 1935.

Our laboratory will be the proving ground of ideas which will be presented in books we shall publish in the future, inclusive of Rider's Manuals. It is our aim to publish Rider Manuals, which will be so far superior to all other volumes offered for simi-

lar use—that Rider's Manuals will be beyond comparison.

Servicing suggestions and practical applications which will find their way into future Rider publications will have been TRIED AND TESTED. . . . To be able to state definitely that "such is such"—and to make certain that the statement made will stand the closest analysis—we have founded the *Successful Servicing Research Laboratory*.

A New Policy

We have established the new policy that we shall refrain from printing continued articles which will require several months for completion of the series. Please read our editorial on page 5 concerning the cathode-ray series which was started in the January, 1935 issue of *Successful Servicing*.

Thanks.

All possible aids in radio servicing and helpful suggestions have not as yet been made. . . . Myriad more are possible and it is our desire to cooperate with the servicing industry to the fullest extent. . . . We feel that we can do no more than to actually analyse radio service problems as they are experienced in the field, then determine and present the solutions to you. . . . We forecast that this Rider laboratory is going to be of the greatest possible aid to you.

Kind of Equipment on Hand

No doubt you're wondering about the type equipment we have on hand for all of the work we have in mind. Well, we feel that we have quite a representative and efficient selection. The few photographs given herewith do not do the apparatus justice. In the line of oscillators and signal generators, we have the following:

Western Electric audio oscillator with a range of from 30 to 50,000 cycles. This is a regular audio oscillator and

(Continued on page 8)

How Much P. A. Business DO YOU DO?

We've been hearing lots of stories about the vast amount of public-address business which is being carried on by service men and organizations. What's the truth in this matter? . . . How many servicemen sell, install or build public address equipment? . . . We would like to know for future guidance. . . . Certain manufacturers have come to the conclusion that the men who read SUCCESSFUL SERVICING, represent an excellent cross section of the servicing industry—and as a result have come to the editors of S.S. to find out if there is any truth in the statement that Public

Address work is such a lucrative field. . . . What do you think?

Take your pen in hand and write us on a postcard. . . . Tell us what you think about the public address field. . . . If you do P.A. work—have done such work—or intend doing such work. . . . Spend the penny or two for the postcard. . . . The information we hope to derive and the possible results therefrom—will be of definite aid to you. . . . Here is an opportunity to guide the manufacturers as well as the servicing industry.

Philco Model 091 Crystal Signal Generator

If you are in possession of one of these units and the crystal has failed you, in other words, refuses to oscillate, consider the following:

Occasionally a very small amount of

dirt or grease will get inside the crystal holder and will cause failure of the instrument to oscillate. Before making any attempt to clean the crystal, a careful check should be made of the "A" and "B" batteries. Also the adjustment of the mica adjusting condenser at the front of the instrument should also be checked.

If the unit fails to operate and the batteries and the aforementioned condenser are in good condition, carefully remove the top of the crystal holder and gently wipe off the surface of the crystal with a small piece of chamois, which has been moistened in carbon tetrachloride, carborana, or the new type of non-flammable Energine. Do not use an ordinary cloth or any cloth which contains lint, because even the smallest particles of foreign matter, if lodged upon the surface of the crystal, will make the unit inoperative. The surface of the crystal must be **PERFECTLY CLEAN and SMOOTH**. The inside surfaces of the crystal holder must also be cleaned with the cleaning fluid in the same manner and **MUST** be free of all foreign matter.

Resistor Replacement

An item which has been annoying us for many years is one relating to

resistor replacement. If a resistor or volume control fails after a period of operation, and replacement is required, is it due to deterioration of the resistor or to the fact that the wattage rating of the resistor is not enough to allow the proper amount of current to flow through it, after the resistor has been in use for a while. In other words, when replacement is necessary, should the identical resistor be used or should one of high wattage be employed? . . . What do you think?

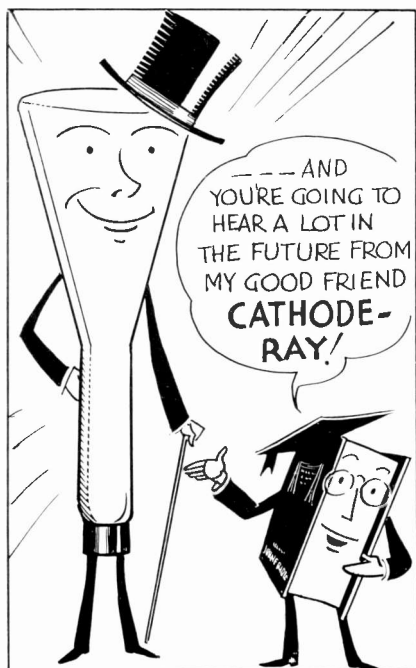
Resistance Measurement

Several men have written to us asking if we had dropped the idea of servicing receivers by means of resistance measurement, in other words, "point-to-point" servicing, which was so much publicized by the editors of this publication. Let it be known that activities have not ceased and we are proud to state that Volume V of Rider's Manuals contains point-to-point data and other information, which enables servicing receivers by means of resistance measurement. If you check through Rider's Volume V, you will find that numerous manufacturers are furnishing data of this type. For example examine the service data for Atwater-Kent, Buick Motor Car, Colonial, Fada, Fairbanks-Morse, Galvin, General Household Utilities, Montgomery-Ward, Noblitt-Sparks, RCA, Sparton, Transformer Corp. of America, and Wells-Gardner. Since the RCA sets are like the General Electric receivers listed in this volume, this means one more name.

If you want a complete résumé of what constitutes servicing receivers by means of resistance measurement, its advantages, the various methods of operation, etc., visit your jobber and ask him to show you Rider's "Servicing Receivers by Means of Resistance Measurement."

You will find this volume of 203 pages, selling for only \$1.00 to be a veritable gold mine of information. *Many thousands of service technicians have purchased this book and have expressed complete satisfaction. . . . Examine this book. . . . Any jobber handling Rider's books, will be pleased to show you a copy.*

Introducing



Hum In The Sparton 333

A possible cause for hum in the Sparton 333 auto radio receiver (Rider's Manual Volume IV, page Sparton 4-20) may be a "floating" ground at the eyelet of the type 41 output tube. One side of the heater circuit is grounded at this point, and if the eyelet becomes loosened, a poor ground results, causing intermittent or "fading" hum of the same pitch as the vibrator.

This may be corrected by soldering two additional ground connections of the same type and in the same circuit, one at the type 6F7 socket and one at the type 78 socket. A grounding wire should also be run from the ground circuit heater terminal of the type 75 tube socket over to the resistor mounting plate, which should be grounded. (This service hint supplied by Sparks-Withington, originated with Mr. Charles Wengert of the Bushwick-McPhilben Corp. of New York City.)

Sparton 70, 77 Alignment

The schematic of this receiver arrived too late for publication in Rider's Volume V, but since these receivers are out in the field, it might be well to furnish alignment information. As to general procedure, the models 70 and 77 are aligned in accordance with the alignment data given for Sparton models 67, 68 and 691 on page Sparton 5-10 in Rider's Volume V. If you will refer to the end view of the 67, 68, 691 chassis on Sparton page 5-10, you will find that it is similar to the end view of the models 70 and 77 and the trimmer specifications for the antenna, r-f and oscillator circuits, as given on page 5-10, are identical for the models 70 and 77. In addition, the 70 and 77 receivers have an oscillator padding condenser accessible through the rear, near the left end of the chassis, looking at the chassis with the tuning dial nearest the observer.

The models 70 and 77 have two i-f. transformers, where as the models 67, 68 and 691, have but one, so that when aligning the models 70 and 77, remember that there are two additional adjustments. The first and second i-f. transformers, in the models 70 and 77 are

located exactly as shown in the chassis view of the models 67, 68 and 691 on Sparton page 5-10. The third i-f. transformer, in the models 70 and 77, is located near the second i-f. transformer, as a matter of fact, adjacent to the type 30 output tube.

The suggestion is made when adjusting these i-f. transformers to adjust the last stage first and proceed towards the first stage.

Aligning Sparton 104

Please add the following data to your Rider Manual Volume V Index. The model 104 alignment data is given on pages Sparton 5-17 and 5-18, in connection with the Sparton, 80, 83, 84, 85-X and 86-X receivers.

Aligning Sparton 105-X, 135 and 835

For aligning these receivers, use the data given in connection with the models 80, 83, 84, 85-X and 86-X on Sparton pages 5-17 and 5-18 in Rider's Volume V.

Sparton Models 65-T and 66-T

If you examine your Rider Manual Volume V index, you will note a reference to the models 65-T and 66-T on Sparton page 5-7 in connection with the Sparton models 65 and 66. These four receiver models are substantially the same, except for the fact that the power plant in the 65-T and 66-T employs a transformer, and the receivers are suitable for use on A-C circuits only. Herewith is shown the power plant circuit of the models 65-T and 66-T. If you will add this data to Sparton page 5-7 and also note the following changes in electrical values, you will be in pos-

session of the circuits covering these four receivers. The various tuning and amplifying circuits shown for the models 65 and 66 are identical in the models 65-T and 66-T. The reference destinations of the leads shown on the diagram given herewith coincides with the reference designations on Sparton page 5-7. One special item which we want to call to your attention is that in models 65-T and 66-T, the resistor R-14, as shown on page Sparton 5-7, is omitted and that other items in models 65-T and 66-T are in accordance with the "change notes" given on Sparton page 5-7.

"X" Models In The Sparton Line

Some of the Sparton model numbers conclude with the letter "X". The following data will no doubt be of value when seeking equivalent circuits in Rider's Manuals. In some instances, the "X" denotes a receiver intended for export sale and containing a special power transformer. In other cases, the letter "X" denotes some addition to the basic circuit.

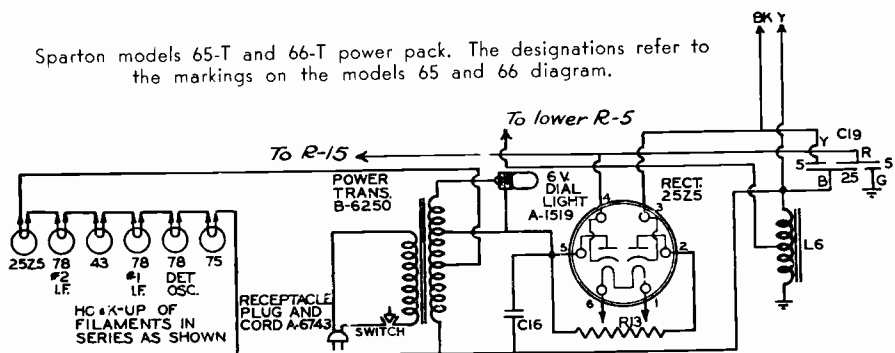
Model 27-X is the model 18 chassis used in a model 27 cabinet. (Rider Manuals Sparton page 3-10, 3-11, 4-2, 4-3.)

Model 67-X is the same as the model 67 with a special power transformer and is intended for export. (Rider Manual Sparton 5-10, 5-11, 5-12.)

Model 73-BX is an export model.

Model 80-X is the same as the model 80, with a special power transformer and is intended for export.

(Continued on page 7)



Regeneration In Receivers

Just a passing thought, but of definite significance. We recently worked upon a superheterodyne receiver which appeared to possess the required amount of sensitivity and selectivity and sounded well. However, upon more critical analysis of the performance, we noted a certain hiss background, which obviously was regeneration. The amount of regeneration did not appear excessive, as a matter of fact it would have passed routine inspection. Yet we were curious to determine the effect of this amount of regeneration upon the r-f. and i-f. portions of the receiver. In other words, we wanted to know just what influence it had upon the passage of the modulated r-f. signal. Having equipment on hand, we checked the resonance curve of the complete system, by means of an oscilloscope. The effect of the regeneration was immediately evident, in the increased steepness of the resonance curve and the comparatively narrow base.

The average person listening to this receiver would never suspect what was taking place and would undoubtedly state that the performance was satisfactory in every respect. The sensible service man, however, who should be more critical than the customer, would discern the hiss and make such a measurement. At least he will do so, after cathode-ray equipment becomes more generally accepted. Determination of the extent of regeneration in a radio receiver is one of the functions of the cathode-ray tube. Just as certainly as the sun rises and sets over this country, just so certain is the adoption of the cathode-ray tube for radio servicing.

Oscillograph or Oscilloscope?

No doubt you have witnessed the use of the words *oscillograph* and *oscilloscope* in connection with the recent announcements of cathode ray equipment. It is interesting to trace the origin of these descriptive terms and perhaps we may arrive at a conclusion of what is the correct term to apply to the device. We favor the word oscilloscope for reasons which are given herein.

What appears to be the first application of the word "oscilloscope" is found in the June 1927 issue of the *Journal of the American Institute of Electrical Engineers* in connection with an article by Bedell and Reich, wherein they describe an instrument by which it is possible to observe visually electrical phenomenon. This device was the cathode-ray tube and the aforementioned article described a means of stopping the image or synchronizing the horizontal sweep with the phenomenon being observed. Now, it might be well to state that the cathode-ray tube was in use long before 1927, but when used in connection with such observation work, it had been referred to as an "oscillograph", the term which for years had been applied to various other devices, employed for the observation of electrical phenomena. The word "oscillograph" was originally applied to the instrument developed by Blondel or Duddel, wherein a vibrating mirror reflected a beam of light upon a photographic film or upon a translucent screen. The vibrations of the mirror were caused by the phenomenon, which was to be observed. If a photographic record was made, it was known as an "oscillogram".

Viewed from the basis of the origin of the two suffixes "scope" and "graph", which are derived from the Greek meaning "to view" and "to write", respectively, it would appear as if the average cathode-ray instrument, would be best described, when referred to, as the oscilloscope; for after all is said and done, the primary purpose of the device is to enable the operator to actually view the electrical phenomenon. The device, which employed the reflected light beam, was used primarily to make photographic records, so that the word oscillograph, most fittingly described that device.

After all of this has been written, we realize that if the cathode-ray tube is used in conjunction with a camera to make permanent records, that it, too, could be called an oscillograph. However, we still feel that oscilloscope is a better name for the cathode-ray tube equipped device, if for no other reason than a means of differentiating between this type and the vibrating mirror type of instrument.



Albert: "Yes, the bullet struck my head, went careening into space, and—"

Bright Girl Friend: "How terrible! Did they get it out?"

—*Philadelphia Bulletin*

Program Manager: "If you're late again like this, don't bother showing up."

Tardy Artist: "Well, you see, it was like this. I squeezed too much toothpaste out on my brush and had an awful time getting it back in the tube."

Didya ever hear about the man who smoked so many Camels that his nerves got so steady he couldn't move?

Old Lady: "Why are you so excited, little boy? Can't you stand still?"

Young Fry: "Lady, is that any question to ask a gentleman?"

—*Penn Punch Bowl*

Frosch: "Ginger ale, please."

Waiter: "Pale?"

Frosch: "Heavens no; just a glass."

—*Green Griffin*

Husband (choosing a fountain-pen): "You see, I'm buying this for my wife."

Salesman: "Little surprise, eh?"

Husband: "You said it. She is expecting a Packard."

—*Stray Stories*

Salesman: "This is our companionate piano."

Customer: "What do you mean—companionate?"

Salesman: "Well, you try it two months and if you don't like it, don't keep it, provided there are no children."

—*Pauls Netting Gazette*

The quitter gives an alibi
The slacker he gets blue
The fighter goes down fighting,
But the real guy sees it through.

—*Pauls Netting Gazette*

She: Are you cool in time of danger?

He: Yes—but at the wrong end.

Successful SERVICING

Dedicated to financial and technical advancement of the radio service man.

Published monthly by

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John F. Rider Editor
G. C. B. Rowe . Assoc. Editor

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Vol. I February, 1935 No. 6

A New Policy

We made the statement in the first issue of SUCCESSFUL SERVICING that this publication was dedicated to its readers and that we would be influenced by the likes and dislikes of our readers. And so be it. . . . We practice what we preach.

The opening story of a series on the Cathode-Ray Tube had barely reached the hands of many of our readers, when to our surprise and gratification, a very large number of letters arrived. Realizing the importance of the subject and at the same time the all-embracing scope, these readers suggested that we refrain from publishing a series of articles on this subject and publish a complete book instead. As it happens, we have been working upon such a volume for quite some time, as you will notice by an advertisement in this issue. A large number of our readers felt that too many months would have to elapse before the conclusion and that the space available for such a series of articles could be put to much better use. As one man expressed himself "Can't you arrange to do this at once, instead of dribbling it along likely into the early summer?"

Well, we are arranging to do it all at once. However, instead of carrying on the publication of a number of ar-

ticles, each complete in itself and relating to the application of the cathode-ray tube in the operating life of a service organization. The reason for this is that we are continually at work in our laboratory and that we shall present new findings to our readers in accordance with the policy of John F. Rider, Publisher, to keep its customers continually up to the minute. In this way, the men who will purchase the two volumes devoted to the theory and practical application of the cathode-ray tube, will not only possess two reference volumes, but will also be supplied with current developments.

Perhaps an apology is due those readers who are disappointed by the discontinuance of the original series, but at the same time, we feel that by doing what we are, we serve the majority and provide space for the presentation of a more diversified type of service data. We shall refrain from publishing articles which will require months to complete.

John F. Rider.

Did You Know That

Napoleon spent seven years in exile upon the Isle of St. Helena and then died upon the island. His first period of exile was on the island of Elba. He escaped and returned to France. He organized his armies and was decisively defeated at Waterloo. About 100 days after his arrival from Elba, he again was making for the coast, with escape in mind. This time it was impossible, because the British fleet had bottled all the harbors. On July 15, 1815, Napoleon surrendered his sword to the British admiral, Hotham. He was transferred to another British warship at Plymouth and was taken to St. Helena.

Count Felix Luckner, a German, whose name you no doubt heard mentioned time and again, has the distinction of having been very much engaged in the world war, yet never to have taken a life. He roamed the seas and sank about 490,000 tons of shipping, particularly boats which carried food-stuffs for the Allies, yet never killed a person.

The **Pilgrims** who left England for America in 1620, departed in two boats, the *Speedwell* and the *Mayflower*. Some-

where off the coast of Belgium, the *Speedwell* got into difficulties and returned. The *Mayflower* on the other hand continued on alone.

The first **calendar** was supposed to have originated in Egypt about **4000 B.C.**

It is said that **Ice Cream** was first introduced in the United States by Dolly Madison, wife of the President of the United States, at a Presidential dinner.

The Gulf Stream, which helps the finances of Bermuda, is the warm ocean current that originates in the Gulf of Mexico. It flows north along the eastern coast of the United States and then flows towards the northwestern portion of Europe. Its width varies from five miles to approximately one hundred miles and it moves at a speed of about 3.3 miles per hour.

But screw your courage to the sticking place,
And we'll not fail.

Shakespeare.

Adventures of HAP HAZARD



Sparton Chassis Similarities

It is possible that some Sparton models may come in for service and that you will not be able to identify the exact chassis because of some suffix letter which may appear in conjunction with the model number. Accordingly, it might be well if you added the following data to your Rider Manual Index:

Models 57-A and 57-B are basically the same as the model 57, shown on page Sparton 5-3, 5-4 and 5-5.

The model 81-A is basically the same as model 81, shown on page Sparton 4-18 in Rider's Manual.

The model 105 is basically the 104, shown on page 5-19 and 5-20 in Rider's Manual Volume V.

Karadio Model 56

If the receiver oscillates, pull front half of cover, in which is mounted the loud speaker, back about one-half inch. If this does not cure oscillations, check up on the volume control. This last is especially to be checked in the early models. The schematic for Model 56 will be found in Rider's Manual, Volume V, on page Miscellaneous 5-9.

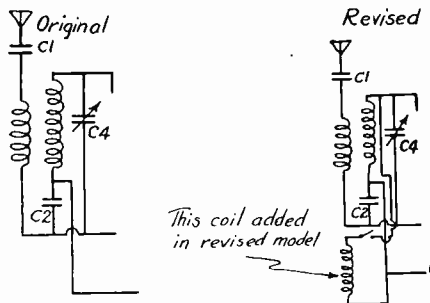
Clare Turnbull.

Bosch Model 420

If you will examine Bosch page 5-35, you will note that the electrical value of condenser C-26 has been omitted. Please add to the diagram, the value of this condenser. It is .01 mfd rated at 500 volts.

Bosch 402 Change

A change has been made upon the Bosch model 402, shown on Bosch page 5-34 in Rider's Volume V. A third



Change in Bosch 402

coil has been added into the antenna circuit. See diagram given herewith. The reference designations refer to the reference points noted upon the diagram in the manual.

Bosch 420 and 421

Please add to your Rider Volume V index, the fact that the Bosch 420 and 421 are the same. The model 421 is the 25 cycle receiver, whereas the model 420 is the 60 cycle receiver.

Bosch Model 460

Since the publication of Rider's Manual, Volume V, Bosch announced a model 460 Edition 2, which is a revision of the model 460 shown on Bosch page 5-36. Voltage data for the model 460 Edition 2, more than likely applies to the early production as well, because the changes noted do not seem to greatly influence the voltage distribution circuits. Accordingly, the following voltage data may be of value on page Bosch 5-36, with the reservations given below.

Tube	Fil	Cath.	Screen	Plate
Rf 58	2.65	2.5	92.	247
1 Det 58	2.65	5.5 3.5*	38.5	220
Osc 56	2.65	—	—	81
IF 58	2.65	3.5	92.	247
2 Det 2A6	2.65	1.1	—	100
Pent 2A5	2.65	—	247	238
Rect 80	5.0	—	—	348

* The 1st detector cathode voltage depends upon waveband. The 5.5 volts exists on the broadcast band. The 3.5 volts exists on the short wave band. Line voltage 115 volts. Power pentode bias is 19 volts.

The reservation referred to above is that pertaining to the Bosch model 460 Edition 2. This receiver employs the same tubes as the model 460, Edition 1, but instead of the two i-f. stages in the original model as shown on page Bosch 5-36, the second edition, employs an r-f. stage and only one i-f. stage. In addition, a number of two winding r-f. transformers are used between the r-f. stage and the mixer tube, in the second edition. In other words, the second edition is really a new receiver, and will be shown in Rider's Volume VI, but in the meantime, here is the voltage data.

Still Traveling

John F. Rider visited Boston, Mass., on January 28 and addressed the radio service men in Filenes Auditorium and spoke before several hundred service

men in Youngstown, Ohio, on February 11. Several I.R.S.M. meeting addresses are scheduled for the month of March. The exact dates are not as yet known.

Philco Model 16 (Codes 126, 127)

Starting January 10th the Shadowmeter shunt resistor, number 78, was changed from part No. 5310, which has a value of 5000 ohms, to part No. 7775, which has a value of 2500 ohms. This prevents the shadow from becoming too wide. Please note that this change will not be made in the model of 16 Code 125 receivers. However, it will be made in Model 500, Code 122 and Model 501, Code 122.

Philco Model 34

Starting with run No. 4, an r-f. choke, part No. 32-1514 is added, connected in the 135-volt B battery lead, between the points where diagram parts No. 37 and 45 join it. This prevents oscillation in the i-f. stage. For schematic see Rider's Volume V, Philco page 5-21.

Philco Model 144

Starting with run No. 3, the following change was made to improve stability:

The 0.25-mf. section of diagram part No. 26 bypass, which has been used as cathode bypass on the 6A7 tube, is now used as cathode bypass on the first 78 i-f. tube. A 0.25-mf. tubular condenser part (part No. 30-4146) is added, as bypass for the 6A7 cathode.

The cathode bypass on the 78 first i-f. tube previous to this change was a 0.5-mf. tubular condenser (in Code 125); in code 121 it was a section of the diagram part No. 26 bypass block, as shown in the schematic on page Philco 5-41 in Rider's Volume V.

These changes also apply to Model 506, code 122, Radio Phonograph.

A change was also made in the shadowmeter circuit to improve its operation. Referring to the schematic, the upper end of the shadowmeter is no longer connected to the diagram part No. 65 resistor, but only to diagram part No. 33 second i-f. transformer pri-

mary and also to the primary of diagram part No. 28 first i-f. transformer. The lead from diagram part No. 52 now goes to lower end of shadowmeter only. A connection must then be made from the lower end of resistor No. 65 to the junction of diagram parts No. 52, 46 resistor and 42 condenser, to complete the circuit.

The shadowmeter used will now be part No. 45-2028 and an 8000-ohm resistor (part No. 33-1114) will be connected across it to prevent too wide a shadow.

Temporary Repairs

There are numerous defects in radio receivers which can be temporarily remedied without installation of a new part in place of the defective unit. For example a fixed resistor of 100 or 200 ohms may temporarily replace an r-f. choke; a smaller condenser may replace a burned out higher value of filter capacity, etc. However, it is necessary that the service organization making such repairs remember that the repair is only TEMPORARY and that the proper unit MUST BE INSTALLED even if the receiver appears to operate properly. The advisability of making temporary repairs is one which depends upon existing conditions. Normally temporary repairs should not be made, unless the customer insists upon the return of the receiver at the earliest possible moment, so as to be able to listen to a certain program and knows that a temporary repair has been made. At the same time, remember that a temporary repair and the final repair, means additional work, for which you cannot charge, so that it is best if the first repair is the permanent repair.

Sparton 65-T

(Continued from page 3)

(Rider Manual Sparton 5-15, 5-16, 5-17, 5-18.)

Model 81-X is the same as the model 81, with the addition of a wave trap. (Rider Manual Sparton 4-16.)

Model 82-X is the same as model 82, with the addition of a wave trap. (Rider Manual Sparton page 4-17.)

Cost Accounting of Interest

It is gratifying to note the interest displayed in servicemen's operating costs and the relation between these costs and service charges. Several local organization committees have been established to investigate operating costs for their localities and to discuss ways and means of applying this data to the operations of the members. . . . What are you doing in your community? . . . Read the handwriting on the wall. . . . Servicing must be made a profitable enterprise, otherwise the shekels required to purchase modern equipment will not be available.

WANTED

John F. Rider, Publisher, will pay \$1.00 per chassis model to anyone who will send in service data on sets put on the market before 1934, which have not been published in Volumes, I, II, III, IV or V of Rider's Manuals.

It is the publisher's wish to make available to servicemen data on any and every receiver that he might be called upon to repair. You more than likely have filed away some servicing material on some old sets that will be of value to other servicemen and which they can get through the medium of Rider's Manuals. So look through your files, see if the data has been published in any volume of Rider's Manuals and if it has not been published, send it to us.

We will purchase only original schematic diagrams, voltage tables, condenser adjustment data, etc., as supplied by the manufacturer. Copies will not be accepted. If more than one person sends in data for the same receiver, the first one to be received at the publisher's office will be accepted.

Your cooperation will be appreciated—thanks.

"Servicing Superheterodynes"

by John F. Rider

288 Pages Price \$1.00

RIDER MANUALS

Have Been Proved

We have told you time and again that if you are a user of Rider's Manuals, you have in your possession the finest compilation of radio service data which money and painstaking effort can compile. There is no other series of manuals which contain radio service information and which is offered in competition to Rider's Manuals, which can even be compared with Rider's Manuals for the number of manufacturers included, the number of models covered and for the completeness of the radio service information.

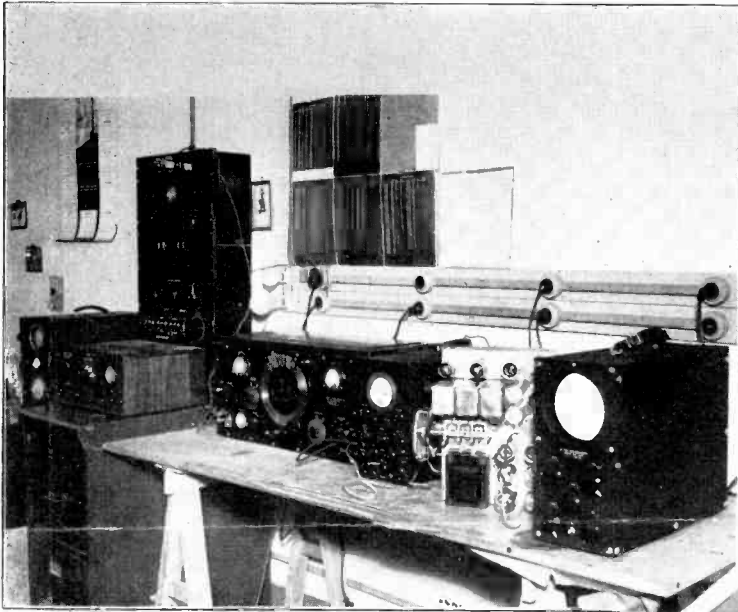
The superiority of Rider's Manuals as established when they first appeared has never been approached. That this is so has been proved time and again by the use of Rider's Manuals in various tube deals by the world's leading radio tube manufacturers, who, desiring to furnish the service industry with the most valuable and helpful service information, chose Rider's Manuals exclusively.

With excellent reputation to uphold, such manufacturers as

- National Union Radio Corp.
- Raytheon Products Co.
- Arcturus Radio Tube Co.
- RCA Radiotron Co.
- Hygrade Sylvania Corp.
- E. T. Cunningham, Inc.

would not pick anything but the finest and they chose Rider's Manuals. . . . Many thousands of radio servicemen have voiced extreme pleasure as a result of the tubes and Rider Manuals they secured through these tube deals.

Why should you men—you who do not own Rider's Manuals—be satisfied with anything less than the finest? If you are using any but Rider's Manuals, you are using reference volumes which are not as complete—which do not cover as many radio receivers—which do not contain as much radio service data as you will find in Rider's Manuals. . . . A comparison will prove these statements.



In the illustration at the left is shown a set-up of some of the apparatus in the Successful Servicing Laboratory. At the extreme left may be seen an Egert oscilloscope. A Western Electric oscillator is contained in the tall rack mounting and in front of this is a beat note audio oscillator. The instrument with the large dial is the General Radio 603-A standard signal generator, to the right of which is an RCA oscilloscope. To the right of the receiver under test is a National Union oscilloscope. Below is shown the rotary converters used for supplying a-c. for test purposes. The fuse box shown is the 110-volt d-c. supply and the a-c. generated is connected to the series of outlets over the test table, shown in the illustration at the left. Since the photograph was made, we have secured another converter, which supplies variable output at 60 cycles from 90 to 150 volts.

Successful Servicing Laboratory

(Continued from page 1)

is not of the beat frequency variety. Very accurately calibrated and with a waveform output, which is a pleasure to look at.

Several General Radio 1000 cycle tuning fork audio oscillators.

Two specially built modulated i-f. oscillators, designed especially to cover the intermediate frequency bands, with very accurately calibrated i-f. peak points.

A General Radio 603-A Standard Signal Generator with a range of from 100 kc. to 25 megacycles. This is the standard signal generator which is used in a great number of manufacturing organizations and is a high precision unit.

An Egert beat frequency oscillator with a range from 20 to 16,000 cycles.

Several commercial all-wave band test oscillators, such as have been developed and sold to the radio servicing industry.

In the line of oscilloscopes, we have the following; as illustrated on the page following. These are the units available upon the market.

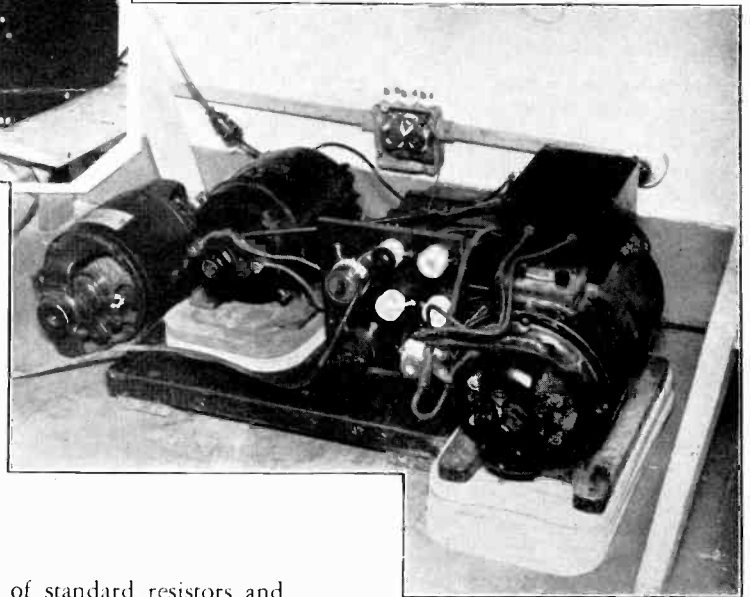
An RCA-Victor unit with 3-inch tube.

An Egert Visual Alignment oscilloscope, with 3-inch tube and electrical rf.-i-f. wobbler.

A Kaltman-Romander oscilloscope with 3-inch tube.

National Union oscilloscope with 5-inch tube.

National cathode-ray power supply and 60 cycle sweep.



In the line of standard resistors and condensers, we have on hand an assortment of General Radio decade resistor boxes and decade condenser boxes. Also standard precision type variable condensers. As far as bridges are concerned, we have a General Radio resistance bridge and a General Radio condenser bridge. For the checking of carrier frequencies, we have a G.R. precision wavemeter.

For our power supply, we have 110 volt d-c. and four rotary converters, with variable voltage output from 78 to about 130 volts a-c. To make certain of what is happening in connection with the a-c. voltage output, an Esterline-Angus recording a-c. voltmeter is available across the a-c. lines. Add to this an assortment of Weston a-c. and d-c. voltmeters, ammeters, milliammeters, microammeters, some thermo-galvanometers, rectifier type meters, output meters, etc., and you no doubt appre-

ciate that we have sufficient meters for our work. For voltage and resistance measurement upon receivers and power amplifiers, we have several different types of testers and analyzers.

In the line of receivers, upon which we are and will work in the future, we are collecting an assortment of long-wave and broadcast, two-band, four-band and all-wave receivers of the conventional and high fidelity type. For power amplifier work, we have several commercial power amplifier chassis.

We are having built for us a typical ham transmitter and several crystal oscillators and power amplifiers. The ham transmitter will be used in connection with modulation tests and other types of testing associated with the application of the cathode-ray tube. Likewise public address amplifier servicing with

the cathode-ray tube will be carried out upon the power amplifiers.

For visual alignment of r-f. and i-f. systems, we are having built a mechanical "wobbler" for use with oscilloscopes not so equipped. For visual checking of complete a-f. amplifier systems and for the determination of the correct operation of tone controls and tone frequency compensating devices, we are having built, an audio "wobbler." (Editor's Note: The day is not far distant when such radio and audio wobblers will be found in service shops.)

What We Intend Doing

No doubt you would like to know what we intend doing with all of this equipment.

Speaking in generalities, the Rider Successful Servicing Laboratory will be the background for the statements made in this house organ, in Rider books of the future and in future Rider Manuals. An equally important purpose, since we feel that we are closely tied to the servicing industry, will be the solution of service men's problems, as related to radio receivers, public address amplifiers and whatever other devices become kindred to the servicing industry.

We are anticipating a change in the type of radio servicing, which will be required in this country in the very near future. Receivers are becoming more and more complicated and servicing will become more and more technical, requiring the application of equipment bordering closer to the engineering field than to what was the servicing field in the past. The types of tests service men will make in the future will really mean something in arriving at a conclusion with respect to the condition and performance of a serviced radio receiver or power amplifier.

We are going to make such tests now—and tell you about them—so that when the time comes for you to work along such lines—you'll be familiar with what must be done and just how to do it. We appreciate the cooperation we have received from the receiver and power amplifier manufacturers and it is our desire to contribute our share in making service better. At the same time, we appreciate the support we have received from service technicians who have purchased Rider Manuals and other Rider books. . . . Consequently,

we will do all in our power to convey to the servicing industry as much practical, authentic and valuable data as is humanly possible. . . . The high standard we have established with past Rider Manuals is but a stepping stone towards our goal. . . . We want each Rider Manual owner to be in a position to make use of every bit of information contained in these manuals and to be able to interpret and apply the more elaborate information which will be contained in future Rider Manuals.

Servicing will be more technical in the future—but we will do all we can to simplify these technicalities and to make servicing more profitable. . . . To that we dedicate the Successful Servicing Laboratory.

Your Distributor

(Reprinted by request)

Your distributor depends upon your patronage just as much as you depend upon the customers, whom you have served efficiently and honestly. Before you start shopping around among distributors, in the effort to save a penny here and a penny there, remember that your time is worth money. Do not misunderstand us. We advocate thrift, but sensible thrift—not false economy. Oftentimes, service men go out of their way to spend an extra half hour plus gasoline or carfare, to save 20 cents on

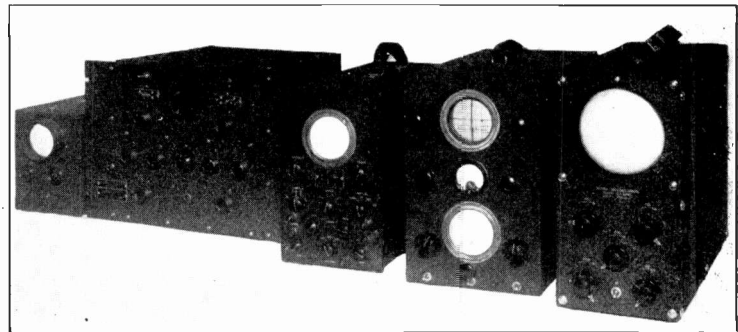
a \$6.00 purchase. . . . Is it really worth it? . . . In addition, they change from one distributor to another without rhyme or reason.

Continued patronage builds good will. Maybe you will need that good will in the near future. Continued trade and prompt payment means the establishment of a credit rating. . . . Maybe you will need all the credit you can secure. . . . All of these factors should influence your trading habits. From the viewpoint of the distributor, the success of his business depends upon your patronage. If he treats you fairly and honestly—co-operate with him. . . . Help him build a solid clientele. . . . You as the customer will profit in the long run.

Treat your purchases like business transactions. . . . Don't chisel. . . . Don't quote fictitious competitive prices, in the attempt to reduce the price to you. . . . If the price asked by your distributor is fair and enables you to make an honest profit—be satisfied. . . . Don't be a profit hog. . . . Live and let live. . . . Help the distributor organization to live and prosper. . . . Don't drive it into the ground. . . . If once you develop the reputation of being a bargainer—you will find that distributors will ask, in anticipation of your bargaining, a higher than normal price. The ultimate sale price will not be a saving for you.

Do Unto Others As You Would Want Them To Do Unto You.

John F. Rider.



Here are the five oscilloscopes available in our lab. Reading from left to right, they are the National, Kaltman-Romander, RCA-Victor, Egert and National Union. All of these units were used in connection with the material prepared for our new books, "The Cathode Ray Tube At Work" and are being used for receiver and public address servicing experiments.

This page was reserved for an important announcement . . . We held the publication of this issue of SUCCESSFUL SERVICING until the very last minute.

At the last moment we found that we were not ready to make the announcement . . . Please pardon the lateness of this issue.

John F. Rider, Publisher.

Publication
in
APRIL



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by JOHN F. RIDER

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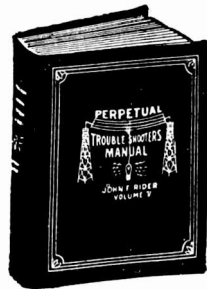
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Detrola	7
DeWald	24
Echophone	6
Edison-Bell	7
Elec. Spec. Export.	5
Emerson	13
Empire	8
Erla	12
Fairbanks-Morse	22
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Fordson	7
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Halsen	6
Horn	5
Hudson Ross	5
Insuline	6
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Kingston	10
Lafayette	26
Lang	5
Larkin	3
Lewol	5
Mission Bell	6
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Noblitt-Sparks	11
Philco	19
Pilot	10
RCA-Victor	63
Radolek	13
R. K. Labs.	4
Sears-Roebuck	56
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Sparton	16
Stewart Warner	38
Supreme Inst.	6
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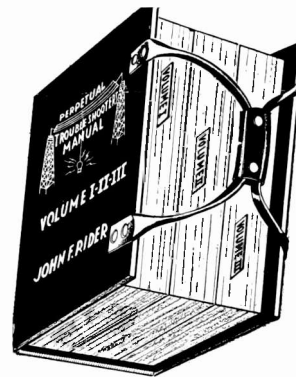
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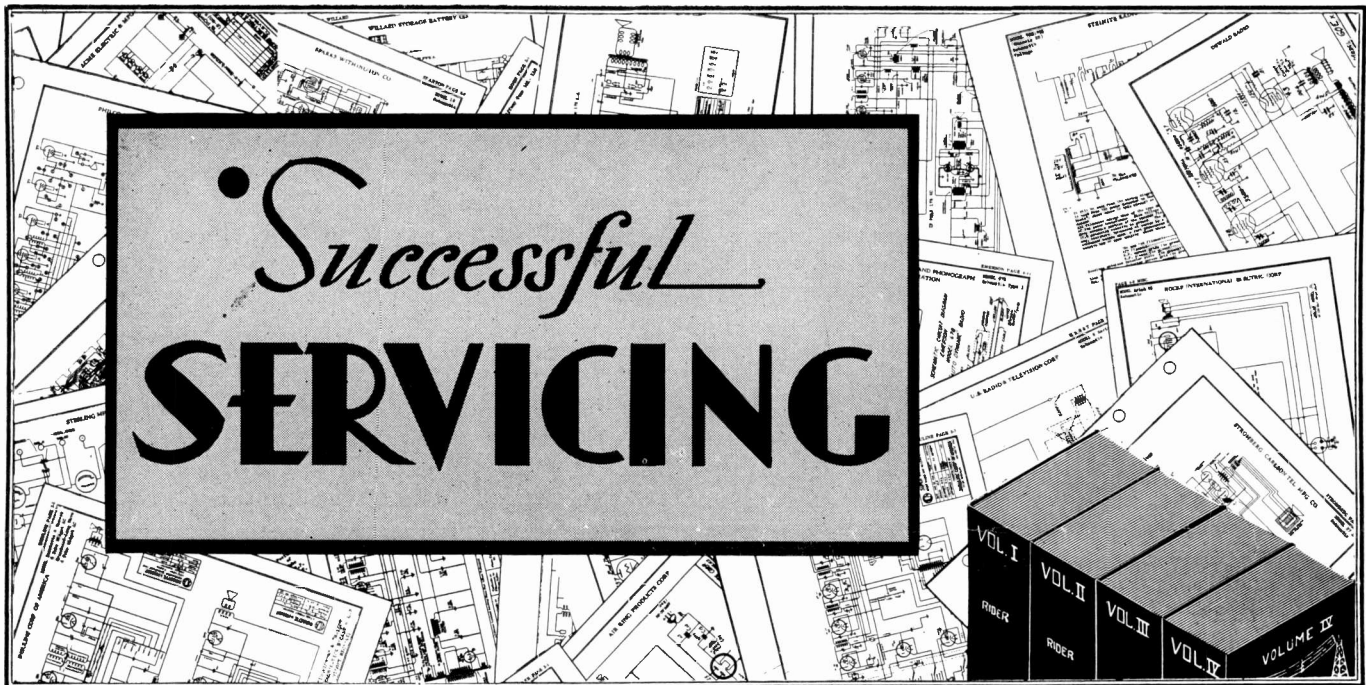
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THE AUDIO WOBBLER

A Device for Checking Overall Response of Audio Amplifiers

By JOHN F. RIDER

COMING events cast their shadows before them. From what has been conveyed to the writer, a great deal of interest will soon be displayed in what is known as the audio wobbler or audio wobulator. This device is a unit which produces a continuously varying band of audio frequencies, utilized in connection with audio amplifier checking with the cathode-ray oscillograph.

In the past, the usual method of checking audio amplifiers during servicing routine was to note the plate current variation in the output tubes. With the cathode-ray tube available, far more accurate methods of isolating defects become available. An examination of radio receivers developed during the past eighteen months brings to light a number of very interesting features in the audio amplifiers, design of systems which calls for more than the plate current tests—which require some such test as is made possible by an audio wobbler.

One of the interesting receivers employs what is the equivalent of a dual-frequency channel in the audio amplifier. One audio transformer is designed to pass frequencies up to 400 cycles and is peaked at 30 cycles. The other transformer is designed to pass

frequencies above 400 cycles. This audio system is used with three speakers, one, which is utilized with special filter circuits, is intended for response at higher frequencies than 4000 cycles.

Ordinary forms of checking the response of such a system would be an extremely tedious operation, yet the importance of isolating a defect, when such would occur, is paramount. In systems of this type, the problem of servicing enters when the receiver is operative, voltages appear normal, yet distortion ensues. Ultimate recognition and placement of the defect can be arrived at with the simplest of equipment, but time is an important factor. The value of new apparatus develops in the rapidity with which the trouble can be localized.

In this connection, the audio wobbler will play an important role. The wobbler, utilized with the cathode-ray oscillograph, will show instantly any frequency deficiency of the audio system. By properly utilizing the device with an audio system, such as was mentioned, a defect in the low-pass channel will become evident the moment the screen is observed. The same is true of the high-pass system, be it any of the transformers at all.

Then again, it seems as if phase-shifting tubes will find frequent application. The only simple and convenient method of checking for proper phase shift is the cathode-ray tube. An attempt to check for the proper operation of a phase shift arrangement, utilizing ordinary equipment, would result in the expenditure of more time than can be allowed. (The phase shift arrangement referred to is used in resistance-coupled audio systems, where push-pull output is desired.)

In general, the audio system is becoming a focal point of interest and with the cathode-ray tube available for use by the servicing industry, waveform analysis will finally come into its own in that branch of the radio industry. This means that the service profession will be called upon to make whatever efforts are possible to comprehend fully the operation of audio amplifiers, the introduction of harmonics, overload, reasons for distortion, etc.

It might be well to remember that with more modern equipment available for servicing, it is highly probable that receiver manufacturers will feel free to employ more complex receivers, with the assurance that satisfactory service will be available.

10 KC. Filter In Philco 201 (Code 121)

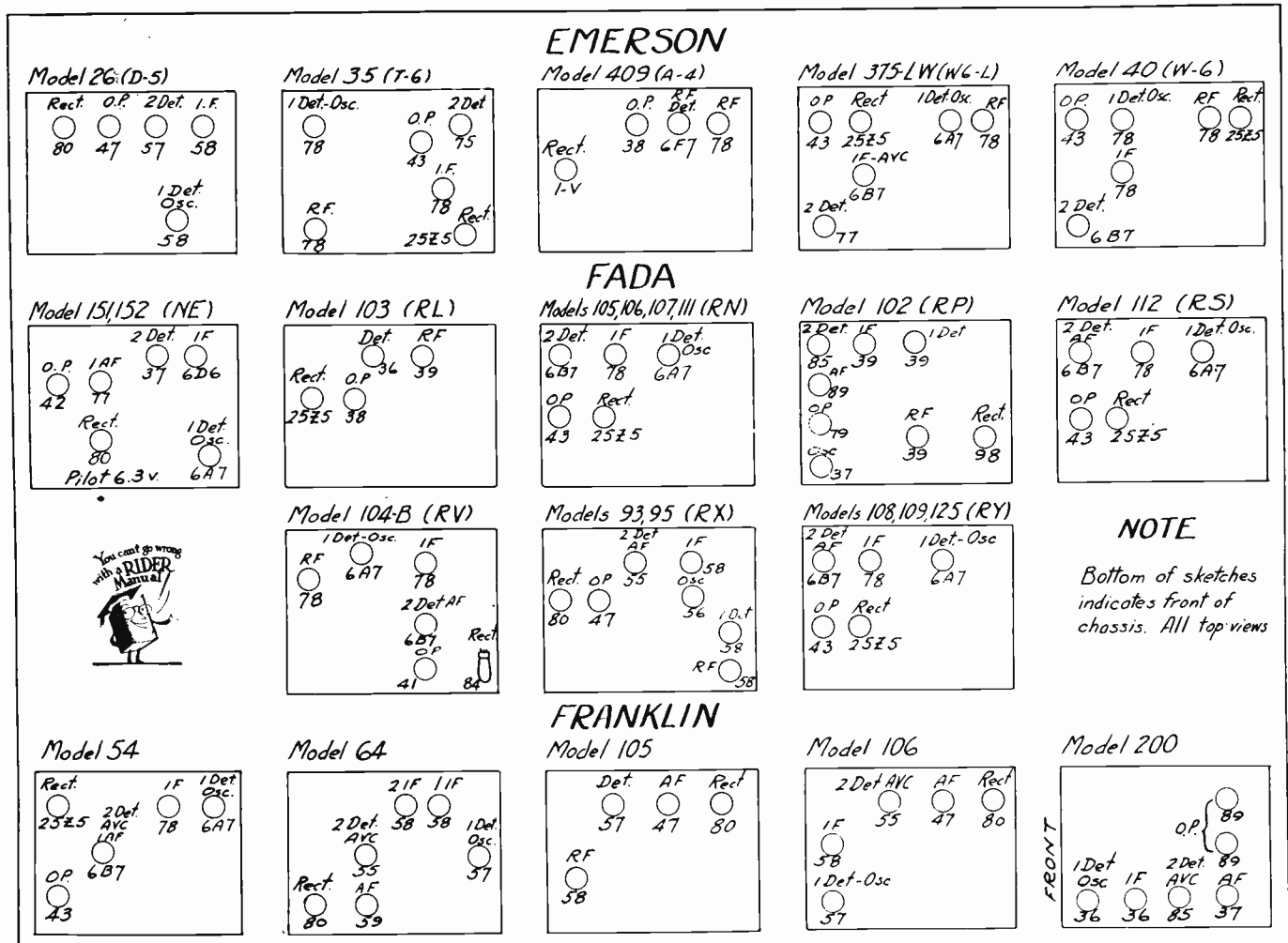
The 10 kc. filter in the audio circuit is located in the plate circuit of the first a-f. tube. While the proper adjustment of this circuit requires an accurately calibrated audio oscillator, an emergency method of adjustment is suggested by Philco. It is as follows:

With the grid clip in place on the 6A7 mixer-oscillator tube, connect the high lead of a signal generator to the control grid and the ground lead to the chassis. Set the receiver dial to 550 kc. Since the receiver employs a 260 kc. i-f. peak, the oscillator in the receiver is tuned to 810 kc. Now set the signal generator to 810 kc. and adjust the unit

to develop an **unmodulated** wave. Shift the tuning of the signal generator very slightly. An audio note will be heard in the speaker. This is the beat note between the 810 kc. signal produced by the local oscillator and the frequency of the signal being produced by the test signal generator. By varying the setting of the test signal generator from 810 kc. to 800 kc., a beat note of from 0 to 10 kc. will be produced. The same is true if the test signal generator frequency is varied from 810 kc. to 820 kc. The setting of the signal generator at 810 kc. should result in a zero beat. (See September 1934 issue of **SUCCESSFUL SERVICING** for more

detailed discussion of zero beat.)

The adjustment of the 10 kc. trap circuit should be such that when the 10 kc. beat is produced, the output from the receiver is minimum. It might be well, as a matter of fact the recommendation is made, to employ an output meter to supplement the audio output of the speaker, because some individuals do not respond to audio tones of this high range. If the output meter is used, the 10 kc. trap trimmer should be adjusted to produce minimum output when the 10 kc. beat note is being developed. It is important that you remember to feed an **unmodulated** signal to the receiver.



Emerson, Fada and Franklin Layouts

Below will be found the pages in Rider's Manuals on which the schematic diagrams for the socket layouts given herewith will be found. It is suggested that these layouts be cut out and pasted on the respective pages.

Emerson Radio & Phonograph Co.

Model	Page	Model	Page
26 (D-5)	4-1	375 LW (W6-L)	54
35 (T-6)	4-3	409 (A-4)	4-8
		40 (W-6)	4-20

Fada Radio & Electric Corp.

Model	Page	Model	Page
NE	4-16	RV	4-7
RN	4-9	RX	4-1
RP	4-5	RY	4-10
RS	4-11	RL	3-25

Franklin Radio Corp.

Model	Page	Model	Page
	4-6	106	4-14
	4-8	200	4-15
	4-14		

959 Radiotron Complete

**Stewart-Warner Model R-125
Chassis Changes**

This is the receiver shown in Rider's Manual, Volume V on pages Stewart-Warner 5-5 to 5-8 and covers the models 1251 to 1259.

The schematic wiring diagram in the manual is that of the early production. In the later runs, certain changes were made. (The revised diagram will appear in Rider's Volume VI.) Referring to the schematic wiring diagram, condenser 18 connects from the B plus to the 6A7 cathode instead of from B plus to ground. In addition condenser 4 shown as .1 mfd., 100 volts, in the diagram was changed to .25 mfd., 250 volts in the later runs.

**Stewart-Warner R-127
Chassis Changes**

This receiver is shown in Rider's Manual on pages Stewart-Warner 5-15 to 5-18 and covers models 1271 to 1279. Referring to the schematic diagram in the manual, this is for the early production. A few minor changes were made upon later runs. Condensers 16 and 17, were originally rated at .25 mfd. and 250 volts. The new rating is .25 mfd. and 300 volts. In addition, condenser 16, originally shown as connected between B plus and ground, now is connected between B plus and the cathode of the 6A7 tube. In addition, condenser 3 was rated at .1 mfd. and 100 volts. The new rating is .25 mfd. and 250 volts.

**Stewart-Warner R-125, R-126, R-127
Chassis Speakers**

The speakers used in these receivers are identified as R-225, R-226 and R-227 respectively and are used in receiver models 1251 and 1259, 1261 to 1269 and from 1271 to 1279 respectively. These receivers are shown in Rider's Manual, Volume V.

The following information is offered for guidance during adjustment. In order to facilitate proper centering of the voice coil, should it ever become necessary, two special centering ring tools have been developed by Stewart-Warner.

The following procedure should be used in all cases where speaker rattles are caused by the voice coil being off center or when replacing the diaphragm assembly.

1. Loosen the two machine screws holding the spider in place until the spider can move freely.
2. Loosen the four speaker assembly screws in order that the shell assembly can be moved with respect to the field assembly, but leave the screws tight enough so that the shell assembly cannot move too freely.
3. The voice coil should then be approximately centered on the pole piece by moving the shell assembly, with the spider screws still loose, until the air gap looks uniform. Then tighten the four speaker assembly screws.
4. Insert the proper centering ring and tighten the two spider screws.

If the speaker still rattles after centering the voice coil, the trouble may be due to particles in the air-gap; loosened cement on the cone or spider; or loose turns on the voice coil. Particles in the air-gap can be blown out with compressed air, but if they are between the outside of the voice coil and the field plate, the speaker must be taken apart and cleaned. This can be done by unsoldering the leads running from the output transformer to the shell assembly and removing the four assembly bolts. Then lift the diaphragm and shell assembly *straight up* from the field assembly, being careful not to injure the voice coil.

RCA 262 and 263

Volume V contains service data covering the RCA 262 released during 1934. However, the 1935 production of the 262 is different from the original RCA 262 and this information is being furnished to avoid confusion. The 1935 production is also known as the 263. One means of identifying the two productions is found in the demodulator and AVC circuits. The very first production during 1934 used a type 76 tube as the demodulator. A later production employed a type 1-V tube in place of the type 76 and R-16 in the diagram on page RCA 5-103 in Rider's Manual, was changed from 1,000,000 ohms to 1,100,000 ohms. The 1935 production of the RCA 262, also known as the 263, employs a type 85 tube as

the demodulator. In addition, the 1935 production employs two type 80 tubes in the rectifier system, in place of the original 5Z3. The first a-f. stage, originally a 76, has been removed, because the type 85 tube serves as demodulator, AVC and first a-f. amplifier. It should be understood that circuit changes accompany these tube changes. The 1935 production of the RCA 262 and 263 will be shown in Rider's Volume VI, and in a forthcoming issue of SUCCESSFUL SERVICING.

How About It?

This 16 millimeter sound-on-film system which RCA has developed should be ideal for lectures before servicing groups, particularly when the nature of the subject is such that sound correlated with what is being shown upon the screen would facilitate comprehension. A swell tie-up would be a lecture describing the application of the cathode-ray oscilloscope to the observation of audio sounds, by showing movies of the changing waveform and also make audible the sounds, which are shown in graphic manner. . . . How about it, Mr. Rider? . . . Maybe so—maybe so.

Zenith Values

Some of the Zenith wiring diagrams in the early Rider Manuals do not show the electrical equivalents for certain parts numbers. While it is true that these receivers are quite old, we feel certain that this information will be found valuable.

Parts Number	Value	Parts Number	Value
22-21	.00025 mfd.	63-31	.35 ohm
-23	1. mfd.	-66	10. ohms
-27	1. mfd.	-67	600 ohms
-38	.001 mfd.	-68	2000 ohms
-40	9. mfd.	-69	2700 ohms
-41	11. mfd. block	-70	22500 ohms
-42	1. mfd.	-71	1600 ohms
-43	.25 mfd.	-72	22500 ohms
-44	1. mfd.	-80	200 ohms
-46	16. mfd.	-96	10000 ohms
-48	19. mfd. block	-98	10 ohms
-49	10. mfd. block	-99	30 ohms
-59	10.5 mfd. block	-100	20 ohms
-61	36. mfd. Mershon	-101	50 ohms
-64	.03 mfd.	-106	25000 ohms
-65	1. mfd.		
-66	.2 mfd. quadruple		
-67	1.5 mfd.		
-69	1. mfd. double		
-70	.001 mfd.		
-71	1. mfd.		
-72	1. mfd.		
-73	16. mfd.		

Additional Equipment for SUCCESSFUL SERVICING Laboratory

Since the February issue of SUCCESSFUL SERVICING was "put to bed" several very interesting pieces of equipment have been added to our laboratory. We are constantly on the look-out for anything new that will aid us in our search for new and better ways to make *your* work easier and more accurate and no expense nor time are spared to achieve these ends.

First there is a new 15-watt "ham" transmitter. No, don't get excited—we are not going on the air; it is strictly for test purposes. The equipment consists of four major units mounted in a welded steel frame. These units are:

1. Variable dummy antenna unit.
2. Radio-frequency unit, including a crystal-controlled oscillator, buffer and modulated power amplifier.
3. Complete modulator and input amplifier, which is capable of delivering up to fifteen watts a-f. energy without appreciable overloading or distorting.
4. Two major power supplies.

The modulator itself is of the Class B type and is capable of being adjusted for Class A-prime modulation. The first power supply furnishes energy for the oscillator, buffer and the low-level speech amplifier. The second power supply is for the modulator and the modulated amplifier. This second power supply is capable of supplying at least two hundred per cent. the normal required energy for the modulator and amplifier and was selected so that it is possible to over-load both modulator and modulated amplifier when this condition is desired.

With this transmitter it is possible to produce in the laboratory any conditions of transmitting desired, without fishing around in the ether for a station that might be working in some particular way. As indicated in the description of the apparatus above, various conditions of over-loading and modulation can be set up and fed to a receiver, so that a true picture of the set's performance may be obtained.

Scientific development of apparatus for aiding the serviceman in his work is well shown in the Dumont electronic switch and

amplifier. This instrument greatly increases the value of a cathode-ray oscilloscope by permitting the simultaneous observation of any two voltage or current phenomena. The device consists of a switching tube and two amplifiers, one amplifier for each of the waves to be observed. The switch functions in such a way that it cuts in first one amplifier and then the other at such a rate that the two waves appear on the screen at the same time. Controls are provided for adjusting the gain of each amplifier, for varying the speed of the switching tube for positioning the patterns on the screen and for separating the waves. The instrument contains a power-pack for a-c. operation.

What can be done with this piece of equipment? Suppose it is desired to observe the functioning of an amplifier. One set of the electronic switch's terminals can be connected to the input of the amplifier and the other pair to its output. Then it is possible to see at the same time the shape of the wave before it is amplified and afterwards—all this with just one oscilloscope. The waves can be shifted to any part of the screen; i.e. one can be placed above the other, or they can be placed side by side or one can be superimposed upon the other. This last is extremely useful when accurate comparison of two waves is wanted and where the difference in the wave-shape is very minute.

Another piece of apparatus from the Dumont Laboratories is an amplifier that is capable of passing up to a 500-kilocycle wave, without distortion or rectification to any appreciable extent. Such an amplifier is useful in the observance of intermediate frequencies, where the voltage is so small that it is insufficient to deflect the cathode-ray beam. Because of the 90 kc. to 100 kc. frequency limit of the amplifiers, usually employed in oscilloscopes, and because of the desire to observe the characteristics of i-f. signals approaching the broadcast band, this special amplifier was secured. Its gain is approximately 500. Three stages are employed, a-c. operated, and each stage is in the form of a bridge circuit. By means of this amplifier, the output from the secondary of any i-f. transformer in a radio receiver can be amplified sufficiently to deflect the cathode-ray beam to almost 1.5 inch. The device likewise is suitable for the amplification of frequencies down into the lower limits of the audio range.



Timid Wife (*to husband who has fallen asleep at the wheel*): I don't mean to dictate to you, dear, but isn't that bill-board coming at us awfully fast?

—Pennsylvania Guardsman

First Yegg: I need eye glasses.

Second Ditto: Why do you think so?

First Yegg: Last night I was twirling the knob of a safe and a dance orchestra started to play.

—Boston Evening Transcript

Female: James, I dislike calling my chauffeurs by their Christian name. What is your surname?

The Chauffeur: Sweetey, madam.

The Madam: Home, James.

Cop (*after the smash-up*): Didn't you see this lady driving towards you? Why didn't you give her the road?

Truck Pilot: Well, officer, it was this way: I saw that deep ditch on one side and that high fence on the other side of the road and before I could make up my mind which one to go into, she took her half of the road—right out of the middle.

Good mornin', Mrs. Murphy. How is everything?

Sure, and I'm havin' a great trouble between me husband and the kitchen fire. As sure as I take my eye off wan uv them, it goes right out.

—Christian Science Monitor

Defense Counsel (*To evasive witness undergoing cross-examination*): Are you acquainted with any of the jury?

Witness: Yes; more than half of them.

Lawyer: Are you willing to swear that you know more than half of them?

Witness: Say, I'm willing to swear that I know more than all of them put together.

—Answers (London)

A young husband had just decided (with his wife's help) on the furniture for their bedroom. He was giving the necessary instructions to the salesman, when his wife interrupted and motioned him to leave the store with her.

"What's the big idea?" he asked, when they were outside.

"Didn't you see that sign in there?" she replied. "It said 'We stand back of every bed we sell.'"

Successful SERVICING

Dedicated to financial and technical advancement of the radio service man.

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Vol. I March, 1935 No. 7

GREATER KNOWLEDGE OF FUNDAMENTALS

We just completed some very interesting experiments. The net result is information which will be used later, but for the moment, this editorial is born.

We made about fifty photographs of images appearing upon the screen of the oscilloscope tube. The image photographed was the composite wave of three mixed frequencies of variable amplitude. The idea behind the test was to portray photographically the change in wave shape of a wave developed by feeding three different frequencies, each a multiple of the other, into the same circuit. The frequency adjustments were maintained constant, but the relative amplitudes of the harmonic frequencies were altered.

The phenomenon of complex waves, distortion, harmonics, etc., constitute a very important part of radio receiver and amplifier servicing and it is somewhat sinful that so little space is devoted to the subject in text books, which are prepared for use in the study of basic radio theory. Herein lies one of the paramount virtues of the cathode-ray tube—a feature which has not been mentioned in connection with the radio service field: the ability to note a changing phenomenon visually, which hitherto could only be imagined. This, in connection with study—not servicing.

It is true that cathode-ray tube equipment manufacturers have re-

ferred to the use of the oscilloscope in college laboratories, but they failed to mention that its use in the service technician's shop for study, in addition to service work, constitutes the finest method of enhancing knowledge concerning radio phenomena. In other words, proper application of the cathode-ray tube will make it possible for the service technician to learn more about radio and audio principles. To evolve pictorially, by a series of individual drawings, the fifty complex waves which we photographed in about two hours, would require months of painstaking labor for artwork, and still not show the instantaneous changes caused by changing the amplitude of harmonics of a sine wave.

I freely go on record as saying that the service technician who acquires a cathode-ray oscilloscope for the purpose of service operations and who, by dint of effort, applies this device to further his knowledge of radio fundamentals, will benefit to a degree far beyond ordinary comprehension or conception. So we say—the cathode-ray oscilloscope should be viewed as an educational as well as a professional device. Its influence as both will be far reaching. . . . We have worked with the device for the past nine years, perhaps longer, yet the desire to probe radio fundamentals and to place them on the screen for visual observation, is as strong as ever. Again we say—as an educational device, it would be difficult to find its equal.

John F. Rider.

Did You Know That—

There are several peculiar things of interest concerning the Brain of man. In the first place, man's brain weighs more with respect to his size than the brain of any other animal with respect to its size.

Tests seem to explode the theory that the size and weight of an individual's brain is related to his or her degree of intelligence. The brain of one of the greatest French writers weighed but 35 ounces whereas brains of idiots have been found to weigh as much as 60 ounces.

There is a definite difference between a Post Card and a Postal Card, at least according to the Post Office. A card

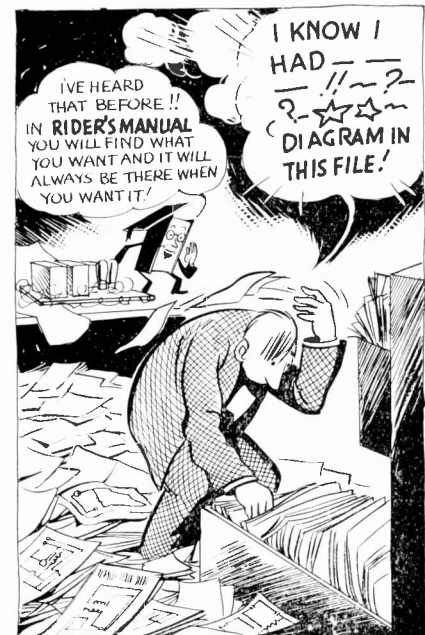
which is bought from a Post Office and upon which a stamp is already imprinted is properly called a Postal Card. Unstamped cards, such as you have seen displayed on stationery store counters and which usually carry that "Having a wonderful time and wish you were here" message are properly called Post Cards.

The King James' version of the Bible fails to show one single mention of cats.

It is said that diamonds being composed of carbon, as is coal, will burn at a temperature of at least 800 degrees Fahrenheit.

Photography is a result of an accident. Photography prior to 1839 required that camera plates be exposed for eight or nine hours to secure a picture. Daguerre, a French chemist, discovered the means of making the first real photograph in 1839. One day a plate which he thought had been underexposed was stored in a closet. In this closet was also stored an uncovered saucer of mercury. Vaporized as a result of the heat in the room, the mercury became a reagent. It brought out the image on the supposedly bad plate and developed the first real photograph—the Daguerreotype.

Adventures of HAP HAZARD



Philco Model 118

Starting with run No. 11, dated February 15th, the shadowmeter No. 35 will be changed from part No. 45-2028 to part No. 6497 (which it was in the original production). The shadowmeter shunt resistor No. 76 in the diagram (Part No. 5309, 2900 ohms), will be omitted. This gives better shadow response. See Rider's Manual, Philco pages 5-34 to 5-38.

Philco Model 16

Starting with run No. 11, dated February 15th, the following two parts will be removed, which will increase the high frequency response. Resistor No. 85 in the wiring diagram, 10,000 ohms, Part No. 3524 and Condenser No. 86 in the diagram, 0.01 mfd, Part No. 3903-F. This data applies to Model 16, Codes 125 and 126, and to Models 500 and 501, Code 122.

Hum in RCA 262

In early type RCA 262 receivers, which employed the 76 or the 1-V demodulators, a slight buzz may be encountered. In order to reduce or eliminate this type of interference, the following changes should be carried out:

Remove the red with yellow tracer lead which junctions with the 10 mfd. electrolytic condenser (C-56) in the schematic (RCA page 5-102) and the lug on the resistor board. In place of this lead, install another which will be located outside of the chassis cable, carried along the front side of the chassis, similar to the red lead connecting the corresponding points.

Then connect the grounding lead from the second detector cathode to a grounded point as near as possible to the detector socket. Then check the secondary leads from the interstage transformer connecting to the driver stage. These leads should be kept as far as possible from the heater prongs and heater wiring. At the same time, these leads should be as short as possible.

Make certain that the heater leads connecting the audio tubes are twisted. This information is gathered from the

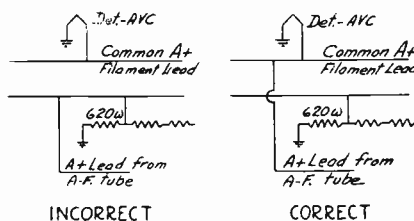
recently issued RCA-Victor Service bulletin.

RCA 128 and 226

The 1934 production of the 128 receiver was also known as the 224, so that the listing in Rider's Manuals, Volume V, is RCA 128 and 224. However, the 1935 production is known as the 128 and 226. To distinguish between these two productions, check the following: The early production employed a type 41 tube in the output stage, whereas the 1935 production employs a type 42 tube. In addition, the 1935 production includes two condensers in series as the blocking condensers between the 6B7 tube and the output stage. One of these condensers is shunted by a pair of twisted leads, which terminate in a number of contacts and a switch. This arrangement provides a means of changing the frequency response of the audio system on short wave bands, so as to produce the desired fidelity on all bands of the receiver.

Sentinel Model 7700, 7732, 7735, 7741

An error is acknowledged in the schematic of this receiver as shown upon page Sentinel 5-35 in Rider's Manual. The A plus lead is connected to the grid circuit instead of to the common filament lead. The diagram as shown and as correct appears below.



Correction in filament circuit of Sentinel 7700, 7732, etc.

Gates Model 901-A Amplifier

This amplifier has been changed in several respects, since its original production. Please note that the original run employed 30,000-ohm units as the plate resistors for the type 37 tubes, but these have been changed to 60,000

ohms. In later runs, the type 37 tubes were replaced by type 76 tubes. The plate blocking condenser in the first stage, now is 0.25 mfd. in place of the original 0.01 mfd. The equalizing potentiometer between the split primary winding of the output transformer has been changed from 400 ohms to 1000 ohms. The input impedance is 50 ohms.

Crosley 164 and 176

The i-f. peaks for these two receivers were not available until recently. Model 164 employs a 181.5 kc. peak and model 176 employs a 456 kc. peak. These two diagrams are shown in Rider's Manual, Volume IV, on Crosley page 4-11. Please add this information to your volumes.

Electrical Prospecting

A short article describing several types of instruments employed in connection with geophysical prospecting, in other words, electrical prospecting, is described in the March 1935 issue of the *American Institute of Electrical Engineers Journal*.

Resistance Facts to Remember

If a resistor is rated at a number of watts, it means the entire resistor—not a part of the resistor.

Since wattage rating is equal to the square of the current times the resistance, the wattage rating increases four times, when the current flow is doubled; nine times, if the current flow is increased threefold; sixteen times, if the current flow is increased fourfold, etc.

With fixed voltage and the resistance decreased to half of its original value, the current is doubled and the wattage rating of the unit must be four times what it was originally, assuming that it was correctly rated for the existing current flow.

The wattage rating required for any unit, depends upon the circulation of air, as well as upon the current and resistance values. Normal wattage ratings assume free circulation of air. If the resistors are confined in places

where air cannot circulate, a tolerance of at least 50 per cent in wattage rating should be allowed.

A Hint Concerning I-F. Alignment

It might be well to remember during i-f. alignment, particularly when you are feeding the signal through the r-f. amplifier, that is using a modulated r-f. signal, not to select a test frequency which is a multiple of the intermediate frequency, or very close to it. If such is done, a fringe exists and a beat note may be audible. Such a fringe broadens the tuning adjustment and it is more difficult to locate the state of exact resonance.

300 Servicemen!

Your communications in response to the announcement in the January issue of SUCCESSFUL SERVICING, have been forwarded to the manufacturer, who requested that we recruit men for his service programs. We have received information from that manufacturer to the effect that they are contacting the men who are located in towns where they have sold equipment and they will contact additional men as the sale of their merchandise advances. We hope that the servicemen who make connections will find them profitable for years to come.

RCA Institute Adopts "SERVICING SUPERHETERO-DYNES"

The following letter was received from the RCA Institutes, 75 Varick Street, New York City.

March 8, 1935.

John F. Rider, Publisher,
1440 Broadway, New York.

Dear Mr. Rider:

This is to advise you that beginning with our May Radio Service classes, your book "Servicing Superheterodynes" will be used as a regular school text.

We consider the book exceptionally well written and covers superheterodynes in a very superior manner.

Cordially yours,
(Signed) J. K. Whitteker,
Chief Instructor.

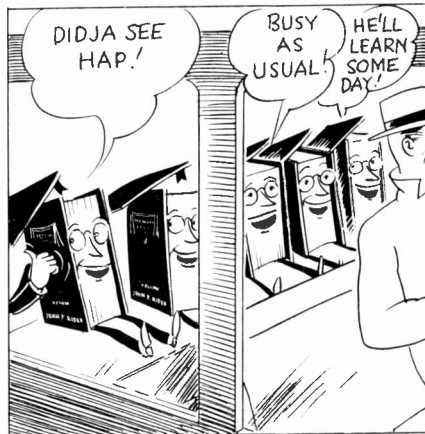
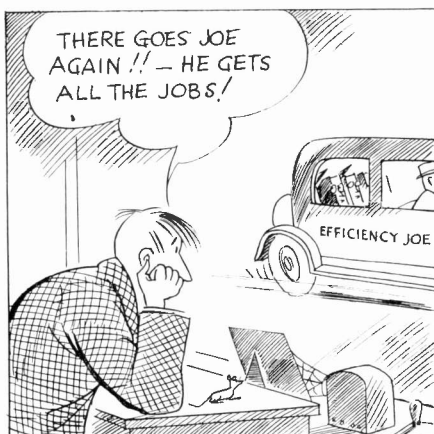
We are indeed grateful to the RCA Institutes and we hope that students will think equally well of the volume. We are certain that they will, because we made every effort to anticipate questions which might arise in the minds of the men who would have occasion to study this volume, and we know that they will find practical and helpful information between its covers.

Incidentally, it has come to our attention that the RCA institutes is also

conducting what is known as "A General Course in the Science of Electrical Communication." This is a resident course covering about 48 weeks in the day classes and about 96 weeks in the night classes. The subject matter covered includes Electrical Physics, Circuit Elements, Vacuum Tubes, Radio-Frequency Engineering, Mathematics, Acoustics, Code, Radio Laws and Drafting. The first four subjects embrace lecture and laboratory work. The laboratory work consists of actual experiments, construction and application of devices discussed in the lectures. From what we hear, the entrance requirements call for the equivalent of one and one-half years of high school algebra and one year of plane geometry.

Getting back to "Servicing Superheterodynes," this is the volume we have been recommending to readers of SUCCESSFUL SERVICING, on the grounds that it is the only volume which affords proper coverage of the subject. The revised volume was published during August 1934 and is up to date and modern in every respect and dwells upon every ramification of superheterodyne receiver theory and servicing. As a matter of fact we believe that it is the biggest book bargain ever offered, for this 288 page book sells for only \$1.00. . . . And to cap the climax, it is sold with an unconditional guarantee. . . . Read it and if you feel that you have not received your money's worth, return it and get your money back.

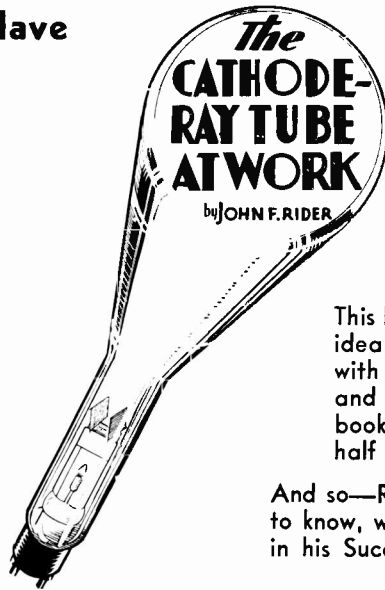
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that is characteristic of all Rider publications. This book will contain about 350 pages and it is expected that the products of about 65 or 70 manufacturers will be covered. These books contain more schematics, more i-f. peaks, more layouts . . . more real servicing data than any other automobile radio manual.

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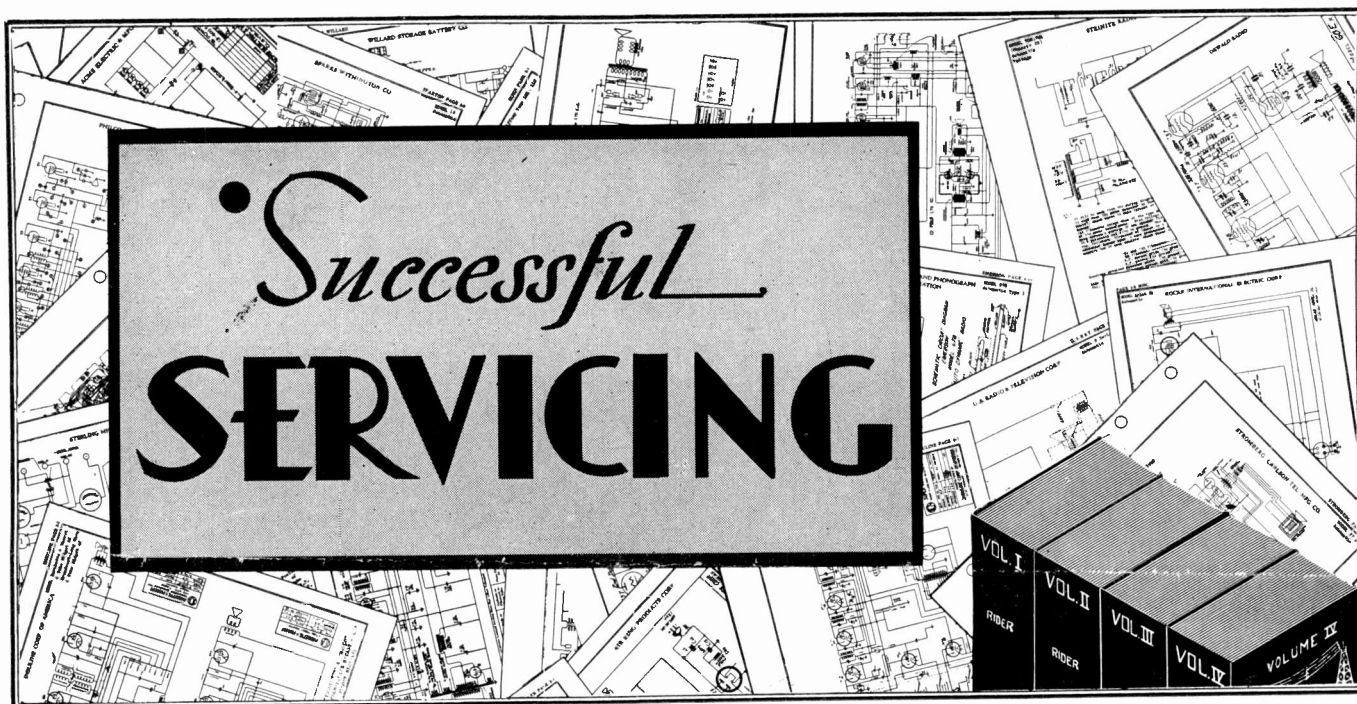
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TIME OR PARTS?

A discussion intended to illustrate the fact that service profits should come from the sale of time rather than parts

'Twas ever thus. . . . The trouble is always due to some one else. Time and again we receive a visitor to this office or someone approaches us at one of the meetings, who is vehement upon the theme of tube prices and mail order houses.

We concede that low tube prices and general distribution of catalogs containing net prices tend to cut down the profits of the servicing industry. However, there are existent other factors more closely related to the servicing industry, which are of equal importance—perhaps even more so. We are referring to service charges. It is our contention that the profits accruing from the sale of tubes and replacement parts occupies a secondary position with respect to the earning power of the service technician.

This does not mean that the service technician should not make a profit upon whatever parts or tube he sells, but what we do mean is that if any effort or interest is to be expended and focused upon what factors influence profitable

operation, let us look within our own back yard first. . . . *Service charges are too low. . . . They must be raised. Profitable operation of a service organization must be founded upon a satisfactory profit upon the time sold and not upon the replacement parts or tubes which are sold.* Naturally, we cannot neglect tube and parts profits. . . . Every dollar profit is just so much more money in the bank—but service charges should NOT be predicated upon the profits accruing from the sale of parts and tubes.

Take tubes first. About 70 per cent of the replacement tube business is found in ten types. The average list price of these ten types during the past five years has been about \$1.40. It is true that some individual tube prices may have been higher, but it is necessary for the service industry to realize that the replacement business is founded on the older types, never in the new types, so that at no time can the service industry hope to be selling tubes in any quantities, which represent high priced tubes. Replacement business on tubes assumes

worthwhile proportions, two or more years after the tube has been placed into receiver use.

Based upon tube prices on March 1, 1935, as stated in *Radio Retailing*, the average price is \$0.83 and was \$1.25 on January, 1934. About 28,600,000 tubes were sold during 1934 for replacement purposes. We shall assume that 60 per cent of this total was sold by servicemen and 40 per cent by dealers. Based upon a 40 per cent discount to the servicing industry and a net profit of about 17 per cent and about 20,000 men selling tubes in any quantities, the possible net profit per man during 1934, as the result of the sale of tubes, was about \$178.50. If we assume similar sales at prices which existed four or five years ago and that the average tube price was \$2.50, the profit still does not assume momentous proportions.

It is our contention that the net profit upon replacement parts is not the 40 per cent which the service technician receives from the jobber, but approaches much closer to 15 per cent than 20 per

cent. Furthermore, the average service organization buys about \$1,200 worth of tubes and parts. Some buy much more, but the above is a fair average for about 20,000 men in the service industry. These parts are sold for \$2,000, at least we hope so. The net profit per organization (average) is about \$340 per year. By itself, this is not a great deal of money, certainly not enough to justify setting up the profit upon replacement parts and tubes as the basis for keeping the base charge for service time at the lowest possible figure.

Once more we want to stress the fact that the profit upon parts and tubes is much desired and perhaps is what one can expect, but the real profit should come from the sale of time. Based upon an average operating cost of \$2,700 per year for the average service station, the income from the sale of time, exclusive of tube and parts sales, should not be less than \$4,000. Based upon 1,600 productive hours per year, this means a base rate of \$2.50 per hour for time. . . . As a matter of fact, we think that the base rate for time sold, in order to provide for all emergencies, should be closer to \$3.00 per hour than \$2.50.

The last thought we wish to leave with you is that there are service organizations in operation in these United States who are receiving as high as \$3.50 per hour and who are making money.

Philco Model 29 Changes

Effective with run 16, dated March 1, 1935, the following changes have been made in the model 29, the schematic of which is shown in Rider's Manual, Philco pages 5-13 and 5-14. Resistor No. 10, in the schematic, originally 20,000 ohms has been changed to 45,000 ohms. Condenser No. 13 in the schematic, originally, .0008 mfd., has been changed to .00025 mfd. The new part number for the resistor is 5256 and of the condenser, 5858.

Philco Model 45 Changes

Beginning with run 17, dated March 1, 1935, the following changes have been made in the model 45 receivers. This receiver is shown in Rider's Manual, Volume V, on pages Philco 5-15,

5-24, 5-25 and 5-26. Resistor No. 10, originally 25,000 ohms, part No. 4516 has been changed to resistor, part No. 5256 of 45,000 ohms. Condenser No. 13 in the schematic diagram, part No. 5878 of .0008 mfd. has been changed to .00025 mfd. and part No. 5858.

Detrola "Roadmaster"

The i-f. peak of this receiver, shown on page Detrola 5-2 in Rider's Manual, Volume V, is 456 kc. Please make this addition to your manuals.

RCA R-34

Information received from RCA Manufacturing Company states that the RCA R-34 is exactly the same as the R-35, R-39 and RE-57, as shown under the Victor heading in the RCA-Victor section of the Rider Manual Index. These receivers are shown in Rider's Manual, Volume I, page 1-30, *524 and on 1856 in the RCA "Combination." It should be understood that while the receivers are identical, they differ in the physical design of the speaker.

Arvin Model 16 Tone Control

When a customer desires a lower pitch to the Model 16 Arvin receiver, this can very easily be accomplished by connecting together the two external speaker leads. Obtain two phone tips similar to the one on the dial light lead, and put one of these on each end of a 2½-inch piece of wire. Slip a small piece of rubber tubing over each phone tip, or use tape. Then plug the two tips—one into each of the external speaker connections. This will give the tone of the set a greater depth. (Editor's Note. This information has been supplied by Noblitt-Sparks.)

RCA Corrections

Several errors have been noted in some of the RCA-Victor diagrams and in their G.E. equivalents. These are really transpositions, rather than errors, in that the d-c. resistance of the "A" and "B" band antenna, r-f. and oscillator coils has been transposed. These discrepancies exist in the RCA-Victor

models 128 and 224 (1935 production) and their G.E. equivalents, shown in Rider's Manual, RCA-Victor pages 5-65 to 5-70 and in the RCA-Victor models 128 and 226 (1935 production).

The d-c. resistance values of the coils as shown in the schematic wiring diagrams are correct. The discrepancies are shown upon the chassis wiring diagrams. The correct d-c. resistance values as furnished by RCA Manufacturing Co. are:

Antenna Coil	
L-1	55 ohms
L-2	8 ohms
L-3	18 ohms
L-4	1 ohms
L-5	2 ohms
L-6	1 ohms

R.F. Coil	
L-7	115 ohms
L-8	8 ohms
L-9	29 ohms
L-10	1 ohms
L-11	4 ohms
L-12	1 ohms

Oscillator Coil	
L-13	6 ohms
L-14	2 ohms
L-15	1 ohms
L-16	1.5 ohms
L-17	1 ohms
L-18	1 oh

Missing I-F. Peaks

Please add to page Franklin 3-1, the reference that the model 100 and the model 102 employ an i-f. peak of 175 kc.

On Galvin page 3-7 in Rider's Manual, add the data that the i-f. peak is 175 kc. This is the model 7T-47-A. Add the same data onto page Galvin 3-15, covering the model 61. Also add the same information onto Galvin page 3-13 and 3-14 in Rider's Manual, Volume III. This applies to the model 88.

Majestic Model 290, 300 and 300-A

If volume cannot be controlled, look for a possible defect in the 10.-mfd. condenser connected between the cathode of the 57 tube and the plate of the type 58 tube. More than likely this condenser is open.

If a complaint of intermittent operation of the model 300, 300-A is received, check the following: The 1.-mfd. condenser connected to the plate of the type 57 noise suppressor tube, may be grounded through a high resistance leak

and also the coupling condenser, which couples the plate of the type 58 tube to the 47 output tube. Replacement has been found to cure such troubles. To be safe, it might be well to replace the other condenser connected between the grid of the type 58 and the type 47 tubes. (John Biesidecki.)

Silvertone 1852, 1853

We have been advised by Sears-Roebuck that the Silvertone 1852 and 1853 receivers employ the same chassis as used in the model 1711-A, as shown on Silvertone Pages 5-5 and 5-6 in Rider's Manual, Volume V.

Silvertone 1800 Series Notes

The following advice has been received from the manufacturers of Silvertone receivers.

All receivers having the new style dial and reflector are equipped with two pilot lights. Some trouble has been experienced with short circuits or grounds occurring at the point where the sockets protrude through the reflector, or where the socket terminals touch the variable condenser frame and reflector. An effort has been made to eliminate this difficulty by covering the light socket with a portion of rubber tubing over its entire length, and by bending the socket terminals away from the nearby metal parts. When these precautions are observed, there is little likelihood of shorts occurring.

However, in spite of the precautions taken, short circuits have occurred and quite frequently at that. Therefore, if, for any reason, a receiver does not function properly when connected to the power line, and there is evidence of overheating or overloading of the power transformer, the first thing to do is to check for a short-circuited or grounded pilot light. Since the transformer winding supplying the pilot light current is center tapped to ground, a short of either side to ground, reduces the voltage of the light by one-half. This results in a decrease of brilliancy and not total extinction as might be expected. Therefore, do not assume that the pilot lights are not grounded, because the dial is illuminated.

To eliminate this trouble, remove the pilot light sockets and bend the two terminals on each socket upward. Also see that the tubing covering the sockets is pushed all the way down. Be careful not to break the terminals or to short them. Replace the sockets and be sure that the mounting clips hold them firmly to the bracket and that there is clearance between the metal terminals and any other metal part of the receiver. Finally, arrange the wires connecting the lights so that they are in the clear with a minimum of tension upon them.

Silvertone 1840, 1842 Oscillator Plate Resistor

In some instances, the 10,000-ohm wire-wound resistor in the oscillator plate circuit of the models 1840 and 1842 opens during operation. The cause of the breakdown is mechanical, rather than electrical. Apparently, the form on which the resistance wire is wound expands sufficiently during operation to break the wire. If this break occurs during operation, a small arc occurs at the point of open, making a burnt mark upon the resistor and creating the impression that the unit failed due to overload. As has been stated, such is not the case. At any rate, replacement should be made with a 10,000-ohm carbon resistor rated at 2. watts and bearing part No. R10465.

Arvin Model 16 Installed in Dodge and Plymouth

The following information is furnished for guidance when installing the Arvin Model 16 radio receiver in 1934 model Dodge and Plymouth automobiles. The airplane dial furnished with this receiver is designed to fit either on the steering column or in the ash tray compartment. A chromium plated panel is furnished with each set for this ash-tray mounting.

On the 1934 Plymouth and Dodges there is a wide bracket directly behind this ash tray that interferes with the shafts of the remote control. It is impossible to run the shafts around the control, for that causes too sharp a bend in the cables and consequently they bind. This condition can be easily remedied

by locating the control with the chromium plate attached in the hole left by the ash tray on the panel. Then remove the key from the control and mark through the keyhole onto the bracket. After this center is located, measure one-half inch above and three-sixteenths of an inch to the right of this first mark, and locate the center of the second hole.

Now drill a 3/8-inch hole at both places. Run the two flexible shafts through these holes from the rear and fasten them onto the remote control. Then fasten the control on the dash with the bracket furnished for that purpose and hook the other end of the shaft onto the radio, as described in the instructions furnished with each set.

Famous Fighting Phrases

Leave my mother out of it. . . . Why don't you ever compliment me? . . . You're beginning to get fat where it shows. . . . Must I always walk around with a button missing off my shirt? . . . So you played bridge again today? . . . I'm going to stay at the office tonight, my dear. . . . You knew that before you married me. . . . Where were you when I phoned? . . . Go ahead and make it, but I tell you I won't eat it.

A-Hunting We Must Go!

A man visited a sporting goods store and the following conversation ensued:

Man: I would like to see some shot-guns.

Dealer: Here are some excellent British guns. They range in price from \$450 to as low as \$275.

Man: Mmm, that's a bit too high. I did not think of paying that much.

Dealer: Well, we have somely lovely French guns—in this case, sir. They range in price from \$300 to as low as \$150. They're very excellent guns.

Man: Even that's a bit too high. Have you anything lower priced?

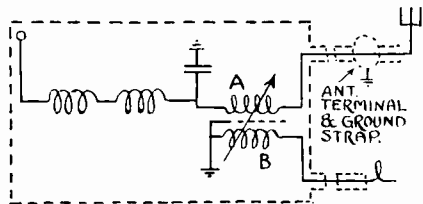
Dealer: Why certainly. Here are some American guns. . . . Here is one for \$40.00. It's a low priced gun, but it is very accurate.

Man: That's okay. I'll take that one. After all, it'll be a small wedding anyway.

Motorola "Magic Eliminode"

This is the name applied to the interference filter employed in the model 100 Motorola receiver, the circuit diagram of which receiver will appear in Rider's *Specialized Auto Radio Manual*, Volume II, which now is on the presses. In the meantime, we give you herewith the circuit of the "magic eliminode," and a few words about its basis of operation.

The circuit diagram is shown. Basically, this is a phase balancing unit; that is, the noise picked up by the antenna is balanced out by a signal, which is deliberately picked off from the source of the noise picked up by the antenna. The noise signal picked up by the antenna



Schematic of Motorola's "Magic Eliminode"

induces a voltage across coil A, simultaneously with the desired signal. A noise signal is fed into the coil B circuit, inducing a voltage across coil B. This voltage is out of phase with the voltage across coil A, or at least is so intended. When the proper phase condition and voltage conditions are obtained, the noise signal is balanced out, and the desired signal only is fed to the receiver. The lead connected to coil B is known as the interference feeder, and is connected within or external of the motor compartment to the choke rod, throttle rod, gas line, spark control, instrument panel, temperature gauge pipe, etc. If desired, either the distributor wire or high tension lead can be used as the source of the noise by wrapping a turn or two of insulated wire around either. Any one of the sources named can be used, depending upon which is most satisfactory. Each car has its salient point.

According to the manufacturer, the filter operates most effectively over the lower broadcast band of frequencies; therefore, if when tuning the receiver over the 800 to 550 kc. band, no motor noise is heard, it can be assumed that the

noise level is within the range of the unit, and the noise then heard when tuning toward 1,500 kc. can be balanced out with the moving coil.

Resistor Replacement

We asked a question concerning resistor replacement in the February, 1935, issue of *SUCCESSFUL SERVICING*. A reply was received from J. N. Golten, Service Manager of Stewart-Warner, and it is published herewith. This should answer the questions asked by numerous radio servicemen.

Mr. John F. Rider
1440 Broadway
New York City

I have just had an opportunity to read through the February issue of your little magazine *SUCCESSFUL SERVICING* and feel that I would like to comment upon your paragraph headed "Resistor Replacement," which is found on the bottom of the middle column on the second page.

In your paragraph you ask the question "—when replacement is necessary, should the identical resistor be used or should one of high wattage be employed?"

Our experience as manufacturers definitely indicates that in ninety-nine cases out of a hundred, and I only make the statement that way so as to avoid being entirely dogmatic, resistor breakdown in well-engineered radio sets, such as are made by nationally known manufacturers, is not fundamentally caused by overload. It is true that occasionally a particular resistor or volume control may be overloaded due to breakdown of some other part of the circuit, thus causing it to carry a current which is abnormally high. However, the cure in such a case is to replace the part causing the trouble originally, as well as the resistor itself. In many cases, and these include wire-wound as well as carbon-type resistors, breakdown is caused by humidity effects and substitution of a higher wattage resistor is not the cure.

In other instances, overheating of the resistor, due to its location in the chassis, may result in resistor breakdown, although the resistor is only normally loaded. Again, high value carbon resistors of the order of one-half megohm and higher occasionally open up, although they carry only a very minor fraction of their so-called wattage rating. We have definitely found in such cases that the use of a similar resistor of higher wattage rating will *not* cure the trouble, which is fundamentally due to the design of the resistor itself.

Speaking again of well-engineered radio sets, you will find almost without exception that resistors are being operated at considerably less than their normal rating. Therefore, when called upon to replace a defective resistor, it is my opinion and recommendation that the service man replace the defective unit with a similar factory part rather than substitute any old

resistor. Of course, if a particular resistor is a chronic offender, the factory substitute for it should be used.

The average service man is in absolutely no position to check such important resistor characteristics as temperature coefficient, voltage coefficient, humidity effects, noise, etc., on replacement resistors he may pick up. In many instances, the above enumerated characteristics play an important part in the successful operation of a receiver, and substitution of a part with poor unsuitable characteristics will result in a poor service job which reflects credit neither to the service man nor the manufacturer of the receiver.

Very truly yours,
STEWART WARNER CORPORATION
(Signed) J. N. GOLTEN
Service Department.

Replacement Tube Sales

Perhaps the following figures may be of interest to men who concern themselves with replacement tube sales. According to Hygrade-Sylvania, 70 per cent of the replacement tube sales consist of type 01A, 24A, 26, 27, 35/51, 45, 47, 71A and 80 tubes.

Rider Still Talks

April 2nd at the Staten Island Chapter of the IRSM . . . April 16th at the Federated School; April 17th at the Bayone Vocational School . . . April 23rd in Baltimore at an NRI Alumnae meeting . . . May 6th at the Northwestern Radio Servicemen's Convention in the Twin Cities.

Cathode-Ray Book

Rider's new book "The Cathode-Ray Tube At Work," is going to be about two weeks late in delivery. We have been delayed in completing our experiments in connection with the application of the cathode-ray tube to "ham" transmitters.

The Rider's *Specialized Auto Radio Manual*, Volume II, will be off on schedule, namely, during the month of April. Shipments to jobbers will go forth sometime during the last week in April.

Successful SERVICING

Dedicated to financial and technical advancement of the radio service man.

Published monthly by

John F. Rider, Publisher
1440 Broadway New York City

John F. Rider Editor
G. C. B. Rowe . Assoc. Editor

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Vol. I April, 1935 No. 8

COOPERATION

If you will examine one of the pages in this issue of SUCCESSFUL SERVICING you will find that it is an advertisement, paid for by an organization which is not connected with SUCCESSFUL SERVICING or John F. Rider, Publisher. In sum and substance we sold this space in our house organ.

We have certain reasons for selling such space and we do not feel the slightest hesitancy in telling you just what we are doing. At the same time, we want your comments, because after all is said and done, this paper was dedicated to your welfare as well as our benefit.

Many thousands of Rider Manual owner-servicemen have flattered us by clamoring for SUCCESSFUL SERVICING. They want to be on the mailing list. We have placed them on the mailing list, so that our list today totals about 12,500 names. The editorial work, art work, cuts, paper, printing, mailing—all cost money and we desire to make this house organ of continued use to you. We can see our way clear to spend a certain amount of money each month, but at the rate that Rider Manual owners have been sending in their names to receive SUCCESSFUL SERVICING, it seems as if within several months, we will be mailing between 16,000 and 18,000 copies per month—if not more. That is going to cost more money than we feel that we

can spend each month for that purpose—unless we can see our way clear to minimize the cost. . . . One way to do that would be to charge a subscription price. . . . That is out completely. . . . SUCCESSFUL SERVICING will be mailed gratis. . . . Therefore to minimize our expense we have accepted an advertisement and we hope to accept more such ads, if you men who receive SUCCESSFUL SERVICING, do not object.

Knowing what development is going on in the servicing industry, we feel that the time is not far distant when SUCCESSFUL SERVICING will become a 12-page issue, instead of an 8-page issue each month. That means more editorial work, paper, printing and mailing. Rather than be curtailed in our activities, we feel that we are answering the many men who have wondered how it was possible for us to mail such an eight-page house organ each month, without any charge. We recognize today's needs and what will develop soon. . . . Hence this first advertisement.

We have been approached by a number of advertisers requesting space in the paper. Each and every one of these concerns was told that if they bought space—they were buying space in our house organ—for that is what SUCCESSFUL SERVICING will be as long as we operate it. These concerns felt that the type of readers we had, were the type they wanted to reach, hence were interested in space.

This first advertisement is an experiment pure and simple. If you think it's okay, we shall try to keep all future advertising copy in this instructional manner—will sell more space, in order to keep our expenses to a minimum—and at the same time increase the mailing list of SUCCESSFUL SERVICING and supply even more than before of the data, which you have stated you favored so greatly.

Will you drop us a line, letting us know if you favor the inclusion of paid space in SUCCESSFUL SERVICING. . . . Thanks much.

JOHN F. RIDER.

*He who has lost confidence
can lose nothing more.*

—Boiste.

Did You Know That

Practically every map at which you look has a river or a bay which is non-existent. The reason for the inclusion of such spurious information is the means of establishing infringement of copyright, in the event that someone reproduces the map without permission. Since the river or the bay and its placement is the brainchild of the artist and the property of the publisher, it is easy to show that the map in question, showing the river or bay, produced by a competitor, is a reproduction of the copyrighted map. Map copyrights are pretty strongly protected.

Science identifies many things which have been known. The medicine man in certain South American tribes used to dose sick men with the bark of a tree. Modern science has identified the sickness as **malaria** and the bark as **quinine**, which today is the regular remedy for such fever.

For a long time prior to **Pasteur**, farmers' wives scalded the milk pail before milking the cow. They knew that such scalding prevented the milk from turning sour. Science has since established that the scalding killed the germs and that prevented the milk from turning sour . . . namely, that germs were the cause of sour milk.



About Rider Manuals . . .

On Tube Deals

A very distasteful condition has arisen among the tube jobbers who have been selling Rider Manuals outright, at reduced prices, with the sale of a certain number of tubes. Numerous instances have been recorded when Rider Manuals were sold at such reduced prices without the required sale of a certain number of tubes. Also when these manuals were sold at ridiculously low prices, with the sole desire of undermining the business of the other jobbers in the same town. . . . The essence of tube deals which was to place Rider Manuals at the disposal of the service industry, in the most economical manner, was ignored entirely.

We have always fought against cut price wars in the servicing industry and among our jobbing trade. We feel that it does no one any good in the long run. . . . When it is over—all partici-

pants have suffered. In the effort to correct the evils, we find it necessary to discontinue the use of Rider Manuals on tube deals where they are available on outright purchase by the customer, at prices below the established list price, contingent with the purchase of a number of tubes.

After May 30th, 1935, Rider Manuals will no longer be for sale by tube companies or their jobbers, at prices below the established list. While we are desirous of distributing as many manuals as possible, we still feel that the man who buys a manual outright at the regular price, should not be penalized. We feel that by doing what we are doing, the entire radio service industry will be more justly served and the parts jobbers who are essential to the welfare of the service industry, will have a more just basis of operating.

Checking Generator Ignition Noise

We are indebted to Colonial for the following data concerning identification of ignition noise due to the generator. If the majority of ignition interference aids do not seem to eliminate the trouble, check for noise originating in the generator.

Accelerate the engine and then cut off the ignition. If a whine is heard as the engine dies down, interference comes from the generator. An additional 1.-mfd. condenser from the ammeter side of the generator cutout to the generator frame should completely eliminate this interference.

Automatic Volume Control Notes

The following represents pertinent notes concerning automatic volume control, without any effort to offer a discourse upon the subject of AVC.

Automatic volume control can be applied effectively only to receivers which afford a high gain preceding the demod-

ulator tube in superheterodyne receivers or the detector tube in t-r-f. receivers. As it happens, all superheterodynes are within this province, but not so with t-r-f. receivers. The high gain is required in order that sufficient change in amplification be available as a result of the AVC action and in order to compensate for the immediate reduction in sensitivity, which takes place as a result of the application of automatic volume control. This reduction in sensitivity is offset by the normally high gain of the receiver.

AVC as used in a radio receiver depends essentially upon the carrier rather than upon the modulation component. In the superheterodyne receiver, this carrier is the carrier portion of the modulated i-f. signal. In some instances, a special AVC amplifier is used between the source of the carrier and the tube which develops the control voltage.

Where difficulty is experienced during alignment due to the presence of the AVC action, a simple means of arranging an indicating device is to connect a high-resistance, low-range voltmeter

across the bias resistor of any one of the controlled stages. Maximum signal strength is indicated by the lowest voltage across the bias resistor. The bias voltage during operation is a function of the tube plate current. The application of the AVC voltage reduces the plate current, consequently, the bias voltage. Hence the state of minimum bias voltage establishes the application of the greatest control voltage, which in turn, indicates the transfer of the maximum signal through the receiver. Obviously, maximum signal strength is indicative of most perfect alignment.

The use of the aforementioned method of indication of signal strength minimizes the complications relating to the level of the test oscillator output.

United Motors 4038

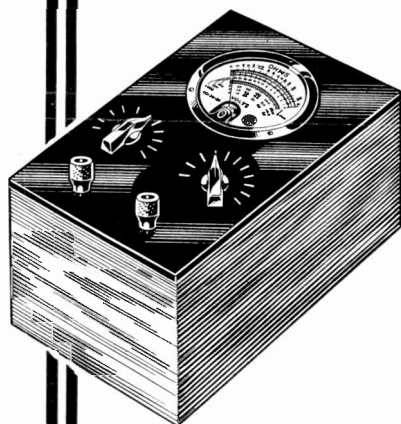
The volume control and tone control used in this receiver, shown in Rider's Manual Volume V, page United Motors 4-7, are 500,000 ohms each. Please make these additions to your manuals.

Rider At San Antonio

We spent two nice summery days at San Antonio, Texas, on April 6th and 7th, attending the convention of the Texas Radio Servicemen's Association, at the Hotel Plaza. We had an excellent time, to say the least. . . . Real southern hospitality. At the same time, the men who were there, attended to business. Some of them traveled 500 to 600 miles to reach the Alamo City. Our subject was "The Effect of Operating Costs Upon Service Charges" and we were pleased to learn that the figures given in *SUCCESSFUL SERVICING* several months ago have been serving as guides to some of the men in different parts of Texas. The interest in determining costs and establishing profitable service charges is tremendous—to steal movie parlance—"stupendous—colossal!"

Several others from above the Mason-Dixon line were there. Ken Hathaway, of the IRSM, was in numerous conferences with the directors of the association. Incidentally, the Texas association is affiliated with the Southwestern Radio Servicemen's Association.

Modernize your One-Milliammeter



CONTINENTAL Carbon Engineers have perfected an exceptional circuit by which you can easily change your milliammeter to a modern Volt-Ohmmeter.

Multiplier Kit

The CONTINENTAL Volt-Ohmmeter Kit is designed to provide the essential resistors and dial scale with which to convert a standard Weston or Jewell O-1 Milliammeter to a multi-range voltmeter and a two range ohmmeter. The voltmeter circuit has 1000 ohms per volt resistance and the ohmmeter circuit limits the current through the resistance under test to not more than one milliampere.

Ranges at 1000 ohms per volt—500, 250, 100, 50, 25, 10, and 5 volts; two ohm scales—0 to 1000 and 0 to 1 megohm with midscale readings of 50 and 9000 ohms, respectively.

Special Dial Scales

Special replacement meter dial scales are supplied with the CONTINENTAL Kit of essential parts. These dials may be attached to the back of the old meter scale with rubber cement. In this way the original dial is not damaged and may be restored at any time.

The resistors supplied with the kit are Special Pre-Aged CONTINENTAL Carbon Semi-Precision Meter Multiplier Resistors, which check well within 5% of the rated values. For practically all phases of radio service work, this degree of accuracy is highly satisfactory.

Official Parts List

Parts Supplied in CONTINENTAL Carbon Volt-Ohmmeter Kit—List price \$3.60
Dial Scales for Weston Model 301; Jewell Patterns 88, 54, 444, 408, 409, 199, 133, 133A, 210, 538, 137, 137A, 574, and Triplett 321, on enameled stock of high grade white paper. 25 ohms insulated resistance wire, Rp. Semi-precision Resistors:—

R2	8,000 ohms	R3	4,950 ohms
R4	5,000 ohms	R5	20,000 ohms
R6	5,000 ohms	R7	40,000 ohms
R8	90,000 ohms	R9	240,000 ohms
R10	490,000 ohms		

Additional parts required—purchase from your distributor:—

Readrite or Oak rotary tap switch, two deck non-shorting, 9, 10, or 11 contacts.

2 Readrite 1/2" bar knobs.

Electrad No. 232, 2000 ohm potentiometer.

2 binding posts or pin-jacks.

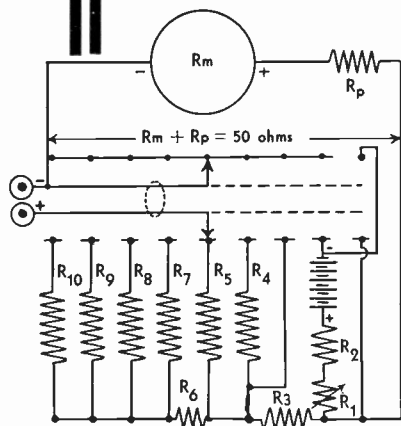
2 Standard 4 1/2-volt Eveready C Batteries.

1—5 1/2" x 8 1/2" x 4 1/2" deep walnut or metal case.

1—5 1/2" x 8 1/2" x 3/16" bakelite panel. One Weston, Triplett, or Jewell O-1 Milliammeter.

The illustration suggests a panel layout that is simple and attractive. Lay out your panel and drill the necessary holes in any order you choose, so long as the different items do not touch under the panel.

Arrange the resistors on a piece of fiber with holes just large enough to take the wire leads on the resistors and to prevent accidental contact between individual lead wires.



Rp may be made from special ballast wire supplied with the kit. Omit Rp if the meter has 50 ohms internal resistance.
R1 2000 or 3000-ohm variable, Electrad 232, or Yaxley Model C.

R2	8,000 ohm	(5% tolerance)
R3	4,950 ohm	(5% tolerance)
R4	5,000 ohm	(5% tolerance)
R5	20,000 ohm	(5% tolerance)
R6	5,000 ohm	(5% tolerance)
R7	40,000 ohm	(5% tolerance)
R8	90,000 ohm	(5% tolerance)
R9	240,000 ohm	(5% tolerance)
R10	490,000 ohm	(5% tolerance)
Battery, 9 volts		

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Volume I covers the auto radio field up to September 1933.

Volume II covers the auto radio field from September 1933 up to April 1935.

There is no duplication between the contents of these two Rider's Specialized Auto Radio Manuals

and if you are doing auto radio work, you need these volumes.

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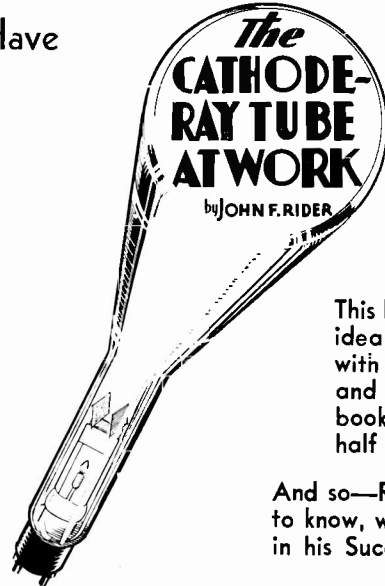
Volume II . . . 410 Pages, \$3.50

Notice is given herewith that these Rider Manuals will not be available for outright purchase from tube companies.

The Book You Have
Waited For
•
May
Publication
•

320 Pages
6" x 9"

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GET READY!

Thousands of servicemen all over the world look to John Rider for servicing information of today and tomorrow. The cathode-ray tube is a tool that the far-seeing serviceman will recognize as a means whereby he can recondition sets with a minimum of wasted effort and so assure himself of an increased profit.

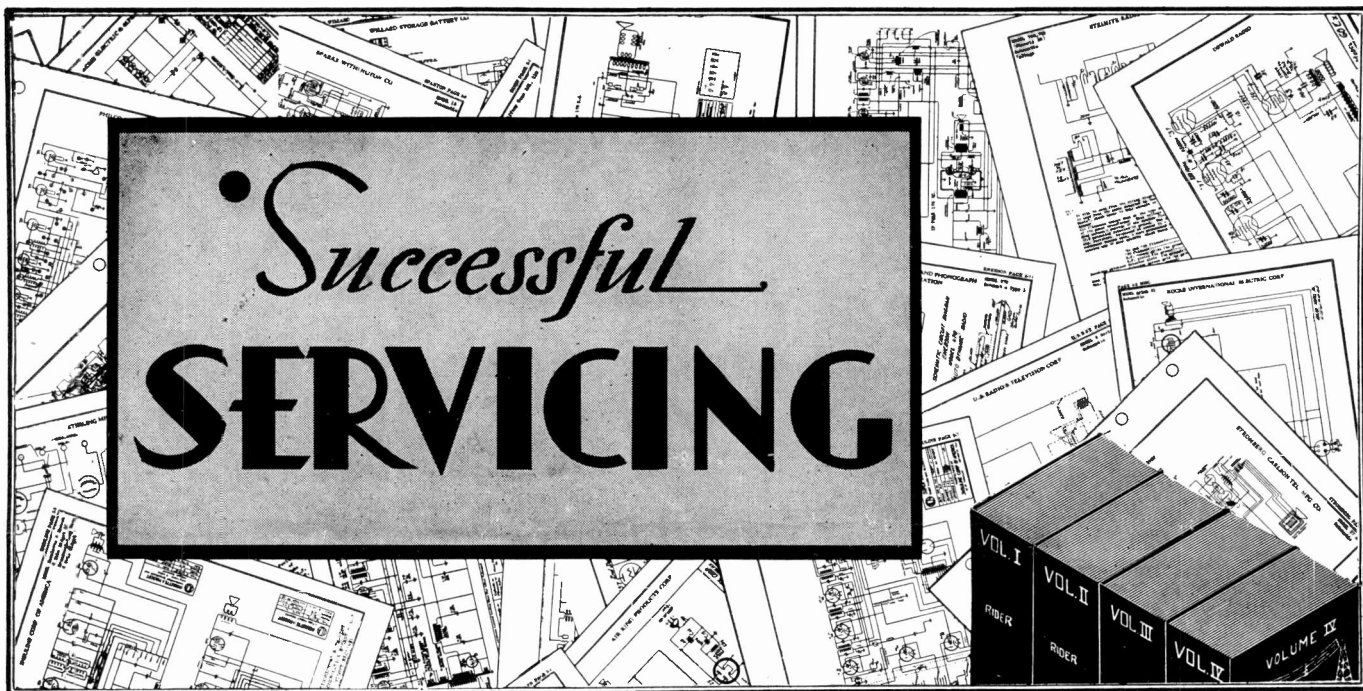
This book is the only one written with the underlying idea that the serviceman must be fully conversant with the functioning of the cathode-ray tube itself and its associated circuits. The first part of the book explains the theory of the tube and the second half is devoted to the practical applications.

And so—Rider does it again! He tells you what you need to know, with graphic findings of experiments performed in his Successful Servicing Laboratory.



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REGENERATION IN I-F. AMPLIFIERS

A brief discussion of a subject seldom mentioned in service literature

By JOHN F. RIDER

EDITOR'S NOTE: *The illustrations presented herewith were made in connection with the preparation of Rider's new book, "The Cathode-Ray Tube At Work." Upon final examination of the photographs and analysis of what had been done, it was found that the material when written up would constitute a resumé of a subject seldom considered by the radio servicing fraternity. No doubt we can attribute this state to the fact that suitable apparatus has not been generally available, until the present time. Consequently, this discussion should be timely.*

The illustrations shown are those of original and unretouched photographs made in the SUCCESSFUL SERVICING Laboratory.

THERE has been a great deal of discussion concerning alignment of i-f. amplifiers. As a general rule, the prime objective has been the adjustment for maximum signal transfer, which, expressed differently, would be the highest amplitude of the resonant peak. Such

alignment is usually carried out with an output meter as the signal indicator or with a voltmeter connected across the bias resistor of one of the controlled i-f. tubes, depending upon the system employed.

Under certain conditions, such alignment is satisfactory in every respect, because proper design of the i-f. amplifier automatically produces the proper band pass. All that is necessary in an i-f. amplifier, which is perfect in every respect but for incorrect alignment, is trimmer adjustment to maximum response. While it is possible that the actual resonance curve, as viewed upon an oscilloscope, may not show perfect resonance adjustment, the deviation from the rated peak is seldom so great as to upset operation, particularly when it is possible to compensate for this deviation by proper trimmer adjustment of the oscillator circuit.

The above statement should not be construed as indicating that an output meter is as good as an oscilloscope, or oscillograph, whichever term is used,

for the alignment of an r-f. or i-f. amplifying system. The speed or accuracy of adjustment available with one of the cathode-ray tube units cannot even be approached by the finest of output meters, no matter how carefully and rapidly a man operates. The statement made, simply recognizes that under certain conditions, satisfactory results may be achieved.

Unfortunately, however, there are an equal number of poor and good working conditions. That is to say, the number of instances where maximum response type of alignment does not provide that which is sought, occurs as frequently as the instances when the proper condition is obtained. One of these bad states is the presence of regeneration in the i-f. amplifier, present during the process of alignment or introduced by changing the position of leads in order to reach some hidden part which may require replacement, or for any one of a number of other reasons, which include deteriorated resistors, poor condensers, etc. It is here that the oscilloscope shines in all its glory and it is

here that its application becomes a necessity, for its use is equivalent to working in light instead of darkness.

We made certain tests upon i-f. amplifiers and the resonance curves appearing as images upon the viewing screen were photographed. These curves show

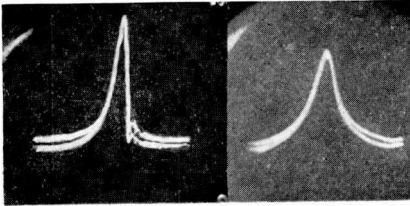


Fig. 1, left. Response curve of i-f. amplifier with regeneration present aligned with meter. Fig. 2, right. Response curve of same amplifier with minimum regeneration, aligned with oscilloscope.

what happens when regeneration exists and the i-f. amplifier is aligned with some form of signal indicator, other than an image of the resonance curve. Figure 1 illustrates the actual response curve developed in an i-f. amplifier, which was afflicted with regeneration and which was aligned for maximum response, as indicated upon a voltmeter connected across one of the bias resistors. Incidentally, the alignment was critical, which fact is shown by the steep side of the curve. The operator did not see the image until he had classed the adjustment as being completed and satisfactory. The curve then was made visible. It is clearly evident that this adjustment, while providing maximum response, would certainly impair reception, particularly when the band width representing the total sweep is 13 kilocycles, or 6.5 kilocycles each side of the peak frequency. The presence of regeneration is very evident. When adjusting with the output meter, or voltmeter, there is no means of knowing that actual oscillations are being generated at one particular frequency, which is not the

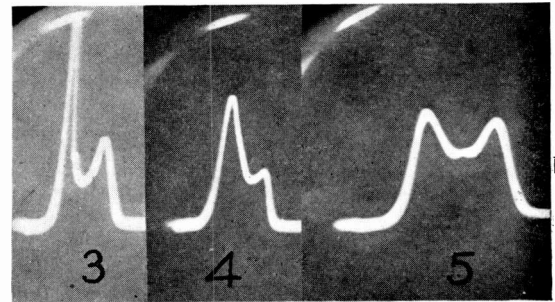
peak frequency. This is shown in the illustration. It is evident that when tuned to accurate resonance, oscillations occur as the signal frequency sweeps past one particular frequency. Also there is virtual cut-off of one side band.

The same receiver adjusted with the oscilloscope for the highest peak consistent with minimum regeneration, develops the curve shown as figure 2. The fact that a certain amount of regeneration exists is shown by the lack of absolute coincidence along the base. Note that the amplitude of the peak is lower than before and that the band-pass both sides of the peak frequency is substantially identical. The method of developing this curve was staggering the stages, slightly, so that the overall response was in resonance with the peak frequency, although the top of the peak was somewhat more round than that which exists in figure 1, where both stages were accurately tuned to resonance. Any attempt to stagger such stages to produce a curve of this kind with meter type indicating equipment is well nigh impossible.

that proper operation was being obtained.

Another example of the presence of regeneration, due to incorrect placement of a lead, which was later corrected, is shown in figures 3, 4 and 5. Figure 3 is the resonance curve, as obtained with an output meter, with regeneration in the i-f. amplifier and the receiver adjusted according to information available. The i-f. amplifier was a high-fidelity system, adjusted for such operation. With regeneration in the system, the response curve was adjusted with a meter type of signal indicator. Strange as it may seem, despite the fact that the desired condition was uniform height of the two peaks, a long and tedious process could not develop anything better than the curves shown in figures 3 and 4. The correct curve, which was developed with the oscilloscope, is that shown in figure 5. Figure 4 illustrates a slight reduction in the amount of regeneration, but not total elimination of the defect. Also, a widening of the band width both sides of the lower peak. The high-fidelity amplifier employs two

Figs. 3 and 4. Resonance curves obtained by aligning i-f. amplifier with an output meter. Less regeneration present in curve of Fig. 4 than in that of Fig. 3. Fig. 5 shows the resonance curve obtained by aligning the same amplifier with an oscilloscope with minimum regeneration.



No attempt at correction of the regenerative condition was made with this receiver, because it was inherent to the design. A checkup of the sensitivity of the receiver, with the i-f. amplifier adjusted as shown in figure 2, indicated

peaks, separated by a certain bandwidth, depending upon the rated bandwidth of the system.

Speaking about output and other meter indicating systems utilized for alignment, we show figures 6 and 7. Here is an example of the fact that satisfactory alignment is possible with an output meter. Figure 6 is the correct resonance curve as developed with the oscilloscope and figure 7 shows the double resonance curve developed by means of the meter. The deviation from correct peaking is shown by the distance between the peaks and the reference line.

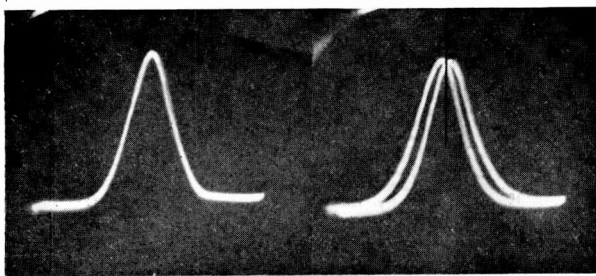
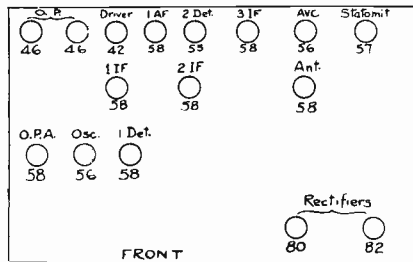


Fig. 6, left. Resonance curve obtained with an oscilloscope as the indicating device. Fig. 7, right. A double curve obtained by means of an output meter. See text for more detailed explanation.

Midwest 16 Tube 1933

There have been numerous requests for alignment and voltage data covering the Midwest 16 tube 1933 receiver. The schematic is shown in Rider's Manual, Volume III on Midwest page 3-3 and in the combination manual, on page 1501. The following is the alignment and voltage data. The position of the trimmers is shown herewith.

The alignment instructions follow: Before attempting to align the i-f. amplifier, we suggest that you inspect the i-f. transformers for correct spacing, as these transformers often collapse and cause broad tuning. The correct spacing of the windings is 3/4 inch between the faces of the coils. Wax the coils tightly in place and then start the procedure of alignment, by adjusting your signal generator to 450 kc., which is the

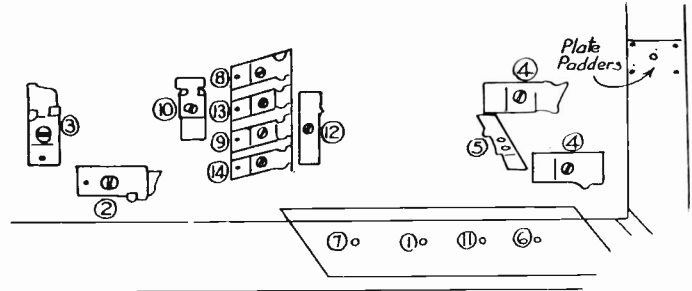


Tube socket layout of Midwest 16-tube superhet, 1933

i-f. peak in this receiver. Keep the test signal input at the lowest possible level consistent with proper operation. Measure the AVC voltage developed for peaking purposes. If signal input is too great, it will result in double peaking of stations.

When the i-f. trimmers have been adjusted, the next step is the trimming of the "A" band (white). NOTICE. Do not attempt to adjust the plate padder. It was adjusted at the factory and should not be changed. Proceed as follows: Rotate the tuning dial to 5 and

On the right will be found the locations of the padding and trimming condensers of the Midwest 16-tube receiver, 1933



adjust the "A" band r-f. trimmers to highest output. The frequency will be about 1490 kc. Adjust the "A" band padder at 550 kc., with the dial set to 98.

Then set the tuning dial to "L" band (red). Dial should be at division 2. Adjust the "L" band r-f. trimmers. The frequency will be about 4.1 megacycles or 4100 kilocycles. Set dial to 98 and adjust padder for that band. The frequency for adjustment is 1712 kc. Adjust feed condenser until maximum sensitivity is reached all over the band. The condenser, in almost all cases, will be tight.

Then adjust "M" band (green). Proceed as for other bands. Adjust "M" band r-f. trimmers at 9.0 megacycles, 8000 kilocycles at 2 on the dial. Adjust the "M" band padder at 4.5 megacycles, which is 4500 kilocycles. Adjust the

feed condenser same as for "L" band. Adjust "H" band (blue or amber). Adjust the "H" band r-f. trimmers at 5 on the dial. The frequency will be about 20. megacycles. Adjust the "H" band padder at 9.0 megacycles at 98 on the dial.

According to the manufacturer, who furnished the above data, the frequencies are subject to a small degree of change in various receivers, due to differences in circuit constants. The positions of the various trimmers are shown herewith and the following is the identification data.

1. "A" band padder
2. "A" band r-f. trimmer
3. "A" band r-f. trimmer
4. "L" band r-f. trimmer
5. "L" band feeder condenser
6. "L" band padder
7. "M" band padder
8. "M" band r-f. trimmer
9. "M" band r-f. trimmer
10. "M" band feed condenser
11. "H" band padder
12. "H" band feed condenser
13. "H" band r-f. trimmer
14. "H" band r-f. trimmer

VOLTAGE TABLE

Type	Function	Plate	Screen	Cathode	C. Grid	Fil.
58	Ant.	220	88	0	.25	2.5
58	Mixer	220	128	2	4.25	2.5
56	Osc.	189	...	0	0	2.5
58	O.P.A.	128	92	0	3.5	2.5
58	1st IF.	216	80	7	2.0	2.5
58	2nd IF.	216	80	7	.25	2.5
58	3rd IF.	216	76	8	0	2.5
55	2nd det.	0	...	0	AVC	2.5
56	A.V.C.	0	...	0	0	2.5
57	Statomit	33	76	8	0	2.5
58	1st AF.	98	97	94	36	2.5
42	Driver	184	216	14	0	6.2
46	Output	478	...	...	0	2.5
46	Output	478	...	...	0	2.5
80	Rect.	350 r.m.s. each plate			...	5.0
82	Rect.	345 r.m.s. each plate			...	2.6

All readings are taken with no signal input and Statomit full on (clockwise). All voltages are plus or minus 15 percent, depending on line voltage.

NOTICE

Every owner of Rider's Manuals should be receiving SUCCESSFUL SERVICING, so that he can keep these important servicing tools up to the minute. There are other servicemen who have not yet bought Rider's Manuals and who would like to be abreast of the times. Inquire among your friends to see if they receive SUCCESSFUL SERVICING. Tell them to let us know about sending it to them. Remember, it costs them nothing and we will be only too glad to see that it is mailed to them monthly. Thanks for your cooperation.

Rolling REPORTER



Are you too, a fugitive from a chain letter? . . . It was inevitable—the servicing fraternity has already dubbed the new metal tubes, "iron tubes" the irony of it. Dropped into a service station not 20 miles from Times Square—the lad who runs the shop was proud. . . . A big job on the bench—the highest priced job of the year—\$92.00 dollars,—to take the set apart and revamp it completely for high fidelity and remote control. . . . New parts cost \$40.00. . . . Big profit—yeah, where the hair is thin. . . . After we figured his total costs—the net profit was less than 60 cents. . . . Big job! . . . **Select your own MORAL.** . . . RIDER started to fly to Minni—to attend the Northwestern Technicians convention. . . . Started on the day when the fog reached from the ground to the sky. . . . The first ship went bad in the air and came home to roost. . . . This was at 1 A.M. in fog you could put in a basket and keep there. . . . Left again later and finally reached Cleveland on Monday afternoon. . . . Grounded there with no air travel east or west. . . . That was the day Senator Cutting so unfortunately cracked up. . . . Came home by train and missed a perfectly good banquet. . . . Called off the scheduled speech by long distance phone.

This issue of SUCCESSFUL SERVICING will reach 13,000. . . . "Great Oaks from little Acorns grow"—or something like that. . . . The Gang in the office were surprised at the response to the editorial "Cooperation". . . . It was swell and the majority of letters asked us to be "fussy" about the advertising we accepted. . . . *This advertising, according to Rider, is going to help us continue giving material like the cathode-ray story in this issue and maybe go to 12 pages.* . . . Hope so. . . . Thanks to L. H. Eden, Sapulpa, Okla., Paul Crowel, Springfield, Ohio, and the hundred and umpty others who wrote. . . . If you like how our advertisers present their products—tell 'em so.

Dropped in on "Red" Kendall, the pride of Cleveland, Ohio, a few weeks ago . . . was busy installing a receiver in a 5-ton Mack truck, railroad competitor—you've seen them. . . . Said it was his twelfth truck installation. . . . Any motor trucking outfit in your town? . . . *Drivers say it helps them drive at night.* . . . Take my word that it'll be worth while waiting for that cathode-ray book. . . . Rider and Rowe have been making so many experiments and photographs that this publishing house looks more like a lab and photo place than an office. . . . From what I've seen—it's going to be a STUPENDOUS . . . MAGNIFICENT . . . SUPER-

DELUXE book. . . . If you don't know how to use the cat-ray tube after you read that book—break the tube and enjoy the noise.

In the bustling city of Mt. Vernon, N. Y. —(okaaaay, Chamber of Commerce)—we got the surprise of our life. . . . A service man actually ADMITTED that his competitor knew his business—and was HONEST. . . . *Can you beat that?* . . . It took two shots of brandy to get over the shock and four more for good measure. . . . Rider's article "Time or Parts"—must have hit home. . . . Lots of letters. . . . **It's food for youse guys.** . . . It's goin' to mean everything, youse'll see.

And here's NEWS. . . . We're going to hand out five bux (C-A-S-H) . . . to the guy what sends in the best business card—the prize will be awarded on the basis of *eye appeal—sales appeal and originality.* . . . Get your cards in before July foist. . . . Winner will be announced in the July number. . . . Those who tie receive equal rewards. . . . Address your entries to

The Rolling Reporter

Regeneration in I-F. Amplifiers

(Continued from page 2)

which is the peak frequency. This space interpreted in frequency would represent the difference between the frequency at which these amplifier circuits are exactly resonant and the correct peak frequency. In this case it is less than 500 cycles.

It may seem strange to give praise to the meter type of indicator in one breath and at the same time state that it is not as good as the oscilloscope. Such is the case and we have no fear of stating that the oscilloscope will come into daily use. The versatility and the range of application of the cathode-ray oscilloscope, or oscillograph, is so great that no other assembly of equipment now available for use by the servicing industry can hope to approximate it in value received. At the same time, we will also say that the output meter will still find room in the service technician's kit of equipment, for it possesses certain portability and other advantages, and if it is of the type which is a combination of instruments, its period of utility, barring damage, will last until such time as something other than electrical phenomena will be associated with radio receivers.

Referring for a moment to the regeneration present in the system, no effort is being made to describe the corrective measures. All that we are concerned

with at this time is the identification of the presence of regeneration and recognition of the detrimental conditions created. Recognition of the presence of regeneration is not a problem, if the operator is familiar with what represents a normal response curve of an r-f. or i-f. transformer. It is further assumed that if the existence of regeneration is determined, that corrective measures will be instituted to minimize, if not eliminate, its effects. Under certain conditions, as for example, in the case of figures 1 and 2, the corrective measure was peaking, which fact was determined by experiment and inspection of the components involved in the circuit.

In conclusion we would like to repeat what is really the paramount thought in this short discussion, namely, that alignment for maximum response is not necessarily assurance that the best operating condition is obtained. This is so despite the fact that hundreds of thousands if not millions of receivers have been so aligned during the years past. For that matter, we have no difficulty recalling a large number of receivers of both the t-r-f. and superheterodyne variety, which never did sound as well as they should. . . . Yet the customers were satisfied and the service technician went home contented. . . . A new era is approaching—greater satisfaction to the customer and continued technical advancement for the serviceman.

Did You Know That

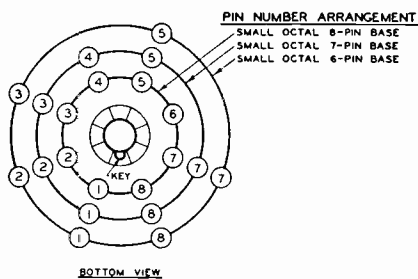
While we studied in school that there were eight planets, namely Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune, we now have nine planets. The most distant planet, **Pluto**, was discovered on March 13, 1930, by Clyde W. Tombaugh. The planet Pluto is on the average, about 36,828,000,000 miles from the Sun. (The Earth is slightly less than 93,000,000 miles from the Sun.)

The star nearest the Earth is **Proxima**, and is about 4.166 light years distant. It is a star of the tenth magnitude and can be seen only through a powerful telescope.

"Iron" Tubes Pin Numbering

Although the so-called "iron" tubes are not yet out in the field—and they will not be generally encountered for several months yet—SUCCESSFUL SERVICING has been able to obtain from the manufacturer the manner in which the pins of these new tubes will be numbered. It is presented herewith so that you will know about it when the need arises.

It was the original plan to have the heater as the reference point and to be designated as pin No. 1, the successive pins being numbered in rotation in a clockwise direction, when the base was viewed from the bottom. However, this was changed and below will be found the revised pin numbering, which will be used on the new metal tubes when they appear.



Courtesy RCA Mfg. Co., Inc.
Layout of new metal tubes' pins, showing positions on 6, 7 and 8-pin bases

In this new system of pin numbering, which is believed to offer great advantages in simplicity, numbers are assigned to each of the eight possible pin positions. This is an important point to bear in mind. An examination of the accompanying diagram will show just what is meant: No matter whether the tubes have six or seven pins, those pins will be numbered and placed on the base as though there were eight pins used. For instance, 6C5, which is a six-pin tube, has pins numbered 1, 2, 3, 5, 7 and 8, the numbers 4 and 6 being skipped, and the 6H6, a seven-pin tube, has its pins numbered 1, 2, 3, 4, 5, 7 and 8, in this case 6 being skipped.

Another fact to remember is that the metal shell of the tube is always connected to pin number 1, which is located at the left of the position of the key, (See diagram) when the base of

the tube is viewed from the bottom. Numbering is followed in a clockwise direction.

The following table gives the pin numbering for seven of the new metal tubes.

Tube Type Number	Pin Positions and Numbers							
	1	2	3	4	5	6	7	8
6A8	S	H	P	G3, G5	G1	G2	H	K
6C5	S	H	P	...	G1	...	H	K
6D5	S	H	P	...	G1	...	H	K
6H6	S	H	P2	K2	P1	...	H	K1
6J7	S	H	P	G2	G3	...	H	K
6K7	S	H	P	G2	G3	...	H	K
6L7	S	H	P	G2, G4	G3	...	H	K, G5

These tubes all are designed to operate with alternating current and it should be remembered that in the metal tubes the connection to the shell through pin No. 1, makes for an extra pin. In other words, even though there are but five elements within the tube, seven pins will be on the base, as a connection is always made to the shell. (It will be noted that the heater has two pins.)

Stromberg-Carlson 70 Series

The specifications of this series are given below with the parts numbers that make up the several models. The schematic diagram and other data will be published in Volume VI of Rider's Manuals this fall.

No. 70 Receiver, 50-60 cycles. P-24783 chassis; P-24777 bass loud speaker; P-24819 treble loud speaker.

No. 70-B Receiver, 25-60 cycles. P-24784 chassis; P-24777, bass loud speaker; P-24819, treble loud speaker.

No. 72 Receiver, 60 cycles. P-24783 chassis; P-24777, bass loud speaker P-24819, treble loud speaker; No. 5-A, phonograph assembly.

No. 72-D Receiver, 50 cycles. Same as 60 cycles except No. 5-D phonograph assembly.

No. 72-B Receiver, 25 cycles. Same as 60 cycles, except P-24784 chassis and No. 6-B phonograph assembly.

No. 74 Receiver, 60 cycles. P-24785 chassis, P-24855 auditorium type loud speaker; P-24819 treble loud speaker; No. 6-A phonograph assembly.

No. 74-D Receiver, 50 cycles. Same as 60 cycles except No. 5-D phonograph assembly.

No. 74-B Receiver, 25 cycles. Same as 60 cycles except P-24786 chassis; P-25378 auditorium type loud speaker and No. 6-B phonograph assembly.

Stromberg-Carlson 70 Series Treble Loud Speakers

Care should be exercised in handling this type of speaker. Do not drop it face down on a flat surface or the center may be damaged due to the resulting air compression. Later speakers have a stud on the front ring that prevents damage of this kind occurring.

The voice coil leads on these speakers are made of fine aluminum wire in order to lessen the weight to the value necessary for the reproduction of high frequencies. Avoid touching these wires, as they are delicate and very easily broken. Do not try to blow chips or dust from these speakers with compressed air as lead breakage will result. The movement of the cone in use is only a few thousandths of an inch and is taken care of by the thin aluminum center suspension. Never force the cone back and forth with the fingers, as you would an ordinary dynamic speaker, or the center suspension will become damaged.

Erla Models 7700, 7732, 7741

In early production of these sets the value of the condenser in the grid return of the first i-f. transformer was .01 mf., Part No. 7860. To eliminate tendency of the i-f. amplifier to oscillate, this condenser has been changed to .02 mf., Part No. 9714. If any receivers are found having i-f. oscillations, change the .01 mf. condenser to one having a value of .02 mf.

To eliminate self modulation of the 1C6 tube the 50,000-ohm resistor, Part No. 6879, has been changed to 35,000-ohm resistor, Part No. 1618. Whenever self modulation occurs, try another 1C6 tube or replace the 50,000-ohm resistor with one having a value of 35,000 ohms.

? . . . do you know the answers?

Ques. 1. Do you thoroughly understand the functioning and appreciate the applications of the Cathode-Ray Oscillograph? (See SERVICE for March 1935.)

Ques. 2. What about the inside dope on Test Oscillators and Set Analyzers? Why do they meet present-day servicing problems? (See SERVICE for December 1934, January and February 1935.)

Ques. 3. Have you a really good operating routine for the alignment of receivers that will serve all receivers? (See the crackerjack article on page 159 of SERVICE for April 1935.)

Ques. 4. Have you a thorough understanding of the why's and wherefore's of all-wave antenna systems—an understanding that will permit you to make the perfect installation for any given location? (See SERVICE for December 1934, March and April 1935.)

Ques. 5. What to do about auto-radio antennas for the new turret-type cars? (See SERVICE for February 1935, and the special May Auto-radio issue.)

Ques. 6. Do you understand the functioning of the Vacuum-Tube Voltmeter and appreciate its value as a bang-up servicing device? (Get all the dope on this from the May 1935 issue of SERVICE.)

Ques. 7. Have you the latest dope on engineering improvements in receivers? (See any issue of SERVICE).

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Data on the new receivers, design kinks, and information about the manufacturers' plans (with schematics and comprehensive technical information), how they work and what to look out for. Broadcast—All-Wave—Auto Radio—High Fidelity, etc. Latest data on P.A. installations, new amplifier designs, how to construct, install and maintain. New test apparatus—diagrams—applications.

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Vol. I May, 1935 No. 9

Wanted—A Decision

In the February issue of SUCCESSFUL SERVICING an article was published entitled "Oscillograph or Oscilloscope?" wherein the question was raised: by which name is this instrument going to be known? Up to date nothing has been decided and it looks as though it was up to the well-known George.

Personally we are in favor of *oscilloscope*, for the reasons that were set forth in the above-mentioned article, but our preference is just one in thousands. We are now putting it up to the radio industry as a whole to decide, because we feel that the serviceman has enough misnomers with which to contend in this electrical field and it seems lackadaisical to introduce another. We could quote numerous examples of misnamed instruments and electrical functions, but you know them as well as we.

Another instrument for which a name should be decided is the frequency modulator, that is used for varying the frequency about an average value to obtain the frequency response curve of a receiver. This instrument also has been called a *wobbler* and a *wobulator* and heaven only knows how many other names. Now one definition of the act of modulating is an orderly change in progression from one thing to another, which is exactly what occurs by using a frequency modulator, i.e. the frequency is changed cyclically through a series of different frequencies about a

mean. So *frequency modulator* as a name is perfectly all right, but—and there is a *but*—which one of the devices shall bear this name or one of the other names already mentioned? There is the motor-driven condenser; the device which depends upon the saturation of the core of an inductance; the circuit in which the dynamic input capacity of a vacuum tube is used to vary the frequency, etc. If all these instruments—or devices, if you please—are to be called wobblers, or wobulators or frequency modulators, how will anyone know which is meant? Then, too, there is the matter of what band of frequencies you are working with—the r-f., i-f. or the a-f. Should the same name be applied to the device used in each?

We raise this matter of names primarily to keep the serviceman from getting befogged, but we have to break down and confess another reason, which is personal. In the course of a year, we cover a good many thousands of pages with typewritten copy on the subject of servicing and when we have to write two or three names for every instrument we mention, so that servicemen as a whole will know what we are talking about, it sort of gets under our hide. Think of all the energy wasted . . . not only physical, in punching out all those extra words, but mental, in trying to remember them all!

So, we ask that someone do something. We are putting it up to the manufacturers and anyone else who can do something about it, but please let us have some action.

JOHN F. RIDER.

Westinghouse Models

A discrepancy appears to exist between the listings in Rider's Manual Volume V and a tabulation of RCA brand equivalents which has recently appeared and which makes reference to Westinghouse models. This tabulation states that certain RCA models are the equivalent of Westinghouse models. A number of these Westinghouse models bear model numbers which are identical to the models numbers listed under the heading "Westinghouse Electric Supply Com-

pany," in Rider's Volume V. It should be understood that this is not an error on our part or upon the part of the company who released the RCA and equivalent brand names tabulation. The Westinghouse models which appear in that list and which bear models numbers like that listed under Westinghouse Electric Supply Company, in Rider's Volume V, were intended for EXPORT only and as such are the equivalents of the RCA models stated. The receivers shown under the Westinghouse name in Rider's Volume V, do NOT have RCA equivalents and are produced for DOMESTIC consumption.

This should clear up the question which has arisen in the minds of servicemen, who have seen the list mentioned and who also own Rider's Volume V and thought that they had discovered an error in the listing of the model numbers. Incidentally Rider's Volume VI, will carry additional Westinghouse Electric Supply models, which will appear to conflict further with the aforementioned list. When that volume appears, please remember what it said in this brief notice.

WHAT PRICE HIGH FIDELITY



Reducing Output Hum

The amount of hum in some receivers using 2A3 output tubes will be found to vary. If some set has excessive hum, it is suggested that several 2A3 tubes be tried. In this way a suitable combination of tubes can be obtained so that minimum hum will result.

Motorola 100

Following will be found some additional points of pick-up for the attachment of the interference feeder on various cars:

Chevrolet, 1934. High tension wire.
Pontiac, 1934. Vacuum spark control pipe, as close to the distributor as possible.

Chevrolet, 1933. Connect to one of the ignition switch contacts. Place a 0.25 mf. condenser in series between feeder clamp and ignition switch contact to prevent burn out of eliminator.

Oldsmobile, 1934. Ignition switch contact. Same as above.

Plymouth, 1934. Connect to point where the ignition switch bypass is grounded to the instrument panel.

Ford, 1934, 1935. Same as Plymouth, 1934.

Dodge, 1934. Same as Plymouth, 1934.

See page 2-9 of Rider's *Specialized Auto Radio Manual* and page 4 of April SUCCESSFUL SERVICING.

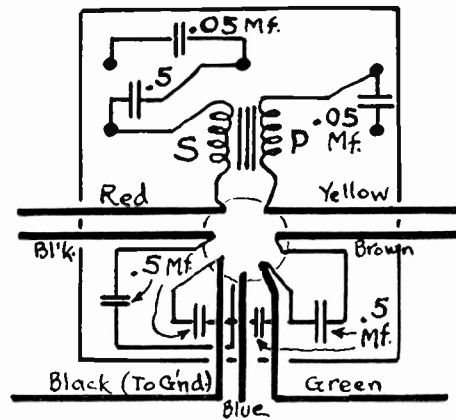
Motorola Flexible Shafts

When inserting flexible shaft bushings into the set housing be sure to align them properly so that the shoulder of the bushing rests flat against the set housing; then turn to the right. If the bushing is not held perpendicular to the housing when inserted, only one lug will engage and when the bushing is turned this lug will be broken off, due to the excessive strain.

Before inserting the flexible shaft bushing into its receptacle, twist it a quarter of a turn to the right. Then insert it in the receptacle and turn it to the right. This will allow the winding stress of the flexible shaft housing to exert itself in a clockwise direction and the bushing will be easily tightened without the use of pliers, and will not jar loose from vibration.

Radiola 66

The schematic diagram of the a-f. transformer and bypass condensers contains incorrect values of capacities. Kindly make the necessary changes from



Corrected values of condensers in Radiola Model 66 a-f. amplifier

the accompanying diagram in the condensers' values in the corresponding diagram in your Manuals, where it will be found on the following pages: 1-42, *499 and 1883 in the Radiotron-Complete.

Philco 200-X Shadow Meter

If you examine the wiring diagram of the 200-X, as shown in Rider's Manual, on Philco page 5-45, you will find a tube labeled shadow meter control, which may appear to be an amplifier tube operating upon a signal fed from the third i-f. transformer tertiary winding. The plate circuit of this tube carries the shadow meter. Well, this tube is acting as an amplifier, but solely for the control of the tuning meter and not upon the i-f. signal from the third i-f. transformer. What really takes place

is that the signal voltage developed across this tertiary winding is rectified by the lower diode circuit and a d-c. voltage is developed across resistor 42. The control grid of the shadow meter tube is tied to the negative end of this resistor through the filter resistor 44. Consequently, a negative bias is applied to the shadow meter tube. The greater the signal fed into the receiver, the greater the signal fed into the diode circuit and the greater the voltage developed across resistor 42 and the greater the bias applied to the shadow meter tube, hence the greatest change in the tuning shadow indicator. The resistor 44 and the condenser 45 constitute a good i-f. filter, so that none of the i-f. signal across the tertiary winding in the third i-f. transformer finds its way into the shadow meter control tube. This filter also serves to keep a-f. signals out of the shadow meter control circuit. These a-f. signals may result from the rectification of the signal voltage developed across the tertiary winding and applied to the diode. Resistor 42 has developed across it a d-c. voltage and also an a-f. voltage. The tertiary winding is made highly resonant to the peak frequency of the receiver. Such control is required primarily because of the response curve of the system, when adjusted to high fidelity. Under such conditions, the response curve of the i-f. transformers spreads across about 15 kc., or 7.5 kc. each side of the peak frequency. In order to allow correct tuning, it is necessary that the tuning indicator be highly selective to the i-f. peak, which it is.

The voltage table for this receiver is as follows. It might be a good thing to add this table to the proper page in your Rider's Volume V.

		TEST POINTS				
Tube	Circuit	F to F	P to K	SG to K	K to Gnd	CG to K
78	RF	6.3	225	80	3	0.2
6A7	Det-Osc	6.3	210*	73	8	0.2
78	1st IF	6.3	210	73	8	0.2
78	2nd IF	6.3	220	76	4	4.0
37	Shadow	6.3	63	...	0	0.
75	AF	6.3	110	...	0	...
42	Driver	6.3	225	225	0	0.2
42	Output	6.3	335	335	0	35
42	Output	6.3	335	335	0	35
5Z3	Rect.	5.0	350 to ground	...	...	...

*G3 and 5K.

6A7-G1 to K is 22 volts. 6A7-G2 to K is 90 volts.

Pilot 103 and 105

Intermediate frequency is 456 kc. Operating voltages are:

Tube	Plate	Cathode	Screen	Fil.
Osc. Det.	230	4.	85.	6.3
I-F Amp	230	3.8	85.	6.3
Demodulator	105*	1.4		6.3
Output	205	**	230	6.3
Rect.	***			

* Voltage measured though 250,000 ohm resistor. ** Grid bias for 42 tube obtained across 250 ohm resistor between ground and rectifier plate winding center tap. *** Filament to chassis ground is 315 volts DC. Anode grid of 6A7 to cathode is 175 volts. All screen voltages measured to cathode. All cathode voltages measured to chassis frame. Speaker field voltage is 90 volts. All plate voltages measured to cathode. Tube placement. Looking towards rear of chassis with front nearest to operator. Tube nearest gang condenser 6A7. Tube in right hand corner towards the rear is 6D6, i-f. amplifier. To the left of this amplifier is the 75 duo-diode demodulator. To left of demodulator and on line with same is the 42 output tube. To the rear and nearest power transformer is the rectifier tube.

Pilot 114 and 115

The intermediate frequency used in these receivers is 456 kc.

Airline Model 62-153

This Montgomery-Ward receiver is the same as Models 62-124 and 62-129, found on page 5-5 of Rider's Manual, with the exception of the following:

A voltage regulator is incorporated on the chassis, this being mounted in the back left corner by means of a two-prong plug and a receptacle on the chassis. When no regulator unit is employed, the receptacle is covered with a piece of fibre, which is eye-letted in place to protect the jumper wire.

When these sets are shipped with a 3-volt dry "A" battery the regulator unit is in place on the chassis and the initial voltage adjustment has already

been made. If the set was originally not equipped with a regulator and it is desired to change from a 2-volt battery to one of 3 volts, the regulator may be inserted by removing the fibre cover, pulling out the jumper wire and inserting the unit by matching up the two-prong plug with the receptacle and pushing down the unit until it rests firmly in the socket. The voltage regulator is connected internally in series with the plus A line.

In some of these sets considerable variation in the type 19 tubes has been experienced with the result that the tone quality has been poor when this tube was operated at a bias of 6 volts. This bias has been changed, therefore, to 4.5 volts, which has been found to be satisfactory in all cases. To effect this change, connect the white battery lead with the "C-6" marker to the -4.5 volt tap on the "C" battery. This lead and the green and yellow lead, with the "-4.5" volt marker, will then be connected to the same -4.5 volt tap on the battery.

Airline Models 62-149, 62-155, 62-160, 62-162

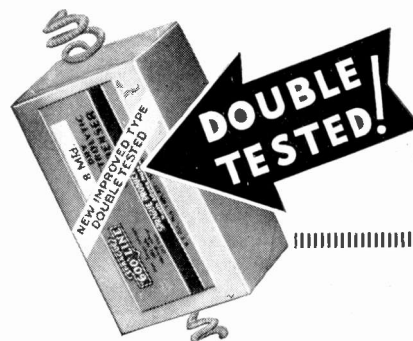
These Montgomery-Ward receivers are the same as those described on page 5-3 of Rider's Manuals (Models 62-120, 62-122, 62-126 and 62-128) with the same exceptions as those noted elsewhere for Airline Model 62-153.

Airline Model 62-165

This Montgomery-Ward receiver is the same as Models 62-132 and 62-137, described on page 5-8 of Rider's Manuals, with the following exception:

Part No. 98006, a three-section wire-wound resistor, has been replaced with Part No. 98006A, a resistor of the same type. The new resistor has the same resistance values, the only change being in the 6,000-ohm section (R-14), where a heavier and different wire is now used. This change was made because of breakage being encountered in this section in some of the early resistors. It is suggested that this section of the resistor be checked if this chas-

(Please turn to page 10)



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R. M. A. Standard Color Coding

Color Coding of Leads for Radio Power Transformers

It shall be standard to use the following color code on power transformer leads for radio receivers:

Primary leads	Black
If tapped—Common	Black
—Tap	Black & Yellow 50/50 Striped Design
—Finish	Black & Red 50/50 Striped Design
Rectifier-Plate Winding	Red
Center Tap	Red & Yellow 50/50 Striped Design
Rectifier—Filament Winding	Yellow
Center Tap	Yellow & Blue 50/50 Striped Design
Amplifier—Filament Winding #1	Green
Center Tap	Green & Yellow 50/50 Striped Design
Amplifier—Filament Winding #2	Brown
Center Tap	Brown & Yellow 50/50 Striped Design
Amplifier—Filament Winding #3	Slate
Center Tap	Slate & Yellow 50/50 Striped Design

Color Coding of Leads of I-F. Transformers

- I-F. Transformer Leads
- Plate Lead — Blue
- B + Lead — Red
- Grid (or Diode Lead) — Green
- Grid Return — Black

(For "full-wave" transformer second diode lead will be Green-Black)

Color Coding of Leads of Audio Transformers

Audio Transformers (Interstage and Output)

In cases of use of single primary and/or single secondary, the top portion of the diagrammed windings should be used to indicate the color coding. Where polarity of primary and/or secondary

is not a factor both outside leads may be the same color as indicated. Where polarity must be indicated the Brown and Yellow leads shall indicate the start of the primary winding and the start of the secondary winding respectively. In the case of an output transformer, the Black lead shall be the start of the secondary.

Airline Model 62-165

(Continued from page 9)

sis is serviced. In the case of complete receivers in stock, it is NOT necessary to change this unit.

If in servicing, this section is found to be open, a complete new three-section unit or a separate 6,000-ohm, 1.5 watt, carbon resistor may be used for replacement. Should a separate unit be used, be sure NOT to use the end connection on the old three-section unit when making this repair, as the old 6,000-ohm section may be open intermittently. Unsolder all the wires which are connected to the end of the candohm resistor and resolder them to one end of the carbon replacement resistor.

ARE YOU AWARE . . .

That many service men believe their soldering irons are out of whack, when the only thing necessary is to tighten the tip?

That the prices of ESICO Soldering Irons range from \$1.10 to \$12.25. The same workmanship goes into the least expensive iron as in the highest priced one!

That the feeder cord in your soldering iron may have an open circuit at the terminal block inside the handle, which makes it inoperative? Don't spend money having it repaired if this is so—your testing equipment can determine the source of the trouble, and you can make the necessary repairs in three minutes.

That after two years of the most exacting tests, made in direct comparison with several well known types of soldering irons, ESICO Irons were adopted as standard in the At-water Kent plant? That was six years ago—they are still used in this factory to the exclusion of all other irons.

That most service men believe the eating away of a soldering iron tip is caused by the flux used? This is not so! The solder itself, being a solvent for copper, causes a minute portion of the copper tip to be deposited in each connection! Want to prove it? Stand the iron vertically, tip down, in a small can of molten solder. In 24 hours, you will observe a decided cavity in the tip!

That the U. S. Navy has rigid specifications for soldering irons? In seven years, more than 10,000 ESICO Irons have been purchased by the Navy!

That the area to be soldered determines the size of the iron required? Don't expect to use a small iron successfully on a large surface, or to solder a large number of connections in one operation. THE METAL TO BE SOLDERED MUST BE BROUGHT TO A TEMPERATURE HIGH ENOUGH TO MELT THE SOLDER. If the iron will not do this, try a larger size iron.

NICK NACK



55 Watts. Tip 7/16" in dia. Weight 6 oz.
Length 11 3/4".
List price complete..... \$1.10

MIDGET



65 Watts. Tip 7/16" in dia. Weight 7 oz.
Length 11 1/4".
List price complete..... \$1.75

JUNIOR



100 Watts. Tip 7/16" in dia. Weight 9 oz.
Length 12 1/4".
List price complete..... \$2.75

TROPHY



150 Watts. Tip 3/8" in dia. Weight 18 oz.
Length 12 1/2".
List price complete..... \$5.00

ESICO

The ESICO Green Label Line may be obtained from your Jobber.

ELECTRIC SOLDERING IRON CO.
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Pilot 93

The Pilot model 93 is shown in Rider's Manual, page Pilot 5-5. Add to the schematic, the information that the i-f. peak is 115 kc. The tube placement is as follows, looking towards the rear of the chassis, with the tuning knob nearest to you: To the right of the 1st i-f. transformer, the 6A7. Between the two i-f. transformers, the 6D6. To the left of the 2nd i-f. unit, the 75 demodulator. Immediately to the left of the speaker transformer, the 25Z5 and on line, but to the rear of the volume control, is the 43 output tube. The i-f. transformers are accessible through the rear of the i-f. cans. The model 93 covers from 545 kc. to 1500 kc. and from 5750 kc. to 15,800 kc. The voltage table, which you should add to the page is as follows:

Tube	Plate	Cathode	Screen	Fil.
Osc.—1st Det	115	3	75	6.3
I-F Amp	115	2.5	75	6.3
2nd Det	50*	1.5	...	6.3
Output	95	15.	105	25.
Rect.	...	135.	...	25.

*Voltage measured through plate resistor.

All plate and screen voltages measured to cathode. All cathode voltages measured to chassis. Speaker field voltage is 110 volts.

The alignment trimmers are placed in various parts of the chassis. Broadcast band alignment trimmers for 1st detector is on side of first section of gang, nearest the front of the set. The pre-selector unit broadcast band trimmer is on the side of the middle gang and the oscillator trimmer for broadcast band is on side of third section. These trimmers are aligned at 1400 kc. The slide wire adjustment is the image suppressor trimmer, aligned at 160 kc. for MINIMUM response. Broadcast band trimmers aligned for maximum response. Short wave trimmer, aligned at 12,000 kc., is located on rear of chassis on line with the phonograph jack. The 600 kc. oscillator trimmer is located on the front of the chassis. To adjust image suppressor, tune the receiver and the test oscillator, feeding into the antenna and ground of receiver, 1630 kilocycles. Slide the wire in or out of the pre-selector circuit until response is MINI-

MUM. Then repeat alignment of the broadcast band at 1400 kc. for maximum signal.

High Fidelity I-F. Transformers

Several receivers now on the market are equipped with triple-tuned high fidelity i-f. transformers. These units, in contrast to the conventional dual tuned i-f. transformers, employ a third winding coupled to the other two and wherein a variable resistor of from 7,500 to 10,000 ohms is in series with the third winding (tertiary) trimmer. When this resistor is entirely in the circuit, the presence of the third winding has no effect upon the normal response curve of the other two windings. This is the normal selectivity position. When aligning such transformers for normal selectivity, the tertiary winding trimmer is not used. However, when the control is set for high fidelity, which means that the series resistor is reduced to a minimum, adjustment of the tertiary winding trimmer has a very great effect and is the means of developing the high-fidelity response curve.

As a general rule, the original settings of the primary and secondary windings are not touched when the tertiary winding trimmer is manipulated. However, experience has shown that a better degree of response and more uniform height of the peaks is obtained when slight readjustments of the primary and secondary trimmers are made in conjunction with the tertiary winding trimmer adjustment.

Incidentally, manipulation of the high-fidelity control can be employed to increase adjacent channel selectivity. Under certain conditions, interference may be encountered from some adjacent channel station. Although not common, this may occur when the receiver is set for high-fidelity operation. By reducing the high-fidelity adjustment, which in effect is a reduction of the width of the band pass in the i-f. transformer so as to be operating at normal selectivity, freedom from interference can be attained.

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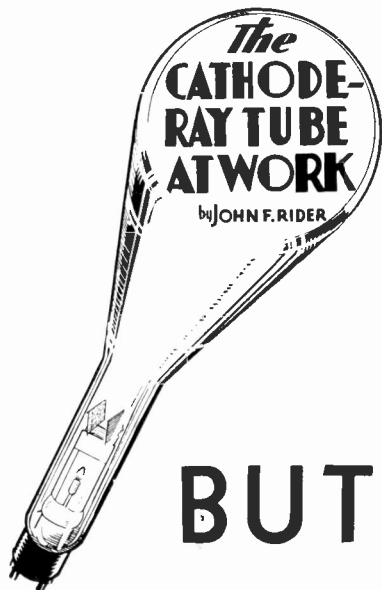
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Walter Winchell

BLESSED EVENT:

The "Doc" Manuals of 1440 Broadway, New York, recently became the proud parents of a 2¾ lb. addition. The newcomer is tagged "RIDER'S SPECIALIZED AUTO RADIO MANUAL, VOLUME TWO." More than sixty-five radio manufacturers were responsible for the robust appearance of "Little Mannie," and he contains more up-to-date diagrams than his older brother, VOLUME ONE. He has a beautiful and tough Fabrikoid exterior, is golden brown in color, and "Dr." John F. Rider who brought the youngster into the world expresses the opinion that he will be most useful to the Servicing profession.



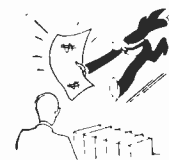
GAG (?)

Two "drunks" staggered down to the banks of the Delaware (or was it the Potomac?) River. "Thish ish the spot where George Washington stood when he threw a silver dollar across the river," said one of them. "Thash nuthin'," said the other, "I'll betcha I can do it." And, SOoooo . . . they bet \$5.00 on the outcome, and "Drunk" No. 2 heaved a silver dollar . . . which landed 'kerplunk' in the middle of the stream. As he paid his bet, he alibied, "Y'unnerstand, that a dollar went a damsite further in 1776 than it does now."



POINT:

The point of the above feeble attempt is . . . your dollar has never before been able to buy as much advanced knowledge of the technique of the radio servicing profession than today . . . SERVICING SUPERHETERODYNES, by John F. Rider, is the biggest dollars worth of dope on the *modus operandi* of "fixing-up" broken down Superhet receivers. If you haven't already bought this tome . . . make a flying dash to your favorite jobber, wave a 59 cent dollar at him, and pat yourself on the back.



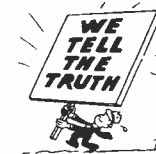
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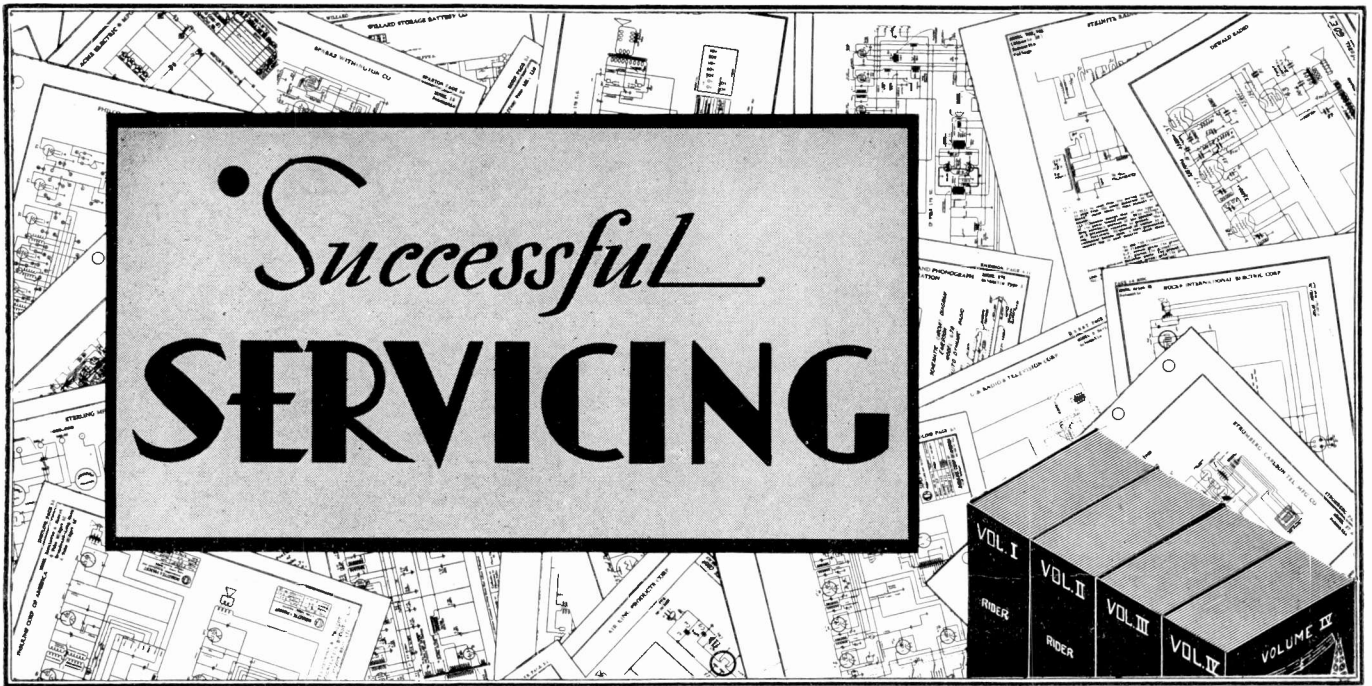
Of course, you knew all along that this was an advertisement . . . but, for the benefit of you and you, and even YOU, we proclaim the fact that it ain't nothing else but, and it's been inserted here in the interest of



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TWO SPECIAL CASES OF DISTORTION

How the Cathode-Ray Oscillograph Indicates Distortion Due to Defective AVC and Diode Load Constants

By JOHN F. RIDER

TWO very interesting examples of the value of the cathode-ray tube in radio receiver servicing were demonstrated a short time ago. Both relate to what may be classified as being the determination of the reason for the presence of distorted signal voltages in the audio-frequency amplifier. Lest you come to false conclusions, these reasons were not the usual which have been mentioned ever so often in connection with audio amplifiers.

One of the major servicing problems, which is still far from solution with the routine meter type of servicing equipment, is the defective AVC system. Under certain conditions, as for example total cessation of AVC action, the operation of the receiver is such that the condition is definitely indicated. However, if the AVC circuit is functioning, but not delivering the proper AVC voltage to the controlled tubes, it is somewhat of a problem to establish the existence of the condition. There are several reasons why this is so. The first is that the usual control circuit includes a number of resistors and operates at comparatively low values of voltage. Consequently,

meter indications of voltage are misleading at best, because of the high resistances in the circuit and because of the low voltages. Add to this the fact that the normal routine plug-and-cable method of test interferes with the operation of the AVC tube, if that is being checked or with the controlled tube circuit, if that is being checked. Consequently, the most satisfactory test under such conditions is a routine point-to-point resistance test, with the receiver inoperative.

However, the routine point-to-point test is not as a rule instituted unless definite indication of the existence of a defect is established. As it happens, the type of defect we are concerned with seldom manifests its effects in such manner as to indicate definitely the existence of the trouble. Particularly so, when

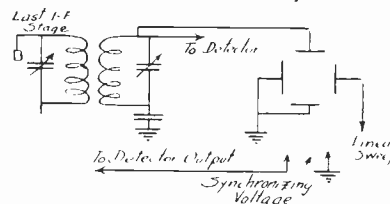


Fig. 1. Basic circuit used for determining the wave envelope of the i-f. system

the defect is of such nature that it tends to increase the sensitivity of the receiver and introduces complications only when strong signals are being received. The steady increase in the number of high powered broadcasting stations is aggravating the situation.

The type of trouble we are describing is a defect located in the voltage distribution circuit of the AVC system. This defect is a leak across the one of the bypass condensers affiliated with the filter or isolating resistors in the AVC voltage distribution circuit. When this type of defect exists, a secondary voltage divider is created across the AVC control circuit and the proper AVC bias is not applied to the controlled tubes. The result is overloading of the pre-selector or i-f. amplifier tubes at signal levels, which would be perfectly satisfactory with a correct AVC system. Such overloading means distortion in the a-f. amplifier and naturally in the output system. Generally, such troubles are missed entirely with the routine voltage tests, because with no signal input all operating voltages are normal or differ so slightly as to be beyond suspicion. If a tuning meter

is used in the i-f. plate or cathode circuits, the meter will operate, although with a limited swing. Since it is quite natural for this tuning meter to operate over a portion of its complete range, as for example when a weak signal is being received, suspicion is diverted from the defect, if the meter pointer does not swing across the required range.

An oscillographic test of the signal output will show that at certain input signal levels, the audio voltage is not the sine wave it should be, as a result of sine wave modulation of the carrier being generated by the test signal oscillator. Tracing back through the audio amplifier shows that the distortion is present across the output of the demodulator tube. Checking still further, viewing the envelope of the signal voltage out of the i-f. amplifier indicates the presence of overload and definitely localizes the trouble ahead of the second detector. Since reduction of the signal level results in the correct wave envelope out of the i-f. amplifier, the finger of suspicion is pointed at those factors relating to the system ahead of the demodulator, which determine the overloading of tube circuits, invariably the control grid bias.

The basic circuit utilized to determine the wave envelope of the i-f. amplifier system is shown in figure 1. In order not to detune the i-f. circuit when the cathode-ray tube is connected across, a 20,000 or 30,000 ohm resistor is connected in series with the "high" lead. If the intermediate frequency is higher than can be properly amplified by the amplifier in the cathode-ray tube unit, an amplifier, tuned to the i-f. peak, is inserted between the receiver i-f. system and the cathode-ray tube unit. The de-

sign of this amplifier is such that it will not overload at high input voltages.

Figure 2 indicates the correct wave envelope and sine wave audio signal secured with correct operation of the

would normally never be discovered unless a waveform test was made, is that relating to the diode load resistor in the demodulator circuit. Too high a value of resistance used for this resistor will

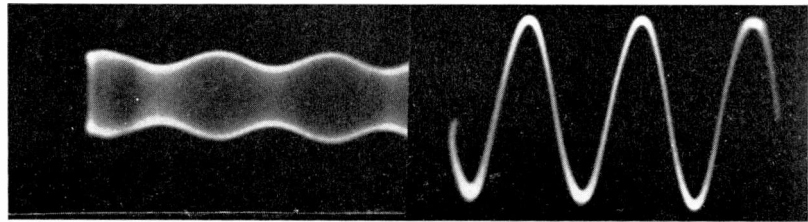


Fig. 2. The correct i-f. wave envelope is shown on the left and the correct sine wave a-f. signal is on the right. These photographs were obtained with proper operation of the AVC in the receiver

AVC in the receiver. Figures 3 and 4 indicate the wave envelope of the i-f. signal and the resultant a-f. signal for two values of leakage across one of the isolating condensers in the AVC filter

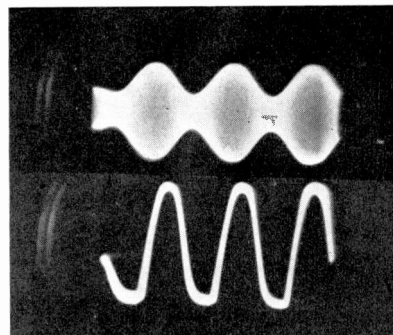


Fig. 5. The i-f. wave envelope (top) is correct, but the a-f. signal taken across the diode load shows marked distortion

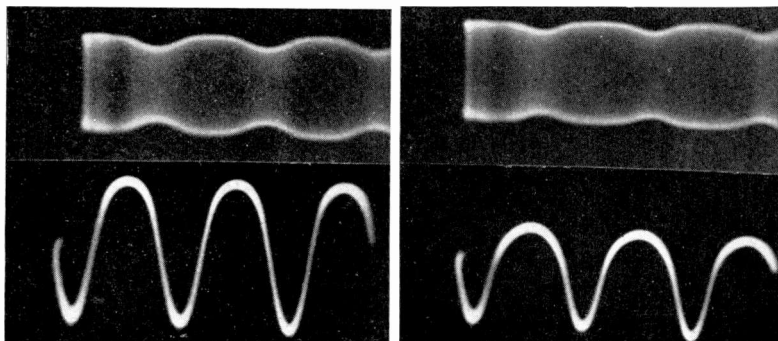
circuit. Figure 3 is for a 1.0-megohm leak and figure 4 is for a 100,000-ohm leak. With such values the control voltage applied to the controlled tubes ahead of the demodulator varied from .1 to .5 of the correct value.

Another example of distortion, which

result in distortion. In the case we experienced the load resistor was the volume control unit. Its correct value was 500,000 ohms, but deterioration had increased the value to about 3,000,000 ohms. Electrically the resistor was intact, so that operation of the volume control was obtained and all suspicion was diverted. However, a routine waveform test established that, as shown in figure 5, the i-f. wave envelope was correct, yet the a-f. signal across the diode load was distorted. The audio frequency used was the conventional 400 cycles. The information thus gained very definitely localized the fault as being in the diode circuit. A routine resistance test then showed the fault as being in the dual acting diode load resistor and a-f. volume control.

You may feel that similar information would have been obtained by a routine point-to-point resistance test. That is correct, if the test would have been made. However, there would be no justification for making the test, since the operation of the control seemed normal and furthermore, the presence of distortion was not indicated by the character of the signal issuing from the speaker. However, a man who knew his music would have recognized the presence of spurious overtones. Be that as it may, a properly serviced receiver should be free from the amount of distortion present in the system described.

All of the photographs shown in this article are unretouched and were made in the SUCCESSFUL SERVICING Laboratory. We are indebted to J. Avins for the servicing operations and the photography, which work was done in the aforementioned laboratory.



Figs. 3 and 4. The wave envelopes of the i-f. signal and the corresponding a-f. signal wave forms were made for two values of leakage across one of the isolating condensers in the AVC filter circuit. Fig. 3 (left) resulted from a 1.0-megohm leak and Fig. 4 (right) from a 100,000-ohm leak

Belmont 580

Starting with serial number 11501 the following changes have been made in the receiver, whose schematic diagram is shown on Belmont page 2-1 of Rider's Specialized Auto Radio Manual, Volume II:

The cathode and the suppressor grid of the 6D6 tube are now connected to R-3, R-5 and C-5 and so to the cathode of the 6A7 tube, instead of to C-1 and R-2. These last mentioned parts are now out of the circuit.

The value of R-6 has been changed to 19,000 ohms from 12,000 ohms and R-11 from 250,000 ohms to 500,000 ohms.

Philco 802

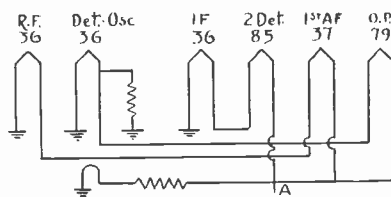
The alignment data for the Philco 802, the schematic of which will be found on Philco page 2-57 of Rider's Specialized Auto Radio Manual, Volume II, is the same as the alignment data for Model 800-Code 122, which may be found on Philco page 2-56 of the same volume.

Run No. 2. Condenser, No. 52 (50 mmf.) removed and Part No. 30-1032 (250 mmf.) added. Filter choke, Part No. 32-1374 added, being connected in series between pilot lamp, No. 51, and resistor No. 53 and condenser No. 52.

Philco 12-Code 122

The original Model 12 was similar to the Model 8, shown on Philco page 3-5 and page 1599 in the Radiotron-Complete Manual, and was properly

known as Model 12-Code 121. The later Model 12 is the Model 12-Code 122 and is similar to Model 9, except that it is for 12-volt operation. The tubes, circuit and base arrangement are the same, but the tube heater circuit is that shown in the accompanying illustration. Since 6.3-volt tubes are used,



Heater connections for Philco Model 112—Code 122

a series multiple connection must be used to operate them from a 12-volt battery.

The shunt resistor on the oscillator tube is Part No. 33-3002 and is 21 ohms. The speaker employed is the A-9 and is equipped with a 12-volt field. The Model EE dynamotor is used, supplying 40 milliamperes at 220 volts.

The Model 12 has been designed especially for bus and boat installations, where 12-volt battery systems are employed.

The alignment procedure for the Model 12-Code 122 will be found on Philco page 4-53 in Rider's Manual, Volume V.

Philco 5

The following changes have been made in Philco Model 5, the schematic

of which is shown on Philco page 3-8, Rider's Manual, Volume III; 1602 Radiotron-Complete Manual, and Philco page 1-4, Rider's Specialized Auto Radio Manual, Volume I. Run No. 3. Resistor No. 5 removed and Part No. 33-3016 (400 ohms) added. Resistor No. 28 (500,000 ohms) removed and Part No. 4410 (250,000 ohms) added. Antenna transformer, Part No. 1, replaced with a new type having the same part number. Can be identified by the red paint on the bracket.

Run No. 4. Antenna transformer, part No. 1, removed. Part No. 32-1152 added. Antenna lead Part No. 9292 removed and Part No. 38-5131 added.

Run No. 5. Five turns of wire were added to make an r-f. choke on top of the 6A7 grid clip.

Run No. 6. Thirty turns of wire added to make an A choke in A filter circuit.

Run No. 9X. Padder, No. 17, removed and Part No. 0-4000A added.

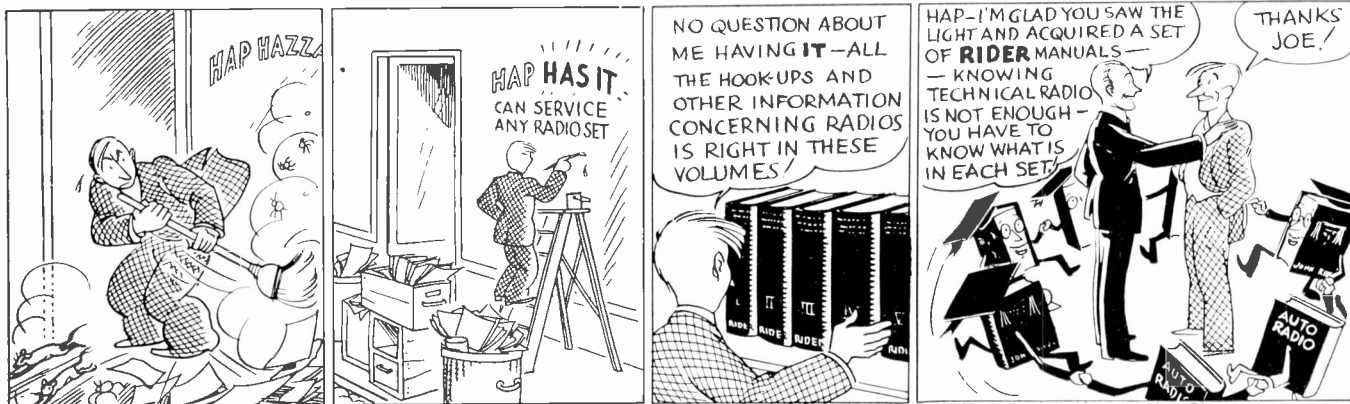
Run No. 9. Resistor No. 15 removed (1000 ohms) and Part No. 6977 (500 ohms) added.

Run No. 12. Additional ground strap on tuning condenser housing connected to receiver housing.

Run No. 13. Part No. 30-4015 (0.5 mf.) connected to A lead, one side to ground.

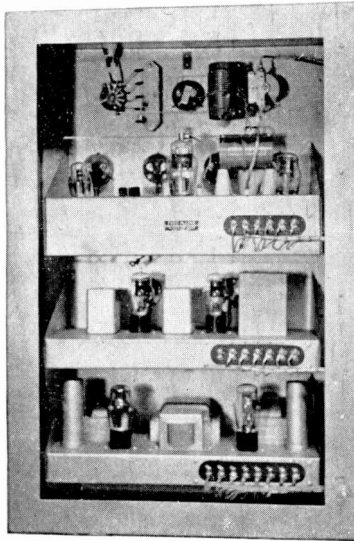
Run No. 15. Pilot light resistor, Part No. 36 (7 ohms) added on speaker panel and removed from receiver.

HAP CHANGES HIS NAME



Our Laboratory Test "Ham" Transmitter

A portion of the forthcoming Rider book, "The Cathode-Ray Tube At Work," is devoted to the adjustment of "ham" transmitters. A special 80-meter unit was built for the purpose. Each circuit in this unit is completely



Rear view of the SUCCESSFUL SERVICING Laboratory experimental transmitter. The shelves can be removed from the rack, making everything readily accessible.

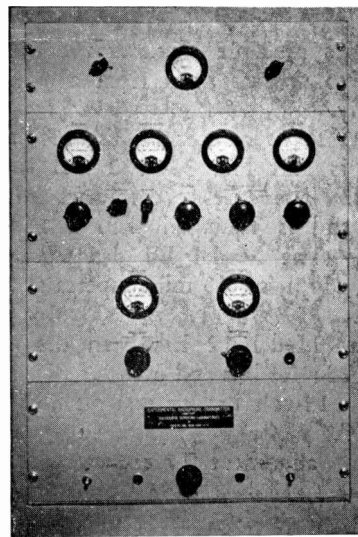
variable, so that the effect of variables can be observed and variables can be established. The two photos shown herewith illustrate the front and rear views.

Looking at the rear of the transmitter, the lower shelf contains the two power supply units. The middle shelf contains the speech amplifier and the Class B stage modulator. The top shelf con-

tains the crystal stage, the buffer stage and the Class C final amplifier. The unit feeds into a variable impedance load.

The meters incorporated show the operating conditions in every part of the system. The oscillator section contains a 76 tube in the crystal oscillator system, an 82 buffer amplifier and a 6A6 final amplifier.

The speech amplifier contains a 6A6 and another 6A6 Class B modulator.



Front view of the transmitter. The seven meters show the conditions in all parts of the circuits.

The power supply unit employs an 80 and an 83. The unit was designed and built by the Fred M. Link Laboratories, here in New York City.

Discount, Profit and Mark-Up

The discount received by you on merchandise which you buy is based upon the list price. The gross profit you make is based upon the difference between your purchase cost and the sales price. The mark-up is based upon the purchase price. A discount of 40 percent off list is the equivalent of a mark-up of 66 percent when you resell the

unit for list. If the list is \$1.00 and the discount is 40 percent, your cost is \$.60. If you resell that unit for \$1.00 the mark-up in percent is \$.40/\$.60 or 66 percent. If you buy at half of the list price, your discount is 50 percent. If you sell at twice your cost, the mark-up is 100 percent.

If you buy at a certain discount off

Successful Servicing, June, 1935

list and sell for list, the following discounts are equal to the following mark-up values expressed in percent:

Discount	Mark-Up
25%	33⅓%
33⅓%	50%
40%	66⅔%
50%	100%
60%	150%

Help Wanted!

What practical data do you have concerning the elimination of ignition interference in 32-volt lighting plants? We can use hints along these lines.

Thanks, Mr. Bell!

The following was received from H. M. Bell of the Bell Radio Company, Massena, New York:

JOHN F. RIDER, Publisher,
New York, N. Y.

"You have just saved my life! Had one of those Airline Model 62-129 battery jobs on the bench. Had adjusted the trimmers and got the volume up okay, but the tone was rotten. Checked all resistors, condensers and coils. Everything okay. Finally put in a new transformer as a last resort, but it made little improvement and while waiting for the soldering iron to heat to take it out again, I picked up SUCCESSFUL SERVICING and there was your dope about changing the bias on the power tube. I should have probably gone on for days trying to make the original hook-up percolate some way, so want to thank you from the bottom of my heart.

"And here is my card for the Rolling Reporter.

(Signed) H. M. BELL."

(Thanks, Mr. Bell! Maybe if our Senator from N. Y. sees your comment about having saved your life, we may receive a medal from Congress. . . . Maybe. . . . At any rate, we only helped save your life. The real thanks is due Montgomery-Ward for having furnished us with the data we published. Incidentally, we intend publishing more and more of the change notices and suggestions received from the receiver manufacturers.—EDITOR.)

Successful SERVICING

Dedicated to financial and technical advancement of the radio service man.

Published monthly by

John F. Rider, Publisher
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John F. Rider Editor
G. C. B. Rowe . Assoc. Editor

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Vol. 1 June, 1935 No. 10

The Power of Suggestion

DON'T be misled by the power of suggestion. As strong an influence as it has upon the human race, it is something we must guard against. The United States Supreme Court has killed the Blue Eagle, on the ground that it is against life, liberty, and the pursuit of happiness.

Although our sentiments are not in accord with the nine gentlemen in Washington, we want to take this opportunity of stating to the servicing industry that it should not be misled by those influences which were automatically restored to their cancerous condition, when the NRA was nullified. . . . We are referring to cut-throat competition.

You men who are doing independent service work, should not view the restoration of cut-price competition, which is cut-throat competition, as being the better of two programs, just because the NRA, which stood for the elimination of such competition, was killed.

Never in the history of the world has anyone proved that cut-throat competition is conducive to good, sound, profitable business. . . . It is not and never will be. There are a number of major industries which, realizing the beneficial effects of normal, sensible competition, based upon the merit of merchandise, are going to continue operating under the NRA standards. Unfortunately, the NRA never established service codes,

but we can still learn from the acts of others. Definite benefit accrued from the stabilization of prices and the establishment of standard practices. Learn from these and not from the concerns, which have always entered into price wars.

The service industry is at the crossroads. . . . Which way is it going to turn? Legal support or legislation seems extremely far in the offing—so that it is up to every man to do his share by co-operating with his fellow service technician. . . . Don't allow the service industry to degenerate again into a cut-price establishment. . . . If you do, all control of the industry is weakened. . . . All of the ground, which has been gained as a result of association effort, will be irretrievably lost.

Solidify the associations. . . . Make them stronger than ever—but in order to do so, the associations must be supported by their members. . . . No association is any stronger than its members. . . . No association can become strong unless its members are strong morally and financially. . . . Cut price—cut-throat competition—is the cancer of business. Do not allow that curse to find root in the service field.

JOHN F. RIDER.

Dumont Supplies the Answer

The editorial in the May, 1935 issue of SUCCESSFUL SERVICING asked for an answer concerning the use of the word "Oscillograph" or "Oscilloscope," to denote the cathode-ray instruments now being offered. According to Allen B. Dumont, who knows his cathode-ray tubes, Ralph R. Batcher, another well-known figure in those circles, covers the question very well in the May issue of "Instruments." The following is the resumé of the answer to the question we asked:

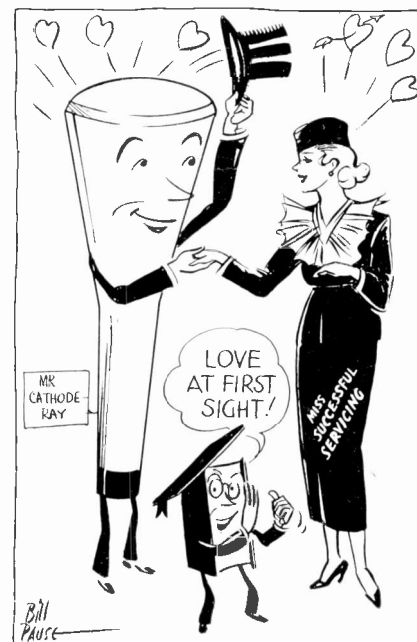
"OSCILLOGRAPH" (Oscilloscope). This is a controversial subject. While accuracy in terminology seems to favor the latter term, an investigation of present usage shows that more than 90 percent of the authors use the word "oscillograph." (Editor's Note—Mr.

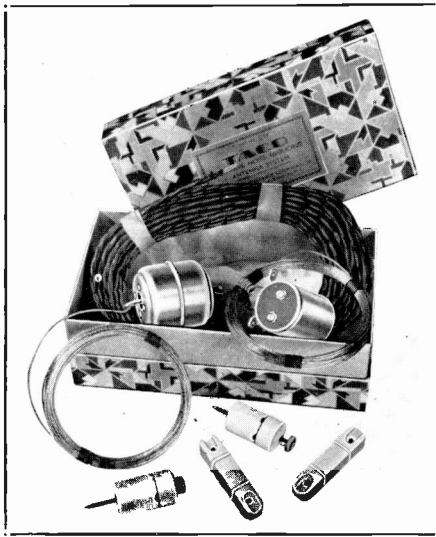
Batcher examined more than 1,200 technical articles on the subject during the last 35 years.) The suffix "graph" by no means definitely connotes writing, printing or other recording equipment (telegraph, phonograph, etc.). It seems that since a graphical or two dimensional figure represents a typical oscillogram obtained with the cathode-ray tube, the term "oscillograph" is justified. It also seems that many engineers tie up the oscilloscope with particular apparatus built by one or two companies, by reason of the stress that they have placed on this word in their advertising.

In addition to the above is the fact that all of the present equipment on the market use the term oscillograph to denote the apparatus. Furthermore, the Sub-Committee on Electron Beam Tubes of the I. R. E. has tentatively standardized on the term "oscillograph."

We want to thank Mr. Dumont for his letter and the interest displayed. Since the I. R. E. has standardized upon the term, even if only tentatively, we'll fall in line and refer to the unit as "oscillograph."

"IN THE SPRING A YOUNG MAN'S FANCY—"





All-Wave Reception ... without Noise!

Fiction and fancy won't help you with customers. Their all-wave sets must pull in overseas programs as well as local broadcasters, without background noises, regardless of location. And that's why you can best count on TACO antenna systems and line filters, backed by years of research and engineering, and fully licensed under A.A.K. Inc. patents.

- New Type 20 TACO Doublet Antenna . . . complete kit with aerial wire antenna coupler, twisted-pair downlead, set coupler, insulators . . . factory wired and soldered . . . easily installed . . . guaranteed customer satisfaction. Lists at \$6.75 (less your 40%).
- And in very noisy locations, TACO H-F All-Wave Line Filter . . . positively filters out noises in short-wave and broadcast bands . . . handles continuous 200-watt load, A.C. or D.C. . . . neat . . . simply plugs between set or noisy appliance and the line. Lists at \$7.50 (less your 40%).

Besides these two fast-selling items, TACO offers other antenna kits and noise-rejector devices. Ask your local jobber about the TACO line. Or fill out and mail coupon below, for engineering evidence and merchandising advice.



TECHNICAL APPLIANCE CORP.
27-26 Jackson Avenue
LONG ISLAND CITY, N. Y.

TECHNICAL APPLIANCE CORP.,
27-26 Jackson Avenue,
Long Island City, N. Y.

(Of course I want the engineering evidence of TACO superiority. Therefore

() Send me your engineering and merchandising data
() Ship C.O.D. a () Type 20 Kit () Line Filter.

NAME
ADDRESS
CITY

Philco Model G-Code 122

Run No. 1. A 25,000-ohm resistor, No. 71, Part No. 3656 has been added. One end is connected to the screen grid lead for the r-f., oscillator and i-f. tubes and the other end is grounded.

Run No. 2. Tuning condenser, No. 4, removed. Part No. 31-1274 added.

Run No. 7. Resistor No. 20 (1,500 ohms) replaced with Part No. 33-3048 (2,000 ohms).

See Philco page 2-7 in Volume II of Rider's Auto Radio Manual, and this same model receiver under different car manufacturers' headings.

Philco-Hupmobile H

Run No. 6. The first i-f. transformer, No. 17, replaced with a new type having the same part number. It may be identified by the green paint mark on the fibre. For schematic, see Philco page 2-19, Volume II, Rider's Auto Radio Manual.

Philco-Hupmobile H-Code 122

Run No. 4. Condenser, No. 52 (50 mmf.) removed. Part No. 32-1374 choke added in series between pilot lamp and resistor No. 53. See Philco page 2-20, Volume II, Rider's Auto Radio Manual for schematic.

Philco 16-Codes 125 and 126

The voltage tables for these two later models have been changed from that given in Rider's Volume IV, Philco page 4-3, and in checking over these sets be sure that the correct voltage table is being used. See tables below.

Philco-Chrysler CT-2 and CT-5, Philco-Packard PT-5

Run No. 2. T-5 ONLY. Antenna choke, Part No. 32-1282 added in series with the antenna lead and antenna transformer No. 1, and condenser No. 2.

Run No. 3. T-2 ONLY. Oscillator transformer No. 14 replaced with new type having same part number. This can be identified by the red paint mark on the fibre.

Run No. 4. T-2 ONLY. Same as Run No. 2.

For schematics see Rider's Auto Radio Manual, Volume II, Philco pages 2-12 and 2-39.

Philco 806

The following changes have been made in the runs indicated. For schematic diagram see Rider's Auto Radio Manual, Volume II, Philco page 2-61:

Run No. 3. The second i-f. transformer, No. 24, replaced with a new type having the same part number. This can be identified by a white paint mark on the fibre. Condenser No. 2 (50 mmf.) replaced by Part No. 4587 (50 mmf.).

Run No. 5. Resistor No. 18 (15,000 ohms) removed. Part No. 33-1163 (51,000 ohms) added.

Run No. 7. Choke Part No. 32-1438 added in series between Choke No. 54 and tube filaments. Condenser Part No. 30-1032 (250 mmf.) added. One side connected between this new choke and choke No. 54 and the other side to ground.

Run No. 8. Antenna choke, Part No. 32-1673 added in series with the antenna lead and antenna transformer, No. 1 and condenser No. 2.

Model 16—Code 125

Tube	78	77	78	78	78	37	77	42	42	80
Function	RF	1 Det.	Osc.	1 IF	2 IF	2 Det.	1 AF	Driver	O.P.	Rect.
P to K	175	185	70	180	180	0	60	100	275	—
SG to K	65	62	—	65	65	—	48	190	275	—
K to Gnd.	2.4	4.8	5.4	2.3	2.5	0	0	0	0	0

Model 16—Code 126

Tube	78	77	78	78	78	37	77	42	42	80
Function	RF	1 Det.	Osc.	1 IF	2 IF	2 Det.	1 AF	Driver	O.P.	Rect.
P to K	210	220	75	215	215	0	70	215	330	—
SG to K	75	70	—	75	80	—	56	215	330	—
K to Gnd.	2.8	5.8	6.1	2.8	3.3	0	0	0	0	0

Filament volts 6.3 for all tubes, except 80 which has 5.0 volts.

Rolling REPORTER



Old Timer

L. H. Eden, Sapulpa, Okla., tells us that the only circuit he cannot find in the **RIDER MANUALS** is a one-tuber he has, which was built by A. C. Gilbert in 1917, when they broadcast the "tremendous distance of SIXTEEN MILES." Have a heart, some of you old timers—in 1917 RIDER was merely a twinkle in his father's eye.

The Beeg Contest

Entries have been pouring in for the business card **Contest**. Some of the cards we have received would sell snowballs to Eskimos. If you haven't sent in **YOUR** card as yet, drop it in an envelope and mail it to your reporter. Winner will be announced in the July issue.

Cathode-Ray

Interesting thought picked up in the course of our rambles. The present activity of the larger tube companies in the field of Cathode-Ray development may very well be the forerunner of television. Get the connection? Service men will be called upon to repair the first television receivers. In order that they may be familiar with the tube, testing equipment, of which the *cat-ray* tube is an integral part, is being developed for the servicers. **Mebbe we're wrong, but—MEBBE we're RIGHT.**

Fourth Estater

We doff our battered 1929 chapeau in the direction of good old Baltimore—for the swell job the **NRI Alumni Association** is doing with its publication, **THE BALTIMORE BULLETIN**. Volume Two, No. 2 has just hit our desk, and to say that **Editor Geise** has turned out a workmanlike job is understating it.

Our Mail Bag

A. B. Chismar, Sterator, Ill.; Thank for your suggestion—we will pass it along in a future issue. W. J. Powell, Slidell, La.; Glad the Service notes on the Stewart-Warner R127 were of help to you. See H. M. Bell's letter, reproduced in this issue. John C. Gosling, Pointe Claire, P.Q., Canada; *Thank for your kind comments. Due to the cooperation of the advertisers in this issue, we are able to enlarge your paper, and you will continue to receive it each month.* R. Del Valle Sarraga, San Juan, Porto Rico;

Glad you like the **CONTINENTAL CARBON "ad"** in the April issue . . . suggest you tell our advertisers when you are favorably impressed with a particular style of copy. **C. Meredith, Sedalia, Mo.;** When a lad from the "Show Me" State admits that **SUCCESSFUL SERVICING** is worth paying for, it's **NEWS!** However, no charge—now or in the future to fellows like yourself. **H. M. Summers, Weymouth, Mass.;** See answer to Meredith—We can best answer your request for "high class advertisers" by referring you to our advertising pages in this issue. **Horace R. Perry, Belmont, Mass.;** It won't be long now—**THE CATHODE-RAY TUBE AT WORK** should be off the press within thirty days. Thank for being so patient. **J. J. G., Bridgeport, Conn.;** Is this a "gag?" *We don't know where your Scotch customer can get her phonograph needles re-sharpened.* **Fred Roth, Brooklyn, N. Y.;** Your sales literature shows much ingenuity, but we can only enter your **CARD** in the Contest. **Westwood Electric Radio Co., San Francisco, Cal.;** Your suggestion of a letter head contest is excellent—when we can scare up another Five Buck Bill, we may spend it in the manner you suggest—but I'm afraid that you have a head start (a **LETTER HEAD** start). **Edward Shannon, Chicago, Ill.;** Of course I'll be glad to have any interesting notes on the activities of Servicers in the Mid-West. Address your contributions to

The Rolling Reporter.

High Frequency Sweep Circuits

A very interesting article concerning sweep circuits in cathode-ray oscillographs appears in the June, 1935 issue of the *I. R. E. Proceedings*. It covers the production of sweep voltages over a range of from 4.2 to about 12.6 megacycles. The authors, **T. T. Goldsmith, Jr.,** and **L. A. Richards,** both of the Department of Physics of Cornell University, describe the means of establishing such high-frequency linear sweep voltages. Considering the limited range of present day units, this extension into the high frequency band should prove of value, as well as interest.

The system employs a linearly charged condenser which is periodically discharged by a high vacuum tube, the grid of which is biased past cut-off, except for short periods, when it is driven positive by a supplementary oscillator. The frequency of this oscillator is made commensurable with that of the unknown wave form to be investigated. The authors show photographs of wave forms of alternating voltages as high as 12.6 megacycles.

HOWDY-
ROLLING
REPORTER!



ESICO has just signed a year's lease on this column, and, as long as we are to be neighbors, mightn't we be friends too?

Here's a suggestion—you get around a lot—so does **ESICO**. Whenever you can drop a word about the goodness of **ESICO SOLDERING IRONS**, do it, willya? We, on the other hand, will do a bit of "log rolling" for you.

Mention to your friends (they number more than 13,000 now, don't they?) that from the far flung acres of Sunny California to the rock-bound coast of Maine, and from the bailiwick of **HUEY LONG** to the lair of the Tammany Tiger, **SMART** service men use **ESICO IRONS**.

Tell 'em, too, that there is more value built into every **ESICO** iron than they ever thought possible. When **YOU** buy a tire for your bike, you don't just look at the **PRICE TAG**, do you? Of course not! You insist upon knowing how many **MILES PER DOLLAR** of cost you will get. **YOUR** readers may be assured of more soldering operations per dollar of cost when they use **ESICO** irons.

Prices of the **ESICO GREEN LINE** range from \$1.10 to \$5.00.



HERE IS THE
TROPHY
priced at
FIVE BUX

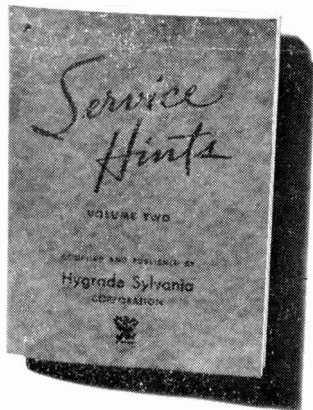
Ask your favorite jobber to show you an **ESICO** iron—or write us direct for descriptive literature.

ELECTRIC SOLDERING IRON CO.
342 West 14th Street, New York, N. Y.

NEW VOLUME OF SYLVANIA'S SERVICE HINTS NOW READY!

IT'S CRAMMED WITH BRAND NEW MATERIAL . . . SERVICE TIPS FROM CRACK SERVICE MEN ALL OVER THE COUNTRY.

**SEND FOR YOUR
FREE COPY TODAY**



Maybe you are one of the 50,000 radio service men who sent for Volume 1 of Service Hints. Then you'll be sure to want Volume 2 of this booklet, because it has more of the same helpful service tips . . . inside dope on special problems . . . but every bit of it brand new material!

This new volume of Service Hints contains the pick of service items sent in by thousands of service men . . . every one of them up-to-the-minute solutions of everyday problems. It's compiled for men who are always willing to learn more about radio . . . and it's a short cut to better servicing and better profits.

Don't wait. Send today for Volume 2 of SYLVANIA SERVICE HINTS. It will iron out a lot of your troubles, and put you in line for more and better service jobs. There is no charge. Simply fill out and mail this coupon today and you'll get your copy of this valuable booklet in a few days.

Hygrade Sylvania Corporation, Makers of Sylvania Radio Tubes and Hygrade Lamps. Factories at Emporium, Pa., Salem, Mass., and St. Mary's, Pa.

Sylvania

The Set-Tested Radio Tube

HYGRADE SYLVANIA CORPORATION, Emporium, Pa.	
Please send me free, without obligation, Volume 2 of Sylvania's "Service Hints."	
Experimenter <input type="checkbox"/>	Amateur <input type="checkbox"/>
Call <input type="checkbox"/>	
Service man <input type="checkbox"/>	Employed by dealer <input type="checkbox"/>
Independent <input type="checkbox"/>	
Member Service Organization.....	
NAME	
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CITY.....	STATE.....
NAME OF JOBBER.....	
ADDRESS	SS-6

Zenith 91, 92

The value of the center-tapped resistor, Part No. 63-210, was omitted from the list of parts shown in Rider's Manuals on pages 2-8, 674-N and 2714. The section connected to the junction of the speaker field and the choke is 2,800 ohms and the section connected to Part No. 63-167 is 10,000 ohms. Please make this addition to the schematic diagram of this set in your Volume II Manual.

Galvin Service Notes

"I have developed a simple method of checking the ground on the antenna junction box to make sure that it is the best ground obtainable.

"After having installed the set with the junction box complete, I remove the cap from the junction box and replace it with another test cap, to which I have soldered a piece of $\frac{3}{8}$ " shield braid about 6" or 8" in length. I can then use this braid to ground to various points within a 6" or 8" radius around the junction box and determine immediately whether I have secured the proper ground or not. If I find another point that is better, I need only move the box to that point; whereas, if no other point produces better results I have conclusively proven that the point of ground I had previously secured was the best."
—HAROLD PERKINS, 15201 Mack Avenue, Detroit.

"We installed a GM-100 set on a 1935 Oldsmobile. This set went out perfect without even static eliminators in the front wheels. About three weeks later the customer came in complaining of a wheel static noise. We installed front wheel eliminators and also bonded the front brake shoes to the back brake plate but this did no good. This car had streamline shields attached to the back fenders to cover up the rear wheels. We found that by removing these plates we did not have any wheel static. We then scraped the paint off under the fender so that the clamps which hold this back shield would get a good ground. We then installed the shields and tried the car out and the wheel static was gone.

Successful Servicing, June, 1935

"There are very few of the Olds cars which have these rear wheel shields but this same trouble might happen to somebody else and it sure would save a lot of time if they know where to look for the trouble."—CHAS. A. PARTISS of Bradford, Pa.

"Regarding a particularly tough job of interference elimination in a 1934 DeSoto airflow—in this case accumulative interference was still present after complete balance had been secured with the Magic Eliminode balancer. An .02 condenser was connected in series with the interference feeder and then connected directly to the ammeter. With this point of pick-up, perfect balance was secured."—J. L. SARGENT, Atlanta, Ga.

Intermittent Ignition Interference Encountered in Cars of All Steel Body Construction

Interference of this type may evidence itself in the later model cars when accelerating or decelerating the engine.

If the interference feeder of the Magic Eliminode is connected at a point where an appreciable amount of this interference is flowing, as well as the normal interference from the spark plugs it will, of course, be balanced out in regular balancing procedure of the Magic Eliminode.

If, however, this is not the case, the balancer of the Magic Eliminode will not eliminate it.

To avoid the necessity of having to cast about for the proper pick-up point for the interference feeder, a Motorola Dome Lite Filter can be connected in series with the DISTRIBUTOR BREAKER POINT WIRE.

Mount the filter on the distributor; secure a good ground to the distributor base; connect the "Bat" side of the filter toward the distributor; connect the "Load" side of the filter toward the ignition coil.

CAUTION—Keep the connection between the filter and distributor as short as possible.

Practically every case of intermittent interference of this type encountered in new cars may be eliminated by this method.

Fada 25, 25-Z

The volume control used in this receiver is rated at 3,000 ohms. The schematic wiring diagram appears in the Rider Combination on page 915 and on page 1-15 in the Fada section and also on page *79 in the early editions of Rider's Volume I.

Colonial 142

If you are seeking information about the Colonial Model 142, check the Sears-Roebuck Silvertone Models 1712 and 1713 on pages 4-18 and 4-19 in Rider's Volume IV. The Model 142 chassis is used in the 1712 and 1713.

Philco Model 144

Effective April 15, 1935, the center tap is removed from the filament winding on the power transformer. If a hum is experienced in reception, connect a 20-ohm, wire-wound resistor across the filament winding, with center tap of resistor grounded. This set is shown on page 5-41 in Rider's Manual, Volume V.

Philco Model 32

Starting with Run No. 6, the part number of the volume control is changed from 33-5063 to 33-5004, and the wave-band switch from 42-1017 to 42-1123. This makes the design and connection of these parts the same as in Model 89. See Rider's Manual, Volume V, page 5-17.

Philco "Run Number" Identification

These numbers are stamped on the chassis sub-base for identification. These run numbers are changed consecutively as major changes are made in the receiver wiring and parts.

Installing Galvin Model GM Sets on Roof Aerial

When installing roof aerial with GM model sets, always connect a .00015 mica condenser in series with the aerial lead. This condenser may be conveniently mounted in the antenna junction

box. Its use is necessary because this set is designed to operate on the GM-47 under-car aerial, having a capacity of approximately 150 mmfd., and if used on a roof aerial without a series condenser you will be unable to track properly the antenna trimmer of the first tuning condenser.

Philco 10

Run No. 3. A ground strap was added (Part No. 9481) from tuning condenser housing to receiver housing.

Run No. 8. The first and second i-f. transformers, Parts No. 16 and 25, were replaced with new types having the same part numbers. They can be identified by the red paint marks on the spools.

See Philco page 4-56, Rider's Volume IV.

Philco 10-Code 122

Run No. 2. Condenser Part No. 61 (50 mmf.) was removed and Part No. 30-1032 (250 mmf.) was added.

Run No. 3. The first i-f. transformer, Part No. 18, was replaced with a new type, having the same part number. This can be identified by the green paint marks on the fibre.

Run No. 4. Resistor, Part No. 23 (500 ohms) was removed and Part No. 6443 (700 ohms) was added.

For schematic diagram see Rider's Volume V, Philco page 5-5.

Philco-Pierce Arrow MT-3 and Philco-Reo RT-3

Run No. 1. An antenna choke, Part No. 32-1372, No. 75, has been added. It is connected in series with the antenna lead and the antenna transformer No. 1 and condenser No. 2.

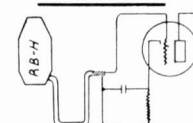
Run No. 3. Wire the white lead of the output transformer directly to the plate of the 42 tube socket instead of to the pin jack.

Run No. 4. Tone control, No. 56, removed. Part No. 30-4298 added. When using this new tone control, condenser No. 47 is also removed.

See schematic for these receivers in Rider's Auto Radio Manual, Volume II, Philco page 2-41.

New
HIGH IMPEDANCE VELOCITY MICROPHONE

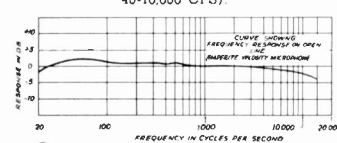
(Model RB-H)
Operates WITHOUT PRE-AMP



- 1 A HIGH IMPEDANCE VELOCITY MICROPHONE WHICH OPERATES DIRECTLY INTO GRID OF TUBE.
- 2 REQUIRES NO PRE-AMPLIFIER WHEN USED WITH REGULAR HIGH GAIN AMPLIFIER (100 DB.).
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- 4 WHEN MICROPHONE LINE IS LESS THAN 30 FEET LONG, NO DETECTABLE CHANGE IN FREQUENCY RESPONSE IS EXPERIENCED. WITH SPECIAL LOW CAPACITY CABLE, THE LINE CAN BE EXTENDED.
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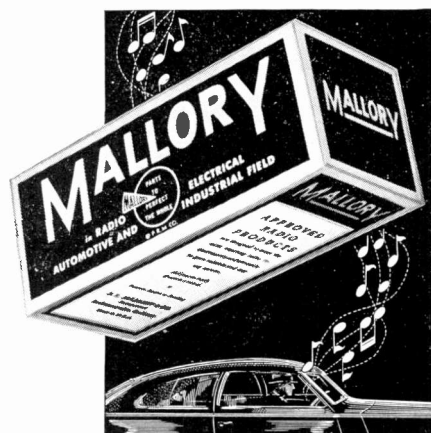
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Noisy Patterns

If during alignment work with the cathode-ray oscillograph and the motor driven frequency modulator, you find that the pattern upon the screen indicates the presence of noise, check the stud contactor. We found just this type of trouble, here in the SUCCESSFUL SERVICING Laboratory. We changed the stud and the pattern became normal. This is the stud which makes contact with the rotating shaft that is common to the motor and the condenser. It is the contact to the rotor of the condenser.

Volume VI on Deck

Last November when the final page proofs of Volume V of Rider's Manuals had been checked and the presses were rolling merrily, we heaved a sigh, stretched our weary bones and then—went to work on Volume VI.

During the seven months that have elapsed since Volume V was put to bed, we have been busy collecting servicing data, schematic diagrams, voltage tables, alignment data, etc., for publication in Rider's Volume VI. From the looks of things at the present writing, this forthcoming Volume VI of the Rider's Perpetual Trouble Shooter's Manuals is going to be the greatest in several ways. First of all, it will be necessary to increase the number of pages above the 1,200 comprising Volume V. The products of more manufacturers than ever will be found in its pages, giving the usual complete coverage of the field. Incidentally you will find receivers of some manufacturers which never before have been published anywhere. Not only will the latest 1935 receivers be among those present, but the missing of the vintage of 1930-35 will be included. (Those advertisements which we ran in SUCCESSFUL SERVICING certainly bore fruit for we have received a great amount of data, which you will find valuable.) In other words, we feel sure that you will find Volume VI to be bigger and better in every way than any other manual ever published.

Hundreds of thousands of receivers have been sold by some of our big department and mail order stores under their own trade names. A vast collection of these—never before in

Successful Servicing, June, 1935

any manual—will be in Rider's Volume VI.

And here is the real news: Our present plan is to have Volume VI ready for distribution sometime in October. . . . Just as soon as we have the data on the new receivers of 1935-36, we will hand Volume VI over to the tender mercy of the printer, heave another sigh and then . . . get going all over again.

Changes in Chassis

Again we take the opportunity of calling to your attention changes which are noted upon many diagrams, but which invariably miss your eyes. In numerous instances, the diagrams which appear in the Rider Manuals are reproductions of the blueprints furnished to us by the receiver manufacturers immediately after the announcement of the receiver. Time and again, the final prints contain a number of changes or revisions, which were made upon the various production runs of the receiver prior to the time that the final print was developed. These changes are shown, but are not noted by the Rider Manual owner and he is confused when the receiver before him does not coincide in every respect with the schematic shown. Check all data furnished on the diagram and you will more often than not, find the information which so confuses you.

Take as an example, the Halson Model 520 shown in Rider's Manual, Halson Page 5-2. If you look in the extreme left-hand corner, you will find reference to a resistor designated as "a," which was 110,000 ohms. The parts list shows this resistor as being 51,000 ohms. No doubt receivers with a 110,000-ohm unit in this position are out in the field, so that if such a receiver were compared with the schematic, change unnoted, a discrepancy would exist. The same diagram shows the addition of another 51,000-ohm resistor. Numerous examples of this type are to be found in the manuals, and much grief can be avoided by closely examining the contents of each page.

The Cathode-Ray Book will be out in July. Order Now.

Reversing Magic Eliminate Connection in Galvin GM No. 79 and GM No. 110

When installing GM No. 79 and No. 110 sets on a *roof aerial*, it is also necessary to reverse the two connections to the *movable coil* of the Magic Eliminate. This coil may be reached by removing the rear cover of the set. This change is also necessary, but in reverse order, when installing the standard No. 75 or No. 100, using an under-car aerial. See Galvin page 2-9 in Rider's Auto Radio Manual, Volume II.

Installing Motorola Auto Radio Sets in 1935 LaSalle—1935 Studebaker—1935 De Luxe Nash

Any GM model Motorolas may be installed in the 1935 LaSalle car. The installation fundamentally remains the same as that in the other General Motors Turret-Top cars, and the same GM control head may be mounted in the instrument panel, using the PONTIAC MEDALLION and KNOBS (Cat. No. M-35), as this very nicely matches the instrument panel.

To install the GM control head in the instrument panel, remove the medallion plate which is attached to the instrument panel and file the holes provided for the flexible shaft bushings with a rat tail file sufficiently to allow the shafts to extend through from the rear of the instrument panel. Next, increase the width of the square window in the instrument panel to allow the Pontiac medallion to recess properly through this window. Complete the installation as outlined in the GM instruction sheet.

The Ford model Motorolas may be adapted to the 1935 Studebaker cars, using the header type speaker. In these cases it is only necessary to remove the baffle plate from the Ford header speaker and proceed as follows:

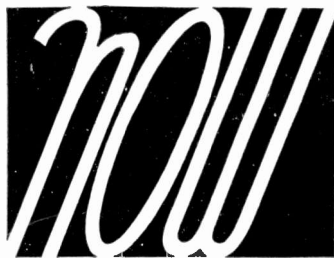
Loosen the screws holding the header bar in place and drop it forward. Cut the upholstery covering the opening provided in the header bar for the speaker. Place the speaker grill and speaker bezel ring in position—mount the speaker at the rear of the header bar—extend the speaker cable down the

corner post by using the piece of cord string provided in the car for fishing this cable through the post. The control head may be placed either in the left dummy glove compartment door, or in place of the ash receiver provided in the instrument panel. Instrument panel mountings for mounting the control in the ash receiver in the Studebaker cars will be available in the near future (Cat. No. M-38).

Instrument Panel Mounting 1935 De Luxe Nash

Remove the clock from the center of the instrument panel and install the control head in this opening, using the standard 1935 Plymouth medallion, carrying part number M-31. The clock mounting may be transferred to the left dummy glove compartment door.

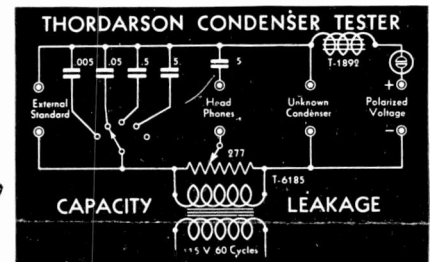
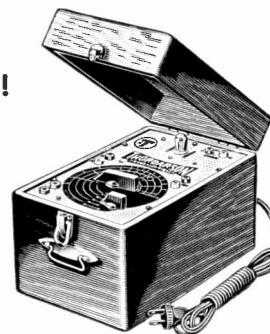
The above-mentioned installation allows for a more accessible operation of the radio set, as tuning can be accomplished with the right hand instead of with the left hand through the spokes of the steering wheel.



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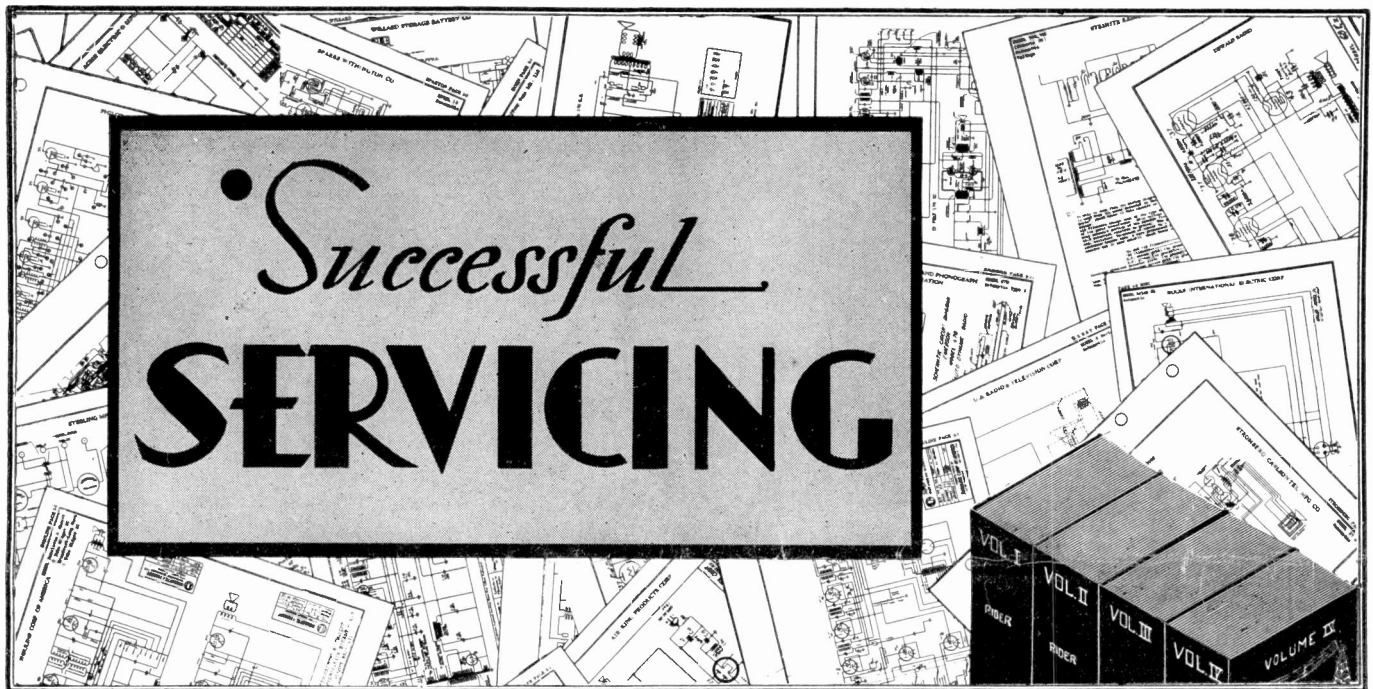
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THE A-F. FREQUENCY MODULATOR

An Experimental Unit for Checking Overall Audio Response

By JOHN F. RIDER

The March, 1935 issue of *SUCCESSFUL SERVICING* made mention of a device, which was named an "audio wobbler." In sum and substance this device supplied a constant voltage output over an automatically varied band of audio frequencies. In effect it is the same as the r-f. and i-f. frequency modulator device, now being offered for use in connection with alignment operation. Whereas the r-f. and i-f. frequency modulator provides for checking the response of an r-f. and i-f. system, the a-f. frequency modulator provides for the checking of the overall response of the audio-frequency amplifier. To conform with existing phraseology, we have changed the term "audio wobbler," as previously described, to "a-f. frequency modulator."

A number of experiments have been carried on since the publication of the short discussion previously mentioned and sufficiently satisfactory results have been obtained to justify the forecast that such devices will be available for commercial use. While it is true that the results we have obtained cannot be

classified as being representative of the ultimate in quantitative results, we have been sufficiently successful to hazard the statement that it will be a serviceman's tool, just as the r-f. and i-f. frequency modulator will be a commonplace tool for alignment operations.

The use of the cathode-ray tube for the determination of audio-frequency response curves is no innovation. As far back as 1927, Diamond and Webb pointed out the suitability of the device for the rapid determination of audio-frequency response curves and published excellent response curve oscillograms in the September 1927 issue of the *I. R. E. Proceedings*. The authors used a beat-frequency oscillator, wherein the continuously vari-

able frequency control condenser was mounted upon the shaft of the potentiometer, which, with a battery, supplied the sweep voltage. The potentiometer arm and the condenser rotor were simultaneously driven by a low speed motor.

We shall now describe some of the results which we have obtained in the Successful Servicing Laboratory, using an a-f. frequency modulator of simple type, containing elements available upon the open market. Two radio-frequency oscillators, operating at about 200 kilocycles, were heterodyned to obtain an r-f. signal. To one of these oscillators was connected a motor-driven condenser, such as is available for alignment work. The unit used was the RCA model TMV-128A fre-

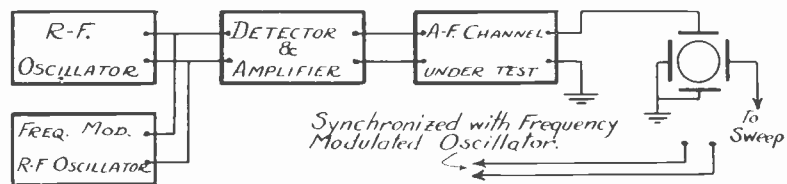


Fig. 1. Diagram showing arrangement of apparatus for checking overall audio response.

quency modulator. The frequency operating conditions were so chosen that the beat frequency sweep was 10,000 cycles. With the equipment available,

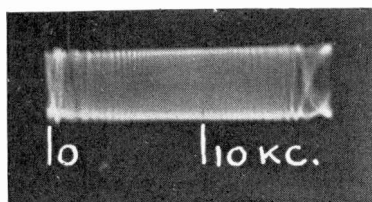
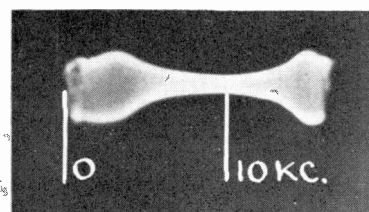
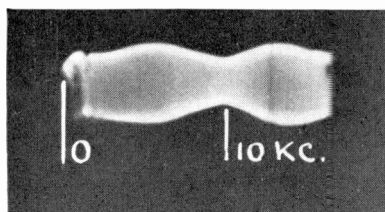


Fig. 2. The characteristics of the a-f. signal over the 10-kc. band. Note the linearity.

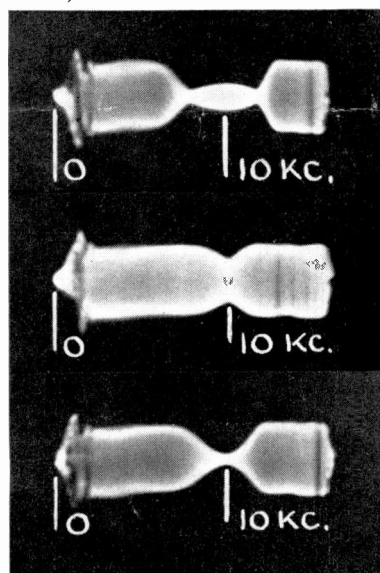
the sweep frequency was necessarily limited to 20 cycles, since this was the lowest sweep frequency available in the commercial cathode-ray oscillograph used. Synchronization between the sweep and the a-f. signal was effected in the usual manner as for i-f. alignment. The characteristics of the a-f. signal over the 10,000 cycle band, as generated by this apparatus, shown in block form in figure 1, is shown in figure 2. It will be noted that the output is essentially linear up to 10,000 cycles, the upper frequency limit. It should be realized that only half of the entire pattern is used here, as indicated. The other half of the trace is a repetition of the first in reverse order. This limitation of screen space is due to the design of the device we were using and is not a limitation of the system. Further elaboration of the design can remove one half of the trace, thus greatly simplifying the utility of the image. By properly phasing the sweep circuit, the zero beat position can be placed at the left of the image, so that frequency increase is towards the right.

The accompanying unretouched photographs will show a few of the practical applications to which we have put this experimental a-f. frequency modulator unit. Figures 3, 4, and 5



Figs. 6 (left) and 7 (right). The frequency response curves of two a-f. transformers. Note the difference in cut-off.

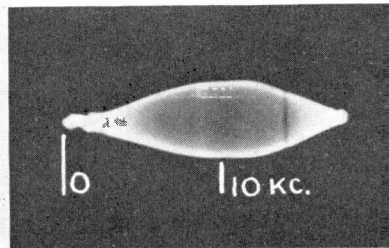
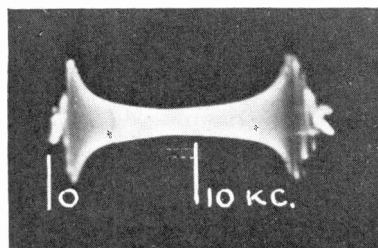
show the application of the unit to the adjustment of the 10 kc. low pass filter. The three illustrations show the filter adjusted below 10 kc., above 10



Figs. 3, 4, 5. Patterns obtained during adjustment of a low-pass filter. Fig. 3 (top) filter adjusted below 10 kc.; Fig. 4 (middle) above 10 kc., and the correct adjustment in Fig. 5.

kc. and the correct adjustment respectively. The advantage of operating with such a frequency modulator is found in the fact that the effect of each adjustment is instantaneously noted.

Figures 6 and 7 show the application of the device to the comparison of the frequency response of two transform-



Figs. 8 (left) and 9 (right). Patterns obtained when adjusting a circuit wherein bass and treble compensation were available. Note the high peaks at the lower frequencies in Fig. 8, showing accentuation of the bass. Accentuation of the higher frequencies in Fig. 9.

ers. The advantage of one over the other is clearly evident and the tedious labor of point by point measurement with a vacuum tube voltmeter has been avoided. Figure 8 shows the system applied to a circuit, wherein bass compensation was available. Note the increase in amplification at the lower frequencies. Each adjustment of this bass compensation circuit was instantaneously evident upon the screen. Similarly figure 9 shows treble compensation. Figure 10 shows the operation of the conventional tone control in cutting down the treble response, at the same time influencing the response over the entire band.

The possible applications of such a device for servicing or design are too numerous to mention at this time, but it is clearly evident that as a servicing tool for the checking of audio units in receivers and public-address systems,

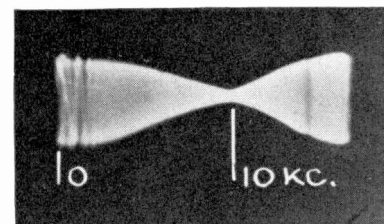


Fig. 10. How the operation of a tone control reduces the treble response. Note the reduction of the higher frequencies.

either individual stages or the complete system as a unit, such a device has no parallel. The apparatus used to secure the oscillograms shown herewith, while admittedly far from being the last word, does, we believe, show clearly that the audio-frequency modulator is worthy of serious consideration by test equipment manufacturers.

The unit and its application, showing a much greater number of oscillograph patterns obtained under numerous conditions, is described in Rider's "Cathode-Ray Tube At Work."

Philco 700

The following changes were made in the runs indicated. The schematic diagram will be found in Rider's Volume V on Philco page 5-48 and on Philco page 2-52 in Rider's Auto Radio Manual.

Run No. 4. Tone control, No. 62, removed and Part No. 30-4298 added.

Run No. 5. Part No. 5858 condenser (250 mmf.) connected between the primary center tapped power transformer and resistor No. 53.

Run No. 8. The first i-f. transformer, No. 15, replaced with a new type having the same part number. This can be identified by the green paint mark on the fibre. Resistor No. 18 (1,500 ohms) replaced with Part No. 33-3048 (2,000 ohms).

Run No. 9. Condenser No. 64 (50 mmf.) replaced by part No. 30-1032 (250 mmf.).

Philco 800

Run No. 4. The Airplane control was added. Part No. 28-8224 brush springs were added to tuning condenser and volume control shaft couplings.

Run No. 3. Part No. 32-1374 choke and 30-1029 condenser (50 mmf.) added to the "A" side of switch. Part No. 30-1029 (50 mmf.) added, one side being connected to the pilot lamp side of Part No. 45 and the other side to ground.

Run No. 9. First i-f. transformer, No. 17, replaced with a new type, having the same part number. This can be identified by the green paint marks on the fibre.

Philco 808

Run No. 2. A 250-mmf. condenser, No. 89, Part No. 30-1032, is now connected across the secondary of the output transformer.

Run No. 3. Condenser, No. 89, removed.

The alignment data is the same as for the Philco Model 806, for which see page 2-60 of Rider's Auto Radio Manual, Volume II. For schematic diagram of Model 808, see Philco page 2-62 of the Auto Radio Manual.

Crosley 5V2 and 5A3

The i-f. peak in these receivers is 181.5 kc. The alignment and servicing procedure for the 5V2 is the same as that for the 5V1, shown on pages Crosley 5-21 and 5-22 in Rider's Manual, Volume V. The circuit is substantially the same except for the addition of a 2,000-ohm resistor between the moving arm of switch 48 and the terminal which is a part of switch 48 and which connects to the low end of the input coil to the mixer portion of the 6A7. The voltage for the 5V2 is the same as that for the 5V1, shown in Rider's Manual.

Airline Model 62-166

The present production of these receivers differs from the early runs. In the early models the plate circuit of the 75 triode, contained only the plate coupling resistor of 150,000 ohms. In the

later models a plate filter resistor of 50,000 ohms was added. In addition a .25-mfd. bypass condenser, which bypassed this plate filter resistor, was also added.

In the early models the capacity range of the trimmers used across the windings of the first i-f. transformer, was 150 to 300 mmfds.

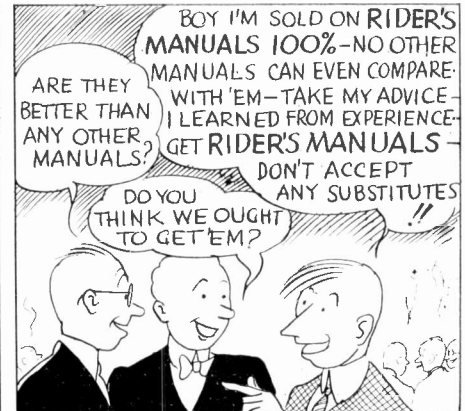
Motorola 100 Hum

If excessive hum is due to a ripple in the grid circuit of the 85 tube, due to chassis currents, check by short circuiting the grid circuit to ground. If the ripple is materially reduced, the following wiring change may help:

With the set chassis placed upon the bench so that you are facing the four tubes and output transformer assembly, remove the 37 tube and 85 tube from their respective sockets. Locate the black lead extending from the ground lug of the manual volume control to the ground lug of the small 4 contact dummy lug strip located at the top of the r-f. tube shield.

Next locate the black lead extending from this same lug on the 4 contact dummy lug strip down to the cathode of the 85 tube socket. Clip this lead at both ends and remove it from the set completely. Disconnect the volume control ground lead from terminal 2 of the 4 contact dummy lug strip and re-ground this to the i-f. coil can, (the face directly behind the 85 tube) and at a point approximately 1 1/4 inch above the set chassis.

HAP'S A BOOSTER



Depreciation—What It Is!

The word "depreciation" appears quite frequently in connection with discussions concerning operating costs. From what information can be gathered, it has been learned that the significance of this word, is generally not understood. Judging by the response to talks concerning the effect of operating cost upon service charges, which have been given by John F. Rider at various servicemen's meetings, it might be a good step to furnish some data about this item of depreciation which appears in all operating cost tabulations.

In every concern of the type where equipment, mobile or fixed, is used, such equipment is subject to deterioration as a result of wear and tear. For example, the service station, consisting of a shop, employs equipment and fixtures. The equipment usually consists of an automobile, testing equipment of various kinds, fixtures, etc. From time to time, this equipment may reach such a condition that it is no longer fit for use and *replacement* is necessary. At the time that replacement is required, this equipment has what is known as a scrap or trade-in value, which value naturally, is less than the original cost value. The difference between the original cost value and the scrap value is the depreciation of the value of the equipment.

As a general rule, it is customary to set aside funds for the replacement of such equipment and the amount of money set aside over a period of time is the amount equivalent to the depreciation. The replacement cost is the sum of the amount set aside, as being the depreciation, plus the scrap value converted into dollars when the new unit is purchased. In the event that there is no scrap or trade-in value, then the depreciation is 100 per cent and the funds set aside would amount to the figure required to replace the equipment. For example, if an automobile is purchased for \$1,000 and it is estimated to have a life of five years, at which time, the trade-in value is 10 per cent of the cost, or \$100, the difference between the cost and the trade-in or scrap value of \$900 is the depreciation over the period of five years. To replace this car, it will be

necessary that \$900 be available at the end of five years. A similar situation exists in the case of testing equipment, differing only in the amount of dollars and the number of years figured as the normal operating life. Depreciation is also considered in connection with the furniture and fixtures and the tubes used for testing, etc.

Depreciation is reflected in cost, at least in determining operating expense in the service business, because, depreciation is made a fixed expense, by setting up the depreciation as a monthly recurrent expense, with the destination of this money in what would normally be known as a "sinking fund" account. Expressed in another manner, the depreciation per year on the car previously mentioned is 900/5 or \$180 per year. Since service stations do not operate with a great deal of money and since replacement of the car is imperative, it is best if the money for replacement be set aside as a fixed expense of \$15.00 per month.

There are various ways of establishing depreciation, and while the fixed proportion method here suggested is not ideal for cases where long life of equipment is involved, it is the simplest and satisfactorily effective. The reason for suggesting that the money, to be finally used for replacement, be placed in a separate account, is founded upon the fact that small business is lax and while the books of the concern may show funds for replacement, the one-man shop operator, who does not establish such a sinking fund, is very apt to forget such records and consider all of the funds in the one bank as operating capital.

As far as estimated life of equipment and scrap or trade-in value are concerned, the car is five years with 10 per cent, testing equipment is three years with 10 per cent as the maximum and 100 per cent depreciation a safer basis, tubes used for testing about one year without any scrap value, and fixtures about eight years without any trade-in. Furniture, such as chairs and tables, should not be considered as having an operating life in excess of five years with no trade-in value.

Incidental equipment which may re-

quire replacement, but which does not entail any expenditure of more than six or eight dollars per year, should be considered as ordinary operating expense for that period.

Perhaps you have noted that repairs and maintenance of equipment which requires replacement is not included in the depreciation. It does not belong there. It is a variable expense. You should not confuse replacement of tires on a car or some part which has become worn, or replacement of a meter in a tester, which has become damaged, with replacement of the car or the tester.

Circuit Design Explanations

Service technicians have always been keen for explanations concerning the design of circuits used in radio receivers. The June 1935 issue of the *I. R. E. Proceedings*, contains a tremendous amount of material of interest and value.

You will find in this volume excellent reading matter concerning the design of image suppression circuits, as used in superheterodyne receivers of the past and as will no doubt be used in the future. At the same time, the discussion covering the design of high fidelity i-f. transformers should furnish a wealth of material to remember when examining the circuits of some of the superheterodyne receivers to come, for one or more of these designs, as developed by several engineers of the Hazeltine Corporation, will find their way into future radio receivers.

The article by Wheeler on "Image Suppression in Superheterodyne Receivers", and that by Wheeler and Johnson on "High Fidelity Receivers" should be of particular interest.

An Apology to Batcher

The June 1935 issue of *SUCCESSFUL SERVICING* stated on page 5, that Allen B. Dumont supplied the answer to the question asked in the Editorial in the May, 1935 issue. Credit for the answer should have been given to Ralph R. Batcher, although thanks are due to Dumont for his communication advising us of Batcher's resume.

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Vol. I July, 1935 No. 11

Survival of the Fittest

IT is our belief that the next two years are going to witness an exodus from the ranks of the servicing industry. A combination of events is going to contribute greatly to the betterment of the industry as a whole. Improved economic conditions are going to cause many men who drifted into radio servicing as a possible means of livelihood, to go back to their previous lines of work. Increased technical complications presented by the arrival of superheterodyne receivers instead of the t-r-f receivers in service shops, will cause those who are not familiar with radio technique and who do not have confidence in the service industry as a field where suitable remuneration is possible, to embark upon other enterprises. Still further increased technical complications introduced by radio receiver development now going on, and the possibility of television, will contribute to the demise of the group who have been "getting by" for so long.

The time is not far distant when a service station operator, to survive or keep in the swim, will have to acquire far more servicing equipment than he now possesses, so that being in the service business will require some sort of a respectable financial investment. This condition will tend to sort the serious minded man out of the group who have been doing servicing simply because it was possible to enter the field with minimum investment.

Another and important reason is that greater technical knowledge will be required and the man who remains in the business will be the individual who will be willing to burn the midnight oil, acquiring that technical knowledge and who will possess sufficient ambition to work and keep his knowledge up to date.

The last, but by far not the least of the reasons is that greater business acumen will have to be displayed. Ever so many service station operators are complaining about the terrific amount of competition, about the fact that they are not securing sufficient work and satisfactory prices. All of this is true and to survive, business ability is imperative. The man, who will stay, will be the one who has sufficient initiative to go out and get the business—who has stick-to-it-iveness, to fight the thing through—who thinks each day about new sales ideas and ways to get more business—who gives thought to all possible means of increasing efficiency in the shop—and who knows that his store of technical knowledge can never be too full.

JOHN F. RIDER.

Distribution of this issue of
SUCCESSFUL SERVICING
13,000 COPIES

A Statement—NOT An Apology

Since the announcement of our book "The Cathode-Ray Tube at Work" we have received many queries as to when the book was coming off the press and why was it not out before this. We believe that we should take you into our confidence and give you the well-known low-down. Here 'tis.

We had collected a world of data concerning the cathode-ray tube and how it can be used in radio servicing and allied fields, but we were unsatisfied. We wanted to see for ourselves just how much time could be saved in doing certain servicing jobs with the cathode-ray tube oscillograph . . . how it could be adapted to servicing the new receivers with all their manifold technicalities. So we equipped our Successful Servicing Laboratory with the best

and newest apparatus that was available

Then the fun began!

It was our intention to inform the owners of "The Cathode-Ray Tube at Work" about all the ins and outs of the oscillograph and to do this properly, we found it necessary to perform experiment after experiment and test after test in our lab. After all, we are human (very much so) and such tests and experiments have a way of taking up an unbelievable amount of time. A new oscillograph was announced to the servicing industry . . . it was immediately purchased for testing purposes. A new oscillator bloomed forth. . . . "Ship us one AT ONCE," went out our order. How did such newcomers affect the preparation of the book? Only to the extent that we tried them out to see if they would do the same things existing apparatus would do or perhaps something new might have been incorporated in their innards that would do something new.

In order to fulfill our intentions, as mentioned at the top of the previous paragraph, we purchased a camera and the necessary photographic equipment for recording the patterns we obtained on the cathode-ray oscillograph's screen. Some of our early photographs were unsuitable for the making of half tone illustrations for the book and elaborate set-ups had to be repeated, so that good, "contrasty" photographs could be obtained. Literally, hundreds of pictures were made, so that from this mass of photographic data we could select those which told their story most accurately and most completely. Incidentally, we are a firm believer in the saying of—was it Confucius?—"One picture is worth ten thousand words."

And all this is beside the fact that the transfer of our laboratory findings to paper was no mean task (especially in this hot weather!!). Then there were the numerous drawings, sketches and diagrams that had to be placed in artists' hands and their checking, when they were returned. Oh, yes indeed, the preparation of a book of this nature is a job . . . and how.

But the end is in sight.

We have done all these things mentioned above for one reason and one

(Please turn to page 10)



More Miles to the ALL-WAVE SET

Do you run a 1935 auto on 1920 gas? Certainly not! You couldn't get high-compression engine performance without anti-knock fuel.

Likewise with those 1935 all-wave sets. You can't enjoy their extreme sensitivity and high-fidelity reproduction without a noiseless antenna system . . . and sometimes an all-wave line filter, too. So here's the dope:

TACO No. 20 KIT . . . all-wave noiseless antenna system . . . positively kills local man-made static . . . maximum signal in broadcast, amateur, short-wave bands . . . complete, factory-wired and soldered, ready to string up. Lists at \$6.75. Where line-noises interfere . . . add TACO H-F ALL-WAVE LINE FILTER . . . plugs between set and line . . . or between noise-producing appliance and line . . . filters out noises in broadcast, amateur, short-wave bands. Handles 200 watt load, A.C. or D.C. Neat. Compact. Lists at \$7.50.

These are the season's big sellers. But TACO makes other antenna systems, components, accessories. Thoroughly engineered, licensed under A.A.K. Inc. patents, fully guaranteed. They'll make money for you because they'll make good!

Mail Coupon — Make Money!

Fill out and mail coupon below. Get our technical data and merchandising ideas. Meanwhile, ask your local jobber to show you the TACO line of extra-dollar makers.



TECHNICAL APPLIANCE CORP.
27-26 Jackson Avenue
LONG ISLAND CITY, N. Y.

TECHNICAL APPLIANCE CORP.,
27-26 Jackson Avenue
Long Island City, N. Y.

I'd like to pick up some extra dollars on my service calls, so

Send me your technical and sales dope.
 My local jobber is
of

NAME

ADDRESS

CITY

Packard-Bell I-F. Peaks

The i-f. peaks used in some of the Packard-Bell receivers, to be published in Rider's Volume VI, during the coming fall, are given herewith.

Model	I-F Peak
25	460 kc.
35	458
35-A	460
36	460
65	465
76	465
86	465

Tube Puller

An excellent suggestion has been received from Wells-Gardner concerning a tube puller for use in auto radio receivers, where it may be difficult to remove a tube from its socket in the chassis.

Sharpen the end of an ordinary screw driver to a knife edge. Then bend about $\frac{3}{8}$ of an inch of the end until it is at a 90 degree angle with the shaft of the screw driver. To get a tube out, push it over to one side and insert the knife edge of the tube puller under the base of the tube. Then straighten the tube, move it slightly from side to side and pull upward on the puller.

Secondary (S-2)
Black
Red and Green

Output Transformer
Primary
Yellow
Green (C. T.)
Yellow

Secondary
Red
Blue

Condenser Bank
Between Red and Black 0.5 mfd. each.
Between Blue and Yellow 3.0 mfd.
Between Blue and Green 2.0 mfd.

The schematic wiring diagram of the Radiola 33 DC is shown in Rider's Manual, early page * 489, revised 1-28 and in the combination on page 1848.

The d-c. resistance of the output transformer secondary is 625 ohms. The d-c. resistance of the output transformer primary, from outside lead to outside lead, is 338 ohms.

Stewart-Warner Model R-118 Chassis

This chassis is used in the models 1181, 1182 and 1183 receivers. The i-f. peak is 177.5 kc. The voltage table follows:

Tube	Circuit	Fil.	Plate	Screen	Cathode	Control
78	R-f	5.8	239	103	3.1	0
6A7	1st Det. Osc	5.8	239	103	3.1	0
78	I-f.	5.8	239	103	3.1	0
75	2nd Det.	5.8	158		1.8	0
41	Output	5.8	230	240	0	See Note B
84	Rect.	5.8			227	

Radiola 33 DC. A-F. Transformer Data

The input and output transformers and the filter condenser bank are contained in a single can. The following list of color codes should identify the connections.

Input Transformer
Primary Black and Red
Black with Red Tracer
Secondary (S-1)
Brown
Black and Brown

Note A. Oscillator grid voltage varies from -5 at 1400 kc. to 0 at 600 kc. Oscillator anode voltage is 103 volts.

Note B. Actual bias voltage on the grid of the 41 tube is -22.0 which must be measured from ground to the filter choke terminal. Due to the high resistance grid leak, the voltmeter will show only about -2 volts at the grid terminal. All d-c. voltages are measured from socket terminal to the chassis, using a high resistance voltmeter of 1,000 ohms per volt. Filament battery voltage is 6 volts.

Rolling REPORTER



Spy No. 349 reports a most interesting state of affairs among the servicing fraternity in Glendale, Cal. There are about 20 service shops in that bustling little city—each one displays a card testifying to his membership in the Service Men's Ass'n—and carrying the names and addresses of EVERY OTHER MEMBER. Also displayed is a minimum price list for various jobs, and no member can quote below the price displayed. John L. Vincent, square shooting, clear thinking Servicer, is President of the Glendale group, and the present happy state of affairs in that town is due largely to his efforts. *Why cannot more groups get together and permit the American Public to pay for its entertainment???*

Chit Chat

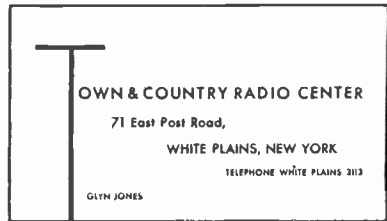
"Stars yell on Alabama last month" . . . there was a large gathering of the bright shining stars of the radio industry at the annual convention of the Southern Radio Service Association . . . among them, **Charlie (Human Dynamo) Golenpaul** of AEROVOX, **Paul Ellison**, genial advertising genius of SYLVANIA, **V. E. Jenkins** of WESTON, "**Bill**" **Kantenberger** of Dallas, "**Bill**" **McDonald** the editorial shogun of RADIO RETAILING, and, of course, that perennial traveler, **John F. Rider**. . . . *The Newark Chapter of the IRSM put on the "jeed bag" at the Robert Treat Hotel last month—you oughta see some of those Servicers EAT!* . . . "**Bill**" **McDonald** has been promoted to the post of Managing Editor of RADIO RETAILING—congrats. . . . Advance orders for RIDER'S new book THE CATHODE-RAY TUBE AT WORK indicate that it will be in the "best seller" category—it should be off the press this month. . . . This issue of SUCCESSFUL SERVICING will be over 13,000—it is now distributed in over fifty foreign countries . . . pretty big for its age.

The maiden effort at "impresario-ing" of **Morris Green** and **John Stern** of **RADIO ELECTRIC SERVICE CO.**, Philadelphia, resulted in one of the most comprehensive parts shows this reporter has ever seen. **HIGHLIGHTS**—the heat—the **FREE BEER**—the humidity—**Charlie (AEROVOX) Golenpaul's** "little black book"—**R. C. A.'s** "Ten Ring Circus" of Oscillographs—**RIDER'S** shirt after his sizzling talk on "Time or Parts"—**Harry (AD-MAN) Bridges** five gallon sombrero—**Paul (SYLVANIA) Ellison's** cigar—**Shoyer's** grand restaurant—**Harry Gebhart's** geniality—the heat—the humidity—the **BEER**—the turn-out of Servicers in search of knowledge—

Jack (*Newlywed*) **Costello's** bartending—the **BEER**—the **HEAT!**

THE WINNAH!!!

The Better Business Card Contest is closed—the winner of the \$5.00 prize is **GLYN JONES**. All of the judges were in unanimous accord on the decision, although there were several hundred entries to choose from. Some of the cards were **TERRIBLE**—many were excellent—most of them were merely "adequate." Mr. Jones' card is reproduced herewith—it was printed in green ink on a fine quality of card stock.



Congrats, Mr. Jones—you must be a **SMART** Servicer.

The Mail Bag

E. J. Bancroft, Fresno, Cal. Such letters as yours make things easier for us. Thanx for all the nice things you say. All of the photographs of Cathode-Ray Tube images are taken in the **SUCCESSFUL SERVICING LABORATORIES** with an ordinary fast lens camera, costing under \$50.00. They will be reproduced in "**THE CATHODE-RAY TUBE AT WORK**" which will be off the press soon. Some of the auto radio circuits are reproduced in the regular **MANUALS**, not all . . . *Harvey C. Messner, Tucson, Ariz.* Thanx for your nice letter. The **ROLLING REPORTER** likes you too—so that makes us even, doesn't it? *R. Douglas Clerk, Westmont, P. Q., Canada.* Sorry that we were all out of Numbers 1 and 5 of **SUCCESSFUL SERVICING**. Better file your copies under lock and key to prevent any future "borrowing." Be assured that you will continue to receive your "indispensable magazine." **National Radio Service Co., London, England;** We, too, think that **RIDER MANUALS** are invaluable to Servicers . . . What is the significance of the "**National Scheme for Disabled Men**" logotype which appears on your letterhead? *James G. Greenhill, Wellington, New Zealand;* Your flattering comments on the **RIDER MANUALS** are indeed kind. In forty-two countries, these "veritable gold mines of information" are pointing the way to greater profits for Service Men. Write us again, won't you? *E. H. Sleeth, Dawson Springs, Ky.;* Next time we see Governor Ruby Lafoon, we are going to nominate you for a Kentucky Colonelcy, then we can salute you properly. Glad you like the **RIDER** publications—we try to make them **RIGHT**. *C. E. Anderson, Dillon, S. C.;* No matter how much profit there is in the publishing business, it would never be worthwhile unless, like the actor, we got a little applause occasionally. . . . The revised edition of **SERVICING SUPERHETERODYNES** is now in it's **SEVENTH** printing—so your opinion seems to find many supporters.

The Rolling Reporter.

OUR HAT
IS OFF TO
GLYN JONES



ESICO congratulates Mr. Jones on winning the Better Business Card Contest which our pal, The Rolling Reporter has just closed.

Water always seeks its own level—that goes for Prize Winners too—and we shouldn't be at all surprised if Mr. Jones invested his winnings in one of the **ESICO GREEN LABEL LINE** soldering irons.

The same keen judgment which dictated Mr. Jones' choice of a business card will guide him in his selection of **ESICO**, the Prize Winner of soldering irons. He may be certain that, no matter which size he selects, (prices range from \$1.10 to \$5.00 list) he will be getting the finest iron that money can buy.



HERE IS
THE
TROPHY

(available with either $\frac{3}{8}$ " or $\frac{7}{8}$ " tip, as specified.)

A Five Dollar Bill will buy this Champion of soldering irons . . . a penny post card will bring you literature describing the entire **ESICO GREEN LABEL LINE**, and the address of your nearest **ESICO** jobber.

ELECTRIC SOLDERING IRON CO.
INC.

342 West 14th Street, New York, N. Y.

"YOUR NEW BOOK IS A WOW!"



SEND FOR YOUR FREE COPY OF SYLVANIA'S NEW SERVICE BOOK!

Sylvania's New Volume of Service Hints is Going Like Hot Cakes. . . . Send for Your Free Copy Today. . . . Up-to-the-Minute Service Tips from Radio Men All Over the Country.

In this FREE booklet Sylvania has compiled, hundreds of successful service men give you the low-down on tough problems they have solved. . . . problems you might run into any day. Their tips may save you hours of trouble-shooting on some hard-to-crack job.

Don't wait. Send today for Volume 2 of SYLVANIA SERVICE HINTS. It contains inside dope on receiver troubles that will iron out your own problems, and put you in line for more and better service jobs. And remember . . . *there's no charge at all.* Simply fill out the coupon below today . . . and you'll get your copy of Service Hints in a few days.

Hygrade Sylvania Corporation. Makers of Sylvania Radio Tubes and Hygrade Lamps. Factories at Emporium, Pa., Salem, Mass., and St. Mary's, Pa.

FREE! Send for Your Copy Today.

Sylvania
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HYGRADE SYLVANIA CORPORATION, Emporium, Pa.
Please send me free, without obligation, Volume 2 of Sylvania's "Service Hints."
 Experimenter Amateur Call.....
 Service man Employed by dealer Independent
 Member Service Organization.....
 NAME.....
 ADDRESS.....
 CITY..... STATE.....
 NAME OF JOBBER.....
 ADDRESS.....SS-7

International 71 and 71-C

Although like tubes are used in these receivers and the i-f. peak is 456 kc. in both, the exact design is not the same. Either a 1A6 or a 1C6 can be used as the oscillator-mixer in the 71. These diagrams will be shown in Rider's Volume VI.

Radiola 21, 22 Resistance Data

Although this receiver is quite old, the following resistance data may still be of aid. The schematic diagram is shown in Rider's Manual, early * 480, revised 1-18, and Combination 1803. The following data can be added to the wiring diagram.

Primary of antenna transformer	30 ohms
Secondary	3 ohms
Primary of second r-f. transformer	60 ohms
Secondary	3 ohms
Primary of third r-f. transformer	60 ohms
Secondary	3 ohms
Primary of 1st a-f. transformer	1100 ohms
Secondary	5500 ohms
Primary of 2nd a-f. transformer	1000 ohms
Secondary	5500 ohms
Output choke	550 ohms

Philco 11

Run No. 3. Part No. 30-2072, condenser Part No. 57 has been changed to incorporate an additional 10-mf. section. Part No. 7440 condenser No. 38 removed and the new section replaces it.

Run No. 2. Part No. 3525 resistor (32,000 ohms) added between Parts No. 21 and 32, one side being connected to ground.

Run No. 6. The speaker mounted on rubber. The type 36 r-f. tube replaced with a type 44 tube.

Run No. 7. Part No. 32-1374 "A" choke and 30-1029 condenser (50 mmf.) added on the "A" side of switch No. 27. Part No. 32-1372 antenna choke added in series with the antenna lead.

Run No. 8. Airplane control added. Part No. 28-8224 brush springs added to tuning condenser and volume control shaft couplers.

Run No. 9. Resistor No. 45 (7 ohms) removed and Part No. 32-1438 choke added.

For schematic see Rider's Volume V, Philco page 5-8 and page 2-48 in Volume II, Auto Radio Manual.

On the Cuff

Many thousands of dollars have been taken from the pockets of service station operators by "dead-beats," as a result of writing service charges upon the cuff. What to do about this problem? . . . How to collect the money due?

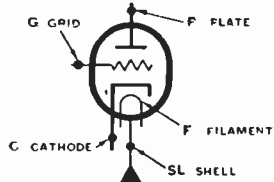
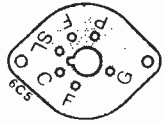
The picture is not as bad as it may appear. As a general rule the American man or woman is honest. They pay their bills and the tremendous growth of the installment business is testimony of this fact. However, as in all other forms of commercial enterprises, credit losses will exist as long as the business exists. The soundest method of handling the situation is to realize that credit losses will ensue and act accordingly.

The consensus of opinion is that 10 percent. is a fair average of the extent of bad debts, when service calls are handled upon credit with the ordinary private individual. This 10 percent. should be borne in mind when arrangements are being made for such credit operation. The soundest method of doing business upon such a basis is to secure some sort of initial payment, to cover the basic cost of materials which have gone into the job, and, if possible, to cover also the basic cost of the time involved. The profit then is the credit gamble.

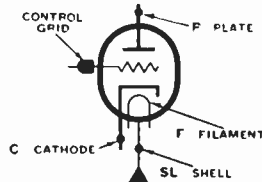
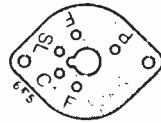
A number of service organizations, who do such work, render estimates with the statements that it is within about 10 percent. of the exact service charge. Since it is usually understood, before the job is taken on, that the payment will be cash or handled in one or two or perhaps three payments, the service station operator is in a position to tack on the protective sum, usually

(Please turn to page 11)

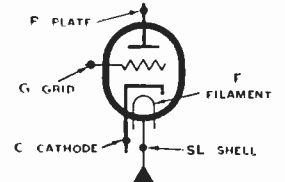
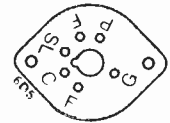
NEW METAL TUBES



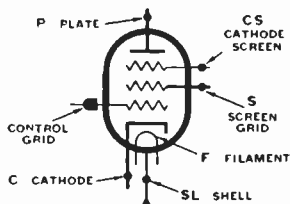
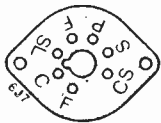
6C5
DETECTOR AMPLIFIER TRIODE



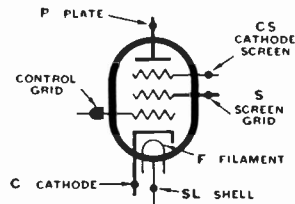
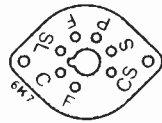
6F5
HIGH-MU TRIODE



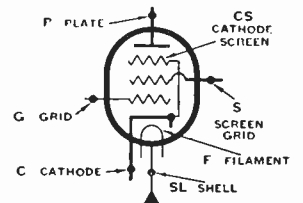
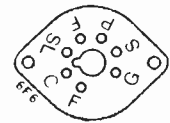
6D5
POWER AMPLIFIER TRIODE



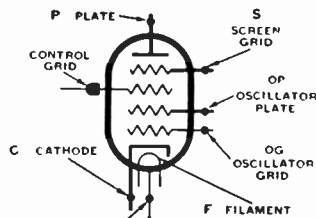
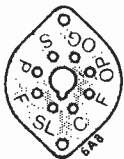
6J7
TRIPLE-GRID
DETECTOR AMPLIFIER



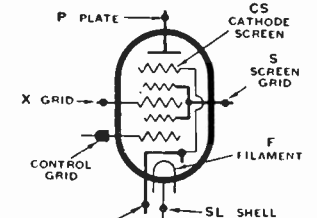
6K7
TRIPLE-GRID
SUPER-CONTROL AMPLIFIER



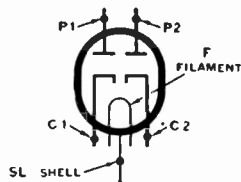
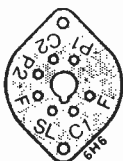
6F6
POWER-AMPLIFIER
PENTODE



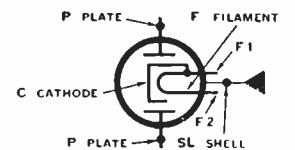
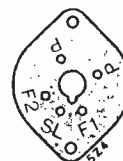
6A8
PENTAGRID CONVERTER



6L7
PENTAGRID MIXER AMPLIFIER



6H6
TWIN DIODE



5Z4
FULL-WAVE RECTIFIER

The above tube symbols and socket arrangements will be used in Atwater Kent Service Manual Diagrams
 Courtesy Atwater-Kent Mfg. Co.

**YAXLEY
MALLORY**

**MALLORY AND
YAXLEY RADIO
PARTS** are produced with the dominant idea of promoting the Service Man's interests. With the manufacture of these parts, it is our ambition to retain permanently our reputation for leadership in furnishing constructive, helpful information and assistance.



**YAXLEY
MALLORY**

INDIANAPOLIS.....INDIANA

A Statement—NOT An Apology

(Continued from page 5)

only: we wanted "The Cathode-Ray Tube at Work" to be as complete an exposition on the whys and wherefores of this piece of apparatus as was in our power to give you. We think we are justified in taking this extra time, for we have discovered a host of facts which we believe you will find invaluable. We have endeavored to make the theory underlying the functioning of the ap-

NOTICE

SUCCESSFUL SERVICING is published for owners of Rider's Manuals and we want every owner to receive this house-organ monthly. Will you cooperate with us by asking your friends if they are on **SUCCESSFUL SERVICING'S** list, so that they, too, can be informed of the changes that manufacturers are constantly making and which should be incorporated in their Manuals, and so keep them up to date? Just tell them to drop us a postal and we will be glad to send them **SUCCESSFUL SERVICING** each month *free*. Thanks very much.

paratus clear to you . . . we have tried to show you how you can use the cathode-ray oscillograph in your daily work and make it pay dividends.

May we repeat ourselves and say again—all this has taken time—much more time than we dreamed it would. However, we think it will be time well spent and when you see the book, we trust that you will agree with us.

Just Cute!

Bright Chorine is being driven in her boy friend's car past the Essex greyhound track. She spies the sign and asks about the place.

Bright Chorine: What place is that?

Boy Friend: They run greyhound races on Sundays.

Bright Chorine: My . . . really . . . but how can those big buses make such sharp turns?

**SPRAGUE
INTERFERENCE
ANALYZER**



**SHOW CUSTOMERS
JUST WHERE
INTERFERENCE
ORIGINATES**

Then Eliminate It!

At last—a quick, practical way for eliminating radio interference from ANY electrical device. No more guessing. No lost time. First, you actually *eliminate* the noise with the Analyzer. You *show* customers just what proper filtering of appliances will do. Then, from the instruction sheet, you learn what Sprague filter condensers or chokes to install to insure *exactly* the same results as those obtained with the Analyzer. An indispensable service instrument. Only \$9.75 net—will quickly pay for itself in new business it helps you build. See it at Sprague jobbers or write for catalog.

FREE!

What does the Power Factor rating really mean — What is the whole truth about leakage claims — capacity and voltage ratings, etc. All are clearly explained in our new "FACTS!" folder which we'll gladly send you.



SPRAGUE PRODUCTS CO.
North Adams, Mass.

**SPRAGUE
CONDENSERS**

Made Right **SPRAGUE 600 LINE** Priced Right

On the Cuff

(Continued from page 8)

set at \$1.00 for the credit risk he is taking. If the customer pays cash, the risk reserve is not added. If it is understood that he will make a down payment and pay the rest in a week or two, the bill which is rendered usually is \$1.00 higher than it would be for cash payment. If the customer has changed his mind, between the time that the job was taken to the shop and brought back, and decides to pay cash, the added sum can well find its place in a credit risk reserve fund.

The service man, who does work for dealers, must of necessity give credit, but he should do so only when he knows that the dealer can meet his obligations. This can be determined by communication with the credit departments of the companies who supply the dealer. If he is not a good credit risk or is reputed to be a slow payer, it is reasonably certain that he will not be prompt in paying service business. In that event, decision to do work depends upon the financial condition of

the service establishment. If, however, the dealer is prompt in making his payments to his distributors, it is quite certain that he will pay his service bills. At no time should unlimited credit be extended by an organization with limited funds, just in order to get the business. The same is true with respect to the period of payment. Inventory is by far preferable to accounts receivable, which are no good.

As to collecting monies which are due and hard to get, there are a few avenues open. Unfortunately, however, the amount involved is a determining influence. If it is a small amount, recourse to collection agencies is out of the question. First because collection agencies will not handle them, unless there is volume and, second, because certain agencies, the majority at that, have a minimum charge, which oftentimes is more than the entire amount involved.

Certain states or cities have what may be termed "Small Claim Courts" or they may go by some other name, where small claims are handled with-

out recourse to the normal process of law. Whether or not a judgement so secured is collectable again depends upon circumstances, but as a general rule, people, who while not free payers, are reluctant to have judgements against their name. If the amount is small and several letters have been written, the most sensible and logical step is to forget about the money and make an effort to judge people more closely next time. The 10 percent. previously referred to is supposed to be the means of equalizing money lost in such manner. It may sound strange that we suggest taking losses so gracefully, but there are times when it is cheaper to forget money due, than to put good money after bad money.

Frozen fish live in Siberia. In the rivers of Yenisei, Lena and Obi, Siberia, fish which have been frozen in the ice all winter are found **alive** in the spring. These fish hibernate, but do not die.

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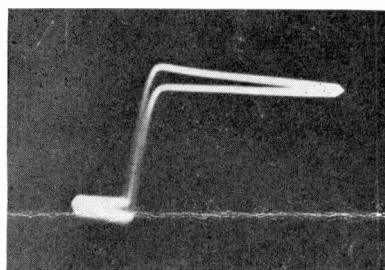
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WHAT DOES THIS MEAN TO YOU?



NO—it is not a crank handle for a 1912 vintage flivver nor is it a mason's trowel—it is one of the patterns showing amplifier overload taken from the chapter on amplifier testing in

THE CATHODE-RAY TUBE AT WORK

by

John F. Rider

The 320 pages of this book will prove to you how easy the cathode-ray oscillograph can be adapted to your service problems . . . how you can speed up your work and so speed up the flow of profits into the old bank account.

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Profusely illustrated.

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JOHN F. RIDER, PUBLISHER

**1440 BROADWAY
NEW YORK, N. Y.**



RAMBLING THROUGH AUDIO AMPLIFIERS

Random Observations Made with the Cathode-Ray Oscillograph

By JOHN F. RIDER

One of the oft mentioned subjects associated with Class B amplifiers is fuzzy response. That is to say, the character of the speech is marred by "mush" and "fuzz." Usually, such distortion becomes quite pronounced when proper impedance relations are not maintained in the Class B stage and when appreciable signal input is applied.

Concerning the impedance relation, the trouble is most pronounced when the Class B stage is working into an impedance greater than the normal value. While it is true that Class B amplifiers are not very abundant in radio receivers, this type of amplification is found in very many public address amplifier systems. The men who work with such systems oftentimes operate with incorrect impedance relations and the following may be of interest.

The presence of such fuzz has been commented upon time and again in various publications and it was acknowledged that, under certain conditions, sustained oscillations are generated in the Class B stage. These oscillations may be generated as a result of operation

of the Class B amplifier tubes in the zone of negative resistance, caused by the application of sufficient signal input so that the control grid voltage rises to the value where negative resistance characteristics exist. The frequency of these oscillations is determined by the constants of the units in the plate circuit. Such operation was more common with tubes first introduced for Class B operation, than it is today. However, such problems are still existent. These oscillations exist only over a portion of the audio cycle.

The three oscillograms of figures 1, 2 and 3 show the presence of these oscillations. These oscillograms were

taken across one half of the plate winding. Figure 1 illustrates a number of audio cycles. Figures 2 and 3, show a single audio cycle. Figure 3 is the same as figure 2, except that the amount of signal input to the Class B stage has been reduced. This is evident in the illustration. Note that the duration of the transient, with respect to the audio cycle, is much smaller, thereby showing that the time during which the grid voltage is in the zone productive of oscillations is much smaller.

The frequency of these oscillations, judging by the number of cycles which appear upon the screen, is about 25,000 cycles. The amplifier referred to worked



Figs. 1, 2 and 3. Fig. 1 (left) shows a transient oscillation in a Class B amplifier. Note that the oscillation is more clearly evident with a single cycle on the screen, see Fig. 2. Fig. 3 (right) shows a single cycle of the output voltage for decreased grid excitation

into a 25,000-ohm impedance, instead of the correct 4000-ohm impedance.

Any tests made upon Class B amplifiers require that correct load impedances be used, otherwise the information conveyed by the image appearing upon the cathode-ray tube screen will be misleading.

The two oscillograms in figures 4 and 5 show the effect of correct loading and incorrect loading of the output transformer upon the waveform of the output voltage. The incorrect load impedance was higher than the correct load impedance, hence the greater amplitude.

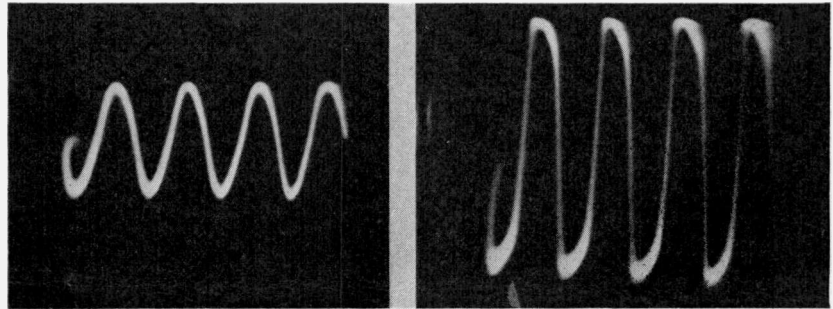
Linear operation of an amplifier can be checked rapidly by developing an image indicating the relation between the input and output signal voltages. One such oscillogram, showing distortionless operation with a phase differ-

ence of 180 degrees between the input and output circuits, is shown in figure 6. The input voltage is applied to the vertical plates and the output voltage is applied to the horizontal plates. By proper adjustment of the gain controls, the amplitude of the two voltages is made equal. The presence of phase shift is indicated by a departure from a straight line and approach to an ellipse, as in figure 7. Non-linear operation is

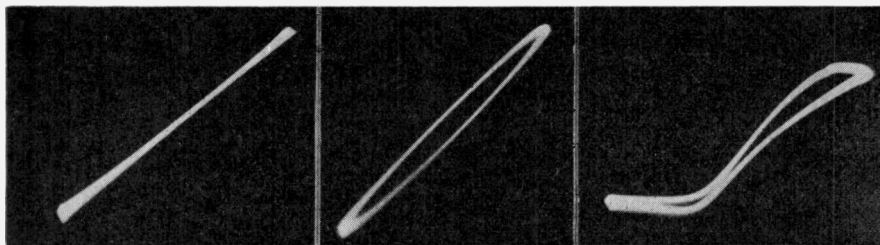
indicated by a bending of one or both ends of the image, as in figure 8. In this case, phase shift as well as non-linearity and the resultant distortion, is indicated in the pattern.

Concerning the application of the cathode-ray oscillograph to the obser-

observation of the nature of the transient is impossible. Somewhat improved observation is made possible by increasing the sweep frequency so that a single cycle appears, as in figure 11. Much easier observation is made possible by increasing the sweep frequency still



Figs. 4 and 5. The voltage across the output, with the plate impedance correctly matched, is shown in Fig. 4 (left). The distortion introduced when the load impedance is higher than the correct value is shown in Fig. 5



Figs. 6, 7 and 8. The input-output voltage characteristic for an amplifier with no distortion and no phase shift is shown in Fig. 6 (left). Fig. 7 indicates the presence of phase shift. Fig. 8 indicates phase shift and amplitude distortion

ence of 180 degrees between the input and output circuits, is shown in figure 6. The input voltage is applied to the vertical plates and the output voltage is applied to the horizontal plates. By proper adjustment of the gain controls, the amplitude of the two voltages is made equal. The presence of phase shift is indicated by a departure from a straight line and approach to an ellipse, as in figure 7. Non-linear operation is

indicated by a bending of one or both ends of the image, as in figure 8. In this case, phase shift as well as non-linearity and the resultant distortion, is indicated in the pattern. Concerning the application of the cathode-ray oscillograph to the obser-

more, so that individual portions of a single cycle appear as separate traces.

An Audio Oscillator

We have just completed the design of a sine-wave audio oscillator, operative at about 20 different frequencies within a 50 to 10,000 cycle range, which can be built by a service technician at comparatively little expense. Recognizing the importance of a sine-wave output to the man who does his checking with an oscillograph, this ac-dc. unit will be found extremely valuable. It will be described in detail in the September issue of SUCCESSFUL SERVICING.

Cathode-Ray Volume Is Completed

Rider's new "The Cathode-Ray Tube at Work" is completed and it is now on the presses. Deliveries will be made to jobbers this month. The finished volume contains 336 pages instead of the originally planned 320 pages.

More than 1000 photographs were taken and there are about 450 illustrations in the volume. We are confident that the men who have been awaiting this volume for so many months will find that it was worth while waiting for.



Figs. 9, 10 and 11. An audio wave with a superimposed transient, as indicated by the "dots," is shown in Fig. 9 (left). One cycle of the wave is shown in Fig. 10. Note how the detail of the transient is brought out in Fig. 11 by the use of a higher sweep frequency

Montgomery-Ward 114 and 116 Rewiring

This receiver uses 2-volt tubes and a 6-volt storage battery as the power supply. Power for the tube filaments is obtained from individual cells of the storage battery. A 4 lead cable is used and connections are made at the negative terminal, 2-and 4-volt straps and the 6-volt terminal. If some of the connections are incorrectly made or are open due to corrosion at the battery, it is possible to impress excessive voltages on certain of the tube filaments, burning them out or paralyzing them.

For this reason, a system has been worked out by the manufacturer for rewiring the tube filaments so that they will be connected in series across the 6-volt battery. The rewiring is simple and can be accomplished in a short time. After rewiring there are only two battery leads; the negative and 6-volt positive. If you have any particularly troublesome cases where tube burn outs continue, it is advisable to rewire the chassis as described.

In the schematic diagram, the old wiring removed is shown in dotted lines

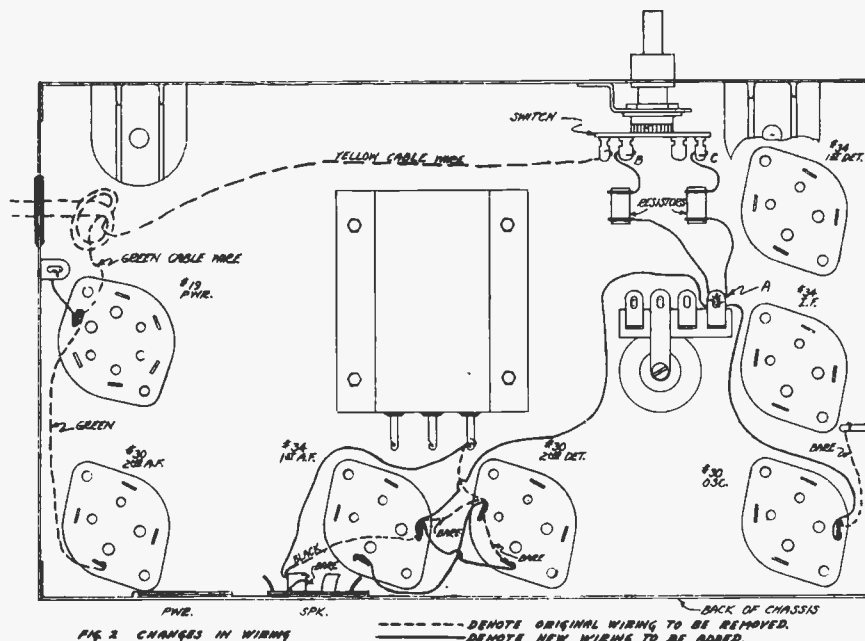
while the new wiring is shown in heavy lines. The actual wiring change is illustrated in figure 2. The following are the various stages in the process of rewiring:

1. Cut the yellow battery lead at the

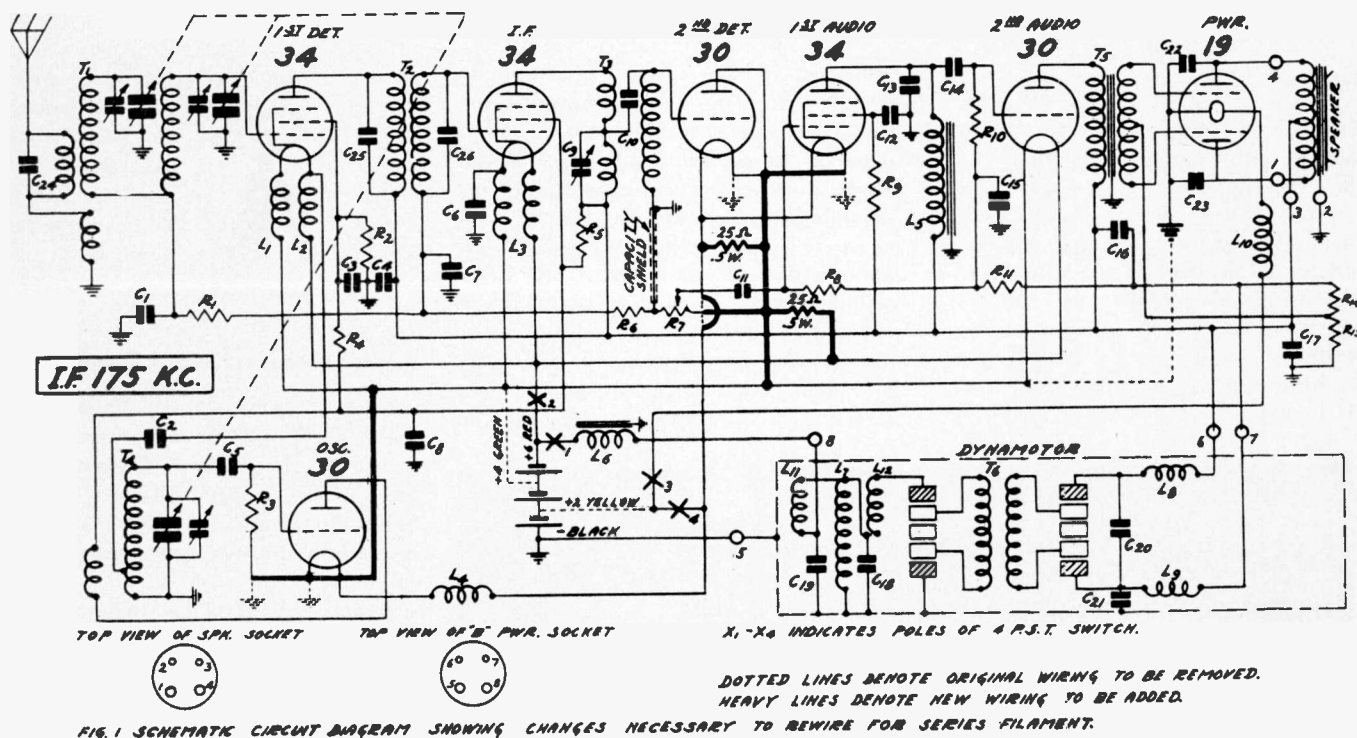
switch and remove it from the cable.

2. Disconnect the wire connecting the 2nd a-f. and type 19 tube filaments at the 2nd a-f. terminal and ground it at the lug on the side of the chassis.

(Please turn to page 7)



The layout of the Montgomery-Ward 114 and 116. The dotted lines indicate the original wiring which is to be removed. The black lines show the new wiring to be added



The schematic of the Montgomery-Ward 114 and 116, showing the changes necessary to rewire for series filaments. The wires to be removed are indicated by dotted lines and the heavy black lines indicate the wiring to be added

The RCA 6E5 Electron-Ray Indicator Tube

The 6E5 is a high vacuum, heater-cathode type of tube designed to indicate visually the effect of change in the controlling voltage. The tube, therefore, is essentially a voltage indicator.

In the basic design of the electron-ray tube, a hot cathode is the source of the electrons. These electrons are attracted to a positively charged target, which is coated with a fluorescent material. When electrons impinge upon this target, they cause it to glow. The extent of the fluorescent area is controlled by a third electrode placed between the cathode and the target. The pattern developed on the fluorescent target depends upon the contour of the target as well as the position and shape of the third electrode.

The physical arrangement of the electrodes within the 6E5 are shown in Fig. 1. The third electrode, identified as the "ray-control" electrode, is an extension of the triode plate. The visible effect produced by different voltages upon this electrode is a pattern

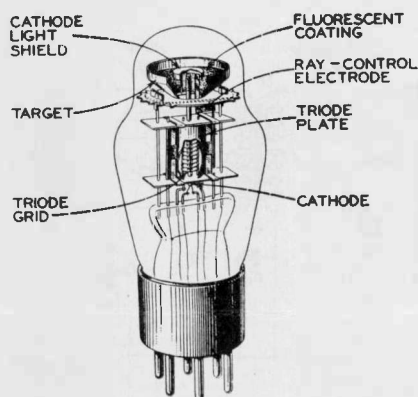


FIG. 1

The arrangement of electrodes in the RCA 6E5

Operating Voltages for 6E5

Heater Voltage (AC. or DC.)	6.3 volts
Heater Current	0.3 amperes
Plate Supply Voltage	250 volts maximum
Target Voltage	250 volts maximum
Target Current at 250 volts	4.5 milliamperes (Approx.)
Triode Plate Current for 0 Triode Grid Voltage	0.25 milliamperes
Triode Grid Voltage for 0 Degree Shadow Angle	-8.0 volts

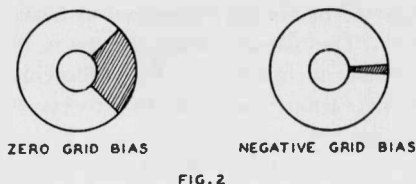


FIG. 2

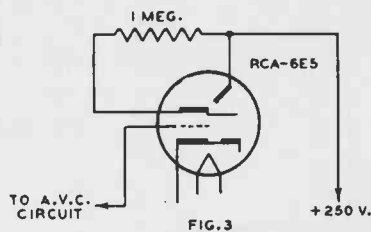


FIG. 3

Fig. 2. The shaded areas indicate patterns on the target for different voltages

Fig. 3. Circuit of the RCA 6E5

upon the target, which varies through a shaded angle of from 90 degrees to 0 degrees. Exact tuning is indicated by the narrowest shaded angle obtainable. Two examples of such voltage adjustments are shown in figure 2.

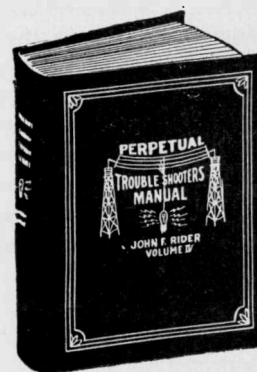
The circuit of the 6E5 is shown in figure 3. The voltage upon the ray-control electrode is determined by the voltage applied to the grid of the triode, connected as a d-c. amplifier. The series resistor connected between the triode plate and the high voltage supply to which the target is directly connected, reduces the voltage applied to the triode plate, and consequently to the ray-control electrode under conditions of decreased triode grid bias. When this bias is reduced, the plate current increases and the drop across the 1.0-megohm resistor increases, so that the voltage at the triode plate is reduced. For conditions of increasing triode grid bias, the triode plate voltage increases, because the drop across the 1.0-megohm plate resistor is reduced until triode plate voltage approaches the supply voltage.

Successful Servicing, August, 1935

U. S. Trade Marks Issued

Notice is given that U. S. Trade Mark Patents have been issued for the following:

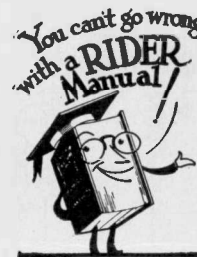
For the name "Perpetual Trouble Shooter's Manual," U. S. Letters Patent Number 325698 has been issued.



For the name "Successful Servicing," U. S. Letters Patent Number 326165 has been issued.

Successful SERVICING

For the illustration of the living Rider Manual, bearing the slogan "You



Can't Go Wrong With A Rider Manual," U. S. Patent Letters Patent Number 326164 has been issued.

Super-regeneration

How long will it be before super-regenerative circuits will be found in commercial radio receivers? They are used quite extensively in some of these 5-meter transceivers and there seems to be quite extensive discussion of the subject in technical journals. . . . Perhaps it will be used in commercial receivers, when operating over the ultra high-frequency band. . . . Who can tell?

Successful SERVICING

Reg. U.S. Pat. Off.

Dedicated to financial and technical advancement of the radio service man.

Published monthly by

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Vol. I August, 1935 No. 12

The Medical Man as a Criterion

TIME and again we have voiced the opinion that we did not think that operation in the radio service industry should be compared with what goes on in the medical profession. We still feel the same way about things and perhaps more so. The medical profession, with all due respect, should not be selected as the shining example of what should be accomplished by the servicing industry.

Let us look at the financial side of the picture. Statistics show that the medical profession is an extremely poorly paid one and always has been poorly paid. By this we mean that the average gross income of the average doctor, taking into consideration doctors in small towns as well as in big towns, even during the boom days was very much less than most people thought it to be. The gross income of the average M.D. during the boom days was less than \$4000 per year, or less than \$80.00 per week. These figures are quite liberal. Today the average gross income is reputed to be less than \$2500 per year or less than \$50.00 per week.

This by no means belittles the prestige of the medical profession and what we say here is not intended to disparage the medical man in the slightest, for they have our own profound respect. However, we do feel that the medical profession should not be the criterion placed before the servicing industry. It

is harmful to the servicing industry in that it instills the wrong ideas in the minds of service technicians, who should understand that servicing is a technical business and not a profession.

The code of ethics of the medical profession has been presented as a basis for relationships between members of the servicing industry. That is well as far as it goes; but strict adherence to such a code cannot be carried out by the servicing industry, because of the sales activities which are imperative to the welfare of the service organization. Cordial relations between men—fair competition—are good principles to be followed by all—but competition still is the life blood of business and any effort to live up to the principle of the medical man's code, wherein competition is greatly subdued—is out of question in servicing. And servicing is a business. . . . No amount of professional talk is going to change the picture.

The nation is gradually moving away from those years of depression. The economic condition is improving—Business is improving, as is evidenced by the earnings of our large corporations and by the expansion programs of our large organizations. . . . The servicing industry must awaken. . . . If during the years to come it is going to operate as a profession, it will miss every opportunity to improve its finances. Instead of patterning its operations upon professional lines—it should pattern its activities after the lines of successful commercial enterprises. Therein lies the welfare of the servicing industry.

This suggestion to follow commercial lines does not imply that technical ability is to be sacrificed.—Technical proficiency cannot be sacrificed. . . . In fact it is to be enhanced—it will have to be increased, for without technical ability, the service technician of the future will not be able to sell his services. . . . The servicing industry must have two thoughts in mind. These are that technical ability is what justifies the man in business and proper business administration is what enables the man to capitalize upon his technical proficiency.

JOHN F. RIDER.

Distribution of this issue 13,000 COPIES

Did You Know That

The Teru-Teru bird goes visiting in pairs and that a ceremony occurs on these occasions. The host and hostess greet their guests with loud cries and signs of pleasure. They stand side by side, just behind their guests. Then starts a parade, keeping perfect step with their guests, they march about and make a loud purring noise regularly. This bird is a native of the South American pampas.

The Eagle is the most frequently used bird for illustration upon postage stamps of the world. The second in rank is the Carrier Pigeon, which seems strange in face of the fact that it is more symbolic of postal service.

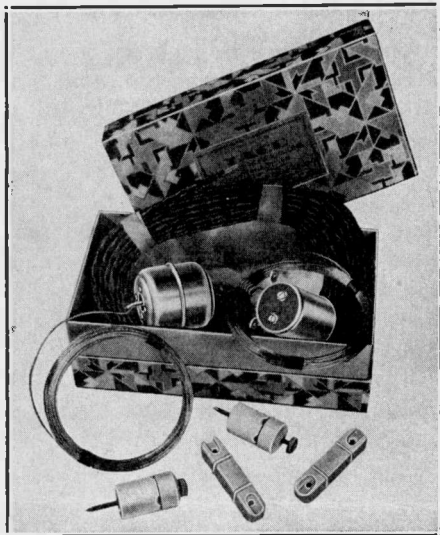
The Bird of Paradise is related to the crow.

The Partridge has more young than any other game bird. If the eggs in the nest are disturbed, that is, the position changed, the bird destroys the nest.

The Quetzal is one of the prettiest birds native to Central America. It does not frighten easily, as a matter of fact the natives can approach close enough to kill it with sticks.

"MORE MANUFACTURERS
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Tune in those ALL-WAVE \$\$\$!

How? Simply give your customers those all-wave thrills they expect. Make good on all-wave set promises. Install TACO profit-makers for greatest signal strength and least man-made static noises:

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Original all-wave noiseless antenna system. Latest Type 20 based on experiences with tens of thousands of installations. Best by impartial comparative tests. Maximum signal strength. Minimum background noise. Positively an all-wave system. Factory assembled, wired, soldered. Just string up in an hour. List \$6.75.

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For extremely noisy locations. Filters out troublesome line noises on short-wave and broadcast bands alike. Simply plugs between set and line. Or between noise-producing device and line. Handsome enameled case, compact, efficient. Thousands in use. List \$7.50.

Here's How: Fill coupon and mail. We'll send new 1936 catalog covering line of money-makers. Our local jobber will show you this extra-dollar line.



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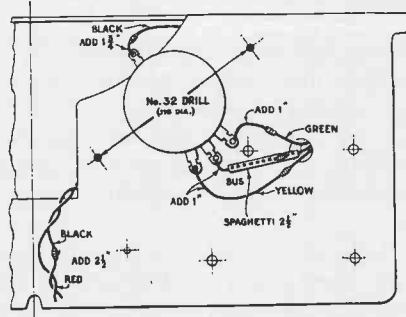
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Yes, I can use some of those extra dollars. Therefore
 Send me your technical and sales dope.
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RCA Volume Control for All-Wave Receivers

The volume controls on many RCA all wave receivers produced during the 1933 season were mounted direct to the chassis, from which location replacement is difficult. Later productions were changed, so that the volume control was mounted upon a bracket. For such replacements, the suggestion is made by the manufacturer that the shaft of the old volume control be sawed off and the new one mounted in the following manner:

Refer to the illustration. Mount the new volume control, Stock No. 6612



New layout for mounting volume control in RCA all-wave sets

and Bracket Stock No. 4030 as shown. Two self-tapping screws and washers are furnished with the bracket. Unsolder the leads to the old volume control splice and connect them as shown. It will be noted that the power switch wiring to the tone control must be changed to enter through the large dial hole instead of the small hole.

Cost Accounting

You will hear much more this fall about cost accounting in the radio servicing industry. We cannot stress too highly that the most important factor controlling the destinies of the industry is the establishment of profitable servicing charges, based upon operating costs.

First Auto Radio Servicer: Which do you like, leather or fabric upholstery on cars?

Second Ditto: Me, I like fabric; I can't clean the grease off my hands so well on leather.



Small... Smaller... Smallest..

AEROVOX MIDGET ELECTROLYTICS

For those midget set repairs... or new assemblies... wherever space is extremely limited but electrically-over-sized units can be squeezed in for a stay-put job... here's a brand new dry electrolytic.



Without sacrificing working voltage, full capacity, economical life, Aerovox engineers have achieved startling reduction in bulk. Note above comparison—original cardboard case electrolytic, recent ultra-compact, and now the midget! All of same capacity and voltage rating—8 mfd., 625 surge peak voltage. Midgets come in 200- and 450-volt ratings, 2 to 16 mfd. And prices are equally small!



FREE DATA: Send for Aerovox general condenser and resistor line. Also supplements featuring exact duplicate replacements, auto-radio condensers, etc. Sample copy of Research Worker included. Meanwhile, see your local Aerovox jobber for satisfactory parts and service.



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Rolling REPORTER



Ain't It the Truth??

Genius is no divine afflatus, marking off the gifted from the rest of Mankind, but an inexhaustible energy, a power of self-limitation and self-concentration; an ability to bend upon the work in hand all the strength of the life.

—Charles F. Aked.

Calsis

(look it up y'self)

In Camden, N. J., a radio service man utilized a slightly novel way of increasing his business—he represented himself as an investigator for the Electric Co., and proceeded to fix the householders' radio so that it wouldn't work. Of course, for a monetary consideration he'd fix it up again. It was during the recent warm spell, so a kindly judge put him in the "cooler" for 90 days. *Betcha the W'arden won't ask him to fix the jail radio.*

But It's Advertising!!!

Julius Sanstag, Service Man of Brooklyn, N. Y., tried to emulate Steve Brodie by jumping from the Brooklyn Bridge. He was hauled from the East River with a brain concussion and possible internal injuries. "They tell me I have no reputation," he said. "I'll get one if I jump from the bridge." *What's wrong with this picture????*

Gag of the Month Dep't.

RIDER'S article in the July issue brought to mind an incident which happened recently in Chicago. A Service Man received a note from a customer which read "Please send set. If O.K. will send check." To which the astute Servicer responded, "Please send check. If O.K. will send set."

Mail Bag

James G. Horsford, Santurce, Porto Rico. Hope you like SUCCESSFUL SERVICING AS WELL AS YOU LIKE THE MANUALS. . . . RADIO DOCTORS, KANKAKEE, ILL.; Sorry we didn't have the data on the Hamilton Rice receiver which you requested. . . . Some of those old timers got away from us. . . . Will send you data on THE CATHODE-RAY TUBE AT WORK as soon as it is printed. Leo A. J. deRoo, Lanikai, Oahu, Hawaii. Glad to number you among the more than 13,000 readers of SUCCESSFUL

SERVICING—it WILL help you to keep your five MANUALS up to date. McCormick Radio & Sound Service, Grand Junction, Colo.; Many Servicers who have invested in Cathode-Ray Oscillographs have written us, saying that the instrument is hard to understand. There has been little practical information on the subject but we promise you that RIDER'S "CATHODE-RAY TUBE AT WORK" will iron out your troubles, enabling you to realize on your investment. When you get your copy, we'd appreciate your comments.

From Taylor, Tex., comes news of a Servicer being called in to diagnose the trouble in a radio receiver. He removed a 26 inch snake from the interior. *Things have come to a pretty pass when service men have to be snake charmers!!!*

The Rolling Reporter.

Audio Amplifiers

(Continued from page 3)

3. Remove rear mounting foot.
4. Cut out the bare wire jumpers from the 2nd detector and 1st a-f. filaments to the plate of the 2nd detector and replace with a bare wire jumper connecting between the two filaments only, leaving just the black wire on the 2nd detector plate.
5. Disconnect the black wire at the condenser block and connect it to the same lug to which the green wire is connected at the 1st a-f. filament.
6. At the 1st a-f. tube socket, disconnect the black wire from the filament prong and connect it to the empty lug on the condenser block
7. Extend the lead from the bare wire junction of the 2nd detector and 1st a-f. filaments to the lug marked "A". (Do not solder yet.)
8. Remove the filament ground on the oscillator tube and extend the lead so that it can be connected to lug "A". (Do not solder yet.)
9. Connect a 25-ohm, .5-watt resistor between lugs "A" and "M". Do not solder lug "A".
10. Connect a 25-ohm, .5-watt resistor between lugs "A" and "C". All four connections to lug "A" now can be soldered.
11. Cut the green cable wire at the type 19 tube socket and remove it from the cable.
12. Replace the mounting foot and check to see that the 25-ohm resistors are not in a position to short on the bottom plate or other connections.

"LET ME GIVE YOU A HAND... I'M A SPEEDY ASSISTANT... AND INEXPENSIVE TOO!" says, EMANUEL ESICO

Yes Sir! 'Emanuel Esico' certainly is speedy! With friend Esico at your right hand there is no need to fret, while your iron regains its heat.

Do you swear, every time you reach for your iron, to solder a ticklish joint, and find it completely oxidized? Here is where 'Emanuel Esico' will be of real saving to you.



Eight years of research and development has produced an electric soldering iron element, second to none! Wound with a special nickel chrome wire, the element supplies a constant heat to the tip.

Esico forged copper tips stay clean longer when inactive—alho plugged in, than other makes now on the market.

Through increased production caused by a tremendous demand, an additional saving can be passed along to you.

Glance at these attractive prices and convince yourself.

- 55 Watt Nick Nack. Your cost 66c
- 65 Watt Midget. Your cost \$1.35
- 85 Watt Junior. Your cost \$1.65
- 150 Watt Trophy. Your cost \$3.00

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RCA RAE-68

The RAE-68 receiver employs the model 82 Radiola 82 chassis with remote control and the automatic electric phonograph.

Zenith 90

Add to your Rider's Manual Index that Zenith Model 90 is the same as Models AH, CH, RH, which are found on Zenith pages 1-23 and 1-24 of the revised edition; *674-E, *674-G and *674-H of the early edition, and 2717 and 2718 of the Rider-RCA Combination Manual.

We Agree

She was a sweet, demure bride-to-be. She was pale, nervous at being the cynosure of hundreds of eyes. Her lips, trembling, were smiling as she floated down the church aisle, clinging to her father's arm. As she stepped to the low platform before the altar, her trim little slipped foot encountered a potted flower, upsetting it. She looked at the broken flower—the spilled dirt, gravely. Then lifting her gorgeous eyes to the benign countenance of the gray-haired minister, she uttered—

"That's one heluva place to put a lily."

Bow Wow

My Grandpa notes the world's worn cogs,
And says we're going to the dogs;
His granded in his house of logs,
Swore things were going to the dogs;
His dad, among the Flemish bogs,
Vowed things were going to the dogs;
The caveman in his queer skin togs,
Said things were going to the dogs;
But this is what I wish to state—
The dogs have had an AWFUL wait!

Tell Me

Why creases in men's coat sleeves?
Why cuffs on the bottom of men's trousers?
Why are shirt tails round instead of square?

What can't be explained is usually denied.

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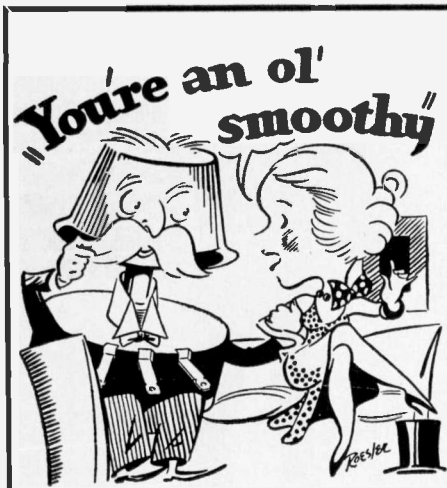
SERVICING SUPERHETERODYNES

by
John F. Rider

As a serviceman, there is little need for you to be reminded that the majority of receivers that are on the market today are superheterodynes. Following the law of averages, the majority of the sets that come into your shop for repair will be superhets; therefore, isn't it common sense and good business to provide yourself with the means with which you can locate the troubles inherent in such sets as quickly as possible and so increase your profits? Invest a dollar today in this book . . . it will be worth while. . . . It is the best investment you can make!

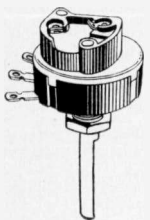
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Metal Tube Sets In Rider's Volume VI

Rider's Manual, Volume VI is scheduled for publication in October. Ever since the announcement of the metal tubes, we have been in close contact with the receiver manufacturers and a substantial number of the 1936 season receivers, which use metal tubes, will be found in this volume. A large number of these diagrams are already in work, being prepared for the printer. Many more will be received by the time we go to press, so that a good representation of the metal tubes will be found in Rider's Manual, Volume VI.

You can always depend upon our efforts to furnish to the radio servicing industry the most up-to-date and complete service data. More information about Rider's Volume VI is given elsewhere in this issue.

Cathode-Ray Book Ready

The new Rider "The Cathode-Ray Tube At Work" is being shipped on the 30th of August. It should be in the hands of your jobbers by the end of the month.

Faith is the force of life.
—Tolstoi.

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Want to find out how old someone is? And how much change they have in their pocket? Tell them to unlimber a pencil and a piece of paper, then give them this to work out:

"Multiply your age by 2, to which add 5. Then multiply the sum by 50, from which subtract 365. Now add to this the amount of the change in your pocket under one dollar and to this add 115."

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RCA R-10 DC

With the exception of the interlock, the R-10 DC is identical with the R-7 and R-9 DC chassis, shown on pages RCA 2-8, 2-9 and 2-10 in Rider's Manual, Volume II, pages 504-D-3 and 504-D4 in the early issues and on pages 1772, 1773 and 1774 in the Rider-RCA Combination Manual.

RCA RE-16

The RCA RE-16 receiver employs the standard R-7, R-9 AC Superette chassis already listed in Rider's Manual. To this chassis is added the phonograph motor, pickup and volume control. Service information other than those relating to replacement parts can be had by referring to the service notes covering the Superette and the Radiola 86 receivers.

In view of the absence of phonograph pickup connection to the Superette receiver, the pickup leads in the RE-16 are connected to terminals 1 and 2, the connecting link being removed. The ground connection upon the shielded lead is joined to terminal 4. The d-c. resistance of the pickup coil is 4.5 ohms. The pickup volume control is 60 ohms. The input transformer is tapped and the following values of d-c. resistance apply. Between terminals 1 and 2, 3.2 ohms; between terminals 2 and 3, 150 ohms, and between terminals 3 and 4, 4300 ohms. The connections of the pickup correspond with the data shown for the RE 16-A receiver, shown on pages RCA 4-19 and 4-20.

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Fada 52

The Fada 52 receiver employs the KF chassis shown in Rider's Manual Volume III, page Fada 3-1 and 3-2. A special cabinet is used for the model 52. Please add this model number to the Fada listings in your index. This receiver is also shown on pages 926 and 927 in the Combination Manual.

Majestic 15-B Alignment

Alignment instructions for this receiver were omitted from Rider's Manual Volume II. The schematic is shown on page Majestic 2-6 and 2-7. The receiver models which employ this chassis are 151, 153, 154 and 156.

To align, supply a 175-kc. signal to the grid of the first detector and adjust all intermediate frequency tuning condensers to give maximum sensitivity. Then feed a 1500-kc. signal into the receiver and align the r-f. stage and oscillator condenser. The r-f. stage and oscillator aligning condensers are on the gang condenser.

To align the oscillator tracking condenser, adjust the test oscillator to 600 cycles. Adjust both tuning control and tracking condenser simultaneously to give maximum signal, as noted upon an output meter. This will be obtained by rocking the tuning control across the resonance point while adjusting the tracking condenser to give maximum output at the point of resonance.

Majestic 400 Changes

Make certain to add the following data to your manuals. The receiver schematic appears upon page Majestic 3-42 and in the RCA-Rider Combination Manual on page 1234.

In some receivers the 250-ohm resistor R-3 and the 2000-ohm resistor R-11 were replaced by a 160-ohm and a 2500-ohm resistor respectively. The purpose of this was to make the G-57A-S modulator tube oscillate more readily. If a 250-ohm and a 2000-ohm resistor are used in the receiver, it may be necessary to try two or three different tubes in this stage, when replacement is being made, before a tube is found, which will oscillate readily over the entire frequency band. If trouble is experienced along this line, the changing

of either one or both of the resistors mentioned should eliminate the difficulty.

Condenser C-17 will be found to have a value of .05 mfd, in a number of receivers; however, it should be replaced with a .1-mfd unit, as shown in the schematic.

NOTICE

SUCCESSFUL SERVICING is published for owners of Rider's Manuals and we want every owner to receive this house-organ monthly. Will you cooperate with us by asking your friends if they are on **SUCCESSFUL SERVICING'S** list, so that they, too, can be informed of the changes, that manufacturers are constantly making and which should be incorporated in their Manuals, and so keep them up to date? Just tell them to drop us a postal and we will be glad to send them **SUCCESSFUL SERVICING** each month free. Thanks very much.

Auto Vibrator Notes

It is imperative that the d-c. resistance of the primary circuit should be kept as low as possible. When making tests upon vibrators, make certain that the connections are very well made. Ordinary alligator clip connections are not the most satisfactory, unless the prongs grip the terminals rigidly. Corroded terminals or connections should not be used. This is particularly true in the synchronous type of vibrator.

Do not depend upon condensers to remove the arcing between the contacts. Make certain that the spacing is correct and is uniform.

When replacing buffer condensers, make certain that the replacement unit is of the correct value. The value of the buffer condenser is critical between certain limits.

Teacher: Now if I lay three eggs here and lay six eggs here, how many—

Pupil: (very sotto voce) I'll betcha she can't do it.

AMPERITE

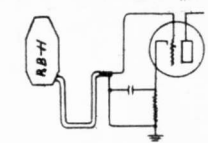
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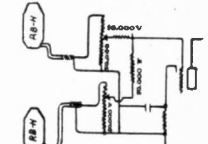
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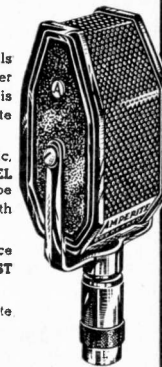
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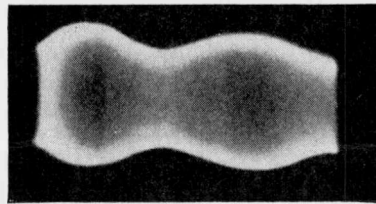
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YOU DO? WELL, YOU'RE WRONG!

That photograph, gentlemen, is the reproduction of an oscillogram, showing how a 5000-cycle signal looks, after passing through an amplifier and being modulated at 60 cycles, because of unbalance in the output stage. AND furthermore, when you open up your copy of

John F. Rider's

THE CATHODE-RAY TUBE AT WORK

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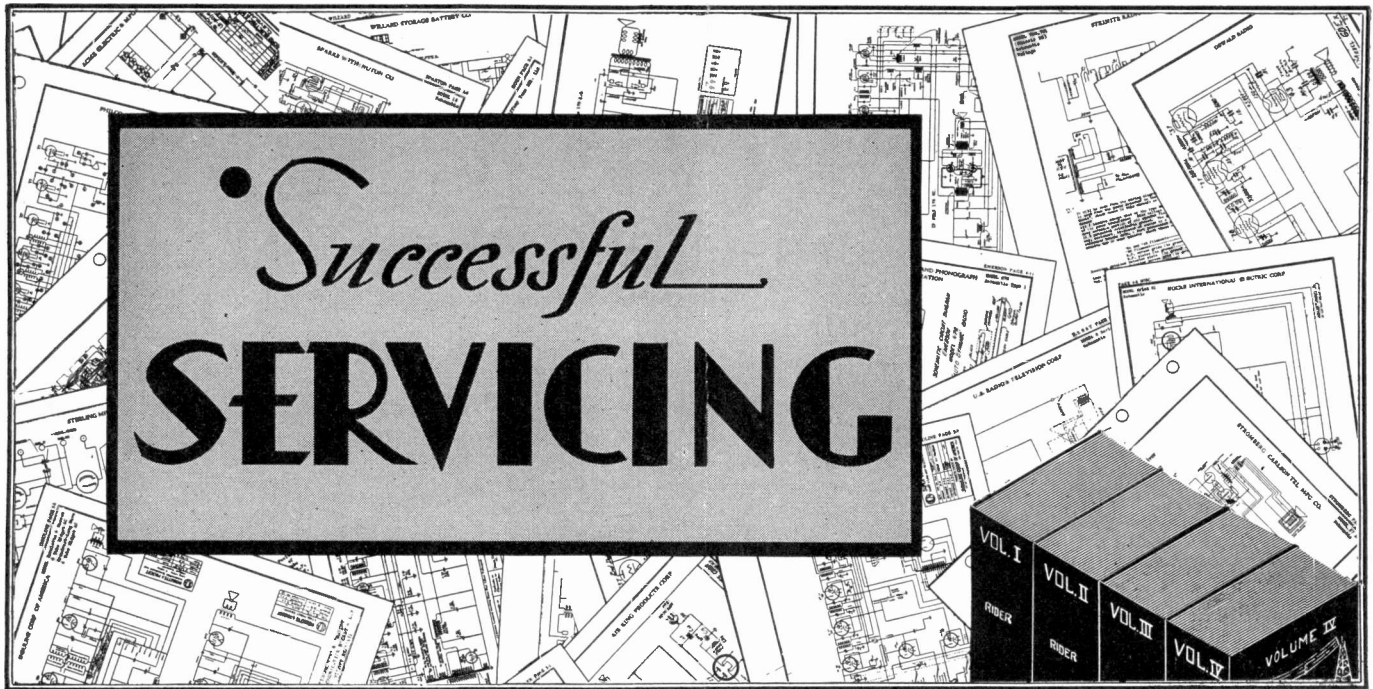
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A VERSATILE AF.-RF. OSCILLATOR

Describing a Multi-Range Oscillator of Excellent Waveform

By JOHN F. RIDER

SOMEHOW or other we have the feeling that the type of oscillator described in this article will find its way into the commercial field as a unit sold to service technicians. Its simplicity and versatility make it ideal to manufacture, as well as to apply to practice.

—Editor.

IN the August issue of SUCCESSFUL SERVICING the description of an audio oscillator capable of delivering a sine wave output over a wide frequency range was announced. Having frequently commented on the desirability of having a sine rather than a distorted audio wave available for the checking of audio amplifiers in receivers and in P. A. equipment, in conjunction with the oscillograph, we need not dwell here in detail upon the useful gap which this oscillator fills. The oscillator to

be described is not the first one with which we have experimented, but of the several available circuits tried, it proved to be the simplest and least expensive, consistent with an output of good waveform.

The circuit, which is shown in Fig. 1, may not be familiar, since it is comparatively new, having been announced a short time ago by RCA. It employs the negative resistance characteristic obtained by operating the elements of the 6C6 tube at suitable voltages and coupling the screen grid to the suppressor grid through a condenser. Without going into an elaborate explanation as to why this circuit oscillates, we can point out that an increase in voltage on the screen is accompanied by a decrease in screen current, because the voltage on the suppressor grid is simultaneously increased (through condenser C_1) and in this way the net result is the appearance of a negative resistance at the screen. By the term negative resistance we mean that an increase in voltage results in a decrease in current.

If a tuned circuit is inserted at the screen the circuit oscillates at the resonant frequency of the tuned circuit. Like the closely related dynatron oscillator, we have found this 6C6 oscillator to provide a signal of excellent stability and waveform with a minimum of adjustment.

In Fig. 2 is shown the complete schematic of the a-f. oscillator and its a.-d.c. power supply. While an amplifier stage is not at all essential to the operation of the oscillator we have included one to facilitate coupling to the oscil-

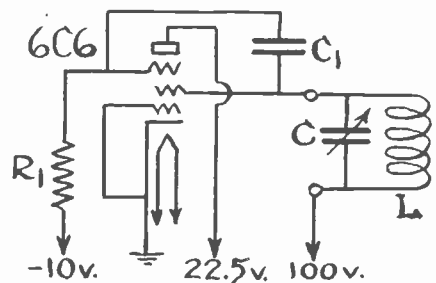


Fig. 1. Simplified circuit of the oscillator that uses the negative resistance characteristic of the 6C6

lator. Furthermore, in some cases, especially in testing class B amplifiers, it is convenient to have an oscillator capable of delivering a fair amount of power. The use of an amplifier also permits working the oscillator at a low level, thus insuring excellent waveform. In this connection we should state that the potentiometer R_2 has been introduced into the circuit to permit the control of the oscillation amplitude. The operation of this control, which varies the amount of negative resistance generated, is not at all critical; in fact, we have found that if reasonable values are used for the L-C ratio, excellent waveform is obtained even with the control set to deliver zero bias. In general, increasing the control grid bias will reduce the amplitude of the oscillations and the potentiometer should be adjusted so that no distortion appears in the signal. Again we say that this control is not critical; we have included it because its use results in the generation of a pure wave even with high L-C ratios. The output control, of the audio taper type, is located in the input circuit to the 76 amplifier tube and requires no further comment. The output transformer may be of the universal type, providing a high impedance winding, and a low impedance winding for feeding directly into a 200- or 500-ohm line. The use of a poorly designed transformer will introduce distortion which is not present in the signal generated by the oscillator, especially at the low frequencies.

You may have observed that the diagram shows just a single tuned circuit in the screen circuit of the 6C6 oscillator. We have omitted showing any one definite arrangement, because we feel that you will want to vary the number of frequencies to be made available to suit your own individual needs. Excellent results have been obtained with

the arrangement shown in Fig. 3, using two values of inductance and a number of condensers to provide a frequency range from 50 cycles to well above 10,-

be used in conjunction with the oscillograph, calibration can be effected using the 60-cycle line or some other frequency as the standard. It is useful

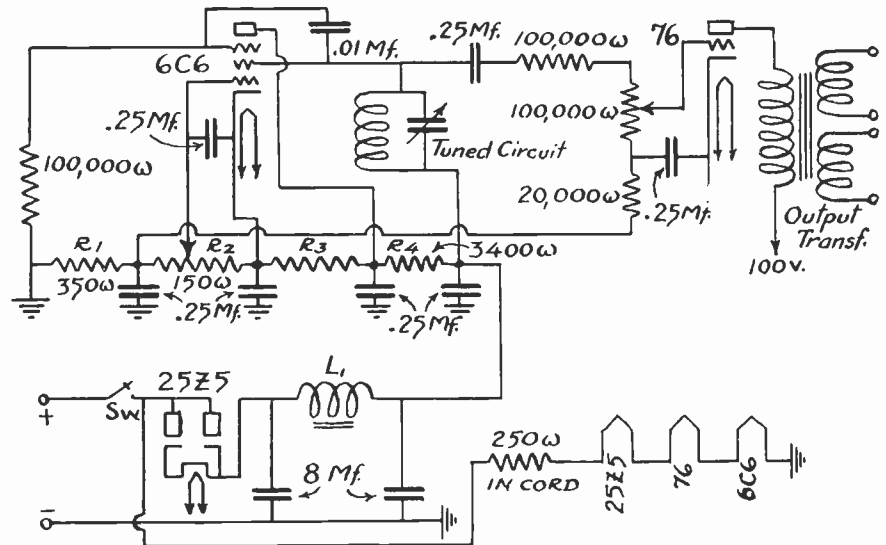
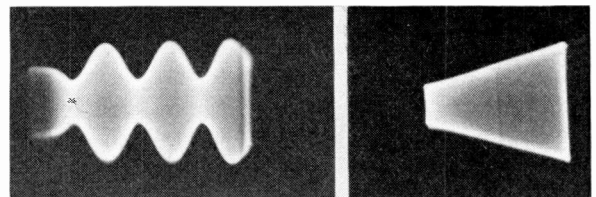


Fig. 2. Schematic diagram of the ac-dc. operated a-f. oscillator. For range of values of tuned circuit see Fig. 3. The 76 cathode connects to the junction of R_2 and R_3 . R_4 has a value of 1100 ohms.

1000 cycles. The capacity values necessary to cover this band range from about .005 to 2 mfd. The primary of a line-to-line coupling transformer can be used to serve as the 5-henry inductance, while the 250-mh. choke is readily obtainable at any of the supply houses.

to remember that the frequency varies inversely as the square of the capacity; e.g., four times the capacity cuts the frequency in half. In Fig. 4 we show three oscillograms, which are indicative of the performance of this oscillator throughout the audio range. The sine

Fig. 6, left, Fig. 7, right. The modulated output of the oscillator of Fig. 5 is shown in Fig. 6, the modulation being 50%. Note the linearity of the modulation in the corresponding trapezoidal pattern of Fig. 7.



We have not felt it worth while to give exact values of capacity since ordinary paper condensers can be used and the exact frequency is not of great importance for most work. Furthermore, since it is intended that this oscillator

wave character is quite evident in all cases.

The stability and excellent waveform, which the 6C6 showed as an audio oscillator, was found to be present to no less an extent when it was used as an r-f. oscillator. We have long felt the need for a modulated test oscillator which possessed linear modulation by an undistorted audio wave. It occurred to us that the simple two terminal oscillator just described could be used to advantage to serve both as an audio and r-f. oscillator. For three reasons we decided that a modulated amplifier should be incorporated in the instrument. First, it is highly desirable to

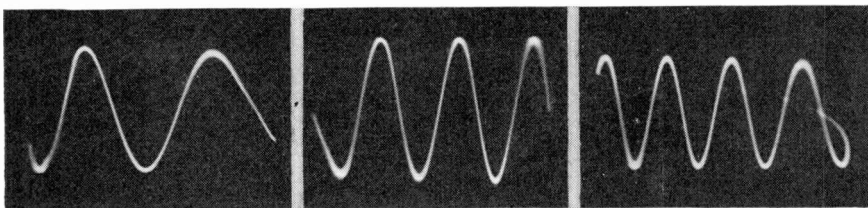


Fig. 4. The output of the a-f. oscillator of Fig. 2 is sinusoidal over the entire frequency range, as is evidenced by the oscillograms which were made at 50, 1000 and 10,000 cycles respectively. The apparent distortion of the 50-cycle wave is due to the sweep's non-linearity

isolate the oscillator from the load circuit. Secondly, linear modulation is more easily effected in the amplifier and is independent of the oscillator fre-

quency. In the third place, the incorporation of an amplifier simplifies the problem of attenuating the signal. point of convenience and ease of operation it is suggested that an audio oscillator working at one frequency be incorporated as shown in the diagram.

in the broadcast band. The performance of the unit is indicated by the unretouched oscillograms of Figs. 6-10. Fig. 6 shows the modulated wave output, the modulation being 50%. Fig. 7 shows the corresponding trapezoidal pattern: note the linearity of the modulation. Figs. 8 and 9 show the type of pattern which appears on the oscillograph screen when a-f. is present in the output of the modulated amplifier; apparently the modulation is non-linear, but actually the modulation is perfect in every respect. When this signal is fed into an r-f. amplifier, the output will be similar to the symmetrical wave shown in Fig. 6, since the audio component is removed during the passage of the signal through the r-f. amplifier. For the purpose of checking the output of the modulated amplifier, the insertion of a closely coupled r-f. transformer will permit the determination of the true character of the modulated wave by removing the a-f. component. Fig. 10 is representative of the type of pattern due to improper adjustment of the bias on the 6D6 modulated amplifier; the peaks can be made equal in height by adjusting potentiometer R₁.

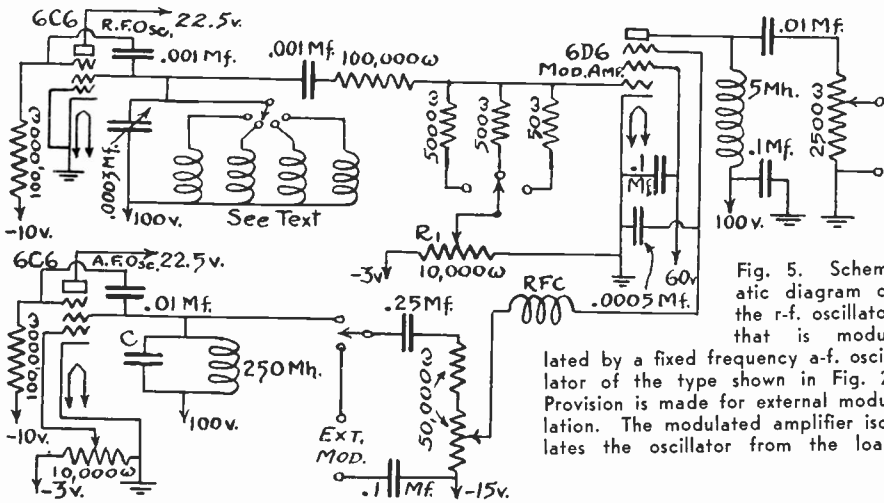


Fig. 5. Schematic diagram of the r-f. oscillator that is modulated by a fixed frequency a-f. oscillator of the type shown in Fig. 2. Provision is made for external modulation. The modulated amplifier isolates the oscillator from the load

quency. In the third place, the incorporation of an amplifier simplifies the problem of attenuating the signal.

The complete schematic of the modulated oscillator is shown in Fig. 5. The r-f. oscillator is shown in the upper left corner and the circuit follows the same layout as the audio oscillator just described. The circuit will oscillate readily as high as 15 megacycles; the values of capacity and inductance in the tuned circuit are conventional and will depend upon the frequency range to be covered. To keep the minimum signal low, it is advisable to shield all circuits carrying r-f. and to arrange the layout to make all r-f. leads as short as possible. A three step attenuator is provided at the input to the modulated amplifier. This provides a range of signal strength of 1000 to 1. In addition, continuous control of the signal level is provided by the potentiometer in the output circuit of the amplifier.

The audio oscillator employs exactly the same circuit as has been previously described and can be designed to work at any frequency. To obviate the need for an iron core choke, we suggest the use of a 250-mh. choke in parallel with a 1-mfd. condenser; this combination will generate approximately a 1000-cycle note. Provision is made for external modulation if desired. While the audio oscillator described above can be used to effect the modulation, from the stand-

Lack of space prevents us from showing the power supply for this unit. However, it follows along the same lines as that shown in Fig. 2. The voltages re-

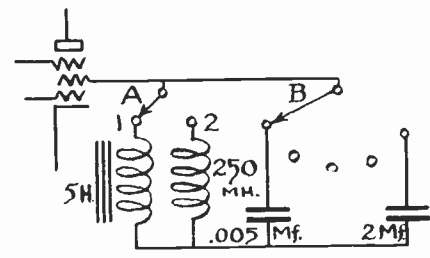


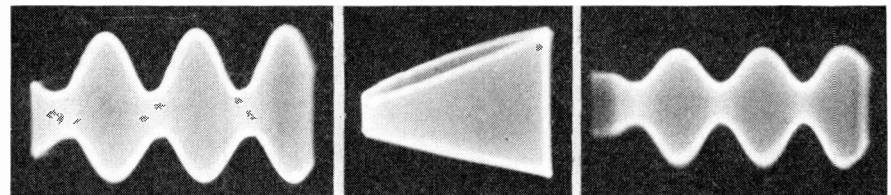
Fig. 3. Detail of the tuned circuit (see Fig. 2) showing the range of values

quired are indicated directly on the diagram in Fig. 5. It is important that all voltage taps in the power supply be bypassed to prevent hum and interaction of circuits.

The modulated oscillator described above will find its chief utility in checking for distortion in i-f. amplifiers and

in the broadcast band. The performance of the unit is indicated by the unretouched oscillograms of Figs. 6-10. Fig. 6 shows the modulated wave output, the modulation being 50%. Fig. 7 shows the corresponding trapezoidal pattern: note the linearity of the modulation. Figs. 8 and 9 show the type of pattern which appears on the oscillograph screen when a-f. is present in the output of the modulated amplifier; apparently the modulation is non-linear, but actually the modulation is perfect in every respect. When this signal is fed into an r-f. amplifier, the output will be similar to the symmetrical wave shown in Fig. 6, since the audio component is removed during the passage of the signal through the r-f. amplifier. For the purpose of checking the output of the modulated amplifier, the insertion of a closely coupled r-f. transformer will permit the determination of the true character of the modulated wave by removing the a-f. component. Fig. 10 is representative of the type of pattern due to improper adjustment of the bias on the 6D6 modulated amplifier; the peaks can be made equal in height by adjusting potentiometer R₁.

Again we wish to emphasize that the oscillators described above are intended primarily for use with the cathode-ray oscillograph. While they are suitable for all measurements not involving the use of the oscillograph, existing equipment is entirely adequate for such work. Where the job at hand involves the tracking down of distortion in a receiver or audio amplifier, it is highly desirable that the initial signal be free from distortion. This is essentially the criterion which has guided the design of the oscillators here described. We believe these oscillators will prove a valuable tool in coping with and simplifying many servicing problems.



Figs. 8, 9 and 10, from left to right. When a-f. is in the output of the modulated amplifier the patterns of Figs. 8 and 9 result. Fig. 10 results from improper adjustment of the bias on the 6D6 in Fig. 5

What Does a Volume Control Replacement Job Mean to You?

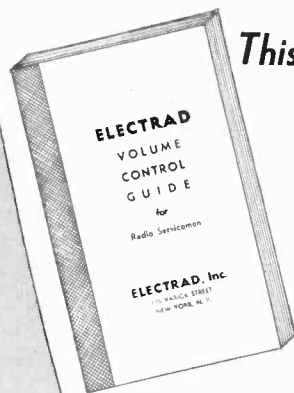
A Cinch



...or a Nuisance?



This **NEW 100-Page**
VOLUME CONTROL
GUIDE



Makes Servicing a
Profitable Pleasure!

HERE'S the book of books for the active service man who wants to save time and trouble and get some fun out of his work.

Of handy size (6 $\frac{1}{4}$ " x 9 $\frac{1}{4}$ "), it contains a complete alphabetical list of receiver models for which Electrad standard or special replacement volume controls are made. Includes name of receiver manufacturer, model number, catalog number of proper Electrad replacement control, resistance value and list price—all you need to know to make a quick, economical and thoroughly satisfactory volume control replacement.

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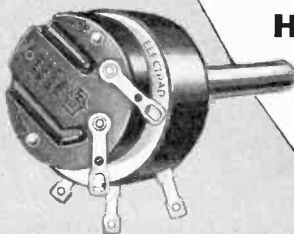
The cost of this Guide prohibits general free distribution. But you may have a copy if you send us the flap (*part showing specification and resistance*) torn from any new-type Electrad Carbon Volume Control carton, together with your business letter-head or business card. Address Dept. SS-9.

RESISTOR SPECIALISTS

Featuring:

QUIET CARBON VOLUME CONTROLS
VITREOUS RESISTORS
TRUVOLT RESISTORS
POWER RHEOSTATS

Standard Replacement Unit with Power-Switch attached



175 Varick St., New York, N.Y.
ELECTRAD
INC.

Philco Models 201 and 509

The correct i-f. peak of these sets is 260 kc. instead of 460 kc.

Effective with Run No. 5, February 1st, the following parts were changed to eliminate the possibility of harmonic interference:

Condenser No. 87, 0.09 mf. has been changed from Part No. 4989-D to 4989-N.

Condenser No. 95, 0.03 mf. has been changed from Part No. 8318-J (originally 30-4025) to 30-4145, 0.01 mf. tubular.

Effective with Run No. 3, February 1st, the fibre panel assembly under the chassis, carrying five tubular condensers, was removed, and separate bakelite bypass condensers were substituted. The following part numbers were changed:

Condenser No. 42, 0.05 mf. changed from Part No. 30-4020 to 3615-BC.

Condenser No. 95, 0.03 mf., changed from Part No. 30-4025 to 8318-J.

Condensers Nos. 12, 17, 41, and 66, having values 0.05 mf., 0.05 mf., 0.02 mf. and 0.03 mf., respectively and Part Nos. 30-4020, 30-4020, 30-4113, and 30-4025 respectively, were changed to 3615-AM, 0.05 mf. twin and 8318-H 0.03 mf. twin.

The servicing data on these two models will appear in Rider's Manuals, Volume VI, to be published this fall.

Philco Model 610

Effective July 1st, Part No. 32-1670, oscillator transformer, was replaced with 32-1831, which may be identified by the red paint on the bracket.

Under "Adjusting Compensating Condensers" in the manufacturer's service bulletin on page 4, under paragraph 3 in right-hand column: Signal generator must be set at 18.0 M.C. when making this adjustment. Under paragraph 4, signal generator must be set at 7.2 M.C. when making this adjustment.

Philco Voltage Note

The voltage given for the 6A7, "G 3 & 5" is voltage on the oscillator plate, which is properly G-2. "G 3 & 5" is the screen grid of the 6A7, which receives the same voltage as the i-f. tubes in most of the sets.

Successful SERVICING

Reg. U. S. Pat. Off.

Dedicated to financial and technical advancement of the radio service man.

Published monthly by

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Vol. 2 September, 1935 No. 1

SOMETHING TO THINK ABOUT

HERE is something to think about . . . Just what the answer is we do not profess to know . . . However, we most certainly would like to hear some comments.

A friend of ours is the sales manager for a well-known condenser and resistor manufacturer. One day, he received a letter from an individual, in which the following information was conveyed: A Mr. Brown—and that name is as good as any other—called a serviceman to repair his radio receiver. The complete bill amounted to \$5.35. The afflicted receiver was subject to intermittent reception and fading. The service call was declared completed and the receiver returned as being in good shape. Within several hours, the ailing manifested itself again and Mr. Brown felt that he had been gyped.

He called another serviceman, the receiver was inspected, and an estimate rendered. This serviceman bent backwards to satisfy and rendered a complete diagnosis in his estimate. The estimate was free and the estimated service charge was \$5.00. Mr. Brown read and reread the estimate and finally decided to do the repair job himself. He hied himself to a parts jobber and ordered the exact unit stated upon the estimate. (This serviceman being very conscientious, actually stated the part to be replaced and the name and part num-

ber he intended using for the replacement unit.)

Mr. Brown secured the part from the jobber at the serviceman's discount, identified the part to be replaced, which was easy, because the replacement part listed in the estimate was the duplicate part intended for that receiver—and made the repair. His letter to the parts manufacturer was very laudatory, because the home-made repair actually remedied the defect. Now he would like further information from the parts manufacturer concerning the possibility of additional replacement of similar units with the idea of improving the tone quality.

That is the story. Perhaps you are saying "So what?" There are several interesting points in this story, which provide food for thought. In the first place, the first service call was never completed. That is to say, a call, which does not accomplish what it is supposed to accomplish, is not completed. Here is an example, which, while not new in the annals of radio servicing, is the major contribution to killing public confidence. Perfect servicing is imperative!

The second item of interest is the estimate rendered by the second serviceman. It is proper to tell the man the approximate cost for the repair, but it is entirely out of place to tell him the exact work to be done, the units to be removed, and the name and manufacturer's part number of the replacement unit. It is entirely sufficient on the estimate to state the nature of the trouble which will be rectified. The description of the work done belongs on the invoice rendered after the job is finished. Mention of the part by brand name and part number is not required at any time. It is sufficient to state that the best parts are used and that the work is guaranteed. To do as this serviceman did is bending backwards and there is no justification for it.

The third item is that relating to the sale of the replacement part by the parts jobber, as described herein. It is hoped that some form of identification will be required by servicemen in order to secure parts at a discount. Identification

cards have been issued by numerous local associations. If such cards are not in existence in certain towns, the requirement to present at least a written order on the service company's letterhead, should be established. In the case cited, we cannot blame the parts jobber too much. After all, if a man asks for a part by brand name and part number, it is logical to assume that he is a member of the service group.

What are your reactions? Think well before you reply. The solution is not as easy as it seems upon first thought. Give heed to the fact that some plan must be evolved to establish responsibility on the part of every service man for the work he does . . . Bear in mind that some standard form of rendering an estimate is required . . . Accord thought to the free inspection call, for in this instance, the second serviceman inspected the receiver, received no money and definitely lost a service job. Let's hear what you have to say . . . Your answers mean a great deal.

JOHN F. RIDER.

Our Anniversary

SUCCESSFUL SERVICING is 1 year old. This, the September issue, is our anniversary number and we think it only fitting to express our sincere thanks to those men associated with the radio service industry, who have seen fit to read the house organ of John F. Rider, Publisher, consistently and thereby have aided in its growth and development. At the same time, we are extremely anxious to voice our appreciation to those men who have aided in the growth of John F. Rider, Publisher, by purchasing our publications. It is needless for us to embark upon a flowery discourse concerning our feelings towards our customers. . . . Let it suffice to say that we deeply appreciate your cooperation and that you can feel certain of our wholehearted desire to please every one of our customers and to do all that we can in the effort to further the financial and technical advancement of the radio service industry.

Strange as it may seem, the publication of 16 pages in our September, 1935

(Please turn to page 8)

Distribution of this issue
13,600 COPIES

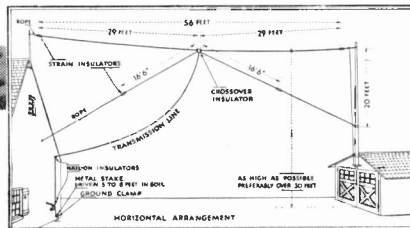
Because it is scientifically-designed IT PERFORMS!



Stock No. 9500-A, RCA World-Wide Antenna Kit. List \$6.00.

RCA World-Wide Antenna System

("DOUBLE-DOUBLE")



AND because the RCA World-Wide Antenna does perform, it makes pleased customers for the service engineer who installs it.

Any all-wave receiver performs much better when connected to an RCA World-Wide Antenna System. The set owner finds short wave stations are received with increased volume; often he hears stations previously inaudible with an ordinary L or T antenna. This is because the carefully-chosen dimensions of the two doublets bring them into close tune with favorite international frequencies.

Interference, especially from automobiles, and man-made static, is greatly reduced, sometimes eliminated. The transposed lead-in, coupled to the



set by a transformer having a remarkable electro-static shield, eliminates pick-up except by the antenna proper, which can be swung high and clear, to give the best possible signal-to-interference ratio.

For average locations we recommend Stock No. 9500-A, complete with all wire, coupling transformers and insulators. List \$6. Stock No. 9550, Kit of Essential Parts, lists at \$5. Where there is interference on the standard broadcast band, use the De Luxe Antenna, Stock No. 9555, list \$7.75. Write for catalog listing antennas and other RCA Parts and Service specialties.

Bosch Model 133

Please add to your Rider's Manual Index the fact that the Model 133 of Bosch is the same as Models 73 and 74, which are to be found on pages 1-22 and 1-23 of the revised edition of Volume 1; *800-A, *800-B and *800-C of the early edition and pages 2515 and 2516 of the RCA-Combination Manual.

Wells-Gardner Models 27D1, 27D5 (Series 7D)

The two-section armoured wire-wound resistor, Part No. 98020, has been discontinued and two carbon resistors are being used in its place. In making the replacement in the chassis, three terminal strips as listed below are required.

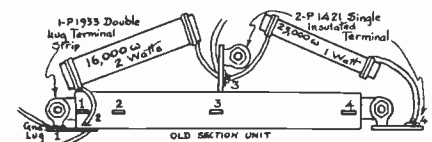
1—P-C93253, 25,000 ohms, 1.0 watt resistor.

1—P-D93163, 16,000 ohms, 2.0 watt resistor

2—P-1421, Single Terminal Mounting

1—P-1933, Double Lug Terminal Mounting strip

To install the carbon resistors in chassis having the old wire-wound unit, first remove all the leads from all the lugs on the old two-section unit. Care should be taken that the leads are held in their respective positions. Remove the armoured wire-wound resistor from the chassis. This is essential. Then mount the terminal strips to the chassis wall by means of the holes in the wall and connect the leads to the lugs as shown in the accompanying illustration.



Method of connecting the carbon resistors which replace the two-section resistor in the Wells-Gardner 7D chassis

In the illustration the lugs on the old two-section unit are numbered and the lugs on the new terminal strips are correspondingly numbered. The leads, for example, which connect to lug No. 1 on the old unit are connected to lug No. 1 on the new terminal strip.

RCA PARTS DIVISION

RCA MANUFACTURING CO., INC., CAMDEN, NEW JERSEY
A RADIO CORPORATION OF AMERICA SUBSIDIARY

Rolling REPORTER



Howdy Podner:

In this issue we greet a lotta new neighbors—paying guests as it were—there's RAYTHEON—ELECTRAD—RADIART—SUPREME—TRIPLETT—and over to our right, our good fraaand, RCA, no less. (THEY'RE good, TOO.)

Nugget of Wisdom

There are four things that come not back—the spoken word, the sped arrow, the past life, and the neglected opportunity.

—From the Arabic.

Speaking Of—

NEGLECTED OPPORTUNITY — how many of youse guys take advantage of the generosity of parts and instrument manufacturers who spend gobs and gobs of \$\$\$\$\$\$ each year in an effort to keep Servicers up to date on the new products? We have seen some of the really fine examples of catalogues, broadsides and other literature which have been prepared for your benefit. ASIDE FROM THE FACT THAT THEY ARE INTERESTED IN MERCHANDISING THEIR OWN LINES, THESE MANUFACTURERS ARE RENDERING A REAL SERVICE TO THE MEN WHO ARE EXPECTED TO MAINTAIN THE RADIOS OF THIS COUNTRY, BY SHOWING THEM THE WAY. By all means, spend a two cent stamp and get the "lowdown" on the latest developments in replacement parts and test equipment.

Another Year—

has rolled around since the day SUCCESSFUL SERVICING was born . . . my goodness, how we've grown—both in size and circulation. From a rather humble beginning last September . . . eight pages . . . we are now "sweet sixteen" . . . our readers have increased from six thousand to almost FOURTEEN THOUSAND . . . WE MADE OUR DEBUT AT THE I.R.S.M. SHOW IN NEW YORK LAST YEAR . . . which reminds us—the I.R.S.M. Show will be held in New York on October 25, 26 and 27. From advance reports, which come rolling in, this will be the most complete Service Man's Show ever arranged. The number of exhibitors will be greater—the lectures and demonstrations will surpass anything ever presented. THERE IS NO ADMISSION CHARGE. It will be well worth your while to hop into the old car and drive in, if you're within 200 miles of New York. THE PLACE IS—PENNSYLVANIA HOTEL. SEE YA THERE???

Vital Statistic:

He is one of the more prominent radio instructors, and he is connected with a well-known radio training school. He divulged the startling information that two out of five students registered in the school are INDEPENDENT SERVICE MEN. Hmmm, and a coupla Hmms. What with the new circuit design developments—cathode-ray test apparatus, etc., the Service Profession is TWO YEARS behind the laboratory. It will never catch up unless it decides to take the advice that RIDER has been handing out for a long time—"Go back to school, Mr. Service Man." Wasn't it old Sam'l Smiles who said, "It is one of the signs of weakness to leave things to fate?"

Mr. Farley's Dep't:

H. F. Zynda, Charlestown, W. Va.; You DID spread it on a bit "heavy" in praise of SUCCESSFUL SERVICING, but we kinda like it . . . it's pleasant to know that our efforts to assist the Servicers are profitable to both of us . . . thanx. Wallace Bros., United Labs., William Hendricks, Elmer Warde, Service Shoppe, R. O. Tomlinson, Jack Warnecke, Green Electric Co.; "THE CATHODE-RAY TUBE AT WORK" should be in your jobber's hands now . . . if he hasn't got it, drop us a line. Ralph Hoyt, Jacksonville; VOLUME SIX of RIDER'S MANUAL will go to press about October 15th.

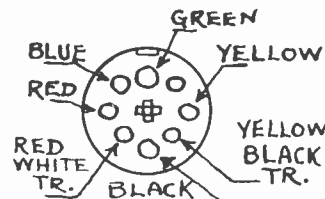
The Rolling Reporter.

SORRY!

Because of space limitations, we are forced to omit nine columns of paid advertising from this issue.

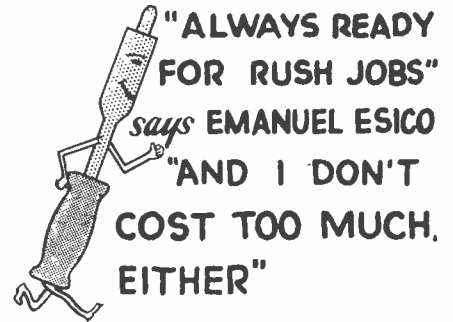
Philco Model 39

Effective January 15th, condenser No. 33, Part No. 3903-AD, is changed to 3903-J, which has the same capacity. Different lug arrangements facilitate wiring and prevent resistor shorts.



Herewith will be found the correct sketch of the connections to the battery cable plug. The cut published in the manufacturer's bulletin is reversed.

The servicing data on this receiver will be published in Rider's Manual, Volume VI.



How many times a day do you cuss your electric soldering iron because it is oxidized? ESICO electric soldering irons are equipped with copper tips forged by a special process to prevent quick oxidation.

Are you wondering why your iron heats up slowly and doesn't retain its heat? That is because of the poor element used in the construction of the iron. ESICO electric soldering irons, being equipped with nichrome V assure you of constant soldering heat at the tip. The slow oxidation of the

element resulting from the use of nichrome V guarantees full wattage rating throughout the long life of the iron.

Are you oftentimes inconvenienced by the cord shorting on your iron?

ESICO electric soldering irons are wired with heavy asbestos lined number 14 cord. The special method developed by ESICO, of fastening the cord to the iron proper eliminates entirely this time waster.

You can cut your production costs and increase your efficiency by using Esico electric soldering irons. Why not give them a try? They are guaranteed; and the cost is within your budget.

55 Watt	Nick Nack	Your cost	.66
65 Watt	Midget	Your cost	1.35
85 Watt	Junior	Your cost	1.65
150 Watt	Trophy	Your cost	3.00

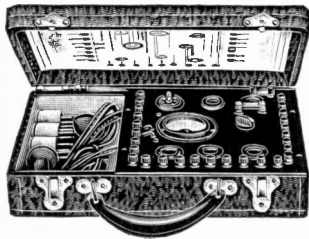
Electric Soldering Iron Co., Inc.
342 West 14th St. New York City



Radiart

Vibrator and
Power Supply

ANALYZER



Is Yours for Only

\$ 7⁵⁰
Cash

Pay for the Balance with
Your Purchases of
Radiart Vibrators

More than 1,000 servicemen contributed their ideas toward the correct design of this analyzer. As a consequence it does everything you want it to—in the way you want it done. Orders are pouring in, and we are filling them in rotation. Better see your jobber and get your order in now.

Ask Your Jobber

The Radiart Corporation
Shaw Ave. at E. 133rd St.
Cleveland, Ohio.

Our Anniversary

(Continued from page 5)

issue was not premeditated with respect to its being the anniversary number. It was purely coincidental, based upon the volume of advertising. It seems as if the fates were with us, helping to celebrate the occasion. . . . For which we are duly thankful.

We desire to state our thanks to the advertisers who have displayed tremendous confidence in our house organ and we feel certain that the excellent reader response to the entire contents of SUCCESSFUL SERVICING in the issues past, will continue in the future. We want to call to your attention that we omitted several columns of paid advertising from this issue. This is in line with the policy voiced several months ago, wherein we stated that we desired just enough advertising to permit the enlargement of the house organ to a sufficient number of pages so that it would be of greatest help to the owners of Rider's Manuals.

We calculated that we would require about seven pages of paid advertising to permit a 16-page issue, with a maximum distribution of about 18,000 copies. This issue of SUCCESSFUL SERVICING will have a distribution of approximately 14,000 copies. The maximum number of paid advertising pages has been reached and advertising in excess of this amount had to be omitted. At no time will we carry advertising which will occupy too great a portion of the entire number of pages in each issue. To do so would be defeating the purpose and function of the house organ and would be penalizing the reader, who, in our estimation, is the soul of the publication.

Since this is an issue of gratitude, we want to thank the readers who voiced their opinions that advertising would be satisfactory in SUCCESSFUL SERVICING. We shall do all in our power to demonstrate that their confidence has not been misplaced.



"ROAMING FILAMENTS"

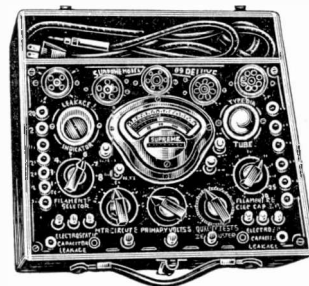
The first all-metal tubes announced had the filament or heater circuits terminate at pins numbered 2 and 7. Subsequently, the metal tube 5Z4 was announced with a filament circuit terminated by pins numbered 2 and 8, so that two 8-prong sockets or an extra switch had to be incorporated in tube tester designs, unless socket contacts No. 7 and No. 8 were connected together within the tester, thereby providing incomplete test of ALL octal tubes.

Supreme engineers, however, foresaw at the time that other tubes would be announced in which a filament circuit would not necessarily terminate at pins No. 2 and No. 7 or No. 2 and No. 8, but that the filament COULD terminate at any one of eight possible positions. Supreme anticipated "Roaming Filaments" and incorporated in 1936 Models an exclusive feature "Filament Return Selection" whereby the filament current, which may be considered as entering the No. 2 pin of octal tubes, could return through the "Top Cap" or through ANY of the tube base prongs.

This development enables Supreme owners to immediately take care of such new tubes as the type 6P7, just announced, in which the heater circuit is terminated by pins numbered 2 and 3 or any other new tube which may be announced in the future in which the filament (or heater) current returns through any pins other than those specified in the original series of octal tubes.

Remember, "Filament Return Selection" is found only in 1936 Supreme Instruments. An exclusive development of Supreme engineers, it is just one more reason most wide-awake servicemen are choosing new Supreme models in preference to any other make.

Practically all good jobbers now have these instruments in stock for demonstration and for your inspection—Supreme's new complete catalog, just off the press and sent to you without obligation, tells you more about "Roaming Filaments."



SUPREME
89 DE LUXE
TUBE
TESTER
\$45.95

Dealers Net Cash
Wholesale Price.

The 7-in-1 Instrument. Resistance ranges to 20 megohms are with self-contained power supply. Also available in beautiful Tri-Toned Walnut Counter Display Model.

SUPREME 385 AUTOMATIC

A multi-unit instrument, combining features of 339 DeLuxe Analyzer and 89 DuLux Tube Tester, plus other flexibility features possible only through Supreme's exclusive Uni-Construction . . . \$77.95
Write for new complete catalog describing in detail these and other Supreme new 1936 instruments.

Supreme Instruments Corp.
537 Supreme Building Greenwood, Miss.

RAYTHEON

TRADE MARK

presents

"33 DEALS FOR YOU!"

Raytheon's 33 New Tube Deals

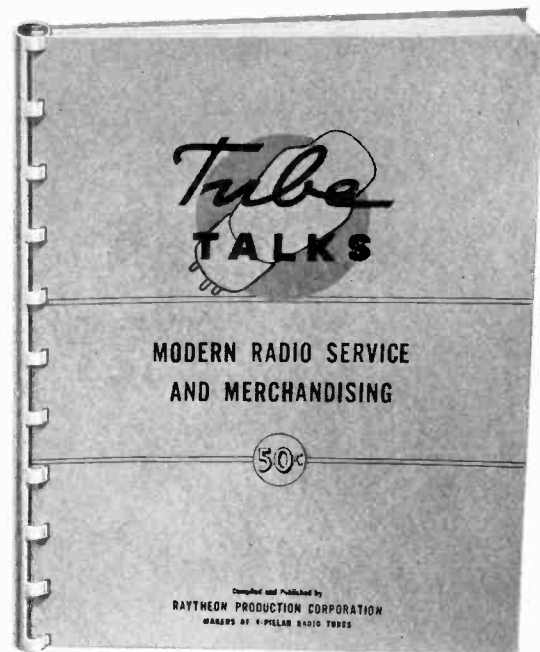
offer a wide range of service equipment, designed to meet 1935-36 conditions including the special requirements of metal tubes and octal sockets.

"TUBE TALKS" Modern Radio Service and Merchandising (including tube complements). This 48-page book is hot-off-the-press, full of sales ideas, service tips and constructive suggestions, which have been tried out and proved in actual practice. Subjects cover not only radio tubes but also include sound methods applicable to all radio products.

Finally, 30 of the 48 pages are devoted to a tube complement section which lists the types and numbers of tubes required by various model receivers of 25 well-known radio manufacturers. This data covers over 2,000 models. This information should be available for reference, in all dealers' sales and service departments and by all independent service men.

This is the start of a service reference library. The binding, designed especially for this book, permits the addition of supplementary pages which we will supply periodically . . . We believe this book is unique and is worth many times the price placed upon it. First edition is limited **Mailed prepaid for 50c**

and ↘



Ask your Jobber for complete details of Raytheon's New Tube Deals or write to

RAYTHEON PRODUCTION CORPORATION

General Sales Office: Dept. U 9, 30 East 42nd Street, New York

"Your Books Make the Tough Jobs Easy!"



FREE!

Send for Your Copy Today

● Service Men everywhere praise Sylvania's new book, Service Hints. . . . Send for your FREE copy today. . . .

Sylvania's book, Service Hints, contains a world of practical servicing tips compiled by hundreds of successful service men from all over the country. It gives you the simple solutions to everyday service problems with special attention given to the hard-to-erack jobs. You will know that you are getting first-hand information because it has been gathered through actual experiences. These valuable tips may save you hours of trouble-shooting on some tough problem.

Don't wait! Send for your copy of this valuable book today. Get the inside dope on receiver troubles. Iron out your problems. Put yourself in a position for more and better service jobs with bigger profits. There's no charge at all. Just fill out the coupon below, today, and you will receive your copy of Service Hints, Volume 2, in a few days.

Hygrade Sylvania Corporation, Makers of Sylvania Radio Tubes and Hygrade Lamps. Factories at Emporium, Pa., Salem, Mass., and St. Mary's, Pa.

Sylvania

The Set-Tested Radio Tube

HYGRADE SYLVANIA CORPORATION,
Emporium, Pa. SS-10

Please send me free, without obligation, Volume 2 of Sylvania's "Service Hints."

Experimenter Amateur Call.....
Service man Employed by dealer Independent

Member Service Organization.....

NAME

ADDRESS

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

NAME OF JOBBER.....

ADDRESS.....

Arvin Model 7

Effective May 23rd the following changes were made:

1. A 200-ohm resistor, R-14, has been added in the power pack across the points of the vibrator.

2. The 100,000-ohm resistor, R-3, in the No. 1 grid circuit of the 6A7 has been changed to R-29, Part No. 17-2060, .25 watt, 50,000 ohms.

It was found that in some instances motor noise entered the set where the local-distance plug and tone control were attached. A change in the mechanical design which eliminated this difficulty was made beginning with those sets from which the louvers were omitted.

Arvin Model 27

Effective May 23rd the following changes were made in Model 27, which will be covered in the forthcoming Rider's Manual, Volume VI:

The 100,000-ohm resistor, R-3, Part No. 17-2068, in the No. 1 grid circuit of the 6A7 tube has been changed to R-29, 50,000 ohms, .25 watt, Part No. 17-2060.

The 1000-ohm resistor, R-24, has been inserted in the No. 1 grid circuit of the 6A7 tube.

The 400-ohm resistor, R-2, has been changed to R-10, 500 ohms, .25 watt. The allowable variation on R-2 was from 200 to 600 ohms; the allowable variation on R-10 is from 400 to 600 ohms.

R-10, the 500-ohm resistor in the cathode circuit of the 78 tube has been changed to R-28, 1500 ohms, .25 watt.

C-12 and C-26 condensers have been combined into one dual condenser, Part No. 17-4742, 0.006 mf., 800 volts and 0.25 mf. 400 volts. The lead with the red dot is the 0.006-mf. unit.

A suppression choke, X-5, Part No. 00-4782, has been inserted in the "A" line. A 0.002 mf. condenser, C-6, has been inserted before the choke X-5, and is connected from the battery side of X-5 to ground.

Starting with serial number D440-11H, the type 75 tube was replaced with a 6B7, triode connected.

(Please turn to page 11)



PREPARE FOR YOUR FALL BUSINESS WITH C-D CONDENSERS

Are you prepared to take care of the service business that has become available this month?

With people starting to use their sets on a full time basis again, cheap electrolytic and paper condensers will soon go bad.

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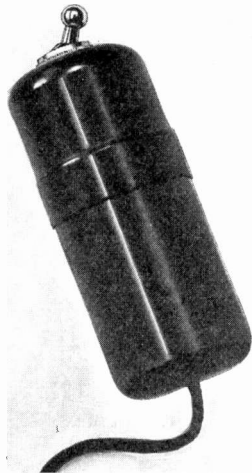
TYPE JHM JUNIOR HANDY MIKES

Working Voltage	Cap. Mfd.	Cap. No.	List Price	Size Lead	Code Word	Your Cost
PEAK VOLTAGE 300 V. D.C.						
250	4	ED-3004	.45	2 3/4 x 1/2	Xonoc	.39
250	8	ED-3008	.85	2 3/4 x 7/8	Xonob	.51
250	10	ED-3010	.95	2 3/4 x 1	Xonoc	.57
250	12	ED-3012	1.05	2 3/4 x 1 1/8	Xonod	.63
250	16	ED-3016	1.15	2 3/4 x 1 3/8	Xonof	.69

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The 0.003-mf. condenser, C-25, was changed to C-26, 0.006-mf., 600 volts.

Beginning with serial number E45219H, the triode connection on the 6B7 was changed to a pentode connection. The 0.25-mf. condenser, C-12, was added as a screen bypass from the screen of the 6B7 to ground. A 1-meg-ohm resistor, R-9, was added as a screen dropping resistor from +B to screen of the 6B7 tube. The 0.006-mf. condenser, C-26, was changed to C-25, 0.003 mf., 600 volts. Voltages on the 6B7 tube are as follows: Plate, 60 volts; Screen, 30 volts, and cathode, 1.7 volts.

Arvin Model 37

The following changes were made as of May 23rd:

The 100,000-ohm resistor, R-3, in the 6A7 No. 1 grid circuit has been changed to R-29, 50,000 ohms, 0.25 watt.

The 1000-ohm resistor, R-24, has been inserted in the 6A7 No. 1 grid circuit.

The 400-ohm resistor, R-2, has been changed to R-26, 600 ohms, 0.25 watt. Allowable variation of R-2 was from 200 to 600 ohms. The variation of R-26 is from 500 to 700 ohms.

A suppression choke, X-6, Part No. 00-4782 has been added in the "A" line and a mica condenser, C-6, 0.002 mf. has been inserted ahead of X-5, being connected from the battery side of X-5 to ground.

Philco Model 49

Effective January 1st with Run No. 6 the suppressor grids of the two 78 tubes (R.F. and I.F.) will be connected together and to the other end of the bias resistor No. 40 from that shown on Philco page 5-28 of Rider's Manuals. They will be no longer tied to the corresponding cathode in either case, this connection being removed.

The part numbers of the components below have been changed to the following:

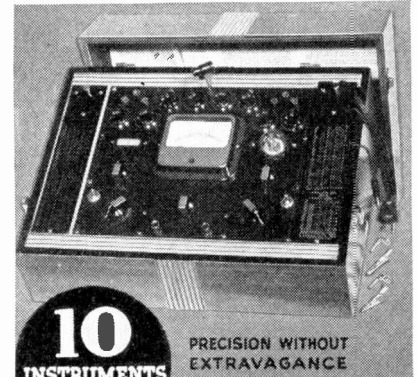
Antenna Transformer, No. 2, should be Part No. 32-1427.

Detector Transformer, No. 10, should be Part No. 32-1379.

Volume Control, No. 35, should be Part No. 33-5059.

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TESTS ALL TYPES
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\$46⁶⁷ MODEL
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9. Decibel Meter
10. Impedance Meter

Radio dealers have always wanted a tube tester that would test tubes under conditions approximating their use in a radio set. Here it is. Try it out. See for yourself how this instrument can save you time in hunting for troubles and help you sell more tubes. Model 1501 is a Power Output Tube Tester with Neon short test and shadowgraph line voltage indicator. Dealer Net Price.....\$36.67. For more information see your jobber. Send for catalogue to

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Catalogue.....Information on

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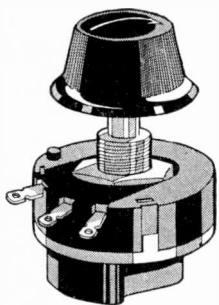
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MILWAUKEE, WIS.

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FIXED RESISTORS

Circulars As Business Getters

There is a man in a suburb of Boston who has been in the servicing business for more than a decade, under the name of the Allston Music Shop at 127 Harvard Ave., Allston, Mass., who is a firm believer in the use of postcard type of circulars as business getters. He was in our office a few days ago and we asked him, if he had any advice to give to other service technicians who were using similar methods of getting business or who intended doing so.

The advice we pass on to you is that persistency is vital. Do not expect to secure returns within a week or even a month. For years past, Mr. Pearlstein of Allston, Mass., has been distributing about 4,000 cards each week, and it has been his experience that the results of the distribution of these cards is not realized for four or five months. With continued distribution, once the business starts coming in, it continues.

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Frequency-Modulated Oscillator Note

Oscillators which have an r-f. output transformer that is apparently untuned, are in some cases unsuited for visual alignment work. The cable connecting the secondary of the output transformer to the device under test has a certain amount of capacity. This is sometimes large enough to tune the secondary to a frequency in the neighborhood of the alignment frequency being used. Under these conditions incorrect alignment will result, since the selectivity characteristic of the output transformer is superimposed upon that of the receiver. The remedy is to replace the inductive coupling with resistive coupling or to shunt the secondary (output) with a low value of resistance.

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Wells-Gardner 7A Series Chassis

In a few receivers of this model, the tone control condenser C-9, 0.05 mf., 400 volts, has broken down. When this occurs the output plate voltage is applied across the tone control resistor and in many cases the resulting current burns the tone control. For this reason, if it is necessary to replace the condenser or the tone control resistor in this model; connect the side of the condenser which formerly went to ground to the +B end of the output transformer primary, as shown in Fig. 1.

This connects the tone control condenser and resistor across the primary of the output transformer. In this

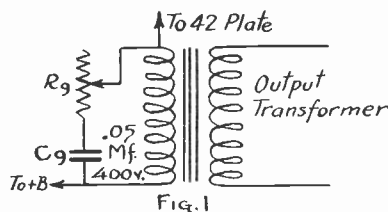


FIG. 1

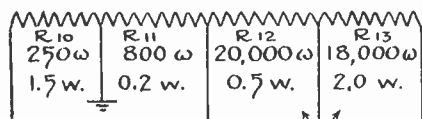


FIG. 2

Replace these two sections.

Fig. 1. New connections for tone-control circuit of Wells-Gardner 7A chassis.

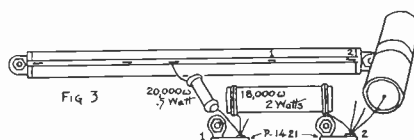
Fig. 2. Resistor values of four-section unit.

method of connection, should the tone control condenser break down, no damage will be done to the resistor.

In case either the 18,000 or the 20,000-ohm section of the four section armoured wire-wound resistor becomes open, it is unnecessary to replace the entire resistor. A separate 18,000 ohms, 2 watt or 20,000 ohms, 0.5 watt carbon resistor may be used. DO NOT USE THE OLD LUGS OF THE WIRE WOUND RESISTOR TO MOUNT THE CARBON RESISTORS, AS THE OLD UNIT MAY HAVE AN INTERMITTENTLY OPEN CONNECTION. If one of these two sections, as mentioned, becomes open, it will be best to replace both of them. The values of the four sections of this unit are given in Fig. 2.

If the entire four-section unit is replaced, the old mounting holes and the

old wiring connections are used. However, if the separate 18,000 and 20,000-ohm carbon resistors are used, they are mounted and connected as shown in



Method of mounting and replacing resistors in Wells-Gardner 7A Series chassis. See Fig. 2.

Fig. 3. Two single terminal mounting strips can be used for the wiring connections. The leads, which connected to terminals No. 1 and No. 2 on the old unit, are connected to the separate terminals marked No. 1 and No. 2 in the illustration.

- P-98002A. 4 Section Resistor (2 wire wound, 2 carbon)
- P-D-94183. 18,000-ohm, 2 watt resistor
- P-B-94203. 20,000-ohm, 0.5 watt resistor
- P-1421. Single terminal Mounting strip

Silvertone Models 1802, 1802A, 1803, 1803A, 1807

Some difficulty has been experienced due to failure of the R10861 tapped Candohm resistor. Should replacement of this part become necessary, R11711, which is a wire-wound, vitreous type, should be ordered.

The power transformer used in the earlier production runs of these sets has given some trouble in a few cases. The transformer has been improved in later runs and should give no further trouble. The improved transformer is listed under the same part number, R10823A, and is identified by a spot of yellow paint on its cover.

See Sears, page 5-31, Volume V, of Rider's Manuals, for data.

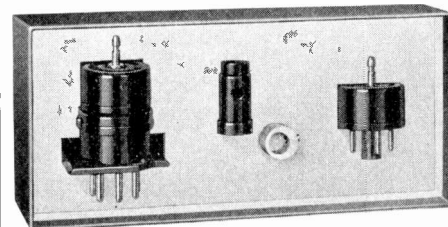
Silvertone Models 1806, 1823, 1829

Any complaints about poor selectivity in these models will most likely be due to faulty alignment of the receiver. Accordingly, an attempt should be made to correct the trouble by careful realignment. Oscillator coil replacement in these models is unnecessary.

For alignment data see page 5-36 in Rider's Manual, Volume V in the Sears-Roebuck section.

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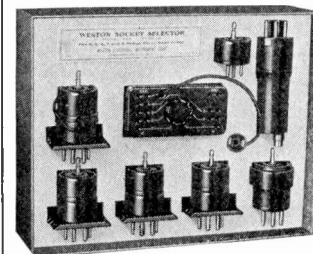


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Erla Model 6200

The 0.02-mf. condenser, Part No. 9714, used to bypass the grid return of the first i-f. transformer was a 0.01-mf. condenser in early production. To eliminate any tendency of the i-f. amplifier to oscillate, the 0.01-mf. condenser has been changed to 0.02 mf. in later production. If receivers are encountered in which i-f. oscillation occurs, replace the 0.01-mf. condenser, if there is one, with one having a value of 0.02 mf.

The 10,000-ohm resistor, Part No. 6786, and the 0.005-mf. condenser, Part No. 1275, have been added to the plate circuit of the 33 output tube, where they are in series with the plate and ground. This addition improves the tone quality and decreases background noise. Excessive background noise and high-pitched tone in these sets can be rectified by adding these two components as indicated. Early production sets did not have this resistor and condenser.

The 4-mf. wet electrolytic condenser, Part No. 1291, connected between ground and the connection between the primary of the first i-f. transformer and the 10,000-ohm resistor in the No. 2 grid circuit of the 1A6 tube, has been added in late production sets to eliminate motorboating when the set is operated with low "B" battery voltages. If sets are encountered that motorboat when the "B" battery is low, install a 4-mf. condenser, as indicated.

The complete servicing data on this receiver will be published in Volume VI of Rider's Manual.

Auto-Radio Specialists

Do you have the two Rider "Specialized" Auto Radio Manuals? These two volumes selling for \$3.50 each cover auto radio receiver production since about 1930 to about May 1935. If you are an auto radio specialist, you will appreciate the thorough detail of the service notes in these two Rider Specialized manuals. . . . Your jobber has them. . . . Buy them from him! They are sold with a Money Back Guarantee. . . .

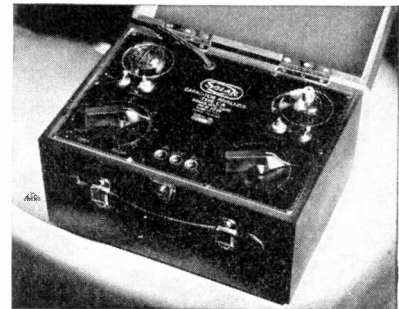
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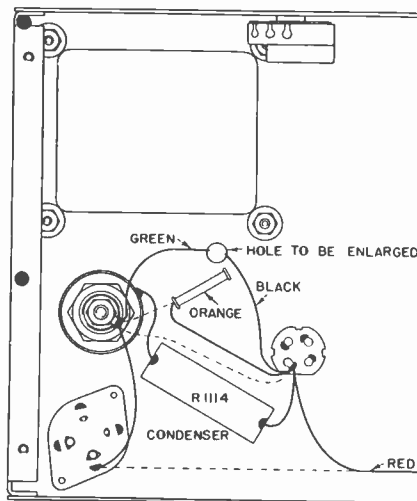
Silvertone 1720, 1725, 7065

Any trouble due to hum in these models can be eliminated by performing the following operations, the purpose being to add an additional section of filtering to the power supply.

Enlarge the hole in the chassis near the power transformer to about 0.25 inch diameter, as indicated in the illustration.

Remove the cover of the power transformer. To do this, it is first necessary to remove the four nuts on the under side of the chassis and then to unscrew the bolts that pass through the laminations. The tone control and switch will have to be dismantled in order to get at one of the transformer's nuts.

Mount a Part No. R10793B choke on top of the power transformer in place of the original transformer cover. Be sure to mount the choke so that its leads can come down through the enlarged hole in the chassis. Also be sure to tighten the bolts well, in order



Changes to be made in Silvertone Models 1720, etc. The condenser's part number is wrong; it should be R1114.

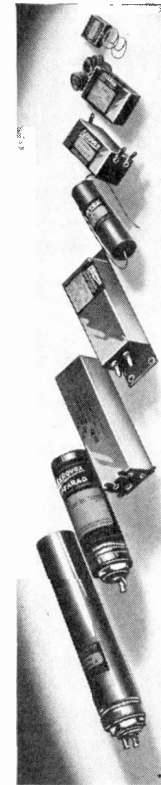
to prevent hum. Then remount the transformer and choke assembly on the chassis and remount the tone control.

Make the wiring changes indicated in the illustration. The dotted lines represent the original wiring, which is to be changed and the solid lines show the new connections. Note that a new part, a 2-mf., 440-volt, dry electrolytic condenser, Part No. R1114, is added.

See page 4-22 of Rider's Manual for schematic diagram.

For that fussy trade . . .

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To the already extensive listing of exact duplicate replacement condensers contained in the 1935 Aerovox Catalog, many new types have just been added. These are listed in supplementary catalog bulletins available on request.



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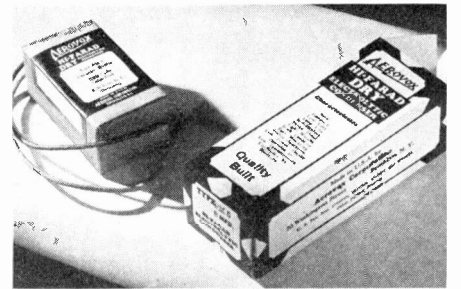
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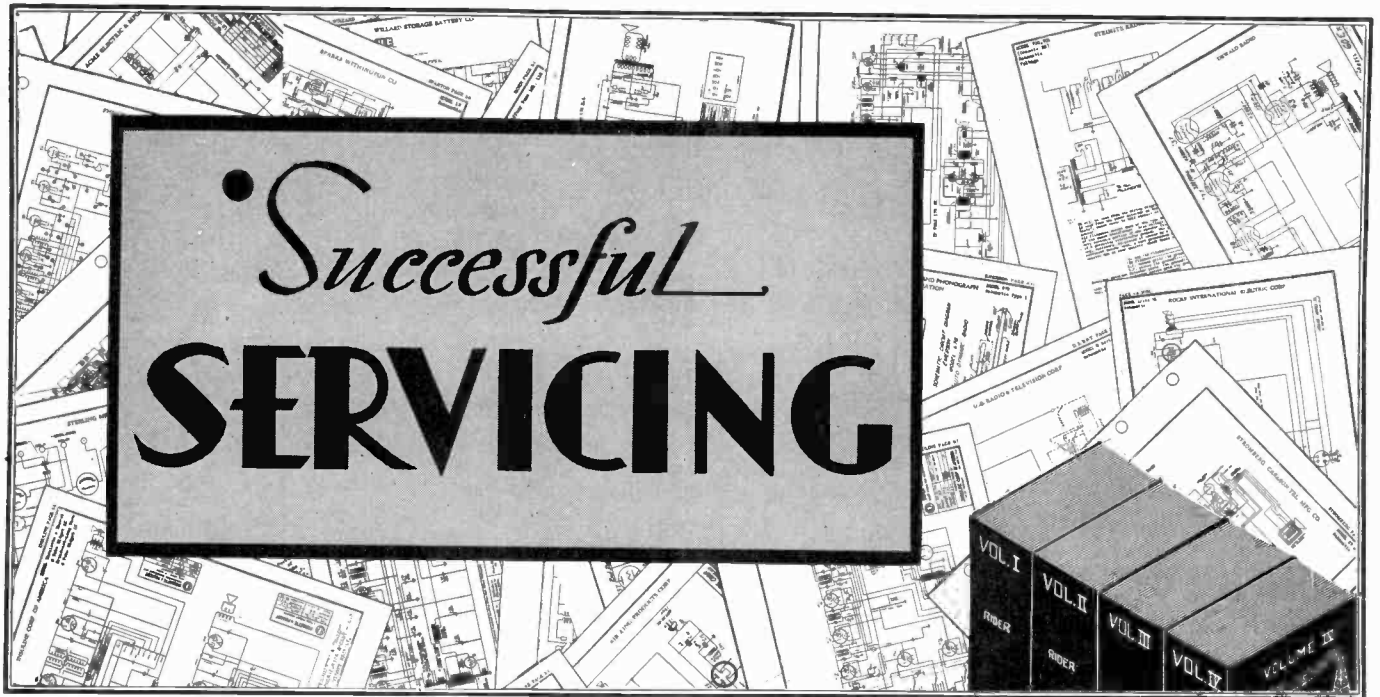
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The Effect of Variation in Coupling on the Band-Width

By JOHN F. RIDER

Many of the 1935-36 receivers are of the high-fidelity type, which have band-pass i-f. amplifiers. This type of circuit is one with which every serviceman should be thoroughly familiar and in order that a complete picture be given we are presenting in the article below some of the theory underlying the basic circuit.—Editor.

THE basic coupling unit employed in i-f. amplifiers is the two winding, tuned primary-tuned secondary transformer. It is essential that the manner in which it functions be completely understood if intelligent servicing is to be done and so a study of this and related units was made in the SUCCESSFUL SERVICING LABORATORY, in order that we could present data, which, we trust, will prove valuable.

A variable coupling i-f. transformer was placed in the test circuit, shown in Fig. 1. It was desired to duplicate the actual conditions in a receiver as far as possible and so the first tube was inserted to isolate the tuned circuit from the signal generator output circuit. The input to the first stage was not tuned, as we wanted to investigate the characteristics of the transformer alone. The output of the first stage feeds into a 6C6 tube, operating as a biased detector

and the rectified voltage appears across the detector load resistor, R.

The selectivity characteristics of the transformer might have been investigated with an ordinary modulated signal generator (test oscillator) and, by varying the frequency of the generator in 2-kc. steps, the frequency response of the transformer plotted. It can be readily seen that this would have been a long, tedious process. Instead, the cathode-ray oscillograph, in con-

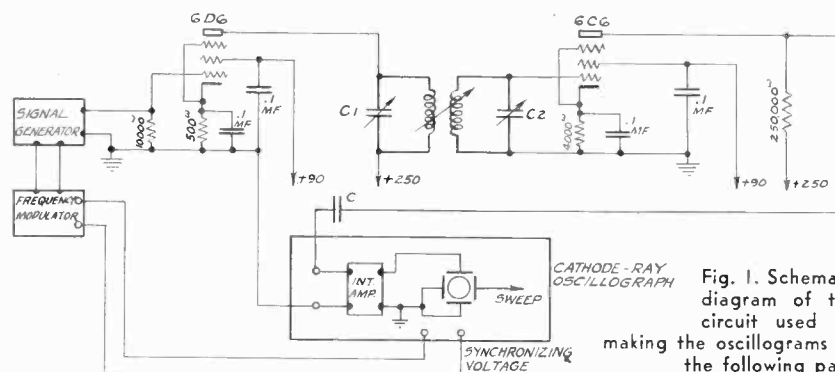


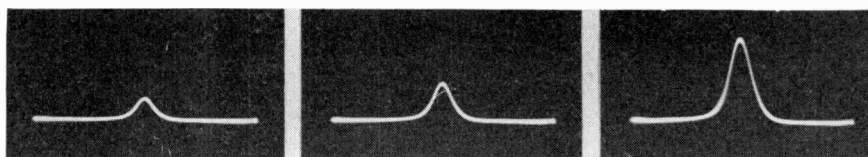
Fig. 1. Schematic diagram of test circuit used for making the oscillograms on the following page

junction with a frequency-modulated signal generator, was employed to ascertain what was taking place. This, you see, is in keeping with our statement made in the past, that the cathode-ray oscillograph is useful not only as a servicing device, but as an educational tool as well.

The connections to the oscillograph and the associated equipment are no different from those used in regular alignment work. As may be seen in Fig. 1, the frequency modulator is connected to the signal generator and the synchronizing voltage is taken off the frequency modulator and brought to the proper terminals on the oscillograph. The demodulated output is taken off the detector load R and fed to the vertical plates of the oscillograph through the internal amplifier. The blocking condenser C is generally located with-

by advancing one of the coils a distance corresponding to three turns of the screw provided for this purpose. The total possible movement of the coil corresponded to 24 turns of this screw

2A and 2C. It must be understood that before the band-width characteristics, which are shown by these oscillograms, can be compared with one another, they must be shown to the same



Figs. 2A, 2B, 2C. The oscillogram of Fig. 2A (left) shows response with minimum coupling. In Fig. 2B the coupling was increased by about one-eighth of the total possible movement and a further increase is shown in Fig. 2C

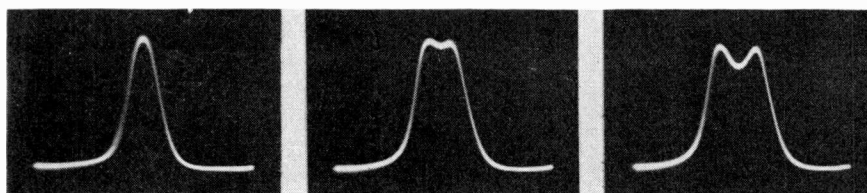
and, therefore, the amount the coupling was increased was one-eighth of the total coil movement. The resulting selectivity curve for this increased amount of coupling, just mentioned, is shown in Fig. 2B.

We want to emphasize here that the

scale. Now if Figs. 2A and 2C were drawn to the same height—that is, if the output of the signal generator had been increased when the oscillogram of Fig. 2A was taken—then it would be apparent that these two oscillograms were very similar. However, we purposely kept the signal generator output constant, because we were interested in showing the relative response of the amplifier under various coupling conditions. We do not show the three oscillograms of Fig. 2 to the same scale, as they would be substantially alike.

Should it be desired to repeat this test, we recommend that the operator change the signal generator output so that the three curves of Fig. 2 can be observed when each has the same height. The comparison will be facilitated if the curves are traced on tracing paper held flush against the screen of the cathode-ray tube.

Before the oscillogram of Fig. 3A was taken, the coupling was increased to a total of 13 turns, which is a bit more than half of the total possible movement. Note that this oscillogram shows an appreciable increase in gain and that the peak is slightly broader. In Fig. 3B the double peak definitely makes its appearance. While no increase in gain is shown in Fig. 3B over the curve of Fig. 3A, the marked increase in band-width should be noted, which is in evidence not only near the peak of the curve, but also at the base. In Fig. 3C the band-width has increased still further, as is shown by the very definite double peak, the increased distance separating the two sides at the base, and the more nearly vertical sides. The coil was moved four turns of the



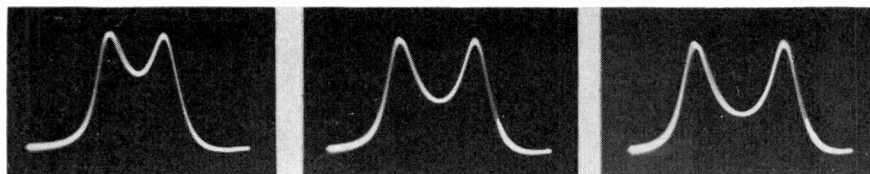
Figs. 3A, 3B, 3C. When the coupling was increased to 13 turns, the band-width increased, as well as the gain. See Fig. 3A, left. Four more turns of the screw resulted in Fig. 3B, where the dip is first seen. Fig. 3C is the result of two more turns. Note the more rapid change per turn of the screw

in the oscillograph unit; should this not be the case, it should be connected in the external circuit.

The i-f. peak of the unit used in this test was 465 kc. The signal generator was set to this frequency and, with the coupling between primary and secondary at minimum, the trimmers, C_1 and C_2 , were peaked for maximum output. Under these conditions, the curve of Fig. 2A was obtained. Note the small band-width and the small gain in comparison with the response obtained when larger values of coupling were used. Without changing the signal input, the coupling was increased

tuning adjustments were unchanged in going from the curves shown in Fig. 2A to Fig. 2B; the only change was the slight increase in coupling mentioned. Note that the increase in coupling, shown in Fig. 2B, has resulted in a small increase in gain. A further increase in coupling, without altering the other conditions, resulted in the oscillogram of Fig. 2C. Here again the increase in gain is shown, but there is no appreciable change in the band-width.

Perhaps it might be well to clarify this last statement: no appreciable change in band-width between Figs.



Figs. 4A, 4B, 4C. Further increase in coupling results in the greater amount of dip and the broadening of the band-width, but no great change in the amount of gain
Photos by Successful Servicing Laboratory

screw between the oscillograms of Figs. 3A and 3B and only two turns between Figs. 3B and 3C. In other words, now a slight movement of the coil results in a pronounced change in the response curve, because the coils are closer.

A further increase in coupling, accomplished by two more turns of the screw, resulted in the selectivity curve of Fig. 4A. The tendencies toward broader band-width, apparent in Fig. 3B, are more and more pronounced in Figs. 4A, 4B and 4C; that is, the band pass and the depth of the dip progressively increase, these conditions resulting from a continued increase in coupling between the two coils. It will be noticed further, that no appreciable change in the gain with increase of coupling can be seen from the conditions of Fig. 3A to Fig. 4C.

Up to the present point we have simply pointed out the effect of a variation in coupling upon the shape of the selectivity curve. We now wish to make some comment upon the significance of these curves insofar as they are related to the interaction between the primary and secondary circuits. Referring back to the oscillograms, you will note that for values of coupling less than that used in Fig. 3A, the transfer of

Double Spreads in Rider's Volume VI

One of the special highlights of Rider's Manual, Volume VI, now in the process of preparation, will be double page spreads for those diagrams which are very complicated.

A great number of the modern receivers use a large number of tubes and if the schematic were published on the regular 8½ x 11 inch size paper, it would mean crowding of the data. Such crowding makes it a very difficult matter to distinguish the intersections or connections of the circuit leads—makes it difficult to read the electrical values, etc. . . . In general the utility of the material shown upon the page is definitely reduced. . . .

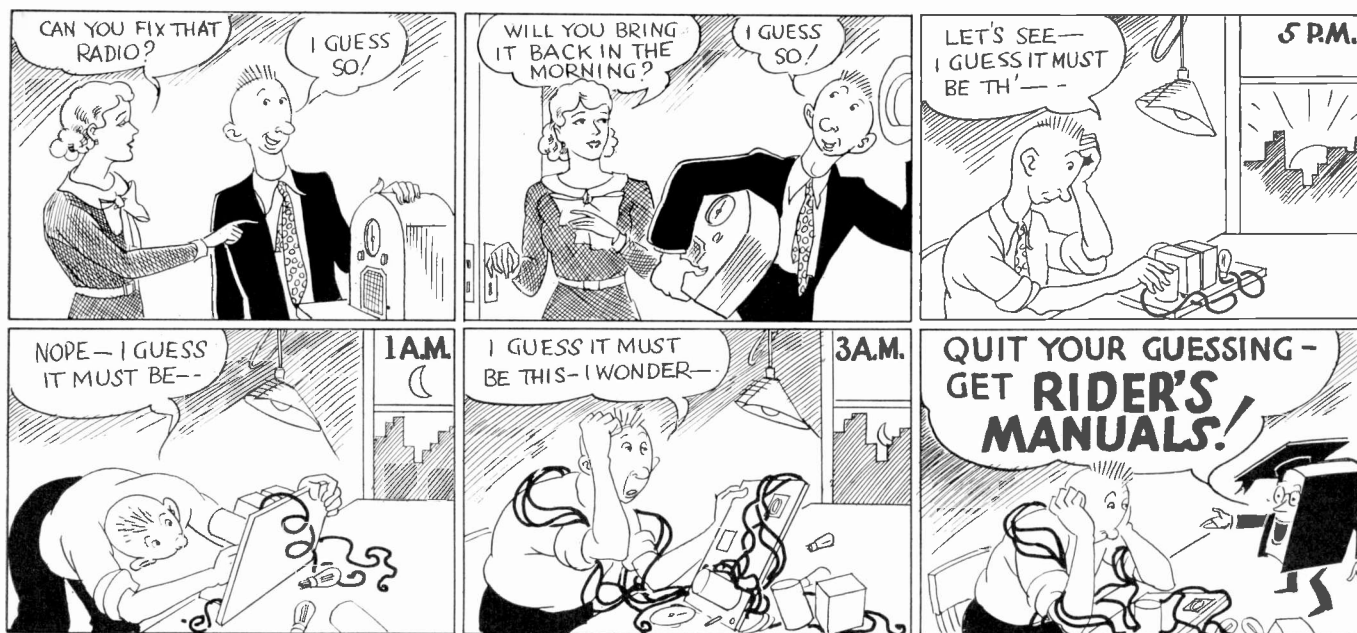
To make it easiest for the user of Rider's Manuals to secure the greater amount of data with the greatest amount of ease, we are incorporating such double page spreads. . . . The approximate size of the sheets, showing such complicated diagrams, will be 11 by 15 inches, almost twice the size of the regular letter head.

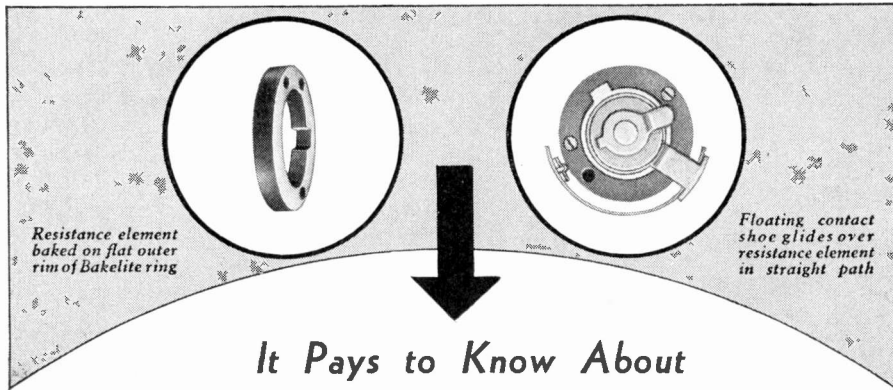
An eccentric fold will be used, so that these double page spreads will be accommodated by the binders and when folded will be the same size as the conventional pages. . . . This is another example of the detail and care put into the production of Rider's Manuals in the effort to make them of utmost utility to the radio servicing industry.

energy is accomplished without appreciable interaction between the two circuits. In other words the current flowing in the primary is substantially the same as it would be if the secondary were removed. However, as the coupling is increased beyond this value, the above statement is no longer true. Now the primary circuit is very definitely influenced by the presence of the sec-

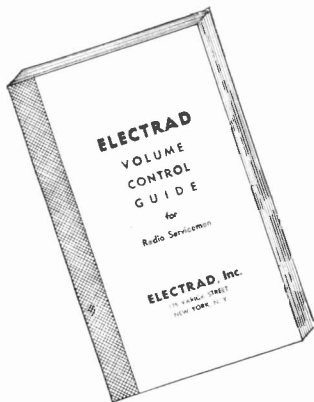
ondary tuned circuit and the effect of this is to produce two peaks at different frequencies instead of the single peak at one frequency obtained with low values of coupling. The interaction between two windings, when large values of coupling are used, is the factor which makes it difficult to align these transformers with the type of output meter generally used.

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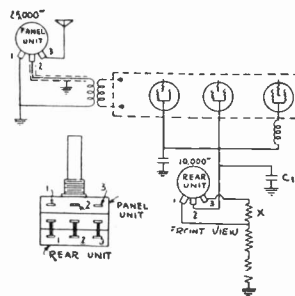
There is no charge for this 100-page book (Size 6 1/4" x 9 1/4"), but because of the great expense involved it is limited to professional servicemen only. To obtain a copy, simply tear off the flap on the carton of any Electrad new-type Carbon Volume Control and mail it to Dept. SS-10, together with your business letterhead or business card.

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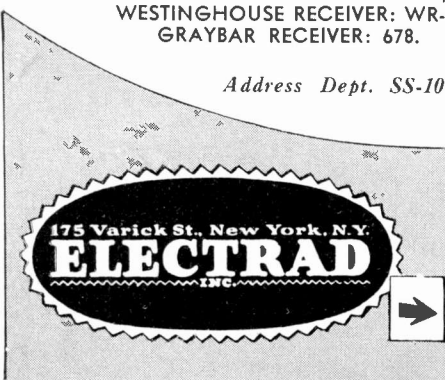
DIAGRAM is a reduction from one of many such in the Electrad Volume Control Guide, showing special applications of Electrad controls to certain makes of receivers where replacement difficulties may be encountered. Full detailed data accompanies each diagram.

This diagram illustrates how Electrad applies a three-section unit (instead of the usual tandem control) to the following named receivers, in order to distribute the relatively huge wattage dissipation required of the screen grid voltage control in the R. F. stages of these receivers:—

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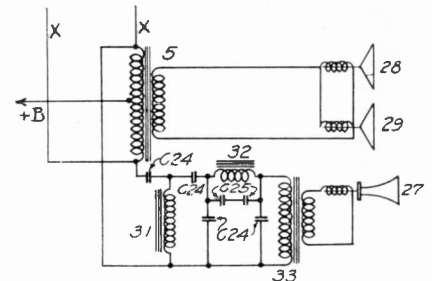
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Zenith Stratosphere

Three dynamic loud speakers are used in the Model 1000-Z, The Stratosphere, as shown in the accompanying illustration. The small one, No. 27, reproduces frequencies above 4000 cycles and the two 12-inch speakers, Nos. 28 and 29, reproduce frequencies under 4000 cycles.

The two leads marked X come from the plates of the eight 45's, which are in parallel pushpull, and it will be noticed that the primary of the output trans-



Schematic diagram of Zenith Stratosphere output circuit

Courtesy of Zenith Radio Corp

former, No. 5, is in parallel with the choke, No. 31. The two chokes together with the several condensers form a filter, which passes only those frequencies above 4000 cycles to the primary of the output transformer feeding the small speaker. While the frequencies above 4000 cycles, as well as those below, are fed into the other output transformer, No. 5, both this transformer and the speakers function more efficiently below 4000 cycles than they do above. The overall result is a rejection of the higher group of frequencies by the two large speakers, which leaves the reproduction of the higher register and the overtones to the small speaker.

The complete schematic circuit will be published in Volume VI of Rider's Manuals.

Silvertone Models 1808 and 1825

Please add to your Index for Volume V of Rider's Manuals, that Model 1808 is the same as Silvertone Models 1804, 1805, 1820 and 1826.

Also note that Model 1825 is identical with Model 1828.

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Vol. 2 October, 1935 No. 2

ANTENNA INSTALLATIONS

WE have had the opportunity during the last thirty days to witness an example of how one man runs a well established service department. . . . We had this experience, because we paid the bills—that is, will pay the bills when they are rendered—and, strange as it may seem, will be glad to do so—providing that the man involved will not read these lines and tuck on a few items. . . .

We were interested in a good antenna installation. . . . One of those noise elimination gadgets. . . . Being located in an apartment house, the problem of noise source deserves more than the usual amount of consideration. The concern in question was well recommended—so we asked to have the system installed.

Now, the usual procedure in such cases is to go on the roof, search for an area fairly free of flat-tops and erect the antenna within this area. . . . We said that this is the usual installation, of which there are hundreds of thousands. . . . Lo and behold, these people did not operate that way. . . . You desire a good antenna installation—okay! Imagine our surprise when a man called for one purpose only—to survey the roof—to plan the location of the antenna, with respect to the erection of the masts, other aerials, etc.

The man returned to the shop and we were advised of the fact that the

antenna installation would require the erection of a temporary system, which could be checked for noise pickup and moved from one spot to another, in the effort to locate a position which would afford the best reception and minimum noise. The estimate approximated around \$25.00. . . . \$25.00 for an antenna system! . . . Worth every cent of it, if it does the job.

There are many more people in the United States who desire good antenna systems and there must be other service organizations with sufficient courage to charge for goods delivered. . . . This service organization is making money—and they are entitled to every cent.

Now, we have one suggestion concerning such methods of installation. Instead of shifting the temporary antenna, the company should be equipped with a means of establishing high and low noise levels. In other words a sort of noise meter. This can be a simple vacuum-tube voltmeter arranged upon a telescoping tube and connected to a pickup rod. The rectifying portion of the voltmeter is at the top of this pole and the rectified d. c. is fed to the amplifier and indicating device upon the roof. This elevated r-f. voltmeter is moved from place to place upon the roof and the noise level charted. Such a survey will convey valuable information and will enable the definite placement of the antenna.

A man who is interested in a good antenna installation, so as to secure his money's worth from a medium priced or expensive receiver, will realize the value of such a survey and pay the price.

Whether or not such a noise measuring device is used, the fact remains that the methods employed by this service concern are commendable. . . . Of course, they erect the conventional type of unit—that is the catch-as-catch-can system; in other words, just an antenna—if you want one and their price is right in line with the usual run.

We have not examined the books of this company. . . . but we feel confident they do not erect as many aerials as the average service concern—but they

do complete enough installations to earn a respectable profit and the respect of the people they serve.

Dependability

What does a service concern have for sale? . . . Is it strictly labor? . . . No! . . . It is dependability! What does a customer desire of his receiver? Primarily dependability! . . . He wants to be certain that whenever he turns the set on, it is going to work properly. . . . He wants to depend upon the work done by the service station. . . . 24 hour service is important, but dependable service is far more important. A man is interested in the speed, economy and appearance of an automobile—but above all he demands dependability! Let that be the theme song of the service industry. . . .

—JOHN F. RIDER

Did You Know That

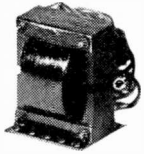
A game very closely resembling modern Chess was played in Hindustan about 5000 years ago. It was played on a 64-square board, similar to today's chess board, by four people, two competing against the other pair, as contract bridge is played.

In ancient Greece it was the custom for a host to drink some of the wine from a cup, before it was offered to his guest, to prove that the drink was not poisoned.

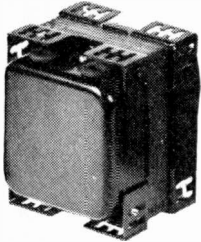
A Dutch war fleet was captured by French cavalry in the 18th Century. France had sent her armies into Holland and had penetrated to Amsterdam, where the Dutch war ships were frozen solid in the *Zuyder Zee*. The invaders forced the ships' crews to surrender, having ridden their horses over the ice to the sides of the boats.

Liquid fire was used as a weapon in the seventh century. It was invented by *Callimachus* and used against the Saracens when they were besieging Constantinople. Its composition of naphtha, sulphur and pitch was kept a secret by the Greeks for over 400 years. This terrible weapon was used until about 1350 A.D., when gunpowder took its place.

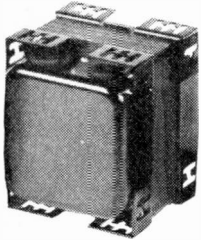
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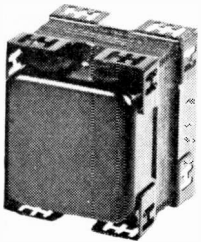
RCA Universal Power Transformer, Stock No. 9556, for 4-tube sets. List \$2.06



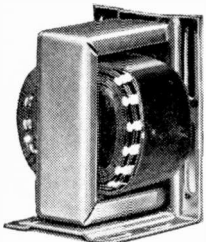
RCA Universal Power Transformer, Stock No. 9553, for 5 to 9-tube sets. List \$4.75



RCA Universal Power Transformer, Stock No. 9551, for 10 to 12-tube sets. List \$6.00



RCA Universal Power Transformer, Stock No. 9552, for all Class B sets. List \$6.50



RCA Universal Output Transformer, Stock No. 7852, matches all output tubes and any dynamic speaker (1 to 15 ohms). List \$1.95. Stock No. 7853 is vacuum-impregnated in cadmium-plated can, tropical use. List \$2.42



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Silvertone Sensitivity Control Circuits

Because of the high sensitivity of the several models mentioned below, trouble may be experienced with inter-station noise in some localities. This difficulty may be corrected by adding a resistor and short circuiting switch to the circuits, as described hereafter. The added resistor increases the starting bias on the tubes, thus decreasing the sensitivity of the set.

Under average conditions a 100-ohm resistor will be satisfactory, but some locations that are noisier than usual will require a higher value and those that are quieter will need less than 100 ohms. The switch, which is connected in parallel with the resistor, can be mounted in any convenient position, perhaps at the rear of the cabinet. Resistors should be of the carbon type and of a 1-watt rating. The switch in every case can be a SPST type.

In Models 1821, 1827, 1832 (see Rider's Manual, Volume V, Sears page 5-37) the connection between the 10-ohm resistor in the lower right-hand corner of the diagram and the junction of the speaker field with the cathode of the 37 AVC tube is opened and a 100-ohm resistor, shunted by the SPST switch, is inserted.

In Models 1825 and 1828, found on Sears page 5-39 of Rider's Volume V, the connection between the junction of the 960-ohm choke with the cathode of the 37 AVC tube and the junction of the 10-ohm resistor with the 200,000-ohm resistor, that is in series with the 1-megohm resistor, which are in the screen circuit of the 75 tube, is opened. A 100-ohm resistor is connected between these two junctions and is shunted by the SPST switch.

In Models 1804, 1805, 1808, 1820, 1826, shown on page 5-33 of Volume V of Rider's Manuals, the connection between the junction of the 300-ohm resistor with the 2000-ohm resistor in the cathode circuit of the 75 tube and the left side of the 75-ohm resistor, whose other side goes to ground, is opened. A 100-ohm resistor, shunted by the same type of switch as mentioned above, is connected in series between these two points.

Rolling Reporter



Due to the absence of the Rolling Reporter on a tour throughout the West, his column is taken over by his assistant.

Dear Boss:

A little bird whispered in my ear that you and "Ken" (I.R.S.M.) Hathaway were seen "bending the elbow" in the College Inn of the Hotel Sherman, Chicago. Is Mr. Hathaway still on the Silver (fizz) Standard? . . . Speaking of I.R.S.M., you have a nice letter from your palsy-walsy Neal Bear, of the Cleveland Section, who wishes you to tell your four readers that they are running their Service Men's Show at the Hotel Cleveland on November 10th and 11th. Hopes you can get there to attend the Show—promises to initiate you in the S O H A R S M. What does SOHARSM mean? . . . got your note about some of the plants in the middle West—the fact that they are working three shifts right along kinda speaks well of the present prosperous condition of the Radio Industry, doesn't it? . . . Mr. RIDER says "Yes" to your suggestion that he address the Servicers of DAYTON, OHIO—date will have to be set later . . . Sorry that the Jobbers throughout the Mid-West are complaining of the difficulty of getting as many copies of THE CATHODE RAY TUBE AT WORK as they need—Mike, our demon shipping clerk, has been working until midnight for two weeks trying to get orders out—the first printing is practically exhausted—the second run is going on the presses soon. . . . One of your correspondents sends along the news that the past summer has witnessed an unexpected boom in the Servicing field—seems that the excessive humidity has caused trouble in electrolytic condensers—"It's an ill wind, etc., etc.—wish you'd check on this report. . . .

Heard a nifty you might wanna run next month . . . one of the officials of a well-known organization (I promised not to tell his name) got a wire announcing the birth of his FIFTH daughter. Pasted on the telegram was a note that read "When you want a boy, call Western Union" . . . Cute?????

Your wife phoned—wanted to know if you were in jail—hadn't heard from you in four days—better send some roses before you return . . . Wish you'd hurry back—there's a stack of mail this high on your desk. . . .

The Big Boss says we will have a booth at the I.R.S.M. Show at the Hotel Pennsylvania—the dates are October 25, 26 and 27—you have a flock of dates at the Show, for Gossakes get back in time, willya??? . . . you hadda nice letter from FRED DE FRIESSE of the COMMUNICATIONS DEVELOPMENT LABORATORY

—says the Cathode Ray book is the "Nuts"—shall I thank him???? . . . There is a bill for a pair of shoes in your top drawer—you wear Size 9½, I see—OOOOH, Grandpa, what big feet you got!!!

Jim Gomperts of the Greater Bridgeport Radio Men's Ass'n sends a cordial invitation to attend their annual banquet—to Mr. Rider and yourself—Mr. Rider said "Yes" for both of you—can I go along??? I hear the chicken is good. . . . You have plenty of stuff from readers—enough to fill four columns—better send them personal replies this month—the mail department would take up too much space. . . . We took an additional office since you left—needed more space for the draftsmen to work on VOLUME SIX . . . I asked Mr. Rider how I should sign this—he said why not do like Winchell's secretary does—sign it "Your Girl Friday"—I told him that I'm not a plagiarist or a piker—I'm

Your Girl EVERY day.

Two at a Time

Recent advances in cathode-ray equipment design, as reported in the October, 1935, issue of *Electrical Engineering*, now make it possible to operate the oscillograph as a multi-element instrument, thus overcoming one of the disadvantages of the cathode-ray, as against the bifilar oscillograph. In the preparation of "The Cathode-Ray Tube at Work" we were confronted with this limitation and overcame it by the expedient of using multiple exposures. For example, Fig. 443 on page 317 shows the current and voltage relations in a circuit containing resistance, capacity, and inductance. It was made by synchronizing the phase of the sweep with the voltage supplying the circuit and making four exposures on the same plate.

In this connection, it was mentioned in the Appendix of "The Cathode-Ray Tube at Work" that an electronic switch was available for permitting the simultaneous observation of two waves.

We're working on
VOLUME VI
of RIDER'S MANUAL
coming in
NOVEMBER



Essential—in order to operate profitably in the radio servicing field, are the proper tools. The electric soldering iron is one of these tools—in fact the most important!

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Years of experience have gone into the ESICO Green label iron. Proper distribution of weight—so that you don't have to lug a heavy iron around when all you need is the heat of a 150 watt iron, is one of the new features.

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By using Nichrome V in the construction of the element—ESICO assures you of a constant heat throughout its long life. When you use ESICO there is no aggravation about the iron getting cold after a few moments' work. Nichrome V prevents oxidation of the element—the Waterloo of all other irons.

Tip Stays Clean

A special drop forged copper tip supplied with a constant heat—remains clean—after tinning—longer than other irons now available.

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A price consistent with quality—but still low is the cost of ESICO. Check these prices and see if you can afford to be without one of these "modern as tomorrow" irons.

- 55 Watt Nick Nack. Your cost .66
- 65 Watt Midget. Your cost \$1.35
- 85 Watt Junior. Your cost \$1.65
- 150 Watt Trophy. Your cost \$3.50

All Esico electric soldering irons are guaranteed.
Available at all Esico Distributors.

Electric Soldering Iron Co., Inc.
342 West 14th St. New York City



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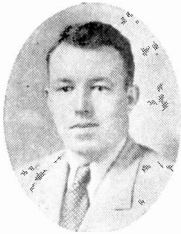


According to conservative estimates, one out of four servicemen fail or go out of business EVERY YEAR!

Will you be among them? Will you be one of the even larger group making only a bare living from the work. . . . Or, will you join the select, ambitious few who, in every town and city, grasp existing opportunities and build an outstanding success?

Sprayberry Training is specifically designed for men who aim to be in the latter group. Through it, I want to help you forge ahead as I have already helped hundreds of others. I want to help you do all types of radio work easier and quicker—help you build a REAL future in the work to which you are devoting your life.

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Name

Address

SS 10/35

Sparton 67, 68, 691

Some Model 67 chassis have a small piece of rubber in the middle of the rear edge of the chassis base plate to prevent vibration against the frame. If vibration is found, it may be corrected by removing this rubber and placing small strips of one-inch masking tape along the edges of the base plate, thus preventing the base plate from vibrating against the frame. One end of the tape should be stuck to the top side of the plate and the other end folded around to stick to the bottom.

Philco Model 116-B (Code 121)

Effective July 5th, with Run No. 6 the condenser No. 71, Part No. 30-1028, 0.003 mf. on the tone control was replaced with Part No. 30-1057, 0.0022 mf. Also condenser No. 72, Part No. 30-4169, 0.01 mf. was replaced with Part No. 30-4334, 0.004 mf. These changes were made to decrease the "high" cut on the control.

Effective July 10th, the speaker socket No. 27-6033 was replaced with Part No. 27-6043, Codes 121 and 122.

Philco Model 116-X, Code 122

The same changes apply to this model as those listed under Model 116-B with the following addition:

The correct Part No. of Pilot Lamp No. 108 is 34-2039.

Philco Voltage Note Philco Models 640 and 650

Effective July 1st new type i-f. transformers are used, having high-melting point wax. 1st i-f. transformer, Part No. 32-1711 changed to 32-1835 and 2nd i-f. transformer, Part No. 32-1712 changed to 32-1836.

Effective July 10th, speaker socket, Part No. 27-6033 is replaced with 27-6043.

Effective July 12th in Model 650, i-f. transformer No. 32-1835 is replaced with 32-1917 and condenser Part No. 3615-DU with 3615-DG. This transformer can be identified by the black spot on the top of the can.

"I'll Pay a Few Cents More for a SPRAGUE ANY DAY!"



"Remember," writes a successful serviceman, "if filter condensers fail to supply the proper voltage (as many 'bargain' condensers do) nothing about a radio can be wholly right. Other essential parts will work far below their standard of efficiency. The set might play, but never with its greatest volume or best tonal quality.

"I was surprised to find what a whale of a difference Sprague Condensers actually made in pepping up the performance of 'sick' sets. That's why I use 'em on every job. Take it from me, they're cheaper in the long run—and they've helped me build a real reputation for getting better than average results from the average radio set."

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. . . and many other types. Write for Catalog.

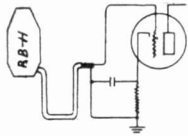
SPRAGUE PRODUCTS CO.
North Adams Mass.

SPRAGUE CONDENSERS

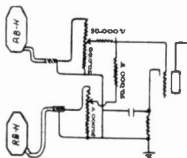
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- 5 REPLACES CONDENSER AND CRYSTAL MICROPHONES—NO CHANGES OR ADDITIONS NECESSARY. OPERATES DIRECTLY TO PHOTO-ELECTRIC CONNECTIONS OF "TALKIE" AMPLIFIERS.



- 6 ORDINARY CARBON VOLUME CONTROLS CAN BE USED FOR MIXING.
- 7 MORE CONVENIENT — SAVES SPACE AND WEIGHT.

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The Amperite High Level Velocity reproduces both speech and music with their original brilliance. Also excellent on close talking.

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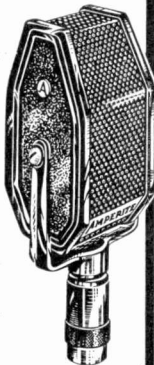
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AMPERITE Company, 561 BROADWAY, NEW YORK

AMPERITE *1 POINT Velocity* **MICROPHONE**

Arvin Model 17

Effective May 23rd, the following changes were incorporated:

The 100,000-ohms resistor, R-3, Part No. 17-2068, in the No. 1 grid circuit of the 6A7 tube has been changed to R-29, 50,000 ohms, .25 watt, Part No. 17-2060.

The 1,000-ohm resistor, R-24, has been inserted in the No. 1 grid circuit of the 6A7 tube.

The 400-ohm resistor, R-2, has been changed to R-10, 500 ohms. Allowable variation on R-2 was from 200 to 600 ohms. Allowable variation on R-10 is from 400 to 600 ohms.

R-10, the 500-ohm resistor on the cathode of the 78 tube, has been changed to R-28, 1500 ohms, .25 watt.

C-12 and C-26 condensers have been combined into one dual condenser, Part No. 17-4742, 0.006 mf., 800 volts and 0.25 mf., 400 volts. The lead with the red dot is the 0.006-mf. unit.

X-5, a suppression choke, Part No. 00-4782, has been added in the "A" line.

A 0.002-mf. mica condenser has been inserted ahead of the X-5, suppression choke and is connected from the battery side of X-5 to ground.

Montgomery-Ward Models 62-185, 62-187, 62-190, 62-196

In the early models 6D6 and 42 glass tubes were used. These have been replaced by the metal tubes, 6K7 and 6F6 respectively.

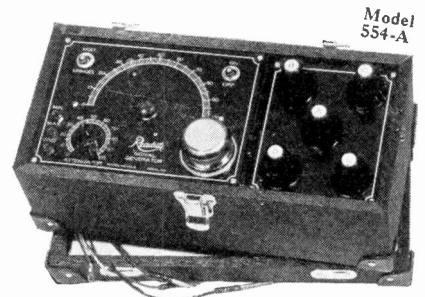
Silvertone Models 1822, 1831, 1824, 1830, 1806, 1823, 1829

There may be complaints, in some localities, of insufficient selectivity in these four-band all-wave models. Selectivity can be increased by substituting an R11748A i-f. input transformer for the present R10802A and an R11749 i-f. output transformer for the R10758. The i-f. input transformer is the one that makes the greater difference, so that in some cases the substitution of only the input transformer will be sufficient to correct the trouble.

For servicing data on Model 1806 see page 5-35, Rider's Manual, Volume V. Data on other models will be published in Volume VI.

New ALL-WAVE SIGNAL GENERATOR

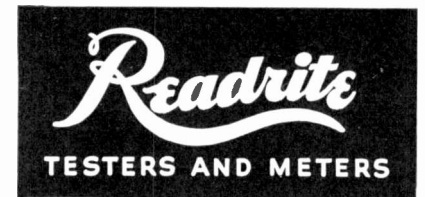
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With all improvements of present day engineering. All frequencies are fundamental and stabilized, completely shielded and tube modulated. Plug-in coils for present 5 frequency bands, 100-21,000 k.c. (Any new frequency range can be added by new coil.) Extra large scale permits accurate frequency settings. Large, accurate calibration curves supplied. In leatherette Portable case complete with batteries and two No. 30 tubes. Dealer Net Price—\$14.40.

Readrite manufactures all types of testers used for servicing Radio Sets, including Set Testers, Tube Testers, Resistance, Continuity and Capacity Testers, Point-to-Point Testers and inexpensive Indicating Meters.



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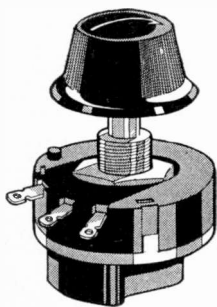
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 Please send me more information—
 Model 554-A. Catalogue
 Name
 Address
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 FIXED RESISTORS

Rocking Necessary at High Frequencies

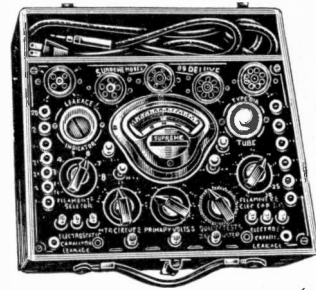
An important difference in alignment procedure on the short-wave bands, as against alignment of the broadcast band, is necessitated on account of the interaction between the oscillator and first detector circuits.

The regular procedure for alignment at the high-frequency end of a band is to tune the receiver to the calibration point and adjust the oscillator trimmer for maximum output. The next step is to align the detector and r-f. trimmers for maximum output. Now while this procedure is entirely satisfactory for the broadcast band, it does not yield the optimum adjustment on the short-wave bands because of the aforementioned interaction between the oscillator and detector circuits. This is especially prominent when the pentagrid converter is used. Changing the detector trimmer after the oscillator trimmer has been adjusted, changes the oscillator frequency and therefore the best adjustment cannot be gained by the conventional method. The remedy is to employ the same rocking process, which is used to effect alignment at the low-frequency end of a band. What it really amounts to is the finding of that combination of oscillator trimmer and detector trimmer adjustments which tunes the detector circuit to the signal and at the same time provides an oscillator frequency higher than the signal frequency by an amount equal to the intermediate frequency. Practically, it is accomplished by shifting (rocking) the tuning condenser backward and forward about the peak, which is due to the proper difference between oscillator and signal frequencies, and at the same time adjusting the first detector trimmer for maximum output.

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CONDENSERS LOOK ALIKE ON THE OUTSIDE... BUT IT'S WHAT'S IN HERE THAT INTERESTS ME



- A—Dry Electrolytic Condenser
- B—Pure condenser linen tissue wrap
- C—Wax dip humidity seal
- D—Chemically pure cambric wrap
- E—Asphalt composition coating
- F—Inner wax impregnated liner carton
- G—Outside metal container

Although all condensers look alike on the outside, it is what is in the inside that is of primary importance to the serviceman. Dependability in the continued operation of the receiver that has been repaired is the only thing that will interest your customer. Breakdown, no matter how small, is 100% failure to him. Are you going to lose his good-will by buying on a price basis alone?

For 25 years CORNELL-DUBILIER has never deviated from the strict rule of quality first. The wide acceptance accorded CORNELL-DUBILIER condensers in all fields is sufficient indication that quality cannot be replaced by price.

● Catalog No. 128 on the general replacement line and No. 127 illustrating exact duplicate electrolytic condensers. Available at all C-D. authorized distributors.

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NEW YORK • N. Y.

Sparton Model 333

Reception of code or police signals can be caused by the breaking of the wire connecting the antenna equalizing condenser to the r-f. section of the gang condenser. In the schematic diagram, found on Sparton page 4-20 of Rider's Manuals, Volume IV, and on Sparton page 2-2 of Rider's *Specialized Auto Radio Manuals*, Volume II, this is the connection between L-1 and C-1.

To correct this defect, remove the broken wires and solder in a 6-inch length of flexible wire. It is advisable to form a loop in this wire, by winding a few turns around a lead pencil. This will allow sufficient slack and the flexibility of the wire will prevent future breaks caused by the normal movement of the condenser assembly.

In the event that the wire connecting the grid cap of the 6F7 (1st detector-oscillator) tube to the antenna equalizing condenser breaks, the repair connection should be made by a longer flexible wire run from the grid cap down under the condenser and then to the antenna equalizing condenser.

NOTICE

SUCCESSFUL SERVICING is published for owners of Rider's Manuals and we want every owner to receive this house-organ monthly. Will you cooperate with us by asking your friends if they are on SUCCESSFUL SERVICING'S list, so that they, too, can be informed of the changes, that manufacturers are constantly making and which should be incorporated in their Manuals, and so keep them up to date? Just tell them to drop us a postal and we will be glad to send them SUCCESSFUL SERVICING each month free. Thanks very much.

Sparton Models 61, 62

A 50-ohm, 2-watt resistor, Part No. B-6061-1, has been added in series with the plate lead of the 25Z5 that is drawn nearest the speaker field in the schematic diagram, shown on Sparton page 4-11 in Rider's Volume IV. This resistor protects the 25Z5 tube against voltage surges.

It is advisable to put this resistor in any Models 61 and 62 not so equipped that you may service.

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Cable Address: PELMALLO

Does This Strike Home?

The other day while examining some statistics compiled by the U. S. Department of Commerce—and we know these figures are right—we came across something that backed up the statements that we have made upon more than one occasion: the average service station does *not* charge enough, with the result that nobody—employer or employee—makes a decent living.

For example:

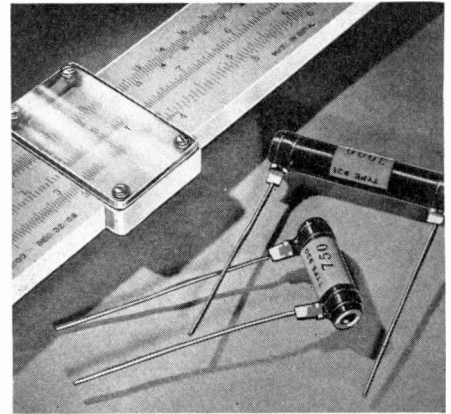
Out in California 349 service stations report total receipts amounting to \$509,000 with a total payroll of \$49,000, which does not include the owner's salary and which is split up \$36,000 to full-time employees and \$13,000 to part-time workers. These 349 service establishments have 402 proprietors, meaning that quite a few partnerships exist, and they employ 34 full-time and 32 part-time workers. This means that the average employee working full time receives \$1,059.00 annually—just a little more than \$22.00 per week.

The operating expenses of these 349 California service stations total \$222,000.00 per year and this includes the \$49,000 payroll, but does not include the cost of merchandise purchased for resale . . . the statistics did not break down the sources of income to show parts and service sale. However, upon a little thought, it can be readily seen that the basic cost of merchandise will make a big hole in the \$287,000, which is the difference between the total receipts and the operating expenses. Where does the proprietor get off? The payroll does not include his salary.

In Minnesota the full-time worker fairs better than in any other state of the Union. The average yearly wage is \$1,308, but that is only \$25.00 per week. On the other hand, the proprietors report that their annual receipts amount to \$139,000, of which 50% goes for operating expenses. Do they fair much better than their employees? We doubt if they do as well!

People are prone to look upon New York State as being in the lead when it comes to business, income and all that, but look at this: The 558 service stations of the Empire State report annual receipts of \$1,187,000 and total oper-

(Please turn to page 14)



So SMALL yet So POWERFUL!

Genuine wire-wound vitreous-enamel resistors. Nothing sacrificed except troublesome bulk. Available in 5, 10, 15 and 20 watt ratings. And all standard resistance values. For compact assemblies. And stay-put servicing.

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Refer to the autopsy on a typical Pyrohm Jr. unit, shown below, and compare these features with those of other resistors:

1. Crack-proof refractory tubing for support. Adequate heat dissipation.
2. Quality resistance wire precisely space wound under tension.
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4. Heavy vitreous enamel coating for permanent sealing . . . moisture-proof, damage-proof.
5. Pigtail of stiff wire soldered to terminal band for positive, non-breakable connection.



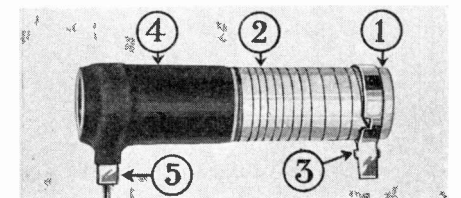
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NOISE MASTER ALL-WAVE ANTENNA

This remarkable unit, A.A.K. patented and engineered with traditional CORWICO thoroughness, is actually AUTOMATIC electrically—no adjustment is needed and no manual operation is required, once "NOISE-MASTER" is properly installed.

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Erla Model 9100

Some of the early Model 9100 receivers had a tendency to motorboat on the broadcast band when the tone control was turned to the bass position. This has been rectified in later production by removing the 0.002-mf. condenser, Part No. 6590, and by passing the plate of each 30 a-f. tube with a 0.004-mf. condenser to the chassis base. Make this change if motorboating should be encountered in any Model 9100 receiver.

Sparton Models 65, 66

In some locations it has been found that the addition of a tuned circuit in the early Models 65 and 66 will improve selectivity. Refer to the schematic diagram of this chassis on Sparton page 5-7 of Rider's Volume V and you will see that only the secondary of the i-f. transformer, L-5, is tuned. The following changes will permit the tuning of the primary of this transformer:

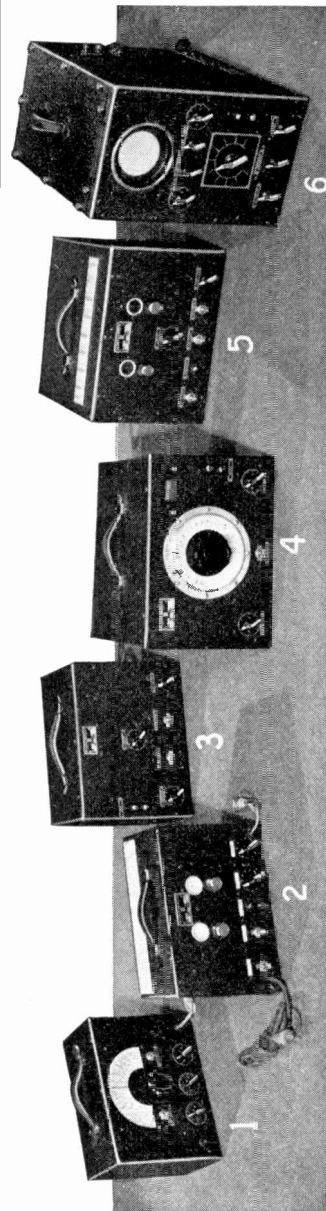
Remove L-5 and install a new transformer, Part No. A-11535. Remove the condenser C-3 and install a new one, Part No. A-11474. Connect one condenser of the new C-3 across the primary and the other condenser across the secondary of L-5. Remove the resistor, R-11, and install Part No. B-5458-1, having a value of 2200 ohms, 0.25 watt. Remove resistor R-15 and replace it with Part No. B-5458-31, having a value of 50,000 ohms, 0.25 watt.

Grunow Note

Some of the receivers manufactured by General Household Utility are intended for export and differ in the power transformer, which is designed for the particular voltage wherever the set is to be used. In general the export sets are designated by the addition of an extra letter after the model number; as, Chassis 5DX indicates a 115-volt, 25-50 cycle set and 5DZ, one which has a multiple transformer and is designed for 110-135-220-250 volt, 50-60 cycle operation. The letters X and Z are used in the same way on all chassis that are for export.

PARADE

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1—MODEL 82 Direct Reading Oscillator—85 k.c. to 21 m.c., 8 1/2" scale. Net. \$19.90
2—MODEL OC R.F. Oscillator — with direct reading chart. Accuracy of 1/2 of 1%. Net \$32.90

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The CLOUGH-BRENGLE Co.
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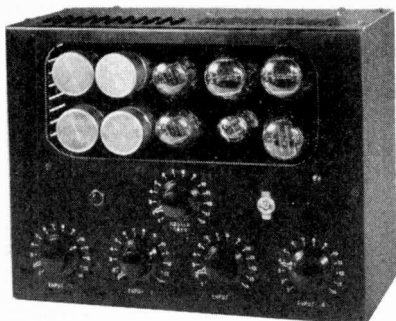
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Ask for Bulletin PA-417

THE WEBSTER COMPANY

3831 W. Lake Street
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Does This Strike Home?

(Continued from page 12)

ating expenses of \$580,000. Top figures for the country, but wait a bit. The 558 establishments have 610 proprietors and 126 full-time and 48 part-time workers, who receive \$120,000 annually and \$27,000 annually respectively. This means an average yearly wage of \$952.00 for the full-time employee and \$562.00 for the part-time man. How about the proprietors? Their operating expenses, 49%, are just a little higher than the average for the whole country: 47.6%, so you see with the greater number of men involved, their share is nothing to write home about.

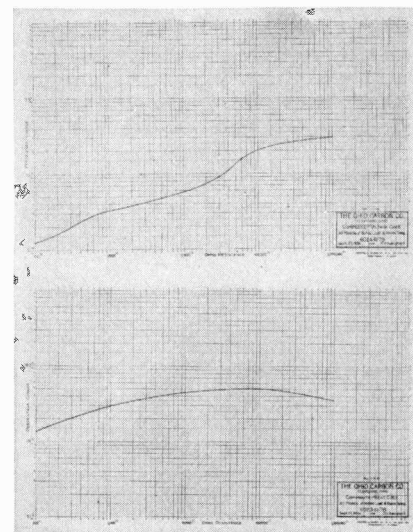
We could go on breaking down these figures—telling you about the wages of \$500.00 per year earned by the average full-time employee in both the Carolinas—about the operating expenses amounting to 56% and 57% in New Hampshire and New Jersey respectively—but space will not permit. And furthermore, we have told you enough to make you realize that "something's rotten in the state of servicing" (with due apologies to the Bard.)

Think this over. In the first few issues of SUCCESSFUL SERVICING we published a series of articles telling servicemen how they could run their businesses as they should be run, by installing a simple system of expenses, costs, and service charges. You will hear much more in the very near future. There is no getting away from the fact that the monies coming into the industry are not enough! Service charges must be increased to conform with operating expense! Profits must be realized on part sales!

Superhets

Rider's "Servicing Superheterodynes" still is a "best seller" in the radio text book field . . . This is the only volume which presents the complete up-to-date picture of superheterodyne receiver servicing . . . 288 pages . . . \$1.00 . . . Sold with a Money Back Guarantee . . . Buy it from your jobber. . . .

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Under each chart, a resumé of the test conditions is given so that you may know what should be reasonably expected of the resistors you buy. You should know the actual features of a resistor which determine not only its quality but its suitability for your particular problems.

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THE OHIO CARBON COMPANY
12508 Berea Road Cleveland, Ohio

Stewart-Warner R-138— Eliminating Hiss

Comparatively few broadcast stations transmit programs covering a range of frequencies between 30 and 10,000 cycles (the average is 100 to 5,000 cycles) and as the Model R-138 is said by the manufacturer to reproduce up to 13,000 cycles, the static, station hiss, station interference, etc., may prove annoying to some listeners. Although such noises can be eliminated by turning back the treble control, it is suggested that a circuit change be made and so eliminate this high-frequency interference permanently.

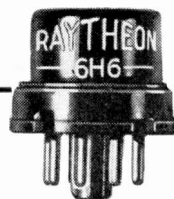
The following procedure is recommended:

Remove the four nuts holding the tone compensator can to the side of the chassis. You will note that four wires come from this can. Cut the green lead about an inch from the can and tape up the bare end sticking from the can to prevent possible short circuits. Disconnect the other end of the green lead from the grid terminal of the 6C5 tube. Connect a .1 mfd., 400 volt condenser part No. 83440, to the same grid terminal. You can get the condenser into place best if you point it to the front of the set and keep it as close to the socket as possible. Now connect a 6 inch length of wire to the plate terminal of the 6J7 socket. This socket is the corner one, and the plate terminal has a yellow wire connected to it, which runs to the tone compensator can. After this is done, replace the tone compensator can.

You now have one end of the condenser, and one end of the lead wire coming from the plate of the 6J7 still to be connected. These should both be soldered to the yellow and green wire coming from the tone compensator unit. The best way of making this connection is to strip away a small amount of the insulation at a convenient point in the yellow and green lead, and solder all three wires together.

This circuit change will eliminate all station hiss, extraneous crackling noises, and high frequency distortion introduced.

However, it will now be found that the treble control will now have much less effect than heretofore, since the higher tones have already been reduced.

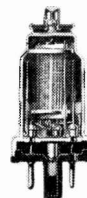


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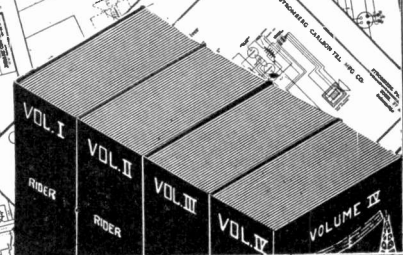
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Successful SERVICING



COUPLING IN I-F. AMPLIFIERS

A Discussion of the Methods Used in Modern Receivers

By JOHN F. RIDER

In the October issue of *SUCCESSFUL SERVICING* we discussed the ordinary two winding i-f. transformer with respect to the effect of a change in coupling on the form of the selectivity curve. The oscillograms showed how the band-width and gain depended upon the degree of coupling between primary and secondary windings. Three winding transformers are also being used by a number of manufacturers to control the selectivity and to obtain a selectivity curve, more nearly ideal. In this article we shall show how the basic principles are applied in the i-f. amplifiers of modern receivers.—EDITOR

A DIRECT application of the principles previously discussed, is made in the Zenith Stratosphere. That part of the receiver which concerns us is shown schematically in Fig. 1. As indicated by the conventional arrow, the coupling in the first and second i-f. transformers is continuously variable. We show this receiver as being representative of that

type which uses a mechanical variation of the coupling to accomplish a continuous variation of the selectivity. We suggest that you refer to *SUCCESSFUL SERVICING*, October, 1935, for the effect of various degrees of coupling on the gain and band-width. It should be noted that only the first two transformers are controlled, the response of the third i-f. transformer being sufficiently broad so that the sidebands are not appreciably attenuated.

The Wells-Gardner ODM is typical of the class of receivers which uses a switching arrangement to obtain various degrees of coupling in the i-f. amplifier. Referring to the partial schematic shown

in Fig. 2, it will be seen that a third winding is included in the first and second i-f. transformers. The primary and secondary are loosely coupled, while the auxiliary winding is closely coupled to the primary winding, the close degree of coupling being obtained by winding it underneath the primary. By means of the selectivity control switch, this third winding can be cut into or out of the circuit. Two values of coupling are provided. With the switch in the broad position, the third winding is part of the secondary tuned circuit and the effect is to produce a large value of cou-

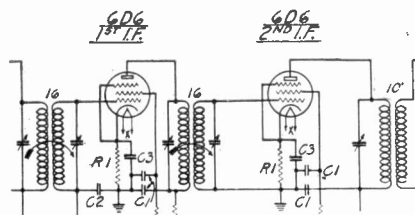


Fig. 1. Variable coupling in Zenith Stratosphere.

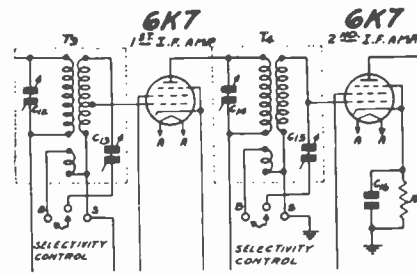


Fig. 2. Third winding in Wells-Gardner ODM.

pling between primary and secondary. With the switch in the sharp position, the third winding is free and the resultant coupling is loose; this results in a sharp selectivity characteristic. Figs. 3A and 4A in the October issue illustrate, in a general way, the frequency response for sharp and broad selectivity positions. The coupling in the second i-f. transformer is controlled in the same way and the two selectivity control switches are ganged to form the overall selectivity control.

A slightly different variation of the same principle is used in the Fairbanks-Morse 100. Reference to Fig. 3 shows that the secondary is composed of three

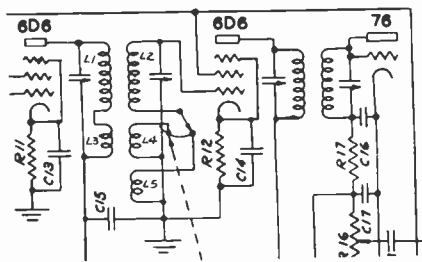


Fig. 3. Third winding in Fairbanks-Morse 100.

sections—L2, L4, and L5. L1 and L2 are loosely coupled to each other and constitute the major portion of the primary and secondary inductance respectively. L3 and L4 are tightly coupled, while the coupling between L5 and the primary is loose. With the switch in the broad position L5 is out of the circuit and the secondary winding consists of L2 and L4. Since L4 is closely coupled to L3, the coupling between the secondary and primary windings is sufficiently great so that a broad response is obtained. With the switch in the sharp position the closely coupled L4 is replaced by L5, which has the same inductance but is loosely coupled. Thus in this position the overall coupling between primary and secondary is low and hence the frequency response is sharp. The tuning is not disturbed when changing from the sharp to the broad selectivity position, because L4 and L5 have the same inductance.

A Different Type

Up to the present point we have limited our discussion to i-f. transformers wherein selectivity is a function of

the coupling between two tuned circuits. A type of three winding trans-

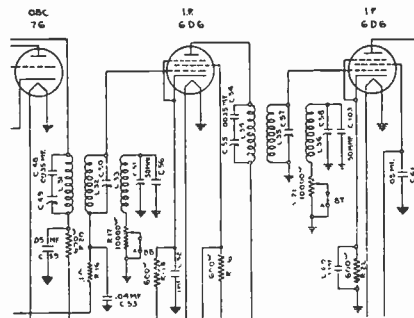


Fig. 4. I-F system in Stromberg-Carlson 70.

former in common use is shown in Fig. 4; this is a partial schematic of the Stromberg Carlson Model 70. Note that the first and second i-f. transformers consist of three tuned circuits. Transformers of this type operate in the following manner: The primary and secondary windings are loosely coupled while the tertiary winding is closely coupled to the secondary winding. When the resistance in series with the tertiary winding is greatest, the tertiary tuned circuit draws practically no current and consequently there is practically no reaction between it and the other windings. Thus the transformer operates as an ordinary loosely coupled two winding transformer to provide sharp selectivity and reduced band-width. In the maximum selectivity position, a switch operated by the selectivity or fidelity control, opens the tertiary tuned circuits completely. Now let us see what takes place as the resistance in the tertiary tuned circuit is decreased. This circuit, being tuned to the i-f. peak, acts as a load across the secondary winding, abstracts energy therefrom, and results in a broadened response. This effect is most pronounced, of course, when all resistance is out of the circuit, for then

a maximum current flows in the tertiary circuit and there is a maximum broadening of the frequency response.

The Philco 201 is another example of a receiver using three winding i-f. transformers, with a variable resistance in series with the tertiary winding to control the selectivity and band-width.

The three oscillograms in Fig. 5 indicate how the form of the selectivity curve changes with the magnitude of the resistance in the tertiary tuned circuit. Fig. 5A is the response of an amplifier employing two transformers of this three winding type and one closely coupled two winding i-f. transformer; this is for a maximum of resistance in the tertiary circuits. Fig. 5B is the response of the same i-f. amplifier with an intermediate value of resistance in the tertiary circuits. Note how the selectivity is broadened as against the sharp response of Fig. 5A. With no resistance in the tertiary circuits, the absorption of energy at the peak frequency results in the familiar dip and greatly increased band-width, as is shown in Fig. 5C.

While on the subject of three winding transformers, the function of the transformer used in the Atwater Kent 856, Fig. 6, is not to provide a control over the selectivity, but to make possible increased gain in the i-f. stage by stabilizing the amplifier. This, as can be seen from the schematic, is accomplished by using the third winding to feed back a portion of the voltage from the plate to the screen circuit in the correct phase to prevent any tendency toward oscillation.

In the oscillograms shown in last month's article we showed how the gain as well as the selectivity was dependent upon the degree of coupling. An example of how the former is applied can be seen by examining the schematic in Fig. 7. The volume control in this re-

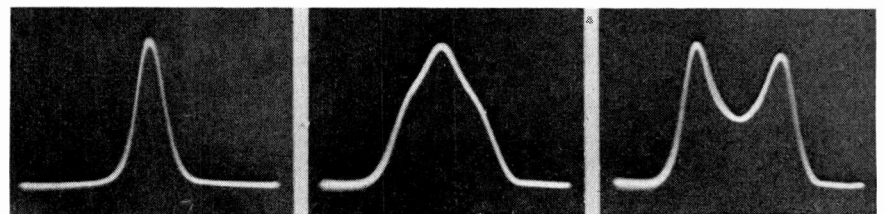


Fig. 5A.

Fig. 5B.

Fig. 5C.

The oscillograms are explained in the text.

Photographs by Successful Servicing Laboratory

ceiver is effected by mechanically varying the coupling between the primary

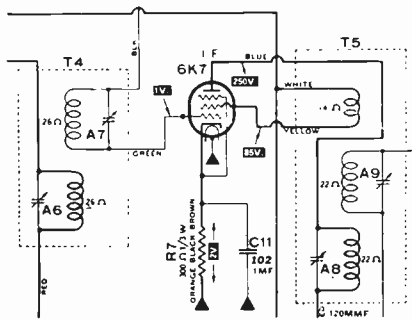


Fig. 6 (Above). Third winding in A-K 856.
Fig. 7 (Below). Variable coupling in Sears-Roebuck 1904.

and secondary of the last i-f. transformer. It should be noted that there is no appreciable change in selectivity with this arrangement since the coupling is at all times sufficiently loose so that there is negligible reaction between primary and secondary.

While on this subject we wish to emphasize the extreme importance of aligning receivers with the selectivity control in the maximum selectivity position. As pointed out in the article previously referred to, the reaction between primary and secondary, when large values of coupling are used, results in an interlocking of the trimmer adjustments, which makes it impossible to arrive at a satisfactory alignment unless special methods are used. But if the trimmers are adjusted with the coupling at a low value, then the alignment will remain correct as the coupling is increased to provide a broad response.

Emerson Models 38, 42, 49

These receivers which use the U6D chassis, shown on pages 5-3, 5-4 of

Rider's Manual, are identical. The Model 49 uses an 8-inch speaker. In the revised model U6D chassis a 5000-ohm voltage supply resistor replaces the 10,000-ohm resistor used in the earlier type. This change accounts for several discrepancies in the voltage table. The revised voltage table is shown herewith.

	Plate	Screen	Sup-pressor	Cath-ode
6D6 R.f.	75	45	0	3
6A7 Oscillator-Modulator	95	45	—	3
6D6 I.f.	95	95	3.5	3.5
75 A.f.	35	—	—	1
43 Output	90	93	—	11.5

The pilot light used is Mazda No. 40, 6-8 volts and .15 ampere, brown lead.

Voltage across field-115 volts, d.c.

Line voltage—117.5 volts a.c.

In connection with the early U6D chassis, page 5-3, the plate voltage of the 6A7 tube is given as 70 volts. This value refers to the oscillator anode voltage and not to the plate voltage. The plate voltage on the 6A7 tube is 100 volts.

Incidentally, the U-6 chassis is not the same as the U6D chassis. The U-6 chassis, also used in Models 38, 42, and 49, will be found on pages 6-9 and 6-10 of Rider's Volume VI.

WANTED—Early Issues

Every few days we receive requests for the early numbers of **VOLUME I of SUCCESSFUL SERVICING** and have to disappoint our readers, for these back issues have been completely distributed long ago. Also several public libraries have asked for a complete Volume I and they, too, have been given the same answer.

It was brought to our attention quite some time ago that in some cases more than one copy has been sent to the same person, which condition has been remedied of course, and we are asking now if some of you who have more than one copy of any issue will please send us these duplicates. You will be helping out some fellow servicemen. Thanks.

Atwater Kent 465Q, 655Q

If the receiver fails to operate over the entire band, with partially used "B" batteries, change R2, the present value of which is 10,000 ohms, to 5,000 ohms. Complete data for these models appear on pages 6-23 to 6-26 of Volume VI.

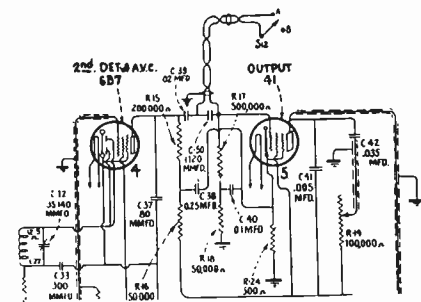
Dewald 803

Model 803 is the same as model 802, which is shown on page 5-17 of Rider's Volume V, with the exception that in the 802, band 2 covers 1.5 mc. to 4 mc., while in the 803 the range covered by band 2 is from 150 kc. to 400 kc.

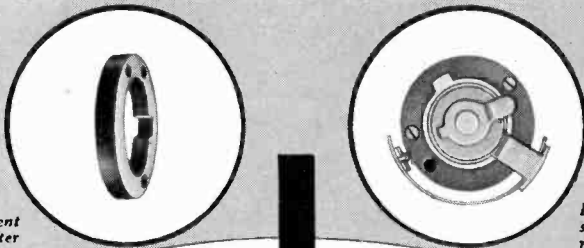
RCA Models 128 and 224—Late Production

The early production on this model is shown on pages 5-65 to 5-70 of Rider's Volume V. Later production on these models includes a fidelity change with band position. The accompanying illustration shows the revised circuit.

Note that there is an additional condenser, 1150 mmf., in series with the coupling condenser, C39. This condenser is shorted out on the broadcast band, but serves to reduce the bass response on the two short-wave bands. The switching is accomplished by means of additional contacts on range switch S2, which is the section nearest the front of the chassis. The additional data, which appears in Volume 5 pages 5-65 to 5-70, applies to both the early and the late models.



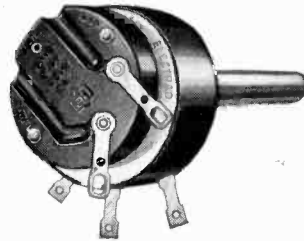
Late production of RCA-Victor 128 and 224.



Resistance element baked on flat outer rim of Bakelite ring

Floating contact shoe glides over resistance element in straight path

These Three Pictures



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When replacing the volume control, it is important that the 20,000 ohm resistor, indicated by arrow, be replaced by an Electrad wire-wound vitreous resistor of 10-watt rating. The carbon resistor used in this position causes faulty volume control operation due to change in value. Use Volume Control No. 298. Use 10-watt Vitreous Resistor, 20,000 ohms.

This control has been redesigned to provide an internal connection between terminals 1 and 2 and a properly tapered rheostat between terminals 2 and 3. This improvement greatly reduces possibility of noise and increases current carrying capacity of the control, insuring far more satisfactory operation.

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STEWART WARNER 950 AC ELECTRAD SPEC 298

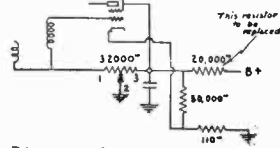


Diagram shows one of many special applications described in the ELECTRAD VOLUME CONTROL GUIDE. (See free offer below.)

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6 1/4" x 9 1/4"



Motorola 77, 77A, and 77AB

The following voltage data is in addition to the data on these models appearing on pages 4-11 to 4-13 of Rider's Volume IV.

No. 77							
	2nd R.F.	Auto-Dyne	1st I.F.	2nd Det.	L.A.	L.A.	
Ep	155 V.	160 V.	155 V.	155 V.	150 V.	175 V.	175 V.
Eg	A.V.C.	0	—	A.V.C.	1.5 V.	20 V.	20 V.
Es	75 V.	75 V.	75 V.	75 V.	0	155 V.	155 V.
Ef	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.
Ee	0	0	10 V.	0	0	0	0

Total B Current of set 49 mls. at 195 V. measured from -B to +B. Battery voltage 6.5 volts at Battery Terminal. Approximate voltages Motorola Model 77 Voltage Chart.

No. 77-A							
	1st R.F.	Auto-Dyne	1st I.F.	2nd I.F.	2nd Det.	12A5	12A5
Ep	195 V.	195 V.	195 V.	195 V.	50 V.	195 V.	195 V.
Eg	A.V.C.	0	A.V.C.	A.V.C.	1.5 V.	0	0
Es	75 V.	75 V.	75 V.	75 V.	0	195 V.	195 V.
Ef	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.
Ee	0	6 V.	L. DX. 5V.2V.	3 V.	1.5 V.	39 V.	39 V.

Total B current of set 56 mls. at 195 Volts. Battery Voltage 6.5 volts at battery terminals. Approximate Voltage Motorola Model 77-A Voltage Chart.

VOLTAGE-CURRENT CHART 77-AB

	1st R.F.	Auto-Dyne	1st I.F.	2nd Det.	2nd Audio	12A5	12A5
Ep	195 V.	195 V.	195 V.	35 V.	45 V.	195 V.	195 V.
Eg	A.V.C.	0	A.V.C.	A.V.C.	2 V.	0	0
Es	75 V.	75 V.	75 V.	0	0	195 V.	195 V.
Ef	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.	5.8 V.
Ee	0	8 V.	L. DX. 7V.2V.	0	A.V.C.	39 V.	39 V.

Total B Current of set 58 mls. at 195 volts. Battery Voltage 6.5 volts at battery terminals. Approximate voltages Motorola Model 77-A Series B Voltage Chart.

Arvin Model 35

The voltage data on page 5-13 is for chassis below serial number E31577H. Voltage data for Model 35 above serial E31577H is in Rider's Vol. VI.

Arvin Model 45

The voltage data shown on page 5-17 of your Rider's Manual is for chassis below serial number E40356L. For chassis above E40356L, see Vol. VI.

Successful SERVICING

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Vol. 2 November, 1935 No. 3

RACKETS

MUCH has been written about rackets run by servicemen. . . . Perhaps it is time that we talked about Mr. John Q. Public as a racketeer. . . . The devious subterfuges employed by the public to avoid payment of just debts are numerous—and the various methods employed to collect money—dishonestly—from those believed to be in a position to pay, likewise number very many.

Accordingly, it might be well to warn service organizations, that is, service establishments,—that they, too, are coming within the sucker classification. . . . As each day passes, one or more newspapers in different parts of the country contain some notice of litigation between a set owner and a service establishment—which, obviously, is an effort not to pay for services rendered or to collect on some fraudulent ground. . . . Such sharp practices have been perpetrated upon many other branches of business, which because of the nature of the business—cannot stand unfavorable publicity. . . . Vindication in the courts clears the case, but the sting of the publicity still manifests its effect. . . . To avoid unfavorable publicity and its bad reaction—concerns pay right through the nose. With this in mind, it might be well to set forth certain pertinent facts which may be of help in protecting

service organizations against such sharpers.

1. Never remove a radio receiver for service work from a home unless some member of the family is on the premises. . . . If the family is out and you have authorization to call on the superintendent and have him open the door—suggest another time to call—when someone is home.
2. When you furnish a receipt for a receiver which has been removed, identify the receiver by model and serial number of the chassis If the model number or serial number is not available, use some other number, invariably found upon the chassis or speaker, to identify the chassis. . . . Whatever it is—make certain that the identification is positive, so that there can be no argument concerning the identity of the receiver returned to the customer.
3. See to it that your own records concerning the service job are complete, showing the work done, parts used, etc., and that this record is clearly identified with the invoice rendered to the customer. The date of the repair, the name of the customer and the amount charged should be in your files for subsequent identification, if necessary.
4. When delivering a job, secure a receipt—not only for the delivery of the chassis or the complete receiver—but for the fact that the chassis and/or receiver were in good physical condition, identifying the unit returned by serial number or the form of identification, shown upon the receipt held by the customer.
5. If you do any service work in the customer's home—see to it that some member of the family is at home. . . . Do not work alone in the home or apartment.
6. Do not accept authorization for service work from a minor member of the family or from domestics employed by the household.

(Continued on page 14)

SERVICING—A BUSINESS

Certain well meaning, but perhaps misinformed individuals have been inflating the men engaged in the radio service industry with "professional" helium, and have accused us of being a "die-hard," because we have been deflating the industry of this gas. . . . We still insist that radio servicing is a business and not a profession! . . . Without intending to embark upon a discussion of definitions developed by good old Noah Webster, we suggest that when reading a definition—*all of the related synonyms also be read.* Therefore, we suggest that the full definitions of "trade," "craft," "vocation," "business," "occupation" and "profession" also be read so as to learn Webster's means of distinguishing between "profession" and "business." At the same time, it might be well to consider the mode in which the U. S. Government distinguishes between profession and business in connection with taxes. . . . If you check through *all* of these definitions and references—you will find that radio servicing is a business and NOT a profession.

There is no profession in which the buying and selling of merchandise is a daily activity. Such commercial elements as cash received, cash disbursements, purchases, sales, inventory, accounts receivable, fixed expenses, variable expenses, advertising, credit losses, competition, cut-price leaders, profit, loss, etc., are present in the daily activity of a radio service establishment and consequently establish radio servicing as being a business.

The service industry has spoken about cut-price artists, reduced profits because of low list prices upon tubes—the effect of net instead of list prices in jobber catalogues—identification cards to be presented to jobbers so as to secure the maximum discount, sale of replacement parts at cost, flat rate service charges, etc. . . . **ALL OF THESE ARE BUSINESS CONSIDERATIONS**—not considerations of a profession.

We have been accused of retarding progress and relegating service men into the "gutter," just because we advocate the recognition of radio servicing as a business, rather than as a profession—so that the men so engaged, will treat the activity in accordance with proper business tactics and thereby secure better financial incomes. Better incomes will provide the men who seek technical advancement with the funds they need to secure this knowledge—with the funds needed to purchase the most modern equipment year after year and enable men to live like human beings and have leisure time to study and enjoy life. . . .

If this is retarding the progress of the radio servicing industry—or if this is relegating radio service men into the "gutter"—then move over, Brother, and make room for us!



New RCA Piezo-Electric Calibrator, Stock No. 9572, \$29.95 net, complete with crystal, tube, power supply.

Check FREQUENCY with ACCURACY of 2 parts in a million

Ideal for individuals, service associations, laboratories, schools, factory test rooms.

NEW precision is brought within the reach of any radio worker by the new RCA Piezo-Electric Calibrator. With it you can check frequencies from 100 to 20,000 kilocycles in 100 kilocycle steps, and from 1000 to 50,000 kilocycles in 1000 kilocycle steps. Calibrator provides two fundamentals, 100 and 1000 kilocycles, and a series of strong harmonics.

A properly-ground and accurately-calibrated crystal maintains its

frequency more accurately than any other known device. Each calibrator is supplied with individual crystal calibration showing temperature at which made. This makes possible the most accurate work in radio service, testing and design work. Service associations and parts distributors should be particularly interested in this instrument, which could be made available to individuals as needed. Write for descriptive folder.



RCA PARTS DIVISION

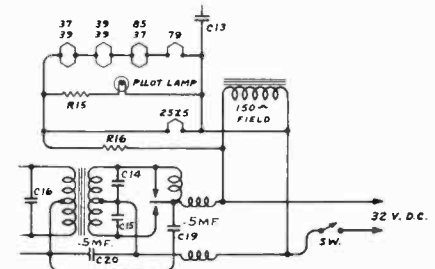
RCA MANUFACTURING COMPANY, INC., CAMDEN, NEW JERSEY

A SUBSIDIARY OF THE

RADIO CORPORATION OF AMERICA

Fairbanks-Morse 32 Volt Chassis Used In Models 816-840

This chassis is the same as that shown on page 5-13 of Rider's Manual with the exception of a few minor changes



Revision in Fairbanks-Morse 816-840.

in the power supply circuit, which are shown in the accompanying illustration. Two line filter condensers, C19 and C20 and two r-f chokes, in series with each leg feeding the vibrator, have been added. The two r-f. chokes in the heater supply circuit are not used in the 816-840. The voltage data, shown on page 5-14, remains unchanged.

Freed-Eisemann NR Models— Neutralization Procedure

In neutralizing these receivers it is important that the operation be carried out at a test frequency of 1200 kc. The test oscillator is connected to the antenna post and both receiver and oscillator tuned to 1200 kc. The last r-f. stage is, of course, neutralized first. Replace the last r-f. tube with a dummy tube having an open filament. Now adjust the neutralizing condenser associated with this stage so that the output is a minimum. Since a modulated signal is being fed to the set, an ordinary output meter can be used. In order to adjust the neutralizing condenser accurately, it is advisable to increase the output of the test oscillator.

However, the signal input should at all times be sufficiently low so that overloading does not take place. In the same way the neutralization of the remaining r-f. stages is effected, working forward from the detector to the antenna stage of the receiver.

Rolling REPORTER



OSCILLOGRAPHS:

Your reporter was amazed to learn from parts jobbers throughout the Mid-West that the sale of Cathode-Ray Oscillographs has reached proportions which exceeded their fondest expectations . . . several of them were kind enough to give credit for the increase to Rider's book, **THE CATHODE-RAY TUBE AT WORK** . . . they said the book made the instrument so *understandable* that Servicers who, in the normal course of events, would have postponed their purchases until they had grasped its mysteries, felt that, with the aid of the book, they were qualified to use it. Let's hope they weren't taking your Reporter for a "ride."

GAG OF THE MONTH DEP'T:

In Ohio (never mind what town) we saw a sign that sent us on a still hunt for further enlightenment. We discovered that a Servicer had quarreled with his wife—her aim with a flatiron was deadly—result, he went to the Hospital for a week. His wife, with a rare sense of humor, had posted a sign on the shop, which read—"CLOSED ON ACCOUNT OF ALTERCATION."

SQUELCH:

Quite a few readers of this alleged pillar of wisdom have written in to say that they liked last month's column, written by the young lady, who sits on my right, much better than anything your Reporter has ever submitted . . . she wants a raise now, and about the only thing the twelve letter writers can do to square themselves is to mail in to this department the sum of TWO BUCKS a month (we will kick in with the other buck) and make the little gal happy. (Aside to J. T. G.—I'm gonna take another trip soon, and my "Girl EVERY Day" will do another column, and mention your name.)

RIDER RIDES:

RIDER spoke to the Servicers of Cleveland on November 10th—his subject was **THE INFLUENCE OF THE CATHODE-RAY OSCILLOGRAPH ON SERVICING** . . . on November 12th, the Servicers of the Miami Valley caught H. E. Double L in Dayton—his subject there was "Establishing Proper Service Charges."

IRSM SHOW:

Random observations—Fred Horman and his zealous staff did a swell job—the turnout of exhibitors and Servicers exceeded any previous Show. . . . The lectures were of a high order. **SHOW PERSONALITIES:** The

two gentlemen from Indiana, "Bill" Garstang and Norman Keevers of Electronic Labs . . . Paul (Sylvania) Ellison, God's Gift to the Cigar Maker's Union . . . Dan (IRC) Fairbanks—with the smile that won't come off . . . Genial John Erwood of Webster-Chicago . . . H. E. (Centralabs) Osmun—all the way from Milwaukee for the Show . . . Art (Savior Faire) Moss of Electrad . . . Jack (Dapper Dan) Gertner of Arcturus. . . . The RCA triumvirate, Tom Joyce, Frank Stevens and George Allen . . . Charlie (Little Black Book) Golenpaul of Aerovox . . . Johnny (Clough-Brengle) Meck . . . "Doc" Arnold, hard working Prez of IRSM . . . Bruce (Supreme) Burlingame—Good Will Ambassador, Extraordinary. . . . O. H. Caldwell, Editor of **RADIO TODAY**. . . . Paul Smalley, Yaxley-Mallory Sales Genius in the East . . . W. C. (Solar) Harter . . . Sales Mogul Jenkins of Weston . . . Frank Sprayberry, Director of the Sprayberry School in Washington. . . . That muchly photographed Educator—J. E. Smith of NRI. . . . John Stern and Morris Green of Radio Electric Service—Philadelphia, who divulged plans for another Service Man Show in the Quaker City next March or April . . . Leon Adelman—Cornell-Dubilier Sales Head. . . . Charlie Corwin, who is guiding Raytheons' sales policies—and HOW. . . . your Reporter had to get down to the Bar at this point, and couldn't see anybody for the balance of the Show except four bartenders . . . Sorry, we didn't catch their names. (*Assoc. Editor's Note—Dinny and Mac were two; you called 'em all Bill.*)

THE MAIL BAG:

Berti & Sodini, Cicero, Ill: We like to know that you are "proud to possess the RIDER MANUALS" . . . we, in turn, point with pride to intelligent Servicers like yourselves who use the MANUALS. *Thomas L. Albright, San Francisco, Cal.:* Your letter had us "on the ropes"—really, we don't deserve ALL of the nice things you say about RIDER PUBLICATIONS . . . sorry your VOL. V. was stolen . . . the thief was discriminating, at least. . . . Sorry I haven't enuf space to publish your letter in full—it might do some of your fellow Servicers a lotta good to know that you have been repaid many times over for the cost of the SEVEN MANUALS you have purchased. *A. F. Martin, Rochester, N. Y.:* Glad you like **SUCCESSFUL SERVICING**—have you any suggestions as to how we could improve it? **RAYMOND WYMAN, MEDFORD, MASS.:** **WAS OUR ADVERTISING MANAGER'S FACE RED!** Your interest is muchly appreciated. *Robert Gobel, Tireau, New Zealand:* Copy of your letter has been forwarded to the manufacturers in question . . . glad the Servicers "down under" get a lotta benefit from our humble efforts . . . the **CATHODE-RAY TUBE AT WORK** should be in your jobbers hands by now.

FACT:

"Bankrupt" means literally, "To break the Bench." In olden times, in Italy, his money table or bench was broken to indicate that the money changer had failed in business.

Anybody Wanna Buy A Nice Strong Solid Steel Service Bench???

The Rolling Reporter

QUESTION:
What Low Priced Iron do most Servicemen Prefer?

ANSWER:

"ESICO"

To "efficiency-minded" servicemen, the chief attraction of the ESICO iron lies in its exceptional effectiveness under a variety of working conditions.



The ESICO SOLDERING IRON stays hot when you need it—and stays clean—after tinning—longer than any other iron now available. NICHROME V, used in the construction of the element, assures constant heat, prevents oxidation of the element and lasts longer. In addition, the cords don't fray! Ask your fellow servicemen—get the facts about ESICO—the iron that is *unconditionally guaranteed!*

- 55 Watt Nick Nack—
List Price \$1.10
- 65 Watt Midget—
List Price 1.75
- 85 Watt Junior—
List Price 2.75
- 150 Watt Trophy—
List Price 5.00

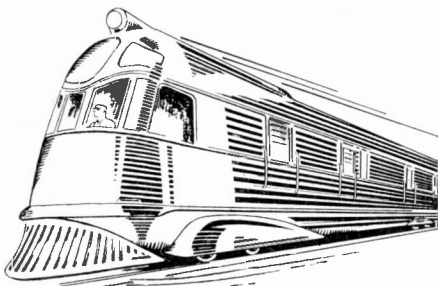


AVAILABLE AT ALL ESICO DISTRIBUTORS

Electric Soldering Iron Co., Inc.
342 West 14th St. New York City



Servicemen! . . .

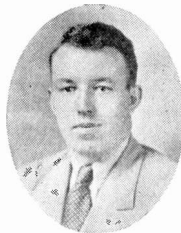


KEEP UP-TO-DATE!

At last—practical, how-to-do-it dope on EVERY phase of servicing. Designed NOT for beginners, but for men already in the service business, Sprayberry Training brings needed help—saves time—enables you to work more efficiently.

I don't claim to show you how to make "big money"—but I DO show how to handle all types of radio service work in a quick, practical way. Cathode Ray Oscillograph, AVC, All Wave, Short Wave, P. A., Auto Radio, etc., are but a few of the subjects covered. Also, I show step by step how to modernize old equipment, how to test by the various methods, etc. So modern that many revised lessons are just now coming off the press. The finest business investment you can make—at a price within reach of all. Investigate!

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Without cost or obligation, please send your booklet "PUTTING PROFITS AND EFFICIENCY INTO SERVICING."

Also send FREE information on your new publication "VOLTAGE TABLES FOR BROADCAST RECEIVERS" containing over 300 pages and 1500 tables giving complete voltage information on all types of broadcast receivers. A complete Service Manual priced at a fraction of the usual cost.

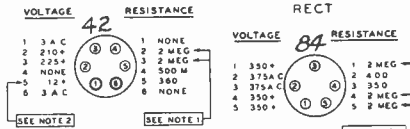
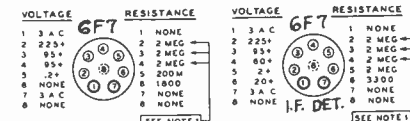
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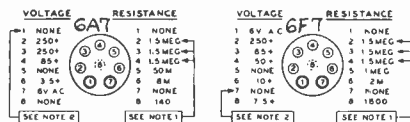
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Grunow Chassis 4A, 4B, 6A, 6C, 6D

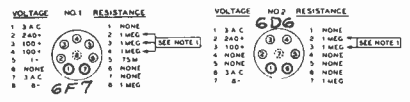
Voltage data and resistance readings for these chassis types are shown in the accompanying figures. Additional data



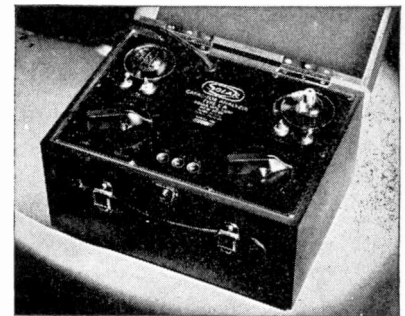
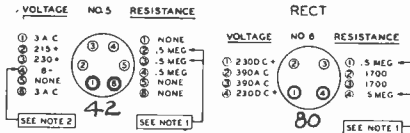
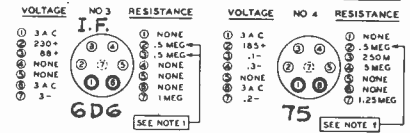
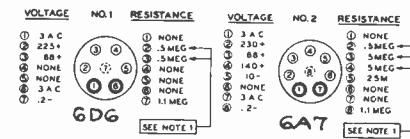
Voltage and resistance Model 4A.



Voltage and resistance Model 4B.



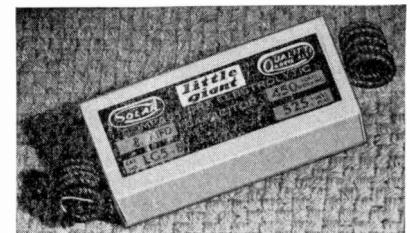
Voltage and resistance for Model 6A (above) and 6C (below).



TYPE CA-1 precision CAPACITOR ANALYZER

110 Volts — 60 Cycles

This really scientific instrument is a valuable accessory for laboratory and service use. It brings you the Wien Bridge method of capacity measurement; also measures leakage and indicates power factor, dielectric resistance. Compact, portable, and embodies strict accuracy, independent of line voltage variations. May also be used as a continuity meter for testing all types of circuits.



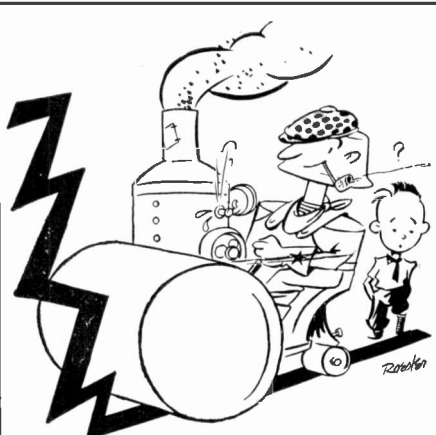
"little giants"

ULTRA-COMPACT ELECTROLYTIC CAPACITORS in Two Ratings 150 v.w. and 200 v.w.

For quick repairs—unbelievably small—with the efficiency and stamina of the famous SOLAR standard Dry Electrolytics. Low power factor, minimum leakage, immune to temperature and humidity even in the tropics! Minimum thickness enables them to fit anywhere.

Send for Complete Literature.

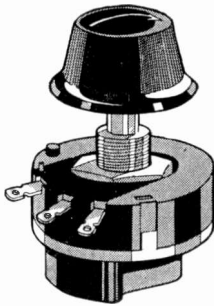
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"Smooth job-eh?"

Old Man CENTRALAB is at the wheel my fraand! Arch-enemy of noise . . . as smooth as an ambassador . . . he takes those noisy "sets" and presto: the customer pays with a smile. Thousands (yes thousands) of servicemen everywhere carry a small stock of CENTRALABS at all times . . . and they can service practically any job . . . better than ever before.

Centralab smoothness results from the patented Centralab non-rubbing contact whereby a strip of polished metal rocks on the resistor so that the only rubbing action is between an oil-less wood bearing and the polished metal.



Every Radio Service Man should be a member of the Institute of Radio Service Men

Centralab

MILWAUKEE, WIS.

SUPPRESSORS RADIOHMS
FIXED RESISTORS

Raytheon OZ4 Rectifier (Ionic Heated Cathode)

This new Raytheon Metal tube has no filament but operates through the ionization of a gas contained in the glass inner bulb. In basic principles the OZ4 is closely related to the early gas-filled rectifiers. The cathode of the new rectifier operates at an emitting temperature, thus permitting values of rectifier efficiency and voltage drop comparable to those found in a mercury vapor tube equipped with a filament.

The OZ4 was developed primarily for use in vibrator type B-supply units for automobile receivers. It has the typical characteristics of all gas-filled rectifiers, as regards a constant drop and ability to handle peak currents, and a tendency to generate r-f. noise. The r-f. noise may be eliminated by proper filtering and by connecting the metal shell to the point giving the best shielding. The shielding and filtering commonly used to eliminate vibrator noise will usually be sufficient.

The new rectifier has the same external form and dimensions as other tubes of the metal line. However, in this tube the metal shell serves chiefly as container and electrostatic shield for the glass bulb, which is required to insulate the contained gas from the grounded shell.

The operating conditions follow:

- D-C. Voltage Output 300 max. Volts
- D-C. Output current 30 min. ma.
75 max. ma.
- Peak Plate Current 200 max. ma.
- Starting Voltage 300 min. volts
- Voltage Drop (Dynamic) 24 avg. volts

It should be observed that the OZ4 has no filament and that the cathode is heated to a temperature at which emission takes place by means of ionic bombardment.

Distribution of this issue more than 15,000 copies.

NEW!

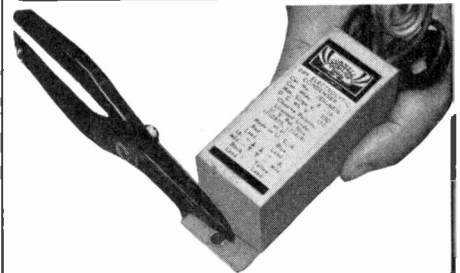


COMPACT STURDILY BUILT

These high formation electrolytic condensers were constructed to fill the multitude of electrolytic replacement requirements that arise in the servicing of AC-DC Midgets.

★ ★ ★ ★ ★
CONVENIENT

Handy — flanged — cardboard box with convenient long terminal leads coded for quick capacity identification. Flanges can be quickly snipped off with a pair of shears when not required. Small size makes for an easy and neat job. Overall length 3". Approximately 1/4" square.



TYPE	CAP	LIST PRICE
JEH-6404	4-4	\$.85
JEH-6408	4-8	.95
JEH-6808	8-8	1.20
JEH-6416	4-16	1.25
JEH-6816	8-16	1.35

Send in your reservations today. Available at all Cornell-Dubilier authorized distributors.

Did you get your copy of the latest Cornell-Dubilier Catalog? It is free for the asking.

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10,000 LEADING SERVICEMEN

will graduate from the

Radiart

Correspondence School Course in

"THEORY, DESIGN and PRACTICAL SERVICING of AUTO RADIOS"

Radiart

SHOWS THE WAY IN ACTIVE COOPERATION WITH THE SERVICE MAN AS IT DOES IN THE REPLACEMENT VIBRATOR FIELD.

Radiart

The ORIGINAL Replacement Vibrator

The Radiart Corporation
Shaw Ave. at E. 133rd St.
Cleveland, Ohio

Sears Model 1850, 1851, 1861, 1868, 1870.

The i-f. peak of these models, the data for which appears on pages 5-41 and 5-42 of Rider's Volume V, is 175 kc. This is incorrectly listed as 480 kc. Please make this change in your manual.

Is the Oscillator Functioning?

If a preliminary analysis of a "dead" superheterodyne shows that the operating conditions are apparently correct, it is worthwhile procedure to make sure that the oscillator is oscillating. This check should be made especially in those cases where the sensitivity of the i-f. amplifier is normal, as shown by feeding a signal into the grid of the first detector and checking the output.

A quick way to check the oscillator output is to pick up the oscillator signal in another receiver. For example, with the "dead" set tuned to 600 kc. the oscillator should be generating a 1050 kc. signal, assuming that the i-f. peak is 450 kc. In general the oscillator should be operating at a frequency higher than the dial frequency by an amount equal to the intermediate frequency. Thus it is only necessary to tune another receiver, which is known to be in good operating condition, to the frequency at which the oscillator should be working and the signal should be picked up in this neighborhood. However, it is necessary to use a tuning meter as an indicator, since the oscillator signal is not modulated. If the receiver is equipped with a beat oscillator, then this can be used to indicate the presence of the oscillator signal, a beat note being produced as the oscillator frequency is passed. A piece of wire placed in the vicinity of the oscillator tube, will give ample pickup to the receiver.

"Servicing Superheterodynes"

By John F. Rider

288 Pages

Price \$1.00

"YOUR NEW BOOK HAS PUT MONEY IN MY POCKET!"



FREE!
Send for Your Copy Today

● Servicemen write us that Sylvania's new volume of Service Hints can't be beat. Send for your FREE copy today.

Sylvania's new book Service Hints contains practical servicing tips that have been gathered from successful servicemen all over the country.

You get the benefit of their years of experience when you tackle tough problems. It gives you the easiest solution to everyday problems. These and hundreds of other up-to-the-minute service tips are contained in Sylvania's new book Service Hints. Send for this valuable book today, and put yourself in line for more and better service jobs with bigger profits.

Get the inside dope on receiver troubles. Iron out your problems. Right now . . . fill out this coupon and send it to the Hygrade Sylvania Corporation. The New Volume of Service Hints will be sent you within a few days.

Hygrade Sylvania Corporation, makers of Sylvania Radio Tubes and Hygrade Lamps. Factories at Emporium, Pa., Salem, Mass., and St. Mary's, Pa.

SYLVANIA

(Reg. U.S. Pat. Off.)
The Set-Tested Radio Tube

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Emporium, Pa.	
Please send me free, without obligation, Volume 2 of Sylvania's "Service Hints."	
Experimenter <input type="checkbox"/>	Amateur <input type="checkbox"/>
Service man <input type="checkbox"/>	Employed by dealer <input type="checkbox"/>
Independent <input type="checkbox"/>	Member Service Organization.....
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CITY..... STATE.....	
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Exact Duplicate REPLACEMENT CONDENSERS

When owners insist on restoring set to original factory status with precisely matched replacements . . . when service jobs must "stay put" . . . when you really think of profits—you simply must have AEROVOX Exact Duplicate Replacements.



Exact physical dimensions and design of initial set equipment, but with service-plus quality which AEROVOX label denotes.

Widest variety of cardboard and cartridge electrolytic replacements.

Standard and special types of metal-can elec-

trolytics for any replacement need.

Single and multiple sections . . . condenser filter banks . . . by-pass groups.

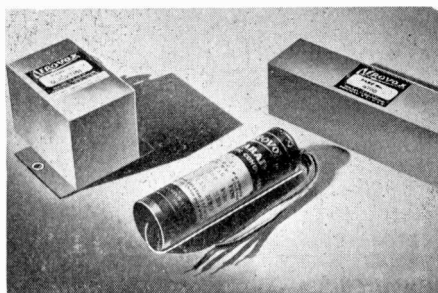
AEROVOX has it in stock . . . or can make it for you.



NEW CATALOG Just issued. Contains four pages of exact duplicate replacement electrolytics. Also complete line of condensers and resistors. Copy on request. Meanwhile, meet your local AEROVOX jobber.

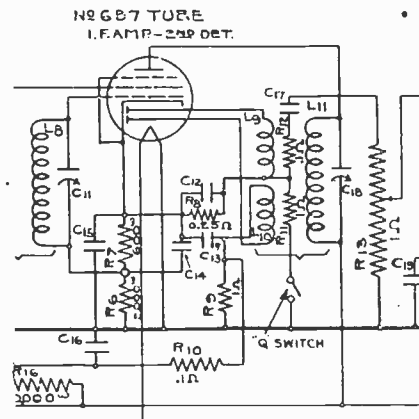


CORPORATION
76 Washington St. Brooklyn, N. Y.



Stromberg Carlson 33 and 33A

These receivers are equipped with a "Q" circuit, which automatically cuts off the signal when the signal strength decreases below the average open country noise level. The circuit arrangement which is shown in the accompanying figure, functions as follows: When the "Q" switch is closed, the circuit functions because of the delay voltage in the audio diode circuit. This delay voltage is the voltage drop across the resistor R8, which in series with R9 forms a voltage divider across the cathode bias voltage. The model 33, shown on pages 1-1 to 1-9 of Volume I of Rider's Specialized Auto Manual and on pages 4-3

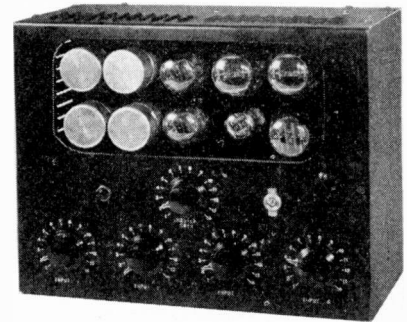


"Q" control in Stromberg 33-A.

to 4-6 of Volume IV, does not contain this "Q" switch. It can be installed on the 33 models by disconnecting the grounded end of R11 and connecting it to ground through a single pole-single throw switch, as shown in the accompanying circuit. With the "Q" switch open there will be an increase in the sensitivity of the receiver and at the same time a corresponding increase in the interstation noise. Installation of this switch in the 33 models will be of greater value in sections of the country where the general prevailing signal strength is low, and an increase in sensitivity is desirable.

Another Goes Oscillographic

The latest General Electric Co. servicing data shows alignment oscillograms. RCA and G.E. are among the first to do this. Who next will give servicemen similar valuable data?



Announcing Four Position 17-Watt Amplifier . . . Another NEW! Webster-Chicago Product

WEBSTER-CHICAGO engineers have recently developed two new sound units that every service man should know about . . . if only to keep posted on the latest advancements in the sound field.

Four-Position 17-Watt Amplifier

One of the new units is the 4-Position 17-Watt Amplifier illustrated. Suitable for four crystal microphones or three crystal microphones and one phono. input. High gain. No pre-amplifier required. Output impedance is tapped from 2 to 500 ohms. Self-contained. For multiple microphone and public address installations.

HG-417 4-Stage Amplifier

For crystal microphone or phono-graph. 17 watts output. Field excitation for two dynamic speakers. Tapped output transformer. Fader control system. Speaker and microphone connections terminate in polarized plugs. Tubes, 1 6C6, 1 53, 3 2A5's, 1 5Z3. General public address work and party call systems. Self-contained. Completely enclosed.

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Webster-Chicago sound equipment is made in a complete line. Ask for Bulletins or Catalog.

THE WEBSTER COMPANY

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A Swell Idea

During the last public Radio Show held in Philadelphia, the Philadelphia Radio Service Men's Association maintained a booth for the purpose of acquainting the Public with the completeness of the service rendered by members of the Association. As an attention-getter a Cathode-Ray Oscillograph was installed, connected up with a "mike" which fed a phonograph oscillator, the output of which fed the oscillograph.

Thousands of prospective customers filed by—speaking, singing and whistling into the "mike," in order to "see" their voices on the screen of the Cathode-Ray Tube.

Also displayed was a Model Service Bench, completely equipped. The Philadelphia Servicers really merchandise their business.

Bosch Model 79C

The parts list for this model on page 5-10 of Rider's Manual incorrectly lists the color coding for part No. 105279. The dot should be yellow instead of orange.

Sears 7045, 7046, 7047

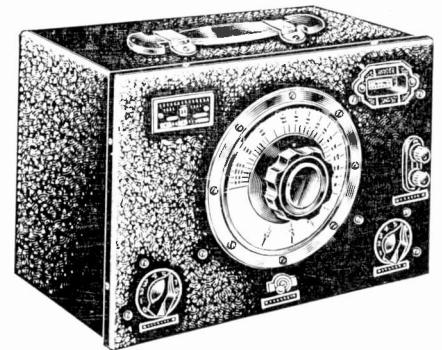
These are the same as the models 7043 and 7044, which are shown on pages 5-51 and 5-52 of Rider's Volume V.

Grunow Models 660, 661, 662— Chassis Type 6C, 6CW, 6CX and 6CZ

The value of the tone control resistance is 200,000 ohms. Make this notation on the schematic shown on page 5-10 of Rider's Manual. The W, X, and Z designations refer to the type of power transformer supplied.

The difference between Profit and Loss is a measure of your business ability.

C-B Equipment for all Cathode-Ray Applications



Beat-Note Audio Oscillator

MODEL 79—A necessary companion to the Cathode-ray Oscillograph now offered at a new low price. Continuously variable 50 to 10,000 cycles. High voltage output at 5,000-ohm load. Pure sine wave. Low distortion content. Constant output voltage. Zero-beat indicator and adjustment. Operates from 110-volt 60-cycle. Net price, complete with six tubes.....\$51.90

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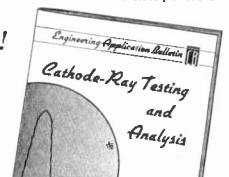
MODEL OM — All-wave continuously variable from 85 k.c. to 30 m.c. Built-in fixed-sweep frequency modulator provides calibrated selectivity curve images with any standard oscilloscope. May be used as standard oscillator if desired. 1/2 of 1% frequency accuracy on direct-reading chart or hand drawn 11" x 17" calibration curves. Net, complete with tubes.....\$57.75

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MODEL CRA—Cathode-ray Oscilloscope with built-in amplifier and power supply. Highest input sensitivity of any standard design. Portable for field or laboratory use. New simplified controls. Write for new booklet "Cathode-Ray Test and Analysis" outlining application procedure of this instrument to service, broadcasting, and industrial fields. Complete with 3" Cathode-ray and all other tubes, net\$84.50

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NEW YORK, N. Y.—The almost overnight growth in popularity of all-metal tubes has made the service man an indispensable factor in the maintenance of radio reception.

The service man in turn must depend upon test instruments and service equipment as never before. The Radio Technician turns to a different manufacturer for each make of set, in order to secure schematic diagrams and service hints; but when it comes to problems involving the function of tubes in the radio circuit (no matter what standard type) he may submit his questions to the HEADQUARTERS for Tube Information.

Raytheon recognizes the radio service man's importance and is making every effort to cooperate: If you need up-to-date test instruments and efficient servicing equipment send for the Raytheon Broadside. It explains in detail how you can get them in tube deals. It's free!

The 8th Edition Tube Chart including characteristics of "G" type and all-metal tubes is just off the press. A postal card will bring it to you.

Tube Talks (including Tube Complements with over 2,000 standard models) a big loose-leaf book is available at 50¢* (*this includes free service supplements to be issued periodically.)

Finally if you have any tube problems or questions write to the nearest address below.

HEADQUARTERS FOR TUBE INFORMATION
Raytheon Production Corporation

30 East 42nd Street, New York, N. Y.
55 Chapel Street, Newton, Massachusetts
445 Lake Shore Drive, Chicago, Illinois
100 Howard Street, San Francisco, Calif.

(Continued from page 5)

7. Do not—in a moment of generosity or because you feel that a change would result in better performance—make any unauthorized changes in a radio receiver or other unit being serviced.
8. Contract work should be carried out in accordance with a contract, duly signed and not as a result of a verbal agreement, unless some other person known to you is present during the discussions. . . . A signed agreement is by all means preferred.
9. If you have agreed to use certain specified parts, do not change the brand or manufacture of these parts without first securing the approval of the customer, unless your agreement states "or the equivalent."
10. When doing contract work or presenting a contract, do not take for granted that certain things are understood. . . . Nothing is understood!—that is why a contract is made. . . . State all facts and conditions.
11. When making out a contract, remember that it must be equitable in order that it stand the test of litigation.
12. Parts which have been replaced in a radio receiver should not be thrown away. If they are not returned to the customer, they should be kept for a period of thirty days after the repair has been completed and then disposed of. Statement of these conditions should be made upon the estimate rendered or upon the invoice, so that if the customer decides that he wants the parts replaced, he can call for their delivery within 30 days of the repair.
13. Be painstakingly careful when working in the customer's home—not to overload the power line and thereby possibly blow a fuse. . . . Many subsequent claims, entirely unjust, have been made on the basis of such a trivial incident.
14. When working in the customer's home, be extremely careful of the finish of the furniture. If called

(Continued on page 15)

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THE CATHODE-RAY TUBE AT WORK

By JOHN F. RIDER

The cathode-ray tube oscillograph is destined to become the most universally used testing device in the radio servicing field. Servicemen who are using this instrument tell us they have speeded up their production—especially with the aid of Rider's book, which gives them the essential information they need in the form of easily understood explanations of all parts of the oscillograph and how it is used on the test bench.

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SERVICING SUPERHETERODYNES

By JOHN F. RIDER

No other circuit in the radio field has undergone all the changes that have been incorporated in the superheterodyne. In order to service superhets with a profitable speed you must be able to analyze the different portions of the circuit quickly and this is just what Rider tells you how to do in this book. Thousands of servicemen are using "Servicing Superheterodynes" and have found the investment one that paid dividends in increased profits.

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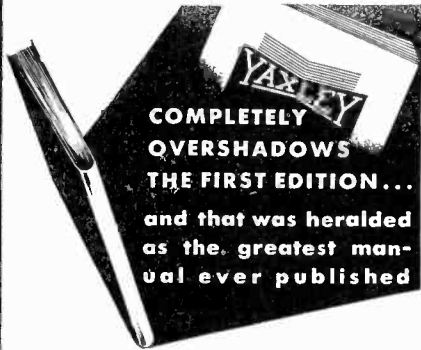
John F. Rider
PUBLISHER

1440 Broadway
New York City

The
YAXLEY

1936

**Replacement Volume
Control Manual**



**COMPLETELY
OVERSHADOWS
THE FIRST EDITION...
and that was heralded
as the greatest man-
ual ever published**

YOU'LL want a copy of the latest and greatest edition of the Yaxley Replacement Volume Control Manual.

Twenty-four months were devoted to its production.

Five radio service engineers—specially trained for the task—compiled, checked and re-checked the data that makes it the most complete and comprehensive manual of its kind ever offered to you by anyone.

Its preparation took plenty of time and plenty of work. And it will *save* you plenty of time, plenty of money, and plenty of grief.

The 1936 Yaxley Replacement Volume Control Manual lists more set models than any other. It provides more factual data. It contains a complete catalog of Yaxley approved radio products. No service man can well afford to do without it. It's complete—authoritative—up-to-date! And it's free.

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YAXLEY MANUFACTURING DIVISION
of P. R. Mallory & Co., Inc.
Indianapolis, Indiana
Cable Address: PELMALLO

(Continued from page 14)

upon to move cabinets containing glass ware, try to convince someone in the home to move such articles—if at all possible. Secure permission to move the cabinet and have someone connected with the household help you—even if only to hold the cabinet steady while you do the heavy work.

15. If as a result of an accident you damage the customer's property, make a note of the damage upon the invoice and arrange to settle costs, then and there.

These are precautionary measures intended to safeguard against milking of the radio service station operator by customers with phoney inclinations. . . . Some of them are the result of observations and others represent subject matter discussed at litigations. . . . Some may appear foolish upon the surface—but since there must always be a first time to everything—application of that old adage "An ounce of prevention is worth a pound of cure," is forever justified. . . . It is true that the service industry does not present a very lucrative market to the people who live by their wits—but even the poorest man is on the spot, when his reputation is in jeopardy. . . . Close the barn door before the horse is stolen. . . . Be on your guard!

JOHN F. RIDER

**Motorola Ear-Level Speakers for
1936 Cars**

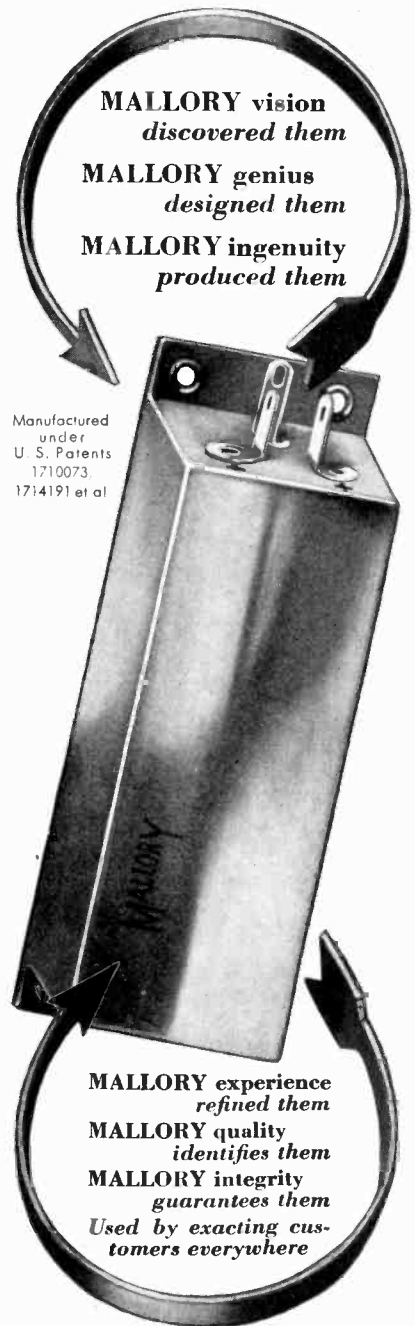
The ear-level or roof type speaker for General Motors cars is provided with a basket that allows for mounting it to the speaker bracket built into these cars in the front center of the roof. When using an ear-level speaker with the Motorola Model 79 set in General Motors cars, it will be necessary to use a blank front cover (part No. 1366-TC) on the set, such as is used with the No. F-75 set for Fords. Since the tone control is omitted from the M-33 control head, provision is made for it in the front cover.

In the 1936 Ford car it is necessary to drop the header bar and mount the speaker over the 5-inch speaker opening punched in the header bar.

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MALLORY
**DRY ELECTROLYTIC
CAPACITORS**

FOR RADIO AND INDUSTRIAL FIELDS

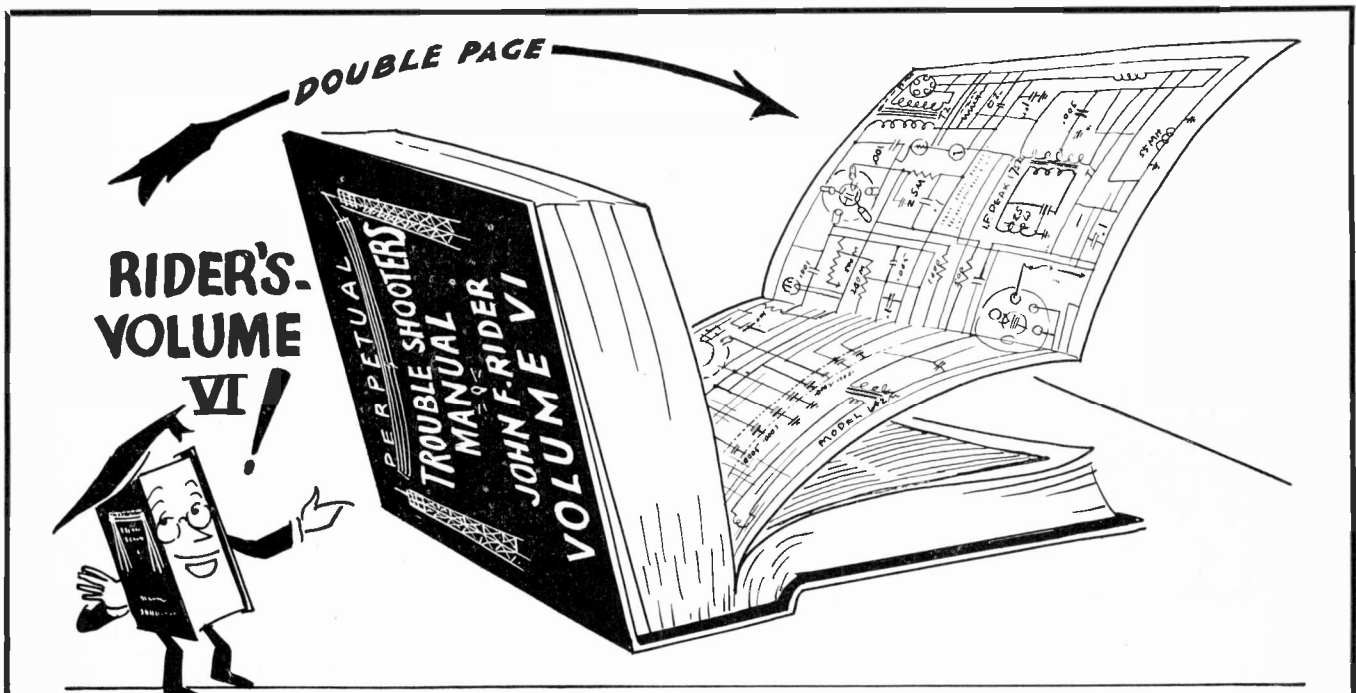


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VOLUME VI HAS

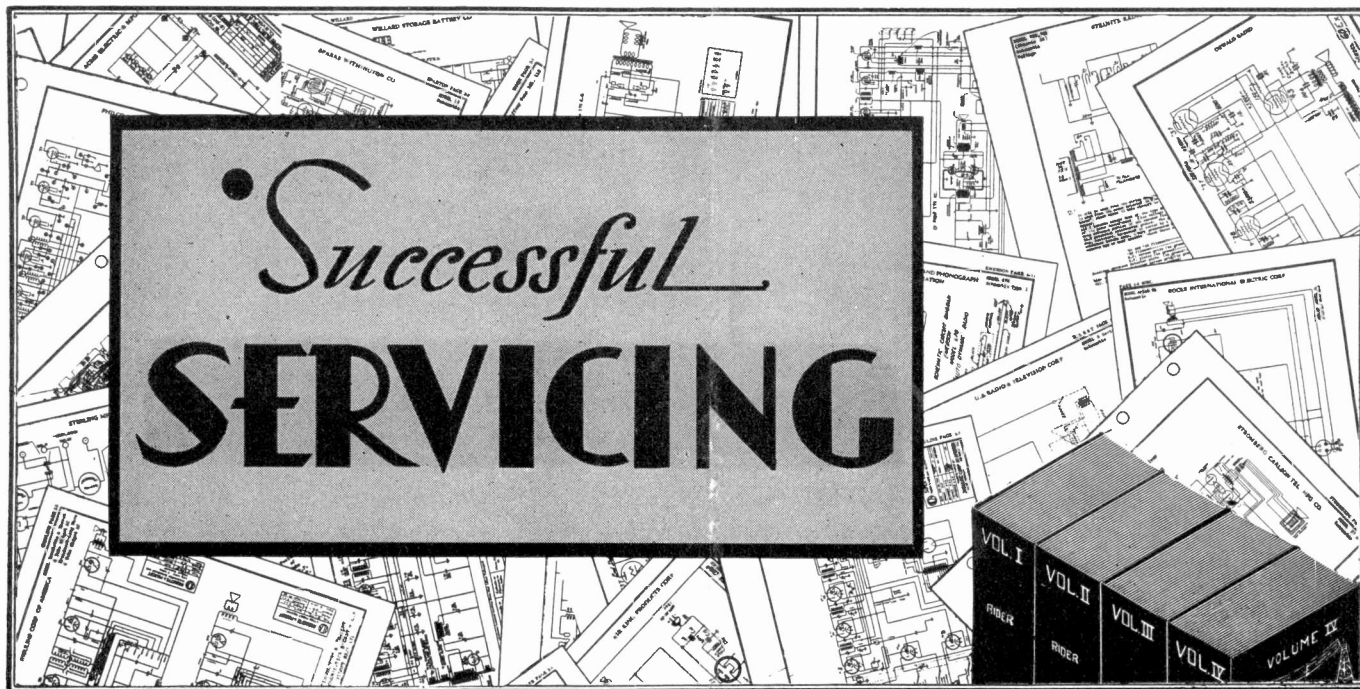
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1936?

Will 1936 Show an Improvement Over 1935?

By JOHN F. RIDER

1935 is over and we are heading towards a new year . . . What now? . . . Will 1936 show an improvement over 1935—or will it be just another year for the servicing industry? . . . Space being at a premium, we shall refrain from reviewing what has happened and speak about what the future holds in store . . . Of course, not what will necessarily happen—that is in the lap of the gods plus the ambition of the service man.

BUSINESS

We feel confident, being naturally optimistic, that many service establishments will be on a paying basis beginning with 1936—because many hundreds of men have pledged themselves to run their service concerns according to the principles of sound business. It is true that speaking in hundreds represents but a small portion of the entire industry—but many thousands of men are interested—and progress begins with the

minority, usually a very small minority. . . . Those who prosper—and there will be many—will force the hands of the majority.

DEALER COMPETITION

More and more radio set dealers are establishing service departments. Some of these are placing their service departments upon a paying basis—but very many are again operating in the manner identical to that which existed during 1923 to 1926—when service was considered a necessary evil and was never expected to pay out. This group allot a certain portion of their servicing expense to their total sales of receivers and act accordingly. . . . However, the fact remains that the established independent service concern is being subjected to more and more competition each day. . . .

To start with, the set dealer has a definite advantage over the independent service man. . . . The set dealer is established. . . . The set owner finds it much simpler to call on his dealer when

service is needed than upon an independent service concern, if only because he is more familiar with the set dealer since he purchased the receiver from that concern. Furthermore, the set dealer is invariably in a better location—one which is more frequently seen by the potential customer. The set dealer can afford greater advertising because his financial condition, while not necessarily the best, is still better than that of the average service station. . . . It is generally assumed that the set dealer is more reliable—if only because the quarters he occupies are more pretentious. . . . To combat such competition—the service establishment must be put upon a paying basis, so that it will have the funds needed for competition. Furthermore, the service station must have the desire to compete.

Unless service men have both the desire to compete and cultivate the ability of competing properly, as based upon sound business principles, they will lose more and more service business to the set dealer.

Set dealers have watched the growth of service activity. . . Today they are displaying envy. . . They realize the tube sale competition which service men present. They realize that the ultimate destination of a profitably run service shop is a set-dealership. The present set dealer is not going to sit by idly and watch the service shop grow into formidable competition. . . What will the service men do? . . . Relax in a glory which is not there? . . . Stand idly by and witness business dollars taken away from them under their very noses? . . . Be content to see the size of their business and the number of their customers dwindle day by day? . . . Not if they have any gumption and the ambition to succeed.

The independent service man came into existence because of three conditions. One of these was that the set dealer, during the early days of radio, did not render proper service. The second reason was that there was a definite place for the independent service man because there were many localities throughout the United States where set dealers could not deliver proper service, inasmuch as the receivers were located at points far distant from the dealer's service shop. The third reason was that in very many cases the dealer was primarily concerned with the sale of the receiver and he was not interested in the position which service occupies as a part of merchandising effort.

Today, however, the set dealer has been educated to appreciate the significance and value of service as a part of merchandising effort. Today the set dealer feels that he can make servicing pay, or at least he knows how to employ servicing so that it is not a loss. . . Will the servicing industry sit by and watch the set dealer grab back that which he originally cast off as being undesirable? . . . It is true that there will never be a total elimination of the independent service men, but if servicing is going to gravitate back to the set dealer, the number of service men who will remain as independent radio service operators will be so few as to be of very little, if any, significance as a factor in the servicing of radio receivers. Furthermore, the income of these men will be very definitely limited, because their

locations will be such as to minimize the number of receivers which will come into their hands and the possible income. As a matter of fact, we hazard the statement that if any such condition develops, the possible business which will accrue to the independent service stations will be so little as to prohibit full-time operation and dependence upon the income of this operation for their livelihood.

THE "GYP"

We hear a lot about the "gyp". Why waste a lot of time talking about and identifying this type of service man? . . . Would it not be so much better if the men who were engaged in radio servicing as a means of earning a livelihood devoted the same amount of effort to the betterment of the industry and to improvement of financial income by having each man do his share to make his business a profitable enterprise without worrying about what the so-called "gyp" is doing? . . . We have attended a number of service meetings and we have watched many precious minutes wasted in arguing about "gyp" tactics. Those precious minutes could have been devoted to far more enterprising and lucrative forms of discussion. Such discussions of personalities harbour antagonism and really serve no purpose because they will never correct the condition. Rectification of a problem of this type is accomplished solely by education—by illustrating that the proper method of operation is by far more profitable. This is not assuming a pacifistic attitude. . . It is the more sensible attitude.

AUTO RADIO

It has come to our attention during several trips, that radio service men in a large number of communities refuse to service auto radio receivers. It appears as if the general attitude is that prevailing service prices do not allow profitable servicing of auto radio receivers. From this angle alone the attitude assumed by these service men is laudable. However, auto radio receivers must be serviced. . . Some one will have to service these radio units. We believe that a far better plan during 1936 will be to sell the set owner

on the idea of paying a proper fee rather than to dispose of the matter by simply refusing to repair the receiver—that is salesmanship!

From information we can gather, service men feel that they are entitled to a certain charge for removing the receiver from the car. . . They further feel that they are entitled to another charge for the inspection and analysis of the receiver and that they are entitled to a third charge, over and above whatever labor is involved in making the actual repair, when the receiver is again installed in the automobile. As a general rule these three charges approximate \$1.50 for each operation, which means that the repair of an auto receiver involves approximately \$8.00 to \$10.00.

In our estimation this fee is not exorbitant. Considering the nature of the receiver and its usual inaccessibility, it is impossible to make any test without removing the receiver from the car. . . Of course, the tubes can be tested without the receiver itself being removed from the automobile. It is perhaps true that the ratio of service charge to the original cost of the receiver is greater in an auto radio installation than in a home receiver of equivalent list price. That is natural because, servicing of an auto receiver is much more difficult.

There has been some talk about the responsibility which a radio service station assumes when they make a radio installation in a car and make a short run in the car in order to test the receiver. It seems as if car owners have placed the blame for certain accidents upon the installation of the radio receiver and held the service shop responsible for the accident, because it occurred during the time that the installation was being checked. One such incident, which came to our attention, was a crash due to faulty brake operation. The owner of the car claimed that the brakes were originally intact, but had been tampered with by the service men. It is imperative that responsibility be definitely settled in connection with the consequences of bonding operations, the cleaning of brakes, the installation of hub springs and other alterations or additions, which are made in order to assure a satisfactory installation.

Another Year . . . Another Volume

Rider's Volume VI is off the press! That's news—*real news*—to thousands of servicemen throughout the world.

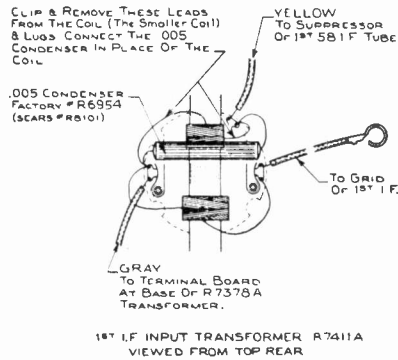
Once again Rider has prepared for the servicing industry a Manual that is even above the high standard of those which have been published previously. Every year thought has been given to improving the Manuals, so that they will do more for the serviceman than preceding volumes. And it is believed that this new Volume VI will reflect all the time and thought that have been expended in its making.

Take the matter of the double-page spreads. Examine these pages . . . note the clarity of the values of the parts . . . how easy it is to trace out the various complicated circuits. And then imagine how utterly confusing it would be if this large schematic were reduced to fit

(Please turn to page 12)

Silvertone 1650

The selectivity of this set can be improved by disconnecting the two leads to the small choke coil in the 1st i-f. circuit and inserting in its stead a 0.005-mf. fixed condenser. (This choke coil is in parallel with the 20,000-ohm re-



Substituting a condenser for the choke in the i-f. amplifier improves selectivity of Model 1650.

sistor in the input circuit of the 58 i-f. tube. See *Rider's Volume VI*, Sears page 6-7.) After this substitution, the i-f. stages must be re-aligned with an oscillator. This re-balancing is very

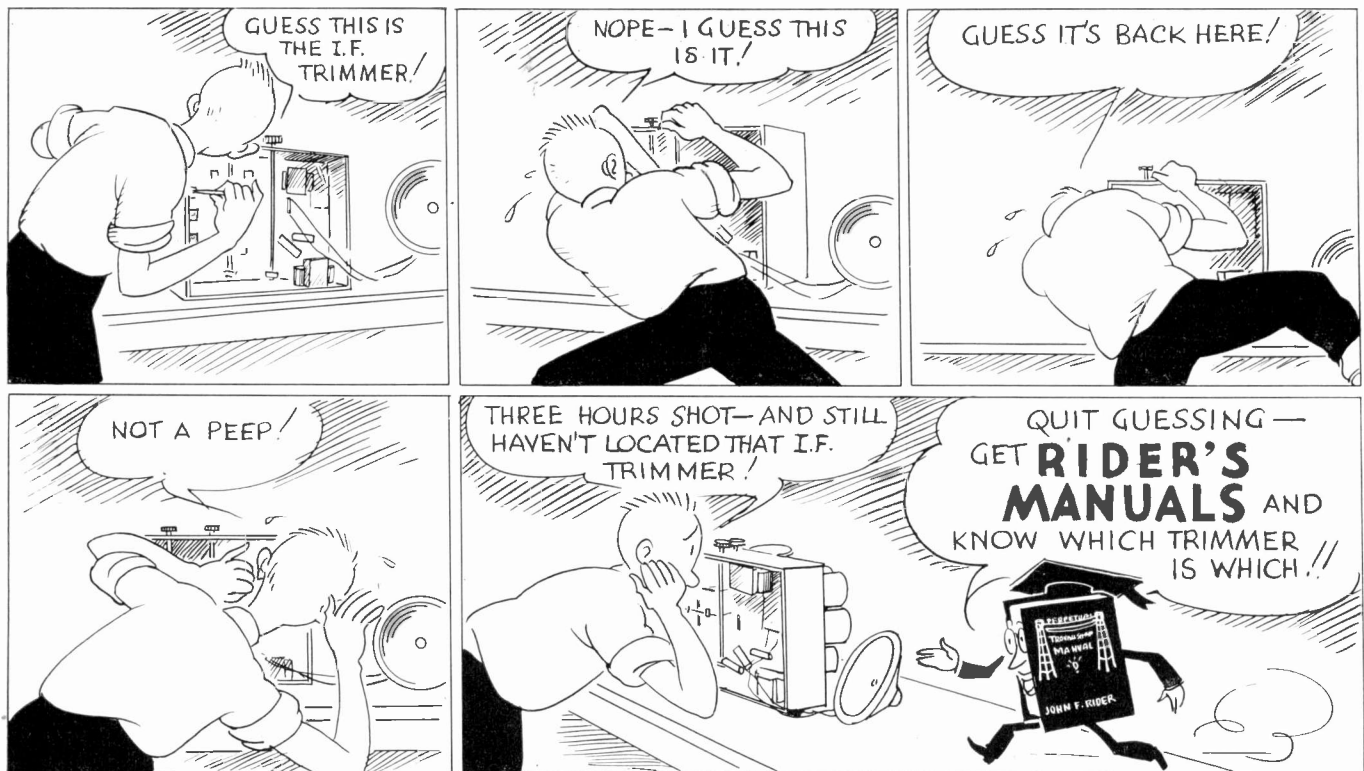
important, as the effect of the change will be lost if it is not done. See accompanying sketch for locations of coil to be removed and condenser to be substituted.

Sparton 80, 83, 84, 85-X, 85-XS, 86-X, 835

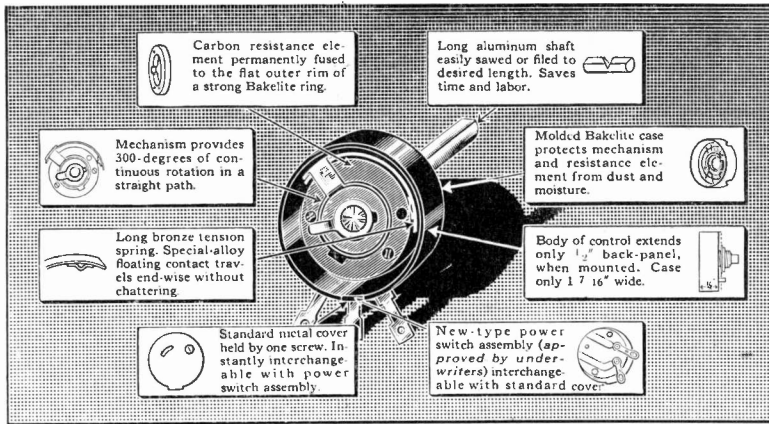
The same chassis that was used in Models 80-83, 84, 85-X and 86-X is now also used in Models 85-XS and 835. Please make this addition to your Index of Rider's Manuals. Note that in the Model 85-X a repeater phonograph mechanism is used in conjunction with the regular eight-tube chassis. The Model 85-XS represents the same combination with the exception that the phonograph mechanism is for single record operation only.

The voltage data for this chassis, which is found on *Sparton* page 5-16 of *Rider's Manual*, has a change which should be noted. In the column headed "Prong No. 4" the resistance reading for the 6A7 converter should be 1,000 ohms instead of 45,000.

GUESSING GUS is on the hunt



New ELECTRAD CARBON VOLUME CONTROL



SMOOTH · · QUIET · · LONG-LIVED

The DIRECT-CONTACT, CARBON VOLUME CONTROL *with* ONLY ONE MOVING UNIT

SIMPLICITY is the keynote of Electrad design—simplicity which performs efficiently without waste motions.

Direct floating contact on the carbon resistance element, with only one moving unit in the entire assembly, mean freedom from mechanical complications—no gadgets to go wrong. They also mean longer life, *more positive and finer variation of current regulation.*

With nothing but established electrical materials—Metal, Bakelite and Carbon—in its construction, the Electrad Volume Control is immune to changes in resistance value or variation in resistance curves caused by temperature, water, salt air or humidity.

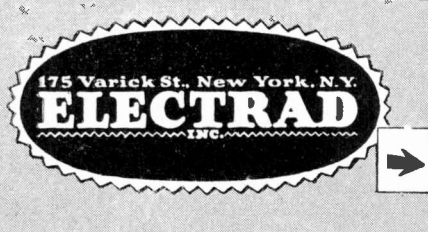
The resistance element is *permanently fused* at high temperature (not merely dipped or painted) to the flat outer rim of a warp-and-wobble-proof Bakelite ring. The special-alloy floating contact is self-cleaning—polishes the carbon to icy smoothness—keeps it clear of dust. No skipping, leaping or stuttering to make noise. Electrad individually tests each volume control for noise before it leaves the factory.

Study the additional features in the above illustration and you will understand why Electrad *unqualifiedly guarantees trouble-free performance.*

Install the Electrad Carbon Volume Control in your next service job.

RESISTOR SPECIALISTS

Featuring:—Quiet Carbon Volume Controls, Vitreous Resistors, Truvolt Resistors and Power Rheostats.



New 100-Page VOLUME CONTROL GUIDE

FREE if you send us the flap (part showing specification and resistance) torn from any new-type Electrad Carbon Volume Control carton, together with your business letterhead or card.
Address Dept. SS-12.



Special Application of Electrad Control No. 200-T to the A.C. Dayton Navigator Receiver

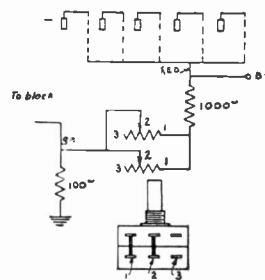
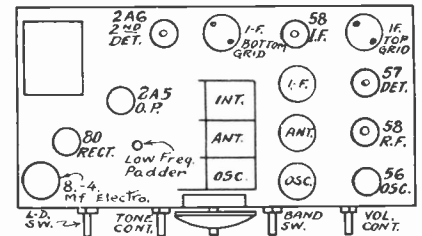


Diagram shows one of many special applications described in the **ELECTRAD VOLUME CONTROL GUIDE**. (See free offer below).

Silvertone 7124, 7132

The voltage data for the above Sears-Roebuck models will be found below. The schematic and other data will be



Chassis layout for Models 7124, 7132.

found on *Sears page 5-65 in Rider's Volume V.*

Type	Function	Cathode	Cont. Grid	Suppr. Grid	Screen Grid	Plate
58	R-F.	3.2	0	3.2	90	245
57	Det.	4.3	0	4.3	90	245
56	Osc.	4.1	0	—	—	155
55	I-F.	3.2	0	3.2	90	245
2A6	2nd Det.	1.1	0	—	—	88
2A5	O.P.	16.	0	—	250	235

Line Voltage—117 volts, a.c.

Herewith is also given the tube socket layout for this chassis.

Midwest 16-34

Procedure for rebalancing the Midwest 16 tube, 1934 model is as follows: Peak the 1st, 2nd, and 3rd i-f. transformers at 450 kc. to maximum a-f. output. Do not measure the AVC voltage as is usually done. Trim the small AVC amplifier to maximum a-f. output.

Turn wave change switch to M position and dial to 12 mc. Adjust trimmers in oscillator and mixer section. (See *Midwest page 6-11 in Rider's Volume VI* for locations of trimmers.) Set switch to L position and adjust trimmers in r-f., mixer and oscillator sections at 4.5 mc. Turn dial to 1.6 mc. and adjust padder in oscillator section. Turn switch to A position and adjust trimmers in r-f., mixer, and oscillator sections at 1500 kc. Adjust A padder at 530 kc. Turn switch to E position and adjust trimmers in the r-f. oscillator and mixer sections to 370 kc. Adjust E oscillator padder to 160 kc. On H band no adjustment can be made, as this is done at the factory by spacing the turns.

The schematic diagram of this receiver will be found on *page 6-7, 6-8 of Rider's Volume VI.*

Successful SERVICING

Reg. U. S. Pat. Off.

Dedicated to financial and technical advancement of the radio service man.

Published monthly by

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John F. Rider Editor
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Vol. 2 December, 1935 No. 4

DUE \$3.50, BUT CAN'T COLLECT

JOHN Q. PUBLIC is not the most honest individual in the world—he has his petty rackets, as well as the full-fledged gentleman who makes his living in that manner.

What can the service man do to collect claims for what is normally classified as being too small an amount to justify legal service? Mr. Public, realizing that the amount is small, knows that the service man will not hire a lawyer to collect an amount which is less than what would normally be the legal fee for collection. . . The result—Johnnie Public just doesn't pay.

This practice in numerous fields has reached substantial proportions. It has become a flagrant violation of honest dealing. So much so, that a number of different municipalities throughout the land have established small claims courts or public defenders which, or who may be identified by different names in different towns. In these courts the plaintiff does not require a lawyer. He presents his case to the judge or the referee—whoever is sitting in the court—and the decision is rendered on the basis of the facts of the case as presented by the plaintiff and the defendant. From what information we can gather, the decision rendered in such a court is the equivalent of a judgment and payment must be made.

In order to be able to present a case of this type properly, should it ever occur, it is vital that all facts pertaining to the service job completed should be on hand. This means that full and complete records must be kept. Reference to such records was made in an editorial which appeared in the November, 1935 issue of SUCCESSFUL SERVICING.

It is possible that your town may not have such a small claims court. Under such circumstances, there is not very much you can do unless you wish to spend the monies required for a normal legal prosecution, which is not sound business because the amount of money involved is too small. However, it is conceivable that the service association in town may make some arrangement with one or more lawyers in town to act as counsel if such cases occur.

Value Your Life!

The human nervous system is a marvelous means of communication, but, like everything else, time elapses while it is functioning . . . a small fraction of a second, yet, nevertheless, an appreciable amount of time. That this infinitesimal time lapse is highly important to everyone is clearly shown by the time taken to brake an automobile.

Assume that you are driving along a highway at twenty miles per hour and

you see something ahead for which the car should be stopped. What happens? First the optic nerve must carry to the brain the picture of that obstruction in the road and then the brain must send out a message, via the nerves, to the muscles in your right leg to contract and expand so that your foot will move from the accelerator to the brake pedal and push it down to the floor. Certainly the time all that takes is less than a second, but during that period of nervous communication your car has been rolling forward. How far? Above it was assumed that your car was traveling 20 m.p.h., so while you were *thinking* about stopping, you went forward 22 feet. Then after the pedal was pressed and the brakes started to function, another 18 feet were covered before the car came to rest.

Of course, the higher the speed that the car is traveling, the more distance will be covered during this process of thinking and getting your foot over to the brake pedal. At 40 m.p.h., this distance is 45 feet and, assuming brakes to be in good condition, another 70 feet are covered before the car stops. At 70 m.p.h. the thinking distance is 79 feet and the stopping distance 240 feet, a total of 319 feet.

These figures have been derived by the State Board of Public Works, which has made an intensive study of drivers and driving conditions



Another new leader!
RCA UNIVERSAL A.C. BRIDGE



Now You Can QUICKLY,
 ACCURATELY MEASURE

INDUCTANCE—100 Microhenries to 10 Henries
 CAPACITY—10 Micro-microfarads to 10 Microfarads
 RESISTANCE—1 Ohm to 1 Megohm
 ACCURACY—5% overall at full scale

HERE is the newest piece of RCA Test Equipment for speeding up service and laboratory work. It gives a quick and accurate check of inductance, capacity and resistance over unusually wide ranges, including the low values that ordinary resistance and capacity meters cannot check. Measurements are made at 1000 cycles per second, and the Bridge includes not only a 1000-cycle oscillator, but also a 2-stage amplifier tuned to 1000 cycles, in order to assure adequate voltage for making any balance required. Service work requires measurement of inductance, capacity and resistance many times daily, and this compact, self-contained Universal A. C. Bridge not only lessens the work of such measurement but greatly increases its accuracy. See it at your RCA Parts distributor.



RCA PARTS DIVISION

RCA Manufacturing Company, Inc.
 Camden, N. J., a subsidiary of the

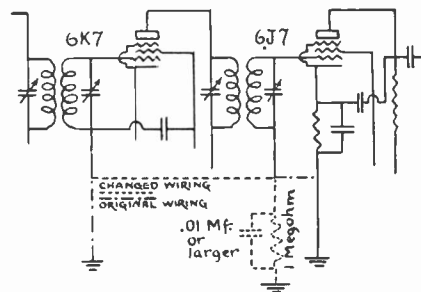
RADIO CORPORATION OF AMERICA

NET PRICE \$ **49.65**

Complete with tubes and standards. Nothing else needed except a high-impedance headphone as null indicator. Stock No. 9600.

International 53, 553

The first production of these models, in which a 6J7 tube is used as the second detector, does not incorporate AVC. When operated in the vicinity of powerful broadcast stations, a tendency toward overloading may be found on strong signals. It is evidenced by blocking out of the signals as the volume control is advanced. This condition can be corrected by making the simple change shown in the accompanying illustration.



Partial schematic diagram of early Models 53, 553 showing changes to prevent blocking.

Originally the grid returns of the 6K7 and the 6J7 tubes go directly to ground. See schematic diagram in *Rider's Volume VI*, page 6-8. These should be removed from ground, tied together and returned to ground through a 1-megohm resistor shunted by a condenser of 0.01-mf. or larger. In making this change, be sure that the cathode of the 6J7 tube is connected as shown in the illustration and not left connected to the low end of the second i-f. transformer grid winding.

About Binders

Would you be interested in obtaining a binder in which you could keep your file of SUCCESSFUL SERVICING intact? We have received several letters asking if such a binder were available; so if enough of our readers want one, we will look into the matter further. Please let us have your thoughts on this. Thanks.

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 THIS ISSUE
 16,000 COPIES

Rolling REPORTER



THAT TRIP

During our recent trip West, we thought we were back in 1929 . . . radio parts and instrument factories working on 24-hour schedules . . . Chicago, Dayton, Milwaukee, Indianapolis, Bluffton, all busy, **BUSY, BUSY** . . . flying fingers and enormous stamping machines grinding out a symphony of **BIG BUSINESS**. . . I hope all of you lads will be on your toes to grab the business which is certain to come your way in 1936.

ECKSMUS

The **ROLLING REPORTER** extends to each and every one of the readers of this "not-so-hot" colyum his best wishes for a **Very Merry Christmas**, and a **TERRIFIC, COLOSSAL, STUPENDOUS NEW YEAR**. (Editor's Note: Please extend my good wishes also.) (Assoc. Editor's Note: Hey, I wanta get in on that . . . My best, gang.) (His Girl Every Day: Me, too!) . . . and remember, my hearties, "the bigger the head, the bigger the headache." (Boy! bring on a flock of aspirin.)

NIZE MOMMA

The wife of a Servicer in New Jersey dropped in to the office the other day and ordered a complete set of the **RIDER MANUALS** for her Hubby's Xmas present. They are to be tied up with a nice blue ribbon and delivered the day before Xmas. It's a **SWELL** idee, but I'd like to see the stocking that will hold all **SIX** of the **MANUALS**. (Aside to Johnny Service Man. . . Cut this item out and "carelessly" place it somewhere so that Friend Wife can't miss it. It **MIGHT** work!!!)

THE ROLLING PUBLISHER

RIDER, the old "die-hard" (see p. 5, November issue) sure gets around . . . this month he spoke to the Servicers of **Springfield, Mass.**, and **Boston, Mass.** . . . total audience was over 500 . . . the boys "ate up" his ideas on "**ESTABLISHING PROPER SERVICE CHARGES**" . . . incidentally, why don't you, and you, and even **YOU** make **YOUR** New Year's Resolution a firm resolve to put your business on a **BUSINESS BASIS???** It's a "pushover"—you'll be amazed to learn that it's **EASY** . . . now that Prosperity is definitely here, let **John Q. Public** pay for his own radio entertainment.

(Not so) VITAL STATISTICS

Experts estimate that about thirty-five years from now, the Nation's population will cease to grow and for a stretch will stay at a certain definite level. *Meanwhile, however, the embryonic service man population will increase at the usual rate, about 20 per cent annually.*

Deaths from monoxide gas in this country are three times as many in the winter months as they are in the summer. One presumes that most of them occur in closed garages—*Gosh! our poor old "blimp" has been standing in front of the house for three years. . . . Oh! Death, where is thy sting?*

EARLY XMAS MAILERS:

T. P. Robinson, Dallas, Tex.; I'll say you are equipped to "take care of ANY servicing job that comes in," with five **RIDER MANUALS** as part of your equipment. . . . Vol. VI, is at your jobber's now. F. Claude Moore, Pekin, Ill.; Do you service receivers as snappily as you write letters? . . . wish we could reproduce your note . . . you'll get **SUCCESSFUL SERVICING** every month from now on, and we **WON'T** "lay off that Cathode Ray dope for a while," as you request, "for the good of your pocketbook." . . . Mister, for the good of your bank account, you'd better jar y'self loose from the price of an Oscillograph—it's a very valuable aid to faster, more accurate and **MORE PROFITABLE** servicing . . . write us again, will-ya???? Joseph D. Napura, Uniontown, Pa.; Has the fact that you are 100% equipped with **RIDER MANUALS** any bearing upon your address being 60 **EASY St.**? . . . Thanx for your suggestion that we publish photos of 100% **RIDER EQUIPPED** service laboratories . . . won't have room to do that, I'm afraid, but we **WILL** start the 100% **RIDER EQUIPPED CLUB**—and you are hereby nominated its **PRESIDENT** . . . all Servicers who have the six **MANUALS** are eligible . . . send in your names, boys. G. C. PERSONIUS, PEIPING, CHINA; The last two Volumes sent to you make you eligible for the "100% CLUB," don't they???? Say, our Boss is a confirmed stamp saver, and he'd like to get a gang of Chinese stamps, uncanceled . . . if he told you what he wanted, would you buy some for him??? drop a line to **JOHN F. (for Philatelist) RIDER**, 1440 Broadway.

JANET

The three-and-a-half-year-old pride and joy of the John F. Riders visits the office occasionally, and, upon such occasions, explores every nook and cranny of the place . . . she has little respect for the sanctity of editorial sanctuaries—she used the first three chapters of her Daddy's latest book for drawing paper—and the lads in the laboratory still talk about the day she threw a forward pass which was **UNCOMPLETED** . . . no football being available, she used a **FIVE-INCH CATHODE RAY TUBE!!!** During her last visit, she sat upon our fat lap, and, as is our wont, we asked her several questions, which we thought appropriate to the occasion. Among others we asked, "Janet, do you know what Heaven is?" "Yes," replied the little grown-up, "it's **DANCING CHEEK TO CHEEK.**"

The Rolling Reporter.

"LIKE NAPOLEON I'M SMALL IN STATURE - BUT I CAN DO PLENTY OF BIG THINGS" Says Esico



ESICO is right!

Esico Green Label Irons are scientifically constructed to insure maximum wattage at minimum weight.

No longer do you have to use an out of balance tool when Esico gives you everything you need, plus a well balanced soldering iron that is light in weight.

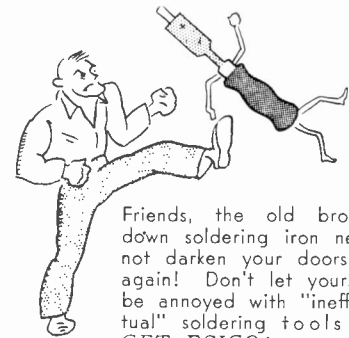
And here are some of the other ways Esico does "big things" for the serviceman!

ESICO SOLDERING IRONS heat quickly and stay hot longer. Slow oxidation of the element, which is wound with Nichrome V insures an iron that retains its heat throughout the working day and is constantly at your service.

ESICO SOLDERING IRONS have cords that will not fray and therefore cannot short. A special method of anchoring the cord to the iron eliminates any inconvenience encountered at this point.

Treat yourself to a real Christmas gift. Get an Esico soldering iron. You'll never regret it!

Available at all Esico distributors. A complete range of irons from 55 watts to 150 watts. Larger irons supplied upon request.



Friends, the old broken down soldering iron need not darken your doorstep again! Don't let yourself be annoyed with "ineffectual" soldering tools — **GET ESICO!**

Electric Soldering Iron Co., Inc.
342 West 14th St., New York, N. Y.

ESICO

REG. U.S. PAT. OFF.

BOY! OH BOY!



JUST THE CONDENSER

you've needed for those AC-DC midget repairs!

Servicemen! Here is the handiest electrolytic ever put out—

THE NEW TYPE JEH!

It's destined to become the serviceman's favorite! Check these outstanding Features:—

COMPACT ● CONVENIENT

Encased in handy flanged cardboard containers, which flanges can be removed if necessary without damage to capacitor. Approximately 3" long by 1 1/4" square. Separate leads color-coded for polarity and capacity.

● DEPENDABLE ●

Type JEH "stays put." No kicks or return calls to make good. Wise servicemen build their reputation—and add "steady" customers to their books—by always using C-D electrolytics.

● INEXPENSIVE ●

By buying from the world's largest manufacturer of condensers you enjoy quantity prices on quality condensers. See your local C-D authorized distributor on a complete line of replacement condensers. Also Catalog 128 available for the asking.

Type	Capacity	List Price
JEH 6404	4-4	\$.85
JEH 6408	4-8	.95
JEH 6808	8-8	1.20
JEH 6416	4-16	1.25
JEH 6816	8-16	1.35

**CORNELL
DUBILIER
CORPORATION**
4365 BRONX BOULEVARD
NEW YORK • N. Y.

Wells-Gardner 7G and OD Series

If the double end pointer remains stationary when the tuning knob is turned, the following possibilities should be investigated and procedure followed:

First, be sure that the tuning condenser rotor has not reached the end of its travel. Also, see if the screw at the center of the large pointer is tight. Next inspect each pointer to be sure that it is not caught at some place.

If slippage continues, remove the chassis from the cabinet. Turn the knob to the point where the shaft seems to bind. See if the drive shaft set screw is tight, and if the idler and idler spring are in position—See Fig. 2.

Take off the two pointers, the large one by taking out the pointer screw and the small micrometer pointer by unscrewing it off of the shaft (turn it counter-clockwise to do this). Turn the

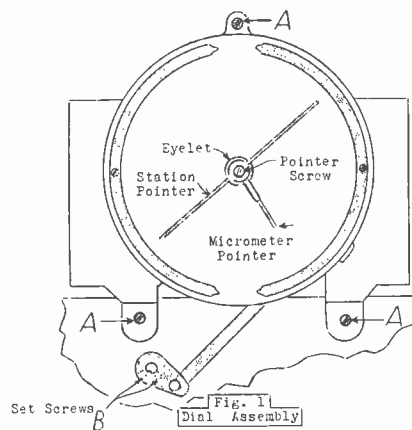


Fig. 1. Front view of the Wells-Gardner dial assembly.

tuning knob and see if pointer shaft turns properly. Inspect the shaft to determine if it is at the center of the eyelet in the dial scale. If the shaft appears to be binding against the eyelet, loosen the three screws A, Fig. 1, which hold the dial assembly in position. Shift this assembly until the shaft is centered, tighten the screws and again see if the shaft turns properly when the tuning knob is rotated.

If the shaft continues to stick, remove the dial assembly by taking out the three screws A and the two set screws, B—See Fig. 1. Turn the tuning condenser rotor and see if the pointer shaft wob-

AMPERITE HIGH LEVEL VELOCITY

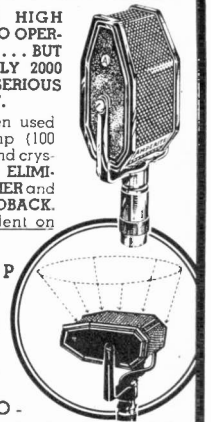
OPERATES WITHOUT PRE-AMP
ELIMINATES HUM TROUBLE

THIS MICROPHONE IS HIGH ENOUGH IN IMPEDANCE TO OPERATE DIRECTLY INTO GRID . . . BUT NOT HIGH ENOUGH (ONLY 2000 OHMS) TO INTRODUCE SERIOUS LOSSES IN LINE UP TO 200'.

Requires no pre-amp when used with regular high gain amp (100 db) Replaces condenser and crystal mikes **NO CHANGES. ELIMINATES INPUT TRANSFORMER** and its losses **ELIMINATES FEEDBACK.** Lifelike brilliance Excellent on close talking

FOR 360° PICKUP

Lower the microphone, tilt until parallel to floor For "hanging microphone." raise above speaker's head and tilt until parallel to floor.



PERFECT REPRODUCTION FROM ALL ANGLES

MODEL RB-H, for speech and music, LIST \$42.00 with coupling. MODEL RS-H, for speech, but can also be used for music, LIST \$32.00 with coupling.

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New! POSITIVE-AND-SMOOTH-ACTION STANDS

FEATURING NEW
PATENTED CONSTRUCTION

Positive, NON-SLIDING, ball-bearing clutch! Will never wear out . . . never require adjustment. WILL NOT "CREEP." Tightens with only 1/8 turn of clutch.

Microphone can be ROTATED WITHOUT LOOSENING CLUTCH. Smooth, PNEUMATIC-LIKE ACTION up and down.

A model for every purpose . . . studio, P.A., desk, banquet, and portable.

WRITE FOR BULLETIN S-1

AMPERITE Company

561 BROADWAY NEW YORK

AMPERITE 1 POINT VELOCITY MICROPHONE

NEW LOW PRICE

on
AMPERITE
CURRENT AND VOLTAGE
REGULATORS



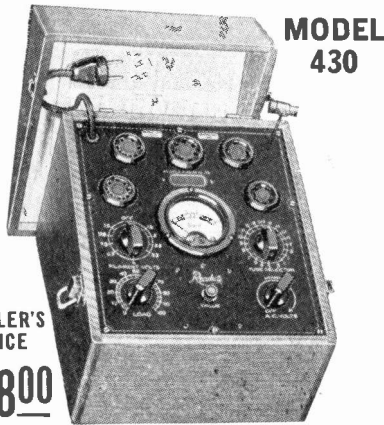
Amperite replacements for AC-DC sets now LIST \$1.25. Amperite 3-40 can replace AC-DC set regulators 50x3, 300, and 5B. Also new low price on replacements for 2-Volt Battery Sets, List \$1.60

Write for CHART CV.

AMPERITE Co. 561 BROADWAY NEW YORK

A NEW TUBE TESTER

RELIABILITY AT LOW COST



DEALER'S PRICE
\$1800

A new emission type Tube Tester—tests all metal and glass-metal tubes. Features:

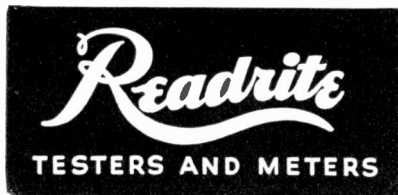
Tubes are tested under actual load for value and shorts. Leakage and short test. But four simple operations required. Shadow-type A.C. meter for adjusting line voltage and visibly indicating when line supply switch is ON. Double Grid Cap for Metal and Glass-Metal tubes. Handsome portable quartered oak case, removable cover, with all-metal sloping panel having silvered letters on black background. Especially constructed against obsolescence.

Model 430 complete with Triplett moving coil instrument having direct reading GOOD-BAD scale, protected against damage, Dealer's **Net Price.....\$18.00**

Model 431—same as Model 430, except has Readrite direct reading GOOD-BAD meter. Dealer's **Net Price.....\$14.40**

Readrite also manufactures all types of testers used for servicing radio sets, including: Set Testers, Tube Testers, Resistance, Continuity and Capacity Testers, Point-to-Point Testers and inexpensive Indicating Meters, used by thousands of Hams, Industrials and Servicemen.

SEE YOUR JOBBER



MAIL COUPON NOW

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Please send me more information.....
.....Model 430Model 431
.....Catalogue

Name

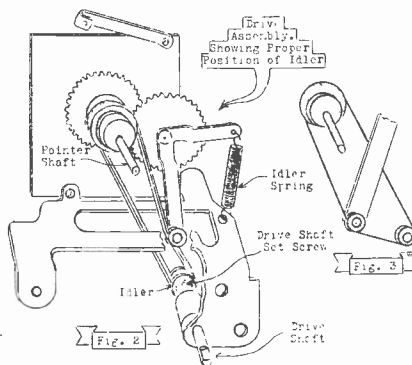
Address

City..... State.....

bles. If it does, straighten it by pressing the shaft to one side.

Also, in a few of the dial assemblies there is a burr at the back edge of the eyelet which can bite into the shaft. If this is the case, take a small round file and file down the burr. A penknife can be used if no file is available.

See if the pointer shaft and tuning condenser rotor turn the entire length of travel. If they do, put the dial assembly back into position to again determine if the drive turns properly. If the shaft and rotor do not turn the entire length of travel, inspect the gears for dirt, damaged teeth and any obstruction to the rotor.



Figs. 2 and 3. Rear views of the Wells-Gardner dial assembly.

In some cases the belt may slip because it is too long. The best way to correct this condition is to put on a new belt. It can also be corrected in many cases by putting the idler on the inside of the belt as shown in Fig. 3. This method should be followed only as a last resort and is not, in general, as satisfactory as changing the belt. If the idler is moved to the inside of the belt, the idler spring may not be under sufficient tension to keep the belt tight. To remedy this, take the spring off, cut off a piece and again put it back in place. Care should be taken when reducing the spring length not to make the belt too tight as this would cause the drive to turn hard.

After the above procedure has been followed, the drive should operate properly after reassembling. If it does not, it will be necessary to get in touch with the factory for further instructions. See *Rider's Volume VI*, page 6-20 for further data on the 7G series.

RAYTHEON

PARADE of All-Metal Radio Tubes



- 6A8—Oscillator-Detector
- 6K7—Detector Amplifier
- 6Q7—Diode Triode Amplifier Detector
- 6L7—Pentagrid Mixer Amplifier
- 6J7—Pentode Amplifier Detector
- 6F5—Triode Amplifier



- 6C5—Oscillator Amplifier
- OZ4—Full-Wave Gas-filled Rectifier (exclusively Raytheon)



- 6H6—Detector (Diode)



- 6F6—Power Amplifier
- 25A6—Power Amplifier
- 25Z6—Rectifier
- 5Z4—Full-Wave Rectifier
- 6X5—Full-Wave Rectifier (Auto Sets)

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Get the inside dope on receiver troubles. Iron out your problems. Right now . . . fill out this coupon and send it to the Hygrade Sylvania Corporation. The New Volume of Service Hints will be sent you within a few days.

Hygrade Sylvania Corporation, makers of Sylvania Radio Tubes and Hygrade Lamps. Factories at Emporium, Pa., Salem, Mass., and St. Mary's, Pa.

SYLVANIA

(Reg. U.S. Pat. Off.)
The Set-Tested Radio Tube
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Hygrade Sylvania Corporation SS-12
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Experimenter Amateur Call.....
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NAME

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

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ADDRESS

Lincoln Zephyr Antenna

The rear deck cover in this car is used as the antenna and the lead-in is brought down the left front corner post. Because of the large capacity and small area of this type of antenna, it is suggested that a 0.00025-mf. condenser be used in series with the antenna, when used with Motorola Models 62, 79, and 110, schematics for which will be found in *Rider's Volume VI* on pages 6-1, and 6-2.

What Is Wrong?

What is wrong when owners of radio receivers find it necessary to call our office in the hope that we will be able to recommend a service station capable of repairing their receivers? The usual complaint is that several men worked upon the receiver, collected their fees and did very little to really restore the receiver to its proper electrical state. . . . What is it? Lack of knowledge? Inability to spend sufficient time because of the low service charge—or just the "devil take it" attitude, because they feel that the customer does not know any better?

It is a losing game for the man who does not know enough about radio and makes no effort to educate himself now to repair radio receivers. . . . The time and effort he spends making a bare living in radio bears less fruit each day, because every dissatisfied customer drives other possible prospects from the shop.

If it is the low service charge, the price must be raised and better work done. A customer who has been dissatisfied with work done, will never come back, no matter how little is charged for the work done.

If it is because the service station operator just does not give a damn, well, nothing much can be said. There is only one road and the end is behind the eight ball—.

What is wrong? . . . Will some one tell us?

**THE CATHODE-RAY
TUBE AT WORK**
336 PAGES \$2.50



. . . and Note the Difference!

Countless radio sets are working far below their peak efficiency—because poor condensers won't let them do any better!

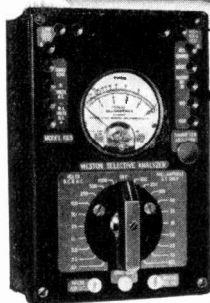
When filter condensers fail to supply the proper voltage—when cheap, inferior condensers are used—nothing about a radio can be wholly right. To test this assertion we only ask that you take a "sick" radio and equip it THROUGHOUT with Spragues. You'll be amazed at the improvement in "pep," volume and tonal quality.

Remember: You'll never go wrong with a Sprague. Every condenser is guaranteed.

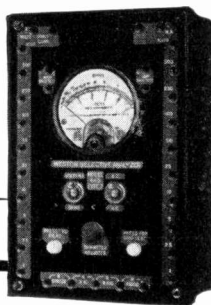
SPRAGUE PRODUCTS CO.
North Adams Mass.

**SPRAGUE
CONDENSERS**
Made Right **GOO'LINE** Priced Right

THE
life-time
ANALYZER
now made in
two models



ROTARY SWITCH MODEL



PIN JACK MODEL

Both models illustrated use
Weston Socket Selectors

The demand for Weston Selective Analyzers proves conclusively that dealers and service men are finding it highly profitable to use nothing but a quality, life-time analyzer. This selective method of analysis, introduced by Weston, now is standard practice among radiomen everywhere.

To suit all requirements, two types of the famous Model 665 now are available. Type 1 employs a rotary switch for the selection of ranges . . . while Type 2 has a series of pin jacks and is offered at much lower cost.

Both types have the same broad list of ranges, and combined with the Weston Socket Selector Set are truly universal in their capacity to analyze radio receivers. A bulletin is available giving complete information on these life-time analyzers . . . Weston Electrical Instrument Corp., 625 Frelinghuysen Avenue, Newark, New Jersey.

WESTON
Radio Instruments

Sentinel 108

The voltage and alignment data for Model 108 will be found herewith. The schematic diagram for this receiver appears on *Sentinel page 1-3 of the revised edition of Rider's Volume I; page *624-A of the early edition and on page 2107 of the Rider-Combination Manual.*

Type	Function	Fila- ment	Plate	Grid	Screen	Plate MA
224	R-F.	2.4	250	4	75	2.15
224	1st Det.	2.4	250	6.0	80	.25
224	I-F.	2.4	250	4	75	2.25
227	Osc.	2.4	60	—	—	4.75
224	2nd Det.	2.4	100*	6	40*	.25
245	Output	2.4	250	50**	—	30.
280	Rect.	4.85	—	—	—	27 per plate

* Comparative readings; not true voltage applied.
** To take 245 bias reading, read between the electrolytic cans.

Alignment Data:

Set the signal generator to 175 kc. and connect the output to the grid of the 224, 1st detector, from which the grid cap has been removed. Trimmers of the i-f. transformers are accessible through the small holes in the top of the cans. Align the grid trimmer of the first i-f. coil, then the second i-f. coil.

Replace the grid cap on the 1st detector and connect the signal generator's output to the antenna and ground posts of the set, having tuned it to 1435 kc. Set the receiver's dial to this frequency also. Track the variable condensers by adjusting the trimmers in the following order: Oscillator, antenna and r-f. (The sections of the condenser are in this order, starting at the front of the set.) Then check the condensers at 1295 kc., by bending the end plate of the rotors: Check also at 880, 650, and 550 kc.

Silvertone 1630

Abrupt volume control action in Sears-Roebuck model 1630 can be minimized by inserting a 0.0001-mf. condenser in series with the antenna. While shortening the antenna will produce the same result, the use of the condenser is preferable, since shortening the antenna reduces the signal to noise ratio. The data on this receiver will be found in *Rider's Volume III, Sears pages 9, 10, and 11; Rider-Combination pages 2095, 2096 and 2097.*

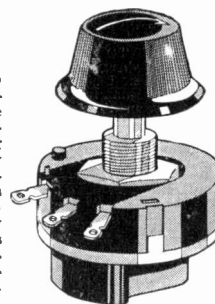


*-it's a Landslide
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Every serviceman from coast to coast knows Centralab . . . everybody's his friend and the worst thing his enemies can say is that he's a mighty smooth article.

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SS-12/35

SPRAYBERRY'S PRACTICAL MECHANICS OF RADIO SERVICE

Another Year—Another Volume

(Continued from page 3)

on a single page. It just simply could not be done . . . not if the Rider standard were to be maintained.

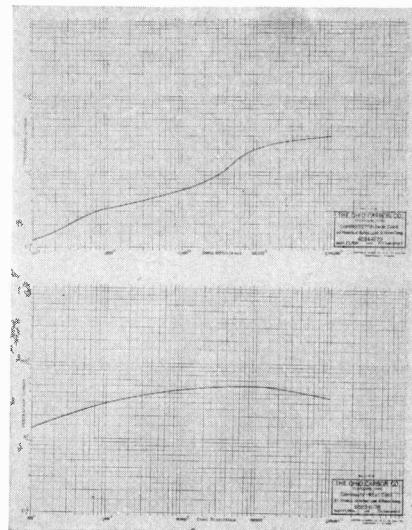
Then glance through the 80 pages of the Index that informs you where the exact data you are hunting appears. If you are after the voltage data of a set, the total information of which covers several pages in the Manual, you will find that it is unnecessary for you to look through the mass of material on those several pages, for the page number will be opposite the words "voltage data" in the Index. *There's a time-saver for you.*

And now the servicing information itself! In the past it has been necessary to do some editorial squeezing to get in all the data available, but this year it was a matter of super-squeezing. It was desired to keep Volume VI about the same number of pages, but the number of new sets exceeded the expectations and so forty more pages were added, bringing the total to 1240. **But if you will once more examine the pages of Volume VI, you will find that more information than ever before has been printed on the pages and yet it is all clear and legible.** Truly a triumph of the editorial and printer's arts! And that information represents just about all the information that was received from the manufacturers and other sources.

Speaking of manufacturers, look at the number that is represented in Volume VI. *More than ever before.* Manufacturers you have heard about, but servicing data on whose products have never been presented before to the radio servicing fraternity in any publication. During the past year, an unceasing search has been maintained to gather as much data as possible from as many manufacturers as possible and the results in Volume VI speak for themselves . . . **servicing data from more than 115 manufacturers!**

The new metal-tube and glass-metal tube sets? Certainly, they are in Volume VI! Right up to the last minute, data was dummyed-up and sent to the

Stated Conditions With



DEFINITE RESULTS

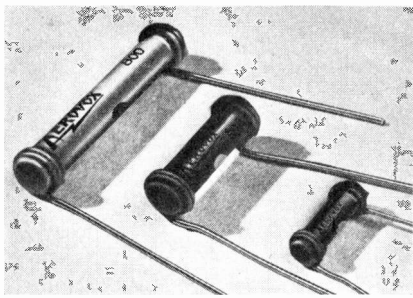
● The intrinsic worth of resistors can be measured only by their performance under recognized standards of comparison. Charts showing the results obtained with Ohiohm resistors when subjected to tests covering such important points as length of service, overloads, voltage variation, heat and humidity conditions are available to you.

The performance curves cover not one or two tests on special values but show the composite results of thousands of tests covering a wide resistance range of the three most popular Ohiohm sizes namely, 1, 1/2 and 1/4 watt capacities. Ohiohms are manufactured in resistance values as low as .04 ohms and high as 100 megohms.

Under each chart, a resumé of the test conditions is given so that you may know what should be reasonably expected of the resistors you buy. You should know the actual features of a resistor which determine not only its quality but its suitability for your particular problems.

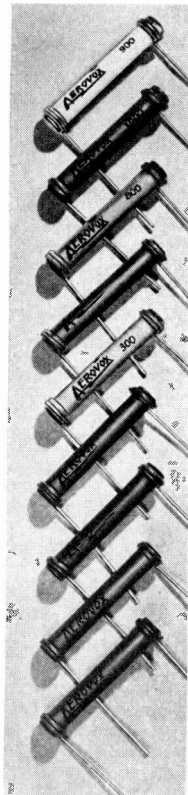
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New and Better CARBON RESISTORS

They sure look good! And they're just as good as they look. Ideal for applications requiring non-inductive resistance dissipating 1 watt or less. Superior radio parts... yet costing no more than inferior ones.



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Solid molded carbon element. Positive conduction. Non - fluctuating. "Noiseless."

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Accurate resistance values (well within 10%) as plainly stamped on body, and R.M.A. color coded.

●
Non-inductive — no appreciable change in resistance value at high frequencies.

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Slight positive temperature coefficient compensates negative potential coefficient, protecting units against heavy short period overloads.

●
In 1/3, 1/2 and 1 watt ratings. All standard resistance values.

DATA Send for your copy of new catalog covering THE COMPLETE condenser and resistor line. Also sample copy of monthly Research Worker. Meanwhile, contact your AEROVOX jobber for better parts.

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CORPORATION
76 Washington Street Brooklyn, N. Y.

Packard Bell 45 M

To align this receiver proceed as follows: Have the variable condenser plates fully meshed. Set signal generator to 460 kc., the i-f. peak. Connect the output of the generator to the control grid of the 6A8 tube (top cap). Adjust trimmers on i-f. transformers for maximum gain. Tune the generator to 1700 kc. and the receiver to approximately the same frequency and adjust the trimmers of the oscillator and modulator condensers for maximum output. Be sure that the wave change switch is turned to the right. In case the receiver will not track, tune the generator to 1400 kc. and readjust for maximum output. The adjustments for 1000 and 600 kc. are made by bending the outside rotor plates of the gang condenser. Then turn the wave-change switch to the left and tune the signal generator to 18 mc. Adjust the trimmer condensers of the short-wave oscillator and modulator coils for maximum output. The adjustment at 6 mc. will have to be made by spacing turns of these two coils, but unless the receiver has been tampered with, it is unlikely that this adjustment will have to be made.

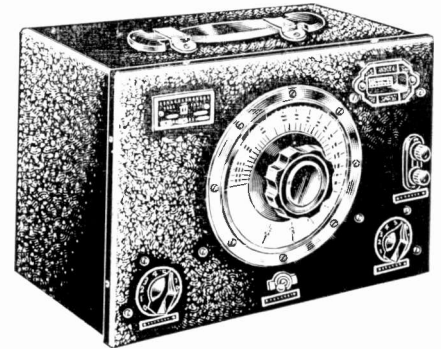
The schematic diagram for this receiver will be found on page 6-4 of *Rider's Volume VI*.

Sparton 104, 105-X, 105-XS, 135

The same chassis that was employed in the Model 104 is now used in the other three models enumerated above. In Models 105-X and 105-XS, the phonograph motor is connected across the primary of the power transformer with a separate on-off switch that is on the phonograph unit. The terminal of the motor to which the switch is connected runs to that side of the power transformer's primary that does not contain the on-off switch for the set.

The voltage data for this chassis, which will be found on *Sparton* page 5-20 of *Rider's Manuals*, contains a change, which should be noted. Under "Prong No. 2" the voltage reading for the 76 tube (first a-f.) should be 195, instead of the notation that the voltage can not be read.

C-B Equipment for all Cathode-Ray Applications



Beat-Note Audio Oscillator

MODEL 79—A necessary companion to the Cathode-ray Oscillograph now offered at a new low price. Continuously variable 50 to 10,000 cycles. High voltage output at 5,000-ohm load. Pure sine wave. Low distortion content. Constant output voltage. Zero-beat indicator and adjustment. Operates from 110-volt 60-cycle. Net price, complete with six tubes.....\$51.90

Frequency Modulated Oscillator

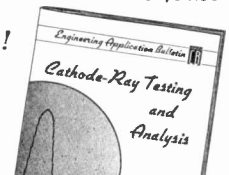
MODEL OM — All-wave continuously variable from 85 k.c. to 30 m.c. Built-in fixed-sweep frequency modulator provides calibrated selectivity curve images with any standard oscilloscope. May be used as standard oscillator if desired. 1/2 of 1% frequency accuracy on direct-reading chart or hand drawn 11" x 17" calibration curves. Net, complete with tubes.....\$57.75

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Chest supplied with 56 Type B-1 (1 watt) IRC INSULATED Metallized Resistors. You pay the net price of these resistors ONLY.

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The Resist-O-Chest contains two 1-watt (Type B-1) INSULATED Resistors of each of the 28 following popular ranges. 56 Resistors in all!

Ohms	Ohms	Meg.
300	10,000	0.1
500	12,500	0.15
1,000	15,000	0.2
1,500	20,000	0.25
2,000	25,000	0.3
2,500	30,000	0.5
3,000	40,000	1.0
5,000	50,000	1.5
7,500	65,000	2.0
	75,000	

List Price of Resistors \$14.00.
 NET.....**\$8.23**
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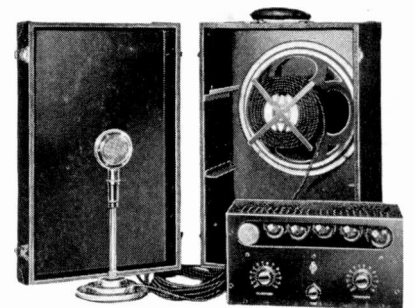
(Continued from page 12)

printer. In fact, some information, that had been promised, was received after the pages in which it would normally appear had been in the printer's hands for several days. A frantic phone call . . . "Hold that form. . . Something more must go in!" And so the presses were held, new plates made, and this new data got in Volume VI.

Space really does not permit more to be written about this latest addition to the Rider Manuals and anyhow, words can not give you a true picture of Volume VI. See it for yourself and when you do, we are willing to bet that you will agree with us that *it is the best Rider Manual yet . . . the ultimate . . .* and as such, you will need it in your business.

Audio Howling

After replacing the speaker cone or output transformer a tendency toward an audio howl may sometimes be noted. This is due to reversal of the phase of the audio voltage impressed on the voice coil. The remedy is to reverse the connections from the secondary of the output transformer to the voice coil. If this does not remove the howl, then a check should be made to determine whether the howl is due to feedback from the speaker to the audio amplifier. Disconnect the speaker voice coil and replace it with a resistance approximately equal to the voice coil impedance to load the output stage properly. If a check with the headphones under these conditions shows that the howl is not present, then the trouble is established as an audio microphonic. The condition may be due to a defective tube; in this case replacement will effect the cure. In the older receivers a flexible detector socket and a weight on the detector tube will often eliminate the howl.



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Full 17-Watt Output . . .

A new development, with extreme range and power, this new Webster Portable Public Address System provides full 17-watt output. Suitable for group performances and similar installations.

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Noted for its elimination of background noise with wide sensitivity, the Webster crystal microphone response is not affected by position or movement of microphone.

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This High-Gain 4-Stage Amplifier is ruggedly constructed for professional portable use, as it embodies the latest features of design. Mixing circuit allows combination of microphone with musical background.

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Amplifier provides sufficient power for efficient performance of either one or two dynamic speakers. This feature provides unusually wide coverage. Additional speaker is mounted in companion carrying case.

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