

SEPTEMBER, 1951

Radio Television SERVICE DEALER

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GREEN BAY WISC
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The Professional Radio-TVman's Magazine

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- Reducing Interference With TVI Kits
Oscilloscope Circuits, Part 2
- TV Servicemen Must Be Technicians, Diplomats,
Peace-Makers, Benefactors
- Effective Shop-Built Antennas for TV, Part 3
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- Men of Radio, Part 7

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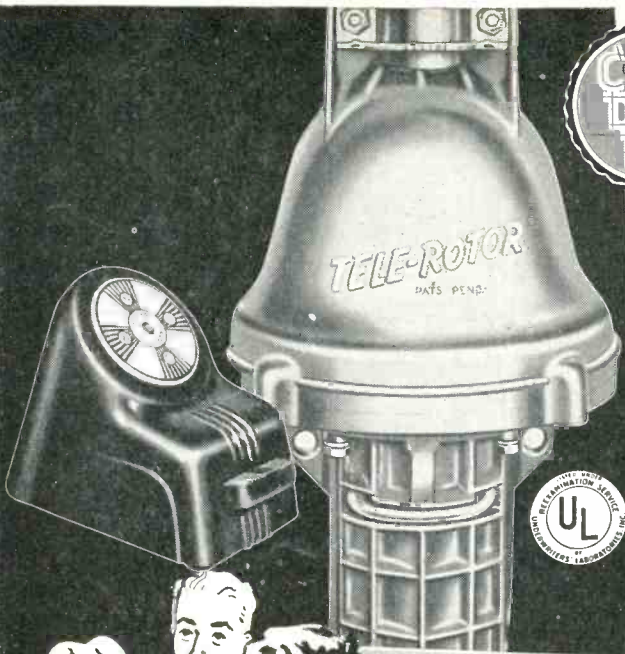




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This heavy-duty TELE-ROTOR has no match! It's more powerful . . . will turn any TV antenna array under any weather conditions. Easily installed . . . it is trouble-free in performance. Easiest of all to operate!

MODEL TR-2 . . . rotator with "compass control" cabinet having illuminated "perfect pattern" dial . . . (uses 8 wire cable) \$49.95



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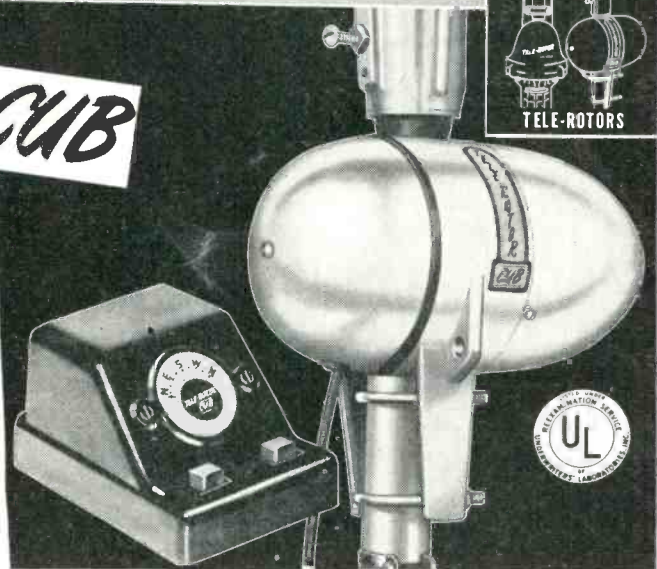


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The new TELE-ROTOR "CUB" is ideal for average installations. The same husky motor as the Heavy-Duty model . . . the "CUB" is the fastest and easiest of all rotators to install. All-In-Line design . . . with true in-line thrust between antenna and mast. The 3/4" STEEL shaft rotates on a case hardened steel ball . . . with in-line reamed oilless bearings.

MODEL 502B Rotator with plastic control cabinet having indicating meter for "hairline" tuning. (Uses 5 wire cable) . . . \$44.95

MODEL 501B rotator with control cabinet having end-of-rotation signal. Light flashes every 7.2° showing antenna is turning. (Uses 5 wire cable) \$34.95



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WORLD EXPORT: ROBURN AGENCIES, INC., NEW YORK 7, N. Y.
CANADIAN DISTRIBUTOR: VAN DER HOUT ASSOCIATES, TORONTO

EDITORIAL

by S. R. COWAN

Nix To Rebuilt TV Pix Tubes

Until recently the service profession suffered from a serious dearth of nationally advertised brands of TV picture tubes needed as replacements. Most tubes produced were being diverted to manufacturers. We deplored the untenable situation to slight avail.

Early this year two score or more new firms popped into the scene offering servicemen rebuilt TV picture tubes, requiring a defective tube "shell" as part of the transaction. This publication alone declined the rebuilders' advertising. We did not wish to risk our readers' Good Will by introducing you to firms who offered products that were not guaranteed without qualification.

Meanwhile, many Service Dealers and TV Service Contractors were literally forced to buy from tube rebuilders. They simply had to have replacement picture tubes so their customers could be pacified. (The bulk of the complaints lodged with Better Business Bureau against TV Service Contractors had this "delay factor" as their base). Frankly, our sympathy lies with the servicers who tried to make the best of an almost impossible situation.

Now—let's review the entire matter. Let's study—how did the rebuilt tubes stand up in use?—and, are servicers still buying rebuilt tubes? Answer: practically every rebuilt tube used gave poor to absolutely bad service compared to new tubes. And yet, our research discloses that some Service Contractors are still buying rebuilds. Why? The excuse is: most rebuilds work long enough to at least get them past the contract-still-in-force expiration. How shameful!

We feel that servicers should buy and use only the best replacements and that every contract in force should be maintained without stinting. It never pays to "cut corners" on quality. Summed up, while rebuilders did "bail out" the service industry for a while, and simultaneously the big tube makers did "let us down" while catering almost exclusively to TV manufacturers—now it is time for the past happenings to be discounted and forgotten completely. In future service firms should buy and use only new picture tubes produced by reliable makers who advertise nationally or in trade journals such as this.

Service Booms Again!

For a few weeks early this Summer there was a slight slackening of service work, mostly seasonal, especially in TV areas. TV set sales fell off to almost zero and that accounted for the slump to some extent. However, in late August it became noticeable that set sales were picking up at a rate far beyond expectation, and at the same time service calls were swamping the trade. Man-power shortages are a factor. Get good technicians, and keep 'em. It will pay off all around. Service business in the months ahead will undoubtedly break all previous records.



Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
MANAGING EDITOR

COWAN PUBLISHING CORP.
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NEW YORK 18, N. Y.



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SANFORD L. CAHN, Advertising Director HARRY N. REIZES, Advertising Manager
DAVID SALTMAN, Production Mgr. CHARLES LO CICERO, Circulation Mgr.
BRANCHES: H. A. METZGER, 230 S. Wells St., Chicago, Ill., WEbster 9-2666
TED E. SCHELL, 112 West 9th St., Los Angeles 15, Calif., VANDike 8921

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TRADE FLASHES

A "press-time" digest of
production, distribution,
and merchandizing
activities

TV Pix Tube Sales Dip

Sales of television picture tubes to TV receiver manufacturers in the first six months of 1951 decreased 20 per cent below the corresponding period of 1950, the Radio-Television Manufacturers Association reported.

Set manufacturers' tube purchases amounted to 2,552,757 units in the first six months of this year compared with 3,171,660 in the same period last year. Sales to set manufacturers in the first half of this year were valued at \$66,546,932.

RTMA's TV tube sales report showed that 86 per cent of all tubes sold to manufacturers during the period were rectangular in form and 92 per cent were 16 inches and larger in size.

June cathode ray tube sales to manufacturers totalled 221,759 units valued at \$4,664,744.

TV Color Production

President Glen McDaniel of the Radio-Television Manufacturers Association dismissed as "nonsense" intimations that television manufacturers will refuse to make and sell color television receiving equipment because the Federal Communications Commission rejected their advice in the color system it has approved.

Speaking at a panel session of the National Association of Music Merchants in Chicago, Mr. McDaniel said:

"Whenever a public demand arises for adapters, converters, or color sets at prices that make production feasible, I am sure the manufacturing industry will meet that demand."

Mr. McDaniel pointed out that the U. S. Supreme Court has sustained the FCC's decision approving the field sequential color television system proposed by the Columbia Broadcasting System and added: "The proceedings are over the controversial language and the emotionalism should be forgotten."

Vee-D-X Packages Promotion

In order to further introduce the new VEE-D-X single channel "Out-
[Continued on page 10]

PHOTOFACT Users Write Our Best ADS!

Hundreds of unsolicited letters tell what the world's finest Radio & TV Data means to Service Technicians



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RCA WR-59B Television Sweep Generator

What it does—Provides fast and accurate sweep alignment and trouble shooting of TV front ends . . . sound and picture if amplifiers . . . discriminators and ratio detectors . . . trap circuits . . . video amplifiers . . . and if amplifiers in FM sets.

What it features—Preset switch positions for TV channels 2 to 13 . . . continuous tuning from 300 kc to 50 Mc . . . flat output, within ± 1.5 db even at maximum sweep width . . . fundamental oscillator output on all TV channels . . . filtered beat-frequency-fundamental output on if/vf range . . . zero-voltage reference line provided by return-trace blanking . . . dual piston attenuator with maximum attenuation ratio of 20,000 to 1 . . . continuously variable sweep width up to 10 Mc . . . output frequency-modulated at the fundamental frequency by a precision-type vibrating capacitor, for long life and good linearity . . . balanced rf output cable terminated in 300 ohms . . . fully shielded circuits and filtered power line . . . resistance-terminated if/vf output cable.

For complete details ask your RCA Test Equipment Distributor for Bulletin 2F753-R.

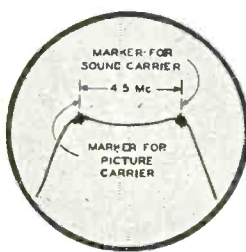
RCA WR-39C Television Calibrator

What it does—Provides dual markers for rf picture and sound carriers . . . provides signals for peak alignment of stagger-tuned if amplifiers . . . develops vertical bar pattern for horizontal linearity adjustments . . . generates a crystal-controlled AM signal for alignment of inter-carrier sound if's . . . provides triple markers for sound discriminator adjustment . . . allows adjustment of local oscillators in TV front ends with crystal accuracy . . . checks reception on all 12 channels by means of video signal obtained from single channel of a TV set.

What it features—Variable-frequency oscillator operating on fundamentals over entire range . . . sound and picture carrier frequencies marked on expanded, easily-read scale . . . two crystal oscillator stages with 3 crystals supplied . . . wide-band modulator stage with range of 0 cps to 30 Mc . . . crystal standard supplying over 600 calibration check points at 0.25-Mc intervals . . . bar-pattern generator for

linearity adjustments.

For complete details ask your RCA Test Equipment Distributor for Bulletin 2F751-R



'Scope pattern of dual markers for rf picture and sound carriers, produced by the "TV Duo."

Available from your RCA Test Equipment Distributor



RADIO CORPORATION of AMERICA
TEST EQUIPMENT

HARRISON, N. J.

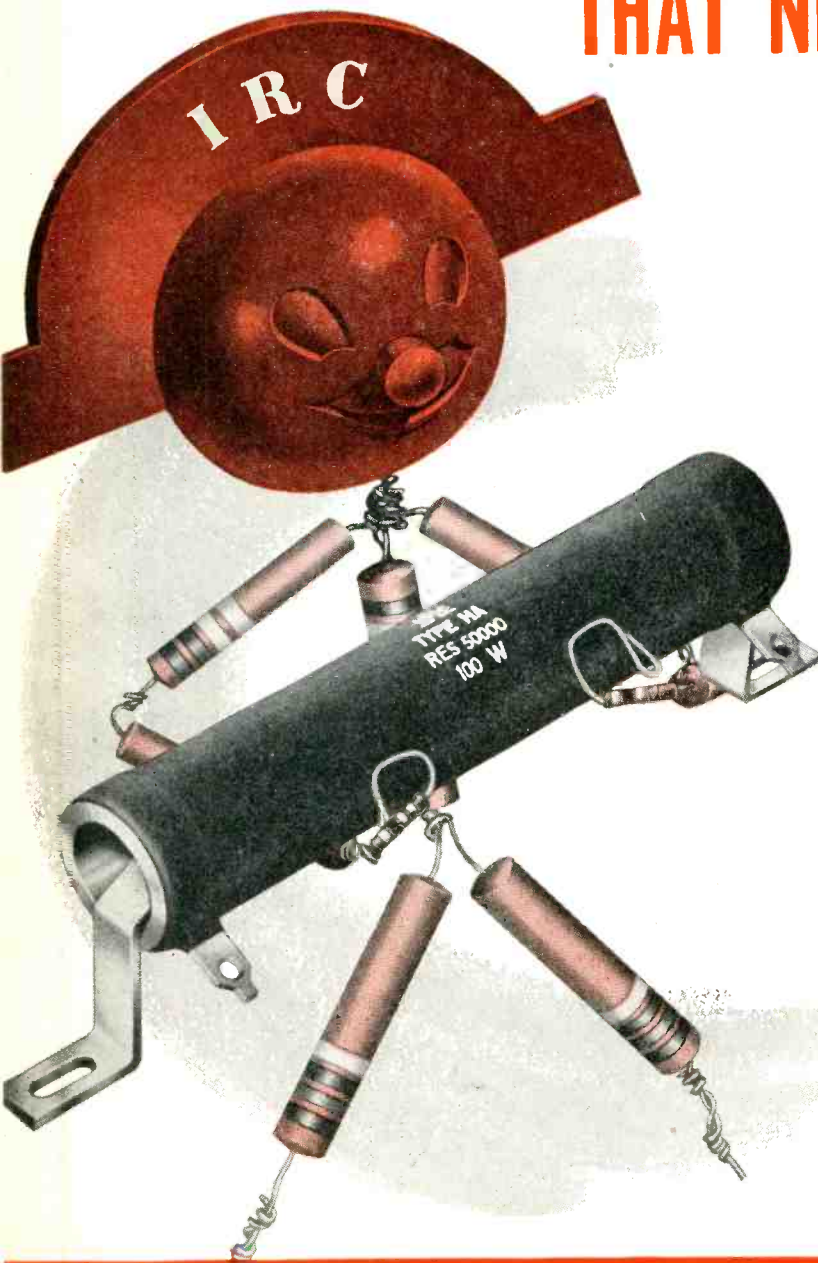
HERE'S THE POWER RESISTOR THAT NEEDS NO DE-RATING

IRC PWW's Carry Full Wattage in **ANY** Range!

What is the function of this type of resistor? To handle POWER!

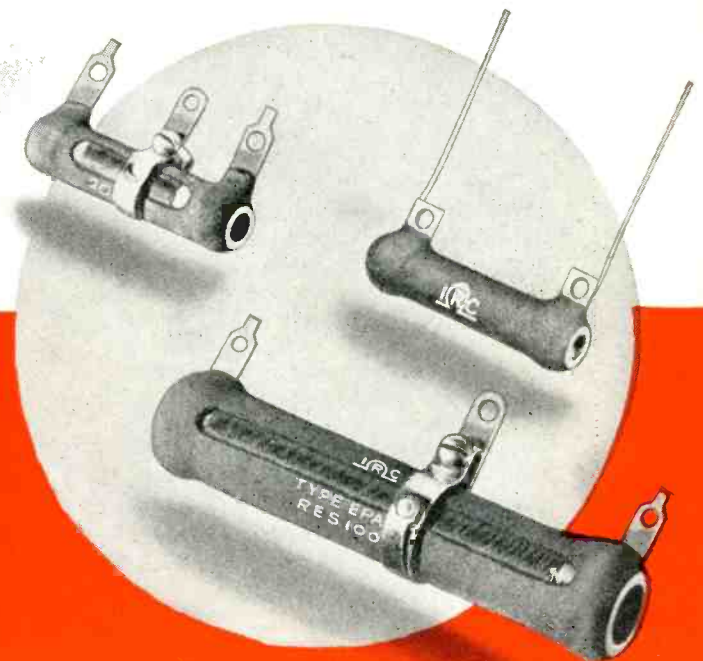
Power rating of many power resistors is derated sharply—as much as 75%—in the higher resistance values—to prevent voltage breakdown between winding turns and resultant turnouts.

IRC PWW's need no derating because of resistance value! These rugged, full size power wire wounds carry full wattage rating—even in the highest stock resistance values—without failure. Ample core sizes produce larger heat-radiating surface areas and the special rough, dark coatings dissipate heat fast—so IRC PWW's operate at lower temperatures. Low temperature processing preserves fine wires and prevents turns of windings from shifting—reduces likelihood of hot spots and voltage breakdowns.



THERE JUST ISN'T A BETTER POWER WIRE WOUND FOR CONTINUOUS OPERATION AT FULL RATED POWER FOR LONG, DEPENDABLE, TROUBLE-FREE PERFORMANCE . . .

You can get fixed and adjustable IRC PWW's in a full range of power ratings, resistance values, sizes and terminal types . . . adaptable to any rig or use. In adjustable types, contact is made by a metal band which can be positioned anywhere along the resistor. By using additional bands, various taps can be obtained—permitting the resistor to be used as a voltage divider. Tolerances: Fixed types—standard tolerance $\pm 5\%$ for 50 ohms and over, $\pm 10\%$ below 50 ohms. Adjustable types—standard tolerance $\pm 10\%$.



For exacting, heavy-duty applications—high-voltage bleeders, bias supply, grid and filament-dropping resistors—leading technicians and industrial users have specified IRC PWW's for more than 15 years.

COMPARE IRC PWW's WITH ANY OTHER POWER RESISTOR

Feature by feature, IRC PWW's *prove* their superiority over ordinary resistors. PWW's give balanced performance in every characteristic. Here's why...

Rugged Steatite Winding Forms. Carefully selected steatite tubes have superior mechanical strength, withstand sudden variations in temperature, are impervious to moisture.

Adjustable Bands. IRC Adjustable PWW's are fitted with adjustable bands specially designed to maintain constant pressure. Bands feature a stainless steel spring with a silver contact button, which is oxidation free and cannot corrode to cause open circuits or high resistance at point of contact.

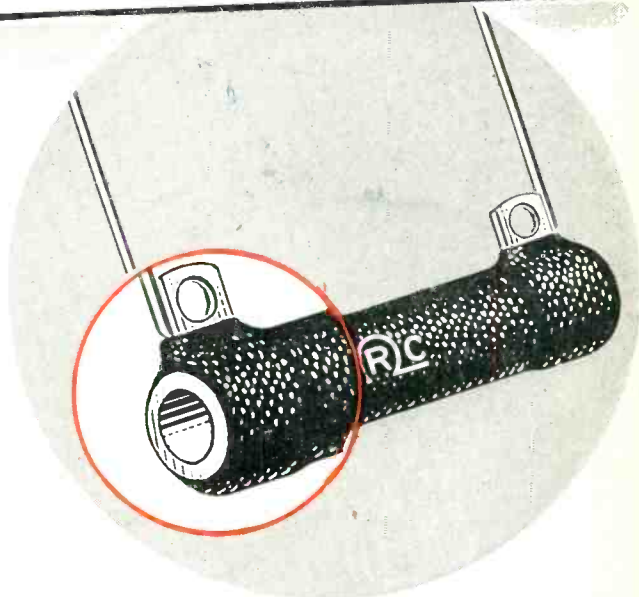
Uniform, High-grade Alloy Windings. Unusually rigid specifications govern resistance value, diameter, elongation, and weights. Resistor elements are wound with uniform spacing and tension, and wire is secured to terminal electrically and mechanically.

Special Heat-dissipating Cement Coatings. IRC's exclusive dark, rough coatings are used for 3 specific reasons: (1) They can be processed at lower temperature, which does not harm the wire windings or cause them to shift. (2) The rough surface provides a larger area for faster heat radiation. (3) The porous cement coatings do not trap moisture which might cause windings to corrode.

Full Size for Cooler Operation. Ample size is essential to fast heat dissipation. Because IRC PWW's are full-size units, they operate at much lower temperatures. This cooler operation assures long life for the resistor, and also safeguards critical components mounted nearby.

UNIQUE LUG-AND-LEAD DESIGN GIVES FLEXIBILITY IN MOUNTING

An exclusive feature of IRC 10- and 20-watt Power Wire Wound Resistors is the combination lug-and-lead terminal for flexibility in mounting. In tight space applications, lugs may be cut off without disturbing lead, and in other installations the leads may be removed. Leads are a full 1 3/4" and all terminals are hot tin dipped for easy soldering.



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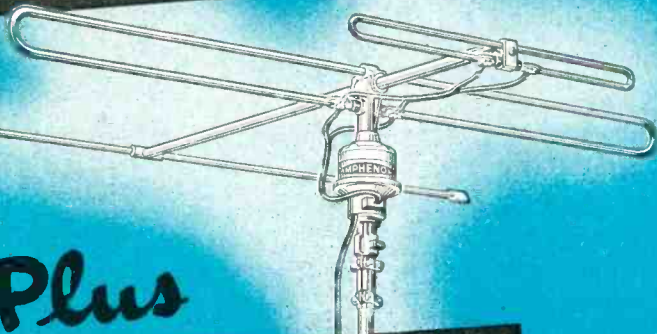
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The single forward lobe of the
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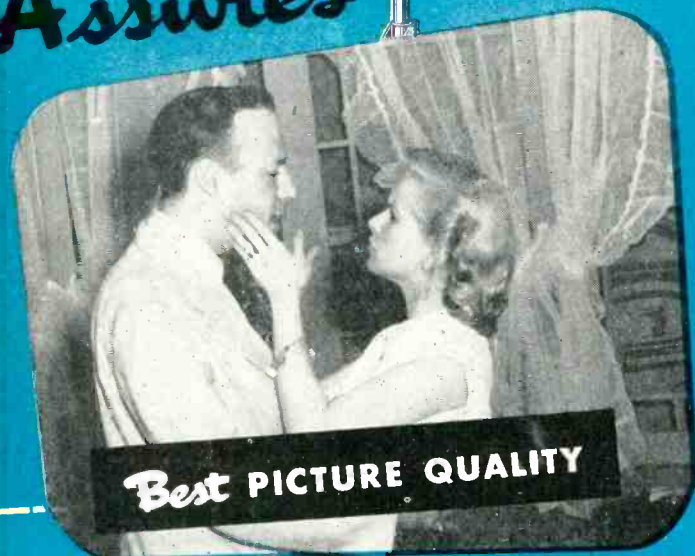


Plus

the accurate pointing of this
lobe in the direction of the
strongest signal by the

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"AUTO-DIAL"
ANTENNA ROTATOR.

Assures



Best PICTURE QUALITY

The Amphenol INLINE Antenna has no minor lobes to pick up reflected signals that create poor picture quality. When its single forward lobe is directed at the strongest signal, the best TV picture a set is capable of producing is received. When used in combination with an Amphenol "Auto-Dial" Rotator, the best picture possible can be received on all channels. The "Auto-Dial" performs so accurately the antenna positions which receive the best pictures on each channel can be recorded and exactly returned to when desired.

The best combination for the best TV picture on any channel — from any direction!

*Reissue Pat. No. 23,273

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SYNC PULSES

by San D'Arcy

Nassau's Smart Merchandising!—When business fell off early this summer the Nassau TV & Electronic Lab., an aggressive Long Island, N. Y. Service Dealer wasted no time in taking action to meet the problem. They offered an "Anniversary Special."

Before telling about the "special deal" let's review Nassau's overall merchandising setup. The firm relies upon a monthly, direct-to-their-customer-and-prospects promotional piece that is timely and yet inexpensive. Called the "Tele-News Letter," it's a mimeographed single or double sheet with some intelligently selected items that will interest every TV or radio set owner. And, somewhere in the piece is a selling squib that cannot help but impress the reader with Nassau's reliability and sincerity of purpose.

For example, one "Tele-News Letter" issued just at the time the color TV controversy had everybody on the fence, (and most TVset prospects hedging on buying), clearly outlined in simple English all the true facts. Then, its punch line told the reader that if he wanted to get color TV right away Nassau was prepared to do the necessary conversion work and supply the adaptor—with the further declaration that later on, if something better in color TV came along, Nassau would again be ready to meet the situation. It was, to put it mildly, a smart way to get attention from old customers or new prospects.

Now, about the "Anniversary Special" referred to above:—when sales and service jobs slowed down, the "Tele-News Letter," written to attract the attention of the ladies of the house in particular, offered to show how Mesdames might be able to buy some extra groceries for the house on the money saved by taking advantage of the opportunity being offered. In fact the "Tele-News Letter" was headed: "What Have Groceries to Do With TV?" Nassau suggested that they be allowed to examine the owner's TV set . . . and that if replacement tubes were needed, same would be installed for no service fee and at 40% discount off regular list price. Required repairs would be estimated before any job was started, with the following scale to be charged: 7" sets, \$2.50; 10" sets, \$3.50; 12" sets, \$4.50; 14" sets, \$5.50; 16" and 17" sets, \$6.50; 19" and 20" sets, \$7.50.

Checking with Nassau some time after this special offer was made we learned that it more than paid off. Hundreds of jobs were obtained, and the great bulk of them were profitable because they comprised, in the main, a simple realignment or adjustment process, and in many cases the sale of a few replacement tubes.

Orchids to Nesco—Immediately after the terrible Kansas City flood, Nesco Inc., housewares manufacturer, offered to repair and recondition, free of charge, all of the company's roasters which suffered damage.

In a newspaper ads in Kansas City, the company suggested that those whose Nesco roasters were damaged by the flood need only return the merchandise to local Nesco dealers. "It is the least we can do to help those whose homes were damaged during the flood," the copy declared.

The company said that it was preparing to extend the same service to other flood-stricken communities if the need should arise.

This is a fine lesson in Humanity and Public Spirit. Other appliance and radio manufacturers would win much acclaim if they followed suit. The Publisher of "Service Dealer" and "CQ-The Radio Amateurs' Journal" has offered to replace any damaged file copy of either publica-

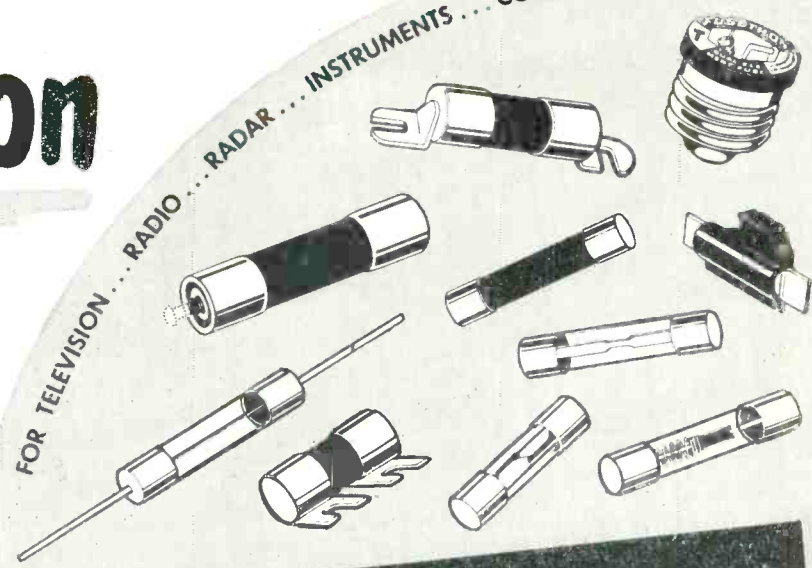
[Continued on page 49]

RADIO-TELEVISION SERVICE DEALER • SEPTEMBER, 1951

For Protection

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Electrical Circuits
 and
Your Reputation

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Every BUSS FUSE is Electronically Tested

To assure and maintain top quality and performance each individual BUSS fuse is tested in a highly sensitive electronic device. Fuses that are not correctly calibrated or not properly soldered or whose dimensions are not right are automatically rejected.

That is why a user can depend upon every BUSS fuse to operate properly under all service conditions—and the manufacturer or service man can rely on them to protect against complaints often caused by use of poor quality fuses.

When electrical protection is your problem turn first to BUSS

It is easy to select a fuse to do the job for BUSS makes a complete line — and behind each BUSS fuse is the world's largest fuse research laboratory and fuse production capacity.

Fuses of Dual-Element (Fusetron slow blowing fuses), Renewable and One-Time types are available in many standard sizes — and many special designs are also obtainable to fit unusual protection needs.

It's "profit wise" to use BUSS fuses for Sales and Service

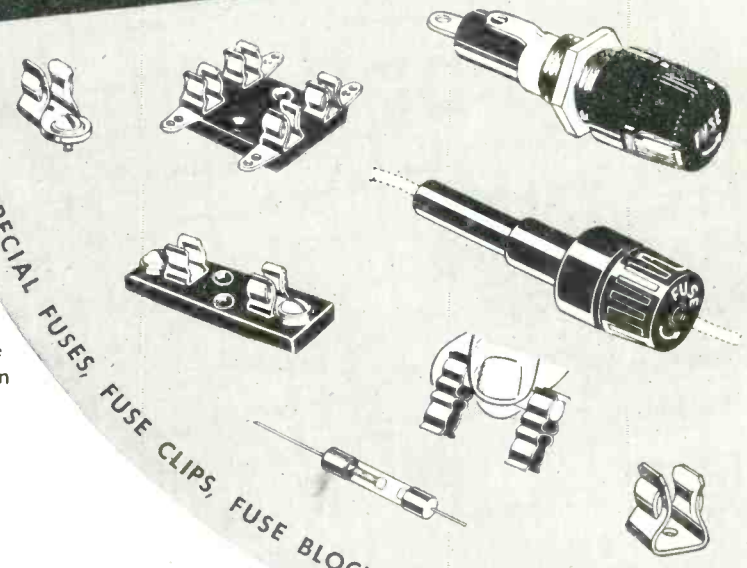
People everywhere accept BUSS fuses with confidence. So whether it is Sales or Service they know you are furnishing the best obtainable because in the past 37 years the millions and millions of fuses used in homes, stores, buildings and in industry as well as in electronic equipment, have firmly established the BUSS trademark as standing for fuses of unquestioned quality.

Since BUSS Fuses are the "known" brand you will never be bothered with kicks and comebacks that occur when people, rightly or wrongly, blame troubles they have on the fuses you furnished them.

Thus the BUSS trademark protects your profits and goodwill as surely as it protects the user.

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This is the only source of service data that really tells you everything. From complete wave-form data to factory parts lists, your knowledge of every set, every change, is accurate and complete. Ask your jobber to show you Rider Manuals — today!



JOHN F. RIDER Publisher, Inc.
480 Canal Street, New York 13, N. Y.

TRADE FLASHES

[from page 4]

board" booster, a special packaged promotion including the "JC" Yagi and the new booster has been made available to all VEE-D-X distributors and dealers, it was announced by The LaPointe Plascomold Corporation.

Advertised as the "World's Most Powerful Combination" for Single Channel TV Reception," this special offer is made up of either the single, double, or four stacked "JC" packed in one carton with the same channel OB Booster. VEE-D-X has prepared a two color self-mailer announcing the special offer and listing part numbers, components, and special prices. This mailing piece is for distribution by jobbers to their dealers. A colorful streamer has also been prepared for jobber store display. This introductory offer will positively end September 15, 1951.

Greene Appointed V. P. of Gabriel

Announcement is made by The Gabriel Company, Cleveland, of the appointment of Gardiner G. Greene as Vice-President in charge of the Electronics Divisions of Gabriel. These include Ward Products Corporation of Cleveland, manufacturers of automobile and television antennas, and the Workshop Associates of Needham, Mass.

Amphenol Adding New Plant

Completion of Amphenol's new Plant No. 4 on Chicago's west side will permit a great expansion in AN and RF connector assemblies at the main plant, American Phenolic Corporation officials announce.

Massive plastic molding presses and cable extruders are being moved to the new plant, thus making room for more than 300 new employees at the main plant to speed production and delivery of AN and RF connectors.

The new plant, with 65,000 square feet of space, will house all synthetic operations including the molding of plastics, wire mill operations including extruding and braiding, and will warehouse the vast supplies.

Webster Demonstrates Color Unit

Webster-Chicago Corporation recently demonstrated an auxiliary color television unit, for attachment to standard black-and-white receivers. First deliveries of the unit are now being made to distributors, it was announced by C. P. Cushway, executive vice-president. This is the first such unit to be delivered for consumer sale.

The company is also making color wheel assemblies for sale to set manufacturers for inclusion in their aux-

July 27, 1951

Hytron Radio & Electronics Co.
76 Lafayette Street
Salem, Mass.

"HOW WE SAVED THE SALE"

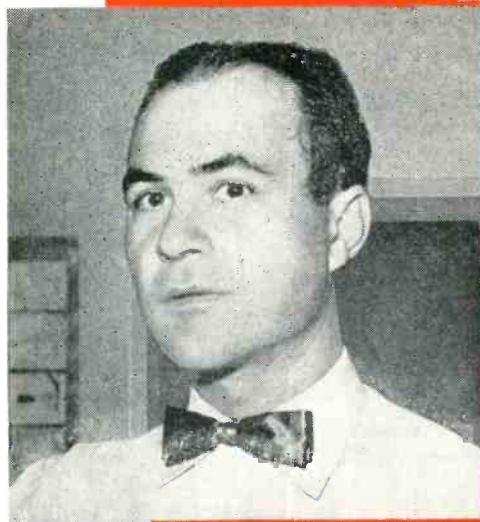
Gentlemen:

We thought you would like to know just how fine we think the new Hytron "Easy Payment Plan" is. We had a set in our shop for estimation the day this plan was first introduced to us by a salesman from Ra-Tel, Inc. This set would require a new 19AP4A picture tube and some other parts and service. The total charge would amount to about \$100.00, and right then we thought we might lose the sale because our customer might not have the cash for such a repair. Then, we learned of the Hytron plan and immediately introduced it to our customer. He thought it was a wonderful plan to be able to get his set repaired without having to part with so much cash at one time. Needless to say, he accepted the job, and went away a happy satisfied customer.

We have used Hytron products for years, and have always thought them to be of the highest quality. The new rectangular picture tubes are wonderful. We feel that this new "Time Payment Plan" is another Hytron first, and will no doubt be a great asset to the serviceman as well as the customer. We recommend it highly to all.

Very truly yours,

B. W. Hodges
B. W. Hodges



B. W. Hodges,
owner of Air Park
Radio & Television,
Dallas, Texas

ANOTHER HYTRON "ASSIST" FOR YOU

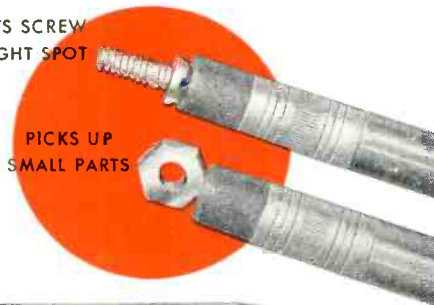
Dropped a screw into an inaccessible chassis? No need to fuss. Just reach in with your Hytron-CBS Pick-Up Stick. A slight pressure of its special wax tip picks up screw pronto.

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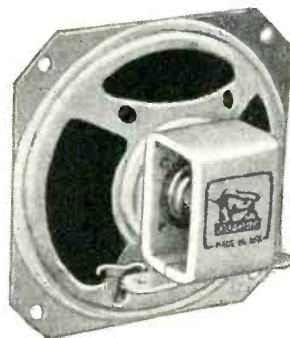


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iliary units or combination color and black-and-white sets, Cushway said.

The auxiliary unit provides a 12½-inch picture. It has a 16-tube chassis, a picture tube and the color wheel assembly. It is housed in a mahogany console cabinet that blends well with standard television sets. There are three controls — contrast, brightness and color phasing.

RCA Announces Low-Priced Junior Volt-Ohmyst

An all-electronic vacuum-tube Junior Volt-Ohmyst meter designed to meet service technicians' demands for a low-priced volt-ohmmeter capable of measuring a-c volts, d-c volts, and resistance in five different ranges was announced by the RCA Tube Department. The new test-bench unit bears a suggested user price of \$47.50 and will be available through RCA test equipment distributors.

The a-c operated Junior Volt-Ohmyst meter (WV-77A) employs a high-impedance diode tube as a signal rectifier—an unusual feature in volt-ohmmeters in this price range. In addition, the test instrument features an electronic bridge circuit similar to the one used in RCA's Senior Volt-Ohmyst meter, a 200-microampere movement, and carbon-film multiplier resistors.

Employed as a d-c voltmeter, the Volt-Ohmyst motor will measure dc from 0.05 volt to 1200 volts in five ranges. Used as an a-c voltmeter, it will measure ac from 0.1 to 1200 volts rms in five ranges. It also measures resistance in five ranges, from 0.2 ohm to one billion ohms.

Other engineering and convenience features include high input resistance on all ranges, electronic protection against meter burn-out on all functions, a d-c polarity-reversing switch to eliminate reversing of test leads, zero-centering facilities, for discriminator alignment, metal shielding for stability in r-f fields, and an ohm probe to facilitate testing of electrolytic capacitors.

The WV-77A Volt-Ohmyst meter has been calibrated against laboratory standards and is backed by a 12-month warranty. It measures 8 inches high, 5¾ inches wide, and 4½ inches deep, weighs only four pounds, and comes complete with a carrying strap for portability.

Clearbeam Expands

Fulfilling a long-felt need to centralize its far-flung five-factory West Coast operations, Clearbeam Television Antennas announces a move to a new, recently completed factory and assembly plant in Burbank, Calif.

The newly constructed \$100,000.00 plant will house not only the complete

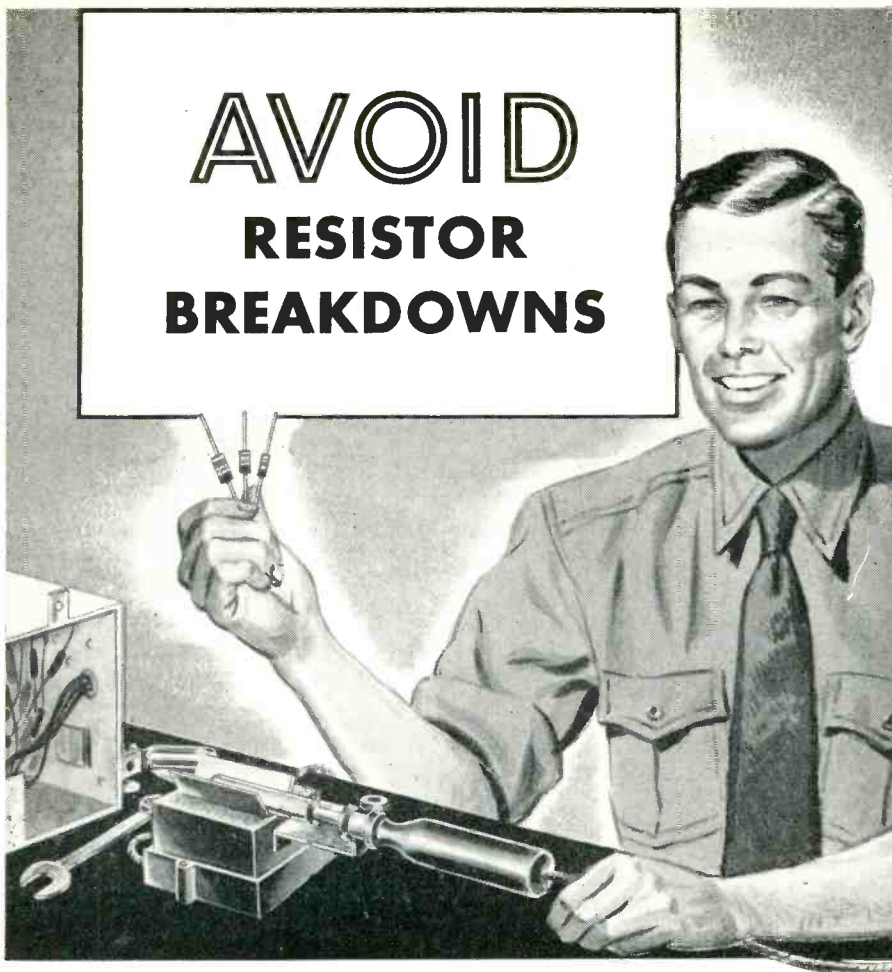
Largest Selling Booster

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Regency

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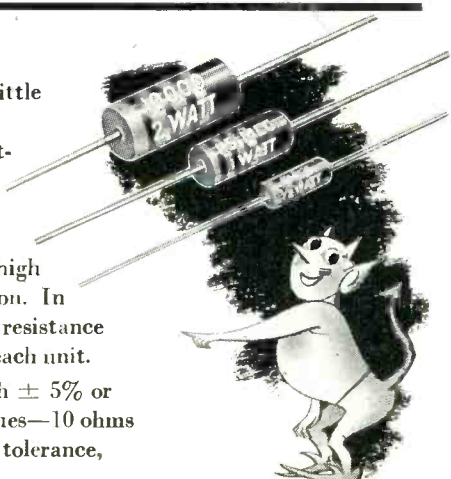
OHMITE Little Devil Resistors Provide EXTRA MARGIN of SAFETY

Although they are tiny in size, Ohmite Little Devil molded composition resistors have unusual ruggedness, stability, and current-carrying capacity. For example, they are rated at 70C instead of the usual 40C.

They meet all test requirements of JAN-R-11, including salt water immersion and high humidity tests without wax impregnation. In addition to conventional color coding, the resistance value and wattage are clearly marked on each unit.

Available in 1/2, 1, and 2-watt sizes with $\pm 5\%$ or $\pm 10\%$ tolerance, in standard RTMA values—10 ohms to 22 megohms. The 1-watt size, $\pm 10\%$ tolerance, comes in values as low as 2.7 ohms.

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manufacturing facilities of Clearbeam Antennas, but also the operations of its two subsidiaries, TV Wire Products and Tempo Products, manufacturers of Television Lead-in and Antenna Masts, according to Peter S. Wald, President.

Located on a sprawling 3-acre site in the heart of Burbank's bustling manufacturing district, the 16,000 square foot plant at 100 Prospect Avenue, promised to more than double the firm's output and efficiency. Designed by Architect Herman Light, the Clearbeam factory and home offices was constructed by builder John L. Meeks in a record-breaking time of 21 weeks. Over \$40,000.00 worth of additional manufacturing equipment has been installed, including new punch presses, shearing machines, and an impressive array of Extrusion Mills; the latter of which backs up Wald's statement that they are the only known television antenna manufacturer which produces their own aluminum tubing.

Sylvania Observes 50th Anniversary

On July 31, Sylvania Electric Products Inc. observed the 50th anniversary of its founding.

The Company is the outgrowth of two small concerns, one in Massachusetts and the other in Pennsylvania, that were established in the early years of the century and followed parallel courses in manufacturing for nearly three decades. They merged in 1931 to form the nucleus of Sylvania as it is today—a widely diversified manufacturing organization with plants in 20 communities in six states and more than 22,000 employees, as well as several foreign affiliates and wholly owned subsidiaries.

Sylvania products are numbered in the thousands, but almost all of them fall into one of three general categories.

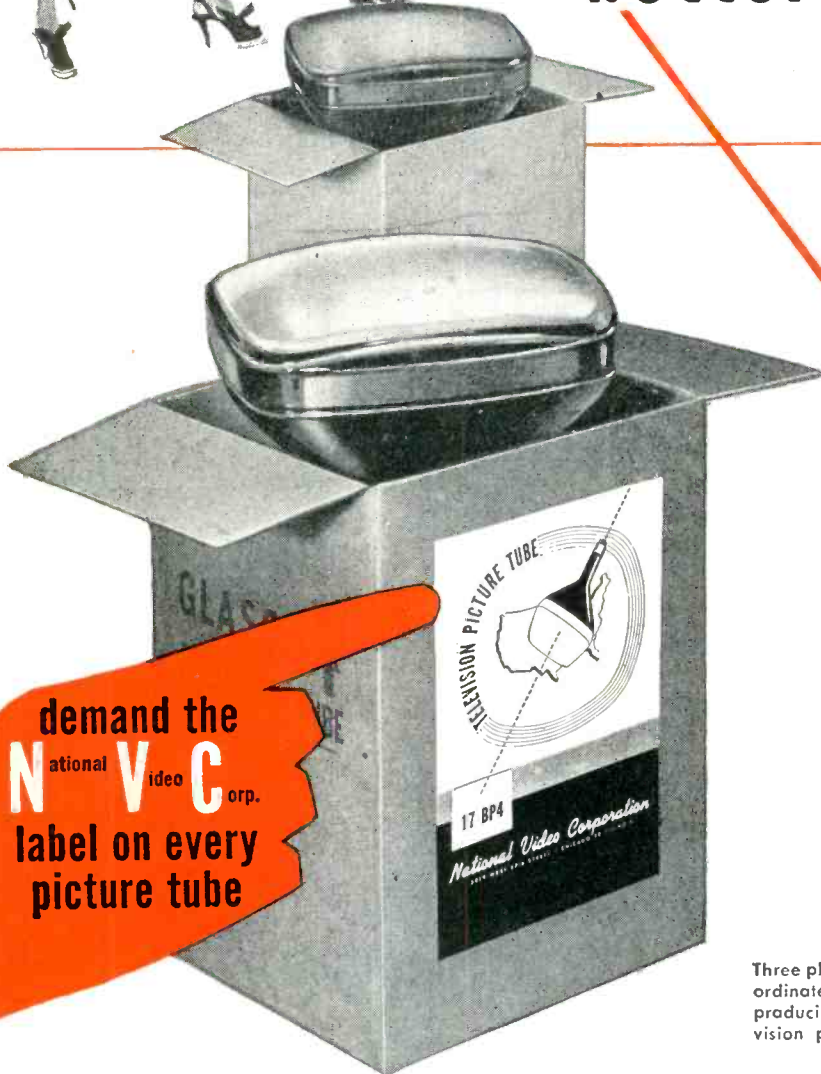
The company is one of the major suppliers of glass envelopes containing an electrical circuit. These include incandescent and fluorescent lamps, radio receiving tubes, television picture tubes, photoflash bulbs, and electronic tubes. Equipment to use these envelopes, such as television, home radio sets, auto radios, and fluorescent lighting fixtures, constitutes an important part of the business. The third classification is that of components by which quality of performance can be maintained. These include tungsten parts, chemicals for radio and TV, metal parts and stampings, wire, and plastic parts.

More than \$600,000,000 of Sylvania products have been sold since the end of World War II. Sales rose to an all-

[Continued on page 46]



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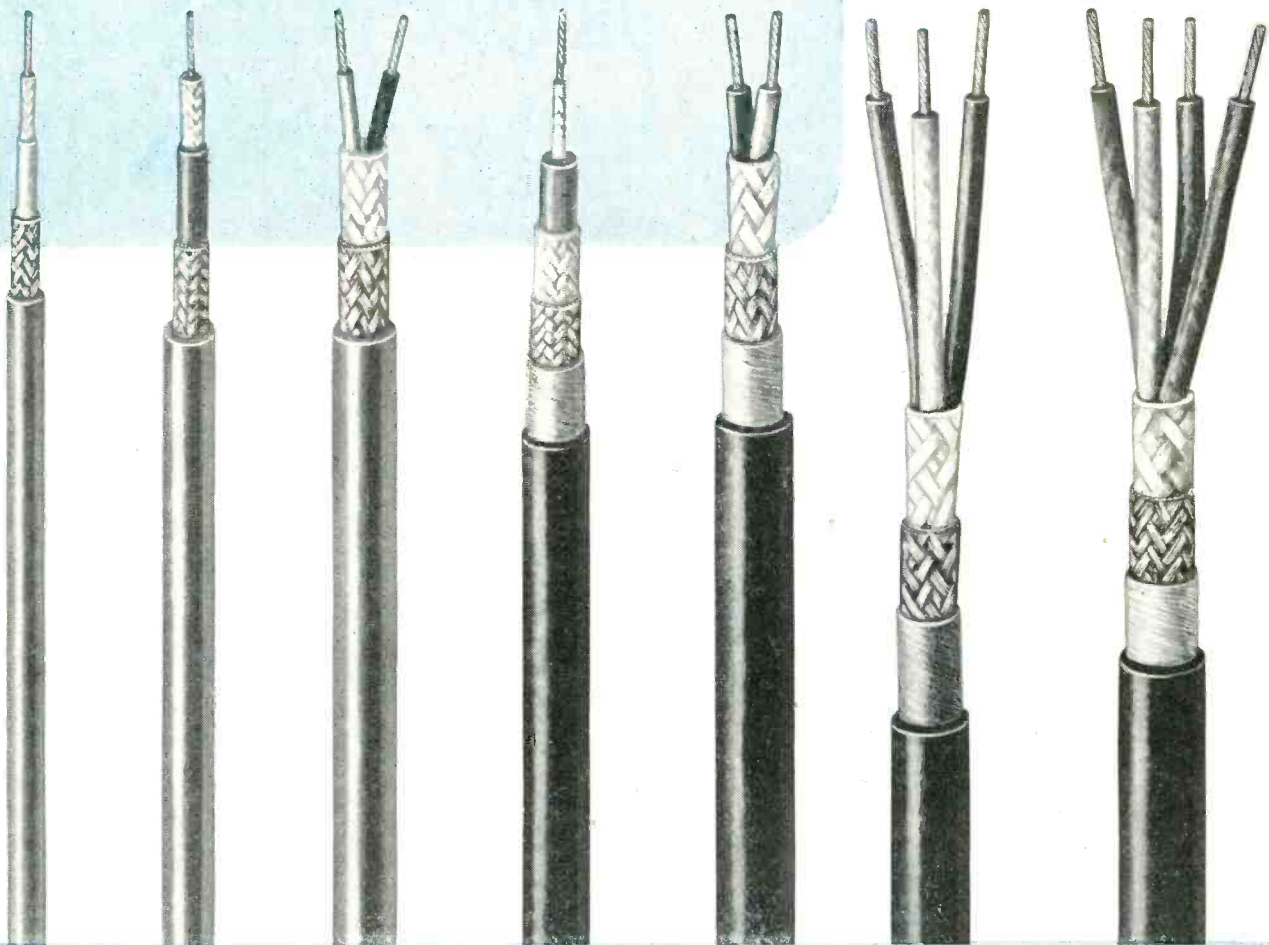
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Reducing Interference WITH TVI KITS

by JAMES A. HILL

Chief Engineer, Telematic Industries, Inc.

This article describes the various sources of TVI which affect TV receiver performance. In addition, it explains the circuitry and operation of various types of traps which may be used in eliminating interference.

THE constantly growing millions of TV viewers today demand the finest picture and sound reception. Viewers who might have tolerated distortion in an AM radio, as far as audio quality was concerned are today perfectionists when it comes to TV picture and sound reception.

A conscientious and ambitious group of jobbers, dealers, installation and service men are attempting to satisfy the wants of these growing groups of critics and perfectionists. They have found that a considerable degree of distortion may be the result of outside interference (TVI). Many of them, after having installed wave traps where high pass filters should have been installed and high pass filters where wave traps should have been installed, have thrown up their arms in despair and considered any type of filter just another gadget.

The inability to lick these interference problems has spoiled many a good installation and consequently meant loss of sales and installations in neighboring localities. Different locations throughout all sections of

the country have their own specific interference problems produced by varying frequencies of fundamentally, harmonically and sub-harmonically radiated r-f carriers. Hence, no one filter is either broad enough or efficient enough to satisfy the filter de-

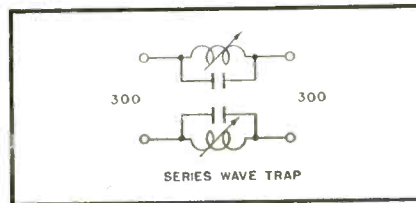


Fig. 2. Applications of series wave trap inserted in transmission line for purposes of eliminating unwanted signals (97.1 mc in the illustration used in text) in receiver.

mands of all existing interfering signals for all locations.

Reradiating Receivers

Numerous sources may be responsible for interference and noise generation on TV frequencies. Perhaps the source most responsible is the manufacturer who turns out a receiver where the r-f oscillator is unshielded, and insufficient r-f pre-selection precedes the mixer section of the tuner, thus resulting in a spuriously radiated signal transmitted by the receiving antenna attached to the antenna terminals of the receiver. A surprising number of these radiating monsters are still in use today and have been causing no end of trouble for many neighboring TV viewers. Adding a good booster ahead of the radiating receiver will sufficiently

isolate the oscillator section of the receiver from its antenna circuit and prevent future calls from exasperated neighbors. The latest model TV receivers contain improved tuner sections and isolated r-f oscillator coils preventing antenna radiated signals at oscillator frequencies.

FM Stations

FM (Frequency Modulation) stations are causing no end of trouble today, the interfering FM carrier producing a definite swirling herringbone pattern on the face of the picture tube (See Fig. 1). The FM Stations are allocated frequencies ranging from 88 to 108 mc. Harmonic, sub-harmonic and images of these frequencies fall directly into the r-f and i-f ranges of TV receivers. Since these carriers vary in frequency proportionately to the modulation applied to the oscillators, their spectrum of interference is quite broad, and usually broad enough to enter the sound strip as well as the video strip of the receiver.

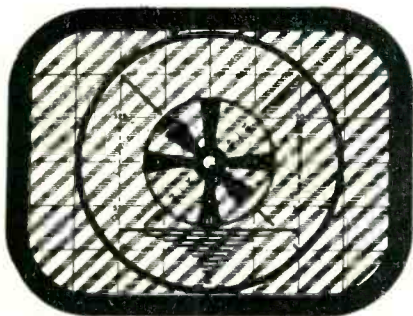


Fig. 1. Pattern produced by FM or r-f interference.

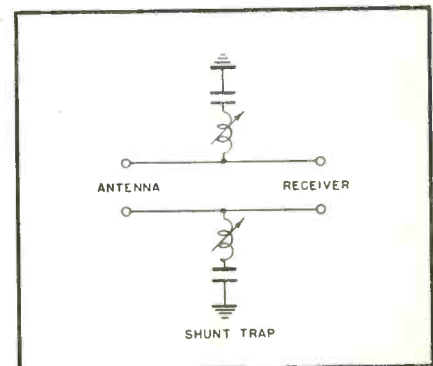


Fig. 3. Shunt wave-trap circuit.

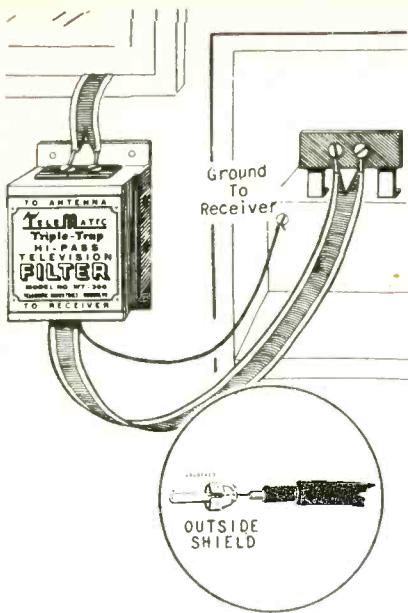


Illustration showing connections between High-Pass filter and TV receiver.

However it is possible to completely eliminate most traces of FM interference by using properly designed and installed high pass filters and wave traps tuned for the FM frequencies. As an example we have found in one instance that sufficient signal was being re-radiated by the FM station to enter the i-f strip (19 to 27.75 mc) of the receiver and to enter the r-f section at 97.1 mc. To eliminate the signal in the i-f strip a high pass filter was used in series with the antenna; and, to eliminate the signal of 97.1 mc, a wave trap was installed across the antenna input terminals to ground. (See Figs. 2 and 3).

The high pass filter was designed, keeping in mind the thought that the least possible loss could be tolerated while at the same time the highest degree of attenuation must be obtained in the "stop band" range of the filter. A cut off frequency of 50 mc was chosen for the filter. (All frequencies below 50 mc are prevented from passing through the filter and

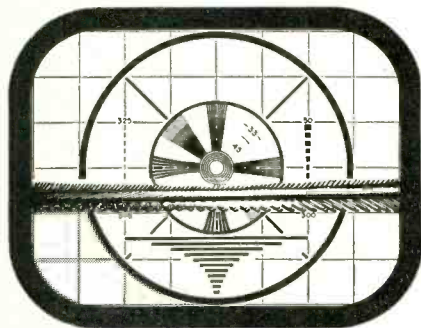


Fig. 5. Diathermy interference.

entering into the receiver itself).

Bearing in mind the efficiency and low loss requirements of the filter, a Pi intermediate section of filter was chosen. The Pi section and the T section perform equally well as to cut-off frequencies. However, it was found that the Pi intermediate section had a much lower loss factor in db than the T section. A comparative sketch (Fig. 4) shows the configuration of both type filters. Figure 4a is a high pass filter made up of K and T sections while Fig. 4b shows one of the Telematic High Pass filters using a K and Pi section.

Since any mutual coupling between the coils in the opposite legs of a high pass filter tends to high inductively shunt the line creating great loss factors, each section of the filter must be individually shielded to keep the losses at a minimum.

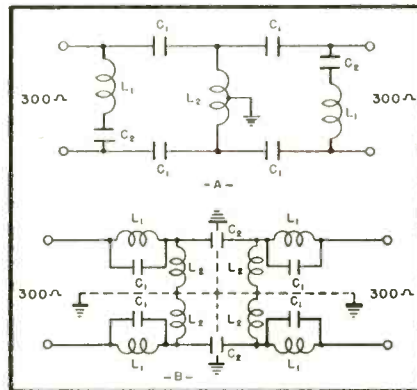


Fig. 4. Various filter circuits.

Even weak radiated signals falling into the i-f range of the TV receiver may sufficiently impair the amplifying action of the video section, causing a fuzzy or snowy picture. A high pass filter will most always eliminate this weak signal from the i-f section and clear up the picture definition.

Short Wave and Amateur TVI

Two other sources of TVI which are fast grabbing the limelight in suburban areas are the commercial short wave and amateur AM stations operating on frequencies between 13 and 65 mc. Suburban areas are mentioned because the stations locate their antenna systems out of town and neighboring communities are made to feel the full brunt of power outputs approaching 100kw. Most of these stations are employing low pass filters in the transmission lines or feeder systems which help considerably. However, the tremendous output of the final amplifier of the transmitter may cause re-radiation directly from the transmitter tank circuit, defying the

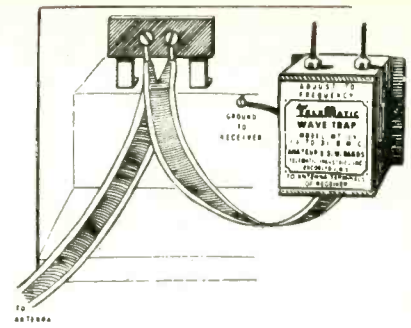


Illustration showing connections between wave-trap and receiver.

shielded rack and cabinet. The harmonics of these frequencies may fall into the i-f channel of the TV receiver. In this case, as in the previous case of the FM station, the high pass filter should be used. However, the harmonic content of this signal may have parasitic frequencies, falling both in the i-f range of the receiver and the r-f range of the receiver. In the latter case, a shunt trap tuned to the frequency of the transmitted signal must be employed.

Since it is seldom known on what exact frequencies the stations are operating (commercial AM frequencies vary from day to night; and most amateur operators now have variable frequency control over specific designated frequency ranges) the necessity for a complete coverage of frequencies becomes evident. We have found it advantageous to develop a complete line of wave traps covering a range of frequencies from 10 to 120 mc.

The most effective low loss trap is of the shunt variety. However, two types of traps have been used for a number of years, the series fed trap and the shunt fed trap. Our laboratory experiments have proven to us that the shunt type has the lowest loss factor and covers the greatest range of frequencies. (See Figs. 2 and 3). As in the design of high pass filters, the Q of the coil becomes a critical factor in trap design. If the coil Q is too high, the physical size

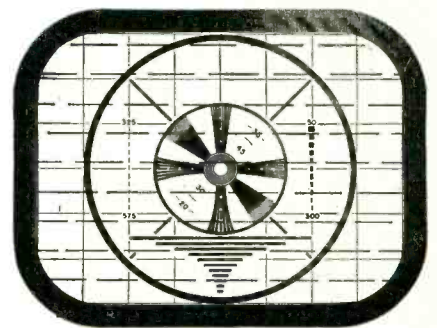


Fig. 6. Ignition interference.

of the coil prevents practical operation in the low frequency range. If the coil Q is too low, cut-off frequencies become critical, mismatch losses are introduced in the antenna circuit of the receiver and the broad band frequency range of the coil is reduced below a practical usable point. A moderate Q range must be used that will cover a frequency response of several megacycles tunable only by a powdered iron core and pre-set to the tuning range with the smallest allowable capacity.

Many unshielded traps have been put on the market and failed to operate satisfactorily due to the lack of shielding. Our experience has shown that all traps and filters must be fully shielded in a metal container and grounded to the chassis of the receiver to prevent signal pickup directly in the tuning circuit of the trap coil and re-radiation into the antenna input of the receiver.

Diathermy

Until the revised frequency allocations for diathermy are put into full effect, diathermy interference will continue to plague certain unfortunate viewers who are located relatively close to a physician who owns and operates such a machine. Diathermy radiation is one of complex wave form resulting in a type of interference illustrated in Fig. 5. The interference appears as a horizontal broken streak slowly traveling upward or downward across the face of the picture tube. Because the r-f signal generated by diathermy machines is of a complex wave form, many parasitic frequencies are radiated, several of which fall into the i-f and r-f range of a TV receiver. A trap tunable over the frequency range of 60 to 90 mc (later model diathermy), or a trap tunable from 30 to 60 mc (early models) should in most cases eliminate this interference.

In homes closely situated to that of the physician, a portion of the interfering signal may enter the receiver directly through the a-c power line. To eliminate this source of interference, a line filter has been designated which is by nature a low pass filter

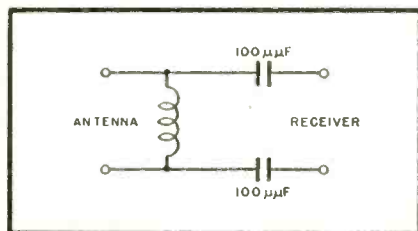


Fig. 7. Circuit diagram of ignition interference trap.

with a variable cut-off frequency of high attenuation on diathermy frequencies. A combination of this line filter and either a wave trap for the older type diathermy or a wave trap for the newer type diathermy should eliminate all traces of interference.

Ignition Interference

Ignition interference is perhaps one of the broadest types of interference yet encountered. The r-f generated by ignition, being of the spark type, supports an infinite frequency range limited only by the amount of current broken at the distributor points, the timing of ignition, and the amount of gap between the points on the rotor arm (See Fig. 6). Because of the relatively close proximity of the automobile to the ground most ignition interference is produced by a vertically radiated signal introduced into the feeding system of an antenna rather than the antenna proper.

A balanced coaxial fed antenna, reasonably matched and reasonably

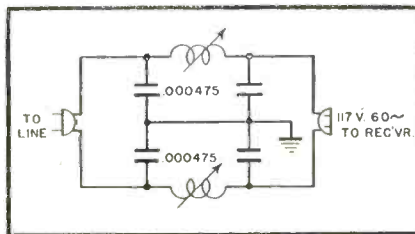


Fig. 8. Circuit diagram of tuned line interference filter.

high above ground, usually experiences little or no interference from ignition sources. In locations where ignition interference is extremely severe and receivers with a 300 ohm input are being used, a 72 ohm antenna coaxial fed and matched to the receiver with a shielded and grounded 72 ohm to 300 ohm matching transformer will sufficiently lower the ignition interference to a level where it is no longer objectionable. The ignition frequencies of highest transmitted level fall into the frequency range between 14 and 31 mc. This being true, a high pass filter will greatly aid in reducing ignition interference since all frequencies below 50 mc will be highly attenuated. Any interfering signals above 50 mc are relatively weak.

We have designed an ignition trap which provides extremely high attenuation at ignition frequencies and no attenuation at TV frequencies. (See Fig. 7). This trap inserted between the antenna lead and the receiver terminals should greatly attenuate all ignition entering the receiver via the antenna and transmission line.

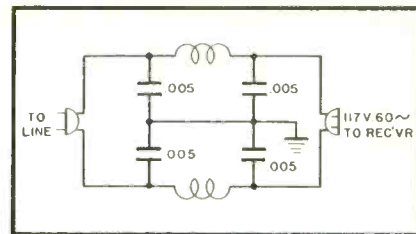


Fig. 9. Circuit diagram of line filter.

Appliances

Frequently, appliance motors particularly brush type motors, create a spark radiation similar to that caused by automobile ignition. The frequency range may vary depending upon the cleanliness of the brushes, the speed of the motor and the amount of current drawn through these brushes. Oil burners, electric hand drills and outmoded refrigerators should be bypassed for r-f interference with a .5 μ f or larger capacitance. However, in many cases this will provide inadequate filtering for high frequencies which fall into the TV spectrum. A grounded low-pass line filter inserted at the TV receiver will eliminate all of the interference which may enter through the a-c line cord. (See Figs. 8 and 9). A well designed commercial line filter should be fully shielded and capable of carrying line loads of one-half horse power. Filters of this type are designed to highly attenuate all frequencies above 70 cycles while not impeding the 60 cycle component of the A.C. line.

Direct Pickup

In areas where r-f interference is extremely severe, poorly designed and poorly shielded receivers pick up the interference directly in the tuning circuits and component parts (i-f coils etc.) of the chassis. Attempting to trap interference of this nature and strength at the antenna terminals of a receiver will be unsuccessful. The only cure for this interference may be found in completely shielding the interior of the TV cabinet. A good grade of copper screening tacked to the inside walls of the cabinet and soft soldered at the corner seams will sufficiently isolate the chassis from any direct r-f pickup. The mesh of the screen is fine enough to completely shield the chassis and at the same time allow proper ventilation of the heated tubes and components within the receiver. Interference of this type exists only where the TV receivers are located directly in the radiation field of a high powered transmitter or ignition generator. Occasionally the re-radiation from a horizontal sweep oscillator in a TV receiver injects a beat frequency into the sec-

ond detector of a broadcast receiver producing a high pitched tone in the loud speaker. A high voltage r-f power supply or a fly back circuit insufficiently shielded may produce this same annoying disturbance.

Wave traps made of quarter wave open stubs cut to the frequency of the interfering station have been used with a moderate degree of success. The chief objection to this method lies in the fact that this quarter wave open stub is unshielded and an ideal resonant pickup for other high level interfering signals.

Ghosts

High pass filters and wave traps will not cure ghost interference. Ghost interference appears on the screen of the picture tube in the form of a double image located either to the right or the left of the picture. Ghosts are produced by multipath reception of signals re-radiated from a source other than the transmitting antennae. These signals may be re-radiated from adjacent buildings, bridges, water towers or neighboring TV receiving antennae. These multipath signals may arrive at the receiver via a shorter path than the desired signal (leading ghosts) or by a longer path than the desired signal results in a ghost. The signal which arrives later than the desired signal displaces a ghost to the right of the picture image while that arriving ahead of the desired signal places a ghost to the left of the picture image. Leading ghosts may be reduced in strength by better orientation of the antenna in respect to the transmitter antenna. (This shortens the path for the directly transmitted signal). The use of a shielded down lead or feeder from the antenna to the set will prevent multipath signals from entering any half wave sections of this down lead. Trailing multipath signals may be eliminated by raising the transit time of the arrival of the desired signal at the input terminals of the receiver. An adjustable resistance pad inserted in the line at the antenna terminals may be varied to synchronize the time of arrival of the desired signal and the ghost signal at the antenna terminals of the receiver.

Wave traps and high pass filters will not eliminate picture flutterings (phase shift) caused by airplanes passing between the transmitting antenna and the receiving antenna. The vertical plane width of the horizontal radiated signal from a transmitting antenna is sufficiently broad in pattern to cover a considerable height above ground. This range increases in proportion to the distance between the receiving object and the



Fig. 10. Various types of TVI filters and wave traps which form a convenient kit for use by the serviceman in tracking down and eliminating TVI.

transmitting antenna. An airplane above the receiving antenna and in the field of a TV transmitting antenna picks up considerable energy and reflects it downward toward the receiving antenna. The reflected signal plus the signal direct from the transmitting antenna enter the receiver at approximately the same time. The airplane, since it is traveling at high speed, gradually increases or decreases its distance from the transmitting antenna and the receiving antenna. This varying distance changes the number of half waves away from either the receiving antenna or the transmitting antenna, the change being from an odd number of half waves to an even number of half waves. When the airplane is an odd number of half waves away from the transmitting antenna, the reflected signal is added to the signal at the input terminals of the receiver, causing considerable gain in signal strength. When the airplane is an even number of half waves away from the transmitting antenna, the reflected signal is 180 degrees out of phase (opposite polarity) with that at the input terminal of the receiver causing a cancellation and noticeable decrease in signal strength. This rapid changing from odd to even half waves of distance produces a picture fluttering from a high relative strength to low relative strength.

TVI Kits

After having read the possible

headaches involved in interference elimination, one almost is tempted to believe it impossible to adequately eliminate TVI. However, with a full range kit of filters (See Fig. 10) the serviceman may readily determine the interfering frequencies and sufficiently lower their strength beyond detection in the picture screen of the receiver.

Since a kit of this type contains high and low pass filters and tunable wave traps, which cover the entire interference spectrum, the service man, in doubt as to what frequency is causing the interference, may first attach the high pass filter of proper matched impedance to the receiver. He then attaches various wave traps across the antenna terminals of the receiver and slowly tunes the slugs one at a time, hoping to eliminate the interference. Should one trap fail to eliminate this interference, he tries the next etc. until he locates the trap which tunes to the frequency of the interfering signal. The low pass filter of course is used where it is suspected that the TVI enters the a-c line. Thus, a filter kit becomes an inexpensive means of detecting and eliminating interfering signals, and has the added advantage of being small in size, and readily attachable to any receiver. In addition, the filter kit results in valuable time saved, becomes another source of profit, and establishes customer good-will relationship and confidence.

OSCILLOSCOPE CIRCUITS

PART 2

by ALLAN LYTEL

In this second installment the author discusses the radio frequency oscillator type of power supply first, following which gas filled triodes as sweep generators and multivibrator sweep circuits are also discussed. A simple explanation of the latter features this article.

Radio Frequency Oscillator High Voltage Power Supplies

The only requirement of a high voltage supply is that it provides a sufficiently high d-c voltage for the cathode ray tube and its associated circuit. Because of the exceptionally low current drain which is demanded, a new approach may be used. An ordinary transformer of the iron core type operating at the 60 cycle frequency, requires a great number of turns on the secondary to produce a sufficiently high voltage. A power supply of this type also has certain attendant possibilities of dangerous high voltage shock. Any high voltage system inherently is capable of shocking the serviceman who attempts to repair the equipment. While a 60 cycle high voltage power supply is capable of dangerously high currents, the radio frequency type of power supply is incapable by its very design of providing a sufficient current drain to cause death.

A power supply of this type as shown in *Fig. 2A* has additional advantages. The cost of such a circuit is considerably less than the transformer type of high voltage supply. At the same time there is a considerable saving in weight since the air core transformer is much lighter. Because of the possibility of radio frequency interference, these power supplies must be adequately shielded. As shown in the figure, a 6V6 tube, V-1 is used as an oscillator circuit. The tank coil with inductance *L-1*, and capacitor *C-2*, is connected between plate and screen. The supply voltage for the plate is connected in series with the tank coil. The oscillator must have a d-c power supply feeding plate and screen. The control grid of this oscillator has its feedback through the coil *L-2*; an automatic bias supply is obtained through the grid leak method of *R-1* and *C-1* in parallel. The filament for the 6V6 tube obtains its power from the same

low voltage power supply which provides plate voltage for this tube.

A special high frequency rectifier diode, the 8016 or 1B3GT type, is used for the rectifier V-2. Two coils are coupled to the output of the oscillator which operates between 100 and 200 kc. Coil *L-3* supplies the filament power which is only 0.2 amperes at 1.25 volts. This is most conveniently obtained from the output of the oscillator tube the 6V6. Ordinary 60 cycle power could be used for this rectifier heater, but this would involve an additional filter network to keep the radio frequency out of the 60 cycle circuit. By using the high frequency oscillation for heater power, circuit simplification is obtained.

The secondary coil, *L-4*, supplies high voltage for the plate of the rectifier diode. Half wave rectification is obtained, but at this high frequency, extremely small filter capacitors are entirely adequate, having a value of only 200 $\mu\mu\text{f}$. A capacitor

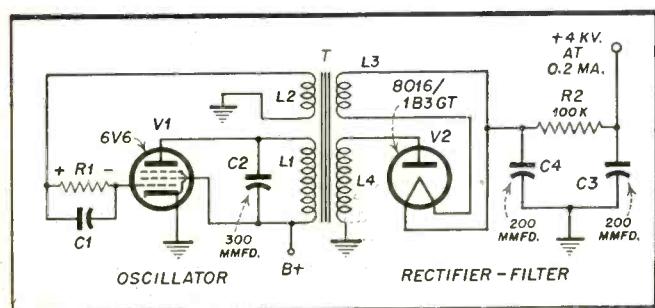


Fig. 2A. Circuit diagram of an r-f type of high voltage power supply. The cost of a power supply of this type is considerably less than the transformer type.

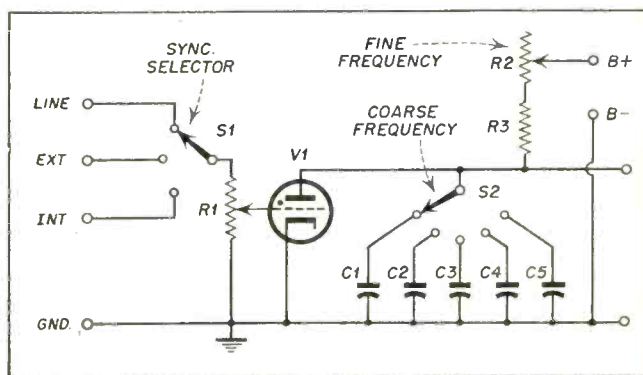


Fig. 3. The gas triode sweep circuit.

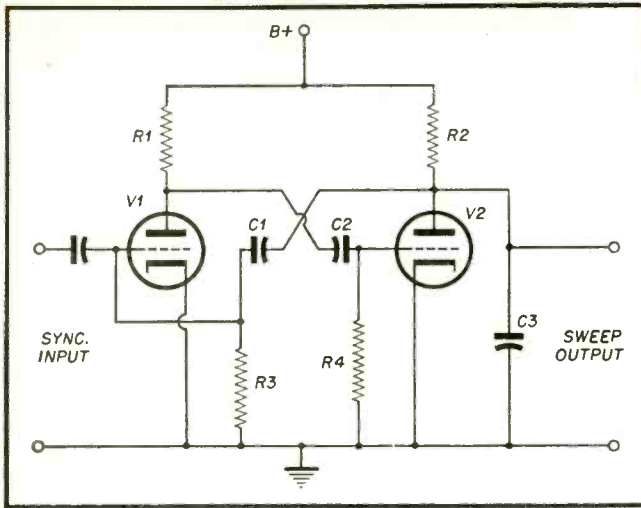


Fig. 5. The balanced multivibrator with synchronization input. The sweep capacitor is C_3 . Greater ease of control is obtained here.

of this value supplies approximately the same filtering action as a much larger capacitor operating at a lower frequency. This high frequency rectifier tube provides in this circuit, an output voltage of 4000 volts at 0.2 milliamperes. A 60 cycle power transformer supplying this same output voltage, would be in some cases, a third as big as the entire oscilloscope.

This high voltage, high frequency rectifier tube has a peak inverse voltage of 10,000 volts primarily because of its design where the distance between its cathode and plate is large. The plate connection is through a cap at the top of the glass envelope providing maximum distance between the plate and cathode con-

nections. The maximum plate current for this tube is 7.5 milliamperes and its average plate current is a minimum of 2.0 milliamperes. This tube will provide high frequency rectification up to a maximum of 500 kilocycles. The plate to filament capacitance is given as $2.6 \mu\text{f}$. The secondaries, $L-3$ and $L-4$ are not tuned by an external capacitor. They are brought to resonance by means of the tuning of the primary $L-1$, as well as the distributed capacitances of their own inductance turns and the capacitance between the wiring of the secondaries. The plate to filament capacitors also contribute to the necessary value to tune this circuit to resonance.

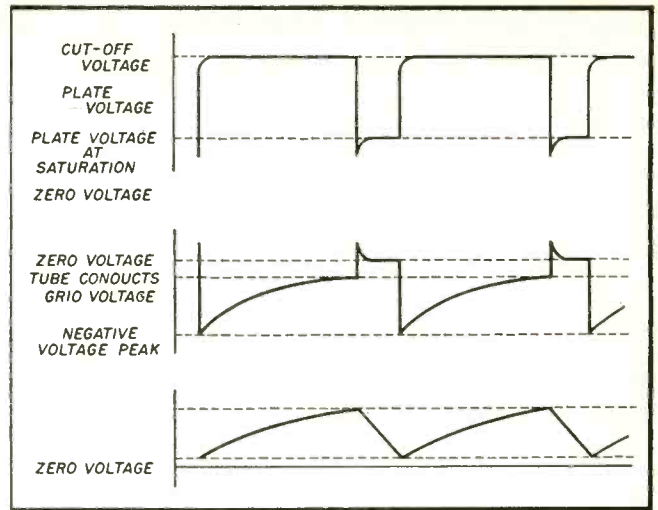


Fig. 6. Waveforms that are obtained with an unbalanced type of multivibrator. Sawtooth output is shown at the bottom.

Gas-filled Triodes as Sweep Generators

While the gas diode sweep generator circuit fundamentally performs all of the functions of the more complicated sweep oscillators circuits, it is seldom used in any but the most inexpensive cathode ray oscilloscopes. A linear sweep is not obtained with this generator since a large portion of the capacitor charging curve is utilized. A much more common type of sweep generator commercially uses a gas filled triode which is known as a thyratron. In industrial electronic applications, tubes of this type are very widely used as grid control rectifiers. By means of the addition of the grid element, a much more versatile type of control is available over the tube operations than with the gas-filled diode.

Gas filled thyratrons are also capable of a greater current flow during periods of conduction than could be obtained with the gas diode or voltage regulator type of tube. When the gas triode is conducting its resistance is very low due to the additive effect of electron flow from cathode to plate caused by electronic emission and electron flow caused by gas ionization. Since the plate resistance is lower, the charging capacitor discharges much more rapidly, which provides a faster return on the screen. A gas triode generator can then have a higher frequency limit than the gas diode because of this rapid discharge.

The time base generator in Fig. 3 has three separate and individual controls. Control No. 1 Synchronizing- changes the amount of synchronizing signal applied to the gas

[Continued on page 53]

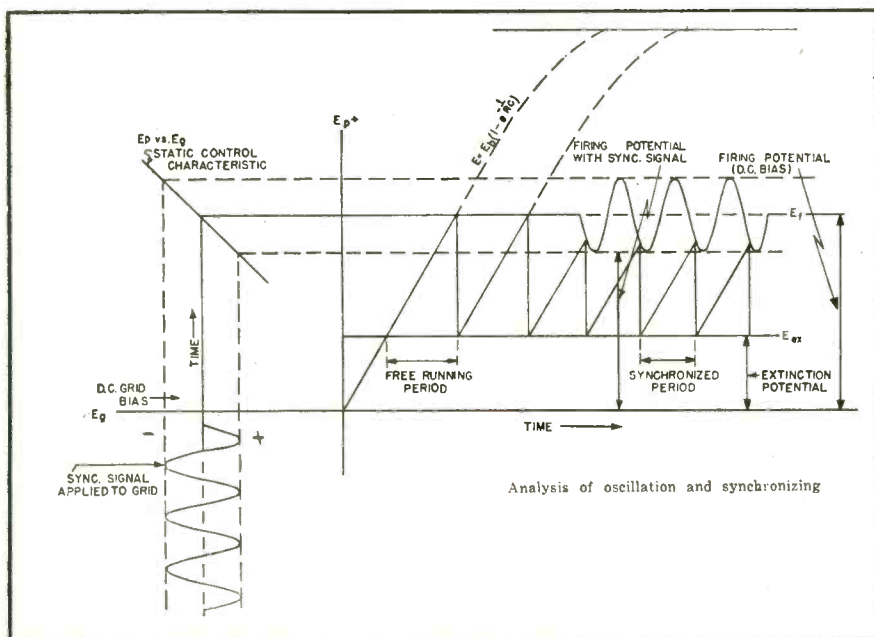


Fig. 4. Graph showing analysis of oscillation and synchronizing waveforms.

TV Servicemen Must Be

TECHNICIANS,
DIPLOMATS,
PEACE-MAKERS
BENEFACTORS

"A CUSTOMER"

"A Customer is the most important person ever in this office—in person, on the telephone, or by mail. A Customer is not dependent on us—we are dependent on him. A Customer is not an interruption of our work—he is the purpose of it. We are not doing him a favor by serving him—he is doing us a favor by giving us the opportunity to do so. A Customer is not an outsider in our business—he is part of it. A Customer is not someone to argue or match wits with. Nobody ever won an argument with a Customer."

—Paul T. Babson
from *Sales Management*

We thought so much of this article, which appeared in the July, 1951 issue of RADIO AGE, published by RCA, that we arranged for permission to reprint it for the benefit of our many readers. We welcome contributions from our readers of similar unusual experiences.

AN RCA serviceman rapped smartly on the door of the Smith home in Forest Hills. It was the first call of the week and he felt unusually chipper. "Oh, I'm so glad you're here," cried Mrs. S., "you can watch the children while I go to the store!" Before the amazed technician could protest, mother had disappeared, leaving him with three screaming little "darlings" aged 4 years, 2 years, and 8 months. The week was off to a bad start, but RCA's TV "surgeon" heroically inspected the chassis, located the trouble and corrected it, while his temporary wards hid his tools, rode on his back and tried to hide in the empty cabinet. Mother finally returned one hour later and released the babysitter for his next assignment.

Hundreds of similar situations confront the easygoing technicians in RCA Service Company branches all over the country. They regard such breaks in routine as "all in a day's work"—24 hours in which the customer is always right.

The RCA experts, skilled at curing TV's mechanical ailments, must be equally adept as public relations men. When a Norwalk, Conn., woman phoned the service branch demanding: "Where do I send the bill? While backing my car out of our drive into



the street, I smashed into one of your trucks and put a gouge in my fender!", the manager calmly advised: "Just be brave, madam, and tell your husband."

One customer, detecting strange burning odors in his receiver, gazed in astonishment as RCA's "exterminators" removed several electrocuted mice from his highly-polished cabinet. "They must have come inside the set from the factory; we don't have mice!" was the reply.

One service manager succeeded in reuniting a Rockaway, N. Y., couple whom television had estranged. The day after their set was installed it needed adjustment, at which point Mr. X upbraided his spouse for spending all that money for nothing. Blows were exchanged, neighbors called in police, and wife went home to mother as the first step in divorce proceedings. With the best of intentions, the RCA manager talked to both parties and arranged to have a new receiver de-

livered two days later. The manager was duly chagrined when Mr. X stormed into his office with these words: "I've been trying to get rid of that old battle-axe for 10 years, and now when I have a perfect excuse you have to go and ruin it!"

Although medieval armor is not in vogue these days, many a bruised TV mechanic would welcome its protection. Such was the case of the eager young technician who, having erected a difficult rooftop antenna, stepped back to admire his work. When he landed on the hard ground, the mistress of the house asked if he had knocked any slate from the roof. "Lady, I came down too fast to count them!" was his bewildered reply.

A similar incident occurred on Long Island during the blizzard of 1947. While mounting an antenna, the serviceman slipped off the icy rooftop, landed in a snowdrift and somewhat disheveled, rang the doorbell. After reviving the astonished housewife, who fainted at the sight of him, the technician completed the installation.

If a homeowner wants to know how solidly his house is constructed, serviceman Clark can tell him. He tests all ceilings and beams these days, before starting work. While rigging an



antenna in the unfinished attic of a Bronx dwelling, Clark lost his footing, slipped between two beams, crashed through the ceiling, and landed on a card table surrounded by a ladies bridge club.

The Service Company's unusual case histories are not without their share of international flavor. A penniless oriental prince, posing as a bona fide UN delegate, stormed into headquarters demanding immediate and very special TV service. Investigation revealed that he lived over a cheap 52nd Street nightclub, but through some scheme received his mail and phone calls at Lake Success.

Two RCA technicians have the distinction of being invited into a Russian inner sanctum. The dubious duo set out for the Russian Embassy, housed on the Morgan Estate at Glen Cove, Long Island. They were "welcomed" at the gate by heavily-armed uniformed guards who escorted them to the mansion. Inside two other guards, this time with mere revolvers, scrutinized the entire procedure. When the technicians ran the TV feed line down from the attic, their Soviet "helpers" tried to stop them on the grounds that this would make the pictures come in upside down. After completing the installation, our heroes were upbraided because the receiver "would not tune in Russia, where television was invented."

In direct contrast was the temporary TV installation made for the President of a South American republic during his New York visit. In an effort to cement Latin-American relations RCA's technician tried to give immediate service, but was asked to come back at 5 p.m., as the President was taking his siesta. When he returned at the appointed hour, the serviceman had to wait in the lobby until the dignitary, properly garbed in his dinner clothes, could receive him.

A simple address on the day's schedule often turns out to be a virtual obstacle course for the dauntless serviceman. One call—a confectionery store in Garfield, N. J.—was in reality a "horse parlor." The RCA technician rang the bell and knocked loudly, but received no answer. A bystander gave him a second address which proved to be a Social Club.

Here he was referred to a third address where he finally found a man with a key to the confectionery store in which the TV set was located.

Whether they have to climb a steep slope to a hillbilly's shack, or row out to a house built on stilts, service crews generally accomplish their missions. Unless, as happened in Paterson, N.J., the technicians try to install a TV receiver in a Turkish Bath on "Ladies Day."

On occasion the impossible rears its defiant head to stump the most experienced serviceman. Witness the time one tried to locate the source of heavy interference on a Bronx set located in a good reception area. The enterprising RCA man finally gained entrance to an unfinished attic which had been closed off for over 10 years. Here he found lighted an old, chattering carbon bulb, apparently installed by the workers who had run the original electric line up to the attic. Once this obstacle was removed, reception was perfect.

Another baffled family had to choose between video and heat, until a technician solved the mystery. When the



new TV set was tuned in, the oil burner quietly ended operations. RCA's sleuth discovered that a receiver should never be located under a thermostat—especially in winter weather.

The famous case of Brooklyn's "Bessie" is familiar to RCA V.I.P.'s and servicemen alike. She has called them all. Bessie purchased an expensive projection-type receiver, and then complained bitterly and frequently that the picture got fuzzy every night at 9 o'clock. After countless check-ups, which revealed no trouble, the branch manager went to her home each night for a week to see this phenomenon for himself. It turned out that Bessie was not exactly a teetotaler, and, as might be expected, the picture to her eyes sometimes got fuzzy. Since it isn't wise to tell a customer that she may be seeing things, the manager made motions of adjusting several knobs behind the set, whereby the complainant was temporarily happy.

One distinguished serviceman can testify to the fact that appearances are indeed deceiving. His was the task of installing a receiver in the Brooklyn State Hospital. He had no

problem gaining entrance to the institution, but leaving was another story. Guards detained him for nearly an hour, confident that he was one of their mental patients, masquerading as a television engineer.

A few months later the same man was "locked up" again, this time by a conniving housewife who refused to let him leave until he had put in all the screens in her six-room house.

When the telephone rings in a Service Company branch office, the staff members are prepared for anything. One woman demanded that they put a shade on the screen of her set so the TV performers couldn't spy on her; another requested them to "pull up the shade in front of the orchestra" on her receiver, which was actually showing a test pattern with canned music. A retired schoolteacher was convinced that television was making her radioactive, while an expectant mother asked if metal-cone tubes really gave off a harmful ray. Dozens of calls have come in requesting servicemen to install films in the TV instruments.

Back in 1947, when receiver sales were skyrocketing faster than the Service Company could expand its staff, things were really hectic. Installation orders had reached a three-week backlog and people offered all kinds of gifts in return for immediate installations. Service trucks returned cases of whisky, suits, jewelry, pens, and numerous gadgets which hopeful customers sent in with cards attached. Hundreds of written requests were received from doctors who claimed they wouldn't be responsible for their patients if the latter had to look any longer at unopened cartons containing their long-awaited television sets.

In those days, the serviceman was king. One particular technician named Sweeney was assigned to the Park Avenue trade because of his engaging personality. Monday through Friday, Sweeney never bought a meal. He had breakfast with the maid, lunch with the woman of the house or her daughter, and dinner with the whole family.



Judges, bankers, and vice presidents called for him by name when they wanted service.

[Continued on page 53]

Effective Shop-Built ANTENNAS for TV

PART 3

by RANSOM BEERS

Third and final installment of this series. This installment details constructional features of the 4-bay Yagi antenna, and illustrates matching method.

THE elements of the Yagis designed were of $\frac{1}{2}$ " O.D. copper tubing available in auto supply stores or plumbing supply stores. Often junk yards offer copper tubing from discarded refrigeration systems at a fraction of new cost. While copper is heavier and softer than aluminum, it has better conductivity and can be soldered much easier. If the builder desires to further the efficiency of these antennas, a thin coating of silver can be plated over the copper. (Solutions are available that will plate by merely rubbing on the solution with a cloth).

Single 6-Bay Director Yagi

All elements are mounted on $\frac{1}{2}$ " I.D. used conduit straps or water pipe with light flexible $\frac{1}{2}$ " conduit or $\frac{1}{2}$ " cable straps. As the outside of the pipe is about $\frac{1}{4}$ " larger in diameter than the inside, the straps hold the elements on quite snug. The straps were fastened on with #10-32 machine screws $1\frac{1}{4}$ " long. The elements need not be insulated from the pipe as the potentials of the elements are zero at the center. (See Figs. 10A, 11).

The best way to construct the folded dipole is: Mount the $\frac{3}{8}$ " diameter

plastic rods about 2" each side of center of the $\frac{1}{2}$ " driver copper rod. Each plastic rod is mounted with 10-32 x .1" machine screws screwed into tapped holes $\frac{5}{8}$ " deep (see Fig. 10B). From each top end $\frac{3}{8}$ " down, a $\frac{1}{8}$ " diameter hole is drilled laterally for passage of the #8 wire. Drill $\frac{1}{8}$ " diameter holes about $\frac{1}{4}$ " from each end of the $\frac{1}{2}$ " driven element. Pass a two foot length of #8 wire through the holes in the ends of the $\frac{1}{2}$ " driven element and holes in the plastic rods. Space the #8 wire evenly $\frac{1}{8}$ " from the plastic rod spacers to the ends and solder the ends on each side of

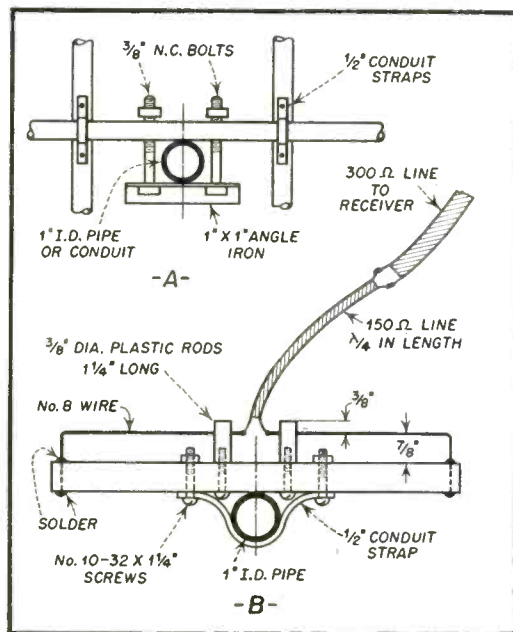


Fig. 10A. Top view, showing mounting of antenna on the mast and element mounting. Fig. 10B. Constructional details of folded dipole driving the Yagi.

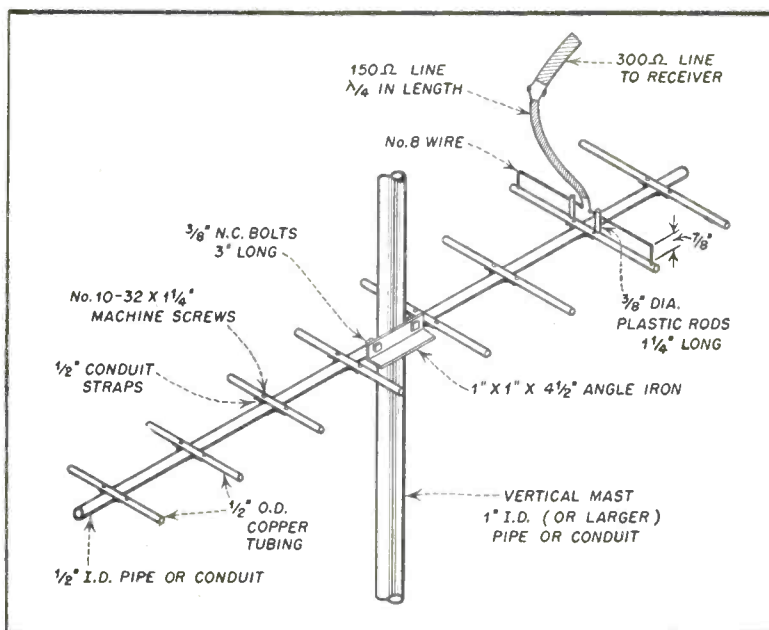


Fig. 11. Constructional details of single bay Yagi using six directors and a folded dipole as the driven element. Two $\frac{3}{8}$ " diameter N.C. bolts of suitable length secures the antenna proper quite firmly on the vertical support mast.

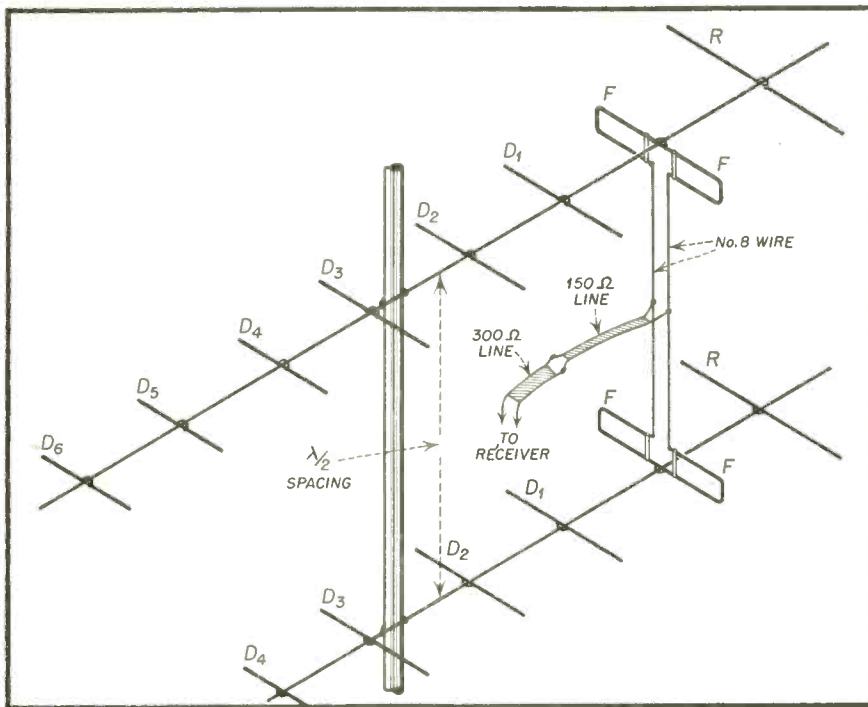


Fig. 12. Method of connecting 2 folded dipole-driven Yagi antennas. Approximate increase in gain over a single Yagi is from 10 to 14 db.

the $\frac{1}{2}$ " diameter driven element. Midway between the plastic rods cut the #8 wire, bend the ends out and solder on the $\frac{\lambda}{4}$ matching section. The 300 Ω line to the receiver is then

soldered to the other ends of the 150 Ω matching section. The center to center spacings of the elements are given in Table 2. The lengths of each element are also given in Table 2.

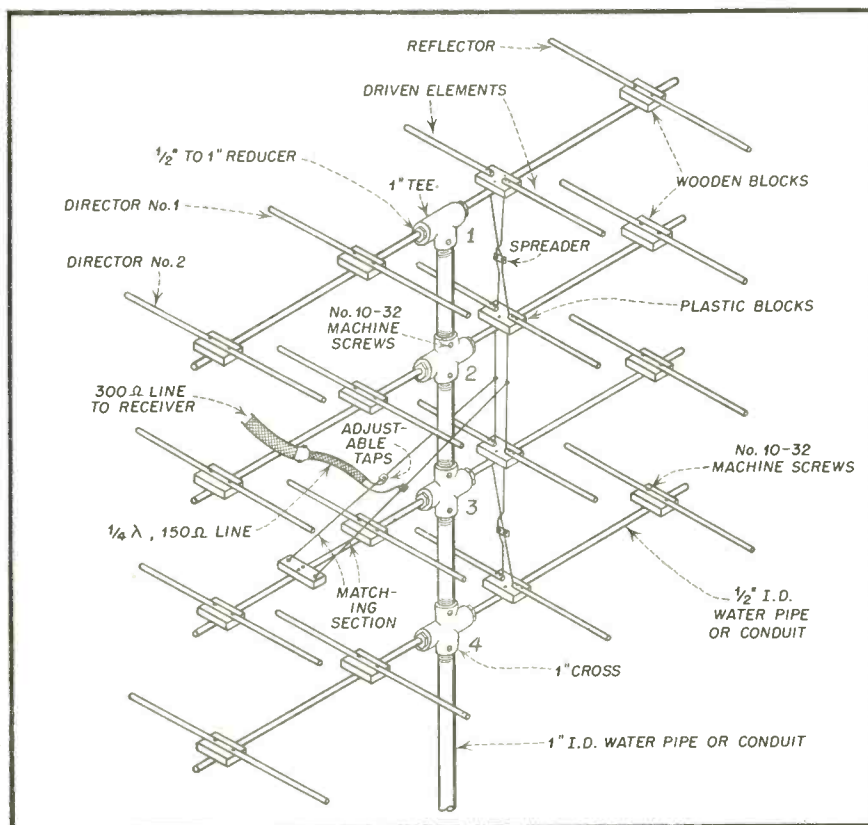


Fig. 13. Constructional details of 4-bay Yagi, using one reflector and two directors for each bay. Notice adjustable taps on matching section.

A total of six directors was used giving about 10 to 12 db gain.

To mount the antenna on a mast of a 1" I.D. or larger pipe, $\frac{3}{8}$ " holes are bored about the center of the $\frac{1}{2}$ " elements support and through a 1" x 1" x $4\frac{1}{2}$ " piece of angel iron. Two $\frac{3}{8}$ " diameter N.C. bolts of suitable length (depending upon the size mast used) hold the antenna quite firmly on the vertically support mast. (See Figs. 10A, 11). A complete list of parts is given in Table 3.

This Yagi using a folded dipole as driven elements can be stacked to two bays. If more than two bays are stacked the gain drops off seriously as the impedance is sharply reduced. Adding a second bay increases the gain from about 10 to 14 db. (See Fig. 12). Each bay should be $\frac{\lambda}{2}$ apart. Although $\frac{\lambda}{8}$ or $\frac{\lambda}{4}$ stacking is often used to stack arrays on low TV bands, it is not recommended for high band operation as space is not so seriously a premium. If stacking is inconvenient, two of these arrays can be separated at great distances using a separate transmission line of the same length to each, and connecting the two transmission lines in parallel near the receiver. Since the impedance at the connection will be 150 Ω , at least $\frac{\lambda}{4}$ length of 300 line should follow this junction to the receiver for better matching.

Stacked 4-Bay Yagi

While stacking four bays of Yagis produces more gain, it is much more difficult and expensive to construct. (See Fig. 13) As dipoles are used as driven elements rather than folded dipoles, the elements are spaced $\frac{\lambda}{4}$ apart in order to present a matchable impedance at the transmission line. It was felt that using more than two directors to each Yagi was not justified as the antenna would be quite large. Full half wave spacing is employed between bays. (See Fig. 17)

The antenna frame was built entirely of used water pipe (or conduit). (If the builder desires, a lighter frame can be made of aluminum). See Fig. 14 for a suggested alternate method of frame construction. The vertical mast is 1" I.D. pipe and the horizontal element supports are of $\frac{1}{2}$ " I.D. The vertical mast and horizontal element supports are joined with 1" pipe crosses. One inch to $\frac{1}{2}$ " reducers are used between the 1" crosses and $\frac{1}{2}$ " horizontal element supports.

It is desirable to drill a hole through the junction of each cross and 1" pipe and insert #10-32 machine screws to prevent sections of the mast from turning relative to adjacent sections. (See Fig. 13).

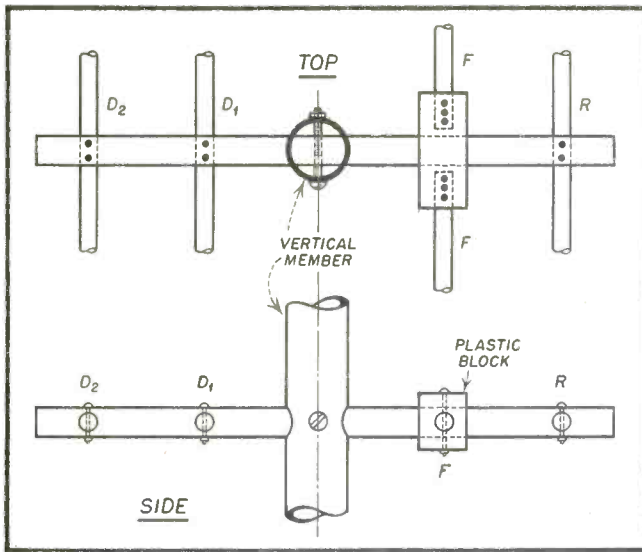


Fig. 14. Suggested alternate construction of 4-bay Yagi by mounting cross members through holes in larger diameter antenna supports.

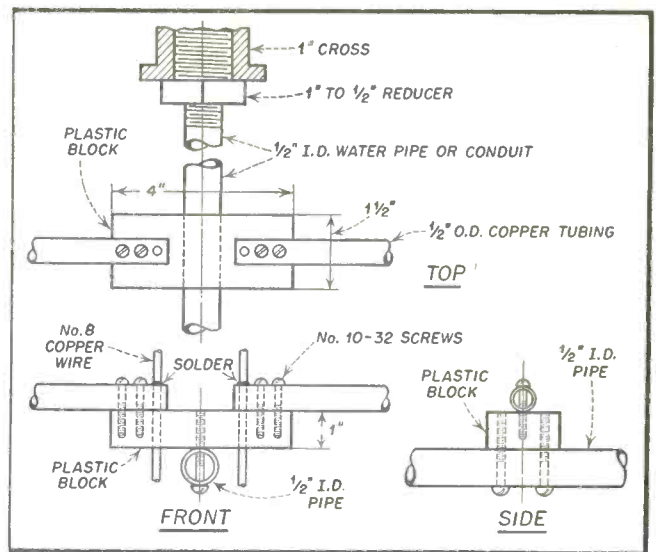


Fig. 15. Constructional details illustrating the mounting of the driven elements of the 4-bay Yagi. The elements are mounted on plastic blocks.

The driven elements must be insulated at the center as they are center fed dipoles. For this purpose the elements are mounted on 1" x 1 1/2" x 4" plastic blocks. It is highly recommended that the blocks be of the impregnated canvas type, as this type of plastic has great strength as well as good insulating qualities. The plastic blocks are secured to the frame by two #10-32 machine screws through holes in the frame, and into tapped holes in the blocks. (See Fig. 15). The parasitic elements are mounted on wooden blocks and secured to the frame by 1/2" conduit clamps as was done with the single bay Yagi first described. The wooden

blocks are necessary to put the parasitic elements in the same plane as the driven elements. (See Fig. 16).

Observe that the transmission line between bays 1 and 2 and between 3 and 4 are reversed while between bays 2 and 3 it is straight. This is necessary to keep the currents in each bay in phase with those of the next (See Fig. 17). The antenna is center fed between bays 2 and 3 via an open section. Approximately $\lambda/4$ from the points of feed down the matching section of the impedance will be about 72Ω . A $\lambda/4$ section of 150Ω twin lead can then be used to match a 300Ω line to the receiver. Sliding taps made with two large fahrenheit clips allow

the impedance of the antenna to be adjusted to the 150Ω line quite accurately. Observing the receiver for maximum reception while adjusting the taps will assure the maximum energy transfer. This is an important step in the overall installation.

This 4-bay stacked Yagi will give about 15 to 17 db. gain. Closer spacing between elements was tried but the lowered impedance attenuated the signals seriously. Adding material to make the driven elements folded was also unsuccessful.

To mount both previously described antennas on a chimney, a frame made of angle iron as shown in Fig. 18 serves quite well. The same steel construction applied to these Yagis may be applied to any other antenna type construction in Fig. 1. A good receiver and several good boosters between antenna and receiver are just as important as a good antenna.

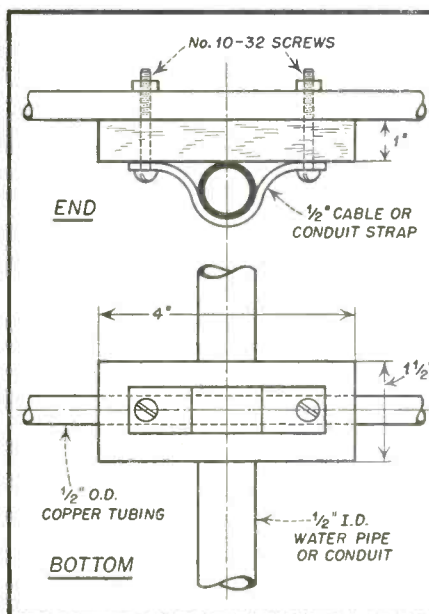


Fig. 16. Details of mounting parasitic elements of 4-bay Yagi.

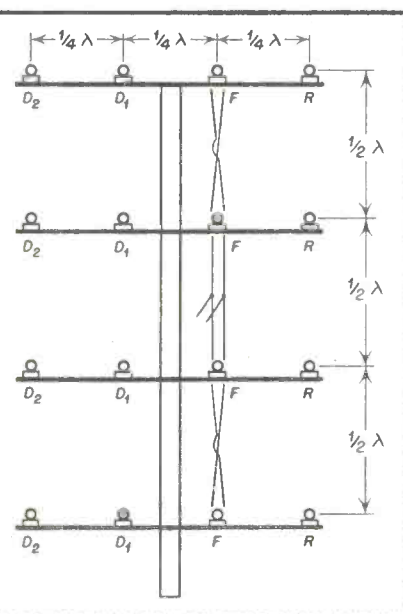


Fig. 17. Notice transposed connections between elements.

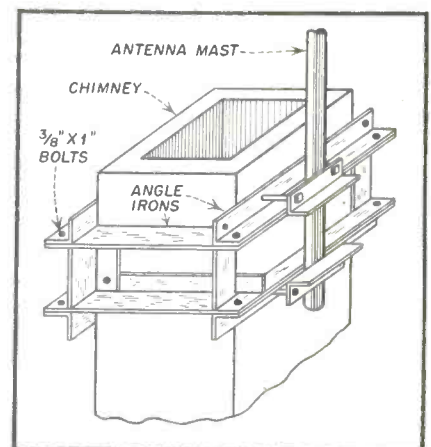


Fig. 18. Constructional details of mounting the antenna on a chimney. Note use of angle iron.

L A R G E S I Z E C O N V E R S I O N

by **VICTOR MARKOSIAN**

Chief Engineer, Ram Electronic Sales Co.

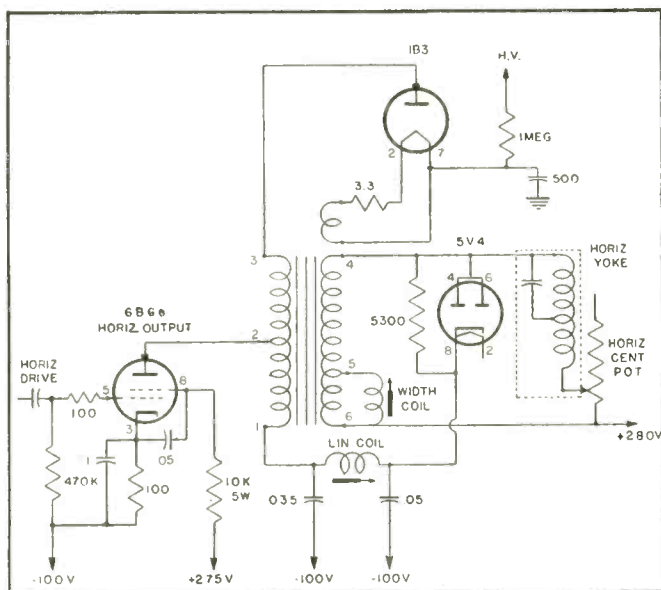


Fig. 1. Typical 630 type circuit which may be easily modified for large picture use.

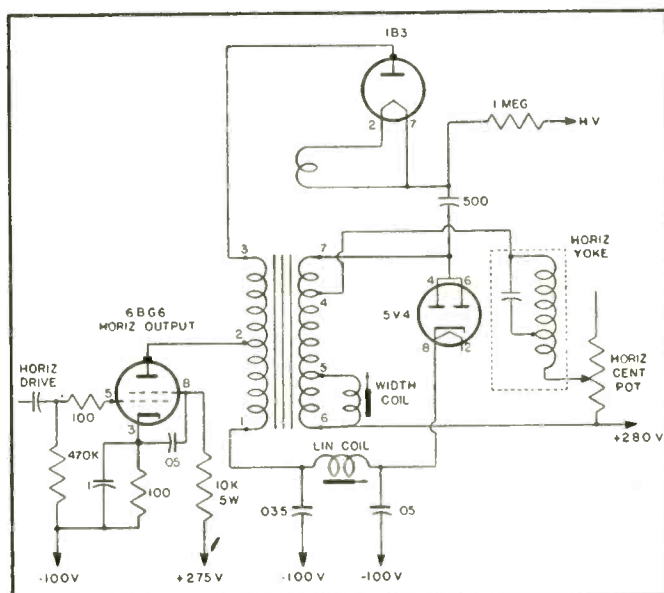


Fig. 1A. 630 Type circuit converted to use Ram or equivalent high-efficiency parts.

THE circuit shown in *Fig. 1* is used in many early TV receivers. Any circuit similar to this can easily be adapted to the circuit in *Fig. 1A*, taking advantage of the new high efficiency transformers. The 5300 ohm damping resistor from plate to cathode of 5V4 can be removed if desired. The original width and linearity coils can be used in most cases.

Any voltage doubler circuit similar to *Fig. 2*, can be modified to use the circuit in *Fig. 1A*. When operating at full horizontal drive, the new transformer will provide enough sweep and high voltage to make the use of a voltage doubler unnecessary. The high-voltage regulation will be superior to that obtained with a doub-

ler circuit. The original width and linearity coils can be used in most cases, just disconnect one of the 1B3 doubler sockets.

Most Philco circuits can be adapted to use the circuit in *Fig. 3* or *Fig. 1A*. It requires a new width coil, and flyback transformer in place of the original components and a little rewiring. When operating at full horizontal drive, the new transformer will provide enough sweep and high voltage to make the use of a voltage doubler unnecessary. The high-voltage regulation will be superior to that obtained with a doubler circuit. As a final operation it is merely necessary to disconnect one of the 1B3 doubler sockets.

CONVERSION PROCEDURE

1. Remove old flyback transformer and yoke.
2. Remove any damper resistor from cathode to plate of damper tube.
3. Connect new yoke to same connecting points except for the red horizontal lead. This is connected to pin 4 of the new transformer (Ram type or equivalent), not to the plate of the damper tube.
4. Run jumper from pin 7 on transformer to plate of damper tube.
5. Run jumper from pin 5 of transformer to B+.
6. Connect pin 1 of transformer to original linearity coil.
7. Connect a width coil between

PICTURE TUBE PROCEDURES

The information contained in this article has been collated from booklet, "Ram TV Replacement and Conversion Guide", May, 1951. It is being reprinted by courtesy of Ram Electronic Sales Co. Information along these lines by other manufacturers will appear in forthcoming issues of RSD.

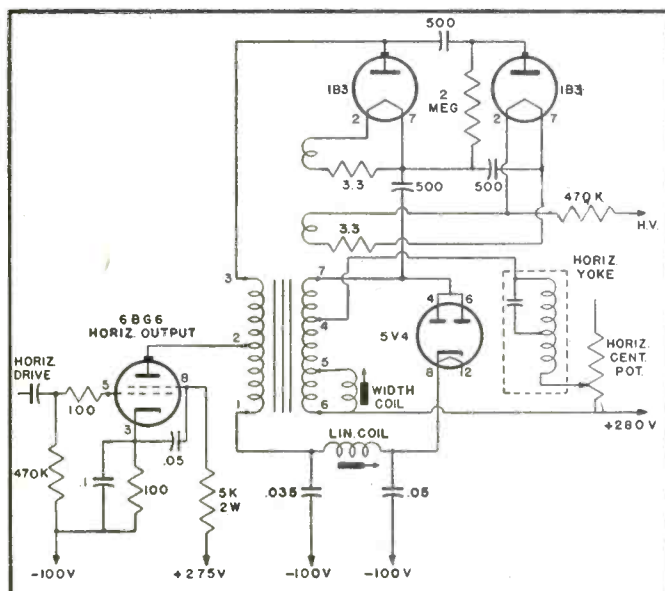


Fig. 2. Typical voltage doubler circuit which may be readily modified for larger picture use.

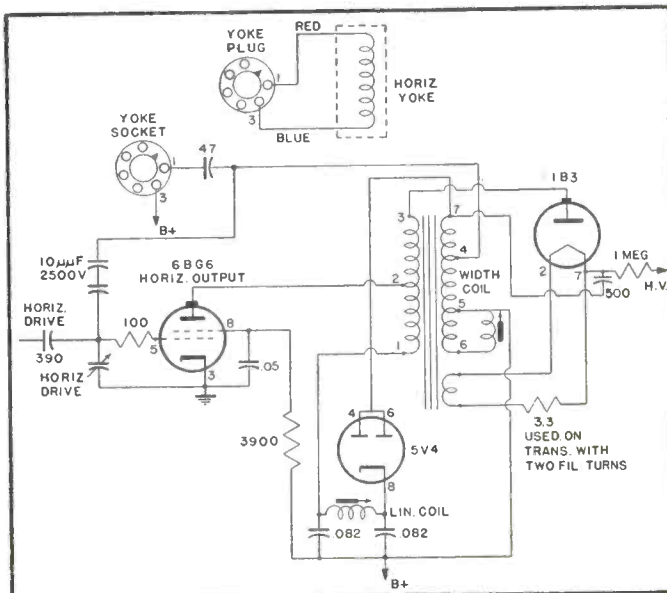


Fig. 3. Philco circuit converted to use Ram or equivalent high-efficiency components.

pin 5 and pin 6 if adjustment is desired.

8. For additional high voltage and sweep, feed-back can be provided by connecting two 10 mmf. 1500 volt condensers in series from pin 4 of transformer to grid of 6BG6.

9. For more high voltage at the expense of a little sweep, disconnect the negative side of the 500 mmf. high voltage condenser from ground and connect it to the plate of the damper tube.

10. If the vertical sweep is insufficient, reduce the size of the resistor in series with the primary of the vertical sweep output transformer. If still more vertical sweep is desired, connect a 5K resistor between the

Vertical Sweep Output Transformer and the cathode of the damper tube. A 10 μ f condenser from the B+ side of the vertical output transformer to ground should be used for decoupling if it is not already in the circuit.

11. At higher anode voltages, a larger focusing field is required. Remove any shunting resistor across the focus coil. If this does not provide the required range, substitute a RCA type 20202 or equivalent. The new PM type may be used.

12. As the Ion traps used on the small screen tubes will not generally be satisfactory, purchase the correct Ion trap. The incorrect Ion trap will provide a poor picture and may damage the picture tube.

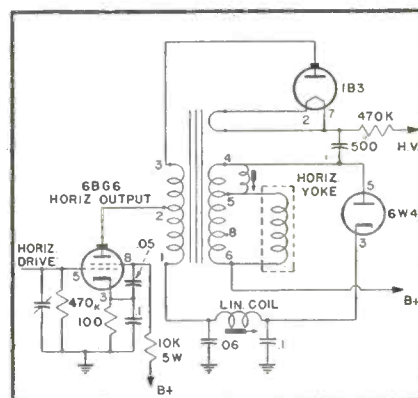


Fig. 4. G.E. type circuit converted to use Ram or equivalent high-efficiency components.

MEN OF RADIO

PART 7

by WILLIAM R. WELLMAN

The contributions of Edwin Howard Armstrong and Louis A. Hazeltine are discussed in this installment. The author traces the development of the regenerative receiver, the super-heterodyne, and the neutrodyne receiver.

ONE of the most interesting phenomena in all the history of radio was the wave of set building that swept the country and affected a large segment of the population with the beginning of regular broadcasting service in 1920. Almost overnight a tremendous demand for tubes, parts, and information on set construction was created. Bank clerks and letter carriers, policemen and doctors, people in all walks of life, most of whom had little or no previous radio experience, spent long evening hours constructing the latest circuits.

The Regenerative Circuit

To deny that the famous regenerative circuit played a leading part in this series of events would be futile. Saturday radio supplements of the principal newspapers ran full descriptions of new circuits supposed to be capable of marvelous performance. Most of these were, of course, variations of the feed-back circuit. The amateur set builder soon discovered that when the feed-back principle was employed in his receiver, the one-tube job often outperformed others having three or more tubes. This meant a worthwhile saving, for the cost of tubes and parts in those days was not an inconsiderable part of the family budget.

Although the popularity of the regenerative circuit declined soon after the introduction of neutralized tuned radio frequency receivers and is little used today for broadcast reception, there is little doubt that it has had a profound effect upon the growth of radio. Aside from its use in receivers the feedback principle, as we are all aware, is the basis of the vacuum tube oscillator without which modern radio transmitters would not

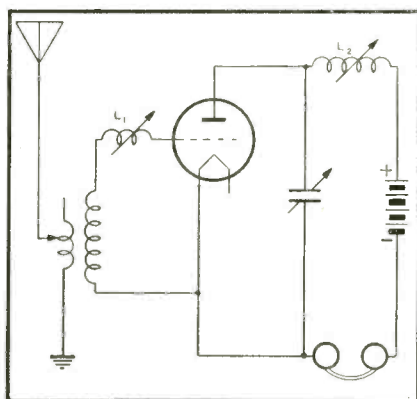


Fig. 1. Armstrong circuit.

be possible. The importance of the discovery of this circuit then, can hardly be overestimated.

In view of the foregoing, we may well ask the question: Who invented the regenerative circuit? The answer, we shall see, is not easy to elicit. It is clouded by litigation and the claims of rival inventors. Although the issue presumably was settled by a decision of the U.S. Supreme Court, it has never been fully resolved in the minds of many radio men. Since we are now approaching a controversial topic, it may be well to explain that the purpose of this article is not to attempt to bolster the claims of one side or the other, but merely to record the facts.

Edwin Howard Armstrong

Edwin Howard Armstrong, one of the two men who claimed title to the extremely valuable feed-back patents, was born in New York City on December 18, 1890. His father was head of the American branch of the Oxford University Press. Young Armstrong attended Yonkers High School, took up the study of radio as a hobby and owned an amateur

station at sixteen. In 1909 he entered Columbia University and was fortunate in being able to study under that famous physicist, inventor and educator, Dr. Michael I. Pupin.

Even at the risk of digression some mention of Dr. Pupin's Alger-like career should be made here. He arrived in this country from Serbia at the age of sixteen and by hard work was eventually able to put himself through Columbia, then went to Cambridge and finally studied at the University of Berlin under the noted Von Helmholtz. His greatest contribution to the electrical art was his invention of the telephone repeater coil, but he was also responsible for the discovery of secondary X-ray radiation as well as many principles pertaining to the tuning of radio apparatus.

Armstrong profited from Pupin's instruction and his own determined pursuit of knowledge to the extent that he was as well grounded in the subject as most of the text book authors of his day. And when Pupin died in 1935, Armstrong succeeded to his post as Professor of Electrical Engineering. Yet he was not a typical bookworm; he liked sports, drove recklessly from his home in Yonkers to Columbia on a motorcycle and was good at tennis.

DeForest's audion was relatively new during Armstrong's college days. Like most of the amateurs who could afford to buy one he was constantly tinkering with it in an effort to discover the most effective ways of using it in receiving circuits. Various theories had been expounded concerning the operation of the device, but most of these did not jibe with the actual results. Armstrong, it is said, deliberately regarded the audion as an entirely new device, having no

established theory of operation. After trying innumerable hook-ups, he found that he was bringing in signals from unheard-of distances and with far greater signal strength than ever before realized. This happened dur-

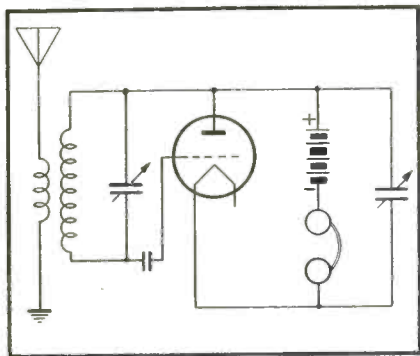


Fig. 2. Ultra-Audion circuit. Grid return not shown.

ing the fall of 1912, and at first he did not learn the reason for his startling success. In fact, several months passed by before he analyzed the results and discovered that he had been using some of the signal energy in the tube's plate circuit and feeding it back to the grid circuit where it reinforced the original signal. This process, repeated over and over, built up the feeble signals to thousands of times their initial strength. He immediately realized that he had a valuable idea, for it could be used to pick up signals that ordinarily were too weak to be detected by other methods. The cost of patenting the discovery would have been about \$150. His allowance was too small to cover this, so he approached his father for assistance. The senior Armstrong declined to advance the money, not because he could not afford it but because, as he explained to his son, he felt that the hobby of radio was taking too much time from his college studies. In this situation he did the only thing possible—made a drawing of the circuit and had it notarized and dated. Perhaps the \$150 patent fee might have spelled the difference between ultimate success and failure to clinch the rights to his invention in later years, for it is certain that if it had been protected by a patent, DeForest would not have been able to contest the claim. DeForest's counterclaims, it later turned out, were no more substantial than his rival's, being based upon dated sketches and notations in laboratory notebooks.

June, 1913 marked Armstrong's graduation from Columbia and a start in a job as laboratory assistant

at Columbia Engineering School at fifty dollars a month. Of course, a not inconsiderable attraction in this post was the opportunity of using the laboratory facilities for his own researches. Immediately he made preparations for demonstrating his discovery. His equipment was brought down from Yonkers and a suitable antenna was erected. When all was in readiness, he invited engineers of the American Marconi Company to be present. A Marconi engineer arrived accompanied by an assistant, a young man named David Sarnoff who later became president of Radio Corporation of America. Armstrong's circuit was enclosed in a box, to preserve secrecy; with little difficulty he performed the startling feat of bringing in signals from the Marconi transmitter at Clifden, Ireland. This demonstration and the ones that fol-

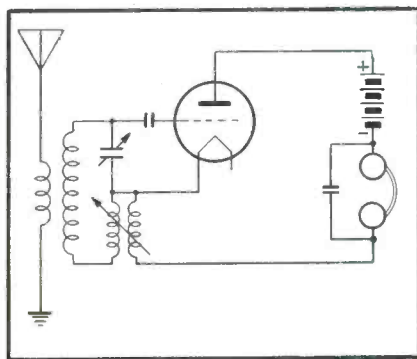


Fig. 3. Heterodyne receiver. Grid return not shown.

lowed impressed the Marconi men, but time slipped away and the inventor received no offer. In 1914 he was awarded a patent and the regenerative circuit soon became a sensation. A few companies were licensed to use it and Armstrong began to reap royalties to the extent of about \$500 a month, a princely sum in those days.

So that we may understand fully the conflict that later developed between Armstrong and DeForest, it might be well to digress at this point. Armstrong had developed a method of inducing regeneration in a vacuum tube circuit. Apparently DeForest had invented a different method, but both achieved, basically, the same results. The Armstrong circuit, as used in the early days of broadcasting, is illustrated in Fig. 1. As may readily be discerned from a brief examination of the diagram, the Armstrong circuit depended upon tuning both the grid and the plate circuits of the tube to the same frequency; this was accomplished by the use of variometers (variable inductances L_1

and L_2) connected in the grid and plate circuits. Feed-back was the result of the inter-electrode capacitance of the tube.

In 1914 Dr. Lee DeForest applied for a patent on his ultra-audion circuit, shown in Fig. 2. Claiming to be the prior inventor of the feedback principle, De Forest attacked Armstrong's claims. An additional DeForest application described the use of a feed-back circuit in producing oscillations. Interference proceedings followed and the resulting litigation dragged on for years.

In the meantime, America was drawn into World War 1. The legal actions were suspended by mutual consent. Armstrong entered the Signal Corps as captain and was sent to England in the summer of 1917. In London he had an opportunity to study the communication problems of the Allied forces. Not the least of these was the difficulty experienced in picking up transmissions from the German military radio stations located in the war zone in France. Both the British and the French signal officers agreed that this was a problem indeed. Although the stations were located less than five miles from Allied receiving points, the signals could not be brought in for two reasons: the German transmitters were exceptionally weak and the frequencies employed were far above those in normal use. The situation was aggravated, from an Intelligence point of view, by the fact that there was no difficulty in unscrambling the

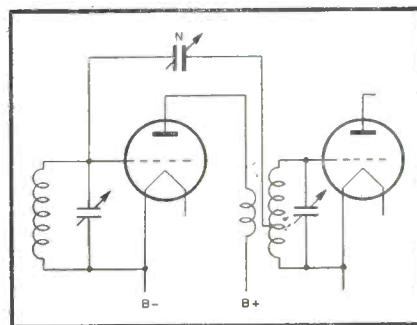


Fig. 4. Basic neutrodyne circuit.

German codes. Code books providing the key to the German messages were already in the hands of the Allied forces; one had been found aboard a German submarine washed ashore on the English coast, and another had been taken by the Russians during the sinking of a German cruiser.

The Super-Heterodyne

At first, Armstrong toyed with the idea of using the well-known hetero-

[Continued on page 50]

SHOP NOTES

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

Westinghouse-General Information— Germanium Crystal and Selenium Rectifier Markings

The variety of markings used on rectifiers has led to some confusion as to meaning of codings, schematic representation, and method of connection. To clarify the situation, the information given may be of assistance.

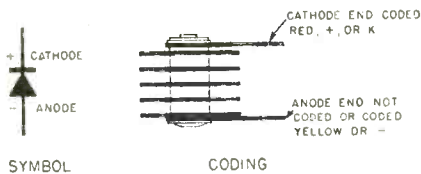


Fig. 1. Selenium marking

Figures 1 and 2 indicate that the same schematic symbol is used for both selenium rectifiers and germanium crystals. Note, however, that the polarity codings are opposite. This

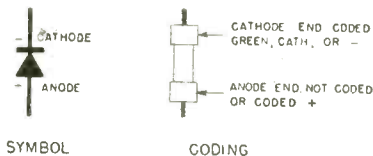


Fig. 2. Germanium crystal marking

does not mean that the units operate differently. They are both rectifiers, and the predominate direction of electron flow is from cathode to anode in both units. The reason for the opposite polarity codings in these units is that they are coded according to application.

Selenium rectifiers are generally employed in power supply circuits in lieu of rectifier tubes. In these circuits, the important consideration is the polarity of the d-c output voltage. The coding used on selenium rectifiers indicates the polarities that will result from any particular connection.

In contrast to the coding method used on selenium rectifiers, germanium crystals are coded to show the d-c polarity that must be applied to ob-

tain maximum current flow. With this system of marking, the polarity as observed in the circuit will be opposite from the markings on the crystal.

The important thing to remember is that the cathode end of either unit is equivalent to a tube cathode and the anode end of either unit is equivalent to a tube anode (or plate). This, in conjunction with a knowledge of the coding marks, will help to avoid making wrong connections.

Incidentally, the arrow in the schematic symbol does not point in the direction of maximum electron flow. Instead, the symbol conforms to an

Improving Reception In Weak Signal Areas 20T1, 20V1, And 21B1 Series Chassis

There are a number of ways to improve reception in weak signal areas, depending upon local conditions and the chassis type. Many of these methods have been described in earlier bulletins. This bulletin contains additional general information and also summarizes the earlier bulletins so that you will know under which conditions to try any particular remedy. It is possible to apply more than one of the suggestions to a chassis to obtain better reception in weak signal areas. Generally, step A should always be tried before making the circuit changes described after A.

A. Improved Reception Is Obtained By Correct Alignment

Correct receiver alignment becomes an important factor when receivers are operated in low signal strength areas. It is possible for a receiver to have a good over-all response curve even though the r-f and i-f stages are not perfectly aligned, since the r-f alignment can be off in one direction and the i-f stages off in the other direction. With this type of alignment, excessive snow may show on the picture when receiving weak signals.

The r-f tuner should always be aligned to produce maximum ampli-

tude on the oscilloscope. Correct shape of the r-f curve will be automatic if the amplitude is at a maximum. If the i-f curve is also similar to that shown in the manuals, the receiver signal-to-noise ratio will be good and there will be a minimum amount of snow in the picture.

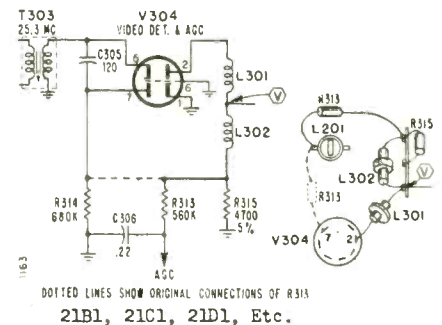


Fig. 3. Changes in 21B1 etc. chassis

If you find it difficult to get the right curve during i-f alignment, check whether the set uses three 6AG5 tubes in the i-f amplifier. If it does, alignment can be made easier if you install a 6AU6 in the first and possibly in the second i-f stage. To do this, merely connect a short ground lead to pin 2 of the tube sockets and change the tubes.

B. Additional Picture Contrast 21B1 Series Chassis

Additional contrast can be obtained by increasing the value of the video detector and video amplifier load resistances. This change results in a loss of high frequency response (definition) and should not be used unless the signals are too weak to provide enough contrast. However, when the signals are weak, the change will

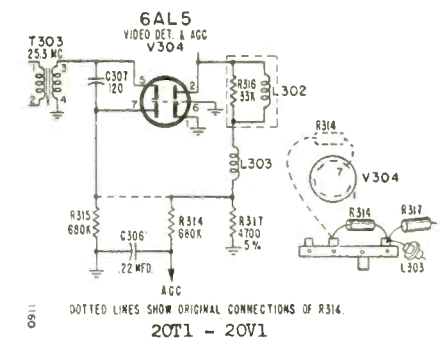


Fig. 4. Changes in 20T1, etc. chassis

often improve reception due to the fact that high frequency noise pulses do not appear on the picture.

The change is made in the 21B1 series chassis by connecting a 3900 ohm 1 watt resistor in series with R315, and a 3900 ohm 1 watt resistor

in series with R_{322} (at the junction of R_{322} and R_{326}).

C. Increasing Sensitivity Of The 21B1 Series Chassis

The receiver sensitivity may be increased by connecting a 470,000 ohm resistor between test point T and ground to decrease the AGC voltage. This change should not be made where a strong signal can be received as overloading will result.

D. Improving Reception In Weak Signal, High Noise Areas, 20T1, 20V1, and 21B1 Series Chassis

The AGC circuit may be changed to prevent noise peaks from controlling the receiver gain. This change should not be made where a strong signal can be received as overloading will result.

Circuit Change for 20T1 & 20V1 Chassis

1. Locate V304 (6AL5)
2. Disconnect resistor R_{314} (680K) from pin 7 of V304
3. Connect R_{314} as shown in Fig. 4
4. Remove tuner AGC lead (white) from AGC lug and ground the wire to the chassis.

Circuit Change for 21B1, 21C1, 21D1, 21E1, 21H1, 21J1 Chassis

1. Locate V304 (6AL5)
2. Disconnect resistor R_{313} (560K) from pin 7 of V304
3. Connect R_{313} as shown in Fig. 3
4. Remove tuner AGC lead (white) from AGC lug and ground the wire to the chassis.

E. Increasing Sound Output 20T1, 20V1, and 21B1 Series Chassis, 20T1 and 20V1 Series

1. Disconnect audio lead from pin #2 of 6AL5 video detector (V304)
2. Connect this lead to pin #5 of 6AU6 video amplifier (V305)
3. Retune L_{201} sound take-off coil. This adjustment should preferably be made using a station signal as outlined in the service manuals.

21B1 Series

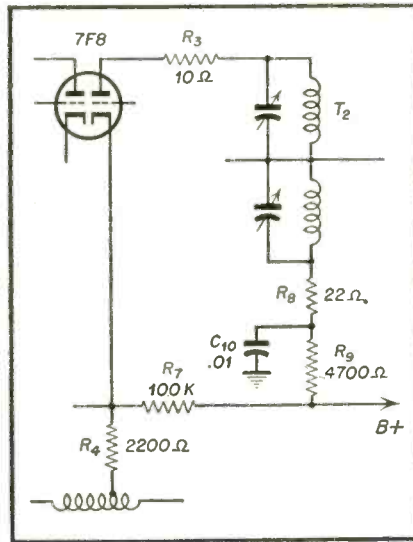
1. Disconnect audio lead from pin #2 of video detector (V304)
2. Connect this lead to pin #8 of 6AC7 video amplifier (V305)
3. Retune L_{201} sound take-off coil. This adjustment should preferably be made using a station signal as outlined in the service manual.

Admiral Corporation
Service Division

Philco Model 46-480—Noisy

Noisy reception and frequently defective converter tubes (7F8) can be

eliminated by replacing the 4700 ohm resistor in the plate circuit of the mixer section with a 50,000 ohm re-



Partial schematic of Philco 46-480

sistor. (R_9 in the diagram). When this is done the 100,000 ohm resistor connected between the cathode and B+ must be removed. (R_7 in the diagram).

Submitted by
George Raymond
Biloxi, Mass.

Hints For Reducing Sweep Radiation Which Interferes With Radio Reception

1. With glass type picture tubes, make sure that the tube has a good coating of aquadag. If the tube has no coating, it may be necessary to replace the tube. If the aquadag is peeling or is missing from some portion where it is required, repair the aquadag with "Television Tube Koat -No. 49-2," manufactured by General Cement Mfg. Co., Rockford, Illinois. Also, be sure the aquadag is grounded to yoke with ground clip.

2. With Scotch tape, fasten one end of a sheet of aluminum foil (approximately 10" x 10") to the aquadag on the top area of the picture tube. Ground the other end of the foil under the tube strap.

3. Line the inside of the cabinet (area surrounding chassis) by cementing foil to the cabinet and grounding it to the sides of the chassis. Be sure to cut the foil away from any ventilation opening in the cabinet. In some cases it may be necessary to also place the foil completely across the chassis mounting shelf, underneath the chassis. After lining the cabinet with foil the built-in antenna is no longer effective and should be grounded to the chassis. Therefore, it

[Continued on page 49]

HERE'S HOW & WHY

by CHET JUR

Sales Engineer

Merit Transformer Corp.

A discussion of the air core "flyback" transformer

SO many inquiries have been forthcoming in recent months regarding use of the air core "flyback" in the direct drive system, we have felt a concise description in order.

Yes, it is a transformer. . . but quite different from the conventional type of horizontal output transformer we have been accustomed to seeing in TV sets.

It consists of a primary winding which is the plate load of the horizontal output tube, and a second winding of many turns of which one end is tied to the plate end (top) of the primary. The other end of this winding is tied to the plate of the high voltage rectifier and across it is developed the high voltage needed to light up the cathode ray tube. The filaments of the high voltage rectifier are also powered by a secondary winding consisting of a few turns.

Action?? Sure—plenty!! When the horizontal saw hits the grid of the horizontal output tube, it overcomes the bias and the tube conducts, developing the power in the yoke (in series with output transformer) necessary for horizontal deflection. When the saw decays, the tube (horizontal output) is again cut off. But with the collapse of this field in the primary, a back EMF is developed across the largest winding which can be rectified to supply the high B+ needed for the second anode of the C.R.T. This process is repeated at the horizontal frequency rate.

Why does it work?? Well, it was found that different from the old output transformer action with the voice coil, it is not necessary to have a low impedance for the horizontal winding of the yoke. This makes it possible to place the yoke in series with the plate load and eliminate the secondary of the horizontal transformer.

TRADE LITERATURE

A revised and enlarged eighth edition of the *Sylvania Technical Manual* in a completely new "snap-open" loose-leaf format has just been published, according to an announcement by Terry P. Cunningham, director of advertising of *Sylvania Electric Products Inc.*

Completely revised, the new Manual now contains comprehensive technical data on more than 500 receiving tube types, standard TV picture tubes, as well as 84 pages of general information on vacuum tube operation. It is furnished in a green embossed plastic fiber cover and metal multi-ring loose-leaf binder.

The 84-page engineering data section includes text on fundamental electrical laws, fundamental properties of vacuum tubes, definitions of common radio terms, general tube and circuit information, tube dimensions, the use of curves, resistance coupled amplifier data, information on obsolete tube types, tube base diagrams, and data on panel lamps, ballast tubes and plug-in resistors.

The new manual, according to Cunningham, contains data on sixty new receiving tube types and all standard TV picture tubes. The manual, priced at \$2.00 per copy, may be obtained from Authorized Sylvania Distributors or by remittance to the advertising department, Sylvania Electric Products Inc., Emporium, Pennsylvania.

* * *

Distributors of *John F. Rider Publisher, Inc.*, 480 Canal St., New York 13, N.Y., have received stock of the organization's latest servicing volume—*Rider's Television Manual Volume 7*.

The productions of 74 manufacturers are included in this volume, which is the largest to date. 776 models produced during the period Fall 1950 to Summer 1951 are contained here. All servicing data presented in this 12 x 15 inches volume is manufacturers' factory-authorized material. All pages, the equivalent of 2,352 (8½x11) are prefiled for immediate bench use. The accompanying cumulative index for *Rider TV Manual Volumes 1 through 7* makes all models accessible in a matter of seconds.

The volume contains schematics, chassis views, voltages, resistance

readings, alignment procedures, test patterns, waveforms, parts lists and parts values, boosters, tuners, and up-to-date manufacturers' changes on previously published information. Instructional circuit action descriptions and time-saving unpacking and installation data complete the contents of the manual. It is priced at \$24.00.

* * *

In response to dealer requests, the *RCA Tube Department* is making available to parts dealers and service technicians, through RCA distributors, a revised and amplified version of its book "*Television Components*," introduced earlier this year. Heretofore, distribution of the book has been restricted to distributors.

The revised book (CTV-1011-A) was brought up-to-date to include recently introduced RCA television components, and contains vital statistics on more than 60 such components.

Compiled for quick reference, the book presents, with each component listed, such vital information as electrical ratings and characteristics, terminal connection diagrams, outline drawings, typical circuits, associated components, and recommended installation procedures.

"Television Components" is available through RCA distributors at a suggested list price of twenty-five cents.

* * *

Technical Bulletin No. 42-123, "High Accuracy Capacitors, Type 950 Series," covering complete technical data, dimensions and suggested applications, has just been published by *Centralab*, division of *Globe-Union Inc.*, Milwaukee, Wisconsin.

These capacitors are shielded, sealed hermetically and intended primarily, for close tolerance oscillator circuits, primary and secondary frequency standards, frequency meters and similar precision resonant applications.

Capacitance tolerances are of the order of 1% up to 2200 mmf. and 5% up to 6000 mmf. Temperature coefficient tolerances are likewise, extremely rigid. All type 950 Series High Accuracy Capacitors are rated at 500 volts d. c. working.

Volume 2 of Television Tube Location Guide, published by *Howard W. Sams & Co., Inc.*, Indianapolis, is off the press and being shipped to distributors.

The new volume of *Television Tube Location Guide*, which takes up where Volume 1 left off, shows the position and function of tubes in hundreds of new television receiver models, and is designed to save servicing time, Sams said.

Fully indexed for quick reference, the Sams Tube Guide is handy pocket size, 5½ inches by 8½ inches and contains over 220 pages, including coverage of TV models produced in 1949-50. The list price of the Guide is \$2.00.

The Guide makes trouble diagnosis and tube replacement quick and simple, and in many cases makes removal of the chassis unnecessary. Each TV model has its own clear, accurate diagram, its publishers added, and advance orders for the Guide indicate that it will repeat the success of Volume 1, which is already in the hands of thousands of service technicians.

* * *

Standard Transformer Corporation's new television catalog and replacement guide, listing more than 1500 models and chassis built under seventy-nine brand names, is now available, Jerome J. Kahn, president, announced.

The guide and catalog, in addition to listing all replacement items by model number, manufacturer's part number and Stancor stock number, identifies each by code number signifying power transformer; filter reactor; horizontal output transformer; vertical output transformer; horizontal blocking-oscillator transformer; vertical blocking-oscillator transformer; audio output transformer; deflection yoke or focus coil.

All manufacturers are listed alphabetically and the models and chassis are listed in numerical order. A separate section lists all Stancor TV transformers and related components by part number.

* * *

JFD Mfg. Co. Inc. makes available a folder describing its line of 220V-110V Step-Down Transformers, *Re-*
[Continued on page 40]

NEW PRODUCTS

21-INCH METAL RECTANGULAR KINESCOPE

The television industry's largest metal, rectangular picture tube, a 21-inch kinescope, has been announced by the RCA Tube Department.

The new tube, RCA-21AP4 utilizes the full screen area, producing a picture $18\frac{3}{8}$ inches wide by $13\frac{1}{8}$ inches high, with slightly curved sides and rounded corners. Providing pictures with high brightness and good uniformity of focus over the entire picture area, the 21AP4 has a high-efficiency, white fluorescent screen on a relatively flat, high-quality face made of frosted Filtorglass, which minimizes reflection of bright objects in the room and increases contrast.

The rectangular shape, conforming to proportions of the transmitted picture, avoids waste of screen area. This permits the use of a cabinet having about 20 per cent less



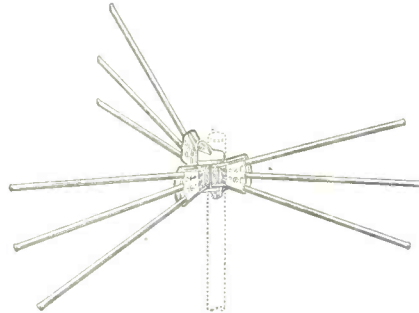
height than is required for a round-face tube providing pictures of the same width. In addition, the chassis need not be depressed or cut out under the face of the tube, and controls can be located as desired beneath the tube.

Employing magnetic focus and magnetic deflection, the 21AP4 is designed with a funnel-to-neck section which facilitates centering of the yoke on the neck and, in combination with better centering of the beam inside the neck, contributes to the tube's good uniformity of focus. The diagonal deflection angle is 70 degrees; the horizontal deflection angle, 66 degrees.

Complete technical data on this new RCA metal rectangular kinescope is contained in a technical bulletin which may be obtained from the Commercial Engineering Section, RCA Tube Department, Harrison, N. J.

TV ANTENNA

To bring its new Directronic motorless TV aerial directly to the attention of the ultimate consumer, the television set owner, Snyder Manufacturing Company of Philadelphia has launched a wide scale consumer campaign in



newspapers in major metropolitan markets throughout the country.

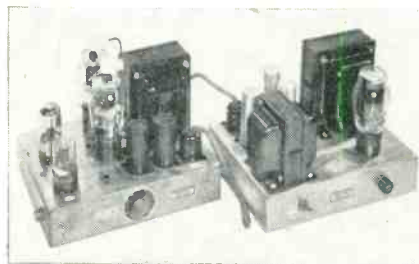
The new Snyder Directronic TV Aerial, according to company engineers, gives the same clear TV picture as motor driven aerials without the use of any motors. It is operated by a beam selector switch mounted on or near the set and the clearest picture on every channel is obtained instantly by a simple flick of the switch.

WILLIAMSON AMPLIFIER COMPONENTS

Standard Transformer Corporation, Chicago, today announced Stancor components for the famous Williamson Amplifier, designed to make high fidelity audio available at low cost. The new Stancor components include a high fidelity output transformer, a power transformer and a filter choke.

"The full potentialities of the famous Williamson Amplifier, which until now it had been assumed could be realized only through the use of costly imported transformers, can now be attained by these new Stancor components," Jerome J. Kahn, president of Standard Transformer said in announcing the new units.

The components include Stancor high-fidelity output transformer, A-8054; power transformer PC8412 and filter choke C-1411.



Stancor Williamson Amplifier Bulletin No. 382, now available, describes construction of the amplifier, with chassis drawing, schematic and complete parts list.

TELEVISION VIDOMETER

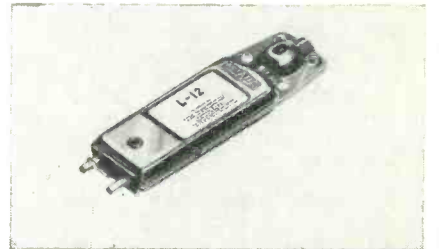
Hickock Eleertical Instrument Co., Cleveland 8, Ohio announces an all-purpose video generator designed as a test instrument to quickly and visually identify and localize trouble in any section of a TV receiver—independent of station operation. Developed after three years of research and engineering testing.



Crystal controlled for electronic accuracy. Speeds trouble-shooting. Exceptionally stable, ideal for on-location fringe area servicing. Called the Model 650, this fine instrument has RF output directly calibrated in microvolts for TV receiver sensitivity checks. Contains line voltage scale for instantaneous check on line voltage fluctuation—a common cause of picture trouble. Includes horizontal and vertical sawtooth voltages which can be directly substituted for vertical and horizontal oscillator in a TV receiver. Amplitude is sufficient to give full raster deflection, and in the case of flyback type high voltage power supplies, the horizontal sawtooth can be used to light up the picture tube. Can also be used as a TV transmitter to simultaneously transfer a program to any number of TV receivers on any desired channel.

PHONO CARTRIDGE

A new phonograph pickup cartridge, the crystal model L-12 for standard 78 RPM records, and which features low cost with high output, has been introduced by The Astatic Corporation, Conneaut, Ohio.



New excellence of reproduction quality, entirely out of proportion to the competitive low cost, is claimed by the manufacturer.

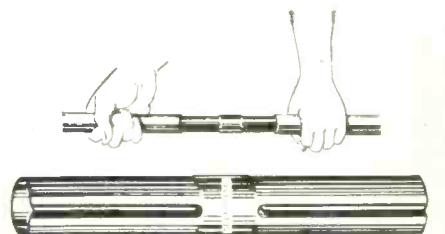
Output of the L-12 is rated at approximately 4.0 volts at 1,000 cycles per second, on the Audiotone 78-1 test record. It is designed to operate at a needle pressure of one ounce, has a total weight of 18 grams.

The housing is stamped steel, terminals are quick disconnect pin type. The crystal element is moisture-proof coated.

The L-12 is furnished without stylus and has a universal chuck to receive all standard type needles.

MAST COUPLER

The ideal method for securely coupling two masts by simply sliding one end of the Tele-

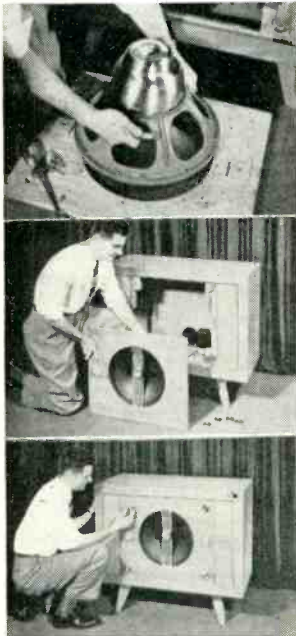


matic mast coupler into each mast section. Made of heavy weatherproof cadmium plated steel, no tools required, no hardware required,

cannot work loose. Made in two sizes Cat. No. CU-1 to fit 1¼" O.D. mast and Cat. No. CU-2 to fit 1" electrical conduit. Immediate delivery.

SIMPLIFIED SPEAKER MOUNTING

Good looks combine with the ultimate in utility to make a speaker cabinet by Jensen Manufacturing Company one of the most logical and adaptable designs of the year.

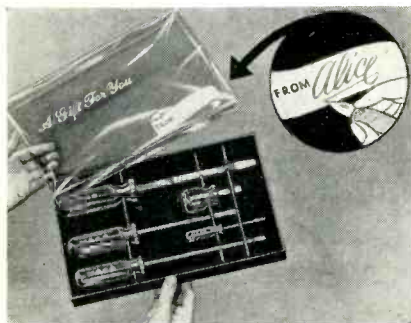


The new cabinet is known as the Jensen Customode Imperial. It comes in either blonde or cordovan mahogany finish, to match other basic units of Jensen Customode.

The pictures tell the story of how quickly and easily speaker installation and removal can be accomplished from the front of the cabinet. Until the Jensen design, the procedure involved considerable more time and effort as the entire back (fastened with numerous wood screws) had to be removed and only then could the speaker be installed or removed from the cabinet. The problem is particularly aggravated when the cabinet is built into the room along with other units.

SCREW DRIVER PACKAGE

Bringing spritely glamour to the mechanic's screwdriver, the Vaco Products Company, 317 E. Ontario Street, Chicago, has just placed upon the market an amazingly attractive set of five assorted screwdrivers in a box so cleverly presented that an entirely new idea in gift packaging is introduced.



Called the VACO All-Purpose Screw Driver Gift Set, this assortment of high quality screwdrivers consists of the following models: (1) No. C-56, for heavy duty. Overall length 10¼". Handle 1½" x 4-¼". Square blade ⅝" in diameter. (2) No. 416-5 for general service.

Overall length 8-⅝". Handle 1 x 3-⅝". Round blade ¼" in diameter. (3) No. 316-6 Electrician's type. Overall length 9½". Handle ⅞" x 3½". Round blade ⅜" diameter. (4) No. A-182. Stubby type. Overall length 3-⅛". Handle 1-½" x 1-⅞". Flat blade, ¼" in diameter. (5) No. A-130-2. Pocket clip driver. Overall length 3-⅞". Handle ½" x 1-⅞". Round blade, ⅛" diameter.

IMPROVED OPEN-LINE TRANSMISSION

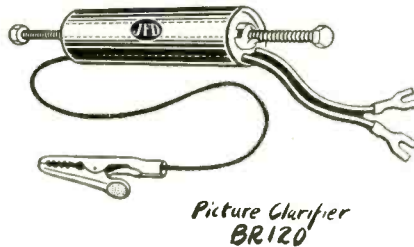
Sidney Pariser, President, Radio Merchandise Sales, Inc., announced the development of an improved open-line transmission wire for the television trade.

The new line is called HI-GAIN transmission line and is a properly balanced line with virtually no noise pick-up. It is claimed that the signal at the receiver end of the line is approximately the same as the antenna end. A significant improvement upon this type of line is its bi-metal construction consisting of a steel core for strength against stretching and breaking and an ample cross-section of copper over the steel core, and through which the television signal travels.

TV PICTURE CLARIFIER

The new E-Z Picture Clarifier now being made by the JFD Manufacturing Company of Brooklyn, New York, filters out FM Image and Amateur Harmonic interference easily and effectively.

No special connection or installation is required. The JFD Picture Clarifier is simply attached to the input terminal of the television set and adjusted until picture clears. Sharp, bright interference-free pictures result.

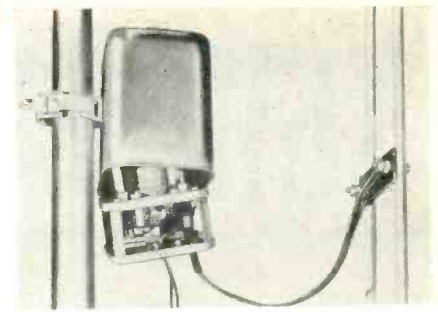


JFD E-Z Picture Clarifiers list at \$2.75 and are available in the following models: No. BR120-10-30—Filters out amateur Harmonic Interference from 14 and 28 megacycle bands. No. BR120-80-110—Filters out FM Image Interference. No. BR120-30-60—Filters out amateur Harmonic Interference from 30 to 60 megacycles. No. BR120-60-90—Filters out Diathermy Interference from 60 to 90 megacycles.

ANTENNA AMPLIFIER

A new Antenna-Amplifier located at the antenna is now being offered by Technical Appliance Corporation, manufacturers of TACO Antennas and TACOPLEX Master Antenna Systems. Designed for use in fringe-area installations, the new unit provides a signal amplification of 14db of the clear signal received by the antenna before noise pickup in the transmission line. This provides a much higher signal level in the transmission line, thus greatly increasing the signal-to-noise ratio.

The TACO Antenna-Amplifier is powered by means of a 24 volt transformer located at the receiver. A relay automatically energizes the transformer when the receiver is switched on. No separate electrical connections are necessary as an outlet is provided on the lower unit for the television receiver. A power cord from the lower unit plugs into a 110 volt wall outlet. The Amplifier is designed for use with standard 300 ohm lead-in from the antenna to the transformer. The 24 volt



power is conducted up the same 300 ohm lead-in to the transformer in the upper unit. Complete isolation between the signal and the power is accomplished through an isolation network.

21 INCH CYLINDRICAL-FACED TUBES

Two new 21-inch picture tube designs having a rectangular face and cylindrical front section have just been announced by National Union Radio Corporation of Orange, New Jersey. These new tubes employ a special filter glass in the face plate to reduce ambient light reflection, and advantage is taken of the well-known optical properties of the cylindrical front surface to eliminate reflection and preserve sharp definition of the picture.

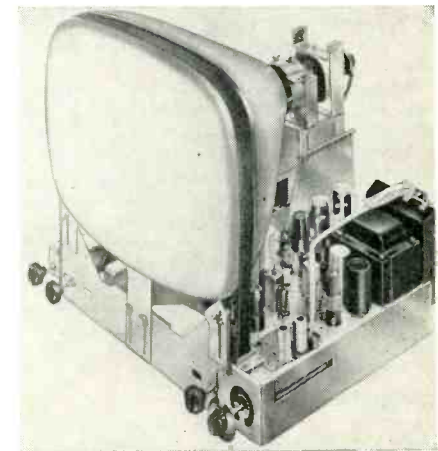
These new tubes bearing designations N.U.-21EP4, N.U.-21EP4A, N.U.-21FP4 and N.U.-21FP4A provide a picture of 19½ inches by 13⅞ inches.

Type N.U.-21FP4A employs low-voltage electrostatic focus and magnetic deflection. Type N.U.-21EP4A features magnetic focus and magnetic deflection. Both types are designed to be used on a single-magnet type external beam bender (ion trap assembly), and have external conductive coatings. They are also available without external conductive coating, bearing type designations N.U.-21FP4 and N.U.-21EP4 respectively. These tubes have characteristics as described in the attached data sheets.

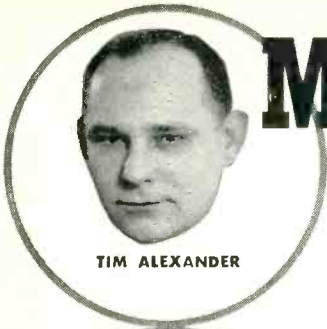
The electrostatically-focused type is designed to operate from the normal low-voltage power supply of the television set, the focussing electrode potential of 200 ± 200 volts being obtained from a one-megohm potentiometer connected across the B supply.

NEW 630-TYPE CHASSIS

A new 'Video-630' chassis capable of bringing in a clear, sharp picture at a distance 200-miles from the transmitting station is announced by Video Products Corporation of Red Bank, N. J., one of the manufacturer of the famed 630-chassis.



The sensational new development of the powerful 80-tube chassis into a long-range re-



TIM ALEXANDER

Motorola



MAX SCHINKE

Admiral



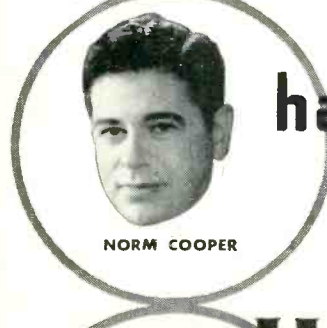
FRANK SMOLEK

ZENITH



FLOYD MAKSTEIN

Emerson



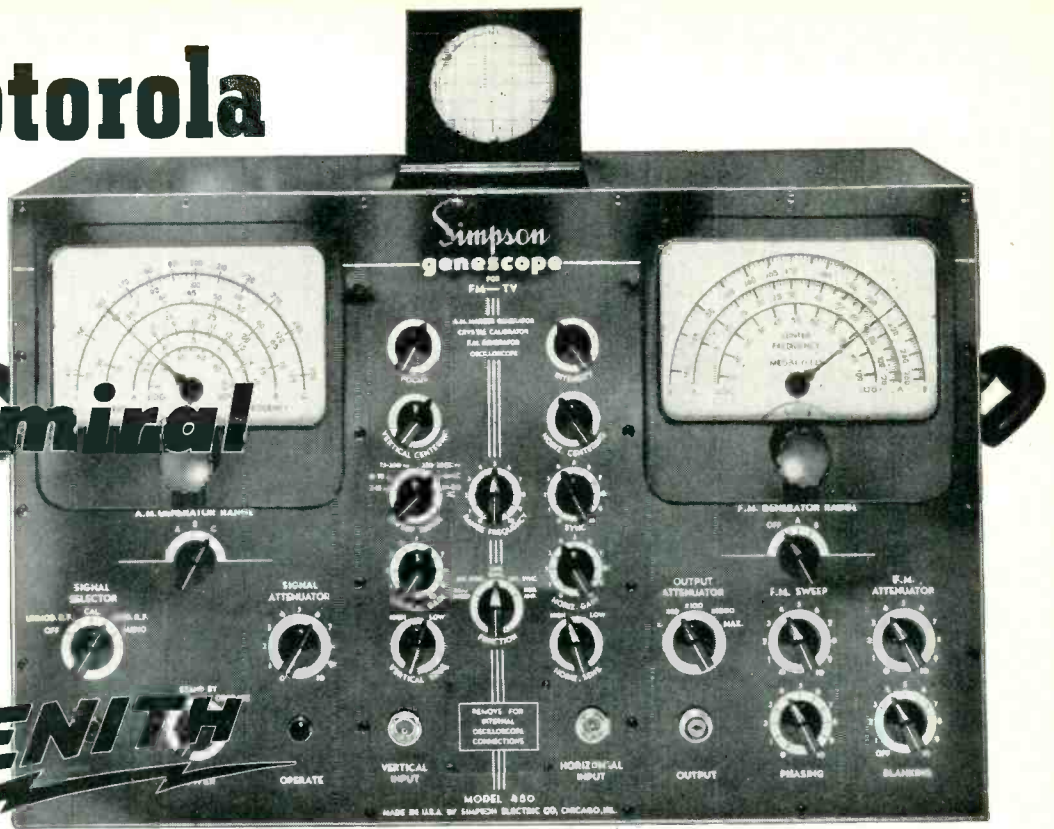
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RECOMMEND

Simpson Model 480 GENESCOPE for TV-FM Servicing

These leading manufacturer's service managers agree — the Simpson Model 480 Genescope is perfectly designed for proper testing, servicing and alignment of all TV and FM receivers!

THE SIMPSON MODEL 479 TV-FM
SIGNAL GENERATOR

Exactly the same circuits, ranges and functions as the Model 480, with the exception of the oscilloscope.



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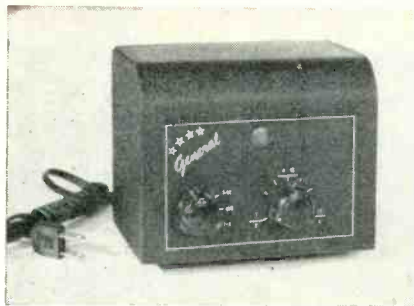
In Canada: Bach-Simpson, Ltd., London Ontario

ceiver comes as the culmination of over two years research under the most exacting conditions in the field by Video Products engineering department.

TV BOOSTER

T.V. Development Corp., Bklyn. 23 announces their new booster, the General, which will provide television enjoyment in different and weak signal areas.

It is claimed that here is a booster that can boost the signal with a uniform gain of 5 times the original signal on all channels. It is actually factory pretested on a battery of Television receivers to insure performance and alignment. It is peaked and pre-aligned—and will stay that way even though rough handling while enroute to you. Designed to cover the entire bandwidth it is full signal boosted with high signal-to-noise ratio. It will not produce any interference, and is



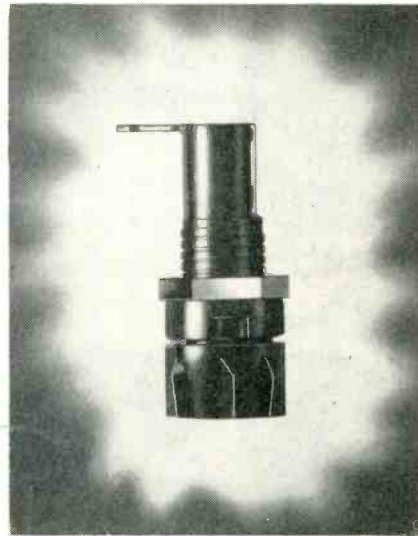
not affected by local interference or hand capacity.

Made with only the finest parts and craftsmanship, including precision-wound silver-plated coils, ceramicons etc. It is unconditionally guaranteed for 6 months.

MINIATURE FUSE EXTRACTOR POST

A new fuse extractor post for 3 A G fuses which offers 7 distinctly new features is the latest engineering development of Littelfuse Inc. The new fuse post reduces behind-the-panel distance by one inch.

A leaf-spring tension lock in the knob of the post materially reduces voltage drop between the knob contact and the fuse. An All Purpose Terminal (solder, wrap-around or quick disconnect) is used on both side and bottom terminal. The Knife-Edge Bottom Contact effectively cuts through any surface accumula-



tion on the fuse cap to assure low resistance electrical contact. The side terminal and the internal metal ring which makes contact with the top of the fuse are in one piece—therefore there is no soldered or welded joint.

With the new, Littelfuse Extractor Post it is not necessary to remove the fuse in order to test it: At the top of the knob is a hole for a test prod.

COLOR WHEELS

The Deitz Sales Company, Newark, New Jersey, announced this week the availability to jobbers and distributors of its new color wheel, made especially for the CBS color television system. This is the same wheel that was used successfully a few weeks ago in conjunction with the Colortone color TV demonstrations.

The new color wheel is a solid, one-piece product, not laminated and cannot fly apart. 1/100" in thickness, the wheel is dynamically balanced to prevent vibration.



Other features include true color reproduction (hue and density properly matched to the CBS color system), light fast colors which will not fade, and pre-drilled mounting holes for assembly to either spindle or hub. This past further insures proper balance.

Wheels are currently available for 7", 10", and 12 1/2" sets from the Deitz Sales Company, 120 South Orange Ave., Newark, New Jersey, Market 3-5294.



with the **TELEMATIC** FULL RANGE **FILTER KIT**

ELIMINATES —
Interference caused by short wave, F.M. Amateurs, Diathermy atmospheric disturbances, etc.

CORRECTS —
90% of all types of antenna fed interference

THE CAUSE OF ANY SPECIFIC INTERFERENCE IS USUALLY AN EXPENSIVE GUESSING GAME. In the majority of cases the interference is brought into the set through the antenna and lead. This interference can be eliminated by the use of the proper filter or wave trap. Since the location and cause of the offending interference are usually unknown, a lot of time and trouble can be saved by using the Telematic "Full Range" Filter Kit, which covers the complete range of interfering signals that can be eliminated before they enter the receiver. The filter or wave trap used to do the job can be replaced in the kit individually.

KIT No. 600 contains—2-WT 300—1 ea. WT 14, WT 15, WT 16, WT 17
KIT No. 601 contains—1-WT 300—1 WT 072—1 ea. WT 14, WT 15, WT 16, WT 17



Write for free complete descriptive catalog. — Dept. RSD

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TRADE LITERATURE

[from page 34]



**VEE-D-X
"JC"
YAGI**

**VEE-D-X
Outboard
BOOSTER**

**MOST
POWERFUL
COMBINATION
for
SINGLE
CHANNEL
RECEPTION**

VEE-D-X

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Windsor Locks, Conn.

sistance Line Cords and Ballasts for radios, electric razors and many other electrical appliances. These JFD products are essential where a 220-110 AC or DC voltage step-down is needed for foreign and domestic consumption.

You will find our popular line of Step-Down Transformers, illustrated on page 2, complete and available in a wide range of units from 85 to 3000 watt capacities.

The new 3rd edition of the famous *Sprague Television Replacement Capacitor Manual* is double the size of the previous edition and lists correct capacitor replacements for 964 television sets of more than 60 brand names. The manual can be obtained free of charge from Sprague parts distributors throughout the country, or will be sent direct from *Sprague Products Company*, North Adams, Mass. upon receipt of 10 cents to cover the cost of handling and mailing. Television receivers are listed alphabetically for quick, easy reference and listings include the manufacturers' original part numbers as well as the suggested replacement capacitor number and its list price. Backed with this manual, servicemen will be ready for prompt, accurate capacitor replacements in nine service calls out of ten.

For added convenience, the *Sprague Manual* contains a comprehensive listing of TV replacement capacitors in numerical order plus a listing of handy TV replacement capacitor service packages for the most widely used brands of receivers.

Listing over fifteen hundred (1500) phonographs, radio-phonograph combinations and radio-television-phonograph combinations using Shure crystal and ceramic cartridges, *Shure Brothers, Inc., Chicago*, has issued *Shure Replacement Manual No. 66*, described as its most complete and comprehensive replacement manual available.

Featuring a special listing of over 1500 sets that are equipped with or which can effectively use Shure pickup cartridges, the Manual refers to sets by manufacturer's name and each model number, with the Shure model number for each cartridge replacement. In addition to all the current models, the listing goes back to brands dating from 1938 and includes 123

manufacturers, according to Joe Morin, Distributor Sales Manager of Shure Brothers.

Servicemen who want an aid to faster and easier fuse replacement can now get an official *TV Fuse Guide* which gives all the information needed.

The Official TV Fuse Guide is printed on a durable stock and punched at the top so that it can be hung on a nail in the Repair Shop. It lists the brand name, model numbers and corresponding fuse requirement on all makes and models, starting with the very first sets made and ending with those on the market.

It is available through the jobbers or by writing direct to *Littlefuse Inc.*, 4757 N. Ravenswood, Chicago, Illinois.

Just off the press, the new 32-page *screwdriver catalog-handbook* of the *Vaco Products Company*, 317 East Ontario Street, Chicago 11, Illinois, is announced for distribution, presenting a vertiable show window and reference encyclopedia, comprising the most complete array of screwdrivers, nutdriver kits and other hand tools ever offered. This catalog-handbook is sent free upon request.

Profusely illustrated in three colors, the *Vaco catalog-handbook* is 8½" x 11", with a strikingly handsome multi-colored illustrated cover made of heavy varnished stock to withstand hard usage. The binding edge has numerous perforations in several different sizes and shapes to permit fitting into any holder or portfolio, thus representing the last word in convenience.

Magnecord Inc. of Chicago, makers of *magnetic tape recording equipment* for professional use have issued an illustrated *catalogue* to describe the versatility of their line and to make known to a wider field, their facilities for building special equipment to individual requirements.

The catalogue makes explicit mention of *Magnecord conversion and adaptation equipment*. All equipment is coded, and a special page lists and describes such accessories as special switches, spooling mechanisms and adapter panels.

This new booklet with an accompanying price sheet can be had by

**LOOKING FOR A NEEDLE
IN A HAYSTACK?**



THEN YOU'D BETTER SWITCH TO

PERMO
long-life
PHONO NEEDLES



COMPLETE

Facts

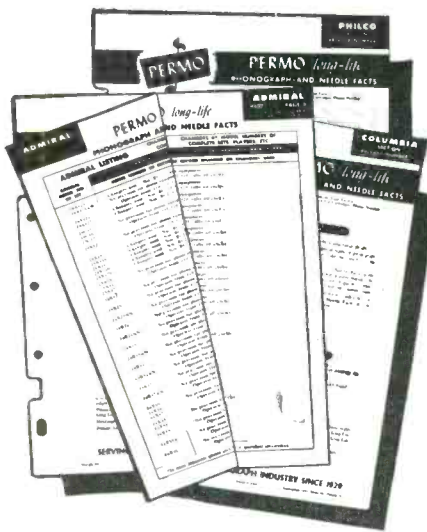
MAKE THE DIFFERENCE!

**YOU GET COMPLETE INFORMATION
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—when you use Permo Long-Life Phonograph and Needle Facts. It's fast—easy—no fumbling—no failures—no guesswork. Permo "Facts" tell you what needle goes where! Current releases cover Admiral, Columbia and Philco sets; giving **EXACT, COMPLETE** information regarding record changers, cartridges and needles used in those sets.

PLUS THESE "EXTRAS" TO HELP YOU SELL!

Permo Long-Life Needle Replacement Kits for all Admiral or Philco models are yours for less than \$6.50. Here's what you get: (1) Admiral, Columbia or Philco Section, Permo Long-Life Phono and Needle Facts. (2) Complete opening stocks of superb Permo Long-Life Phono Needles—to fit all post-war Admiral and Philco sets. (3) Convenient display cards that fold to fit into handy pocket-size packets. (4) Needles are individually packaged with *installation tools* where necessary, and *spare parts* (nuts, screws, etc.) This kit is bound to make you a best seller of replacement needles!



Admiral, Columbia and Philco "Facts" now available. Write for your **FREE** copies. Additional "Facts" covering other manufacturers will be released progressively. Get your profit by selling Permo Long-Life replacement needles!



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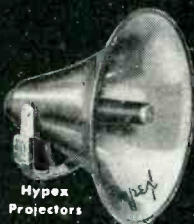
H-510 Coaxial with Acoustic Lens



Speechmaster Reproducers



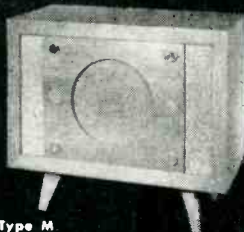
G-610 Triaxial



Hypex Projectors



VIMING economy speakers



Type M Reproducer Cabinet



Extended Range



Standard Series

Jensen MANUFACTURING COMPANY

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6601 S. LARAMIE AVENUE • CHICAGO 38, ILLINOIS

BURTON BROWNE ADVERTISING

writing Magnecord Inc., 360 North Michigan, Chicago, Illinois.

* * *

The *RCA Service Company* disclosed that it was turning over to the industry's independent television service organizations the field-tested methods for conserving critical materials and the data on use of alternate parts and tubes which it has developed during its own materials conservation program, begun nearly a year ago. The information has been compiled in a unique "*Handbook on Conservation of Materials.*"

Heart of the handbook is what is believed to be the first compilation of its kind of alternate receiving tubes and component parts for use in the operation and maintenance of television receivers, according to E. C. Cahill, President. More than 300 pretested and approved alternate parts and tubes are listed for approximately 50 different specific uses.

Copies of the handbook are being mailed to all television service associations in accordance with the company's long-established policy of sharing information and developments calculated to improve the industry's standards of television installation and servicing, Mr. Cahill said.

* * *

Standard Transformer Corporation's Mid-Year catalog, listing 441 *Stancor* transformers and related components, is now available, Jerome J. Kahn, president, announced today.

All transformers, including television components are classified and indexed in the catalog for ready reference. Each listing includes electrical specifications, dimensions, weight and list price. Illustrations show each mounting type in detail.

The catalog covers all electronic applications of the *Stancor* line, including radio, television and sound, under sixty-five separate classifications ranging from audio chokes to vibrator transformers, and covering TV, high fidelity; input, output; interstage; driver; modulation; power; filter chokes; filament; plate; isolation and autotransformers, with a special classification for *Stancor* "amateur specials."

* * *

A new *vibrator replacement guide* has just been published by the *James Vibrapowr. Company*, according to John A. Kennedy, President. Called the "James Blue," it covers the firm's complete line of vibrators, besides giving valuable, detailed cross-reference information. Also included are complete base wiring diagrams. A copy of the new replacement guide

may be had by contacting your nearest James distributor or by writing to The James Vibrapowr Company, 4036 North Rockwell Ave., Chicago 18, Illinois.

* * *

Some hitherto unpublished correspondence of *Guglielmo Marconi*, inventor of wireless communication, has been incorporated in a new booklet written by *Orrin E. Dunlap jr.*, vice president of the Radio Corporation of America.

Issued in commemoration of the 50th anniversary of the first transatlantic wireless signal, the *Dunlap* booklet gives a new picture of the great scientist. It reveals a man of infinite shyness, tortured by the thought of a biography written on his life and accomplishments.

Mr. *Dunlap's* booklet is based on his years of friendship with *Marconi*, and on his experiences in preparing an authorized biography of the inventor's life. Titled "*Marconi, The Man And His Wireless,*" the biography was published by The *Macmillan Company* in 1937.

* * *

The *M. A. Miller Manufacturing Company*, Chicago, has made available a leaflet diagramming "*How To Select The Proper Needle For Your Phonograph,*"

This is furnished in convenient padded form without charge through the local jobber. It is recommended that a pad be left in each listening booth of the store for the customer's convenience and edification.

When the customer has obtained the necessary information to determine his correct replacement needle the *Miller* leaflet is returned to his dealer and retained as a permanent record. This will eliminate the necessity of confusion in trying to establish the correct replacement needle for a future purchase. This further creates a service for the dealer to perform which will result in closer customer-dealer relations.

The *M.A. Miller Manufacturing Company* is located at 1165-69 East 43rd St. Chicago 15, Ill.

* * *

The sixth bound volume of *RCA Victor Service Data*, which provides, in a single hard-cover book, service and technical data on all 1950 models of *RCA Victor* television sets, including the famous "*Million Proof*" line, as well as radio receivers and phonographs, is now available to servicemen through *RCA* distributors.

Designed as a permanent reference volume, the book contains the in-

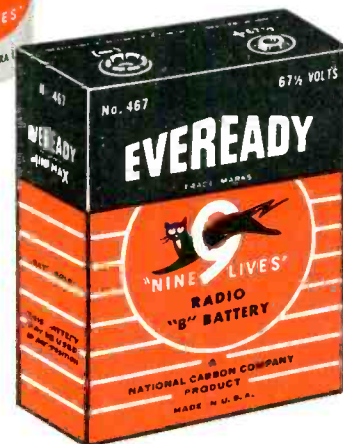


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• Dress up your counter or window with this handsome "Panoramic" window display for portable radios and "Eveready" Batteries. It's 23" wide . . . 18" high . . . and offers you four interchangeable "billboards" in vivid color, one for every season of the year. You can get this display as part of a bonus kit—including colorful pennants, streamers and replica "Eveready" batteries—with a purchase of "Eveready" portable radio batteries totalling \$25.00 or more at dealer prices. Order from your "Eveready" radio battery distributor today! Get your display in time for the big football listening season! Offer expires October 31, 1951.



"BATTERY-ENGINEERED BY BATTERY MANUFACTURERS FOR BEST BATTERY PERFORMANCE!"



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for every electronic application

Seventeen years of production experience, making millions of quality capacitors, has created this complete, outstanding ILLINOIS CONDENSER line. There's a full Jobber line of capacitors for every TV and radio replacement purpose; capacitors for the entire electronics industry—capacitors that meet the highest standards of dependability.

This engineering and manufacturing experience enables ILLINOIS CONDENSER COMPANY to meet every demand for new capacitor types, whether for peace or defense applications.

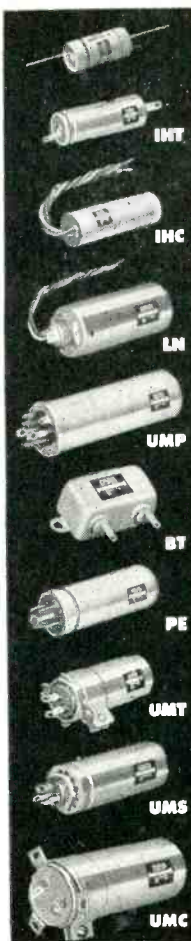
Write for catalog or tell us your needs. There is an ILLINOIS ELECTROLYTIC CAPACITOR exactly suited for the job—a capacitor of "Time Tested Quality".



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EXPORT DIVISION: 15 Moore St., New York 4, N. Y., U. S. A.
CABLE ADDRESS: "MINTHORNE"



formation provided by the single service-data booklets issued during 1950 for individual RCA Victor instruments.

The contents include servicing information such as schematic and wiring diagrams, electrical and mechanical specifications, alignment and adjustment procedures, complete service parts lists, chassis layouts, and other useful and essential service data on 1950 RCA Victor instruments.

The new Volume VI contains 472 pages and is an addition to the five previously issued bound volumes, which provide service data on RCA Victor instruments from 1923 through 1949.

All of the bound volumes, as well as single booklets on RCA Victor instruments for the current year, are available to servicemen from RCA distributors. The price of Volume VI is \$5.50.

* * *

A new 16-page *catalog* just issued by *Sprague Products Company*, North Adams, Mass. provides complete, easy-to-find data on modern capacitor types for practically every radio and television service, amateur radio, experimental, laboratory and other needs. Also included are details on Sprague Koolohm wire-wound resistors, interference filters, capacitor mounting hardware and the Sprague Tel-Ohmike universal capacitor and resistor analyzer. Of particular importance from a television servicing standpoint are the complete listings of Telecap molded tubular capacitors, Twist-Lok prong mounting dry electrolytics, Ceramite disc ceramics, Bulplate multiple ceramics, "door-knob" high-voltage ceramics and numerous other recent developments that are finding widespread use in present day equipment.

The new catalog, C-607, is now available free of charge from Sprague parts distributors or may be obtained direct from the manufacturer.

* * *

The *Admiral Corp. Service Letter*, "Simplified Procedure for Television Service" will be extremely helpful in handling television service where experienced television service men are not readily available.

It is intended primarily for fringe area dealers who do not have experienced television servicemen but will also be useful in the city especially if trained television servicemen get scarce.

With the aid of the Procedure and the few items listed on the top of the first page, anyone who can oper-

A MUST for every radio man

CQ is a monthly publication for Radio Amateurs, Technicians, Engineers, and Communications personnel. As radio-television servicemen you will be interested in knowing that the FCC has recently initiated both Novice and Technician Class licenses for radio amateurs. Since these licenses are easily obtained, many of you will undoubtedly be interested in preparing for them. (These are discussed fully in the March issue.)

For many years CQ has served radio amateurs and communication men throughout the world. Its articles are a constant reading necessity for all men in the radio profession.

Enter *your* subscription to CQ NOW!

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RS-1

Sirs: Here is my check (or money order) for \$..... for years subscription to CQ.

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

ate the set can take care of a good many service problems merely by reading it carefully and following instructions.

It is not our intention to have consumers service their own set. This Procedure is intended for the following people:

1. Dealers.
2. Radiomen who have not been trained in television servicing.
3. Salesmen.
4. Television installation men.
5. Anyone else who has to make repairs but up to now hasn't had instructions for doing so.
6. The experienced television man who isn't familiar with Admiral receivers.

* * *

John F. Rider Publisher, Inc., 480 Canal St., New York 13, announces that the third edition of *Radio Operator's License Q&A Manual*.

The new edition includes Element 8 covering Ship Radar Techniques, and the new elements 2, 5, and 7, and revised elements 3 and 6.

The author, Milton Kaufman, an instructor of radio operating at RCA Institutes, Inc., has written the book with the view of self-study in mind. Not only are questions and answers to past FCC exams listed, but follow-through discussions are included to give the reader full understanding of difficult technical questions.

Among the valuable appendices are Small Vessel Direction Finders and Automatic Alarm, never before available in a book of this type.

Radio Operator's License Q&A Manual, Third Edition, contains 734 pages and 243 illustrations. It is 5½ x 8½ inches in a cloth binding. The price is \$6.60.

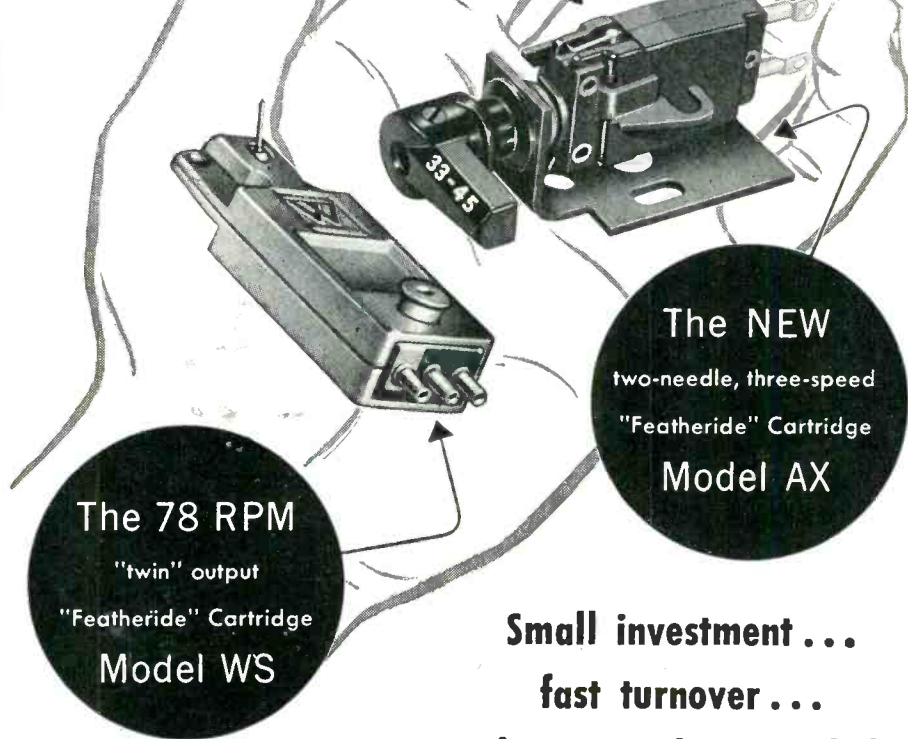
* * *

A sixteen-page illustrated brochure describing new magnetic tape recording equipment for professional broadcast use has been released by the RCA Engineering Products Department.

The booklet fully describes the basic RCA Type RT-11A magnetic tape recorder, as well as the console Type RT-12A equipment and custom-built recording and editing equipment available in either rack or console combinations. Accessories, such as remote control units, metering panels, and vacuum equipment for holding the tape in place during cutting and splicing operations, are also described.

Copies of the brochure (Form 2J8024) are available to broadcast station engineers requesting it on their letterhead.

Handle your replacement business the easy way!



The 78 RPM
"twin" output
"Featheride" Cartridge
Model WS

The NEW
two-needle, three-speed
"Featheride" Cartridge
Model AX

**Small investment ...
fast turnover ...**

no replacement chart needed

The Model WS replaces more than 100 different types for 78 RPM records

The WS cartridge can be installed in any ½" standard tone arm. The one cartridge develops either 1½ volts or 4 volts at ¾ ounce tracking pressure. The Model WS is furnished complete with a factory-tested, osmium-tipped replaceable needle, rest button, terminal clips, extra needle screws and instructions for installing. The Dri-Seal protected crystal and the exclusive Dri-Pack container assure a cartridge always ready to deliver peak performance.

Featheride cartridges are made only by Webster Electric Company, Racine, Wisconsin. Established 1909.

The Model AX replaces today's two-needle, three-speed cartridges

This two-needle, three-speed replacement cartridge ends the need for replacement charts and big inventories. The Model AX cartridge is a complete unit, including twist mechanism, cartridge, needles and instructions for installing in any standard ½" mounting. Model AX twist mechanism is easily removed when cartridge is to be installed in tone arms in which such mechanism is an integral part. Double-protected against moisture by the Dri-Seal crystal and Dri-Pack packaging.

Write for descriptive folder to Webster Electric Company, Racine, Wisconsin. Established 1909.



WEBSTER ELECTRIC
RACINE ♦ WISCONSIN

"Where Quality is a Responsibility and Fair Dealing an Obligation"

TRADE FLASHES

[from page 14]

time company record of \$162,500,000 in 1950.

The post-war sales record reflects the steady expansion of the company's production facilities, as sales have increased every year since 1945. The figures were \$69,300,000 in 1946, \$95,700,000 in 1947, \$99,300,000 in 1948, and \$102,500,000 in 1949. War-time sales were greatest in 1945 when the total was \$125,800,000. From the time of the merger until the outbreak

of World War II, annual sales ranged from less than \$6,000,000 to around \$20,000,000.

New Directors And Officers Of CBS-Columbia Inc.

D. H. Cogan, President of CBS-Columbia Inc., manufacturing subsidiary of the Columbia Broadcasting System today announced the list of members of the board of directors and officers of CBS-Columbia Inc.

Members of the board of directors are as follows: Bruce A. Coffin, Chairman; D. H. Cogan; Lloyd H. Coffin; Adrian Murphy; Frank Stanton; Sam Dean; and Ralph Colin.

Officers of CBS-Columbia Inc.: D. H. Cogan, President; Bruce A. Coffin, Executive vice-president; J. A. Stobbe, Vice-president in charge of operations; L. M. Kay, Vice-president in charge of engineering; M. A. Gardner, Vice-president in charge of purchases; Allan Strauss, Vice-president in charge of export; John Ward, Controller, Asst. Secretary and Asst. Treasurer; Sam Dean, Treasurer and Secretary.

Kolorvision Screen A Hit At N.A.M.M. Show

An outstanding exhibit of the Chicago N.A.M.M. show, Duotone's Kolorvision screen demonstration showed how the illusion of rich color can be added to any black and white picture. Using the tri-color principle, Duo-



tone's exciting new TV color products is now available for all size screens and can be attached without any special skill or mechanical aids in a few minutes time. The Kolorvision screen, by cutting down harsh tone and eliminating any "snow" also relieves eye-fatigue and strain.

Merit Advertising Will Aid TV Servicing

Bill Barron, Sales Manager of the Merit Transformer Corp., makers of TV Transformers and Components, in a recent statement, said that Merit's advertising will aim at considerably more than a description of their full line of products for conversion and replacement. He said that Merit believes servicing should be one of the major interests of the components manufacturer and consequently much of their campaign will be directed towards supplying adequate information to the technician.

This type of thinking has developed a Merit program known as "TV Service Aids." Any question on repair problems can be written or phoned in to Merit HQ and will be answered by a Service Engineer.

The program will be expanded as the replacement and conversion business expands in order to maintain a coordination between manufacturer, jobber and the service man.

**Keep Picture Quality UP
Keep Service Calls DOWN**



**JUST PRESS THE BUTTON,
SPRAY IT ON —
NO SPECIAL
EQUIPMENT NEEDED!**

Spray on antenna and lead-in terminals

Krylon prevents corrosion and pitting, even in salt-spray areas. It seals antennas and connections in a waterproof acrylic (not vinyl) blanket. (When aluminum finish is desirable, use special aluminum Krylon.)

Spray on high voltage circuits

Spray Krylon on the high voltage coil and insulation . . . in the socket of the high voltage rectifier . . . on component parts of rectifier circuit. Helps prevent corona because of its high dielectric strength.

Two types — clear and non-conducting aluminum. Both have exactly the same qualities. Packed in 12 oz. aerosol spray cans. List prices: \$1.95 clear, \$2.25 aluminum. Also available in gallons for application by brushing or dipping. See your jobber, or write direct.

KRYLON, INC., Dept. 509
2601 No. Broad St., Philadelphia 32, Pa.

Advertised in
"The Saturday
Evening Post"

KRYLON®

THE ACRYLIC SPRAY THAT PREVENTS TV TROUBLE

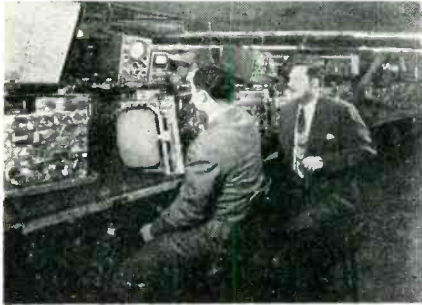
Rider Announces Sales Promotion Manager

William J. Slawson, general sales manager of John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y., announces the appointment of George Siegel to the position of sales promotion manager.

Mr. Siegel has been associated with the organization for the past five years in the advertising and sales departments.

EICO Equipment Used In TV Production

The photo below shows Harry R. Ashley, (right), President of Electronic Instrument Co., Inc. (EICO), inspecting the use of the Eico Model 425 Oscilloscope and Model 221 Vac-



uum Tube Voltmeter at the important constant-duty alignment positions along the new television production lines of the Tele-King Corporation, New York City. James Adler, (left), Tele-King Production Test Foreman, demonstrates the alignment procedures used.

Du Mont In Production On Self-Focus Teletrons

Production of 17 and 20-inch self-focus electrostatic Teletrons has been started at Allen B. Du Mont Laboratories, Inc., cathode-ray tube plant at Allwood, New Jersey, Bill C. Scales, national sales manager disclosed recently.

The two types in production are the 17KP4 and 20JP4 TV picture tubes.

The present 17-inch self-focus tube is a direct replacement for all 17-inch glass rectangular tubes on the market today, whether electrostatic or electromagnetic.

Manufacturers have already been sampled with the new tubes, Scales said, and production shipments have started.

Development of this tube, Scales said, opens a new field for servicemen in their replacement and conversion operations. An important sales feature, he pointed out, is the simple conversion procedure. The focus coil is removed from the chassis and replaced by a resistor. No other changes or adjustments are necessary to obtain optimum focus in the converted set.

Handy New "Slide-Pak" for Sprague Ceramics

Latest innovation in capacitor packaging is the "Slide-Pak," just introduced by the Sprague Products Company, North Adams, Mass., for its Cera-mite disc capacitors and Bul-plate printed circuits and multiple capacitors.

The "Slide-Pak" is a transparent rigid acetate tray with slide-on cover, which permits easy removal of individual capacitors without destroying the package or impairing its utility—two difficulties with the pliofilm envelope previously used by most capacitor makers about which service tech-

nicians have complained in the past. Unlike cardboard window boxes which also have found limited use in capacitor packaging, the completely transparent "Slide-Pak" permits stock-taking without a second glance. It is also more economical of shelf or drawer space.

Part numbers and complete information are given on an insert card

RCA Shows 3-Speed Counter-Type Record Demonstrator

A new counter-type record demonstrator with facilities for playing records of all three speeds was unveiled here this week by RCA Victor as part of the company's exhibit at the



Like the proverbial mouse trap, a better ion trap is bound to be popular. INDIANA'S E-ZEE-ON Ion Traps are better too. Servicemen like them because E-ZEE-ON can be slipped on the tube neck and adjusted in seconds with just one hand. There's no manual clamp — just one compact piece of permanently magnetized Cunife that grips snug and stays put.

E-ZEE-ON provides an even magnetic field pattern that results in brighter, more uniform picture definition. They fit any picture tube neck and function efficiently on large and small tubes. E-ZEE-ON Ion Traps are ideal for servicing older sets or for conversion jobs. They are already standard equipment on many new TV sets.

EASY TO CARRY

Each E-ZEE-ON Ion Trap is protected in a compact package that takes but little space in your service kit. An instruction sheet is included with each unit.

Your jobber now has these better ion traps; look for the colorful E-ZEE-ON counter-top display carton. Write for descriptive folder. E-ZEE-ON Ion Traps are made by the world's largest producer of permanent magnets . . .



THE INDIANA STEEL PRODUCTS COMPANY
Specialists in Packaged Energy Since 1908
VALPARAISO, INDIANA

annual convention of the National Association of Music Merchants.

In addition, the RCA Victor display includes the company's complete current line of home instruments: its Million-Proof television receivers, Golden Throat radios, 45-rpm phonographs and record-players, and combination instruments housing TV, radio, and phonograph facilities.

A display of RCA Victor records highlights the company's new *Alice in Wonderland* album, recorded with the same voices that were featured in the Disney film, including Ed Wynn, Jerry Colonna, Sterling Holloway and Kathryn Beaumont.

The new three-speed demonstrator is equipped with two turntables, one for 45-rpm records, and the other for 78 and 33-1/3-rpm records. The instrument's 12-inch, high-efficiency, electro-dynamic speaker and RCA Victor Golden Throat Tone System bring out the best in records of all speeds.

The machine is housed in a cabinet of limed oak, with the back enclosed to prevent tampering. Customer operating instructions are provided on plates mounted in front of each of the two turntables.

The demonstrator is now available to dealers at the suggested price of \$65, f.o.b. record distributors' headquarters.

Thomas Issues Picture Tube Guarantee

Thomas Electronics Inc. has issued a guarantee against defects in materials and workmanship for a full period of six months from the date on which the "Phototron" goes into the TV Set.

This new guarantee for the Thomas cathode ray picture tube accompanies the purchase of each tube. An added feature—with the Phototron guarantee—is that if the tube should be replaced within the six month period, the replacement is also guaranteed for a six month period.

The guarantee is printed on a 2-fold card and consists of a Dealer's Copy, a User's Copy and a User's Registration copy. The Registration copy is mailed, postpaid, to the factory.

Cards contain space for such information as the make of the set, and whether tube is purchased for repair replacement or conversion replacement.

Sylvania Demonstrates Halolight

New York gets its first look on Aug. 1st at Surround Lighting built into television sets when a 10-day showing of Sylvania Electric Products Inc.'s new Halolight opened at the Park Sheraton Hotel.

This new development for viewing comfort is to be seen on four of the fourteen models in the company's Golden Jubilee Line of television receivers, on display here by Sylvania distributor Victor H. Meyer. All sets of this line, which celebrate Sylvania's fiftieth year in lighting and electronics, incorporate such improvements as a way of minimizing interference by trucks, buses and low-flying planes, and higher sensitivity for clear reception in areas at a distance from transmitting stations.

Halolight, is a frame of soft light surrounding the picture image. By lessening the contrast between the bright screen and the darker surrounding area, Halolight adds apparent depth to the picture, makes it seem brighter and even larger. It is anticipated that it will also be used in Sylvania color television sets when they become available.

This Surround Lighting is accom-

THIS IS IT! THE RELAY WITH Interchangeable Coil FOR A WIDE RANGE OF RADIO APPLICATIONS

GUARDIAN Series 200

Interchangeable

COIL and CONTACT

Switch Assembly



Two basic parts—a coil assembly and a contact switch assembly—compose this simple, yet versatile relay. The coil assembly consists of the coil and field piece. The contact assembly consists of switch blades, armature, return spring and mounting bracket. The new Guardian Midget Contact Assembly which is interchangeable with the Standard Series 200 coil assembly, is also available in either single pole, double throw; or double pole, double throw.

CONTACT SWITCH ASSEMBLIES

CAT. NO.	TYPE	COMBINATION		
200-1	Standard	Single Pole	Double	Throw
200-2	Standard	Double Pole	Double	Throw
200-3	Contact Switch Parts Kit			
200-4	Standard	Double Pole	Double	Throw
200-M1	Midget	Single Pole	Double	Throw
200-M2	Midget	Double Pole	Double	Throw
200-M3	Midget Contact Switch Parts Kit			

13 COIL ASSEMBLIES

CAT. NO.	A.C. COILS*	VOLTS	CAT. NO.	D.C. COILS	VOLTS
200-6A	6 A.C.	6	200-6D	6 D.C.	6
200-12A	12 A.C.	12	200-12D	12 D.C.	12
200-24A	24 A.C.	24	200-24D	24 D.C.	24
200-115A	115 A.C.	115	200-32D	32 D.C.	32
			200-110D	110 D.C.	110

*All A.C. coils available in 25 and 60 cycles

GUARDIAN ELECTRIC
1606-K W. WALNUT STREET CHICAGO 12, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING RADIO AMATEURS

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Order them now — the supply is low.

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JULY 1949 Picture Tube High Voltage Systems High Quality Tuner Analysis Amateur TV Interference	OCTOBER 1950 Know The Cathode Ray Tube, Part I Comparing AM & FM Service Problems Reducing Losses in Trans. Lines Band Selection Features of Tuners
SEPTEMBER 1949 Legality of TV "Policies" Clarified A Klystron TV Sweep Generator High Quality Analysis Series, Part I	DECEMBER 1950 Operation & Service of Keyed AGC Systems Sampling Techniques Applied to TV
APRIL 1950 Servicing Sync Separators The TV Waveform & Its Components Understanding Push-Pull	JANUARY 1951 The CBS Field Sequential Color System, Part I How De-Coupling Networks Operate Improving TV Booster Performance in Fringe Areas Radio Symbols Chart
MAY 1950 1-Man TV Antenna Orientation Elements of TV Signal Distribution TV Sync-Sweep Tracing	FEBRUARY 1951 The CBS Field Sequential Color System, Part II Phase Inverters Antenna Rotators, Part I

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Please send me the back numbers checked here	<input type="checkbox"/> June 1949	<input type="checkbox"/> Aug. 1950
	<input type="checkbox"/> July 1949	<input type="checkbox"/> July 1950
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	<input type="checkbox"/> May 1950	<input type="checkbox"/> Dec. 1950
		<input type="checkbox"/> Feb. 1951

I remit herewith \$ for the copies ordered at c. each.

NAME
ADDRESS
CITY ZONE STATE

plished by encircling the screen with a translucent panel which is lighted from behind by a cold cathode-ray tube.

New Tel-O-Tube Warranty

Tele-O-Tube Corporation of America, cathode ray tube manufacturer, this city, announced this week its new policy of warranting its replacement picture tubes for six months after the date of installation.

The new policy, which will go into effect immediately, is directed toward the protection of the jobber and distributor by allowing them unlimited shelf time for all tubes purchased from the company. Warranty now becomes effective as of the date of installation.

SHOP NOTES

[from page 33]

will be necessary to use either an external indoor or outdoor type antenna.

4. Sometimes it may be necessary to make a shield, out of copper screen, to fit over the horizontal output and damper tubes.

Crosley Service Dep't.

SYNC PULSES

[from page 8]

tion for the subscribers who suffered loss of same as a result of the flood. Would that more could be done for the unfortunate victims of circumstance.

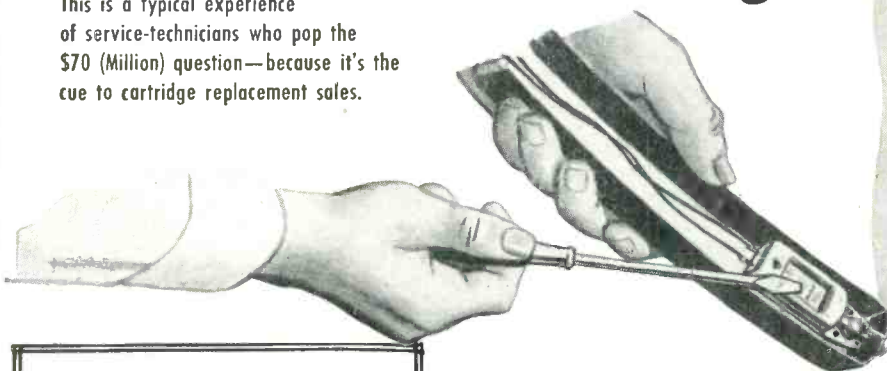
Increased TV Power Output — as covered by the Sync Pulses column in the August issue,—our timing was bad, and we are glad about it. In that column we stated that FCC would probably allow TV transmitters to increase their output, but such an event might not transpire for some time. Immediately after the printer locked up forms, FCC decided to give stations the green light. Some stations upped their signal over 500%, and as a result, many thousands of homes in the ultra fringe areas who heretofore could not get a TV signal already report their delight with the fine TV reception they are getting. In the less extreme fringe areas where signals were somewhat weak before the power increase there has been a noticeable improvement in picture clarity and stability. All this summed up means extra TVset sales and more service jobs. Increased TV transmitter power



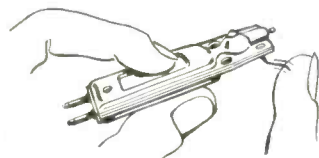
I SELL ONE OUT OF THREE
BY ASKING:

“When did you
last change your
Phono-Cartridge?”

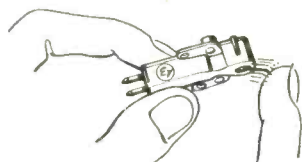
This is a typical experience of service-technicians who pop the \$70 (Million) question—because it's the cue to cartridge replacement sales.



Make the Finger-Tip Compliance Test



Old style, stiff-acting needle system

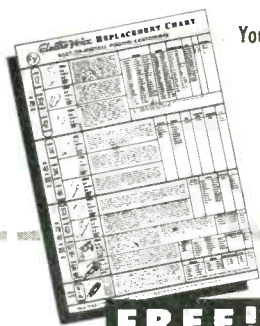


Modern, compliant needle system

It makes record-player owners aware of the importance of the cartridge. It gives you the opportunity to prove that a *modern, lightweight, compliant* cartridge will greatly improve reproduction and save records and needles.

Right now... 10,000,000 old-style, heavy, stiff-acting phono-cartridges in existing players need replacing. Current cartridges that are inefficient should be replaced, too.

Follow the E-V plan — *it works*. Check the cartridge on every job — you'll make more sales, more profit!



REPLACEMENT CHART

Large, Complete Replacement Chart. Gives handy cross-reference and valuable data. Tells when to replace a phono-cartridge. Ask your E-V Distributor or send for it now.

You can make most cartridge replacements with fewer E-V models

Electro-Voice INC.

411 CARROLL STREET • BUCHANAN, MICHIGAN

Export: 13 East 40th St., New York 16, N.Y., U.S.A. Cables: Arlab

Electro-Voice, Inc., Dept. T9-51
412 Carroll St., Buchanan, Michigan

Send FREE Cartridge Replacement Chart

Name (PLEASE PRINT)

Address

City Zone State

Service-Technician Dealer Record Fan

already means well over 1 million more prospective TVset buyers in fringe areas already being served. Soon, the inauguration of new VHF stations can mean an additional 3.5 million potential TV buyers. Servicemen, there's work to be done!

MEN OF RADIO

[from page 31]

dyne detector for the purpose. This circuit, invented by Professor Fes-

senden before the advent of vacuum and at that time appeared as in tubes, had been improved and refined *Fig. 3*. Very soon he perceived that there were several drawbacks to this plan. First of all, the heterodyne receiver, sensitive as it was, still would not pick up the very weak German signals. It should be remembered that at that time, no one had thought of following the heterodyne detector with one or more stages of high frequency amplification. In fact, there was no such thing as a second detector as we know it today; the heterodyne detector delivered an aud-

ible signal. Although relatively unimportant in this discussion, one more difference between the heterodyne detector and modern receivers stands out; the heterodyne detector itself supplied the second signal which was used to beat against the incoming wave. A local oscillator was not used to generate this signal.

Armstrong evidently did not have a chance to demonstrate his new super-heterodyne receiver in the field, but its superiority has since been adequately shown; today it is the standard of the industry. In 1919, by then a major, he was given the assignment of testing the radio communication link between General Pershing's headquarters and that of the Armistice Commission. While on this assignment he received an urgent call to return to the United States. With the end of the war DeForest had reopened the patent fight which had been temporarily suspended by hostilities. At first, things seemed to be all in Armstrong's favor; he was able to bring suit against DeForest for infringement and the Patent Office began an investigation into the matter of priority in the regenerative patents. Then Westinghouse Electric made him a very attractive offer, which he accepted. The regenerative and the superheterodyne patents were purchased for a total of more than a half-million dollars; \$200,000 of the total amount, however, was contingent upon Armstrong's successful defense of his claims to the use of the feed-back circuit as an oscillator. A number of years elapsed before the issue was settled, and we shall have to depart from strict chronology here in order to anticipate the results. In 1924 DeForest won the first important round by a decision of the District of Columbia court which awarded both the regenerative and audion oscillator patents to him. Finally, in 1934 the Supreme Court of the United States, in a decision that has been described as "astonishing" handed down the opinion that DeForest, not Armstrong, had invented regeneration. This decision was based upon certain entries in DeForest's laboratory notebooks, and which the court interpreted as meaning that he had made the discovery. Radio experts who examined the testimony disagreed; in their opinions, DeForest's notation did not warrant such a conclusion. Later on, Justice Cardozo, who prepared the opinion, revised part of it to read that DeForest was the rightful patentee because his notebooks showed observations "which

Especially Designed for Radio & TV!

LYNN Lightning
SOLDERLESS WIRE
TERMINAL
REPAIR KIT

NO. 2195
SERVICE KIT



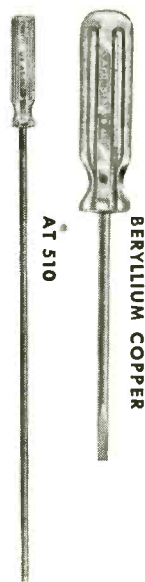
Now you can get a positive, trouble-free connection on every terminal... as fast as you can close your hand. No messy soldering or waiting for an iron to heat! With a Lynn Lightning service kit you just strip primary wire from 10 to 22 gauge with handy, combination stripping and crimping tool... select the proper terminal... then *crimp* it on. Every job quick, clean, professional-looking! Kit comes complete with crimping tool, 10 different types of terminals in 11-bin, clear plastic box. Only \$8.50

Two New Television Screw Drivers

Reach hard-to-get-at spots with the new Vaco AT 510 non-metallic, fiber shank driver for critical tuning and aligning work... the 10" blade gives you all the length you need. Adjust the new type focalizers with specially designed Vaco Beryllium-copper drivers... non-magnetic, yet nearly as hard as steel for adequate torque without interference with the Ion trap field. Full information on other aligning tools, nut setters and special radio tool kits on request. Write for FREE catalog.



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Don't Take Unnecessary Chances

An overwhelming majority of servicemen say that *performance* is what they want most in a capacitor. If you agree, and if you don't want to take chances, your best bet is . . .

Make Sure! Make it Mallory!

Performance is the one big reason why more than half of the hundreds of servicemen interviewed in a recent survey use Mallory Capacitors.

Despite excessive operating temperatures and higher ripple currents, Mallory Capacitors have taken the rugged service of TV operation

in stride. The far superior heat dissipating characteristic for which Mallory FP Capacitors have long been known is the reason for this trouble-free performance. And Mallory Plascap* plastic tubulars are suited for the same 185° F. (85° C.) operation.

When you are looking for performance, don't take a chance on just any capacitor. Make it Mallory . . . and make sure! It costs you no more to play safe.

MALLORY PLASCAP



The plastic tubular specifically designed to meet your field service problems. Available in a complete range of ratings.

Depend on your Mallory Distributor for precision quality at competitive prices.

*Trade Mark



P. R. MALLORY & CO. Inc.
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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

Insure BETTER Television Service to Your Customers! . . . Exclusively Designed



HIGH VOLTAGE AND ELECTROLYTIC TUBULAR TELEVISION CAPACITORS

Especially Engineered for Television Circuits by INDUSTRIAL CONDENSER CORP.

The economical quality line for replacement. Industrial Condenser Corp., manufacturers of Capacitors exclusively brings you highest quality for the particular requirements of Television at exceptionally attractive prices! Special Capacitors are Pyroteen impregnated for low power factor, high insulation resistance, high operating temperatures. Oil, Pyroteen, Wax and Electrolytic Capacitors. Finest materials throughout.

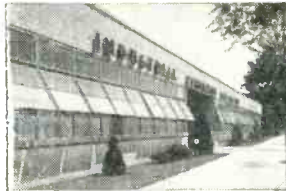
Ask Your Jobber for our Attractive Prices Today!

Or write for Bulletin 1095. Industrial makes quality Capacitors for Television, Radio, every electronic and industrial application—all types.

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Sales offices in principal cities.



Modern plant built by Industrial Condenser Corp., for manufacture of Capacitors only.

SAVES TIME-MONEY ON EACH CALL



N.U. VIDEOTRON

PICTURE TUBE CHECKER 28⁷⁵
Net to Dealer

- PORTABLE • RUGGED
- ACCURATE

- Checks all magnetically and electrostatically deflected tubes.
- Uses beam current principle of test.
- Checks electron gun for continuity and shorts.
- Checks tubes in carton or set without removal.

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means, or was understood, we are told, by DeForest to mean" that he had invented the circuit.

Immediately after the decision, Armstrong returned to the Institute of Radio Engineers the medal which earlier had been awarded to him for his accomplishment in the feed-back invention; the directors of that institution voted unanimously to reward the medal to him. In 1941 the Franklin Institute awarded its medal to Armstrong for his inventions, among them the regenerative circuit. The following year he received the Edison Medal of the American Institute of Electrical Engineers for his invention.

Louis A. Hazeltine

By the time DeForest had won his initial battle in the great patent fight, regular broadcasting service had been instituted throughout most of the country and the regenerative circuit had come into its own. Its popularity in broadcast receivers was destined to be of short duration, however. The less skillful experimenter found that the circuit was critical and rather difficult to adjust, despite its unquestioned superiority in sensitivity. Within a few years, receivers of the regenerative type had been superseded by models using one or more stages of tuned radio frequency amplification, equipped with one or another form of stabilization to prevent oscillation. One of the most successful of these was the Neutrodyne circuit, the work of Louis A. Hazeltine. Hazeltine, an instructor in electrical engineering at Stevens Institute, had been called upon by the Navy Department during World War I in connection with the design of an advanced type of receiver, the SE 1420. It is known that this receiver embodied some of the principles later used in the Neutrodyne.

In 1922 Hazeltine's attention was directed to the excellent possibilities then existing for tuned radio frequency amplifiers, which had been little used up to that time on account of their tendency toward oscillation. It has been said that Hazeltine, an excellent mathematician, depended primarily upon sliderule, pencil and notebook in working out his famous circuit; however true this may be, it is apparent that his calculations actually worked in practice. The basic Neutrodyne circuit is illustrated in Fig. 4. Tube inter-electrode capacitance was neutralized by means of small adjustable capacitors called neutrons (at *N* in the sketch). Not evident in the drawing is the fact that magnetic coupling between

coils, another source of oscillation, was overcome by mounting the coils at the specific, rather critical angle of 60 degrees to the horizontal.

[To Be Continued]

TV SERVICEMEN

[from page 24]

At the peak of the early demand for TV sets, eager owners were willing to make almost any sacrifice for a clearer glimpse of Uncle Miltie or a championship fight. Some even insisted on having full-size antennas erected indoors in any spot where reception was best. One family had such an antenna in the bathtub, another under the bed, and several had masts mounted on the bedposts. A swank Forest Hills apartment owner agreed to put his antenna on the dining room table. The family dined between dipoles.

Which only goes to prove that the customer may not always be right—but he wants what he wants where he wants it. Any serviceman will agree to that!

OSCILLOSCOPE CIRCUITS

[from page 22]

diode. The purpose of this control is to keep the time base sweep locked in the with applied signal and provide a stationary picture on the oscilloscope screen. As will shortly be seen this control is used in conjunction with the two other frequency controls. After the approximate frequency of the time base is set, the synchronization control is then adjusted to provide an exact lock-in frequency.

Control No. 2 - *Course Frequency Adjust* - chooses the proper value of charging capacitor to produce the saw tooth wave. A larger capacitor will take a longer period of time to charge and a smaller capacitor will take a smaller period of time to charge, hence the approximate frequency of the time base may be chosen through use of the proper value capacitor by means of this selector switch. On commercial type oscilloscopes this switch is calibrated in approximate frequency ranges.

In order to obtain a closer adjust- of this time base sweep, the charging resistor is made variable; this is control No. 3. This variable resistor is the *Fine Frequency Control* and the resistor is the charging path for the capacitor to the d-c supply volt-

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age. A vernier adjustment in frequency is available by means of this control.

By means of these three controls, the fundamental time base sweep generator will provide a synchronized saw tooth output whose frequency may be adjusted in coarse steps by varying the charging capacitor. Between these individual steps, a variable charging resistor will allow smooth frequency adjustments to be made. The range of sweep frequencies depends upon the values chosen for the charging capacitor and resistor.

In order to synchronize the time base, some of the applied signal is taken off and used for the synchronization signal as in Fig. 4. The smallest possible amount of synchronization which is sufficient to supply a stable trace on the tube face should be used. If the synchronization control is advanced too far, providing too much synchronization voltage, the linearity of the saw tooth sweep will be affected. For this reason the coarse and fine frequency controls should always be adjusted first, in an attempt to stop the horizontal motion of the picture pattern. The final adjustment may be made with the synchronization control and in most applications, the control should not be turned more than half-way in order to provide complete synchronization.

The Multivibrator Sweep Circuit

The high vacuum tube may be used as a switch across the charging capacitor of an R-C circuit in order to provide a saw-tooth voltage. A circuit of this type as shown in Fig. 5 is more easily controlled as to frequency and time duration than the gas filled type of sweep circuit. High vacuum tube sweeps of the multivibrator variety are widely used in television receivers to provide both horizontal and vertical sweep voltages. The multivibrator circuit may be viewed as two resistance coupled amplifiers which are connected together; the output of one is the input of the other.

The plate load resistor of one tube is coupled by means of a capacitor and grid leak to the grid of the next tube. The operation of this circuit depends on the fact that it is impossible to completely balance any two tubes even if the exact value components are used. There is always some deviation in value between two parts whose values may be exactly the same. Since there is no bias on either tube when the plate voltage is applied, it may be assumed that both tubes conduct. Due to some unbalance, one tube inevitably must conduct more than the other. Assume for the

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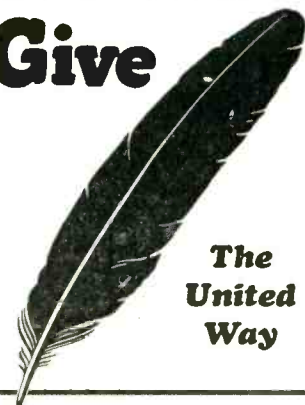
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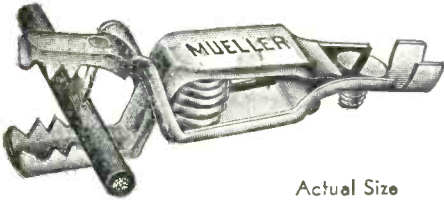
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moment that V-1 conducts slightly more and its plate voltage will be lowered. A more heavily conducting tube will have a larger voltage drop across its plate load and this will reduce the plate voltage.

Capacitor C-2 which couples the plate of V-1 to the grid of V-2 originally had charged to the plate voltage of V-1. Since the plate voltage of this tube V-1 is now lowered, this coupling capacitor will discharge across the grid leak R-2 of the tube V-2. This negative voltage causes V-2 to conduct less and its plate voltage will accordingly rise. An increasing plate voltage on V-2 will couple an increasing voltage on the grid of the opposite tube V-1. Since V-1 originally was assumed conducting more heavily, a positive voltage on its grid will further increase its conduction. This lowers its plate voltage and coupling through capacitor C-2, a more negative voltage will be seen on conduction. In less time than it takes grid V-2 which further reduces its to say, vacuum tube V-1 will be operating at saturation, that is in its maximum conduction position, and V-2 will be completely cut off or in its non-conducting position shown in Fig. 6.

This condition will be maintained until C-2 has completely discharge through R-2. It is this discharge which provides the negative voltage on the grid of V-2 and holds this tube at cut off. When the negative voltage caused by this discharge is insufficient to cut the tube off, conduction immediately begins and the entire cycle repeats. The conduction of V-2 lowers its plate voltage which couples back a negative voltage on the grid of V-1. This decreases the conduction of V-1 and increases its plate voltage. Capacitor C-2 charges and a positive going voltage is now applied on the grid of V-2 which further increases its conduction. After a very short time interval, depending on the circuit constants, V-1 is cut off and V-2 is conducting. The circuit is now operating as a free-running multivibrator. There is no input synchronization and both tubes constantly change from a condition of cut-off to a condition of saturation. If such a charging capacitor were to be placed between plate and cathode, in one of these tubes, the tube would act as a switch and produce a saw tooth output across the charging capacitor. The vacuum tube performs the same function as the gas filled triode did; it alternately discharges the sweeping capacitor and then allows it to charge.

[To Be Continued]



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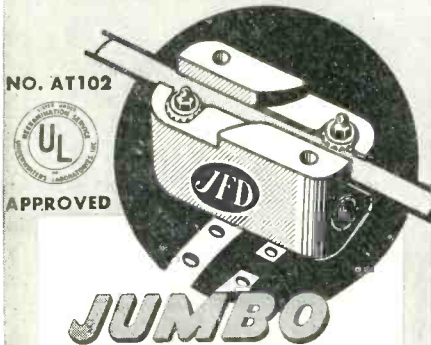
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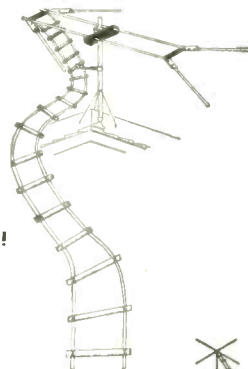
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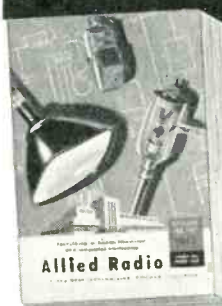
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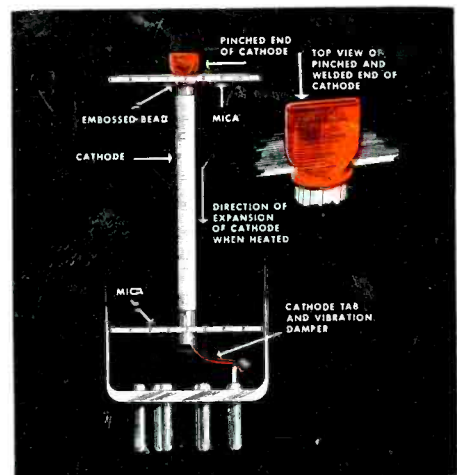
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