JULY 1946

radio service dealer

In This Issue:

CIRCUIT COURT

MULTIVIBRATORS

DISTORTION

LIVE DISPLAYS BRING CUSTOMERS

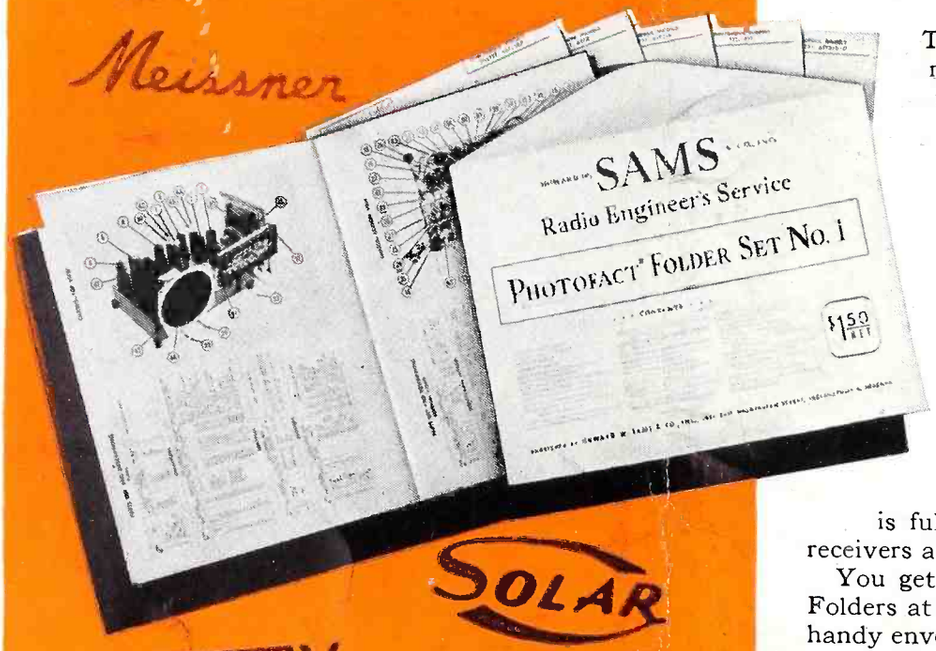
THAT'S TELEVISION . . .

YOU name the brand—

(original equipment or replacement)

PHOTOFACT FOLDERS

give you the exact part numbers



The manufacturers behind these and many other famous radio trademarks, including many radio set manufacturers, say that Howard W. Sams PhotoFact* Folders offer you the most revolutionary service data ever devised. They claim — and rightly — that they can save up to 50 percent of any radio service engineer's time.

No wonder! PhotoFact Folders tell you — by data and pictures — everything you want to know about servicing every post-war radio made. Every part is listed and numbered. Every servicing shortcut and installation fact is fully set down! This at a time when receivers are more complicated than ever!

You get a set of from 30 to 50 PhotoFact Folders at a time. Each set comes to you in a handy envelope at a cost of only $1.50 for each group. They cover all new radios, phonographs, intercommunication systems and power amplifiers as they reach the market.

Demand for the Howard W. Sams PhotoFact Folder Service is phenomenal. Paper shortages may make it impossible to send you the first sets immediately. But reprints are now being made—and you will get additional sets as fast as they are issued. Ask your distributor for full details and specimen folders. Have him put your name on his reservation list!

HOWARD W. SAMS & CO., INC.
2924 East Washington Street, Indianapolis 6, Indiana

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WHAT THE PHOTOFACT SERVICE IS:

It's a new and radically different method of giving you the complete service story on every receiver manufactured since January 1, 1946.

All information is compiled by experts — from actual examination of models themselves, not from ordinary service data. No brand of product is recommended above another — all original equipment part numbers are listed as well as competitive component part numbers. Each Folder gives you from 2 to 12 clear photos of the chassis . . . a keyed reference alignment procedure . . . complete voltage and resistance analyses . . . complete stage gain measurement data . . . plus a schematic diagram.

PUBLICATION DATE—SET NO. 2
JULY 25th—ORDER TODAY

HOWARD W. SAMS & CO., INC. RADIO PHOTOFACT SERVICE

BY HANDLING GE RADIO TUBES

GOOD business is waiting for you, at a return that will mean handsome profits! And the way to secure these quick-money sales is to *handle G-E radio tubes!*

Owners of radio sets requiring new tubes—every home in your area has one or more such sets—prefer G-E tubes because that's the brand they know best, and respect the most. The famous G-E monogram is found everywhere, on radios, lamps, irons, refrigerators, other household appliances that have given long, dependable service. *Radio owners buy General Electric both by force of habit and from conviction*—and they'll be *your* steady customers for tubes once they see the G-E sign on your door!

Time to stock and sell G-E tubes is *now,* while this hungry market—further stimulated by G.E.'s national electronics advertising—still is looking for a convenient supply source in your neighborhood. Write for information about tube selling rights to *Electronics Department, General Electric Company, Schenectady 5, N. Y.*

Every tube dealer and service man should have G.E.'s Tube Characteristics Booklet ETR-15. Send for your free copy today!

GENERAL ELECTRIC

176-E4-8850

FIRST AND GREATEST NAME IN ELECTRONICS

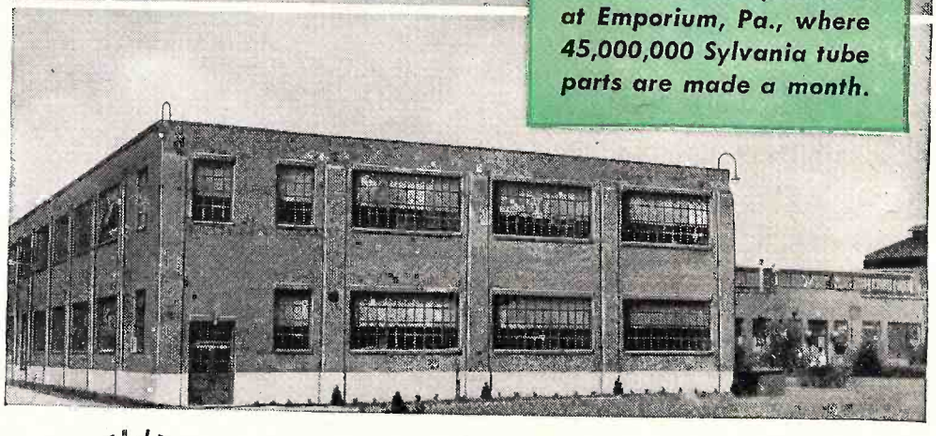
SYLVANIA NEWS
RADIO SERVICE EDITION

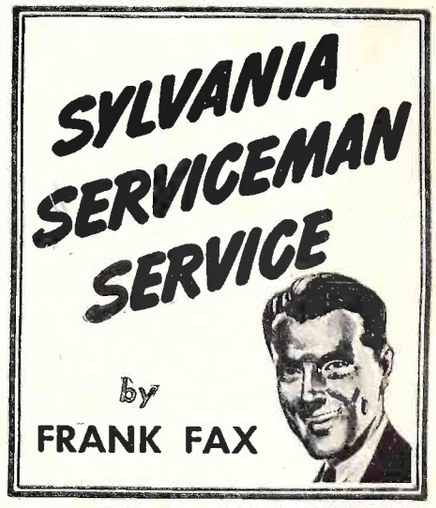
JULY *Prepared by* SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946

SYLVANIA MAKES OWN TUBE PARTS AS AN EXTRA GUARANTEE OF QUALITY

(Above) *These are some of the parts for Sylvania's Lock-In tube.*

(Below) *Parts Department at Emporium, Pa., where 45,000,000 Sylvania tube parts are made a month.*





"Do it right" has always been a guiding principle of Sylvania tube production.

For instance, at Sylvania's Emporium, Pa. Tube Plant, there is a Parts Department that makes over 45,000,000 precision tube parts a month.

Sylvania even has its own Tungsten Plant, where fine wire filament for Sylvania tubes is made—to safeguard the quality of this vital tube element.

QUALITY *AND* QUANTITY

By making its own parts, Sylvania can (1) control raw materials and processing to an extent not surpassed by any other tube manufacturer, and (2) provide a constant supply of parts for rapidly increasing tube production.

You benefit by receiving tubes that have been tested and proved at every stage of manufacture—quality *SYLVANIA-MADE* tubes.

Share Wheat And Fats. Fight Famine!

SYLVANIA ELECTRIC

Emporium, Pa.

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

radio service dealer

Member Audit Bureau of Circulations

Covers all phases of radio, phonograph, sound and electrical appliance merchandising and servicing

VOLUME 7 Number 7

JULY, 1946

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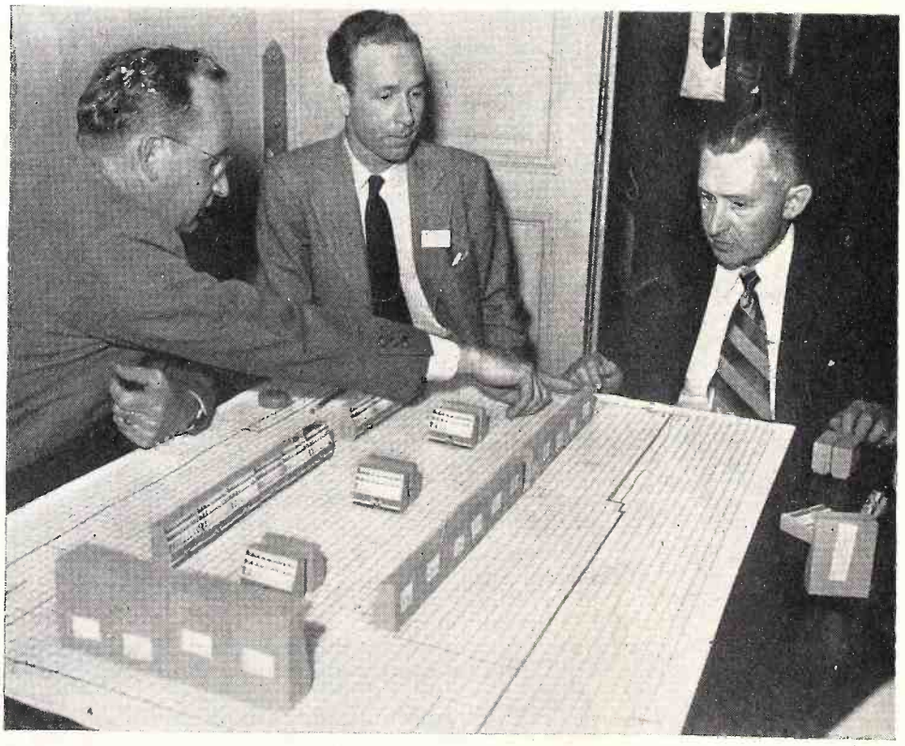
In & Around the Trade

Being a condensed digest of production, distribution and merchandising activities in the radio and appliance trade.

MAKING RADIO RECEIVERS: Production of radios, hampered by shortages in parts and components, is being speeded up by groups such as this, working on coils in the component parts division of the Hallicrafters Company, Chicago, producers of high frequency radio equipment.



SELLING RADIO RECEIVERS: A "design for selling" was being plotted with miniature models of the new RCA self-service merchandising fixtures when this photo was taken at the 1946 Radio Parts and Electronic Equipment Conference and Show in Chicago. Shown arranging the display units are (l. to r.) Ben Krell, Dixie Supply Co., Columbia, S. C.; Randy Frisbee, RCA Renewal Sales Department; and W. B. Stubbes, of the Dixie firm.

Television Kinks Ironed Out For $10.

Owners of television receivers recently received the following letter from RCA:

To Owners of RCA Television Receivers

Recently, you may have observed an interference, when receiving Television, in the form of a series of moving vertical bars across the picture. This interference is from "FM" stations, operating in the new high frequency "FM" band, as recently authorized by the Federal Communications Commission, and which is adjacent to present Television channels.

At the time your television receiver was designed and manufactured during 1939 and up until May of 1946, this condition did not exist, nor was there reason to anticipate its development. Accordingly, the inclusion in the set of additional complex circuits necessary to protect this type of interference was not warranted.

Through the cooperation of the "FM" stations, however, we have been able to develop a suitable "wave trap" which may be installed in the receiver, for correcting the interference as it currently exists. We will furnish, install and adjust "wave traps" where necessary in conjunction with all frequency modifications handled in accordance with our letter of February 18, 1946.* This will be done at no extra charge; and will apply as well to receivers already modified by us. If you desire the "wave trap" without the frequency modification, we will make this installation for the nominal sum of $10.00. In making this adjustment, we do not establish or indicate a precedent in the case of future service requirements.

If you are experiencing this interference and desire us to effect the correction as described above, or to modify your receiver for operation on the new television channels, kindly notify the RCA Service Company, Inc., Television Section, Camden, New Jersey.

For your information, there are indications that at least one of the major "FM" stations is cooperating by curtailing operations during the evening of June 19, in order to avoid interference with the telecast of the Louis-Conn fight. If your receiver has not yet been modified for the new frequencies, there is a possibility that, until this work can be done, temporary reception may be obtained from WNBT New York or WPTZ Philadelphia, or by trying positions No. 3 and 2, respectively, of the station channel switch.

**See "Radio Service Dealer," April, 1946, page 43.*

HOLD-THE-LINE PRICES FOR RADIO INDUSTRY

In a memorandum to all division heads titled "Interim policy on prices while price control legislation is pending in Congress," James S. Knowlson, president and board chairman, Stewart-Warner Corp., directed that restraint in prices will be the rule limited in every case "to total current cost plus a reasonable profit margin. We do not wish to contribute either to inflation or to a buyers' strike," Mr. Knowlson's policy statement asserts. "At the same time, we cannot willingly continue to sell any item at a loss. Unless rising costs of material force us to do so, there will be no change in our prices, except on a few items where operations are not returning a reasonable profit margin. Any revision made in the price of these items will be those which we believe would have been obtained under OPA if properly presented. Current discounts will be maintained."

Dr. Ray H. Manson, president of the Stromberg-Carlson Company, announced that the company's fast-mounting production of AM and FM home radio receivers "would continue to be priced for the time being within the spirit of common-sense price control and as though the OPA were still in existence. Naturally, in fairness to our customers and stockholders, we will keep a weather eye out for any unduly sharp changes in any of the several cost factors which influence pricing."

Dr. Manson's "hold-the-line" price announcement was telegraphed to the 53-year-old communications firm's distributors and dealers throughout the nation.

The above is typical of the position taken by other manufacturers of radio receivers.

FM Receivers to Dealers

General Electric is scheduled to build FM radio receivers beginning July at its Bridgeport, Conn., plant, announces Arthur A. Brandt, general sales manager for the Electronics Department.

The first new FM receivers will begin appearing in dealers' stores early in August, Mr. Brandt explained, and will "tune in" programs from FM stations in the lower (42 to 49 mc) band as well as the high (88 to 108

[*see page 29*]

Raytheon ANNOUNCES

JUST OFF THE PRESS!

The most complete, most carefully-indexed, most usable and informative catalog of war surplus electronic equipment yet offered! Describes more than 5000 items, with specifications and PRICES. . . .

SEND FOR CATALOG TODAY!

. . . A READY SUPPLY

OF ELECTRONIC EQUIPMENT and COMPONENT PARTS

available for immediate delivery

to wholesalers, retailers and manufacturers

Here is merchandise you need. Electronic merchandise you can sell at a profit, with or without further processing. And there's plenty of it! Enough to "plug the gap" until your normal sources of supply can replenish your shelves and stockrooms.

RAYTHEON

Excellence in Electronics

It's Army and Navy gear—now being returned to the regular channels of trade by the War Assets Administrator. Acting as agent, Raytheon has a plentiful supply for you—together with a carefully indexed, easy-to-choose-from catalog that's literally bursting with news about the kind of goods you *want, need,* and *can obtain* right away. *Send for this catalog*—it means business for you. Good business, ready business, profitable business.

Most of the equipment is in the communications field—but there are large supplies of components too, electrical and electronic parts that you and your customers can find immediate use for. It's all in the catalog—carefully described—priced—easy to find and easy to order. And of course it's all top-quality equipment, made to Government specifications by America's finest electronic manufacturers.

You'll be missing a bet if you don't take immediate advantage of this opportunity to *sell merchandise at a profit.* The market is hungry for this equipment. The business is there. Get your share of it.

Sending for the Raytheon catalog is the first step. Do that at once. Then get in touch with Raytheon for technical advice and merchandising plans for speedy action.

RAYTHEON MANUFACTURING COMPANY

Acting as Agent of the
War Assets Administrator under Contract No. SIA-3-46

60 East 42nd Street, New York
West Coast Office: 2802 N. Figueroa St., Los Angeles 31, Cal.

RAYTHEON MANUFACTURING COMPANY
60 East 42nd Street, New York 17, N. Y. RSD-7

GENTLEMEN: Send your new Catalog of salable and immediately-available items of war surplus electronic equipment to

Name.....

Firm Name.....

Street Address.....

City..... *State*.....

Jensen

TYPE "RD"

Reproducer

WITH THE NEW TYPE "H"

ARTICULATED Coaxial

This new Reproducer, combining the Type "H" Coaxial speaker with the new Jensen Type "D" Bass Reflex* cabinet, offers superior reproduction of your favorite program material and is unconditionally recommended for FM receivers, high quality phonograph reproduction, reviewing studios, monitoring, and home and public entertainment generally.

The cabinet is beautifully styled and fashioned of satin finish striped walnut. The harmonizing grille fabric is overlaid with a protecting pattern of flat, interlaced bronzed strips.

The Type "H" Coaxial, with all ALNICO 5 design, employs a h-f horn and l-f (15-inch) cone which are electrically and acoustically coordinated to achieve brilliant and natural response throughout the entire useful frequency range. The frequency dividing network has variable control in the range above 4,000 cycles. Nominal input impedance to dividing network, 500 ohms; maximum power handling capacity 25 watts, in speech and music systems.

Model RD-151 Reproducer complete, approximate list price $180.

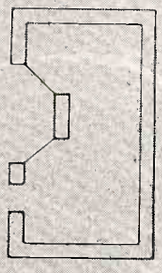
*Trade Mark Registered

JENSEN MANUFACTURING COMPANY

6619 S. LARAMIE AVE., CHICAGO 38, ILLINOIS

In Canada—Copper Wire Products, Ltd., 11 King Street, West, Toronto

JENSEN BASS REFLEX



Acoustically-correct Bass Reflex Cabinet gives smoothly extended low register. Better than an "infinite" baffle . . . efficiently uses back radiation too.

Jensen SPEAKERS WITH ALNICO 5

Specialists in Design and Manufacture of Fine Acoustic Equipment

with the publisher.....

Service Data Gripes

PHILADELPHIA, Pa., and vicinity is fortunate to have working there the Phila, Radio Service Men's Assoc., one of the finest, best organized, progressive and effective groups of its kind in the country. P.R.S.M.A.'s president Krantz chides radio receiver manufacturers because some will not furnish servicemen with schematic diagrams of their models while others do, and in some cases others even charge a fee for service data States Mr. Krantz:

"Before the war a few set manufacturers started to charge the individual radio serviceman for service notes. This practice has been continued by a greater number of manufacturers who are asking from ten cents a copy for a schematic to five dollars a year.

"You manufacturers always ask that when repairing your set that the serviceman be sure to replace defective parts with *your own* replacements so the customer may be assured of perfect reception! At the same time you are denying us, or making it difficult for us to obtain, the very information we should have at hand so we can ascertain that exact part and in many cases its true value.

"You have made available service notes for the set dealer who, unless he has a service department or knowledge of servicing, has always filed this data in his waste paper basket. You have also enclosed a service note or schematic of the set sold to the public in the radio and frequently this induces the set owner, despite his incompetence, to tinker with his set and thus add to a serviceman's woes.

"It seems that radio schematics and data necessary for servicing radios is made available to almost everyone without cost except to the men (servicemen) who need it most and who can use it to the best advantage of all parties concerned. From servicemen you want to get paid. Were we to start buying this data from each non-cooperative manufacturer we would probably have to pay upwards of thirty dollars a year.

"I believe that service data should be made available free, together with trouble-shooting hints when possible, to every reliable radio serviceman or dealer. Frequently for some reason or other a set-owner will absolutely not countenance having his defective set repaired by the dealer who sold it to him. Set manufacturers should not penalize such a set-owner or the service-dealer with whom he may wish to do business."

No radio service dealer will disagree with Mr. Krantz. His case is strong. Manufacturers should take heed and oblige. By cooperating with legitimate, established service-dealers the horde of unqualified, unresponsible "amateur servicemen" will be held down to a minimum. The public will be gypped less and the servicing profession will gain the high recognition to which it is entitled. Soon complex FM and television sets will be around and now is the time to start training the public to understand that such sets require proficient servicing and qualified repairmen are justified in getting fair fees for rendering the service.

Television Comes Of Age

JOE LOUIS and Billy Conn stepped into the Madison Sq. Garden ring on June 19th to fight for the World's Heavyweight Boxing Title. Television's reputation was also at stake for over 75,000 people were viewing the fight via television that night. Happily, television added new laurels to its already fine record of performance.

On fight-night six manufacturers of television receivers held parties in different New York City hotels and office buildings. Thousands of invited guests saw the fights on the screens of hundreds of stock-model television receivers, some with small screens of seven inches and others of projection type capable of giving images several square feet in size. We made a "round robin" evening of it to compare television quality, performance and audience reaction and comments. Incidentally, the sets ranged in price from $100 to $2000.

The bigger and more costly television sets, especially those having a picture over two feet wide by seventeen inches high, and those which projected even larger views, were without question the most satisfactory performers in every way. The cheapest sets constantly required manual adjustments, went out of sync., or were otherwise haywire. Audiences viewing these models got the oft-expressed opinion that television is still "not so hot". But the moderately priced models (in the $350 range) gave a fine performance and had their audiences enthralled. The deluxe and highest priced models came through with a performance as good as any Hollywood-made movie could boast.

The sponsored commercials between rounds had no technique, must be vastly improved. Sponsors missed the boat by merely showing a sloppy photograph of their product. The pickup cameras and cameramen did a grand job. So, our advice is this, don't sell television short. It soon may be a terrific factor in our field of radio and home education and enjoyment.

S. R. Lowan

Publisher

This Unique Display *SELLS* RCA Batteries

Ask for Form No. 2F231 when ordering from your RCA Distributor

Has timely display value . . . and handy comparative replacement chart on back

With vacation time in full swing, little radios come outdoors—and little radios have big appetites for "A" and "B" batteries.

RCA's new and distinctive Radio Battery Display Poster-Chart will bring you a large share of this profitable business—right through to the end of the football season.

Printed in two colors, and measuring 14 x 22 inches, it's bound to attract attention in your store window or on the counter—bring more people to your shop. Three cutouts are provided for the display of RCA Preferred Type Radio "A" and "B" Batteries that will service the 29 makes of personal radios prominently listed on the front. A comprehensive battery replacement chart covering all well-known makes of battery-operated radios is affixed to the back of the easel for easy reference.

You'll find this RCA Poster-Chart the greatest little radio battery merchandiser ever offered to the trade. Lose no time in getting one from your RCA Distributor. (Form No. 2F231.)

RCA Batteries are "Radio-Engineered" for Extra Listening Hours.

Listen to "THE RCA SHOW,"
Sundays, 2:00 P.M., EDT, NBC Network

RCA

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

Salesmen Hold Key To Business Stability

by JOHN MECK*

THE entire structure of American economy will be endangered if the art of selling is lost.

America is the only major country today that does not have an economic system based on government subsidy. Consumption of manufactured goods in this country is not wholly determined by the consumers' ability to buy. In order to keep goods moving, there must be a demand which can only be sustained by good salesmanship. If we salesmen fail to create an absorption somewhere comparable to our tremendous productive capacity, then we can expect a considerable change in the order of things which will eventually end in an economy without salesmen.

Unless production and salesmanship work together to preserve the freedom and independence of American industry, we shall find ourselves behind the economic eightball in more ways than one.

Unless we start selling again, and then keep on selling, and selling, and selling, the production machine originally built by American salesmanship will turn on its creator like a monster Frankenstein.

We must prepare now for a surplus market. The vacuum days are already gone. It's no longer enough to listen politely to the gripes of customers and then write the factory. We must sell over the gripes and keep the volume of sales going up. This will result in more and more goods becoming available and in bringing them to the customer at less and less cost. Only if increased production can take up the slack by cutting the costs of distribution and merchandising rather than production, can we escape the consequences of the present inflationary spiral of wages and prices.

The transition from scarcity to surplus is not a long process. Essentially it's only the difference between one radio on the counter and another on the shelf. We are already entering a buyers' market. There is evident the customer's growing reluctance to buy inferior products at high prices even in scarce items, which is a foretaste of the coming buyers' era. With most of our labor difficulties in basic industries settled, our tremendous productive capacity will move into high gear and unless we sell aggressively and continuously, the economic consequences will be disastrous.

The art of selling has been virtually lost during the war years when the government was the country's only customer. Salesmen in general have become representatives of the customer instead of the manufacturer.

The sooner we get the American public back on time payments as the fastest way of making all types of goods available to the consumer, the safer will be our whole economic system.

President, John Meck Industries

(*Based on a talk before a meeting of Representatives of the Radio Parts and Electronic Equipment Industries in Chicago.*)

LOSS LEADERS AND DEALER PROFITS

by JOSEPH GERL,
President, Sonora Radio & Television Corp.

DURING the years from 1925 to 1929, we had many manufacturers who introduced and priced lines, only for one purpose —to sell stock to the public. As soon as they disposed of their stock they left the dealers and the public with orphan radio sets, and innocent investors with valueless stock. Regardless of the regulations of the Securities and Exchange Commission, every indication is that we will go through a like period soon.

For example, one radio manufacturer whose annual business prior to the war was in the neighborhood of $1 million, has been doing a $35 million annual business during the war years. He has succesfully offered stock to the public based on his company's war production capacity, yet everyone in the industry cognizant of the facts knows that this manufacturer's annual postwar production will be closer to his $1 million prewar output annually than to his $35 million war manufacturing volume.

Several radio producers are trying this technique. The almost inevitable result will be frantic company officials striving to earn profits for their overcapitalized companies, finally falling back on loss leaders and other sharp practices in desperate attempts to capture the market. They may succeed, but if they do it will be at the expense of the entire industry, for such devices *cannot succeed without manufacturers chiselling their suppliers, sweating their labor and robbing their dealers of their legitimate discount.*

May I remind you of the use of the leader model in 1931 with the $49.50 baby grand; of the $9.95 radio in 1937, and of the $39.50 record changer combination in 1941—just to mention a few? All of these underpriced models may not have been due to inflated capitalization, but if all the facts were known, it would be evident that many of these loss leaders were related to such factors. Whether such loss leaders will be in the picture in coming months remains to be seen. But the indications now are that some officials may be forced to such desperate measures to gain the busines their stockholders have been falsely led to expect.

The result may affect not only every radio manufacturer, but every supplier, distributor, dealer and the public. It will certainly upset the balance between proper pricing and proper margining for the wholesale and retail distributive trades.

OHMETERS, Condenser Testers, Capacitance Meters

Article 2 of two articles. (See June Issue).

by GEORGE LEVY, B.S., E.E.,
Illinois Institute of Technology

Condenser Tester

Other simple instruments that may be constructed by the radio service technician are a condenser tester and a capacity meter. The component parts required for these instruments might be found in the serviceman's odd parts box. The types of checks a service technican might want to make on a condenser consist of:

1. Checking for a short-circuited condenser
2. Checking for an open-circuited condenser
3. Checking for condenser leakage resistance
4. Checking on leakage current of an electrolytic condenser
5. Checking the actual capacitance of the condenser

The first four checks may be made with an ohmmeter, but the last one requires a capacitance meter. The latter measurement is only important when no information is available on the capacitance of a defective condenser. In most cases, the capacitance is marked on the condenser or it may be obtained from the circuit diagram, instruction book or service manual on that particular receiver. In the absence of a capacitance meter the correct value of capacitance for a replacement condenser may be sometimes determined by cut-and-try methods. That is, condensers of different values may be substituted in the circuit until it operates satisfactorily.

A condenser tester or checker is an instrument which tells the service technician the condition of a condenser, i.e., the first four tests above. A capacitance meter, on the other hand, actually enables him to measure the capacitance of an unknown condenser.

As previously stated an ohmmeter makes a fairly satisfactory solid-dielective (not electrolytic) condenser checker, but it will not measure the capacitance. The procedure in testing a condenser with an ohmmeter consists in unsoldering one lead to the condenser and then connecting the ohmmeter needle for various conditions is shown below:

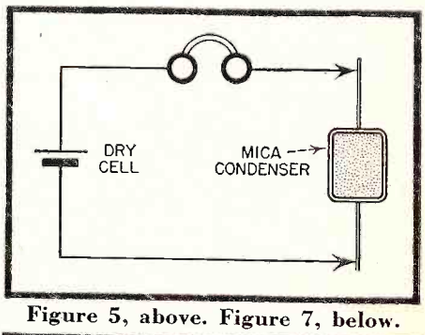
1. *Good condenser*—Needle kicks to *zero* resistance and then swings rapidly to *infinite* resistance.
2. *Leaky condenser*—Needle kicks to zero but does not swing to infinite resistance side. The ohmmeter reading is a measure of the leakage resistance of the condenser.
3. *Open-circuited condenser*—Needle does not move at all.
4. *Short-circuited condenser* — Needle kicks to zero and remains there.

The kick in the ohmmeter needle is caused by the charging current of the condenser. After it is charged to the voltage of the battery in the ohmmeter; no further current will flow unless the condenser is leaky. The above method of checking is suitable for large and medium values of capacitance. For very small capacitances (like mica condensers) the charging current is so small that there is no appreciable kick in the ohmmeter. Small condenser is shown in *Fig. 5*.

A "good" condenser will be indicated by a loud click in the headphones when it is first connected across the test probes. Disconnecting the condenser and re-connecting should produce no new click. If a click is heard each time the condenser is re-connected, the condenser is short-circuited. No click in the phones indicates an open condenser. A leaky condenser is sometimes indicated by weak repeating clicks as the probes are quickly removed and connected across the condenser. This test for a leaky condenser is not, however, too accurate, and if the condenser acts suspiciously, it should be re-tested on a more elaborate tester.

Very often a condenser will check alright on a voltage below the operating voltage and be short-circuited on the operating voltage. A satisfactory high voltage condenser tester consists of a rectified power supply as shown in *Fig. 6*. The condenser to be tested is connected across the test probes for a few seconds and then removed. The terminals are then short-circuited with a screw driver, and if a healthy spark is produced the condenser is good. If there is no spark, or if the pilot light burns, the condenser is short-circuited.

Another condenser tester suitable for low, medium, and high values of capacitance is shown in *Fig. 7*. In operation, the condenser is removed from the circuit as before and connected to the test



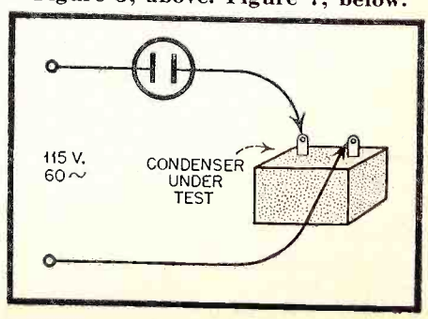


Figure 5, above. Figure 7, below.

probes, followed by no further flashes. If the lamp continues to flash, the condenser is leaky and should be replaced. No flash at all indicates an open circuited condenser. Good condensers of lower capacity will give a weaker flash but this does not indicate a leaky condenser.

The neon bulb test may be used on both AC and DC. On DC a glow will occur around only one electrode, while on AC both electrodes will glow. Thus it may also be used to distinguish between AC and DC.

The foregoing tests all applied to solid dielectric condensers like paper and mica condensers. We also have a type of condenser known as the electrolytic condenser used primarily in the filter circuits and cathode by-pass circuits in audio amplifiers. The dielectric in this condenser is a gauze soaked with a paste electrolyte. Due to a chemical action which occurs between the electrolyte and the aluminum foil, very thin oxide film is formed on the plate connected to the positive side of the circuit. Because of the thinness of the film the capacitance of this type of condenser is very high. Since the chemical action depends on a unidirectional current, such a condenser can only be used on DC. Therefore it must also be tested on DC.

Electrolytic condensers may be tested with an ohmmeter in the same manner as the solid dielectric condensers. It will be found that the ohmmeter needle will give a kick when the probes are first connected and then fall back to some finite value of resistance instead of infinite resistance. If the meter reads zero resistance when the probes are connected, the probes should be reversed and the condenser tested again. Due to the comparatively high leakage current in an electrolytic condenser it cannot be tested by charging it upon a source of DC and then observing the spark when the terminals are shorted with a screw driver. The leakage current may be measured by using a DC milliammeter and the power supply similar to *Fig. 6*. The proper set-up is shown in *Fig. 8*.

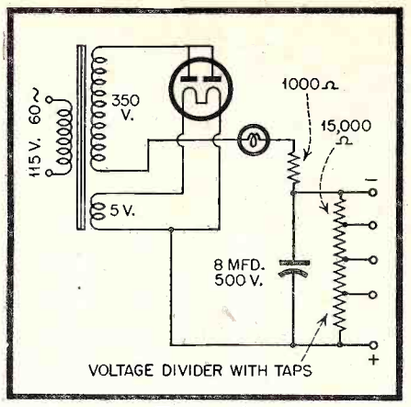


Figure 6.

The condenser is charged up to the rated voltage through resistor, R, by leaving switch, sw, open and sw_2 closed. Then sw is closed and sw_2 is opened and the leakage current can be read on the milliammeter. The leakage current for a "good" electrolytic condenser should be under 2 MA. As the condenser ages the leakage current increases gradually, and 5 MA is considered the maximum allowable leakage current.

Capacitance Meter

All of the foregoing dealt with condenser testers, not capacitance meters. Practically all of the condensers used in radio circuits have a paper and mica dielectric and therefore can be tested on AC. The principle of operation of a capacitance meter is to measure the value of the current under condition of constant applied AC voltage. The basic circuit is shown in *Fig. 9*.

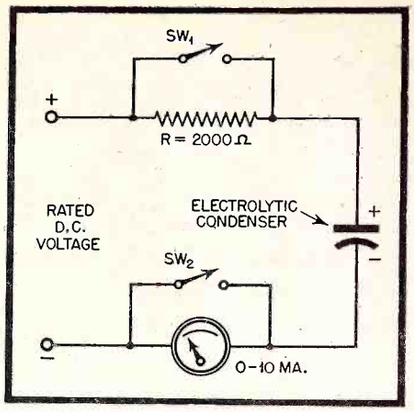


Figure 8.

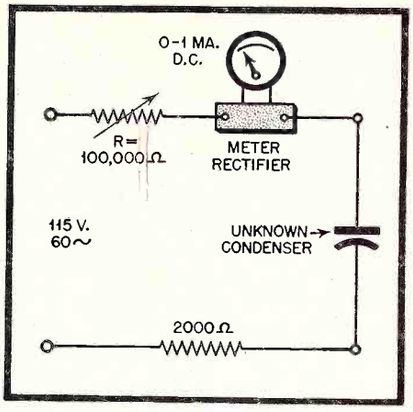


Figure 9.

The measurement procedure is the same as with the ohmmeter. That is, with probes TT short circuited resistance, R is adjusted so that the meter reads full scale I MA, DC. Then when the condenser is connected between probes TT the current will be reduced because of the reactance of the condenser. Therefore, the larger the capacitance, the smaller the reactance and the higher the AC current.

Calibration of the motor may be made in two ways. A number of different capacitance condensers are obtained and connected across terminals TT one at a time and the milliammeter reading recorded. The other method consists in calculating the calibration which is much more complicated than for the ohmmeter. Since there is both resistance and reactance in the circuit it is necessary to calculate the impedance of the circuit.

The foregoing discussion on the less complicated units of test equipment should give the radio technician considerable knowledge on the method of design and the utilization of basic electrical and radio circuit principles in developing useful test instruments.

SAMPLE CALCULATIONS FOR CALIBRATING CAPACITANCE METER

Assume $c = 0.01\ \mu f$

$$\text{Then } x_c = \frac{1}{2\,fc} = \frac{1}{2(3.14)(60)(.01\times10^{6})} = \frac{1\times10^{7}}{6.28(6)(1)} = 265{,}000$$

$$= \frac{}{R^2+x_c^2} = \frac{}{(115{,}000)^2+(265{,}000)^2} = \frac{}{10^3(115)^2+(265)^2}$$

$$= 1000\,\frac{}{13{,}300+70{,}000} = 1000\,\frac{}{83{,}000} = 290{,}000$$

$$I = \frac{E}{}$$

$$I = \frac{115}{290{,}000} = \frac{115\times10^{-3}}{290} = 0.396\ \text{MA}$$

The milliammeter will therefore read 0.396 MA AC when a condenser of 0.01 μf is connected to the test probes. To calibrate the remainder of the scale other values of capacity are assumed and the current is similarly calculated.

THAT'S Television . . .

World heavyweight championship bout booms television, as public "accepts" televiews of fight. Low and high priced sets announced and advertised. Mr. E. F. MacDonald, Jr., warns of problems facing industry . . .

by **LEWIS C. STONE**, *Editor*

TELEVISION got a big play—and a big boost—on the night of the Louis-Conn fight. A number of manufacturers and broadcast studios ran house parties, serving hors d'œuvres plus drinks to go with the prelim matches; and, finally, serving folding chairs to seat the crowds that surged from bar and snack tables into the semi-dark televiewing chambers.

One such party attended by the editor was distinguished by an excellent punch (alcoholic) served from a huge bowl by a dignified butler it looked like, white gloves and all. Everybody who took the punch as they watched the punching sipped it (the punch) slowly from champagne style goblets. As the main event of the evening came into televiey, attention was rivetted to the screens and tube ends; the punch grew flat in hands no longer aware of the precious liquid they held. Such is the fascination of television!

During the prelim bouts (and during the main bout, too) commercials came in, with "still" pictures of the merchandise. Gillette razors were being boosted. People seated within earshot said they didn't mind the commercial-with-sight; besides it was really a short-short commy. Some of us tried the experiment of closing our eyes while the commercial was on. Listening—just *listening*—we found somewhat irksome, by comparison. So open went our eyes again during the next spot commercial (still Gillettes)—and check! Seeing the product while the announcer talked about it made it easier to stay interested. So help us—that's the way it was this particular night, on that particular occasion. Other folk may disagree, but we mention it for what it may be worth, for the record.

Our hosts (and they must remain anonymous) set up four or five viewing chambers, curtained off from each other. The rear of the chambers, where you entered, was a sort of continuous vestibule. If you stood well back, you could get a view simultaneously of two tele-receivers. One of them showed a direct-view image; the other was a projected image, onto a screen set into the receiver. Both images were about the same size. The direct-view image came brilliant; the projected image, somewhat smoked over with a blue tinge, and hazy.

The direct view image at times had almost a stereo effect; the fighters could be seen almost in three dimensions. Occasionally—but rarely—the image wavered. At those moments it was the only motion visible, since the principal actors of the evening often indulged in tableau poses with nothing, nothing, nothing happening for precious seconds of round after round—worst of all being the much-booed first round of the Louis-Conn antics. But that—that is already history.

The crowd was casual, for the most part. You'd think, from looking at them, that they were at a home-movie showing of some family doings. Which is, psychologically speaking, a favorable augury for television. In the minds of most people, television has already arrived. They accept it. They take it for granted. They are casual about it. They don't take sides, as to color or black-and-white; nor do they raise other violent controversies.

The crowd was casual. Certainly that part of it which was lay took the show in stride. There were a few engineer guys around. Two of them, seated right in front of where the editor was standing (astride the two vestiblues, looking at direct-image and screen-projected image alternately) would get up as each round opened and sit down promptly with the gong each time. These twain were the only visibly restless element in the audience—bobbing up, bobbing down, and up again, as the slug-show tolled its bells.

Otherwise the crowd sat or stood about like people stand or sit at a regular movie showing. From the look of it the television show was a "natural" form of entertainment with a public schooled for so many years in viewing motion picture shows.

The aftermath of the Louis-Conn battle brought a spate of promotional

Well-timed in wake of Louis-Conn fight were ads of de-luxe television sets, announcement of lower priced sets. Novelty item like wire recorder also got a push.

and inspired announcements in its wake. (See adjoining text). One was Emerson's low-cost tele-radio console sets to come this summer; another was an ad run by Wanamaker's for Dumont tele-sets priced at the very, very high end of the spectrum; another was the General Electric tube with aluminum-backed screen which they say will triple picture clarity and brilliance; another was an optical-projection method for receivers, by American Optical Co.; and RCA again publicized its orthicon-image pickup tube, which was used in televizing the fight for broadcasting. Everybody sounded off with enthusiasm.

Dissenting note was sounded by Zenith Radio's president, E. F. McDonald, Jr., with his article in the June 29th Collier's, "Television Will Cost Big Money." Mr. McDonald fears the American public may be in for another let-down, opens his article with, "The televisionaries are beating their drums again . . . they can hurt your pocketbook and disappoint your hopes. . ." In a personal letter to the editor, Mr. McDonald adumbrates the position he takes in Collier's, saying in part: ". .Most of the articles I have read indicate that the advertisers of America are going to foot this enormous bill of providing television entertainment. I do not believe it! . . .The sooner we can persuade the technical talent of our industry that the advertisers are *not* going to pay for television, the sooner they will get busy and develop a means of technically obtaining a box office which will pay for the entertainment necessary to be offered by this great new industry."

That's television!

TELEVISION MODELS

EMERSON Radio and Phonograph Corporation recently presented the first two television post-war receivers to be produced by the company: a small table model with a 7-inch screen, and a chair-side console with a 10-inch screen. The table model is a straight television and accompanying sound receiver to retail at approximately $150. The chair-side model, which combines both radio and television, will retail at approximately $250.

The screen so exposes the television image as to be clearly seen by many onlookers in a room, either sitting or standing. This is a distinct improvement over the direct and indirect view receivers produced up to this time.

Mr. Benjamin Abrams, president of Emerson, announced that his company would begin producing the two new models some time in July and would be in full swing by September.

As to the place of television in the radio industry, Mr. Abrams said that with an industry production capacity of 20,000,000 radio receivers per year and with a normal demand of from

[*see page* 37]

OPTICAL SYSTEM

Larger, clearer television pictures from postwar home television receiving sets are made possible by a new image-correcting glass lens announced by American Optical Company. This lens is more than ten times as fast as an f/2.0 camera lens. Dr. E. D. Tillyer, research director, described the new lens as "the heart of a television receiver's optical system," and said its unique wave-like curves correct aberrations caused by projecting television tube images on a reflecting mirror used in the optical system to enlarge the images. He also announced a reflecting glass mirror as a companion piece to the correcting lens and said the combination permits reception of screen images five times larger than the prewar variety.

A television optical system using the new correcting lens-mirror combination functions as follows: Television images from the receiver's cathode-ray tube are projected on the mirror, then reflected through the correcting lens onto a flat mirror which in turn reflects the focused picture on the viewing screen. Larger, clearer tele-

[*see page* 37]

THEATRE TELEVISION

Experimental electronic equipment which revealed future possibilities for nationwide distribution and projection of theatre television was demonstrated recently to fifty General Electric officials and motion picture representatives at the private thirty-minute show involving facilities of the company's television station WGRB and the Civic Playhouse, Schenectady, N. Y.

G.E. engineers used microwave radio relay equipment to send the program from the WRGB studio to the Playhouse, where it was flashed on an 11 by 15 foot screen by a special television projector provided by the Rauland Corporation of Chicago. The program consisted of special films provided by 20th Century Fox Film Corporation and a live talent show produced by the WRGB staff.

Charles E. Wilson, G.E. president; E. N. Rauland, president of the Rauland Corporation; and Dr. W. R. G. Baker, vice-president in charge of G.E. electronics, were among those who witnessed the special demonstration.

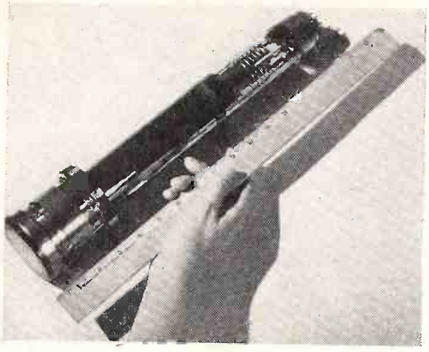
The Process

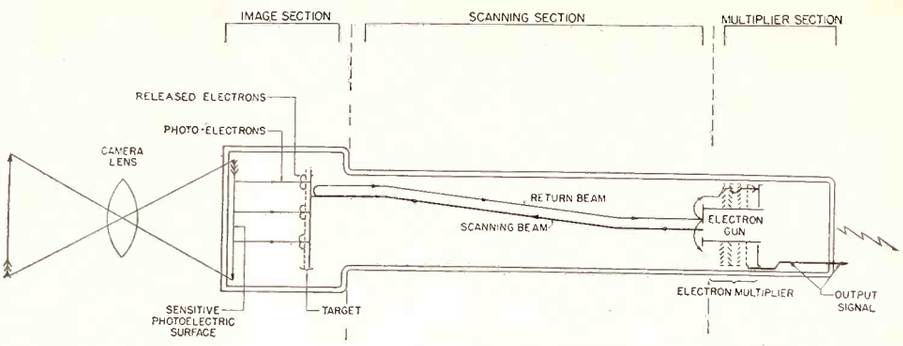
As the WRGB cameras "viewed" the various performances, the scenes were fed by way of coaxial cable to a special low-power microwave FM transmitter located on a tower adjacent to the studio. The transmitter output was then beamed by a directional transmitting antenna toward the Playhouse. Here another directional antenna picked up the microwave transmissions and supplied energy by way of coaxial cable to a special FM picture receiver. This unit fed the picture signals to the Rauland television projector which flashed them on the screen. The sound was also transmitted from the WRGB studios to the Playhouse by means of a radio link.

This was the first time microwave relay equipment has been used to feed television signals to a theatre for large-screen projection.

General Electric officials and Mr. Rauland stated that the demonstration was part of a broad program of research and engineering being carried

[*see page* 37]





RCA Image Orthicon tube is 15 inches long, about 2 inches in diameter. This new supersensitive "pick-up" tube is liberating television programming from its traditional dependence upon brilliant lighting. It assures round-the-clock coverage of news and special events, regardless of weather conditions. This was proven in televizing the Louis-Conn fight, where it was used in a specially designed lightweight portable television camera. Simplified drawing of the Image Orthicon shows how the tube's response to the light of a single candle or even a match is built up to provide a signal which can reproduce images on home receiver screens.

Super-Sensitive Tele-Pickup Tube

Image Orthicon Tube can televize scenes and events under extremely low light conditions. Promises new developments in telecasting, and in application of wired television for industrial and commercial ends.

by WALTER L. LAWRENCE*

THE development of the Image Orthicon, RCA's new super-sensitive television pickup tube, has opened new vistas of program possibilities for television broadcasters and promises to accelerate the application of wired television to the service of industry and commerce. The Orthicon is expected to revolutionize television programming. With it, broadcasters will be able for the first time to televise scenes and events, either indoors or out-of-doors, under extremely low light conditions, where pick-up heretofore has been impossible.

In combination with other features of the new RCA Image Orthicon Camera, in which it is incorporated, the new tube is especially well suited for televising events remote from the studio and those where brilliant lighting is either impracticable or undesirable. The portable camera is lightweight, simple to operate, and can be quickly set up and placed in operation. It is ideal equipment for televising out-of-door events and for remote indoor pick-ups such as may now be made in theatres, concert halls, schools, churches, courtrooms, and other public places.

By freeing television from its dependence on brilliant lighting of subjects, the new equipment will also substantially reduce the cost and complexity of television program production, thereby hastening the day when the smaller cities and towns will find television programming practicable.

The outstanding feature of the new tube is its tremendous sensitivity—approximately 100 times that of old-style pick-up tubes. In non-technical terms, the sensitivity of the new tube is comparable to that of the human eye. This means that it is now feasible to take television cameras anywhere that people go for visual entertainment, enjoyment, or instruction. For outdoor pickups, this would mean any event that normally attracts a crowd—sporting events, public celebrations, parades, testimonial ceremonies for public figures, and other newsworthy public events. The dependance on brilliant sunshine which used to limit the televising of outdoor events has been eliminated. Ability to schedule remote pickups on a "round-the-clock" basis makes available to the television broadcaster a wealth of low-cost, rehearsal-free, program material.

The increased sensitivity of the new pickup tube eliminates the need for ultra-fast lenses, which were costly items in older television cameras. Since the photo-sensitive surface on which the transmitted scene is imaged by the camera lens is comparable in area to that of a double frame of 35 mm. motion picture film, Image Orthicon cameras can utilize candid camera lenses, which are both inexpensive and readily available due to their high rates of production. The smallness of these lenses permits the use of a lens turret with its quick-change advantage.

These shorter-focal-length lenses, when stopped down to their higher "f" value gives much greater depth of focus than has hitherto been obtainable in television optical systems. No longer need the cameraman continually rack the lens back and forth while following a performer about. The development also makes readily available long-focal-length lenses of compact design for telephoto work.

Another important property is the great range of right levels that can be tolerated by the Image Orthicon without any adjustment of the camera controls. A variation in light level of several hundredfold can be accommodated without any change in control settings. This is particularly helpful in

*Engineering Products Department, Radio Corporation of America

television public ceremonies where press photographers use photoflash bulbs. In the earlier orthicon type of pickup tube, these bursts of high- intensity illumination frequently caused loss of picture for several seconds, due to charging or "sticking" of the light sensitive mosaic. This phenomenon does not occur in the new tube.

The cylindrical shape of the new tube—approximately 3 inches in diameter and 14 inches long—favors a camera design of convenient shape and proportions. Dimensions for the new RCA Victor field pickup camera, which is expected to become available in September, are 10 inches wide by 10 inches high by 22 inches long. It weighs about 45 pounds. The light, compact construction of this camera simplifies the cameraman's job in following fast action in sporting events and in covering "spectacular" news events.

Simplification of the camera control operator's job also results from the absence of the spurious or "shading" signal. The presence of such a signal requires continual adjustment of the shading controls as changes occur in the composition and illumination of the scene being televised. Because of its small size and independence of special lighting equipment, the RCA Image Orthicon camera is ideal for industrial and commercial applications of television, where space limitations, and the necessity for easy portability of equipment and freedom from the excessive heat and glare of special lighting, are important factors. Many very useful functions for television in industry are visualized, and some have already been tried and proven.

Television cameras operated at key points along a production line will permit coordination and over-all control from a central station in which operation can be observed on a television screen. Television cameras placed in locations where it is impossible or inconvenient to station a human observer, either because of space limitations, lack of accessability, or difficulty in transporting the observer to the point of observation, will provide means of monitoring operations or noting behavior of machinery or materials in such locations.

Processes which cannot be directly observed without exposure to explosives, flames, corrosive acids, poisonous fumes, or excessive heat or cold, can be kept under continuous observation and control by placing a television camera at the processing location and viewing a receiver screen in the safety of a remote station, protected by space or adequate structural insulation from the danger area.

TELEVISION ENTERTAINMENT UNLIMITED

by SOLOMON SAGALL*

UNQUESTIONABLY, there will be improvements in television both at the transmitting and receiving end. But these improvements will not necessarily make obsolete the television receiver which the industry is to bring out this fall. The public, which did not hesitate to buy early automobiles and which thus contributed to the growth of the American motor-car industry, will, similarly, not hesitate to contribute in a practical way to the development and growth of television by taking it out of the laboratory.

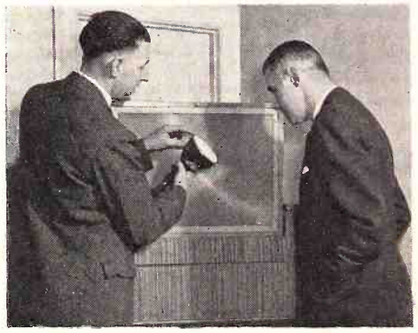
We are, of course, only on the threshold of commercial television. The future fare to be offered to televiewers is practically inexhaustible. One can possibly foresee the cooperation in the field of television, of theatres, the movie industry, newspapers and news - disseminating agencies. Since, within a few years, one could visualize a nationwide chain of television stations (linked by radio relays, coaxial cables, or stratovision transmitters), one could have a practically inexhaustible supply of news from all over the continent. Probably a few more years would be required to link this country with the rest of the world, by means of television. This would still further enrich the supply of news to home televiewers and to theatregoers.

A further, equally-rich source of television fare for audiences would be the supply by telecasts of sporting events from all over the nation, and, later, from all over the world. The World Series; the Football Cup Final from England, cricket from Australia, tennis championships from Wimbledon, the Kentucky Derby, the Grand National from England, skiing championships from Switzerland or Norway, yachting contests off the Riviera, perhaps even bullfights from Mexico would be viewed by means of television, as the events took place. In addition to sporting events, it can be easily seen that displays of fashions from Paris salons and similar items will have a tremendous appeal to the fairer half of the tele-audiences.

The receivers that were viewed on the night of the Louis-Conn fight were experimental models, housed in a hurry so that visitors could view the fight in large boxes prepared overnight by our handymen — ham-carpenters. Special cabinets designed by prominent industrial designers are on the way. Some of the Telicon models will have a unique feature in a "turntable" mount which permits placing of the cabinet in almost any part of the room the owner desires and turning the screen to face whichever direction is most comfortable for the viewers. Patent applications protect some special features of these sets, among them, the special push-button method of tuning which assures accurate trouble-free tuning and adjustment of the receiver to any of the 13 television channels. Full details will be released later.

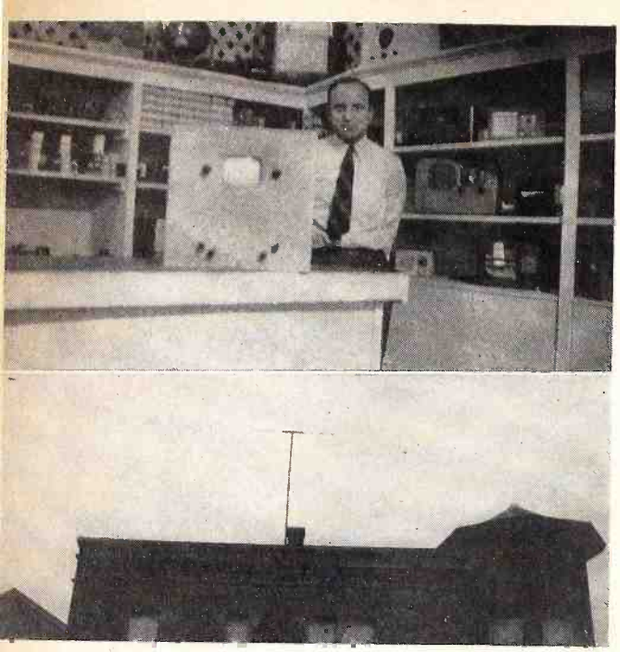
The lowest-priced Telicon, one giving approximately a ten-inch picture, will probably retail for around $350 to $400 while the two-foot screen set may retail for around $1,500. High quality of performance will be common to all our sets, whatever the price. Sets will make their debut at dealers some time in the fall.

Our engineers have made a substantial contribution to the furtherance and promotion of the growth of television by solving the greatest bugbear of modern television: satisfactory reception in multi-family houses. Telicon "intra-video" community reception systems assure "ghost-free" and interference-free reception from all transmitters for apartment houses. A further development of "intra-video" will result in a centralized television reception and distribution system for hotels, schools, hospitals, stores and the like.



THE COVER: V. J. Schaefer, GE engineer, shows W. H. Clarke, sales manager, equipment tubes, revolutionary features of new aluminum-backed television picture tube to be used in receivers similar to large-screen set shown on our cover. Tube triples sharpness and clarity on viewing screen of home television models.

*President, Telicon Corp., N. Y.



"TRAINS" Television Customers

by F. W. AMANN

WILLIAM DOMURAY, a radio and appliance dealer in Melrose Park, Illinois, has the whole town talking. Aware of the vast potential market television will command when this infant industry casts off its swaddling clothes (which will be soon, he predicts!) Mr. Domuray is building up a "taste for television" right in his own community.

In the appliance business for the past eight years, he opened his present store in September of 1943. The accompanying photo shows that Mr. Domuray's interest in television is definitely of the practical variety. On Wednesday evenings of every week for the past year he has been giving all who cared to see a unique treat . . . television shows. Wednesday evenings are chosen because it is then television reception is best for this vicinity.

With mostly "word of mouth" advertising, induced by the television sign displayed in his window, the tale of television has spread throughout the town until people flocked to his store eager to see television reception with their own eyes. A few came to scoff, but went away convinced that television, like radio, is here to stay! Domuray says there are always thirty to forty persons crowding in to watch the programs.

These broadcasts are tuned in on a set that he himself built; his third set, incidentally. Although his location is about seventeen miles from Chicago's television stations, Domuray says the pictures received on his set compare with the best he has seen. I've seen them myself, and they are clear and unwavering. A dipole antenna, rotated by an electric motor to keep the antenna always in line with individual stations, would result in even more perfect reception, he claims.

"My plan," Mr. Domuray said, "is to give people an idea of what television really looks like and what to expect. Then, when the new sets are on the market, it's my hope people will remember me and come in to buy from me.

"The average person certainly goes for television in a big way," he continued. "Why, I've heard any number of people remark, on seeing these broadcasts, 'That's what I want!'"

Among other comments overheard at the displays were: "I didn't know it was that clear!" and "How soon can I buy one?" Many people seemed willing to pay up to $500 for a television receiver, according to Domuray. "I could have sold a number of television sets immediately after last night's program," he said enthusiastically.

Because of his experience in building television sets, William Domuray will be able to offer expert repair and maintenance service to customers who buy future television receivers from him. These sets are complex and they will present greater complications in installing and servicing than does the ordinary radio. He is well prepared for this end of the business, too.

Top Left: Dealer Domuray with his own make television receiver; view of dipole antenna atop of his building. Store display (above) features promotion of television programs, in addition to servicing and sales. Preparation for television set sales marked in business cards which read: "*Domuray's Radio and Appliance Store, Expert Radio and Television Servicing*".

PRACTICAL POINTERS ON STORE DISPLAY

(From "Salesmaker", by Crosley Sales Promotion Inst., Cincinnati, O.)

The floor of every retail establishment in America is paved with dollars. In your store, they're YOUR dollars. They are the dollars you pay for rent or, if you own your store, they represent the money you pay for taxes, depreciation, interest on capital investment. They are what you pay for a place in which to do business — FOR FLOOR SPACE.

TWO JOBS

Floor space has two purposes: It is an area for customer traffic. It is a "showroom" for your merchandise. Since a basic rule of merchandising is "The more merchandise readily accessible to customers, the more merchandise sold" no modern merchant can afford to waste floor space. Utilization of floor space in the correct way is simply making every possible inch of it sell.

FLAT SELLING SURFACES

Investigation, research and years of experience by merchandising experts disclose that flat, rectangular selling surfaces, allow maximum "display" of merchandise. Concretely, this means The Selling Table, 2½ x 2½ x 5 feet, upon which any type of merchandise except floor models can be shown for sale, with usable area from **side to side and end to end** with no "blank" spots like those found usually in the fancy fixture or selling rack.

CUSTOMER TRAFFIC

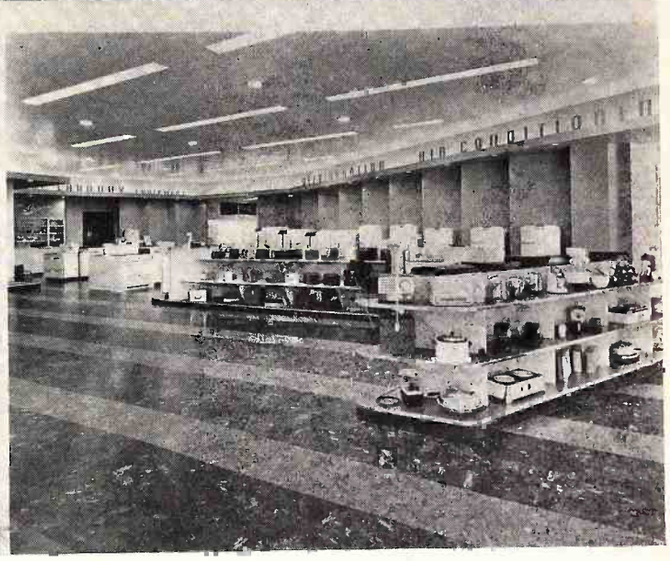
Investigation has also shown that customers like to shop a store with straight, well-defined aisles and customers shopping in such a store BUY MORE. This is simply explained: In a store that is chopped and hacked into a maze of confusing aisles, the customer's subconscious goes to work — the customer, to put it bluntly, feels that he has to watch his step or he's liable to bump into one of these grotesque shapes and wind up, as Fibber McGee says, "with a busted clavicle".

Consider the store your Institute recommends, with flat selling tables and straight aisles: here every inch of usable floor space is concentrating on the job of selling. No luxurious open vistas of space where your valuable rent dollars are going down the drain. No wasteful holes left by wierd convolutions of kidney-shaped or zig-zag selling fixtures.

Here there are no imagined traps or snares waiting for your customer. He's going in a straight line so his mind's at ease. His eyes are free to roam over the merchandise which you have displayed where he can SEE it, FEEL it and BUY it. His mind is free to shop and shop he does.

Check your store for its adherence to these basic rules of merchandising: (1) The modern store must have straight, well-defined aisles. (2) The more merchandise made readily accessible to customers, the more merchandise sold. If you're OK in both of those departments, you don't need store layout; if not, whip out that pencil, ruler and paper and get going! It's easy!

And the shape of your store is no problem—shallow and wide, or narrow and deep.



Live Displays BRING BUYERS

Top, left: Raymond Rosen Company rep. Ed Prinsky goes through a sales routine with Virginia Van Ness, head of Wilf Brothers new record shop. Other photos show backgrounds and displays of radios, major and traffic appliances. Note angle displays of radios and refrigerators; floor design leading into displays; also "broadcast" lighting. Above: Show windows are continuous, with full visibility.

THE appliance and radio section of the new store opened by Wilf Brothers in Philadelphia utilizes the trick of displaying freestanding merdise items at angles to gain the effect of spaciousness, and to attract and hold the attention of customers. The interior is ultra-modern in styling; color scheme is soft grey for walls, with blue trim. The lighting system, which casts no shadows, is a well blended combination of fluorescent and incandescent fixtures.

The appliance display is a "live" display:

Every *radio* is tuned to a station in readiness to play at the turn of a button.

The *vacuum cleaners* are plugged in in too, with a sample of carpet there ready for a demonstration.

The *washing machines* are hooked up, and there's hot and cold water in the taps so that demonstrations can be given by the salesmen at any time.

There is even a working kitchen with a range connected ready to use for actual demonstrations, and the sink has hot and cold running water.

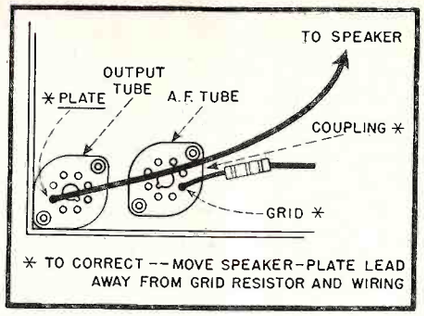
Floor selling is really taken seriously here. The whole scheme of the store is a background for modern merchandising techniques.

They have complete service and warehouse facilities in the rear of the store occupying an area of 55′ x 83′ on each floor. Here they will be able to install and service auto radios, repair and service any radio, install F-M and television sets, etc., repair and service many kinds of home appliances.

The soft rose, pink, bright blue, and soft grey color scheme of the appliance store is tellingly effective and the fluid type of display causes great comment from the customers, who are surprised and delighted to find appliances that are actually "ready-to-work."

The Wilf Brothers store, which is the last word in functional design, is located on one of the best business corners in Germantown; it has a frontage of 90 feet on Chelten Avenue, and 90 feet on Green Street, both of which are extremely busy thoroughfares. Chelten Avenue has two-way street-cars, and five bus lines operate a steady stream of buses on both streets, and the foot traffic past the store is very heavy both day and night. The store was under construction for eight months, and improvements cost well over $100,000.

Figure 1. Example of audio feedback caused by improper arrangement of wires.



DIS

Equipment and methods required for determining the cause of both hum and distortion. Ordinary voltage and resistance checkups often fail to reveal the trouble.

BY means of a few simple observations and checks, a general idea of the location of the fault as to the stage or section (i.e., R.F., I.F., Det., etc.) of the receiver can be obtained.

In broad terms, there are two general types of distortion:

1. Signal distortion which is the result of an extraneous frequency combining with the desired frequency.
2. Tube distortion which is the result of the tube in any stage being operated on a non-linear portion of its characteristic curve.

Extraneous Frequency

The extraneous frequency which causes signal distortion can originate in but two ways: *First,* by the reception of two out-of-phase carrier waves, of nearly equal intensity such as a sky-wave and a ground-wave, or two sky-waves with different angles of refraction. These combine to produce a distorted modulation envelope which results in the distortion. The condition is readily recognizable because it is unstable and will exist only on distant reception. There is no remedy for this type of distortion; however, in some cases, changing the position of the receiving antenna, or the receiver itself, if it is a loop-type, to increase sensitivity, will alleviate the condition (if it is chronic rather than a temporary atmospheric condition); *Second,* by the introduction of an extraneous frequency somewhere in the receiver, which combines with the audio portion of the signal to produce the distortion. The extraneous frequency can originate in two ways:

1. From defective filtering, in which case the extraneous frequency is either a 60 cycle hum or a hum at the ripple frequency of the rectifier.
2. From regeneration somewhere in the receiver, in which case the extraneous frequency is a whistle of a pitch determined by conditions surrounding the circuit failure.

Recognition of the type of distortion just described is made plain by the fact that the extraneous frequency will exist during the periods when the modulation of the desired carrier is zero. In other words, by listening to the output of the receiver and noting whether a hum or whistle is present when the program ceases momentarily, the presence of an extraneous frequency can be detected, and the fact that the distortion is caused by it ascertained.

Cause of Hum

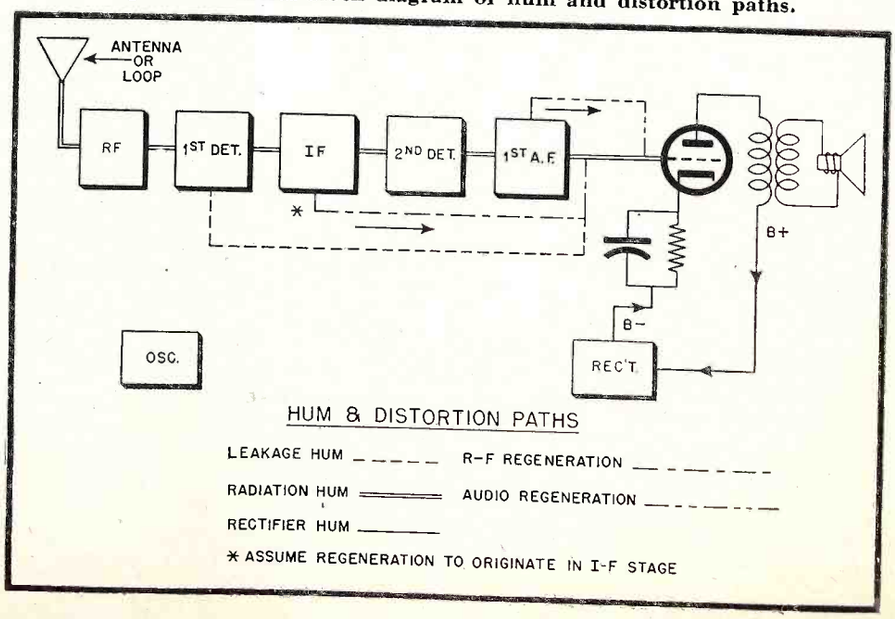
If the presence of a hum is detected, its cause can be determined by proceeding as follows: Ground the antenna (or short the loop in the event that one is used in place of an antenna) on the receiver in order to kill the incoming signal. Observe whether the hum is still present. If it is not present, the receiver must be picking the hum up from a nearby 60 cycle power line. The line condensers, position of the antenna and lead-in or the location of the receiver should be changed so as to move out of the field of the 60 cycles.

NOTE: A very common example of this condition occurs when the a-c cord to the receiver is very close to the loop. If the hum remains present, turn the receiver volume control all the way off. If the hum dies away, it is caused by a defect that exists somewhere between the antenna stage and the high-side of the volume control (i.e., between the antenna and the second detector).

The trouble can be located as to *stage* by removing the tubes, one at a time, beginning with the 1st R.F. tube and proceeding, in order, to the second detector tube. When the removal of some particular tube causes the hum to cease, check the tube by replacing it with one known to be good. If the tube is O.K., check the circuit of that stage with an ohmmeter for shorts or leakage from filament to ground, filament to cathode and cathode to grid.

Also check for an open or "floating grid". If the hum remains with the receiver volume control turned all the way off, the hum is caused by a defect in either the rectifier, audio system, or the volume control itself. Check the volume control for continuity through the wiper-arm. Check the audio stages using the same procedure as was given for the R.F. and I.F. systems. In addition, check the grid, cathode and plate by-pass condensers by shunting another condenser across them and observing the effect upon the hum. If the hum remains in evidence

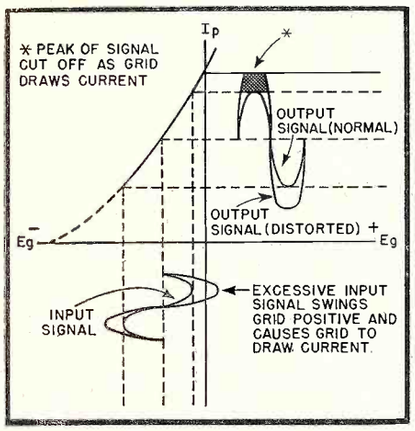
Figure 2. General block diagram of hum and distortion paths.



TORTION

by C. C. ROBERTS

Part One.



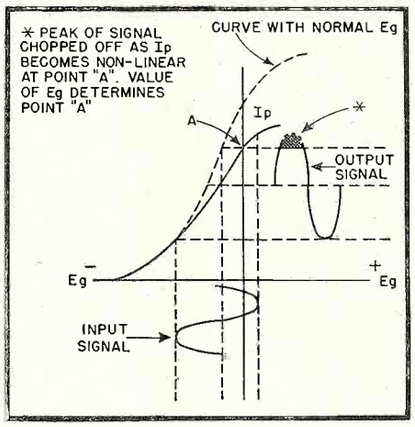


Figure 3. Illustration of distortion caused by overloading. Figure 4. (right): Distortion caused by operation of non-linear portion of characteristic curve.

with all the tubes removed with the exception of the final output tube, the cause of the hum must be in either the loudspeaker, the rectifier or the output stage itself.

The rectifier and output tubes should be checked by replacement and, if the hum persists, the audio stage, continuity and by-pass checks previously mentioned should be made on the output stage. If the output stage is O.K. the rectifier filter condensers should be checked by shunting a like capacity across them and noting whether the hum remains. If it does, the resistance value of the filter choke or field coil of the speaker (depending upon the circuit of the receiver in question) should be checked with an ohmmeter. If the above checks reveal no trouble, the final check to be made is on the hum-bucking coil of the speaker. A check should be made to see that the hum-bucking coil is not shorted or its polarity reversed.

Cause of Whistle

If the presence of a regenerative whistle is detected, its cause can be determined as follows: Slowly tune the receiver through the side-bands of the carrier. If the whistle varies in pitch, i.e., the frequency of the regenerative whistle seems to increase as the side-bands are approached, the extraneous frequency results from regeneration somewhere in the I.F. or R.F. section of the receiver and the trouble can be found by following the procedure outlined in the article entitled "Trouble-Shooting by Resonance Testing" found in the September 1944 issue of **RADIO SERVICE DEALER.**

If the whistle remains the same in pitch while the receiver is slowly tuned through the side-band of the carrier, the regeneration can only be the result of a beat-frequency. This can only be due to the presence of a powerful marine or aircraft range transmitter whose frequency is at or near that of the I.F. of the receiver. The remedy may be found in either installing a wave-trap (tuned to the I.F. of the receiver) in the antenna circuit of the receiver or shifting the I.F. of the receiver ten or twelve K.C. so as to preclude the signal from the marine or aircraft range transmitter from being amplified in the I.F. stages of the receiver.

One other kind of regenerative distortion may occur. This is due to audio regeneration. Distortion due to audio-regeneration can be identified primarily by the fact that it dies out very rapidly. In effect, the audio-regeneration is a squeal or howl that distorts the output of the receiver for short periods of time. The regeneration is the result of an audio stage being shocked into oscillation by heavy audio-signals. Due to the low frequencies involved, the oscillation is shortlived. Location of the audio stage responsible for the condition can most readily be made by using earphones to listen to the output of each stage starting with the first, and ending with the final output stage.

To be explicit, if we hear the howl or squeal with the earphones attached to the plate (through a 0.1 mf condenser) of the first audio stage, but do not hear it with them attached to the output of the second detector, then the regeneration is occurring in the first audio stage. Once the offending stage has been identified, the usual checks for the cause of the regeneration should be made, such as tube, by-pass condensers and, in this case *especially*, the wire dress should be checked.

Audio-regeneration is very frequently caused by feedback from the plate of the same stage, or from the plate of one nearer the final output stage, to the grid. This feedback is usually caused by the proximity of two wires. The wiring of the audio stage should therefore be checked by moving all grid and plate leads away from each other. *Fig. 1* shows an example of this type of coupling. *Fig. 2* is a general block diagram showing the signal paths of various common extraneous frequencies.

Tube Distortion

Tube distortion is often more noticeable than the signal distortion previously described because it directly affects all audio frequencies of the signal equally. As previously stated, tube distortion is the result of operation on the non-linear portion of its characteristic curve. This can happen in two ways:

1. When the tube is overloaded.
2. When the operating voltages of the tube deviate from their normal values.

Fig. 3 shows the output from an overloaded tube. *Fig. 4* shows the output from a tube whose operating voltages are such that the tube is not operating on the linear portion of its characteristic curve.

Overloading of a tube can only be caused by excessive signal applied to the grid. This can occur in a well designed receiver only when the A.V.C.

[*see page* 36]

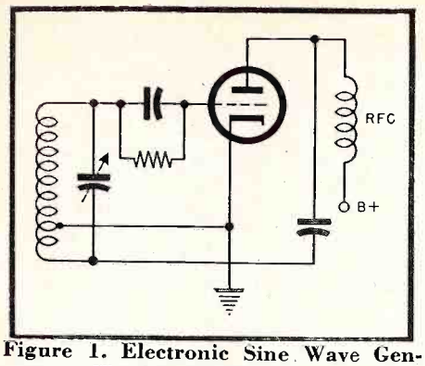


Figure 1. Electronic Sine Wave Generator—Hartley Oscillator.

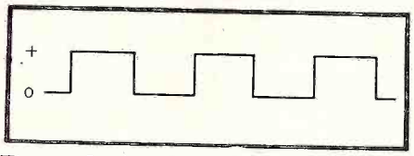


Figure 2. A desired nonsinusoidal waveform.

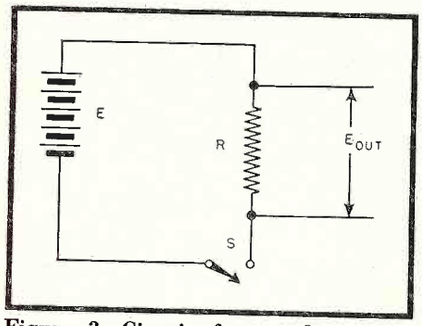


Figure 3. Circuit for producing the voltage & current waveform of Fig. 2.

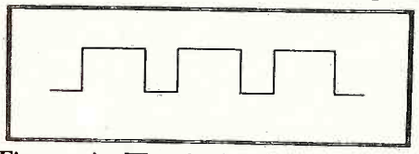


Figure 4. Waveform obtained from circuit of Fig. 3 if switch open and close time were of unequal duration.

MULTIVIBRATORS

Pointers on operation of multivibrator circuits used in television receivers & in frequency calibrating equipment

PART 1

By OSCAR E. CARLSON

UNDERSTANDING the generation of non-sinusoidal waveforms is an integral part of the knowledge required to understand television and radar fundamentals.

In conventional broadcast radio theory sine waves of voltage and current have been the only requirement for the service dealers' knowledge of a.c. waveforms. With commercial television soon to be added to the service dealer's list of repair business and commercial radar to be added to the marine and aviation radio operators' stock in trade, it is necessary for the far-sighted radio technician to improve his knowledge of these required fundamentals

We are familiar with the generator action for mechanical generation of sine waves and with the simple electronic generator as exemplified by the Hartley Oscillator, *Fig. 1.* Such a circuit generates sine waves of a frequency determined by the grid circuit inductance and capacity.

Suppose, however, that our required waveform is as seen in *Fig. 2.* This is, you may say, simply interrupted D.C. Let us consider it from that standpoint for a moment. *Fig. 3* illustrates a means of producing such a voltage or current waveform. Opening and closing the switch of that circuit at proper time intervals will cause a current variation through the resistor, R, *Fig. 2.* If the open and closed periods were of unequal time duration a waveform as of *Fig. 4* would result.

To obtain a repetition rate of 60 periods per second would require that the switch, *Fig. 3,* open and close 60 times a second or 60 × 60 = 3600 times per minute. This could be accomplished with a motor driven switch of the commutator type. But if we wished to obtain a repetition rate of

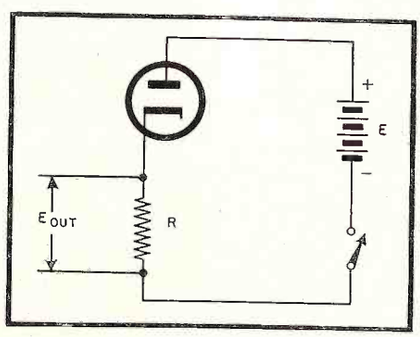


Figure 5. Revision of Fig. 3 to show use of diode type vacuum tube.

our motor speed would soon become the limiting factor.

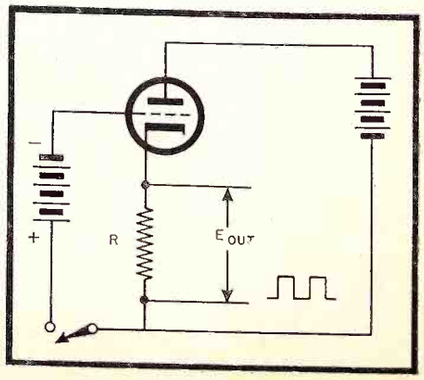
If we revise *Fig. 3* to that of *Fig. 5,* we have added a diode in the circuit and the voltage waveform across the resistor is still determined by the open and closed periods of the switch. The tube acts merely as an additional circuit resistance. Further revision of that circuit gives us *Fig. 6* wherein many thousands of times per second a triode tube is employed. Here the switching allows the tube to operate alternately between a condition of open grid and cutoff bias condition.

It is evident that we must eliminate the mechanical switch not only to make this a pure electronic device, but also to allow for the generation of higher frequencies of our non-sinusoidal waveform. *Remember that the triode of Fig. 6 may be made non-conducting by a sufficiently negative grid bias.*

In *Fig. 7* the triode would conduct with the switch in position 1. With the switch in position 2 the capacitor "C" would charge up to the battery voltage. Turning the switch to position1 again would not make the tube conducting until the capacitor had discharged through R3 sufficiently for the bias to reach the conduction level for the tube. *Fig. 8* illustrates the various waveforms of voltage and current for this.

In *Fig. 9,* that of a conventional multivibrator, the grid bias battery and switch are replaced with another tube. The circuits for both tubes are

Figure 6. Use of a triode in control action of current through a resistor.



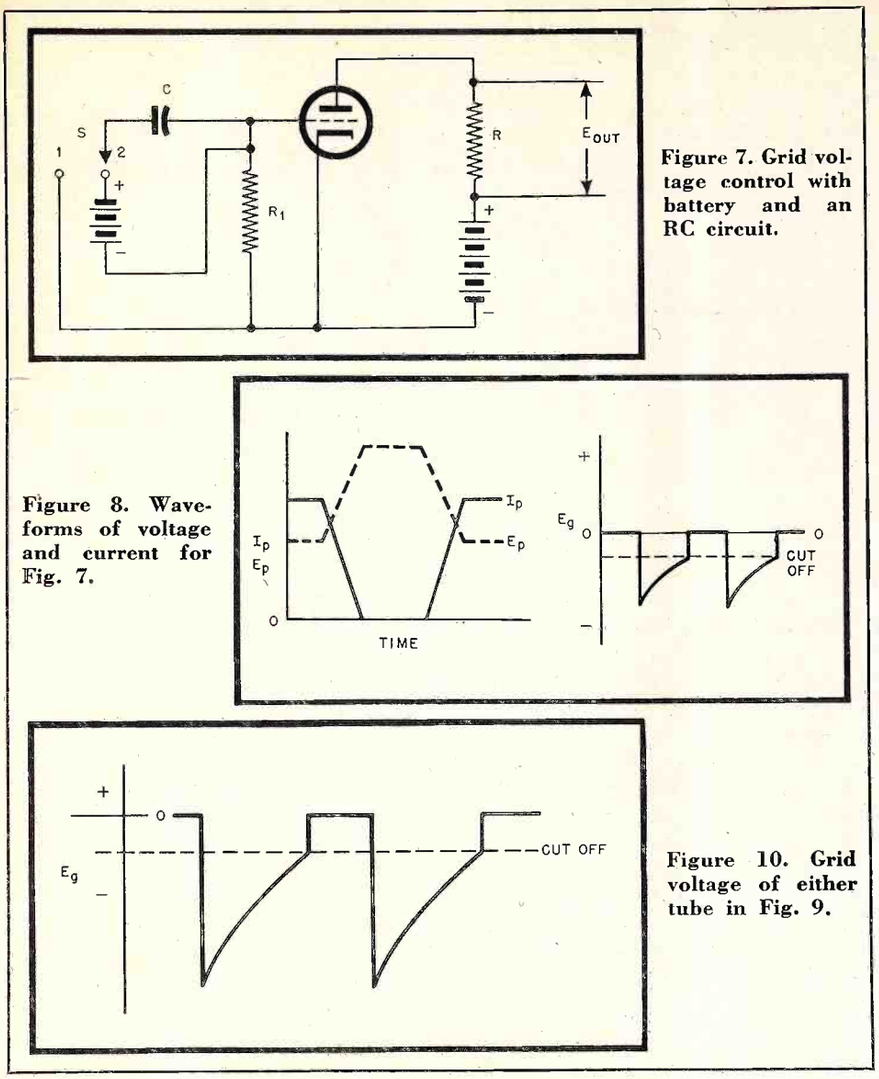


Figure 7. Grid voltage control with battery and an RC circuit.

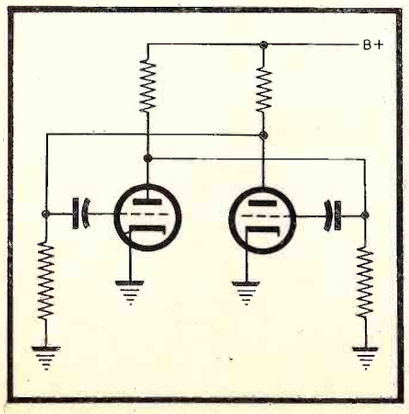
Figure 8. Waveforms of voltage and current for Fig. 7.

Figure 10. Grid voltage of either tube in Fig. 9.

identical. The plate circuit of one is used to control the bias on the other. This is the popular "Multi-Vibrator" type of relaxation oscillator. An output voltage may be taken from either plate, or either grid. The voltage waveform required will determine whether plate or grid is used as output circuit.

The instant power is applied to this circuit both tubes have zero bias and begin to draw plate current. Since no two tubes are perfectly matched as to plate current versus heating time of cathode, one tube will act previous to the other. The tube which first starts to draw plate current causes a decrease in its plate voltage. This plate voltage decrease allows the grid coupling capacitor to couple a negative step of voltage across the grid resistor of the other tube.

Figure 9. Conventional Multivibrator circuit.



Thus the tube which started at zero bias has its grid voltage very nearly instantaneously made equal to the negative step, and will then slowly *increase again toward zero bias following the exponential rise of the capacitor discharge.** This discharge is through the associated grid resistor. As this tube starts to draw current a negative step of voltage is applied to the grid of the other tube and the process repeats. First one tube conducts, then the other. Here then we have an electronic switching device wherein two tubes alternately conduct and shutoff. The grid voltage for either tube may be seen then to follow the curve of *Fig. 10.*

At the instant of zero bias the plate current of the tube at that bias level is at some maximum value. Plate voltage will be at a minimum. As the grid goes negative the plate voltage increases until E_g reaches cutoff and stays at that value until E_g returns to the cutoff value in its decrease toward zero bias again.

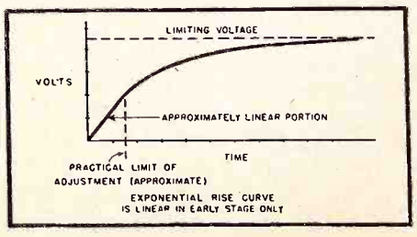
Since the time of cutoff determines the frequency of the waveform of *Fig. 10* our frequency is then a logarithmic function of capacity and resistance used in the grid circuit. Our frequency depends also upon the voltage required to cause plate current cut-off. This cutoff bias is a function of plate voltage, and the tube gain, or Mu.

The value of the supply voltage for the plate circuits and the value of the load resistors in the plate circuit will determine the upper frequency limit to which the multivibrator will supply square wave output voltage from the plate circuit. Each tube must be considered as an RC coupled amplifier. (This is true since the multivibrator circuit is essentially a two stage resistance capacitance coupled amplifier with the output circuit of each stage feeding the input of the other.) When each tube is considered as being a stage of resistance capacitance coupled amplification, that stage must as an amplifier have a band pass characteristic such that it would pass all the components going to make up the complex nonsinusoidal waveform we wish to generate.

Without going into the analysis of complex waveforms, let us assume that a square wave of voltage may be synthesized by a group of sine waves. The lowest frequency sine wave is that which would occur in the time of one cycle of the square wave. The highest frequency required will be for a nearly perfect square wave a sine wave of some twenty times the frequency of the fundamental. (A review

[*see page* 41]

Editor's Note: TV sweep circuits make use of exponential discharges which are initially linear for all practical purposes, but which can distort the picture when too long a discharge is utilized. If crowding of the picture to one side of the screen is observed, the remedy lies in using less sawtooth drive voltage, and more gain in the sawtooth amplifier (when used). Note diagram below.



L. to r. Model 561, mahogany. Model 562, 563, plastic.

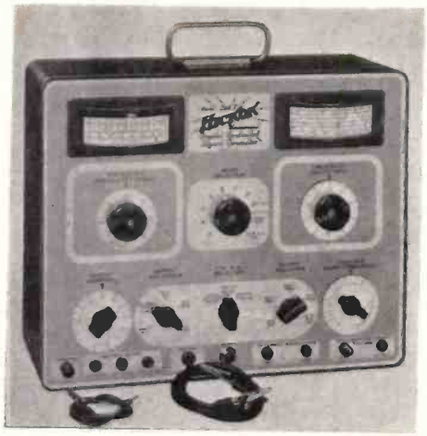
MODELS GO TO DEALERS

Nate Hast, merchandise manager of the Lear Home Radio Division, announces that dealers are now able to offer the first of three table models in the 5-tube series to buyers. One model is in hand-rubbed genuine mahogany, and two in plastic are to be ready shortly. "Our production on these sets is going ahead enough to keep dealers fairly well sampled in a limited way," Mr. Hart said. "Production on console and radio-phonograph combinations is scheduled and we should have these sets in the hands of dealers in 60 to 90 days.

Table model 561 in mahogany, has an OPA ceiling of $31.50. 8x10x6¾ inches, with full-vision, angle-mounted, illuminated slide rule dial. This set can easily fit into the background of any room with almost every type of furniture.

It has a single band for standard broadcast from 540 to 1730 kilocycles. The five tubes carry eight-tube functions. The speaker is dynamic, permanent magnet, Alnico No. 5; built-in loop, with outside aerial connection.

The other two table models have plastic cases. Model 563 ceiling price is $25.20; is of ivory plastic; Model 562, of mahogany plastic, has a ceiling price of $24.15. Specifications are the same as Model 561.



Crystal Controlled Signal Generator

Features of the new Hickok signal generator, now in production, are:

Amplitude modulation coverage from 100 k-c to 110 m-c.

Frequency modulation coverage 100 k-c to 160 m-c with three variable bandwidths of sweep. 0-30 k-c, 0-150 k-c, 0-450 k-c.

Frequency modulation at two self-contained modulating frequencies: 60 cycles and 400 cycles.

Provisions for external frequency modulation to 15,000 cycles.

Provisions for external amplitude modulation to 15,000 cycles.

Self-contained amplitude modulation at 400 cycles.

0.01% accurate crystal controlled outputs, both amplitude modulated at 400 cycles and unmodulated. Offered in Models 288X and 277X only.

Continuously variable audio frequency from 0-15,000 cycles. Audio frequency and radio frequency outputs are continuously variable from zero to maximum.

60 cycle synchronized sweep voltage is available for use with an oscillograph.

Self-contained decibel meter with 42" cable. Model 288X only.

One 42" shielded cable is furnished for the signal output.

Power consumption: 20 watts at 115 volts.

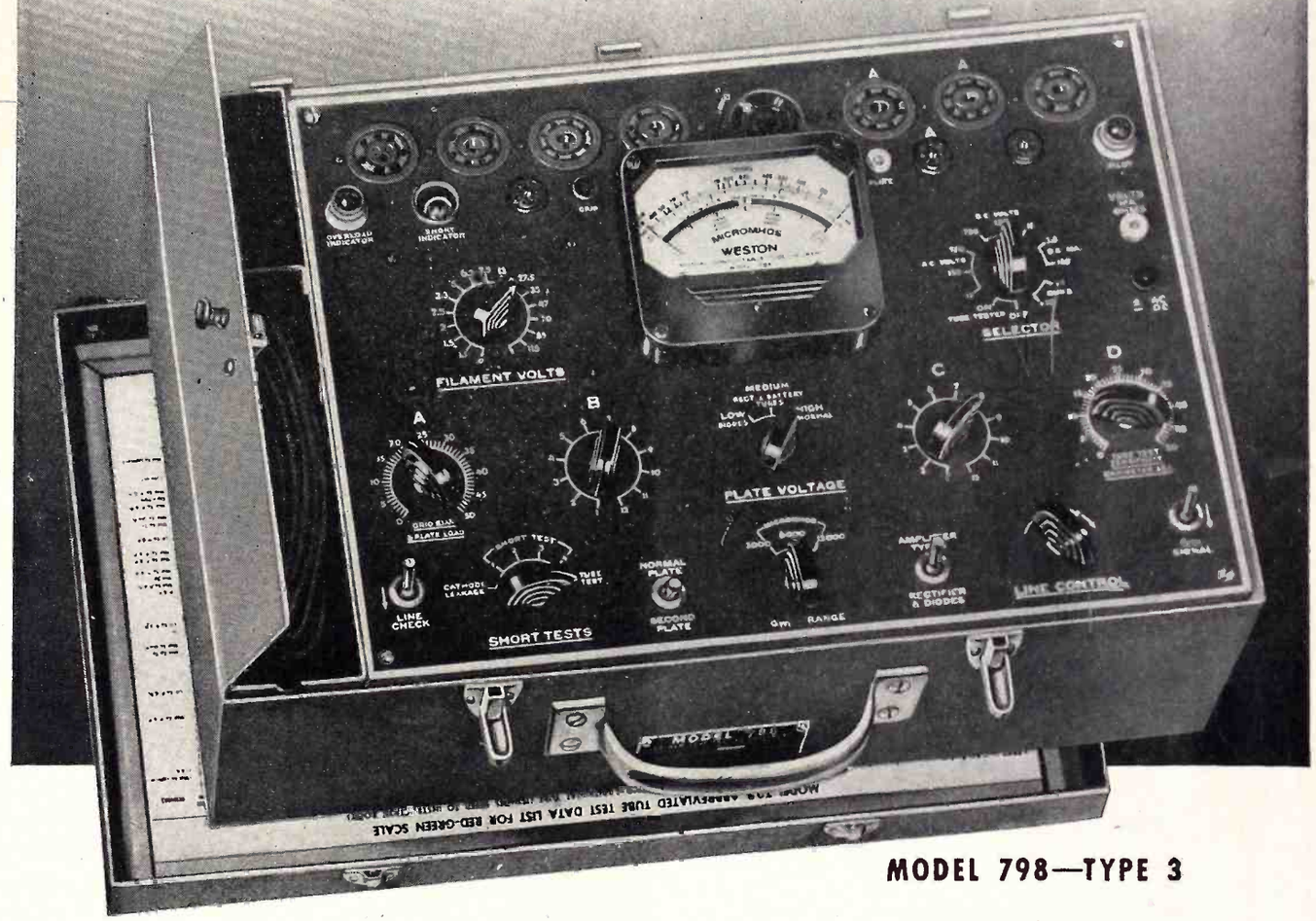
Dimensions: 14" x 16½" x 8". Weight: 28 lbs. Manufactured by the Hickok Electrical Instrument Company, 10533 Dupont Avenue, Cleveland 8, Ohio.

New Record Demonstrator

A new booth demonstrator, the first of its kind specifically designed and manufactured for its record dealers' listening rooms, is announced by the RCA Victor Record Department. Every detail of construction and design has been worked out from the dealers' point-of-view. Delivery of the new demonstrator is expected to start about July 15, according to M. Seklemian, General Sales Manager of the Department.

The unit is in modern styling, exceptionally large for a booth demonstrator, measuring 18½ inches wide; 14 inches high; and 20½ inches deep. It was necessary to make the demonstrator large in order to accommodate the 12-inch speaker, powerful motor and 7-watt power supply.

NEW!! WESTON Mutual Conductance Tubechecker and Circuit Analyzer



MODEL 798—TYPE 3

Outstanding Features

- ✓ Direct-reading mutual conductance tests, and "Good-Bad" indications.
- ✓ New patented high frequency tube testing circuit.
- ✓ AC-DC volt-ohm-milliampere ranges.
- ✓ Tests 4, 5, 6, 7 prong octal, loctal, miniature, and acorn tubes...spare octal and miniature sockets.
- ✓ Hot neon leakage test between any two tube elements . . . neon short check.
- ✓ Adjustable plate, screen, grid bias, and signal voltages.
- ✓ Flexibility in switching simplifies testing present and future tubes.
- ✓ Durable heavy-gauge, light-weight alumium case.

Model 798 combines broad utility, ruggedness, and dependable accuracy for maintenance of sound and electronic equipment. Detailed bulletin available. Weston Electrical Instrument Corporation, 605 Frelinghuysen Avenue, Newark 5, New Jersey.

Weston Instruments

ALBANY • ATLANTA • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • JACKSONVILLE • KNOXVILLE • LOS ANGELES • MERIDEN • MINNEAPOLIS • NEWARK
NEW ORLEANS • NEW YORK • PHILADELPHIA • PHOENIX • PITTSBURGH • ROCHESTER • SAN FRANCISCO • SEATTLE • ST LOUIS • SYRACUSE • IN CANADA, NORTHERN ELECTRIC CO., LTD., POWERLITE DEVICES, LTD.

CIRCUIT COURT

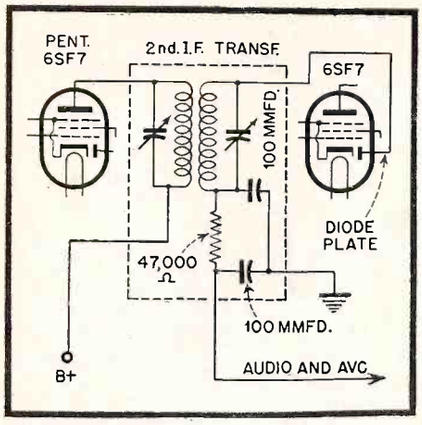


Figure 1A (Westinghouse)

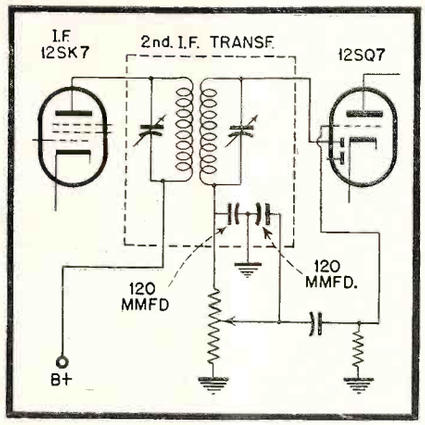


Figure 1B (Bendix)

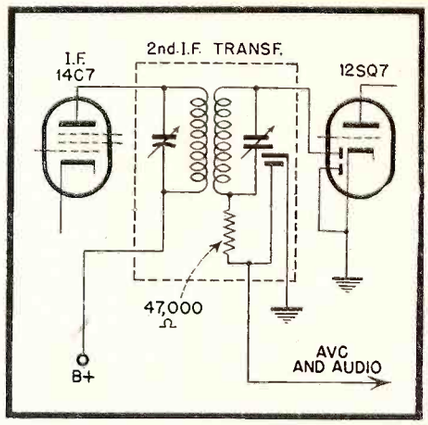


Figure 1C (Zenith)

BY-PASS CONDENSERS

A feature frequently found in recent receivers, particularly the more compact and less expensive variety, is the incorporation of by-pass condensers inside the second intermediate transformer shield can. Since these are not evident during an inspection of the chassis, and often not too clearly shown in the schematic diagram, and are subject to failure and need for subsequent replacement, it would seem wise to investigate their type and variety.

Fig. 1*A* shows the adaption of the plan used in the Westinghouse H-122 and H-130. In this case two 100 mmfd. units of the conventional moulded mica variety are used to by-pass the I.F. voltage to ground, one on either side of a 47K ohm resistor which is also included in the can.

In *Fig.* 1*B* is illustrated the method employed in the Bendix 526 series. Here we find that the trimmer capacitor of the secondary has an extra plate coupled to the low potential side and connected to the shield for a ground. This by-passes the I.F. voltage and permits the audio voltage to continue its path out to the remainder of the circuit.

Still another type of construction is shown in *Fig.* 1*C*, used in Zenith models 6D014 and 6D029. Again we find a 47K ohm resistor as a part of the filter and two extra plates in the trimmer assembly of the secondary. It can be seen that one plate is common to the pair at either end of the resistor. This common element is returned to ground and the operation is similar to the ones just covered.

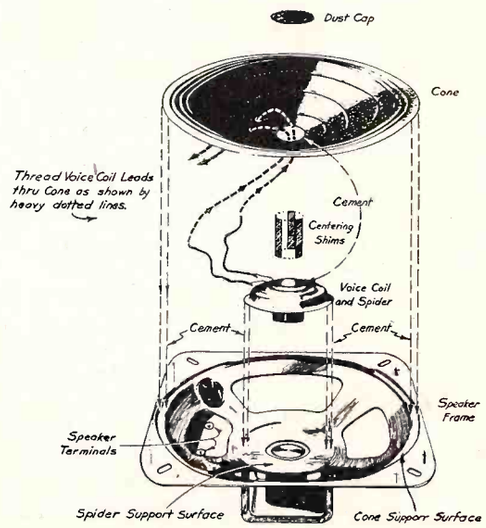
[*see page* 34]

GENERAL ELECTRIC

RADIO SERVICE BULLETIN

RSM-3, NO. 2. JUNE 1946

SUBJECT: REPLACEMENT OF SPEAKER CONES.



The following procedure is recommended for replacing speaker cones of all sizes. The speaker illustrated is a 5-1/2" speaker, however the procedure is the same or similar in all cases.

1. Disassembly.
(a) Unsolder the voice coil leads, then tear away the cone and voice coil assembly from the frame of the speaker.
(b) Clean the surfaces to which the spider and cone were cemented by saturating with acetone until the material may be scraped away from the frame.
(c) Clean out the voice coil gap in the speaker frame with a dampened, lintless paper.

2. Assembly.
The cone is assembled to the speaker frame as shown in the illustration and as per the following procedure:
(a) Spread speaker cement, Part No. UIC-001, over the spider support surface of the speaker frame so that when the spider is in place the complete surface of the spider mounting flange is wetted by the cement. Do not get cement near voice coil gap.
(b) Immediately place the spider in its proper position in the speaker frame so that the voice coil is approximately centered in the gap. Make sure that the voice coil leads are turned towards the same side as the speaker terminals as illustrated.
(c) Place three centering shims down between the voice coil and pole piece so that the shims are equally spaced around the gap. The arrangement of the shims before insertion is shown in the illustration. Celluloid centering shims are usually available in kits of variable thickness. A glossy-coated paper of proper thickness may be used in place of the celluloid shims, cut to 1/4"-wide strips. The recommended thickness of the shim for the various size speaker cones is given in the table on the reverse of this sheet.
(d) Allow cement to set firmly, then spread speaker cement over cone support surface. Using a fine brush apply cement around the outer surface of the voice coil where it is joined to the spider.
(e) Place cone down into housing, at the same time thread the voice coil leads from spider up through center hole of cone. The cone should be oriented so that the two small holes face the speaker terminals.
(f) Apply cement to center of cone where it joins the voice coil. Do this carefully because the voice coil transmits the sound to the cone through this bond. Do not allow cement to run into the gap.
(g) After cement has set firmly, cement cone gasket to rim of the cone.
(h) Thread voice coil leads through holes in cone and solder leads to the speaker terminals. Leave some slack in leads to permit normal movement of cone in air gap and dress them so they will not rattle against the cone. Cement voice coil leads where they pass through cone on both sides. Also cement the fine single strand voice coil leads to the cone surface, otherwise they may cause rattle during operation.
(i) Remove centering shims after assembly is thoroughly dry. Cement dust cap in place using cement at the edge only.

REPLACEMENT CONE PART NUMBERS

The following replacement cone information should be added to the RSM-1 service data sheets:

Service Note Reference	Models Involved	Replacement Cone Part No.	Cone Centering Shim Thickness
ER-S-100	100,101,103,105	UOX-008	5 to 6 mils
ER-S-219	219,220,221	UOX-008	5 to 6 mils
ER-S-106	106	UOX-001	5 to 6 mils
ER-S-250	250	UOX-006	5 to 6 mils
ER-S-321	321	UOX-008	5 to 6 mils
ER-S-326	326	UOX-005	7 to 8 mils

The Part No. for the cone cement is UIC-001.

Keep Your Name in Front with
N. U. BUSINESS-BUILDERS

One of the largest and finest assortments of dealer helps and sales promotional material ever offered to radio service dealers is now available from National Union Distributors. Here are business-builders for practically every need of the radio service engineer. All are smartly designed in the most modern styles. Many are offered with personalized imprint of your name and address. Let N. U. help you advertise *your* business, find new customers and increase your sales.

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- Cartoon Cards
- Trouble Finder Folders
- Battery Cross-Indexes

TECHNICAL HELPS

- Electronic Engineers Reference Manuals
- Service Engineering Bulletins
- Uniballast Manuals
- Visual Aid Vacuum Tube Charts

COMING

- Window Displays
- Outdoor Signs
- Indoor Signs
- Imprinted Scotch Tape
- 4 Purpose Tube Decals
- Shop Coats

National Union Radio Corp.

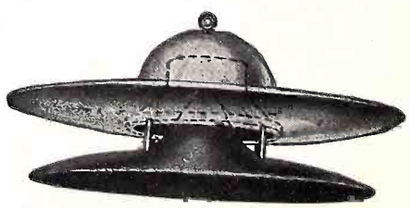
Newark 2, New Jersey

Transmitting, Cathode Ray, Receiving, Special Purpose Tubes • Condensers • Volume Controls • Photo Electric Cells • Panel Lamps • Flashlight Bulbs

RACON IS THE BEST IN SOUND EQUIPMENT

RADIAL HORN SPEAKER; a 3½' re-entrant type horn. Projects sound over 360° area. Stormproof. Made of RACON Acoustic Material to prevent resonant effects.

PAGING HORN; extremely efficient 2' trumpet speaker for use where highly concentrated sound is required to override high noise levels. Uses P.M. unit.



RADIAL CONE SPEAKER; projects sound over 360° area. Cone speaker driven. Will blend with ceiling architecture. RACON Acoustic Material prevents resonant effects.

Leading Soundmen everywhere specify RACON Horns, Speakers and Driving Units when quoting on potential sound installation sales or rental contracts because RACONS deliver maximum output and response for size of driving unit used. There's a RACON sound reproducer for every conceivable purpose. Each affords more dependable and efficient service and they are competitively priced.

SEND FOR CATALOG
OF COMPLETE LINE

RACON ELECTRIC CO., INC. 52 EAST 19th ST. NEW YORK, N. Y.

In the Trade

[*from page* 5]

mc) band, and standard AM programs. The sets will be of the console type and will be combined with phonographs, each having a revolutionary system called the G-E electronic reproducer that will produce a high degree of realism in recorded music. Other FM models, including table sets, will be put in production in August and all will be built by the G-E Receiver Division in Bridgeport.

As a feeder for the FM receiver market the G-E Transmitter Division (Syracuse, N. Y.) is making FM station transmitters to fill more than 125 orders. FM transmitters have been shipped to WGN for use in Chicago, to the Canadian Broadcasting Corporation for installation on Mt. Royal outside Montreal, to KFI in Los Angeles, and the G-E station WGFM at Schenectady. The new FM transmitters use a revolutionary circuit and phasitron tube development which enable direct crystal control and will operate with fewer tubes and simpler circuits than pre-war FM transmitters.

Ohmite Lab Dedicated

The Ohmite Laboratory was dedicated June 18 in all-day ceremonies at the Armour Research Foundation of Illinois Institute of Technology to serve industry of the middle west with precision electrical measurements established on the basis of and approved by the Bureau of Standards. Established through an endowment by David T. Siegel, president of the Ohmite Manufacturing Company and a '26 graduate of Illinois Tech, the laboratory is equipped with $35,000 worth of testing and measuring apparatus that permits frequency calibration to 20 megacycles, the measurement of the power factor and dielectric constant of liquid dielectrics to an accuracy of 0.01%, and audio and radio frequency measurements and calibrations. Although calibrations are not of the same fineness and preciseness of those of the Bureau of Standards, they have been perfected to fulfill most of the needs of industry.

Phonola Production

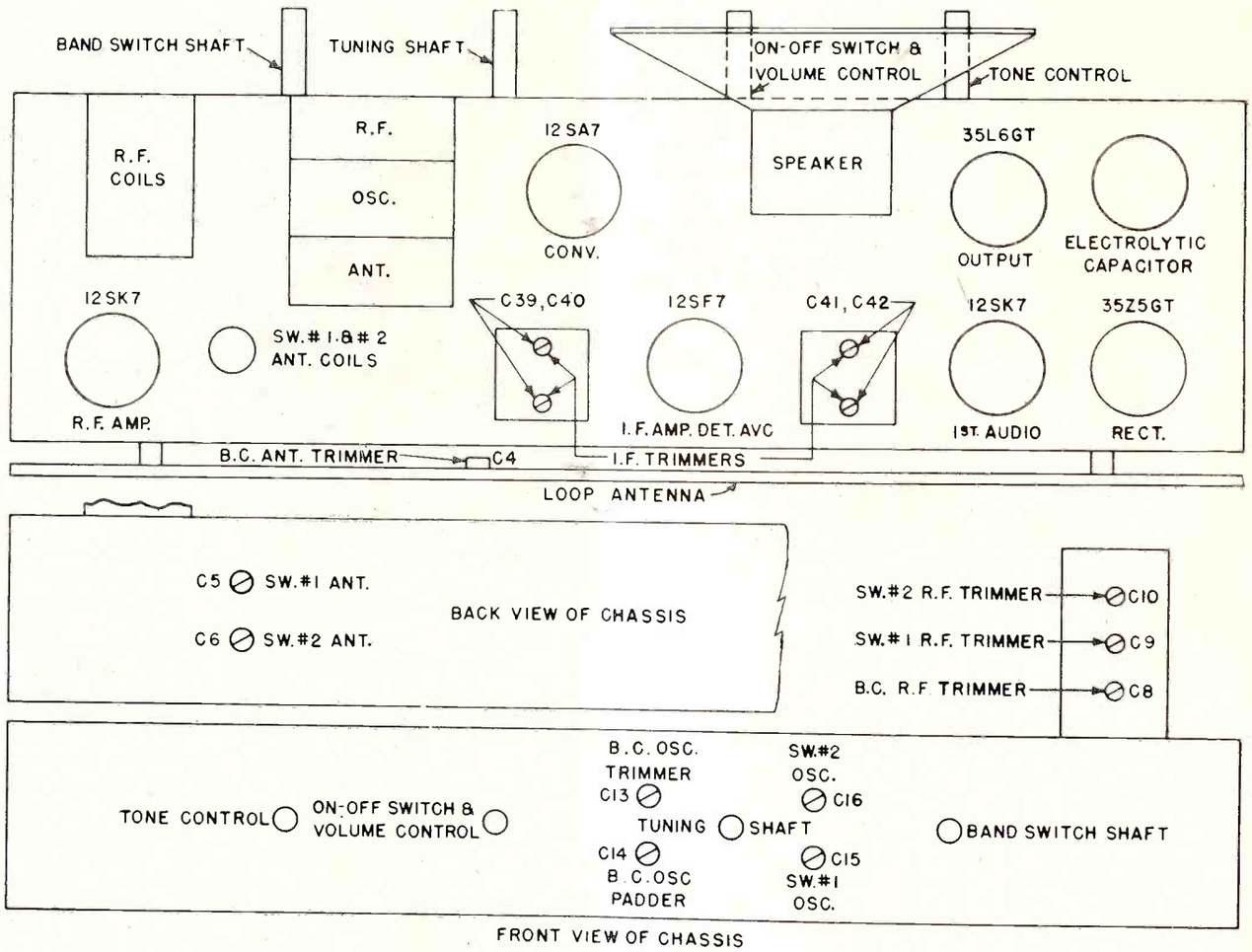
Phonola portable phonographs will be distributed nationally and exported to most parts of the world when production starts within the next few weeks. Both acoustic spring driven and amplified models will be produced in the Waters Conley Company plant at Rochester, Minnesota. Four models each of acoustic and electronic port-

[*see page* 32]

SERVICE DATA

for

LEAR RADIO MODEL 661



ALIGNMENT CHART

OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANTENNA	GENERATOR FREQUENCY	BAND SWITCH SETTING	DIAL AND CONDENSER SETTING	TRIMMER	REMARKS
1.	Set dial pointer to last mark at low frequency end of dial with gang condenser closed.							
2.	2nd. IF	12SA7 Grid & B–	.05 mf	455 KC	BC	open	C41 & C42	Max. Output
3.	1st. IF						C39 & C40	Max. Output
4.	BC	Ant. lead and B–	200 mmf.	1500 KC	BC	1500 KC	C13, C8, C4	Max. Output
5.				600 KC		600 KC	C14	Osc. Padder
6.	Repeat operations 4 and 5 until alignment frequencies fall on correct calibration points.							
7.	SW 1	Ant. lead and B–	400 ohms (res.)	5 MC	1	5 MC	C15, C9, C5	Max. Output
8.				1800 KC		1800 KC		**
9.	SW 2	Ant. lead and B–	400 ohms (res.)	16 MC	2	16 MC	C16*, C10, C6	Max. Output
10.				6 MC		6 MC		**

Notes: * Rock dial while trimming C16 at 16 MC

** Check sensitivity and dial calibration.

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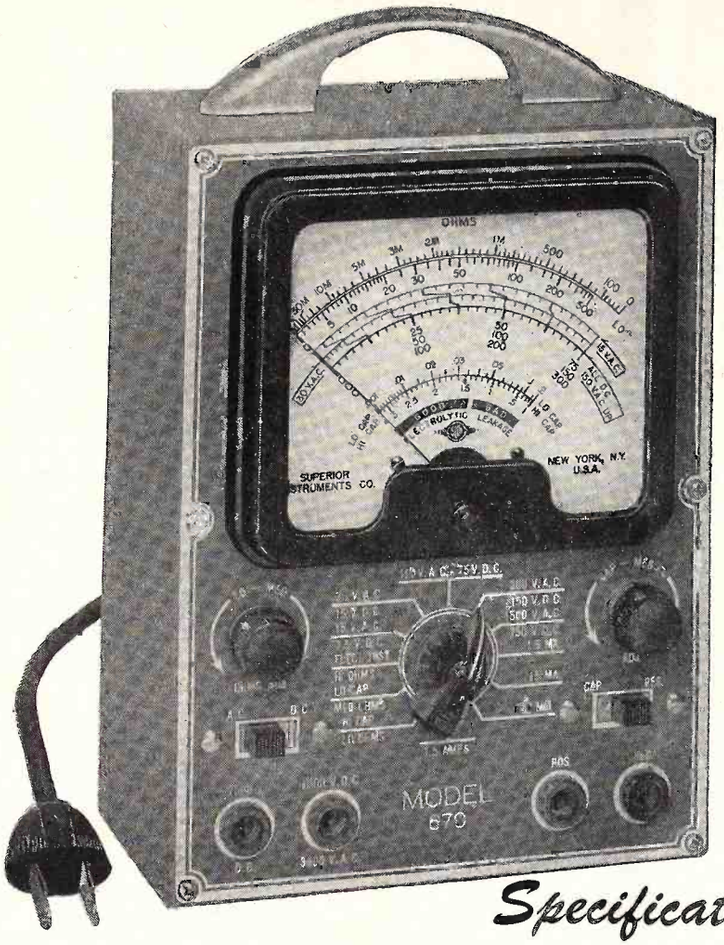


The New Model 670

SUPER-METER

A Combination

VOLT-OHM MILLIAMMETER plus CAPACITY REACTANCE INDUCTANCE and DECIBEL MEASUREMENTS

Added Feature:

The Model 670 includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 Volts.

Specifications:

D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500 Volts
A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5 Amperes

RESISTANCE: 0 to 500/100,000 ohms 0 to 10 Megohms
CAPACITY: .001 to .2 Mfd. .1 to 4 Mfd. (Quality test for electrolytics)
REACTANCE: 700 to 27,000 Ohms 13,000 Ohms to 3 Megohms
INDUCTANCE: 1.75 to 70 Henries 35 to 8,000 Henries
DECIBELS: —10 to +18 +10 to +38 +30 to +58

The Model 670 comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 5½" x 7½" x 3".

$28.40 NET

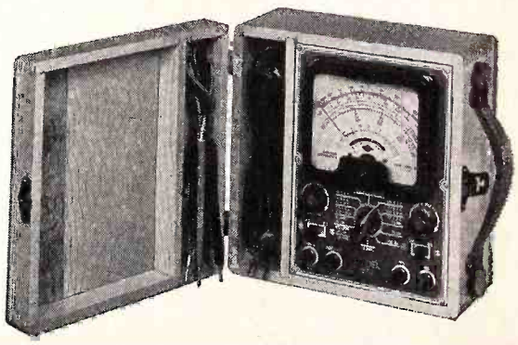
Please place your order with your regular radio parts jobber. If your local jobber cannot supply you, kindly write for a list of jobbers in your State who do distribute our instruments or send your order directly to us.

Model 670P

The Model 670P is identical to the Model 670 described in detail except housed in a hand-rubbed, portable oak cabinet complete with cover.

The Model 670P comes complete with test leads and all operating instructions.

$35.75 NET



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SUPERIOR INSTRUMENTS CO.

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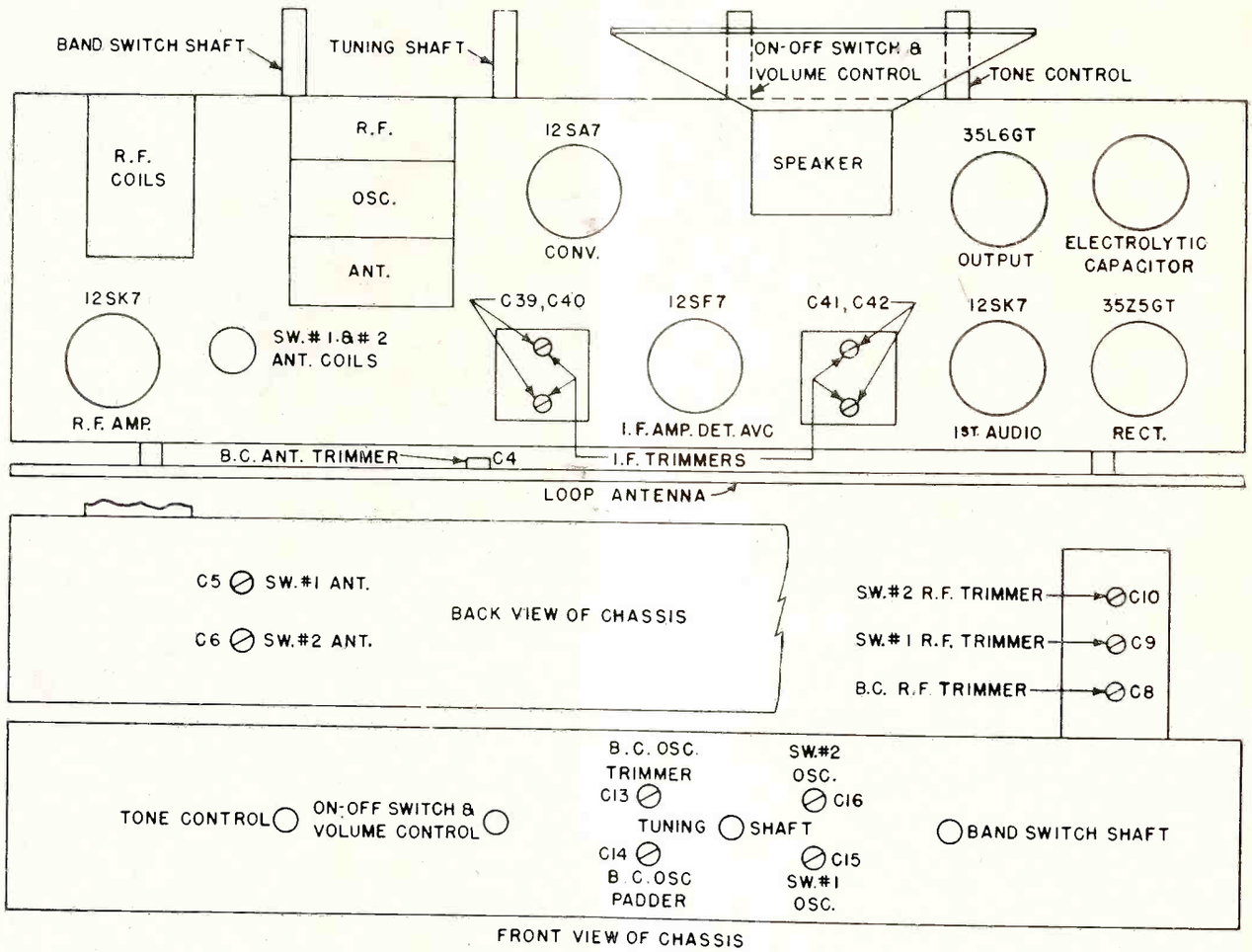
SERVICE DATA

for

LEAR RADIO MODEL 661



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** Check sensitivity and dial calibration.

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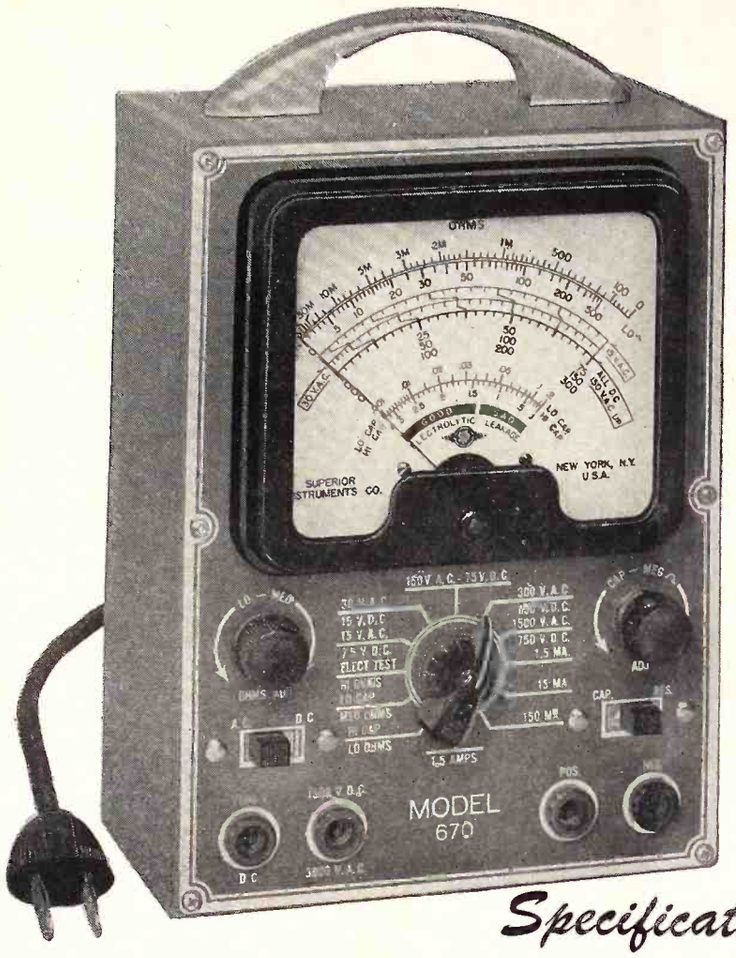

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A Combination

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$28.40 NET

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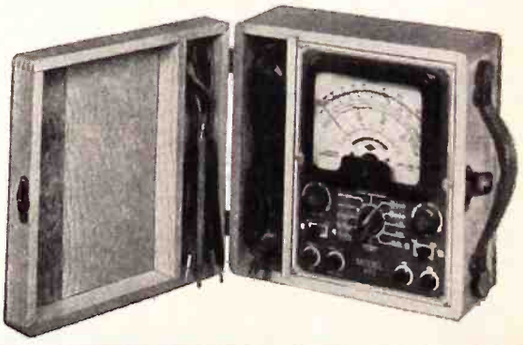
$35.75 NET



SUPERIOR INSTRUMENTS CO.

Dept. D 227 FULTON ST., NEW YORK 7, N. Y.

In the Trade

[*from page 29*]

ables will constitute the first Phonola line, with more models to be added as public demand is measured and necessary materials become available.

The company owned sales offices are at 224 South Michigan Avenue, Chicago, Ill., and at 17 East 42nd Street, New York City. The former office handles midwestern and western territories while the New York office handles the eastern territory and export accounts.

G. E. Tubes Described

Two new publications (ETR-15 and ETR-16) on the essential characteristics and important ratings of General Electric and Ken-Rad receiving tubes are announced by the Tube Division of the General Electric Company. Each 40-page publication, complete with characteristics and ratings of receiving tube types, will be helpful to radio servicemen, radio technicians and electronic engineers who work or experiment on receiving tubes. These technical and descriptive data will also be of assistance in the design of electronic circuits.

The new brochures have been divided into four sections: (1) the interpretation of ratings and technical data; (2) recommended types; (3) characteristics and ratings; (4) outline drawings and basing connections of the tube types. The characteristics and ratings section presents electrical design characteristics, maximum ratings, and typical operation conditions for each tube type as well as references to the base connections and outline drawings located in the final section of the manual.

A copy of either of the receiving characteristics brochures may be obtained on request to the Tube Division, Electronics Department, General Electric Co., Schenectady, N. Y.

Wireless Record Player

Tagged the WR8, this fibre-based (Hawley process pressed fibre) wireless record player plays through any radio. It includes "Floating Action" which silently handles ten 10″ or eight 12″ records; the newly designed record release spindle that permits easy placement and removal of discs; the Featherweight Tangent Tone Arm designed to reduce record scratch and wear. Other popular Motorola features retained in this new model are the Crystal Pickup, Automatic reject button, "Manual" play position for playing one record at a time, constant speed self-starting motor, positive rim-drive turntable and spring-operated locating pin for playing home recordings.

Phonola Prices

Glen Waters, president of the Waters Conely Company of Rochester, Minnesota, has announced the release by O.P.A. of approved prices on three models of the company's Phonola portable acoustic phonographs. Prices on the fourth acoustic model will be released soon.

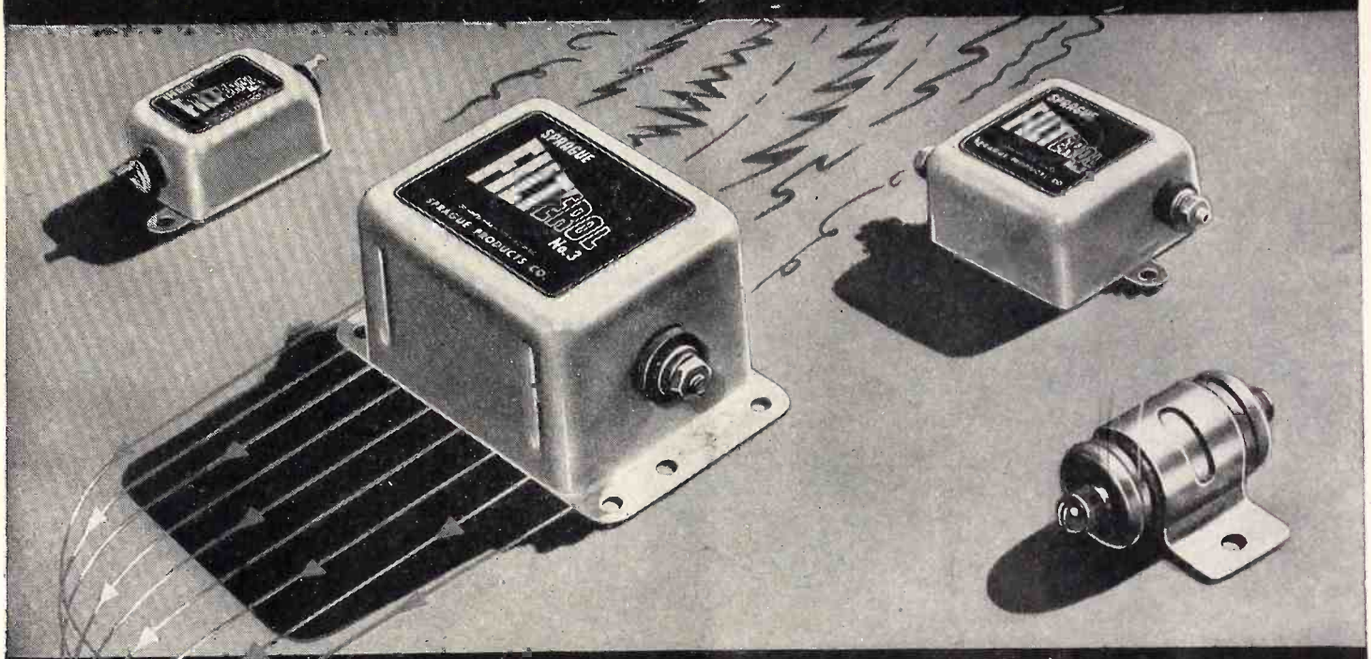
Retail ceiling prices, including excise taxes, are as follows Acoustic Model S-50, Zone I $15.45, Zone II $16.20; acoustic model S-60; Zone I $16.85, Zone II $17.70; acoustic model S-80, Zone I $20.25, Zone II $21.25. Shipments of these models have already been made to the forty-eight exclusive domestic distributors and export agents through whom Phonola Portables are available anywhere in the world. The company produces a complete line of portable phonographs, both acoustic and electrically amplified. Quantity deliveries on amplified units will be made as quickly as material deliveries will permit.

Pen Sells at $15

With first sales of the new Eversharp "CA" Repeater Pen in seven metropolitan centers beginning April 29, Eversharp opened a barrage of full-page ads in metropolitan newspapers. The new campaign places em-

[*see page 44*]

GOODBYE TO MAN-MADE RADIO NOISES!



SPRAGUE FILTEROL

The famous wartime 3-terminal network noise filter development

GET THIS NEW CATALOG!

Contains complete details, dimensions, data, etc, on Sprague Capacitors and *Koolohm Resistors for every radio service, amateur and experimental need.

**Trademarks Reg. U. S. Pat. Off.*

Don't waste time trying to stop man-made radio noises with plug-in filters or by other old-style, inefficient methods. Instead, install Sprague FILTEROLS directly across the line or terminals of the offending device. Do the job in the same efficient manner that made these amazing Sprague 3-terminal networks the outstanding filters for all types of war equipment!

FILTEROL TYPES 1, 2 AND 3

These light-weight, highly compact filters are rated 1, 10 and 35 amperes respectively at 115 volts A.C. They provide effective filtering throughout the entire broadcast band. Their basic circuit is a Sprague 3-terminal network of which the can is one terminal. Selection is based on current rating, the filter used having a rating *higher* than the continuous operating current of the device being filtered. Unexcelled for all small motors, flashing signs and similar radio noise producers.

FILTEROL TYPE 4

This unit incorporates a famous Sprague *HYPASS Capacitor and provides exceptionally high attenuation at frequencies above 5 mc. and is effective up to 150 mc. or more. It is designed for filtering small devices having continuous current ratings up to 20 amperes.

Be the acknowledged interference expert in your locality! Get next to FILTEROLS today!

SPRAGUE PRODUCTS COMPANY

NORTH ADAMS, MASSACHUSETTS

JOBBING DISTRIBUTING ORGANIZATION FOR PRODUCTS OF THE SPRAGUE ELECTRIC CO.

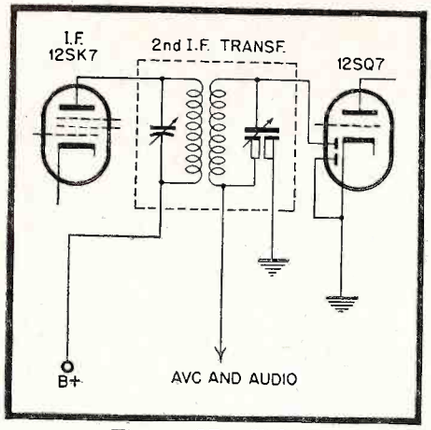


Figure 1D (RCA)

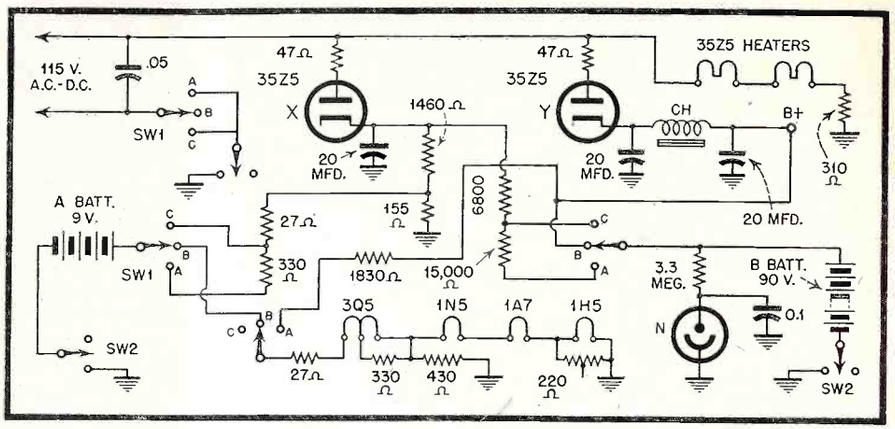


Figure 2 (Stewart-Warner)

A final system, found in the RCA 56x5, has the by-pass condensers, this time 120 mmfd. units, built into the base of the transformer insulation between the appropriate terminals. There is no separate resistor in this version, rather a stop is built into the volume control so it never reaches a value less than 50K ohms. It will be noted that six leads come out of this assembly, the ground being obtained at an external point. *Fig.* 1*D* illustrates this circuit.

Each rectifier tube has a 47 ohm protective resistor in series with the plate lead but there the similarity ends. Tube X has a single 20 mfd. filter and the output is shunted by the voltage divider consisting of 1460 and 155 ohms. The full output is applied to the B battery via a 6800 ohm resistor in the charging position, and through an additional 15K ohm in the trickle position. Voltage to charge the A battery is taken off between the voltage divider sections and on full charge feeds through a 27 ohm unit. Trickle is provided through an added 330 ohm resistor.

The other rectifier, marked Y, feeds the B plus terminal of the circuit through a filter consisting of a choke and two 20 mfd. condensers. A dropping resistor of 1830 ohms carries voltage to the section of the switch which selects supply for the filament string. An additional 27 ohm unit is in series with the string at all times. The use of shunt values in the filament string to provide bias voltages is conventional.

CHARGING CIRCUIT

An interesting adaption of the use of a charging circuit to obtain longer life from dry batteries in a 3-way portable is found in the new Stewart-Warner model 9007 series. A full explanation of the details of this circuit can be followed by referring to *Fig.* 2.

Provision is made for the use of a pack with in the cabinet, or, by employing a special adaptor, external batteries of the individual type. In either case the

requirements are for a 9 volt A unit and 90 volts of B battery. A neon oscillator circuit, with the tube visible on the front panel, indicates the condition of the B battery. The values shown, 3.3 megs and .1 mfd. provides a flashing light three times per second with 90 volts. When the rate has decreased to one flash per second the voltage has reached the low limit of about 72 volts and charging should take place. If the voltage is allowed to go much below this value the charging will be less satisfactory. Dead batteries cannot be charged.

Examination of the circuit shows two switches which control all functions in the power supply circuit. The OFF-ON switche which control all functions in the ON position both battery negative points and the low side of the light line are connected to the common ground. The second switch is a 3 position, 4-gang affair which serves to provide connections for:

a) AC-DC operation, with small trickle charge.

b) Battery operation.

c) Battery charging.

Obviously, it is necessary to have the set plugged into the power line for positions A and B, and if the line is DC the polarity must be correct for either operation or charging.

It will be seen that there are two rectifiers, both type 35Z5 tubes. The one marked X provides either full charge in position C or trickle in position A. The one marked Y provides A and B voltages for the remaining tubes during line operation on position A.

Centralab Catalog

Centralab's new Catalog #25, containing the CRL post-war stock line, is now available on request. This catalog is designed primarily for distributors and their customers, and was introduced to the trade at the recent parts show in Chicago.

The new catalog contains 20 pages and features additions as well as deletions to the regular jobber line. Some part numbers have been changed too. Lines omitted from the new catalog are 1-watt T Pads, 1-watt C.I. Faders and Insulated Capacitors. Regular tubular capacitor numbers have been changed from an 800 series to a CC series. The 1465 Tone Switch and the 420 Switch Kit are back again in distributor literature.

New parts described, illustrated and priced include 18 Transmitting Capacitors, 6 High Accuracy Capacitors, 3 HDC Capacitors and 12 Silver Mica Capacitors. Tubular Capacitors have expanded to include four more capacities in the zero temperature coefficient and seven in the negative coefficient. Five new items have been included in the Trimmer line.

Get your copy from your nearest distributor or from Centralab, Division of Globe-Union Inc., 900 E. Keefe Avenue, Milwaukee 1, Wis.

DISTORTION

[*from page* 21]

voltage fails on some R.F. or I.F. tube. (In the old type receivers which lack A.V.C., turning the volume control fully on, with the receiver tuned to a nearby station, caused distortion). Recognition of the fact that an overloaded tube (i.e., excessive signal is being applied to the grid of some R.F. or I.F. tube) can be made as follows:

First, determine whether the distortion exists on relatively close powerful broadcast stations and not on the weaker stations.

Second, select a powerful nearby station, and slowly tune the receiver through the side-bands of the carrier and observe whether the distortion remains or subsides at the side-bands.

If the distortion is present *only on relatively strong* incoming signals and has a tendency to *subside* as the receiver is tuned through the sidebands, then the cause of the distortion is unquestionably the overloading of some R.F. or I.F. tube. As this overloading is caused by the lack of A.V.C. voltage on the grid of some R.F. or I.F. tube, the A.V.C. grid voltages should all be checked. This can only be done with a vacuum-tube voltmeter. If there is no A.V.C. voltage on any of the grids of the R.F. or I.F. tubes, the A.V.C. filter resistors and condensers should be checked for continuity and leakage respectively, with an ohmmeter.

Should these checks show that all filter resistors, etc. are O.K., the trouble can only be one of two things. Either the second detector tube (or A.V.C. tube if the circuit uses a special separate A.V.C. tube) is defective or the secondary circuit of the last I.F. transformer is out of alignment. (See Article on "Trouble Shooting by Resonance Testing" in the September issue of "R.S.D.") Of course, the tube should be checked by replacing it with one known to be good. It is also good practice to realign the entire receiver.

Operation of a tube anywhere in the receiver at other than the normal operating voltages can produce distortion. Distortion caused by voltage conditions can be identified and the cause found by the procedure that follows: Slowly tune the receiver through the side-bands of a relatively powerful broadcast station signal and note whether the distortion exists at the side-bands of the signal.

If the distortion does not exist or has a tendency to lessen as the receiver is tuned toward the extremes of the side-band, the voltage failure will be found in an R.F. or I.F. stage of the receiver. If the distortion remains present as the receiver is tuned through the side-bands of the broadcast station signal, the voltage failure will be found in the audio stages of the receiver.

If it is found that the distortion diminishes as the receiver is tuned through the side-bands, it should next be determined whether the condition prevails on both weak and strong incoming signals. If it is not present on both, there is some doubt as to whether the cause is voltage failure or overloading due to faulty A.V.C. action. Should this be the case, the A.V.C. system must be first eliminated as a possible cause of the trouble by following the procedure already given.

Capitol Record Growth

Recently opened branches in Charlotte, Cincinnati, Minneapolis, Pittsburgh and Newark are announced by Floyd Bittaker, national sales manager, Capitol Records, Inc.

Television Models

[*from page* 15]

twelve to fifteen million, the full utilization of the industry's facilities could not help but overproduce within a few years.

"It is a fortunate circumstance", Mr. Abrams said, "that the engineering and manufacturing facilities of the radio industry can be used for the production of television receivers, for which there will be an incalculable market for many years to come. *This diversification of manufacturing operations can establish balances in the industry which will keep the plants running and employment at high levels, with no danger of flooding the market and bringing about confusion and loss in the trade.*"

Mr. Abrams said he did not go along with predictions that it would take many years to effect the spread of television throughout the country. He said that with determination on the part of the industry to forge ahead, and with the cooperation of our government in the allocation and regulation of television broadcasting stations, the expansion of the business from principal cities to smaller communities could be effected in much shorter time than is indicated in current estimates. He said that with 50,000 sets in New York City, for instance, good programming could be financed by the key stations, and the larger stations could feed smaller ones as they are established.

Optical Systems

[*from page* 15]

vision pictures result from such a system. For example, a cathode-ray tube only five inches in diameter produces an image which fills a screen 18 x 24 inches. Prior to the war, a direct-viewing tube, 12 inches in diameter, produced pictures about 7 x 9 inches.

Theatre Television

[*from page* 15]

on by both companies in the television field. The television projector equipment employs present commercial techniques, according to Dr. C. S. Szegho of the Rauland Corporation, who explained that new methods now under intensive development promised significant improvements.

The microwave relay equipment used in the demonstration was part of the apparatus G.E. engineers have developed for an experimental radio relay network to connect Schenectady and New York City in a two-way operation. This network is being designed to carry simultaneously many electronic services, such as television, FM radio and facsimile.

J. F. Rider Is Consultant

Lt. Col. John F. Rider has been retained by the RCA Victor Division of the Radio Corporation of America as a consultant on test equipment, it was announced by Meade Brunet, vice president in charge of Engineering Products Activities. Well known for his technical writings and his work in the field of radio servicing and servicing methods, Col. Rider has been active in radio for more than a quarter century. Outstanding among his accomplishments is his development of the Chanalyst and the Voltohmyst, which are manufactured by the RCA Victor Division. He also pioneered in the development of signal tracing as a means of diagnosis. In his new position as consultant, Col. Rider will supplement the activities of RCA's staff of test equipment specialists. His reports will be made available to RCA distributors and servicemen.

MEN IN THE NEWS

Olson Appointed

Sidney L. Olson, partner in the radio mail order firm of Olson Radio Warehouse, 73 East Mill Street, Akron 8, Ohio, has been appointed as chief purchasing agent. Previously he was manager of customer relations. In accepting the new post, Mr. Olson has stated his intentions of further serving customers by adding new lines in the radio parts field as well as expanding which manufacturers offer.
the older lines to include all items

Julius Haber, Advertising & Sales Promotion Manager, RCA Tube Dept.

Hallicrafters Promotes

Promotion of Fritz Franke, former chief engineer in charge of research and design, to assistant sales manager, is announced by Rollie Sherwood, sales manager for the Hallicrafters Company, Chicago. Franke joined the company in 1940, and was one of the original group of engineers who produced the famous SCR-299, army mobile communications unit. He had previously operated his own airline ground equipment and special electronic devices business, and earlier had been a radio engineer for American Airlines. He is a member of the Institute of Radio Engineers.

Name Barnett, Simpson

I. W. (Red) Barnett, well-known in the merchandising and advertising fields, is named sales manager of the rapidly expanding ElecToy division of the Electronic Laboratories, Inc. of Indianapolis. At the same time, William W. Garstang, president of the firm, announced that Samuel W. Simpson, of Indianapolis, will serve as Barnett's assistant with the title of manager of the division.

The ElecToy division is responsible for the sales and distribution of a line of electronic toys, which include an electric game, the Buzz-Ball; a Black

[*see page* 45]

Shop Notes

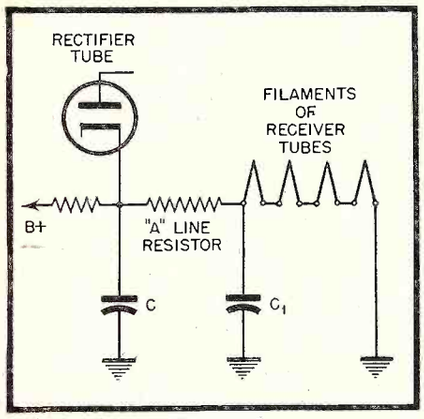


Figure 1

3-WAY PORTABLE RECEIVERS

In most cases, audio frequency howl or regeneration in these receivers is caused by defective "A" circuit filter condensers, such as the one shown in the circuit in *Fig. 1*. The values of these capacitors vary between 50 and 100 mfd. This regeneration is readily identified because it can be easily controlled by means of the volume control. Since the degree of regeneration depends on the intensity of audio signal present, at "low volume" positions on the volume control no regeneration will occur, whereas at "high volume" positions regeneration will take place.

The reason why this regeneration is confined to audio frequencies is because at these frequencies C1 must be perfect for effective by-passing and filtering. A condenser with reduced capacitance may be suitable for by-passing *R.F.*, but will not be suitable at *A.F.*

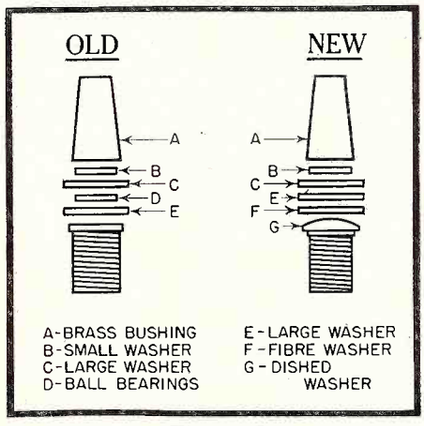


Figure 2

RUMBLE IN PHONO-RADIO RECEIVERS

The rumble in the Models 42-1010 and 1016 Philco Phono-radio receivers can easily be corrected by replacing the turntable bearing. Remove the turntable and the spindle, and then take out the brass cone and the ball bearings and washers. Rebuild the bearing, using the old washers and the new flat fiber washer and the concave steel washer. See *Fig. 2*. Add Stay-Put Grease or Lubriplate between the washers to eliminate friction. When replacing the spindle assembly, the spindle must be more than ½ turn loose while lining it with the record support shelf. (*Philco Service Notes*).

PORTABLE RECEIVERS

Weak reception due to unfavorable local conditions such as mountainous surroundings, steel structures, etc. may require the use of an outside antenna. If the receiver contains only a loop antenna with no facilities for outside antenna connections, a few turns of wire, 5 to 10, wrapped or wound adjacent to the turns on the loop corresponding to the "high side" will result in an equivalent antenna transformer. The "high side" of the loop is the one nearest the end which connects to the grid return. The primary, consisting of the added turns, is connected to an external antenna and ground.

It is advisable to retune the R.F. trimmer after this alteration is made. This is due to the mutual inductance effect of the new primary on the loop, which might unbalance the alignment slightly.

R.C.A. recommends the installation of a 10 megohm —½ watt resistor across

[*see page* 42]

Phono Amplifier

A new phonograph amplifier, the KXP-30, has been designed by the Newcomb Audio Products Company particularly to meet the demands of critical listeners using today's wide range loudspeakers. With ample reserve power (30 watts) it is said by the company to give less distortion, more uniform power at all frequencies, extended frequency response, distortion free tone controls of greater range, maintenance of quality at low volume, freedom from hum and ample gain for high fidelity pickups. Separate bass and treble controls permit increasing or decreasing bass, and/or treble as desired, with minimum change in midrange volume.

The KXP-30 provides two inputs, one for phonograph, the other wired for use with the Newcomb TR-92 plug-in bridging transformer, or TR-91 low impedance plug-in transformer, thus making the device an ideal bridging amplifier for broadcast or recording studios or adapting it to low impedance pickups, and for home use.

Power Output: 30 watts at less than 5% distortion with wide flat power output versus frequency curve and low distortion at any volume level.

Frequency Response: 20 to 20000 cycles within 1 db.

Inputs: One with crystal pickup network. Impedance ½ megohm. The other without phono equalizer but wired for use with TR-91 or TR-92 plug-in input transformers. Impedance without transformer, ½ meg.; with transformer 50, 200 or 5000 ohms, depending on transformer selected.

Output Impedances: (6) 3, 4, 6, 8, 16 and 500 ohms to terminal strip two bakelite molded sockets.

Gain: 85 db. either input, high impedance; 79.5 db. with TR-92; 73.5 db. with TR-91.

Tone Compensation: bass range from −17 to +24 db. treble range from −24 to +24 db.

Controls: (5) two channel input; one bass; one treble; one power switch.

Power Consumption: 144 watts.

Tubes: (7) 1 - 6J7, 3 - 6J5, 2 - 6L6G, 1 - 5U4G.

MULTIVIBRATORS

[*from page* 23]

of Rider's "Alternating Current in Radio Receivers" is suggested for further study of complex waveforms.) Nearly perfect square waves of low frequency may be synthesized with only the first 10 harmonics. Thus to reproduce a 100 Kc square wave we would require a sine wave response of from 100 Kc to 1 megacycle. This would necessitate the use of a rather low value of plate load resistor and as a consequence the amplitude of the generated square wave would be low. The value of the plate load resistor cannot be lowered beyond that limit at which excessive plate current would flow thus damaging the tube by excessive plate dissipation.

Part 2 of this article will deal with the Unsymmetrical Multivibrator and with Synchronization.

[*To be continued*]

Reeves-Ely Changes

The recent acquisition by Claude Neon Lights, Inc. (545 Fifth Ave., New York City) of approximately 98 per cent of the outstanding common stock of Reeves-Ely Laboratories, Inc. (25 West 43rd St., New York City) has led to staff changes.

Morell Mackenzie is president and treasurer. He is also vice-president of Claude Neon. Randal Young, vice-president & ass't. treasurer; Edwin L. Wayman, Jr., vice-president; Alfred C. Pratt, secretary.

Lowell M. Birrell is chairman of the board. Birrell is president of Greater New York Industries, Inc.; president of Claude Neon; chairman of the board of Pioneer Equitable Insurance Co. of Indiana.

No important changes have been made in the management of the four subsidiaries of the Reeves-Ely Laboratories, which include Hudson-American, 25 West 43rd St., New York City; American Transformer Co., 179 Emmett St., Newark 5, New Jersey; Waring Products Corp., 331 Madison Ave., New York City, the Winsted Hardware Co., Winsted, Conn., and the operating division of Reeves Sound Laboratories.

With the war ended, Reeves-Ely is continuing to produce oscillators for peacetime uses. It also is manufacturing radio and electronic equipment, industrial transformers, and electrical home appliances. Among its products are ship-to-shore radio marine telephones, electric irons, food and liquid mixers, clothes driers, power and package transformers, re-recording equipment and radio novelty receivers.

SHOP NOTES

[*from page* 39]

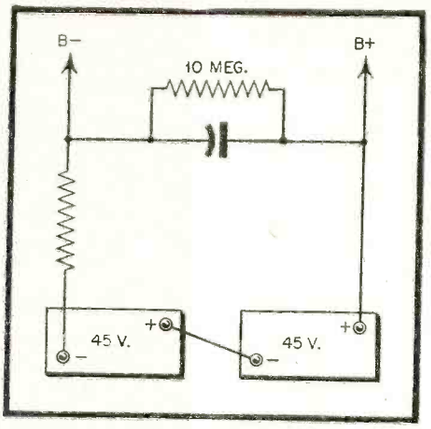


Figure 3

the electrolytic capacitors connected across the B+ circuit. See *Fig. 3.* The purpose of this resistor is to discharge the capacitor when the set is turned "off". In this manner, any voltage difference between the I.F. and A.F. primaries and the chassis is discharged. This voltage difference is due to the voltage stored up in the electrolytic capacitor.

In certain climates, particularly where it is humid, the voltage drop just referred to gives rise to an electrolytic action across the A.F. and I.F. transformers which often results in their breaking down.

SHORTED VARIABLE CONDENSER PLATES—R.C.A. 46

Many variable condensers do not have enough side play in the screw holes through which the stator plates are fastened to the frame, to permit of adjustments when necessary. But when warpage occurs, and the plates are shorted, there are times when the position of the stator plates cannot be moved sufficiently for proper adjustment.

By the simple expedient of enlarging these holes, the stator plates may be shifted farther horizontally in either direction, thereby enabling the repairman to adjust the stator plates so that they clear the rotor plates.

AUTO RADIO RECEIVERS—MOTOROLA

In some auto radio receivers the 6AB6 is employed in the audio circuit. Because of the cathode-follower type of circuit in which this tube is employed, it does not lend itself easily to trouble shooting in the convenional manner, that is, by removing the grid cap of the previous tube and listening for the characteristic audio growl when the finger is placed on its grid. It becomes necessary to use some sort of A.F. signal tracing equipment for this purpose. When such equipment is not immediately available the vibrator power supply may be used as a voltage source of A.F. power with excellent results.

Referring to *Fig. 4*, connect a .1 mfd. condenser and a 1 meg. resistor to the

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Write up any "kinks' or "tricks-of-the-trade" in radio servicing that you have discovered. We will pay $1 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor," RADIO SERVICE DEALER, 342 Madison Ave., New York 17, N. Y. Unused manuscripts cannot be returned unless accompanied by stamped and addressed return envelope.

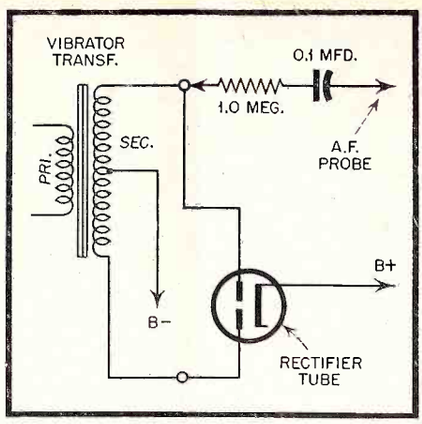

Figure 4

high side of the power transformer as shown, using the condenser end as the A.F. signal tracing probe. In this manner a quick check on the audio components may be made.

Because of the rich harmonic content of the output wave of vibrator circuit there are sufficient components of R.F. to utilize this set-up as a source for R.F. and I.F. signal tracing also. Sometimes better results are obtained by connecting one end of .1 mfd. condenser directly to the primary of the power transformer, and utilizing the other end as the signal probe.

Servicemen Host to Raytheon

D. W. Mack, owner of Scranton Radio and Television Supply Co., Scranton, Pa. was host to the Radio Servicemen's Association of Luzerne County, Wilkes-Barre, Pa. and other service dealers of this locality at a meeting held recently, sponsored by the Raytheon Corp. It was held in the Hotel Sterling in Wilkes-Barre.

Raytheon representatives present were L. D. Lowery, Robert Sylvester and George Scarborough, all of Philadelphia, Pa. Mr. Sylvester, formerly of Hazleton, Pa. explained fully the Raytheon "Bonded Electronic Technician" program. Movies were presented as a means of further explaining the requirement and advantages. Purely entertainment features were also shown and refreshments were served.

Dealers to Sell and Service Telesets

Ernest A. Marx, general manager of the Television Division of Allen B. Du Mont Laboratories, Inc., announces that distribution of telesets will be handled through a select group of dealers. A control will be maintained over installation and service, which will aid materially in providing absolute satisfaction to the consumer.

In addition, the neighborhood dealer will be in a position to establish his organization firmly on a wide service basis.

In the Trade
[from page 32]

phasis on the cartridge refill, which may be reloaded cleanly in 15 seconds and carries an ink supply sufficient for 74,802 words, or two good-sized mystery novels. A sizeable portion of Eversharp's 1945 advertising budget, in excess of $3,000,000, will be allocated to promotion of the "CA" Repeater Pen, which retails at $15.

Scott Radio Sales

E. J. Halter, vice-president of the Scott Radio Laboratories Inc., of Chicago, announces that in spite of lagging schedules in most radio production, the company, first to be on the post-war market with a large-size radio-phonograph, has since February sold more sets than ever before in any previous 18 months in its history. "The demand has been three times what we anticipated", said Halter, "but we have been able to meet these demands with an exceedingly favorable production record."

The Scott radio-phonograph is now available to the public in a medium priced set, the series 800, retailing in zone 1 for $937.50 and $984.35 in zone 2. The set includes 24 tubes of the latest type and covers the full broadcast band, the new FM band of 88 to 108 megacycles and the principal short wave stations of the world. A record changer of English origin is designed to play any assortment of 10-inch or 12-inch records. Its instrument panel, something new in the radio field, was designed by Walter Dorwin Teague, famed industrial designer. The panel rests inside the cabinet when not in use and rolls out on a track for tuning.

Stewart-Warner Set Promotion

Celebrating 22 years of radio manufacturing, Stewart-Warner Corporation has created a nine-piece counter and window display set which is being used by distributors and dealers to herald the new line of post-war models. The key figure in the display is a life-like full size cut-out in several colors of a young woman sitting on an ottoman—"listening" to an actual Stewart-Warner twenty-second anniversary model radio.

The anniversary idea is carried out on a series of cards featuring a birthday cake with 22 candles. One of these cards summarizes the four features of the new line:

"Radair Antenna. Picks up the faintest radio signals—actually repels annoying static. *Strobo-Sonic Tone.* Never before has such real-life tone been developed. *Signal Sentry.* Eliminates annoying "pops" and "crackles"—crystal clear daytime reception. *Stepped-Up Performance.* Sensitivity and Selectivity—up to 60 per cent greater than pre-war models."

Many of the Stewart-Warner twenty-second anniversary models are housed in period cabinets with authentic Chippendale, Sheraton, and Duncan Phyfe designs. "Your New Radio TODAY" is a new consumer booklet which describes the whole line of new models.

Hamilton Radio Production

Radio receiving sets are being built and shipped by the Hamilton Radio

[see page 46]

MEN IN THE NEWS

[*from page* 38]

Light Painting Kit with fluorescent paints; the Utiliphone, a toy intercommunications system based on the walkie-talkie principle, and an electric cannon which can lob a wooden pellet a distance of thirty feet.

Shure Ad Manager

Shure Brothers announces appointment of Howard T. Horwich as advertising manager. He brings seven years of advertising experience and three years of military experience to his job. He has had a broad experience in direct-mail and other forms of advertising. Mr. Horwich will direct publication advertising, catalog designing, direct-mail and jobber-help activities. He will direct advertising promotion behind Shure Microphones, Phonograph Pickups and Pickup Cartridges.

Raytheon Appoints

Carl J. Hollatz, general manager of the Radio Receiving Tube Division of Raytheon Manufacturing Co., announces the appointment of L. R. O'Brien as general sales manager of the division. Although a native of Philadelphia, Mr. O'Brien has spent most of his life in Chicago. He was director of sales for the Ken-Rad Tube and Lamp Corp. at Owensboro, Kentucky, and with the sale of this company to General Electric he was appointed sales manager of the Ken-Rad Division of General Electric (Equipment Sales). His period of employment with Ken-Rad dates back to 1925.

Simms To Sprague

O. E. (Gene) Simms, well-known to the trade through his past associations with the National Company, Inc. and, more recently, with the General Control Company, joined the Sprague Products Company of North Adams, Mass. in December in line with that firm's expansion of its engineering and sales facilities to the distributing trade. Mr. Simms will serve as assistant to Sales Manager Harry Kalker and will devote his time primarily to contacting distributors in connection with the merchandising of important new lines now nearing completion.

Emerson Appoints

Charles O'N. Weisser, western divisional sales manager, has been appointed sales promotion manager of Emerson Radio and Phonograph Corporation, announces Phil Gillig, vice president in charge of the Home Products Division.

In the Trade

[*from page* 44]

Corp. in steadily increasing numbers, with present production, in substantial amounts, confined, for reasons of economy, to five of twenty designed models, Adolphe A. Juviler, president, told stockholders at the annual meeting recently.

"By mid-summer, when we hope, providing the prevailing tube bottleneck ends, to attain our capacity rate of 2,000 sets daily," Mr. Juviler declared, "we propose to have at least twelve Olympic table models in production to comply with commitments to our 75 distributors, serving approximately 9,000 retail dealers, and to our numerous export outlets.

"Although the bulk of current output —models with list prices ranging from $23.50 to $119.95—is being consigned to franchised distributors, we are busily engaged, as well, in producing sets in volume under an exclusive contract with Affiliated Dealers, Inc., central buying agency for about thirty of the nation's leading department stores, including Macy's, Bamberger's, May, City Stores and others. These sets are being built for distribution under Affiliated's own brand—Artone.

"Due to the overwhelming demand for present models," Mr. Juviler added, "we deem it advisable to defer FM model production until such time as consumer demand for that type of receiver manifests itself on a greater scale than is indicated for the remainder of this year. Television set assembly, on the other hand, has been abandoned until such production is deemed commercially profitable."

Add to Investment in Television Development

The most modern electron and television tube manufacturing plant in the world, located at Lancaster, Pa., has been purchased from the U. S. Navy Department by the RCA Victor Division of the Radio Corporation of America, announces Frank M. Folsom, executive vice president in charge of the Division, which built and operated the plant for the Navy during the war. The purchase price, it was announced, was $4,362,500. The availability of television for the public will be advanced considerably by RCA Victor's acquisition of the plant, Mr. Folsom stated.

In disclosing future plans, L. W. Teegarden, vice president in charge of the Tube Department, stated:

"We expect the market for kinescope picture tubes will eventually exceed our wartime production of all types of cathode-ray tubes. We anticipate a demand for large power tubes, both for high-frequency heating in industry and for use in the communications field, including television, which will likewise exceed the wartime peak. A growing variety of applications for phototubes in the field of industrial control indicates a future market at least five times as great as the pre-war level."

Coin-Operated Personal Radios

A coin-operated radio for hotel rooms—the set operates two hours for a quarter—is the latest electronic de-

velopment to be introduced to the American public. The new radios are being manufactured in Syracuse, N. Y., by the Specialty Division of the General Electric Company's Electronics Department for Radio-Matic of America, Inc., who will install them in hotels throughout the country. When peak production is reached, over 8,000 hotel-room receivers a month will be built at the division's Wolf St. plant in Syracuse. Already 350 hotels have contracted for over 50,000 sets.

Installed in a hotel room, the set works this way: The guest deposits a quarter in the coin mechanism, pushes a lever, and then plays the radio as he would any other radio in his home. If he listens to programs for an hour and a half, for example—and then remembers that his favorite program begins in a half hour—he may turn the set off and still have thirty minutes left to hear the special program. Thus two hours of radio entertainment, although not necessarily a continuous performance, have been provided for the guest. Or he can listen all evening —a quarter for every two hours.

GE Radio Production

Table model radios will be manufactured by the Receiver Division of the General Electric Company's Electronics Department at Utica, N. Y., it has been announced by I. J. Kaar, manager of the Receiver Division for the department, who disclosed that the company has leased a factory from the Utica Industrial Corporation.

General Electric will continue to make radio receivers at its Bridgeport, Conn., plant until completion of receiver manufacturing facilities at Electronics Park, the new headquarters plant G.E. is building for its electronics department at Syracuse, N. Y. The Utica operation will be in addition to the Syracuse receiver manufacturing plant.

Stromberg-Carlson Sound Line

Stromberg-Carlson's new sound equipment line was shown to the public for the first time at the Radio and Electronics Conference and Show, May 13-16 in Chicago's Hotel Stevens. The comprehensive line of communications equipment includes newly designed amplifiers, amplified and regular telephone inter-communications systems, new-standard "packaged" sound systems for large industrial or auditorium use, and a variety of public address system speakers. Following OPA price adjustments, shipments to distributors were begun April 15, according to Allan R. Royle, sales manager.

"Big" Little Business Builder: Dial station list on one side, ads for service and merchandise on back, shown half size.

Ad Index

ADDRESS CHANGES—

Subscribers to RSD should notify our Circulation Dept. at least 3 weeks in advance regarding any change in address. The Post Office Dept. does not forward magazines sent to a wrong address unless you pay additional postage. We cannot duplicate copies of RSD sent to your old address.

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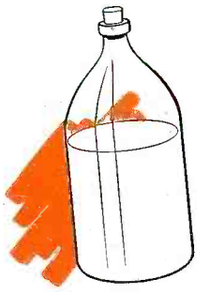

HEATER COATING

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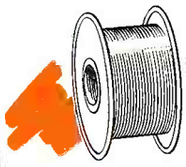

BARE TUNGSTEN WIRE

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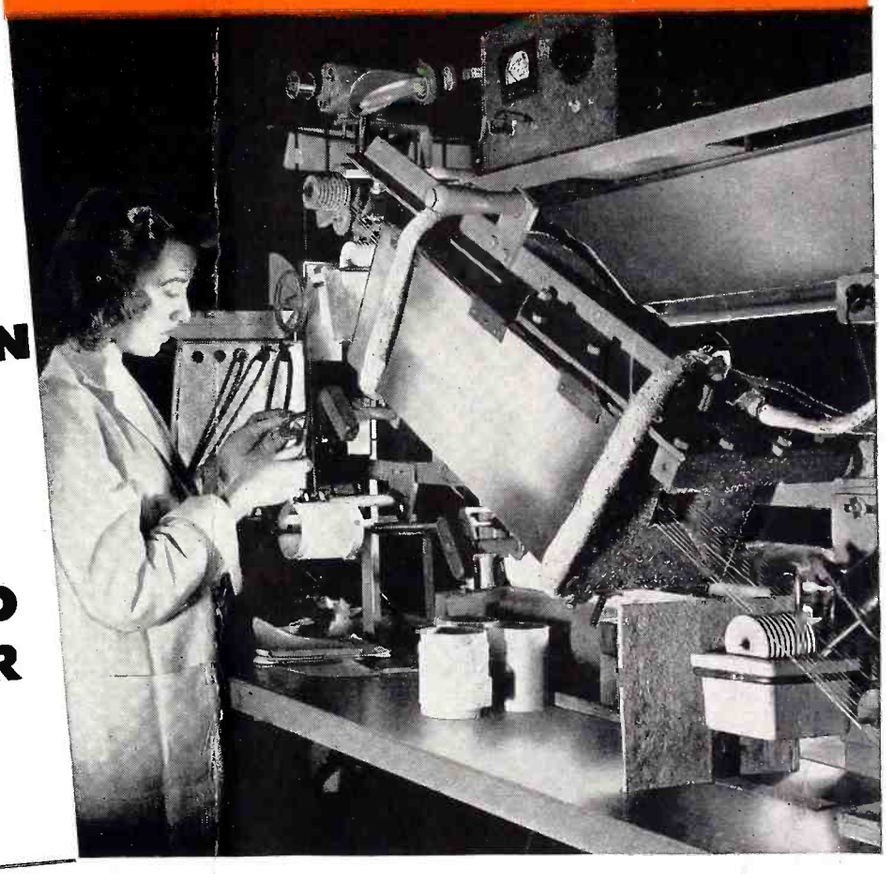
COATED HEATER WIRE



HYTRON KNOW-HOW MAKES EASY THE APPARENTLY EASY

MERELY to apply an insulating coating to tungsten heater wire—that should be easy. To say the illustrated heater-wire coating machine simplifies the job appears a paradox. Why, the machine looks like a product of Rube Goldberg's fertile mind!

Imagine, however, the complexity of producing a thin but perfect insulating coating—a dielectric with a resistance of tens of megohms—yet capable of operating at over 1500° Kelvin! Chemical purity of the coating must be rigidly controlled. Application must be in thin multiple layers to achieve uniform adhesion and density. Thickness must be exact for correct stacking of the folded heater when inserted into the cathode sleeve. Just the right degree of hardness must be maintained to provide stiffness without brittleness.

A complex precision machine actually does simplify the job. Fundamentally its compact mechanism unspools and spools the wire. Guided by threading pulleys, the wire passes eighteen times through coating cups and drying oven via a cross-over figure-8 path. Speed and oven temperature are finely regulated. An ingenious electromagnetic device smoothly maintains proper wire tension. Completely coated wire is wound by a spooling head in a basket-weave pattern.

The know-how of this Hytron coating operation is hidden away within the cathode sleeve. Trouble-free tube performance, however, gives you concrete proof of the know-how Hytron constantly strives to expand.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

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See your CUNNINGHAM Distributor today

Now Cunningham offers you these *full-color* window and counter cards designed to sell your service and increase your business. These easel-type cards measure approximately 10½ x 15 inches—will attract attention to your shop and let customers know you handle top-quality Cunningham Electron Tubes.

With the servicing business at an all-time high, you can't afford to miss the opportunity of building up your future trade now, while servicing demand is heavy. You can do it by putting yourself out front with Big "C". So, put these business-building displays to work for you *today.*

AND LOOK FOR MORE
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