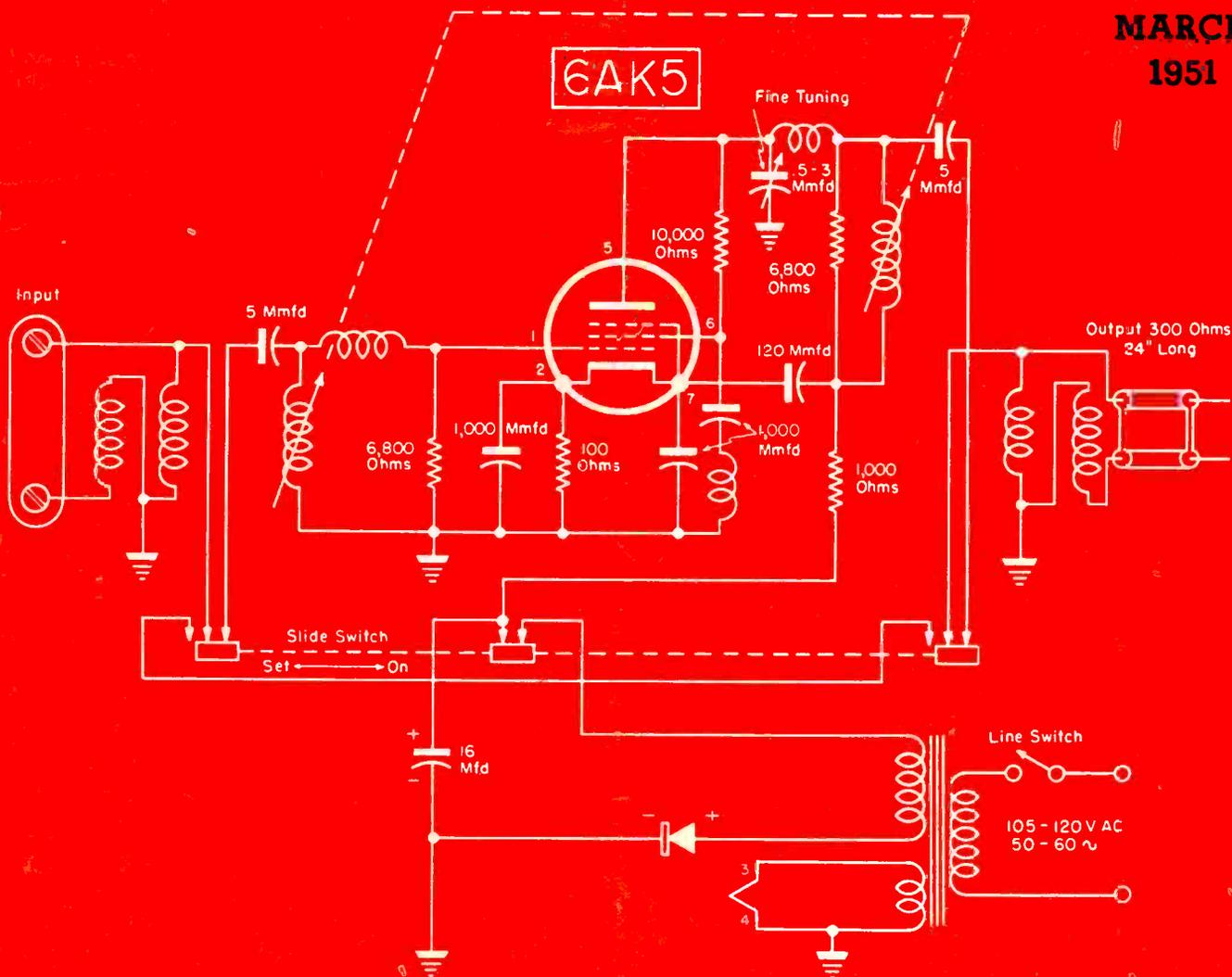


# SERVICE

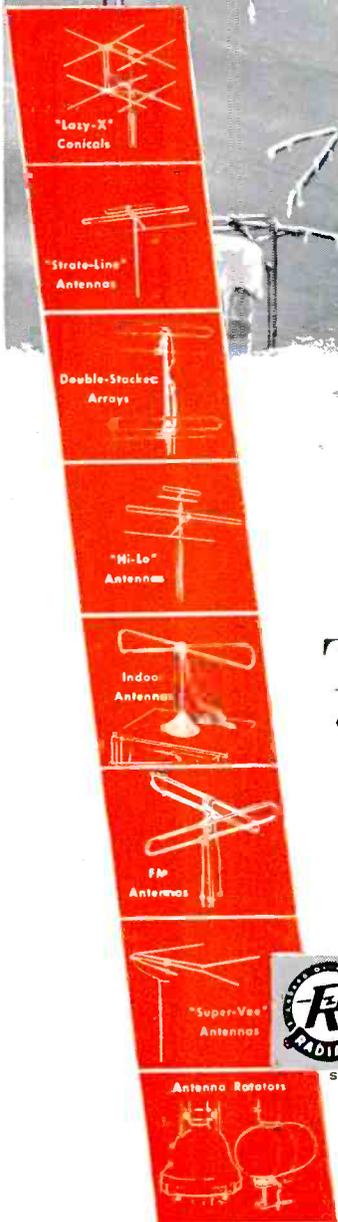
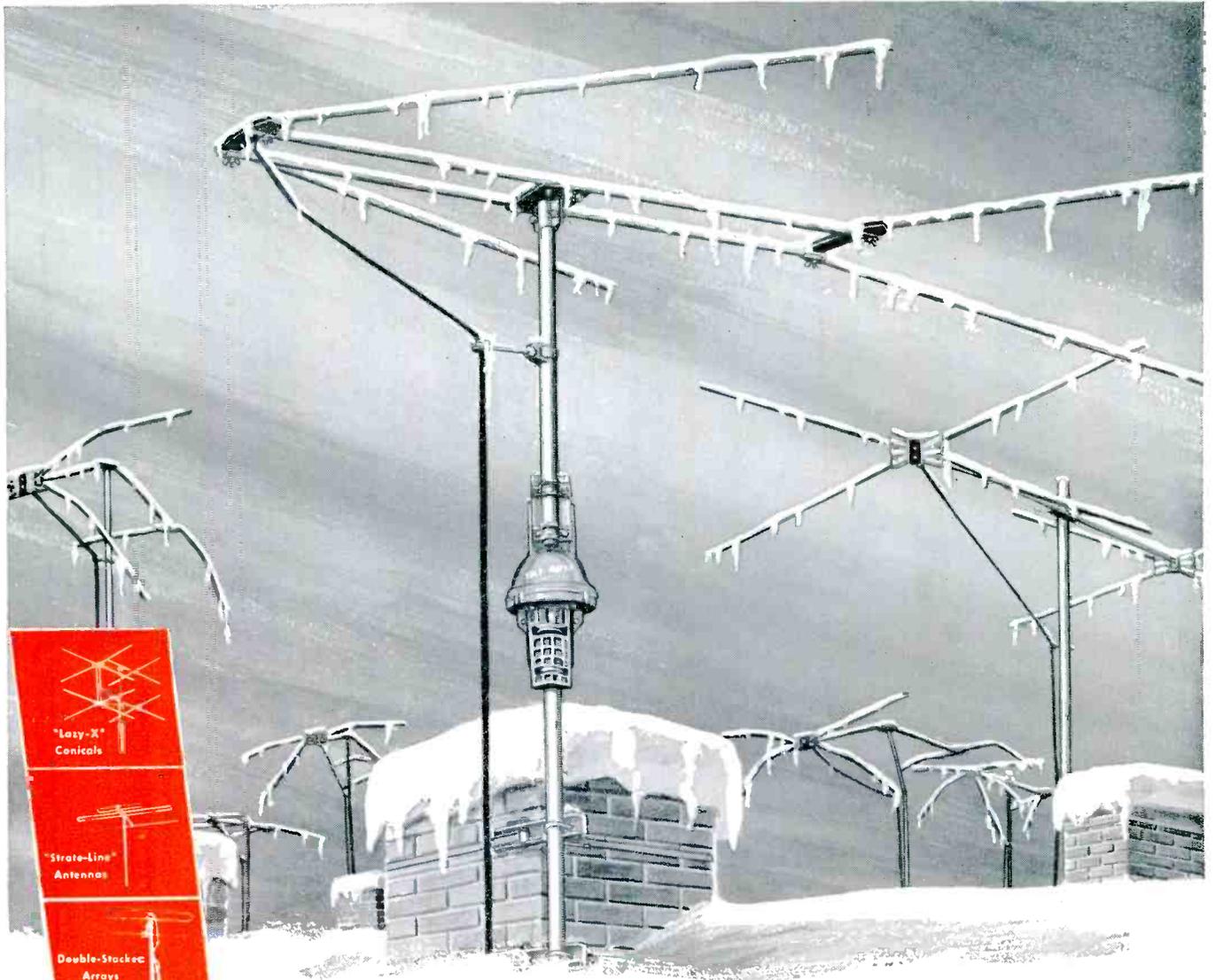
MARCH  
1951



TV booster featuring tuning coils printed on phenolic discs.

[See page 2]

THE TECHNICAL JOURNAL OF THE RADIO TRADE



When It's Needed the Most...

## RADIART Quality Meets the Challenge

**T**ELEVISION viewers expect a crystal clear picture always... in fair weather or foul! The antenna installation must be secure... and the antenna itself rugged far beyond ordinary requirements. Storms mean little in the life of a RADIART antenna. Recent severe winter weather wrecked havoc with many, many antennas... but not so with RADIART! Layers of ice and snow... winds of gale proportions... BUT NOT A SINGLE CASE OF DAMAGE DUE TO INFERIOR DESIGN OR QUALITY WAS REPORTED ON RADIART ANTENNAS. This is even further proof of RADIART superiority. AND, performance-wise... their superb engineering design delivers the ultimate in performance. Again... RADIART quality meets the challenge!



SUBSIDIARY OF



**THE RADIART CORPORATION** CLEVELAND 2, OHIO

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

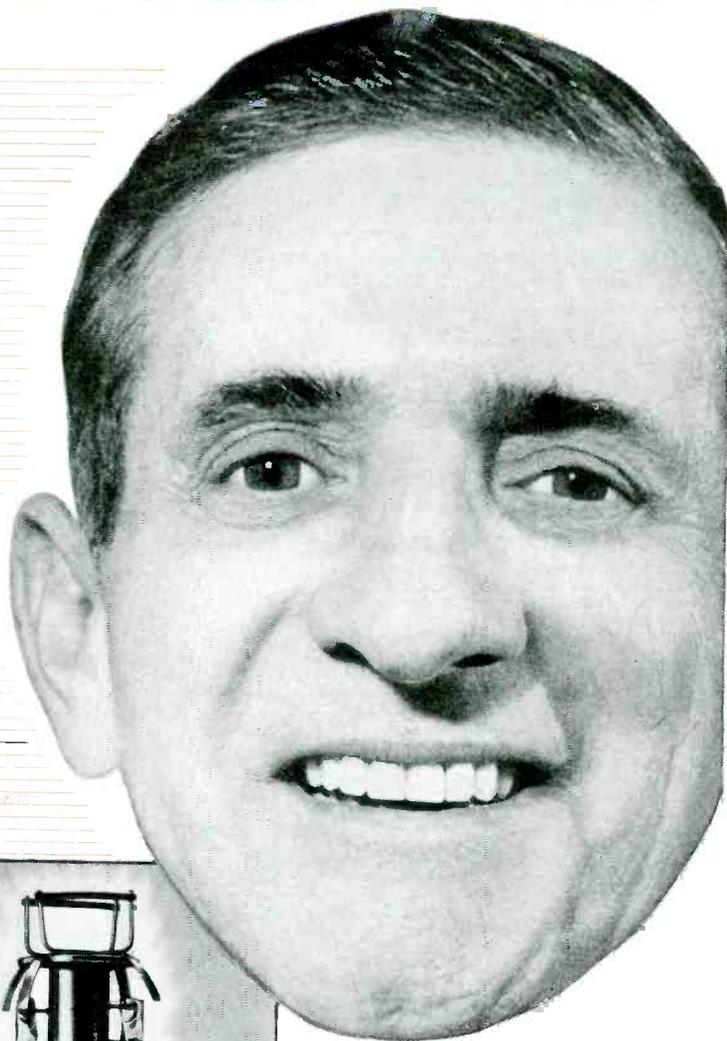
# "CALL-BACKS CAN WIPE OUT PROFITS!"

"Quality tubes mean  
fewer call-backs—  
protect income.

That's why we use G-E."

Says

Joseph F. Lauinger, President  
CONLAN ELECTRIC COMPANY  
1042 Atlantic Ave., Brooklyn, N. Y.



Conlan Electric Company and other service firms—large and small—find that customers ask to see the G-E label on tube cartons. It's proof to set-owners that they're getting highest tube quality, as well as competent radio-TV service.



Typical of General Electric tube quality, is the glass beading of the electron gun in G-E picture tubes. Unlike cheaper, porous ceramics often used, glass will not readily contaminate. Result: much less chance of voltage breakdowns.

"Call-backs on TV-service customers consume working time, and working time is what we have to watch at Conlan Electric. With 40,000 owners on our contract list in Greater New York, extra service calls can multiply to a cost figure that changes black to red. . . . Tube failures are a common cause of call-backs. We've found that good tubes—quality tubes—perform better, give much less trouble. G-E tubes have a top record with Conlan Electric. We feature them. We know that when one of our men installs a G-E picture tube or receiving type, chances are that customer will *stay satisfied!*"

FOR QUALITY TUBES TO CUT DOWN YOUR CALL-BACKS, SEE YOUR G-E TUBE DISTRIBUTOR!

GENERAL  ELECTRIC

181-KA3

SERVICE, MARCH, 1951 • 1



**LEWIS WINNER**  
Editor

**F. WALEN**  
Assistant Editor

Including *Radio Merchandising and Television Merchandising.*  
Registered U. S. Patent Office

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Don't be vague... ask for

# SPRAGUE CAPACITORS



SPRAGUE TVL "TWIST-LOK" DRY ELECTROLYTICS



SPRAGUE "TELECAP" MOLDED TUBULARS



SPRAGUE "CERA-MITE" DISC CERAMICS



SPRAGUE TVA "ATOM" DRY ELECTROLYTICS

*Sprague's famous Four*

**BIGGEST LITTLE TROUBLE-SAVERS IN TV SERVICING**

... Avoid costly callbacks!

WRITE FOR CATALOG

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DISTRIBUTORS' DIVISION OF THE SPRAGUE ELECTRIC COMPANY

61 MARSHALL ST., NORTH ADAMS, MASS.

ATOM, TWIST-LOK, TELECAP and CERA-MITE are SPRAGUE Trademarks

"Sure we can fill many Shoes"



**See how versatile SYLVANIA tubes  
help you solve  
shortage problems**

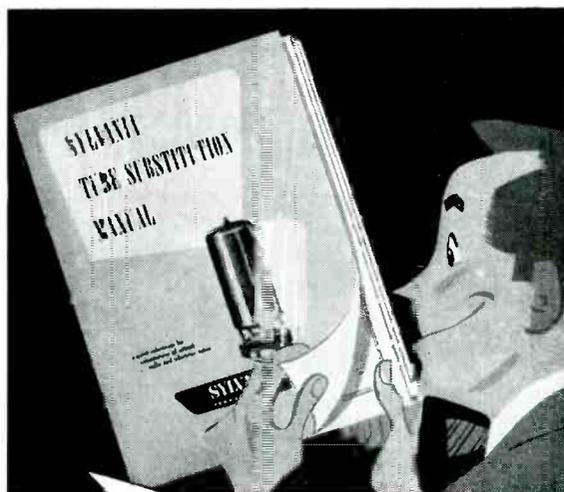
Yes, radio tubes are still in short supply. But, Sylvania is doing its utmost to serve all its loyal customers.

Production facilities are being increased, and all Sylvania Distributors are being taken care of on the fairest possible allocation basis.

But, there's *no shortage* in ingenuity at Sylvania! Now this company offers you service dealers a great new tube substitution manual.

Here's a complete classified listing to assist service technicians and engineers in making substitutions for tube types not immediately available. This booklet includes circuit modifications and substitution directions for battery types, 150 ma. and 300 ma. types, as well as for Transformer and Auto Tube types . . . Television Tubes and Picture Tubes, too.

40 pages of valuable, up-to-the-minute information . . . FREE from Sylvania. Get your copy from your Sylvania Distributor NOW, or mail the coupon below.



This book is being given away FREE by Sylvania as a service to its good friends, the country's radio-television service dealers.



**SYLVANIA  
ELECTRIC**

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXT

# A RAULAND EXCLUSIVE!

*New*  
**"Tilted-Offset" Gun**  
WITH  
**INDICATOR  
ION TRAP**



## For Faster Service—Bigger Profits

More and more dealers and service men are swinging to Rauland picture tubes because of Rauland's exclusive development—the Tilted Offset Gun with mistake-proof Indicator Ion Trap.

This new feature—the most recent of many Rauland firsts in picture tube design—saves time and trouble in Ion Trap Magnet adjustment, eliminates mirrors and guesswork. A vivid green glow on the anode tube signals when adjustment is incorrect. The service man simply moves the magnet until the glow is reduced to minimum. Adjustment becomes a matter of complete precision, yet one accomplished in a matter of seconds without equipment of any kind.

In addition, the Tilted Offset Gun offers the advantage of maximum sharpness of focus and requires only a single

at advancements.

### **RAULAND**

The first to introduce commercially these popular features:

Tilted Offset Gun

Indicator Ion Trap

Luxide (Black) Screen

Reflection-Proof Screen

Aluminized Tube

**AND CORPORATION**

*Through Research*

VENUE • CHICAGO 41, ILLINOIS



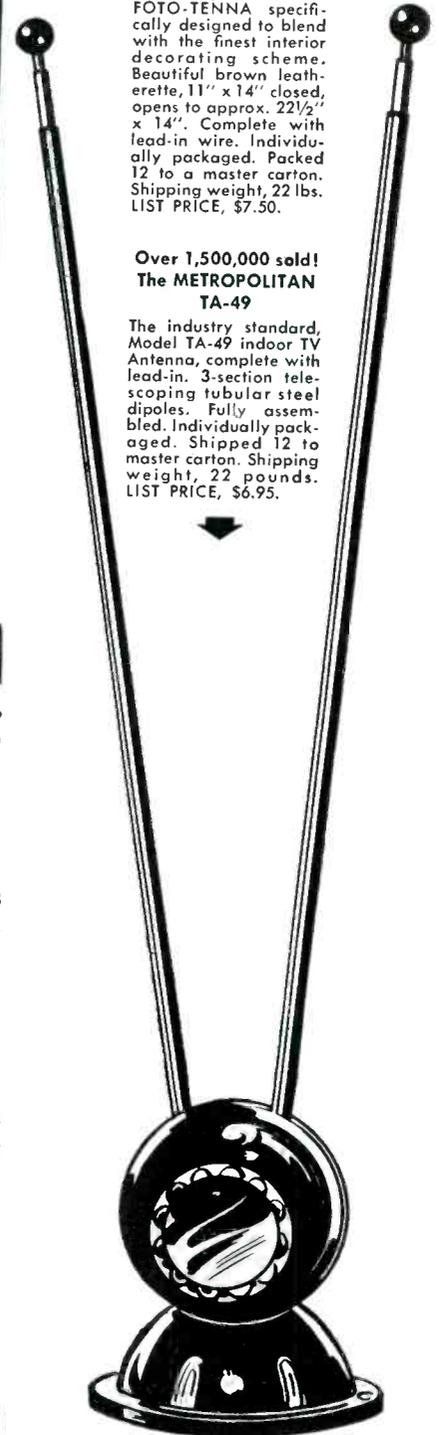


← **Aristocrat of indoor antennae!**  
**The COSMOPOLITAN TA-55**

Uniquely beautiful FOTO-TENNA, specifically designed to blend with the finest interior decorating scheme. Beautiful brown leatherette, 11" x 14" closed, opens to approx. 22 1/2" x 14". Complete with lead-in wire. Individually packaged. Packed 12 to a master carton. Shipping weight, 22 lbs. LIST PRICE, \$7.50.

**Over 1,500,000 sold!**  
**The METROPOLITAN TA-49**

The industry standard, Model TA-49 indoor TV Antenna, complete with lead-in. 3-section telescoping tubular steel dipoles. Fully assembled. Individually packaged. Shipped 12 to master carton. Shipping weight, 22 pounds. LIST PRICE, \$6.95.



**Could you use an extra man—to work FREE?**

Men are scarce. *Good* men, much scarcer. But in some respects, your handling *Radion* is like adding a good man—an expert who not only works “for free” but even pays you a tidy profit.

**An extra installation man?**

In areas where most TV set sales are made, *Radion* often makes installation a one-man, instead of two-man, job. *Faster* installation, too. Almost like an extra installation man!

**An extra salesman on TV sets?**

*Radion* on your demonstrators—*Radion* as part of a “no installation charge” offer—*Radion* to bring in beautiful images when built-in antennae fail—yes, *Radion* may easily increase sales as much as adding a man!

**An extra sales clerk for parts, etc.?**

As a traffic item—a “pick-and-pay” profit maker for you—*Radion* saves clerks’ time. Needs no explaining, no wrapping. Shows many dealers a surprisingly good volume!

**This coupon brings EXTRA help – mail it NOW!**

# Radion

**THE RADION CORPORATION**  
 1137 Milwaukee Ave., Chicago 22, Ill.

THE RADION CORP., 1137 Milwaukee Ave., Chicago 22, Ill. <sup>8-3</sup>  
 Please send complete details on Radion products and dealership.

Metropolitan No. TA-49  Cosmopolitan No. TA-55

Name.....

Company.....

Address.....

City.....Zone....State.....

# Use Sheldon "Telegenic" Picture Tubes FOR REPLACEMENTS, CONVERSIONS & INITIAL EQUIPMENT . . .



Miss Connie Corrado  
Inspector  
Sheldon Electric Co.

## Because . . . **THEY STAND UP!**

"I KNOW THAT SHELDON 'TELEGENIC' PICTURE TUBES ARE GOOD. I INSPECT THEM." They are custom-made. They have a life of more than 4,000 hours.

(This Advertisement is being repeated by POPULAR DEMAND!)

**Sheldon**  
NATURAL IMAGE

SOFT GLOW  
Picture Tube



**WRITE TODAY** for the new Sheldon "General Characteristics & Dimensions" Wall Chart containing complete data on ALL Sheldon tubes.

**KEEP INFORMED ON COLOR TELEVISION.** Get your **FREE** copy of Television Mis-Information #4 with its feature presentation on color television.

## SHELDON ELECTRIC CO.

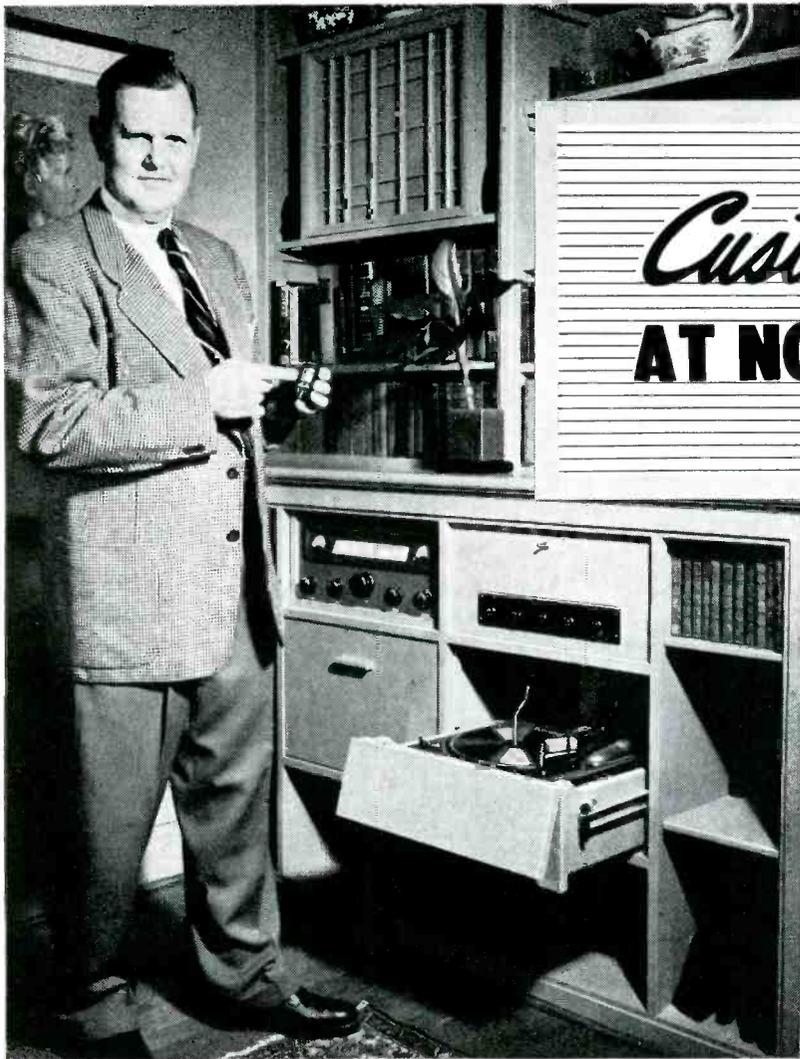
A Division of ALLIED ELECTRIC PRODUCTS INC.

68-98 Coit Street, Irvington 11, N. J.

Branch Offices & Warehouses: CHICAGO 7, ILL., 426 S. Clinton St. • LOS ANGELES 26, CAL., 1755 Glendale Blvd.

▶ VISIT BOOTHS 390-1-2 AT THE RADIO ENGINEERING SHOW, GRAND CENTRAL PALACE, MARCH 19-22 ◀

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*Custom Quality*  
**AT NO EXTRA COST!**



## VARIABLE RELUCTANCE CARTRIDGES

**W**HERE cost is no problem, custom designers specify the best. Philip C. Kelsey of Guilford, Connecticut, shown here beside one of his made-to-order FM phonograph installations, says:

"Customer satisfaction means everything in my business. That's why G-E cartridges are standard in all my installations. I know they are the best."

This same cartridge—with diamond or sapphire tip—belongs in your line and in your customers' sets. More than 100,000 G-E cartridges were sold last year—a better score than all other VR cartridges combined! Today, more than ever before, dealers will push quality merchandise backed by a name people believe in—General Electric.



### Build Your Profits . . . Build Your Reputation

Stock the complete G-E Parts Line now—let your customers know you can put new life into radios, phonographs, TV sets, with General Electric

- Speakers
- Styli
- Tone Arms

Call your G-E distributor today, or write: *General Electric Co., Electronics Park, Syracuse, N. Y.*

**JUST OUT!**

**—GET YOUR COPY NOW!**

General Electric Company  
Section 331  
Electronics Park, Syracuse, N.Y.

Send me your new stylus booklet  
"Why You Should Use a Diamond."



NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

**GENERAL**  **ELECTRIC**



# ALL RANGES WITH THIS ONE CONTROL

Just *one* knob—extra large—easy to turn—flush with the panel, controls all ranges. This one knob saves your time—minimizes the chances of “burn-outs” because you don’t have to remember to set another control. You can work fast with Model 630 with your eyes as well as your hands. Look at that scale—wide open—easy to read, accurately. Yes, this is a *smooth TV* tester. Fast, safe, no projecting knobs, or jacks, or meter case. Get your hand on that single control and you’ll see why thousands of “Model 630’s” are already in use in almost every kind of electrical testing



**Model  
630**

**ONLY \$39.50 AT YOUR DISTRIBUTOR**

*In Canada: Triplett Instruments of Canada, Georgetown, Ontario*

FOR THE MAN WHO TAKES PRIDE IN HIS WORK

# Triplett

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



in the southeast  
**RELIABILITY**

sold  
**2215 EXPERTS**

**renew**  
*with* **N.U.**

**premium quality tubes**

**SAYS BILL GRIGSBY**

**Southeastern Radio Parts Co.**

Georgia: Atlanta, Savannah

Alabama: Montgomery

South Carolina: Columbia

We don't guess when we stock tubes. We meet the demand of our 2,215 Servicemen and Service Dealers who have made N. U. tubes their first choice. These experts know from actual experience that N. U. tubes meet the strictest service requirements . . . that N. U. tubes are uniform, reliable, properly designed for interchangeability. The confidence of our customers in N. U.'s quality control and advanced research makes N. U. tubes profit-makers for all of us.

- RADIO and TELEVISION RECEIVING TUBES
- VIDEOTRON TELEVISION PICTURE TUBES
- PANEL LAMPS
- TRANSMITTING and SPECIAL PURPOSE TUBES



**NATIONAL UNION RADIO CORP.**

Main Office: 350 Scotland Rd., Orange, N. J.

Research Division: Orange, N. J. • Plants: Newark, N. J. — Hatboro, Pa.

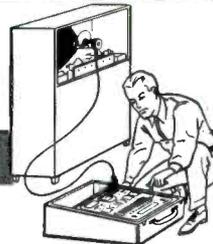
# THE NEW PRECISION CR-30 CATHODE RAY TUBE TESTER

## TESTS ALL TV PICTURE TUBES

(MAGNETIC AND ELECTROSTATIC)

### 'SCOPE TUBES AND INDUSTRIAL CR TYPES

for True Beam Current (Proportionate Picture Brightness)  
Tests ALL CR Tube Elements—Not Just a Limited Few



**IN FIELD OR SHOP**  
Tests CR Picture Tubes  
Without Removal from  
TV Set or Carton!

The new Precision CR-30 fills an obvious gap in the test equipment facilities employed by TV service and installation technicians.

Because of the absence of a reliable cathode ray tube tester, up to 50% of so-called "rejected tubes" are found to be fully serviceable and should rightfully never have been "pulled out."

Proven product of extended development, the CR-30 has been

specifically engineered to answer the question, "Is It the TV Set or is it the Picture Tube?"

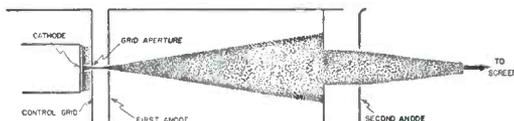
The Precision CR-30, a complete and self-contained Electronic Instrument, incorporates a TRUE BEAM CURRENT Test Circuit. The CR-30 checks overall electron-gun performance for proportionate picture brightness as well as additional direct testing facilities for accelerating anodes and deflection plate elements.

The Precision CR-30 should not be confused with mere adapters connecting to ordinary receiving tube testers which were never designed to meet the very specialized needs of CR tube checking. Similarly, it is not to be confused with neon-lamp units or similar devices of limited technical merit and which do not check all CR tubes or all tube elements.

## GENERAL AND TECHNICAL SPECIFICATIONS

- ★ Tests All Modern Cathode Ray Tubes:—Magnetic and Electrostatic, 'Scope Tubes and Industrial Types.
- ★ Tests All CR Tube Elements:—Not just a limited few.
- ★ Absolute Free-Point 14 Lever Element Selection System, independent of multiple base pin and floating element terminations, for Short-Check, Leakage Testing and Quality Tests. Affords maximum anti-obsolescence insurance.
- ★ True Beam Current Test Circuit checks all CR Tubes with Electron-gun in operation. It is the Electron Beam (and NOT total cathode emission) which traces the pictures or pattern on the face of the CR tube.

Total cathode emission can be very high and yet Beam Current (and picture brightness) unacceptably low. The CR-30 will reject such tubes because it is a true Beam Current tester. Conversely, total cathode emission can be low and yet Beam Current (and picture brightness) perfectly acceptable. The CR-30 will properly pass such tubes because it is a true Beam Current tester. The significance of the above rests in the fact that Beam Current (and picture brightness) is primarily associated with the condition of the center of the cathode surface and not the overall cathode area. (See illustration below)



- ★ Voltage Regulated, Bridge Type VTVM provides the heart of the super-sensitive tube quality test circuit. Such high sensitivity is also required for positive check of very low current anodes and deflection plates.
- ★ Micro-Line Voltage Adjustment  
Meter-monitored at filament supply.
- ★ Accuracy of test circuits closely maintained by use of factory adjusted internal calibrating controls; plastic insulated, telephone type cabled wiring; highest quality, conservatively rated components.
- ★ Built In, High Speed, Roller Tube Chart.
- ★ Test Circuits Transformer Isolated from Power Line.
- ★ 4 3/8" Full Vision Meter with scale-plate especially designed for CR tube testing requirements.
- ★ Heavy Gauge Aluminum Panel etched and anodized.
- ★ PLUS many other "PRECISION" details and features.

SERIES CR-30—In hardwood, tapered portable case, with hinged removable cover. Extra-Wide Tool and Test Cable Compartment. Overall Dimensions 17 1/4 x 13 3/4 x 6 3/4". Complete with standard picture tube cable, universal CR Tube Test Cable and detailed Instruction Manual.

Shipping Weight:—22 lbs. Code: Daisy  
NET PRICE:—\$99.75

See the new CR-30 on display at leading electronic equipment distributors. Place your orders now to assure earliest possible delivery.



## PRECISION APPARATUS CO., INC.

92-27 Horace Harding Boulevard, Elmhurst 6, New York

Export Division: 458 Broadway, New York, U.S.A. • Cables—Morhanex  
In Canada: Atlas Radjo Corp., Ltd., Toronto, Ontario





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**COMPLEX, EFFICIENT . . . KESTER SOLDER MAKES IT POSSIBLE**

Good fast work can only be done with the best materials. Kester Plastic Rosin-Core Solder and the more active Kester "Resin-Five" Core Solder, made only from newly mined grade A Tin and Virgin Lead, are formulated especially for TV, radio, and electrical work. Kester Solders flow better . . . handle easier . . . faster to use.

Free Technical Manual—Send for your copy of "SOLDER and Soldering Technique."

## **KESTER SOLDER COMPANY**

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Newark, N. J. • Brantford, Canada



SAVES TIME

DEPENDABLE

EASIER TO USE

FASTER



**KESTER  
SOLDER**

# Hiawatha was a PIKER!



"Go out into the world," said Pops\*  
"and don't come back 'till you're proved tops!"



The water test he passed with ease,  
Earning a feather was just a breeze...



Heat was applied to test his worth  
In "hot spots" he then won a berth...



The life test took a long, long time  
Though others quit—he kept his prime...



His leads proved strong—his casing tough  
It did no harm to treat him rough!

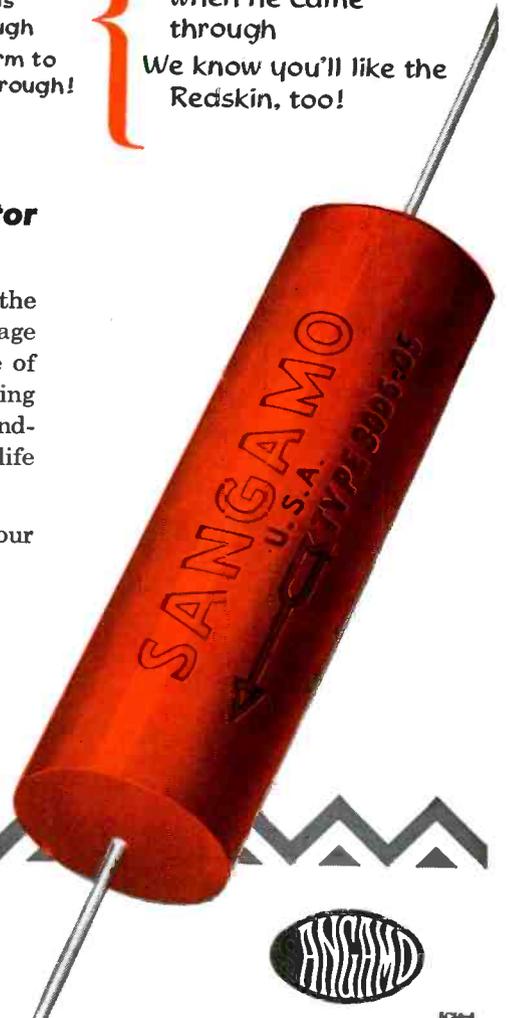
His Pops was pleased when he came through  
We know you'll like the Redskin, too!

## Sangamo's New Molded Paper Tubular Capacitor gives LONG LIFE under severe conditions!

The REDSKIN is easy to work with—on production line or on the bench—because the especially designed 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, longer life and greater dependability. It is an 85° C tubular which offers assurance of long life under television and other severe operating conditions.

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

\*Big Chief Sangamo



**SANGAMO ELECTRIC COMPANY**

**SPRINGFIELD, ILLINOIS**

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



DC36-4

# New Round Shaft

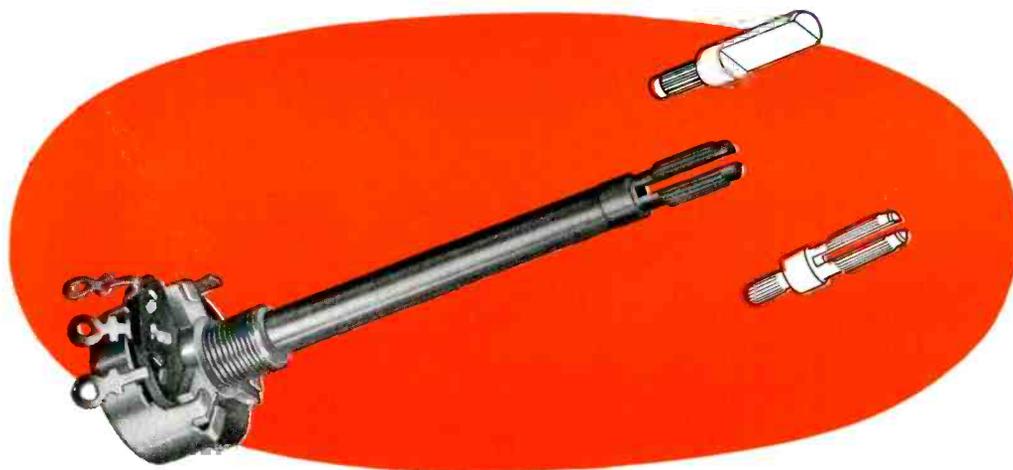
## *Saves Valuable*

### Single Section Mallory Midgetrol

Now you can have the outstanding electrical characteristics of the *time-proved* Mallory Midgetrol . . . with two new time-saving features that make carbon control installation faster and simpler than ever before !

This sturdy  $\frac{15}{16}$ " control is supplied with a *permanently fixed, tubular brass shaft*. It is easily cut to required length. It can be adapted for split-knurl or flatted type knobs in a few seconds by inserting one of the two steel shaft-ends packaged with every Mallory Midgetrol. It has been designed to give you utmost convenience—without sacrificing the important advantage of a stable, permanently secured shaft.

In addition, switch attachment is made simple and sure by positive indexing and a design that permits secure locking in position without removing the control housing.



*The Mallory Midgetrol gives you fast, sure, simple installation—with electrical characteristics specially engineered for critical applications in both television and radio. Precision-controlled carbon element assures smooth tapers, quiet operation, accurate resistance values and less drift in TV sets.*

## Make Sure! Make it Mallory!

# Mallory Midgetrol\*

## Installation Time

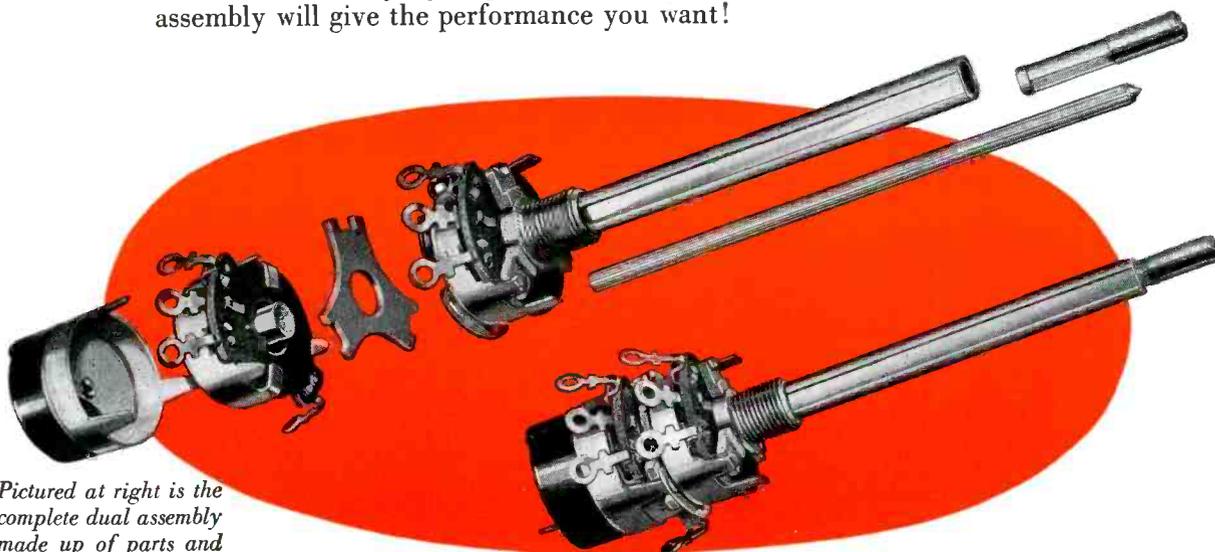
### Dual Concentric Mallory Midgetrol

This revolutionary new control can be assembled in five easy steps, in less than five minutes—makes it possible for you to match a wide range of combinations immediately from convenient distributor stocks, and without the high "time" costs involved in more complex assembly operations.

The "exploded" view below illustrates the parts and assembled control sections supplied with each control. Extremely simple, brief instructions show you how to assemble them quickly and surely—without soldering—with only the simplest of tools.

As with the single Mallory Midgetrol, an AC Switch can be attached quickly—with no question of proper position, without removing the control housing.

The control is so designed that both front and rear sections are *factory-assembled and carefully inspected*. You can be sure that your final dual assembly will give the performance you want!



*Pictured at right is the complete dual assembly made up of parts and sub-assemblies above.*

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

*Check with your Mallory Distributor right now about this important contribution to better, more profitable service work.*

Recommended in the 2nd Edition Mallory Television Service Encyclopedia. Get your copy today!

\*Trade Mark

Here's the **BOOSTER** that says  
**"YES"** to all your demands...



*the New*  
**AUTOBOOSTER**

THE *FULLY AUTOMATIC* TV-FM BOOSTER



Here at last is a TV Booster that gives you gain up to nine times, full band width for undistorted video and audio on all channels, plus — the newest development in booster design — completely automatic operation.

The ITI AUTOBOOSTER turns itself on and off and is automatically tuned by the normal operation of the TV receiver. No confusing array of knobs — no unsightly mess of wires — You can install the ITI AUTOBOOSTER in the back of the receiver, out of sight. You get all the improved performance, all the fine picture quality that this precision-engineered booster can give you with none of the trouble of tuning, none of the exposed wiring usually involved in booster operation.

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**BOOSTER CHECK LIST**

<b>AUTOBOOSTER</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
Automatic On-Off	YES	YES	NO	NO	NO	NO
Automatic Tuning	YES	NO	NO	NO	NO	NO
Concealed Installation	YES	NO	NO	NO	NO	NO
Full Bandwidth (All Channels)	YES	NO	YES	YES	NO	YES
Amplifies FM Band	YES	YES	NO	NO	YES	NO
Single or Dual Input	YES	NO	NO	NO	NO	NO
Gain 19db on Low Channels 2 - 6 FM	YES	NO	NO	NO	NO	NO
Gain 14 db on High Channels 7 - 13	YES	NO	NO	NO	NO	NO
Made by a TV Receiver Manufacturer	YES	NO	NO	NO	NO	NO

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### **Profit and Loss in TV Installations**

WITH THE INVASION OF TV on most fronts, there reappeared a phase of servicing which seemed to be rapidly disappearing from the scene . . . *installation*.

### **AM and TV Requirements**

As more and more standard-type chassis became equipped with built-in antennas and the sensitivity factor of the sets began to rise, the detailed installations began to lose their import, and assignments became of a very routine nature involving nothing more, in most cases, than a power-line hookup. However, as sight and sound sets poured into homes, it became apparent that assurances of good reception would entail more than a house-line plug-in installation effort. Yes, there were many problems to be considered, in pickup, receiver positioning, tuning instruction, and even adjustments of internal controls upset during shipment.

### **Preplanning Techniques**

Installation became quite a factor, with the advent of TV, and many became installation conscious, devoting full time to the new enterprise. Techniques to accelerate installation, without sacrificing efficiency, were evolved by many. As a result, business boomed and there were many smiles around town. As the months and years rolled by, however, and more and more sets came into the field, the boys began to find their calendars very, very crowded. To cope with the problem, installation systems had to be further streamlined, using many new advanced methods featuring preplanning, which involved area surveys to determine . . . the types of antennas that would work best in specific

locations, noise conditions, reflection problems and even roof-top conditions that might be encountered. Those who adopted such methods found that the tight-appointment schedules introduced no problems and business was still something to shout about. There were others who felt that the detailed effort involved in planning was a nuisance, and the antiquated cut-and-dry approach would just have to hold. Unfortunately, it didn't and there were many who suddenly found themselves with monthly balance sheets featuring red ink. Reviewing their plight, the shop-owners found that the troubles centered about their inability to hold to any consistent schedule because of haphazard installation methods . . . methods which included makeshift setups as well as careless consumer instruction, which often prompted expensive callbacks. Misuse of material and lack of test equipment, as well as insistent refusal to even use such gear, also played a role in running up the loss column. Some have capitalized on these experiences, altered their approach, accepted the sound practices adopted by many and found that it's possible to turn red to black in the ledger. Many, however, are still trying to cut corners, and the results are still disastrous.

### **Merits of Systematic Preparations**

The systematic preparation for installations, revolving about the use of carefully-evaluated techniques and properly-applied field measurement equipment, has helped to provide a real service to the consumer, assuring an installation which could be guaranteed for results.

TV installation can be a highly profitable item in the service shops, if given the careful consideration it requires.

### **Distributors and the Service Man**

TOO OFTEN, THE IMPORTANCE of the distributor is discounted by the Service Man. Actually, his value to the shop is inestimable.

It is the distributor who provides that important component or accessory at the right time. He's the man who follows through on the shipments and sees to it that his shelves are stocked with the merchandise required for that installation or servicing call.

His trained sales personnel often provide the Service Man with vital application guidance. It is the distributor who even assumes the credit responsibility for the service shop.

The distributor is a true friend of the Service Man and his shop!

### **Reducing Callbacks**

A NOVEL 10-POINT PROGRAM, which has been found to reduce service calls to a minimum has been evolved by a service shop in Nashville, Tenn.

Following, in part, a format suggested by a group in Washington some time ago, the plan states that before calling for service the consumer should determine . . . whether the set is plugged into the line; if the house fuse has burned out; the antenna leads are connected to the set; the switch is set on TV; the TV transmitter is functioning properly; picture is out of linearity due to improper rear-control readjustments; fuzzy or not clear picture due to smoke or dust on face of picture tube or front glass; antenna leads or line cord damaged due to mishandling; record player switch is in the correct position; and if there is local interference, such as stokers, neons, or other appliances.

A sound, logical approach to a difficult problem.—L. W.



## Beware the TV Gypsies

BY LESTER DAVID

Bronx, New York, new \$510 for what they brand-new console set. A week after installed the picture and the young around inside the mass of old, rusted which hung a few years earlier and address

signed a contract to buy the set. Swindles such as these are typical instances in an alarming situation which has already developed in an industry still in the growing-pains stages. The gypsies, the smooth-talking chislers have swarmed into this vast new business to defraud thousands of families from coast to coast.

A total of 6,000,000 sets was sold in the U.S. during 1950, twice the 1949 total and six times that of 1948. The majority, of course, were sold by reliable dealers and serviced by competent, honest repair organizations. But the spectacular rise of the industry, unprecedented in any other field within recent years, has attracted a horde of unscrupulous fakes who are now fleecing the purchasers through tricky and confusing advertising, misleading statements about credit terms, sales of defective merchandise and phony repair service.

bought a 31-inch 21 tubes. The agent, the and her the ally—promising an extra \$100. The people agreed to be installed in their "free trial." The agent asked the potential customer to sign a "receipt" for the temporary installation. The old man signed—and learned next day that he had



## BONDED ELECTRONIC TECHNICIANS

have the answer to articles like this. Their cash bond of protection and code of ethics inspire customer confidence in their integrity and ability. Ask your Raytheon Tube Distributor if you can qualify for this vitally important sales asset.

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*Excellence in Electronics*

# *SERVICE...The National Scene*

REPAIR PARTS WIN PRIORITY RATING--Parts will be available for servicing to fill all normal requirements, according to a recent ruling from Washington. Thanks to round-the-clock efforts of industry committees, particularly the mobilization group of the Association of the Electronics Parts and Equipment Manufacturers and the Sales Managers Club Eastern Group, service shops will be able to secure the parts they need by simply using the magic preference symbol, DO-97. All shop owners will have to do to use the rating will be to merely write on the order, or on a piece of paper attached to it, the words: "DO-97, Certified under NPA Regulation 4," and sign his name. Generally, the only limitation that will apply on the amount of supplies that can be obtained will be the purchases made in 1950; it will not be possible to buy more than in '50. New shops will be able to spend up to \$5,000 a quarter for replacement supplies. According to NPA, the DO ratings will receive the same recognition for accelerated shipment as those issued by the armed services.

LESS COBALT, COPPER, ALUMINUM AND STEEL IN NEW SETS--Radio and TV chassis that will be coming off the line in early spring will take on a new look with modifications in layouts, construction and circuitry, due to material conservation programs scheduled to be adopted by most manufacturers. According to a report from RCA, the cup over the end of the picture tube on the rear of the cabinet will be changed from aluminum to plastic. There'll be shorter mounting bushings on some variable controls and a reduction in the length of copper wire leads on capacitors. Copper-clad steel wire will be used instead of copper wire leads on wire-wound resistors and chokes. Beam benders will use Alnico 3 magnets, where no cobalt is required, instead of Alnico 5.

PHILCO DEVELOPS SPECIAL AUSTERITY-TYPE CHASSIS--Metal conservation will also be stressed in a new Philco line soon to start rolling. The receivers will feature a new output circuit, including a new diode damper, the 6V3, which will make it possible to use a smaller flyback or horizontal-output transformer, and, in addition, operate on 250 volts as compared to 315, now used. Selenium rectifiers and a voltage doubler circuit will be used, this providing for the elimination of power transformers. Models will also feature the use of electrostatic tubes which will make it possible to eliminate the heavy permanent-magnet Alnico 5 focuser, or the alternate, the electromagnetic focuser which requires a copper coil and rectified power for energizing.

MIAMI AND BOSTON SAY "NO" TO LICENSING--Municipal and state proposals to regulate television and general servicing were routed recently in Miami and Boston. In Florida, before the mayor and board of city commissioners, Lou Calamaras, NEDA's executive secretary, helped to secure an official rejection of a licensing plan by showing that such a law would directly or indirectly encourage or create practices which would be injurious to the public interest. Calamaras pointed out that he had yet to find an instance where licenses insured, guaranteed or protected the consuming public against unethical practices. In his opinion, wherever faulty practices do exist, correction can only be achieved by self-policing. . . . In the State House in Boston, two bills that would regulate television procedures in Massachusetts were killed after the committee on state administration found that the proposed legislation would complicate, rather than cure whatever problems do exist.

RECTANGULAR PICTURE-TUBE INTEREST SPIRALS--Rectangular picture tubes represented 78 per cent of tube sales made to chassis manufacturers during the first thirty days of the year, according to a report from RTMA, a report which also disclosed that 93 per cent of all the tubes sold to set makers were 16 inches or larger.

# *SERVICE...The National Scene*

BUILT-IN ANTENNA INTEREST DWINDLES--A recent survey\* revealed that less than 1 per cent of prospective TV set buyers showed any interest in built-in antennas. The feature which seemed to appeal to most was clear pictures. The survey also revealed that the majority of prospective buyers were more interested in FM than in the AM pickup in combination sets. In a query about the phono requirements, the three-speed player received most mentions.

C-D EQUIPMENT SCHEDULED TO BECOME VITAL PROJECT OF SERVICE MEN--Civil Defense plans, across the country, are accenting the importance of radio, and manufacturers have begun to produce several special types of equipment for C-D use. One manufacturer has announced a two-way FM system covering the 30-50 and 152-174 mc bands. Known as the Civil Defender, the apparatus will permit headquarters to broadcast messages to all groups at once or to separate groups individually. In addition to receiving messages from headquarters, the equipment will permit the automatic starting and stopping of air raid sirens or other warning devices. Receivers will be of the double-conversion superhet types, with two separate crystal-controlled oscillators.

NEW YORK STATE APPROVES TV HOME STUDY COURSE--The first TV home study course, consisting of ten lesson units, was recently approved by the New York State Department of Education. The course, developed jointly by the RCA Service company and the RCA Institutes, will be made available to working members of industry, and particularly, independent Service Men. Course will feature practical how-it-works information with pre-tested how-to-do-it techniques.

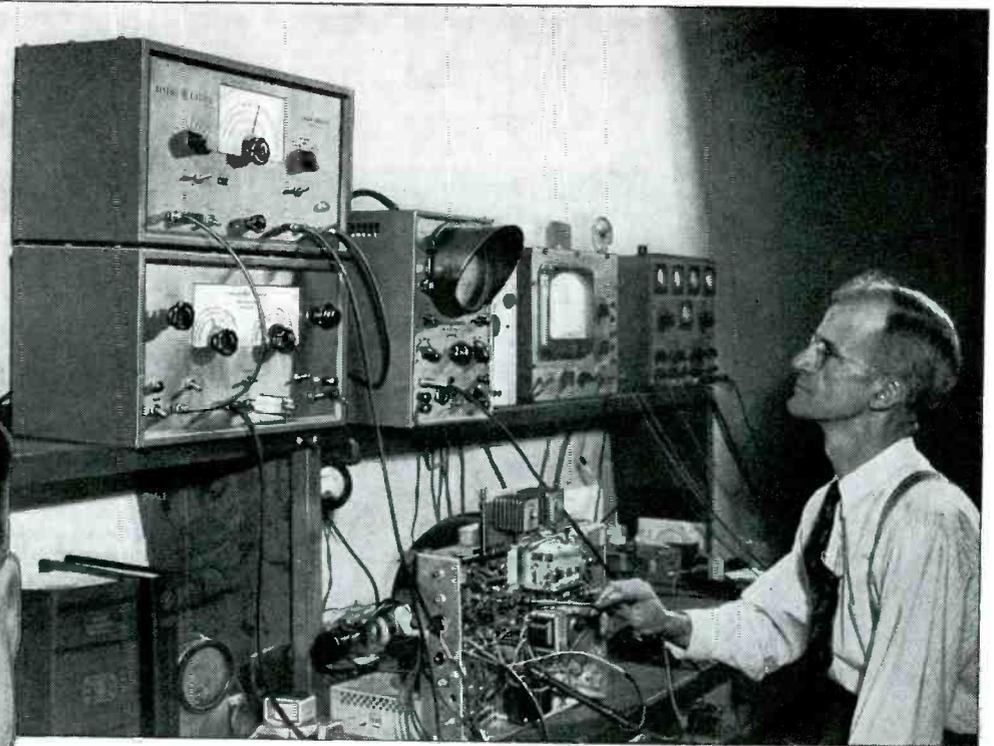
COLOR STILL IN EXPERIMENTAL STAGE--Recent deliveries of color-tube plans and samples to manufacturers have been described as purely a developmental move and not to be taken as an assurance of immediate commercial production. According to one leading tube and set manufacturer, it would take more than a year to produce the three-color tube under present conditions. In his opinion, no production of color receivers can be expected in the foreseeable future. General consensus seems to be that there is still much to be learned about color and it will take a long time to do the learning.

COUNTRY-WIDE PROBLEMS STUDIED BY NATIONAL SERVICING GROUP --Recent meetings of the recently formed national servicing organization, of which Max Liebowitz is prexy, have featured discussions of many topics of vital interest to Service Men everywhere. At one meeting E. C. Cahill, RCA Service Co. prexy; Ken Kenyon, Philco general service manager; Mort Farr, prexy of the National Appliance and Radio Dealer Association; Al Steinberg, chairman of the Keystone chapter, NEDA, and Al Haas, TCA prexy, appeared. Topics covered included training plans, factory-supervised service programs, jobber distribution problems, component supplies and business building conditions. Congratulations to the group, officially known as the National Electronic Technicians and Service Dealers Association, for their resourceful efforts.

WELCOME APPLAUSE--It's gratifying to report receipt of a few more complimentary notes from readers of SERVICE. Paul G. Clauser told ye editor that . . . "I have received SERVICE the past three years and would not want to miss a single copy as I think every copy is filled with valuable information." Henry R. Stocker reported that he has found the magazine to be . . . "far the most helpful in servicing." Welcome comments, indeed!--L. W.

-----  
\* Good Housekeeping survey.

**TOM JACOBS, Owner  
Apex Radio Shop  
Detroit, Michigan**



***“200% MORE TV BUSINESS  
--NO INCREASE IN OVERHEAD!”***

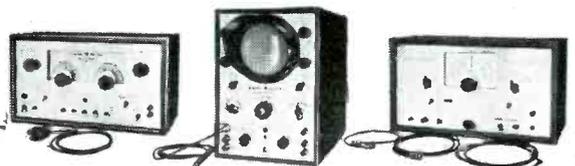


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*Marker Generator* we always get accurate and reliable results. While keeping profits up, the G-E Test Package has cut our service time in half!”

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# PICTURE-TUBE

## Servicing



by **VICTOR I. ROBINSON**

Chief Engineer  
Precision Apparatus Company, Inc.

Testing a picture tube with 'scope-picture tube tester, while the tube is in the carton, prior to installation.

THE UNPRECEDENTED and extremely-rapid growth of TV, which has posed many problems for those in the plant and in the field introduced one situation which has often been cited as the most acute; the urgency for specialized test equipment which would reduce the number of test operations required. The average Service Man, surrounded by the relative complexity of circuits, found the instrument problem to be a serious one, for he was in the midst of video technicalities almost before he could find the time to prepare himself with the necessary new technical education.

### Evolution of Required Equipment

Most test-equipment manufacturers faced the problem squarely and evolved new instruments to provide the Service Man with visual type test equipment,

high-voltage testing facilities and other necessary gear, which subsequently proved to be invaluable not only for their time-saving features, but also for the descriptive fashion in which they assisted in interpreting the test results obtained.

Until fairly recently it appeared that a service lab equipped with, in the main, standard AM type test equipment, plus a sweep generator, a properly compensated 'scope, high-voltage multiplier probe, a good *vtvm*, and required technical literature, was prepared to meet most TV service problems. However, as picture tubes in postwar TV sets began to reach middle and old age, the Service Man began to realize that he would have to maintain a stock of *test tubes* which he would have to install in questionable sets. The investment and space required for such *test tubes* and the nuisance problem which they created,

discouraged most service labs from maintaining such a stock of tubes.

Many experienced Service Men therefore educated themselves to become familiar enough with tube-trouble symptoms, exhibited by definitely deteriorated tubes, so that the difficulty could usually be localized in the tube without substitution of a known good tube.

### The Beam-Current Problem

However, most of the headaches were found to be caused not by the obviously *dead* picture tube, but by tubes with reduced beam current, internal intermittents, high-resistance leakage paths and near-shorts, as well as actual TV *chassis* trouble which deceptively simulated possible picture-tube troubles.

Without quick and simplified facilities for a positive *yes* or *no* answer to

---

**Probe of Common Failings of Picture Tubes and The Functions of The Tube's Elements Which are Related to These Defects Reveals That Factors Such as Beam Current Actually Discloses a Tube's Condition, and its Value Can be Judged on a Meter in a Portable Test Instrument.**

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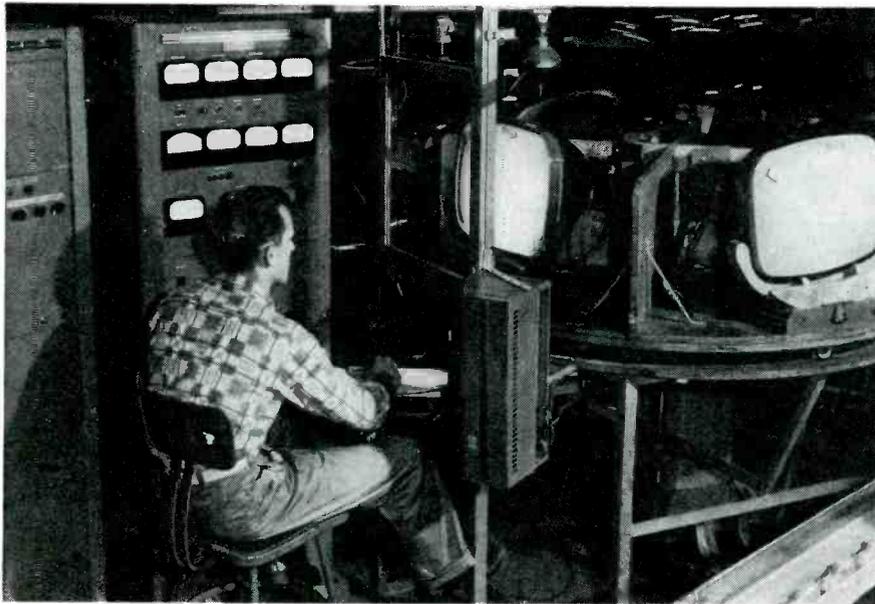


Fig. 1. Returned-tube test setup used at DuMont.

the question of defective picture tube or defective chassis, it has been necessary to trouble shoot chassis laboriously only to find, in many cases, that the fault was attributable to the picture tube. Often a reduction in the high-voltage supply has been interpreted as the cause for reduced brilliance, when reduced beam current in the picture tube was actually the culprit. But, particularly disturbing has been the fact that many perfectly useable tubes, were, and still are being rejected because the trouble symptoms appeared to be similar to those encountered in *another* chassis wherein the tube *was* defective.

Because of the relatively high cost of picture tubes, a decision to reject a tube is often met with doubt and mistrust by the set owner, particularly when the tube is no longer in warranty. Cumbersome substitution of tubes, in the set owners' home, as a

convincing demonstration, becomes impractical, particularly in these days of the 16, 19 and 20 inch tubes.

#### Returned-Tube Records

The most conclusive proof of the picture-tube problem, which has finally grown to considerable proportions, is graphically illustrated by records of the returned-tube divisions of picture-tube manufacturers. Of all tubes returned to them marked *defective*, up to 50% of these *defective* tubes are either perfectly good or still sufficiently bright for many more hours of use. The picture-tube manufacturer, thus far, has been unusually cooperative and lenient in the judgment of tubes returned, *within warranty*. However, it is reasonable to expect that even though he can appreciate the problem of judging this condition of tubes in the field, he should not be required to supply replacements for tubes which

can still meet new tube production limits, or which can pass acceptance tests set up for used tubes.

#### Plant Test Practices

The picture-tube manufacturer usually subjects each returned tube to exhaustive tests, using custom-built complex rigs which duplicate his extensive new-tube acceptance tests. Typical rigs, as used by the Allan B. Dumont Laboratories and the Tung-Sol Lamp Works, are illustrated in Figs. 1 and 3. These lab-type test rigs, costing many thousands of dollars, would of course be an excellent *technical* answer to the picture-tube test problem in the field, but of course are physically and economically impractical for general field use.

#### Tube-Failure Study

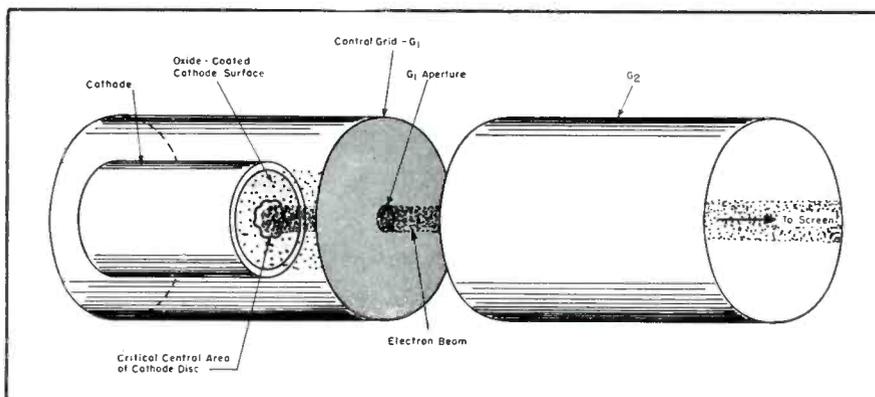
With an eye to the field problem, a study was therefore instituted covering the tube characteristics which contributed most to a reliable overall indication of tube condition. The study was conducted with the intention of eliminating many of the twenty to thirty individual supplementary tests performed by the lab rigs, which are required for *exhaustive* lab analysis of new tubes, and to simplify testing to the extent where the most revealing check could be provided by a portable relatively inexpensive field instrument. Such an instrument could be carried into the set-owners home, used on the repair bench, and in the dealers' or distributors' stock rooms.

In determining the practical characteristics of such an instrument it was found necessary to probe the common failings of picture tubes, and the functions of the picture tube which relate to these failings.

#### The Cathode Role in Tube Life

With the exception of purely mechanical defects, the greatest contributor to picture-tube deterioration is that familiar villain, the cathode. In the picture tube, the oxide coated cathode is constructed as illustrated in Fig. 2. The total area of the coated-cathode disc emits electrons and negative ions, when properly heated by the filament. It is generally agreed that the negative ions are those of *oxygen* and *chlorine* and that the negative *oxygen* ions are produced by the slow decomposition of the cathode during the life of the tube. The source of *chlorine* ions may be produced by a chemical reaction in the glass tube it-

Fig. 2. Cutaway view of oxide-coated cathode structure.



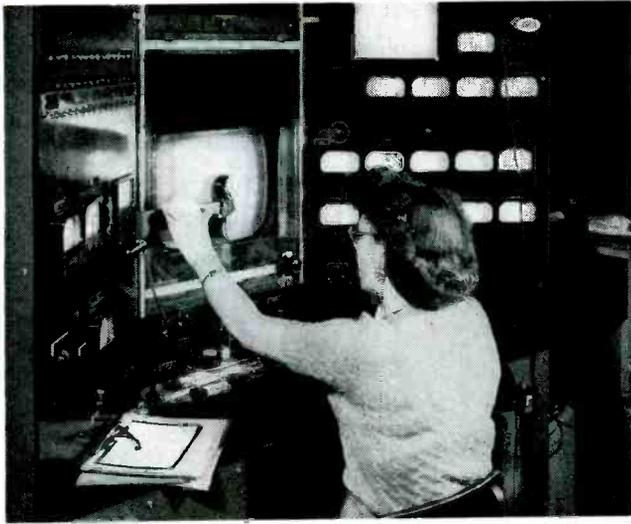


Fig. 3. Picture-tube electrical-characteristic test setup at Tung-Sol, during which breakdown, shorts, cutoff bias, screen quality, etc., are evaluated.

self, during the manufacturing process.

These negative oxygen and chlorine ions are undeflected by magnetic fields and if allowed to bombard the phosphor crystals of the fluorescent screen, would produce burned-screen areas. The familiar *beam bender* or ion trap separates the magnetically deflectable *electron* beam away from the unaffected ion beam and directs it in line with the gun apertures. The destructive ion beam dissipates itself at the positive grid 3, as illustrated in Fig. 4.

#### Electrostatic Tube Features

In the *electrostatic* type tube the negative ion beam is deflected by the electrostatic potentials of the deflection plates and as a result does not continuously bombard a small screen area.

Now let us return to the emission of electrons from the cathode. The attracting field of the positively energized grid 2 extends down through the small grid aperture, resulting in an electron beam originating from the small critical central area of the cathode. The remaining area of the cathode disc supplies little or nothing to the useful electron beam which passes through the tiny control grid

aperture. In fact, special experimental cathodes, prepared with an oxide coating *only* in the tiny central cathode area, yielded *normal beam current and brilliant rasters!* It is interesting to note that the picture-tube manufacturer has facilities in his large test rigs, for projecting an actual image of the cathode disc upon the picture-tube screen. In cases of cathode deterioration, the image of the cathode on the screen looks like a bright disc with dark craters directly in the central portion of the disc. Cathodes with extremely low central emission, produce very dim rasters, and show up as very bright discs with a complete dark or black central area. In these instances, even though the *outer* areas of the cathode disc are *bright* (indicating vigorous *overall* emission), the deteriorated *central* contributing area, directly in line with the grid aperture, is incapable of normal emission, resulting in a defective tube. The electron stream, originating from the critical central area of the cathode, becomes the picture tubes' *beam current*, in contrast to *total* cathode emission, simply called *emission*.

It is thus obvious that one of the most significant picture-tube character-

istics for test is the tube's *beam current*. A field or lab test which will graphically reveal the magnitude of this *useful* electron stream, will directly relate to *screen brightness*, inasmuch as it is this *beam current* which impinges upon the fluorescent screen, producing screen illumination. The greater the magnitude of the electron beam the more brilliant will be the screen, up to practical limits. In a series of extensive tests using quantities of picture tubes in various conditions, a direct correlation between foot-lamberts of screen light and the magnitude of beam current was obtained. As proof of this test correlation, additional quantities of picture tubes were *first* checked for *beam-current* readings in terms of microamperes and as a result, identified as to varying degrees of *expected* screen brightness. These tubes were then directly measured for light *intensity*, resulting in a 98% correlation between *predicted* brightness (based solely upon the *beam-current* reading) and actual *measured* light output.

As electrons and ions leave the surface of the cathode and stream up through the grid aperture, they tend

(Continued on page 50)

Fig. 4. Bent-gun type of picture tube, which employs a beam bender.

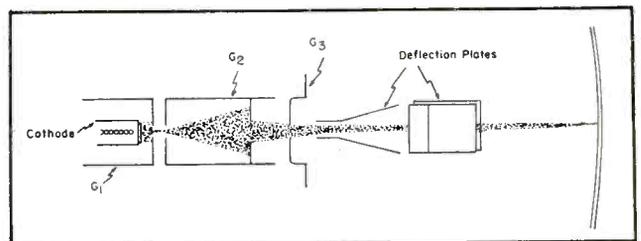
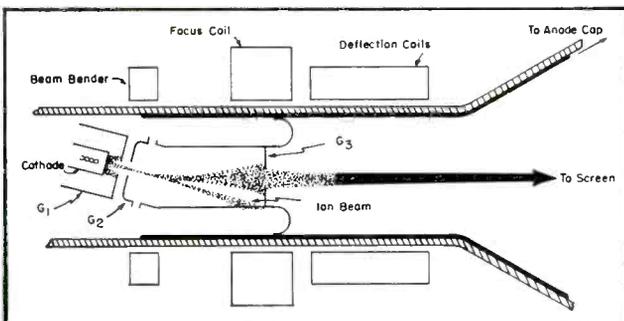


Fig. 5. Electrostatic-type picture-tube makeup, where the negative ion beam is deflected by electrostatic potentials of the deflection plates, and as a result does not continuously bombard a small screen area.

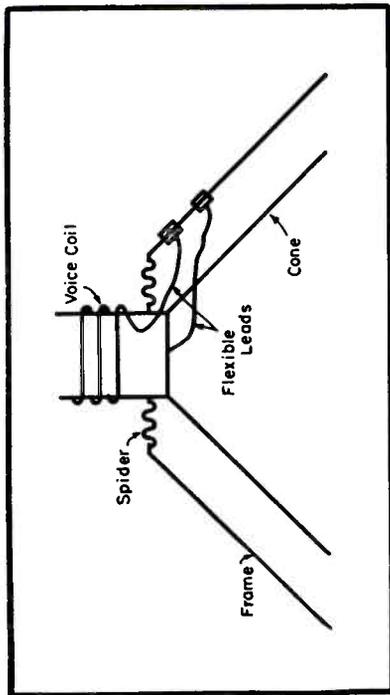
# Largest Selling Booster

**AT ANY PRICE !**



# Regency

# Servicing INTERMITTENT



(Above)

Fig. 1. Voice-coil suspension in dynamic-speaker, where the flexible leads should be checked for intermittent open circuits.

MANY AN HOUR of good time has been wasted, and many a temper frayed in the pursuit of the elusive intermittent. The opinion has been advanced that intermittents are really caused by electronic gremlins, who live inside receivers and pull connections apart just when the point of a joke is told, or something exciting is about to happen in a football game. Be that as it may, the intermittent receiver presents a serious problem to any man who is servicing chassis for a living. It is up to him to make a lasting repair job on one of these irksome assignments and still keep the cost in time expended down to a reasonable level.

The identification of the exact location of an intermittent part is still a major question when working on these sets. Once the trouble-spot has been isolated, the procedure is quite simple. In servicing intermittents there are three factors which should receive careful consideration: (1) It is important to have a thorough knowledge of receiver circuitry; (2), know the application habits of the design engineers of different manufacturers; and (3), be familiar with the different aspects of receiver and component function. It is also helpful to be able to recognize the typical symptoms encountered for

defects in each stage of the set; audio, *if*, mixer, oscillator, etc. Each of these will have its own identifying trademarks, and once these are learned, the task can be much easier.

## Two Types of Intermittents

There are two main classifications of intermittents; the *jar* intermittents, which appear when the chassis is jarred, and the *electrical* intermittents, which just seem to cut in and out at annoying unrelated intervals, and are usually unaffected by routine surface adjustments. The jar intermittents are somewhat easier to correct; often you can tap the chassis, or tube, or twist parts until you have located the source of the trouble. With the electrical type, it is often best to place the chassis on the back of the bench, out of the way, and let it play softly until the cutout occurs. *A word of warning* on the electrical-intermittent jobs: No job on this type of set should be accepted with a time limit on it! There is no way of telling how long it will be necessary to hold the model. In fact, it has been found that often up to three days may pass before trouble appears. It is always wise also to be absolutely certain that you have really located the seat of the trouble and that the repair can be guaranteed. Customers won't object waiting an extra day or two, if that extra time will provide a trouble-free chassis.

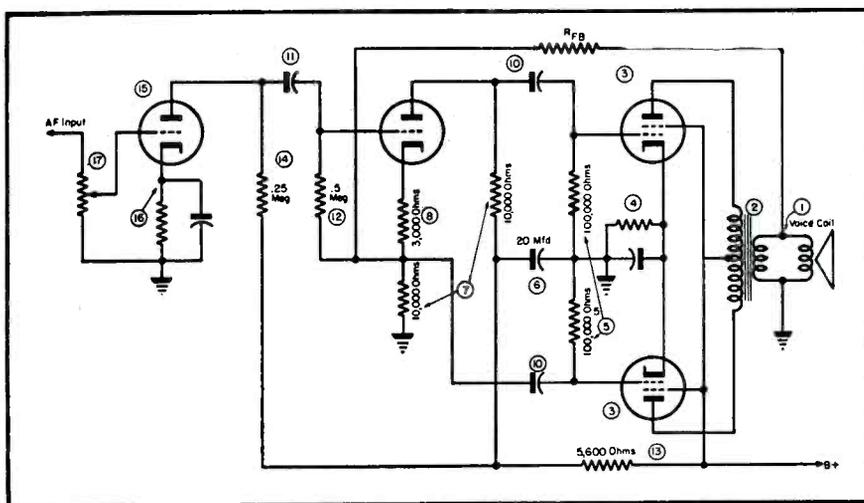
## Exceptions to the Rule

There are always slight exceptions to the rule, of course. If the sets appear to have single-tube trouble, you might replace the tube, and then let the customer take the job home, explaining thoroughly that this is only a try-out move, since it may be that the replacement might not cure the trouble. This procedure applies only if the customer lives within a reasonable distance of your shop. This move can save time, and crowding on your bench.

## Typical Intermittent Troubles and Symptoms

With a good signal tracer, intermittents may often be isolated and repaired easily. Connecting the probes to the various stages of the set, and making a note of their readings, repre-

Fig. 2. Typical push-pull output stage, with single-tube phase inverter and driver, in which the following points must be investigated when intermittents occur: (1) Wiring to voice coil from output transformer; (2) output transformer for high-resistance joints or open windings; (3) output tubes for intermittent shorts or opens; (4) cathode resistor for changes in value or opens; (5) grid resistors for equality or open circuits; (6) last filter-audio plate bypass where an intermittent open can cause audio oscillation and a short will kill all signal; (7) load resistors (phase inverter) for equality or changes; (8) bias resistor (phase inverter) for correct value; (9) phase inverter tube, for proper output or intermittent shorts; (10) coupling capacitors for leakage or intermittent opens; (11) input coupling capacitor for leakage or intermittent opens; (12) grid resistor for open or change in value; (13) phase inverter-decoupling resistor for open or change; (14) driver plate-load resistor for proper value; (15) driver tube for shorts, intermittent operation or noise; (16) driver cathode resistor for value; and (17) volume control for dirty contacts, noise, etc.



# AM and FM RECEIVERS

by JACK DARR

Quachita Radio Service

## Determining the Source of the Intermittent . . . Audio-System Trouble Checks . . . Probing the Second-Detector First-AF Stage . . . Tracing Intermittents in the IF Stages . . . Wire-Defect Problems.

sents a key move in the trace job. For when the set cuts out, a glance at the meters or eyes will show in which stage the trouble lies. With the field narrowed down to only one stage, repairs can be much easier. All the parts associated with this stage may be carefully checked, and the trouble isolated.

### Audio-System Troubles

Intermittents around the speaker are found mostly in the voice coil and the flexible leads connecting the cone to the frame. Indications of trouble here are sharp cutoff or no sound at all. The quickest check is to connect the voice coil of a test speaker across the set's speaker. If set speaker has an open, the signal will come out through the test speaker. The small leads from cone to frame, held in place by the cord center, occasionally break. A sharp probe, such as a needle-point test lead, should be used to explore the leads for breaks. If the break is located, the end may be pulled up and resoldered. Too much slack should not be taken up, as they'll only break again soon. All old speakers should be saved; the leads from them make excellent replacement leads.

### Intermittent Field Coils

Intermittent field coils in electrodynamic speakers represent another trouble source. This defect will show up as a complete lack of high-voltage everywhere, except the rectifier filament, where it will be too high. Measuring the *dc* resistance, and checking against the values stated in service manuals or technical journals such as SERVICE, can provide an effective answer. If diagrams are not available, the following values can be used as

guides: *ac/dc* sets, 450 ohms; *ac* sets, 750-1500 ohms; and some old models, as high as 2500 ohms. On any set produced after '39, values over 1,000 ohms might well be viewed with suspicion. A momentary short of the output end of the field to ground, with a screwdriver, has been found to be a good test. If there is a corroded or high-resistance joint in the field, the overload will cause it to open up, and you can spot it. If the coil is good, the coil will not have been harmed.

### Speaker-Plug Checks

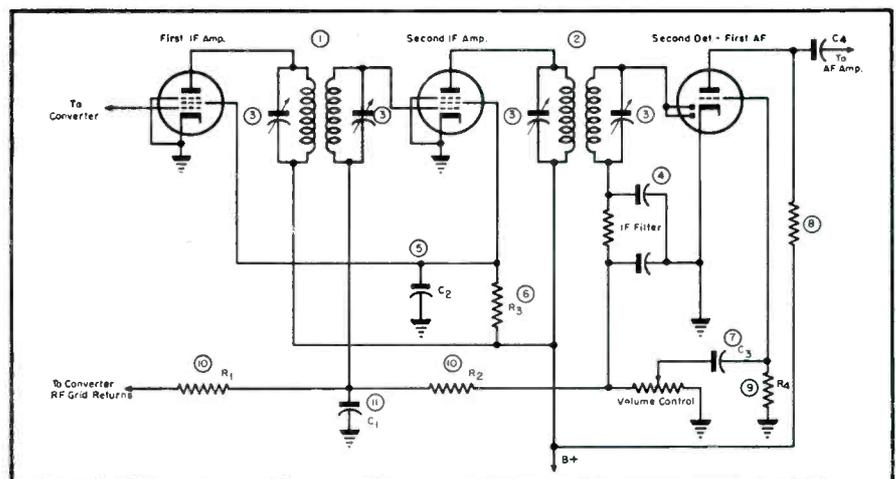
The speaker plug and connecting wiring must always be checked for possible shorts, opens, bad insulation,

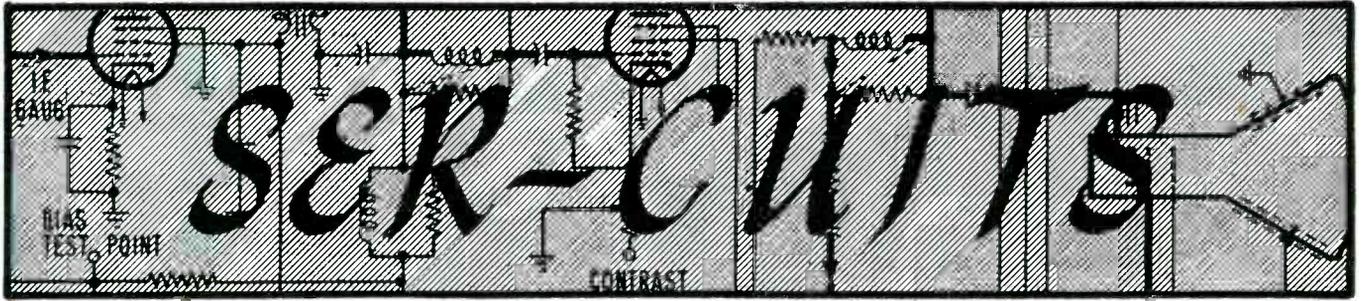
etc. Output transformers can be a source of quite a bit of trouble. They are similar to the speaker fields in construction, consisting mainly of a large primary coil of fine wire, on an iron core, and a secondary of only a few turns, of pretty heavy wire. Secondaries seldom give trouble, but it is best not to take this fact for granted. In intermittent work, nothing can be assumed. There have been secondaries with opens.

In the primaries, many headaches can prevail. For instance, there's electrolysis which can cause corrosion and high resistance joints, resulting in intermittents. These are usually noted by a pattering, frying sound, followed

(Continued on page 62)

Fig. 3. Typical two-stage *if* amplifier, where eleven points should be probed for intermittents: (1) *IF* transformer (check for high-resistance joints in windings, shorted trimmers, leakage between windings); (2) output *if* (follow same checks as for (1)); (3) trimmers (check for noise and leakage); (4) *if* filter, in output (check for shorts or leakage to ground); (5) screen bypass (check for leakage, shorts, or intermittent connections which can cause oscillation); (6) screen-grid dropping resistor (check for increase in value); (7) coupling capacitor (check for leakage or intermittent connections); (8) second-detector plate-load resistor (check for increased resistance or opens); (9) second-detector grid resistor (check for open or increased value); (10) the *avc* filter resistors (check for opens); (11) the *avc* bypass (check for insulation resistance or leakage). Tubes should also be checked carefully for gas or noise.





## Analysis of Circuitry Features of Westinghouse 17 and 20-Inch Chassis: Noise Clipper . . . Phase-Detector Horizontal AFC . . . Horizontal Sweep Oscillator . . . Vertical Sweep . . . Keyed AGC . . . Video Amplifier and Sync System.

by **CYRUS GLICKSTEIN**

American Radio Institute

TV CHASSIS, now coming off the line, particularly those featuring the larger picture tubes, are replete with novel circuitry ideas included to provide a better picture on the larger picture areas, with simplified tuning operation. In one line of chassis, using 17 and 20-inch tubes, Westinghouse models H-640T17, H-641K17, and H-642K20, a phase detector horizontal *afc* and a noise clipping system have been included; Fig. 1.

### The Noise Clipper

The noise clipper circuit is a series-parallel network using  $\frac{1}{2}$  of a 6AL5, connected to the plate of the sync-amplifier stage. Fig. 2 shows this circuit, redrawn to clarify this relationship.

The object of the circuit is to minimize the effect of large noise pulses in random triggering of the sweeps. It also reduces the amplitude of noise pulses which might be riding on top of the sync pulses and thereby provide a spurious *agc* voltage. The composite video signal on the plate of the sync amplifier has a positive polarity. A .25-mfd capacitor,  $C_{401}$  charges up rapidly to the peak of the positive signal, which occurs at the start of the sync pulse. The diode conducts, shorting out a 2.2-megohm resistor,  $R_{315}$ , so the time constant of charge is very short. During the remainder of the sync pulse period and until the time the next sync pulse arrives, the diode does not conduct. Instead,  $C_{401}$  discharges across  $R_{315}$ . During this interval, the plate is negative with respect to the cathode and the diode

cannot conduct. In the period between sync pulses, only a noise pulse of equal or greater amplitude than the sync pulse will make the diode conduct. In conducting, the diode shorts out  $R_{315}$  and thus effectively acts to short out the load resistance of the sync-amplifier stage. Large noise pulses, therefore, are not amplified in the same proportion as sync signals and such pulses can have no greater amplitude than the maximum established by the height of the sync pulses. A network composed of  $L_{305}$  (14  $\mu$ hy) and  $C_{314}$  (22 mmfd) increase the effectiveness of the *shorting-out* process by acting as a series-resonant (low  $Z$ ) circuit for high-frequency noise pulses.

### Horizontal AFC

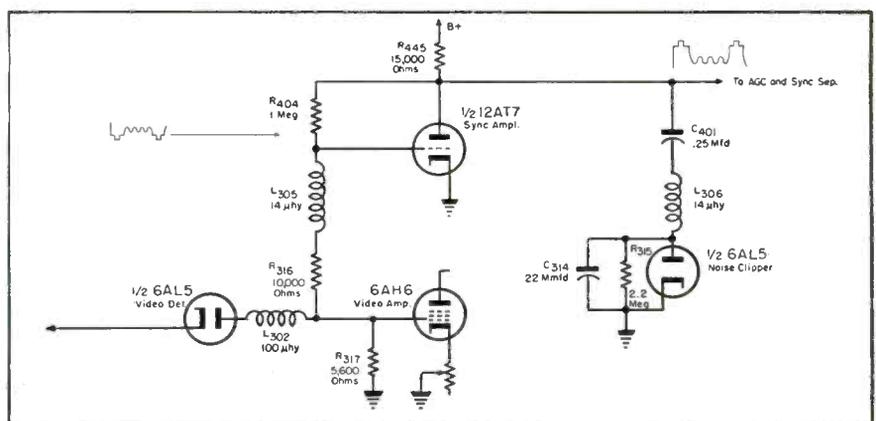
To apply a correction voltage to one grid of the horizontal multivibrator, to stabilize the frequency of the hori-

zontal sweep, a triode 6C4 phase-detector stage is used. In this system the 6C4 plate voltage is kept very low, a few volts. A 100,000-ohm grid return,  $R_{428}$ , is connected between cathode and grid so that there's no cathode bias. The cathode resistor,  $R_{429}$ , has a 100,000-ohm value. Sync pulses of negative polarity are fed to this cathode resistor. Horizontal pulses are taken off a winding of the width control and fed to the plate of 6C4; generally, the higher the plate voltage of a triode, the less grid current will be drawn when the grid becomes positive with respect to the cathode.

To illustrate how the stage operates, let us take two cases of an out-of-sync condition. First, with the sawtooth frequency too fast, the negative sync signal arrives at the cathode at a time when the sawtooth at the plate is

(Continued on page 30)

Fig. 2. The sync amplifier and noise clipper setup in the Westinghouse chassis.



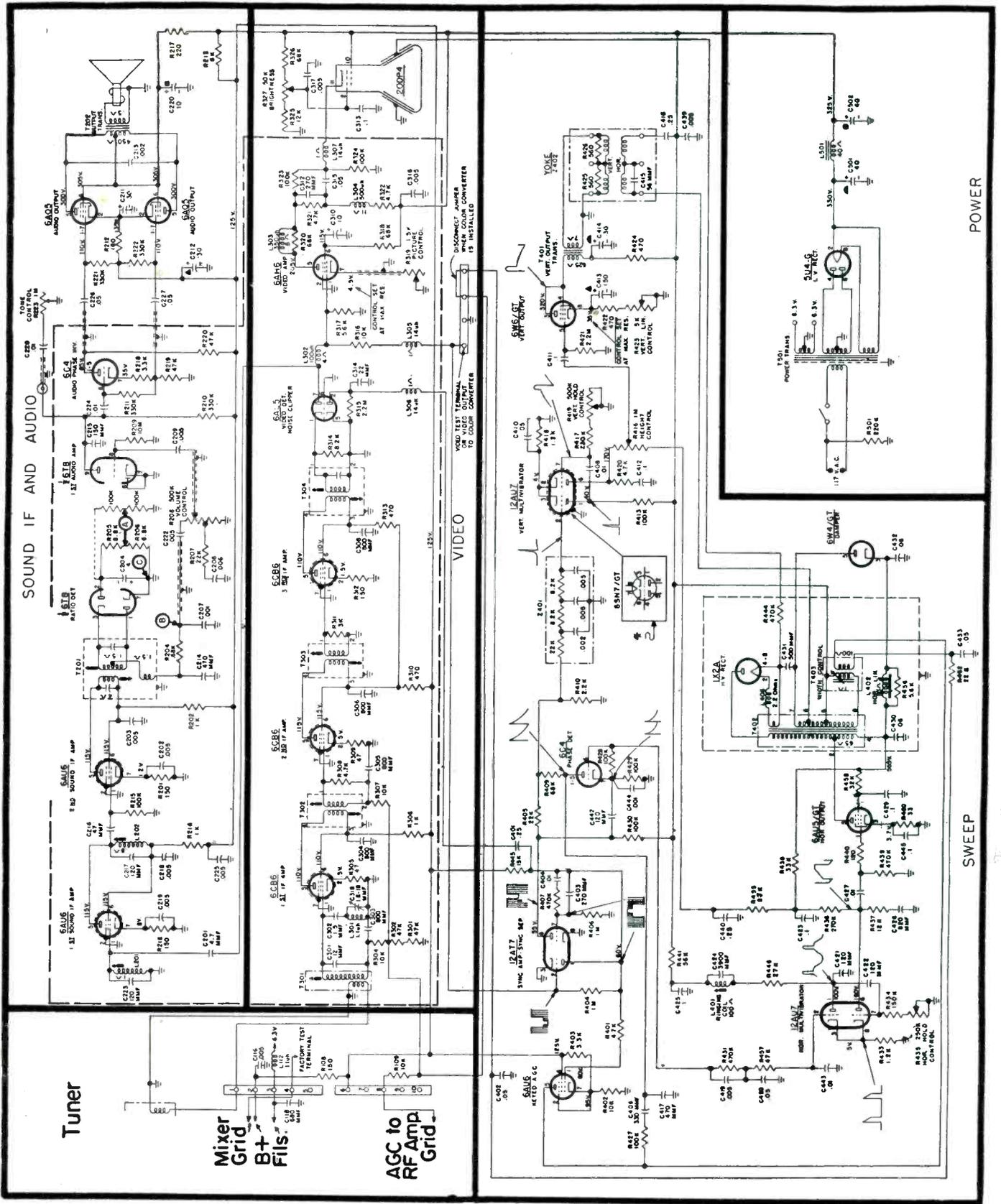


Fig. 1. The sound if and audio, video, sweep and power sections of Westinghouse chassis, V-2178-1 and 3. Picture tube is a 20-inch type.

(\*Some chassis have been wired for 6SN7GTs.)

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## Ser-Cuits

(Continued from page 28)

negative; retrace has already started. The grid is effectively at ground, because of the .005-mfd capacitor,  $C_{419}$ , from grid to ground. The negative signal applied to the cathode makes the cathode negative compared to the grid, and the grid thus draws current. This current charges up  $C_{419}$  in a negative direction. Between sync pulses, this capacitor will discharge and the voltage will be filtered by a network consisting of 470,000-ohm ( $R_{431}$ ), 47,000-ohm ( $R_{467}$ ), .05-mfd ( $C_{420}$ ) and .01-mfd ( $C_{448}$ ) units, thus applying a negative voltage to one grid, pin 2, of the horizontal multivibrator, 12AU7.

On the other hand, if the negative sync pulse reaches the cathode when the positive peak of the sawtooth arrives at the plate (frequency of sawtooth too slow) there will be current flow through the tube, rather than from cathode to grid. Voltage between grid and ground (sum of voltage across  $R_{428}$  and  $R_{429}$ ) is now positive and the filter network will apply a positive voltage to the multivibrator grid. These two cases represent the extremes of possible variations in time between sync pulse and horizontal sawtooth. Correction voltages on the multivibrator grid will vary the frequency to bring it into synchronization with the sync pulses. The correction voltage applied to the grid will either increase or decrease current through the tube depending on the polarity of this voltage. This, in turn, will either decrease or increase plate voltage, which will then decrease or increase the discharge time of the 120-mmfd coupling capacitor,  $C_{422}$ , and accordingly increasing or decreasing the frequency of operation.

### Horizontal Sweep Oscillator

In these chassis, the horizontal oscillator is a cathode-coupled multivibrator, 12AU7, producing a peaked sawtooth output across a 12,000-ohm resistor,  $R_{437}$ , and a 820-mmfd capacitor,  $C_{428}$ . To increase the stability of operation, a tuned circuit,  $L_{401}$  and  $C_{424}$  (3900 mmfd) is included in the plate line of the triode.  $L_{401}$ , a *ringing coil*, acts as a coarse-frequency adjustment, with a 250,000-ohm pot grid resistor ( $R_{435}$ ) controlling the time of discharge of a 120-mmfd capacitor,  $C_{422}$ , acting as the fine frequency adjustment.

### Horizontal Output and High Voltage

The modified sawtooth wave is fed to a 6AU5 horizontal output stage. A flyback transformer in the plate of this tube serves two main functions: (1) Provides sweep current for the horizontal deflection coils, and (2) generates high voltage for the picture tube. The decaying lines of force during flyback time collapse across the bottom half of the primary. By autotransformer action, the induced voltage is stepped up across the whole primary. This voltage is rectified by a 1X2A. A 500-mmfd capacitor,  $C_{431}$ , a 470,000-ohm resistor,  $R_{444}$ , and the capacity between the inner and outer aquadag coatings of the picture tube provide an *rc* pi filter for the high voltage  $B+$ , which is fed to the anode of the picture tube.

### Vertical Sweep

Vertical sweep in these models is provided by two stages; a conventional cathode-coupled multivibrator, 12AU7, generating a modified sawtooth voltage and a 6W6 output stage, converting the voltage to deflection current

through the output transformer feeding the vertical section of the yoke.

### Keyed AGC

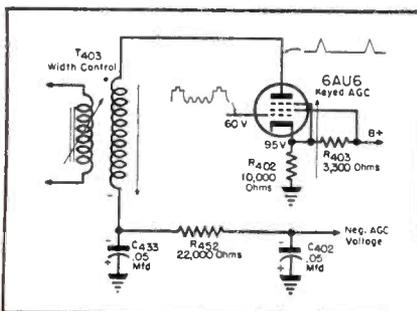
Keyed or rapid *agc*, that highly-efficient system, is used in these models, too. As indicated in earlier discussions of the circuit, standard *agc* is objectionable because it may act on noise pulses which, on occasion, may have an amplitude as great as or greater than the sync pulse. This creates a false *agc* voltage, where the noise rather than the signal dictates the amount of bias generated. This type of *agc* action hurts performance in low-signal high-noise areas. Another disadvantage is the long time constant used in the *rc* net to filter out the 60-cycle sync pulses. This makes it impossible to follow rapid changes in signal strength such as airplane flutter.

Keyed *agc* overcomes these objections by immobilizing the *agc* generator during the interval between sync pulses. As a result, intervening noise pulses have no effect. A shorter time constant can be used in the filter because only the 15,750-cycle pulses are present in the output to be smoothed out.

In these chassis, a 6AU6 stage is used to provide *agc* voltage to the *rf* amplifier and the first and second *if* amplifiers. No *dc* voltage is applied to the plate. Also, the cathode is made 35 *v* positive, compared to the grid, by a voltage-divider arrangement. No plate current will flow through the tube except when a positive pulse coming from the winding off the horizontal width control is fed to the plate, and a positive sync pulse from the sync amplifier goes to the grid. Because of the large bias on the stage, positive pulses must be present on both the grid and the plate to make the tube conduct. As noted in the simplified circuit of Fig. 3, a .05-mfd capacitor, *C*<sub>433</sub>, charges up in a negative polarity. The action is similar to half-wave rectification, with the pi filter in series with the transformer

(Continued on page 54)

Fig. 3. Simplified keyed *agc* circuit, which illustrates action of the system.



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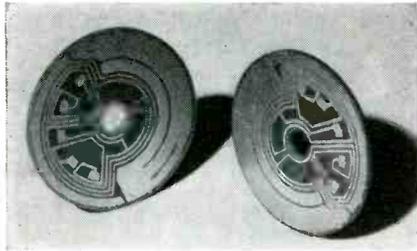
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Printed-circuit elements used in booster.

# Printed-Circuit TV Booster

[See Front Cover]

PRINTED CIRCUITRY, which has become a feature of many TV components and assemblies, including some tuners, has now been applied to the tuning system of a booster<sup>1</sup>, the circuit of which appears on the cover, this month.

The booster, a twelve channel *rf* amplifier, uses a 6AK5 pentode as a tuned input-tuned output amplifier.

Wide band, balance-to-unbalance transformers,  $T_1$  and  $T_2$  (Fig. 1), are used. These consist of a bifilar winding on a small powdered iron core and are essentially autotransformers with the coupling between turns made as high as possible.

In Fig. 2 we have a simplified input circuit showing  $T_1$  as a conventional autotransformer. The unbalanced output impedance of  $T_1$  is approximately 75 ohms and is coupled to a high impedance point of the tuned grid circuit by a small capacitor  $C_1$  (5 mmfd). This type of coupling provides a *high pass* characteristic to the resonant circuit and effective rejection of frequen-

cies lower than the television band. It has been found that this form of coupling also reduces interference caused by strong broadcast signals cross modulating the TV signal in the booster amplifier or *rf* stage of the receiver, a type of interference that is often encountered in *fringe areas* having local broadcast transmitters.

The tuning inductance consists of  $L_1$  (variable) in series with  $L_2$  and is tuned by the input capacity with additional stray capacity and the series combination of  $C_1$  with the distributed capacity of  $T_1$ .  $L_2$  is a small inductance consisting of a self-supporting coil which may be adjusted to track the circuit on the high-frequency channels.  $L_1$  thus becomes a significant portion of the total tuning inductance at the high-frequency channels. The junction of  $L_1$  and  $L_2$  is therefore a lower impedance tap on the total tuning inductance at the higher frequencies.  $C_1$  is coupled into the circuit at this tap to provide a better match at the high-frequency channels, since both

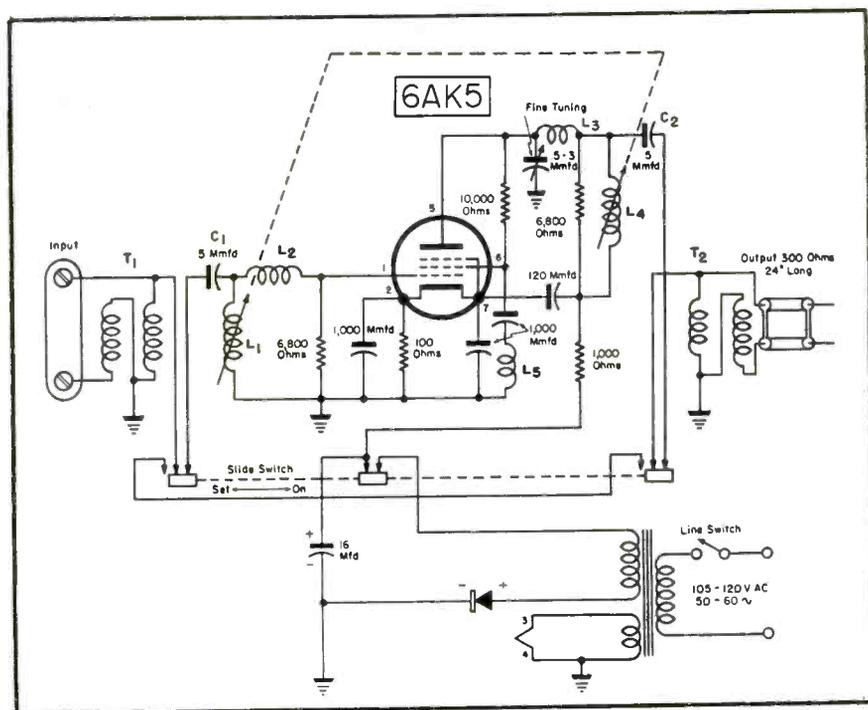
input-tube resistance and output impedance of  $T_1$  decrease with increasing frequency. At the low-frequency channels  $L_2$  is negligible compared to  $L_1$ .

The plate-tuned circuit is similar to the grid circuit with the addition of the fine tuning capacity. Sufficient fine tuning is accomplished by varying the plate tuning only, the grid circuit being broad enough so that fixed tuning is satisfactory.

## Cathode-Lead Neutralization

Much of the increased tube *loading* of the input circuit at the higher frequencies is caused by cathode-lead inductance. A small inductance,  $L_3$  (Fig. 1), is used in series with the screen-grid bypass capacitor. This inductance tends to *neutralize* the effects of cathode-lead inductance, which increases selectivity of the grid circuit and results in a higher resonant voltage applied to the grid. This increases the overall gain of the booster circuit in

(Continued on page 66)



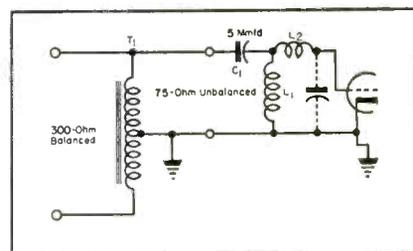
<sup>1</sup>Standard B-51.

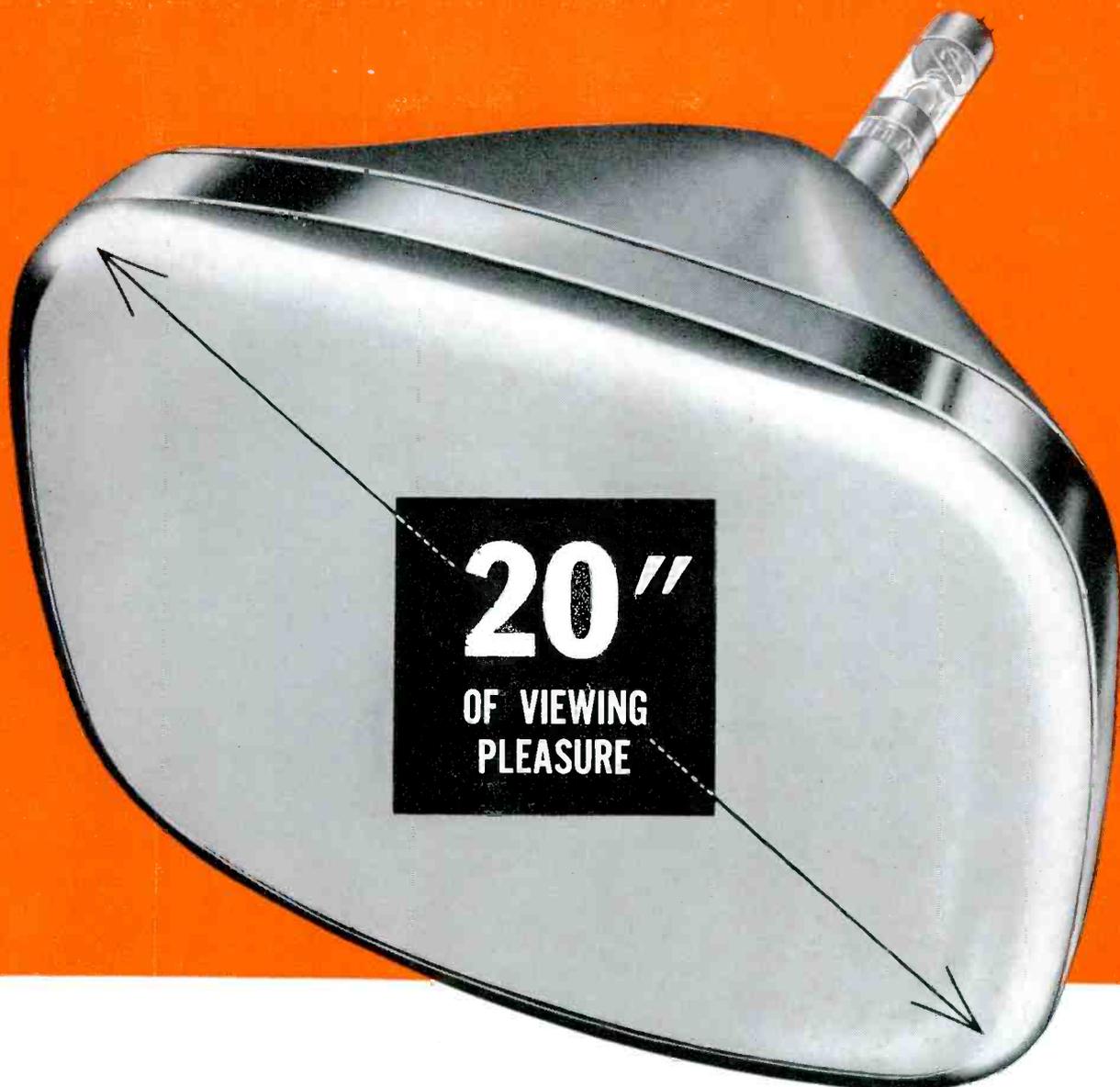
(Left)

Fig. 1. Circuit of the Standard B-51 TV booster.

(Below)

Fig. 2. Simplified input circuit.





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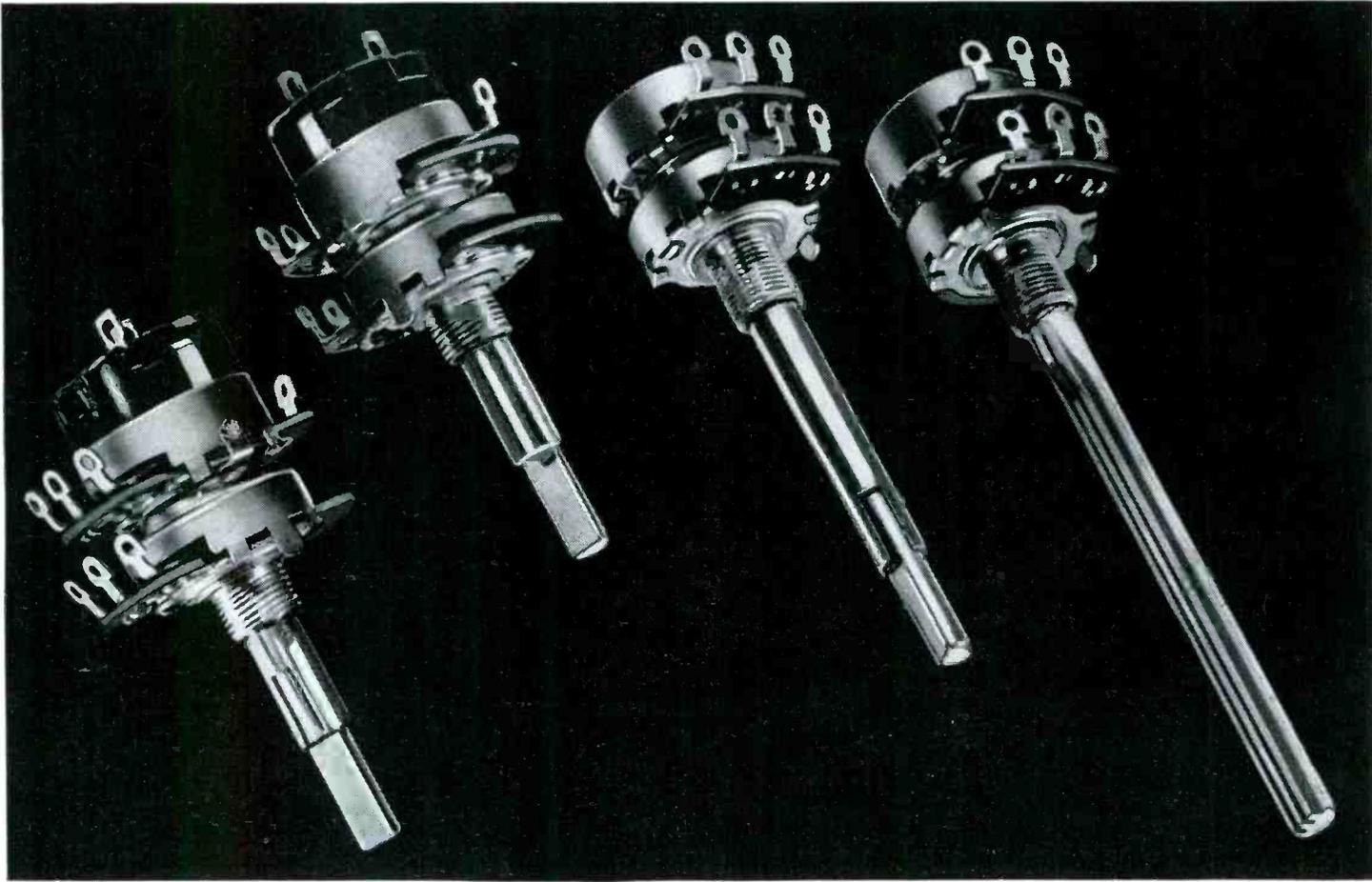
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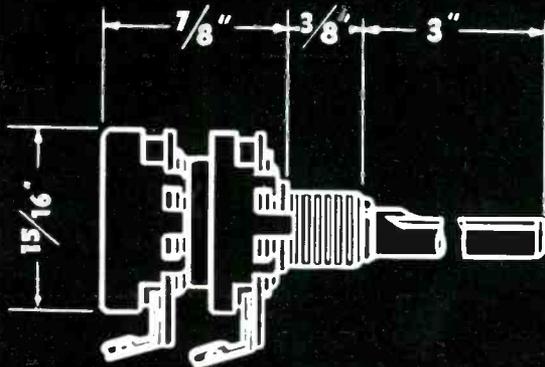
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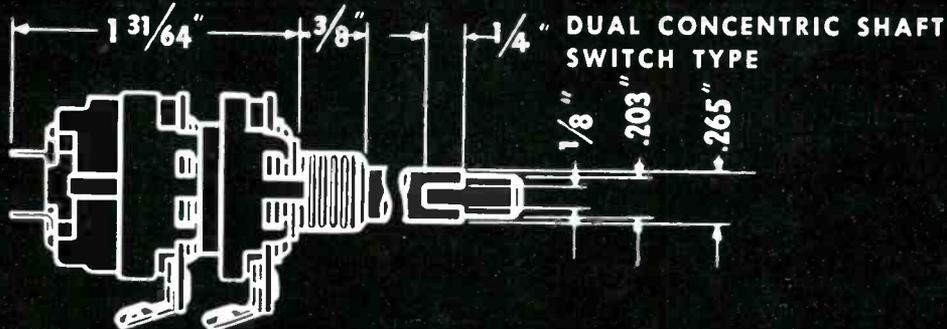
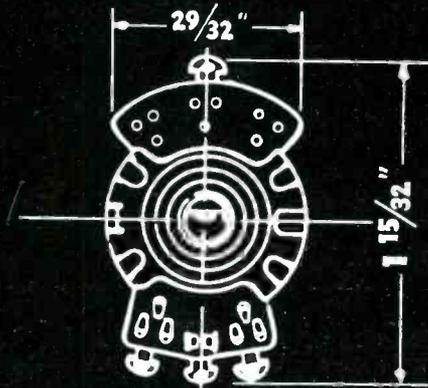
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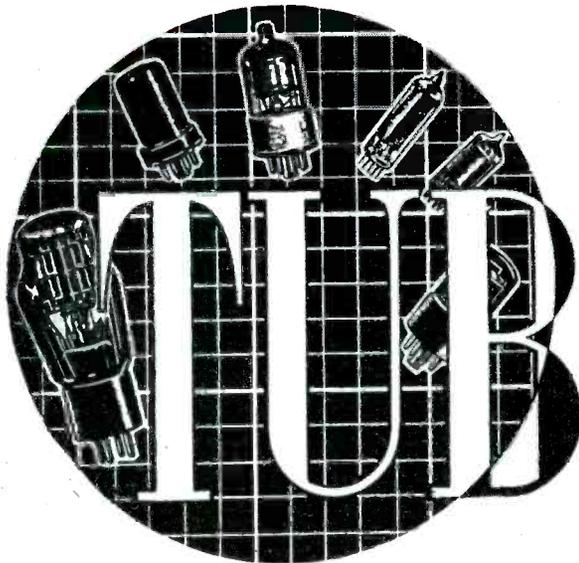
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# TUBE News

by L. M. ALLEN

## Picture-Tube Open-Heater Characteristics\*. 17 and 20-inch Electrostatic-Tube Design and Application Notes.

THE PICTURE-TUBE FILAMENT, to many Service Men, has been quite a puzzling element, particularly as to its exact structure. Actually the filament in this tube is very similar to those encountered in conventional receiving type tubes, a tungsten double helix utilizing a carbonate coating for insulation. The insulation is necessary to prevent inter-filament shorts and filament-to-cathode shorts.

In operation the picture-tube filament is also identical to a receiving tube filament; for example, the 6X4. It requires 3.78 watts of power and if operated under these conditions will, in many cases, outlast its parallel, the 6X4 filament.

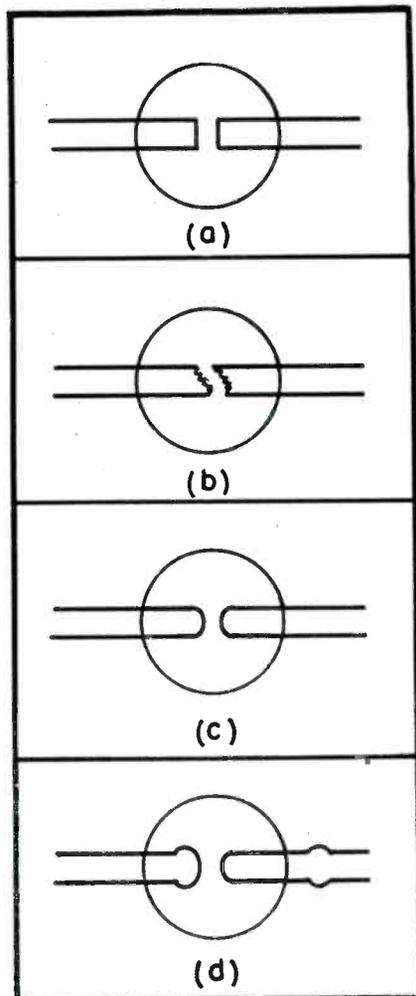
The picture tube, due to its principle of operation, must necessarily have a considerably higher vacuum than receiving tubes. This factor is in the favor of the filament since there is *less vaporization of the tungsten and therefore, longer life.*

Factually, there can only be three reasons for filaments becoming defective:

(1) *Severe physical shock* which, due to instantaneous strain, actually causes the filament to separate.

(2) *Excessive voltage* which actu-

Fig. 1. Four types of opens in picture-tube filaments. At *a* and *b* are examples of mechanical-type breaks, while in *c* and *d* appear examples of open filaments due to electrical abuse.



ally burns the filament in two or more pieces.

(3) *No vacuum*, which actually vaporizes the filament away.

Open filaments, due to *severe physical shock*, are the most common of the three causes for open filaments. These are readily detected if the tube is opened and the filament removed and examined. At the location of the break the ends are sharp and fit neatly if reconnected, as shown in Fig. 1 (*a* and *b*). In (*c*) and (*d*) appear examples of open filaments due to electrical abuse. The break in (*d*) represents a tungsten ball which has formed and which can run to as far as 1" from the actual break.

### Rectangular Electrostatic Picture Tubes

The past few weeks have witnessed the announcements of quite an assortment of electrostatic-type tubes. Hytron has produced a 20-inch type, 20FP4, which utilizes electrostatic focus and magnetic deflection to provide a 17"x12¾" picture.

For focusing, a focusing electrode of zero current design is employed, a feature which permits elimination of the magnetic focus unit.

Other features of the 20FP4 are a relatively flat face incorporating a neu-

\*Based on notes from Capehart-Farnsworth service bulletins.

(Continued on page 70)

# THE NEW... IMPROVED

## "STANDARD TV BOOSTER"

Model B-51



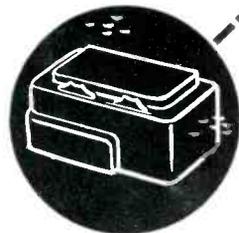
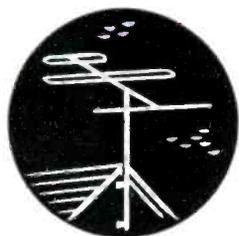
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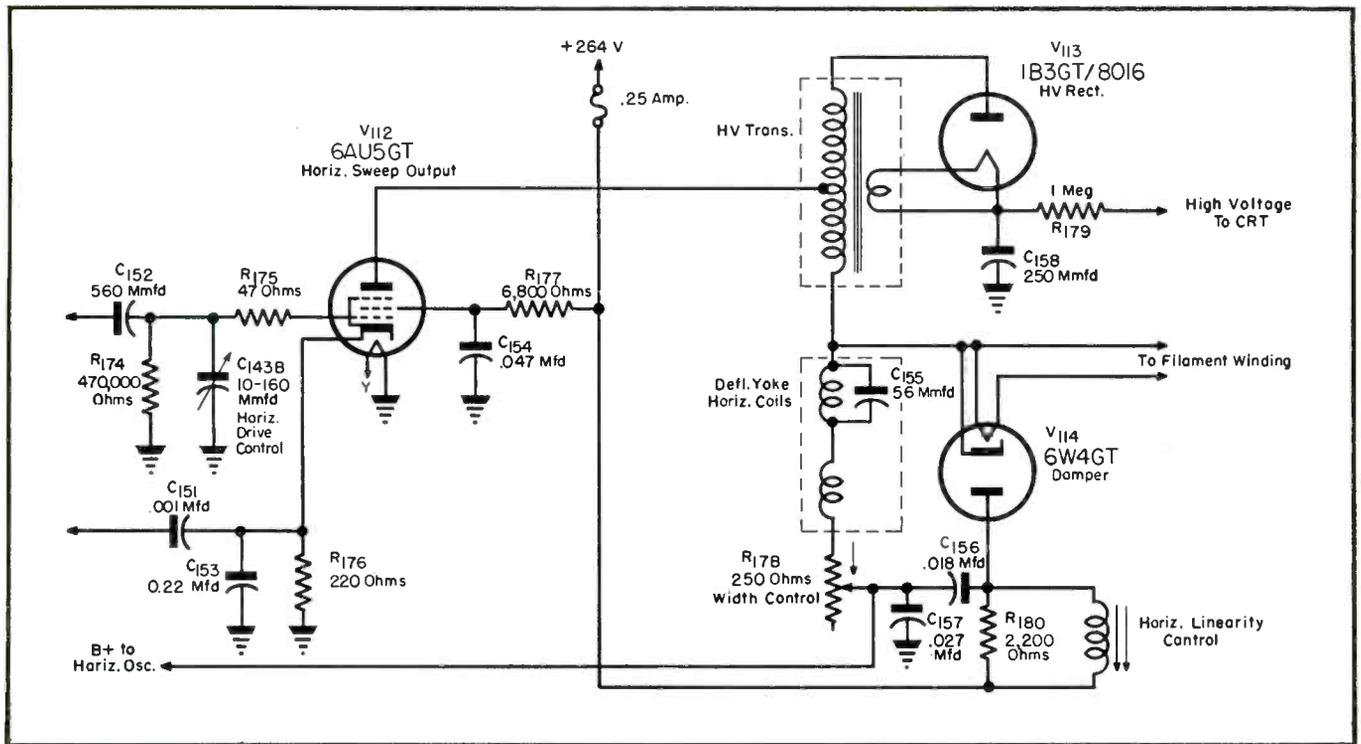
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# DIRECT-DRIVE Horizontal Output System\*

IN THE HORIZONTAL-OUTPUT CIRCUIT, it has been a standard practice to use a flyback transformer with a primary and secondary. Recently it was found that a *direct-drive* type of output system could be used employing a modified structure in the flyback transformer.

The system, employed in the RCA chassis, is shown in Fig. 1. It will be noted there is the usual autotransformer hookup and action in the primary, but there is no step-down secondary connecting to the horizontal section of the yoke. Instead, the horizontal deflection coils are connected *in series* with the primary winding.

To understand the basis of the new circuit, let us review the action of an output transformer. As is well-known, the audio-output transformer must pro-

by WYN MARTIN

vide an impedance match of the voice coil to the impedance of the power tube to deliver the maximum power output from the circuit. It would obviously simplify manufacture if the voice coil could be designed to match the impedance of the power output stage directly without the use of a transformer; Fig. 2a; p. 56. However, that is not feasible. The number of turns that can be used for the voice coil is limited. Too many turns would weigh down the speaker

cone so that it would not vibrate freely. And to operate properly, the voice coil must create a strong magnetic field. Since a strong field depends on the number of turns and the current going through them, and since the number of turns on the voice coil is limited, it is obvious that the signal currents in the voice coil must be stepped up by transformer action. In other words, to get the necessary power output, the impedance of the voice coil must be matched to the impedance of the *pa* by means of an output transformer.

### Original Horizontal Matching System

In former RCA models, the horizontal output matching system was similar to the *af* idea, where low-impedance deflection coils were employed. The major secondary winding on the older type of flyback transformer stepped voltage down and current up so that the amount of current through the deflection coils provided a strong mag-

(Continued on page 56)

(Above)

Fig. 1. Direct-drive horizontal output circuit; RCA T108.

**Transformer Type of Drive Eliminated in RCA Chassis, Deflection Yoke Serving as Portion of Output of Horizontal Sweep, With Coils Connected in Series With Primary Winding.**

\*Based on copyrighted notes appearing in RCA Victor TV Service Clinic, Lecture 4, prepared by RCA Service Co., Inc.



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CONSERVE  
CRITICAL  
MATERIALS

# Servicing Helps

by M. A. MARWELL

**Crosley TV Chassis Servicing Notes\* : Avoiding Breakage of Inductuner Shafts . . . Eliminating Picture Streaking . . . Intermittent Cures . . . Horizontal Drift Remedies. Sentinel TV Receiver Service Hints: Increasing Range of Focus Control . . . Improving Horizontal Hold . . . Eliminating Semi-Circular Shadow Around Corner of Pattern. Sylvania TV Notes: High-Voltage Regulation . . . Improved Horizontal Drives. Ansley Receiver Helps: Avoiding Burnouts of AGC Coils . . . Eliminating Flyback System Arcing . . . Broad-Bandpass Alignment Techniques . . . Syncrolock Adjustments.**

CROSLY RECEIVERS, using Mallory Inductuners, with a porcelain shaft, often come in the shop with broken shafts. Through carelessness the sets are lifted, using the *rf* tuner knob as a handle, placing a strain on the shaft. The shafts must be replaced with new ones, but in order to get at them, the tuning unit, designed to be dustproof, must be removed from the receiver and opened up carefully to make the repair.

## Shaft-Mount Features

In Fig. 1 appears a cutaway view of the shaft mount and one of the three coils and sliding contact arms in this area. The contact arms and small fibre contact block move in a metal slot or raceway in a direction parallel to the axis of the ceramic shaft upon which the coils are mounted. Foreign matter at *A* can cause the fibre block (with contact point) to lift partially out of raceway, when a torque transmitted through the grooved spring and its contact with coil (point *B*) is not strong enough to overcome this extraneous matter. The shaft of the tuner is subject to breakage more easily than the wood fibre type. There are approximately ten interlocking metal leaves concentrically mounted on the shaft to stop motion at end of the coil. Users often find that they can't

go from channels 10 to 3 after much pressure on the shaft; this also ultimately causes breakage.

## Picture Streaks

Some Crosley chassis have been reported to have pictures streaked with fine needlelike lines, and a high pitched hiss, something like a mosquito's song, being heard. This trouble was found to be due to corona discharge from the high-voltage system. In one instance, a trace of this area revealed a fine blue spear of ionized air projecting from the end of a wire which had not been completely wrapped around a soldered connection. To eliminate the corona in this case, it was necessary to cut off the wire as short as possible and then apply quite a bit of solder over its tip.

In another case, where a high voltage filter resistor ran too close to the chassis, a corona was seen along

its whole length, accompanied by static in the sound and picture. Repositioning the resistor cleared up the trouble.

## Lack of Raster

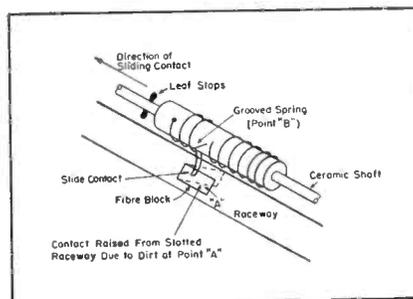
In 16" Crosleys, a lack of raster has been traced to a burn-out on the high-voltage transformer and fused line. The heat also carbonizes the two high-voltage rectifier tube sockets. Repair thus involves replacement of the sockets, to prevent future arcing and breakdown, along with a new high voltage transformer and fuse.

In Crosley models 348 CP-TR1, pictures have been found to be non-linear vertically, no amount of adjusting the controls providing help. The trouble has been a vertical oscillator operating at the wrong frequency as a result of an open timing capacitor ( $C_{as}$ ).

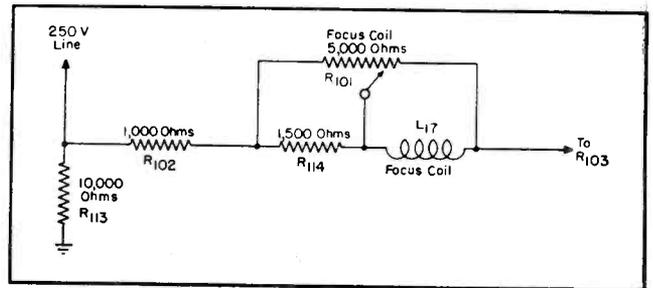
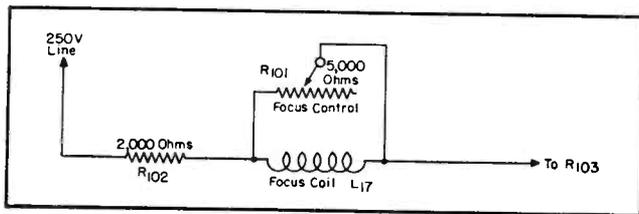
In many models, the center of the face of the picture tube will display a brown spot. This can be avoided if, before turning off the set, the brightness control is reduced, thus preventing the formation of a standing spot in the center of the screen as the circuits die. Such a spot, when repeated every time the set is turned off, can ultimately burn a hole in the phosphor coating.

In some 630TS type Crosleys, there have been reports that reception which had been excellent, suddenly became intermittent and finally quit altogether, both on sound and picture, although the raster remained bright. This has

Fig. 1. Possible sources of trouble in contact-shaft arrangement of Inductuner used in Crosley TV chassis.



\*Based on notes prepared by Norman T. Kinzey, director of TV, Temple University.



Figs. 2 and 3. At left (Fig. 2) appears the original focusing circuit used in Sentinel series YA, YB, YC and early YD chassis, which has been altered, as shown at right (Fig. 3) to increase the range of the focus control.

been found to be due to bad soldering in the *rf* coil system. Oxidation had created a high enough resistance between the coil and the switch lug against which it was lying, so that sets refused to work until the conditions were corrected.

#### Additional Crosley Service Notes

Complaints of pictures not being wide or high enough have been found to be caused by a burned-out low-voltage power supply tube. Picture tearing and rolling has been found due to a defect in the sync separator not amplifying the sync; the sync section not getting proper sync and varying its frequency. Replacing the tube cured the trouble.

Horizontal oscillator drifts on Crosley 10-401s causing receiver to fall out of sync, have been reported, and found due to a .01-mfd capacitor (molded type) which shunts the *b1o* transformer, changing its capacity due to temperature. Replacement with .01-mfd papers, which are not subject to temperature changes as much as molded types, have solved the problem.

#### Sentinel Revisions

To increase the range of the focus control, a 2,000-ohm series resistor  $R_{102}$  (Fig. 2) has been changed to a 1,000 ohm 7.5-watt resistor; a 1500-ohm 5-watt resistor  $R_{114}$  has been added in series with the output side of the focus coil,  $L_{17}$ ; and the focus control  $R_{101}$  has been rewired so that it is across the focus coil and a 1500-ohm resistor,  $R_{114}$ , that has been added in series with the focus coil. The variable tap from the focus control is connected between the 1500-ohm resistor and the focus coil. In addition, a 10,000-ohm 10-watt bleeder resistor,  $R_{113}$ , has been added between the 250-volt line (output side of  $R_{102}$ ) and ground. These changes have been included on all chassis starting with latter part of series YD and series YE production.

Field reports have indicated that with some types of tubes there has

been a tendency, in the Sentinel models 412, 413, 414 and 415, to require a different setting of the *horizontal hold control* when the set was first turned on and after it was warmed up.

To correct this, several changes have been incorporated in chassis starting with series YG. (These changes are not included in chassis stamped series YA, YB, YC, YD, YE and YF). The modifications are revealed in Fig. 6:

- The .005-mfd capacitor,  $C_{55}$  and the 470,000-ohm resistor,  $R_{54}$  parallel filter in the output circuit of the 6AL5 phase detector have been removed from the circuit.
- The 100,000-ohm resistors,  $R_{55}$  and  $R_{56}$  in the output circuit of the 6AL5 phase detector have been replaced by a series-parallel resistor and capacitor combination:
  - The 100,000-ohm resistors  $R_{55}$  and  $R_{56}$  have been changed to 470,000 ohms  $\pm 5\%$   $\frac{1}{2}$  watt resistors.
  - The .002-mfd 200 v capacitors  $C_{55}$  and  $C_{56}$  have been added in parallel with  $R_{55}$  and  $R_{56}$ .
  - The 33,000-ohm  $\pm 10\%$   $\frac{1}{2}$ -watt resistors  $R_{116}$  and  $R_{117}$  have been added in series with  $R_{55}$  and pin 5, and in series with  $R_{56}$  and pin 7 on the 6AL5 phase-detector tube socket.

#### Semi-Circular Shadow Around Corner of Pattern

During shipment, the metal ring inside the focus magnet in the Sentinel

<sup>1</sup>Available from Sentinel; part P-1004.

models 420 B, 423 and 424, often shifts position producing a semi-circular shadow. This can be eliminated by adjusting the *hex stud*, located to the left of the focus adjustment screw, with a circular motion until the semi-circular shadow is eliminated.

The *hex stud* should be adjusted with a brass, copper, or a non-magnetic tool<sup>1</sup>. Then the ion trap should be adjusted for maximum brightness. The ion trap, itself, should not be used to eliminate semi-circular shadow around corner of pattern, if by so doing the intensity of the raster is decreased.

If necessary, after completing the foregoing procedures, the picture should be recentered with the centering controls on the back of the chassis. The horizontal hold control should not be used to center picture.

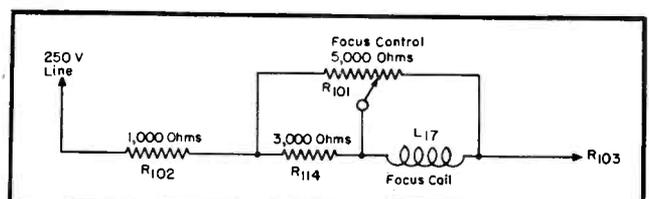
#### HV Regulation on Sylvania Chassis

To provide better operation of high-voltage supplies on Sylvania models 1-139, 1-108, 1-186, using the 6SN7 as oscillator, the value of grid bias resistor  $R_{107}$  should be changed from 3900-ohms  $\frac{1}{2}$  watt to 5600 ohms  $\frac{1}{2}$  watt, and the value of series-grid resistor,  $R_{204}$ , from 100 ohms  $\frac{1}{2}$  watt, to 22 ohms,  $\frac{1}{2}$  watt; Fig. 7. The high voltage oscillator should be tuned to the high-capacity side of the 11-kv peak.

#### Improved Horizontal Drive on Sylvania Chassis

To improve the horizontal drive on Sylvania models 1-108, 1-139 and 1-186 the horizontal output tube has been changed from a 6BD5GT to a

Fig. 4. Another modified focus-control circuit; Sentinel YF series.



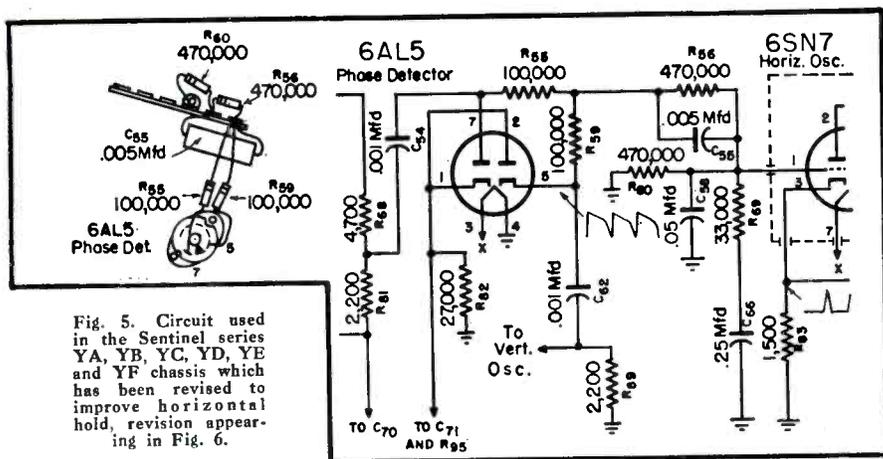


Fig. 5. Circuit used in the Sentinel series YA, YB, YC, YD, YE and YF chassis which has been revised to improve horizontal hold, revision appearing in Fig. 6.

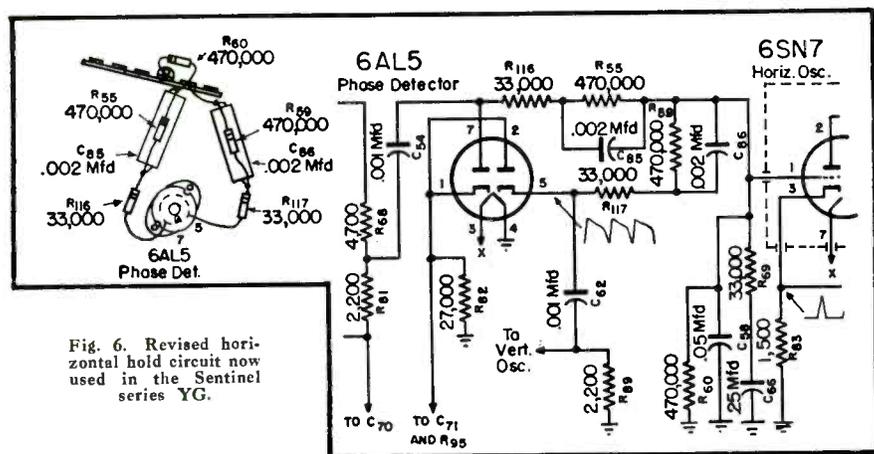


Fig. 6. Revised horizontal hold circuit now used in the Sentinel series YG.

6BQ6GT. This change, with associated circuit revisions, is shown in Fig. 8.

#### Ansley Service Notes

##### Burn-outs of the agc coil:

Burn-outs are due to poor ventilation on the width coil since another coil is wound on top of it. If the slug is pulled all the way out, the reactance is lowered, causing coil to heat. The lack of air tends to burn out the coil. When adjusting the slug should not be pulled all the way out. In addition,

the width coil should not be used as the centering control.

**Critical vertical sync:** In certain noisy localities, the vertical sync may be critical. This can be remedied by installing a .01-mfd capacitor from the yellow lead of the vertical blocking oscillator to ground. This will tend to reduce and bypass all high-frequency noise which may pass through the sync-amplifier system.

**Flyback-system arcing:** In some of the older models using the RCA

voltage doubler flyback system, there have appeared corona arcs from the 1B3 socket to the 6SN7. In a few of the later models there's a shield of bakelite between the 1B3 socket and the 6SN7. Present models use the GE flyback system; there is plenty of room so that no arcing occurs.

**Alignment procedure:** There have been complaints about noise in the picture of some Ansley models, a trouble that has been traced to alignment. The Ansley chassis are aligned for a full 4½-mc band pass, measured from the picture carrier to the sound carrier in the 'scope pattern. This is the maximum band pass that can be used in the present TV system. On the picture this will appear as the center of the picture. This type of alignment, of course, will cause some noise in the background in areas where the picture strength is not of the best. It may be necessary to touch up this alignment in these particular locations. The 21.8-mc coil on the tuner next to the 21.25-mc sound trap can be touched up so that a lower band pass is obtained and less background noise will appear.

This coil should not be turned more than 2 complete turns; after this coil is turned, complete vertical definition should not be expected.

**Adjustments:** To adjust for proper centering and to eliminate shadows on the corners of the picture, the deflection yoke should be pushed up as far forward as possible; the focus coil, ion trap, and the phasing control adjusted properly.

The syncrolock should not be used as a centering control. This has a tendency, although it does center the picture, to cause the picture to fall out of sync after a short period of time causing innumerable service complaints. The syncrolock is not a centering control.

Fig. 7. Circuit, which provides better regulation of the high-voltage supply, developed for Sylvania models 1-139, 1-108 and 1-186.

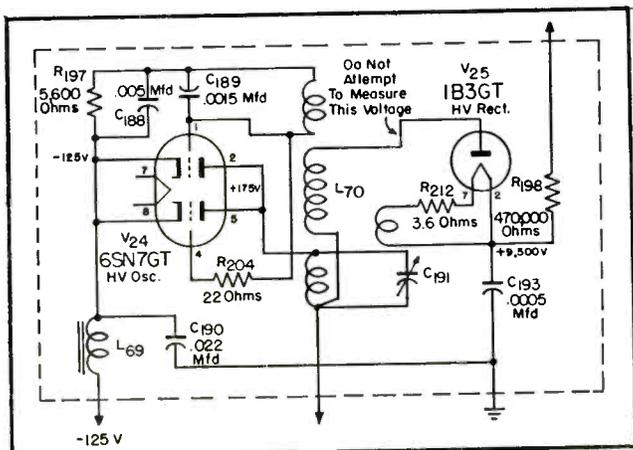
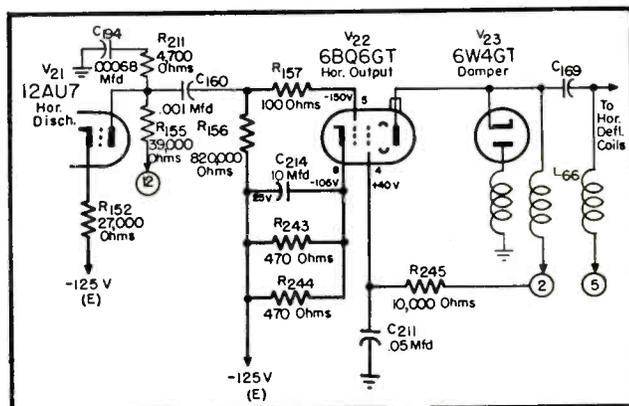


Fig. 8. Improved horizontal-hold circuit for Sylvania 1-108, 1-139 and 1-186.



# New Parts. Tools. Instruments

## SIMPSON 5" 'SCOPE

A 5" 'scope, model 476 *microscope*, has been announced by the Simpson Electric Co., 5200 W. Kinzie, Chicago, Ill.

Instrument affords mounting of the cathode-ray tube in a vertical position that is said to reduce bench requirements to an area of 9"x8". The image is reflected from a mirror mounted in the adjustable cover at the top of the cabinet, and the viewing surface is brought near the eye level when the instrument is used on benches of normal height. Mirror and wing sides at top, for deflecting light, fold into the cabinet when it is not in use. Height, 16¼"; width, 9¾".



\* \* \*

## TRIPLETT TUBE TESTER

A tube tester, model 3413-A, that is said to permit checking of any type radio receiving tube, miniature hearing aid tubes, pilot lamps, flashlight bulbs and TV picture tubes, has been announced by The Triplett Electrical Instrument Co., Bluffton 2, Ohio.

Tester gives both *short* and *open* circuit check of each element of every tube. TV picture tubes can be checked without removing them from the receiver, by use of an adapter. *Continuity* test is provided for checking electrical appliances, motors, etc.

Has flexible 3-position lever switches for coverage of present and future tube connections. RMA pin numbering of tube element levers.

Has a line voltage indication on center of meter dial. Filament voltage: 0.63 to 110 volts in 14 steps.

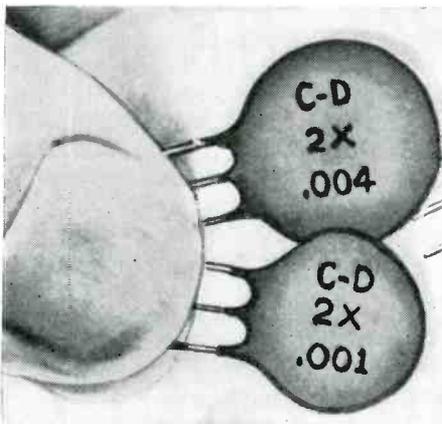


## C-D CERAMIC DISC BYPASS AND COUPLING CAPACITORS

A series of miniature ceramic disc capacitors for bypass and coupling in TV, FM, *uhf* and *vhf* is now available in the tiny mike series from Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Five basic types are available in this series: type 2 TM, ¼" diameter, single capacity units from 500 to 1,000 mmfd at 500 *vdcw*; type 6 TM, 19/32" diameter, single capacity units from 50 to 5000 mmfd at 500 *vdcw*; type 8 TM, ¾" diameter with a capacity rating of 10,000 mmfd (8TM5S1C) at 500 *vdcw*; type 6 TM, 19/32" diameter dual capacity units (from 2 x 100 to 2 x 2,500 mmfd) and type 8 TM, ¾" diameter dual capacity units (from 2 x 3,000 to 2 x 10,000 mmfd) all rated at 500 *vdcw*.

Capacitors have parallel leads and phenolic coating and high-temperature wax impregnation that is said to protect against humidity and also against grounds caused by contact with nearby components.



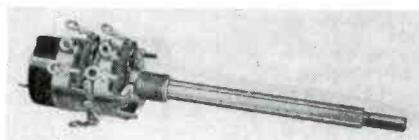
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## MALLORY DUAL VARIABLE RESISTORS

A dual concentric 15/16" variable resistor is now available from P. R. Mallory and Co., Inc., P. O. Box 1558, Indianapolis, Indiana.

Dual controls are available in sub-assembly form. Control sections are supplied in factory-assembled form. An *ac* switch features positive indexing. Its design is said to permit secure locking in position without removing the control housing.

Single controls are supplied with a permanently fixed, tubular brass shaft that can be adapted for split-knurl or flatted type knobs by inserting one of two steel shaft ends.



[Additional new-part news appears on page 67 and 71.]

## THORDARSON VOLTAGE REGULATOR

An automatic voltage regulator has been announced by Thordarson-Meissner Mfg. Div., Maguire Industries, 500 West Huron St., Chicago 10, Ill.

Rated at 750 va, the regulator utilizes a power transformer with tapped windings and electrically adjusted to keep the output voltage within prescribed limits.

One model adds 25 volts to the output when line input drops to 95 volts. Said to automatically *stepdown* 25 volts if line surge exceeds 130 volts. Relay is said to be chatter-proof. Unit is filtered to prevent interference to radio or TV.

Available in conduit box type housing to meet electrical codes for permanent installations and as a semi-portable unit.



\* \* \*

## CHICAGO INDUSTRIAL POTENTIOMETER

A calibrated 0 to 100,000-ohm linear potentiometer, the Selectohm, for use as a resistance substitute, has been introduced by the Chicago Industrial Instrument Co., 536 Elm St., Chicago 10, Ill.

Unit may be used to replace a decade box, serve as a rheostat, shunt or multiplier. Rated at 25 watts.

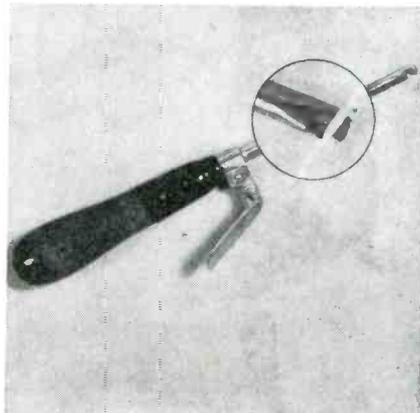
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## C AND G SALES WIRE CUTTER

A wire-cutting tool which features an *easy-action* lever and a hi-carbon steel tip for cutting has been announced by C & G Sales Co., Columbus, Ohio.

Snips copper wire of 18 gauge or less. Because the tip of the tool hooks over the wire to be cut, users can never snip the wrong wire.

Wire cutter also can be used to hold wires and strands during soldering work.



# AUDIO installation and service

## Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART

THREE-SPEED CHANGERS for 7, 10 and 12-inch platters, which appear to have become standard accessories in phono combinations, have undergone quite a stage of streamlining since the single 78 days. Today's three-speeders feature mechanical and electronic innovations which not only ease installation, but service work, too.

An interesting example of simplified design appears in the Philco M-22. For instance, the possibility of damaging the changer by holding the tone arm during a change cycle is prevented by spring-loading all actuating levers.

### Tone-Arm Set-Down Indexing

Tone arm set-down indexing has been simplified by eliminating feelers and establishing the set-down by means of the record-shelf position. The nodding spindle, rather than a complicated system of levers and blades, accomplishes the record dropping. Most of the working parts are mounted on a bridge sub-assembly, a feature which makes the parts easily accessible for servicing.

### Cycling Simplification

Cycling has been simplified, too. Reporting on this operation, the Philco service department notes that at the completion of a record, the changer trips, and allows a dog latch to engage

the spur of the turntable hub gear. This rotates a cam gear, allowing the teeth of the cam hub gear to engage. As the cam rotates, it forces a lifter lever down, raising the tone arm from the record. As the tone arm reaches maximum height, the tone-arm actuator, motivated by the cam gear, contacts the trip-arm stud and swings the tone arm against the rest post. After the tone arm reaches the rest post, the push-off lever rotates, nodding the spindle and dropping the next record onto the turntable. After the record has dropped, the return lever contacts the stud of the trip arm, and starts the tone arm inward. The tone arm is now controlled by the actuator and return levers, in contact with the stud of the trip arm. The return lever continues swinging the tone arm inward until it is stopped by the set-down lever, whose position is dependent upon the setting of the record shelf. This stoppage of the inward travel of the tone arm by the established position of the return lever accomplishes the set-down indexing. The tone arm is thus held above the set-down point. The lifter lever now moves upward, slowly dropping the tone arm to the record surface. As the cam gear continues to rotate, the actuator lever is moved outward and away from the trip-arm stud. The tone-arm return lever then moves away from the trip-arm stud, but the spring portion of the actuator mo-

mentarily remains in contact with the stud, eliminating a sudden release of control of the tone arm, and preventing the needle from jumping into the modulated grooves. The trip-plate supporting finger now engages the dog latch, and the index lever locks the cam gear in a neutral position. The tone arm is then free to play the record.

### Friction-Clutch Trip Finger

As the tone-arm advances toward the spindle, a friction-clutch trip finger engages the end of the trip plate. Through the applied pressure of the friction finger (approximately 2 grams) against the trip plate, the trip-plate finger supporting the dog latch begins to move, lessening the engagement of the trip-plate finger and dog latch, preparatory to releasing the latch. This engagement is slowly lessened while the needle is in the playing grooves, giving the reset cam an opportunity (once each revolution of the turntable) to reset the trip plate into full engagement and slip the friction finger in the friction clutch. As the needle rides in the lead-out or eccentric groove of the record, the velocity of the friction finger is increased. The speed of the disengagement of the trip-plate supporting finger and the dog latch is also increased sufficiently to allow complete disen-

Fig. 1. Network devised to eliminate microphonics in a Sylvania TV console record changer.

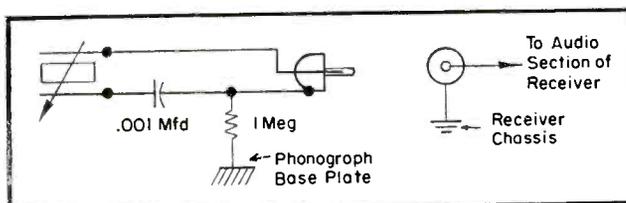
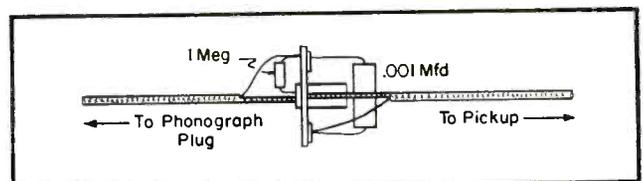


Fig. 2. Parts layout for the Fig. 1 circuit revision.



# Cycling Operation of Simplified Three-Speed Changers . . . Removing Microphonics in Sylvania TV-Phono Models . . . Repairing Audio IF Transformers . . . Motor Conversions . . . Reducing Radio Talk in G. E. Phono Systems . . . Dual-Consolette Design.

gagement of the dog latch before it has been restored by the reset cam.

## Removal of Microphonics

The old bugaboo, microphonics, still appears to be around causing trouble. Sylvania reports that it has found a way to eliminate it in their record changer, 1-171, when used in model 076 (chassis 1-108), with a filter net work, such as is illustrated in Figs. 1 and 2.

## Failure of Audio IF Transformer

Failure of 4.5-mc audio *if* transformers in the G. E. 10T- and 12T-series of television receivers, in areas of high humidity, has been found to be due to faulty lead dress inside the transformer shield which permitted the secondary leads to touch the primary winding at the point where these leads pass the primary winding prior to their connection to the transformer terminals. Although the leads and winding were insulated, electrolysis occurred under conditions of high humidity, eventually causing a breakdown between the primary winding and secondary lead.

## Production Corrections

This condition was corrected in production by placing a fiber washer adjacent to the primary winding which prevents the secondary leads from touching the primary. However, some of the replacement transformers (RLI-097) may not have this fiber

washer incorporated. Therefore, it is suggested that, when making a replacement, the shield be removed from the replacement transformer and the secondary lead dress be checked to make certain that these leads do not touch the primary winding.

## Variable Reluctance Pickup Problems

G. E. cartridges found to be defective because of an open in the pickup coil indicates that the trouble is due to, in most cases, by a practice of soldering the phono leads directly to the cartridge terminals. This application of heat may burn the fine wire to the pickup coil, causing an open. Push-on terminal lugs are furnished with G. E. replacement cartridges and the leads should be soldered to these lugs instead of to the cartridge terminals.

## Motor Conversion

To convert a G. E. model P15 record changer, using an RBH-015 motor, to 50-cycle operation, it is only necessary to connect a 70-ohm resistor in series with the motor leads to reduce the voltage to approximately 95 to prevent the motor from over-heating, and replace the 60-cycle bushing on the rotor shaft, with a 50-cycle spring-type bushing (RMS-231).

## Tone-Arm Indexing

A few early G. E. P15 changers have been found to index the tone arm for 10" records while playing 7"

*(Continued on page 46)*

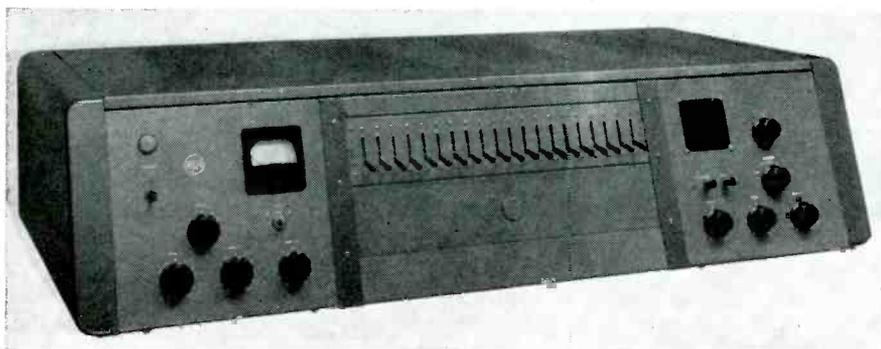


Magnetic pickup unit for 33 1/3, 45, or 78 rpm. Special connector permits the unit to be plugged into a Garrard changer arm. The point pressure is said to be 8 grams for all discs. Output is approximately 20 mv. (Polyphase reproducer L-6-G; Audak Co., 500 Fifth Ave., New York 18, N. Y.)



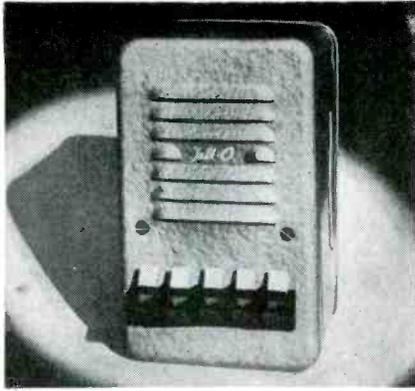
Bass-reflex speaker cabinet which is claimed to feature non-vibratory construction, with 3/4" plywood throughout. Interior acoustic padding is said to eliminate internal sound reflections. Capacity is 10,000 cubic inches. The baffleboard is cut out for 15" or 12" speaker and mounted and equipped with speaker mounting bolts. To vary size of the port opening, the baffleboard is adjustable up or down. Cabinets suited for mounting single speaker or two-way woofer-tweeter system, including crossover networks. Dimensions: 36" high, 16" deep, 24" wide. (Model RX; Standard Wood Products Corp., 43-02 38th St., Long Island City 4, N. Y.)

Dual 30-watt-amplifier consolette, which is 44" by 20 1/2" by 10 3/4". (Courtesy RCA)

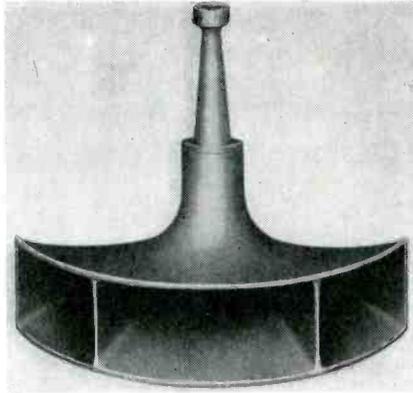


Acoustic tape, available from Jensen Industries, Inc., 329 South Wood Street, Chicago 12, Ill., in either plastic or paper base, on 600 and 1,200-foot plastic reels. Jensen recently obtained an interest in Orradio Industries, Inc., Opelika, Ala., tape producers.





Intercom unit using one amplifier; current is drawn only during actual conversations, as the amplifier is normally in off position. When a call is put into system, the amplifier is turned on by a patented on-off switch. (Talk-O Products, Inc., Allen Street, Rochester 6, New York.)



Cobra-type horn which is said to provide a uniform sound field over a horizontal angle of 120° and a vertical angle of 40°. It is of straight horn design and is exponentially flared throughout. Low frequency cut-off design point is 250 cps. The horn consists of a two-piece, non-vibratory aluminum casting. It is provided with a rib-reinforced two-section serrated mounting bracket (not illustrated) which permits coupling to a standard 1 1/4" mounting flange. Speaker may be used as a middle register or high frequency horn in wide range audio systems using 2 or 3 loudspeakers. Dimensions: 17 3/8" h, 13 3/8" d, 22 1/4" w. Thread size is 1 3/8"-18, permitting the use of standard 25-35-watt driver unit. (COB-11; Racon Electric Co., Inc., 52 East 19th Street, New York 3, N. Y.)



Three-speed portable record player which features a 3-tube amplifier, variable tone and volume controls, and a 5" pm speaker. Has a twist-arm crystal pickup with two needles (for standard and lp records) and a chuck for 45 records. (Model 931; Dynavox Corp., L. I. C., N. Y.)

records. To remedy the small half-round tab on the discriminator lever should be bent about 30 degrees so that it will limit the downward travel of the lever.

#### Reducing Radio Talk

To reduce radio talk when the G. E. 752 or 753 is operated on phono, late production 752 and 753 models have had three changes incorporated:

- (1)  $C_{60}$  which was originally grounded on the rear apron of the chassis is now grounded to the same ground as  $C_{60}$ ; this ground point is near the end of the terminal board.
- (2)  $C_{42}$  is dressed towards the end of the chassis and away from  $V_8$  as far as the leads will permit.
- (3) The blue lead from pin 5 and green lead from pin 6 of  $V_8$  (phono preamp) is now dressed in front of the terminal board instead of in the back.

#### School and Industrial-Sound Systems

To provide recorded programs, radio programs, or locally originated sound programs or announcements to as many as 40 selected rooms or areas, there has been designed a console<sup>1</sup> which incorporates two complete audio channels, which may be used to provide different programs to selected areas, or they may be tied together to furnish the same programs to all areas. The console can be used as a two-way communication system without disturbing the two program channels, by the addition of an optional amplifier. Programs can be monitored

by means of a loudspeaker and a volume meter, which visually indicates correct volume level.

#### Switching Facilities

An inclined front panel of the console provides for one or two banks of twenty switches, each switch controlling one loudspeaker location. Controls include means for mixing and

<sup>1</sup>RCA MI-12781.

controlling ten inputs from microphones, radio, phono, or remote telephone lines; a meter for measuring output level, a talk-back speaker with push-button talk-listen switch, a channel selector and master emergency switch, and a monitor selector switch. Seven controls permit variation of the levels of the program inputs.

#### 30-Watt Amplifiers

Console includes two 30-watt amplifiers, matching transformers, and monitoring loudspeaker. Provision has been made for use of the console with a metal pedestal desk which houses a three-speed record transcription turntable in a pull-out drawer and a tilt-out AM-FM radio.



Working display of over 100 different models of test instruments, including a wide assortment of audio gear, from more than 10 different manufacturers, recently installed at Kierulff and Co., 820 West Olympic Blvd., Los Angeles 15, Calif. Each test unit can be demonstrated under actual working conditions.

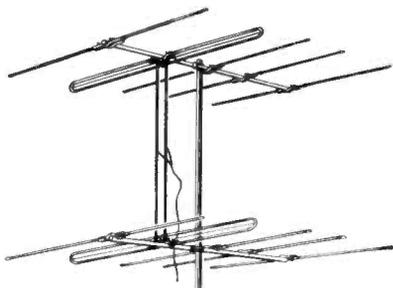
# New TV Parts . . . Accessories

## CHANNEL MASTER YAGI ANTENNAS

A line of yagi antennas, the 500 series, has been announced by Channel Master Corp., Ellenville, N. Y.

Antennas are said to have a gain of 8 db which may be increased by stacking, and a front-to-back ratio of 26 db. Matches both 72 and 300-ohm line.

Construction features include aluminum elements and crossarm, high impedance stepup dipoles of seamless tubing, and reflectors and directors of  $\frac{3}{8}$ " butted tubing with  $\frac{1}{2}$ " external sleeves.



Low-band Channel Master yagi

\* \* \*

## HYTRON PROBING TWEEZERS

A polystyrene probing tweezer is now available from Hytron Radio and Electronics Corp., Salem, Mass. Has fine and coarse serrations for different sizes of wires, capacitors, resistors, etc. It is said to feature high dielectric constant, no pull by strong magnetic fields and a heat resistance, if very hot irons and components are avoided.



\* \* \*

## KAY SWEEP OSCILLATOR

A sweeping oscillator for the *uhf* and microwave ranges, the *Super-Sweep*, has been announced by Kay Electric Co., Pine Brook, N. J.

Featured are a frequency range of 500 to 2000 mc and a sweep width of 30 mc and up. Output is said to be .5 volt maximum from 50-ohm internal impedance. Has an absorption-type wavemeter for measuring and setting frequency. Includes a variable output attenuator covering a range of 30 db. Output is said to be flat within 0.1 db/mc while sweeping.

## MASCO 2-STAGE TV BOOSTER

A 2-stage booster, Super Skychief, has been announced by Mark Simpson Manufacturing Company, 32-38 49th St., Long Island City, New York.

TV receiver may be turned on and off by the booster switch. Booster has eight tuned circuits. Has 4.5-mc bandwidth.



\* \* \*

## ARGOS TV TUBE CADDY

A TV tube caddy has been announced by Argos Products Co., Inc., Genoa, Ill.

Caddy has drawers which automatically classify tubes by sizes, with each tube type number visible. Removable partitions permit expansion of stock to 221 tubes, or allow additional space for tubes not in cartons or small tools.

Featured is a compartment especially sized to carry 22-3AG fuse boxes. Clips on the cover are installed for holding a current price list and inventory sheet. Constructed of plywood with a leatherette covering.

\* \* \*

## TENSOR 'SCOPE CALIBRATOR

A 'scope calibrator, A-42F, essentially a source of continuously variable monitored voltage from 0.0005 to 100 volts *rms*, has been developed by Tensor Electric Development Co., Inc., 343 Classon Ave., Brooklyn 5, N. Y.

When used with a 'scope it enables the operator to make measurements of voltages within this range. Has an added feature of being calibrated directly in peak-to-peak volts and db as well as *rms* volts.



## HOUSE OF TV PICTURE-TUBE REACTIVATOR

A reactivator that is said to restore brightness to 10- to 20-inch television picture tubes is now available from the House of Television, Inc., 40 W 4th St., New York City.

It is said that reactivating requires thirty minutes without removing the tube from the cabinet or chassis.

Pocket size unit is 5" wide x 5" high x  $2\frac{3}{4}$ " deep; weighs 3 pounds.



\* \* \*

## PATENTED ODEGAARD POLYETHYLENE STANDOFFS

Nail-polyethylene standoff, produced by the Odegaard Manufacturing Co., 5416 Eighth Ave., Brooklyn 20, N. Y., now carry a patent, No. 2527442.

Shaped like a horse-shoe nail, with small steps along one edge, the item consists of cadmium-plated, high-carbon steel and a piece of polyethylene.



\* \* \*

## VEE-D-X LIGHTNING ARRESTER

A lightning arrester, RW 200, has been announced by La Pointe-Plascomold Corp., Windsor Locks, Conn.

It is similar in design to the 4-wire RW 204, but is constructed with only two saw-tooth contact points instead of four.

\* \* \*

## HICKOK TUBE TESTER

A portable tube tester, model 600, that tests AM, FM and TV tubes, has been announced by the Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio.

Featured are tests for gas content and for future life of tubes. Separate voltages are applied to each element. Scale readings are directly in micromhos; ranges, 0-3,000-6,000-15,000 micromhos. Incorporates dynamic mutual-conductance circuit.

Size is  $7\frac{1}{2}$ " high,  $11\frac{3}{4}$ " wide, and  $16\frac{3}{4}$ " long.

# ASSOCIATIONS



## TCA

IN AN ADDRESS before a graduation dinner of Service Men who recently completed an RCA training program, Albert M. Haas, recently-reelected prexy of the Television Contractors Association of Philadelphia, presented an inspiring report on the standards of practice which Service Men should follow to be successful.

Haas revealed that the consumer of television must have good service, and if he fails to get it, everyone in the industry can suffer. Since the customer is the one that the Service Man is dependent upon for a living, it is important, said Haas, that he is continually satisfied with his television service.

The customer has only one way to judge a Service Man's ability, and that's by the reception he gets, emphasized the TCA executive. He pointed out that if the Service Man doesn't see to it that good reception is provided or if an attempt is made to kid the customer into believing that he is getting good reception, the results can only be disastrous in the end.

Offering a series of points of procedure which Service Men should follow, Haas said: "Never argue with a customer. Listen to him courteously, even if you think he is being ridiculous. When you answer, make sure that it is in a moderate tone of voice that

doesn't antagonize. . . . If you have a problem in the customer's home, don't be afraid to call back to the shop for help. It will pay off. . . . The longer you stay in the customer's home, the less effective you look. If you can't finish the job by yourself in a reasonable time, arrange to take the chassis into the shop. Tell the customer why you must do this. Don't make any specific guarantees about when he will get it back. . . . Advise the customer to call the office for further information when the set is at the shop. . . . When you finish with a job, make sure you don't leave any debris. Don't leave until your working area is as clean as you went into the home. . . . Never speak disparagingly of the set of the customer's selection, nor of the last Service Man who might have handled the repairs on the set. If there are any signs of a bad job by another Service Man, it is just up to you to correct it, but you gain nothing by telling the customer about the poor ability of a man whom you may have never known or seen. You don't know the circumstances of the last job and you are not in a position to judge another man's qualifications. . . . Always try to maintain a schedule. Too many coffee stops interfere with the plans worked out by the home office for the most productive results. . . . Keep your service car or truck in order. Make certain that your tools, equipment or

supplies are not in danger of being ruined by carelessness."

At the recent election of TCA, Samuel A. Whittingham and Jack Phillips were also reelected to the posts of vice president and secretary, respectively. Joseph F. Griffin was named to succeed George F. Weber as treasurer.

## TISA

FRANK J. MOCH, TISA prexy, noted in a recent bulletin that the association contacted Senator Saltiel of the Illinois State legislature recently to probe the subject of licensing which had been discussed at the state capitol.

At a mass meeting of service operators in the Chicago area, six industry specialists appeared to discuss current servicing problems.

## PRSMA

AT A RECENT board meeting of the Philadelphia Radio Service Men's Association, ye editor received an honorary membership award for his contributions to the servicing profession.

The award was presented by prexy Thomas Middleton.

Among those at the meeting were Jack P. Dickstein, vice president; James T. Daly, recording secretary; Stanley W. Myers, treasurer; Samuel M. Brenner, corresponding secretary; and Dave Krantz, Frank Gerhard, William Royal and Leonard Carr.



Thomas Middleton, PRSMA prexy, presenting an honorary membership award plaque to ye editor, during a recent board-meeting session of the group.



At a recent meeting of PRSMA, which featured a talk by James Iden, field service of Zenith Radio. Iden covered the new Zenith chassis circuits.

**TEN YEARS AGO**

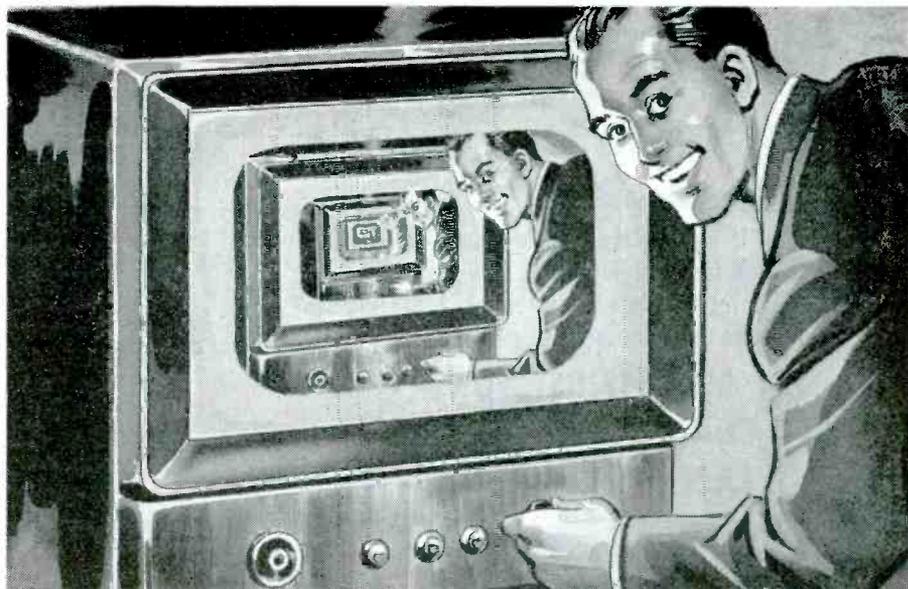
From the Association News Page of  
**SERVICE, March, 1941**

A TALK ON AUTOMATIC-FREQUENCY CONTROL was delivered by Doc McKinney at the meeting of the Danville chapter of RSA. . . . John Sestini was elected president of the Lawrence chapter of RTG. Other officers elected were Almeric Dussault, vice president; James A. Mulligan, secretary; Herbert Grosser, treasurer, and Wallace Dill, sergeant-at-arms. A new board of directors was also named: Herbert Stadler, W. T. Nesbitt, Haven McCrillis, Robert Bingham, Howard C. Parker, James A. Mulligan, Almeric Dussault, and Herbert Grosser. . . . A meeting of the Whaling City chapter of RTG in New Bedford, Mass., featured a talk by Al Saunders who discussed the relationship of theory and practical radio servicing. Saunders showed the effects of the different voltages, generated by an oscillator, on the strength and quality of a signal delivered to *if* channels. He also reviewed the effects of open *avc* lines and the characteristics of phase inversion in audio systems. . . . A. Barricks, of Hickok, delivered a talk before the Long Beach chapter of RTA. Other representatives of industry scheduled to appear before the group were Bill Hitt of Aerovox and Lou Walton of Philco. Harry E. Ward, Jr., was named president to succeed Oliver Colburn, and Walter Rundquist became vice president and treasurer. . . . E. V. Kesheimer, commercial engineer of Ken-Rad, delivered a talk on *noises in radio tubes* before a group of PRSMA in Philadelphia, Pa. Max Schinke, service manager of Stewart-Warner, also appeared before PRSMA and discussed equipment for radio servicing.

**THOMAS ELECTRONICS NATIONAL  
PICTURE-TUBE CAMPAIGN**



Tom Clinton (right), president of Thomas Electronics, Inc., and Edward A. Conti, president of Conti Advertising, checking final proofs of picture-tube advertising which appeared recently in a national weekly.



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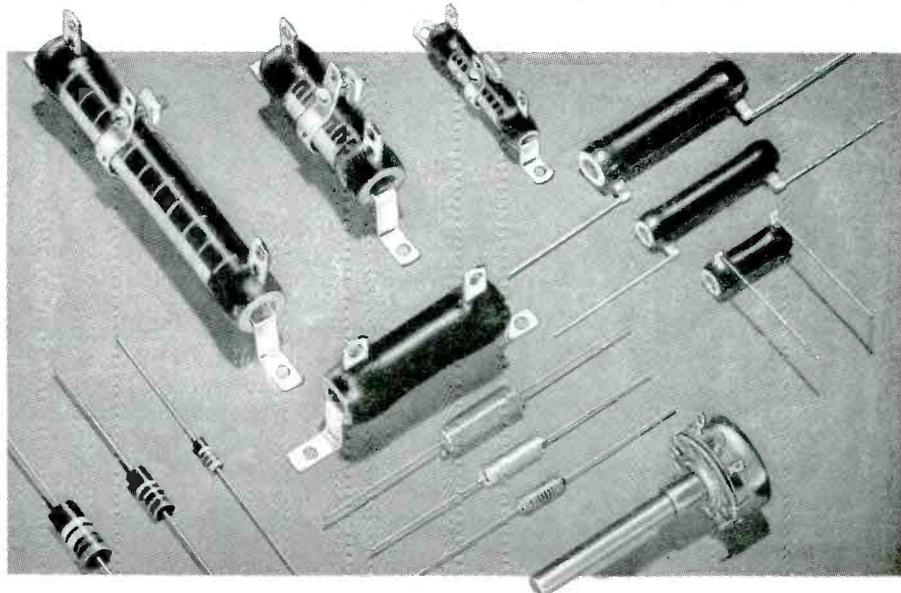
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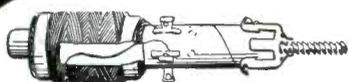
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**Picture-Tube Service**

(Continued from page 24)

to carry off the oxide coating itself in various forms. In the case of normal good tubes, with a minimum of gas content, this form of cathode deterioration is very gradual, resulting in years of normal home usage before emission drops below the critical point.

However, should an excess of gas be present in the tube, the electrons constituting the electron beam, can collide with the atoms of gas, knocking electrons from the orbit of the atom and thereby producing *positive* ions. These positive ions tend to seek areas of negative potential and as a result bombard the relatively negative cathode. This continuous bombardment of the cathode by *positive* ions contributes to abnormally rapid cathode poisoning.

**Importance of Ion Traps**

Minute leaks in the glass or metal structure of the tube often admit small amounts of air. Bombardment of the atoms of gas which constitute air, in addition to the possibility of bombardment of the metallic areas of the gun structure, can release destructive positive ions. This latter point is an important one to remember, inasmuch as careless adjustment of ion traps can cause a portion of the electron beam to strike the edge of the control-grid aperture, producing positive ions which can result in early poisoning of the cathode. Complete information on the origin and production of various types of ions, within the picture tube, are not as yet completely and definitely known. It will suffice, for our purposes, however to recognize the destructive effect of ion production, which in the case of positive ions indicates that it is important to avoid an inadvertent increase in their quantity, by proper adjustment of the beam bender or ion trap.

**The Accelerator Grid**

The  $G_2$  (accelerator grid) is the next element after the  $G_1$  (control grid) in the typical magnetic type of picture tube, which is vital in tube operation. The accelerator grid serves 3 basic functions: (1) As a screen element (isolating cathode from the field of the high voltage or anode elements); (2) as an accelerating element (accelerating the electron beam up from the cathode) and (3) as a contributor to pre-focusing of the electron beam.  $G_2$  seldom is a cause of defective tubes but still should be

**GET RID OF B. O.\***



**in TV Pictures!**

**\*BARKHAUSEN OSCILLATION**

When *vertical black bars* appear in TV pictures, as shown above, they are the result of *Barkhausen Oscillation* occurring in the horizontal sweep output tube (such as the 25BQ6, 6BQ6, 6EV5, 25EV5, 6AU5, or 25AU5, etc.). To correct this difficulty our engineers have developed the

**PERFECTION B.O.\*ELIMINATOR**



B.O. ELIMINATOR (Actual Size)



**EASY TO INSTALL**

Just slip the B.O. Eliminator over the tube, move down, or up, or turn until the dark vertical bars disappear from the picture. Spring grip holds the Eliminator in place.

This compact device fits over the horizontal sweep output tube, and because it brings a concentrated magnetic field near the source of the Barkhausen Oscillation—namely the screen grid—it usually eliminates the oscillation and the black

lines on the face of the picture tube. Service men who have used the B.O. Eliminator say it is the simplest and most positive method of getting rid of the vertical bars that they have ever known. They see a big demand by service men in maintaining the 10,000,000 TV sets now on the market.

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checked for the possibility of an open connection between it and its base pin termination.

#### High-Voltage Anode

After  $G_2$  we have the  $G_3$  or high-voltage anode to consider. Connection of the high voltage is made to  $G_3$  through the anode cap on the side of the picture tube (in the case of glass tubes). This cap is connected to the coating on the inner surface of the tube.  $G_3$ , in turn, is connected to the inner coating, by means of several spring-supporting clips which constitute part of the  $G_3$  structure.

The connection between the anode cap and the inner coating may become open or intermittent after use. In addition, the contact between the spring clips of  $G_3$  and the inner coating may also become questionable. The continuity of this anode cap to the inner coating to the  $G_3$  conducting path must also be checked in a comprehensive field test.

#### Electrostatic Problems

In the electrostatic-type tube the problem is similar to the magnetic type, with the exception that additional elements, such as deflection plates and focusing anodes, can also contribute to faulty operation. It is comparatively seldom that mechanical misalignment of gun and deflection plate structures occurs in normal use; however, the possibility of open or intermittent connection between the individual plates and their base termination cannot be overlooked. These elements must also be continuity-checked to yield a really complete test.

#### Continuity-Test Requirements

In our probe, it was found that most conclusive continuity test proved to be one which would directly employ any questionable element (which did not contribute to the basic *beam-current* test) as a current-collecting anode. Should the element be open-circuited within the tube (or in the tube base) there, of course, would be no current flow through to the indicating circuit in the test instrument. The open circuit would therefore be revealed by no deflection of the meter of the indicating circuit.

The initial problem encountered in the development of such a test circuit was posed by the extremely small currents which traverse the relatively long distance from the cathode to such elements as the deflection plates, under

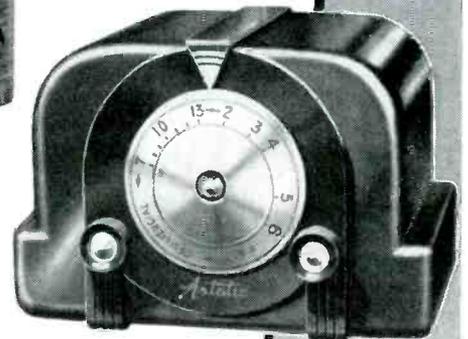
(Continued on page 52)

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YES, ASTATIC engineering research has found a way to improve still further its BT Series Boosters, in ability to sharpening quality of TV reception. From the first, these Astatic entries in the low-cost booster field have won top preference of the trade in virtually every instance where performance has been compared. So, it's a matter of yesterday's best made even better today—thanks to constant Astatic research and engineering progress. This continuing search for better methods and products is also your greatest assurance of first quality in phonograph pickups and cartridges, microphones and related equipment.



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List Price  
**\$32.50**



**Model BT-2**  
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#### QUALITY FEATURES

- 1 Mallory Inductuner for continuous variable tuning.
- 2 High gain, very uniform on both high and low channels.
- 3 Simplified controls—single tuning knob with continuous tuning through both TV and FM bands.
- 4 Band width adequate over entire range.
- 5 Low noise design and construction.
- 6 No shock hazard to user.
- 7 Off-on switch for easily cutting in and out of the circuit.
- 8 Selenium rectifier.
- 9 Single 6AK5 tube.
- 10 Provide for either 72 ohm or 300 ohm impedance input and output.
- 11 Model BT-2 has handsome, dark brown plastic cabinet.
- 12 Model BT-1 has metal cabinet in rich mahogany woodgrain finish.
- 13 Large dial face is easy to see in tuning.
- 14 Model BT-2 has recessed pilot light to show when booster is on.

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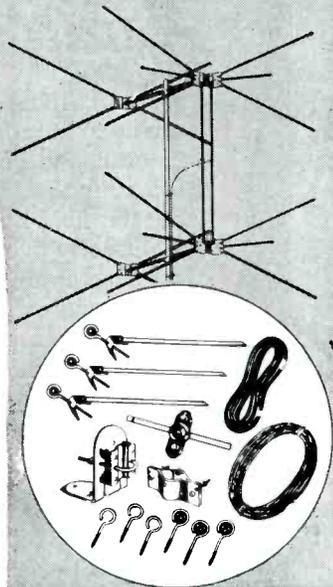
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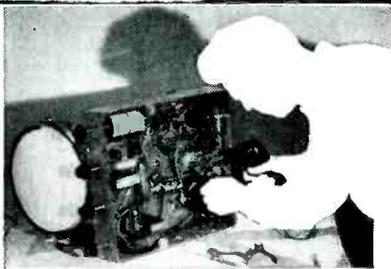
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( ) BEGINNERS check here for information on Pre-Tel Radio Course.

## Picture-Tube Service

(Continued from page 51)

safe, relatively low voltage test conditions. This problem was solved by designing a flexible switching network which applied separate in-phase accelerating potentials to all elements between control grid and the element to be continuity checked.

These minute element currents when used to activate a sufficiently sensitive indicating circuit, can reveal element continuity by virtue of an upscale meter reading. Conversely, an open element will produce no reading in the indicating current. The study also revealed that although beam-current values range all the way from approximately 2000 microamperes down to approximately 10 to 20 microamperes, the test instrument must provide indicating circuits of sufficient sensitivity to yield readable meter indications for currents down to a fraction of a microampere. Without this high sensitivity capability a test instrument or circuit could not conveniently indicate element continuity.

### Importance of Mechanical Tests

While it is true that the foregoing possible causes for electrical failure of picture tubes can be quickly localized through use of an appropriate test instrument, the importance of a thorough visual examination for mechanical or physical defects cannot be overstressed. The purpose of the most complete and complicated electrical test can be largely defeated if the Service Man overlooks the existence of scratched faceplates, loose bases, peeled outer-coatings and similar important and obvious tube defects.

### Instrument Specifications

It has been found that, to disclose reliably the condition of present and future types of picture tubes, a portable service instrument should fulfill all of the following conditions:

- (1) Must be obsolescence-proof by providing a sufficient number of test circuits to anticipate future developments in both the black and white and possible types of color picture tubes. Experience in the receiving-tube field has proved that instruments which do not provide a maximum of circuit flexibility become prematurely obsolete as a result of new-tube developments.

<sup>1</sup>Precision CR-30.

(2) Must be minimum in size and weight, and of minimum complexity so that all tests can be performed quickly. The unit, also should not expose the operator to dangerously high voltages, and must therefore present reasonably low potentials to tubes under test, using appropriate test parameters which will positively relate directly to *screen brightness*. Test results must be immediately indicated in an obvious fashion, through the use of, for instance, limit sectors on a colored meter scale.

(3) The electrical tests must include:

(a) A hot-cathode leakage-short test at appropriate sensitivity to locate troublesome high and low resistance shorts.

(b) A (proportionate screen brightness) *beam-current* test with selected rejection limits, which will indicate the *end of useful life* point, related to actual use in average TV receivers.

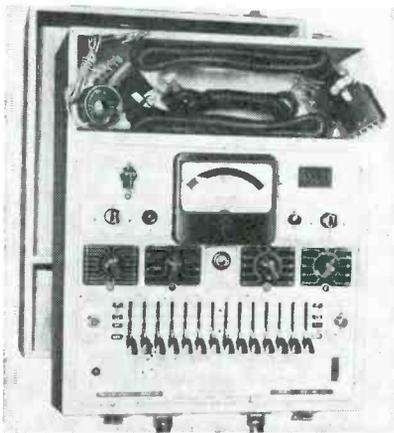
(c) Sufficient ranges of test parameter *sensitivity* to cover the complete required readable current range of from approximately 2000 microamperes down to less than 1/2 microampere.

(d) Sufficient flexibility to provide accelerating voltages to selected elements, preceding very low-current elements. If such facilities are not provided it would be difficult, if not impossible, to continuity-check suspected open elements which do not contribute to the *beam-current* test.

These factors served as the basis of planning and producing a portable field instrument<sup>1</sup>, illustrated in Fig. 6, with

(Continued on page 54)

Fig. 6. The 'scope-picture tube tester.



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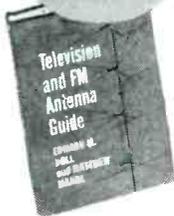
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by Edward M. Noll & Matthew Mandl

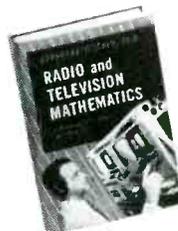
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## Picture-Tube Service

(Continued from page 53)

which it is possible to check tubes without removal from the chassis or the picture-tube carton.

To simplify scale reading on the instrument's meter, the good or *bright* sector was designed to occupy approximately 70% of the total scale displacement, with the definite reject sector extending over only approximately 12% of the scale. This apparent disproportionate distribution was included when it was found that values of beam current encountered in *good* tubes range all the way from approximately 1700 microamperes down to approximately 150 microamperes, under the selected set of test parameters. Brand new tubes range between approximately 500 to 1700 microamperes, while used tubes can normally be considered *useable* down to approximately 125 microamperes.

A color-gradient, in-between sector, labeled *dim to bright* was also included as a necessary leeway in judgment dependent upon the standards and attitude of any one particular set owner. It has been found that there is obviously no absolutely sharp line of demarcation between a bright and dark picture tube. Sensible interpretative limits are the only answer to the rejection point problem.

## Ser-Cuits

(Continued from page 31)

winding, rather than coming off the cathode of the rectifier tube. The pulses are filtered by  $C_{433}$ , a 22,000-ohm ( $R_{458}$ ) resistor, .05-mfd capacitor ( $C_{402}$ ) and the negative *agc* voltage, now pure *dc*, is fed back to the controlled stages. Since the positive sync pulse input to the grid varies with the signal strength, the output *agc* voltage will vary accordingly. Each controlled stage is decoupled from the *agc* line by *rc* networks to prevent interaction.

### Picture Tube

As noted in the preceding analysis, video information is fed to the cathode of the picture tube by direct coupling. Brightness is controlled by varying the bias voltage between cathode and grid. In this case, the grid is connected to a pot which varies the positive voltage on the grid. Since the cathode has a fixed positive potential, grid voltage can be varied from considerably less positive (more negative) than the cathode or cut-off to approxi-

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mately the same voltage or maximum brightness.

Both centering and focusing are accomplished by varying the position of a magnetic ring, mounted in a bracket, around the neck of the picture tube.<sup>1</sup> Focusing is varied by the adjustment of a threaded slug located at the top of the bracket. A non-magnetic screwdriver is recommended for the adjustment. Centering is accomplished by moving a lever extending from the assembly either horizontally or vertically as required.

#### Audio Strip

The 4.5-mc signal is amplified through two sound *if* stages, using 6AU6s. The FM signal is detected in an unbalanced ratio detector circuit using one half of a 6T8. A 4-mmfd capacitor,  $C_{204}$ , across the full load acts to limit the incoming signals and therefore cancel out the effect of amplitude variations. Audio information is fed to the other half of the 6T8, first audio stage, where it is amplified, passed to a 6AQ5 power output stage, and on to the speaker. The 20-inch models feature a 6C4 audio phase inverter and another 6AQ5 to give push-pull output. The audio output stage is connected between the +125  $v$  and the +325  $v$  points in the low-voltage power supply. As a result, the high positive cathode and control grid voltages are found in normal operation. To prevent interaction between the *pa* and other stages, a decoupling net composed of a 10-mmfd capacitor,  $C_{220}$  and a 220-ohm resistor,  $R_{217}$ , is used between the output transformer and *B+*. A 30-mmfd capacitor,  $C_{212}$ , from the low side of the stage to ground, also serves the same purpose.

#### Video Amplifier

The detected video frequencies are amplified in one stage of video amplification, using a 6AH6. Both series and shunt peaking are used to give adequate high-frequency response by counteracting the tube's interelectrode and the stray circuit capacity.

#### Direct-Coupled Plate

The plate of the video amplifier is directly coupled to the cathode of the picture tube. Since there is no capacitor coupling between the detector and the picture tube, there is no loss of the *dc* component and no *dc* reinsertion circuit is necessary. The contrast control is a pot used as the cathode resistor of the video amplifier

<sup>1</sup>Focalizer.

(Continued on page 56)

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## Ser-Cuits

(Continued from page 55)

stage. Varying the control varies the bias of the stage and thus the gain.

### Sync

The video signal is also taken from the video detector and directly coupled to the grid of a triode sync simplifier, one-half of a 12AT7. The entire video signal is amplified in this stage and passed on to the sync separator stage, one-half of the 12AT7, and the *agc* stage. The signal is positive in polarity at the grid of the sync separator, where clamping action takes place. Through the fast charge of two coupling capacitors,  $C_{403}$  and  $C_{404}$ , and their slow discharge, the video signals become pulsating *dc* in a negative direction at the grid, instead of *ac*. The sync pulses are on the top portion of the signal. Since this stage is run at low plate voltage, only the least negative part of the signal is amplified, the sync pulses, while the remainder of the signal, being more negative, drives the stage to cutoff, and thus does not appear in the output. The separated sync pulses are then fed to the horizontal and vertical sweep circuits.

## Direct Drive

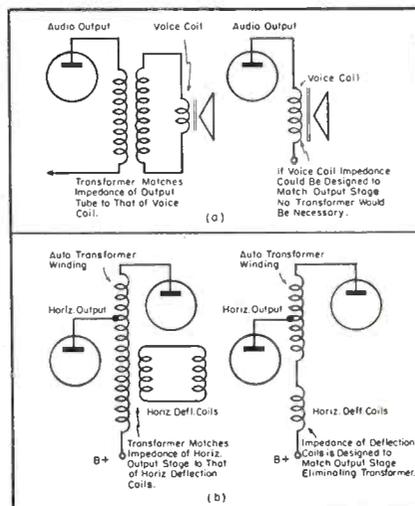
(Continued from page 38)

netic field for adequate deflection of the beam.

It was found though, that unlike the situation with the voice coil, there was no fundamental reason why the horizontal deflection coil had to have a low impedance. Increasing the impedance of the horizontal coil could provide a match to the impedance of the horizontal tube, and therefore a direct series

(Continued on page 57)

Fig. 2. Schematics arranged to explain matching problems in audio and horizontal output circuits. (Courtesy RCA Service Co.)



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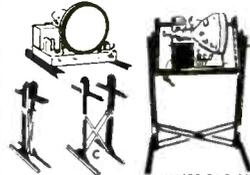
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connection could be affected; Fig. 2b. Less current going through more turns can provide as strong a magnetic field for deflection as is necessary.

Through the application of this technique, it has been possible to eliminate the need for a transformer type of drive, the deflection yoke being used as a portion of the output circuit of the horizontal sweep output tube.

The remainder of the deflection operation is similar to that used in previous models. Incidentally, because the impedance of the direct drive yoke is higher, a larger amount of boosted *B* voltage is available at the cathode of the damper tube.

#### PHILCO NEEDLE DISPLAY

A phonograph needle display merchandiser for four types of needles has been announced by the accessory division of Philco.

Featured are a rear drawer holding 48 individually packaged needles and displays for one needle of each type in a clear-view package at the top of the unit. Included are ruby, sapphire, long life and high quality phono needles.

\* \* \*

#### RAYTHEON BONDED DEALER PROGRAMS

Raytheon bonded dealer program campaigns have been recently launched by many Raytheon tube distributors throughout the country.

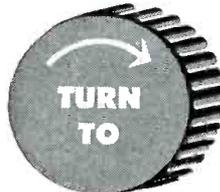
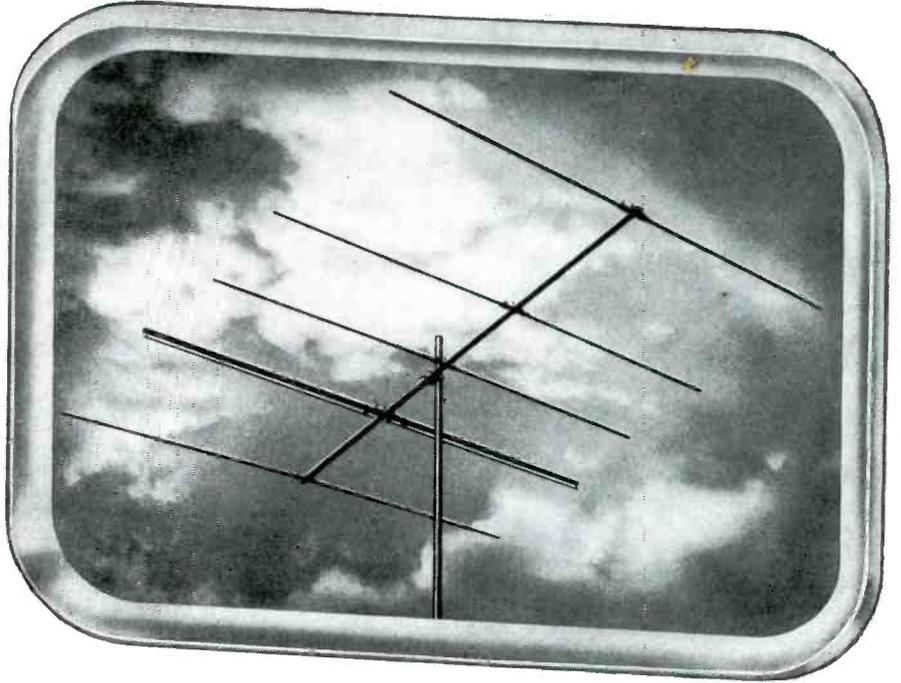
Among distributors reporting campaigns underway are: Metropolitan Radio-Electronics Corp., New York, New York; Trojan Radio Co., Inc., Troy, New York; Mattson's, Inc., Richmond, Virginia; Hi-Park Distributors, Detroit, Michigan; McGee Radio & Electric Co., Kansas City, Missouri; A. T. Stewart Company, Tacoma, Washington, and The Henderson Company, Los Angeles, California.

Almo Radio Co., Raytheon tube distributor in Philadelphia area, have launched a local consumer advertising campaign featuring the bonded program in support of their radio and television service customers. Final plans for the campaign were completed when F. E. Anderson and E. I. Montague of Raytheon's receiving tube division with L. D. Lowery, Raytheon rep in the Middle Atlantic States, recently visited Morrie Green, president of Almo.



Left to right: E. I. Montague, M. Green, L. D. Lowery and F. E. Anderson.

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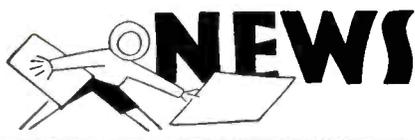
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A 42-page catalog, RC-8, has been published by the electronic components division, Stackpole Carbon Co., St. Marys, Pa.

In addition to a description of the standard line of fixed and variable resistors, line and slide switches, iron cores, choke forms and gimmick capacitors, cataloged are single, dual shaft and special purpose volume controls, 3-ampere slide switches, non-metallic cores in U, E, width control and segmented deflection yoke types.

\* \* \*

### SAMS DISTRIBUTING COYNE PUBLICATIONS

The distribution of the Coyne Electrical and Television-Radio School electronic and electrical publications through Howard W. Sams & Co., Inc., 2201 E. 46 St., Indianapolis 5, Ind., has been announced. Among the Coyne group of field reference and home study electronic-electrical technical handbooks and practical instruction material, Sams will distribute are the 1951 Coyne Television Cyclopaedia by H. P. Manly; Radioman's Handbook, by Manly; Starting an Electrical or Radio Business, by R. A. Snyder; Electrical, Radio and Electronic Dictionary; Applied Practical Radio-Television, and Television Servicing and Trouble Shooting, by Manly.

\* \* \*

### ELECTRO-VOICE DYNAMIC MICROPHONE BULLETIN

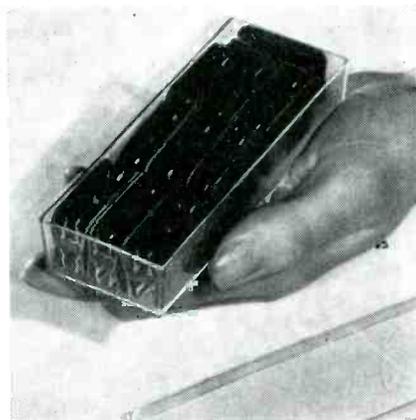
A bulletin, No. 160, describing E-V model 636 Slimair dynamic microphones, has been published by Electro-Voice, Inc., Buchanan, Mich. Bulletin shows how the unit can be used on a stand or boom, vertically or tilted, or in the hand.

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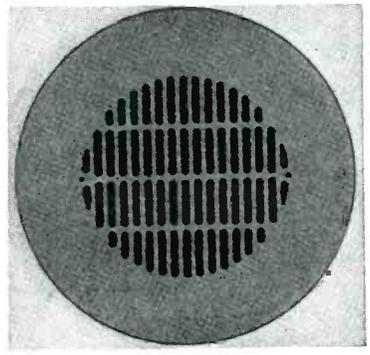
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## NEW-ENGLAND REP-NEDA DINNER

The New England chapter of *The Reps* and the Yankee chapter of NEDA will hold a Electronic-Radio and TV Industry dinner on Monday, April 16, 1951, at the Louis XIV ballroom and suite of the Somerset Hotel, Boston, Mass.

The dinner and entertainment committee are headed by Joseph A. DeMambro, Henri Jappe, Stanley A. Harris, Lou Scott, Art Ackeroyd, Jack Goss and William Pray. Tickets may be purchased from Joseph A. DeMambro, DeMambro Radio Supply Co., Inc., 1111 Commonwealth Ave., Boston, Mass., and Stanley A. Harris, 318 Harvard St., Brookline, Mass.

\* \* \*

## ZETKA ACQUIRES HALF INTEREST IN SIGHTMASTER COLOR TUBE PROCESS

Zetka Television Tubes, Inc., Clifton, N. J., has acquired the right to purchase an interest in Sightmaster's patent position for the sum of \$250,000. It is said that Zetka has already made a substantial payment on account.

These patents are said to cover an increase in the brightness of a tube and the intensity of the primary shades of the spectrum; red, blue and green.



Meyer Bonuck, president of Zetka.

\* \* \*

## JFD TV ANTENNA AND ACCESSORIES CATALOG

A TV antenna and accessories catalog, No. 58G, has been announced by JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y.

Covered are antennas, brackets, mounts, screw eyes, lightning arresters, indoor antennas, masts, insulators, transmission lines, guy and ground wire. Also included are additions to the JFD line such as the *Long-Ranger* yagi antennas.

\* \* \*

## E-V CARTRIDGE REPLACEMENT PROGRAM

A phono-cartridge replacement-modernization program for distributors and Service Men has been launched by Electro-Voice, Inc., Buchanan, Mich. One of the keynotes of the campaign is the question, "When did you last change your phono-cartridge?"

\* \* \*

## ED HINCK HEADS DU MONT COMPONENT SALES

Edwin B. Hinck has become sales manager of the Electronic Parts Division, Allen B. DuMont Laboratories, Inc., 35 Market St., East Paterson, N. J. Hinck succeeds Harry Van Rensselaer, who has been recalled by the Air Force, in which he holds the reserve commission of Major.

# 22 YEARS and 28 Manuals TELL THIS STORY

Most servicemen inform us that they prefer RIDER MANUALS for their absolute reliability. Daily, they depend upon our Factory-Authorized, Factory-Accurate servicing information (from the service departments of the receiver manufacturers themselves) to speed repairs... remove all guesswork... and assure the satisfactory completion of repair jobs, whatever their nature.

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Despite severe production difficulties, this new "BIG" TV Manual is ready for you. However, due to extreme paper shortages, we were unable to produce as many as we feel will be required. So make sure of your copy... order it from your jobber TODAY! This is another

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**SNYDER PERSONNEL BOOKLET**

A booklet, explaining in detail everything workers should know about their job and the company, has been published by Snyder Manufacturing Co.

\* \* \*

**RCA VOLUME 5 SERVICE DATA NOW AVAILABLE**

The fifth volume of RCA Victor Service data which provides service and technical data on all '49 models of RCA TV and radio receivers and phonos, is now available.

Contains the information, provided by the single service-data booklets issued during '49, for individual RCA instruments. Includes schematic and wiring diagrams, electrical and mechanical specifications, alignment and adjustment procedures, complete service parts lists, and chassis layouts.



\* \* \*

**FAIRCHILD APPOINTS CREWS VICE PRESIDENT**

Ray F. Crews has been appointed vice president in charge of sales for the Fairchild Recording Equipment Corp., White-stone, New York.

\* \* \*

**RCA TUBE DEPARTMENT PROMOTIONS**

W. L. Rothenberger, formerly assistant general sales manager, has been appointed manager of sales operations of the RCA tube department. He will coordinate the activities of the renewal sales and equipment sales sections.

L. J. Battaglia has been appointed manager of the renewal sales field force. L. F. Holleran has been named manager of sales administration, and G. C. Brewster has been appointed manager of the sales planning section. M. R. Stoecker is manager of the product distribution section.

Lawrence LeKashman has been named manager of the advertising and sales promotion section. Howard S. Gwynne has been appointed assistant to the general sales manager.

\* \* \*

**WELLER SOLDERING GUN CATALOG**

Soldering information, helpful to TV and radio technicians, is contained in a soldering gun catalog recently issued by Weller Electric Corp., Easton, Pa.

Fully illustrated, the catalog covers the line of Weller guns and features a new light-duty model with dual spotlights.



**"When did you last change your Phono-Cartridge?"**

**That's your \$70 (Million) question, Mr. Service-Dealer!**

Right now . . . 10,000,000 old style, heavy, stiff-acting phono-cartridges in existing record players are *obsolete*. They limit reproduction. They rapidly wear out valuable records. They should be replaced immediately with *modern, lightweight, compliant* cartridges that guarantee greater record enjoyment, longer record and needle life. Current cartridges that operate inefficiently should be replaced, too.

So check the cartridge on every job . . . ask every record player owner this simple question: *"When did you last change your phono-cartridge?"* You'll render a service your customers will appreciate—you'll sell replacements like never before—you'll make more money!

Now for better playing, record saving performance . . . REPLACE . . . MODERNIZE with easy-to-install E-V Cartridges. Exclusive features of E-V Torque Drive make it ideal for fast and slow speed records. Has extra-high voltage-compliance ratio. No bearings or bushings to deteriorate. Simplified design permits maximum replacements with fewer models. Single and dual needle types. Used today in original equipment of many leading manufacturers.

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**Modern, compliant needle system**



**Old style, stiff-acting needle system**

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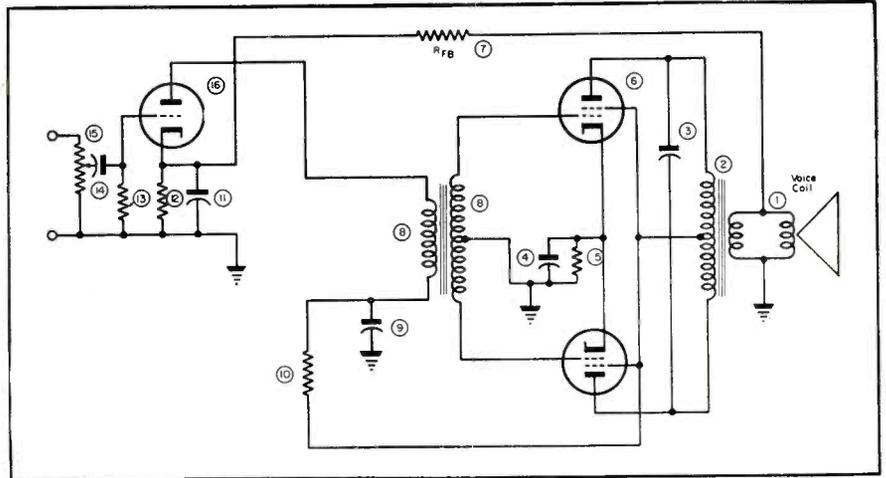


Fig. 4. Typical output stage using input transformer. Procedure detailed for push-pull system (p. 27) should be applied here, too. Input transformer should be checked for high-resistance joints or leakage to ground.

## Servicing Intermittents

(Continued from page 27)

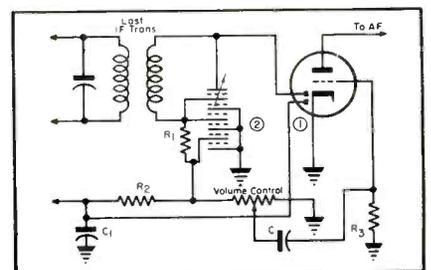
by a drop or complete loss of volume. These should be checked in the same manner as a field coil, by shorting the plate to ground. A defective winding will give up the ghost, and a good one will not be affected. Another mysterious fault might also be found at this point in the small bypass units connected across the primary. Often they have .003 to .02-mfd values which break down or leak. This will bypass all audio signal to ground, and leave the set dead; yet all voltages will be okeh. A *dc* resistance check from plate to screen will show up this difficulty. If still in doubt, one end of the capacitor can be disconnected and subjected to a breakdown test of at least 500 volts. Incidentally, the capacitor-tester will prove a very valuable instrument on these witch hunts. They can serve to track down every suspected capacitor. These are tests that will pay off.

A sudden drop in volume, with some distortion, can be due to an intermit-

tent cathode bypass on the power tube. The bias resistor should be checked to see if it has changed in value. If it is over 20% off, it should be replaced. Bias voltage should be checked at the grid and the supply end of the bias resistor. If there is more than one volt difference in the readings, the coupling capacitor should be replaced. The tube must be checked carefully first for it may have developed a leakage, and be developing a positive voltage on its own grid. It has been found that the 50L6s, 35L6s, 50A5s and 50B5s are the worst offenders in this respect. The grid resistor must be tested to be sure that it still has the proper value. Too much resistance in the grid of a power-amplifier stage can upset the characteristics, and so can too little.

If the set has a phase-inverter stage, the load resistors should be checked for balance. An unbalance here can play havoc with both tone and volume. If the phase inverter tube is a twin-tri-

Fig. 5. Combination trimmer if filter-capacitor assembly (2) used in numerous late-model sets. Trimmer assembly must be checked carefully for leakage or shorts; unit may be disconnected and replaced with separate components outside the can, if necessary. The gas-gate diode (1) used to minimize effects of gas-current on *avc* voltage must be checked, too.



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ode, both halves must be checked for balance in emission or mu. If the set has a driver or input transformer, all windings, especially the primary, must be checked for high-resistance joints.

### Second-Detector Stage First-Audio Troubles

In this area the plate-load resistor which has shifted or opened is often a sore spot. These resistors run from .5 megohm on up, and an increase in value not only removes the gain, but the plate voltage. If the tube is a pentode, the screen resistor must be checked; it's ordinarily around 3.3 megohms. If it opens entirely, you'll have low volume and distortion.

As in the previous instance, coupling capacitors, here too, must be checked very carefully; not only those between the first *af* and the power tube, but the units from the volume control to the first *af* grid. Many, many intermittents have been run down in these parts of the chassis, where symptoms are sudden drops in volume or complete cutoff. To check, an insulated probe should be used, moving the leads of the suspected capacitor. A good probe can be made out of an old fiber tuning tool, of 1/4" rod. A slot, about a half-inch deep, should be sawed in one end, making a kind of fork. This slot may be slipped over wire leads of capacitors, resistors, etc., with the leads being pulled or tugged about to check connections.

### Volume Controls

Volume controls can be the cause of an intermittent, especially if they're very dirty. If the slider happens to stop on a bad spot, the set may cut completely off. There are several excellent cleaning compounds on the market which will clear up this trouble, unless of course the control is actually worn out.

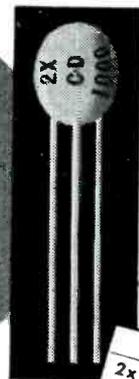
It is important to watch out for loose connections on the rivets which hold the lugs and make connection to the ends of the resistance strip. These can be tested by twisting them gently with the slotted tool. The only cure for this is replacement.

Output *if* transformers in some post-war sets used a combination *if*-trimmer *if*-filter capacitor arrangement, with the filter resistor mounted inside the can. These have been found to give quite a little trouble, usually of shorting-out type. If your intermittent seems to center around the last *if* stage, the trouble may be due to a defect in one of these gadgets. If so, the transformer must be replaced. If a

(Continued on page 64)

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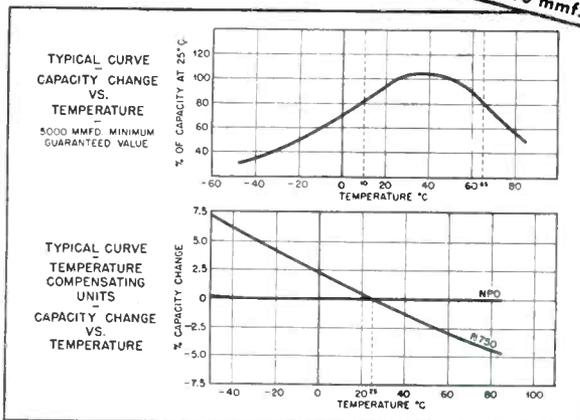
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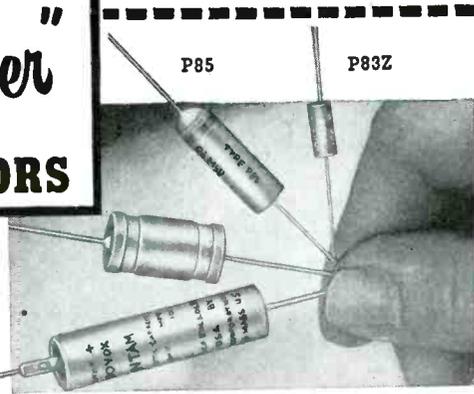
### ELECTRONICS PARK SERVICE MEN MEETING



Representatives from G. E. Supply Corp., who attended a recent meeting of distributor-factory receiver division product Service Men at Electronics Park, Syracuse, N. Y. Left to right: W. L. Parkinson, manager of G. E. product service and conductor of the week-long meeting; and GESCO representatives A. B. Sherwood (Los Angeles); C. L. Reeve (Seattle); R. W. Nicols (Atlanta); L. H. Taylor, national product service manager (Bridgeport); and J. Catterall (Boston).

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• • • • •  
Ask your Aerovox jobber about these miniaturized capacitors. Try them!

## Servicing Intermittents

(Continued from page 63)

similar replacement is not available, a modified standard can be used. The *if* filter can be made up of two 100-mmfd micas and a 47,000-ohm resistor, mounted just outside the can.

One more common trouble has been found around this stage; the mica capacitor on the first *af* plate to ground. These will give rise to a crackling noise and often a cutout, by becoming leaky. If this *crackling* noise appears, and everything else seems all right, you should try disconnecting this capacitor. If these are replaced with the ceramic type, no further trouble will be experienced.

### The IF Stages

Intermittent troubles in *if* stages can be of the cutout or intermittent-oscillation type. Cutouts may be due to shorted trimmers, if the transformers are of that type, or in partly open or corroded windings. An ohmmeter should be used to check the resistance of each winding, which should be the same, within one or two ohms. Resistance may differ between input and output transformers, but as a rule the two windings of any one transformer should be identical. Bad primaries should be tested just as output transformers are tested. They should be shorted temporarily to ground. Bad windings will be knocked out, good ones unaffected. In a quick test each trimmer can be turned just a little. A good winding will peak sharply, but a high-resistance winding will have a very broad peak, if any at all. Transformers with such a wide peak are bad, and should be replaced. Although it is the primary which suffers most of these troubles, the secondaries should not be overlooked; every now and then you'll find one open, too.

### Intermittent Oscillation

Intermittent oscillation may be traced to several causes. If the set has shields over the *if* tubes, you should be sure that they are tight and well-grounded. In some of the older sets, the shields were grounded by a ring, or clip, which fastened to the chassis on the same rivets which held the socket. Old age and corrosion often cause a very bad ground at this point. Scraping clean and soldering firmly to the chassis will help. Tie-points, with a center-lug used as a ground for bypass, are sometimes fastened down in the same way. This



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H. G. CISIN, well-known to radio men as a recognized electronic engineer, inventor, technical author and educator, has trained thousands of television technicians, many of them now owning their own prosperous TV service organizations. The results of his years of experience are embodied in this remarkable **TV TROUBLE SHOOTING METHOD**.

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FIRST in Television Antennas and Accessories

has accounted for many a puzzler, when this ground connection becomes bad.

### Intermittent Bypass Troubles

Intermittent bypass capacitors in screen and plate return circuits are the cause of much intermittent oscillation. They should be checked with the slotted tool, working them back and forth vigorously. Incidentally, an intermittently open filter in the power supply of *ac/dc* sets can also cause *if* oscillations. These filters are used also as *rf-if* plate return bypasses, and an intermittent connection can cause all sorts of weird effects. They should be checked by bridging with a good capacitor. Sometimes this may appear to clear up the trouble permanently. However, this expedient should not be relied on, and a permanent cure made by replacing the capacitor, or the same trouble will recur.

### Rosin-Joint Problems

It is important to watch out for *rosin-joints*, especially inside the transformers themselves. Don't think your new replacement transformers are immune, either! Recently, we were involved in two call backs because of a rosin-joint in a freshly-replaced *if* transformer! If an intermittent shows up in an *if* stage, the transformer should be checked carefully, and if still in doubt, the transformer should be removed from the can and all the joints resoldered.

### Leaky Trimmers

Leaky or shorted trimmers will give trouble in *ifs*, too. If moisture gets to them, they'll leak, and tune broadly. If they are noisy, it'll usually show up when they are tuned, with popping and cracking noises.

### Wire Tests

It is important to watch out for wiring shorts involving wire used in the older sets with soft rubber-coated wire, which deteriorates with age, and the newer sets wired with some types of plastic-covered wire, which have been found to be very heat-sensitive! The heat, resulting from the soldering of a joint, will sometimes soften the insulation of a wire for as much as two inches, and cause shorts to adjacent lugs, chassis, etc. If you

get a case of this, the whole wire should be replaced with braid-covered wire, and that trouble will be over.

Speaking of excess heat, if you meet a *heat-up-and-quit* intermittent, it should be looked over closely for signs of excess solder, particularly on the terminal strip or socket lug. We've found this numerous times, and it's given trouble every time. If too much solder is applied to a joint, the excess will run on below the lug, out of sight, and occasionally a drop will form, almost touching the chassis. Thermal expansion of the parts will cause this

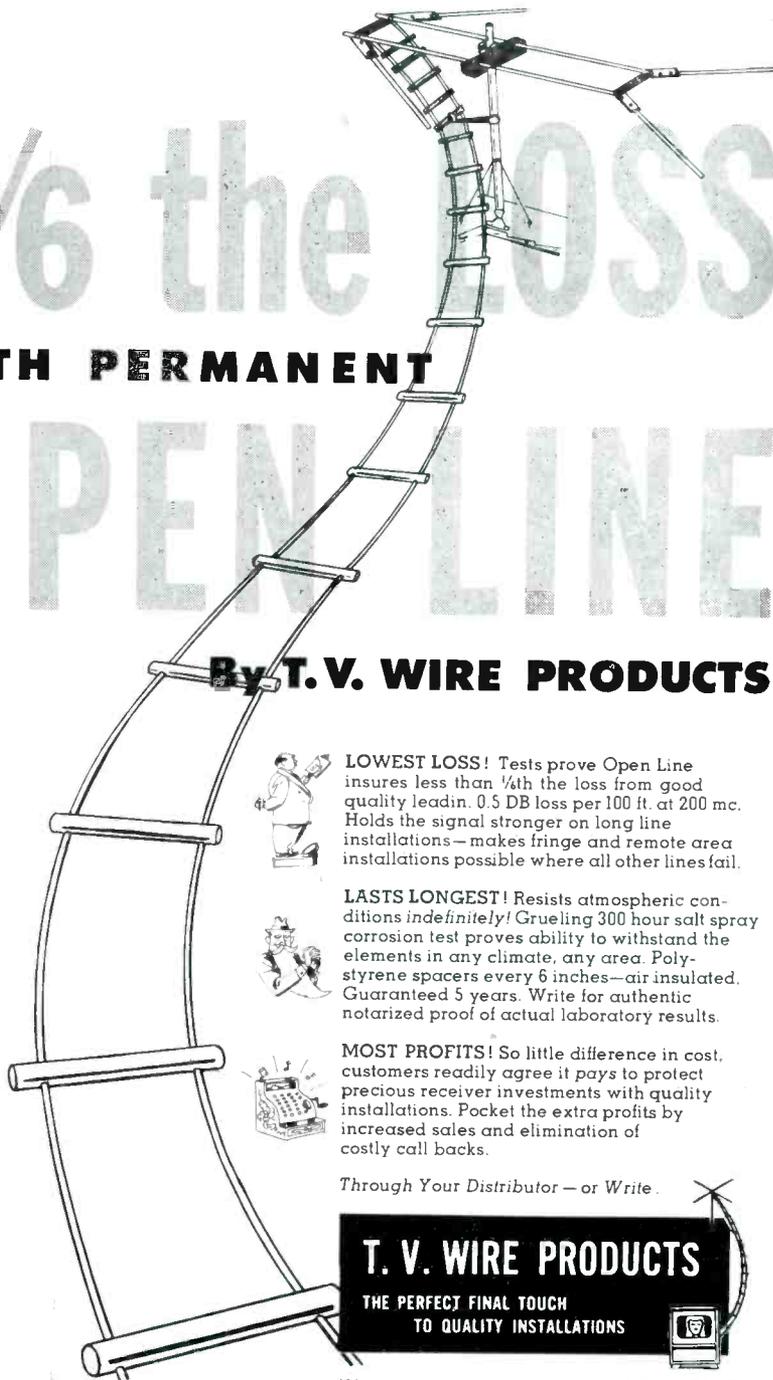
to touch and short out. All lugs and socket connections should be checked, too; this is sometimes the result of careless servicing, on someone else's part, of course! Small bits of wire, left in the chassis after being clipped off, are good prospects for intermittents, too. Pick 'em out and throw 'em away!

### An Apology

THE ADVERTISEMENT of Sangamo Electric in the February issue of *SERVICE* should have appeared in red, and not in green.

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## CISIN'S TV TROUBLE SHOOTING BOOK

A 23-page book, *Rapid TV Trouble Shooting Method*, showing Service Men how to locate the causes of TV troubles by means of a novel trouble-shooting method has been published by H. G. Cisin, 200 Clinton St., Brooklyn, N. Y.

There are three basic steps used in the method: Recognition of the nature of the trouble through the use of tabulated trouble symptoms (approximately 85 picture-trouble symptoms are listed alphabetically), application of thirteen special checks to a defective section of the receiver, and instructions for locating such faults.

Book also contains 69 rapid checks and 25 waveform illustrations.  
Priced at \$1.00.

\* \* \*

## VEE-D-X CATALOG

A 16-page catalog describing the line of Vee-D-X television antennas and accessories, has been issued by The La-Pointe-Plascomold Corp., Windsor Locks, Conn.

Along with technical, installation, and ordering data on all antennas, the catalog contains general information of interest to the trade. Considerable space has been devoted to such products as the Vee-D-X lightning arrester, the 3-way switch box, the mighty-match, and to Vee-D-X towers.

## TV Booster

(Continued from page 32)

spite of an actual reduction in gain of the tube itself, due to screen grid *swinging*.  $L_s$  may be adjusted to compensate for differences in tube characteristics. However, if  $L_s$  is increased beyond a certain point it will become parallel resonant with the screen grid to ground capacity at signal frequency and cause the circuit to oscillate.

The tuning inductors are printed on phenolic discs. Incremental variation

## VEE-D-X for the finest LIGHTNING ARRESTERS at the Lowest Prices



**New!**  
**2-WIRE  
RW-200**  
only **125**  
LIST

**4-WIRE  
RW-204**  
only **150**  
LIST

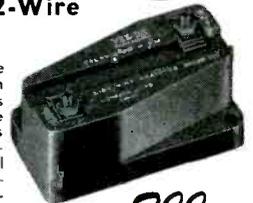
The first and only arrester that will accommodate 4-wire rotator line as well as regular 2-wire transmission line.

The new VEE-D-X Model RW-200 is the popular low-priced arrester. Similar in design and construction to the RW-204. Two saw tooth contact points assure positive protection for any 2-wire installation.



**The Original 2-Wire  
RW-300**

For use with 2-wire standard transmission line. An air gap plus resistor provide double protection. RW-300 is manufactured of moisture resistant Mica-fill Bakelite. RW-300A — highest quality thermo-setting plastic.



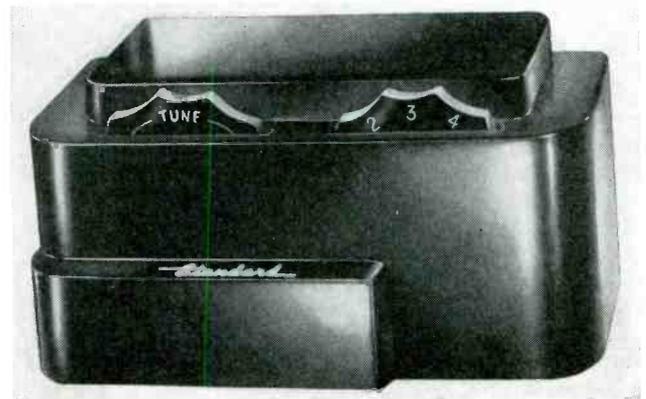
only **200**  
LIST

LA POINTE-PLASCOMOLD CORP., WINDSOR LOCKS, CONN.

of inductance is employed. Tuning would be continuous over the high-frequency channel band were it not for a detent action of the selector knob. The low-frequency channels vary in discrete steps.

### Voltage Gain Data

The average voltage gain has been found to be 6 or 7 on the low-frequency channels and 5 or 6 on the high channels. Bandwidth to a 6-db point will average 5 mc on the low channels and 6 or 7 mc on the high band.



Front view of 6AK5  
TV booster.

# New Parts . . . Instruments . . . Tools . . . . .

[For additional new-part news see page 43]

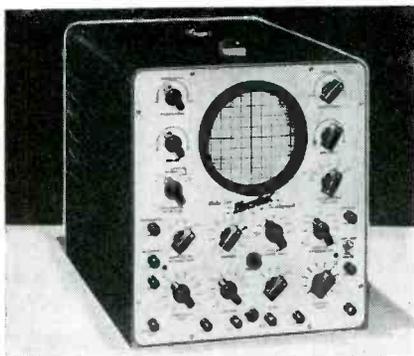
## HICKOK 5-INCH 'SCOPE

A 5-inch 'scope, model 640, with a wide-band amplifier whose *dc* frequency response is said to be from 0 to 4.5 mc, down 3 db, is now available from Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio.

Vertical *dc* and *ac* amplifier is said to have a 10-25 mv-per-inch sensitivity. Unit is said to provide a maximum input potential of 1,000 volts peak, and an input impedance of 2 megohms, 50 mmfd. Horizontal amplifier has a direct deflection factor of 20 volts *rms* per inch; at full gain settings it is 50 millivolts and the frequency response is 0-200,000 cycles.

Test signals available at a line frequency of 3 volts per inch. Saw-tooth available from front panel; direct connection to both horizontal and vertical deflection plates. Linear time base, recurrent and driven sweep, 2 to 30,000 cycles. Provides for external capacities for slower frequency sweeps of 10 seconds and slower. Sweep speeds are said to be faster than .75 inch per microsecond. TV fixed frequencies are 30 and 7,875 for observing blanking and sync waveforms. Synchronization is at line or two times line frequency.

Provides Z-axis modulation, capacitively coupled to the grid of the 'scope tube; 15 volts will, it is said, blank trace fully at normal intensity.



\* \* \*

## PYRAMID HEARING-AID CAPACITOR

A tubular paper capacitor, type 65PTR, rated for 65° C at 150 *vdc* has been announced by Pyramid Electric Co., 1445 Hudson Boulevard, North Bergen, N. J.

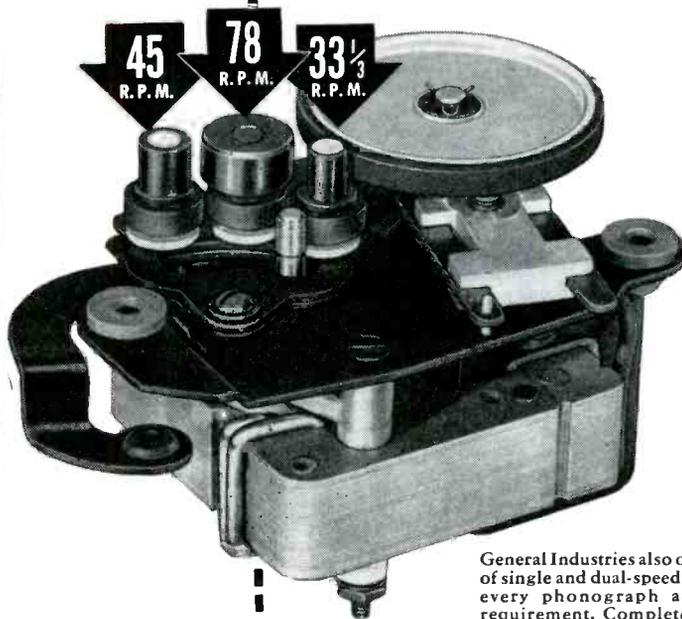


HEART  OF A *good* RECORD-CHANGER

It's General Industries' turret-type, 3-speed motor, currently being supplied to record-changer manufacturers.

In this highly efficient design, turntable speeds of 33 $\frac{1}{3}$ —45 and 78 RPM are secured through three separate pulleys mounted on a turret plate. By means of a simple lever, the desired pulley is brought into contact with the idler wheel. The two pulleys not in contact with the idler wheel remain stationary.

In addition to this turret-type motor, General Industries also offers the popular Model TR turret-type, manual 3-speed motor, as well as the Model TS belt-driven 3-speed motor for both manual and record-changer applications. Write today for full information on all models.



General Industries also offers a complete range of single and dual-speed phonomotors to meet every phonograph and record-changer requirement. Complete details on request.

**The GENERAL INDUSTRIES Co.**

DEPARTMENT O • ELYRIA, OHIO

## CLAROSTAT SWITCH DUST COVER

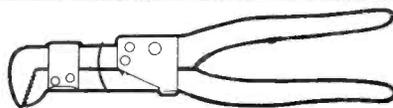
A pry-off dust cover for *Ad-A-Switch* controls has been announced by Clarostat Mfg. Co., Inc., Dover, N. H.

Construction features a single-piece metal casing with scored center section and tab. Section is said to pry open and tear off, leaving the control casing open to take the proper switch. Two lugs on the *Ad-A-Switch* engage with side straps, and are slightly bent to hold the switch firmly in place. Switch mechanism and control rotor are aligned. Six types are available. Inclusion of the *Pick-A-Shaft* feature provides a choice of twelve shafts.

## COLMAN WRENCH

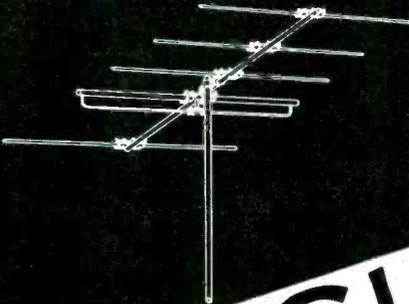
A tool, the *Power-Grip* wrench, is now available from the Colman Tool & Machine Co., P. O. Box 364, Amarillo, Texas.

Featured are a rack and pinion action with an angle head that is said to afford extreme pressure application in inaccessible spots. Head thickness is  $\frac{1}{8}$ " while overall length is 5 $\frac{1}{4}$ ". Jaw opening gives an infinite number of sizes from 0 to slightly over  $\frac{1}{2}$ ".



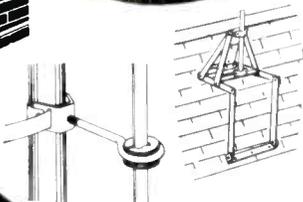
# Phoenix

Speed-Tennas  
Speed-Mounts  
Hardware



## HIGH GAIN YAGI

HIGH GAIN  
INLINE



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300 OHM WIRE  
ALSO ROTOR 3-4-6 WIRE

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YOUR PARTS JOBBER

## Rep Talk

GRADY DUCKETT, 1145 Peachtree St., N. E., Atlanta, Ga., has been appointed sales rep for Newcomb Audio Products in North Carolina, South Carolina, Georgia, Tennessee, Florida, Alabama, and Eastern Mississippi. . . . *Kenneth Randall*, 121 N. Broad St., Philadelphia 7, Pa., has been elected to senior membership in the Mid-lantic chapter of the Reps. . . . *Frank W. Rauer*, 4144 Marvin Ave., Cleveland 9, Ohio, has been elected to senior membership in the Buckeye chapter of the Reps. . . . *J. T. Hill Sales Co.*, Los Angeles has been appointed sales rep for Waldom Electronics, Inc., Chicago, in Arizona and Southern California. . . . *William A. Wright* has joined the staff of Harold A. Chamberlin covering the New York State area. . . . *G. G. Williamson Co.*, 2030 Harold St., Houston 6, Texas (covering Texas, Oklahoma, Arkansas and Louisiana), *R. J. Kennedy*, 522 South Cook St., Harrington, Ill. (covering Illinois, Lake and Porter Cts. in Indiana, eastern Wisconsin, east of a north and south line through Wausau and Madison, including Madison and Wausau), and *Garrett M. Lowman and Associates*, 507 Westlake Ave., N., Seattle, Washington (covering Washington, Oregon and Alaska) have become sales reps for Circle-X Antenna Corp., Perth Amboy, New Jersey. . . . *John B. Tubergen*, 1406 South Grand Ave., Los Angeles 15, Calif., has been named sales rep for Hi-Lo TV Antenna Corp., 3540 N. Ravenswood Ave., Chicago 40. . . . *John B. Pepper*, Box 142, Savannah, Ga., has been elected to associate membership in the Dixie chapter of the Reps. . . . *Frank J. Perna*, 111 South 22 St., Philadelphia, Pa., has been elected to associate membership in the Mid-lantic chapter of the Reps. . . . *Arnold Robert Andrews*, 521 Cumberland Ave., Syracuse, N. Y., has been elected to senior membership in the Empire State chapter of the Reps. . . . *William J. Purdy, Jr.*, 79 Ninth St., San Francisco, Calif., has joined the California chapter of the Reps. . . . *John Albert Keeneth*, 29-09 Bridge Plaza North, Long Island City, N. Y., is now an associate member of the New York chapter of the Reps. . . . *E. V. Roberts and Associates*, Los Angeles, Calif., have been named sales reps for Rutherford Electronics Co., 3724½ S. Robertson Blvd., Culver City, Calif., in the states of California, Arizona, Nevada and New Mexico. . . . In Ohio, western Pennsylvania, Kentucky, and West Virginia, the *Ernest P. Scott Co.*, Cleveland, Ohio, has been appointed ITI factory rep. In the state of Indiana, the

At the recent dinner-dance of the Reps and NEDA, in N. Y. City. Among those present were Julius Bressler, Dan Bittan, Joe Sprung, Leon Adelman, etc.



First Time Advertised!

## NEW PRECISION WIRE CUTTER

Just hook on, press the trigger and SNIP. That's the new easy way to safely cut copper wire of 18 gauge or less in hard to reach places. This "easy-action" wire cutting tool features a hi-carbon steel tip that assures a clean, quick cut. You never cut the wrong wire.



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THE POSTAGE**

Put this pencil-thin "service man's dream" in your repair kit. Order from your jobber. If he can't supply, send check or money order direct. Complete satisfaction or money refunded.

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COLUMBUS, OHIO

Central Sales Company of Fort Wayne will represent ITI. . . . *M. P. Mack*, 1427-16th St., Denver Colorado, and *Russ Hines Co.*, 234 Ninth St., San Francisco, Calif., have been named Webster Electric cartridge-sales reps in their respective territories. . . . *The George Pettit Co.*, 549 W. Washington Blvd., Chicago, has become a rep for Jensen Industries, Inc., and will cover Illinois and Wisconsin. . . . *William H. Clithero, Jr.*, 3100 Hedgerow, Dallas, Texas, has been appointed district manager for N.U. in the southwest. He will serve the states of Texas, Oklahoma, Arkansas and Louisiana. . . . *Art Cerf & Co.* now represents Newcomb Audio in Eastern Pennsylvania, Washington, D. C., Delaware, Maryland, New Jersey and all of New York State including Metropolitan New York City and Long Island. In Virginia he represents Newcomb through Dave Brothers, 3581 Boarman Ave, Baltimore, Md.

**LIPPERT AND FOWLER HONORED**

Kenneth Fowler and Harold B. Lippert of the G. E. electronics department, recently received the company's highest honor, Charles A. Coffin Awards, for their preparation of *Television Principles and Practice*.

The men were jointly cited for their "outstanding vision and persistence in preparing for publication the text of an effective television service course."

Fowler, who has been with G. E. since '42, joined the company at Bridgeport, Conn., as a circuit analyst, and has been engaged in field service engineering for the receiver division here since '47. He is currently supervisor of this section.

Lippert, a graduate of the G. E. Electrical Engineering School, and with the company since '27, has served as lab assistant and field engineer, and in '47 was made supervisor of technical publications for the receiver division. He is now supervisor of the government instruction book section.



K. Fowler



H. B. Lippert

\* \* \*

**HELIPOT CATALOG**

A 32-page catalog devoted to technical discussion of potentiometers including linearity, noise, torque, resolutions and non-linear functions, has been published by Helipot Corp., S. Pasadena, Cal.

\* \* \*

**BOZZELLI JOINS HAYDU**

Joseph F. Bozzelli, formerly assistant sales manager for Brach Manufacturing Co., has been named general sales manager of Haydu Brothers, Plainfield, N. J. He will direct the sales and promotional program for television and receiving tubes, transmitting and industrial tubes and precision products.

\* \* \*

**PENTRON APPOINTS SCHNEIDER PURCHASING ASSISTANT**

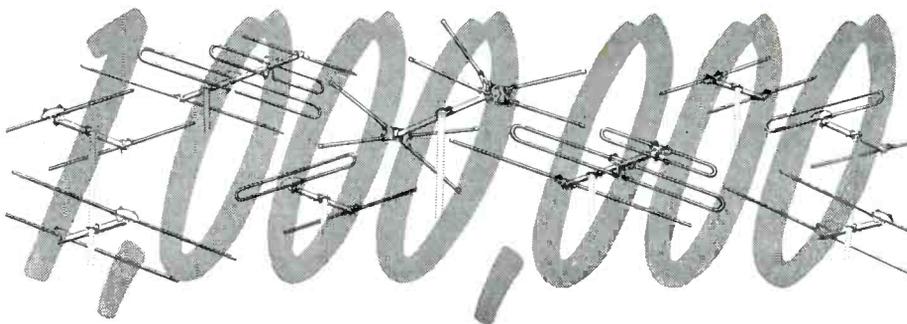
Henry Schneider, formerly with Stewart & Warner, has joined the Pentron Corp., 221 East Cullerton Street, Chicago, as assistant to Irving Rossman, director of purchasing for Star Products, Sound Incorporated and the Pentron Corp.

\* \* \*

**CINEMA CATALOG**

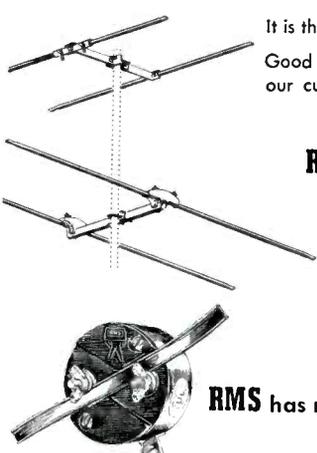
A 36-page catalog, 11-AY, with product pictures and descriptions of sound equipment, has been published by Cinema Engineering Co., 1510 W. Verdugo Ave., Burbank, Cal.

Listed are jacks and accessories, control knobs and dials, orthacoustic equalizers, etc.



**IN NUMBERS THERE IS STRENGTH!**

It is the strength of purpose . . . and that purpose is to build quality products. Good quality, consistent quality — of products and of personal service to our customers . . . is the underlying reason why:



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**RMS** has produced over 250,000 TV Boosters and is the oldest booster manufacturer in the business!



**RMS** has made over 1,000,000 lightning arrestors for radio and TV!

**RMS** has manufactured over 25,000,000 pieces of essential TV hardware!



We sincerely thank those who made this possible . . .

**The radio and TV Jobbers who appreciate quality . . . their servicemen and dealer customers who demand quality!**



**RADIO MERCHANDISE SALES INC. NEW YORK 59, N. Y.**

**HENRY L. CROWLEY RECEIVES DOCTORATE**

In recognition of his contributions to the ceramic and metallurgical arts, the honorary degree of Doctor of Engineering was conferred recently on Henry L. Crowley, who heads Henry L. Crowley & Company, Inc., West Orange, N. J., manufacturers of steatite parts and powdered-iron cores, by his alma mater, Stevens Institute of Technology.

\* \* \*

**BULLARD NOW G. E. TUBE DIVISION MANAGER OF MANUFACTURING**

R. O. Bullard has been appointed manager of manufacturing of the G. E. tube divisions.

**HEATH KIT BULLETIN**

An 8-page issue of the *Flyer*, describing instrument kits, has been released by the Heath Co., Benton Harbor, Mich.

Included are kits for receivers, 'scopes, generators, audio-generators and vtvm. Other kits described include those for an impedance bridge, power supply, signal generator, tube checker, and hi-fi amplifier.

\* \* \*

**FEDERATED PURCHASER HOUSE ORGAN**

An issue of *Mr. Fed* has been released by Federated Purchaser, Inc., 66 Dey St., New York 7, N. Y.

Covered are special merchandise savings and tube allocation material. Featured is a cash for ideas program that will aid both the employee-management front.

# NEW IMPROVED TV SERVICING TECHNIQUE!

Developed by OAK RIDGE Engineers, this new, simplified technique permits better servicing of TV sets, RIGHT IN THE HOME, by the only foolproof method: Signal Tracing by Signal Substitution!

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 Model 101 Substitution Tester, Dealers' Net \$17.95  
 Model 102 High Voltage Meter, Dealers' Net 17.95  
 Model 103 Signal Generator, Dealers' Net 33.50  
 Model 104 "Synchro-Sweep", Dealers' Net 44.50  
 Complete laboratory Model A-100 illustrated above, includes four individually removable instruments in carrying case, Dealers' Net \$122.40  
 Model X-100 four units permanently mounted in carrying case, Dealers' Net \$112.00

**EVERY TV SERVICEMAN NEEDS NEW OAK RIDGE TECHNICAL BOOKLET "TV SERVICING TODAY"**  
 A GOLD MINE of valuable information! Describes new servicing technique in detail. Acclaimed by servicemen as a great forward step, a tremendous time-saver, and a wonderful improvement in servicing efficiency. Write today for **YOUR FREE COPY!**

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**TV CONICAL ANTENNA (Dubi-X)**—Sturdy Prefab Const. Versatile 72, 150 or 300 ohm Match. Incl. 8 elements and 100 ft. All-Copper Twinex, Cross Bar and Hardware. Brand New. Only \$9.49  
**Dubi-Stacked Conical Array**—Similar above, but with 16 elements and all hardware plus 2 crossbars and 100 ft. All-Copper Twinex. Brand New. \$12.98  
**TWINEX 300 OHM WIRE**—7-Strand ALL-COPPER each lead. Low-Loss, Brown, 55 mil. Web. Per 1,000-foot spool. \$29.95

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1U5 ... .95	6J6 ... 2.75	26Y5/25Z5 ... .70
1X2A ... 1.59	6L6A ... 1.98	3SZ4GT ... .95
2X2 ... .98	6SN7GT ... 1.32	3SZ5GT ... .90
3Q5GT ... 1.25	6U4/8W4 ... .95	50A5 ... 1.35
3S4 ... 1.05	6V6GT ... 1.20	60C5 ... 1.03
5V4 ... 1.05	6X4 ... .89	50L6GT ... .99
5U4G ... .99	7C5 ... 1.08	Tubes Gtd. Via
5Y3GT ... 1.25	12AU7 ... 1.92	R. Exp. Only.
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**Top Dollar for Your Surplus Tubes**  
 Receiving • Transmitting • Industrial  
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 Cor. Church and Liberty St. Room 200. Phone WO 2-7230

## Tube News

(Continued from page 36)

tral density gray filter to increase the contrast ratio, and an electron gun designed to be used with a single-magnet external ion-trap magnet.

The anode 2 voltage for the tube is 12,000 dc, while the anode 1 voltage for beam current at 100 microamps is 2300 to 3100 dc. Anode 1 current (microamps) is from -15 to +25 dc. Voltage for the 2 grid is 300 dc.

In the terminal connections for the tube (Fig. 2), pin 1 is for the heater; pin 2 is for grid 1; pin 6 is for anode 1 (focus electrode); pin 10 is for grid 2; pin 11 is for the cathode; and pin 12 is for the heater. The cap is for anode 2.

According to the tube notes released by Hytron, to deflect a beam

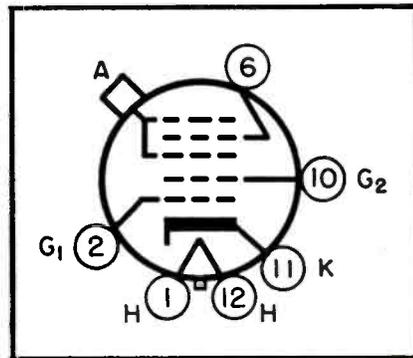


Fig. 2. Bottom view of Hytron 20FP4 electrostatic-picture tube.

from side to side of a raster  $17\frac{1}{4}$ " wide, with a Teletran deflection yoke type 70°, 8.3 mh or equivalent, a horizontal deflection coil current of approximately 750 ma (ac, pp) is required. Coil current varies directly

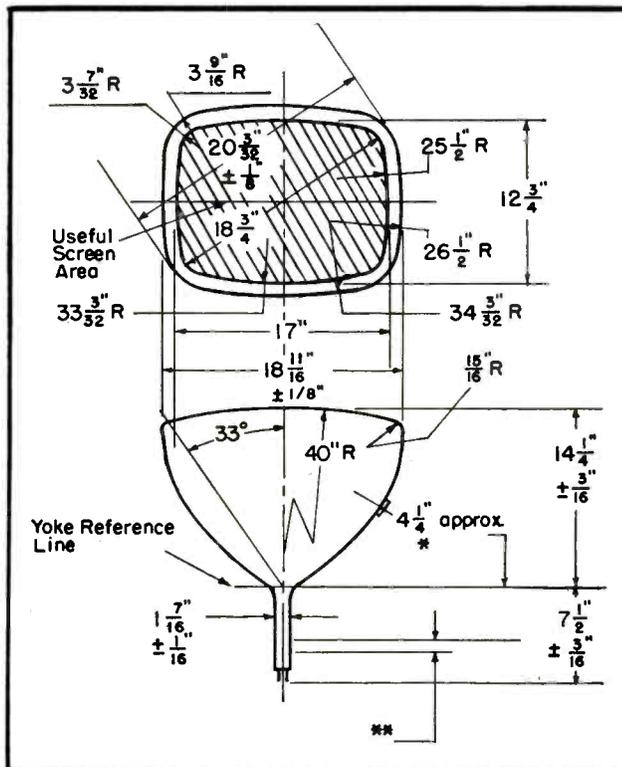


Fig. 3. Cross-sectional views of 20-inch electrostatic tube. The deflecting yoke is placed at point \*. At \*\* the area is kept clear for a single-field-type ion trap.

## ODEGAARD ORIGINAL NAIL

for **FASTER, EASIER** ANTENNA INSTALLATIONS at **Lowest Cost!**

**POLYETHYLENE STANDOFF**

For **Twin-Lead or Coaxial Cable**

High quality steel nail and virgin polyethylene.

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Just quick, easy hammer strokes for "step"-locked permanent installation! See it at your local jobber. For FREE sample & literature, write NOW to Dept. S.

**ODEGAARD MANUFACTURING CO.,**  
 5416-8th Avenue, Brooklyn 20, N. Y.

as the square root of the anode voltage.

Seventeen-inch rectangular electrostatics are also available. One model announced by National Union, type 17FP4, provides a 10¾"x14¼" picture. It has an electron gun designed to be used with a single-magnet external ion-trap magnet; an external conductive coating which when grounded functions as a filter capacitor. The rectangular face of the 17FP4 uses a filter glass plate which is said to reduce ambient-light reflection.

The anode voltage for this tube is also 12,000 *dc*; grid 2 voltage is 300 *dc* and the grid 1 voltage is from -33 to -77 *dc*. Focusing electrode voltage is from 2300 to 3100 *dc*.

#### CLAROSTAT POTENTIOMETER

A precision potentiometer has been developed by Clarostat Mfg. Co., Inc., Dover, N. H.

Tapered winding is said to be held to a tolerance of ±1½% linearity, and mechanical tolerances to ±0.00025 inch. Positive low-loss conductivity is said to be assured by the silver contact carried by a ring-shaped slider which rides the winding as well as the contact rail. A slip-on black plastic cap protects the control mechanism.

\* \* \*

#### NEMCO AUTO ANTENNA

An auto radio antenna designed for installation by one man has been announced by the National Electronic Mfg. Corp., 4202 Vernon Blvd., Long Island City 1, N. Y. Called the Nemco *Triple-Kwik*, it is made of chrome-plated brass. Fits the fender or cowl of any late model car. Has three telescoping sections extending to 60", and has a permanently attached three-foot shielded lead-in cable with Delco and Motorola fittings.

\* \* \*

#### PHILCO HIGH-VOLTAGE CAPACITORS

Designed for high-voltage, high-temperature applications in such equipment as television receivers, and vibrator power supplies, a line of 26 capacitors in working voltage ranges of 3,000, 5,000, 6,000 and 10,000 volts *dc* has been announced today by the accessory division of Philco.

Capacitors are said to be rated for operation up to 85° C. Housed in a molded phenolic casing which is said to be humidity resistant and non-inflammable. Specially treated mineral oil is utilized as impregnant. Capacitors have tolerance of ±20%.

\* \* \*

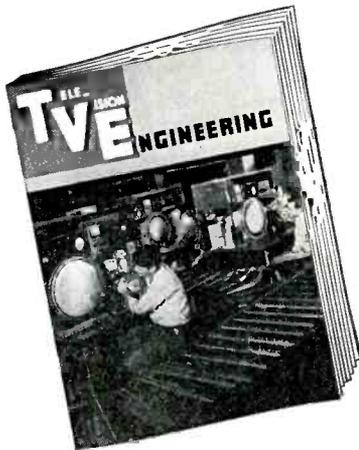
#### IRC PROMOTES BUTLER AND WHITAKER

R. M. Butler, who has contacted IRC distributors in the Philadelphia territory for the past four years, has been appointed assistant sales manager of the merchandise division, servicing distributors. Butler joined the company early in '44 and by September of that year was made manager of the industrial customer service division. In '46 he was appointed jobber contact man for the merchandise division in the Philadelphia territory.

J. F. Whitaker succeeds R. M. Butler in the Philadelphia territory.

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*Color TV Systems . . . Ultrahigh Receiver-Transmitter Design Problems . . . Tube Production-Line Techniques . . . TV Broadcast Equipment . . . Camera Tube Research . . . Glass, Plastics and Metal in TV . . . TV Test Equipment in the Plant . . . Film Recording . . . Flying Spot Scanners . . . Tone Amplifiers for TV Films . . . Compact Motors for TV . . . TV Component Design . . . Mechanical Design Factors in Antennas . . . Quality Control Charting . . . Microwave Relays . . . Receiver and Transmitter Servicing . . . Production Aids . . . Instrument Activities . . . TV Sound Systems . . . Studio Lighting.*

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Employed by .....

Nature of Business .....

(State if TV Manufacturer, TV Broadcast Station, etc.)



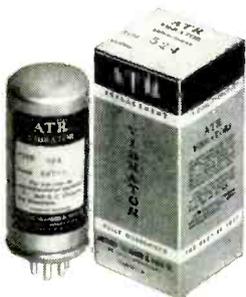
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By every test

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is Best!

**ATR**  
AUTO RADIO  
VIBRATORS

have Ceramic Stack Spacers



A COMPLETE LINE OF VIBRATORS . . .  
Designed for Use in Standard Vibrator-Operated Auto  
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turing Ceramic Stack Spacers for Longer Lasting Life.  
Backed by more than 19 years of experience in  
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VIBRATOR FIELD.

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NEW LITERATURE

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## JOTS AND FLASHES

SERVICE MEN'S MEETINGS, featuring television analyses by specialists from the manufacturing world, have become quite an item on the education calendar. As held today, the meetings offer talks and demonstrations which no Service Man can afford to miss. In one session, recently conducted by Clarence L. Simpson, radio and television service engineer for the Sylvania radio and television picture-tube divisions, extremely detailed operation and circuit adjustments of typical receivers were probed. In an illustration, the vertical scanning section was reviewed and adjustments were made to compress and distort image width. Results in waveform shapes were shown on 'scopes. The use of the 'scope in checking tubes was also demonstrated at this interesting meeting. . . . Sylvania Electric has purchased a new factory site at Woburn, Mass., where it will produce tubes and equipment for national defense. . . . G. E. has announced plans for constructing a multi-million-dollar plant for the manufacture of electronics equipment at Utica, N. Y. . . . Insuline Corp. of America has taken possession of a third plant in Long Island City, N. Y. . . . The National Electronic Manufacturing Corp. has moved to larger quarters at 4202 Vernon Blvd., Long Island City, N. Y. . . . Radio Materials Corp. are now located in a new plant in Attica, Indiana, where ceramic capacitors will be made. . . . A new pilot tube plant has been opened by Raytheon in Quincy, Mass. . . . A description of a TV field-strength meter appears in the January, '51 issue of the *Aerovox Worker*. . . . According to Fran J. Chamberlin, jobber sales manager of Clarostat, jobber sales doubled during 1950. . . . The February issue of the *Burlingame-Brujac Digest* contains a description of a new instrument, *Lab-scope*. . . . Jerome Tannenbaum is now chief engineer of the audio division of Concord Radio Corp., Chicago, Ill. . . . Among those present at the recent Southwestern Electronic conference held at Fort Clark Ranch, Brackettville, Texas, were F. E. Anderson, renewal sales manager of Raytheon and F. B. Simmons, also of Raytheon. . . . Two television kits employing the basic 630-type circuit have been announced by Tech-Master Products Co., 443 Broadway, New York 13, N. Y.



New Raytheon pilot-tube plant in Quincy, Mass.

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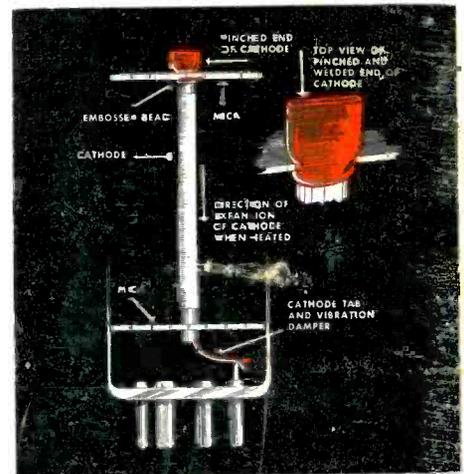
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