JUNE
1948

Radio SERVICE DEALER

IN THIS ISSUE:

AM-FM-TV-SOUND

EQUALLY MATCHED

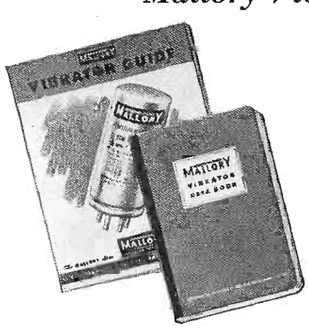
Split the reed assembly of a Mallory vibrator down the middle and the two halves will match each other so accurately that no scale made will register a significant difference.

This precise distribution of weight is a major factor in assuring accurate output, reliable operation and long life.

Mallory Vibrators Make the Best Replacements

Such careful manufacturing makes Mallory vibrators free of bounce and chatter and dependable in starting. More of them are used in original equipment than all other makes combined. That's convincing proof they are the best replacement vibrators for you to stock.

In addition to assured quality, Mallory offers the most complete line in the business. Mallory standardization permits 12 basic vibrators to meet 90% of your replacement requirements. But a complete line of 52 vibrators is available to meet virtually every vibrator need.



The Mallory Replacement Vibrator Guide is free. The Vibrator Data Book is $1.00—from your distributor or by mail.

Mallory "2448" Vibrator Deal

This deal gives you a handsome storage and display cabinet for your stock of vibrators, together with a selection of vibrators and buffer capacitors that will answer 75% of your requirements.

You pay only the service man's net price of $24.48 for the six vibrators and twelve buffer capacitors. There is no charge for the attractive, convenient cabinet. Your Mallory distributor has them in stock for immediate delivery.

MORE MALLORY VIBRATORS ARE IN USE THAN ALL OTHER MAKES COMBINED

P.R. MALLORY & CO. Inc

MALLORY

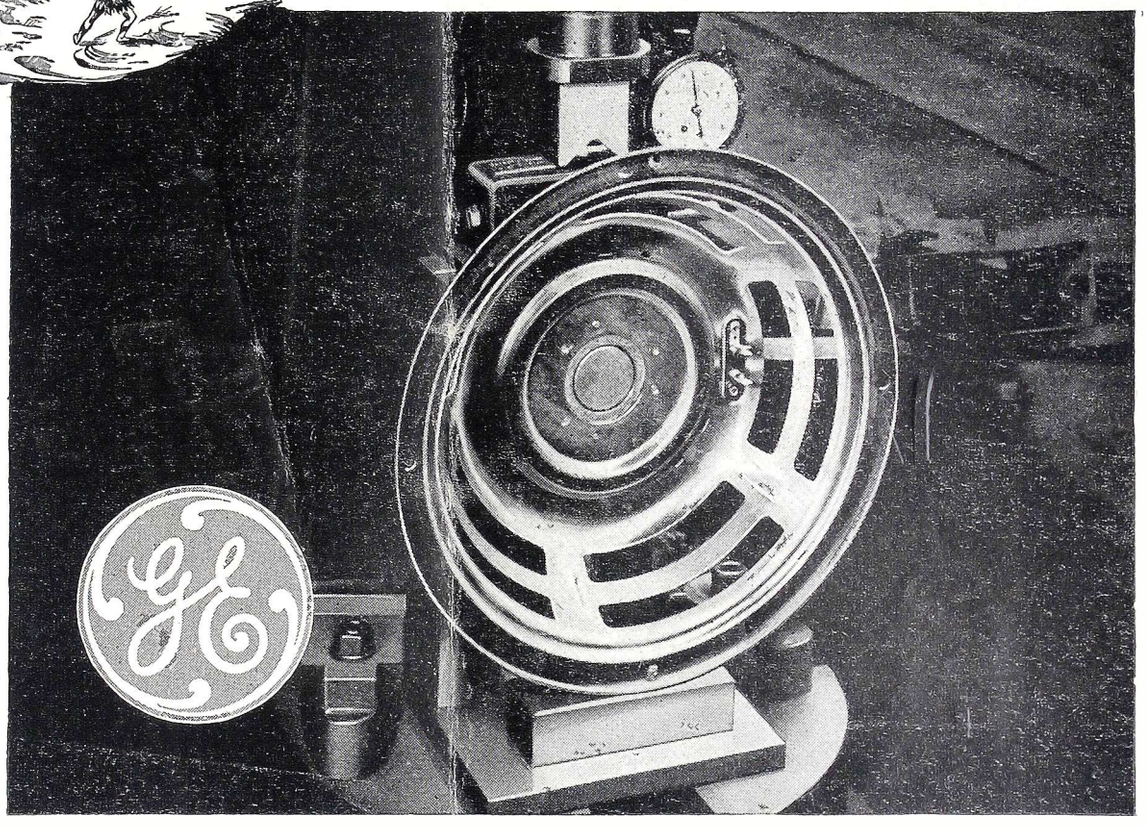
CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS

*Reg. U. S. Pat. Off.

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SURVIVAL OF THE FITTEST

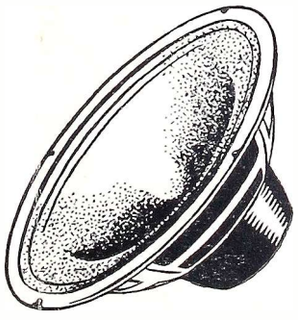


PUSHOUT: No push-over for speakers is this magnet test which checks the strength of the combination of seal and cement up to *1500 pounds.*

MEANS FINER SPEAKERS FOR YOU

ONLY the fit survive the stern tests our G-E speakers meet on the production lines. At frequent intervals speakers are picked from the lines and subjected to rigid tests to assure the maintenance of high standards in the manufacturing process.

Test after test is applied to single elements, combinations of elements and to the final, completed units. The test shown here is only one of the many that General Electric speakers face as they roll down the production lines. This unceasing care in building speakers of quality builds confidence and customer satisfaction.



Write today for information on General Electric quality speakers to:
General Electric Company, Electronics Park, Syracuse, N. Y.

GENERAL ELECTRIC

169-G6

"KEN-RAD TUBES PAY OFF!"

TILLMAN F. BABB, *Wilshire Radio Shop, 6114 Mockingbird Lane, Dallas, Texas.* Tillman knows his tubes, and like thousands of outstanding servicemen, he prefers Ken-Rad tubes. They're quality, through and through.

"Ken-Rad tubes? I'll say I use them!

"Ken-Rad tubes have been doing a job for me for 13 years. And I'll say this—there's not a better tube made. They perform well and stand up.

"You can depend on them to make customers happy. Happy customers build business.

"And I'm not letting customers down. I'm selling *quality.* It pays off!

"That's why I'm for Ken-Rad tubes!"

"Ken-Rad tubes are MADE TO PAY OFF"

"We make Ken-Rad tubes to stand up—satisfy users—and build business for servicemen.

"Before a Ken-Rad tube is sent to you it must pass a series of tests for noise, microphonics, static, life, short, appearance, gas, air and hum.

"That's why Ken-Rad tubes meet your most exacting demands—for quality, stamina, endurance.

"That's why they'll bring customers back satisfied."

ROBERT HAGAN, *Shop Foreman, Quality Laboratory,* is in charge of the strict Life Test, above. It's typical of the numerous tests that Ken-Rad tubes must pass before leaving the plant.

The Serviceman's Tube

178-GA7-8850

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

EDITORIAL

by S. R. COWAN

Fix-Your-Radio-Week

New York's Better Business Bureau reports that now about 85% of the complaints lodged by set owners are against retailers and *not* radio servicemen. Retailers, especially those who don't operate their own service departments, are accused of failure to make good on their 60 and 90-day warranty. It took research to bring out the fact that in many cases servicers were blamed for retailers' short-comings because the average retailer who don't operate his own service department had a working arrangement with a service organization, and after "indifferent" treatment of set-buyers, finally took the set back, and naturally the set-owner figured that the serviceman gave him a bad deal whereas in fact it was the retailer who was guilty.

RMA plans another Radio In Every Room Week. Instead, it might be a good idea for RMA to schedule a Fix-Your-Radio-Week for this coming Fall. Millions of sets now idle in homes would be more efficient, if put in good repair, than *some* of the new, cheap, off-brand sets being marketed by retailers.

TV's Meaning In Dollars

Approximate receiver production figures for RMA members only during the first four months of 1948 are: TV models, 160,000; FM-AM types, 580,000; Auto radios, 1,200,000; all others 5,650,000. Over 300,000 TV sets are now is use.

It is likely that 1948 will see all previous set production records broken. From a dollar point of view it's a certainty. As 11% of the output will be AM-FM types selling at approximately $110; 3% will be TVs averaging $460 and other models average $30, the industry can expect passing the billion dollar mark. One should note especially that of this total dollar volume TV and FM combined represent more than one-half. Undoubtedly within a short time TV alone will pass the billion dollar figure.

To retailers TV and FM means unit sales of 1 to 4 or 1 to 15 (one TV set selling for $460 representing the same profit as a dealer would gain from selling 15 ordinary AM sets at $30 each). No wonder dealers love TV and FM. Service dealers should take the same view, as the number of components in a TV set ranges from 3 to 9 times the number required for an ordinary AM type. So, a TV service job could represent from 3 to 9 times the profit one could expect from an ordinary AM repair job.

MEMBER AUDIT BUREAU OF CIRCULATIONS

Member of the Audit Bureau of Circulations

radio service dealer

VOL. 9 NO. 6

SANFORD R. COWAN, *Editor & Publisher*

SAMUEL L. MARSHALL, *Technical Editor*

JUNE, 1948

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TRADE FLASHES

A "press-time" digest of production, distribution & merchandising activities

Deep South Gets TV

A high-powered G. E. television transmitter, the deep South's first station—WTVJ at Miami, Fla. is slated to be in operation by the end of July, to bring television to Miami and other Florida locations.

WTVJ is expected to be functioning about the same time as stations in Atlanta, Ga. and Dallas, Texas.

GE Boosts TV Output

General Electric announced it has begun shipping the lowest-priced television receiver yet made by the company and the first to be made at the company's new Electronics Park plant.

Known as model 810, the new receiver uses a 10-inch direct-view picture tube with an aluminum-backed fluorescent screen.

G. E. intends to concentrate its receiver division production efforts on television sets. Nine buildings at Electronics Park, Syracuse will be devoted entirely to television set production by the end of the year.

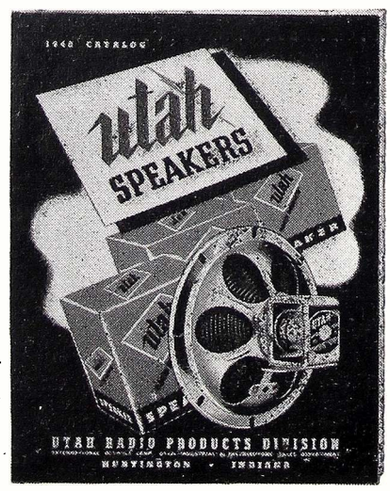
The company expects television within the next five years to develop into a $600,000,000 receiver sales business at retail value and to serve more than 40,000,000 people in the 140 principal U. S. markets.

Speaker Catalog

Utah Radio Products, Huntington, Indiana, announces its new 1948 Radio Replacement Speaker Catalog, Number 100, is now available.

This new catalog was especially designed to make it easier for the service man to select the proper speaker for any particular sound application.

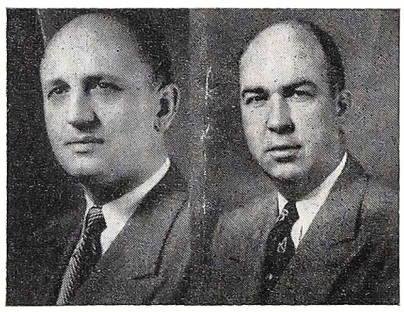
Complete electrical specifications for each speaker are listed in easy-to-read tables. Physical dimensions listed are within close tolerances so that the service man knows if the speaker will fit the job simply by referring to the catalog.



To obtain this new book write to, Utah Radio Products, Division of International Detrola, Huntington, Ind.

Sylvania Promotions

J. C. Farley has been appointed general manager of the Radio Division and J. H. Hauser has been designated assistant manager of the distributor



J. H. Hauser J. C. Farley

sales department of Sylvania Electric Products, Inc. according to Ward Zimmer, vice-president in charge of the company's operations.

Hytron Contest A Success

Hytron's 6 month "Idea Contest" for radio servicemen is already a *certain* success.

Already hundreds of entries have been received, and the number of practical, useful devices among them is posing real problems to the judges in reaching their decisions—a very real tribute to the resourcefulness of the country's radio servicemen. By the time the contest closes in October, the collection of ingenious ideas should be impressive.

The prizes include some of the most coveted pieces of radio service equipment which are well worth the effort of making an entry. All radio servicemen who have original, simple, useful tool ideas, that have been tried and proved in their own shops, should submit them to Hytron. In so doing they will help themselves and their fellow-workers at the same time.

Meissner Joins Marion

Paul Meissner, formerly with National Co., RCA and Holtzer-Cabot has been appointed production manager for Marion Elec. Instru. Co. of Manchester, N. H.

Roth Now Radiart S-M

Milton S. Roth who for several years was Outside Service Manager for one of Cleveland's largest contract dealer service organizations has been appointed

Milton S. Roth

Jobber Sales Manager for Radiart Corporation, Cleveland, Ohio. The firm manufactures aerials, TV antennas and vibrators.

Zenith FM Antennas

Zenith Radio Corporation announced a complete new line of frequency modulation antennas, reflectors, and extension arms designed to insure maximum FM receiver performance.

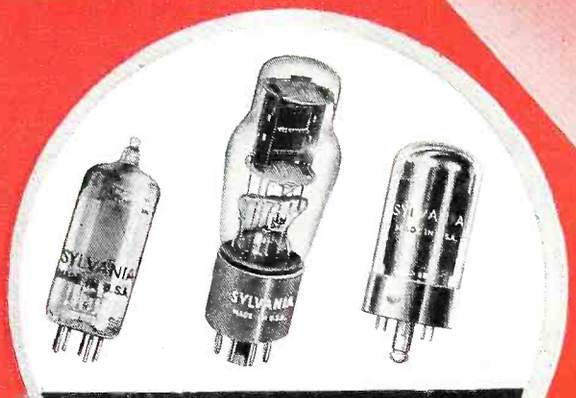
R. F. Miller, manager of Zenith's parts division, said that the new line includes a folded dipole FM antenna to cover the 88-108 mc band, an accessory reflector assembly for use in locations where noise or distance requires a reflector, and an accessory extension arm assembly for use with the folded dipole in areas where 45 mc band reception is desired. Full details may be had. Write Zenith, 6001 W. Dickens Ave., Chicago 39, Ill.

Rhodes Joins Sangamo

Howard E. Rhodes, formerly vice-president and chief engineer of Aerovox Corp. and more recently chief engineer of Mallory's dry battery division has joined Sangamo Elec. Co., capacitor manufacturers, as chief engineer.

Rural Areas Radio Prospects

Electrification of farms and a vast increase in farmers' net earnings indicate bright prospects for the radio industry. Whereas in 1940 farmers enjoyed a net income of slightly over 3 billion dollars, in 1947 the net rose to well over 15 billion dollars. Twenty



SYLVANIA RADIO TUBES...

...MAKE THE SERVICE DEALER HAPPY...

...BECAUSE THEY KEEP SET-OWNERS HAPPY!

Whether a replacement job calls for miniatures, standard tubes or the famous Lock-Ins, you can install Sylvania Tubes with complete confidence. You *know* they'll give the kind of performance that builds good will among your customers!

And... don't fail to cash in on Sylvania's national advertising. Make full use of the Radio Serviceman's decal—*your* decal—featured in every single one of Sylvania's national ads!

DISPLAY THE DECAL THAT BRINGS CUSTOMERS *TO YOU!*

RADIO SERVICE
SYLVANIA RADIO TUBES
Authorized Dealer

SYLVANIA ELECTRIC

Radio Tube Division, Emporium, Pa.

MAKERS OF RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS

Sylvania Electric Products Inc.
Radio Tube Division
Advertising Dept., Room R-1406
Emporium, Pa.

Gentlemen:

Please send, FREE, the following quantities of the Sylvania Serviceman's decals:

..... 8-inch size ..... 12-inch decals

Name .....

Company .....

Street Address .....

City ..... Zone # .....

State .....

TRADE FLASHES

(from page 4)

years ago there were less than 200 thousand rural homes wired. Now there are over 3½ million. Statisticians accordingly compute that radio receiver sales in the newly electrified areas during the next few years will exceed 2 million units.

Levey New Allied S-M

Sanford H. Levey has been appointed Sales Manager of Allied Radio Corporation, Chicago, distributors of radio and electronic equipment. "Sandy" Levey, well known in the trade, has been associated with Allied Radio in various merchandising and sales positions since 1933. Walter F. Marsh, formerly Sales Manager, leaves allied to join the Leroy W. Beier Company.

Two-Way Radio On Ferryboats

Installation of G-E two-way FM radio television equipment on four ferryboats and land locations of the Chesapeake Bay Ferry System, near Annapolis, Md., has been completed.

The system, operated by the Maryland State Highway Commission, thus becomes the first radio-equipped regularly scheduled ferry system in the nation.

FM transmitter-receiver sets have been installed in the wheelhouse of each ferryboat while the station headquarter units are located on the docks and in the State Highway Commission's office at Annapolis.

State Highway Commission officials expect that the system will enable dockmen to "talk the ferries in," in spite of fog and heavy storms which are prevalent in the area especially in the Fall and Winter; speed up docking and traffic throughout the main Bay channel; and facilitate many public service applications like the reporting of marine accidents, etc.

Robbins Rejoins Emerson

Charles Robbins, formerally Sales Manager of Emerson Radio and Phonograph Corporaton, returns to that position effective immediately according to an announcement by Benjamin Abrams, President. Mr. Robbins has been in business for himsefl the past three years.

Robbins succeeds Leslie M. Graham who becomes the company's new Midwest representative. Graham will make his headquarters in Indianapolis, Indiana.

Lehman-Davis Now Jobbers

Ben Lehman, former General Manager and Hy Davis, former purchasing

(Continued on page 9)

. . . these GI HOME RECORDING Units

There's *extra* customer-appeal in combination radio-phonographs which offer the added feature of *Smooth Power* home recording. Here, indeed, is the answer to your ever-increasing competition in the home-entertainment field . . . the answer, too, for prospective buyers who want *more* than just an *ordinary* combination set.

Both the GI Dual Speed Recording and Phonograph Assembly (upper right) and the ever-popular GI Record-Changer Recorder Combination (lower left) have ample power for noiseless, vibration-free recording and reproducing . . . both are simple to operate, and sturdily built for trouble-free long life.

And equally important—*both units are remarkably low-priced to fit into your volume sales picture.*

For complete information on this popularity-building combination that can add new sales appeal to your radio-phonograph combinations, write us *today.*

The GENERAL INDUSTRIES Co.

DEPARTMENT K • ELYRIA, OHIO

TRADE FLASHES

(*from page 6*)

agent of Radio Wire Television, Inc. have formed the Davis Electronics Corp. in Hempstead, New York and henceforth will be engaged as wholesalers of radio parts, p-a and TV equipment.

Garstang-May Now Reps

W. W. Garstang and H. C. May, formerly president and vice-president respectively of Electronic Laboratories, Inc., announce forming the Garstang-May Co. to act as manufacturers' reps in the territory adjacent to Indianapolis, Dayton and Cinn., Ohio.

Cherry Rivet Steadies Prices

Cherry Rivet Co. of Los Angeles announces that no increase in prices is now anticipated for 1948.

DuMont Expands

Acquisition of the former Wright Aeronautical Plant in East Patterson, N. J. from the WAA as a site for a new television receiver plant was announced by Allen B. DuMont Laboratories, Inc. The new plant is expected to triple DuMont's present 3,000 receiver a month production by the end of 1948 with an eventual goal of 20,000 receivers monthly.

G. E. Merchandising Package

A complete package of promotional material on the General Electric variable reluctance pickup and preamplifier, is now available to all franchised distributors from the G-E Receiver Division at Electronics Park, Syracuse, New York, according to R. S. Fenton, in charge of the sale of component and universal parts for the division.

The package includes a window streamer on the pickup, a show case sticker, an envelope stuffer in layman's language, and a six-color counter card. There is also included a catalog page on the new diamond stylus pickup, designed for professional and broadcast use.

Sylvania Boosts Service Dealers

An intensive national campaign to boost radio repair sales for authorized radio servicemen has been launched by the Radio Tube Division of Sylvania Electric Products Inc., in Saturday Evening Post, Collier's, Life and Radio Best.

The national magazine campaign is designed to attract the radio set owner through cartoon type illustrations, text featuring the radio service dealer, his services and the Sylvania authorized dealer emblem.

Capehart Revises Policy

The complete line of Capehart phonograph-radios and television receivers will be marketed henceforth through a

(*Continued on page 39*)

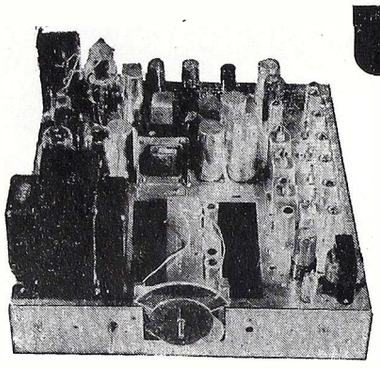
TELEVISION ASSEMBLY CO.

INTRODUCES THE

Champion Models

with

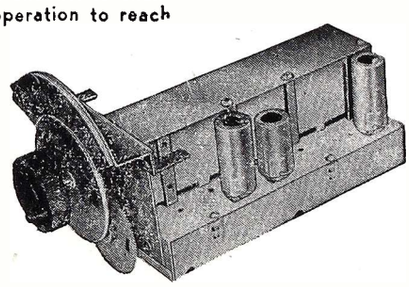
DUMONT INPUTUNER



The Dumont Inputuner tunes continuously from 44 to 216 megacycles without a break, covers all 13 channels as well as FM, amateur, and aviation channels. For ease and convenience of operation no band switching of any kind is required when tuning from channel to channel with the imputuner system. Just one simple operation to reach any desired station.

Assemble the Champion model of your choice, 10" flat surface screen picture, 51 sq. in. picture, 12" screen picture with 75 sq. in. picture or the 15" screen picture with 120 sq. in. picture.

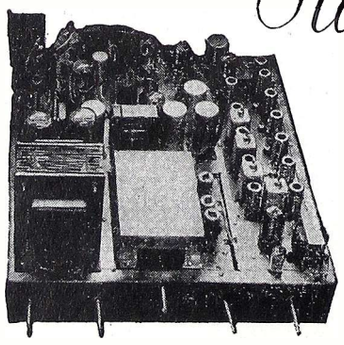
All Champion Models are complete with all tubes and components including the CR Tube.



10" FLAT SURFACE	12" SCREEN PICTURE	15" SCREEN PICTURE
52 sq. in.	75 sq. in.	120 sq. in.

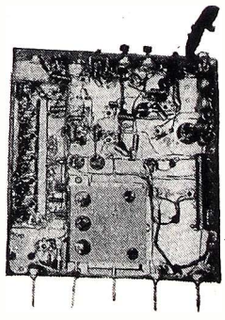
Standard Models

NOW AVAILABLE WITH THE STANDARD MODELS—FM RADIO AT A SLIGHT ADDITIONAL COST OF $7.95.



All Television Assemblies are complete and include: 29 RCA Tubes-1 CR Tube-Heavy Duty RCA 6.8 oz. slug 12" PM Speaker-Specially designed dipole antenna with 60 ft. lead in.

Superior performance is obtained with a new IF Video & Sound IF Strip (Pat. Pend.) aligned, wired, pretuned, tubed and tested. All circuits are contained on one chassis ready to use with the front end unit supplied. This front end will handle 13 channels and is aligned and tested, mounted on a separate chassis. Merely connect B plus filament and output IF leads to the television chassis. It is not necessary to make any RF alignments. These units utilize a clipper circuit which filters out ignition noises.



10" FLAT SURFACE	12" SCREEN PICTURE	15" SCREEN PICTURE
52 sq. in.	75 sq. in.	120 sq. in.

Guaranteed

All Television Assemblies are guaranteed to operate to your satisfaction when simple directions are followed.

SEE YOUR LOCAL NATIONAL PARTS DISTRIBUTOR

TELEVISION ASSEMBLY CO.

540 BUSHWICK AVE.
BROOKLYN 6, N. Y.

AMPLIFIER CHECKING *by Signal Injection*

BY RUFUS P. TURNER

Amplifier signal tracing usually operates in the forward direction—from the imput terminals of the amplifier to the speaker. Signal injection is a somewhat simpler method, requires less test equipment, and moves backward through the amplifier—from the speaker to the input terminals. This article describes fully the signal injection method.

TWO systems of dynamic analysis are in widespread use today for rapid trouble shooting in PA amplifiers. One is *signal tracing;* the other is *signal injection.* Both should be well known. While the techniques involved in these systems are somewhat similar, the methods still are sufficiently different to raise some question among radio service dealers as to the superiority of one over the other.

Both systems require an audio signal. One frequency is sufficient for ordinary trouble shooting. A simple, single-frequency audio oscillator will suffice. However, there is no objection to using a tuneable audio oscillator or audio signal generator, as is shown in *Fig. 1*, if one is available.

In conventional signal tracing, the signal usually is applied to the input terminals of the amplifier under test, and the detector (a. c. vacuum tube voltmeter, oscilloscope, or probe-type signal tracer) is moved from point to point, following the signal in a forward direction through the amplifier, from input to output. The detector must be a high-impedance, well-shielded device to prevent circuit loading and to minimize interference with stage operation.

In signal injection; the detector may be an ordinary a-c voltmeter (or similar output indicator) connected across the speaker voice coil—or it may be the speaker itself. No v-t voltmeter, nor tracing instrument is required. The signal is injected at various points in the amplifier stages, working backward successively through the amplifier from speaker voice coil to amplifier input terminals.

Both methods, signal tracing and signal injection, consist of point-by-point tests made for the obvious purpose of determining at which point (s) in the circuit the amplifier becomes inoperative. However; since signal tracing requires at least one special instrument in addition to the audio oscillator and *usually* does not provide an aural as well as visual indication, the signal injection method appears to us the simpler system.

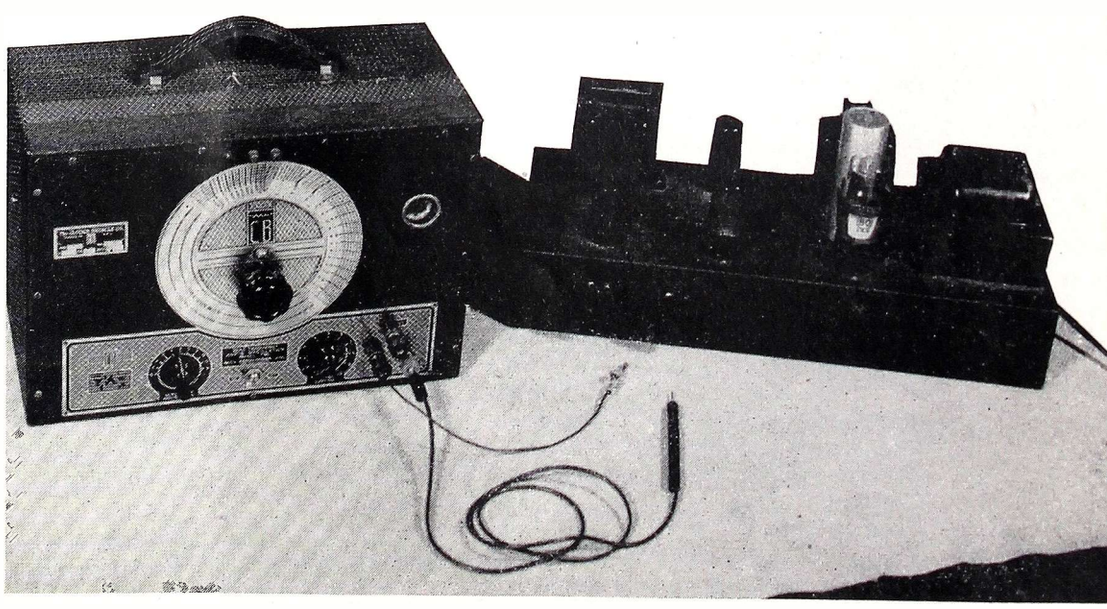
The technique of servicing amplifiers by means of signal injection can be mastered completely after a surprisingly small amount of practice. Using this method, an operator can shoot trouble confidently in a strange amplifier and locate quickly the seat of trouble.

The following paragraphs describe in detail the step-by-step procedure to be followed in the signal injection servicing of a typical amplifier. From this description, the reader will understand how the same method may be applied to any amplifier.

Signal Injection Procedure

Before undertaking the signal injection test, the audio oscillator must be set up as indicated in *Fig. 1.* The signal "injector" in a shielded test prod connected by means of a flexible, shielded lead and an 0.01-μf, 400-volt isolating capacitor to the "high" out

FIG. 1—SETUP FOR TROUBLE SHOOTING BY SIGNAL INJECTION
The only instrument required by this method is an audio oscillator. An a-c voltmeter connected in parallel with the speaker voice coil is helpful but not essential, since the speaker itself can serve as an output indicator.



put terminal of the audio oscillator. This injector prod will be touched to various circuit points during the course of the test. The "low" (grounded) output terminal of the oscillator is connected to an alligator or crocodile clip by means of a length of flexible, insulated wire. During the test, this clip normally will be fastened to the amplifier chassis or B-minus lead. For best results, the oscillator should have a continuously variable output control. If the oscillator is turnable, its dial may be set conveniently to 400 or 1000 cycles.

STEP A. (*1*) Plug-in amplifier to be tested and allow about 5 minutes for tube heaters to come up to normal operating temperature. (*2*) Connect rectifier-type multi-range a-c voltmeter (1000 ohms per volt, or better) to voice coil terminals *14* and *15* (See *Fig. 2*). (*3*) Connect oscillator output clip to terminal *15*, and inject signal at point *15*. Advance oscillator output to maximum. No sound in speaker, although voltmeter deflects, indicates dead speaker. No sound in speaker, together with no voltmeter deflection, indicates shorted T_2 secondary.

Make necessary repairs before proceeding to Step B.

STEP B. (*1*) Transfer oscillator output clip to *16*, and inject signal at *12*. No output indicates open upper half of T_2 primary. (*2*) Inject signal at *13*. No output indicates open lower half of T_2 primary.

Make necessary repairs before proceeding to Step C.

STEP C. (*1*) Transfer oscillator output to *2*. (Clip will remain at *2* for rest of test), and inject signal at *10*. Loss of, or reduction in output indicates defective tube V_3, loss of tube voltages, incorrect tube voltages, or open resistor R_{10}. (*2*) Inject signal at *11*. Loss of, or reduction in output indicates defective tube V_4, incorrect tube voltages, loss of tube voltages, or open resistor R_{10}.

Make necessary repairs before proceeding to Step D.

STEP D. (*1*) Inject signal at *9*. Increased output shows step-up ratio of transformer T_1. Loss of output (or reduction of output, if T_1 has 1:1 or step-up ratio) indicates defective transformer T_1. (*2*) If output appears normal, remove tube V_3 from socket. Output then should drop to approximately ½ former value. Loss of output indicates open or shorted lower half of T_1 secondary. (*3*) If output dropped to approximately ½ when tube V_3 was removed, replace V_3 in socket and remove V_4. Here again, output should fall to approximately ½ value observed when V_3 and V_4 both are in sockets. Loss of output indicates open or shorted upper half of T_2 secondary.

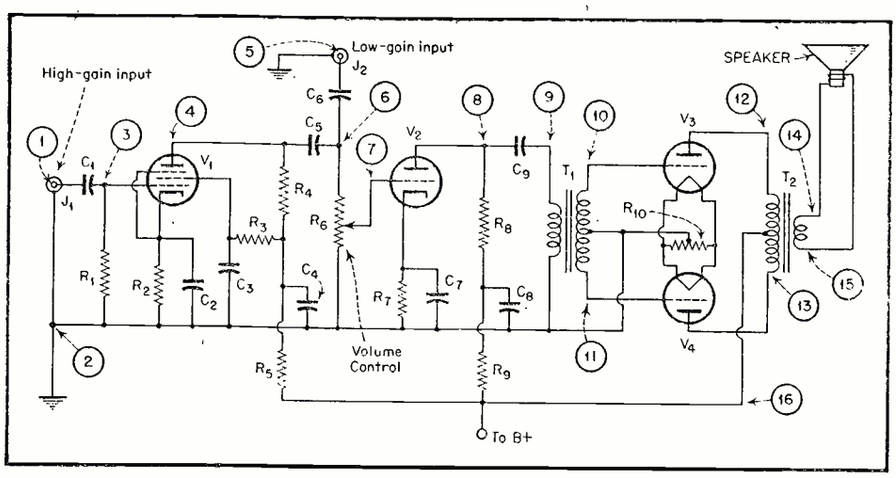


Fig. 2.—Amplifier circuit, with test points for signal injection.

Make necessary repairs before proceeding to Step E.

STEP E. (*1*) Inject signal at *8*. Loss of output indicates open coupling capacitor C_9.

Make necessary repairs before proceeding to Step F.

STEP F. (*1*) Set volume control R_6 for maximum volume, and inject signal at *7*. Increased output shows gain through tube V_2. Loss of, or reduction in output indicates defective tube V_2, loss of tube voltages, incorrect tube voltages, or defective or grounded circuit components (C_7, C_8, R_6, R_7, R_8, or R_9).

Make necessary repairs before proceeding to Step G.

STEP G. (*1*) With volume control R_6 set for maximum volume, inject signal at *6*. Loss of output indicates open volume control. (*2*) If output appears correct, run volume control throughout range, watching effect on output indication. Reset volume control for maximum volume.

Make necessary repairs before proceeding to Step H.

STEP H. (*1*) Inject signal at *5*. Loss of output indicates open or grounded coupling capacitor C_6, or defective or grounded jack J_2.

Make necessary repairs before proceeding to Step I.

STEP I. (*1*) Inject signal at *4*. Loss of output indicates open or grounded coupling capacitor C_5, or grounded resistor R_4.

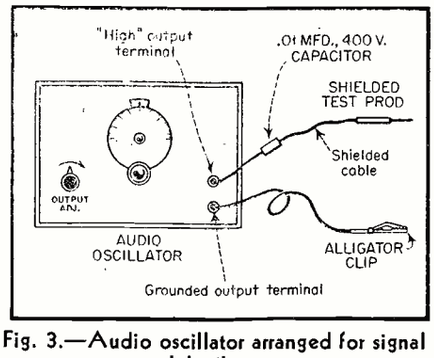


Fig. 3.—Audio oscillator arranged for signal injection.

Make necessary repairs before proceeding to Step J.

STEP J. (*1*) Inject signal at *3*. Increased output shows gain through tube V_1. Loss of, or reduction in output indicates defective tube V_1, loss of tube voltages, incorrect tube voltages, or defective or grounded circuit components (C_1, C_2, C_3, C_4, R_1, R_2, R_3, R_4, or R_5).

Make necessary repairs before proceeding to Step K.

STEP K. (*1*) Inject signal at *1*. Loss of output indicates open capacitor C_1 or defective jack J_1.

Make necessary repairs.

Additional Pointers

The reader will note from the foregoing step-by-step description that the signal injection method is a complete procedure. *All* steps accordingly must be taken, even after a repair along the way apparently has restored the amplifier to operation. Only in this way can all of the troubles be located in an amplifier.

While the loudspeaker alone will suffice as an output indicator, the serviceman is urged to use the output voltmeter (See Step A-2) also. This will enable him to see output changes a great deal more accurately than he can hear them.

Armed with the circuit diagram of an amplifier, the operator can move quickly through the various stages of the amplifier, discovering defects by means of the signal injections. However, the circuit diagram is not absolutely essential. An entirely successful signal injection run may be made in its absence.

As the test proceeds through the various stages of the amplifier, gains due to tubes and transformers are encountered. Each gain causes the output to rise. The operator may compensate for such gains, if he wishes, by turning down the output control of the audio oscillator. If the oscillator has a calibrated output indicator, the gain

(*Continued on page 40*)

Applications of GAS TYPE TUBES in Radio Servicing

BY WILLIAM R. WELLMAN *

While the applications of gaseous tubes in the radio field are not too numerous, they are important enough to merit the attention of all servicemen.

AT THE outset, it should be noted that tubes which contain a gas or a vapor are often loosely referred to as *gas-filled*, a term which is apt to be misleading. We are aware that in the usual type of vacuum tube, as much of the air as possible is pumped out, after which the tube is sealed. In a gas type tube, much the same process is followed, except that before sealing, a small quantity of an inert gas is injected. An inert gas may be regarded as one which does not readily react with other materials. The gases ordinarily used include argon, neon, xenon, helium and mercury vapor. When mercury vapor is used, the mercury is introduced into the tube in liquid form during manufacture, and is boiled by the heat of the tube during operation, thus creating mercury vapor. It should be emphasized that in tubes using either a gas or a vapor, the pressure inside the tube is still far below that of the outside air. In other words, only a small quantity of gas or vapor is used and a fairly good vacuum still remains. The actual pressure existing within such tubes ranges from about 20 to possibly 500 millionths of a pound per square inch. The pressure will depend upon the temperature at which the tube is operated; this is particularly true in the case of mercury vapor tubes, because a rise in temperature will vaporize more liquid mercury, thus increasing the pressure.

When a stream of electrons passes through a tube containing a gas or a vapor, several effects take place which do not occur in vacuum tubes. First of all, there is the phenomenon known as ionization. The gas or vapor exists in the tube in the form of tiny particles called atoms. Each atom consists of positive and negative electrical charges; the positive charge is the core or nucleus of the atom and the negative charge is the electron. These charges are exactly balanced, so that the atom is neutral, having neither a positive nor a negative charge. The electrons traveling from the cathode to the plate collide with the gas atoms, and because the electrons are traveling at high velocity they strike the gas atoms with sufficient force to tear loose one of the electrons of which the atom is composed. This electron is now free to join the stream moving toward the plate, and, as we shall see later, this has the effect of increasing the plate current. We now have a gas atom which has lost one of its electrons—a negative charge—and the balance between positive and negative charges has been destroyed. Since the positive charges predominate, the atom assumes a positive charge; it is now referred to as a positive ion.

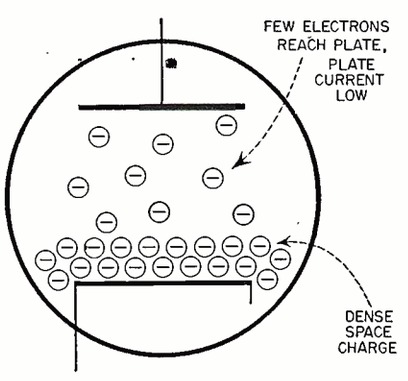


Figure 1—Vacuum diode

*Author of "Elementary Radio Servicing" and "Elementary Industrial Electronics."

Gas-type Diodes

The most familiar types of hot-cathode, gas diodes are of course, the various mercury vapor rectifiers, such as the 82, 83, 866 and 872. These are used in rectifier power supplies for medium- and high-power amplifiers and transmitters. The advantages of such rectifiers over the usual high-vacuum types are three-fold: (a) ability to pass higher current, (b) ability to handle large power peaks and (c) ability to deliver higher d-c voltage for a given transformer secondary voltage.

In order to understand why a gas type rectifier is able to deliver higher current than a vacuum type, suppose we consider the sketch of *Fig. 1*. This shows the condition existing in a vacuum rectifier. Electrons have been emitted by the cathode and are traveling toward the plate. The electrons, of course, will gain velocity as they approach the plate, and therefore they will be moving slowly near the cathode.

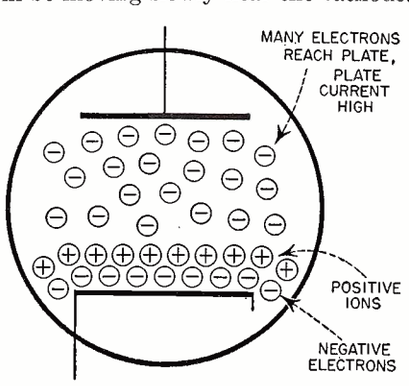


Figure 2—Gas diode

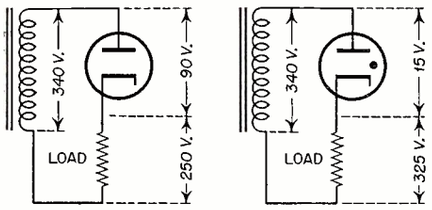


Fig. 3—left, Vacuum diode and Fig. 4, right, gas diode.

This means that large numbers of electrons will collect near the cathode, as shown in the drawing. This "cloud" of electrons sets up a strong negative field, called space charge, which tends to repel electrons trying to leave the cathode, with the result that the plate current will be limited.

Now refer to *Fig. 2*, which shows the action taking place within a gas type tube. Remember, that when a stream of electrons passes through a gas, ionization takes place due to the collisions between moving electrons and gas atoms, thus liberating electrons from the atoms. As stated before, these liberated electrons join those traveling toward the plate and so increase the plate current. But there is a further increase in plate current due to another effect. The collision between electrons and gas atoms created positive ions. These ions, having a positive charge will, of course, be attracted to any negatively charged body. The most highly negative point in the tube is down near the cathode where we have a cloud of electrons—the space charge. The positive ions slowly move down toward this point and tend to neutralize the negative field caused by space charge. The result is that the effect of space charged is reduced, electrons leaving the cathode now find it easier to reach the plate and the plate current is further increased. Another way of considering this is to regard the space charge as resistance (actually it does offer opposition to the electron flow, just as a resistor would). In a vacuum type diode, the resistance of the space between cathode and plate is high due to space charge. In a gaseous diode, the space charge effect having been reduced, the resistance between cathode and plate is much lower, therefore the tube will conduct more current.

Figure 3 shows a vacuum type rectifier used in a half-wave power supply, and *Fig. 4* shows a gas type tube used in a similar power supply. Note that in both cases, the transformer secondary voltage is the same—340. In the case of the vacuum rectifier, the voltage drop across the tube is high, due to the high internal resistance of the tube. (The voltage drop in any case will be equal to the load current multiplied by the tube resistance). The tube drop in this example is 90 volts, leaving 250 volts available for the load. Now look at *Fig. 4*. Here we see that the tube drop (again equal to the load current multiplied by tube resistance) is only 15 volts, leaving 325 volts available across the load. It is clear then, that a gas type tube delivers a higher voltage to the load for a given transformer voltage.

Suppose we assume that the power supply is used for furnishing plate and screen currents to a power amplifier, and that at the moment the current demand is relatively low due to low signal input level. Let us say that the total load current is 80 milliamperes. Suddenly the signal input level increases, with a corresponding increase in amplifier plate current, say to 120 milliamperes. This represents an increase of 50%, and since the rectifier tube resistance will remain nearly constant, the voltage drop or loss in the rectifier tube will be directly proportional to the load current. This will mean, in the case of the power supply shown in *Fig. 3*, that the rectifier tube loss will rise to 135 volts, leaving only 205 volts across the load. If we

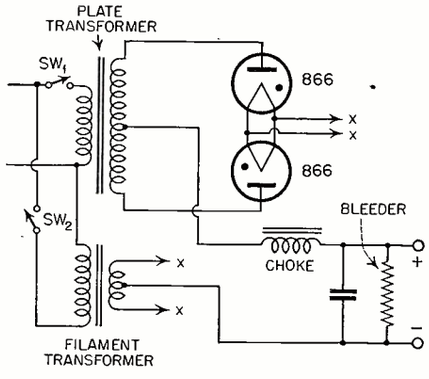


Fig. 5—Full-wave mercury vapor rectifier.

compare this with the action of the mercury vapor tube shown in *Fig. 4*, we shall find that the rectifier tube drop rises 50% to 22.5 volts, and we still have 317.5 volts across the load. So far, it is clear that the use of mercury vapor tubes affords higher current, keeps rectifier voltage loss at a minimum and prevents serious changes in output voltage due to changes in current demand. However, this does not mean that the use of gas or vapor rectifiers is a panacea for all of the ills to which amplifiers and other equipment are subject. To begin with, in order to obtain the higher current it is necessary to use a larger cathode, and, very often, a larger plate as well. The larger cathode will, of course, require more current and generally the tube envelope must also be made larger in order to dissipate the increased heat.

As stated earlier, one important application of mercury vapor tubes is in public address equipment, or any other type of amplifier delivering medium or high power. This is particularly true in class B work, sometimes in class AB as well. A circuit diagram of such a power supply is given in *Fig. 5*. This circuit is also widely used in supplying plate and screen voltages for small transmitters and other equipment. It consists of a pair of 866 tubes in a full wave circuit. Several features of this equipment are worth noting. In the first place, the filter circuit is of the inductive, or choke—input type, which simply means that the usual first filter condenser has been omitted. While this type of filter affords a lower output voltage than the condenser input type, it does provide better regulation. The bleeder resistor, *R*, also tends to improve the regulation of the unit. It should be emphasized that while gas rectifiers are capable of delivering higher output voltages for a given transformer secondary voltage, the transformer winding must be designed to carry the higher current which such tubes will pass. Notice that the rectifier filament voltage is not taken from a winding on the same core as the secondary, but is an entirely separate transformer. The reason for this is that mercury vapor tubes cannot be placed in operation without first preheating the cathode. This is done to permit the mercury to vaporize before applying plate voltage. Notice that separate switches are used to control the filament and plate transformers. When a new tube is placed in operation, or one which has been handled in such a manner as to scatter the mercury, the filament should be heated for about half an hour, with no plate voltage applied, in order to properly distribute the mercury. After this has been done, and provided the tube is not shaken or otherwise roughly handled, the preheating period need be only 30 seconds.

A very important point to be observed in the use of mercury vapor tubes is the matter of ventilation or cooling. If the tube is to be operated under conditions of natural air circulation, ample provision must be made for cooling by locating the equipment in such a position that it is well ventilated. If the power supply uses a cover, the cover must have proper louvres to provide free air circulation. In the case of equipment designed for forced air circulation by means of fan or blower, the fan or blower should be directed toward the lower part of the rectifier tube or tubes, near the base, for this is

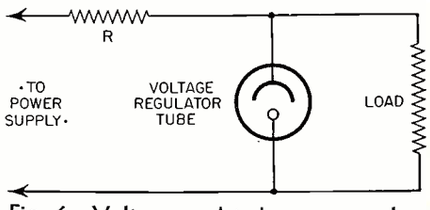


Fig. 6—Voltage-regulated power supply.

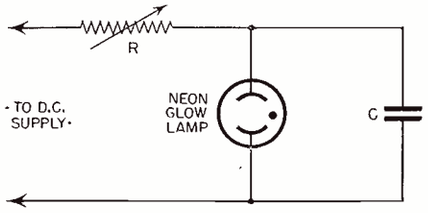


Fig. 7—Neon glow-lamp relaxation oscillator.

the point at which the mercury should condense. Should the stream of air be directed toward the top of the tube, there is the possibility of mercury condensing on the plate, causing the plate to emit electrons and resulting in *arc-back*, which is the flow of current in the wrong direction through the tube.

The matter of cooling is very important in mercury vapor tubes for another reason. As the temperature of the tube rises, more mercury is evaporated, increasing the amount of gas in the tube. The increase in gas pressure increases the liability of arc-back, which of course, temporarily throws the equipment out of service, if not resulting in damage. A little study of tube manuals (such as the RCA manual on air-cooled transmitting tubes) will show that the inverse peak voltage which may be applied to a mercury vapor tube drops sharply as the temperature of the condensed mercury rises. If the tube temperature is allowed to rise above the recommended value, a point may be reached where the negative half cycle peaks of transformer voltage may be higher than the tube can withstand.

Another familiar example of a gas type rectifier, is the tube used in battery chargers. These are available under the trade names of Rectigon and Tungar, and are made in a variety of sizes up to those capable of handling 15 amperes. The gas used is argon, which gives rise to a blueish glow while the tube is in operation. Incidentally, one other characteristic of gaseous tubes is the light which is emitted, the color of which depends upon the type of gas used, and to a slight extent upon the gas pressure. Mercury vapor tubes give a blueish-green light; those using neon an orange-red color, while xenon shows a violet color. This is the basic principle of electronic lamps such as the fluorescent, mercury vapor, sodium vapor and neon tube lighting. In the Tungar and Rectigon bulbs, the gas pressure is considerably higher than in most mercury vapor rectifiers. This is done to make starting easier without preheating the cathode. However, it does reduce the maximum inverse voltage which may be applied to the tube, but in this particular case this is of little importance since the voltage is only in the neighborhood of 15 or so. Such tubes are almost always used in a half-wave circuit, with no filtering at all, since none is necessary for this application.

Voltage regulator tubes, as for example the type VR-105 are used to maintain a constant voltage at the output terminals of a power supply. One such application is found in the Aerovox LC checker. In this case an oscillator is used to determine the capacity of a condenser or the inductance of a coil by measuring the resonant frequency of the circuit in which it is connected. It is absolutely necessary that the frequency of the oscillator remain constant, and to insure this, the power supply voltage must be constant. A voltage regulator tube (often referred to as a glow tube) has two electrodes and generally is filled with argon or neon gas. Such tubes will maintain constant supply voltage within a given range of current drain. For example, the type VR-105 will keep the supply voltage constant throughout a current variation of 5 to 30 milliamperes. This current range is referred to as the *normal* range of the tube. When a regulator is connected across a supply as shown in *Fig. 6*, with a resistor in series with the tube, large changes in load current will be reflected in only small changes in tube voltage. With zero load current the resistor is high enough to keep the current through the tube within the normal range. An increase in load current will result in a greater voltage drop across the resistor, and this, of course reduces the tube voltage. A small change in tube voltage produces a relatively large change in current through the tube. Thus the tube automatically compensates for changes in load current.

Another gas filled device which is of interest to servicemen, although not generally classified as a tube, is the familiar neon or argon glow lamp. These are made in sizes from about 1/4 watt to 3 watts, and are widely used as r-f indicators, polarity indicators, as stroboscopic lamps and in many other applications. You have probably used one many times for checking the speed of a phonograph turntable. Its utility in this application depends upon the fact that, as in other electronic lamps, the discharge is completely extinguished at the end of each half-cycle of line voltage. Incandescent lamps cannot be so used because the relatively heavy filament retains so much heat that it is not actually extinguished at each reversal of line voltage. A neon or argon glow lamp is capable of giving extremely short flashes of light because such lamps do not have the "thermal lag" of incandescent lamps.

The relaxation oscillator, illustrated in *Fig. 7*, is one interesting use of the glow lamp. When this simple device is connected to a d-c source of supply, it may be caused to generate oscillations over a wide frequency range (from one per second, or less, to about 10,000 per second). Its principle of operation is as follows: the condenser, *C*, charges. While the consenser is charging, no discharge takes place in the lamp because not enough voltage is available to break down the lamp. Once the condenser voltage becomes high enough to break down the lamp, the condenser discharges through the lamp causing ionization, accompanied by the usual flash of light. When the condenser has discharged to a point below that necessary to keep the tube in operation, the tube deionizes and the cycle of operations is repeated. The voltage across the condenser thus has a saw-tooth form, rising from zero to a maximum in a definite time, but falling back to zero practically instantaneously. The frequency generated depends upon the capacitance of the condenser and the setting of the variable resistor, *R*.

Grid-Controlled Gas Filled Tubes

A hot-cathode gaseous tube having one or more grids is called a thyratron. Some examples of thyratrons are the types 2A4-G, 884 and 885, all of which have a single grid. Types 2050, 2051 and the miniature thyratron 2D21 are tetrodes, but the second grid is almost always tied to the cathode instead of being made highly positive, as is the case with the usual screen grid. The peculiar properties of a thyratron include the ability to conduct heavy currents, and the fact that once the grid loses control of plate current it does not regain it. As an example of the high current-carrying ability, one type of thyratron which has about the same physical dimensions as a type 76 tube will safely conduct peak currents of 750 ma.

We are all aware that in the usual vacuum triode, a more positive grid means higher plate current and a more negative grid will result in lowered plate current. In other words, the plate current will vary with grid voltage changes. This is not true in the case of a thyratron. Each type of thyratron has a critical grid voltage

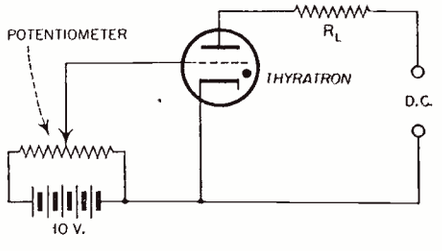


Fig. 8—Trigger control of thyratron.

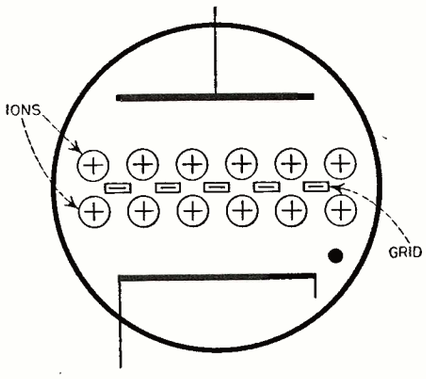


Fig. 9—How ion sheath neutralizes effect of grid.

which depends upon the construction of the tube, the type of gas employed, and the plate voltage applied. The critical voltage may be defined as that grid voltage at which the tube begins to ionize and plate current flows. In some tubes, *firing* or ionization takes place only when some positive value of grid voltage is applied; in others the tube will fire at a negative value of grid voltage.

Suppose that a particular type of thyratron has a critical voltage of -5 (remember that this will apply at only one value of plate voltage. If the plate voltage is increased the critical voltage must be higher to keep the tube from firing; if the plate voltage is reduced, the critical grid voltage necessary to prevent ionization will be lower.) The tube is connected as shown in *Fig. 8.* D.C. is applied to the plate, and a potentiometer is used to vary the grid voltage from zero to, say, -10 volts. The load resistor R_L must be high enough to limit the plate current to a safe value, otherwise the tube may be damaged, In many cases this value is about 1500 ohms. With the potentiometer adjusted so that any voltage higher than -5 is applied to the grid, no plate current at all will flow. If the potentiometer is now set so that the grid voltage is less negative (below -5) the tube will suddenly conduct full plate current.

What happens is that any negative value of grid voltage higher than -5 will cause electrons leaving the cathode to be repelled. A less negative value of grid voltage, however, permits electrons to leave the cathode and they collide

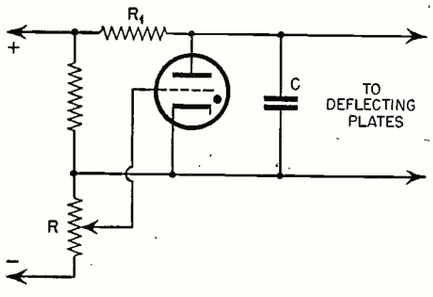


Fig. 10—Thyratron sweep oscillator.

with gas atoms. Ionization then begins, as explained in the discussion on gas diodes. In a very small fraction of a second ionization and the neutralization of space charge are completed and the tube is carrying full plate current.

Now we come to the most important feature of a thyratron—the fact that once plate current flow begins, the grid is no longer effective in controlling it. Increasing the grid voltage to -6, -7, -10 or even higher will neither stop nor reduce the flow of plate current. The reason for this is that some of the ions (which, you will remember, are positive, and therefore will be attracted to any positively charged body) travel toward the negative grid and completely surround it, as illustrated in *Fig. 9.* This "ion sheath," as it is called, has the effect of cancelling the negative charge on the grid and so destroys its effectiveness in controlling plate current. Plate current flow may now be stopped by interrupting the plate circuit, as with a switch, or by using a-c plate supply in place of d.c. In the latter case, the plate is negative during alternate half-cycles of supply line voltage, and therefore cannot conduct current. Thus the tube is automatically deionized and restored to non-conducting condition at the end of alternate half-cycles. Both methods of stopping plate current flow are widely used depending upon the type of operation desired.

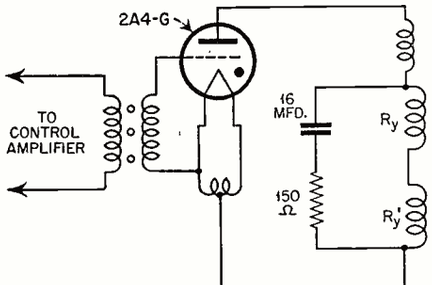


Fig. 11—Mystery control thyratron circuit.

It should be noted here that while the voltage appearing across the electrodes of a gas type tube is low during operation, a considerably higher voltage is needed to cause it to break down or fire. As soon as the tube has fired, the voltage across it drops to a very low value. This peculiarity is taken advantage of in sweep generators used in cathode-ray oscilloscopes and in earlier television receivers. You will recall that earlier in this article we discussed the operation of a saw-tooth generator using a neon or argon glow lamp. This type of voltage is exactly what is needed to cause the electron beam to sweep across the screen; a voltage which takes a finite time to rise from zero to a maximum, but which then drops to zero almost instantaneously.

Most sweep generator circuits use a thyratron; generally a type 884 or 885 is used, and the circuit diagram of such a generator is given in *Fig. 10.* Condenser *C* in this drawing is connected between the cathode and plate of the tube. Since the tube and the capacitor are in parallel, the voltage across the tube must always be the same as that across the condenser. Resistor *R* provides variable grid voltage for the tube. D.C. is applied to the terminals marked *plus* and *minus* and reaches the tube through the resistor, R_1. When voltage is applied, the condenser begins to charge, and the voltage across this unit rises until it becomes equal to that required to break down the tube. Remember that the plate voltage needed to fire the tube will depend to some degree upon the grid voltage. Once the tube fires, its resistance falls to a very low value and the condenser discharges through it. This takes place almost instantaneously. Once the condenser is discharged, the tube deionizes and the condenser begins to charge again. The time required for one cycle to occur will depend upon the capacitance of the condenser and upon the voltage at which the grid of the tube is held.

In an actual sweep oscillator a number of condensers of different value are used and are cut into the circuit by means of a selector switch, which affords a coarse method of frequency control. The variable grid resistor is used for finer adjustments.

A very interesting application of the thyratron is seen in the Philco Mystery Control receivers which were marketed some years ago. Briefly described, the complete receiver consists of three distinct units: *a.* the radio receiver proper, *b.* the control amplifier, together with associated equipment including the pickup loop, thyratron, relays, and the switching mechanism, *c.* the control box. Now, see *Fig. 11.*

The control box is fitted with a dial somewhat like that used on a telephone. This dial has six station positions, together with positions for increasing and decreasing volume. Dialing a desired station or dialing for volume increase or decrease sends out a number of impulses at a frequency between 355 and 395 kc. These impulses are picked up by the control amplifier loop, passed through the control amplifier, and finally reach the grid of a type 2A4-G thyratron. As each impulse reaches the thyratron grid, the tube fires once, operating the relay *Ry.* This relay actuates a rotary switch which advances one step for each impulse received. The rotary switch has three decks; one of these cuts into the circuit the proper antenna trimmer which has been preset for the station selected, the

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MODERN TV KITS

TV kit assembling, having become accepted practice by technicians, is simplified when fundamentals, as described herein are known.

BY SAMUEL L. MARSHALL

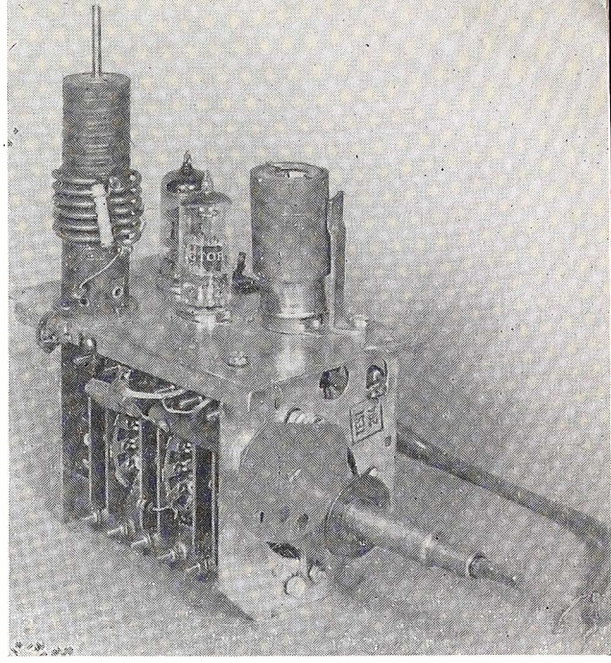


Fig. 1—Sarkes-Tarzian Front-end employed in Standard Model.

THERE are several reasons why servicemen take time out to construct TV receivers from the kits made available for this purpose. The first is the experience it affords them in obtaining at first hand the knowledge required for gainful practice in TV servicing. The second is the opportunity it affords them to share in the profits being made in selling, installing, and maintaining TV receivers. In some localities business of this type is assuming boom proportions.

It is indeed ironical and unjust that the great majority of radio technicians, those who for many years bore the brunt of the economic ups and downs of the radio business, should be brushed aside now that the tide has turned. Not only are franchises denied them even though potential sales exist, but the very basis of their livelihood, *installation* and *maintenance*, has been denied them as well, on pretexts that are ridiculous and have become the subject of widespread mockery.

It is no wonder therefore, that the radioman has taken to the construction of these kits, affording him as they do, the opportunity to remain in the domain of servicing in his community, the wherewithal of getting into the swim of TV sales and installation without forced quantity sales, abusive *tie-ins*, and inventory risks, and finally the knowledge that his prestige as an all-round expert would not suffer for lack of television experience.

Many of the kits sold are worth their purchase price on the basis of the experience and education they afford. However, when constructing a kit which is to be sold as a *Custom Built* piece of equipment it must be remembered that this kit must perform as well as or better than the better commercial receivers available; and that the selling prices of both must be comparable.

With this in mind, the custom builder must be aware of the basic factors which determine the *performance* value of a television receiver. These are as follows:

1. Size of screen.
2. Picture quality or definition.
3. Receiver sensitivity.
4. Stability of reception.
5. Freedom from interference.
6. Quality of components and construction, electrical and mechanical.
7. Ease of alignment and adjustment.

With these criteria as the basis on which to pass judgment on the quality of a receiver let us examine the kit manufactured by the Television Assembly Co.

Front End

A good TV receiver must contain a well-designed *front end*. This unit enables the operator to select with ease any of the thirteen channels available. It must be designed to provide good linear amplification at all the r-f frequencies, as well as effective matching between the external antenna and the receiver input. It must provide for a minimum of image-frequency interference. Finally, it must be designed so that a minimum of feedback and reradiation occurs between the oscillator stage and any of the previous stages.

The Television Assembly Co. makes available two kits, the "Champion" and the "Standard," containing different front ends each of which have been accepted by the industry-at-large as meeting all these requirements. The first is the Sarkes-Tarzian unit, a band-switching arrangement, shown in *Fig. 1*, which enables the operator to switch to any seven of the thirteen available stations. Inasmuch as there is a maximum of seven stations assigned to any service area, the operator is not deprived of the six remaining channels since they are not receivable anyway. This unit is provided with the Standard model. The second unit is the Dumont Inputuner, a continuously tuned assembly, illustrated in *Fig. 5*, and available in the Champion model. So much has been written describing the design and operation of these two front ends that no further mention need be made on that score. A good front end results in satisfying practically *all* the criteria mentioned previously.

Video I. F.

Proceeding into the second section of the receiver, that is, the video i-f stages, certain requirements must be met with if *good picture quality* or definition is to be expected. The first of these requirements is that the complete range of video i-f modulating frequencies, from 30 cycles to well over 4 megacycles be amplified without side-band attenuation. Poor picture definition resulting from inferior i-f band pass designs shows up particularly in the vertical wedges of a test pattern. A good test for this is to observe how far into the center circular area of the pattern the black and white lines of the wedges can be *clearly* defined. A good i-f band pass will provide perfect resolution to the very end of the wedges.

This kit features a uniquely designed 5 stage pre-tuned i-f amplifier. Reference to *Fig. 2* will reveal that the i-f transformer is of the band-pass variety. This results in excellent side-band amplification characteristics. Because

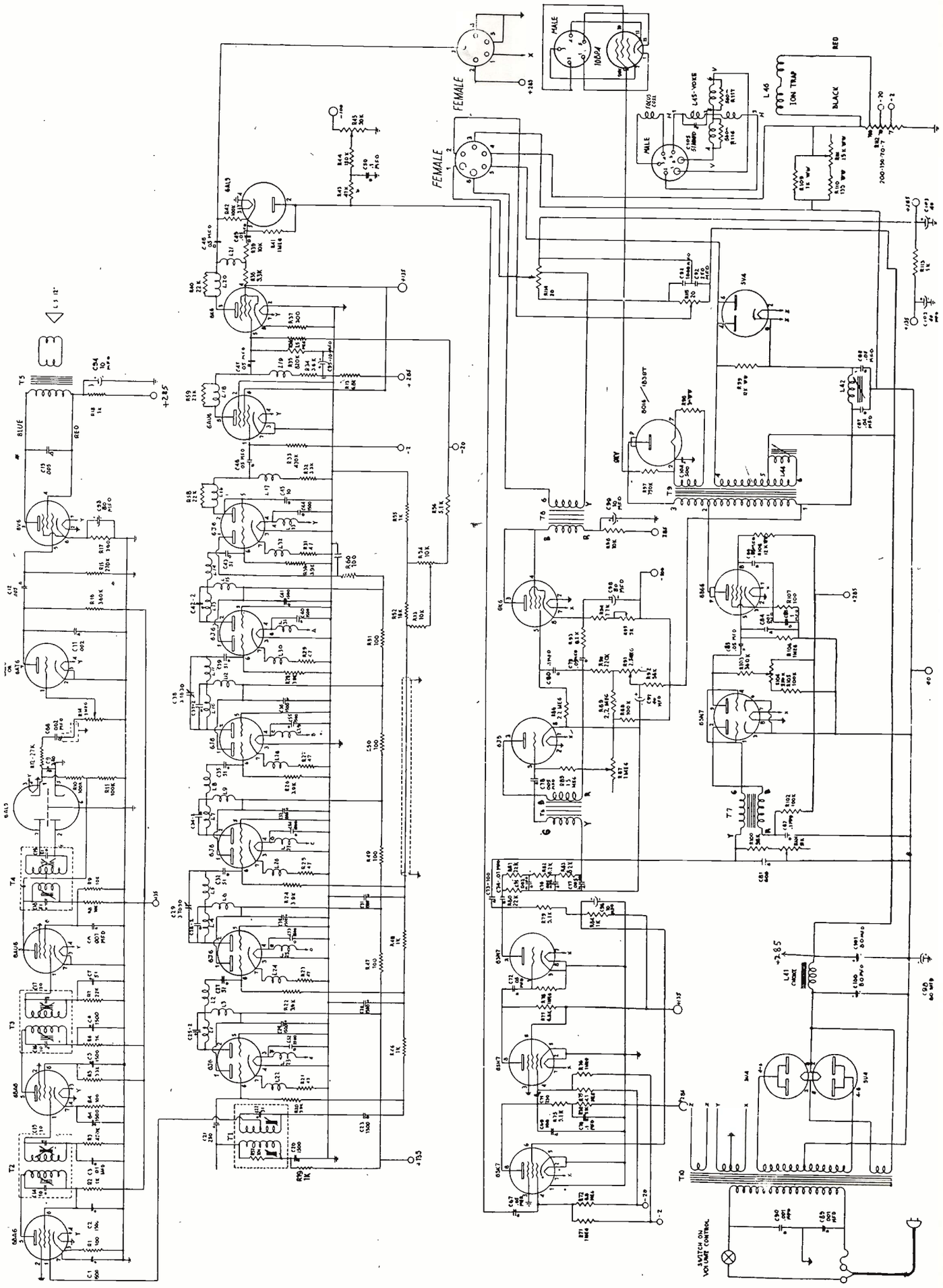


Fig. 2—Schematic circuit diagram of Television Assembly kit.

of the relatively large number of i-f stages employed the gain of each stage can be kept at a relatively low level, thereby resulting in a minimum of feedback, as well as excellent stability and over-all gain. Notice that the first half of each 6J6 is cathode-coupled into the second half, the latter being a grounded grid amplifier. This results in an exceptionally efficient video i-f system.

Two Phillips Norelco traps are provided, one for the adjacent sound, and the other for the associated sound. These traps are pre-tuned at the factory. The final product is a video i-f amplifier with excellent gain, wide-band video response, minimum adjacent-channel interference, and good stability.

The mechanical layout of this unit, which is part of the over-all video and sound strip is shown in *Figs. 3* and *4*, top and bottom views of the strip. As a result of this layout connections are kept very short, and feedback is reduced to a minimum. This strip, like the front end, comes completely wired. The video i-f in the Standard Model is 26.1 mc, the corresponding trap frequencies being 21.6 and 27.6 mc. In the Champion, the video i-f is 26.4 mc, the corresponding trap frequencies being 21.9 and 27.9 mc.

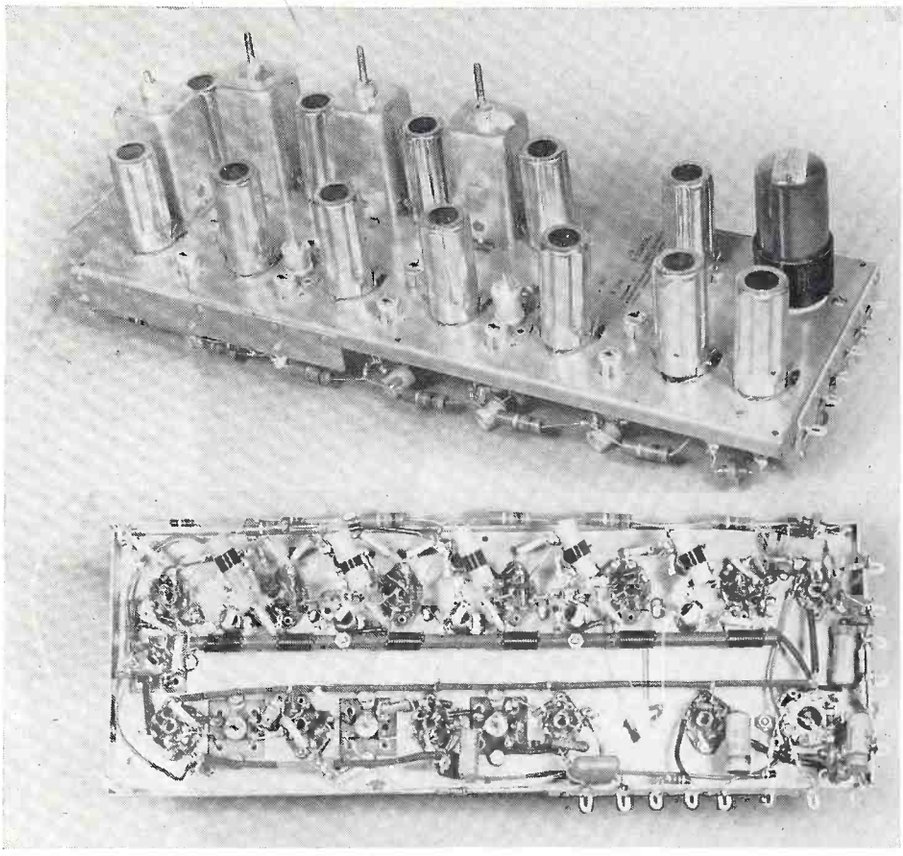


Fig. 3—(Top) Video I.F. and Sound Strip, as seen from top, and below it Fig. 4—underneath view of same sections.

Video Detector and Amplifier

Proceeding, now, into the video detector and amplifier we observe that the detected output is obtained at the diode-connected plate and grid terminals of the final 6J6. The signal polarity developed at this point has a positive picture phase. Two stages of compensated video amplification follow before the video signal is injected into the grid of the picture tube. Plate voltage on the 6K6 second video amplifier is kept at a low value so that the tube acts as a limiter to noise pulses of high amplitude. This limiting action is not affected by the ordinary voltages obtained in the video signal. D-C restoration is obtained by virtue of the 6AL5. The net result is a video amplifier with excellent phase and frequency characteristics.

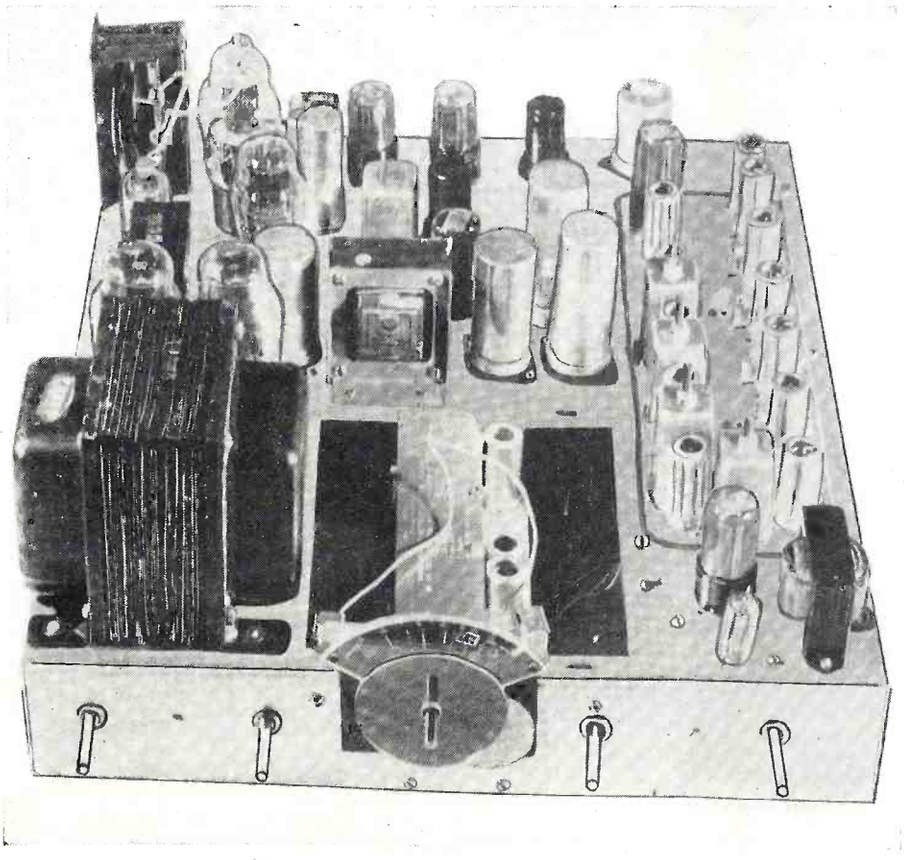
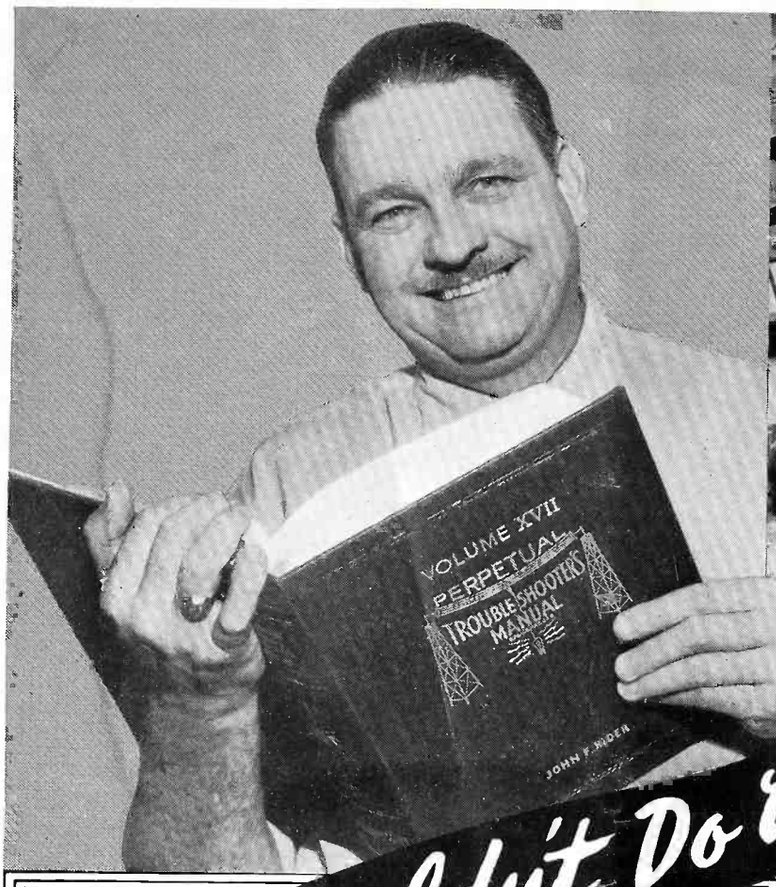


Fig. 5—Completed chassis of Television Assembly kit.

Sweep Circuits

Reference to the circuit diagram of the receiver will reveal that the horizontal and vertical sweep circuit are entirely conventional. The synch pulses are obtained at the plate of the 6AL5 d-c restorer, and are fed into a 6SK7 synch amplifier. From this tube the synch pulses are fed into a 6SH7 synch separater and then into a second synch amplifier, which is a 6SN7. At the plate of this tube suitable integrating and differentiating circuits channel the vertical and horizontal pulses separately into their respective oscillator and output circuits. The sweep oscillators are of the blocking type. A 6K6 serves as the vertical sweep output tube, and a 6B6G as the horizontal output tube. Notice that the high voltage supply is



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RIDER

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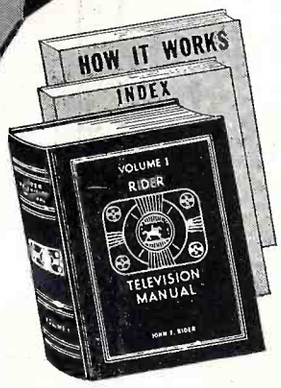
RIDER VOL. I *Television* MANUAL



The Manual provides television servicing data based upon each *Manufacturer's Recommended Procedures* for his own sets. Circuit descriptions, adjustment of various trimmers, traps, transformers, etc.—voltage and resistance readings, complete alignment instructions, parts lists—schematics, patterns, chassis views, wave forms—everything to simplify your work.

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NOTE: The Mallory Radio Service Encyclopedia, 6th Edition, makes reference to only one source of Radio Receiver Schematics—Rider Manuals.

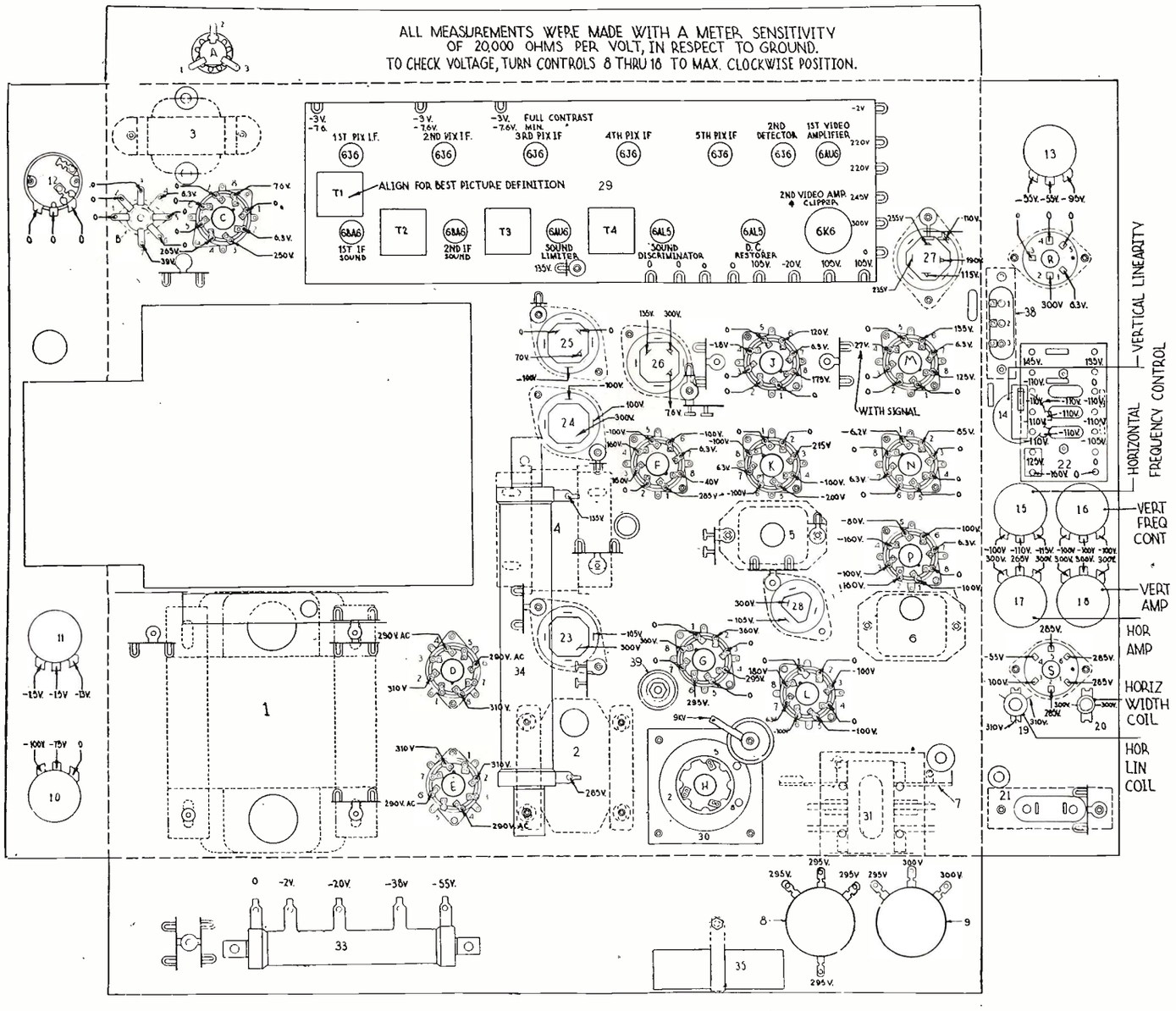


Fig. 6—Voltage chart and parts placement of Television Assembly kit.

of the flyback type, making use of the emf developed in a high voltage winding wound on the horizontal output transformer. About 10kv is made available in this manner.

The rest of the circuit is conventional. This applies to the power supply and the FM section. It will be recalled that the FM section is contained in the video and sound strip shown in *Figs. 3* and *4*. In all, the kit is generous in the matter of circuit design allowances, and the quality of components used, thereby insuring a high degree of receiver performance. A complete chassis view of the Champion is shown in *Fig. 5*.

Alignment

The only alignment adjustment required on completion of the receiver is the one made on the converter output transformer, T_1. A station is tuned in, following which the *bottom* slug is adjusted for maximum picture definition. When making this adjustment the contrast control should be set to the lowest possible output position. In this manner signal *variations* will be readily observed; a condition that ordinarily is not obtained if the signal input is too high. The top slug of the transformer is left alone. This applies to all other transformers and traps, these having been pre-adjusted at the factory.

Accompanying the kit is an excellent set of instruction sheets. Construction and wiring proceeds along a logical sequence leaving no room for error if the instructions are followed implicitly. The final adjustments entailing setting of the vertical, horizontal, and focussing controls. Referring to *Fig. 6*, these adjustments are as follows:

1. Adjust focus control (part *13*) for maximum sharpness.

2. Adjust height control (part *18*) and vertical linearity control (part *14*) so that the center of the target will be equidistant from the ends of the pictures. (Vertical wedges are equal in height).

3. Adjust width control (part *20*) and horizontal amplitude control (part *17*) and horizontal linearity control (part *19*) to obtain a picture of sufficient width and have the center of the target equidistant from the ends horizontally. Pattern circle should be as close to a true circle as possible.

4. Adjust the vertical hold control (part *16*) until the pattern stops vertical movement.

5. Adjust the horizontal hold control (part *15*) until a picture is obtained.

6. Adjust the centering controls (parts *8* and *9*) for proper centing, vertically and horizontally.

Picture Tube Sizes

Three picture tube sizes are available with these kits. These correspond to the 10 inch-10BP4, and 12 inch-12JP4, and the 15 inch-15AP4.

Field Findings

The Editor's views of happenings here and there are of interest to everyone engaged in the radio industry.

by S. R. Cowan

POLITICS are phooey! The radio industry, with good reason, feels let down again. Mr. Truman has just appointed a lawyer named Miss Hennock to the open post on the FCC. Why in heaven's name aren't FCC appointees people with a technical radio background? Except for George Sterling, a very competent radio engineer, all other FCC members are outsiders who don't know the difference between a megacycle and a bicycle. It's a sorry situation!

New Yorkers aren't so happy with WATV, the new TV outlet on channel 13. Hardly anyone in the metropolitan area can get the new station. The few who do report that its programs are the best balanced in town.

Associated Radio Servicemen of New York, Inc., the group that organized about six months ago to "clean up the industry from within" so N. Y. servicemen would not be forced to take out licenses under municipal ordinance is coming in for great acclaim. The Ass'n has already built up its membership to nearly 500; has had informative technical meetings at least once a month; has improved the service profession's status to the point where set-owners constantly phone its headquarters asking for "a man who is a member of your reliable organization to come and fix my set." More important, the N. Y. Councilman, who was going to introduce the Licensing Bill, has seen the situation clean up so nicely now promises that "as long as the fine job now being done is continued there will be no need for licensing N. Y. technicians." Cities where servicemen are in bad grace should take note. The ARSNY and PRSMA are willing to show you how to get an association started, and from the records compiled so far it is a positive fact that it pays to belong to an organization that betters relationships between consumer and supplier. We know of 50 different associations now functioning in the U. S. A.. Is your group sending us your regular monthly bulletins? We're keeping the various groups informed about activities of the others.

Literature About New Items

The Parts & Equipment Mfgr's big annual Trade Show was a huge success. Most new products, introduced were related to TV, FM, Sound and Recording. In this issue we've resumed the show's highlights by giving an outline of the various exhibitors' new products, and by arranging with those manufacturers to have them send you the literature about their new products if, when you write, you mention that you "saw it in *Radio Service Dealer.*"

Jobbers attending the Trade Show say they are no longer over-stocked. There is still a serious shortage of test equipment. Most new instruments introduced are terrific in design and application, and fair in price. Antenna makers are scrambling for the huge volume of business they know is imminent. Here, there and everywhere the "factory franchised TV service organizations" are having troubles because they can't catch up with the load of TV installations. So, independents are starting to get their share of the business. The records show that the independents can and are doing as good a job as the so-called specialists. But in New York there is now a chaotic condition because Philco suddenly switched it's TV policy and no one, set-owner or service dealer, now is sure what the whole thing's about. TV installers were forcefully reminded the other day that TV can be a killer. Two Brooklyn technicians, after completing an installation, accidently allowed their aluminum extension ladder to hit a power line, and p-o-o-f . . . both were dead men. Take heed! Have respect for TV, especially the high working voltages in the chassis.

Our New Cover

Our May issue became a "collector's item" quite by accident. We used our current new, streamlined front cover for the first time, and in our rush to get the issue to press so copies could be distributed from our booth at the Chicago Trade Show, we inadvertently omitted the May "date-line." The printer caught the error after 6,000 copies had been run off. The scramble for the error copies has amazed us. On this subject however, we've been elated to have so many hundreds of complimentary letters from subscribers telling us that "RSD" now has the neatest front cover of any mag in the field. Thanks, pals! And just for your information, during the past year we gave 68 radio service dealer establishments permission to use exact replicas of our now out-of-use sign-type front cover as signs for their shops

"I came to—wow, that is I came to, —ahem—to set up your pushbuttons."

The Customers Always Write

We don't run a "letters to the editor" column but the mail bag recently has had some exceptionally interesting contributions. For example, Charley Kahler, the Soundman of Peoria, expresses his opinion of Jobbers who sell at wholesale to any Tom, Dick and Harry regardless of whether they are professional technicians or not. And friend Kahler opines that "the average customer merely considers a serviceman as being a guy who can replace a tube because the various factors in the industry haven't taken the trouble to educate the set-owning public that there's more to service work than mere tube changing." We agree! Perhaps it would be a good idea if every customer were obliged to take a good look at his set's chassis—to see how complex a maze of parts and wires it is—before any service dealer quotes on a repair job. The public *knows* how complex the human system is and so medical men are never questioned about their diagnoses. The public probably don't appreciate that a radio set is just as complex as the human carcass. Let's try the idea of public education!

Another prolific letter-writer, Mr. J. Roland Daugherty of Balto., Md., keeps pounding our desk insisting that the service business will never improve until licensing is mandatory. He also claims there is a conflict between re-

(Continued on page 30)

TRADE SHOW REVIEW

Literature describing new products announced at Trade Show will be sent free if you write mentioning "RSD".

Permoflux Corporation, 4900 West Grand Ave., Chicago 39, Ill.; and 236 So. Verdugo Rd., Glendale 5, Calif. displayed their PM and dynamic speakers as well as the "permoflux" line of audio transformers. Ask for catalogue 10-7A-1.

The Radio-Craftsmen, Inc., 1341 South Michigan Ave., Chicago, Ill., displayed their new FM-AM tuner, hi-fidelity amplifier, and 12" PM hi-fidelity speaker. Catalog sheet available on request.

Coastwise Electronics Co., Inc., 130 North Beaudry Ave., Los Angeles 12, Calif., showed their new "Ferret" signal tracer-electronic volt-ohm-meter. Other items were a "DeLuxe" test speaker and universal signal substitution, an FM-TV sweep generator, a wide range FM-AM-TV generator, an audio oscillator and a germanium crystal probe. Address Mfgr. for catalog sheets.

Burlington Instrument Co., 1600 Fourth St., Burlington, Iowa, demonstrated their complete line of panel instruments A.C. and D.C. Catalog is available on request.

American Condenser Co., 4410 Ravenswood Ave., Chicago 40, Ill. New types of plastic-housed Amcon electrolytic capacitors, midget paper, tubular paper and bath tub types as described in data sheet "3 Star Performers" available on request.

John F. Rider Publisher, Inc., 404 Fourth Ave., New York 16, N. Y. introduced Vol. 1 of the "Television Manual," a 1400 page compilation of TV circuit data and 200-page "How It Works" supplement together with the TV Manual's separate index. Descriptive sheet available free. Also showed new books on Vectors and FM transmission and reception.

Electro Voice, Inc., Buchanan, Mich. had a full new line of cardiod mikes, both dynamic and crystal, illustrated in bulletin 139. Other types of microphones, such as velocity, contact, and "differential" carbon, along with a line of especially rugged "Mobil-Mikes" designed for mobile applications are described in bulletin 140. Low cost carbon mikes and data sheets are available. Ask for bulletin 137.

Ward Products Corp., 1526 E. 45th St., Cleveland 3, Ohio, displayed TV and FM antennas of novel design, and claimed high gain, together with accessories such as stand-offs, mast extensions, self-supporting bases and transmission line. These and the standard Ward line of auto antennas are described in catalog 54-63 which the mfgr. will supply.

Radio City Products, 152 W. 25th St., New York 1, N. Y., showed a complete new line of signal generators, multi-testers, an FM pocket signal generator, combination tube tester, sig. gen., audio oscillator, and condenser tester and a modernization unit for tube testers, all described in bulletin 132. A new "HI-ME 6" multitester series is described in bulletin 133. TYVMs, checkers, capacity testers and instrument accessories are covered in bulletin 129. All literature is free.

Standard Transformer Corp., 3700 N. Elston, Chicago 18, Ill. Replacement line of transformers, audio and power, iron-core TV components, power-packs and voltage adjusters described in catalog 140H; new heavy duty place transformers (bulletin DD318); amateur mobile transmitter kit, (bulletin EED 1311); special service output and power transformer catalog sheet. Amateur transmitter kit (bulletin EED 1302); also new line of hi-fidelity audio components in new H.F. cases. All literature available.

Jaco Products, 6408 Euclid Ave., Cleveland 3, Ohio showed a handy low-cost "Quick Strip" wire stripper tool for serviceman. A novel Nylon alignment tool soon to be available was also demonstrated. Literature is available on the wire stripper.

Triplett Elec. Instru. Co., Bluffton, Ohio. Demonstrated their new line of electronic test equipment and direct-reading meters. Featured was the Signal-Generator Adaptor Marker Model 2435 for FM-TV which converts a conventional test oscillator into a modern wide-sweep TV and FM sig. generator. Descriptive literature on this unit is Form 41948-T. Also shown was electronic V-O-MA model 2451 and high voltage probe (10 kv). V-O-MA model 630, as described in catalog 5048-T was also exhibited. The literature may be had upon request.

Utah Radio Prods. Div. of Int'l Detrola Corp., Huntington, Ind. displayed a complete line of standard replacement speakers and a new line of wide-range types specifically designed for FM-PA applications. Catalogs may be had by writing Utah direct.

Universal Microphone Company was represented by their complete new line of dynamic, velocity and carbon mikes and mike stands. In the disc recording field their items included home recording chassis, frequency records, recording heads, pick up scales, and stroboscopes. Descriptive material on these items are catalog 578, bulletins P 574, P 575, P 566 and P 560A.

Precision Apparatus Corp., 92-97 Horace Harding Blvd., Elmhurst 8, N. Y. displayed a new line of "Electronamic" tube testers, V-O-MAs, VTVMs and signal generators which are described in a catalog available on request free. Feature at the booth was the protective high voltage test probe about which literature is also available free. The booklet, "Servicing By Signal Substitution," describing a systematic method of dynamic signal analysis is offered free with a Series E-200-C Signal generator or a copy may be had from the factory for 40c.

Atlas Sound Corp., 1443 39th St., Brooklyn 18, N. Y. displayed new speakers featuring "Alnico V-Plus" and a super efficient magnetic circuit. Shown were driver units, horns, projectors, re-entrants, mike stands, booms and accessories, all of which are illustrated and described in catalog 548 which is free.

Operadio Mfg. Co., St. Charles, Ill. displayed a new line of replacement and public address speakers and model 5A10 driver unit, a new 25 watt PM dynamic type. Also shown were inter-com systems, amplifiers and sound systems. Literature is available.

Eagle Electronics, Inc., Irvington, N. Y. showed a new line of "Pict-O-Graph" kits consisting of receivers of all types, from 1-tube a-c/d-c to 4-tube 4-band, a VTVM kit, and the Eagle-Webster wire recorder kit. Catalogs are available.

Howard W. Sams & Co., Inc., Indianapolis 6, Ind., announced that the 1st installment of the Saunders TV Course is inaugurated in conjunction with the issuance of Photofact Set No. 38. A pamphlet describing the "$500 TVCourse" will be sent upon request.

General Electric Co., Syracuse, N. Y.: KenRad Tube Div. showed line of AM and TV tubes. Offers free "Tube Availability Chart ETR-88." Component division showed preamp for use in conjunction with variable reluctance pickup cartridge, described in bulletin 169-3-85; transcription arm for VR cartridge, new VR having diamond stylus; introduced new line of Alnico V speakers, described in bulletin ESD-86; also new oval speaker, specs of which are in bulletin 169-3-87. All literature available by writing G-E at Syracuse.

Meissner Mfg. Div. of Maguire Industries, Inc., Mt. Carmel, Ill. Showed new Signal Shifters, AM-FM tuners, amplifiers, portable radio-phono recorder, construction kits, receiver coil components, the Analyst and FM Receptor. Technical characteristics of the new FM-AM tuner and amplifier included in bulletin J-281 while data on the FM Receptor is in bulletin J-282, both available on request.

Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 6, Ill. New co-axial speakers types J and H (described on data sheet 137A); 4 Hypex Projector horns, (data sheet 142); "Customode" speaker enclosures, (data sheet 140); also 32 page master catalog No. 1010E covering replacement speaker, projector, Bass Reflex and accessories available on request.

Shure Brothers, 225 W. Huron St., Chicago 10, Ill. New "Humi-Seal" crystal replacement cartridge with muted stylus; Model 812 magnetic wire recording head, (data sheet 27A36); phono pickups, microphones, (described in Catalog 158).

P. R. Mallory & Co., Inc., Indianapolis 6, Ind., introduced a complete line of capacitors, noise filters, controls, resistors (fixed and adjustable), switches, vibrators, battery chargers and rectifiers. The radio component line features included merchandising display racks. All are described in the 56 page catalog which will be sent free. Other Mallory items shown were the Inductuner, Videocouple and bias cell. Because of the special applications for the inductuner, complete literature is available without cost. Write Jobber Sales Division.

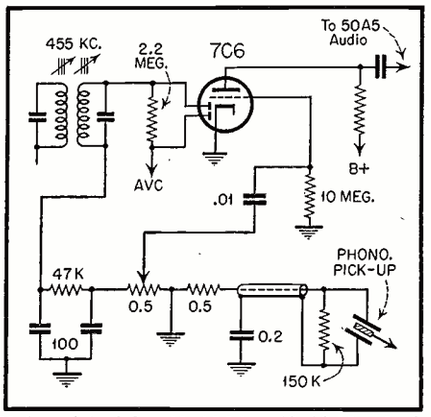
(*Continued on page 30*)

All literature referred to will be sent gratis if you say you read about it in "RSD".

CIRCUIT COURT

Philco 48-1201; 48-1260 etc.

Probably the simplest method of changing from radio to phono in a combination instrument is that employed in several Philco sets, including models 48-1201 and 48-1260. A partial schematic is shown indicating the components involved in the change-over.



Philco Models 48-1201, 48-1260, 2nd Det. and 1st Audio.

The second detector and first audio functions, as well as AVC, are handled by a 7C6 duo-diode-triode tube. The last i-f transformer supplies signal to one diode, where it is rectified to provide the audio signal. A 2.2 meg resistor feeds the signal to the other diode plate for a-v-c development.

The audio component is taken from the low end of the secondary of the transformer, and after filtering in the usual RC circuit, enters one end of the center-tapped volume control. The arm of the control picks off the desired amount of the signal for application to the triode grid of the tube. Subsequent amplification takes place in the 50A5 output tube.

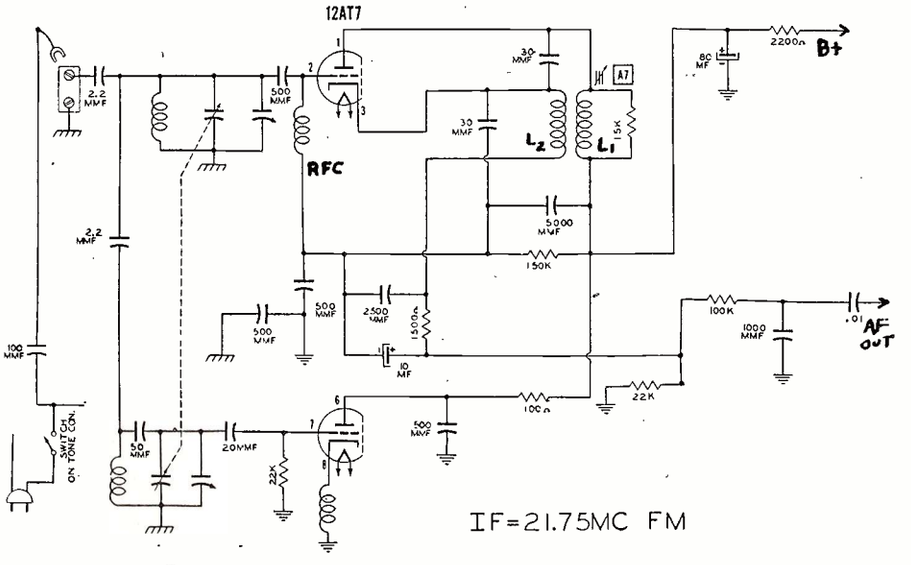
When the arm of the volume control passes the center of the control it enters upon the half which is fed a signal from the crystal pick-up. Thus, without any switching in the signal circuits, the change from radio to phone reproduction takes place.

Olympic 7-532 Series

One of the first appearances of the newly-developed Fremodyne FM receiver circuits is found in the Olympic 7-532 series. A 12AT7, dual triode, performs the combined functions required by the arrangement. The output of the 12AT7 stage is sufficient to directly feed the 12SQ-35L6 audio stages. Thus, several stages, required in ordinary circuits, are eliminated. A 6 tube a-c/d-c, AM-FM receiver results.

Action of the 12AT7 stage can be observed by reference to the partial schematic. One of the triode sections functions as a high-frequency oscillator. The tuned circuit is coupled to the grid and returns to ground. A section of the dual two gang condenser tunes the coil. Feedback results from the cathode being ground for r.f. by returning to ground through an r-f choke. The plate is at ground r-f potential. A 2.2 $\mu\mu f$ capacitor feeds the developed r-f from the grid up to the mixer grid.

The second triode section functions as a mixer for the signal and oscillator voltages and a super-regenerative detector at 21.75 mc. The first function is conventional with the external antenna or light line pick-up connection coupled to the grid via a 2.2 $\mu\mu f$ capacitor.



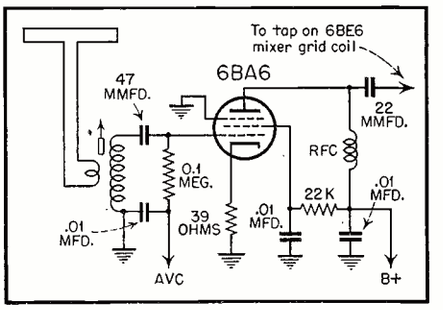
Fremodyne FM circuit employed in Olympic 7-532 series.

The 21.75 mc signal appearing on the plate of the mixer is coupled to the super-regenerative oscillator circuit by the primary coil, *L1* and the capacitor of 30 $\mu\mu f$. The 21.75 mc oscillator is of the self-quenching type, with a positive voltage applied to the grid via the 150 K-ohm resistor and the choke RFC. The choke serves to prevent shunting out the signal frequency. Conditions for detection are maintained by having a voltage developed on the cathode greater than that appearing on the grid.

The tremendous gain possible in the super-regenerative detector makes possible the high audio output developed across the 22K-ohm load resistor. A filter consisting of 100 ohms series element and .001 μf shunt element aid in filtering out the undesirable quench frequency from the audio output.

Packard-Bell Model 872 FM Convertor

The Packard-Bell FM tuner, the r-f stage of which is shown, has a unique semi-tuned antenna coil arrangement. The instrument is a seven tube plus rectifier unit providing high audio output for a following power amplifier. Unlike most such devices, which only



R-F stage of Packard-Bell Model 872 FM converter.

feed the output of a discriminator or ratio detector to the succeeding amplifier, this set has a triode audio stage using a 6C4 miniature tube.

Reference to the r-f stage circuit will disclose that the folded dipole provided connects to a low impedance primary, to which is coupled a slug-tuned grid coil. The voltage developed across the secondary is coupled to the grid of the 6BA6 pentode by a 47 $\mu\mu f$ capacitor. AVC is supplied to the grid via a 100K-ohm resistor.

Fixed bias is generated by the drop across an unby-passed cathode resistor of 39 ohms. Protective bias will thus be available if no signal is present to provide AVC. Having no by-pass makes the cathode slightly degenera-

(*Continued on page 39*)

SHOP NOTES

Write up any "tricks-of-the-trade" in radio servicing that you have discovered. We pay from $1 to $5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor".

Cadillac Auto Radio No. 7240371

Sometimes it will be found that the push-buttons do not remain in position when pressed down, and the dial pointer does not move when the dial knob is rotated. This action may also be one of an intermittent nature. This is due to a faulty spring that maintains tension on a tension bar. See *Fig. 1.* This spring is located beneath the tone control.

The replacement of this spring presents a difficult problem due to the fact that it is almost inaccessible, being located beneath the tone control. However, it becomes an easy operation, without requiring the removal of the entire shell, by drilling two holes in the shell as shown in the front view of *Fig. 1.* These holes are located directly

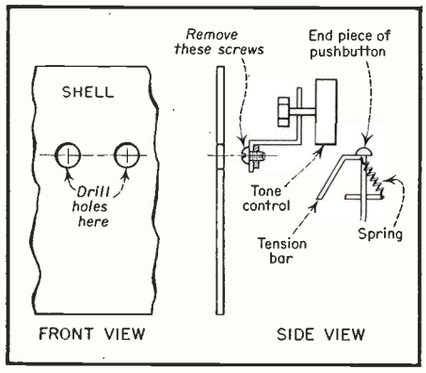


Figure 1

in line with the 6/32 mounting screws of the volume control. In this manner the screws may be removed by inserting a screwdriver in the drilled holes. The tone control is also removed, thereby making the location of the spring easily accessible.

R.C.A. Victor Tone Compensation Circuits for Phone Pickups

The following excellent service data on tone compensation circuits comes out of the R.C.A. Service Division.

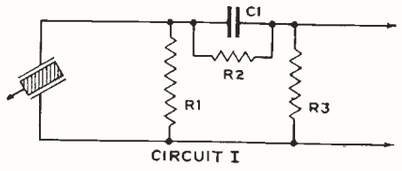
Because of the widely varying frequency characteristics of various types of audio amplifiers with which crystal pickups may be used, it may be desirable in some cases to make refinements in the pickup circuit to compensate for the characteristics of the amplifier. The following circuits show examples of compensation adjustments:

Circuit 1: (*Fig. 2*)

Increasing R_1 increases low frequency response.

Increasing C_1 increases high frequency response.

Increasing value of R_3 with respect to total value of R_2 plus R_3 increases the output.

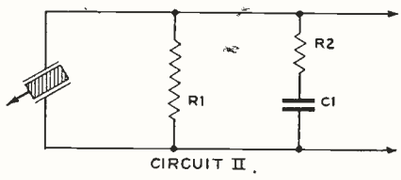


Circuit II: (*Fig. 3*)

Increasing R_1 increases low frequency response.

Increasing R_2 increases high frequency response,

Decreasing C_1 increases output.

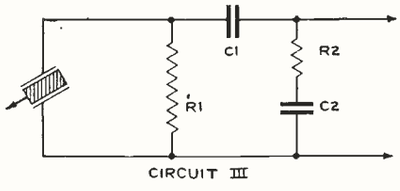


Circuit III: (*Fig. 4*)

Increasing R_1 increases low frequency response.

Increasing R_2 increases high frequency response.

Increasing value of C_1 with respect to total value of C_1 plus C_2 increases the utput.



Hot Tube Puller

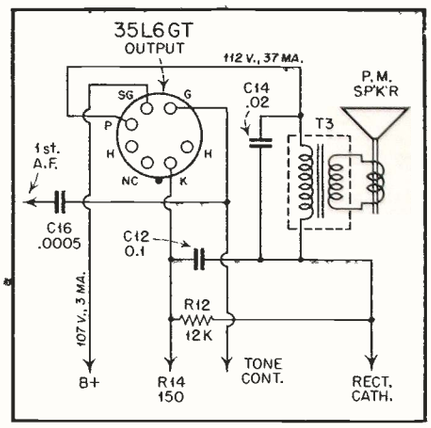
I find the best hot tube puller is the sponge rubber cup on the inside of some model vibrators. Get the size you need, cut the open end off half way up. Using the top part slip it over the tube. The tube can than be pulled with ease.

Submitted by Dudley Wilson, Sweetwater, Tex.

Improving New Model Arvins

Arvin models 664 and 664-A, chassis RE-206-1, may develop a hum. This can be reduced by changing certain values in the hum-backing circuit. As shown in the illustration, *C12* is changed from .1 μf to .03 μf, and *R12* is changed from 12,000 ohms to 15,000 ohms.

On model 140P, chassis RE-209, if the antenna stage will not easily track with the oscillator at 600 kc, check to



see that the loop is parallel with the aluminum plate. Bend it in or out slightly until the set aligns with good tracking.

Submitted by Albert Loisch, Darby, Pa.

IN 34 as Probe Detector

The new Sylvania diode 1N34 has aroused great interest among Dutch radiomen. Radio Peeters, of Amsterdam, Holland, made an effective signal tracer, using the 1N34 as a probe-

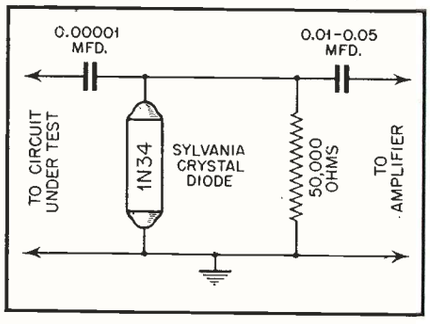
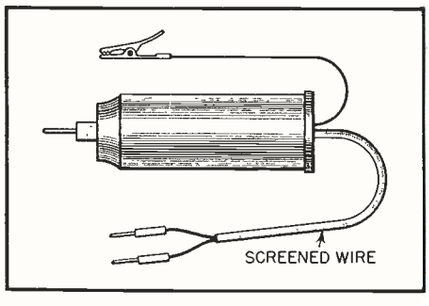


Figure 6 above; Figure 7 below



detector. Sensitivity is very high as compared with normal tube diodes. It can be used as a second detector for sweep-frequency observations of individual band-pass curves on cathode ray oscilloscopes. The device is reliable, and we recommend it highly. Circuit diagram and drawing of the probe are shown above (See *Figs. 6* and *7*).

Submitted by: Technical Service Radio Peeters, Amsterdam, Holland.

ADDRESS CHANGES . . .

Subscribers to RADIO SERVICE DEALER should notify our Circulation Dept. at least 3 weeks in advance regarding any change in address. We cannot duplicate copies of RADIO SERVICE DEALER sent to your old address. Old and new addresses MUST be given.

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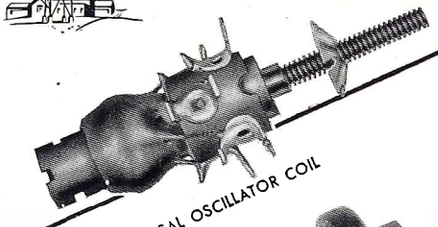
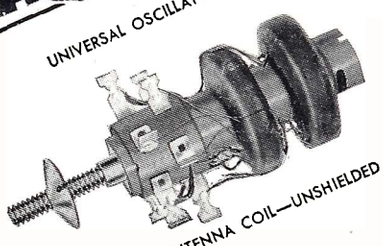
RADIO SERVICE DEALER
342 Madison Ave., New York 17, N. Y.

UNIVERSAL COILS

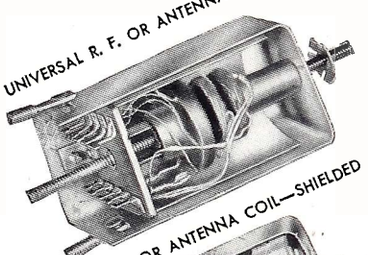
Another Philco First!



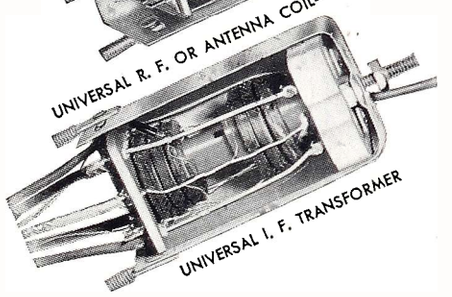
UNIVERSAL OSCILLATOR COIL



UNIVERSAL R. F. OR ANTENNA COIL—UNSHIELDED



UNIVERSAL R. F. OR ANTENNA COIL—SHIELDED



UNIVERSAL I. F. TRANSFORMER

SHORT-WAVE BANDS

Only 2 coils are required to perform all the functions of antenna, R. F. and Oscillator Circuits.

PART NO. 45-6389-2 from 1.7 to 6 mc.
SLIP-ON PRIMARIES FOR 45-6389-2
LOW IMPEDANCE PART NO. 45-6389-1
HIGH IMPEDANCE PART NO. 45-6389-3
PART NO. 45-6389 FROM 6 to 18 mc.
(INCLUDES PRIMARY)

These also have full range of adjustability and flexibility described for other types of Philco Universal Coils illustrated above.

PHILCO COMPLETELY COVERS STANDARD BROADCAST AND SHORT-WAVE RECEIVER COIL REQUIREMENTS . . . WITH 6 UNIVERSAL COILS . . . SAVING UP TO 90% OF STOCK NORMALLY REQUIRED FOR SERVICE REPLACEMENTS . . . REDUCING INVESTMENT . . . SAVING TIME . . . AND INCREASING SERVICE PROFITS.

At last! Coils that are *really* universal. Yes, ONE OF A KIND—and *only one*—for each basic requirement. That's Philco's newest contribution to better, quicker servicing of all makes of radios . . . UNIVERSAL COILS that save the service man time, trouble and expense. They simplify replacement work. They make it possible to service more sets with a stock of fewer types. Here's the answer to *all* coil replacement problems—from the world's largest designer, manufacturer and user of coils—Philco.

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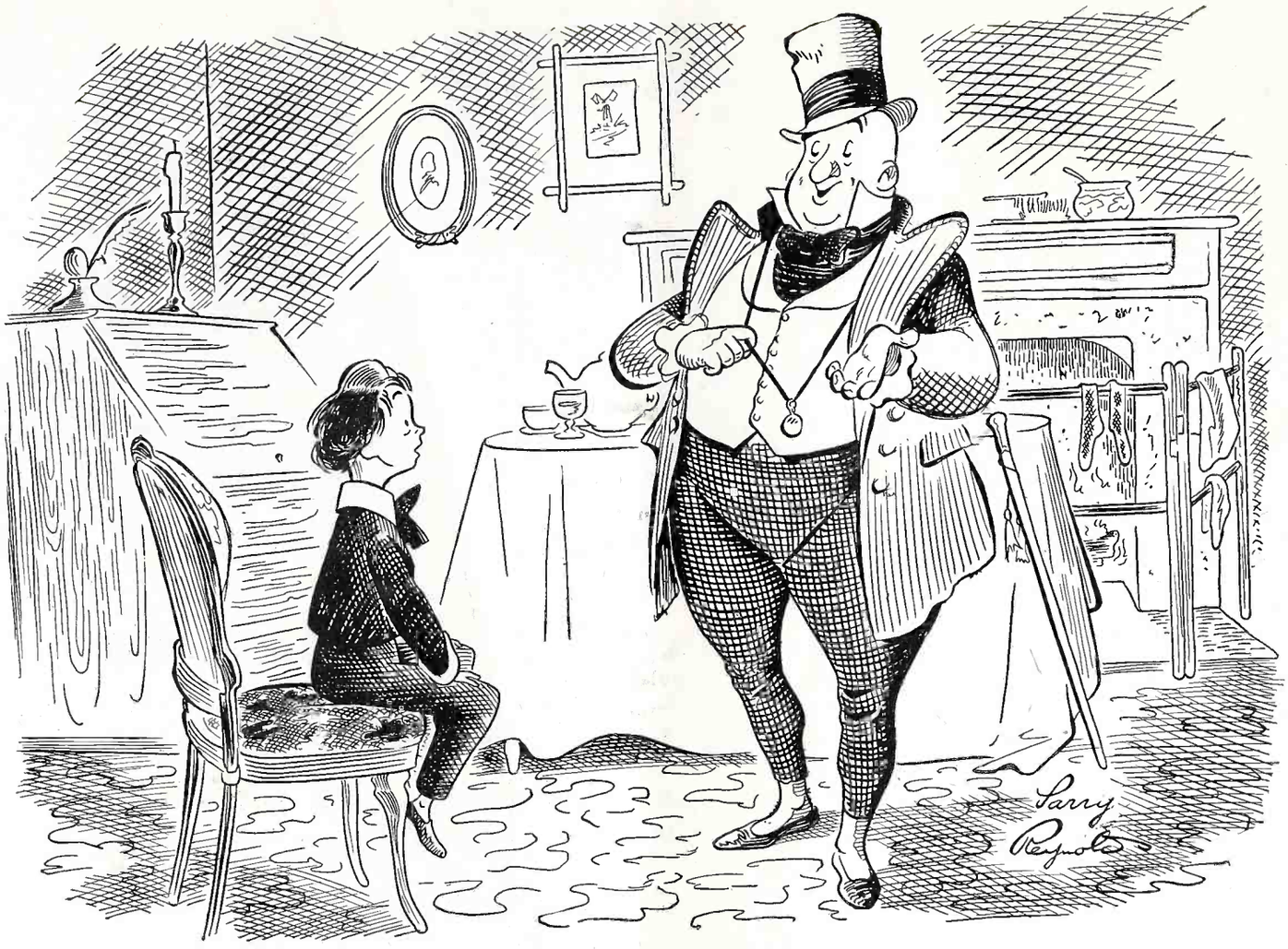

Mr. Micawber was only half-right!

MR. MICAWBER'S financial advice to young David Copperfield is justly famous.

Translated into United States currency, it runs something like this:

> *"Annual income, two thousand dollars; annual expenditure, nineteen hundred and ninety-nine dollars; result, happiness. Annual income, two thousand dollars; annual expenditure, two thousand and one dollars; result, misery."*

Mr. Micawber was only half-right! Simply *not* spending more than you make isn't enough. Every family must have a cushion of savings to fall back on . . . and to provide for their future security.

U. S. Savings Bonds offer one of the best ways imaginable to build savings.

Two convenient, automatic plans make the systematic purchase of Savings Bonds both sure and trouble-free:

1. If you work for wages or salary, join Payroll Savings—the *only* installment-buying plan.

2. If you're in business, or a farmer, or in a profession, and the Payroll Savings Plan is *not* available to you, then sign up at your bank for the Bond-A-Month Plan.

Each helps you build a nest egg of absolutely safe, 100% government-backed U. S. Savings Bonds. And these bonds make more money for you while you save. For after only ten years, they pay you back $400 for every $300 you put in them.

Join the Plan *you're* eligible for today! As Mr. Micawber would say: "Result, security!"

AUTOMATIC SAVING IS SURE SAVING - U.S. SAVINGS BONDS

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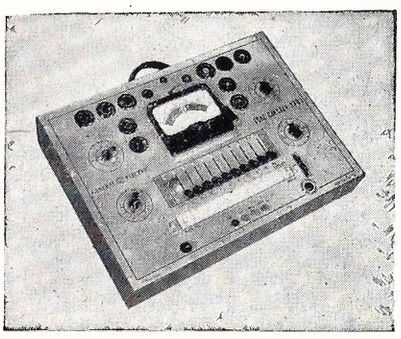
U.S. SECURITY LOAN

NEW PRODUCTS

G. E. Portable Tube Checker

A new portable tube checker, Type YTW-1, is announced by the Specialty Division of the General Electric Co.

Great flexibility is attained in the new device with each tube element having its own individual circuit switch. It tests 4,5,6,7, and 8 pin standard, 5 pin small, 7 and 9 pin miniature, and locking tubes, as well as pilot bulbs and batteries. The new



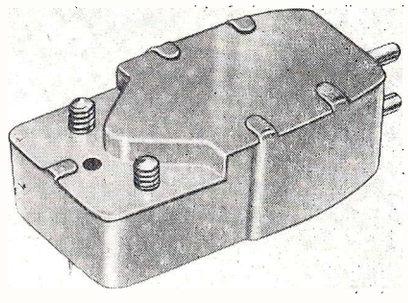
checker tests for filament continuity, heater cathode, open elements, shorted elements, and quality of emission. The YTW-1 immediately exposes a tube with an open filament without the usual warm-up period. The tester operates from standard a-c power source.

For further information on the new tube checker, write the G-E Specialty Division, Electronics Park, Syracuse, N. Y.

Featheride Magnetic Pickup

A new magnetic cartridge, called the "Featheride" announced by Webster Electric Company, Racine, Wisconsin, is offered with pre-amplifier for the replacement trade.

Supplied with a retractable osmium-tipped needle, the cartridge exerts a



tracking pressure of one ounce, giving .1 volt output (uncompensated) at 1000 cps. Weighing 25 grams, it requires no counterbalance in normal replacement use. The unit is magnetically shielded. Literature may be had by writing the manufacturer.

New ATR Inverters

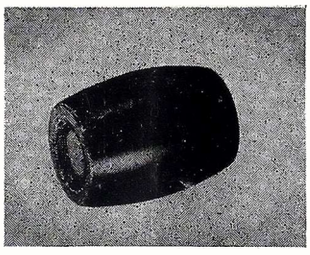
American Television & Radio Co., 300 East Fourth St., St. Paul 1, Minnesota, announces a complete new line of 33 types of DC-AC Inverters, operating on DC input voltages ranging from 6 volts DC to 220 volts DC, delivering an output of 110 volts, 60 cycles, AC at output capacities ranging from 75 watts to 500 watts. These inverters are specially designed for operating AC radios, public address systems, television sets, amplifiers, small AC motors, and electrical appliances, from DC voltage sources.

Being featured in the line is an automatic switching unit for use as an auxiliary unit with 32 volt and 110 volt DC input inverters, permitting the automatic start and stop of these units as the load is turned on and off. Complete descriptive literature is available by writing the factory.

New Phase Modulated Microphone

Incorporating revolutionary design is the Stephens Tru-Sonic Phase Modulated Model C-1 Microphone just introduced by Stephens Mfg. Corp.

Features include: (1) True and absolute linearity of response by any measurement. Low response is linear



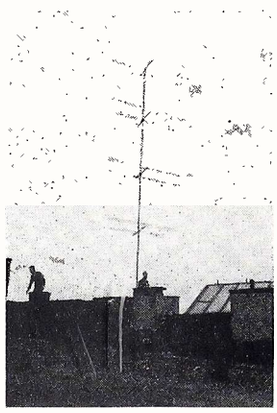
to one-half cycle in 24 hours. (2) No distortion can be read or detected. (3) No arc-over or breakdown. (4) Pressure-operated at all frequencies. (5) Polar pattern at all frequencies. Almost completely one-half sphere—down 5 db at 90° off the axis. (6) High signal-to-noise ratio. (7) Rugged construction. Further information may be had by writing Stephens Mfg. Corp. 10416 National Blvd., Los Angeles 34, Calif.

Long Range-High Gain Antenna

Built of 61ST aluminum throughout, Tele-Beam's rugged construction will withstand high winds and ice loading conditions. Mounting clamps are over-size double strength castings. Mast is 2-13 ft. sections of 2-inch tubing joined with a rigid coupler. Insulation material is high dielectric resistant micarta.

Adjustable in every respect, the bays can be spaced either $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{5}{8}$ wave. Elements and reflectors are telescopic. Simple tuning table is included in assembly instructions. The 4 stack array can also be broken down into two 2 stack arrays or 4 single dipole and reflector assemblies.

Recommendation for the 2 stack array is within a 50 mile radius of the transmitter, but in unusually noise-free areas it can also be used beyond 50 miles. The 4 stack array is recommended for use in the 50 mile radius where noise prevails and reception



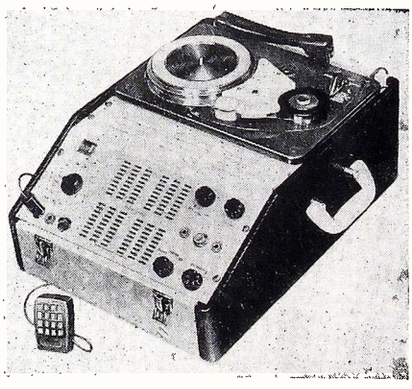
cannot be obtained with a conventional antenna. It is also recommended for distances within a 100 mile radius.

List price on the 4 stack Tele-beam is $124.50. The 2 stack is listed at $67.50. Shipping weight is 23 and 40 pounds. For further information write to Cole-Worner Corp., 11 W. Monument Ave., Dayton 2, Ohio.

New Wire Recorder-Radio Compo

The Astra-Sonic, is a high fidelity wire recorder, capable of producing a flat audio response from 70 to 7,5000 CPS +2db, in combination with a fine superhet AC radio and record player equipped with tru-track pickup arm and Astatic L70 cartridge.

Either radio or record player may be used to record directly on the wire, or may be played independently,



Features include synchronized timing meter, jacks for recording from external FM tuner, radio or record player, a dubbing jack, jacks for playing recordings through external speaker or external amplifier and two way automatic shutoff which prevents wire tangling, necessary.

The instrument may also be used as a P.A. system. It is housed in a fine

(*Continued on page 32*)

SHOW REVIEW

(*from page 24*)

Halldarson Co., 4500 Ravenswood Ave., Chicago, Ill. Complete new line of replacement, high-fidelity, audio and power transformers. Catalog 15 containing pre-war and post-war replacement guide available.

General Industries Co., Elyria, Ohio. New line of "Smooth Power" phono and recording motors, record-changer and recorder assemblies. Completely descriptive catalog 5-48 available. Write "Dept. K."

Duotone Co., Inc., 799 Broadway, New York 3, N. Y. Line of play-back and cutting needles, recording blanks, cutting heads and store counter merchandisers of same. Illustrated price list available.

American Microphone Co., 370 S. Fair Oaks Ave., Pasadena, Cal. New complete line of dynamic and crystal microphones, mike stands and accessories, (catalog 43) and magnetic phono pickups, types MC-1 and MC-2 for which catalogs are also available.

Astatic Corporation, Conneaut, Ohio. Phono pickups, cartridges, mikes and mike stands (catalog 40); new crystal dynamic and dynamic series of microphones, (bulletin 130); new "LT" series of low needle pressure replacement cartridges, (bulletin 155); new Magneto-Induction pickup with 2 equalizer-amplifiers, (bulletin 170). Literature and electrical characteristic sheets on equalizer amplifiers EA-1 and EA-2 available, in addition to other bulletins enumerated.

International Resistance Co., 401 N. Broad St., Phila., Pa., exhibited fixed and variable resistors, volume controls and suppressors. The revised edition of the valuable IRC Volume Control Replacement Manual 1948 and the items displayed are fully covered in the catalog 50-A which you may have free direct from IRC.

Racon Elec. Co., Inc., 52 E. 19th St., New York, N. Y. showed a complete line of horns, projectors, re-entrants, driving units and trumpets; also cellular horns, radials, auditorium types and a varied line of P-A speaker accessories and brackets. The featured item was the "Cellular Grand," a complete-range, high-fidelity unit employing the new Racon Tweeter, housed in a cabinet that can be either used as an entity by itself or placed in a home console to afford optimum audio reproduction. The Cellular Grand is described in a special pamphlet while the balance of the 60 Racon speakers and units are described with application data, wattages and ratings in general catalog 100. Copies of both are available on request.

Drake Elec. Works., Inc., Chicago 13, Ill. demonstrated a new and complete line of soldering irons for service and industrial applications. Also shown were heat control units, replacement iron elements and tips and iron stands. Catalogs with complete descriptions and ratings of the units will be sent upon request.

Tartak Speakers, Inc., 3120 E. Pico Blvd., Los Angeles 23, Cal., introduced a new line of PM, PM-PA and electro-dynamic speakers for replacement and sound reinforcement applications. A catalog is offered.

General Cement Mfg. Co., Rockford, Ill. offered 64 page catalog showing complete line of serviceman's tools, accessories, chemicals and hardware. Write for your copy.

(*to be continued next issue*)

FIELD FINDINGS

(*from page 23*)

tailers and servicemen because retailers cut prices and sell sets so cheaply that customers don't see why they should pay reasonable fees for repairs when a set breaks down if they can buy a new set for about the same amount as it would cost to have an old set repaired. J. R. D. also gripes that to combat dealer competition technicians tell the public that new sets are badly designed, made of trash, etc., and thus aren't fit to buy, and instead the set-owner would do better by having his old set repaired. There's so much logic to some of J. R. D.'s contentions that we can't help but repeat our frequently expressed view that no technician should confine his activities solely to servicing, as sometimes a set is so beyond repair that it would be wiser to tell the customer that and make a sale instead. By the same token, dealers can't afford to operate without their own service department, unless they have a wholesale tie-up with a service organization, because when properly operated, a service department always brings a nice profit to the organization, and no firm can afford to pass profits by.

Jobbers To Sell "RSD"

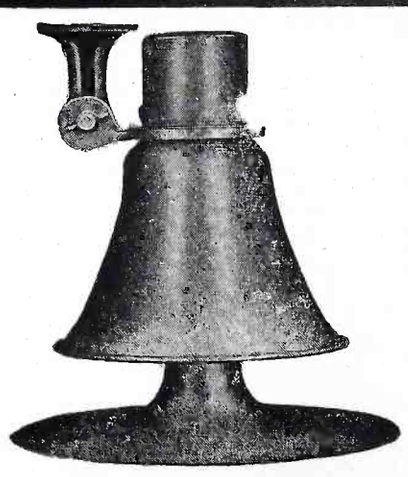
Jobbers everywhere have begun to ask us to revise our policy and allow

Now Available...

New, important additions to the most complete line of Speakers and Driving Units made

NEW SPECIAL PM HORN UNIT, having Alnico V magnet ring, completely watertight, housed in a heavy aluminum spinning. Provides extremely high efficiency reproduction with minimum input. Handling capacity 35 watts continuous, 60 w. peak.

NEW SMALL RE-ENTRANT HORNS, extremely efficient for factory inter-com and paging systems; for sound trucks, R.R. yards and all other industrial installations where high noise levels are prevalent. Watertight, corrosion-proof, easily installed. Two new models — type RE-1½, complete with Baby Unit, handles 25 watts, covers 300-6000 cps; type RE-12, complete with Dwarf Unit, handles 10 watts, freq. response of 400-8000 cps.



NEW RADIAL RE-ENTRANT SPEAKER, excellent for all types of industrial sound installations. Provides superlative and complete 360° speech intelligibility by efficiently over-riding factory high noise levels. Frequency response 300-6000 cps. Handling capacity 25 watts continuous, 35 w. peak. Has mounting bracket. Size 12" wide by 12⅝" high.

To the more than 60 different type and size speakers and horn units that already comprise the RACON line—these new models have been added. There is a RACON speaker and horn unit ideal for every conceivable sound system application.

RACON has not only the most complete line, but also the most preferred line. For over 20 years leading Soundmen have recognized and specified them because of dependability, efficiency and low-cost, and because the reproducers are trouble proof.

Here is a partial list of the various types of RACON products now available:

PM Horn Driving Units, 10 types
Re-entrant Trumpets, 7 types
Tweeter & High Frequency Speakers, 3 types
Radial Horns and Speakers, 3 types
Straight Trumpets, 21 types
Re-entrant Fone Speakers, 7 types
Flat bell straight trumpets, 2 types
Armored Cone Projectors, 7 types

In addition there are cellular and auditorium horns, inter-com, paging, monitor, and dwarf speakers, cone speaker housings, etc., besides all basic accessories such as swivel brackets, mounting units, cone housings, multiple horn throat combinations, etc.

Write for free catalog

RACON ELECTRIC CO., INC.
52 East 19th St. New York 3, N. Y.

RACON

them to sell copies of "RSD" over-the-counter. They tell us that there is a new-comer-to-the-field mag that purports to cater to servicemen who does let them sell copies over the counter. But most Jobbers also appreciate that the other mag's articles are generally so bad that the situation is intolerable. Maybe we had better abide by the Jobbers' requests, for, it is axiomatic that "nothing is as bad as bad information" and with conditions in radio servicing being what they are, it's our obligation to get rid of incompetent technicians, for they are the fellows who louse up the whole parade, making it tough for the legitimate operators.

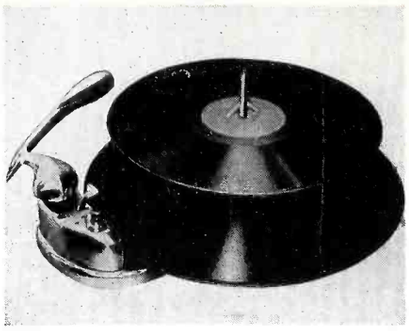
NEW PRODUCTS

(*from page 29*)

simulated leather carrying case, complete with crystal microphone, one 15 minute and one 30 minute spool of recording wire, and nine foot line cord. Literature and complete details may be obtained free by writing to R. M. Karet Associates, 611 W. Division St., Chicago, Ill.

Radical New Record Changer

A new automatic drop-type record changer was announced by the Farnsworth Television & Radio Corp.



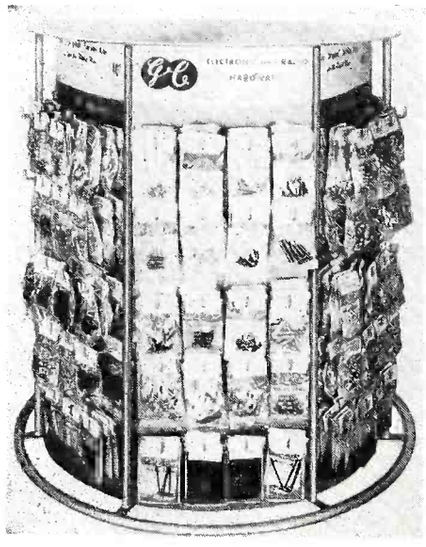
New Farnsworth

It will automatically play twelve 10-and 12-inch records separately or intermixed, without any manual adjustments. There are no levers or posts whatever to be placed in position in preparing the changer for operation.

Records cannot be chipped at the edges or scratched and there can be no jamming or dropping of more than one disc at a time when records are warped, oversized or undersized. For literature write Farnsworth at Ft. Wayne, Ind.

Sales Stimulator

General Cement Mfg. Company of Rockford, Ill. offers a new, unique metal display, ideal for displaying merchandise and stimulating sales at "point of sale." The new revolving type hardware display occupies a minimum of space, can be placed on counters or elsewhere. It holds one hundred and twenty different packaged hardware bags as illustrated.



For additional information on this new revolving metal display write to General Cement Mfg. Company, 919 Taylor Avenue, Rockford, Ill.

Appliance Timer

Time-Aid, a portable, all-electric household appliance and reminder timer is announced by Paragon Electric Co. The built-in switch automaitcally shuts off radios, sun lamps, heating pads, washing machines and other household electric appliances

after any preselected time from 1 to 60 minutes.

An attractive booklet containing details, operating instructions and suggested uses will be sent. Write Paragon Electric Co., 1767 Twelfth St., Two Rivers, Wisc.

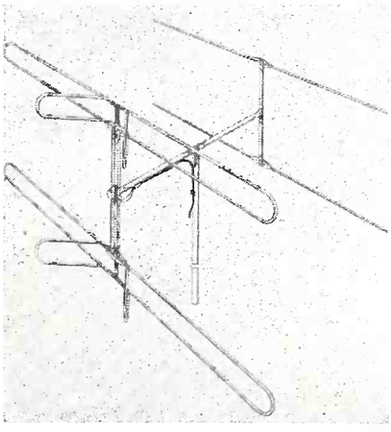
New Guardian Midget Relay

The Series 600 Guardian Relay is designed and priced to meet industrial needs for a small, compat, low cost relay. It can be furnished with innumberable contact switch combinations up to and including four pole, double throw. Also, the short contact blades in the switch assembly eliminate intermittent contact or contact "bounce."

Comprised of two basic parts—a coil assembly and a contact assembly—each basic part is interchangeable. For example, the contact assembly can be used with any of the standard Series 600 or 605 coils whether the operating voltage is 3, 6, 12, 18, 24, 32, 50, 115, 230 A.C. or 3, 6, 12, 18, 24, 32, 50, 110, 220 D.C. The maximum contact current capacity is 8 amperes and power consumption is 6 V.A. Relay will pass underwriters' specifications. For additional information write Guardian Electric Mfg. Co., Dept. 600, 1637 West Walnut Street, Chicago 12, Ill.

Versatile Dipole Line

FM and television antennas that can be quickly converted to other larger arrays is the feature of the new JFD line which covers the complete range from 44-216 mc, channels 1-13 and FM bands. Elements are made of ½ inch heavy gauge aluminum tubing, and masts of 1 inch heavy wall aluminum tubing. The aerials are constructed around the JFD exclusive

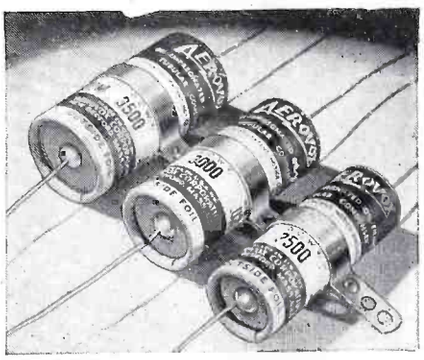


"ROTO-LOCK" insulator. There are 22 different types of antennas, ranging from the single straight dipole to the double stacked folded dipole with high frequency lobes, as illustrated. A particularly popular item is the "upper band" TV attachable antenna which converts a lower band TV antenna to bands 7 to 13 in 5 minutes.

An illustrated 8-page catalog describing the line is available to jobbers and servicemen upon request to JFD Manufacturing Co., Inc., 4117 Fort Hamilton Parkway, Brooklyn 19, New York.

High-Voltage Capacitors

The high-voltage requirements of television, oscillograph and other cathode-ray tube circuits, as well as a growing variety of electronic circuits, are met by the extended voltage ratings of Aerovox Series "84" oil-impregnated wax-filled paper tubular capacitors now being made by Aerovox Corporation, New Bedford, Mass.



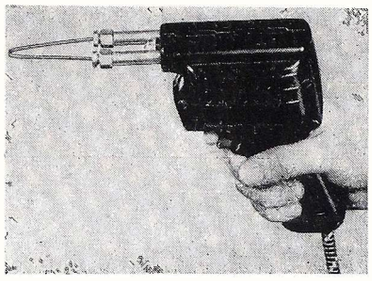
Similar in construction to the Aerovox paper tubulars available in 400 to 1600 v. ratings, these extended voltage additions are now available in 2500, 3500, 5000, 7500 and 10,000 v. D. C. Working, and in capacitances from .001 to .05 mfd. The smallest of the extended voltage units is the .001 mfd. 2500 v., measuring ⅜" dia. x 1-½" long, while the largest is the

.003 mfd., 10,000 v., measuring 1-3/8" dia. x 3" long. The units have bare tinned copper pigtail leads, waxed ends and protective jackets.

New Weller Soldering Gun

Weller announces two new soldering gun models, designed for use on 110 or 220 volts at 50 or 60 cycles.

The new models ES-110 and ES-220 provide single heat at 100 watts with a 4" reach from housing to tip. The

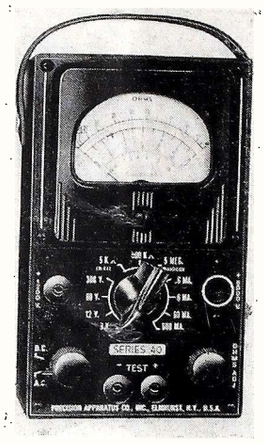


five second heating, prefocused spotlight, and Flexitip of the two regular Weller models are also features of both these new units. For descriptive literature write Weller Mfg. Co., Easton, Pa.

Precision Series 40

A new pocket-size wide-range circuit tester, Series 40, for use by service technicians, production inspectors and radio amateurs is announced by Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.

This instrument, housed in a bakelite carrying case, has dimensions 3¾" x 6¼" x 2½", yet it affords 31 AC-DC ranges to 6,000 volts, 600 MA, +70 DB and 5 megohms. No external batteries or multipliers are required. The meter is a 3" rectangular cased instrument of 400 MA sensitivity. Two pin jacks serve all standard



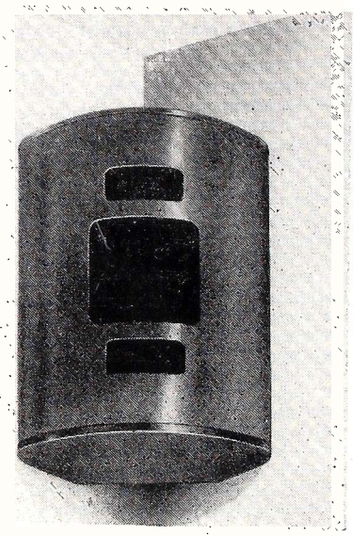
functions and a special recessed safety jack provides for the 6,000 volt circuit.

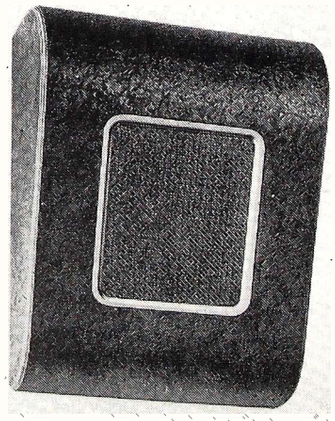
This compact test set has the following range "specs:" 6 AC-DC and Output Voltage Ranges: all at 1000 ohms per volt: 0-3-12-60-300-1200-6000 v. 4 DC Current Ranges: 0-6-6-60-600 MA 3 Resistance Ranges: with self-contained batteries, 0 - 5000 - 500,000 and 0-5 megohms. 6 Decibel Ranges from -22 to + 70 DB.

New Jensen Speaker Housings

Two new wall mounting enclosures, one for 8-inch speakers and the other for 6-inch speakers, have just been announced by Jensen Manufacturing Company of Chicago.

Model H-81 Bass Reflex Sector Cabinet fits anywhere—in 90-degree corners, flat on walls, or at intersection of wall and ceiling. They may be mounted singly, in pairs, or in clusters of four around a post, to attain wide-angle distribution of sound. It may be used with any 8-inch speaker. The cabinet is of wood composition, finished in brown opaque lacquer with chrome trim. It can be covered with color to match the locale of the installation. Height, 22-½"; width, 17-¾"; depth, 8-½".





Model J-61 is a Peri-dynamic enclosure designed to house 6-inch speakers. It is finished in simulated brown leather with grained effect and chrome trim. Height, 16-¾"; width, 12-¾"; depth, 6-¼". Both of these cabinets are furnished with brackets and screws for mounting on wall or post.

Motor-Capacitor Housing

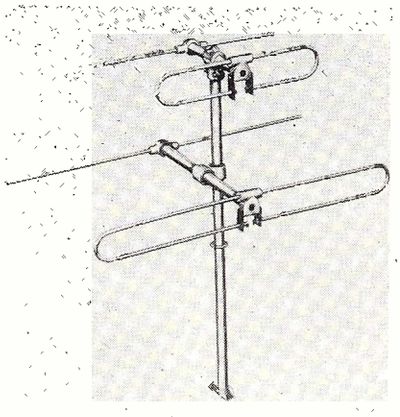
Immediate delivery of the Aerovox motor-capacitor housing, heretofore held up by the steel shortage, is announced by Aerovox Corporation, New Bedford, Mass. This general utility housing accommodates the standard

1-3/8 x 3-1/4" unit. Of heavy-guage metal, it completely covers and protects capacitor and terminals. No

auxiliary caps or brackets are required. The housing fits the motor contour snugly, and provides a strong, rugged, shock-proof, business-like installation.

New Dipole

The new Hy-Lite Studios Television-FM antenna is designed for 44 meg. to 216 meg. broadband signal reception in a stacked parallel fed system. The antenna employs a folded-dipole and reflector with a high front to back ratio, giving a maximum unwanted signal rejection factor, hard to beat.

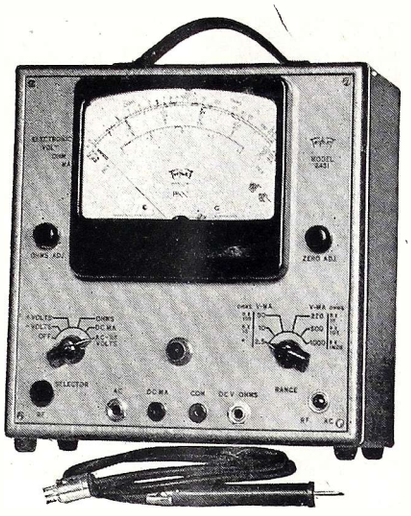


The elements are of high-grade aluminum tubing and the supporting members are cast aluminum. The Hy-Lite antenna is easily assembled and can be tilted in any direction making it easily adapted to any individual installation. Supplied with 60 foot of 300 ohm twin-lead transmission line. Write for prices and literature, 528 Tiffany St., Bronx 59, N. Y.

Triplett Model 2451

Operational simplicity, broad test facilities and new engineering developments are embodied in Triplett's new Electronic Volt-Ohm-Milliammeter Model 2451.

Embodying many new developments assuring simplified operation, it speeds up servicing; yet gives every-



thing needed for the job.

Model 2451 eliminates the cumbersome operation of switching back and forth from range to range to balance the circuit. With Triplett's exclusive new approach just zero the meter on the range to be used and proceed with the test.

For literature, write Triplett Elec. Instru. Co., Bluffton, Ohio.

Shrink Fit Insulating Tubing

Walsco announces a new type synthetic tubing, especially designed for insulating handles of pliers, screwdrivers, test, prods, etc. This tubing, known as Protecto-Tube, comes in a kit containing various sizes and colors together with a special "expanding solution."

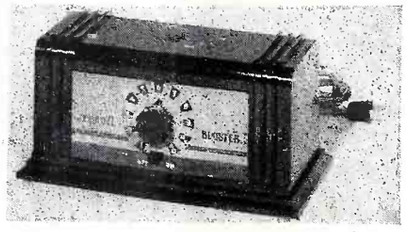
An undersize tubing is selected and,

before application, is immersed in this special solution, where it swells. After application, the tubing shrinks back to its original size forming a durable, shock-proof insulation of high dielectric strength.

Literature may be obtained by writing to Walter L. Schott Co., Beverly Hills, California.

TV Booster

Jerrold Electronics announces a new TV booster covering all 13 channels. It is claimed the new tuned-grid, tuned-plate circuit affords a signal boost of 25 db or more over the entire 6 mc band, greatly extending TV



reception in fringe areas and improving reception in many homes having indoor antenna installations.

A pamphlet completely describing the new unit will be sent free. Write the manufacturer, Jerrold Electronics Corp., 121 N. Broad St., Phila. 7, Pa.

Crosley Needle Merchandiser

A unique needle storage and display rack, to merchandise the Crosley floating jewel, has been announced by Harold Newell, Service Manager, Crosley Division, Avco Manufacturing Corporation.

Utility of the display is found in the vertical shaft of the stylus. This shaft, which is hollow, holds a supply of two dozen needles from which a dealer

may sell. For details, write Crosley, Cinn., Ohio.

Allwave TV-FM Antenna

Tri-craft Products Company announces their new Model 300 antenna which gives full coverage of both television bands and the permanent FM band. It reduces noise to a minimum, and is designed to match all sets with the standard 300 ohm input.

It also has a low standing wave ratio, which means increased signal strength for the set.

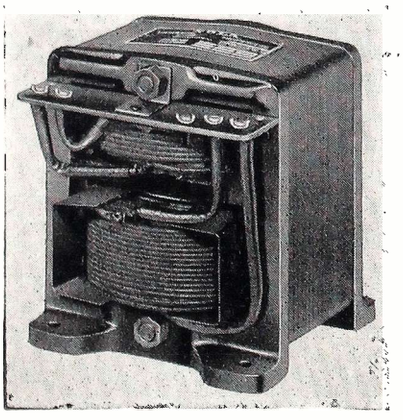
Easy to install, the only tools necessary are a screwdriver and pliers. It comes complete with all mounting hardware and 65 feet of 300 ohm twinlead transmission line.

Address inquiries to Tricraft Products Co., 1535 N. Ashland Ave., Chicago 22, Ill.

Constant Voltage For Mercury Vapor Lamps

Type CVM-1, Sola Constant Voltage Ballast Transformer is a unit specifically designed to protect and stabilize the operation of the G. E. Type UA-4 Mercury Vapor Lamp.

Lamp life is increased by preventing over-voltage operation. In herently high input power factor permits operation of lamp on 115 volt lighting circuits. Type CVM-1 is entirely



automatic; has no moving parts and requires no maintenance or adjustments. Literature on other Sola. Constant Voltage Ballast Transformers is available. Write Sola Elec. Co., Chicago 50, Ill.

Adhesive

Servicemen find Kum-Kleen Self-Adhesive Labels are an effective medium for reminding customers of their services.

These self-adhesive labels are available in small, automatic dispenser

boxes. Further information and samples may be obtained by writing to Avery Adhesive Label Corp., Monrovia, Calif.

New Espey Kit

Espey announces Model 511, an AW-FM superheterodyne receiver employing twelve tubes plus an electron tuning indicator tube and a rectifier, designed to operate on 105-125 volts AC, 50-60 cycles. The unit covers the broadcast band from 535 KC to 1720 KC, and from 88 MC to 108 MC on the FM band. This receiver features AVC on both AM and FM, separate full range base treble tone controls, 13 watt push pull audio output and provision for phonograph operation controllable from the front panel.

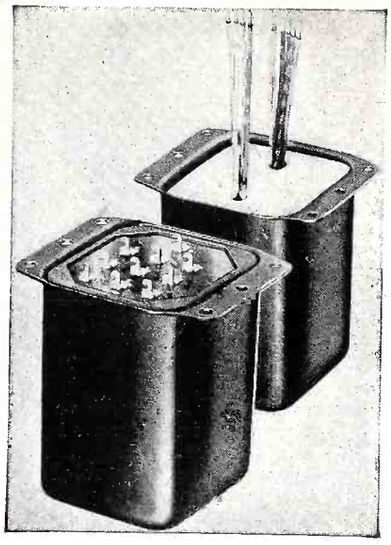
Tuning radio frequency amplification is provided for on both the AM and FM bands. Tuning is facilitated by the use of a fly wheel drive and a giant dial.

The chassis is 13-½" x 8" x 9". A loop antenna for AM and folded dipole for FM, a 10" speaker and all necessary hardware are included.

Details on the entire custom installation line of radio chassis will be furnished by the Espey Manufacturing Company, 528 East 72nd Street, New York 21, N. Y.

New Transformer and Reactor Line

A new, complete line of transformers and reators, for radio transmitting and receiving, PA, and industrial electronics applications, is ready for distribution by Chicago Transformer Division, Essex Wire Corporation Included are power transformers for both capacitor input and reactor input systems, matching filter reactors, plate transformers and reactors, filament transformers, and audio transformers in a range of input, output, driver, and modulation types.



Features of the line include:

1. SEALED IN STEEL CONSTRUCTIONS—Most units are housed in drawn steel cases for compactness, maximum protection against climatic conditions, and streamlined appearance.

2. CHOICE OF CONNECTORS—Most ratings are available either with solder lugs on phenolic terminal boards or with RMA color-coded leads out the bases.

3. CHARACTERISTICS KEYED TO MODERN TUBES—Emphasis in design has been placed on the requirements of circuits using the receiving, transmitting, and other electronic tubes currently in most widespread use. All ratings are specifically suited to up-to-date types of application.

4. TRUE HIGH FIDELITY IN 3 FREQUENCY RANGES—Frequency response within ± ½ db and exceptionally low percentage of distortion is characteristic of the input and output audio transformers. Driver and modulation transformers for 250-watt to 5-KW transmitters provide frequency response within ±1 db. Audio units are designed in three classes according to frequency range—the Full Frequency Range of 30-15,000 cycles, the Public Address Range of 50-10,000 cycles, and the Communications Range of 200-3,500 cycles.

A new catalog describing the entire new line of transformers will be sent to those writing on business letterheads. Write Dept. SD-1, Chicago Transf. Corp., 3503 W. Addison St., Chicago 18, Ill.

TRADE FLASHES

(*from page 9*)

nation-wide distributing organization "to assure the convenient availability of Capehart to the public in all geographical areas," it is announced by President E. A. Nicholas of the Farnsworth Television & Radio Corporation.

The complete line of new Capehart and Farnsworth television receivers, phonograph-radios and radios—consists of 32 different models, including 5 TV models. Prices range from $24.95 to $1,595.

Antenna Catalog

A revised four-page catalog of the Camco "Featherlite" Television and FM Antennas is now available. It is attractively illustrated, featuring the new line of 13 to 1 All Channel Television Antennas. Completely descriptive and functional, making it a simple task to choose the correct antenna for any location and condition. For a copy write Camburn, Inc., 32-40 57th Street, Woodside, N. Y.

CIRCUIT COURT

(*from page 25*)

tive, thus improving stability.

Plate voltage reaches the tube through an r-f choke, but the real plate load is the grid coil of the 6BE6 convertor tube which is coupled to the plate by the 22 $\mu\mu$f capacitor. The grid of the convertor, as well as the oscillator section, are tuned by a dual tuning condenser.

Alignment instructions indicate trimming of the slug in the antenna coil at 96 mc. Gain at 100 mc is stated as being 5 times. In this manner, without resorting to elaborate construction, or even a three gang condenser, considerable advantage is obtained. The high Q possible in the r-f grid stage contributes much to the results.

GAS TYPE TUBES

(*from page 16*)

second deck cuts in the correct oscillator coil which is of the permeability tuned type and has also been preset for the desired station, while the third deck controls a series of pilot lamps which illuminate station tabs on the front panel of the receiver. The switching arrangement corresponds to the ordinary station selector push-buttons on a less elaborate receiver, except that station selection is accomplished from a distance of up to 70 feet or so through the medium of the control

box and control amplifier. A small battery-powered oscillator in the control box generates the control impulses. A second rotary switch is arranged to reverse the direction of rotation of a volume control motor. When volume is to be increased or decreased by remote control, a special button on the control box is depressed after dialing. This causes the oscillator to send out a continuous impulse which keeps the thyratron tube firing until the desired volume setting is reached. Incidentally, holding down the button long enough after dialing for volume decrease will cause the receiver to be turned off, after which it will be necessary to restart it manually, from the control panel on the front of the receiver. It is evident that a relay with sufficient pull to operate a rotary switch will require considerable current, hence the thyratron tube. Notice in the diagram, that the thyratron is supplied with plate voltage from an a-c, source; this means that at the end of impulse the tube will deionize because the plate voltage will fall to zero at the end of the succeeding half-cycle of line voltage. Of course, if the grid continues to receive an impulse, the tube will continue to fire. The second relay, *Ry* shown in the drawing is a locking relay. Should the thyratron receive but a single impulse, such as might originate from local electrical interference, the rotary switch will move one position and will immediately return to normal without affecting the tuning or performance of the receiver.

The material covered in this discussion does not by any means constitute a complete coverage of the applications of gaseous tubes in the field of radio, but should be sufficient to give the reader at least a fair sampling. Many other devices using tubes of this type are in present use, many others are possible.

AMPLIFIER CHECKING

(*from page 12*)

due to a particular tube or transformer then may be determined simply by subtracting the reduced oscillator output from the original oscillator output value.

The shielded injector prod enables the operator to work in high-gain stages without introducing appreciable hum into the amplifier, or causing feedback. However, should hum voltages be coupled into very sensitive stages, it may be detected readily by means of the loudspeaker. A battery-operated audio oscillator precludes entirely the possibility of coupling-in hum voltages arising from power-line operation of the instrument.

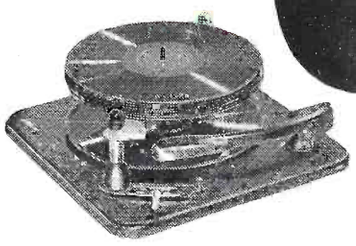
Ad Index

INCREASE PROFITS! BUILD GOOD WILL!

...SELL SEEBURG RECORD CHANGERS

FOR REPLACEMENT

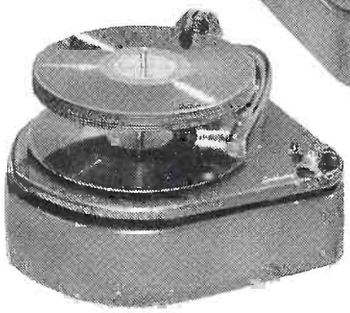
Model DR-1. Two-post construction. High or low output cartridge
Size: 13¼ x 13¼ in.



Model DS-1. Single-post construction. High or low output cartridge
Size: 12 x 13⅜ in.

FOR PLAYING THROUGH EXISTING RADIOS

Model DR-101. Same chassis as DR-1 with walnut finish wood base
Size: 13¾ x 13¾ in.



Model DS-101. Same chassis as DS-1 with walnut finish wood base
Size: 12½ x 14⅛ in.

● These are the same quality mechanisms—*now available for retail sale*—that are standard equipment on so many of today's leading radio-phonograph combinations. And there's good reason for this preference. For Seeburg Changers assure simple, dependable operation . . . constant speed . . . quiet performance . . . the last word in listening pleasure.

Plan now to sell and install Seeburg Changers for every purpose. Mail the coupon for complete information.

Seeburg

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MAIL THIS COUPON FOR FULL INFORMATION

J. P. Seeburg Corporation
1500 N. Dayton St., Chicago 22, Ill.

Gentlemen: Please send complete information on Seeburg Home Record Changers.

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Company_____

Address_____

City_____ State_____ RS-6

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