Radio SERVICE DEALER

FEBRUARY, 1950

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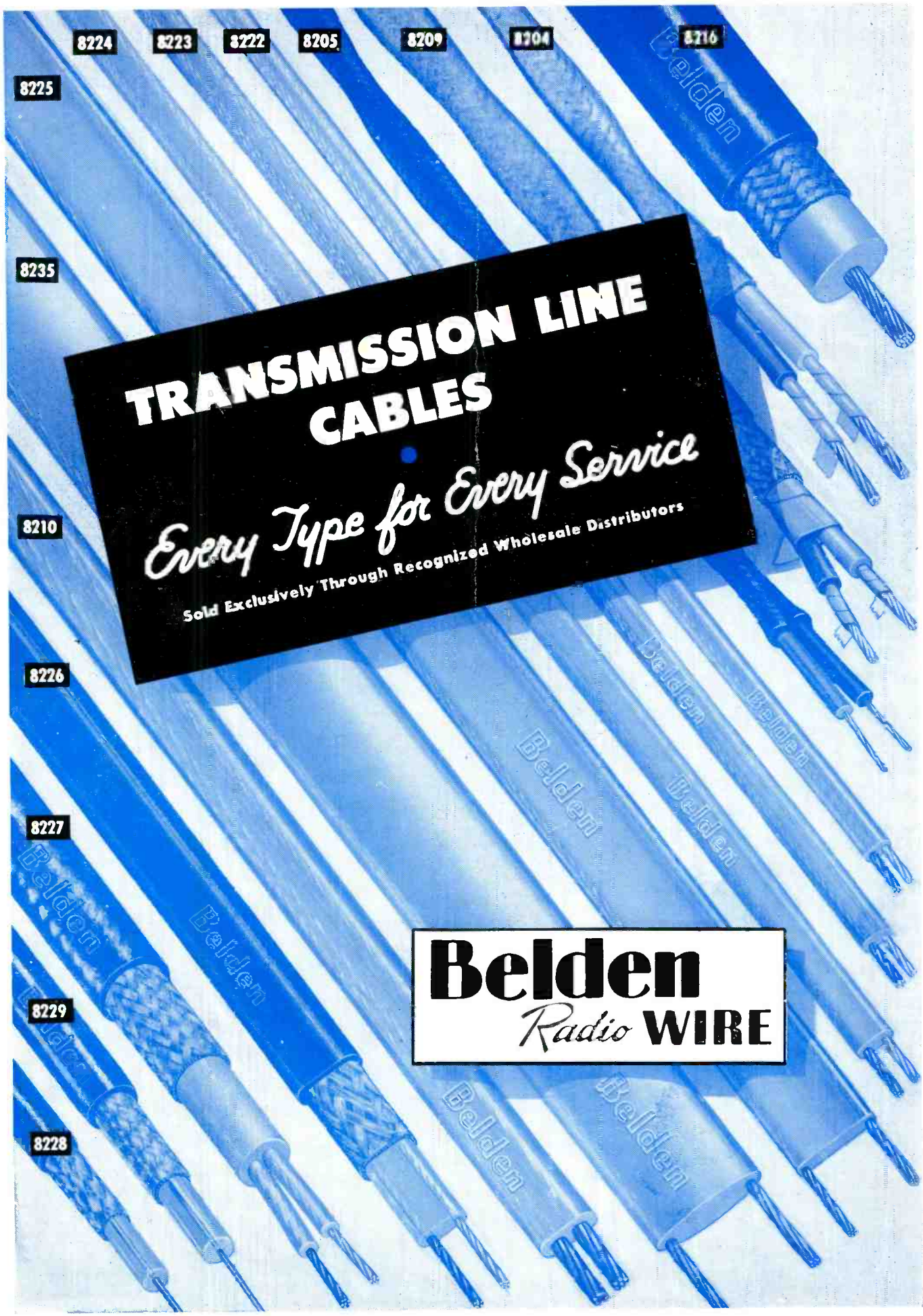
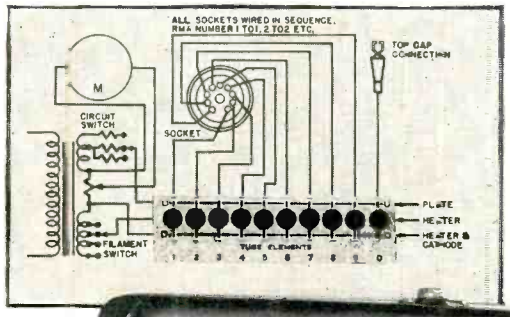


Tube Testers for Today and Tomorrow...

SPECIFY **TRIPLETT**

UP and DOWN

Lever Switching Connects Each Tube Pin to Proper Circuit



1. **ALL ELEMENT CHECK** — Thorough conclusive test of tube elements, shields and taps. The only commercial tester to get at each tube pin and make an open and short check.
2. **NO HUNTING FOR SOCKETS** —No plugging into wrong socket. Circuit flexibility requires only one socket for each type of tube base.
3. **CIRCUIT CLARITY** — Lever switch numbering corresponds to RMA tube pin numbers, connected to bring out each active tube element. A simple up or down motion of the lever instantly makes the connection.
4. **OPERATION SIMPLICITY** — Minimum of control settings plus straightforward arrangement of this outstanding emission circuit. Generally not more than five of the 10 lever switches need be set.
5. **"PICTURE" YOUR CIRCUIT** —Assures confidence in tests and enables special tube checks for balanced circuits, special loads, etc. "Trick" switching circuits make it more difficult for the serviceman to "picture" his test circuit.
6. **SET UP YOUR OWN TEST FOR NEW TUBES** — The "pictured" circuit and straightforward test procedures enable the user to set up data for new tubes. A feature rarely found in commercial type tube testers.
7. **INDIVIDUAL CONTROL FOR EACH TUBE ELEMENT** — Takes care of roaming elements, dual cathode structures, multi-purpose tubes, etc., in addition to standard value tests.

TUBE TESTER MODEL 3413
Triplett lever switching circuit arrangement has 7 distinct advantages contributing to maximum flexibility, simplicity of operation and anti-obsolesence.

NET DEALER PRICE $66.75

. . . Combination Volt-Ohm-Mil-Ammeter Model 3480

This tester combines the Tube Tester Model 3413 with complete facilities for voltage current and resistance analyses . . . a real economy for those shops requiring a combination tube tester and volt-ohm-mil-ammeter . . . Attractive two tone metal case with detachable hinged cover . . .

TECH DATA

D. C. Volts: 0-3-12-60-300-1200, at 10,000 Ohms/Volt.
A. C. Volts: 0-3-12-60-300-1200, at 2,000 Ohms/Volt.
D. C. Amps: 0-12, at 250 Millivolts.
D. C. Milliamps: 0-1.2-12-120, at 250 Millivolts.
Ohms: 0-1000-10,000 (10-100 at center scale).
Megohms: 0-1-50 (10,000-500,000 Ohms center scale).
Output: Output Jacks, Condenser in series with A. C. Volt ranges.
Scale: 5.6" long on top scale arc 0-1000 Ohms and 0-50 Megohms on top arc. 0-12-60-300 A. C. and D. C. Volt figures are on four separate arcs. Scale markings are black on white except A. C. are red on white; O-1K Ohms scale is green on white.

MODEL 3480 **$98.75** . . . U.S.A. Dealer Net

Precision first...to Last

TRIPLETT

SEE AT YOUR RADIO PARTS DISTRIBUTOR OR FOR MORE INFORMATION . . . WRITE

TRIPLETT ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO, U.S.A.

In Canada: Triplett Instruments of Canada, Georgetown, Ontario

EDITORIAL

by S. R. COWAN

TV Manpower Shortage

The exact figure is not known but probably less than 50,000 men are engaged in radio-TV servicing in the U.S.A. at this writing. Because of the huge influx of TV, which requires many more man-hours of installation and service time than does AM-FM repairing, the shortage of technically trained men, especially for TV, has become quite apparent.

Replacement Supply Problem

Component parts, receiver and picture tube manufacturers, despite greatly increased production facilities, are hard pressed to meet the demands imposed upon them by TV set manufacturers who are now turning out upwards of 20,000 TV sets daily. Soon TV set production will exceed 30,000 units daily.

Naturally the parts and tube manufacturers have found it possible to assign but a minute portion of their output to the jobbing trade, who in turn is supposed to have same available for the serviceman to use as required in handling replacements. This parts-tubes shortage is beginning to be noticeable and frequently a TV technician is forced to wait weeks, and even months, for needed replacements.

TV set manufacturers could help out in the emergency by making available to parts jobbers any surplus of material they might have on hand, especially parts or tubes that were required for now out-of-production TV models. But they, (the set manufacturers), are not doing this of their own accord. The next best method of getting this dormant stock back into circulation might be accomplished by the original manufacturers themselves who would get it back, issue full credit refunds, and then reship the stuff to jobbers who have back-orders on file.

On the other hand, TV set manufacturers should bear in mind that inoperable TV sets, made unusable because needed replacements can't be had, are their worst advertisement. It is incongruous that TV set makers laud technicians to the hilt, recognizing that such Service Dealers have tremendous recommending power which influences potential TV set buyers, while at the same time they are withholding the very parts that enable the Service Dealers to stay in business and keep their sets in operation.

National "Fix Your Radio" Month

Full details of the success enjoyed by New York and Pennsylvania Service Dealers who put on a joint, two-state "Fix Your Radio Month" in October 1949 are not yet available, but the campaign was so successful that several leading parts and tube manufacturers are already getting ready to support, in line with our advocated policy, such a "Fix Your Radio Month" on a nationwide basis for October, 1950.

Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
MANAGING EDITOR

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342 MADISON AVENUE
NEW YORK 17, N. Y.

MEMBER AUDIT BUREAU OF CIRCULATIONS

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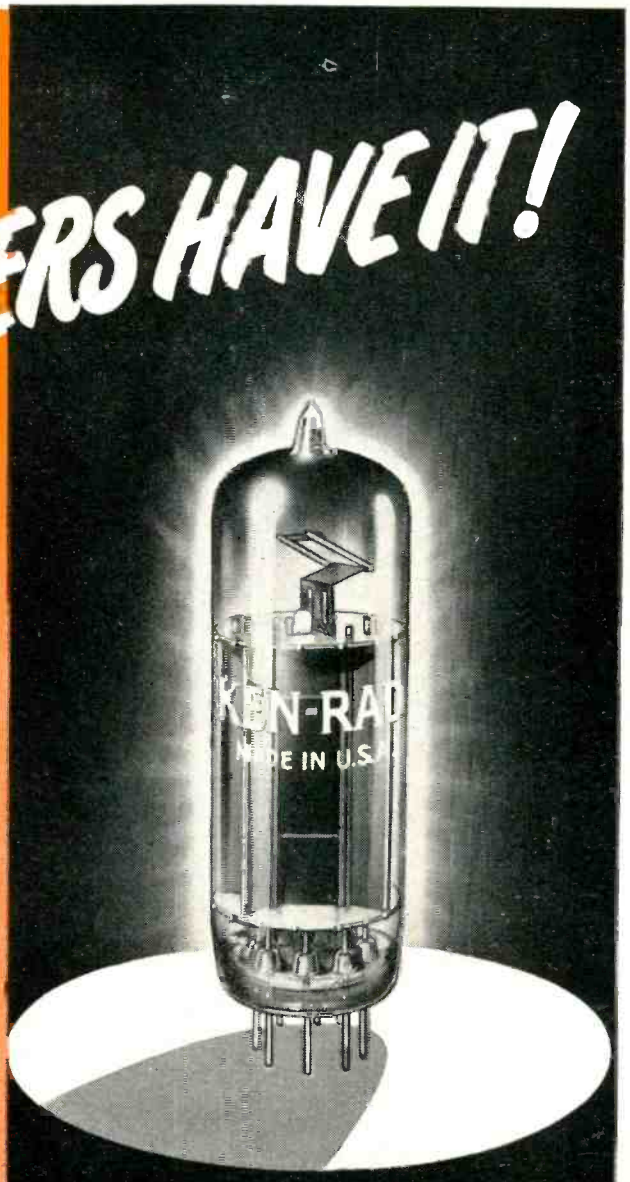
IF IT'S NEW...

KEN-RAD DEALERS HAVE IT!

YOU'RE in the driver's seat as radio-TV serviceman, if you stock and sell Ken-Rad tubes. Backed by General Electric's vast research and development facilities, Ken-Rad engineers provide you *at all times* with outstanding new designs. You can service late-model receivers in your neighborhood knowing that the Ken-Rad complete line of tubes, TV-picture, metal, glass, and miniature, includes the advanced types to be found in new circuits . . . like the pace-setting gated-beam 6BN6 shown here (heater 6.3 v, 300 ma), or its 12BN6 companion (heater 12.6 v, 150 ma). . . . Get the service business that goes to the dealer who has the *new* types—who handles Ken-Rad tubes! It's *new* and profitable business, and builds prestige for your shop. . . . Phone or write your Ken-Rad distributor today!

HOT THIS MONTH!

Here's a clear-all-wires news item! Ken-Rad 1950 advertising help is ready and on its way to you *via* your distributor. There are sales-getting small ads for newspaper use—postcard mailers that *pull*—spot announcements for your local radio station. Add these to the fine Ken-Rad displays and other promotions, and you as an alert Ken-Rad dealer have "what it takes" to profit from the active tube market in your area.



6BN6 MINIATURE

Typical Operating Conditions, TV Application

Plate supply voltage	175 v
Plate load resistance	.22 megohms
Accelerator voltage	85 v
Cathode resistance	145 to 400 ohms
Minimum signal voltage for limiting action	1.25 v RMS
Audio output voltage	12.5 v RMS

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

The gated-beam 6BN6 does three tubes' work. It functions as a limiter, discriminator, and audio-amplifier in new TV and FM receivers. You'll be servicing sets soon with 6BN6's in their circuits, and replacements will be in order. Make sure *you have this essential new miniature when you need it* . . . and other up-to-the-minute tube types . . . by stocking the Ken-Rad brand!

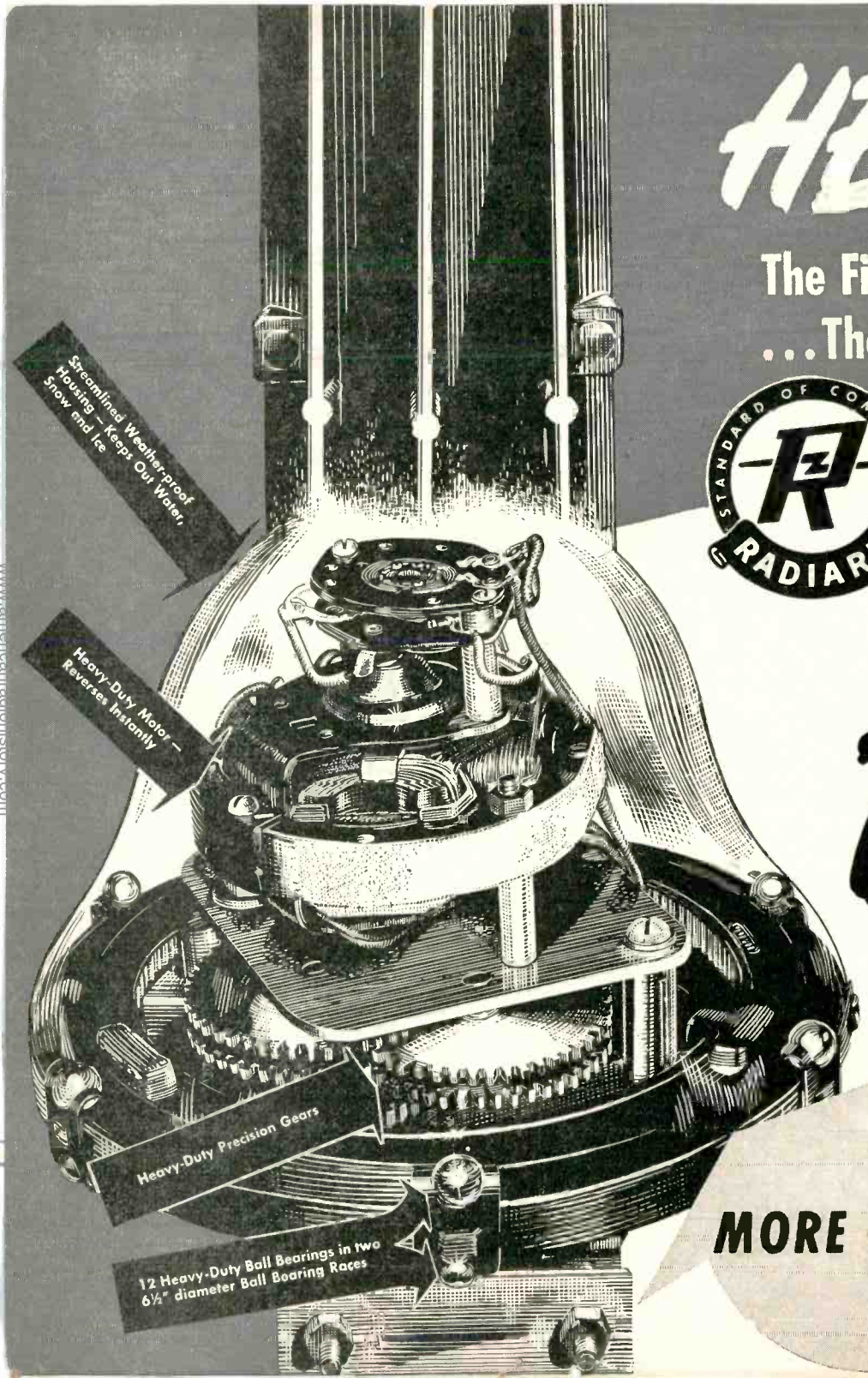
182-JA2

HERE IT IS...

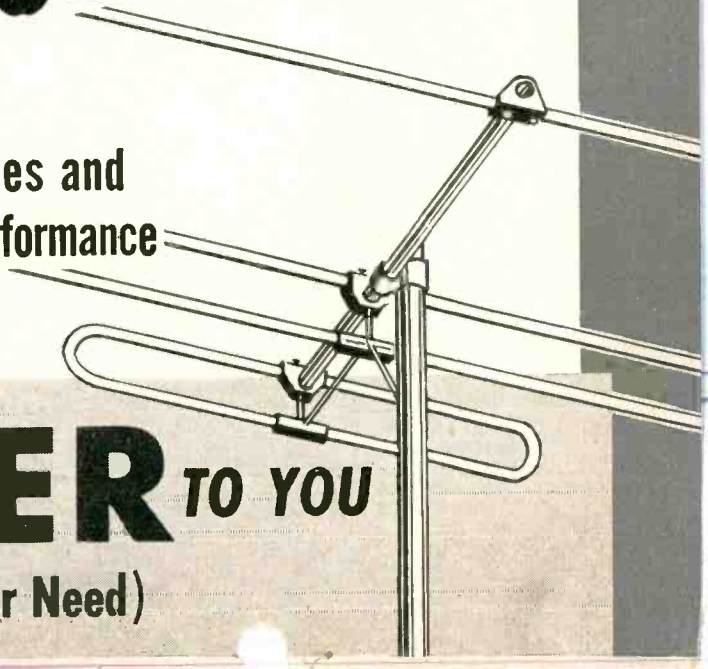
The First Word In PERFORMANCE
...The Last Word In DESIGN!

STANDARD OF COMPARISON
RADIART

THE RADIART TELE-ROTOR



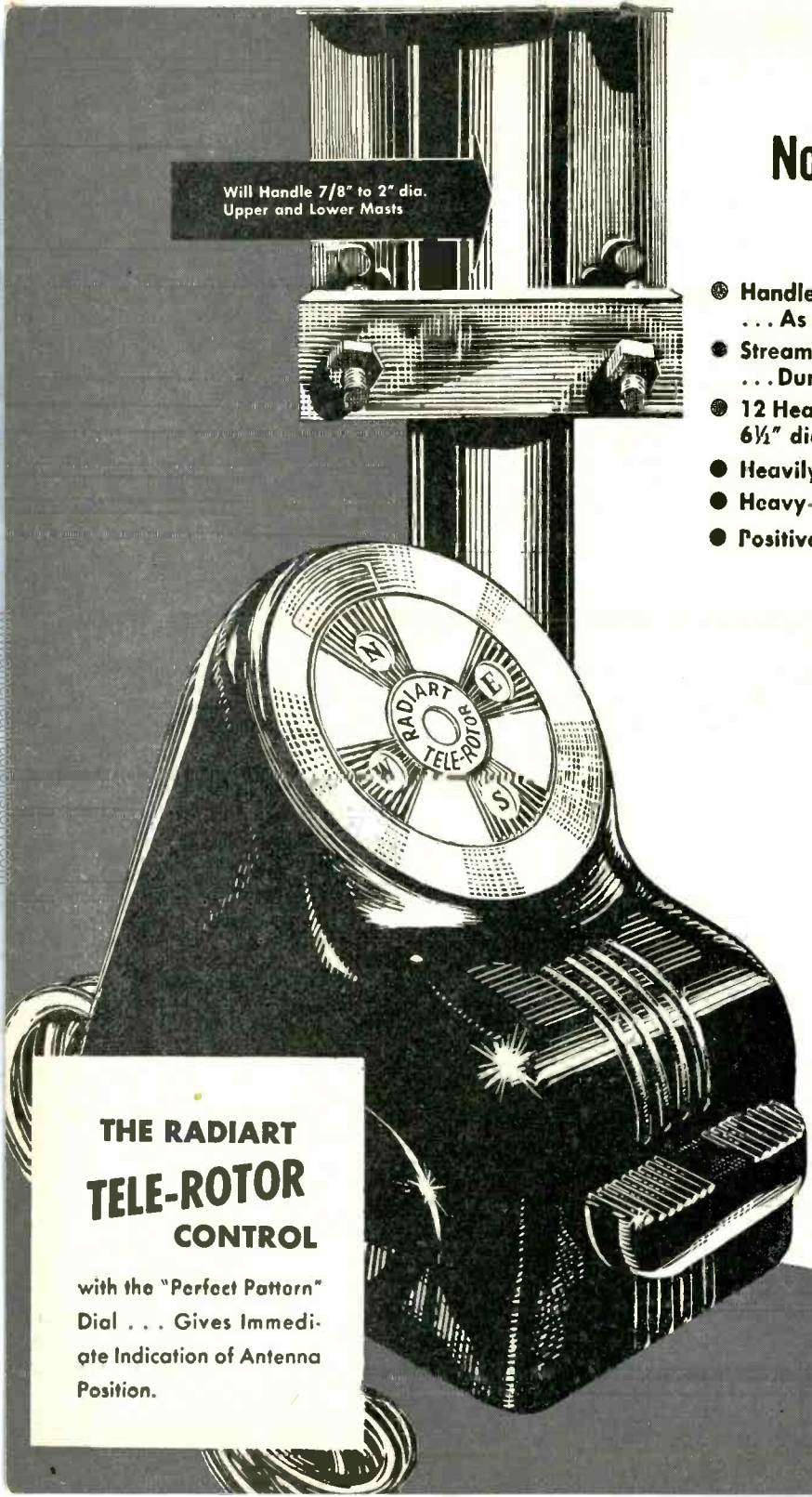
For Clear Sharp Pictures and Perfect Trouble-Free Performance



MORE POWER TO YOU

(More Than You'll Ever Need)

A Triumph In Design!!! There's Nothing Like It — It Is Beyond Comparison



CHECK THESE FEATURES

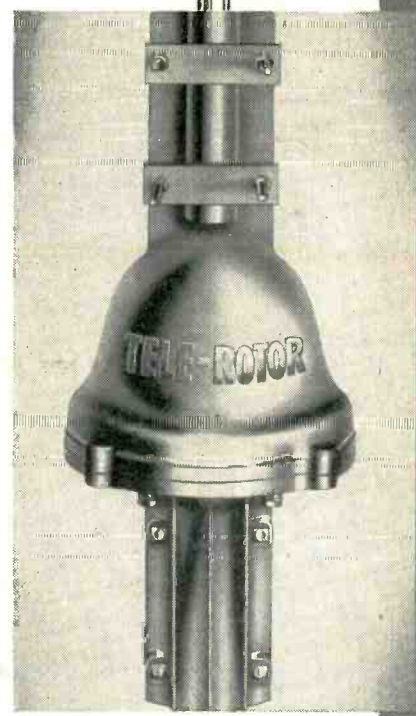
- Handles Heavier Loads With Ease . . . As Much As 150 Pounds
- Streamlined Weather-proof Design . . . Durable Sturdy Construction
- 12 Heavy-Duty Ball Bearings in two 6½" diameter Ball Bearing Races
- Heavily Reinforced Die-Cast Housing
- Heavy-Duty Precision Gears
- Positive Stop at End of Rotation
- Will Handle 7/8" to 2" diameter Upper and Lower Masts
- Heavy-Duty Motor — Reverses Instantly
- Mast, Tower or Platform Mounting
- Four Heavy-Duty Guy-Wire Lugs
- Completely Weather-Sealed . . . Factory Lubricated For Life

The television industry has been looking for something like this . . . and it took RADIART to produce it! THIS is the last word in ROTATORS . . . the finest! . . . BECAUSE IT HAS EVERYTHING! It wasn't developed overnight but is the result of fourteen solid months of research and development! BUT . . . it has been worth it . . . BECAUSE IT MEASURES UP TO RADIART STANDARDS . . . The quality level that makes RADIART PRODUCTS THE STANDARD OF COMPARISON!

Available in the Following Models:

- **TR-1** . . . *rotator with control box* **$39.95**
- **TR-2** . . . *compass control rotator with "Perfect Pattern" dial* **$44.95**

A Combination You Can't Beat . . .
It's a Radiart Antenna with a Radiart Tele-Rotor



THE RADIART TELE-ROTOR CONTROL

with the "Perfect Pattern" Dial . . . Gives Immediate Indication of Antenna Position.

IT'S RIGHT WHEN IT'S RADIART

THE RADIART CORPORATION
CLEVELAND 2, OHIO

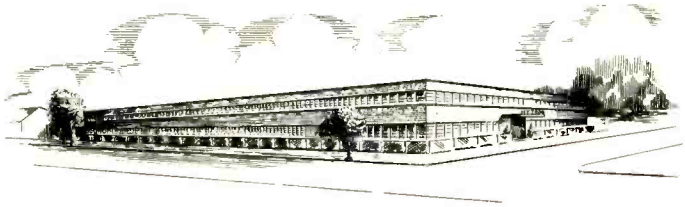
STANDARD OF COMPARISON — RADIART

SUBSIDIARY OF CORNELL-DUBILIER ELECTRIC CORP.

• ROTATORS • VIBRATORS • AUTO AERIALS
• TV ANTENNAS • POWER SUPPLIES

TRADE FLASHES

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



Artist's drawing of new Hytron plant.

Hytron Lays Cornerstone For New Plant

Two of the industry's veterans, Bruce A. Coffin, President, and Lloyd H. Coffin, Treasurer, of Hytron Radio & Electronics Corp., recently laid the cornerstone of Hytron's new television picture tube plant at Newburyport, Massachusetts.

Ultra-modern, the new plant is designed especially for mass production of television picture tubes. With it, Hytron will expand its production of these tubes begun nearly a year ago. Three thousand television picture tubes will roll off the new production lines daily. The tubes will range in size up to twenty inches. They will be of round design and of the new rectangular design recently originated by Hytron.

Hytron will thus increase materially its manufacturing facilities. The extra space of this new picture-tube plant, added to Hytron's present facilities, will give Hytron a total of approximately 400,000 square feet. Starting in 1921 with only 6 employees, Hytron now employs approximately 2500 persons. The new TV picture tube plant will add approximately 300 more.

Coast To Coast TV

Coast to coast television is not far off, with high costs of transmission its main deterrent, Dr. Thomas T. Goldsmith, director of research, Allen B. Du Mont Laboratories, Inc., told a television symposium at the American Association for the Advancement of Science convention in New York City. The Du Mont scientists read a paper on the transmission, propagation, networking and reception of television pictures. Included in his discussion was a review of present commercial VHF channels and the prospective further UHF channels in relation to television service, both national and international.

Radiart Jobber Awards

Awards of the Radiart Service Plaque were made at the recent Minnesota Gopher Conference by Jobber Sales Manager Milton S. "Mike" Roth, pictured here.

Shown left to right are Roth, Ward Jensen of Lew Boun Co., Ray Daly of Power City Radio, Leonard Tesdell of Iowa Radio Corp., each of whom are fifteen-year distributors and Mav Kirkeby, Radiart "rep". Radiart awards these plaques to their jobbers who have a service record of at least five years with Radiart products and adds a gold star for each five year period.

The Radiart Corp. of Cleveland manufactures Vibrators, TV Antennas and Accessories, TV Rotators, Automobile Aerials, "Batrypowers." Vibrator Power Supplies and Converters.

New RCA TV Line

According to a release by RCA-Victor with regard to their new TV line of receivers, news-making highlights of the line are the first sets featuring RCA's new short-necked 16-inch metal-coned picture tube with "Filterglass" face plate, a 10-inch

picture of the Successful T-V Serviceman

*Trade-mark.

For superlative pictures, he installs Teletrons — in the 12½, 15, 16 and 19 inch sizes — selected from this Teletron Catalog. Write for your copy!

DUMONT

FIRST WITH THE FINEST IN T-V TUBES

Teletrons

ALLEN B. DU MONT LABORATORIES, INC. • TUBE DIVISION, CLIFTON, N. J. • PLANTS AT ALLWOOD AND PASSAIC, N. J.

table model at $169.95, and the first console instruments incorporating phonograph facilities for all three record speeds with a separate 45-rpm turntable to preserve all engineering advantages of the RCA-developed 45-rpm system. The new tube length makes possible more compact, well-proportioned cabinets by appreciably reducing depth requirements. The "Filterglass" face plate, based on principles developed before the war by the RCA Laboratories, improves picture contrast by minimizing the effects of unwanted light from sources both within and outside the tube.

Olchak Promoted By Air King

R. D. Payne, Manager of Sales, Air King Products Company, Inc., Brooklyn, New York, manufacturers of radios, wire recorders and television receivers announced the promotion of Samuel Olchak to Advertising and Sales Promotion Manager, effective January 1st.

Mr. Olchak will retain associated duties of his previous position of Commercial Service Manager. Samuel Olchak, well known in the electronic industry for the past twelve years, was formerly Assistant to the Vice-President in Charge of Sales at Tele-Tone Radio.

Alliance Advertising Campaign

The Alliance Manufacturing Company not only continues to advertise the Alliance Tenna-Rotor over most of the major television stations in the nation, but during the past few months has steadily increased the number of stations and the frequency of appearances. The Alliance one-minute TV sound films are strategically placed to capture maximum number of viewers.

In recent months quite a few stations west of the Mississippi were added and the Alliance advertising now includes stations from coast to coast with regularly scheduled spots

Final plans for the Alliance Tenna-Rotor advertising projected into 1950 are reviewed by John Bentia, Sales Manager of the Alliance Manufacturing Company (standing) and Miles C. McKearney, Account Executive for Foster & Davies, Inc., the advertising agency.

adjacent to practically every top network show. For some time Alliance has added a considerable quantity of entirely new films. To capture the peak audiences between top-rated network shows which do not provide a full minute, they have also added 20-second chain break film which still continues to demonstrate their product.

TV Test Equipment By G. E.

W. L. Parkinson, left, supervisor of technical service for the General Electric Receiver Division at Electronics Park, is shown here explaining the operation of G-E television test equipment to General Electric Supply Corporation personnel who attended a recent week-long television service meeting at Electronics Park. From left to right are A. J. Parsons, GESCO vice-president from Bridgeport;

T. L. Campbell, GESCO-Atlanta; E. A. Anthony, service manager for GESCO-New York; and Samuel Cooper, television service supervisor for GESCO-San Francisco.

Taco Antenna Bulletin

Explanation and detailed drawings of the proper procedure in stacking high-band antennas are given in Engineering Bulletin No. 58 just released by Technical Appliance Cor-

poration, Sherburne, N. Y., manufacturers of TV, FM, and AM antenna systems.

There has been much confusion in the field as to the correct method of stacking antennas for use on Channels 7-13. Taco engineers have provided this information in an easy-to-understand form as a service for the busy TV installation man. Dimensions and proper phasing of antennas are given for both the two-stacked and four-stacked arrays. By following this information, the most efficient array is achieved, providing maximum signal strength.

Telrex Ups Production-Lowers Prices

It is announced by M. D. Ercolino, president of Telrex, Inc., that their newly enlarged plant facilities which trebled output of Conical "V" Beam TV antennas and accessories permitted a substantial price reduction general throughout the entire line. Parts jobbers have been notified that the new prices are in effect and that the "V" beam conicals will continue to feature Dural elements while high quality and design features remain unchanged.

Telrex, Inc., manufacturers of antennas since 1921, are especially identified with the development and introduction of conical type TV antennas.

Air King Produces

16"-Rectangular Tube TV Receivers

D. H. Cogan, president of Air King Products Company, Inc., Brooklyn, New York, manufacturers of radios, wire recorders and television receivers announced the production of 16" rectangular tube television models at full

capacity in Air King's modern plant with over 200,000 square feet of space.

Mr. Cogan further stated that with the newly equipped and mechanized facilities, production for the year 1950 would be geared for the largest output of television sets in the company's history.

Anchor Doubles Ouput

Anchor Boosters of Chicago has finally reached a volume great enough to enable them to double their daily

output over the production high established in November of 1949. This, naturally, will help them to cut down the terrific backlog and provide for prompt and efficient deliveries of their successful TV Preamplifier.

They now are asking the industry to disregard the present shipping schedule on all open orders and will advise it of their revised schedule at the earliest date possible.

New Radio Operator's Q&A Manual

John F. Rider Publisher, Inc., 480 Canal Street, New York 13, N. Y., announces its new book (Radio Operator's License Q&A Manual) by Milton Kaufman, is currently at all Rider distributors.

The new book systematically lists the questions and answers to past FCC exams, plus a Follow Through discussion to the answer, so necessary for complete understanding of the technical question. The book is up-to-date in all respects, as of the publication date. It is based upon the latest Government Study Guide and supplementary FCC releases. A valuable "extra" is the useful appendices (Small Vessel Direction Finders and Automatic Alarm), never before available in a book of this type. Abundant illustrations make difficult technical questions picture-clear.

Attractive Service Signs

Celomat Corporation of N.Y.C. announced a new fluorescent plastic sign which is used by the retailer over the different departments in his store.

This sign is available in stock for words such as Tubes, Batteries, Wholesale, Service, Radio, Television, Sound Equipment, etc., and are relatively inexpensive.

Stancor TV Components Replacement Guide

A 20-page booklet, "Stancor Television Components Replacement Guide," has just been released by Standard Transformer Corporation, Elston, Kedzie and Addison, Chicago 18, Illinois. Free copies are available direct or from Stancor distributors.

This guide, Eorm DD338C, lists Stancor replacement transformers for 215 TV receivers and chassis made by

THE REDSKINS ARE HERE!

SANGAMO'S *NEW* MOLDED PAPER TUBULARS

Sangamo presents the REDSKIN . . . a new molded paper tubular capacitor that gives *long life* under severe operating conditions. The REDSKIN is an 85° C tubular that is easy to work with, on production line or bench, because the flexible leads resist breakage and can't pull out! It offers greater mechanical strength because of its plastic construction. It is molded under *low* pressure, assuring elements undamaged in fabrication, greater dependability, and the absence of "hot spots."

A trial of these new molded tubulars will convince you! See your jobber—if he can't supply you, write us.

BIG CHIEF SANGAMO SAYS:
PLENTY PROUD OF NEW PAPOOSES!
REDSKINS HEAP TOUGH...STAND TESTS
THAT MAKE OTHER BRAVES FLINCH.
REDSKINS LIVE LONG TIME...WORK
HARD...HELP YOU MAKE WAMPUM TOO!

IMMERSION and HUMIDITY RESISTANCE
Test Result: ***EXCELLENT!***
Far surpasses normal specification requirements . . . Insulation resistance practically unchanged under severe conditions of immersion or humidity.

85° C PERFORMANCE
Test Result: ***EXCELLENT!***
Long life operation under high temperature conditions make it a "natural" for applications where high temperatures cause trouble.

MECHANICAL STRENGTH
Test Result: ***EXCELLENT!***
Especially designed flexible leads resist breaking or pulling out even when handling is extremely rough.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

In Canada: Sangamo Electric Company Limited, Leaside, Ont.

SANGAMO

SC4911

forty-three manufacturers. Stancor replacement part numbers are listed together with manufacturers' part numbers for positive identification.

Sylvania Merchandising Idea

A personalized selling aid for television sets has just been developed by Sylvania Television and is being recommended to all Sylvania Television dealers and distributors.

This new merchandising idea consists of a large map, which gives the prospective set owner all the information he wants on television in his area.

This map will show exactly where each prospective television set owner lives in relation to available transmission. Depending on the dealer's locality, two or more maps may be advisable—a street guide for urban areas and a road map or trading area map for suburban and rural coverage.

Colored crayons locate major landmarks, especially high structures that might affect reception in the set owner's home. The map will explain in non-technical terms how expert installation will provide the best possible reception.

Three new television receiver models and new, low prices on current Sylvania Television sets have been announced by E. E. Lewis, President, Colonial Radio Corp., Buffalo, wholly-owned subsidiary of Sylvania.

Burgess Merchandiser

Burgess Battery Company has completed design of two new counter cartons to display its new zebra-striped flashlight battery.

The new merchandisers come in 12 cell and 48 cell sizes. As the cartons are opened for counter use, the zebra pops up and combines with bold type to announce the availability of the new flashlight batteries sealed in steel and plastic.

Heat is no Problem, *when you know your stuff . . .*

MALLORY CAPACITORS Can Take It!

Mallory FP Capacitors are built to withstand continuous high temperatures. Tests show they perform consistently during 2000 hours of operation at a temperature of 185°F. At lower temperatures, even longer!

Proof of this performance is found in the experience of one television manufacturer, who kept records of field failures for six months. *Of 385,000 Mallory FP Capacitors in service only six failed!* Special design and meticulous production care make such records possible . . . by eliminating the major source of internal corrosion.

Mallory Capacitors have set new long-life standards for the industry, yet cost no more. You will find it pays to rely on the complete Mallory Capacitor line — paper — ceramics — FP Electrolytics.

See Your Distributor for Mallory Precision Quality Parts at Regular Prices

P. R. MALLORY & CO. Inc.

MALLORY

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

*Reg. U.S. Pat. Off.

APPROVED PRECISION PRODUCTS

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

Large Screen PROJECTION

by **ALLAN LYTEL**

(Author of TV Projection and Enlargement)

In this article the writer explains in the most fundamental terms the various types of basic projection systems. Of particular interest is the treatment on optical relations in which is shown how movement of the object towards and away from the focus increases or decreases the viewing size. Refractive and reflective systems are also explained, and commercial applications of these systems are presented.

PROJECTION television receivers for the home have now been on the market for several years under various trade names. There are two fundamental projection systems which have achieved popularity and are presently commercially available. The least used system involves a combination of lenses only which project the image taken from a small direct view tube onto the viewing screen. This is the refractive, or direct lens projection system. *Figure 1* is a simplified drawing showing this type of projection.

Refractive System

The tube face is mounted at a fixed distance behind the lens system. In the figure, the tube face is represented by a single vertical arrow and one single lens is used in place of the complex lens systems, to illustrate the action. Light is gathered by the lens and because of its refractive properties, an enlarged image is projected upon the viewing screen. Usually a transmissive type of screen is used in which the image is viewed on the opposite side of the actual projection, that is, the light forming the image is projected against one face of the screen while the viewing audience is on the opposite face. The transmissive qualities of the screen allow the light to penetrate; a specially designed screen is used to concentrate the available light. The amount of enlargement or magnification depends upon the position of the tube face relative to the lens system. Any lens system has a focal length which is the measure of its convergent properties. Enlargement is only possible when the tube face or the object in optical terms, is located between two points. These are the focus and a point equal to twice the focus. In *Figure 1*, the object is located just beyond the focal length of the lens to the left. Light from the object passes through the lens, through the second focal point and onto the image presentation on the screen.

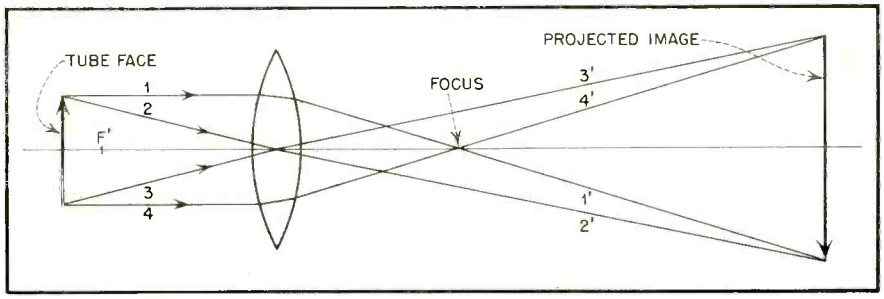


Fig. 1. Refractive or direct lens system used in some projection systems.

Magnification is defined as either the image size divided by the object size or the image distance divided by the object distance. Magnification may therefore be increased by moving the tube face or object to be magnified closer to the lens. As the object is moved nearer to the lens, the image becomes larger and at the same time moves further away from the lens.

In commercial use, this direct and most simple of projection systems has several serious limitations. The lens system is in general, expensive, if all of the inherent and natural defects of convergent lens are properly corrected. Magnification in any case is limited to rather small values. This is because increasing magnification increases the distance between the projected image and the lens and this, of course, causes the projected image to be less bright. The amount of light which forms the image decreases as the square of the distance between the image and the lens.

There are several other systems of projection possible and several of these have been used successfully. There are indeed, several large screen projection systems which do not involve cathode ray tubes but rather use rotating many-faced mirrors. A dark trace tube known as the Skiatron also is in the developmental stage. In this system, the electron beam creates a dark rather than a light image and an external source of visible light projects this dark trace image on the viewing screen.

Schmidt System

The most widely used type of projection is the Schmidt system which has, in its most modern use, been extended to larger and larger screens. This type of projection, technically known as reflective projection, uses a shallow dish-shaped mirror to collect the light rays and throw them upon a screen as an enlarged image. Projection of this type has several popular

sizes. There are the 12 by 16 inch, the 15 by 20 inch, the 18 by 24 inch, and the 20 by 26 inch projected pictures. Modifications of the same system have now been evolved to the point where they can present images as big as 6 by 8 feet and even larger.

The fundamental Schmidt system illustrated in *Fig. 2* uses a concave spherical mirror with the inner surface reflecting. The tube face is mounted facing the inner surface of the spherical mirror which collects the light and by means of its reflective qualities, it enlarges the projected image upon the viewing screen. Since the spherical mirror collects more light than the lens system, it is inherently somewhat more efficient in producing a brilliant well-defined image. There are other components in the complete reflective projection system. However, the simple diagram in *Fig. 2* is illustrative of the optical principles involved. Point *C* is the center of curvature for the mirror whose focus *F* is approximately halfway between the center of the mirror at *B* and its center of curvature at *B*. The tube face, or object, must be located between the center of curvature and the focus. Its distance from the center of the mirror at *B* is known as the object distance. In similar terms, the distance between the projected image and the mirror is the image distance. As shown in the figure, the center portion of the spherical mirror is blacked out so that it will not cause direct reflection from the mirror back into the tube face, thus reducing contrast.

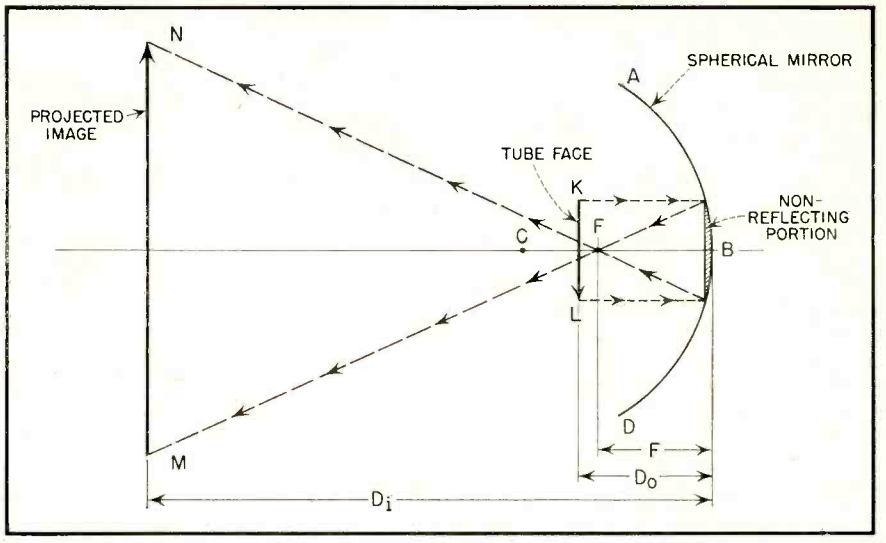


Fig. 2. Fundamental Schmidt system. This uses a concave spherical mirror with an inner reflecting surface. Most projection systems are of this type.

Optical Relations

There are two simple relations involving the several values which determine the optical operation of this modified Schmidt projection system. There is a fixed relationship between focal length, image distance, and object distance which is expressed as:

$$\frac{1}{f} = \frac{1}{Di} + \frac{1}{Do}$$

The enlargement or magnification is again expressed in terms of the image and object size. Linear magnification, or increase in size is expressed as:

$$M = \frac{Image\ Size}{Object\ Size} = \frac{Si}{So}$$

$$M = \frac{Image\ Distance}{Object\ Distance} = \frac{Di}{Do}$$

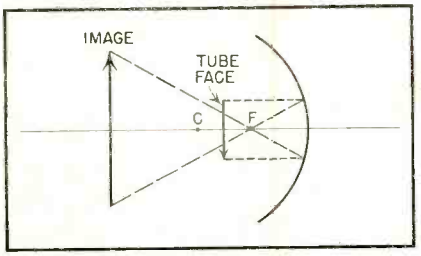


Fig. 3. Object located approximately midway between center of curvature and focus.

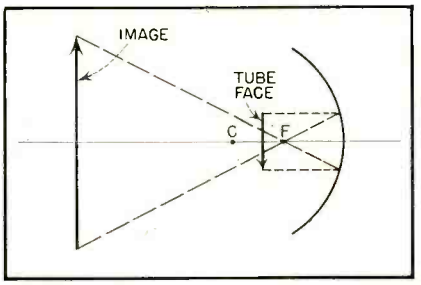


Fig. 4. In this figure the object is moved closer to the focus, increasing the magnification approximately 3½ times.

Since magnification depends upon the relation between image distance and object distance, it would seem that magnification could be increased without limit by decreasing the object distance. This is not strictly true because there are certain optical factors of distortion which prevent excessive magnification. The object must always be located between the center of curvature and the focus to obtain any magnification for the projected image. In *Fig. 3* the object is located approximately midway between the center of curvature and the focus. This produces a magnification of approximately 2½ since the image distance is approximately 2½ times greater than the object distance.

It will be noticed that in *Fig. 2* as with all cases of projection, the object is upside down in relation to the image. This is accomplished by presenting an upside down picture on the tube face which is inverted by the projection system and appears as an upright image on the viewing screen. In order to increase magnification, the object is moved closer to the focus or further away from the center of curvature which is the same thing. In *Fig. 4*, moving the tube face closer to the focus increases the magnification to 3½ times. The object distance is reduced, the image distance is increased, hence the magnification of the system is increased. This is important from the servicing point of view since a larger projected image will be obtained by moving the tube face closer to the concave mirror. In cases of projection television where the image does not quite fill the viewing screen, an increase in enlargement may be obtained by moving the tube face nearer to the concave mirror.

In *Fig. 5* a magnification of 5½ times is obtained by bringing the object still closer to the focus. As we increase the magnification, the picture will lose some of its brightness since the same amount of radiant energy in the form of light is now spread over a larger area. In this manner it will be seen that the reflective projection system can be and is used to present life size projection television by changing the distance between the tube face and the concave mirror. This is not to say that home type projection television receivers can be modified in this manner. However, it does show that the theatre type and life size type projection television sets now appearing on the market utilize the same optical principles as are found in ordinary projection television receivers.

[*Continued on page 38*]

High Quality Analyses Series

No. 4

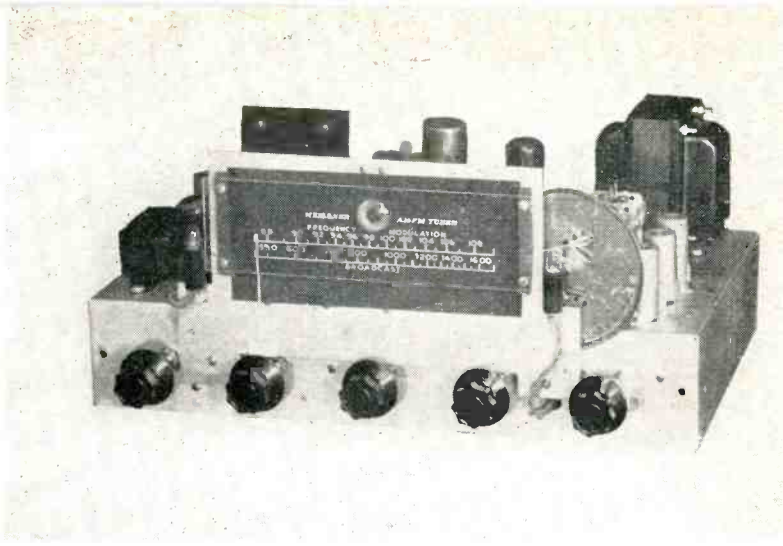


Fig. 1. Meissner 9-1091-C AM-FM Tuner

by C. A. Tuthill

Three products in this High Quality Series have been described in previous issues of RSD. In this article another highly engineered piece of equipment is discussed. We are very happy to make available to those presently engaged in and those contemplating entering the Custom Building field, this information on tuners designed only for quality.

UNLIKE most combination AM-FM tuners this example truly represents two independent receivers combined within one chassis. A bold contrast is presented against the over-played tendency to make one set of tubes do everything. Shortcuts are not tolerated in this Meissner model 9-1091C herewith up for analysis. See *Fig. 1.* Eighteen tubes are employed in this double superhet if we include the tuning indicator and rectifier. Of that total only the tuning indicator, rectifier and the last two cascaded 6J5 audio amplifiers are common to the AM and FM channels. All others are individually assigned modern *miniature* tubes. And the use of more than the usual amount of components is not a mere luxury. Instead, spurious interaction, prevelant in some multi-function tube circuits, is held to a minimum. The direct result is that collective distortion does not grow from stage to stage to mar fidelity. Since the AM circuits are the most familiar we will review that channel first.

Signal Input (AM)

Connections within the chassis are such that no individual antenna for the broadcast band is required. The FM antenna and its transmission line serve as the AM antenna. The schematic (*Fig. 2*) shows that the FM antenna coil (*05763*) is designed for balanced input, hence centertapped. The tap is effectively grounded at FM frequencies by the .000047 μf capacitor which is connected from the tap to ground. This tap feeds the primary of the AM antenna coil (05754) and the .000047 μf capacitor then serves to tune the primary so that it is resonant at a point below the broadcast band.

The importance of a good ground is stressed at this point. Any tuner or amplifier leans entirely upon what occurs across its input terminals. Servicemen can profit by pointing this up and by reminding customers that the *best* ground is none too good for high quality tuners which are even more susceptible to extraneous noises riding in with the desired signal than are receivers of lesser quality.

It will be noted that the input and interstage i-f transformers (*04216*) have three windings. The third coil, which may be looked upon as a continuation of the secondary, is a few turns of wire wound adjacent to the primary. Then, by bringing these secondary connections out to the first two mechanically ganged selector switches, provision is available for *broad* or *sharp* tuning. In the *sharp* position connections are made in a conventional manner to the main secondary at which time the third winding serves no useful purpose. In the *broad* position, due to the third series winding in close proximity to the primary, the transformer becomes overcoupled and thus affords the broad band-pass required for high fidelity reception.

A third section of the same switching system is shown in the lower right portion of the schematic (above the first 6J5). This section affords phonograph, AM or FM signal input to the audio section. The fourth section of the selector switch, shown to the upper right of the 6U5 indicator tube, pertains directly to that tube. It merely shifts the grid of the indicator tube to the section of the tuner being used so as to indicate proper tuning.

An individual wafer switch, more to the right of the 6U5 indicator, is shown in the schematic to distribute screen grid and plate voltages from the well filtered rectifier.

A crystal-type or high level phono pickup may be plugged directly into the phono-input jack at the rear of the chassis. The 47K resistor and .01 μf capacitor network, between the phono-input jack and ground, offers compensation for either type pickup since further and thorough equalization of both treble and bass registers is introduced between the two 6J5 audio amplifiers. The variable resistors, shown as components of those latter equalizers, offer a gradual bass boost up to 12 db at 40 cycles, or a treble suppression of 12 db at 8000 cycles. The value of such equalization cannot be over exaggerated. More and more appreciation of such facility, from the discriminating listener, is becoming the accepted rather than the unusual. Others, who just never

will like *highs*, have a knob with which they can, "do something about it".

In summation, the quad-section selector switch has 4 positions for each of its 4 sections. These are:- Phonograph; AM Sharp; AM Broad; and FM, in that order from left to right. Naturally the second or AM Sharp position offers greater selectivity and therefore should be used for AM tuning when electrical or adjacent channel interference is severe. The physical layout of switching reflects care in design. The two i-f coils (*04216*) are located close to their switching sections. One coil appears on either side of the mechanical switching assembly. (See photo *Fig. 1.*)

Whenever lack of interference permits, the third or AM Broad position should be used in order to derive full benefit from the high quality characteristics of this AM channel. A further step is taken to safeguard high quality reception. A 10KC whistle filter eliminates beat notes in that register created when channel separation is tight between transmitters. As qualitative reception is expanded upward, the importance of such a filter grows. It appears in the schematic as assembly *05753* and consists of an adjustable coil and mica capacitor within the shield adjacent to the high potential control wafer switch.

Returning to the front end section, the schematic shows that synchronous tuning obtains for the r-f, mixer and oscillator circuits on both AM and FM, all of these circuits being mechanically gang-tuned. Beyond the AM converted, selective band-pass is afforded as previously described.

In the 6BE6 FM converter, where signal translation first starts, separate grids are offered to the amplified r-f signal and to that injected from the local (6C4) oscillator. Since these grids are shielded from each other by the screen between them, spurious interaction is thereby minimized.

In the AM section, a simple single-tapped oscillator coil (*05756*) is shunted by trimmers as well as ganged tuning. The lower end of this coil is grounded while its tap connects directly to the converter cathode. The top end of the coil is coupled to the oscillator grid through a .00022 μf capacitor. When servicemen have faults to run down pertaining to these double duty stages, they should first localize the fault, by means of signal tracing, to either mixer or oscillator. Next, ignore the clear section and concentrate upon the *weak sister* as though it were an independent tube.

IF Section (AM)

Following the converter (6BE6) plate are two intermediate 455 kc stages employing 6BA6 pentodes. Double-tuned high efficiency iron cored coils of great stability are used in these stages where most of the AM channel amplification and selectivity are derived. The refinement of choice

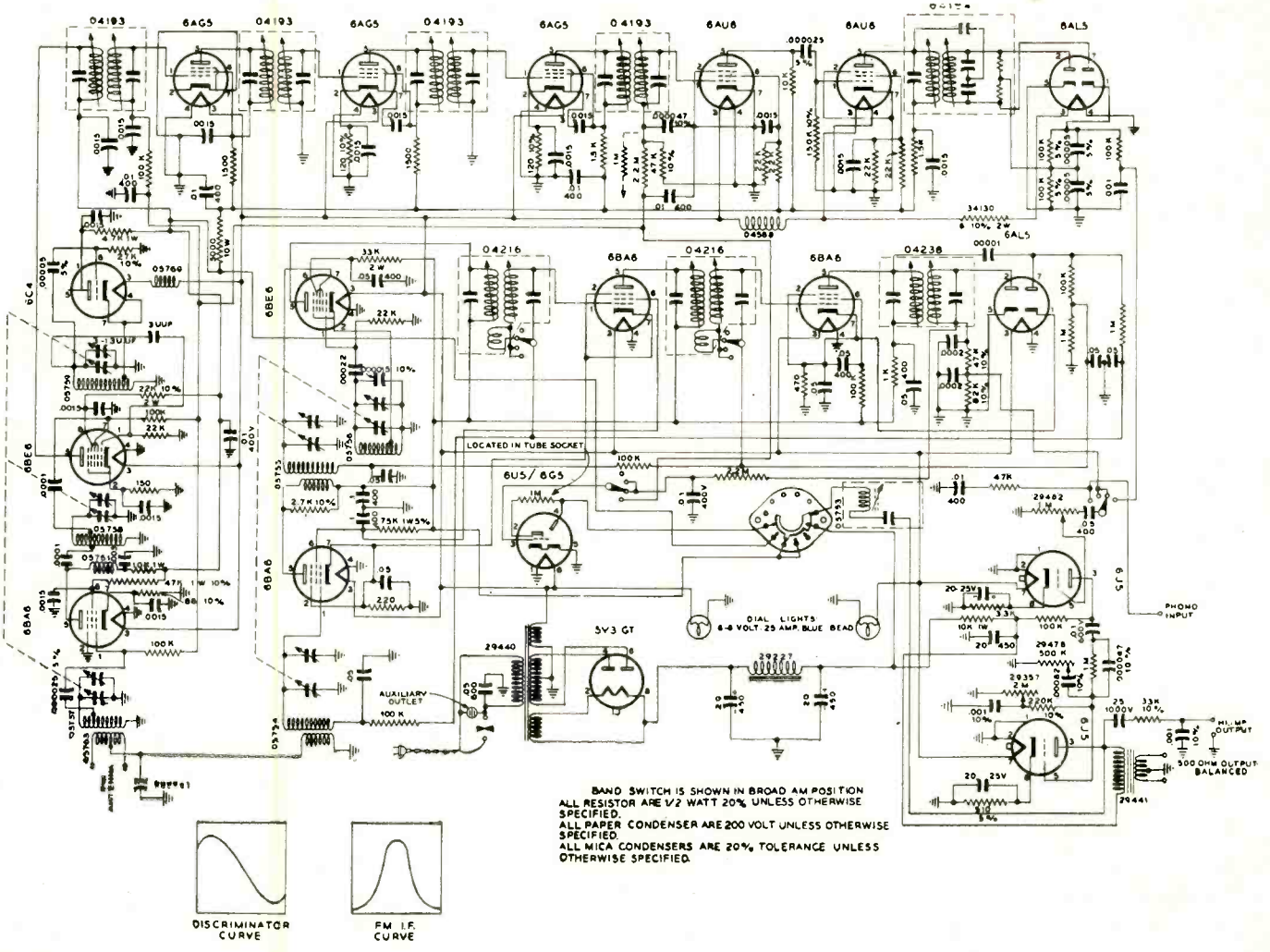


Fig. 2. Circuit diagram of Meissner 9-1091-C AM-FM tuner.

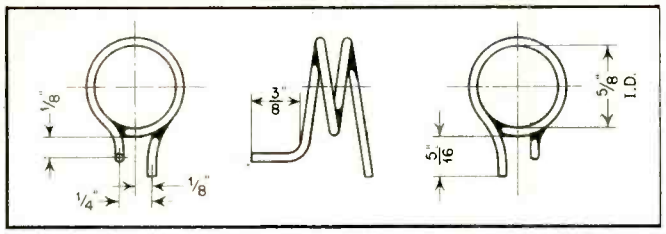


Fig. 3. Antenna coil

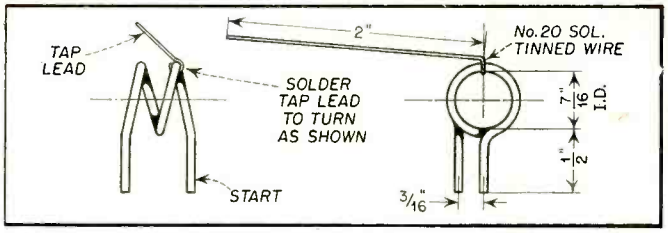


Fig. 4. Oscillator coil

of *narrow* or *broad* bandpass again depends upon the inclusion of the third transformer coil as shown.

Careful alignment of the i-f stages at the frequency specified (455 kc) is a positive requirement. For the sharp bandpass (7kc at 1000 kc), top and bottom adjustments of i-f coils *04216*, *04216*, and *04238* should be made for maximum output. When properly adjusted in the *sharp* position, response in the *broad* position (14 kc at 1000 kc) should be double-peaked with the valley between them centered at 455 kc. Peaks of equal amplitude should be equally spaced either side of 455 kc. It will be found there is less gain for the broad position than for the sharp. The remote cutoff characteristics of the tubes used in this section affords a smooth control of gain as grid bias voltage is controlled by delayed a.v.c. in the following diode.

Detector—AVC (AM)

Each diode section of the 6AL5 functions independently from the other which is isolated by an internal shield. In this tuner provision is made to avoid distortion of modulation entering the detector diode from the secondary of coil 04238. For example, no a-c shunting load is permitted across the diode load resistor wherewith distortion could be born. A 2.2 megohm resistor is in series with the grid of the 6U5 indicator tube and the volume control has a resistance of 1 megohm so that the shunting effect of these units is small when referred to the actual value of the load resistor.

The second section of the 6AL5 serves to develop delayed a-v-c voltage. Its cathode is connected to the cathode of the last i-f amplifier (6BA6) which has cathode bias and is a few volts positive. The signal which develops the a-v-c voltage is taken from the primary of the output i-f coil (*04238*) rather than the secondary.

Signal Input Channel 2 (FM)

The FM antenna should be free from local line-of-sight masking or deflection due to nearby buildings, tanks, towers, etc., and the higher above the ground the better. Any good FM antenna will serve if suitably arranged for 300 ohm line matching. The builders of this tuner enjoy a reputation for coil design hence a few examples are detailed (*Figs. 3* and *4*).

Even multi-band short-wave and video receivers today find one r-f stage adequate because of well designed antenna-to-grid coupling coils facing modern vacuum tubes such as the 6BA6 employed here. The miniature tubes used throughout this FM channel lend themselves to proper matching for greater signal energy transfer. Voltage ratios of better than 50 to 1 between desired and undesired signals are achieved. Not too troublesome at these higher frequency bands, adequate image suppression is obtained.

Lest the schematic confuse, the coil *05761* is an r-f plate choke. The plate of the 6BA6 is capacity coupled to the tuned coil (*05758*) input to 6BE6 mixer. The physical dimensions are given in *Fig. 3*.

Pentagrid Mixer (FM)

The easy application of a converter, acceptable enough for the lower AM channel, is not employed in this v-h-f stage where each control grid of the 6BE6 has its own function. The 6C4 and its tuned coil (*05759*) provide the beat signal. Mixing occurs in the electron stream between cathode and plate and thereby a cleaner signal is passed on to the i-f amplifiers. Tricky distortive interactions between elements within a converter envelope are averted. *Pulling* between stages is reduced and greater stability is the payoff.

Plate and screen potentials are supplied to all tubes from busses set up within the tuner. The 5Y3 built-in rectifier provides the source controlled by the wafer switch shown above the rectifier in the schematic. Another bus supplies one side of all heaters while their returns are grounded.

6C4 Triode Oscillator

In the higher frequency bands local oscillator stability becomes imperative. Drift is usually held to a minimum by such devices as thermal compensation trimmers and separate tubes whose critical circuits are independent of others. In this tuner it has been found more practical to allow for some drift in both the i-f and oscillator circuits, instead of attempting compensation against no temperature drift whatsoever. This has been so handled that the small amounts of drift remaining are in opposite directions and therefore nullify each other. The coil shown beneath the 6C4 in the schematic as *05760* is a close-wound filament choke. The main oscillator coil (*05759*) *Fig. 4* is physically similar to the antenna secondary coil with but the exception of its half-turn feedback tap. Exacting simplicity is keynoted here. All coils and capacitances in these circuits are held to exacting specifications.

IF Section (FM)

Three sharp cutoff 6AG5 pentodes having high mutual conductance plus low input and output capacitances are naturally matched with three identical 10.7 mc intermediate stage shielded transformers (*04193*). A fourth coil or transformer of the same type couples the i-f output to the limiter. Note from the schematic that advantage is taken of the dual cathode leads. Degeneration is minimized when this feature provides isolated cathode returns.

A rather selective alignment trace is recommended for these 6AG5 stages as shown by the FM-IF curve at the bottom of the schematic. Top and bottom adjustment of the four coils (*04193*) is made for maximum amplitude and symmetry of pattern. Overcoupling with the resultant double peak trace is not used in this case. The reason being to obtain the required bandpass width without creating such undesirable operating characteristics as a change in shape of the bandpass curve when a.v.c. is applied.

With some sacrifice of quality, adequate amplification could have been obtained had one less i-f stage been included. However such would have

[*Continued on page 36*]

Fig. 1—Walter L. Elliott, service manager for Vinson Carter Electric Co., of Arizona, in this series of illustrations demonstrates the methods he has found successful in repairing over 200 Geiger counters of all types including the rebuilding of some homemade jobs during the past six months. On the bench are two types of units: One with the Muller tube contained in a probe on an extension cable and the other a completely self-contained unit except for earphone. The Muller tube in the small unit is in back of the round grill. The probe type unit is equipped with a meter which is registering heavily from the chunk of high grade uranium bearing carnite alongside the probe.

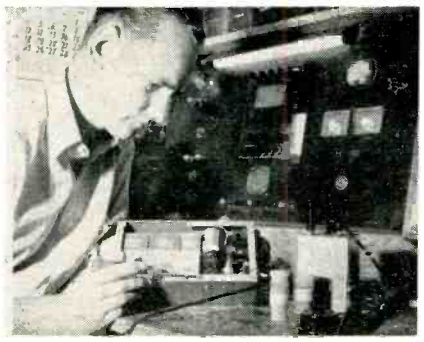


Fig. 2—With the side cover removed the arrangement of the batteries and the circuit can be readily seen.

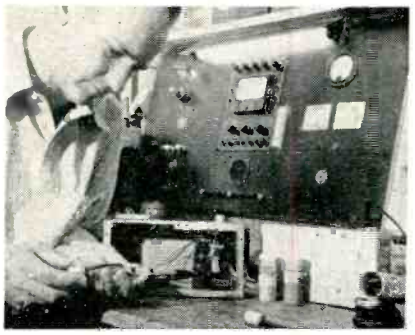


Fig. 3—The Muller tube removed from its probe housing, the open end of which may be seen at right. The tube is wrapped in two sponge rubber cushions held in place by rubber bands. Care should be taken to see that the sponge rubber is not wrapped around the tube near the center lead on the tube or it will cause the tube to short out.

Repa

GEIGER C

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by JOHN L.

Over the vast stretches of the U. S. and Canada the great Uranium hunt is on in full blast, reports Pathfinder news magazine. The Geiger Counter which is the instrument used in searching for this precious element is also used in hun-

FEW sensitive receivers of a delicate type get rougher usage than the Geiger Counter, that portable click-click spy on uranium and other radioactive minerals. Nearly positive in action, it can follow uranium no matter how minute in quantity. And if you have been thinking of Geigers as something only for bearded minors in the great outdoors, consider them again. They are used in every phase of industry from tracing oil thru pipelines to revealing the progressive action of gases in combustion engines. A trace of radioactive element is mixed with the substance under study and followed from then on to the end of the line by the ubiquitous Geiger. Recently it was done on the human body using radioactive iodine to trace down cancer cells in the spleen.

One of the principal problems troubling most Geiger Counter users is the fact that the delicate units with their basic Muller tubes need careful adjustment and checking often, something Geiger owners find difficult to get done properly—yet it's a natural for any competent radio repairman. The basic principle of operation is similar to radio. The wiring has some aspects of a small television set since high voltage is attained from a low power transformer on most sets. Most standard Geiger circuits follow the conventional audio frequency amplifier pattern with the additions of the input circuit and neon light indicators and meters used by some manufacturers.

Of the 250,000 or so Geiger Counters now used and the 200 plus being sold every day, most are manufactured by a few leaders in the field. The Muller tube which has a glass envelope and copper shell is the heart of the counters and is made in several different forms, some more delicate than other types. When damaged it must be replaced at costs ranging from around $15. to $37.50. However a Canadian company is now said to be producing a counter of somewhat different type which uses a diamond to replace the tungsten wire over which the high voltage is carried in the regular Muller tubes.

Most manufacturers of complete counters use a Muller tube of the self quenching type and these are most easily replaced. However it is always advisable to check this point since the wiring circuit is more complicated in the non-self-quenching tube types which use either a resistor or a vacuum tube to quench the discharge from the Muller tube.

Radioactive detection is made by picking up gamma or beta ray emmanations from naturally radioactive materials or those made active for tracing purposes. Most manufacturers produce a counter adapted to gamma ray detection, but any counter can be

iring

OUNTERS

Profitable

PARKER

dreds of other applications. Essentially an electronic instrument, the Geiger Counter needs constant service and is rapidly becoming a new source of income for the Radio Service Dealer. All he has to do is look for this business.

converted to the rarer beta ray use by changing the tube and building up amplifier power to make audible clicks.

In addition to tube variations, Geiger Counters fall into three other general classifications with respect to type of manufacture. The divisions include counters which are equipped with earphones and a neon light for visual check and units with phones and a meter which registers the strength of the rays. Meter type counters are usually small portable units with everything in a single box. However, one of the larger manufacturers does use a meter with earphones on his probe type counter. Manufactured units may be further classified between those in a single unit under one cover and those with the Muller tube mounted in a separate probe unit on the end of a short cable. The rest of the counter is housed in a case carried over the shoulder.

In addition to regular service equipment it is quite essential to have radioactive samples of uranium bearing ores in order to check the operation of the counter. The samples should contain exact percentages of radioactivity preferably not less than 6 per cent. Samples can be had from almost any assay office or from state mineral departments. The Atomic Energy Commission Raw Materials Division, P. O. Box 30 Ansonia Station, New York City will furnish small vials containing marked samples of radioactive ore upon request.

A common ailment of the counter is battery failure and since battery sales are an important part of the servicing of counters, the battery should be checked first. Batteries must be pretty near peak or the counter will not function. Some manufacturers use three 45-volt batteries and a series of 1½-volt flashlight cells. Others use two 300-volt, a 67½-volt and one 1½-volt cells.

Since the counters are subject to frequent knocks, connections work loose and the switches sometimes develop operational defects. On some models the capacitor tends to short out. The meter or neon button rarely fails. Another minor source of trouble on those units using a regular radio tube or a vacuum tube on the Muller tube circuit is failure of the tube or loosened connection. Some units use either an A5 power pentode or an S4 tube in a standard radio socket in the amplifier circuit. Any loose connections increase resistance and seriously interfere with accurate background count, the most important check to be made on the counter.

This background or basic count is the number of clicks, meter vibrations, or neon flashes per minute which generate from cosmic rays and the existance of a certain small amount of

[*Continued on page 35*]

Fig. 4—Elliott is pointing to the location of the Muller tube in the smaller self-contained unit. This unit has a three-way switch, off, start, and on. The "start" position charges the battery up with the capacitor. In the "on" position it gives high voltage without surges in series with the capacitor. The e.m.f. on the units shown is 1000 volts.

Fig. 5—Batteries and Muller tube removed exposing complete circuit of the unit together with the terminals of the three-way switch. Capacitor at the end of the screwdriver. Note large tube of uranium bearing ore and booklet on uranium prospecting put out by the Atomic Energy Commission which offers a $10,000 prize for any major Uranium bearing ore discovery.

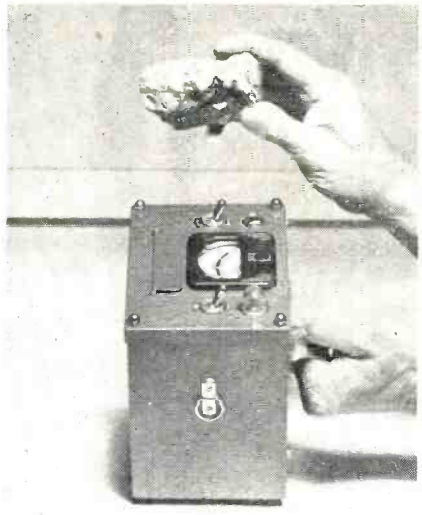


Fig. 6—Final test check of meter and light on another type of counter. Ore contains known percentage of radioactive elements. The sensitive Muller tube is under the hinged metal plate.

The Television WAVEFORM and its COMPONENTS

by SAMUEL L. MARSHALL

(From a forthcoming book, "Television Service Techniques")

Part 2

In this installment the sync signal is analyzed. The horizontal, vertical, and blanking pulses are discussed with regard to the types of signals they produce and how they are produced. In addition, the complete scanning sequence taking place on the picture tube is traced from line to line. Sawtooth waves and their relation to linear scanning are also dealt with, thereby laying the proper groundwork for TV.

IN Part I we discussed the simplified block diagram of a TV transmitter. (See *Fig. 1-1*). We then went on to show how a video signal was developed electrically as a result of an image falling on the mosaic being scanned by an electron beam. Just as amplitude is proportional to sound intensities in audio frequencies, at video frequencies it is proportional to relative light intensity. In sound, the signal frequency depends on the actual number of sound vibrations. In video it depends on how many variations in light level are encountered in scanning. No light change over an entire scene results in a d-c signal.

Having determined one component of the TV signal we are ready to discuss a second, the sync signal. This signal which is derived from the Vertical and Horizontal Sync Generator block shown in *Fig. 1-1* is designed primarily to synchronize the start and finish of the electron beam scanning in the receiver with that of the transmitter. See *Fig. 1-7*. Actually two sync signals are involved, a horizontal signal occurring every 1/15,750 sec., and a vertical signal occurring every 1/60 sec.

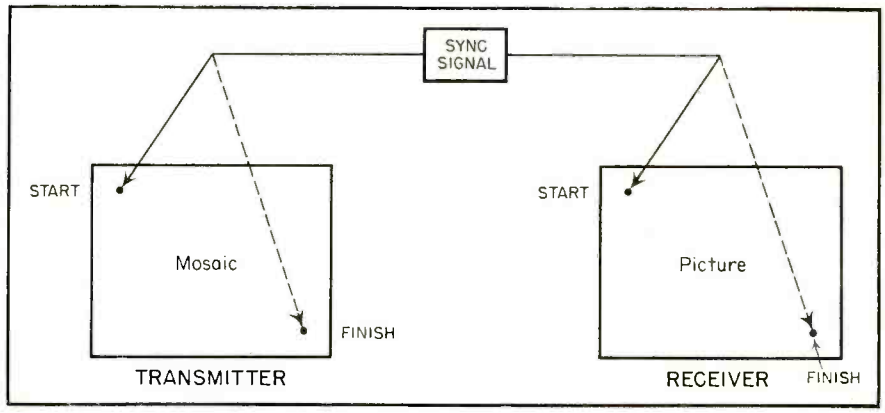


Fig. 1-7: How the receiver signal is synchronized with the transmitter.

Scanning

The entire reasoning behind the need for a sync signal is wrapped up with the subject of scanning. For this reason let us digress a bit on this subject. To begin with, in the scanning process the electron beam is swept horizontally across and vertically down the screen. The speed of beam horizontally is much greater than it is vertically. In fact during the time it sweeps across the screen it moves down the screen only slightly less than 1/262½ of the entire vertical screen distance, so that the resultant motion is a diagonal path as indicated in *Fig. 1-8*.

Every individual scene is scanned twice in a vertical direction. During the first scanning each horizontal line is traversed in 1/15,750 sec., and the entire length of the scene is scanned in 1/60 sec.; however, as shown in *Fig. 1-9*, only the odd-numbered or solid lines are scanned during this period. During the second scanning of the same scene which takes place in the next sixtieth of a second the even-numbered or dashed lines are scanned. Thus, each scene is scanned at a repetition rate of 60 times per second.

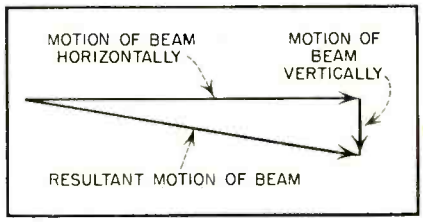


Fig. 1-8: Diagonal motion of the beam due to simultaneous horizontal and vertical forces on the beam.

The effect of this high repetition rate is to render smooth and flickerless reproduction. It is common knowledge that the faster a given number of scenes are passed before the eye the smoother and more natural becomes the effect of motion. Compare the early "flickers" and their repetition rate of 16 scenes per second with modern movies having a repetition rate of 48 scenes per second. The reason for a 60 scene repetition rate in TV is tied up with the 60 cycle frequency of the a-c lines.

The process of scanning one set of alternate lines followed by a second set is called "interlaced scanning". The action is so fast that the eye sees only uninterrupted and continuous

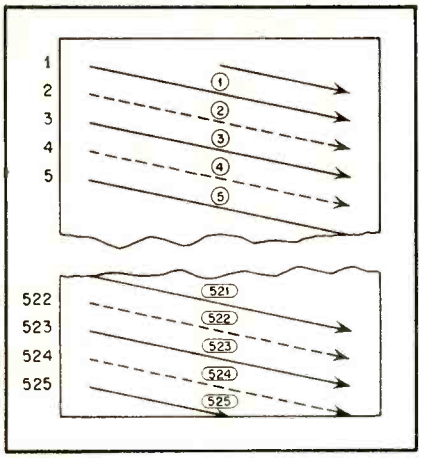


Fig. 1-9: Interlaced scanning. Odd-numbered lines scanned in first field; even-numbered lines in second.

motion. The period corresponding to 1/60 sec. is called a "field". Two fields which are required to scan a complete scene are called a "frame". It is evident that 30 frames are scanned each second and because of interlacing the same effect as a 60 scene repetition rate is obtained.

Sawtooth Waves

For correct picture linearity it is necessary that the scanning beam move at a *constant speed* both horizontally and vertically. If the speed of the beam varies during scanning then that portion of the time during which the speed changes results in one part of the image being out of proportion with the rest of the image. Thus referring to *Fig. 1-10A* the scanning beam moving across the mosaic with a constant velocity produces the video signal shown in *B*. Notice that the pulses in *B* are in the middle of each line which is in accordance with the location of the light struck elements on the mosaic.

Now let us suppose that for some reason the beam velocity is very high during the first half of the scanning time and slows down during the second half. Under these conditions the first bright element will be scanned much sooner than the time corresponding to ½H, and the corresponding signal waveform will be shown in *C*. This results in an image displaced somewhat to the left on the picture screen.

But that is not all. If a long line, such as line 10, is scanned, most of the elements will be scanned during the first half of the sweep, that is we are compressing about ¾ of line length scanned into ½ a line on the picture screen. This will make that portion of the image appear shorter than it actually is. On the other hand, during the second half of the sweep, the remaining elements will give the effect of having been lengthened. Thus, an image shown in *Fig. 1-11A* will take on the form shown in *Fig. 1-11B*. Vertical non-linearity results in the image shown in *C*. This non-linearity may be also produced in directions opposite to those shown.

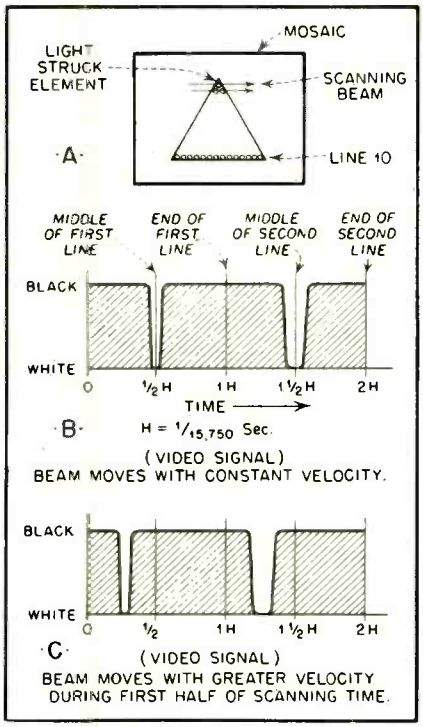


Fig. 1-10: Scanning beam in A produces video signal in middle of first line because light struck element is in middle of picture. This is shown in *B*. In C, video signal is displaced to left of center of line due to faster speed of electron beam sweeping same element, causing video signal to occur sooner.

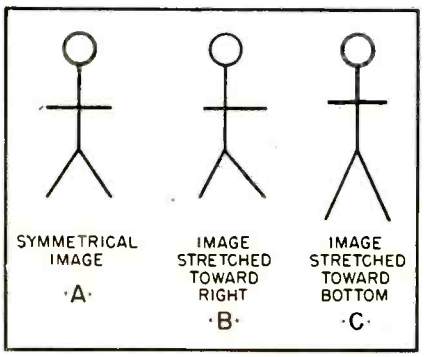


Fig. 1-11: Effects of horizontal and vertical non-linearity.

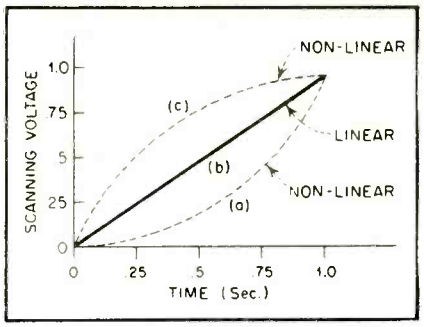


Fig. 1-12: Saw-tooth waveforms are linear.

half-second (.5v) is the same as the voltage rise during the second half-second (.5v.). In curve (a) the voltage rise during the first half-second is ¼ volt, and ¾ volt during the second half-second. Finally, in curve (c) the voltage rise during the first half-second is ¾ volt, and ¼ volt during the second half-second. Only curve (b) is linear, and because of its resemblance to a sawtooth is called a "sawtooth wave".

Sawtooth waves are produced in specially designed oscillators. One of these, called a "blocking oscillator" is shown in *Fig. 1-13*. Its operation is as follows:

1. Feedback from L_2 to L_1 causes the grid of the tube to become highly negative.
2. In this condition the tube is non-conductive and C_2 charges up slowly being fed through R_2 by the B+ supply. This charging process corresponds to the line O-X in the sawtooth output waveform shown in *Fig. 1-14*.
3. At the end of the discharge period of C_1R_1 (which controls the free-running frequency of the oscillator) the grid is no longer negative so that the tube conducts and C_2 is discharged through the tube. This corresponds to line X-Y in *Fig. 1-14*
4. The tube may also be discharged prematurely by an incoming positive pulse applied to terminals *1* and *2*.
5. The complete sawtooth wave consists of a charge period O-X and discharge period X-Y shown in *Fig. 1-14*.

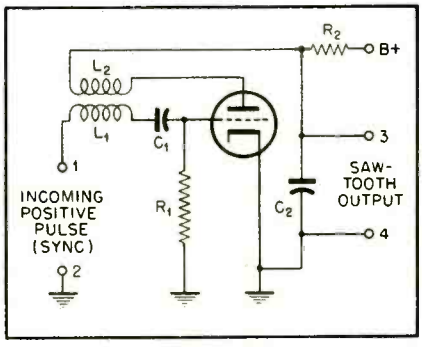


Fig. 1-13: Blocking oscillator.

At the completion of the discharge period the voltage across the condenser is zero and the cycle begins all over again.

Reference to *Fig. 1-1* illustrates the position of the vertical and horizontal scanning generators in the TV transmitter. Notice the sawtooth waveform produced. During the charge period the beam is swept vertically and horizontally. During the discharge period it is brought back to its original postion.

Sync Signal

In the previous discussion we pointed out that the frequency of a sawtooth scanning generator may be controlled by applying a positive pulse to the grid of the oscillator tube *before* it begins to discharge C_2. This means that the incoming control frequency should be slightly higher than the free running frequency of the oscillator. In the transmitter, specially designed and highly accurate generators produce positive pulses for purposes of

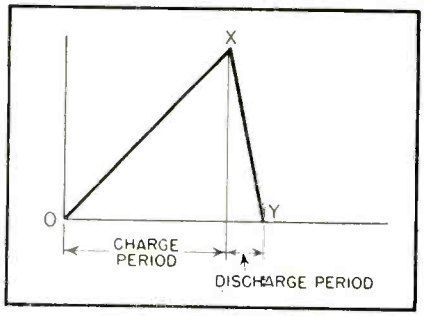


Fig. 1-14: Complete saw-tooth wave.

controlling the frequencies of the horizontal and vertical scanning generators. These pulses are developed in the section marked, VERTICAL AND HORIZONTAL SYNC GENERATORS, and trigger the vertical and horizontal scanning generators to the exact pulse frequencies.

It will be also observed that these pulses are fed into the block marked, MIXER AND AMPLIFIER, except that an additional BLANKING signal is fed into this section together with the sync pulse. Blanking is a condition whereby the signal voltage is brought to a level corresponding to "black" before the actual sync pulse itself is inserted, and keeps the signal at this black level for a short time after the sync pulse has been completed. Actual horizontal and vertical sync signal waveforms with their respective blanking levels and sync pulses are shown in *Figs. 1-15* and *1-16*. In *Fig. 1-15* the relative amplitude relationships between picture, sync, and blanking levels are shown. Also indicated is the duration of the actual sync pulse compared to the actual horizontal blanking signal.

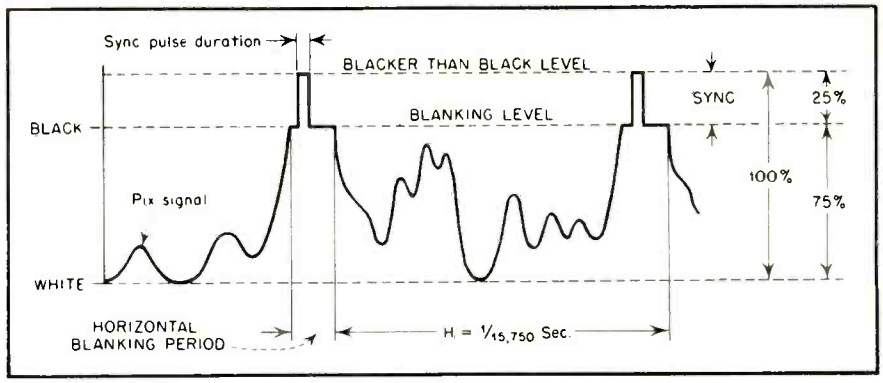


Fig. 1-15: Horizontal pix, sync pulse, and blanking level relationships.

In *Fig. 1-16* the vertical sync signal details are given. In *A* we show this signal as a continuous pulse equal in time to nine horizontal lines. However, in order to maintain continuity of the horizontal sync signal, the vertical sync pulse is sliced or *serrated* into nine sections each one equal to a horizontal line. Each section is then sliced in half again resulting in eighteen short pulses. The first six pulses are of very short duration and are called "equalizing pulses". The second six pulses are of longer duration and are the actual pulses that trigger off the vertical sweep oscillators. The third six pulses are also equalizing pulses and "taper" off the complete vertical pulse. The more exact reasons for the equalizing pulses will be discussed in a later chapter. At this point let it suffice to observe that the frequency of these pulses is twice the horizontal frequency, or 31,500 cps, thereby enabling them to take action in the middle of a horizontal line. The reason for this will shortly become apparent.

Complete Scanning Sequence

We are now ready to discuss the complete scanning sequence taking place at the receiving end. *Figure 1-17A* illustrates how the first field (solid line) is scanned, and how the beam starting at point *A* on line *1* is brought down to the bottom of the picture tube to point *C*. During this

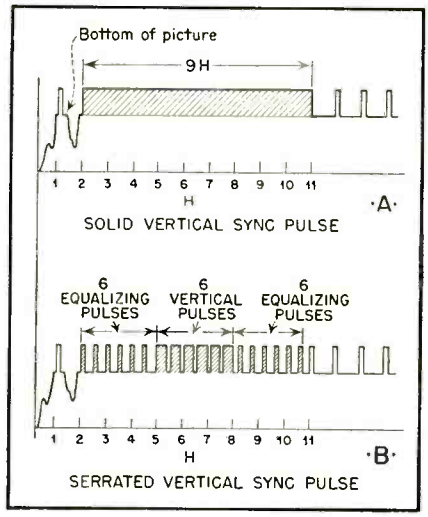


Fig. 1-16: Vertical sync signal details.

process a total of 254½ lines are scanned (this figure varies with different transmitters). At point *C* the scanning stops. Notice that the line is cut short in the middle. This

[*Continued on page 36*]

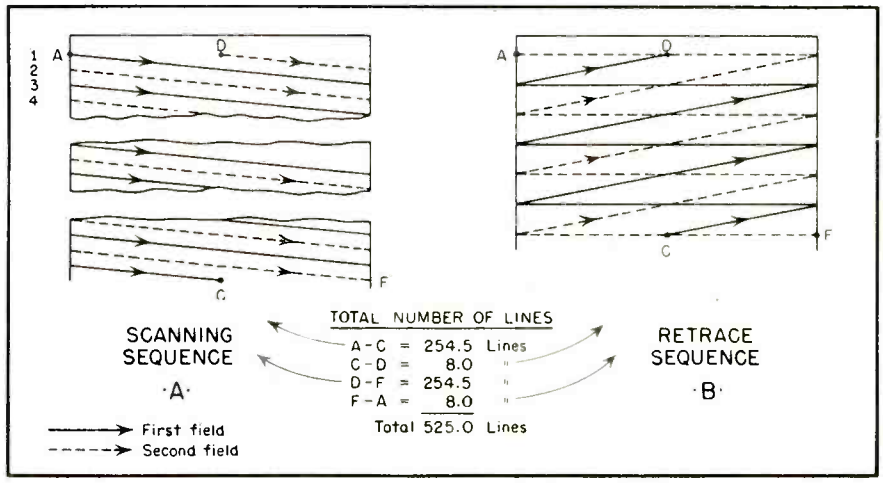


Fig. 1-17: Typical scanning and retrace sequence.

How To Estimate Your 1950 TAX

by **BETTY LEE GOUGH**

This is the time of the year when the small business man typified by the Radio Service Dealer who owns his own shop begins worrying about his debt to Uncle Sam. Read what this writer advises in this regard.

COME March 15, 1950, almost every radio service dealer will have to file with Uncle Sam's special henchman, the Collector of Internal Revenue, a statement "estimating" what taxes he will have to pay for the year. The only exceptions to this are the presidents of incorporated radio service shops who draw their money in the form of salary from the corporation; and these men usually have the vastly bigger headache of wrestling with corporation income tax returns.

Most radio service dealers receive the estimation form as a regular early-in-the-year mailing from the Collector of Internal Revenue. But whether he sent one to you or he didn't, you are liable for filling it out and turning it in. Furthermore, you must pay "installments" on your income tax, four times a year—on March 15, June 15, Sept. 15, and January 15.

Who has to file an estimated income tax form? In a pamphlet on the subject of business taxes, the United States Department of Commerce advises that, "you must meet these requirements if you expect to receive more than $100 from the profits of your business or from other sources besides wages that are subject to withholding; provided that your total income from all sources will be $600 or more. You would also come under the provisions of the law if you received wages of more than $4500 plus $600 for each of your exemptions including your own.

"In meeting these requirements of estimating and paying your tax in advance, you must file a Declaration of Estimated Tax, Form 1040-ES. A copy of this form may be obtained from the Collector of Internal Revenue in your district or from the Bureau of Internal Revenue in Washington, D. C. Copies are not usually sent to you with your regular income tax blank, Form 1040, unless you filed Form 1040-ES in the previous year."

This very simple form contains clear instructions for preparing and filing your Declaration and paying your tax in advance. In estimating the amount of your tax you may base your calculations on last year's income, but allowance should be made for expected changes in income, exemptions, and deductions, for the current year.

In figuring out net income on which you will estimate your tax, you may take last year's deductions if you expect them to be about the same as the deductions for this year. If you receive part of your income as salary or wages from which a withholding tax is deducted, you are entitled to subtract this withholding tax from your total tax liability in computing your estimated tax to be paid in advance. You may, if you wish, file a joint Declaration of Estimated Tax with your wife, if both of you are citizens or residents of the United States. It may be quite profitable for you to do this. The income splitting provisions of the tax law may result in a material reduction in your tax liabilities, if you and your wife file a joint declaration.

The Department of Commerce warns that, "you should understand that this Declaration of Estimated Tax does not take the place of your regular income tax return which you must file on Form 1040 by March 15 each year. It represents an advance statement and payment of your year's tax. For 1949, for example, you will still have to file a final income tax return by March 15, 1950, showing your actual income, deductions, and tax for the year 1949. This return, however, will be in reality a year-end settlement of your tax liability. If, on the basis of your Declaration of Estimated Tax, you over-estimated and overpaid your 1949 tax, you will show this in your final return on Form 1040 and will be entitled to a refund. If, on the other hand, you underestimated your tax, you will have a balance to pay in full when you file your final income tax return.

"Your Declaration of Estimated Tax, Form 1040-ES, should be filed by March 15 of the year to which it applies. Even though, on March 15, your income situation is not such as to require you to file a Declaration of Estimated Tax, a change in your income later during the year may bring you under these requirements. In such case, the time for filing is as follows: June 15, if the change occurs after March 1 and before June 2; Septem-

[*Continued on page 32*]

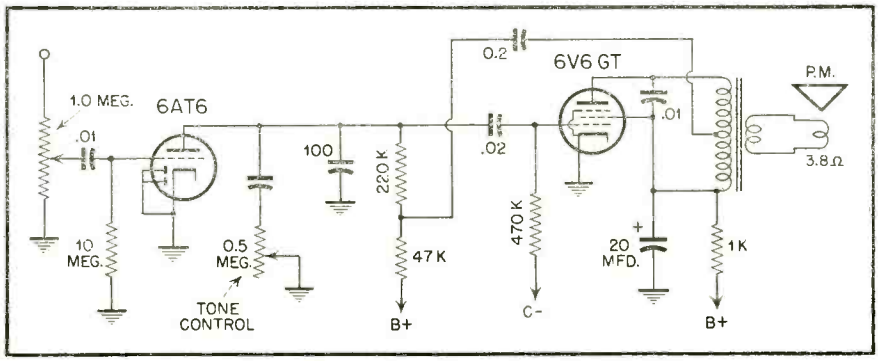
CIRCUIT COURT

Hoffman Model CT 800

An unusual form of audio feedback circuit appears in this 30 tube TV receiver. A schematic of the audio portion of the instrument is shown.

A 12" PM speaker is driven by a single 6V6 output tube. The impedance of the voice coil is 3.8 ohms. Voltage amplification takes place in a 6AT6 stage, the diodes of which are not used.

The audio volume control, a one megohm unit, is linked to the de-emphasis network following a 6AL5 discriminator. The portion of the signal selected for use feeds the grid of the 6AT6 triode. Bias is developed across the 10 megohm grid leak, the cathode being returned to ground.

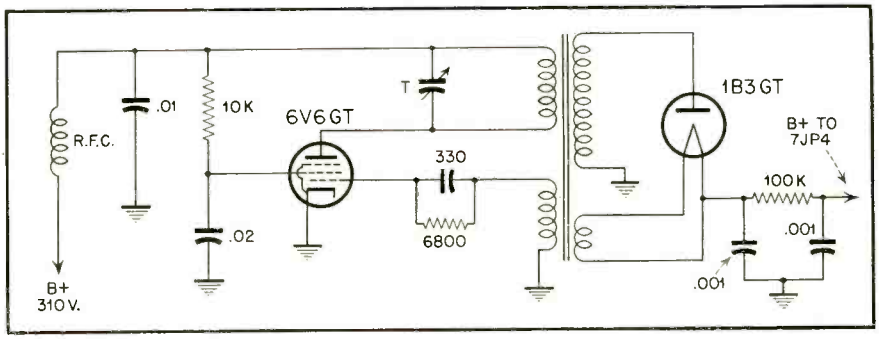


Audio portion of Hoffman Model CT 800

High frequency attenuation is provided in the plate circuit by the .05 μf and .5 megohm components. Fixed by-pass for high frequencies takes place in a 100 μμf capacitor. Plate voltage is supplied through 220K and 47K resistors in series.

Fixed bias of 20 volts is provided for the 6V6 output tube via a 470K resistor and across a 1 megohm grid leak. The plate load of the 6V6 is a center-tapped output transformer primary with .01 μf audio bypass. The tap on the primary is connected back to the junction of the plate resistors of the 6AT6 stage through a .2 μf capacitor.

The feedback system used results in half the voltage developed across the output transformer primary being applied to one fifth the previous plate impedance. This produces roughly the 10% feedback generally considered optimum for such circuits. The usual advantages of hum reduction and attenuation of distortion can thus be achieved.



High voltage circuit of Belmont Model 22A21

Belmont Model 22A21

This 22 tube, direct view 7" TV receiver uses a method of high voltage generation which differs in detail from others to date. The picture tube is the popular 7JP4 type and requires potential of around 4500 volts.

The partial circuit shown discloses that the action takes place in a high-frequency oscillator employing a 6V6GT tube. This differs in tube complement from others in that most use triode tubes or triode-connected beam tubes.

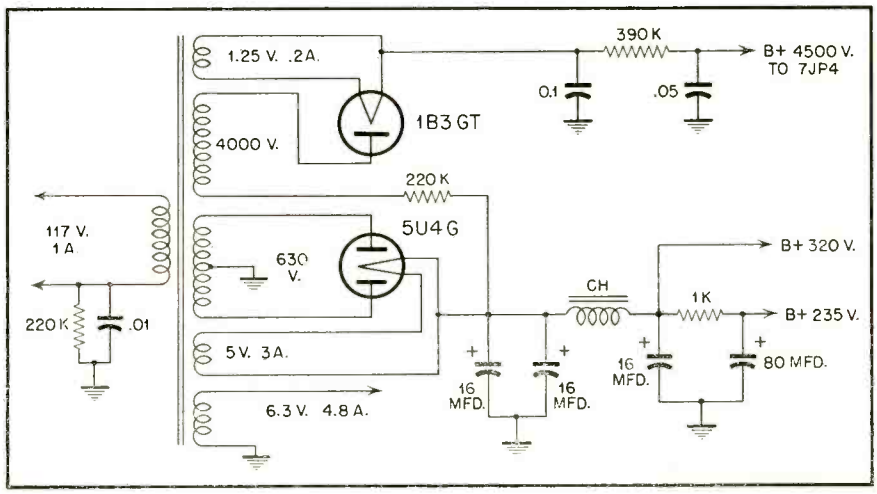
The transformer has four windings; grid and plate coils for the oscillator and filament, and plate coils for the rectifier. The latter is the conventional 1B3GT type.

Tuned plate-grid feedback oscillator coupling is used with a grid leak of 6800 ohms. The plate receives 310 volts via an r-f choke from the main power supply. A 10K resistor drops the voltage to 220 for the screen of the oscillator. Bias of about 100 volts is developed on the control grid.

Temple Model TV-1776

A variety of high voltage supply circuits are to be found in present models of TV receivers. This instrument is unusual in that it makes use

(Continued on page 32)



High voltage circuit of Temple Model TV-1776

SHOP NOTES

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

Motorola Model 5A5- Rectifier lights up with switch turned off.

Three way portables with tube rectifiers are subject to an unusual trouble. With the set plugged in but turned off, the rectifier continues to light. A glance at the circuit in *Fig. 1* shows

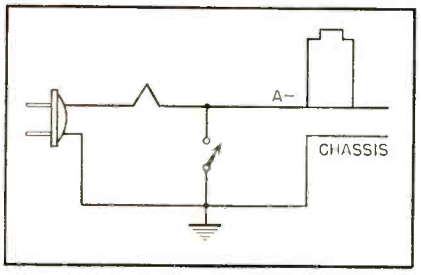


Fig. 1. Ground side of filament connects to A—.

that the ground side of the filament is connected to *A*— which is normally insulated from chassis ground. However, if the battery is used to the point where it leaks, some of the electrolyte completes the circuit (see Fig.

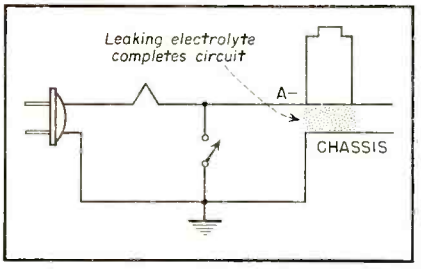


Fig. 2. Short caused by leakage.

2) between *A*— and chassis ground. Cleaning up the set and replacing the batteries quickly clears up this trouble.

Submitted by:
Fred Weinstein
Bellerose, N. Y.

Bending Tool For Band-Switch Contacts

Take an ordinary sardine, or other vacuum-can type opener, place it in the vise, end up, then saw a quarter-inch slot in the end. Alternately, you might take an opener with a slot already cut through the shaft, and cut off the end, giving the same effect. Either technique will provide you with a bending tool.

Whenever you find a band-switch making less than positive contact, slip the notch in the tool about the loose contact and twist in the proper direction. The enormous leverage provided by the tool should now make an easy task out of what before was a gigantic task of forcing a needle-nose plier into a space too small for it.

I prefer as long a shaft as possible, bending it if necessary in extreme cases in order to fit the space available in the crowded switch assembly.

Drawn below is *Fig. 3*, showing the cut to be made in the wire to form

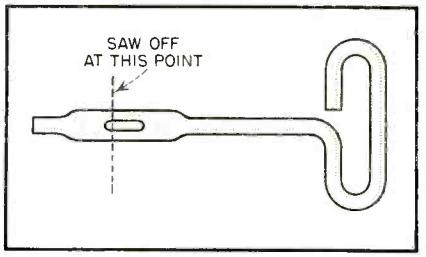


Fig. 3. Where to cut can opener.

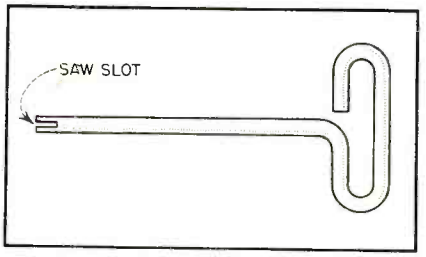


Fig. 4. How to slit can opener.

the tool. *Fig. 4* shows the alteration of a vacuum coffee-can opener. No dimensions are shown. Use what you have.

Submitted by:
David Guessin
Columbus, Ohio

Philco Intermittent High-Voltage Supply

Failure of the high-voltage rectifier will result in a very dim picture or no picture on direct-view receivers using a single half-wave rectifier. On projection and direct-view receivers using voltage-multiplying circuits, an increase in picture size and defocusing will be noted if one of the high-voltage rectifiers fails.

In a number of cases, failure of the 1B3GT high-voltage rectifier has been

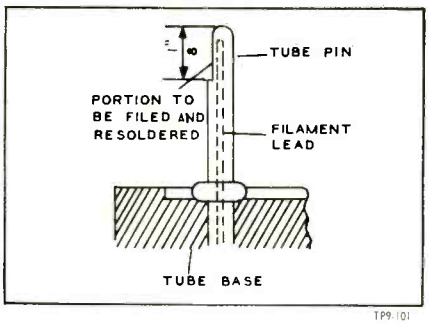


Fig. 5. Repairing 1B3GT tube pin.

traced to poor solder connections between the filament leads and tube pins.

During the present shortage of 1B3GT rectifiers, it is suggested to repair rather than replace 1B3GT tubes having this type of trouble.

To make the repair (see *Fig. 5*) the filament pins No. 2 and No. 7 should be filed and resoldered as shown in figure 4. A small amount of noncorrosive flux should be applied to the filament pin, and the solder should be allowed to flow freely to insure a good connection.

Intermittent 1B3GT tubes are most troublesome in Model 48-2500 where three are used. To reduce the possibility of future trouble, it is strongly recommended that pins No. 2 and No. 7 of all three tubes be filed and resoldered when making a repair.

Philco Service Dep't.

Warm Air Device For Testing Defective Parts

One of the most pressing problems in servicing television receivers is a magnification of a frequent difficulty in servicing compact ac-dc "hot-box" table radios—How do you locate a defective capacitor or other part which is defective only when it is heated up during actual operation.

Removing the receiver from its cabinet for test won't work since the extra ventilation does away with the damaging temperaure rise. This contributor has come up with a practical, ingenious solution, which should be called to the attention of your readers. He simply uses a home hair-dryer to blow a stream of very warm air on the suspected parts. This simulates the "in cabinet" condition quite quickly.

Submitted by:
Richard Wiseman
Chicago, Ill.

Sentinel 400, 401, 402, 405, 406, 411 — Tearing and Picture Breakup

Tearing and picture breakup (noise streaks) when set is jarred, on early models 400, 401, 402, 405, 406 and 411

television receivers using a 12AT7 oscillator tube is caused by the loose padder trimmer slug screw in *C11*.

Loose fit between padder trimmer screw and threaded sleeve, preventing a firm grounding contact resulting in a breaking up of the picture, noise streaks and possible detaining of the received picture.

The installation of a locknut bushing, part no. PST 500, on padder trimmer screw which will hold trimmer screw firmly and provide a proper ground.

Slide the locknut bushing on a thin bladed screwdriver with the nut end toward the handle and insert the screwdriver into the trimmer screw slot (see Fig. 6). While holding the padder trimmer screw so that it will not turn, slide the locknut bushing on the padder trimmer and turn it down by hand until it is tight against the front of the r-f tuner unit chassis (see Fig. 7).

Sentinel Service Dep't.

Philco 46-1203, 48-1262 - Simplified circuit

For your complete files we are presenting the simplified circuit (*Fig. 8*) of the above receivers in order to complete the servce note which appeared in the Jan. 1950 issue of RSD submitted by Wayne Lemons.

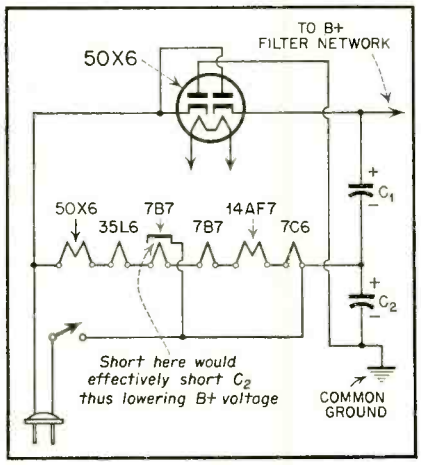


Fig. 8. Simplified circuit of Philco 46-1203, 48-1262.

Damping Tube Trouble Symptom

If a wavy picture appears on the screen of the picture tube, in the vertical direction and more predominant on the right hand side, in many cases the trouble can be traced to a defective damping tube—usually a type 5V4G rectifier tube. Replacing this tube will clear up this trouble.

Submitted by:
Domenic R. Ripani
217 South Church St.
Rockford, Ill.

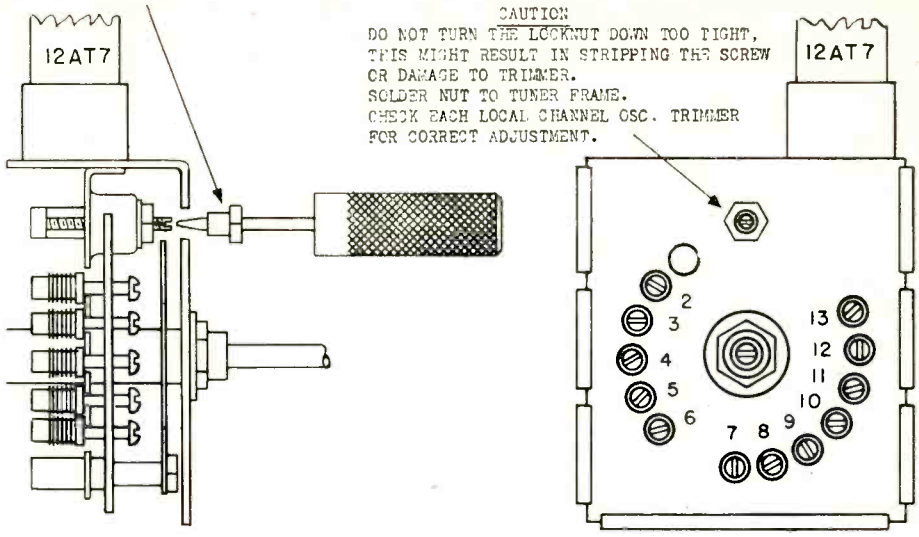


Fig. 6. (Left) Inserting screwdriver into trimmer screw slot.
Fig. 7. (Right) Sliding lock nut bushing on padder trimmer.

Westinghouse — C. R. T. Damage Caused By Incorrect Adjustment of Ion Trap Magnet

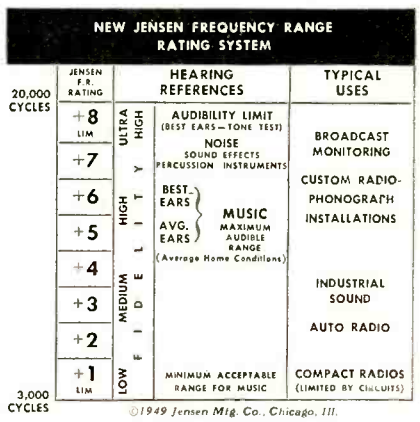
It is extremely important that the ion trap magnet be correctly adjusted immediately after the set is first turned on during the installation. Improper positioning of the magnet may result in the development of circular areas of discoloration on the face of the tube. This is true even though the ions developed in the tube are being properly deflected. When the magnet is not correctly oriented, the electron beam strikes the edge of the aperture in the anode top disc instead of moving cleanly through the hole. The heat produced by the action vaporizes the metal of the disk, thus releasing gas which has a harmful effect on the tube. Some of the vaporized material may be deposited on the screen of the tube and be apparent as darkened areas on the screen.

To correctly adjust the ion trap magnet, position it over the neck of the CRT with the arrow on the magnet pointing toward the face of the tube. Then turn on the set, and with the brightness control adjusted for a *low* intensity, rotate the magnet around the neck of the tube and move it forward and backward until the raster is brightest on the screen. If, in obtaining the brightest raster, it is necessary to move the magnet more than ¼" from the pole pieces in the tube, or if the magnet is pushed against the focus coil, the magnet may be weak and a new one should be tried. As a final check on the adjustment, the brightness should be turned up slightly above average, the focus control should be adjusted for a clear line structure, and the ion trap magnet should again be adjusted for the brightest raster.

Never move the ion trap magnet to remove a shadow from the raster if the brightness is decreased by so doing. Shadows should be removed by adjusting the focus coil.

It is essential that the brightness control be kept at a low setting until the magnet has been initially adjusted. Furthermore, the magnet must be adjusted immediately after the set is first turned on. Cathode ray tubes have been ruined in 15 seconds by operating the brightness control too high when the ion trap magnet was incorrectly adjusted. However, in some cases it may take much longer for the darkened areas to appear on the screen, and the adjustment procedure should not be omitted merely because the set appears to be operating satisfactorily.

Westinghouse Service Dep't.



Jensen - New system of rating speakers

Instead of the former practice of stating frequency limits of loudspeakers in cycles, the h-f region between the minimum useful limit for music and maximum limit for hearing has been divided into eight steps, each of

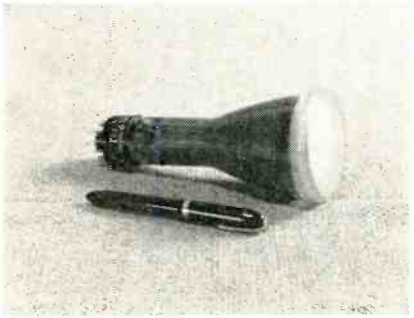
[*Continued on page 32*]

NEW PRODUCTS

THREE - INCH CRT

A new three-inch cathode ray tube, believed to be the shortest three-inch electrostatic cathode ray tube manufactured in the United States, has been announced by the Tube Divisions of the General Electric Company.

The 3MP1 is an electrostatic focus and deflection type with a bulb diameter of three and one-eighth inches and useful screen diameter of two and three-quarter inches. It is equipped with a small-shell, duodecal base which has been set as the standard base on all television tube types.

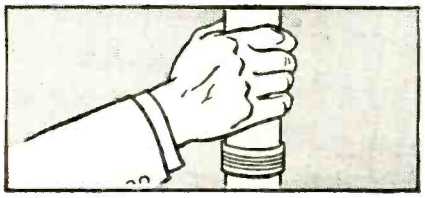


Maximum ratings for the new tube include an anode no. 1 d-c voltage of 1000 volts and an anode no. 2 d-c voltage of 2500 volts. The maximum negative-bias value is 200 volts d-c and the positive-bias value 2 volts d-c. Maximum circuit values: Grid No. 1 circuit resistance, 1.5 megohms; resistance in any deflecting electrode circuit, 5 megohms.

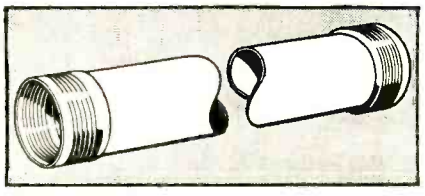
Further information on the 3MP1 may be obtained from the Tube Divisions, General Electric Company, Schenectady, N. Y.

MILNER ALL-ALUMINUM TV MAST

The Milner Mast, just on the market, combines light weight with durable strength, comes in 10 foot sections—can be installed in any height up to 100 feet. The tubing is joined by special rolled thread. With a variety of bases offered, this mast serves any and all installations. Its universal cap adapts to any



Adjustable after installation; can be manually rotated at base for best reception.

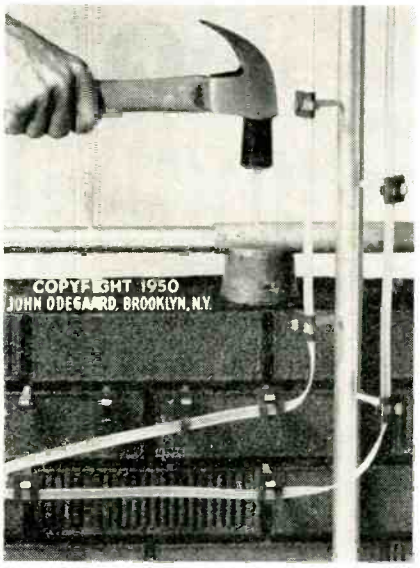


Tubing is joined by a special rolled thread design—(patent applied for). Each 10 ft. section weighs only 7¼ pounds.

size antenna. All fittings as well as the mast are made of rust-proof, non-corrosive aluminum alloy. At 100 feet, complete with fittings, it weighs under 110 pounds.

NAIL POLYETHYLENE STANDOFF

The Odegaard Original Nail Polyethylene Standoff (Patent Pending) is quickly and easily hammered "home" with just a few strokes—no drilling whatsoever is required. It easily drives into wood, mortar, iron and aluminum for a locked permanent installation. In the photo, the top row of Odegaard Standoffs in the wall shows the extremely easy 4-step procedure for use. First the nail is hammered

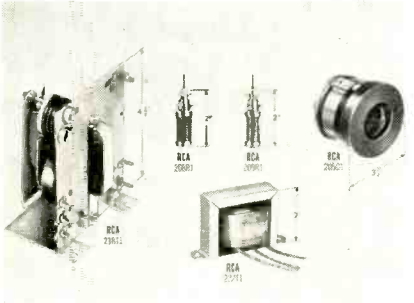


in. Then one of the slots in the polyethylene strip is forced over the nail head. Next the cable is placed beneath the flap, the strip folded over the cable. Finally the slot goes over the head.

For your free sample and full details of this amazing standoff, write directly to Odegaard Manufacturing Company, 5416 Eighth Avenue, Brooklyn 20, N. Y.

RCA-16GP4 COMPONENTS

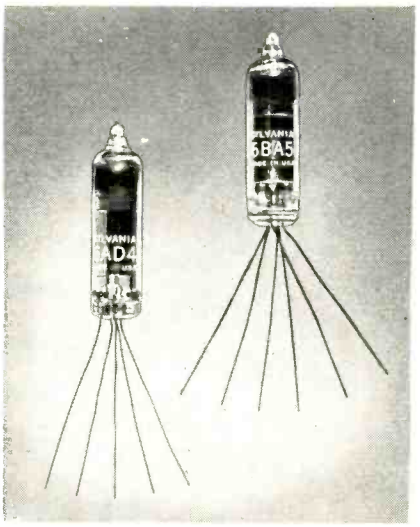
Tube Department, Radio Corporation of America, Harrison, N. J., announces that five new components have been recently offered to equipment manufacturers particularly for 16-GP4 deflection systems designed to use the horizontal-deflection amplifier tube 6CD6-G and the vertical-deflection amplifier tube 6S4.



Coordinated in design to operate efficiently with each other and with the 6CD6-G and 6S4, these new components are as follows: Deflecting Yoke, Type 206D1; Width Control, Type 208R1; Horizontal-Linearity Control, Type 209R1; Horizontal-Deflection-Output and High-Voltage Transformer, Type 218T1; and Vertical-Deflection-Output Transformer, Type 222T1.

MINIATURE TUBES

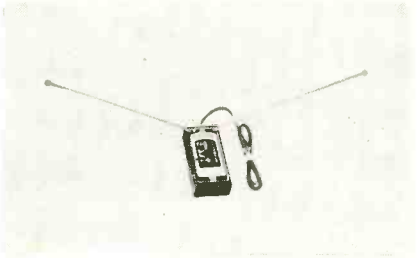
Two new subminiature tubes designed by Sylvania Electric Products Inc., for use as Class A a-f amplifiers or resistance coupled a-f amplifiers have been announced by the Radio Tube Division. Type 6AD4 triode has



a mutual conductance of 2700 micromhos. The 6BA5 pentode rating is 3800 micromhos. Both tubes are enclosed in T-3 envelopes and are supplied with 6.3 volt, 150 milliampere heaters.

INDOOR TV ANTENNA

Tricraft Products Company, 1535 North Ashland Avenue, Chicago 22, Illinois has just announced their new "VIDIETTE" indoor TV antenna model "700". There is no pushing and pulling of rods-change stations without



effort. Simply move knob to channel desired . . . the TV set is automatically electrically tuned in and reception comes booming in.

VERSATILE CONCENTRIC CONTROL

A packaged set of specially designed parts trade-named "Concentrikit" has been announced by International Resistance Company.

IRC states that with this set Radio Technicians can assemble a variety of concentrics to meet over 90% of the replacement requirements.

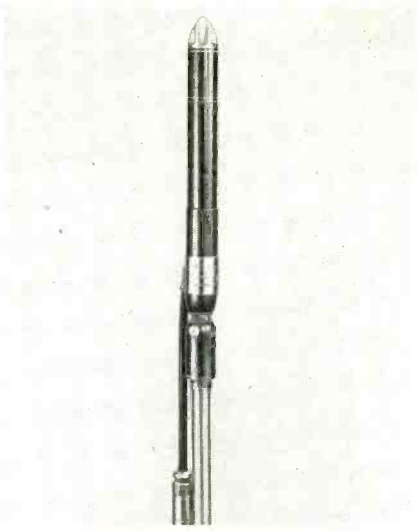
Long searches and waits for exact duplicates are eliminated, and inventory investments are reduced.

In addition to step-by-step instructions which are included with each unit, IRC has published a comprehensive Concentric Dual Control Replacement Manual. This new Manual includes all sets from early radios to current TV's. "Concentrikit" is available from all IRC Distributors. For new Catalog DC1A write: International Resistance Co., 401 N. Broad Street, Philadelphia 8, Pa.

DYNAMIC MICROPHONE

Electro-Voice, Inc., Buchanan, Michigan announces the TV655 high fidelity dynamic microphone. The TV 655 is omnidirectional, becoming slightly directional at extremely high frequencies. Smooth, peak-free response 40-15,000 c.p.s., plus or minus 2.5 db—individually laboratory calibrated and certified. Special hole in lower section of case permits easy control of bass response. Output level: power rating (Odb = 6mw/10 dynes/cm^2): -53. Impedance is 250 ohms—can easily be changed to 50 ohms at internal terminal strip. Has Acoustalloy diaphragm. Uses Alnico V in a specially designed magnetic structure. Removable swivel mounting. ½" pipe thread on microphone and swivel for stand coupling. ⅝"-27 thread adapter furnished. Case is lathe-turned aluminum with gleaming Alumilite finish. Dark baked enamel finish with chrome trim (illustrated) optional. Cannon XL-3 connector is inserted in cable 6 inches from microphone.

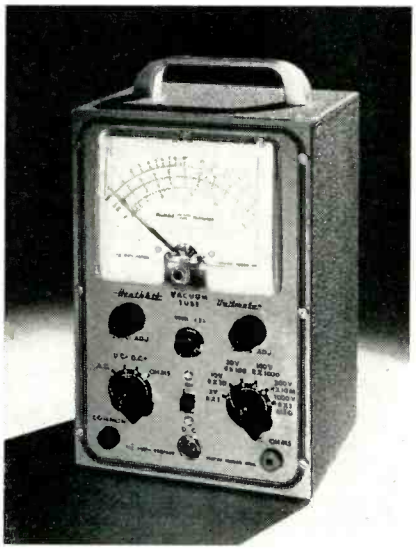
Supplied with 20 ft. of two-conductor shielded synthetic rubber jacketed broadcase type cable. Size of microphone with swivel is 11-⅜" long; without swivel 8-¾" long; diameter 1-1/16".



For further information, write for TV Bulletin No. 156 to Electro-Voice, Inc., Buchanan, Michigan.

VTVM KIT

Heath Company, Benton Harbor, Michigan is introducing a new model V-4 Vacuum Tube Voltmeter Kit. Positive automatic meter protection on all functions is given by the electronic a-c voltmeter and push-pull d-c voltmeter circuit. Electronic a-c voltmeter circuit incorporates new balance control which allows complete elimination of contact potential, removes meter shift with various ranges, is reported to give accurate readings on all ranges, and compensates for variations in tube elements. 200 micro-ampere meter uses Alnico V magnet for fast accurate readings. 1% precision ceramic divider resistors are used. 24 complete ranges are included. Meter pointer can be offset from zero for FM and TV alignment. D-C probe is isolated for dynamic measurements of receiver voltages without disturbing receiver operation.



TV LIGHTNING ARRESTER

Recently announced is a new FM-TV Lightning Arrester of combined bleeder and gap design. Built with a universal base to accommodate all types of lead-in cable—flat or round 300 ohm and twin-x.

Has Underwriters Laboratory listing as safe and approved. Keeps antenna and all surrounding conductors, reflectors, directors and

MILNER TV MAST

At Last! A Sectional ALL-ALUMINUM Mast—

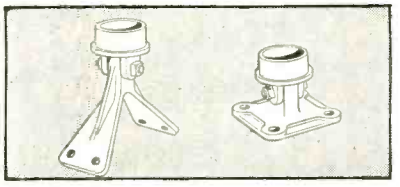
Height to 100 feet—Lowest Cost

Before you recommend any television mast look at the MILNER TV MAST. Here's the best mast for TV, perfect for owners in the "fringe areas." The all-aluminum MILNER MAST is light yet strong: 100 foot mast complete with fittings weighs under 110 pounds.

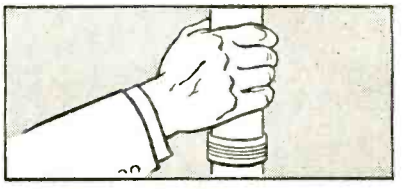
Available in 10 foot lengths with fittings for ground, side-of-building, or any type of roof installation, a MILNER MAST can be installed to any height up to 100 feet. Lowest-priced mast on the market, it also saves on freight shipments — over 50% less than comparable masts of other material.

Home owners will welcome this rust-proof, non-corrosive and durable MILNER MAST with its streamlined, gleaming beauty. Point for point the MILNER MAST surpasses all others. You can sell and recommend them.

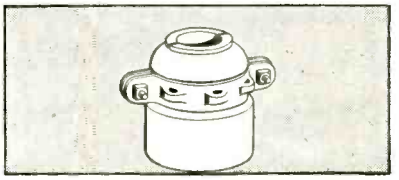
COMPARE THESE FEATURES:



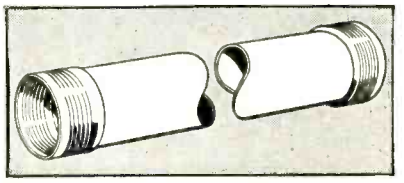
Can be placed anywhere—bases designed for ground or flat installations, for side of building or any type roof.



Adjustable after installation; can be manually rotated at base for best reception.



All-aluminum fittings—universal top with adapters to fit any size antenna.



Tubing is joined by a special rolled thread design—(patent applied for). Each 10 ft. section weighs only 7¼ pounds.

Milner TV MAST

MILNER MANUFACTURING COMPANY JACKSON, MISS.

For full information, write to:

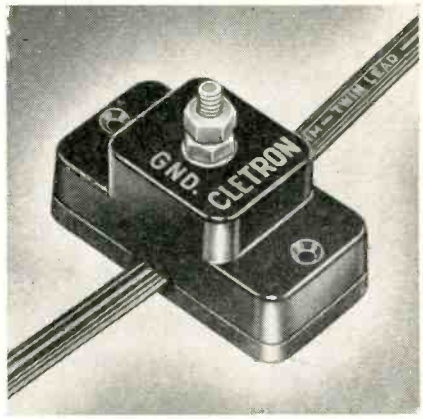
MILNER MANUFACTURING COMPANY

Jackson, Mississippi

masts at a constant potential relative to ground. The balanced bleeder resistors prevent any static built up in the antenna. Momentary high voltages break the gap and are by-passed harmlessly to ground.

An illustration of the Cletron lightning arrestor is shown at the right hand side of this page. Notice how the twinlead is fed through the lightning arrestor. The ground terminal is in the middle of the arrestor, plainly marked, "GND".

In view of the agitation being stirred up by insurance companies and municipal regulations requiring the installation of Underwriter Approved lightning arrestors in TV installations this is a timely item.



For complete information, write Bill Allen, Cleveland Electronics, Inc., 6624 Euclid Ave., Cleveland, Ohio.

CIRCUIT COURT

[*from page 26*]

of 60 cycle AC as a source of power rather than the more common high frequencies.

The primary is designed for 117 volts at 1 ampere. A 5 volt winding at 3 amperes supplies the 5U4G low-voltage rectifier. All six volt tubes are fed from a single 6.3 volt winding with 4.8 ampere capacity. Plate voltage for the picture tube is obtained from a 4000 volt secondary. The high-voltage rectifier, type 1B3, requires only 1.25 volts at .2 amperes from its source. The 5U4G plate winding develops 630 volts end-to-end.

SHOP NOTES

[*from page 28*]

which is just distinguishable from the next as an audible difference for music. The rating of a speaker is determined from the highest interval in which loudness is maintained at a significantly high percentage of normal. The table above relates the ratings to hearing and typical applications.

This new Frequency Range Rating is used to identify all speakers in the Jensen catalog.

Jensen Mfg. Co.

INCOME TAX

[*from page 25*]

ber 15, if the change occurs after June 1 and before September 2; January 15, if the change occurs after September 1. You may pay your estimated tax in four equal installments if you file on March 15. Fewer equal installments are provided for in case of later filing. Appropriate adjustments

in these filing and payment dates are permitted for taxpayers who keep their records and file regular income tax returns on a fiscal year basis. However, if, on or before January 15, 1950, you file your 1949 income tax return and pay in full the balance of tax due, you need not file a declaration or amended declaration which would otherwise be due on that date.

"Penalties are provided in case you fail to file when you should, if you underestimate your tax by more than 20 percent, or if you fail to make a payment when due. These penalties are explained in the instructions on Form 1040-ES. You will not be charged with a penalty for underestimation, however, if you base your estimate on the income which you showed in your income tax return (Form 1040) for the previous year. If during the year you discover that you have underestimated your income, you may avoid the penalty for underestimating your tax by filing an amended Declaration containing a revision of your estimated tax. One amendment may be filed in each quarter of the year. The final amendment must be filed by January 15, following the close of the tax year. If you have overestimated your tax, you may reduce your advance payments by filing an amended Declaration."

Let's take a case by way of illustration. Let's call him Johnny Jones, the owner of a midwestern radio service shop which, during 1949, brought him a net profit of $8000. On that (using a joint return plan with his wife splitting the income), Mr. Jones shelled out $944.00 to his Uncle Sam up in Washington. This was arrived at on the tax tables. His wife paid $530.00. Jones took their only child, a daughter, as his exemption on the return and—declaring the identical $4000 as his wife—paid $414.00.

Jones figured that his business would be slightly better in 1950 than it was in 1949. He estimated that it would pay him a net profit of $8500 instead of eight thousand flat. So he turned to the Form 1040-ES which had been sent to him by the Collector of Internal Revenue. On this form, he found the tax tables that also appear on the final tax return forms. Looking down those tables, he found that he and his wife would have to pay $449.00 and $565.00 respectively —a total tax of $1014.00.

So he flipped over to the other side of the form. At the bottom, below the instructions, were two nearly identical tabs. One was for filing with the Collector of Internal Revenue; the other was for Jones' own files. He filled out names of himself and his wife (using two different estimation forms). On each, he put this information:

Line 1 (estimated income tax)—$507.00.

Line 2 he left blank, since he received no wages out of which taxes were withheld.

On Line 3, he entered the figure $507.00 once more.

Since he had no overpayment "credit" for 1949, he ignored Line 4. Line 5 was likewise left blank; this applied to amended declarations. (Amended declarations are filled out in the same manner as original declarations, except that this line is included.)

On Line 7 (unpaid balance of estimated tax), he again wrote the dollar sum, $507.00.

One-quarter was to be paid on each installment. So on Line 7, Johnny Jones wrote the figure, $126.75.

That's all there was to it.

One thing more: Do you have to file an income tax estimation? The answer is a definite "yes"—provided you come under the classifications explained by the U. S. Department of Commerce. The law provides for prosecution of those who "willfully fail" to do so.

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REPAIRING GEIGER COUNTERS

[from page 21]

radio activity in nearly all locations. A luminous dial watch will throw the background count off and should not be worn when repairing the counter. The background count can be readily established by operating the counter in an area free of any direct radioactivity. If the test samples of radioactive ores are kept in plastic containers the emanations of the gamma and beta rays are slowed down. The basic count varies with each counter even of the same manufacture and with changes in altitude and temperatures. Extreme cold will cause some counters to stop working and heavy thunder-showers will throw the background count too far off from practical use. All units will deteriorate rapidly when used for any period of time in damp underground operations.

On most models the basic count ranges between 14 and 20 clicks per minute. On some older type counters this background count ranges up to 40 per minute. However, this is getting pretty high and makes accuracy doubtful. Any background count above 40 per minute is impossible to use and if the count cannot be brought down by installing new wires in the amplifier circuit and replacement of the 35 $\mu\mu$f condensers used on most counters, the Muller tube should be replaced. The background count should be checked for not less than ten minutes to determine any variations or weakness.

Supplies for much of the Geiger circuit may be had thru almost any large electrical supply house. Good sources for specialized needs are the Fisher Research Laboratory, 1961 University Avenue Palo Alto, California. This firm makes a complete line of geophysical equipmnet in addition to counters; the Omaha Scientific Supply Co., 3601 N. 24th Street, Omaha 10, Neb., and Technical Associates, 3730 San Fernando Road, Glendale 4, California.

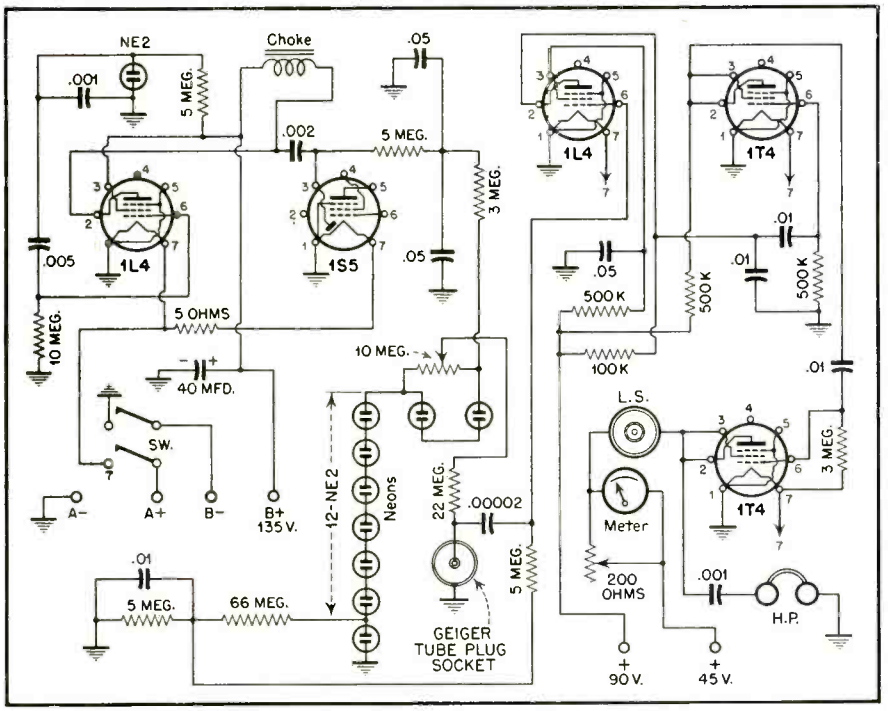

Fig. 7. Circuits in most manufactured Geiger counters follow a similar line. It's the homemade ones that stump you. Shown here are circuits for a self contained unit and one having the Muller tube in a probe attachment.

TV WAVEFORM

[*from page 24*]

is made possible by the equalizing pulse frequency mentioned previously.

In *Figure 1-17B* the *upward motion* of the vertical sync pulse begins its action at point *C* and the beam is retraced along the solid line path to point *D*. Vertical retrace time is generally 8 lines in duration. This retrace path can be observed on any TV screen by tuning in a station, turning up the brightness control, and turning down the contrast control so that the retrace lines become visible. The total number of horizontal lines traversed from *A* to *D* are now 262½, and we are now ready to start scanning the second field.

This is shown by the dotted lines in *A*. Notice that the beam is brought to point *F*. Then comes the final vertical retrace to point *A* for a grand total of 525 lines. It must always be borne in mind that immediately preceding the vertical pulse and just after the time the beam is brought to the top of the screen the blanking signal is active in keeping the retrace well within the black region. This also applies to the horizontal retrace.

At this point we might pause for a moment and recall that we have discussed two components present in the overall video signal. One is the video signal itself which contains the information pertaining to the relative intensities of black and white in each picture area. The other is the pulse signal which controls the beginning and end of each picture in synchronism with the picture scanning at the transmitter, and which cuts off the light on picture screen (blanking) while this control signal is in effect. We are now ready to discuss the remaining signal components present in the composite video signal.

HIGH QUALITY

[*from page 19*]

necessitated the use of high "Q" with a higher inductance. The resultant lower capacitance therefrom would have netted a less desirable frequency shift characteristic with application of a.v.c.

Coil details follow: The primaries and secondaries of the identical *04193* coils each have 27 turns of #35 P.E. wire close-wound and coupled upon a common bakelite tube having an adjustable alignment core assembly at either end. Two heat-stabilized 43

$\mu\mu$f shunt capacitors are mounted within each shield.

Dual Limiter

Amplified i-f output is coupled through the fourth *04193* coil directly to the control grid of the first 6UA6 sharp cutoff limiter. It is essential that the limiter react to both rapid and slow variations in amplitude and that it *smooth out* those variations still attending the signal at this point in the channel. Such variations if allowed to reach the following discriminator will cause distortion or noise. Static or other noises of a variable amplitude nature, riding along with the signal, are in this stage deleted. The use of dual limiters assures the removal of such obnoxions provided ample gain preceded this point. Three i-f stages surely saturate this limiter even for weak signal input.

The thoroughness of the cascade limiter as used here is explained basically as follows:

(a) Time constants set up for the first 6UA6 grid circuit are designed for effective reaction to impulse or noise excitation.

(b) Optimum reaction at the second 6UA6 grid is designed for a wide range of signal strength excitation.

Additive results mean a far more constant output over a wider range of amplitudes than is possible with a single limiter stage. Resistance coupling used between stages prevents regeneration. A.V.C. is developed within the first limiter stage; a bus is set up from the lower end of the 2.2 megohm resistor whence a.v.c. is fed to the control grids of the r-f, mixer and first i-f stages. The 6U5 tuning eye is fed from that same bus when switched for FM indication. An r-f choke (*04588*) in series with the heater supply bus appears in the schematic beneath the two limiter tubes.

Discriminator

The 6AL5 duo-diode demodulator affords independent operation of its two diode units. Its function is to discriminate between frequency deviations above and below the FM carrier frequency. The greater the deviation the greater the output. When there is no modulation introduced, there is no output from the 6AL5. Audio frequency modulations at the FM transmitter cause frequency deviations to occur at audio frequencies within this discriminator stage. Hence its rectified audio output can be amplified for linear reproduction of the original modulations. In other words true fidelity is the result.

The relation between frequency deviation at the input of the discrimi-

nator and that of its output voltage amplitude remains linear throughout the i-f bandpass. The shielded coil assembly (*04194*), conveying the signal from the limiter to the discriminator, introduces both directly inductive and delayed capacitive coupling between the 6UA6 pentode and the 6AL5 double diode. The two cathodes are connected across the network shown and the resultant is passed forward.

Final Output

From the rectified 6AL5 output, the signal is passed on through the final selector of the switching system to the dual 6J5 audio stages whose equalizing attributes were discussed earlier under "Switching". A workable high impedance signal of 11 volts into 30,000 ohms or better, or a balanced 500 ohm 2 volt output, is produced. A maximum distortion of 2½% holds for each output. At higher impedance, care in matching must be exerted and short connectors used, even if low capacity cabling is employed. Checks for losses in frequency response can be compared at the tuner output against that of the input of the following amplifier. The balanced 500 ohm output permits a transmission line link. Don't forget a really good tuner rates a mighty fine following amplifier. This tuner will satisfy discreet custom-made installations.

PROTECTION

[*from page 20*]

the same optical principles as are found in ordinary projection television receivers.

Figure 6 shows the other optical components which are usually found in the television receiver. The projection tube usually a 5TP4 is mounted facing the concave spherical mirror. However, all spherical mirrors have a certain amount of optical distortion which would present a fuzzy over-all appearance to the projected picture. This is not a defect in manufacture but is rather a built-in defect in all spherical mirrors. Theory and experimentation prove that there are several methods of eliminating or counteracting this spherical aberration or defocusing. One way is to use a non-spherical mirror. However, because of technical production difficulties, this has never been used in any mass produced projection television receiver. Instead, a corrector lens is introduced.

The function of this lens is to introduce an equal and opposite distortion to the spherical aberration. The combined effect of the corrector lens and spherical aberration of the concave mirror is to produce a sharp well-defined picture. This corrector lens is

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a very shallow type of lens which does *not* form the projected image but merely serves to sharpen or bring the image into over-all focus. All present day commercial examples of this modified Schmidt projection system use some type of corrector lens. In *Fig. 7* the home type or "small" projection system is shown. In the life size or

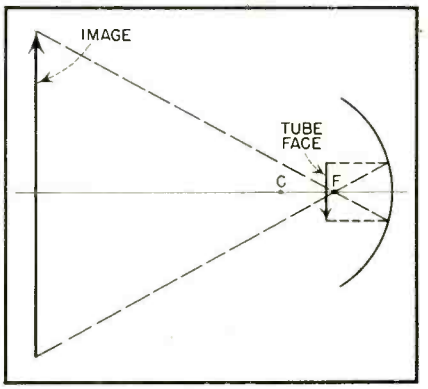

Fig. 5. A magnification of 5½ times is obtained by bringing the object still closer to F.

theatre models, the viewing screen is not a part of the receiver cabinet. The screen is usually of the type found with home motion picture projector systems. In *Fig. 7* a plane mirror is used to fold the optical system and allow it to fit in a more compact unit. Theatre projection uses an optical barrel which is the same as *Fig. 7* without the plane mirror.

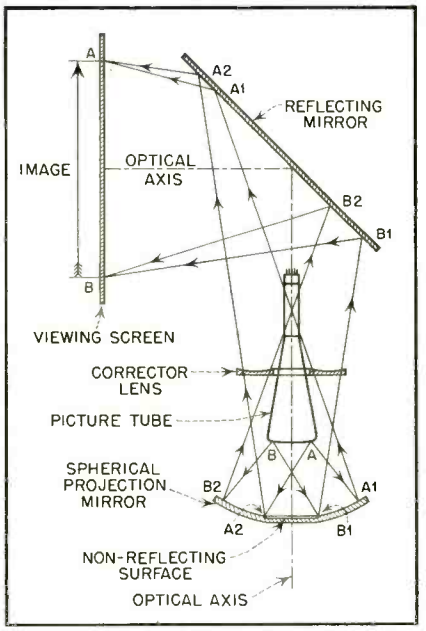

Fig. 6. Components contained in typical reflective TV system.

Life size projection television utilizes the same optical principles as the smaller type of projection which is found on the market under many trade names. The newest trend toward

home theatre television has the same optical principles and may be serviced and adjusted with the same techniques as are found useful in other projection receivers. The magnification can be controlled by moving the picture tube

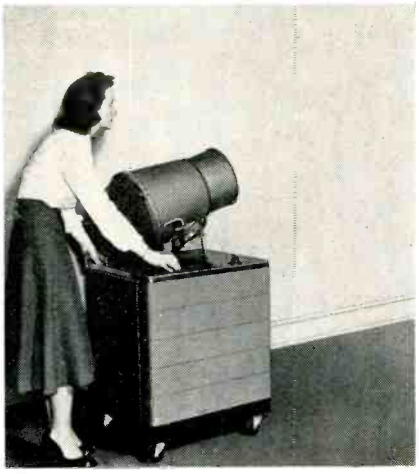

Fig. 7. Home projection system.

in relation to the concave mirror. Increasing the distance between the picture tube and the mirror will decrease magnification and hence decrease the picture size, making the distance between the tube face and the mirror less will increase the magnification while it increases the picture size.

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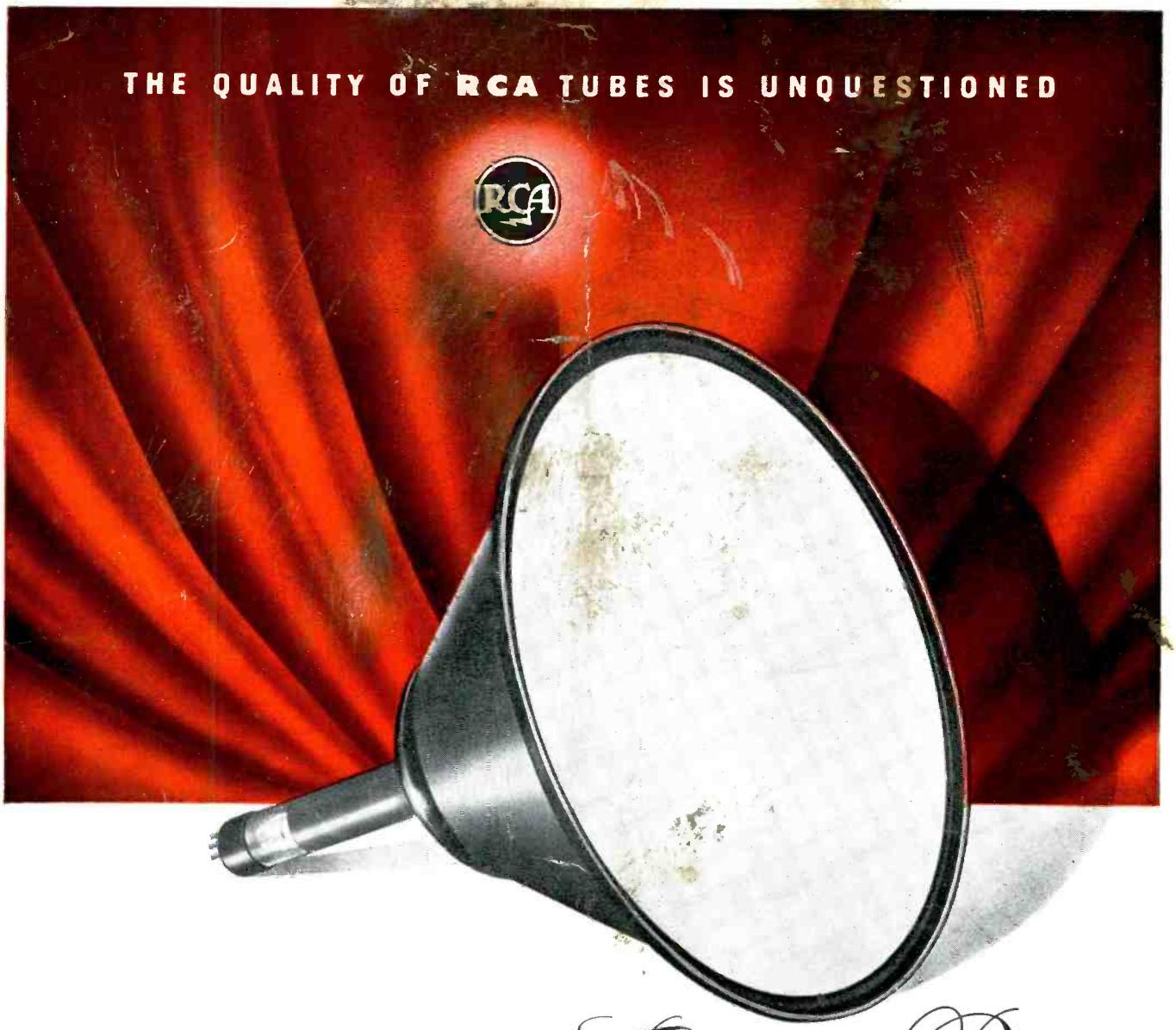

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