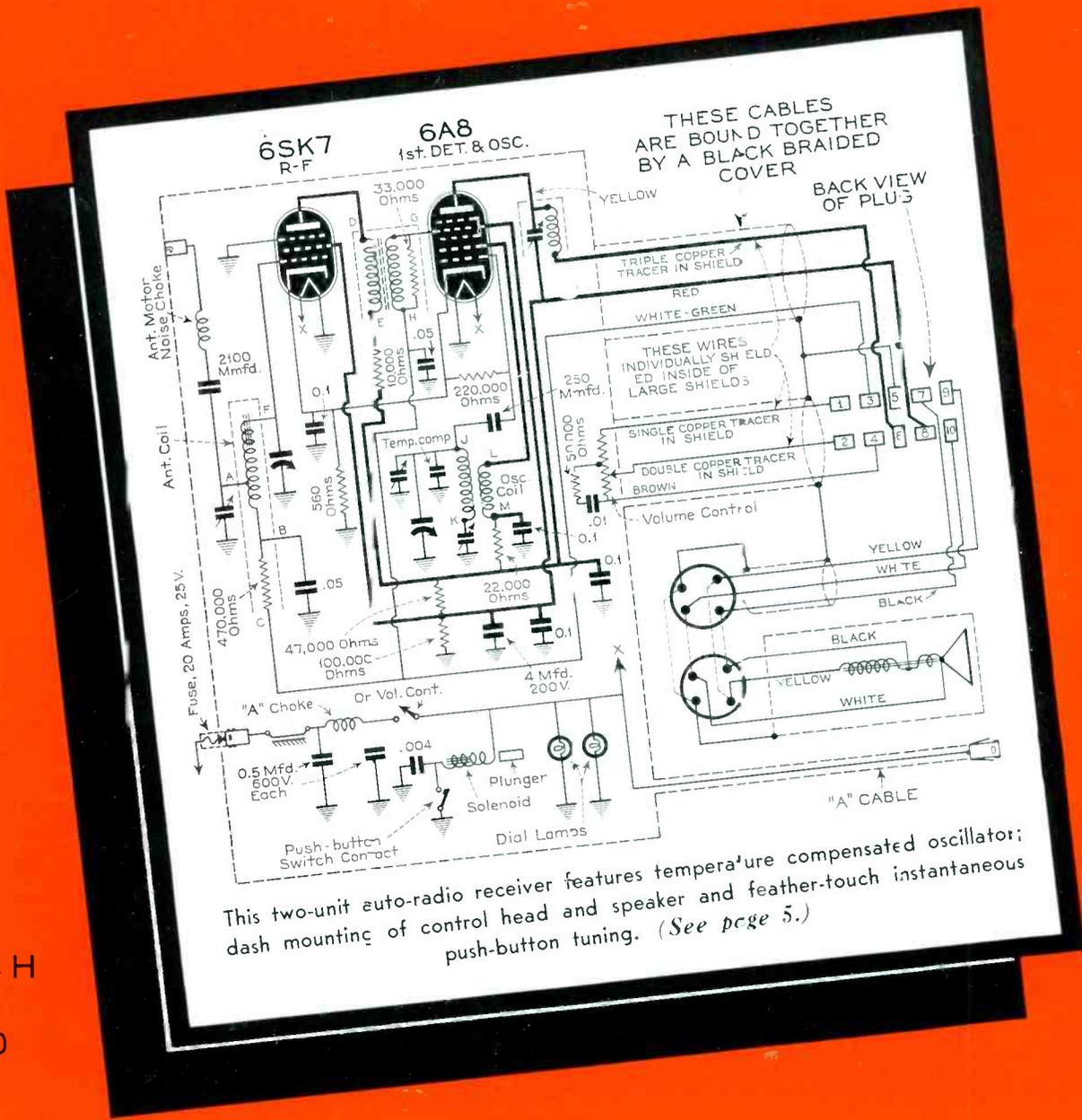


# SERVICE



MARCH

1940

AUTO RADIO PAGE 15

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PM-15-18	15"	18	15	23	1 1/2"	6-8	20	30.00
PM-13-25	13 1/4"	25	21	29	2"	6-8	30	40.00
PM-12-18	12"	18	15	23	1 1/2"	6-8	16	27.50
PM-12-16	12"	16	13	21	1 1/4"	6-8	11	18.50
PM-12-13	12"	13	10	18	1"	6-8	8	12.50
PM-10-14	10 1/2"	14	11	18	1 1/4"	6-8	10	15.50
PM-10-12	10 1/2"	12	9	16	1"	6-8	7	10.00
PM-10-10	10 1/2"	10	7	14	1"	6-8	6	8.50
PM-8-11	8"	11	8	15	1"	6-8	6	8.50
PM-8-9	8"	9	6	13	1"	6-8	5	6.75
PM-8-9	8"	9	7	13	3/4"	6-8	6	8.00
PM-6-9	6 1/2"	9	7	11	3/4"	6-8	4 1/2	4.25
PM-6-7	6 1/2"	7	5	11	3/4"	6-8	4	4.00
PM-5-5	5"	5	3	8	3/4"	6-8	4	4.00

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Type No.	Cone Hsg. Dia.	Und. Peak Watts	Und. Norm. Watts	Peak Power Watts	Field Voltage	Field Ohms	Field Watts	Voice Coil Dia.	Voice Coil Ohms	Wt. Lbs.	List Price
PE-18-40	18"	40	35	46	110V. DC	300	35/50	3 1/2"	6-8	78	\$95.00
PA-18-40	18"	40	35	45	110V. AC	350	22/35	3 1/2"	6-8	88	120.00
PE-18-30	18"	30	25	40	110V. DC	350	22/35	3 1/2"	6-8	60	60.00
PA-18-30	18"	30	25	40	110V. AC	350	22/35	3 1/2"	6-8	70	80.00
PE-15-25A	15"	25	20	30	110V. DC	850	14/21	1 1/2"	6-8	28	26.50
PE-15-25B	15"	25	20	30	110V. DC	2500	14/21	1 1/2"	6-8	28	26.50
PE-13-30	13 1/4"	30	25	35	110V. DC	350	22/35	2 1/2"	6-8	40	35.00
PE-12-20A	12"	20	15	25	110V. DC	1000	14/21	1 1/2"	6-8	20	16.75
PE-12-20B	12"	20	15	25	110V. DC	2500	14/21	1 1/2"	6-8	20	16.75
PE-12-16A	12"	16	13	21	110V. DC	1000	10/15	1 1/4"	6-8	12	10.50
PE-12-16B	12"	16	13	21	110V. DC	2500	10/15	1 1/4"	6-8	11	10.50
PE-10-12A	10 1/2"	12	10	16	110V. DC	1000	8/12	1"	6-8	10	9.00
PE-10-12B	10 1/2"	12	10	16	110V. DC	2500	8/12	1"	6-8	10	9.00
PE-8-10A	8"	10	8	14	110V. DC	1000	8/12	1"	6-8	8	7.00
PE-8-10B	8"	10	8	14	110V. DC	2500	8/12	1"	6-8	8	7.00

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A Monthly Digest of Radio and Allied Maintenance

Reg. U. S. Patent Office

**W**E WOULD like to know how you made good, in your own words. That's the general idea behind the "Service success Contest" announced in this issue. Prizes are offered for the twelve stories which the judges find of greatest merit. Literary style is not necessary, just real ideas proved successful by practical everyday application. Every bonafide Service Man is eligible.

Don't put it off . . . the contest closes May 15. And, don't forget to include a photograph of your store front or work bench.

**R**ECENT U. S. Census figures show that over 80 percent of all American families own at least one car; more than four out of every five. . . . What a potential field for auto-radio sales and service!

And, as we have pointed out repeatedly in these columns, you are the most logical person to sell auto-radio receivers. Your customer invites you into his home and seeks your advice. Simple to turn the conversation to auto-radio. Just ask him how the set in his car is working. If he has one, its just as well—you've another service prospect. If he has none, sell him one.

**B**Y TODAY'S standards sound equipment manufactured only three years ago is almost antique. Improvements in efficiency, quality, ease of operation and dependability have come so rapidly that only systems installed very recently can be considered adequate. Prices, too, have been lowered with the result that the ultimate purchaser can now get considerably more for his dollar than ever before.

In your own community there are undoubtedly many pieces of sound equipment that are limping along on their last legs. Conduct a canvass among these installations and stage demonstrations to show the superiority of modern equipment. A large replacement market is awaiting your sales effort.

**T**HE wide awake Service Man can look forward to a tidy bit of business as a result of the Havana Conference. Reallocation of station frequency assignments will probably be ordered by the FCC shortly. It is said that more than half of the stations in the United States will be affected. When reallocation comes, some 8 million push-button operated receivers will require resetting . . . not to mention the additional service work for which this will provide an entree.

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# SERVICE SUCCESS CONTEST

Open to all bonafide service men and service organizations in the U. S. and Canada

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Write an article telling how *you* developed a successful Service business—in 500 or more words. Enclose a photograph (snapshot will do) of your storefront, work bench or shop and mail it to SERVICE, 19 East 47th Street, New York City, before midnight May 15th.

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

Your manuscript will be judged solely on the value of the ideas it contains. And don't think you've got to be a genius either. A good series of business-getting letters or advertising may win first prize. A method of house-to-house canvassing may win. Possibly an idea for filling in slack seasons with remodeling or sideline activities—development of specialized activities such as

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And don't forget—ALL prize-winning manuscripts will be published in whole or in part in SERVICE. The other fellow may benefit by your ideas—you'll benefit by the ideas of others.

So grab a pencil and start in to help find more ways for Servicemen to make more money.

## RULES

- 1—This contest is open to any bonafide service man or service organization in the U. S. or Canada. There are no other qualifications whatsoever.
- 2—All entries must be mailed to Service Magazine, 19 East 47th Street, N. Y. City, N. Y., and must be postmarked not later than midnight, May 15. They should include a photograph (snapshot will do) of store, shop, or work bench.
- 3—All manuscripts become the property of Service Magazine, and we reserve the right to edit and change them when necessary before publication.
- 4—Two or more service men may collaborate in preparing one article, but in

this case they may qualify for only one prize, the same as though the article were prepared by one writer.

- 5—Winners' names will be announced at the RSA convention in June and published in June SERVICE.
- 6—Winners will be notified personally before June 1 and prizes mailed not later than June 5.
- 7—In case of ties, tying contestants will each receive the full amount of the award.
- 8—The decision of the judges is final.

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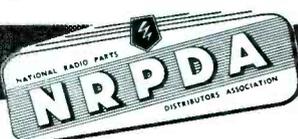
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# AUTO RADIO

By HENRY HOWARD

THE trends of 1940 auto-radio receivers are toward more compact units; easier mounting; better audio features, including more push-pull stages and more power output; broader i-f amplifiers; better station selecting systems, in the form of push-button improvements; stabilized oscillators; ganged permeability tuning; more local tubes, higher-gain antenna-input circuits, with more and better antenna filters; single-ended tubes and the inclusion of short-wave bands—to mention the more obvious.

List prices vary from \$14.95 for single unit compacts to \$69.95 for dual unit deluxe models. Many of the compacts mount in a space only 6 to 7 inches square usually on the steering column or under the dash. Mounting with a single bolt to the fire wall is featured in several instances.

Current drain varies widely; a four-tube Sonora draws only 3 amps while several models by Automatic are listed at 9 amps. Power output varies much more widely, ranging from 0.7 watt for the above Sonora to 10.5 watts for the highest priced Motorola. There is an unexplained lack of p-m speakers, Motorola being the only manufacturer using them—and in only three of seventeen models listed, although they are optional in several other models. Most of the electro-dynamic speakers used have four-ohm field coils which means over one and a half amperes dissipated. It would seem that battery economy might have been stressed as an impor-

RECEIVER manufacturers, in general, have bent their every effort to provide the utmost in sensitivity and quality in their auto-radio receivers. Simple tuning, broad-band i-fs, simplified antennae and improved inputs are preponderant among this year's models. The newer tube types, too, lend themselves to better and more compact designs.

In the next issue SERVICE will present a complete résumé in chart form, of practically every 1940 auto-radio receiver.

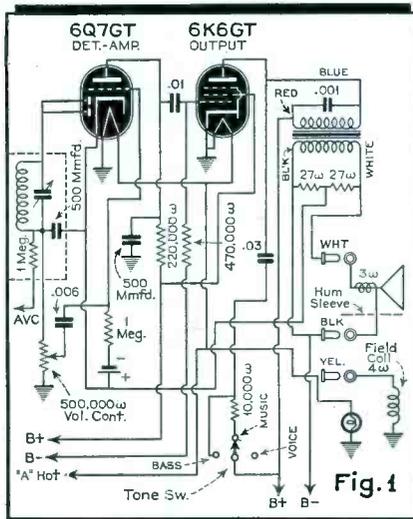
With automobile production for the first three months of 1940 approaching the million and a half mark (output for February alone is estimated at close to half a million) the sales and service possibilities are immense.

tant sales feature.

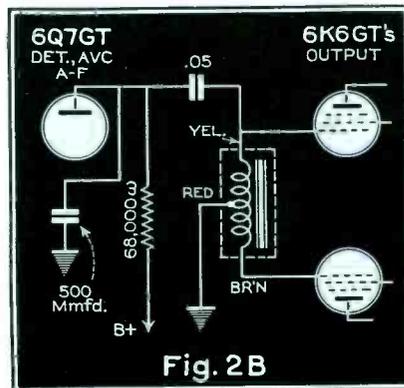
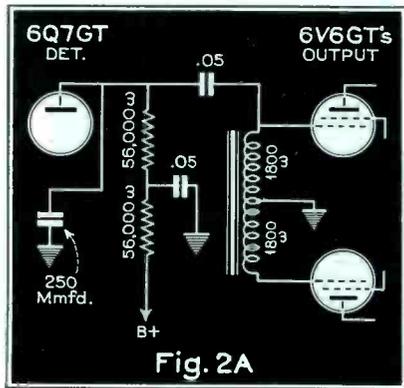
The r-f end of sets having had its shares of development, it's about time the audio end received some attention.

Speakers are lower and often right in front of the operator or passenger where real tone quality can be appreciated. A considerable amount of attention has been devoted toward relieving back pressure of speakers through the use of large holes and louvres. This reduces muffling, and adds brilliance. About twenty percent of the sets are fitted with push-pull output stages with 6K6GT type tubes in favor. Several Class B 6N7 output stages are also with us. Reduction of distortion accompanies the use of degeneration in some models, such as the Motorola Model 26C, shown in Fig. 1. Input transformers are being used exclusively to the push-pull stages; the various inverter tricks have been buried. Zenith-Nash Model 6MN496 and Motorola Model 26C7 and Model 400 use an autotransformer, or tapped choke if you prefer, with a 6Q7GT feeding one push-pull grid directly (see Figs. 2A, and B). Western Auto is using a 6SK7 first audio feeding a 6K6G driver for a 6N7G output stage in their Truetone Model D1091, shown in Fig. 3.

The OZ4 no-heater rectifier is again becoming popular although about a third of the models are still using synchronous vibrators; models of every price range, too. Plenty of three-gang condensers are in evidence attesting the desirability of the good old r-f stage although a new slant appears to be resistance coupling from r-f to mixer, necessitating only a two-gang variable. See the Trav-ler Model 621, Fig. 4 and



Galvin (Motorola 26C, Fig. 1, above) uses degeneration to reduce distortion. Zenith and Galvin (Zenith 6MN496 and Nash AC4289, Fig. 2A, left, and Motorola 26C7, Fig. 2B, right) use an auto-transformer for push-pull operation.



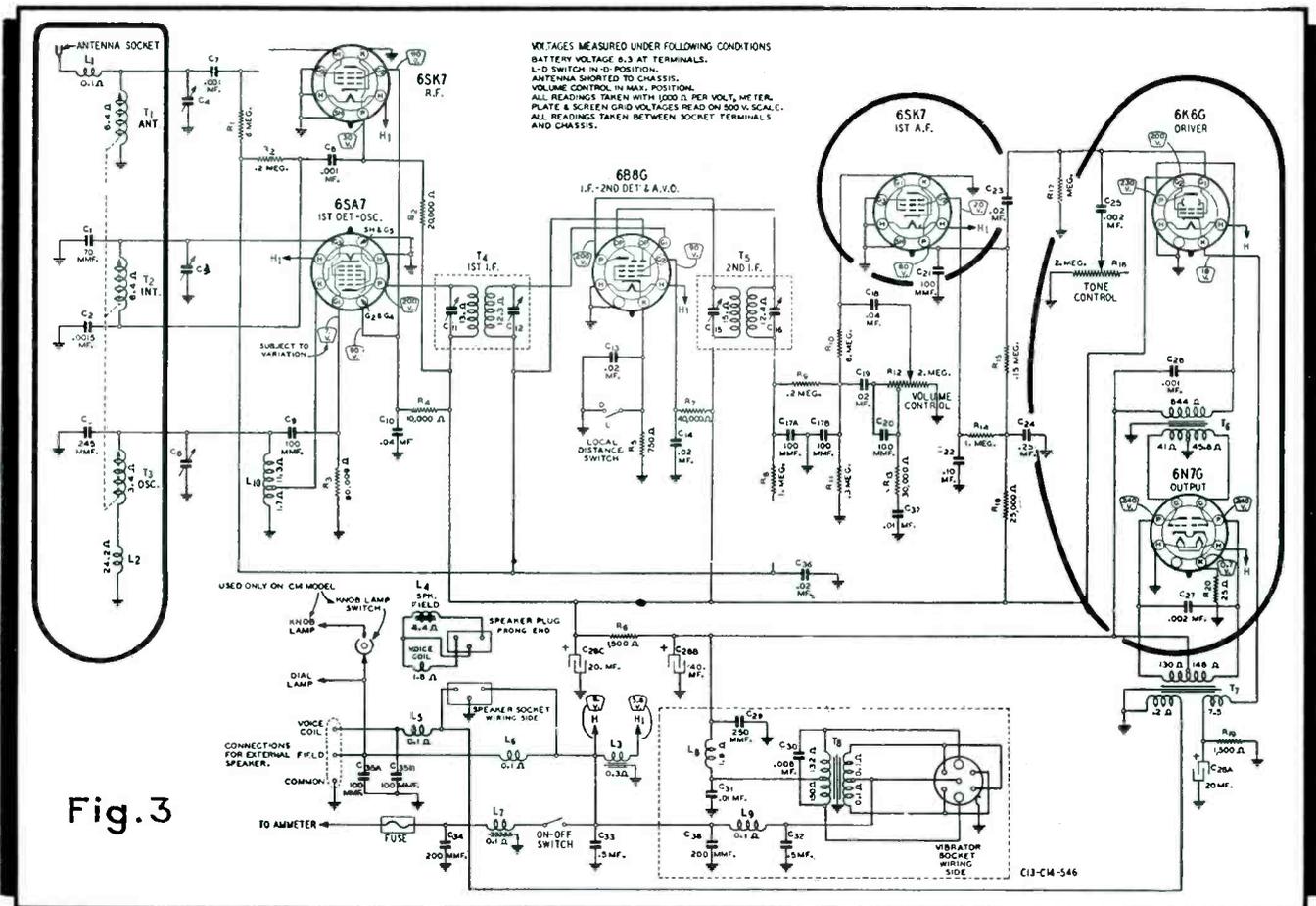


Fig. 3

Western Auto (Truetone D1091, 6C14-3, Fig. 3 above) uses a 6SK7 audio, a 6K6G driver and 6N7G output.

the Crosley A169, Fig. 5. The Crosley also features Magnetune station selection.

The method of untuned coupling referred to is more or less permissible in auto sets with their limited voltage picked up on auto antennas. In home sets, this stunt would give trouble with cross-modulation.

Pole antennas are becoming standard equipment, some with built-in, and others with optional filters and antenna boosters. Some manufacturers go so far as to say their sets will not per-

Stewart-Warner (Packard PA351099, PA351100, and Stewart-Warner R3271, R3271C, Fig. 6, below) provides a tapped antenna input.

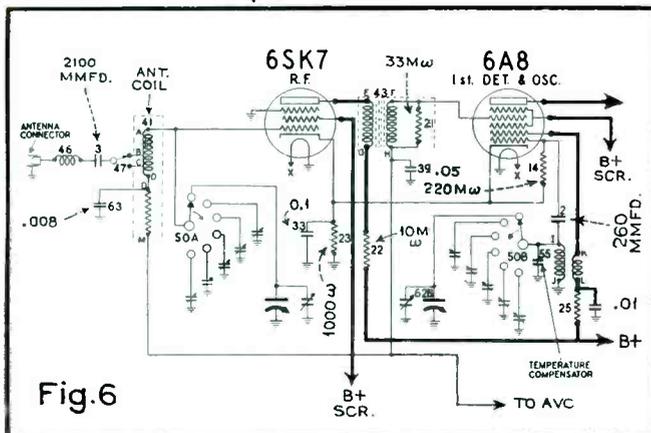


Fig. 6

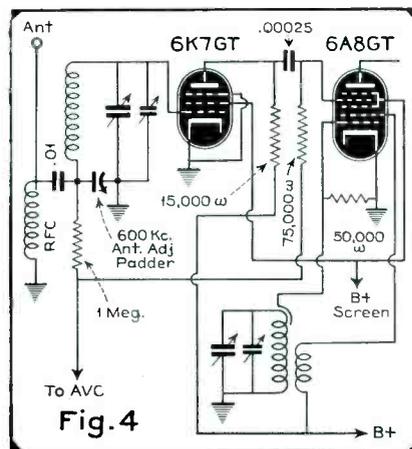


Fig. 4

Travler (Model 621, Fig. 4, left) employs a resistance-coupled r-f stage.

form with high-capacity antennas, such as roof, built-in and under-running-board aerials. Others are more lenient, providing tapped antenna coils for matching various types. See Stewart-Warner Packard Model R3271C Fig. 6. Note also the single push type rotary switch tuning unit. A mute switch is located on the station selector switch. Another Stewart-Warner Packard Model R3291 (Fig. 7) features a single push button with permeability-tuned oscillator coils and, also, a muting switch. A three-gang permeability tuned unit is

Stewart-Warner (Packard PA351101, PA351102, Stewart-Warner 3291, R3291C, Fig. 7, below) features single button with permeability-tuned oscillator coils.

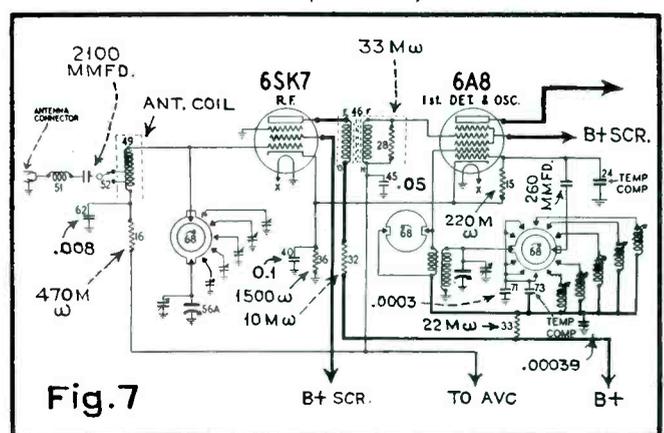


Fig. 7



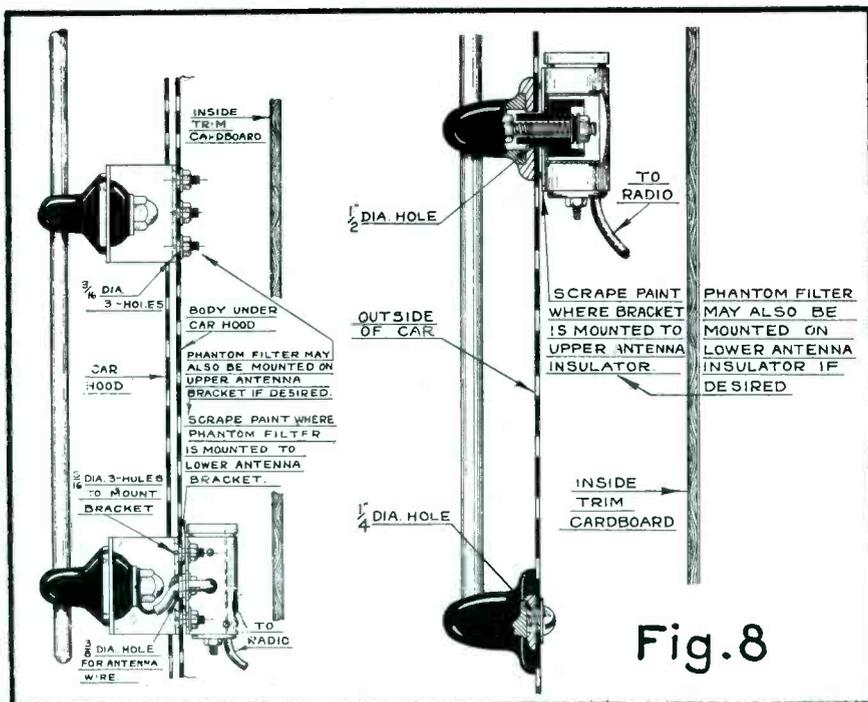


Fig. 8

Arvin contributes the whip antennae with Phantom Filter attached.

standardized for the i-f peak. That will make things a bit easier. The manufacturers are making some push-button settings easier, too, many requiring no tools at all. But we won't let you relax for long. Take a good, deep breath before scrutinizing the Stewart-Warner Hudson deluxe equipment in the person of the Feathertouch Tuner portrayed in Figs. 12 and 13. Trouble here calls for a master mechanic. Correspondence school Service Men should have this one for the final exam!

Single-ended tubes are rightfully popular. Sonora and Crosley use metal except for the power stage. Motorola, Montgomery Ward, Automatic, among others, feature single-ended GT types.

Tone controls, some with Harvard accents, haven't changed a great deal. All but the cheapest sets feature at least a switch type. Some volume controls are equipped with base compensation.

Loctal and octal bases are gripped much tighter than the old types of tubes; also, the tubes themselves are smaller and lighter. This permits mounting the tubes in any position without danger that they will drop out of their sockets. Philco is still the principal user of loctals although, in some sets, bases are mixed. Zenith-Ford models are also fitted with loctals.

Noises are being forced into the background. The mechanical noises of vibrators have been greatly reduced. There is much less hash in the new receivers, thanks largely to the widespread use of oscilloscopes in improving waveforms and reducing elusive parasitic oscillations which were not even

suspected a short time ago. It will be noted that the hash is at nearly the same level throughout the broadcast band in many sets. Proper loading of vibrators (and less revamping by Service Men) is also responsible for cutting down the peaks—and the noise. The car manufacturers should be allotted their share of credit for improving ignition systems and other important items pertaining to radio noise which has enabled the radio manufacturers to get away with a minimum of spark suppression filters and other obnoxious paraphernalia. While on the subject of vibrators, it seems that all the talk of high frequency drifts, with a consequent

saving in size and price of power transformers, has faded away. We still have our old, standard 120 cycle vibrators—for a while, anyway!

A few models (such as the Stewart-Warner Packard Model, Fig. 14 and the Philco Model AR7, Fig. 11) feature motor tuning. Some sets have pilot lamps to indicate which push-button is in operation. Slide horizontal dials seem to be quite practical. They also fit in well with modern car interior design, matching speedometers and other instruments.

Increased use of iron-cored i-f transformers will mean less drift due to vibration and temperature changes. Many i-f units have untuned primaries to increase the broad tuning characteristic, permitting more drift and better quality. At long last there are very few paper tube electrolytics in the newer auto sets. Metal cans will mean less gobs of wax making Service Men's lives miserable. Fibre mounting straps serve to insulate the can from the chassis in designs where the can is more negative.

Oh, yes, there is no afc in any 1940 auto-radio model!

The circuit shown on the front cover is the control head of the Stewart-Warner Hudson Deluxe Model SA40 auto-radio receiver. It houses the untuned r-f stage, the tuned oscillator stage, and part 1 of the first i-f transformer. The i-f signal is fed through a low-loss cable to a coupling coil (part 2 of the i-f transformer) in the lower receiver unit (Fig. 15) which contains the second

Fig. 9 shows the method of coupling the antenna to a converter stage (Arvin RE54) and, Fig. 10, to an r-f stage (Arvin RE60).

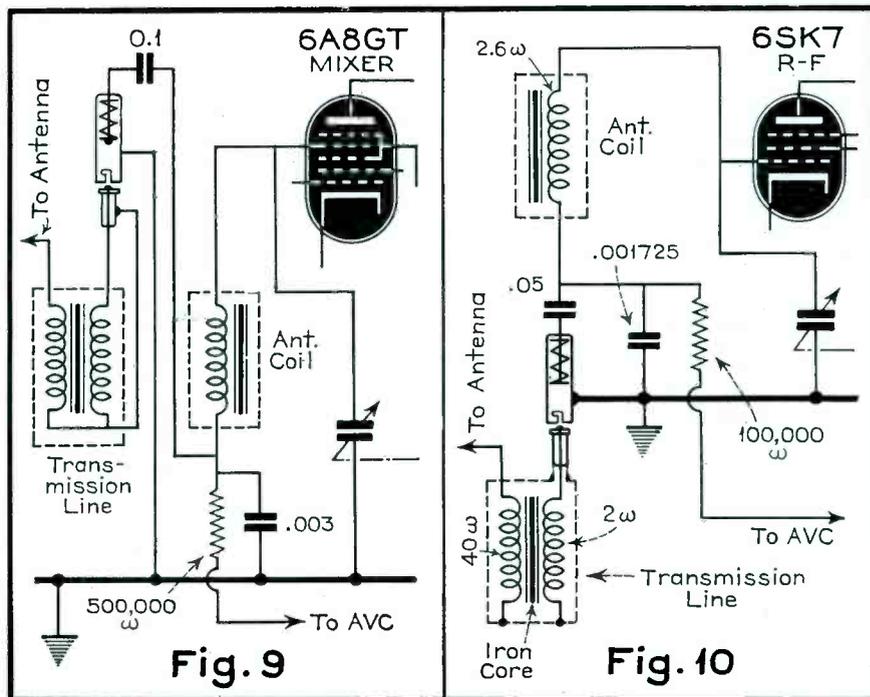
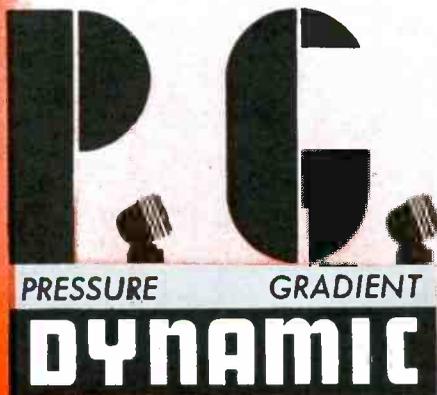


Fig. 9

Fig. 10

# AMPERITE Announces the *BIGGEST ADVANCE* in the Dynamic since its Inception!



- **UNI-DIRECTIONAL.** NEW SUPERIOR ELIPSOID PICKUP PATTERN
- **ELIMINATES FEEDBACK TROUBLE** BECAUSE IT HAS LOWEST FEEDBACK POINT OF ALL DIAPHRAGM TYPE MICROPHONES
- **FLAT RESPONSE.** FREE FROM ANNOYING PEAKS, GIVING STUDIO-QUALITY REPRODUCTION.



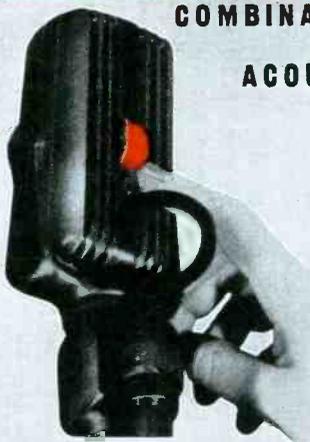
The P.G. diaphragm follows air particle velocity where amplitude is a GRADIENT of the PRESSURE. In ordinary dynamics amplitude is restricted from following air particle velocity.

The P.G. DYNAMIC is a radical improvement in this type of microphone. You can actually hear the difference. Case is designed according to modern acoustic principles. Rugged, not affected by temperature, altitude or humidity. **HAS UNUSUALLY HIGH OUTPUT, -55 DB.**

**MODEL PGH (PGL, 200 ohms).** Excellent for high fidelity, P.A. installations, broadcast studio, and professional recording. With switch, cable connector, 25' cable. Chrome finish, LIST \$32.00 (40-10 000 C.P.S.)

**MODEL PGAH (PGAL, 200 ohms).** For speech and music. 70-8000 C.P.S. Switch, cable connector, 12' cable. Chrome, LIST \$25.00

## COMBINATION VELOCITY-DYNAMIC ACHIEVED WITH ACOUSTIC COMPENSATOR



An exclusive Amperite feature: By moving up the Acoustic Compensator you change the AMPERITE VELOCITY to a DYNAMIC microphone without peaks. At the same time you reduce the back pick-up, making the microphone practically UNI-DIRECTIONAL.

WITH ACOUSTIC COMPENSATOR:  
**MODEL RBHk: RBMk (200 ohms)** with switch, cable connector.  
 Chrome, LIST \$42.00

**RSHk: RBSk (200 ohms).** Switch, cable connector, Acoustic Compensator.  
 Chrome or Gunmetal, LIST \$32.00

## AMPERITE KONTAK MIKE Puts Musical Instruments Across



So beautiful is the tone produced with the Kontakt Mike, that it was used in the Philadelphia Symphony to amplify a mando in solo. Gives excellent results with any amplifier, radio sets, and record players.

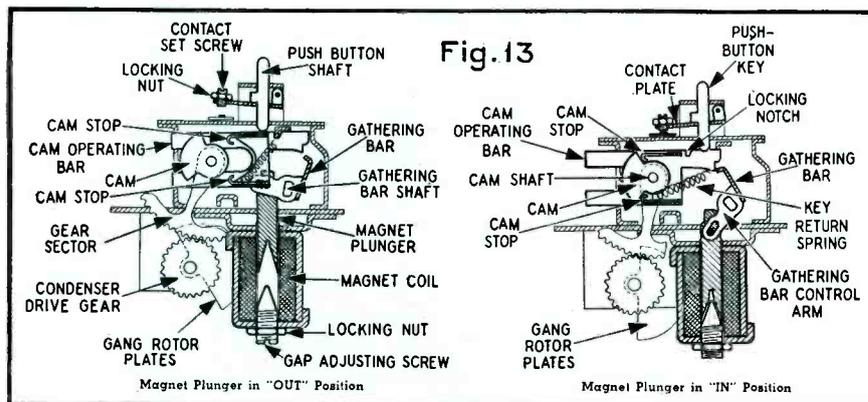
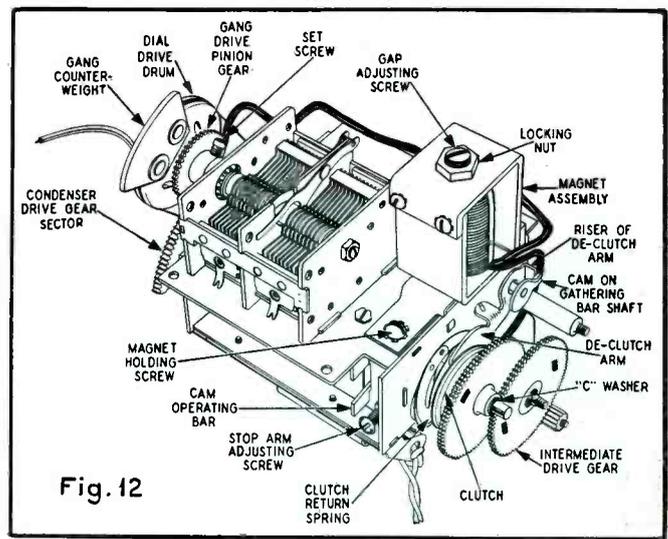
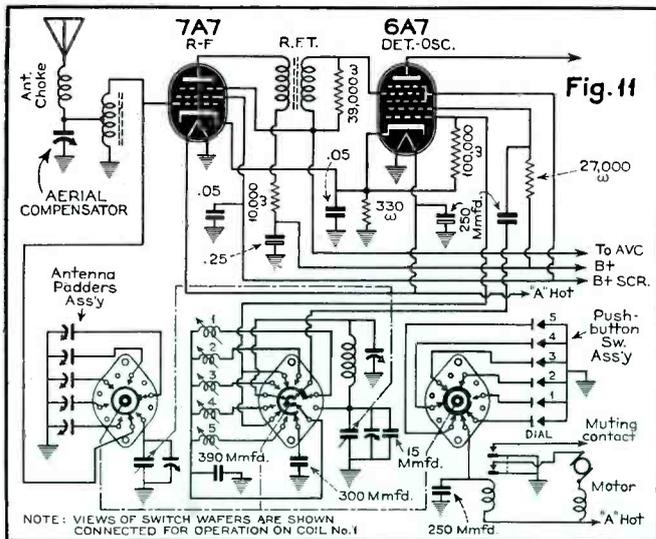
- MODEL SKH (hi-imp)** ..... LIST \$12.00
- MODEL KKH, with hand volume control** .. LIST 18.00
- Plug extra** ..... List 1.50
- FOOT PEDAL, for making beautiful crescendos** ..... LIST 12.00

WRITE FOR FREE SALES AIDS

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Specify **AMPERITE**





A few models, such as Philco AR7, Fig. 11 (upper left), feature motor tuning. The Stewart-Warner Hudson SA40 employs a system called Feathertouch Tuning. The mechanism is shown in Figs. 12 (left) and 13 (above). The tuning buttons can be set in any order and without the use of tools. One or more can be reset without disturbing the others.

with its comparatively long antenna and high signal voltage pick-up, but, in an auto receiver, the antenna is so short that there is little danger of cross talk due to excessive signal voltages from an unwanted station. Of course, only a 2-gang condenser is required.

The new Hudson Feathertouch Control can be set to stations without any tools. This design is unusual in that any button can be set to any station, an obvious advantage over other types of tuners. The buttons can be set in any order and one or more buttons later reset without changing the settings of the remaining ones. All instructions must be observed, however. The antenna trimmer must be properly adjusted when the set is installed or there will be a marked reduction in sensitivity.

detector, audio stage, vibrator and associated power supply components. The speaker is mounted with the control head on the dash (see front cover).

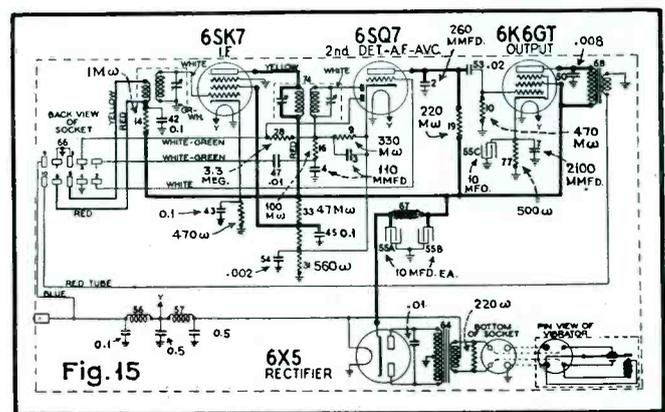
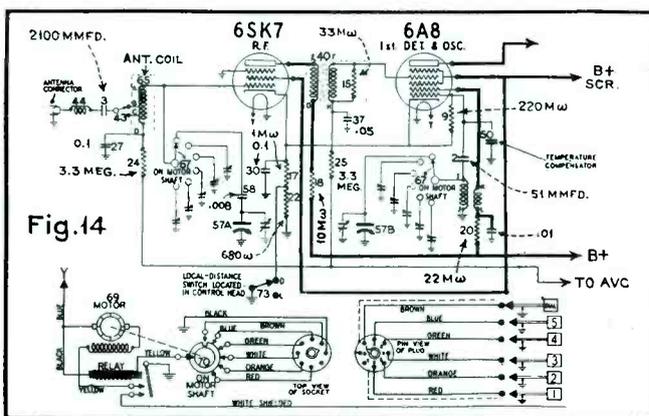
The principal feature of this receiver is the Feather-Touch instantaneous push-button tuning system (see Figs. 12 and 13). Other features include automatic tone compensation, temperature compensated oscillator, and antenna motor noise choke. Two watts of undistorted output are available, with a maximum of three watts.

Stewart-Warner Packard PA33915, PA353-832 (Stewart-Warner 3341) also features motor tuning. Six buttons are provided.

The battery drain at 6.0 volts is 6.5 amps which includes 1.5 amps for the field supply for the 6-inch dynamic speaker. When a push-button is depressed, the drain is momentarily increased to 13.5 amps; a husky magnet being used in the tuning mechanism. The tuning range is from 540 to 1580 kc with a manual tuning drive ratio of 4 to 1.

The coupling between the r-f stage and the first detector is through an untuned iron-cored transformer, resistors being used in series with the primary and in parallel with the secondary. This stunt would not ordinarily be considered good practice in a home receiver

The i-f signal is fed to the second half of the Hudson SA40 through a low-loss cable. (See front cover for first half.)



# DEALER COOPERATION

By MARTIN FRANCIS

*Bob Hinson's personal contact with automobile dealers keeps his shop busy throughout the year. Why not take a leaf out of his book and call on the dealers in your community? Few auto-dealers are properly equipped to render adequate auto-radio service. You can easily become a specialist in this line. And it is highly profitable, too.*

PERSONAL contact with automobile dealers has helped Bob Hinson, owner of Hinson's Radio Service, 711 Texas St., El Paso, Texas, build a fine auto-radio service business. Bob has accumulated a long list of service customers that keep this shop busy throughout the year.

"These automobile radio owners also have sets at home," states Hinson, "and so we often have two sets to repair in the same family. In fact we can figure our auto-radio customers for double the service money each year than we can the ordinary home set owner. As we've gone along we've added a lot of equipment which helps us to do fine repair jobs on auto radios. This impresses auto dealers and more and more of them send us their work."

Once this firm gets an auto radio out of a car, every effort is made to see that all repair work is authorized and performed at that time, so future yanking of the set won't have to be done too soon.

"The minimum on such jobs usually runs well over five dollars," says Hinson, "and the customer appreciates our calling his attention to a complete repair job once the set is yanked. We've got a drive in where car

owners can drive right into our service shop in any kind of weather, and this means a lot in getting business. We want these customers to see our service shop layout and ask questions, for this helps sell them future service jobs on auto radios and often convinces them they should let us repair their home sets as well."

Hinson, who practically grew up with the radio business since 1923, also builds quite a few ham transmitters and finds quite a market for them in his area.

Amateurs come from great distances to get the transmitters, for they have learned that Hinson is an expert in this kind of thing. His store often becomes a sort of headquarters for the hams in the area.

Quite a number of Hinson's transmitters have found their way into Mexico, too, and many throughout Western Texas and into New Mexico.

In addition Hinson does some sound work for two El Paso theatres.

"This wide field of activity gets me well known and brings in more service business constantly," states Hinson. "Enthusiastic hams, for example, will go a long way to sending business to a service shop they like."



Bob Hinson, Hinson's Radio Service, 711 Texas Street, El Paso, Texas, has added a lot of equipment to his shop which enables him to do an expert job of auto-radio repairs. This equipment also helps to impress his automobile dealer clients and the auto-radio set owners as well. The business thus tends to multiply itself, with the result that the shop is getting busier all the time.





Photo courtesy Clough-Brengle

Customer psychology plays an important role for James F. Waldron, proprietor of Community Radio Laboratory, Norwood, Mass. The instruments shown are, from left to right, CRA oscillograph; Model 110 signal generator, Model 111 Uni-signal frequency modulator and Model 135 Uni-checker on rack and a Model 79C beat-frequency oscillator.

**E**FFORTS to educate the Service Man in service technique are very desirable and are, of course, necessary. However, on the psychological side, there is and always will be an unsatisfied need for further information. You may be at the top of your profession in technical knowledge yet you can use guidance in broadening your contacts and harmonizing your relations with others.

Consider a few common problems and how we can meet them. Suppose, for example, that a receiver is returned late; the owner has missed a valued program and she is thoroughly peeved. (Of course, it is understood that as a general practice the set should be returned on time, but that in this case an emergency developed such as unforeseen trouble in the set.) The customer must be handled with tact, you must keep cool and try to plan your policy, especially when the customer follows an unexpected line.

One way of handling this would be to say, immediately upon entering, "I am sorry to be late, madam." Later when the air has cleared the matter can be explained. "When it came time to return your set, I was not completely satisfied because I try to do work only of the highest quality. I went over it completely and made it perfect. I felt convinced that when you understood the reason for the delay, you would approve it." Then you will not only have proved that "a soft answer turneth away wrath" but have turned an irate customer into an admiring one. Strive to leave behind a pleased owner, satisfied with your work. From such a customer may come much future business.

Suppose, again, that a set owner is criticising another Service Man in your presence. Several ways of combatting this are possible.

You can change the subject; excuse

It is the purpose of this article to discuss some of the psychological problems which the Service Man meets. We should be able to draw out of it something which will aid us in each new situation of the same sort which arises. It may be said that this is not possible because each case in human relations is different from the other. This latter certainly is true, yet it is certain too that in all such situations something common does appear and it is this we can use.

him because of the difficult job he had to do; you can say nothing or you can refer to his good points. Most Service Men have heard the customer say, "I don't think much of A's work on my set. It's worse than when he took it and his charges are too high." Service Man B can say to this, "I certainly like your receiver, madame. It was once one of the best and even now has especially clear tone" (if it is true, of course). Or, he may say, "Your receiver was once one of the most complicated on the market and even now requires skill and patience to repair it properly." Or as mentioned before, he may become particularly busy at that moment and say nothing. But you can say, and this is recommended as the best, "I'm surprised at that, Madame, because A is considered to be very square in making things right."

When we say, it isn't ethical to criticize a fellow Service Man, we mean that we wouldn't want him to join in criticism of us if he were in our place in this spot. Something good can be found in the poorest Service Man and here is the time to bring it forth.

As an other example, suppose that you are about to take a set from a home to your bench for repair and that the owner is doubtful about letting you take it. Here is a time for you to express confidence in your ability, not, however, with hesitation or with exaggeration. If your attitude is one of sincere confidence, the owner will feel that you know what is to be done and how to do it and thus will have faith in you. Since the owner knows nothing of what is going into the set to make it work,

he must depend entirely upon his trust in you.

An owner may demand further work to be done without payment shortly after the original job has been finished. You may not be responsible in any way for the added work necessary and demanded. This calls for diplomacy. If the customer is a profitable one, the cost of the added work should be weighed against future business from the customer. If the cost is to be rather high and further business from that source is doubtful, it may be desirable to insist either on full payment or on a compromise for partial payment. If the work demanded is due in part to your negligence then the square thing is to do it even at a loss.

If a customer delays payment beyond all reason, all the judgment you have may need to be used. The method one Service Man used should be used with caution. After he had repaired the receiver, and was holding it in an effort to collect payment, he received a short note from the owner stating, "Check is ready, send set." The Service Man replied with another, equally short note stating "Set is ready, send check."

As a general practice, it is wiser to apply pressure gently over a longer time than to try to collect immediately under too high a pressure.

The foregoing situations have been discussed in detail. Others are:

(a) When the old set must be replaced.

(b) The tact needed when you are plied with questions before you have found the trouble.

(c) What to do when the customer insists on knowing exactly when his receiver will be returned and what it will cost, especially when it is a "fading" job.

(d) Handling the type of customer who phones Service Man after Service Man, for a price on his job.

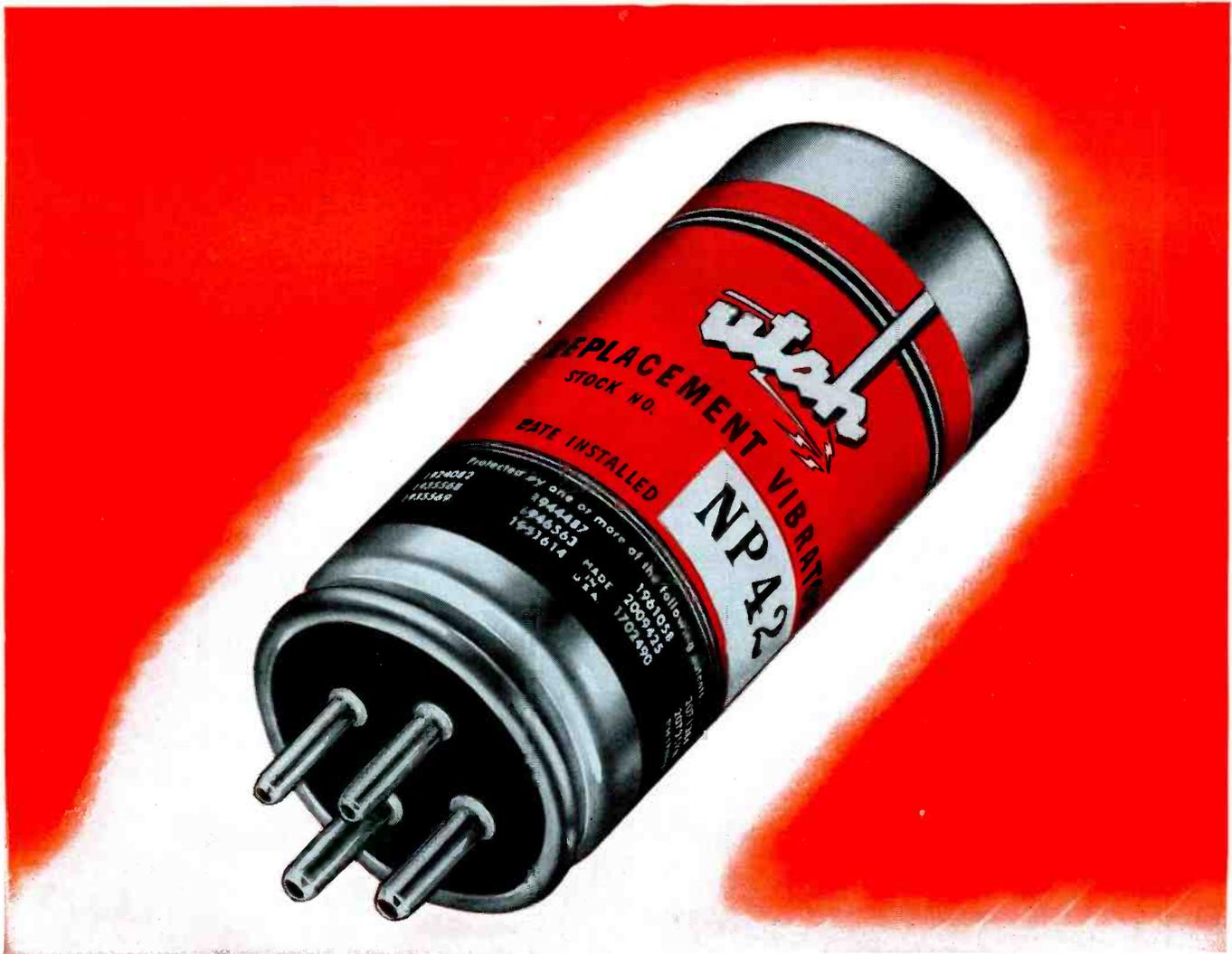
(e) When the customer demands replacement and the guarantee period has just passed.

These are problems in human relations, and for instruction in them, free discussion is one of the best methods. This can properly be held, and in some cases is being held, in the association and club meetings of Service Men.

# CUSTOMER PSYCHOLOGY

By WALTER KENWORTH

SERVICE INSTRUCTOR, RCA INSTITUTES



# 5 REASONS WHY THE DEMAND FOR UTAH VIBRATORS INCREASED 63%

The preference for Utah Vibrators has grown with the industry, because most of the important vibrator developments have originated in the Utah laboratory. Outstanding design and advanced engineering have maintained their leadership. In 1939 the demand for Utah Vibrators increased 63% because:

- 1 Complete exact replacements can be made with the Utah line.
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**V I B R A T O R S**  
**SPEAKERS • TRANSFORMERS • UTAH-CARTER PARTS**

# AMPLIFIER RATINGS

By JOHN M. BORST

**A**N AMPLIFIER is but one part in a complete transmission or reproduction system. We are interested in the performance of the whole system; that is, how well the original sound is reproduced and with how much gain in power. Measurements should then really be made over the whole system from microphone to speaker. Such acoustic measurements are very hard to make and so we have separate ratings for each link in the chain.

It has become customary to let each part stand by itself and give as faithful reproduction as possible rather than to have one part cancel the shortcomings of another part. Such an arrangement makes it easier to use different types of microphones and pickups with the same amplifier.

Ratings which will prove practically useful should satisfy two conditions: 1) The ratings and measurement procedure should be so standardized that they can be repeated by anyone skilled in the art, yielding the same result. 2) The measurements should be made in such a way that the unit under test works under practically the same conditions as it will encounter in actual operation. This means that it works out of the same impedance and into the same impedance as in practical use.

This second condition is hard to satisfy since there are now so many different types of microphones, pickups and speakers. The next best thing is to agree on some standard system of rating and a standard measurement procedure so that products of different manufacturers may be compared fairly.

Introduction of standardization has been slow. RMA has now set some standards for this field but as yet the standardization has not gone far enough. The following is a discussion of the ratings now in use and their interpretation.

## • • • output ratings

Power output is measured in watts but sometimes it may be given in decibels. In the latter case there should be an accepted zero level. For public address work this zero level is defined as

6 milliwatts, or, more accurately as  $\pi$  milliamperes through 600 ohms. Fig. 1 is a chart for the conversion of power levels in decibels to watts or vice versa.

One might measure the output power in various ways as in Fig. 2A and Fig. 2B. In Fig. 2A a non-inductive resistor of the recommended value for the output stage is connected across the primary of the output transformer, leaving the secondary open. The primary then serves as a by-pass for the d-c (without it there would be a large voltage drop). Its reactance with the sec-

ondary across the 2-ohm secondary or in a 500-ohm resistor across the 500-ohm secondary. Practically there is a difference because the transformer becomes less efficient for larger step-down ratios. The standard procedure recommended by RMA is to measure power in a 500-ohm non-inductive resistor across the 500-ohm secondary at 400 cycles.

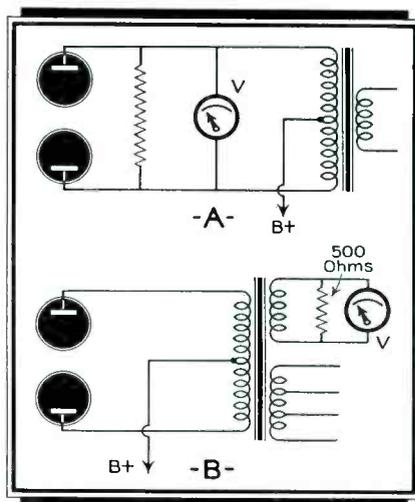
In this connection it should be remembered that the load represented by the speaker consists of resistance plus inductance and that the impedance of this combination varies with frequency. If the speaker is perfectly matched to the amplifier at 400 cycles, it will be mismatched at higher frequencies. When triodes are used in the output stage, this will not make much difference but with pentodes or tetrodes one may expect less power output, more distortion and more gain at higher frequencies.

Inverse feedback can be used to reduce the effect of varying speaker impedance. A tone correction circuit across the transformer primary is also used frequently to equalize the response at different frequencies.

Having thus defined the measuring unit and the standard circuit, it is still possible to arrive at different ratings for the identical output circuit. The reason for this is illustrated in Fig. 3. Here is shown the curve of output power versus grid-signal voltage in one curve, while the other curve shows the accompanying total harmonic distortion. If there were no distortion, the power output curve should be a parabola, or, if the square of the input voltage were plotted along the horizontal axis it should be a straight line. The more the curve departs from this ideal the more distortion. We see that when the grid excitation is increased, the power increases and so does the distortion. When the excitation is further increased, the power increases at a lesser rate and the distortion at a higher rate until a maximum power is reached. Thereafter the power decreases again because the grids rob the plates of some power.

The power output rating now depends entirely on the amount of distortion one wants to allow. RMA has defined as "undistorted output" the point A on Fig. 3, where the total harmonic distortion is 5 percent. This rating applies to push-pull stages. Single ended stages are usually rated at  $7\frac{1}{2}$  percent total harmonic distortion, which is then also called "undistorted output," but this is no RMA standard.

The "peak output power"-rating refers to the point B in Fig. 3, the maxi-

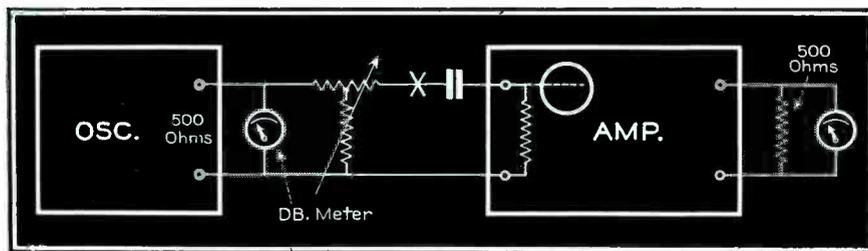


Figs. 2A and B. There are various methods used to measure the power output of an amplifying device. RMA recommends that shown in B.

ondary open is assumed to be so high that for all practical purposes the load is equal to the resistor alone.

The power might also be measured across any secondary in a resistance of the proper value. Theoretically it should make no difference whether the power were measured in a 2-ohm re-

Fig. 4. The gain through an amplifier can be determined by connecting a signal of known power to its input and measuring the output obtained. The final result, however, will depend upon the value of the grid load resistor on the input tube.



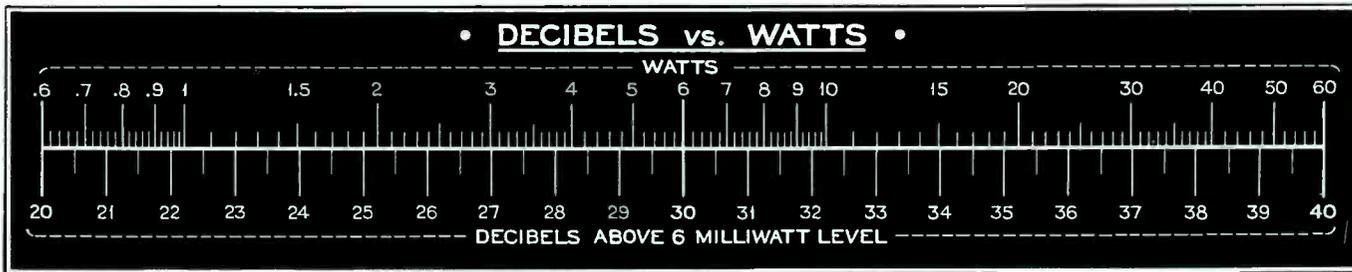


Fig. 1. Power output of amplifiers is measured in watts, sometimes, however, it is given in decibels. The chart shown converts from one to the other.

imum that can be obtained from the tube. This is usually accompanied by bad distortion and may not be useful for reproduction of speech or music.

There are manufacturers who think it desirable to allow less or more than 5 percent distortion and rate their output power accordingly. Such ratings usually carry other names such as "distortionless power" or "usable power." Therefore, to compare the ratings of amplifiers it is necessary to consider measurements which were made under identical conditions and with the same total harmonic distortion.

• • • **hum level**

The hum level is given in decibels below the undistorted output level for that amplifier. RMA standards call for a maximum allowable hum level of 55 db below undistorted output. In practice one may encounter ratings up to -70 db which is considered exceptionally good.

• • • **gain**

The gain of an amplifier is measured in decibels. In order to find this gain, measurements must be made simultaneously of the power delivered to the input terminals of the amplifier and that delivered to the load by the output stage.

The standard frequency is 400 cycles; the standard method for measuring output was described above. The measurement of the input power is not standardized, at least not in the case of amplifiers with resistance-coupled input circuits. Different measurement procedures will give different amounts of gain.

The usual method of measuring amplifier gain is shown in Fig. 4. An audio oscillator with low distortion delivers its power to a 500-ohm line containing a power-level meter, followed by an attenuator and this is coupled to the input of the amplifier through a coupling condenser. The output is measured by a power-level meter across the 500-ohm load. The power-level meter is nothing but a rectifier-type voltmeter which is directly calibrated in decibels above the 6 milliwatt zero level. Its calibration is good only when connected across 500 ohms.

If the input impedance of the amplifier were also 500 ohms, the gain would

be equal to the difference between the two meter readings plus the setting of the attenuator. Since the input impedance of the resistance coupled stage is very high this would be an unfair measurement, for one might use a step-up transformer between the oscillator and the input circuit which would increase the measured gain. Therefore, if we are to stick to the definition of the decibel we must add a correction factor to take care of this impedance difference. This correction consists in a number of decibels to be added to the gain already obtained

$$db = 10 \log \frac{\text{Input impedance}}{500}$$

The difficulty is that there is no agreement about the magnitude of the input impedance. It consists of the grid-cathode resistance of the tube in parallel with the grid-leak. Since the grid-leak is anything from 1/4 to 20 meg, and the grid-cathode (usually somewhere near 300,000 ohms) is not always known, the correction factors may differ.

Several manufacturers assume an in-

put impedance of 150,000 ohms for all amplifiers regardless of the type of input circuit. This value is, however, not universally accepted. There are those who do not use a correction factor at all. The two cases will differ 25 db in the rating of the same amplifier.

• • • **reflection losses**

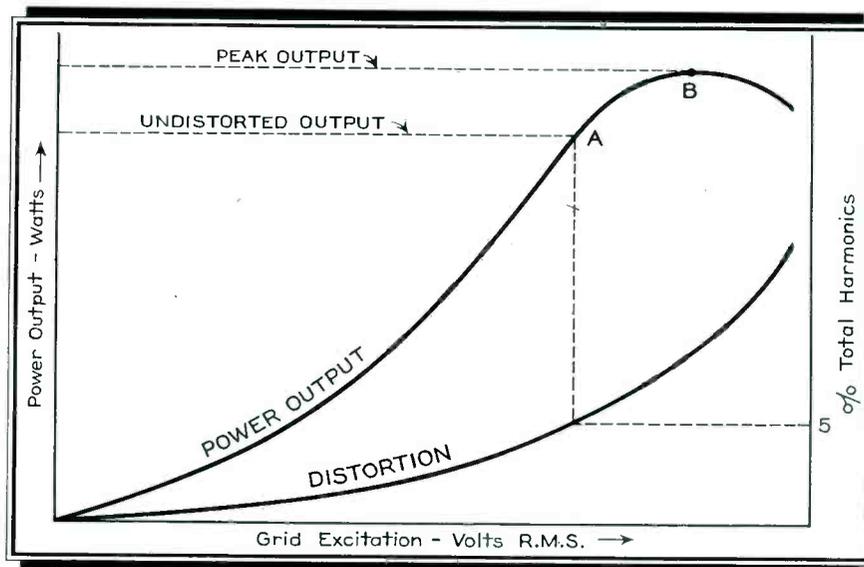
The use of decibels in the ratings of microphones, output powers and gain was intended to give a simple calculation for the required gain of an amplifier. For example: Given a microphone with a sensitivity of -70 db and required an output of +35 db, the gain should be 70 + 35 = 105 db. Unfortunately, that is not true unless the reference level of the microphone rating and the power output rating are the same and there is perfect impedance match between the various components. Neither of these conditions is satisfied; the microphone ratings refer to a different zero level than 6 milliwatts and there are various degrees of mismatch between the average microphone and its amplifier causing a reflection loss.

The correct amount of gain for the amplifier can be calculated as described in a previous article on Microphone Ratings in SERVICE.<sup>1</sup> There are also some who prefer to allow an extra 10 or 15 db above the answer of the above

<sup>1</sup>"Microphone Ratings," by John H. Potts, SERVICE, March 1939, p. 123.

(Continued on page 18)

Fig. 3. The useable power output of an amplifier depends somewhat upon the amount of distortion permitted in the reproduced signal.





trouble will be found to be caused by a defective soldered connection holding the stators to the frame. Resolder.

**Distortion after playing several minutes:** Replace the 25L6. The tube with the orange base is an habitual offender.

**Overloading on low volume:** Replace the 6Q7. This tube also causes a ringing noise after playing for a few minutes. The tube with the silver stamped base is the most frequent offender.

**Weak:** I-f trimmer won't peak. This is due to an open transformer winding. Repair as above.

**Speaker rattles:** This speaker has no adjustments. If the leads are not taut, bend the terminal bracket back until they are. If the voice coil is rubbing, remove the speaker and strike the edge of the frame so as to change the position of the coil with respect to the pole piece. The fabric over the coil becomes loose, too. It is only necessary to recement the material.

**Pilot lights blow frequently:** Replace the ballast.

**Phono switch will not cut out radio:** Clean the contacts on the phono radio switch.—Make certain that the arm is pulled all the way up.

**Key broken:** Remove the chassis from the cabinet. File the burr off the rod on which the keys ride. Pull the rod out. Replace the key. Make certain to get the key on the extreme left hand end back in its right place. This key is different from all the others. Push the rod back in place. Either place a lump of solder on the end or nick it to prevent the rod from slipping out again.

**Key inoperative:** If the screw has been turned out too far the lock will drop out. Retrieve the lock and replace it, noticing the position of the others. If the lock is lost and another cannot be obtained, it will be necessary to solder the C washers in the position to tune the station correctly.

**Key adjusting screw stripped:** Besides replacing the entire assembly, there are a number of ways of correcting this condition.

(1) Tap a larger thread and use a larger sized screw.

(2) Tin the stripped thread with solder and cut new threads with the original screw.

(3) Solder the C washers in place as described in the previous paragraph.

(4) A quick temporary repair can be effected by removing one of the self-tapping screws which hold the chassis in the cabinet and screwing it into the place of the original screw. This is recommended only if an emergency repair is needed, although it will last indefinitely.

**Tuning condensers move too freely:**

Tighten the set screw on the end of the automatic tuning shaft on the bottom of the side of the tuning condensers. It may be exposed by removing the tuning drum. Do not tighten the tuning condenser set screw on the other side.

**Turn table scrapes:** In some cases the spindle on the motor is bent. Replace it. Sometimes the idler wheels scrape against the under side of the turntable. Bend the brackets holding the wheels down about one-eighth of an inch.

**G. E. motor noisy:** Loosen the two screws, holding the bakelite cover of the motor. Do not loosen the two recessed screws yet. Remove the cover. Lift out the armature. Place a small amount of grease in the bearing and replace the armature. If it is not centered, loosen the other two screws and shift the field until it is. Replace the cover. The idler wheels are sometimes noisy. Take off the spring clip holding the wheels. Reverse the wheel so that the flat side is up. Place the oil filled felt washer over the wheel and replace the clip. The noise is caused by the wheel scraping against the clip.

**G. E. motor dead or intermittent:** The trouble is usually in the connections. Remove the bakelite cover as above to expose the terminals.

**Motor wobbles:** If the turntable has been dropped on the edge it will be out of true. Replace it. If the idler or drive wheels have been cut or flattened, replace them, too.

**Brown Alliance motor gets too hot:** Bend the blades of the fan so as to increase the pitch. This will increase the flow of air.

**Motor too fast or too slow on d-c:** The turntable speed depends on the diameter of the turntable and the driver wheels and on the frequency of the a-c from the inverter. If the wheels have not been tampered with, the vibrator is at fault. Replace it as it is essential that it deliver a-c of the proper frequency.

**Motor switch inoperative:** When the pickup is moved toward the record, the motor switch ordinarily is turned on. The switch has a small projecting fork which catches on a flat strip of metal placed vertically. If the strip has been bent back, the fork will not catch. Bend the strip towards the back of the set until the switch catches.

**Phono arm slips down:** Tighten the spring clip on the underside of the phono radio switch. This is near the roof of the set on the pickup spindle.

**Twelve-in. record hits lid:** Make the holes through which the motor screws pass larger and shift the motor toward the front of the set.

• • • specifications

Cabinet: Table model phono-combination.

Tuning: Manual and push button.

No. of station buttons: 6.

Manual tuning drive ratio: 1:1.

Tuning range: 550 to 1600 kc.

I-f peak: 455 kc.

Power supply:

H639 a-c: 115 v, 60 c.

H639 d-c; 115 v, d-c.

Power consumption:

H639 a-c: 75 watts.

H639 d-c: 85 watts.

Power output:

Undistorted: 2.0 watts.

Maximum: 2.5 watts.

Speaker: 6.5 in, p-m; voice coil 3.5 ohms at 400 c.

Dial lamp: No. 44.

Phonograph turntable speed: 78 rpm.

Pickup: High impedance crystal.

Stage gains:

Antenna post to converter grid: 4 at 1000 kc.\*

Converter grid to 6SK7GT grid: 30 at 455 kc.\*

6SK7GT grid to 6Q7GT detector plate: 100 at 455 kc.\*

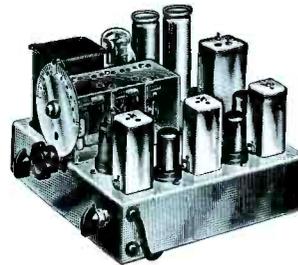
Audio gains:

0.06 volts, 400 c across volume control with control set at maximum will give approximately 1/2 watt at the speaker.

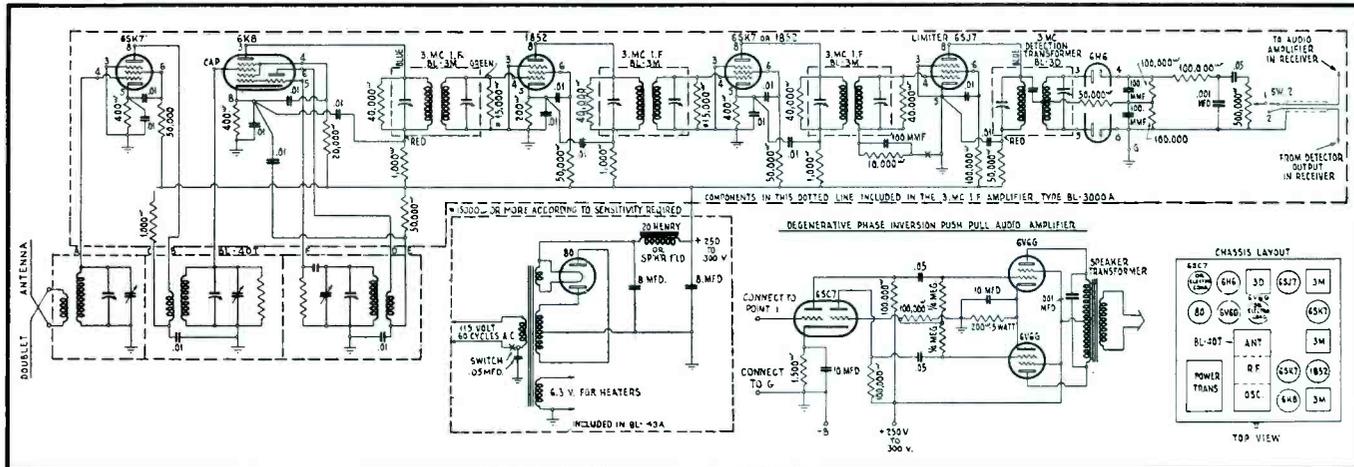
D-c voltage developed across oscillator grid resistor (R1) averages 12 volts.

\*Variations of -10%, -20% permissible.

**BROWNING F-M KIT**



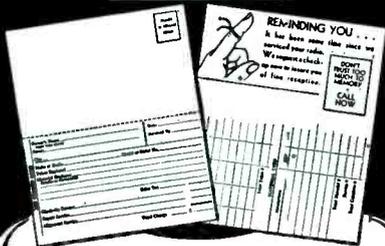
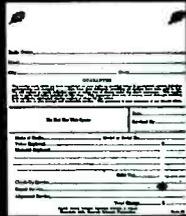
The Browning Laboratories, Winchester, Mass., have announced various component parts for receiving Major Armstrong's wide band frequency modulation method of static-free transmission. Special broad-band 3-mc i-f and detection transformers are available as well as a special high-frequency tuner. A completely wired and aligned adapter is in production which may be plugged into the phono-jack of any receiver.



# 3 MONEY SAVING

## "Sylvania Helps"

### THAT HELP YOU SELL



**YOUR NAME AND ADDRESS IMPRINTED ON ALL FORMS**

**1**—Save time and money and get more business through Sylvania's latest service helps. You will want the Three-in-One Service Form that combines our invoice, guarantee, job record card and a promotional follow-up card for mailing.

**2**—Many servicemen and dealers use Sylvania's Job Record Card and find it's *the* handiest way to keep things straight. This new form combines your job record, a record for the customer and a guarantee.

**3**—Sylvania's "Guarantee Package" is a business getter. It provides you with a "selling guarantee" and repair recommendation form all in one. There's a customer guarantee form and a large one for your shop.

*You can order as few as 100 of any of these Sylvania helps all imprinted with your name—at bargain prices. Send the coupon—today—for samples of these money savers.*

Hygrade Sylvania Corporation S-30 Emporium, Pa.

Please rush free samples and prices on your

- 3-in-1 Form
- Job Record Card
- "Guarantee Package"

Name .....

Address .....

City..... State.....

## AMPLIFIER RATINGS

(Continued from page 15)

example to take care of these losses.

- • • frequency characteristic

The measurement of the frequency characteristic is done with the same apparatus as the measurement of gain, but there is one important difference. The input capacity of the tube is across the grid leak and the generator. This input capacity amounts to the grid-cathode capacity plus the grid-plate capacity multiplied by the gain in the first stage. In the case of pentodes it is not very important, but with high- $\mu$  triodes, such as the 75 or 6F5, it may amount to 150 mmfd.

It will make considerable difference in high-frequency response whether this 150 mmfd is across a 15-meg grid leak and a high-impedance microphone or whether it is across a 500-ohm line. Therefore we must simulate the average condition by inserting a resistance at the point X in Fig. 4. There is again no agreement on the size of this resistor. Some manufacturers use the 10,000-ohm output terminals of their signal generator. Others insert a resistance anywhere between 5,000 and 20,000 ohms. The frequency characteristic will look flatter with the lower values of resistance.

When the amplifier is then connected to a microphone or pickup a considerable change can be expected because of the magnitude and phase angle of the microphone impedance. The crystal microphone has an impedance equivalent to a condenser and resistor in series. The tube capacity results in a loss of sensitivity but does not alter the frequency response. The input resistance of the amplifier, however, affects the low notes, the lower the resistance the less low-frequency response. A velocity microphone or a dynamic microphone is equivalent in impedance to an inductance and a resistance. The input resistance of the amplifier then affects the gain slightly, but the input capacity reduces high-frequency response.

There are still other factors which will affect the frequency characteristic. For instance, it makes a difference whether the measurements were made with a weak signal or with a strong signal.

- • • distortion

There are three kinds of distortion: (1) Amplitude distortion or harmonic distortion; (2) Frequency distortion; (3) Phase distortion. Generally, if one of these three types of distortion is present, all three are present.

Harmonic distortion is perhaps the most annoying of the three. It consists

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*June 11 to 14*

It's the right clue, if you follow through. Because that's where you'll find many a good idea which *you can* turn into profit. Yes, even one thought, one idea would well repay you. That's why the Trade Show is so vital to your business and to you. That's why you can't afford to miss it. Plan now—to go!

### JOBBER DAYS

Tues., Wed., Thurs., June 11, 12, 13

### OPEN HOUSE

Friday, June 14

STEVENS HOTEL, CHICAGO

**Radio Parts National Trade Show**

*Executive Office*

53 West Jackson Boulevard · Chicago

not only of the production of harmonics of each signal component but also of the sum and difference frequencies of all possible combinations of two signal frequencies. When the signal consists of many voices or many instruments these sum and difference frequencies are often discords and their presence causes the well known lack of definition or muddy sound.

Total harmonic distortion can be obtained from the different distorting signal voltages by vectorial addition as in

$$E_t = \sqrt{E_2^2 + E_3^2 + E_4^2 + \dots}$$

where  $E_t$  is the rms value of the total harmonic distortion,  $E_2$ ,  $E_3$ , etc., the rms values of the second, third, etc., harmonic.

The standard output-power ratings give us the total harmonic distortion at full output and at 400 cycles in percent of the output signal. Distortion generally increases with frequency and it is less when the amplifier runs at less than full output.

Frequency distortion is the lack of uniform response to signals of different frequency. The frequency characteristic gives us this information. When it is given in words as "flat from 30 to 10,000 cycles," one generally means flat within plus or minus 5 db or some other limit. In any case, this limit should be understood before the statement has any meaning.

Phase distortion is the change in the phase relations between components of the signal. It alters the wave shape as observed by the oscillograph. This type of distortion is generally disregarded.

The ratings of distortion are those of the amplifier alone, the microphone and speaker add their own distortion.

• • • **construction**

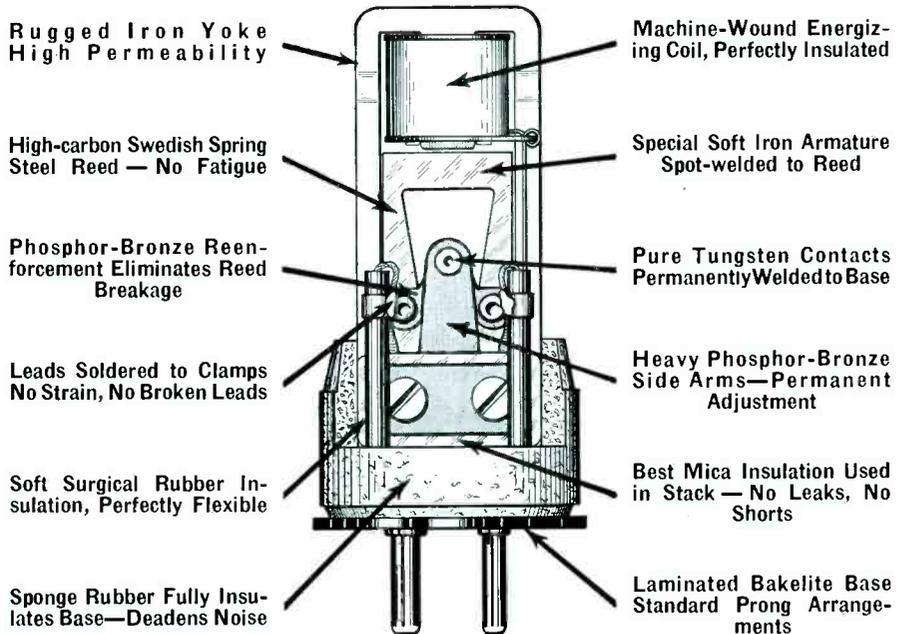
It would be unwise to judge the merit of an amplifier by the ratings alone. An equally important quality is its reliability. Nothing would be gained, for instance, by obtaining extra output power at the expense of tube life. For the same reason it is uneconomical to run other parts beyond their safe ratings. A conservative rating of transformers, condensers, resistors and a judicious placing of them is of prime importance in a unit which must operate reliably over long periods of time.

**OSCILLOSCOPE HELPS SALES**

**I**NCREASED sales, widespread word of mouth advertising and a host of new contacts came to the El Paso Radio Equipment Company of El Paso, Texas, when it put an ordinary oscilloscope in its window and with a brightly colored sign invited the passerby to "come in and see a sound."

A. A. Thomas, manager and owner of the company, put the 'scope in the window

*It's the "insides" that count*



**Meissner Vibrators are built to last!**

Now is the time to check over your Vibrator stock and order your requirements to take care of increasing seasonal demand. And when you do this you want to be sure that you really have the best and most dependable Vibrator available.

Meissner now offers this brand-new, completely re-designed vibrator construction. New standards of efficiency, ruggedness and silent, trouble-free operation are built into every element of this unit. Exhaustive tests under the most severe conditions have conclusively proven its performance to be superior in every way.

Check the twelve important features indicated above—compare each one with the same part of the Vibrator you are now using—convince yourself of Meissner leadership in Quality!

**GET YOUR COUNTER DISPLAY NOW!**

This attractive counter display in striking Meissner orange-and-black will sell Vibrators for you. Contains two each of three most popular replacement vibrators—at a special low price!

In addition—a big, clearly printed Wall Chart, showing the proper replacement Vibrator for any make of auto set—any model—is packed Free with each display. A good start for any dealer-serviceman's stock and a real opportunity for profits. See your Jobber at once or write today for further details and prices!

**FREE CATALOG AND VIBRATOR GUIDE**

Meissner's big 48-page complete catalog describes over 600 items of interest to the radio serviceman. New 12-page Vibrator Guide lists all 4-, 6-, 12-, and 32-volt Vibrators for every model of auto or farm radio set ever made. Complete cross-reference and base diagrams. Write for either one or both to the address below—free and postpaid. A postal card will do.

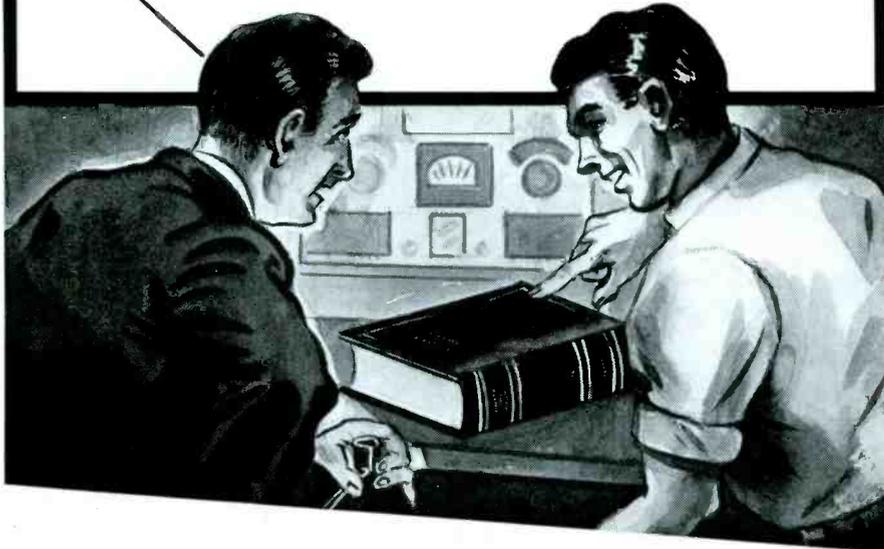


ADDRESS DEPT. S-3

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**"A FAMOUS NAME FOR TWO DECADES"**

# "What Are Rider Manuals? Let Me Tell You..."



"**B**ACK in the early days of simple regenerative sets there was no need for Rider Manuals. But when reflex circuits, stabilized T.F.R. stages, superhets and compact construction appeared, the serviceman needed more than just a diagram to do profitable work. Then, as today, he needed the *complete* servicing information that only Rider Manuals could give him. He needed complete and dependable data on alignment, I-F peaks, parts lists and parts values, voltage ratings of condensers, wattage

ratings of resistors, coil resistance data, and all the other information which is vital if you are to know just what the manufacturer put in that receiver. Nowhere else can you find *all in one place* the essential servicing information contained in the ten volumes of Rider Manuals. Nowhere else can you so easily and so quickly find just what you need. Take the index for all ten volumes—it's separate—and even cross-indexed so you can find things faster.

"I'm telling you, there never was a service that compared in completeness, clearness and value with Rider Manuals. And, with the complicated sets they're turning out today, there never was a time when they were so—just plain necessary. Proof is that you will find practically every successful serviceman in the country has a complete set of Rider Manuals. Take my advice—don't try to 'get by' with just a few of them. Get them all. Remember, having the information you'll do better work—do it faster—and make more money."

### YOU NEED ALL RIDER MANUALS

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V	7.50	1934-35
IV	7.50	1933-34
III	7.50	1932-33
II	7.50	1931-32
I	7.50	1920-31



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

quite some time back and fed the impulses emanating through a radio receiver from the local broadcasting station to it. He intended it only as a novelty display and expected to remove it in a day or so, but so many people stopped to look at the crazily dancing patterns on the oscilloscope screen, described by a sign as the picture of a broadcast, that Thomas decided the display could be used to draw people inside as well as attract them to the window.

He hired a sign painter to paint a sign inviting people to come in and see a sound.



In a neat window dressing idea, El Paso Radio Equipment Company, El Paso, Texas, uses the c-r oscilloscope to attract passersby to their shop.

Several variations of this theme have been used. The most popular of all was, "come in and see your own voice."

"People are always astonished at the idea," Thomas said. "Sometimes they return, bringing their friends to show them their voice. After several weeks the appeal is just as great as it ever was, too. That astonishes me."

This particular oscilloscope is quite bright and when a curious passerby walks in and asks to see the sound, it is easily turned so he can see the screen. It does not have to be removed from the window. When the service department needs it, it is taken out but the sign inviting the public to "see a sound" is left. Calls for it by the service department come only possibly twice a week and then it is used only a short time, so most of the time it is in the window.

Surrounding the oscilloscope in the window are varied radio accessories. People stop to look at the oscilloscope and sign and see something in the window they want. Others, drawn inside out of curiosity, find something in the display counters that appeals to them.

To those persons who come in simply to see the oscilloscope in action without being in the market for anything at the time, Thomas extends a warm greeting, answers their questions about the instruments and invites them to drop in at any time. He introduces himself whenever possible, gives the visitors his cards, and often manages to say a few words about the repair service offered by the El Paso Radio Equipment Company and the radio accessories it has for sale. No effort is made to sell anything to the visitor unless he voluntarily expresses interest in something.

Thomas said, "We get a lot of calls from people who weren't interested in anything but the oscilloscope when they came in. Later they have a set that needs service, or they decide they want to buy a portable, or they want new tubes. Then they remember us."  
Murray Orman.

# TELEVISION SPEEDS UP

**E**XTENSION of television plans is announced by RCA, to provide, first, regular television program service in the New York area; second, receiving sets at moderate prices and, third, the initial step in the construction of a television radio relay system as a means of interconnecting television transmitters for simultaneous service.



An improved program service has been evolved by NBC, and is now available to residents within the transmission range of the transmitter atop the Empire State Building. As soon as network relays are erected, NBC will provide a program service for other communities. This relay service also will be available to other broadcasting companies desiring to transmit television programs.



During the past ten months television receivers have been sold throughout a wide service area in and around New York City. The owners of those sets, some living as far as 90 miles from the transmitter, regularly see and hear NBC's television programs. They report fine, clear reception. They are enthusiastic about the technical performance of their receivers and the quality and entertainment value of the programs.



In order to provide every facility for the expansion of television service throughout the nation, RCA has licensed more than 45 competing manufacturers to use its inventions for the manufacture of television receiving sets, according to David Sarnoff, chairman of the NBC board and president of RCA.



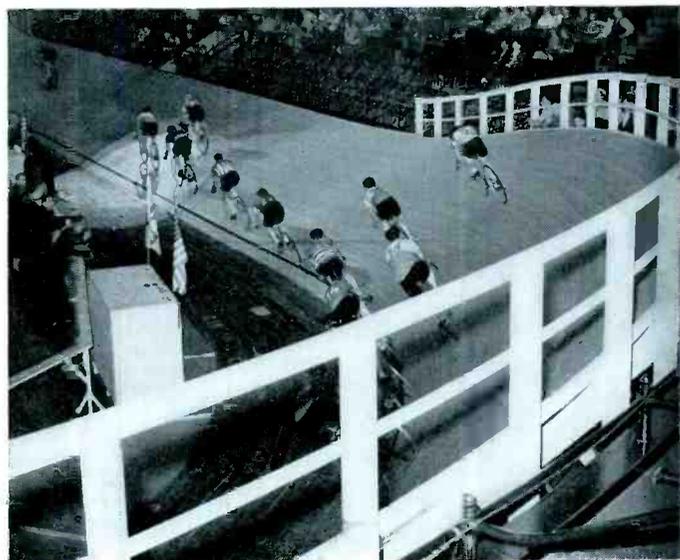
"Plans are under way for the construction of a television radio relay service between New York and Philadelphia," Mr. Sarnoff states. As soon as the New York Philadelphia television relay service is in operation, additional applications will be filed with the FCC to extend this service to Washington, D. C.



It is anticipated that, in the very near future, Boston and other Eastern cities will be interconnected by this method and that eventually television program services may be extended to cover the nation.



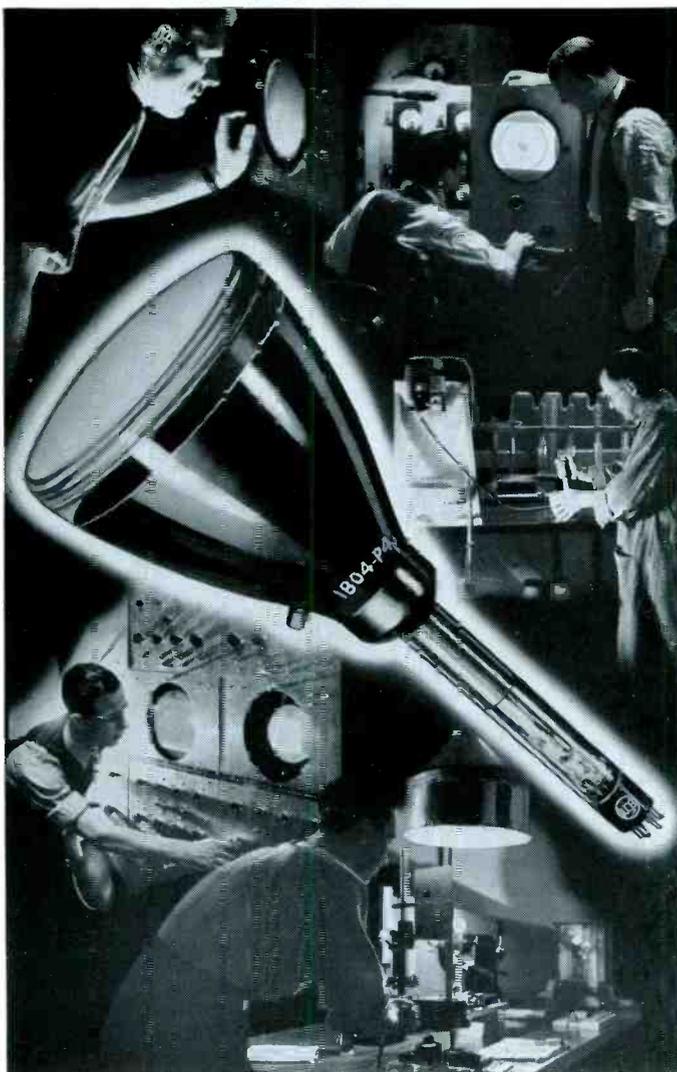
In the past few weeks the present television program service has been extended to include a Broadway play, an intercollegiate track meet, a panoramic view of New York City from an airplane and a performance of grand opera by the Metropolitan Opera Company. Recent outstanding programs included the St. Patrick's Day Parade and Easter Sunday morning church services.





# National Association of

**Forty-seven members of RCA among 572 industrial engineers and scientists given awards as "Modern Pioneers on American Frontiers of Industry."**



SINCE its beginning, the Radio Corporation of America has held that *Research* in all fields of radio and sound is one of its major obligations to the public and to the future of radio.

Research is the keystone of every operation of RCA. RCA Laboratories are the fountain head of many of the spectacular radio and electronic developments of the past twenty years.

Back of these developments...back of the term *Research*, in fact...are men. Men make discoveries. And we at RCA are extremely proud of the man-power which has elevated RCA *Research* to a position of leadership.

We wish to add our own congratulations to the public recognition these men have already received. And, in addition, we extend equally warm congratulations to the many other RCA engineers and scientists whose brilliant work is contributing so much to the progress of their industry.

RCA Manufacturing Company, Inc.  
National Broadcasting Company  
RCA Laboratories  
R.C.A. Communications, Inc.  
RCA Institutes, Inc.  
Radiomarine Corporation of America



# Manufacturers Honors RCA Scientists

Of the 572 industrial engineers and scientists chosen by the National Association of Manufacturers to receive awards as "Modern Pioneers on American Frontiers of Industry," forty-seven were members of the RCA organization. The awards were given for original research and inventions which have "contributed most to the creation of new jobs, new

industries, new goods and services, and a higher standard of living."

Special national awards were given by the National Association of Manufacturers to nineteen of those receiving honors. Dr. Vladimir K. Zworykin of the RCA Manufacturing Company was chosen to receive one of these national awards.

## *47 RCA "Modern Pioneers on American Frontiers of Industry"*

Randall Clarence Ballard	Glenn Leslie Dimmick	Humboldt W. Leverenz	Terry M. Shrader
Max Carter Batsel	James L. Finch	Nils Erik Lindenblad	Browder J. Thompson
Alda Vernon Bedford	Dudley E. Foster	Loris E. Mitchell	Harry C. Thompson
George Lisle Beers	Clarence Weston Hansell	Gerrard Mountjoy	William Arthur Tolson
Harold H. Beverage	O. B. Hanson	Harry Ferdinand Olson	George L. Usselman
Rene Albert Braden	Ralph Shera Holmes	Richard R. Orth	Arthur Williams Vance
George Harold Brown	Harley A. Iams	Harold O. Peterson	Arthur F. Van Dyck
Irving F. Byrnes	Ray David Kell	Walter Van B. Roberts	Julius Weinberger
Wendell LaVerne Carlson	Edward Washburn Kellogg	George M. Rose, Jr.	Irving Wolff
Philip S. Carter	Winfield Rudolph Koch	Bernard Salzberg	Charles Jacob Young
Lewis Mason Clement	Fred H. Kroger	Otto H. Schade	Vladimir Kosma Zworykin
Murray G. Crosby	E. Anthony Lederer	Stuart W. Seeley	

# RADIO CORPORATION OF AMERICA

Radio City, New York

# "Good? say - that RCA Franchise is great!"



says *Bob Smith*

RADIO LAB, KANSAS CITY, MO.

"Our business is pretty much dependent on sales of test equipment, receiving tubes and power tubes. And with the RCA Big Three it's a *profitable* business because RCA makes the outstanding products in each field. The RCA Franchise is better than good. It's great!"

You'll call the RCA  
Big Three *Great* too!

Only RCA Offers You All Three  
TEST EQUIPMENT    RECEIVING TUBES  
POWER TUBES (Transmitting, Cathode Ray, and Special Purpose Tubes)

A successful, progressive parts jobber is Bob Smith. When he says something is great, he speaks from experience. And he calls the RCA Franchise great!

And here are the reasons! RCA has more service experience in every field of radio and sound than has any other organization. This enables RCA to design test equipment which answers every need in the field. Obsolescence is minimized because RCA makes the trends in radio . . . and knows far in advance what the trends will be.

RCA developed the receiving tube business . . . and no one else has caught up yet. The tubes America knows best are easiest to sell.

Not only does RCA offer types of Power Tubes that no one else makes . . . but RCA also knows the tube requirements of transmitters as few can because RCA makes transmitters.

When you think it over, you can't help but agree . . . It Pays to Go RCA All the Way.

Over 335 million RCA Radio Tubes have been purchased by radio users . . . in tubes, as in parts and test equipment, it pays to go RCA All the Way.



## *Tubes and Test Equipment*

RCA Manufacturing Company, Inc., Camden, New Jersey • A Service of the Radio Corporation of America

# AUTOMATIC RECORD CHANGER

## CROSLEY 639

**T**HIS record changer is mounted on a heavy metal base which is rubber mounted to the cabinet. The turntable is rim driven and in turn drives the automatic changing mechanism. It is possible that due to wide variations in types of records used, minor adjustments in settings may have to be made. Under the following headings are listed effects, possible cause and method of correcting.

### Checking for quality:

- 1) Make sure that all the packing has been removed, around motor, turntable, etc.
- 2) See that the changer unit does not touch the cabinet; it must float on the four rubber mountings. The four screws which mount base to cabinet should be removed (after receiver is in position).
- 3) Always use a good needle and see that it is seated and that the needle screw is tight.

### Motor will not start:

- 1) Plug not in receptacle, house fuse blown, defective outlet.
- 2) Defective switch (phono-radio), open motor winding or leads.
- 3) Motor stopped in an overload position, i. e., record drop cam and cam roller at point where roller is just about to lower shelf. Turn the turntable (clockwise) two or three revolutions by hand.

Note: The turntable screws down on the record spindle. To remove, turn in clockwise direction by hand until the curve on the spindle is toward the loading rack, then lock small drive pinion in that position. Spindle must not turn. Unscrew turntable (counter clockwise).

- 4) Friction drive pulley stuck, friction drive pulley not touching turntable rim or bushing on motor shaft not touching friction drive pulley. Oil on friction drive pulley.
- 5) Center pinion shaft stuck or tight. Free and oil.

When replacing be very careful so as not to bend or spring the friction drive pulley which will have to be pushed under the edge while screwing the turntable in position.

### Tone arm does not drop in correct position:

- 1) 10 or 12 inch lever not in correct position for record being played. Check setting of lever.
- 2) Tone arm drop not set correctly to

meet record variations. Records may vary as much as 1/2-inch in diameter. Adjust for average conditions.

To adjust tone arm drop, place gauge, reproduced on this page, on turntable, large hole (A) over spindle, place needle in tone arm and then place tone arm so the needle sets in small hole marked "Needle set for 10-in." Throw 10-in. record lever in correct position. The tone arm adjusting lever, see Fig. 7, must have its stud in contact with the tone arm travel lever, this lever must be in contact with die cast cam and gear. Loosen screw in adjusting lever and adjust lever, then tighten. Check operation and repeat until tone arm drops in correct position.

To adjust for 12-inch records, throw lever to left for 12-inch records. With gauge in place on turntable, place tone arm in position marked "Needle set for 12 in." Loosen lock nut on tone arm travel lever and adjust screw to stop. Tighten lock nut and check. Repeat until needle drops in correct position.

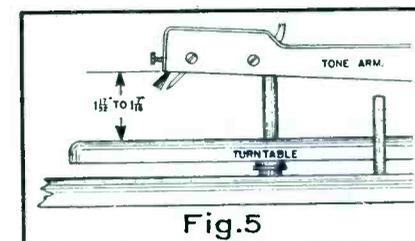
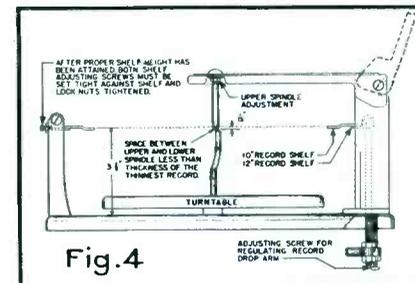
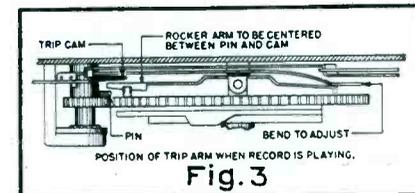
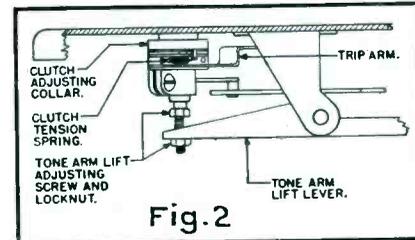
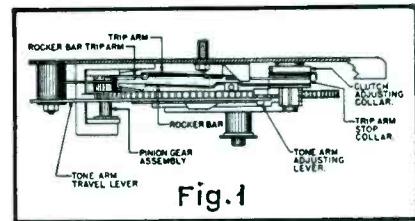
For the above adjustments use a small cotter pin instead of a needle. This prevents any scratching or marring of records or turntable surface.

### Trips before record is finished:

This condition invariably occurs if the clutch is too tight. This clutch is the friction type and when the pickup moves at an increased speed toward the center of the record, sufficient torque is developed to cause the tripping arm to act. To remedy it is necessary to have a No. 6 Bristol wrench to loosen the special set screw in the collar nearest the base of the changer, see Fig. 1. Loosen set screw and turn collar a fraction of an inch to the left (counter clockwise) tighten set screw. Check and repeat until record plays to end.

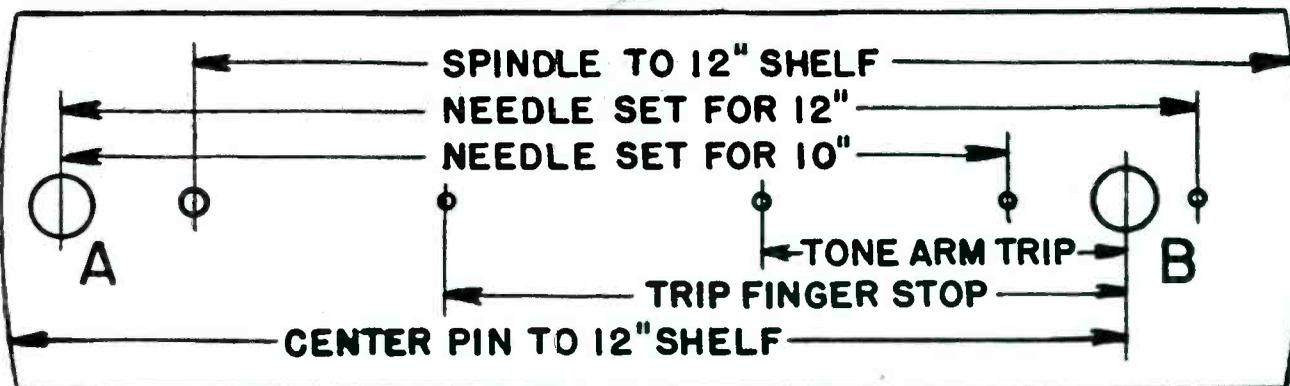
### Does not trip after record is finished:

- 1) Center groove on record does not have sufficient pitch to develop enough torque to actuate clutch. This may result from improperly cut trip groove in record or loose clutch setting.
- 2) It may be possible that the trip arm may have jumped to the wrong side of the rocker bar trip arm, see Fig. 7. It should be on the same side as reject arm.
- 3) To check the trip action adjustment, place the gauge (hole marked B) on the lower spindle and set needle or cotter pin



A rim-driven motor is used to drive the turntable of the Crosley automatic record changer. The turntable, in turn, drives the changer mechanism.

The gage reproduced below is the exact dimensions required for the adjustment of the tone-arm drop.



in hole marked tone arm trip ( $1\frac{7}{8}$ -in. centers). When in this position the cam on the center pinion shaft should be pointing toward tone arm. With cam as stated, the starting lever should be touching cam when cam and starting lever are in this position. The tone arm tripping lever should be in contact with the starting lever. Likewise the rocker bar (Fig. 3) (bar which engages pin in pinion gear shaft causing large cam gear to engage pinion gear) must be in contact (beneath) the end of the starting lever (Fig. 3). The end of starting lever may be bent sufficiently to make contact. The end of starting lever must not be bent any more than that which is necessary to center the other end of the rocker bar between the cam and the pin on the small pinion gear (Fig. 3) (running position).

After the above has been checked and

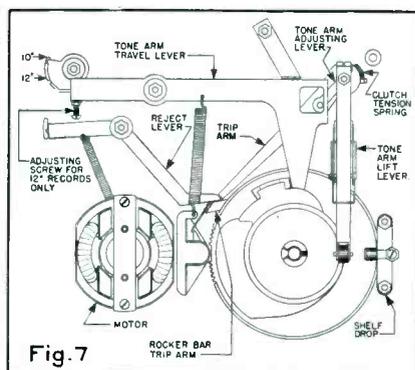


Fig. 7

The tone-arm adjusting lever must have its stud in contact with the tone-arm travel lever. The travel lever must be in contact with the die cast cam and gear.

# SPECIAL TUBES FOR SOUND WORK RELEASED BY NATIONAL UNION



This is SOUND X/TRA type 6J7G

## 13 SOUND X/TRA TYPES AVAILABLE

### Demonstrably Better

The chief requirement for National Union's new SOUND X/TRA tube types is that they must be demonstrably better. In order to accomplish this outstanding performance in SOUND X/TRA types, modification in construction and details of engineering were incorporated. Emission limits are very high to insure exceptional uniformity, long life and adequate power-handling capacity. Gas and grid current are held to exceptionally low limits to insure minimum distortion, uniformity and stability. Every tube is carefully tested for hum and microphonics and, where necessary, changes have been made in construction such as the use of special micas, extra rugged supports, double helix heaters, special insulation, etc.

The thirteen SOUND X/TRA types now available cover the major percentage of replacement requirements. SOUND X/TRA types can be substituted in all cases for the same type of tube in the regular line. This means they can be used for special audio work in any amplifier, public address, inter-office system or other audio device where the identical type number is specified but where improved performance is desirable.

SOUND specialists have long hoped for extra quality tubes engineered specifically for the requirements of SOUND work . . . they're here now in National Union SOUND X/TRA types.

**See them! Buy them! Try them!**  
**Order Samples from Your**  
**National Union Distributor**

**NATIONAL UNION RADIO CORP., Newark, N. J.**

adjusted the trip arm (while unit is running) should come in contact with the starting lever when the needle is about  $3\frac{1}{2}$  inches from the center line of the spindle. This may be adjusted by loosening the Bristol set screw in tripping lever stop collar (Fig. 1) and turning collar a fraction of an inch to the left. Check operation after tightening set screw.

4) The clutch may be too loose, thereby not developing sufficient torque. To adjust loosen Bristol set screw in clutch collar, rotate collar (Fig. 1) to the right a fraction of an inch. Tighten set screw. Check operation.

#### Records do not drop:

1) Record hole tight or record warped.  
 2) Shelf height not correct. To adjust see Fig. 4, for correct height; adjust for 10-in. records first.

3) Spindles may not be in correct relation. See Fig. 4, for correct alignment. Top spindle adjustable.

4) Record drop cam roller out of adjustment. Set correct shelf height (10-in. shelf) by loosening lock nut and turning screw; tighten locknut.

#### Drops more than one record:

1) Warped record.  
 2) Spindle alignment, etc. Same procedure as listed above.

#### Tone arm drags on record:

1) Too many records on the turntable.  
 2) Records may be thicker than average or warped.

3) Needle too long or not properly seated.

4) Tone arm lift adjusting screw loose or out of adjustment.

To check the tone arm for correct lift, rotate turntable (clockwise) by hand and push reject button in order to actuate trip. Turn slowly until tone arm reaches maximum height and starts to travel toward

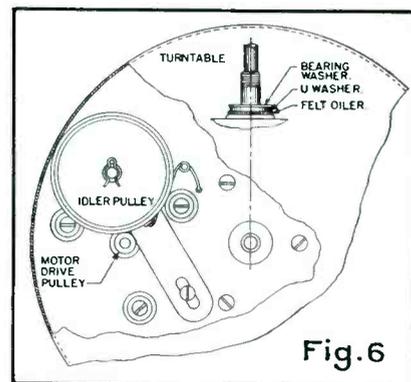


Fig. 6

The idler pulley, which transmits the energy from the rotor shaft to the turntable, acts purely as an idler. Thus the speed of the turntable is independent of the diameter of the rubber-tired idler pulley. The turntable speed depends upon the ratio of diameters of the drive pulley of the rotor shaft and the rim of the turntable. Therefore, even appreciable wear of the idler tire will not affect the turntable speed.

tone arm rest, then stop when the arm is approximately one inch from edge of turntable. Check the height of the tone arm from the surface of the turntable as indicated in Fig. 5. From the lower edge of the tone arm to the top of the turntable the distance should be between  $1\frac{7}{16}$  and  $1\frac{17}{32}$  in. To adjust the tone arm lift screw (Fig. 2-A), loosen locknut and adjust screw until arm is within above tolerance, then tighten locknut.

## BOOK REVIEWS

**RADIO'S MASTER ENCYCLOPEDIA**, published by United Catalog Publishers, Inc., 230 Fifth Ave., New York City, 812 pages, 7¼ by 10½ in., price \$2.50 net.

This book is somewhat misnamed, since it is in reality a master catalog and not an encyclopedia.

It is comprised of five separate sections: (1) Index of Manufacturers' Display Pages, which lists the manufacturers included in the book alphabetically. This is useful in order to locate the different products of a particular manufacturer who makes a number of different products. (2) Classified Directory, which is customarily called a buyers' guide. This tabulates the various manufacturers who make specific equipment, such as amplifiers, generators, hardware, microphones, wire, etc. Although this section is, in the reviewer's opinion, the most valuable portion of the book, it is, nevertheless, full of errors both of commission and omission. To cite but a single case, the field of Hearing Aids is completely ignored. Notwithstanding the preceding indictment, it is probably the most complete buyers' guide readily available. It is for this reason, therefore, and for this reason only, that the exorbitant price asked for this book has any justification. (3) Index of Trade Names, Trade Marks, etc. This section, as its heading indicates, enables the user of this book to readily determine the name of the manufacturer when only the trade name of the product is known. (4) Catalog Section. This section, which comprises the major part of the book, is a reprint of the catalogs of a large number of manufacturers. It is arranged according to types of products, for example, vacuum tubes, loudspeakers, phonograph pickups, meters and testing equipment, condensers, transformers, etc. This section should prove very useful for it encompasses within the confines of a single volume a large number of manufacturers' catalogs, which would otherwise occupy a considerable amount of space. Although quite comprehensive in the number of manufacturers included, it is, of necessity, far from complete. This latter would not be too great a defect were it not for the fact that some of the most important manufacturers in the field are not included. (5) General Index. This section alphabetically tabulates both products and manufacturers.

At the bottom of each page the discount ordinarily available from the list prices indicated is given inconspicuously in simple code. D. B.

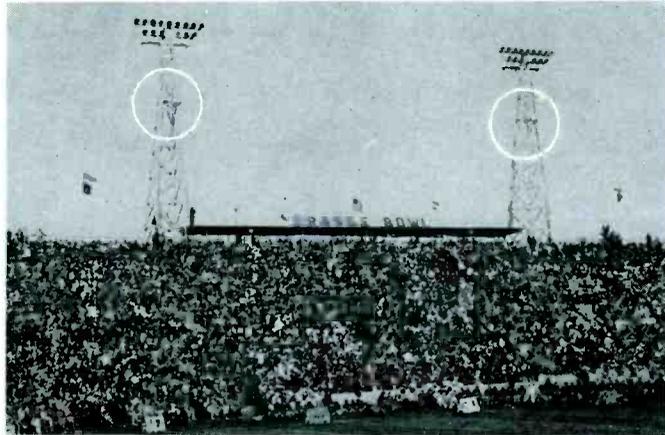
**PHILCO 1939 RMS YEAR BOOK**, published by the Philco Radio & Television Corp., Tioga and C Sts., Philadelphia, Pa., 1939, 120 pages 8½ by 11 in., paper covers, price 75c.

This book is a complete service summary on 1939 Philco receivers and contains information and circuits of every model introduced during the 1939 season. It covers home radio sets, auto-radio sets, combinations and automatic record changers. Instructions are given for setting push buttons, aligning sets and for using the vacuum-tube voltmeter for modern service work. The book contains complete schematic diagrams, chassis layouts, tuning mechanism data, production changes and replacement parts lists.

Because of the great number of Philco receivers in daily use, it is this reviewer's opinion that this book is a necessity to every Service Man. R. H.

Bob Leheldt of Flagler Radio Co., Miami, reports that a high-powered, high-fidelity amplifier plus twenty Atlas G8 Super-Power Cone Projectors offers effective distribution and complete coverage of Dixie's Orange Bowl.

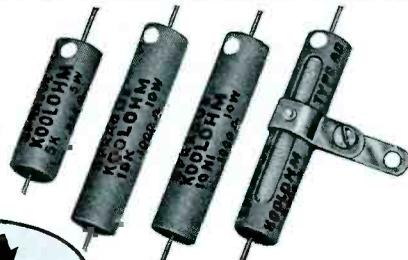
Leheldt experimented with various types of projectors before deciding on the cone size trumpets.



## Typical SPRAGUE VALUES

### SAVE MONEY ON RESISTORS....

You can get the *resistance value* in a Sprague 5-watt Koolohm that would require the purchase of a 10-watt old-style resistor. You can't break down Sprague Koolohms—they take the overloads. Every bit of wire is insulated *before* winding. Units are layer-wound for more ohms in smaller size. Non-inductive Koolohms sold at lowest prices ever. Tele-dot automatic overload indicator warns when 25% overload occurs (see picture). Ask your jobber about this amazing Sprague resistor development!



SPRAGUE KOOLOHM WIRE WOUND RESISTORS



SPRAGUE TEL-OHMIKE Condenser-Resistor Analyzer NET COST \$29.70

### SAVE MONEY ON INSTRUMENTS....

Don't buy meters twice! Get a Sprague Tel-Ohmike Condenser-Resistor Analyzer, plug in your own voltmeter and milliammeter—and you have an instrument worth at least \$50. Tel-Ohmike does more—and does it better—than any other instrument of its kind. Tests all capacities, intermittent opens, power factor, leakage, insulation resistance and resistance values at *all* voltages. It is an instrument you need every day—and one designed for long, obsolescence-proof service. Ask your jobber. Bulletin free.

### MAKE MONEY

on RADIO INTERFERENCE ELIMINATION



25¢ net (direct or from Sprague jobbers)

of the work. Tells exactly what to do and how to do it.

This is the book you've been waiting for — the Sprague Manual of Radio Interference Elimination. Fully illustrated — covers every phase

### SAVE MONEY ON CONDENSERS....

Sprague Atoms (midget dry electrolytics) replace old-style condensers, many times larger in size and costing a great deal more. You save money, you save space—and you save time. A few handy Atom Kits will equip you for 75% of all dry electrolytic replacements. Atoms are the smallest midgets on the market—and made in the most complete line of single and duals. Unconditionally guaranteed. An 8-mfd. 450-v. Atom costs you only 36¢ net. Other capacities proportionately low in price.



SPRAGUE ATOMS Mightiest Midgets of All

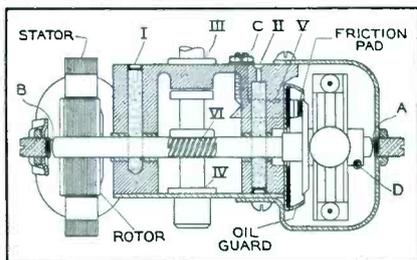


**SPRAGUE** CONDENSERS  
KOOLOHM RESISTORS  
TEST EQUIPMENT  
SPRAGUE PRODUCTS CO. NORTH ADAMS, MASS.

# SERVICE HELPS

## RCA GOVERNOR MOTORS

**Lubrication and adjustment:** To assure normal and satisfactory operation every motor requiring service should be lubri-



RCA governor motors.

cated and adjusted as follows:

(1) Remove motor end brackets, bottom cover containing lower spindle bearing, and governor. Slide vertical spindle downward, remove C-washer; then push upward to disengage worm gear. Slide rotor and shaft from motor.

(2) Clean rotor bearings and rotor shaft thoroughly with Carbona or benzine. Flush oil reservoirs I and II with the same solvent, preferably after removing oil wicks.

(3) Remove governor felt friction pad V. Replace this pad with revised type (Stock No. 34058). Saturate thoroughly with oil.

(4) Put slight amount of oil in each rotor bearing, and reinsert rotor shaft. See that shaft revolves freely when in position.

(5) Oil bearing IV, grease gear VI, and reinstall bottom cover; checking to assure that vertical spindle revolves freely and worm is properly meshed after cover is in place and screws tightened. Do not misplace small disc of bottom thrust bearing.

(6) Inspect governor to see that springs move freely under retaining washers, and that governor is otherwise in good condition. Install on rotor shaft, checking for possible bind of sleeve on the shaft.

(7) Replace end brackets containing thrust screws A and B.

(8) Adjust thrust screw A so that one steel lamination of rotor shows beyond the stator laminations as illustrated. This positions rotor at the electrical center of the stator, for maximum torque.

(9) Adjust thrust screw B to provide  $\frac{1}{8}$  inch clearance from end of rotor shaft.

(10) Fill both wells I and II with oil. At least 30-50 drops are required. Also oil bearing III.

(11) Position governor so that when it is fully contracted (closed), the friction disc is aligned with outer edge of oil guard. Tighten set screw D.

(12) Connect motor to source of power, and adjust screw C to give 78 r.p.m. After allowing motor to run a short time, to compress felt pad. It may be necessary to recheck position of governor to give sufficient range of speed adjustment.

(13) Test motor, after allowing it to reach operating temperature, by grasping spindle and noting relative amount of force required to cause governor to contract. Also stall motor, and release, to see that governor has snappy response.

**Special notes:** Do not interchange parts of different motors, especially bearings, shafts, or gears.

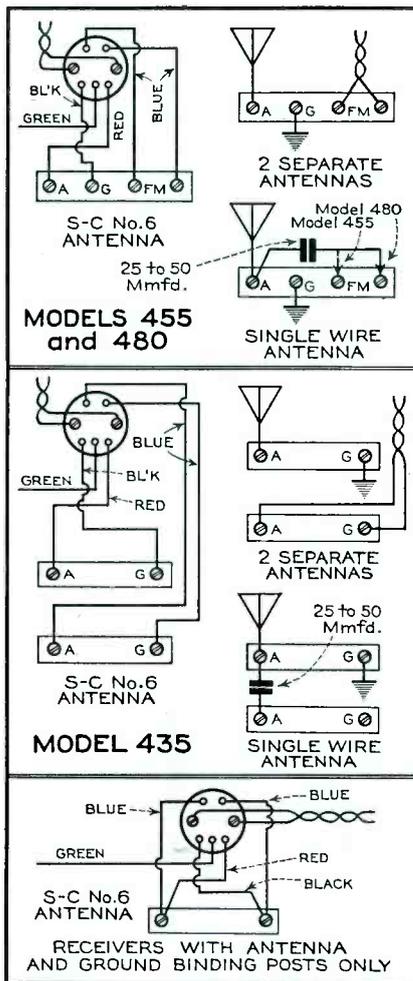
Where a new rotor or turntable spindle

is installed, allow motor to run in for eight hours; preferably under load.

The motor should not be tested or used at temperatures below 65 degrees Fahrenheit.

Where thrust bearing screw A is badly worn or does not have a fibre insert, replace.

Governor motors should be thoroughly lubricated after approximately 300-500 hours of operation. This is equivalent to



Stromberg-Carlson antenna connections.

1-2 years usage in the average home.

**Lubricant specifications:** Only mineral base oils and greases should be used. For points requiring oil use a type with a high viscosity index (with a viscosity rating of SAE 20-30).

For points requiring grease a light gear grease with good clinging properties should be used.

**Governor wavers:** Drifting of motor speed at a slow rate, or erratic shift to other than normal speed, is generally caused by (1) binding of rotor or spindle bearings due to lack of lubrication, (2) scored shafts or bearings, (3) binding due to tight adjustment of thrust bearing B, (4) binding of turntable spindle bearing on motor board (where used), (5) improper centering of motor with respect to turntable spindle.

**Governor chatters:** When the governor rattles or flutters rapidly, accompanied by

excessive mechanical noise, the likely source of trouble is (1) glazed felt friction pad due to lack of lubrication, (2) rotor not centrally positioned in stator, (3) thrust bearing A worn, (4) mis-aligned or rough governor disc.

## STROMBERG-CARLSON 435, 455, 480

**Antenna connections:** The correct methods for connecting various types of antennas to Stromberg-Carlson combined amplitude and frequency modulation receivers are shown in the following sketches.

The sketch for the Stromberg-Carlson No. 6 antenna system shows the red lead connected. The green lead may be connected in place of the red lead to eliminate interference between stations on the standard broadcast range.

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

## WELLS-GARDNER 6C9

**Production changes:** In order to provide improved performance several changes in parts have been made in this model. Chassis on which these changes have already been incorporated and identified by the chassis number 6C9 C.

The 100-mmf dynamic condensers C17 and C27 have been removed and are not replaced by any other part. The dual tubular condenser (C29A, C29B, 0.5 mfd, 180 volt) which was located within the filter unit shield has been removed. One section of this condenser (C29A) has been replaced by a mica condenser (C26, 210 mmfd). Condenser C26 was formerly located outside of this assembly although, electrically, it was connected at the same point. It is no longer used on "C" issue models.

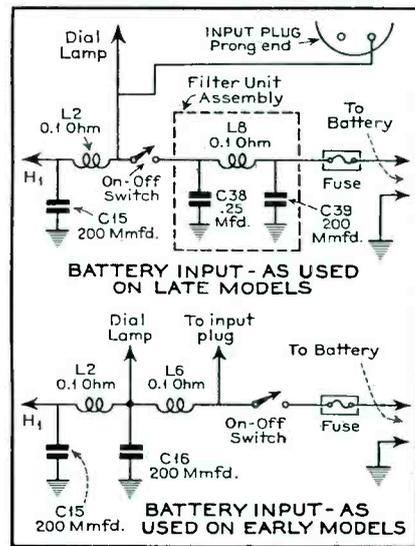
The other section of the dual condenser (C29B) has been replaced by a new tubular condenser (C29, 0.50 mfd, 180 volt).

A new mica condenser (C40, 200 mmfd) has been added to the circuit. It is connected from the B+ side of the 40-mfd filter condenser (C28) to ground.

**Production changes:** In the issue B Series 6C9 auto radios the A line filter circuit was changed as indicated in the accompanying diagram to provide better motor noise elimination. The issue B radios may be identified by the small filter unit attached to the tuning unit case. The A cable is connected to this unit.

Joseph K. Rose, Service Manager  
WELLS-GARDNER AND COMPANY

## Wells-Gardner production changes.



# FOR COMPLETE DYNAMIC *Signal Tracing*

## USE MODEL 560 VEDOLYZER WITH MODEL 561 COMBI- NATION OSCILLATOR

THE MODEL 561 is radio's most complete oscillator—a combination of 4 essential instruments which every well equipped serviceman should have. It provides (1) A.F. oscillator, 15 to 15,000 cycles. (2) R.F. oscillator. Variable amplitude or frequency modulated. (3) Carrier and modulation monitor. Vacuum tube circuit. A.F. and R.F. oscillators may be used separately or the variable audio oscillator used to modulate the R.F. Percentage of modulation read directly on meter. (4) Frequency modulator. Double image, positive self-synchronizing.

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



## OR USE MODEL 562 AUDOLYZER WITH MODEL 561 COMBINATION OSCILLATOR

THE MODEL 562 is the simplest and most logical signal tracing and dynamic tester available. Servicemen everywhere are recommending its use because it will start "paying off" an hour after it reaches your shop. It is not necessary to "take out" a few days and learn

to operate your new instrument. One hour with the AUDOLYZER, a test oscillator, and a receiver and you can tear into those repair jobs you have pushed aside to rest for a while. The AUDOLYZER contains a five inch dynamic speaker for its primary indicating device; a meter to monitor RF, IF, AF, AVC, AFC, and D.C. voltages; a two stage tuned amplifier to check frequencies from 95 KC to 14.5 MC; a vernier and step attenuator to control signal level reaching speaker; a vacuum-tube voltmeter to check D.C. volts from 0 to 1000 volts in seven ranges; a single probe to be used in any type circuit; dual probes for intermittents.

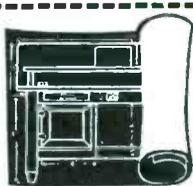


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GO WRONG!



# SUPREME

## 504 TUBE AND SET TESTER



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We do not make or offer for sale any panels or test benches. But it is a definite part of our policy to help all service men. Therefore, we have prepared a large 4-page booklet in which we discuss service benches in general, give valuable cost data, actual designs with detailed instructions for building, and our suggestions for necessary accessories. Sent free.

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# ASSOCIATIONS

## RADIO SERVICEMEN OF AMERICA

THE RSA is pleased to announce the application for the formation of another chapter of RSA in Milwaukee, Wis.

Joe Marty, Jr., executive secretary, has returned from a 7,000 mile trip around the chapter territories of the RSA in the middlewest and throughout New England and Atlantic Coast states. He reports Service Men members of the RSA enthusiastic over the possibilities for increased business during 1940, through cooperation of the NAB and the RSA.

RSA announces there are now 35 chapters throughout the country who have qualified under the Guarantee Service Plan and have further made cooperative arrangements with local broadcasters. This represents a definite step to raise the level of radio servicing on a national basis.

The results from the experimental setups of the RSA under this plan have been so gratifying that the entire membership of the RSA will be included in this plan as rapidly as conditions permit, it is said.

### allentown

The following officers were elected to serve for 1940: Carl Williams, president; Joe Frey, vice-president; Bruno Haake, secretary; J. A. Muthart, treasurer; Mr. Buss, Mr. Rees, and Mr. Schreiber were elected to serve on the Board of Directors. Plans are being made to have a chapter library.

The Second Annual Banquet and Test Equipment Show was held at the Hotel Allen, Allentown, Pa. Seventy-five members and their friends enjoyed the dinner and show. Movies were shown of a trip to Bali and India by Ruth and Les Seachrist, accordion team just returned from a World tour. The latest test equipment was displayed by several of the jobbers. Door prizes and favors were donated by these jobbers.

*H. H. Fillman, Secretary*

### binghamton

The annual election of officers of the Binghamton Chapter saw Herby Snyder unanimously reelected president; Herb Squires was elected secretary and Ross Baxter, treasurer.

*Herbert W. Squires, Secy.*

### rtg, boston

THE administrative board of the Radio Technicians Guild held a banquet at the Miles Standish Hotel, Boston, and after dinner sat in committee to formulate a comprehensive plan designed to insure the public of dependable radio service.

The board also voted the continuance of affiliated groups of Radio Technicians to operate as separate from the parent guild, a system which is said to have functioned successfully for many years.

The Administrative Board of the Radio Technicians Guild of Boston held a banquet at the Miles Standish Hotel. Left to right: G. Batt, staff artist; J. R. Cabral, secy.; W. F. Staples, librarian; E. J. Maginot, pres.; A. C. W. Saunders, educ. director; F. Kennes, treas.; N. Baratta, asst. treas.; S. DiRusso, chair trustees; E. Glynn, vice pres.



The work of the Guild, in cooperation with local editors, radio stores, broadcasters, cannot fail to elevate the radio profession, and benefit the radio listener and set owner.

*Al Saunders.*

### boston

We had a special meeting with the Northwestern Radio Co., featuring Ray Wilson of the Zenith, who spoke on "Frequency Modulation."

The series of talks on "Set Modernization" by Ray Wyman is creating a great deal of interest.

Ray Wynan and Ingvar Paulsen were nominated as directors for District 20 at a recent meeting.

The recent Banquet held by the Boston Chapter was considered an outstanding success by all those present.

*Hy Leve, President*

### bridgeport

The 1940 officers elected by the Bridgeport Chapter were: Roy Wright, president; William Pollock, vice-president; H. C. Eisenman, treasurer; and J. T. Gomperts, secretary.

We are working very hard to start the NAB-RSA program in Bridgeport.

*J. T. Gomperts, Secretary*

### cleveland

Cleveland Chapter elected Rudy Trammell chairman; Al Theriault, vice chairman; Stanley Mros, secretary; and Thomas B. Holmes, treasurer. L. Vangunten and James Hausser were elected trustees.

Considerable publicity has been obtained in the trade journals on the Radio Christmas. Cleveland Chapter considers it a very successful promotion.

*Thomas B. Holmes, Secretary*

### danville

We were host to A. G. Mohaupt at a recent meeting, and as usual the lecture was very instructive and was enjoyed by everyone.

Cal Stapp was nominated for director for District 10.

Owen McArdle, our Program Director, has for the past few meetings, instructed us on bookkeeping for the Service Man. After his presentation we can all realize better than ever, the real need for a system the Service Man can use.

*Cal Stapp, Secretary*

### detroit

A great deal of reorganization has been done looking towards a more stable chapter in Detroit. The old question of a part or full time Service Man has certainly been argued until the rafters ring.

We are enthusiastic about the NAB-RSA Service Plan and believe that within the next few weeks we will have all of our problems solved

and will be in a position to take advantage of this great piece of work.

*Len Ross, President*

### duluth

The first meeting of the year took place at the Lincoln Hotel with our new president, James Springer, in charge. Discussion was centered around the NAB-RSA tie-up, complete details are not as yet available on results.

A very complete and interesting lecture on Ohm's law was delivered by Mr. Lindesmith.

The second meeting of the year concerned itself with the RSA announcements over WEBC, the guarantee service plan, and possible changes of some of the by-laws of our association. Carl Johnson talked on receiver distortion and held our undivided attention for a full hour.

*Rudolph Luukinen, Secretary*

### flint

We were recently host to A. G. Mohaupt of Supreme, who gave a lecture and demonstration on the Vedolyzer. A large turnout of members were present and a number of new members signed up. We are now operating under the Guarantee Service Plan of RSA.

*William F. Lutes, Secretary*

### fremont

Honorary membership in our chapter was awarded to Floyd Wenger. D. R. Bruns was nominated as a director for this district and Gene Davis of Toledo was appointed as liaison man for the Toledo and Fremont Service Men in the NAB-RSA broadcast promotion.

*D. R. Bruns, Secretary*

### jamestown

We are getting favorable publicity through the Local Radio News, in their efforts to improve the status of the Service Men and to provide for Jamestown a courteous, efficient type necessary to service today's receivers.

The newly elected officers of the chapter are: C. Leonard Johnson, president; Francis Samuelson, vice president; Frank Austin, secretary; and Percy Armstrong, treasurer. They were installed at the mid-winter banquet on Feb. 6.

*Lawrence Babcock*

### jersey city

The last several meetings have concerned themselves with the business of advertising and qualifying Service Men under the NAB-RSA Guarantee Service Plan. Several new members were qualified and accepted into the membership.

We had as our guest Carl Rauber, director of our district, who gave us a very interesting talk on classification of Service Men in relation to the NAB campaign. We are looking forward to greatly increased business as a result of this campaign.

*Frank Johnson, Secretary*

### minneapolis

We had a very successful Radio Christmas promotion with splendid cooperation from the broadcasting stations. The public responded beyond our highest hope. We have been so busy lately that we have had to pass up our regular business meetings. We are looking forward to 1940 with more enthusiasm than any year we can remember.

*Sears Milnor, Secretary*

### newark

The last several meetings have concerned themselves almost entirely with the technical details necessary to put into operation the NAB-RSA Service Plan. Because chapters in the New York area are operating as a region, a tremendous amount of detail is involved. We have had to reclassify all of our members in order that we could take advantage of this plan. An employment service is planned for our members and a Budgeting Committee was appointed to work out a budget for the coming year.

Carl Rauber, our president and

national director, was elected as secretary of the regional broadcast promotion board.

We were guests of the Radio Club of America at a recent talk on "Wide Band Frequencies via Coaxial Cable".

*Al Fasanello, Secretary*

### new york

New officers for 1940 were elected as follows: George F. Duvall, president; F. Cassidy, first vice president; J. W. Stuber, second vice president; S. Rosengarten, secretary; and H. M. Guthman, treasurer.

Bob Herzog, Editor of Service, continued his series of Service Forums on "Circuit Constants". John Meagher, RCA Service Engineer, gave a very fine demonstration using the RCA Dynamic Demonstrator and Rider's Chalyt.

Beer and sandwiches were served at a get-together on Jan. 29. Members exchanged a number of interesting stories, Mr. Guthman presented moving pictures, and Mr. Hinkelbein of the Westchester Chapter came with his violin and alternating with Mr. Stuber at the piano, rendered a variety of popular airs.

*S. Rosengarten, Secretary*

### pontiac

A recent visitor to our chapter was Joe Marty, executive secretary of RSA, who gave us full details and instructions of our operation under the Guarantee Service Plan. Complete cooperation was secured from the local broadcasters.

*S. W. Christie, Secretary*

### st. paul

The following officers were elected for 1940: Fred Melius, president; Noel Granger, vice president; and Charles Fox, secretary-treasurer.

We have increased our membership by the application of several new members recently and are cooperating with Minneapolis in the NAB-RSA promotion in the Twin Cities area.

*Charles W. Fox, Secretary*

### scranton

Officers elected for 1940 are Adolph Oschmann, president; Vincent Zurblis, vice president; Olin Van Fleet, secretary; and George Wilson, treasurer. Olin Van Fleet was nominated for the post of National Director for the sixteenth district. The Scranton broadcasters and the Scranton Electric Co. were voted honorary members of our chapter in appreciation of their cooperation with us. We value very highly the spot announcements which WGIB has given us under the Guarantee Service Plan.

*Vincent Zurblis, Vice President*

### springfield

We held a special meeting, Jan. 31, in order that we could hear A. G. Mohaupt of Supreme, lecture on the Supreme Vedolyzer.

We have elected the following officers for 1940: Kenneth Beatty, president; Arthur Milner, vice president; Ray Westerfield, secretary-treasurer.

We are starting two study courses—one in elementary electricity and radio, and one in advanced radio and television. We are trying a new plan of sub-chapters in the Springfield area. Under this plan, in all towns immediately surrounding Springfield, where there are not enough members to form a chapter of the RSA of their own, these groups will be affiliated with the Springfield chapter for the general meetings and will function as individual units for the solving of local problems immediately affecting their businesses.

*Ray Westerfield, Secretary*

### stamford

We elected the following officers for 1940: George C. Upton, president; George Dobsloff, vice president; Howard F. Acton, treasurer; and John K. Gross, secretary.

We are tied into the regional promotion with other chapters in the vicinity of New York on the NAB-RSA Service Plan which is to start

*(Continued on page 38)*

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Subscription Plan**

OUR GROUP SUBSCRIPTION PLAN enables you and three or more of your co-workers to subscribe to SERVICE at one-half the regular yearly rate. In other words it will cost you and your friends only \$1.00 each for twelve issues of SERVICE. The G-S-Plan low rate only applies when 4 or more subscriptions are ordered at one time. (Foreign \$2.00.)

*Speak to three or more of your friends . . . let them sign up with you and then you can remit for the whole group. (Renewals or extended subscriptions are acceptable as part of a group.)*

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City-State .....

Occupation .....

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**features!  
value!  
earning  
power!**

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MULTI-PURPOSE  
TESTER Model 414**

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it far outclasses every other  
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In RCP's system of AC measurements you'll find far more sensitivity . . . higher accuracy . . . greater ruggedness than ever before.

You'll find it far more convenient for service work . . . since it is not subject to the frequency, temperature and wave form errors common to the copper oxide rectifiers.

As a direct reading capacity meter you'll find five individual ranges . . . with measurements from .0001 to 300.0 microfarads. Unlike the conventional meter, capacity scale is easy to read from end to end.

Particularly desirable is the low ohm scale with center reading only 2.5 ohms. Poor contact resistance, shortened turns and voice coil resistance easily determined.

Ohmmeter measurement ratio is 300,000,000 to 1. Center of scale reading on low ohm scale—2.0 ohms. Each of first 10 full size divisions .05 ohm. 5 individual ohmmeter ranges, with self-contained power supply. Built-in battery for ranges below 1 meg. For ranges between 1.5 and 15 megs, simply plug into AC supply. Equipped with handy ohmmeter shorting switch for balancing ohmmeter circuits.

5 D.C. voltage ranges reading 0.5/50/250/2500/5000 V. Potentials above 1,000 V. have independent and isolated switching system. Sensitivity 2,000 ohms per volt. 5 AC voltage ranges 0-10/100/500/1000/5000 V. D.C. Current ranges 1-5-25 amperes. D.C. ma 0-10/50/250/1000.

Model 414—open face bench type, 4½ inch meter, hand rubbed wood case. Net **21.95**

Also available in combination bench-portable type, Model 414P, as illustrated. Hand-rubbed, natural finish, maple case. . . . **24.50**

Model 414—VP7—equipped with 7½" square meter. For counter or bench. Also available for rack mounting. Net **29.95**

Model 414—VP9—identical as above except with 9" meter. Also available for rack mounting. Net **32.95**

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**RADIO CITY**  
PRODUCTS CO. INC.  
88 PARK PLACE, N. Y. C.

# RCA 9901 TUBE TESTER MODERNIZATION KIT

THE RCA 9901 Modernization Kit enables the conversion of Model 156 or 156A tube testers for checking tubes with heater voltages from 1.1 to 120 volts and tubes with a miniature base such as the Hytron Bantam Junior types.

To convert these instruments proceed as follows:

1) Remove the case of the tester by withdrawing the bottom screw and inserting a screwdriver or similar tool in the slots at the front and rear of the panel and prying lightly at each of the four points in turn until the case is free.

2) Remove the "filament volts" knob and switch mounting nut.

3) Remove the two power-transformer mounting screws, unsolder those transformer wires not connected to the "filament volts" switch, also unsolder the black and the brown cable wires connected to the switch, then remove the complete transformer and switch assembly.

4) Mount the new transformer on the other side of the transformer bracket, over the "line volts" control, using the longer screws supplied. It may be necessary to elongate the holes in the transformer bracket, or remove the washer between the "line volts" control and the chassis so that the arm of the "line volts" control will clear the transformer laminations. Mount the new "filament volts" switch, placing the dial plate (supplied) under the switch mounting nut. Reassemble the knob. The locating lug on the "filament volts" switch should be in its locating hole and the line on the dial plate even with the one on the panel for the knob pointer to read correctly on the new dial. Wire the transformer according to the connections shown in the accompanying circuit.

An inspection of the tester and the connections will show those wires to be soldered before the mechanical assembly is made. The red-green wires are for a pilot light and should be taped up if they are not to be used. If a pilot light is desired, a socket and jewel may be installed in a hole  $\frac{1}{4}$ -in. diameter, with  $\frac{1}{8}$ -in. counterbore  $\frac{3}{16}$ -in. deep, drilled in the panel next to the power switch.

5) Replace the old roll chart with the new chart supplied.

A feature of the RCA tube tester is its ability to test doubtful tubes for possible opens. While ordinarily a test such as

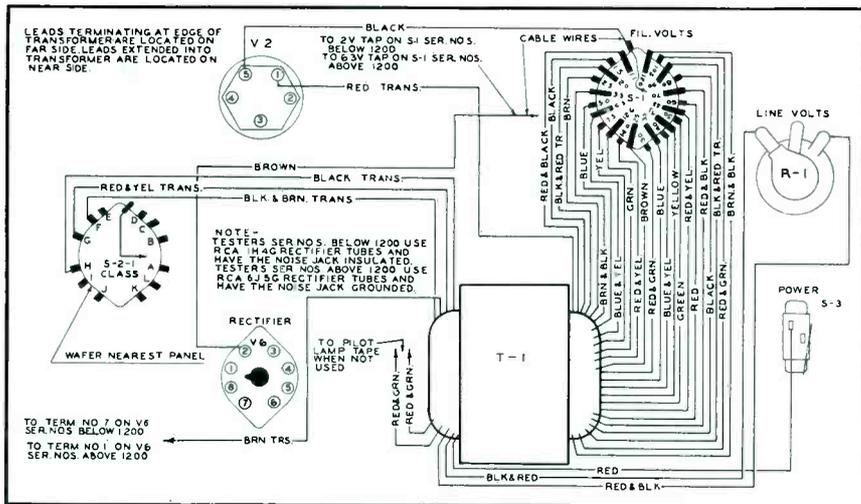
## new tubes

Type	Volts	1	2	3	4	Output	5	6	7	8	Class	Type
EK 1000	12.6	1	—	—	—	—	—	—	7	8	D	23
EK 1000	12.6	—	—	—	—	—	5	—	—	—	D	29
1221	6.3	—	2	3	—	—	—	—	—	8	A	32
1223	6.3	—	—	3	4	—	—	—	—	8	A	32
6AE5 (G)	6.3	—	—	3	—	—	5	—	—	—	A	39
6SJ7 (G)	6.3	—	—	—	4	—	—	6	7	—	A	36
6SK7 (G)	6.3	—	—	—	4	—	—	6	7	—	A	34
6SF5 (G)	6.3	—	—	3	—	—	5	—	—	—	D	37
6SQ7 (G)	6.3	1	—	—	—	—	—	6	—	—	D	33
6SQ7 (G)	6.3	—	—	—	4	—	—	—	—	—	C	—
6SQ7 (G)	6.3	—	—	—	—	—	5	—	—	—	C	—
25AC5	25.0	—	—	3	—	—	5	—	—	—	A	36
6SA7	6.3	1	—	3	4	—	5	—	—	—	A	38
6SC7	6.3	1	—	3	—	—	5	—	—	—	A	28
6SC7	6.3	—	—	—	4	—	5	—	—	—	D	28
4AGG	2.0	—	—	—	3	4	—	—	—	—	A	23
4AGG	2.0	—	—	—	—	—	5	6	—	—	E	23
5X3	5.0	—	2	—	—	—	—	—	—	—	A	24
5X3	5.0	—	—	3	—	—	—	—	—	—	A	24
1G4G	1.5	—	—	3	—	—	—	—	—	—	B	17
1G6G	1.5	—	—	3	4	—	—	—	—	—	A	24
1G6G	1.5	—	—	—	—	—	—	6	—	—	A	24
2A4G	2.5	—	—	3	—	—	5	6	—	—	A	38
12A8GT	12.6	—	—	—	—	—	5	6	—	—	A	33
12A8GT	12.6	—	—	3	4	—	5	6	—	8	A	36
12F5GT	12.6	—	—	—	4	—	—	—	—	—	A	38
12J7GT	12.6	—	—	3	4	—	—	—	—	—	A	33
12K7GT	12.6	—	—	3	4	—	—	—	—	—	A	32
12Q7GT	12.6	—	—	3	—	—	—	—	—	8	A	35
12Q7GT	12.6	—	—	—	4	—	—	—	—	—	C	—
12Q7GT	12.6	—	—	—	—	—	5	—	—	—	C	—
12C8	12.6	—	—	3	—	—	—	6	—	8	A	25
12C8	12.6	—	—	—	4	—	—	—	—	—	C	—
12C8	12.6	—	—	—	—	—	5	—	—	—	C	—
12SA7	12.6	1	—	3	4	—	—	—	—	—	A	38
12SC7	12.6	1	—	3	—	—	—	—	—	—	D	28
12SC7	12.6	—	—	—	4	—	5	—	—	—	D	28
12SJ7	12.6	—	—	—	4	—	—	6	7	—	A	36
12SK7	12.6	—	—	—	4	—	—	6	7	—	A	34
12SQ7	12.6	1	—	—	—	—	—	6	—	—	D	33
12SQ7	12.6	—	—	—	4	—	—	—	—	—	C	—
12SQ7	12.6	—	—	—	—	—	5	—	—	—	C	—
35Z4GT	30	—	—	—	—	—	5	—	—	—	A	40
35L6GT	30	—	—	3	4	—	5	—	—	—	A	38
879	2.5	—	—	—	—	—	—	—	—	8	H	10

## supplementary tube data

Type	Volts	1	2	3	4	Output	5	6	7	8	Class	Type
1B7G	1.5	—	—	—	4	—	5	6	—	—	A	23
1B7G	1.5	—	—	—	—	—	5	6	—	8	A	25
1Q5G	1.5	—	—	3	4	—	—	—	—	—	B	19
2Y2	2.5	—	—	—	—	—	5	—	—	8	H	20
6AD5G	6.3	—	—	3	—	—	5	—	—	—	A	34
6R6G	6.3	—	—	3	—	—	5	—	—	8	A	29
7B5	6.3	—	—	3	4	—	—	6	—	—	A	32
7B6	6.3	shorts	—	3	4	—	—	—	—	—	A	35
7B6	6.3	shorts	—	—	—	—	—	—	6	—	A	32
7B6	6.3	shorts	—	—	—	—	—	—	—	—	C	—
7B6	6.3	shorts	—	—	—	—	—	—	—	8	C	—
7B8	6.3	—	—	3	4	—	5	6	—	—	A	32
7B8	6.3	—	—	3	4	—	5	6	—	8	A	35
7C5	6.3	—	—	3	4	—	—	—	—	—	A	35
12B8GT	12.6	1	—	—	—	—	5	—	—	—	A	37
12B8GT	12.6	—	—	3	4	—	—	—	—	8	A	35
25B8GT	25	—	—	3	4	—	—	—	—	8	A	34
25B8GT	25	1	—	—	—	—	5	—	—	—	A	38
25D8GT	25	—	—	3	4	—	—	—	—	—	A	35
25D8GT	25	—	—	—	—	—	5	6	—	—	A	35
25D8GT	25	1	—	—	—	—	—	—	—	—	C	—
25X6GT	25	—	—	3	—	—	—	—	—	—	A	36
25X6GT	25	—	—	—	—	—	5	—	—	—	A	36
32L7GT	30	—	—	3	4	—	5	—	—	—	A	39
32L7GT	30	—	—	—	—	—	5	6	—	—	A	39
35Z5GT	30	—	—	shorts	—	—	—	—	—	—	A	41
320R4	(Ballast tube)	1	—	3	—	—	—	—	7	—	I	—
200R	(Ballast tube) (Same as KX55A)	—	—	—	—	—	—	—	—	—	—	—
200R4	(Ballast tube) (Same as KX55B)	—	—	—	—	—	—	—	—	—	—	—

Rewired as indicated, the Model 156 and 156A will check the latest tubes.



The following tubes require a special test sequence and in two instances a change in "Class" selector switch.

Tube Type	Test Sequence
1A6	45382
1C6	45382
1C7G	54683
1D7G	54683
2A7	53482
6P7G	438
6A7	53482
6A8G	54683
6D8G	54683
6SA7	5413
7A8	58463
12A8GT	54683
12SA7	5413
1852, 1853	416
Change class selector to L	
6K8	4385
1851	438

this is not required, in special instances it may be accomplished as follows:

- 1) Depress the test button. Allow sufficient time for the tube to reach operating temperature.
- 2) Hold the output button down and successively depress the numbered buttons

opposite the numbers on the chart for the tube under test, starting at the right and proceeding to the left.

- 3) As each button is pressed, the meter pointer should move (sometimes only slightly). If no movement occurs, an open is indicated.

• • • chart corrections

Several minor corrections should be made on the chart of tube testers now in the field. These are as follows:

Type	Volts	1	2	3	4	Output	5	6	7	8	Class	Type
1A6	2.0	—	—	3	4	—	—	—	—	8	A	19
1A6	2.0	—	2	3	4	—	5	—	—	—	A	23
1A6	2.0	—	—	3	4	—	—	—	—	8	A	22
1C6	2.0	—	—	3	4	—	5	—	—	—	A	25
1C6	2.0	—	2	3	4	—	5	—	—	8	A	22
1C7G	2.0	—	—	—	—	—	5	6	—	—	A	25
1C7G	2.0	—	—	3	4	—	5	6	—	8	A	23
1A7G	1.5	—	—	—	—	—	5	6	—	—	A	25
1A7G	1.5	—	—	3	4	—	5	6	—	8	A	19
1D7G	2.0	—	—	—	—	—	5	6	—	—	A	23
1D7G	2.0	—	—	3	4	—	—	6	—	—	A	25
2Z2	2.5	—	2	—	—	—	5	—	—	—	E	33
6A5G	6.3	—	—	3	—	—	5	—	—	—	D	33
6A5G	6.3	—	—	3	—	—	—	—	—	—	A	28
6AB5	6.3	—	2	3	—	—	—	—	—	—	A	27
6C7	6.3	—	2	—	—	—	5	—	—	8	J	32
6P7 (G)	6.3	—	—	Shorts	4	—	—	—	—	—	A	30
6W7 (G)	6.3	—	—	3	4	—	—	—	—	8	A	30
6Z5	6.3	—	—	3	—	—	5	—	—	—	A	30
6Z5	6.3	—	—	—	—	—	—	—	—	—	A	28
12A5	12.6	—	2	3	4	—	—	Shorts	—	—	A	41
1852	6.3	1	—	—	4	—	—	6	—	—	A	39
1853	6.3	1	—	—	4	—	—	6	—	—	A	38
885	2.5	—	2	3	—	—	—	—	—	—	A	38
884	6.3	—	2	3	—	—	—	—	—	—	A	38

• • • Ioktal tubes

Type	Volts	1	2	3	4	Output	5	6	7	8	Class	Type
7A6	6.3	—	—	—	4	Diode	—	—	—	—	C	36
7A6	6.3	—	—	—	—	Diode	—	6	—	—	C	25
7A7	6.3	—	—	3	4	—	5	6	—	—	A	30
7A8	6.3	—	—	—	4	—	5	6	—	8	A	32
7A8	6.3	—	—	3	4	—	—	6	—	—	A	30
7B7	6.3	—	—	3	4	—	—	6	—	—	C	34
7C6	6.3	—	—	3	4	Diode	—	6	—	—	C	34
7C6	6.3	—	—	—	—	Diode	—	—	—	8	C	40
7Y4	6.3	—	—	—	4	—	—	6	—	—	A	39
7Y4	6.3	—	—	—	—	—	—	6	—	—	A	39
1231	6.3	—	—	3	4	—	—	6	—	—	A	40
35A5	30	—	—	—	4	—	—	6	—	—	A	40
35Z3	30	—	—	3	—	—	—	—	—	—	A	40

TUBES

CK501, CK502, CK503, CK504

Four tiny filament type pentodes are available for use in wearable hearing aids. The filament drain, 33 ma, 1.25 volts, is low enough to make standard flashlight cells economical sources of filament power. All types are available either with miniature bases or with tinned copper leads for direct soldering. The tinned lead tubes are only 1 1/2 in. long and 1/2 in. in diameter. The based construction is 1 3/4 in. long and 1/8 in. in diameter. The amplifier tube is of a special low microphonic design. Although bias improves operation, the tubes will all operate at low distortion with zero bias. *Raytheon Production Corporation*

Tiny sockets are already available for the recently released peanut tubes. The low voltage requirements of these tubes as well as their minute size make them ideal for portable amplifying equipment such as hearing aid devices.

Illustration courtesy Amphenol.



	CK501 CK501X	CK502 CK502X	CK503 CK503X	CK504 CK504X
Based construction.....	CK501	CK502	CK503	CK504
Tinned lead construction.....	CK501X	CK502X	CK503X	CK504X
Type .....	Pentode	Pentode	Pentode	Pentode
	Voltage amp.	Output amp.	Output amp.	Output amp.
Typical application.....	Resistance or impedance coupled amp.	Crystal phone output stage	Bone cond. and mag-netic phone air cond. output stage	Crystal phone output stage
Filament .....	1.25	1.25	1.25	1.25
Filament cur.....	33	33	33	33
Plate .....	30	30	30	30
Screen .....	30	30	30	30
Control grid.....	0	0	0	0
Plate cur.....	0.3	0.55	1.5	0.4
Screen cur.....	0.06	0.13	0.35	0.09
Mutual cond.....	325	400	600	350
Plate resis.....	1.0	0.5	0.7	0.5
Load resis.....	...	60000	80000	20000
Approx. output.....	...	3.5	11	4.5



Everyone will want a Ro-TENNA. We all like to keep up with modern ideas.



I'm not ashamed of being lazy. I'll gladly pay for comfort and utility.



I love the convenience of working the aerial from inside.



My pop works his Ro-TENNA without getting out of the car.

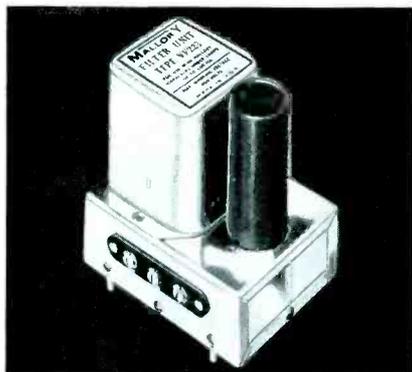
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 EVERY SO OFTEN, inventive activity and technical improvements culminate in a totally new product, which instantly obsolesces older forms and creates a new standard of performance and service. Ro-TENNA — the completely mechanical wind-up, which extends the aerial to its full length from inside the car — will hit a new high in sales of quality aerials!  
 THE RADIART CORP., Cleveland, Ohio • Manufacturing a Complete Line of Quality Aerials and RADIART VIBRATORS, Guaranteed 1 YEAR

### PHONOGRAPH NEEDLE

Permo Products Corp., 6415 Ravenswood Ave., Chicago, have developed a special phonograph needle tipped with an alloy made from the rhodium, ruthenium and osmium group. The inherent characteristics of the alloy provide self-lubricating effect which reduces record wear, it is said. The needle is designed to give approximately 50-hours service on standard 10-in commercial shellac records.

### MALLORY FILTER

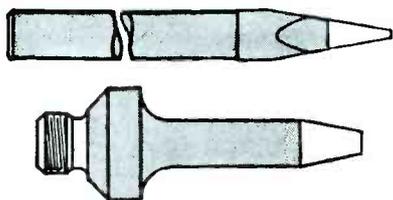
A new audio or hum filter unit, the Mallory VF-223, is now available for use with all single unit Mallory Vibrapacks. The filter condenser is a three-section Mallory FPT-390 of 15-15-10-mfd capacity, 450



working volts. The two 15-mfd sections are used with the choke to form a conventional pi-section filter, while the 10-mfd section connects to a separate terminal so that, if desired, a filtered intermediate output voltage may be obtained. The filter choke is rated at 100 ma and has a d-c resistance of 90 ohms. P. R. Mallory & Co., Inc., Indianapolis, Ind.

### SOLDERING IRON TIPS

Stanley Tools, New Britain, Conn., have announced a new line of Armor Clad soldering iron tips for their screw tip and plug tip electric soldering irons. The Armor Clad tip is a copper tip covered with a special metal coating which it is said protects the high conductivity copper core.



Additional information may be obtained directly from Stanley Tools at the above address.

### OPERADIO INTERCOM SYSTEM

Operadio Manufacturing Co., St. Charles, Ill., have announced their Model BH combination paging and intercommunication system. The standard master station with ten push-buttons, one for each outlying speaker in the system, may, by means of additional switches, provide paging and return speech for an unlimited number of stations. The addition of a call switch permits the speaker stations to call the master station.

Additional information may be obtained directly from Operadio.

### HYTRON DISPLAY CABINET

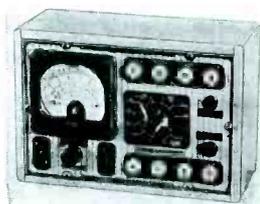
Hytron offers a display cabinet free with the purchase of a standard assortment of 50 Bantam GT type tubes. The cabinet will



house 50 GT types and can easily be detached from the wall so that it may be carried out on the job. Additional information may be obtained directly from Hytron Corp., 76 Lafayette St., Salem, Mass.

### RADIO CITY MULTIMETER

Radio City Products Co., Inc., 88 Park Pl., New York City, have announced their Model 411 Supertester for a-c and d-c



measurements. The instrument features 5 a-c and 5 d-c voltage ranges up to 5,000 volts at 5,000-ohms-per-volt on d-c. There are a total of 33 ranges for 8 functions. A 3-in meter with a 200-microampere movement is used.

### TRIUMPH BATTERY TESTER

Triumph Model 632 Percent-O-Meter is an instrument designed to check individual A and B batteries and battery packs under



load conditions. A 3-in. meter scale, calibrated in percent of new battery voltage showing "Replace-Useful-New" areas, is used. Rotary switch selects 11 ranges from 1½ volts, full scale, to 135 volts, full scale. Additional information can be obtained from Triumph Mfg. Co., 4017 W. Lake St., Chicago.

### ICA UNI-MOUNT ANTENNA

The ICA 1940 Uni-mount underhood auto-radio antenna has a dual bracket; static discharge ball tip; is made of admiralty brass, triple chrome plated and comes with both underhood and alligator mounting brackets. Additional information on this and other ICA products may be obtained directly from Insuline Corp. of America, 30-30 Northern Blvd., Long Island City, N. Y.

### ATLAS SPEAKERS

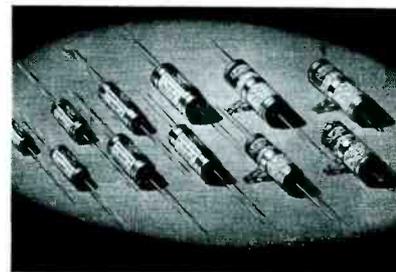
Atlas Sound Corp., 1449 39 St., Brooklyn, N. Y., have announced a new line of storm-proof dynamic reflex trumpets and driver units. The model illustrated has a 6-foot air column, bell opening of 29 in and total depth of 31 in. The line includes



trumpets and units of various sizes. The p-m driver unit is completely enclosed.

### METAL-CASED ELECTROLYTICS

A new BR series of tiny, tubular electrolytic capacitors has been announced by Cornell-Dubilier. Only about one-fifth the size and weight of the older "can" type electrolytics for equivalent capacity and voltage ratings, these new units are available in a wide variety of capacity and voltage ratings—from 4 to 40 mfd, 25 to 500 volts, working. Each BR capacitor is hermetically sealed, inclosed within an aluminum container over which is fitted a varnished cardboard sleeve. Bare wire leads are riveted to rubber-capped bakelite ends.



Available in single and dual capacity ranges. Described in Catalogue No. 175A free on request from Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

### ALLIED SPEECHMASTER

The Knight Model A12255 portable one-unit sound system features 14-watts output, inverse feedback, separate microphone and phono pickup controls, bass-treble control, speaker selector and provision for additional speakers. It is designed especially as a portable system for lecturers, etc. Additional information may be obtained directly from Allied Radio Corp., 833 W. Jackson Blvd., Chicago.

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The good name of Ken-Rad Radio Tubes is due to the high standards of their manufacture.

KEN-RAD TUBE & LAMP CORPORATION  
Owensboro, Kentucky

# KEN-RAD

DEPENDABLE RADIO TUBES

SOLAR

# Sealdtite

WAX-MOLDED



Tubular Paper Capacitors . . . molded in hard wax . . . no moisture can enter . . . much longer life . . . buy from your jobber in factory-sealed cartons.

Write for Catalog

SOLAR MFG. CORP. Bayonne, New Jersey

# Buried!



## NOT IN PROFITABLE WORK BUT— *In Worry!*

A common complaint of servicemen are those sets that "take more time than they're worth." Unfortunately, the number of these sets is increasing so fast that more and more servicemen are becoming buried—not in profitable work but in worry. Worry because they cannot

charge enough to pay for their time.

There is only one solution—faster trouble shooting and faster repair work. There is only one way of accomplishing this—through increased knowledge. Begin today with these Rider Books.

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*The Most Talked of Subject in the History of Radio Servicing*

Use the system of servicing which is proved and endorsed—the system which is fastest—most modern—the system you can apply to all receivers regardless of age, type or make. Servicing by Signal Tracing operates independently of every limiting factor heretofore encountered. In this new book you learn how all receivers are brought to a common servicing level. Read this book and you will be able to service the most complicated set with greater speed and less effort. Over 360 pages—hard covers—only \$2.00.

**SERVICING SUPERHETERODYNES**—Changes, changes, changes! That has been the history of the superheterodyne circuit. Make repairs quickly by analyzing the different parts of the circuit quickly. Rider shows you how. 288 pages. Profusely illustrated. Price \$1.00.

### CATHODE RAY TUBE

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

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PUBLISHER, INC.**

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NEW YORK CITY

Export Div.: Rocke-Int. Elec. Corp.  
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Cable: ARLAB

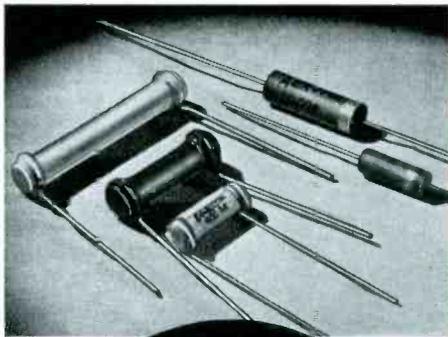
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**THE OSCILLATOR  
AT WORK**

By John F. Rider  
JUST OFF THE PRESS

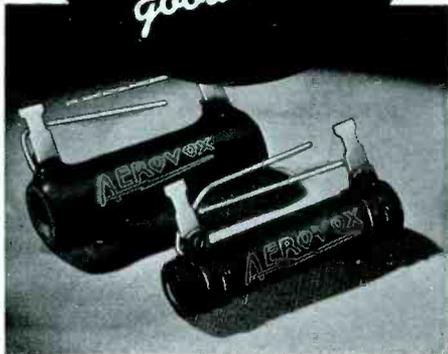
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# Read RIDER BOOKS



Worthy  
of the  
**AEROVOX**  
good name



★ Don't overlook the resistance part of the AEROVOX octagonal symbol! It means that, in addition to an outstanding line of condensers of all types, AEROVOX also offers a choice of essential resistors to the really critical component buyer.

#### WIRE-WOUND RESISTORS

★ Pyrohm Jr. Fixed Types in 10 and 20 watts. All popular resistance values from 1 to 100,000 ohms. Also Slideohm Adjustable Types in 25, 50, 75, 100 and 200 watt ratings, 1 to 150,000 ohms. These power resistors represent the very latest advances in the art. Instead of wasting time with meaningless claims, all we ask is that you try them. Especially so since prices are "right."

#### CARBON TYPE RESISTORS

★ Again we have sought the very latest advances in the art. Two types offered: Insulated Molded Carbon with carbon resistance element permanently imbedded in crackproof casing of insulating material; Lacquer-Coated Carbon with heavy carbon element properly protected. Both types are RMA color coded. Again, prices are "right."

#### Ask Your Jobber . . .

★ Along with those AEROVOX condensers you are ordering, ask for some of these better grade resistors in your required wattage and ohmages. Also ask for the new 1940 catalog—or write us direct.



### RADIO CITY 414 TESTER

THE Radio City Model 414 Master multimeter is available in a variety of combinations to suit individual requirements. It can be obtained in combination with other Radio City instruments or alone with a 4½-, 7¼- or 9-inch meter for bench, portable or rack and panel mount-



Radio City Model 414 multimeter is available with a 4½, 7¼ or 9-inch meter.

ing for any of the meter sizes.

The D'Arsonval movements used are approximately 450 microamperes for full-scale deflection. Each meter is protected with an instrument fuse. The tester is further protected by double fusing in the power-supply line.

Five direct-reading capacity ranges permit measurements from 0.0001 to 300.0 mfd. Each of the first ten divisions on the low-ohm scale read 0.05 ohms; center reads 2.5 ohms. There are five ohmmeter ranges. Ranges below 1 meg have self-contained battery while for the high ranges the tester is connected to the a-c power supply. A shorting button is provided to assist zero adjustment.

Six d-c voltage ranges reading from 0.1 to 5,000 volts are available. Voltages above 1,000 have circuits independent and isolated from the switching system. These voltages terminate in high-voltage jacks. A type 6H6 diode is used as an instrument

A 6H6 type tube is used as an instrument rectifier for the Radio City Model 414 multimeter.

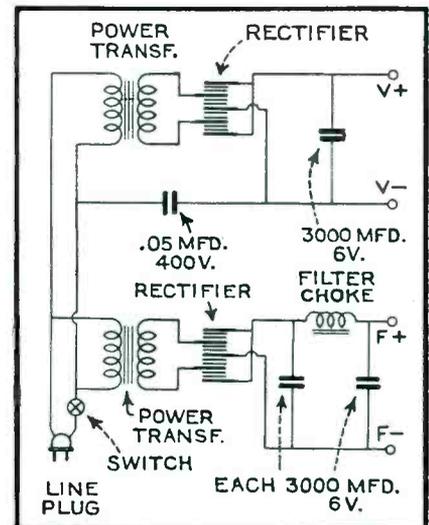
rectifier in a special circuit which, it is said, makes the a-c scales practically linear and coincident with the d-c scales.

• • • full-scale ranges

- Sensitivity: 2,000-ohms-per-volt.
- D-c voltage: 5, 50, 250, 2,500, 5,000.
- A-c voltage: 10, 100, 500, 1,000, 5,000.
- D-c (ma): 10, 50, 250, 1,000.
- D-c (amp): 1, 5, 25.
- Capacity (mfd): 0.03, 0.3, 3, 30, 300.
- Low ohms: 100 (smallest division: 0.05).
- Ohms: 15,000, 150,000.
- Megohms: 1.5, 15.0.
- Inductance: 5 ranges to 10,000 henries.

### GTC P TWIN-POWER

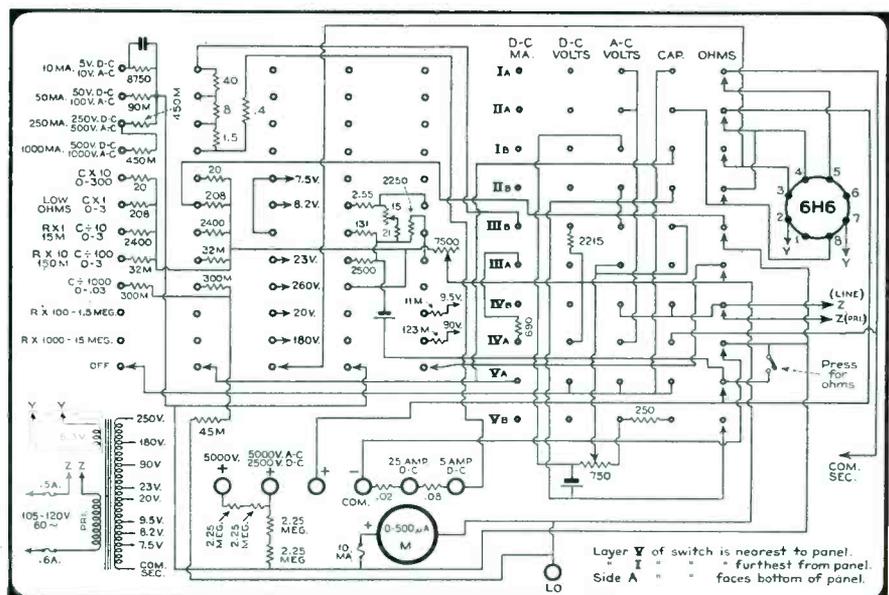
THE General Transformer Corporation Twin-Power Model P is designed to solve the problem of battery elimination in six-volt sets. As can be seen from the accompanying circuit, the unit serves as two separate sources of 6 volts, each with



Two separate sources of filtered voltage are available from the General Transformer Twin-Power unit.

a capacity of 1½ amps. Connected in parallel this would present a single source of 6 volts at 3 amps.

The unit weighs approximately 8-lbs net and measure 3¾ by 6¾ by 5½ ins.

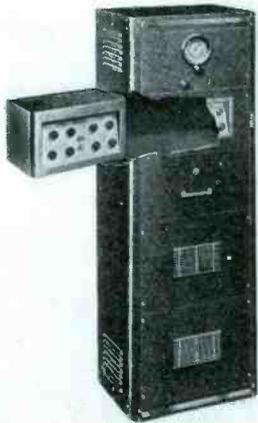


#### RECORDING DISCS

The Walco recording discs are now being marketed by the Electrovox Company, 424 Madison Avenue, New York City. These discs have a special fibre-board base. The acetate coating, .008 inch thick, is said to be the same grade used on aluminum base records. In addition, the records are said to lie flat and have an indefinite shelf life. Records are now being produced in 6 in, 8 in, 10 in, and 12 in diameters. It is anticipated that 16 in discs will be available shortly.

#### MONTGOMERY-WARD PROFESSIONAL P-A

This unit has four individual mike channels, two phonograph inputs and separate bass and treble controls. The mike inputs use four input tubes and individual volume



controls. One master volume control is used for the two phonograph inputs and a second master control with provisions for remote operation is used to adjust the overall volume of all channels. The individual bass and treble controls are of the booster type, permitting adjustment of bass or treble individually.

This preamplifier when attached to the chassis of the 60- or 100-watt amplifiers becomes an integral part of the amplifier. When more than 100 watts is wanted, extra 100-watt chassis can be connected to the preamplifier. Provisions are made for using up to five 100-watt chassis.

This equipment was developed by Montgomery Ward, Chicago, and will be described in their new sound catalog, ready about May 1.

#### OXFORD-TARTAK APPOINTMENT

Paul H. Tartak, president of Oxford-Tartak Radio Corp., has announced the appointment of Bob Adams, sales engineer. Bob is well known in the industry, having been connected with it in various capacities for the past seventeen years.

#### CROWE BULLETIN

Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago, have made available a bulletin covering their line of remote controls for automobile radios. Considerable information is contained in this 16-page booklet. Write for Bulletin No. 232.

#### ERWOOD SLOGAN CONTEST

Erwood Sound Equipment Co., 224 W. Huron St., Chicago, are offering \$450 worth of public-address equipment as prizes for the best slogan written around any feature of an Erwood Sound System. Contest closes May 15. For additional details write to Erwood at the above address.

# COMPARE POWER FACTOR!



## NATIONAL UNION CONDENSERS IN ALL POPULAR TYPES FOR REPLACEMENTS

**Compare Them  
Feature for Feature!**

**They're Built for the  
Service Business!**

**POWER FACTOR**—The life and performance of electrolytic condensers are determined to a considerable extent by the power factor. Compare the low power factor of National Union condensers with other leading makes.

**HIGH BREAKDOWN VOLTAGE**—Uniformly aged and tested considerably above their rated operating voltages.

**UNIFORMITY**—Double checked to insure reliability and uniformity of characteristics.

**CAPACITY**—Very close tolerances result in extreme uniformity and freedom from replacement difficulties.

**LOW LEAKAGE**—Remember, N. U.'s check-test of every condenser insures uniformly low leakage and good leakage recovery. Excessive leakage causes more service difficulty than any other type of condenser trouble. Just compare.

**SIZE**—Type for type, National Union Condensers are as small or smaller than leading competitive makes. Yet Priced the Same.

We have attempted to design a complete line of replacement condensers which would adequately meet the needs of the serviceman. Uniformity and excellent electrical characteristics result in freedom from "call-backs" and field difficulties. Smaller sizes and mechanical ruggedness result in quick and easy replacement installations.

Complete assortment of condensers for replacement applications now available. All popular types and sizes: Junior Box, Standard Box, Universal Replacement, Junior Can, Standard Can, Wets, Large Can, Ceramites, Wumites, Tubular Papers, Auto Generator, Auto Vibrator, Uncased Paper, Transmitting.

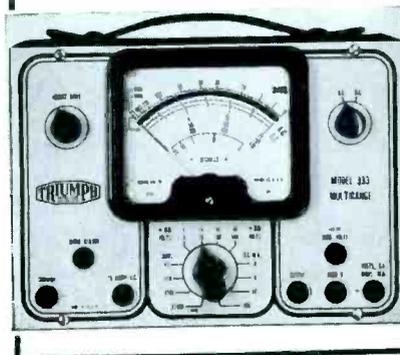
**N. U. CONDENSERS MAY BE  
APPLIED TO TUBE DEALS**

*Send for Catalog*

**NATIONAL UNION RADIO CORPORATION**

**NEWARK, N. J.**

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**34 RANGES • 4 5/8" METER**

Mirror backed scale. Knife-edged pointer. Volt-Ohm-Decibel, Output and Milliammeter

Complete with 15-Volt Battery.

**MODEL 333 MULTIRANGE METER.** See it at your **JOBBER** or write to **FACTORY** for complete 1940 **SERVICEMAN'S** instrument catalog.

**\$21<sup>95</sup>**

**TRIUMPH MFG. CO.**  
4017-19 W. LAKE ST. CHICAGO, ILL.

**ASSOCIATIONS**

(Continued from page 30)

soon. We are looking forward to a most prosperous 1940.

*John K. Gross, Secretary*

• • • **steubenville**

Under the lead of the Steubenville chapter, a great deal of publicity concerning local broadcast conditions in and around Steubenville was published in the local newspaper. Copies of the article are in great demand and have been made up for distribution to the trade.

*Leonard Roberts, Secretary*

• • • **westchester**

We elected the following officers for 1940: Jack Livingstone, president; Philip Brigante, vice president; Arthur Hinkelbein, secretary, and Joseph Hanasik, treasurer.

We are cooperating, through our representative, Henry Lutters, in the regional setup in the NAB-RSA Service Plan.

*Henry Lutters*

**JOBBER GROUP**

• • • **nrpda**

THE following new members have been added to the rapidly growing roster of the National Radio Parts Distributors Association. A successful membership drive has been in progress for the past two months. A trip of approximately 5,000 miles covering the states of New York, Ohio, Indiana, Kentucky, Missouri, Nebraska, Iowa, Minnesota and Wisconsin, has been completed and a number of additional members have joined during this period. The names of these are: in *New York*, Radio Equipment Corp., Buffalo; Roy C. Stage, Syracuse; W. E. Berndt, Syracuse; Stewart W. Smith, Syracuse; Federal Radio Supply Co., Binghamton; Fred C. Harrison, Elmira; Ft. Orange Radio Distributing Co., Albany; Edwin E. Taylor, Albany;

and Vaeth Electric Co., Utica; in *Ohio*, Ross Radio Co., Youngstown; Radio Repair & Service Co., Akron; Armstrong Radio Co., Canton; Thompson Radio Supplies, Columbus; Bell Radio Parts Co., Columbus; Lima Radio Parts Co., Lima; United Radio, Inc., Cincinnati; and Radio Supply Co., Cincinnati; in *Indiana*, Van Sickle Radio Supply Co., Indianapolis; and Archer & Evinger, Terre Haute; in *Missouri*, Ebinger Radio & Supply Co., St. Louis; Tom Brown Radio Co., St. Louis; and Manhattan Corp., Kansas City; in *Iowa*, Dukes Radio Co., Sioux City; Wholesale Radio Laboratories, Council Bluffs; and Iowa Radio Corp., Des Moines; in *Nebraska*, H. C. Noll Co., Omaha; in *Kentucky*, P. I. Burks Co., Louisville; in *Illinois*, Lurtz Electric Co., Belleville; in *Pennsylvania*, Jordan Radio Co., Erie; in *Washington*, Seattle Radio Supply Co., Inc., Seattle; in *Oregon*, United Radio Supply, Inc., Portland; in *Connecticut*, Stamford Radio Supply, Stamford; in *Wisconsin*, Marsh Radio Supply Co., Milwaukee; Radio Parts Co., Inc., Milwaukee; Valley Radio Distributors, Appleton; and Appleton Radio Supply Co., Appleton; in *Minnesota*, Northwest Radio, Duluth; Lew Bonn Co., Minneapolis; Hall Electric Co., St. Paul; and Radio Maintenance Co., Minneapolis.

*Art Moss, Executive Secy.*

• • • **california**

Doctor Lester Reukema gave a supplementary talk on the actual progress and public acceptance of television, as he found it in the East, at 1608 Webster Ave., Oakland, Feb. 26. The meeting was attended by members who took Dr. Reukema's Television course last spring. The lecture was accompanied by colored pictures, taken by Dr. Reukema during the course of his trip, which covered several thousand miles.

*William Appleton, Secy.*

• • • **canada**

Through the courtesy of Vancouver

Radio Engineers, the Vancouver section of the Associated Radio Technicians of B. C. was given an interesting technical lecture on Feb. 28, by Bill Cooms of Portland, Oregon. The subject was "Design and Uses of Various Pieces of Test Equipment."

• • • **evansville**

Our secretary, Kearnie Smith delivered a concise talk together with a demonstration on the signal tracer. Julius Groening, past president, supplemented the talk with applications for the vacuum-tube voltmeter and visual and radio tracing.

A new plan for membership campaign has been inaugurated by Van C. Norwood, president, an H. U. C. Naval radio graduate, incorporating ideas borrowed from the battleship.

*Van C. Norwood, President*

**OTHER GROUPS**

• • • **louisville**

CHARLES R. WEXLER, head of the circuit laboratories for the Ken-Rad Tube & Lamp Corp., of Owensboro, Ky., was guest speaker at the Louisville Service Men's meeting held at the Brown Hotel, Louisville, Ky., Feb. 6.

Mr. Wexler spoke on "Trends in 1940 Radio Receiver Design." He gave an understandable, down-to-earth picture of the development of 1940 receivers, and the engineering and service problems encountered. Mr. Wexler's talk was enthusiastically received by the forty-five Service Men present, and he was invited to return at a later date.

• • • **new york**

A new New York Service Men's organization has been formed under the title: "Independent Radio Service Men's Association of New York City," and has its offices at 225 Broadway, New York.

Typical of the aims of the association, according to Sigmund C. Friedman, its executive secretary, is its clearing house; its exchange for job estimates protection; the licensing and guaranteeing of its members; financial and merchandising guid-



Sigmund C. Friedman

ance; group insurance; a legal service bureau, to mention a few.

It aims not to interfere or overlap any existing organization in the radio service field, but rather to supplement and complement these societies.

• • • **ohio**

New Tubes and their applications warrants special and continued study on the part of today's aggressive radio Service Men, declared Walter Jones, Hygrade Sylvania commercial engineer, before meetings of Service Men in Toledo and Cincinnati, Ohio.

Mr. Jones conducted successful, well attended meetings in these two big towns last week. They were sponsored by Toledo and Cincinnati tube jobbers who assisted Mr. Jones in the arrangements and conduct of the meetings.

*Henry C. L. Johnson*

*Mr. Serviceman:*

**R.S.A. PUTS YOU ON THE AIR!**

Listen In! Broadcasters are cooperating with R.S.A. to sell radio servicing to the American Public! Radio Listeners everywhere are learning that it *pays* to call an R.S.A. man! It means increased business and *more money* for R.S.A. members!

And—this is only one of the big advantages of the R.S.A. Program! Year-Round Sales-Promotion to build Public Confidence, Technical Help for Members, Bulletins, and many other important business-aids are regular features in the R.S.A. program! Cash in on growing Public Acceptance of R.S.A.—Join Today!



Let's Grow Together in 1940!

**RADIO SERVICEMEN OF AMERICA, Inc.**

JOE MARTY, JR., EXECUTIVE SECRETARY  
304 S. DEARBORN STREET, CHICAGO, U.S.A.

**MAIL THIS COUPON NOW!**

RADIO SERVICEMEN OF AMERICA, INC.  
304 S. Dearborn St., Chicago, Ill.

Name .....

Address .....

City ..... State .....

I am interested in R.S.A. Membership. Tell me about it

I am enclosing \$4.00 for National dues and initiation. Covers dues up to Jan. 1, 1941, in accordance with special dues concession

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

S-340

*Now!*

# PERMO POINT GIVES YOU A NEEDLE FOR EVERY PHONOGRAPH NEED!



**FOR RECORDING**— a new stylus equalling cutting ability of sapphire on nitrate coated blanks. Cuts clean grooves, free from surface noises. Records entire frequency range. Minimum loss of high frequencies—no "peaks". Permo Metal point gives long life. MICROSPECIFIED for uniformity, packed in special protective metal container.



**FOR TRANSCRIPTION**— the Transcrip-tone gives an even response over entire audio frequency range—constant at over 10,000 cycles. Specially designed to transmit all frequencies useful in modern broadcasting and recording work. Fits standard groove. Valuable in play-back and dubbing work. Permo Metal tip gives 35-50 hours service. Won't wear acetate, nitrate coated, commercial records—prolongs life with self-lubricating Permo Metal point.



**FOR REPRODUCTION**— the Fidelitone for home record players and changers. Keeps surface noise at a minimum. Permo Metal point assures finest full range reproduction. Record wear negligible with self-lubricating action of Permo Metal. Up to 50 hours service on standard recordings. Long play for use in home, salon, sound distributing systems, schools, etc.

*Microspected* 

### TO INSURE PERFECT PERFORMANCE

Every Permo Point Needle sold subjected to rigid Permo MICROSECTION process before it leaves the Permo laboratories. This process is a positive check on the precious Permo Metal point for perfect uniformity and performance. The above and other Permo Point Needles for professional and home use are available at all leading suppliers.

### PERMO PRODUCTS

Corporation  
Manufacturing Metallurgists  
6415 Ravenswood Ave., Chicago, Illinois

Gentlemen:

Please send me your free booklet on Needles and Records, and full information on Permo Point Needles.

Name .....

Address .....



### REGAL TOKFONE UNITS

Regal Amplifier Mfg. Corp., 14 W. 17 St., New York City, have developed a new line of Tokfone intercommunication systems, Series 600 which provide 2-way communication between any master and any one up to ten remote stations. As many



as five independent conversations can be made simultaneously without crosstalk, it is said.

Additional information can be obtained directly from Regal.

### FM RECEIVERS

Rapidly growing public interest in frequency modulation has opened up a new field for manufacturers of receiving sets. Frequency-modulation receivers capable of reproducing the programs sent out over the new type stations are now on the market. Stromberg-Carlson, General Electric and Radio Engineering Laboratories offer f-m receivers to the public in various console and table models. The experimenter who wishes to build his own may secure a kit of all necessary parts with complete,

simple direction for assembling from Browning or Meissner. Other companies which have secured permission from Major Edwin H. Armstrong to manufacture sets under his patents are Zenith, Stewart-Warner, Pilot, Scott, National, Hammarlund and Hallicrafters.

### CLARION SOUND SYSTEM

The Clarion Model C443 24-watt portable sound system offers multiple inputs, push-pull 6L6G beam-power output, inverse feedback, 120-db overall gain and a universal output transformer with taps of 2, 4, 8, 16, 250 and 500 ohms. The frequency response is from 40 to 9,500 cps, it is said.

Additional information may be obtained directly from the Transformer Corp. of America, 69 Wooster St., New York City.

### N. U. BATTERIES

National Union Radio Corp., 57 State St., Newark, N. J., is offering a complete line of batteries and battery packs for portable receivers. The various sizes in the line are shown in the accompanying chart. Additional information may be obtained directly from National Union.

### KENYON TRANSFORMER

Kenyon Transformer Co., Inc., 840 Barry St., New York City, announce a new transformer in their T line. The new unit, T223, has two 6.3-volt windings, at two and three amp., respectively, and a 200-ma secondary at 1,200 volts, center tapped. Additional information on this and other Kenyon transformer items may be obtained directly from Kenyon at the above address.

**A "LAB" to fit your pocket**



**Readrite**  
**RANGER**

**MODEL 739**

**\$9.90**  
Dealer Net Price

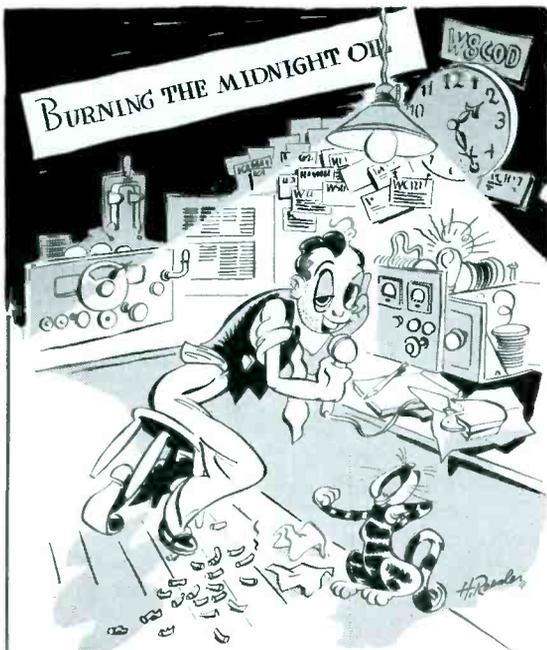
**A.C.-D.C.  
VOLT-OHM-MILLIAMMETER**

Pocket Volt - Ohm - Milliammeter with Selector Switch. Molded Case. . . Precision 3-Inch Meter with 2 Genuine Sapphire Jewel Bearings. AC and DC Volts 0-15-150-750-1500; DC MA. 0-1.5-15-150; High and Low Ohms Scales. . . Dealer Net Price, including all accessories, \$9.90

WRITE FOR CATALOG

SECTION 317 COLLEGE AVENUE

**READRITE METER WORKS, Bluffton, Ohio**



## CENTRALAB Stays Awake



The C. Q.'s have died down . . . too tired to Q. S. L. . . . but Old Man CENTRALAB never bats an eye. Day in and day out this old owl is "wising up" to new developments in the business. In ham shacks . . . on service benches . . . and in the laboratories . . . the word "CENTRALAB" continues to stand for dependability . . . quality . . . and performance.

Volume Controls — Fixed Resistors  
Ceramic Capacitors — Wave Band Switches

# Centralab

Division of Globe Union, Inc.  
Milwaukee, Wisc.

Day or night . . . play  
safe with Centralab!



## STANDARDIZE SALES SERVICE

with



**MODEL 1612**  
Counter Type  
Tube Tester

**\$29.84**

Dealer Net  
**HAS  
RED • DOT  
LIFETIME  
GUARANTEED  
INSTRUMENT**

Here is a "customer acceptance" tube tester that is impressive in appearance, and in the quick "readings" it gives with its fine, business-like 7-inch meter. A quick spin of the illuminated Roll-Dex Speed Chart will give you the settings in a flash. Entire chart scanned in less than 10 seconds. Has all tube sockets including Loctals, Bantam Jr., and the new 1.4-volt Miniatures. Tests High Voltage series including 117Z6G; also Gaseous Rectifiers and Ballast tubes. Future tubes provided for by filament voltages in 20 steps from 1.1 to 117 volts. Has Neon Shorts test; Noise test jack, and separate line voltage control meter. Suede finish Silver Grey and Maroon case and panel of heavy, streamlined steel. Dealer Net Price \$29.84

Write for Catalog—Section 173, Harmon Drive

THE TRIPLET ELECTRICAL INSTRUMENT COMPANY  
Bluffton, Ohio

### POCKET SIZE VOLT- OHM-MILLIAMMETER



A complete pocket-size Volt-Ohm-Milliammeter with AC-DC Voltage ranges: 0-10-50-250-500-1000 at 1000 ohms per volt; DC Milliamperes 0-1-10-50-250; Low Ohms 1/2 to 300; High Ohms to 250,000 with provisions for higher readings by external batteries. Molded case and panel.  
Model 666 . . . . . Dealer Net Price . . . . . \$14.00

## SHOPPING FOR AMPLIFIERS

WHEN shopping for an amplifier, you should give more weight to your own experience, and also to the reliability of the manufacturer, than to the printed ratings. A careful inspection of the amplifier itself can, however, often reveal its true characteristics.

Some manufacturers obtain more than the rated output from an amplifier by raising the tube voltages beyond those recommended as the maximum by the tube manufacturers. Tubes working under these conditions will actually deliver more than their rated output but their life will be seriously shortened. Tube failures are quite annoying and amplifiers working at an overload should be avoided.

The price of amplifiers is sometimes reduced by using poor, undersized transformers. Skippy transformers do not supply a steady voltage to the tubes and run excessively hot. Poor voltage regulation in an amplifier causes distortion and failure to supply the extra power required when loud passages of music or speech are handled. Such an amplifier cannot reproduce the full brilliance of music or the inflections of speech.

When poor output transformers are used there will be a loss of power transfer to the speaker and an uneven transfer of different frequencies. This may not show up in the ratings of the amplifier because some manufacturers make their power output measurements at the output tube plates and not at the secondary of the output transformer.

There is usually a small amount of hum or buzz in the output of an amplifier. This should be so low as not to be noticeable in the output of the system. If large amplifiers are operated in a small room at low volume this hum may become quite prominent. When such an amplifier is used in a large auditorium or hall, of course, the hum would be barely noticeable.

If it is ever necessary to use a large amplifier where only a few watts are required, and the hum is excessive, it can be reduced by using resistance loads to take the place of most of the output load. The resistance should, of course, be equal to the impedance of the speakers which it replaces. The power from the amplifier, including the hum, is then divided between the resistance and the speaker.

D. L. Elam and B. E. Philippsen  
MONTGOMERY WARD & COMPANY

### PLUG-IN RESISTOR MANUAL

The Clarostat Plug-In Resistor Tube Service Manual contains 32 pages of plug-in resistor listings; arranged by respective sets and resistor type numbers, and again as a numerical listing of all types with corresponding Clarostat standard and Clarostat universal types, and other essential data such as number of 6.3 and 25-v tubes, total voltage drop, number of pilot shunts, current in ma, number of pilot lamps and type numbers of same, wiring code, base wiring, type of base, and base-wiring pin numbers. Copy of manual may be had by sending 15c in coin or stamps to Clarostat Mfg. Co., Inc., 285-7 N. 6 St., Brooklyn, N. Y.

### ATR VIBRATOR GUIDE

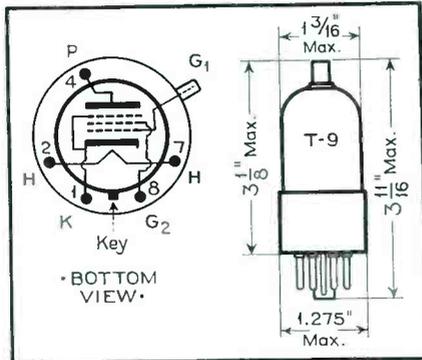
American Television & Radio Co., St. Paul, Minn., have announced their 16-page farm- and auto-radio vibrator replacement guide. Copies of the guide may be obtained directly from ATR.

## TUBES

(Continued from page 33)

### 6S6GT

THE 6S6GT is a remote cut-off r-f pentode with a high mutual conductance and low output capacity. These characteristics make it a desirable tube for use in the radio frequency stage of all-wave



The 6S6GT is a remote cut-off r-f pentode of the GT type. It has a glass bulb, a top (control grid) cap and an octal base with 5 pins.

receivers. The type 6S6GT is a glass tube equipped with an octal base and top cap.

• • • characteristics

Heater voltage: 6.3 v.  
 Heater current: 0.45 amp.  
 Plate voltage: 250 v max.  
 Screen voltage: 100 v max.  
 Grid voltage: -2 v min.  
 Plate current: 13 ma.  
 Screen current: 3 ma.  
 Mutual conductance: 4,000 micromhos.  
 Amplification factor: 1,400.  
 Plate resistance: 350,000 ohms.  
 Grid voltage for  $S_m = 20$  micromhos: -30 v.  
 Capacitances:  
 $G_1$  to plate: 0.01 mmfd.  
 Input: 7.00 mmfd.  
 Output, no shield: 4.60 mmfd.  
 Output, with shield: 6.40 mmfd.

Kenrad Tube & Lamp Corp.

## PHONOGRAPH MOTORS

**General service problems:** The friction or rim drive phonograph motor has had universal acceptance this past year and is now being used even in record changing combinations. This type of motor has several peculiarities.

The idler wheel, i.e., the rubber tired wheel which transmits the energy from the rotor shaft to the turntable, acts purely as an idler. Thus, the speed of the turntable is dependent on the ratio of diameters of the drive pulley of the rotor shaft to the rim of the turntable and is independent of the diameter of the rubber tired idler wheel. Therefore, even appreciable wear of the idler tire will not affect the turntable speed. It should only be necessary to replace the rubber tire or the complete idler wheel when physical damage has resulted from mishandling, when oil or grease has been allowed to get on the rubber tire in sufficient quantities to result in its deterioration or when the unit has been in service long enough for normal oxidation of the rubber to cause its hardening and cracking to a point where unsatisfactory and noisy

## SOUND TIPS ABOUT THE SOUND THAT'S TOPS



THE performance ratings on a great many sound products are often as unreliable as wildcats.

It will pay you to recommend RCA Commercial Sound because you can rely on RCA ratings. Every RCA rating may be proved by test. That means you can use RCA Sound products with confi-

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Remember—RCA has had more experience in sound amplification than any other company in the business. You do a more profitable business—with RCA Commercial Sound!

FOR FINER SOUND SYSTEM PERFORMANCE—USE RCA TUBES

operation results. It is a strange fact that when used quite frequently the rubber tire will not deteriorate from old age as rapidly as when used but infrequently. The flexing of the rubber tends to keep it alive.

One type of idler wheel employs a molded rubber tire which is mounted on a single disc and is readily removable. In this type the tire only need be replaced. The tire should be seated on the steel disc quite carefully and should be pressed down around its entire circumference. The tire will tend to further seat itself and smooth out after it has been in operation for a short time. The rubber tires should be handled with clean hands only, particularly free of grease and oil. Other type idlers using a rubber band cemented in the recess provided by a double flanged disc or rubber

molded to the disc require replacement of the entire idler wheel.

After severe or long service, a phonomotor may begin to lose its speed due to loss of lubrication. Rotor bearings and felts may be re-oiled with a good grade SAE 10 motor oil or special dynamo oil such as Sinclair Cordymo. Idler bearings and felts may be lubricated with Gargoyle 600W or similar grade oil. Turntable stud bearings and felts may also be relubricated with this type lubricant. Care should always be taken not to get an excess of lubricant on the motor, particularly in regard to the idler bearing, for there is danger of its flooding out when hot and ruining the rubber idler tire.

Porter Turner  
 ALLIANCE MANUFACTURING CO.

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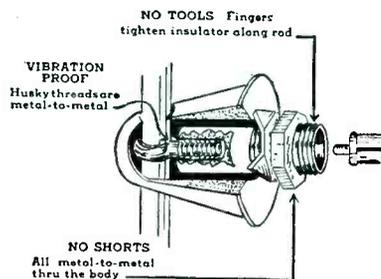
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### RADIART COWL AERIAL

Radiart's 1940 side cowl aerial incorporates an insulator which can be tightened anywhere along the aerial without tools, an advantage which permits easy one-man installation. The lead-in is of

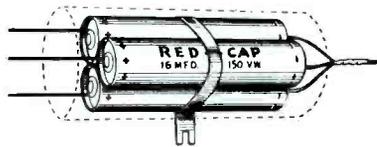


the plug-in type and can be inserted after the aerial is completely installed. This also simplifies installation, it is said.

Additional information may be obtained directly from Radiart Corp., Cleveland, Ohio.

### SOLAR RED-CAP ELECTROLYTICS

Solar's new Red-Cap electrolytics are sealed in metal tubes and, it is said, are rated to withstand extreme surges. They are designed as replacements for older standard types of paper condensers in the filter blocks of receivers. The units are all of the same length but diameters vary



with the capacity rating. This makes it easier to strap several units together to fit the space taken by the original filter.

Additional information on this and other Solar items may be obtained directly from Solar Mfg. Corp., Bayonne, N. J.

### N. U. SOUND TUBES

National Union Radio Corp., 57 State St., Newark, N. J., have announced that they are prepared to supply a special line of tubes for use in sound amplifiers.

The tubes are branded Sound X/tra on the base to identify them. They can be substituted in all cases for the same types in the regular line. The emission limits are very high; gas and grid currents are held to low limits and every tube is carefully tested for hum and microphonics, it is said. In some cases changes have been made in construction.

### PARMETAL CHASSIS

Parmetal Products Corp., 3262 49 St., Long Island City, N. Y., announce a line of



deluxe sloping front foundation units for public-address amplifiers. The chassis are finished in slate grey oven-baked crinkle enamel trimmed with red-striped chrome mouldings and handles. Additional information may be obtained directly from Parmetal.



**JT  
SERIES**

**ASTATIC**

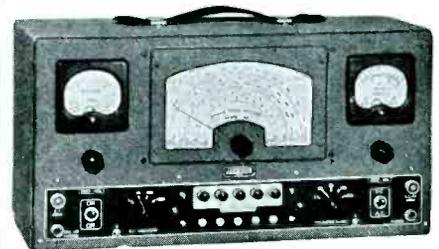
### Crystal Microphone

A public address favorite that also fills a long standing demand for a really good low priced microphone for universal use. Wide range (JT-30) and voice range (JT-40) available. See Astatic Jobber.

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**JACKSON**

**UNIDYNE CAROID MIKE**

A new cardioid dynamic microphone is offered by Shure Brothers. This new Model 555 Unidyne utilizes the Uniphase principle developed by Shure Engineers. It provides true cardioid unidirectional pick-up and may be used to reduce the pick-up of troublesome reflections, rever-



beration effects, or random background noise. Microphone tilts through an angle of 150 degrees. It is available in 35-50 ohm and 200-250 ohm models (or in high-impedance model). For complete information, write to Shure Brothers, 225 W. Huron St., Chicago.

**CLAROSTAT OUTPUT ATTENUATOR**

A means of controlling the volume of individual loudspeakers in a sound system is provided by the new Series CIB output attenuator announced by Clarostat Mfg. Co., Inc., 285-7 N. 6th St., Brooklyn, N. Y. Capable of dissipating 10 watts at any set-



ting, this unit is a junior version of the 25-watt Series CIA attenuator. Insertion loss is below zero. Db range is in 3-db steps up to 24, and then a 6-db step, with final step to infinity. Stock ohmages are 8, 15, 50, 200, 250 and 500 ohms. These units do not come equipped with power switches.

**RCA LONG LIFE NEEDLE**

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has been announced by RCA Victor. Individually packaged in a crystal-clear rectangular block of transparent plastic, the needle has display and promotion possibilities, it is said. RCA enumerates four main points for the new needle: long life, kindness to record surfaces, faithful reproduction, and comparatively low cost. It utilizes an alloy of platinum group of which the rarer are ruthenium, osmium, iridium and rhodium. Molecular structure of the alloy is extremely uniform and fine-grained, making possible a minimum of friction to the semi-circular bottom of the record groove, it is said. RCA Manufacturing Co., Inc., Camden, N. J.

**LAFAYETTE SOUND SYSTEM**

A complete low-price Lafayette sound system designed to provide ample sound coverage to meet all requirements of even

moderately large auditoriums, lecture halls and dance arenas, is offered by Radio Wire Television, Inc., 100 Sixth Ave., New York City, in their Lafayette Model 741-T.

The system consists of a beam-power amplifier, microphone, 2 loudspeakers, cables, plugs, etc., and a carrying case of the airplane-luggage type, which when closed provides a housing for the complete system and when opened separates to provide individual baffles for the loudspeakers. The amplifier provides 15 watts normal output; 18 watts on peaks. Gain is 113 db for the microphone channel and 60 db for the 2 record player inputs. Full facilities are provided for mixing and fading any two of the three channels, and for overall tone control to permit adjustment to local acoustic conditions. The universal output provides terminal impedance value from 2 to 500 ohms.

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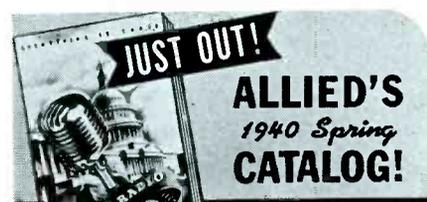
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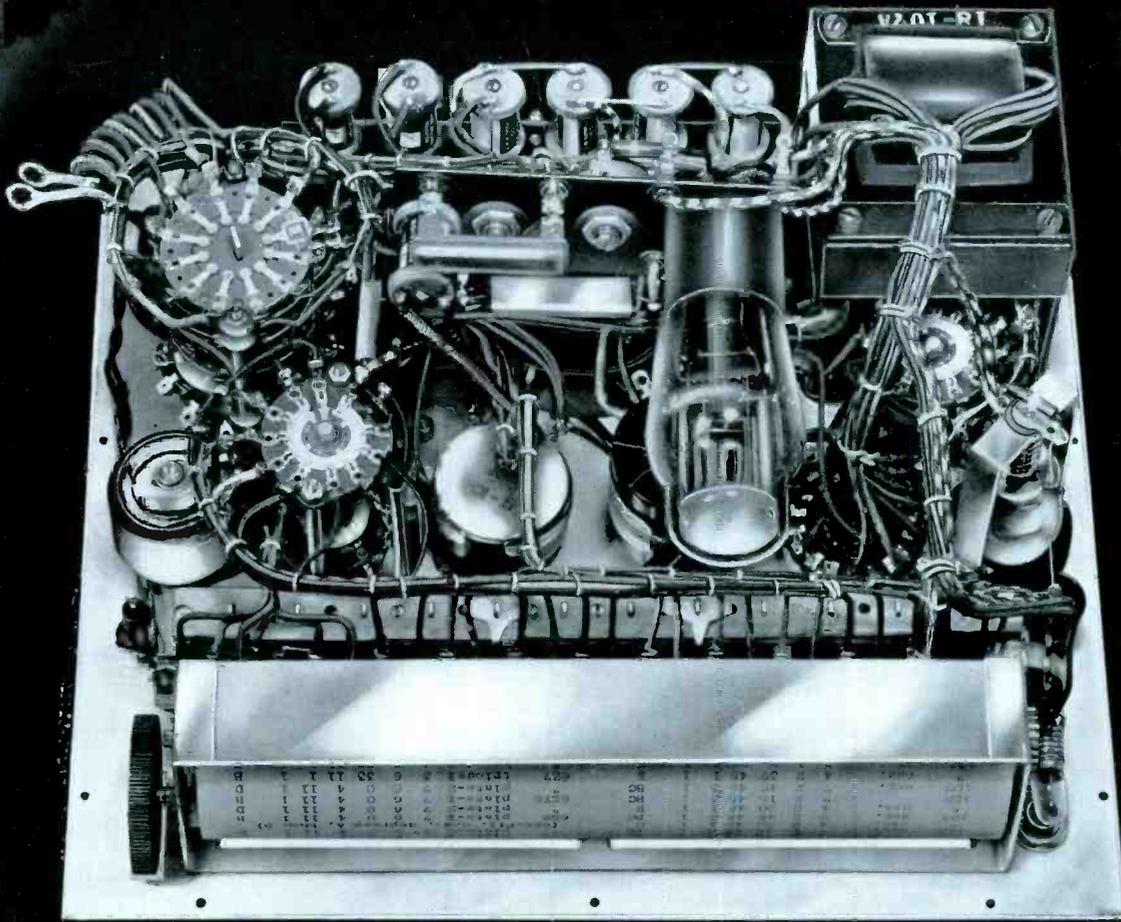
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# Behind The Scenes...



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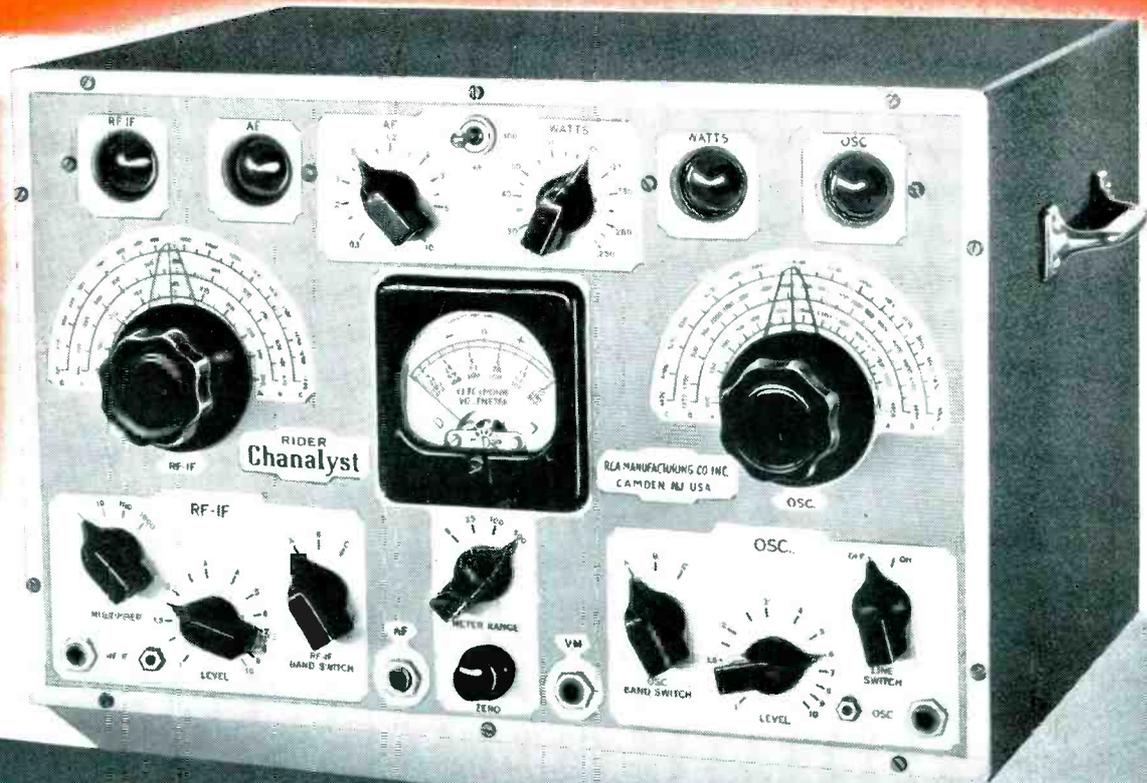


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