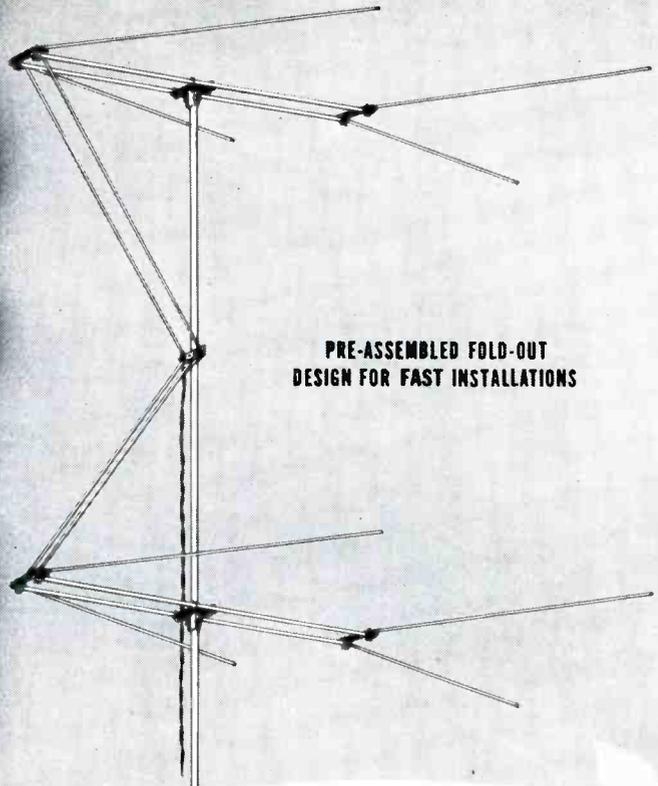


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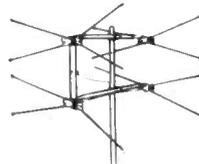
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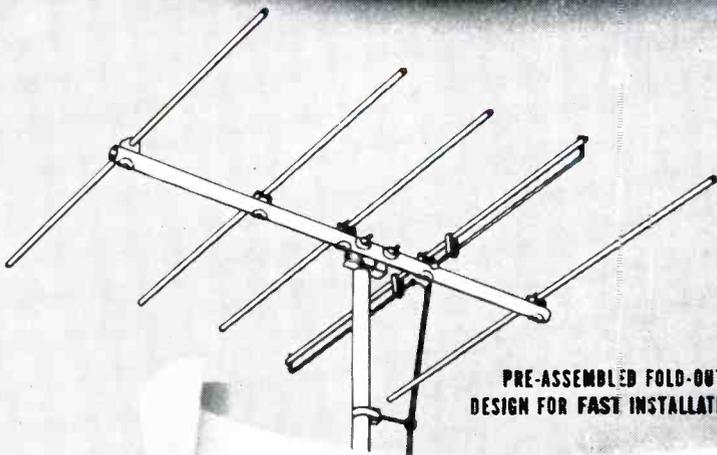
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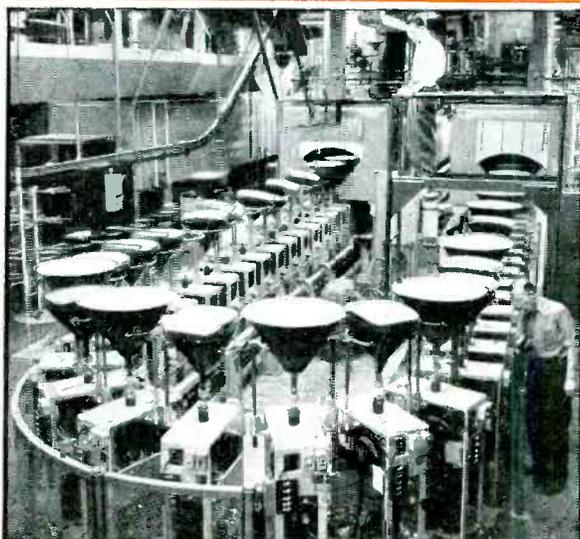
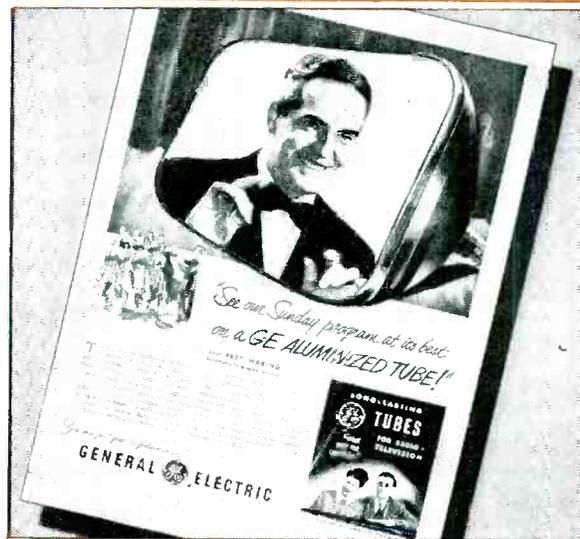
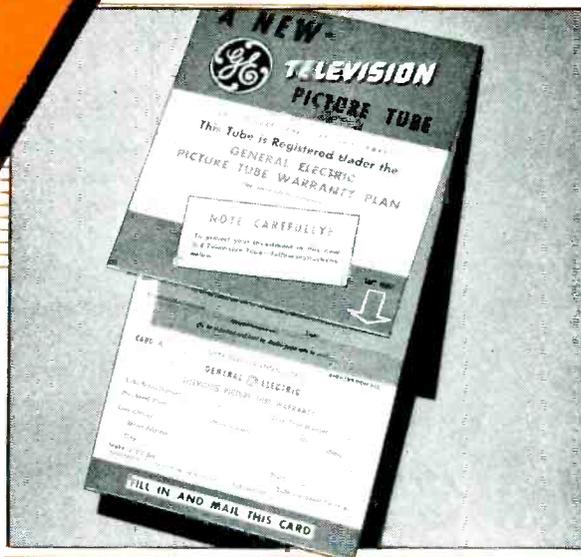
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Vol. 20, No. 7



July, 1951

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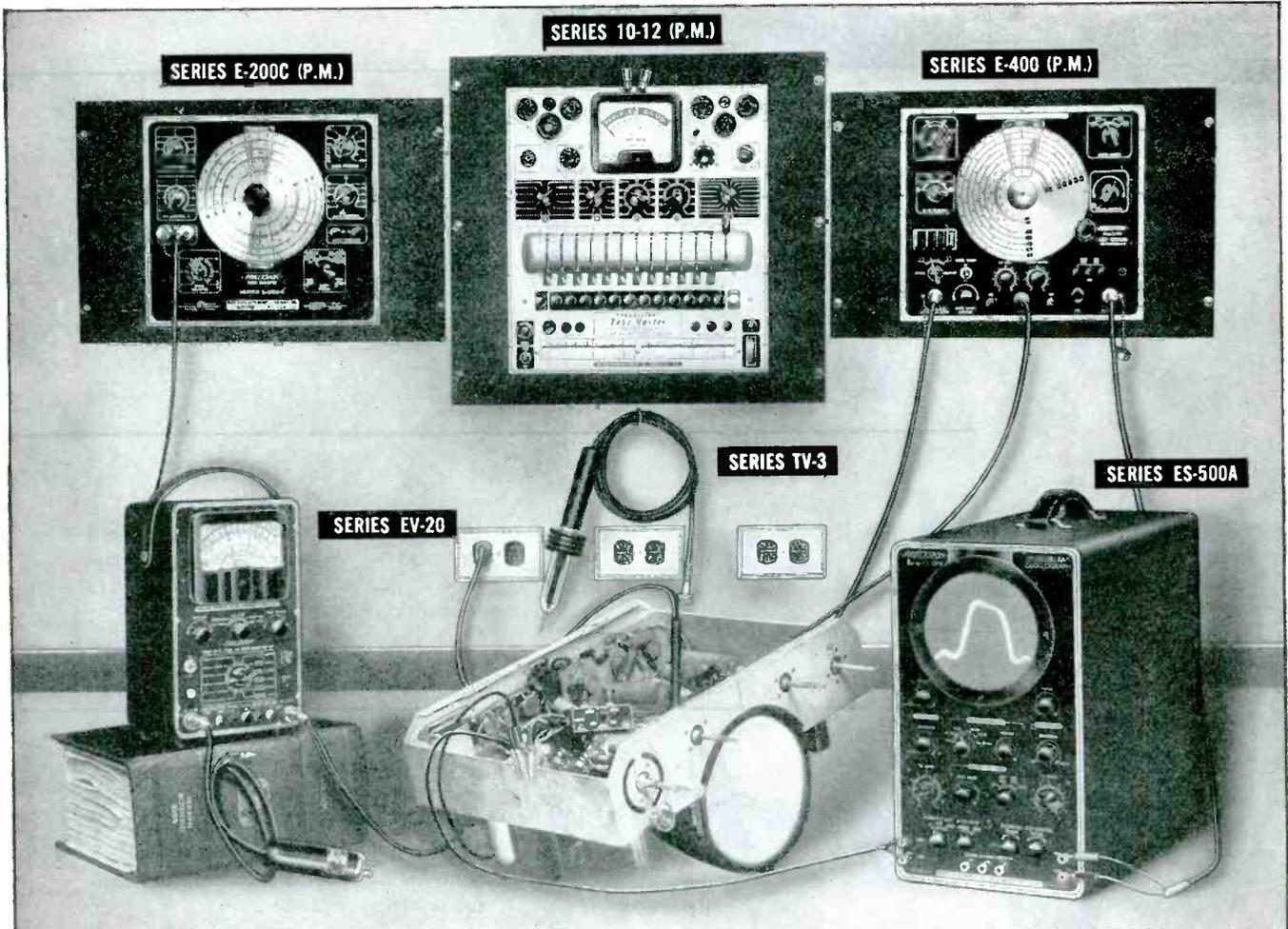


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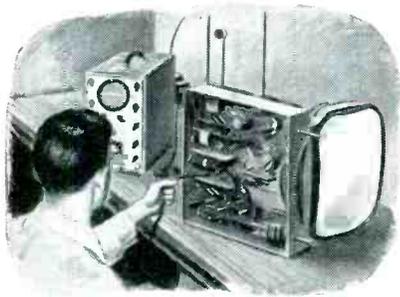
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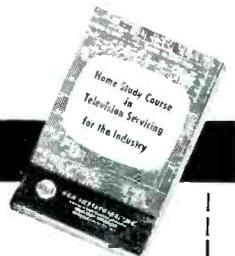
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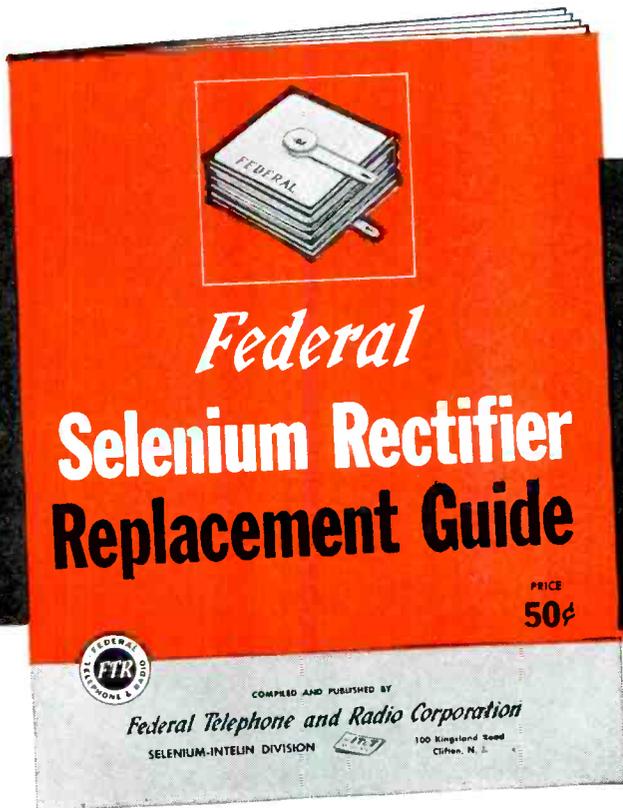
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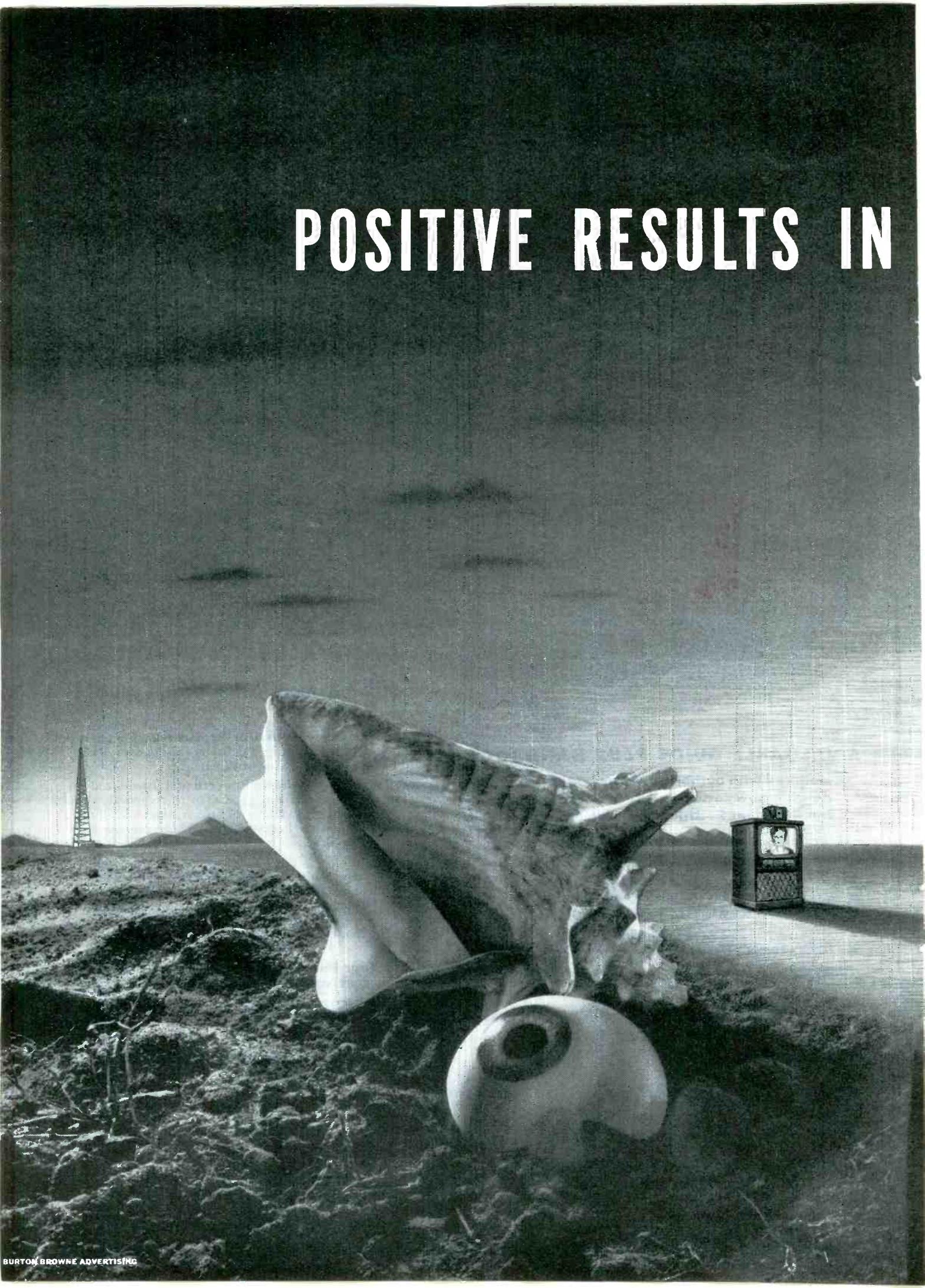
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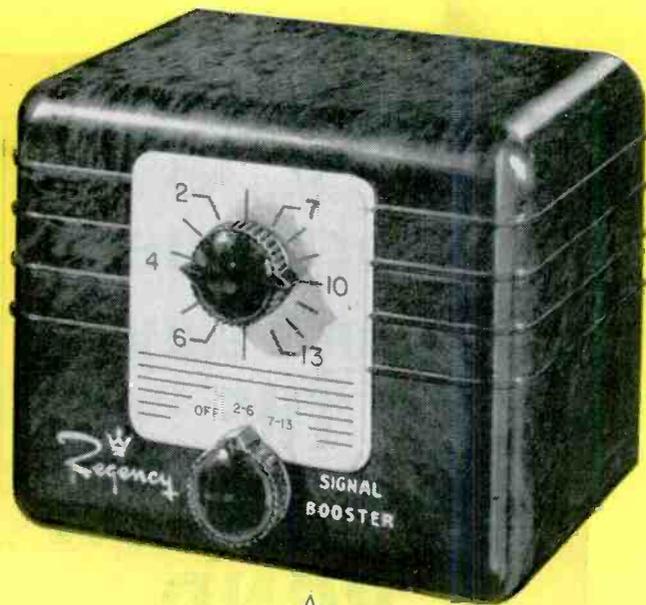
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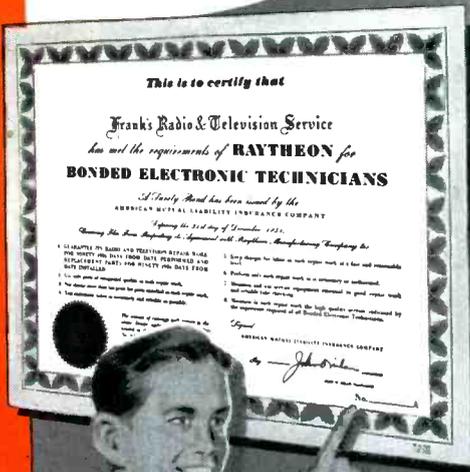

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Rooftop Checkup Time

THE GOOD 'OLE SUMMERTIME, with its pleasant calm days, perfect for installation work, has always been an ideal season, too, for *spring cleaning* for the antenna Service Man.

When broadcasting began, over a quarter of a century ago, and outdoor wires lined the rooftops of the country, the boys always looked forward to the months of July, August and September, when they could inspect the poles, 100-foot antennas, leadin insulation and stays, to be sure that fittings were solid, contacts were clean, leadins were rigidly placed, arresters were set solidly, and widow strips were not frayed, rotted or loosened. This was an annual affair for most resourceful Service Men. With the advent of the highly-sensitized broadcast models, which in most locations could work without outdoor antennas, the checkup system slowly began to disappear, and became to most just another outmoded technique.

Increased activity on the shortwave front, which brought on the doublet era, resurrected the antenna, and checkups saw a striking return. However, that interest, too, began to wane, and the rooftops again saw few soldering guns, pliers or rolls of seven-strand wire.

As the airplanes became crowded with picture signals, poles, pipes and leads once more returned, and with a zoom. Today, the roofs and windows, too, are crowded with all types of gear for video-sound pickup. And with quality pictures so dependent upon properly installed and mounted antennas, the checkup has now been found more important than ever. Unlike the simple one- or even two-wire lengths of copper which were used for AM or shortwaves, the TV and FM systems are comparatively involved, and require detailed surveys to assure continuing maximum service. Whether the setups involve dipoles or conicals, there are many points that must be looked over carefully on the roof, at the window and in the home proper, particularly to combat mother nature's habit of playing havoc with metals, plastics and insulating materials, introducing corrosion, pitted surfaces or fretted contacts which can contribute to the mechanical and electrical downfall of

an antenna system. The recent windstorm in the east, which caused the collapse of thousands of poles, elements and leadins, accented the weaknesses which could have been caught in a checkup. Even at this late date, many of the windswept calamities are still awaiting a checkup and rebuilding. With the excellent surface-protecting chemicals now available, and physical and electronic improvements in elements and basemounts, downlead insulators, roof stays and lightning arresters, a perfect set of tools for correcting antenna-installation defects and providing improved setups, too, are at hand.

The checkups, which can be made with the aid of the many illustrated checkforms produced by antenna and accessory manufacturers, can either be conducted as a special seasonal project, or as part of a call. Many of the boys have announced complete checkup programs as a special feature of the shop for the summer, with nominal rates provided for partial and complete renovations. To keep charges down, some Service Men have entered into arrangements with groups of tenants in apartment or garden-type houses, a move that has served to reduce return-call time and the need for additional roof surveys. In some instances, it has been found possible to remount the antennas on a single pole, or use one antenna for several tenants, and feed lines to distribution boxes, and then to individual apartments. The regrouping of antennas will become, it has been said, quite a factor when color television swings into widespread use. Such a move might remove the possibilities of ghost reception, which it is expected will be particularly acute on color; ghosts have already been found to be caused by reflections due to the proximity of antennas and their assortment of reflectors and directors, as well as high-element stacks.

Checkups on the rooftops and windows offer every Service Man an excellent opportunity to build sales during the summer, and even early fall, and in addition, introduce a means of strengthening community friendship by providing video services that even hurricanes will not be able to upset.

Converters, Adapters and Slaves

THE RECENT INVASION of color has reintroduced three terms which have always been confusing to the Service Man and public—converters, adapters and slave equipment. Prior to color, the converter and adapter were usually synonymous in their feature and application possibilities, providing a means of adapting a receiver to provide an additional service, or converting the circuits to provide this special service. However, with the introduction of mechanical color, the three terms have acquired separate and distinct identities. Now, in color the adapter's only function is to provide a black and white picture from a colorcast, and is essentially an accessory employed with the 405-line field sequential system. The converter is similar to the slave equipment, affording a means of providing color pictures, with a standard receiver as a basis of pickup. However, the converter is attached to the front of the receiver with the color wheel facing the tube in the black and white set, while the slave unit, a separate complete mechanism with its own picture tube can be positioned anywhere.

Service Men should become familiar with these terms to minimize the possibilities of any confusion on the exact functions of the three key accessories.

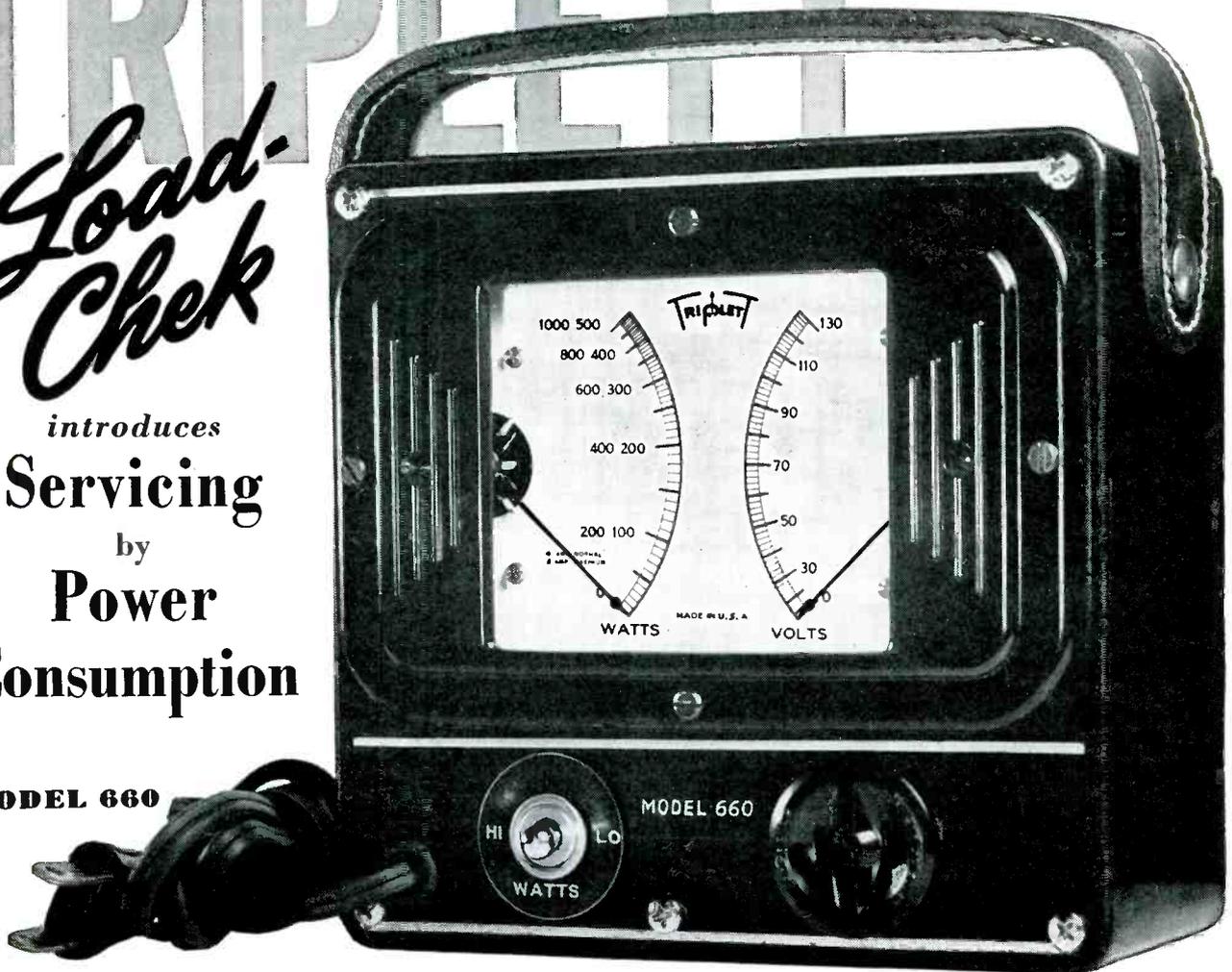
What Future Service Men Must Be

TWENTY-ODD YEARS ago, there appeared in the radio section of one of the New York dailies, a survey of the requirements the Service Men of the future will have to meet, requirements which it was hoped would be accepted as a code by all. The list of regulations pointed out that the Service Man must appear as a professional man—a skilled technician—and not as a laborer. His appearance, his manners and his speech should typify his accredited position, it was said. Too many Service Men, it was said then, entered the homes posing as blacksmiths, instead of expert well-trained technical men. Too many men, today, still have that indifferent attitude toward their dress and behavior in the home. Most have found that it pays to look neat, be neat and provide a polished service with a demeanor that can't help but merit praise in the home and shop.—L. W.

TRIPLETT

Load-Chek introduces Servicing by Power Consumption

MODEL 660



LOAD-CHEK for the first time makes it possible for every technician to utilize what is perhaps the simplest and quickest of all service methods—Servicing by Power Consumption Measurements.

Power consumption measurement has long been proved by auto-radio servicemen as a rapid method of localizing troubles in auto radios. But Triplet's new **LOAD-CHEK** is the first Wattmeter to be produced at moderate cost, and with the proper ranges, to bring this short-cut method within the reach of every radio and TV service man.

Basis of the **LOAD-CHEK** method is the tag or label on every radio and TV chassis which shows the normal power consumption. The following examples are only two of many time-saving uses of this new instrument.

LOCATING A SHORT—The chassis tag may show a normal consumption of 225 Watts. Simply plug the power cord of the chassis into **LOAD-CHEK** (there are no loose ends to connect or be in the way). Note the reading—which should be possibly 350 Watts. By removing the

rectifier tube you can determine at once which side of the tube the short is on. With a soldering iron and long-nosed pliers you can check through the chassis, locate and correct the trouble without having to lay down tools or to check with lead wires!

REPLACING BURNED OUT RESISTORS—With the chassis to be repaired plugged into a **LOAD-CHEK MODEL 660**, note the wattage reading with the burned out resistor circuit open. Now replace the resistor. Should the increase in watts be greater than that of the resistor rating being installed, it indicates that an extra load has caused the trouble which has not been cleared.

LOAD-CHEK is made-to-order for the busy service man and can help stop costly "come back" repair jobs. It's a profit-maker because it's a Time-Saver. And at its moderate cost **LOAD-CHEK** can be standard equipment on every service bench. By all means, inspect this versatile instrument at your distributor and place your order, for under present conditions we must fill all orders on a basis of "First Come, First Served."

SEE MODEL 660 **LOAD-CHEK** AT YOUR DISTRIBUTOR'S

FOR THE MAN WHO TAKES PRIDE IN HIS WORK

Triplet

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

SERVICE...The National Scene

NEW YORK BECOMES SIZZLING PROVING GROUND FOR COLOR TV--With CBS colorcasting their field-sequential pictures daily, and RCA airing compatible dot-sequential scenes on a continuing experimental basis from the Empire State-NBC transmitter, New Yorkers are being given a unique opportunity to judge the virtues of both methods, for pickup of black and white (from color), or color itself. Since the RCA approach utilizes the 525-line scanning standards, all receivers can pick up the monochrome scenes of their color transmissions, and thus everyone has been able to look on. However, CBS with their 405-line pictures, have had to be content with a very restricted audience, because there are few adapters available yet, and in addition, few receivers have been modified with scanning-change switches. . . . Whirling-disc color has been on view in department stores and in the homes of a few, as well as in some labs and shops, operated by those who have been able to locate the required wheels, shafts and motors for conversion. Electronic tricolor-tube color, placed on view for a week before a limited audience, will, it has been announced, become viewable on a regular basis during the latter part of the summer in probably a few centrally-located areas in midtown Manhattan. . . . Presently, the CBS pictures are basically 9-inch type, magnified to 12½ inches, while the tricolor-tube reproduction involves 16- and 21-inch tubes, providing wide-angle 9 by 12- and 12½ by 16-inch pictures. . . . Several manufacturers have also displayed lab-type slave units mounted on top of black and white console models for field-sequential pickup, but have offered no delivery date or price information, the general consensus being that price-delivery information will be announced when and if there appears to be a market for the attachments.

WIDESPREAD DISTRIBUTION OF COMPLETE MECHANICAL COLOR SETS CITED AS REMOTE--Announcements from many set manufacturers have indicated that there will not be too many CBS-type color sets around even during the fall or winter. According to Ben Abrams, Emerson Radio prexy, at least two years will pass before color sets will be available to the public generally. . . . James Carmine, executive vice prexy of Philco, recently pointed out that the system of the future will be an all-electronic system. . . . Thus far, only one manufacturer, CBS-Columbia, has announced any schedules for complete color sets, with about 25,000 receivers slated for early production.

PRIORITY BEING CONSIDERED FOR HOME SET REPLACEMENT PARTS--There appear to be promising prospects that a priority for replacements for home-type receivers and accessories may be issued soon. This possibility, growing out of recent meetings of industry groups and NPA, loomed as government agency heads acknowledged that radio and TV are extremely important to civilian-defense and other emergency activities, and receivers must be kept operating. The expanded MRO order, which would provide these parts, would permit Service Men to issue a priority rating to distributors for essential replacement parts.

SHOP OWNERS FIND TV CONTRACTS UNNECESSARY--Recent surveys among shop-owners and dealers have disclosed that TV servicing contracts are becoming less and less popular. Some of the service shops have reported that the policy has actually outlived its usefulness, and that the standard C.O.D. service procedure, after the 90-day warranty period, is the only practical practice to follow. . . . In a blistering attack on contracts, TISA and NATESA prexy, Frank Moch, declared recently in Chicago that the one-year contract has saddled the service contractor. . . ."with the mistakes of the manufacturer, the vagaries of telecasters and the whims of the the public."

SERVICE... The National Scene

SETMAKERS SERVICE PRACTICES CHIDED BY DEALER ASSOCIATION--Receiver manufacturers received quite a scolding recently from a dealer association in Washington for inadequate provisions for proper servicing. Speaking before a trade-practice conference, conducted by the Federal Trade Commission, Edwin A. Dempsey, executive director of the National TV Dealers Association, declared that there were many defects in the servicing programs of many manufacturers. He pointed out that there should be a rule making it mandatory for manufacturers to furnish service shops and distributors with an adequate supply of replacement parts at all times. In his opinion, the manufacturers could also help the service problem tremendously by designing the sets with future service in mind. Often, he said, it is necessary to do considerable work to remove a small part that could be located in a place more readily available to the Service Man. Another annoyance cited was the streamlined front panel, wherein many important control knobs such as the centering control have been removed. Its present inaccessibility in many chassis has been found to be, it was said, an inconvenience to the set owner as well as to the Service Man, who must go inside the set to bring a picture back to center.

TWO-WAY RADIO SYSTEM SPEEDS UP SERVICE IN NEW JERSEY--Two-way shop-to-car contact has been found to be a boon to servicing by one shop in Bloomfield, N. J., accelerating installation and service calls. Cars have been equipped with mobile phone systems, operating in the 153-mc range, and with an output of about 50 watts. In operation, a router at the shop dials a control office and gives a message to a commercial operator at a fixed transmitter site. The commercial op then begins to page the Service Man by means of voice transmission. If the Service Man is in the car at the time of the call, he can reply. If not, upon entry into the car, he calls the base station and is told whether or not he is wanted and what he may be required to do. According to the operators, the system has provided for the handling of 40,000 service calls a year.

FCC WITNESS MASS INDUSTRY DEMONSTRATION OF UHF GEAR--In a unique RTMA-sponsored meeting at Bridgeport, Conn., before members of the FCC, component and receiver producers recently demonstrated a host of converters and tuners which can be used for ultrahigh reception. Among those on the demonstration line were Capehart-Farnsworth, exhibiting a turret tuner into which uhf channel strips could be installed; Crosley, with an external tuner providing continuous ultrahigh coverage; G.E., with an ultrahigh translator; Hallicrafters, featuring a converter utilizing a tuned low-noise germanium crystal mixer; and Philco, RCA, and Stromberg-Carlson, with external converters. . . . In a commentary on the demonstrations, RTMA prexy Glen McDaniel, noted that while the exhibit conclusively proved that manufacturers had solved the ultrahigh-reception problem. . . "any extensive development of uhf telecasting will take considerable time to achieve even after the FCC opens the channels for commercial operation, and it may be a long, long time before uhf stations are erected in cities now well served by very high outlets."

LICENSING NOW UNDER CONSIDERATION ON PACIFIC COAST--Proposals to license Los Angeles Service Men, conducting radio and television shops, were recently submitted to the city council. The suggested ordinance was criticized by members of the trade, particularly the local association, who pointed out that licensing would not solve the problem of malpractices. According to the association, the policing program in force has curbed the bulk of misrepresentation, and a continuance of this strong program will eventually eliminate all unfair installation and service practices.

IN THE MAILBAG--In a letter to ye editor, John Kulakowski of Wickford, R. I., has reported that he has found. . . . "Service magazine to be the best radio and TV magazine in the country." Many thanks for this warm praise.--L.W.

Snyder
PHILADELPHIA

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TV AERIAL SYSTEM

360° ELECTRONICALLY SWITCHED BEAM

**SUPERSTRUCTURE
INSULATOR ASSEMBLY**

- 3 combinations of elements for perfect picture clarity on each channel
- Full 360° electronic orientation



**DIRECTRONIC
BEAM SELECTOR**

- Gives remote control of element combinations
- Mounts on or near set

*T.M. APPLIED FOR

<p>NO MOTORS OR MOVING PARTS</p>	<p>NO ROOF ORIENTATION</p>	<p>NO ELECTRIC POWER</p>	<p>NO GHOSTS</p>
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**P. S. ONLY ONE
LINE TO INSTALL**

COLOR TELEVISION

by PHILIP SELVACCI

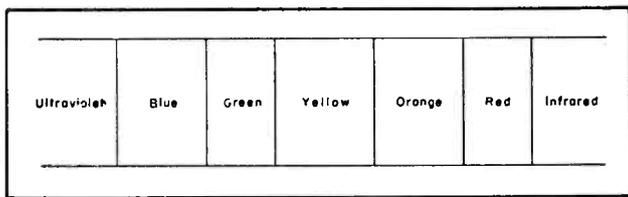
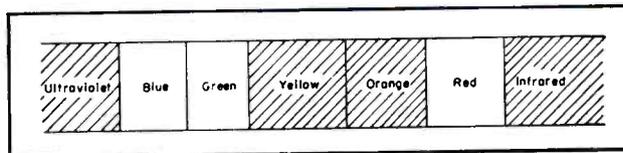


Fig. 1. Color spectrum, with basic color divisions.



Left and above: Color analysis charts.

Fig. 2. Choice of three primary colors used in color TV.

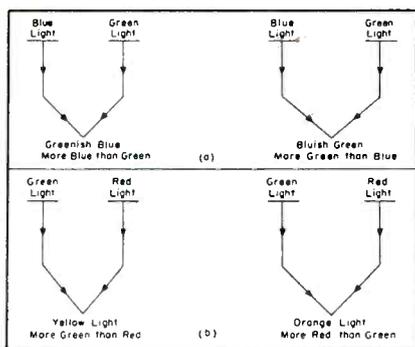
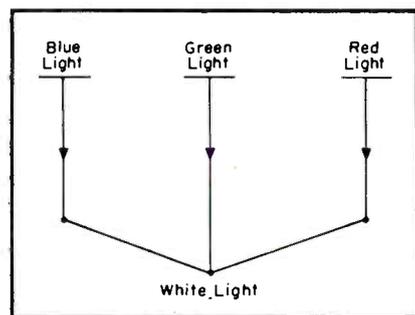


Fig. 3. How colors between primary colors can be created by mixing the right proportions of base colors.

Fig. 4. How white light can be formed through a proper mixture of the three primary colors.



WITH THE RECENT ANNOUNCEMENT by the Supreme Court that they could find no fault with the FCC decision to approve mechanical-color television, an interesting new cycle in TV appeared on the horizon, a cycle which will eventually be of significant concern to every Service Man.

The advent of the new art has already posed a variety of problems, which, at present involve electronic-mechanical controls. And as all-electronic color equipment comes on the scene, and it appears as if such an eventuality is not too remote, there will be rounds of other specialized problems to consider.

To service a color receiver, it will be necessary to be familiar with not only circuitry, but with color reproduction techniques, a knowledge which will facilitate adjustment of controls and internal receiver repairs, too.

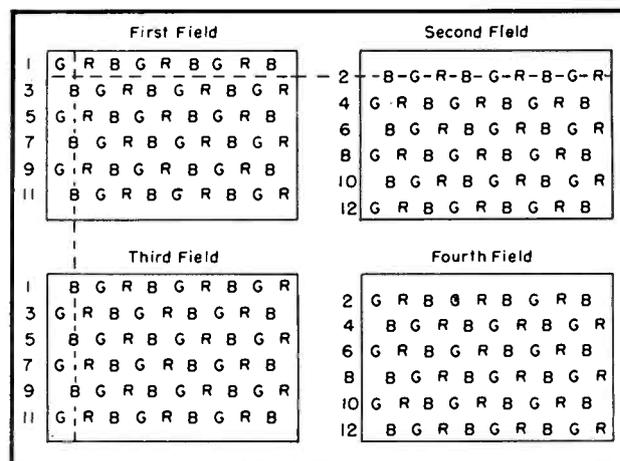
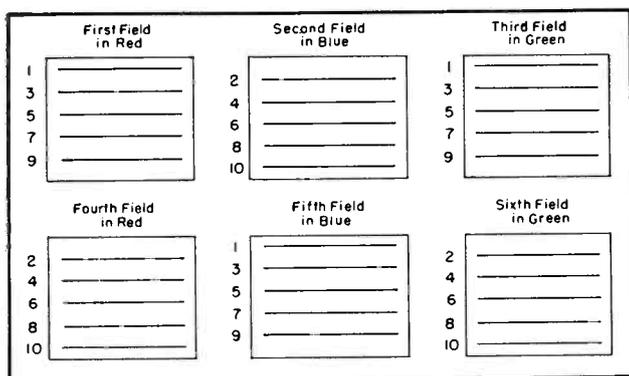
Color Reproduction

Everyone knows that the number of color hues are almost limitless. Anyone who has viewed a rainbow, has seen color variations from the ultraviolet through the yellowish green

region and finally into the red and infrared region. Basically, there are seven colors in the spectrum; Fig. 1. The regions illustrated represent many different colors and hues, all of which are needed to describe adequately a color scene. If a color system had to transmit all the colors and hues the technical problems of transmission would be almost insurmountable. Fortunately, however, different colors can be represented to the eye in a relatively simple way. Hundreds of color shades may be represented by combining the proper proportions of three primary colors. If a color is selected from each end of the spectrum and one color from the middle of the spectrum, it is found that almost any other color can be satisfactorily represented to the human eye by mixing proper amounts of the three selected colors. Figs. 2 and 3 show the choice of three primary colors: blue, green and red. In *a* (Fig. 3) we see how different shades of blue and green can be obtained by mixing proportions of blue and green. The *b* illustration shows how yellow and orange can be formed by mixing the right proportions of green and

Fig. 6. The CBS field-sequential system, which employs a 144 fields per second, 405 lines per picture and 24 color frames per second, in contrast to RCA's 60 fields per second, 15 color pictures per second and 525 lines per picture.

Fig. 5. Color sequence in the RCA system, letters representing sequence of color dots.



A Report on the Status of Color TV: Compatible and Incompatible Systems; Their Receiving and Transmission Characteristics . . . Receiver Modifications Necessary and the Circuits Utilized in Adapters, Converters, Slave Units and Complete Receivers Designed for Black and White Reproduction from Color Transmission, As Well As Complete Color Pickup.

red. How the color white may be represented, as a mixture of real green and blue, is depicted in Fig. 4.

Since most colors can be created by the combination of the three primary colors, the problem of transmitting color is greatly simplified. Most color systems concern themselves with the proportions of the three primary colors present in a color scene. The proportions of the blues, greens and reds, in a scene, are transmitted and recombined in the receiver in the proper proportions to give the original scene. This principle is basic to all the systems proposed. The difference in the systems lies in the color-scanning sequence and the length of time each color is presented before switching to another color.

Compatibility and Incompatibility

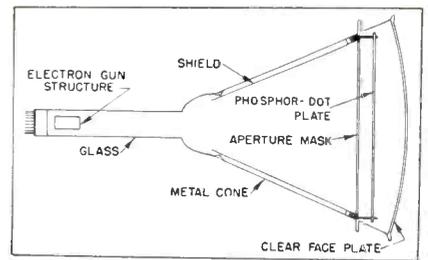
The different color schemes offered require that several modifications be made in present black and white receivers to provide color pickup. Some systems employ different scanning rates and the receiver's vertical and horizontal sweep frequencies have to be altered so that the picture may be seen. (A system which does not require internal changes in connection with the scanning frequencies is said to be compatible.) Thus far, two compatible and one incompatible system, have been announced; RCA and CTI offering the former, and CBS the latter. The compatible systems use vertical and horizontal scanning frequencies, the same as those in the present black and white receivers. Color transmissions in either of the foregoing systems appear in black and white on the screen of a black-and-white receiver. The CBS system, on the other hand, employs different vertical and horizontal scanning rates. In standard black-and-white receivers, the picture is divided vertically into 525 lines, with the odd lines transmitted in

one field and the even lines in the next field. In this case the transmitter transmits the variations of light intensity, which merely gives variations in a shade ranging from black to white. In a color scheme a transmitter has to transmit more information than just the variation of light intensity in a scene.

The CTI System

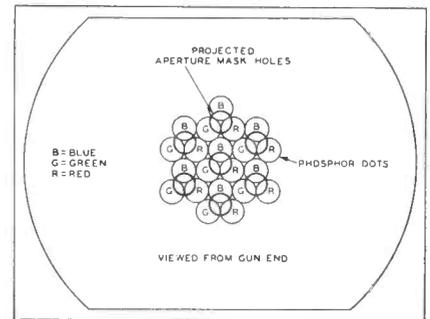
In the system proposed by Color Television Inc., the picture is divided into 525 lines in the vertical direction. Vertical interlace is used, the odd lines being transmitted in the first field, while the even lines are transmitted in the second field. When the field containing the odd lines is transmitted, the first line sent out conveys information about the proportion of red contained in the color of the first line. The third line transmits the green content of the third line, and the fifth line gives the blue content of the fifth line. The seventh, ninth and the eleventh lines repeat this process of the first, third and fifth lines, etc. When the field representing the even lines is transmitted, the second line provides green information, the fourth line offers blue information and the sixth line gives red information. In six fields, each line has been scanned for the red, green, and blue color content. In this system 60 fields a second are transmitted, just as in the black and white method. However, in the latter, two fields make a complete picture, so that 60 fields a second produce 30 complete pictures a second. In the CTI system six fields make a complete color picture and therefore only ten complete color pictures per second are obtained. The receiver for this system would require three picture tubes one for each color, with an approximate filter and converging lens for each. It has been said that the re-

(Continued on page 49)



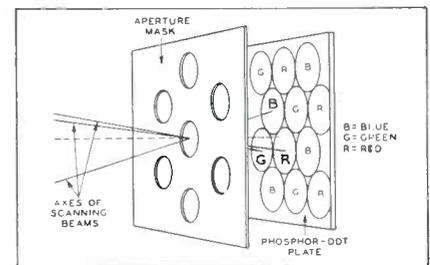
Above

Cross-sectional diagrams of tricolor picture tube, showing basic parts and their relative positions.



Above

Operation of mask holes with phosphor color dots.

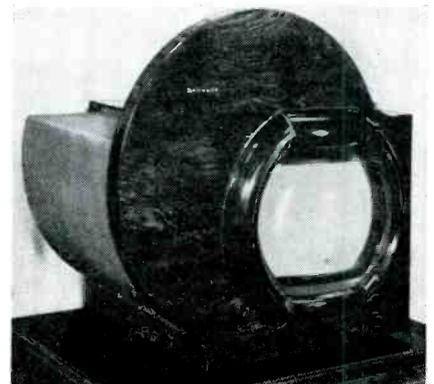


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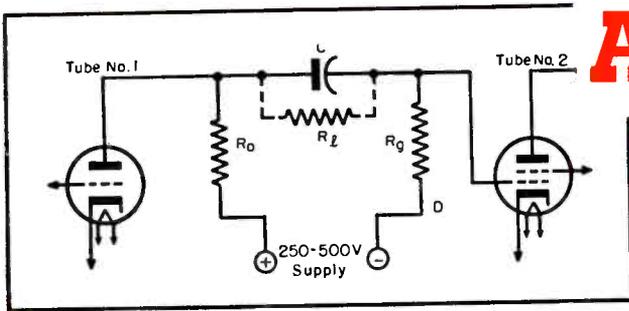
Diagram illustrating principle of operation of tricolor picture tube.

Below

A field-sequential color slave unit, which uses a wheel, 22½" in diameter, made of laminated plastic in the three primary colors: red, blue, and green. The wheel revolves at approximately 1440 revolutions a minute. (Courtesy Crosley)



ACCELERATED

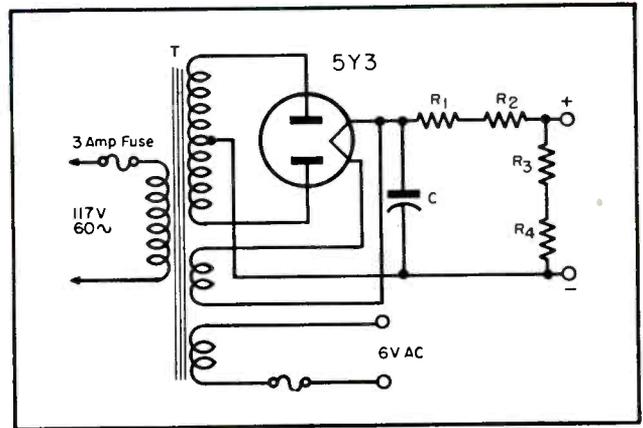


(Right)

Fig. 1. Auxiliary B power supply designed to facilitate troubleshooting.

(Above)

Fig. 2. Typical coupling circuit which illustrates points where leakage tests can be made. Usually the auxiliary power supply is connected across one of the set's filter capacitors. The speaker field-coil connections can be shorted if necessary to close the test circuit.



A MAJOR FACTOR affecting net earnings in radio and TV servicing is the speed realized in finding trouble and making corrections. Whatever job charges may be made, it is obvious that a time-saving test setup can effect a material increase in the service pay rate. The Service Man can fairly bill his customer at a normal charge for a particular job, even though he may have cut the time expended considerably below usual for the work.

Practical service work can be divided into definite type groupings. There is the outside service assignment covering simple tube replacements and checking of antenna and installation conditions. Then, there are the major shop repairs involving finding and replacing or correcting defective circuit components in apparatus. It is true that many tube replacements may be made in the shop, particularly on small table model radios brought in, but often tube testing is incidental to sales, rather than repairs. Finally, there is the tuning or alignment work on chassis which often requires special skill and precision test equipment.

Simplicity, speed, and the utmost in practical convenience are features that really pay off in time saving. Test units and accessories must be tailored or specifically designed to cover most needed tests satisfactorily or serve to help in rapidly carrying out some commonly needed test operation. It is imperative, for fast work, to select tests and test operations which are workable without the need for making laborious circuit disconnections on apparatus under test.

It has been found that usual electronic apparatus failures, exclusive of tube troubles, differ in type and require at least three substantially different test units for checking. The primary failure testing is for shorts and opens by means of an ohmmeter which in

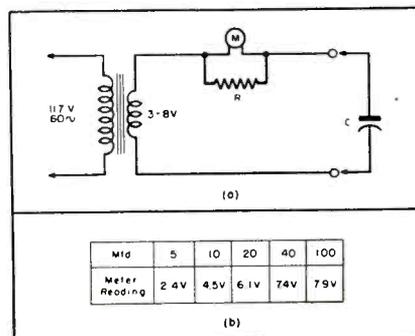
simplified and not closely calibrated form may be called a circuit-continuity and short checker. Since electrolytic capacitors commonly fail in service, quick tests serving to indicate the condition of such capacitors are very useful. Paper capacitors employed in audio, video, bypass and other circuits give much trouble, and it is importantly helpful to provide fast working tests for leakage and capacity. Impedance and inductance tests can also be extremely helpful in locating coil troubles.

Certain test instruments, accessories and gadgets, used singly or in combination, have been found invaluable in this work of quickly finding usual failures. These test units are mainly simple, designed for ruggedness and ability to withstand accidental misuse.

Simplified Ohmmeter Usefulness

A simplified circuit continuity and short checker or simplified ohmmeter has been found to be excellent for locating circuit opens or shorts. In one unit, built in the shop, was installed a 5-mu meter, 1,000-ohm resistor, 4½-volt C battery, terminals and test leads. It has been found necessary to replace

Fig. 3. An impedance meter setup for capacitance testing, where the meter is an ac type with a range of from three to eight volts. Below appear typical readings obtained with the test circuit, an eight-volt meter being used in this instance.



the battery only at intervals of 1½ to 2 years, when its voltage has dropped about 10 per cent. This unit has always been found ready for immediate use and has had no failures other than occasional breakage in the much used test leads.

Where it is always ready, the simplified ohmmeter can be used on nearly all apparatus serviced. Effective resistance across the B power supply of a receiver should always be checked to save damage to rectifier tubes and find major breakdowns or opens quickly. Most transformer-operated receivers show a B resistance value of around 10,000 ohms or more, while ac-dc and universal ac-dc-battery portables will show a B resistance value as low as about 2,000 ohms. Common tube blow-outs in ac-dc sets can be located quickly by checking across tube filament pins with the ohmmeter. In all of this simple fast testing there is no need for calibration accuracy as long as circuit resistance values can be noted as falling in a suitable high or low range. Meter scale readings for resistance values can be readily noted and remembered after checking a few resistors of known values, and a re-check or comparison is possible at any time.

Auxiliary Power Supply

An auxiliary B power supply (Fig. 1) has proven very helpful in practical repair testing, particularly on the larger radio and TV chassis, where it is often awkward to do repair work while speakers, picture tubes or other units are connected. Wherever the B power circuit of a chassis is energized without the tubes being lighted, rapid voltmeter tests across tube screen and plate circuit terminals can be readily made to see if voltage is getting through to all essential points. Also,

TESTING Techniques

by PHILIP H. GREELEY

Practical Time-Saving Test Setups, Which Have Been Found to Expedite Troubleshooting in Broadcast, Auto and TV Chassis, Serving to Locate Quickly Defective Electrolytics and Other Components.

coupling capacitors in audio and video circuits can be checked for leakage without making circuit disconnections. In Fig. 2 appears a typical coupling circuit, where such tests can be made. The plate of tube 1 is coupled to the grid of tube 2 by coupling capacitor C , which should have a very-high leakage resistance, R_1 . Now, it will be noted that plate resistor R_p , R_1 and grid resistor R_g together, form a voltage-divider circuit, when voltage is applied at the supply terminals as across one of the electrolytic filters. If an appreciable voltage can be read with a *vtm* across the grid resistor R_g , capacitor C must be replaced. Good coupling capacitors should have a leakage resistance above 200 megohms, and voltage readable on this test should not exceed $\frac{1}{4}$ volt.

Originally, this auxiliary power supply was developed for operating auto radios, and thus has both the B supply and an A supply of 6 volts ac at about 8 amperes. By removing the vibrator and rectifier from an auto set and coupling on a separate *pm* speaker, it has been found possible to provide satisfactory operating power from this supply. Other more or less incomplete apparatus using 6-volt heater tubes can also be operated by this unit.

The power transformer, T , in this supply can be any substantial type having a secondary providing 350 to 400 volts on each side of center at about 120 *ma* or more, a rectifier filament winding, and a 6-volt winding at 6 amperes or more. An interesting feature in the circuit is the use of current limiting resistors R_1 and R_2 which are each of 2,000 ohms and 20-watt rating. These resistors afford the protection required in a test power supply that may at times be connected to apparatus having a short-circuit breakdown. Even on a short, current is limited to 120 *ma* or less, which is within the rating of a 5Y3 rectifier. Capacitor C can have any value from 2 to 10 mfd, but should have at least a 600-volt working rating. Bleeder resistors R_3 and R_4 are each 50,000 ohms, with 2-watt ratings. Connecting wires for 6 volts ac should be heavy wires, such as low tension auto wire, and may be provided with medium size battery clamps for auto radio connections.

Adequate voltage is often useful in checking electrolytics, new and used, of the 450- and 475-volt rating. With a good voltmeter, having a sensitivity of 1,000 ohms-per-volt or better, connected across the auxiliary power supply output, proper polarity connection

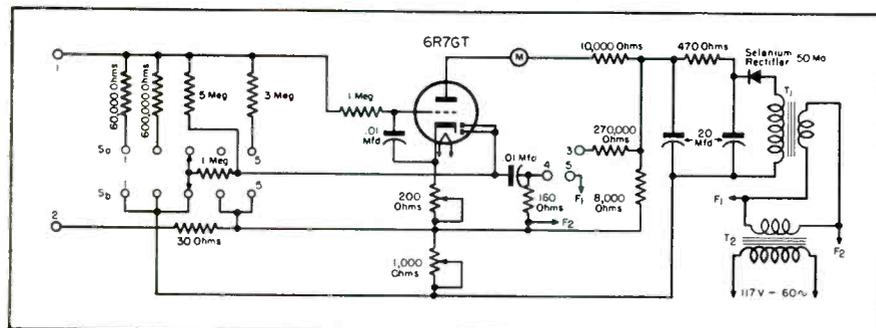
to an electrolytic for test can be made. The voltage reading will drop initially, but should come up not too slowly to within about 25 volts of maximum if the electrolytic is in good condition. The best way to become familiar with and understand the action of this valuable test is to try it out on a few good, new electrolytics of representative types and capacity values. By comparison, capacitors having excessive leakage with an abnormal or long continued voltage drop in meter reading should be rejected. For example, let us suppose the power supply voltage reading is 480. If this reading drops and comes back to about 460 in a few seconds after connection is made to an electrolytic, the capacitor can be considered good, whereas connection to an inferior capacitor will give a very sluggish voltage rise that may not get above 400.

It should be understood that the test voltage should not exceed the rating of a capacitor, which for common electrolytics is 450 working and 525 peak volts. For these the test voltage can be from 425 to 500 volts. As a practical matter, the Service Man should check most carefully the input capacitor section nearest the rectifier tube, where the power transformer high voltage secondary exceeds 350 volts on each side of center; it is here that a high leakage or slow forming capacitor can be damaging to rectifier tubes or to a power transformer. Checking of new electrolytics purchased for replacement is well worth while, to avoid breakdowns and call backs.

A simple impedance type meter has been found to be fast and useful for checking approximately the value of electrolytics in filter and cathode bias circuits. A meter with a low internal resistance or impedance of about 160 ohms has been found to be very desirable permitting the reading of capaci-

(Continued on page 50)

Fig. 4. Circuit of a *vtm* designed for leakage testing. The selenium rectifier, SR , is a 50-ma type. The filament transformers, T_1 and T_2 are 6-v 1-ampere transformers. The .01-mfd capacitors can be micas or ceramics. S_1 and S_2 represent a 2-pole, 5-position wafer switch. R_1 and R_2 (200 and 1000 ohms) are variable wire-wound pots.



AUDIO *installation and service*

Phono-Tape-Wire-PA-Amplifiers-Speakers

by **KENNETH STEWART**

Push-Pull Circuitry Which Eliminates Need for Output Transformers... Attaching Phono Pickups to TV Chassis... Audio Definitions

AUDIO AMPLIFIER DESIGN, which has always been a challenging subject, has prompted many unusual studies. Recently, there was undertaken a probe to consider the possibilities of utilizing the higher efficiency of class *AB* operation without having the serious switching transients that usually occur at high frequencies. The search led to the development of a circuit that could be also used for class *A* operation of push-pull triodes or beam-power tubes, and in addition simplified the application of feedback from the output stage to preceding single-ended stages and provided for the elimination of the coupling transformer.

Discussing this striking development during the annual meeting of the IRE professional group on audio, Arnold Petersen and Donald Sinclair of General Radio said that to avoid the use of a driving transformer, it was necessary to devise a phase-inverter stage that would supply the voltages in the correct phase and at the proper electrodes. The circuit evolved was described as having a driver stage that receives its plate-supply voltage from the midpoint of two series-connected output stages. Equal resistors, used in the plate and the cathode, were said to have equal voltages developed across them, with changes in plate current, produced by signals on the grid.

Specifically, it was noted, the voltage in the cathode circuit is developed between the cathode and grid of the lower tube. An equal and oppositely-phased voltage is developed between the cathode and grid of the upper tube. The upper grid must not be driven with respect to ground. If it were, the upper tube would act as a cathode follower, and the balance of the two tubes would be destroyed.

Direct-coupling was described as frequently desirable even though it

is not essential except for a *dc* amplifier. The *dc* voltage drop across the resistor in the driver plate develops a negative bias for the upper output tube. The voltage drop in the lower resistor is in the wrong direction for supplying negative bias. In the circuit developed it was shown that the proper bias was obtained by the voltage drop in the cathode resistor of the lower output tube which supplies a voltage equal to twice the bias required for a single tube.

The amplifier circuit was said to require no transformers at the output or between stages for class *A* and *AB*₁ operation of push-pull triodes. By using some of the newer low-impedance tubes, it was found possible to make the optimum output load resistance quite low, because the tubes drive the load in parallel. Noting, as an ex-

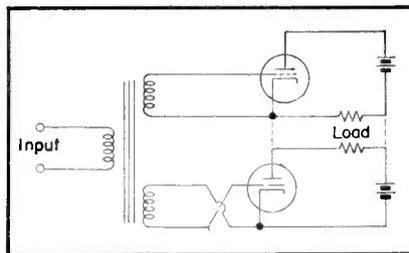


Fig. 1. Triode push-pull amplifier stages. Circuit below represents a simple amplifier supplying a resistance load in the plate circuit. The upper one is similar except that the load and the *dc* plate supply have been interchanged. This amplifier is not a cathode follower since the *ac* grid voltage is applied between the grid and the cathode. If the two tubes are identical in characteristics and the plate-supply voltages and the loads are the same, the *dc* plate current in the two loads will be identical. Then, if the connections shown by the dotted lines are made, the two currents will cancel because they are in opposite directions. When equal *ac* signals are applied to the two circuits, the *ac* components in the loads are equal. These two components would also cancel when the connections are made, if the grid-driving voltages were in phase. But with oppositely-phased voltages on the grids the *ac* plate currents add in the load. Thus, the tubes are in series for the *dc*-plate supply and in parallel for the *ac* signals. The first circuit has a disadvantage; it requires a driving transformer and is difficult to maintain in proper balance at high frequencies.

treme example, it was said that the use of the two halves of a single type, 6AS7G, would lead to an optimum load impedance of about 280 ohms. Pointing out that while this value is still far from the usual 8- or 16-ohm impedance of a loudspeaker voice coil, the audio specialists said that something can be done to raise the voice-coil impedances so that the voice coil can be driven directly without a matching transformer; the voice-coil impedance can be increased without affecting the loudspeaker efficiency. As a practical matter, it was noted, the limit is determined by the smallest aluminum or copper wire that can be handled in a production setup; it is probable that the voice-coil impedance of large loudspeakers can be raised to the level required. In addition, it was indicated, it is entirely possible that a suitable ring-armature drive for small cone speakers can be developed.

There were two characteristics of the new circuit that were said to limit its range of operation. One was the inherent negative feedback, and the other the effect of capacitance from the plate of the driver stage to ground. Since the plate voltage of the driver tube is taken from the output, the output voltage is fed back to this stage. This feedback is negative, and it can be considered useful for reducing distortion. However, when it is desired to avoid the associated loss in gain, the feedback can be minimized by using a pentode driver.

It was pointed out that the impedance level at the plate of the driver stage is in effect multiplied up by the gain of the output stage; that is, the frequency characteristic of the drive for the upper tube is determined by the *rc* combination of the total capacitance from the plate to ground, and the

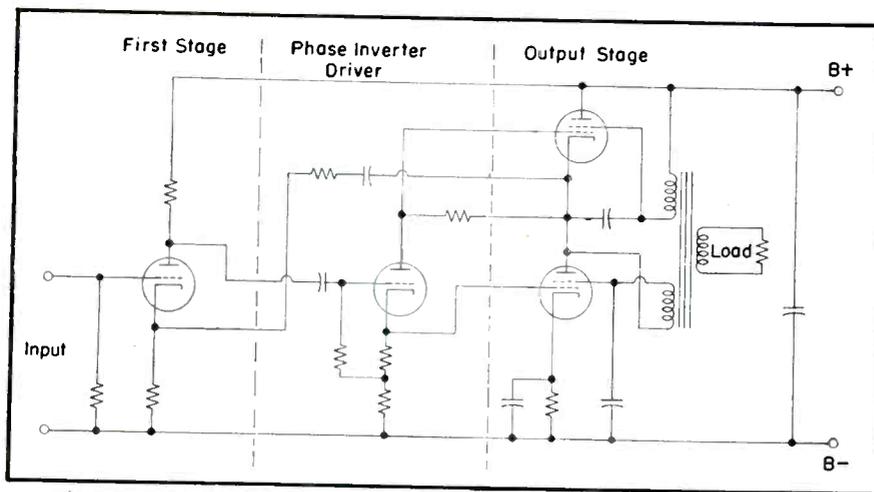


plate resistor multiplied in value by one more than the gain of the output stage. For the *af* range the resulting drop in output can be kept very small. However, if an attempt is made to use an amplifier of this type over the video range, this effect will be serious.

Detailing minor variations that can be made in this basic circuit depending on the application, the audiomen said that the load noted as connected in a balanced fashion to the output stages to make it easier to see the principle of operation, actually, is usually more useful with one end of the load grounded to *B-* and the other end fed from the midpoint through a series-blocking capacitor. In another variation *rc* coupling can be used from the driver to the output tubes instead of direct coupling.

It was pointed out that there was one objection that might be raised to this circuit; a required plate voltage for the output stage that was twice normal. This actually has been overcome by the development of high-voltage selenium rectifiers with voltage-doubler circuits. The development of the low-impedance or high-perveance tubes for television use has also overcome the objection. Their use in this circuit permits the production of relatively high powers with moderate total plate voltage.

Beam-power tubes can also be used in this system. The main problem in using beam tubes revolves about the method of supplying the proper voltage for the screen of the upper tube. The *dc* voltage of the screen is normally near that of the plate, and the screen must be at cathode potential for the signal voltage. If the screen of the upper tube is supplied through a dropping resistor from the plate supply, then the bypass in parallel with the load and some signal power is lost. In some cases, it was said, this loss in power can be made small. In other applications the volt-

Fig. 3. Circuit which illustrates one method of applying negative feedback. Since the output is single ended, the feedback can be made directly from the midpoint of the output stage to a preceding single-ended stage. In this three-stage amplifier, the feedback is applied to the cathode of the first stage. Because of the direct coupling of the phase-inverter driver there is little danger of frequency motorboating with feedback. In addition, since the feedback does not have to be taken from the secondary of the output transformer, there is less danger than usual of high-frequency oscillation.

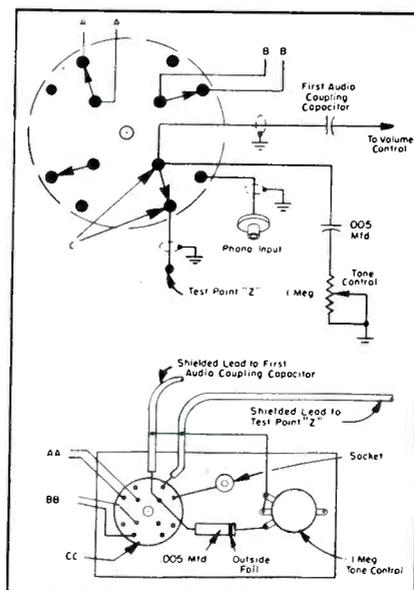
age for the upper screen can be fed through the load, so that no signal power is lost. This feed might be through the primary of a matching transformer.

Attaching Phono Pickup to Straight TV Chassis

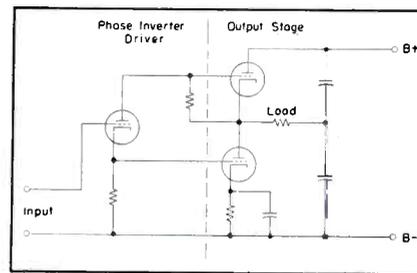
It is possible to include a phono pickup system in Admiral chassis by making the alterations suggested in Fig. 4. It is first necessary to disconnect the low-impedance ratio-detector circuit from the first audio tube. When the first audio tube operates with a high-impedance grid circuit it responds to noise from the vertical sweep circuit; thus it is necessary to stop the vertical oscillator.

To prevent a bright horizontal line remaining on the picture tube it is

Fig. 4. Modifications in Admiral TV chassis which permit inclusion of phono pickup.



(Below)
Fig. 2. Phase-inverter circuit which does not require a driving transformer.



necessary to break the lead to the picture tube's first anode.

In the circuit illustrated, a fourth contact has been included on the switch. This may be used to switch an additional circuit, such as *ac* to the phono motor if desired. A tone control is shown connected to the grid of the first audio tube. This control operates with the switch in either phono or TV position. The switch and tone control should be mounted on a metal or plastic box and placed at the rear of the television receiver in an accessible position.

Audio Definitions

With the rapid growth of the audio art has come many, many new terms, the definitions of which have varied from expert to expert. In an effort to eliminate this variance in interpretation, professional societies have instituted probes which might provide a set of standardized definitions. As a result of one of these studies by the IRE*, a new set of standards have been evolved.

Terms which have been defined include *ac* erasing head, *ac* magnetic biasing, acoustic impedance, acoustical units, articulation, available power, baffle, bidirectional microphone, class *A* push-pull sound track, class *B* push-pull sound track, conical horn, constant-velocity recording, cutter, *dc* magnetic biasing, direct radiator loudspeaker, directivity factor, doppler effect, exponential horn, equalization, gradient microphone, groove angle, lateral groove, loudness, magnetic powder-coated tape, magnetic tape, magnetic wire, multicellular horn, over-

*Standards on electroacoustics (51 IRE 6, SI), published by the Institute of Radio Engineers, 1 E. 79 Street, N. Y. 21, N. Y.

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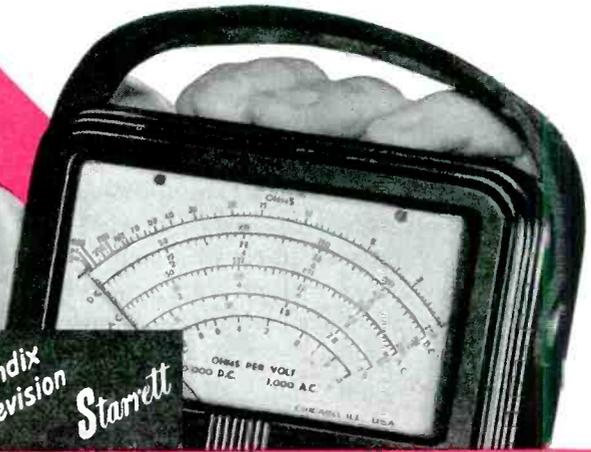
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*Switch Type

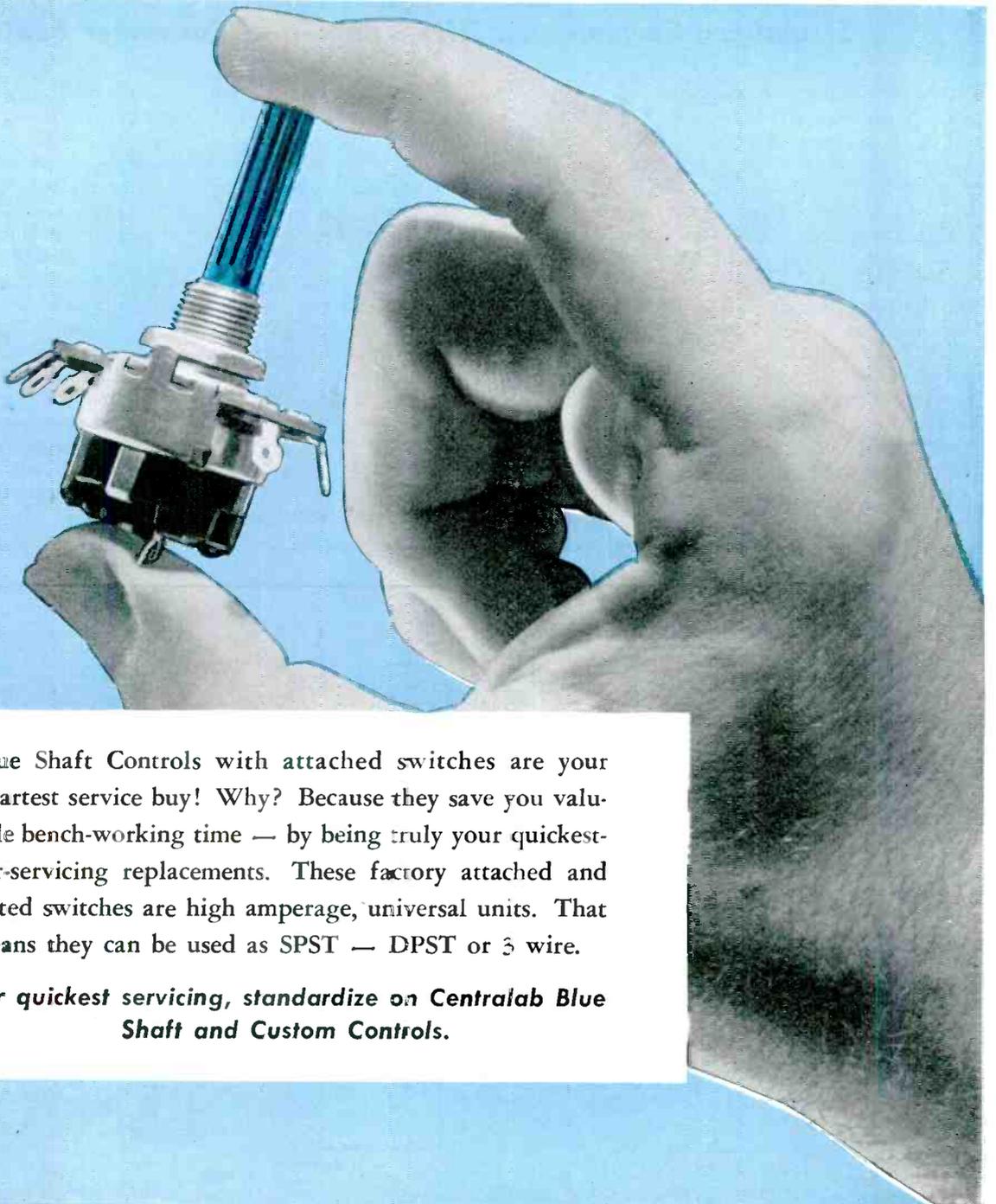
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by M. W. PERCY

Highlights of 30-inch* and 24-inch TV Chassis, Produced by DuMont and Stromberg-Carlson . . . UHF Tuner and Converter Features

WITH THE ADVENT of larger picture tubes chassis designers found that they had to revise many of their circuitry concepts. In the development, for instance, of the 30-inch DuMont receiver, it was necessary to probe not only in deflection yokes, but also in sweep supplies, with the horizontal deflection system looming as a major difficulty. To solve these problems, many innovations in design have had to be provided. In the development work associated with the high voltage power supply it was found necessary to embody voltage regulation, because it was felt that the peak beam current which reaches 600 microamperes would impose such a burden upon the power

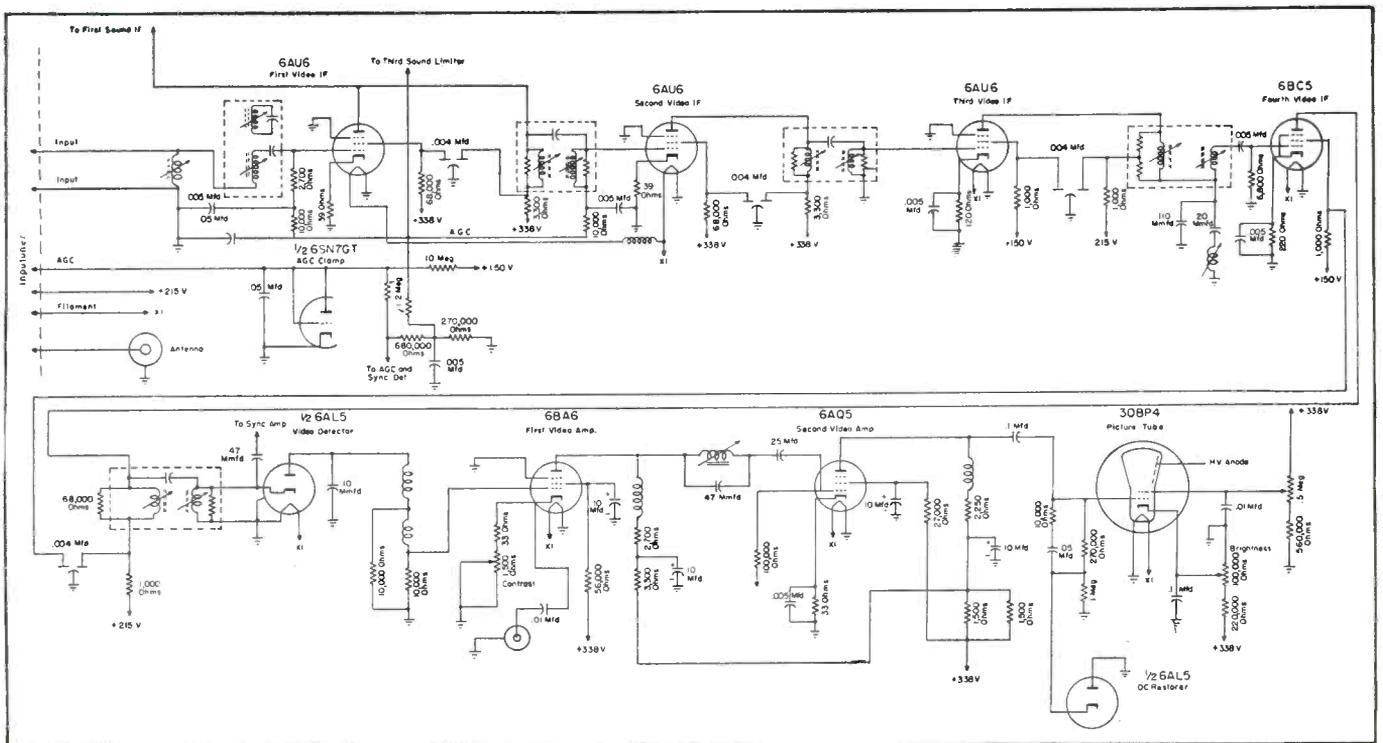
supply that defocusing of the beam might result, due to variations in the output voltage of the supply.

The deflection amplifiers also had to be altered; the flyback-high voltage supply was omitted, the horizontal sweep amplifier acting as an amplifier only. For horizontal size control, there was included a variable resistor in series with the screens of the 6BG6s, not of the inductor type normally encountered in this chassis. A beam power tube was substituted

for the vertical sweep amplifier tube, normally a triode. It was found necessary to provide two vertical linearity controls, one of which could adjust the bias on the tube, while the other controls the screen voltage. The use of these two adjustments was found to provide good vertical linearity over a very wide range of size control setting. To obtain the addition deflection angle for the 30" tube, additional deflection power was, of course, required from both the vertical and the horizontal deflection amplifiers. An especially designed yoke was necessary to deflect this wide angle without neck cutoff. In use, this yoke was found to eliminate the pin-cushion distortion effect

**From an analysis prepared by Ricardo Muniz, general manager, TV receiver manufacturing division, Allen B. DuMont Labs, Inc., and M. Gruenspecht of the DuMont receiver division.*

Fig. 1. The video *if*, video detector, video amplifier and picture-tube circuit of the DuMont 30-inch chassis.



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normally encountered in wide angle deflection yokes, and in addition provide good focus across the whole width of the picture tube. A specially-designed horizontal amplifier output transformer which, of course, does not incorporate a flyback winding, was included to drive the horizontal deflection coil of the deflection yoke. It was found that due to the high peak currents required to provide the necessary deflection power, the transformer became saturated. Accordingly, the vertical deflection amplifier output transformer was modified through the introduction of a 5-mil copper shim type of air gap. (This gap occurs at two places in the coil providing a total gap of 10 mils.) Copper was used because some non-magnetic material was required; yet it was found that most insulating materials would compress and not hold the gap accurately. Accuracy of the gap was important because, if too small, there would be encountered the saturation condition in the core which produces packing on the bottom of the picture. On the other hand, if the air gap were made too large, the picture would stretch at the top, in all probability due to an impedance mismatch between the output transformer and the vertical wind-

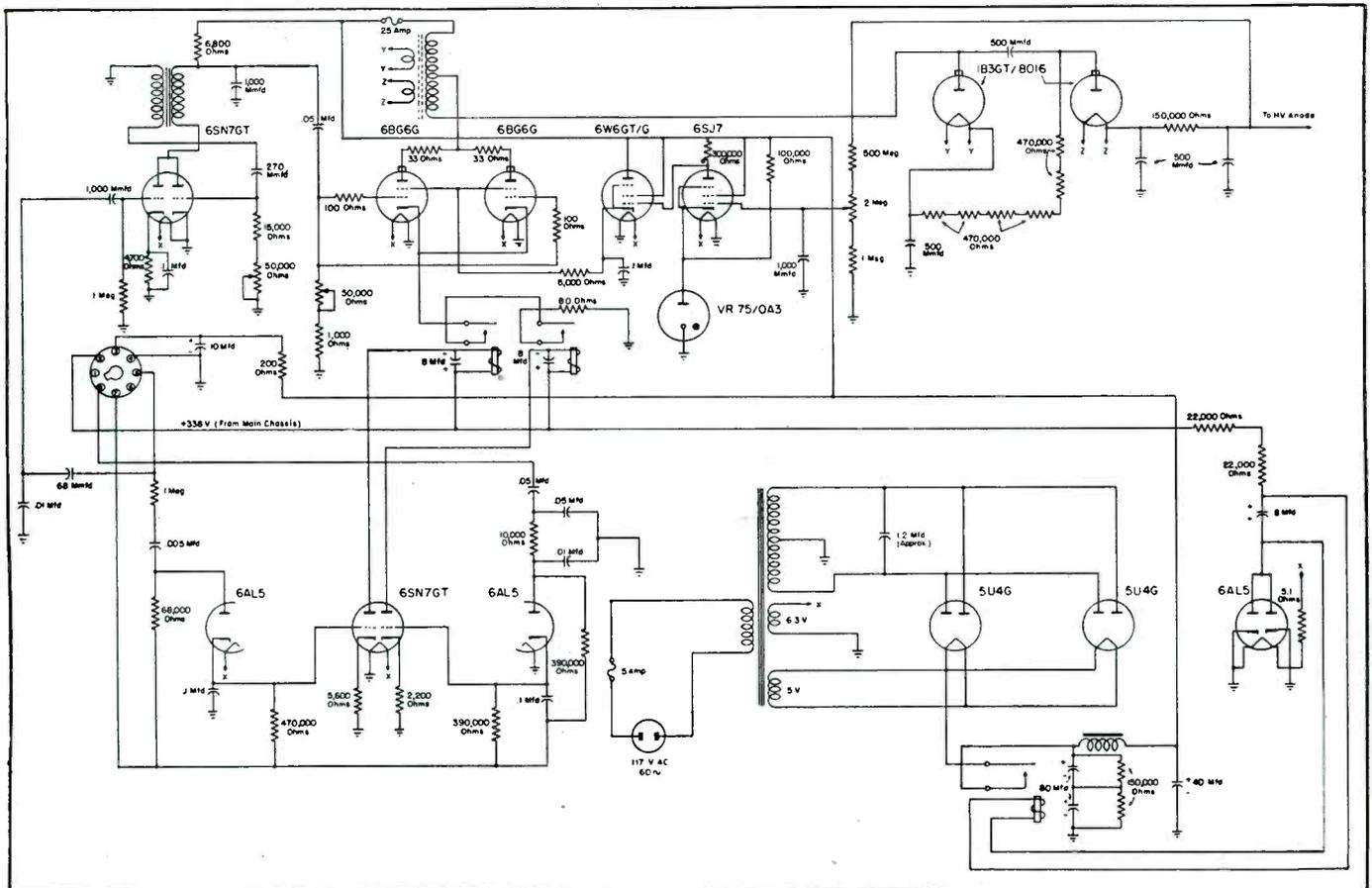
ing on the deflection yoke.

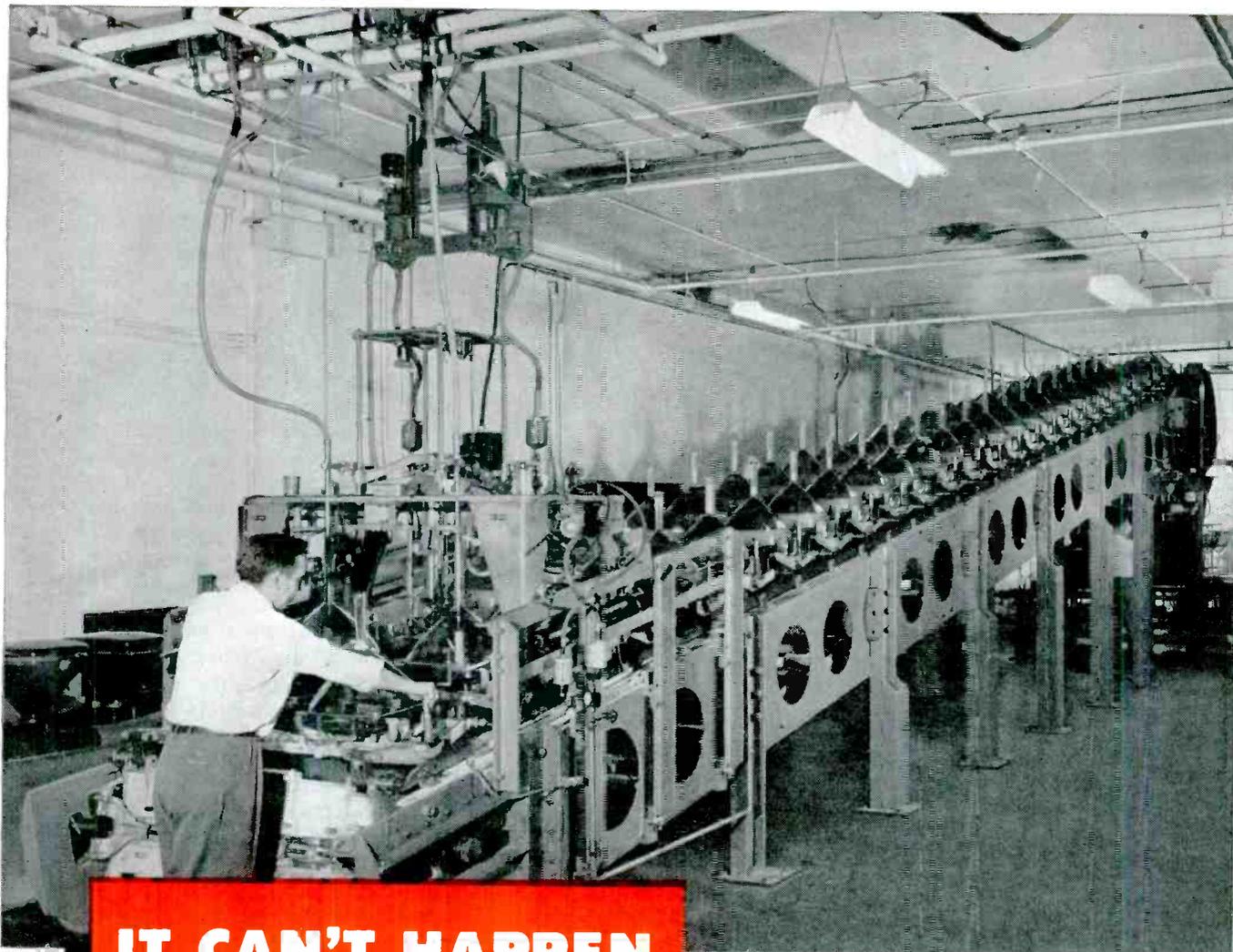
In the high voltage section of the power supply chassis eight tubes were included: a 6SB7 twin triode connected as a blocking oscillator and synchronized by the synchronizing signals from the main chassis. The output of this blocking oscillator is fed into a pair of 6BG6s, connected in parallel. The blocking oscillator, although synchronized by the synchronizing signals from the main chassis operates at twice line frequency or 31,500 cps. The 6BG6 tubes have their output connected to the high voltage coil, which is a pi-wound type, using a slug of ferrite, which has a stepup ratio with a voltage output of approximately 25,000 volts peak-to-peak sine wave; this can be adjusted from 20,000 to 25,000 volts *dc* output, by a control which is provided. This tube complement then serves as the high voltage source at 25,000 volts *dc* for the accelerating potential of the tube; the high voltage output is applied through a bleeder resistor to the grid of a 6SJ7 control tube, which in turn controls the grid voltage of a 6W6. This latter tube acts as a variable resistor in the 6BG6 screen circuit, increasing the screen voltage when the output voltage drops and decreasing

it when the output voltage tends to rise. A VR75 serves to provide a constant voltage on the cathode of the 6SJ7 to provide a fixed voltage reference level. This 6SJ7, 6W6 and VR75 thus form the high-voltage regulator circuit.

The high-voltage section of the power supply chassis has three controls, one of which controls the frequency of the oscillator and is set for correct waveform and dip in the driver screen current. The second control is a drive control, which controls the amount of signal applied to the driver control grids and is set for maximum dip in driver screen current. The third control is the high-voltage regulator control which controls the bias on the 6SJ7 regulator, thus controlling the average flow of current through it, which in turn determines the high voltage available at the rectifier output. This was found to provide an adjustment which permits the selection of accelerating potential. Included also in the high-voltage power-supply chassis, and associated with the low-voltage power-supply section, is a delay relay circuit which utilizes the warmup period of a 6AL5 twin diode to delay the application of a plate potential to the high voltage and deflec-

Fig. 2. Schematic of the DuMont 30-inch model high-voltage supply.





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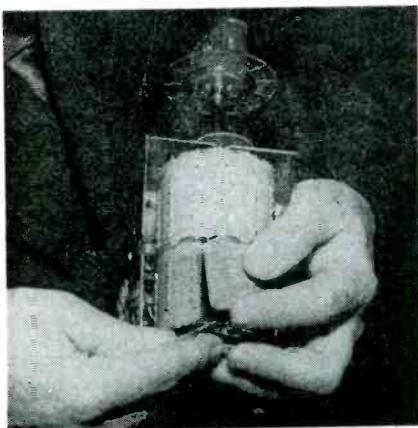
(Above)

A G.E. uhf translator which provides continuous tuning from 475 to 890 mc. This translator contains a 6AF4 oscillator and a 12AT7 if amplifier. Two selenium rectifiers and one 1N72 high-frequency crystal detector are also used.



(Above)

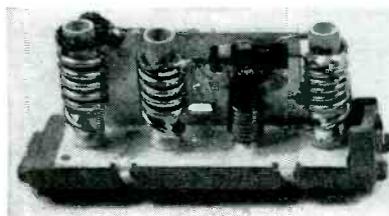
Westinghouse ultrahigh converter recently demonstrated in Bridgeport, Conn.



(Above)

Transferring coil segments onto Standard tuner for ultrahigh pickup.

Ultrahigh frequency coil segments, designed and manufactured by Standard Coil, which can be installed in Standard turret type tuner, recently demonstrated during series of special uhf tests in Bridgeport, Conn.



tion amplifier, until after the cathodes have had the opportunity of reaching operating temperature. This feature has been found to prolong tube life and prevent the application of high surge potentials to the components associated with these tubes.

Another feature is a sweep failure protection circuit with a 6AL5 which utilizes two tubes and two relays. This sweep failure protection circuit will disable the high voltage supply in case either the horizontal or vertical deflection circuits fail, and it provides good protection for the 30-inch tube. The 6AL5 rectifies part of the output of the horizontal and part of the output of the vertical deflection amplifier. The two dc voltages, thus obtained, are applied to two sections of a 6SN7 in such a manner that when there is deflection potential present the two sections of the 6SN7 respectively conduct and hold the plate relay closed. Both relay contacts are wired in series with the cathode of the high-voltage driver tubes, so that failure of either sweep circuit would immediately cut off the high voltage supply or accelerating potential for the picture tube.

Two regulated transformers¹ are used in the chassis. One of them appears in the receiver chassis² and the other one in the power supply chassis to provide the low-voltage source for the deflection circuits. It is necessary that this low-voltage source be a constant voltage so as to avoid sharp changes of picture size with line voltage fluctuations. Were the second regulated transformer not provided, the effect on picture size of line voltage fluctuations would be quite pronounced. This has been found due to the fact that the high voltage is regulated by a vacuum-tube type of regulator circuit and can remain constant, but deflection power is markedly reduced as the line voltage dips, or increased as the line voltage rises. In ordinary receivers which do not utilize a regulated high-voltage supply there is the fortunate tendency for the high voltage to decrease as the line voltage decreases, simultaneously with the decrease in deflection power, so that the effect upon picture size is partially counteracted by

¹Sola. ²DuMont RA-109.

these two effects. The opposite is, of course, equally true, as the line voltage rises, both the high voltage and deflection power tending to rise.

24-Inch TV Chassis

In the 24-inch type chassis,³ reviewed last month, it was pointed out that several circuitry innovations also had to be included in this model to provide satisfactory larger-picture reproduction.

In addition to the modifications, previously discussed, the set also features a highly-effective horizontal-amplifier system. The modified sawtooth wave is applied to the grids of two 6BG6s connected in parallel. Low value resistors are inserted in the control and screen grid and in the plate circuits to discourage Barkhausen oscillations. Parallel operation is used to secure increased current through a kickback transformer primary and thus obtain the required deflection output and high voltage.

To produce the necessary second anode voltage of 14 to 16 kv for the picture tube, a pair of 1X2s are used in a voltage doubling circuit. During the retrace period of the horizontal sawtooth, there is a fast collapse of lines of force across the bottom portion of the primary of the horizontal output transformer. A large voltage is induced, which is stepped up by auto-transformer action and applied to the plate of the first high voltage rectifier. A 500-mmfd capacitor, C_{252} , charges up through the tube to almost the peak value of this voltage. Until the next retrace period, C_{252} slowly discharges through ground, up through low voltage $B+$, through the bottom section of the primary and charges up C_{261} (500 mmfd, 10 kv) through four 680,000-ohm resistors in series, $R_{251, 2, 3, 4}$. Because of the low capacity of C_{251} compared to other capacitors in the path, it takes most of the charge from C_{262} . After several cycles, C_{251} charges up to the same voltage as C_{252} . The voltage across C_{251} is in series aiding with the induced voltage across the bottom section of the primary. The combined voltages are applied to the plate of the second high voltage rectifier; a 500-mmfd 20-kv capacitor, C_{253} , charges up to this value. This rectified voltage is fed to the second anode of the picture tube. No filter resistor is used.

A 120-mmfd capacitor, C_{311} , is placed across the horizontal output secondary to increase the sweep. A horizontal size control, in series with the horizontal yoke, controls the total induc-

³Ser. Cuits; SERVICE, June, 1951.

(Continued on page 32)

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Ser-Cuits

(Continued from page 30)

tance of the load across the secondary. In that manner, the current through the load, which includes the current through the deflection coils, can be varied, thus controlling size.

A portion of the secondary output is fed to a pulse transformer. The sawtooth output from this transformer is fed to the horizontal phase detector as noted previously. The pulse is also fed to the plate of a keyed *agc* amplifier stage.

Keyed AGC

There is a stage of keyed *agc* amplification, using a 6AU6. The purpose of keyed *agc* is to make the gain control voltage dependent only on the height of the sync pulses, while keeping the *agc* amplifier inoperative during the rest of the signal period. This minimizes the effect of random noise. In addition, the *agc* filter system can be made fast acting to cut down the effect of fast changes in signal, such as airplane flutter.

To keep the tube cut off, except when the sync pulses arrive, the grid of the *agc* stage is kept at 100 v, the cathode at 125 v, and the plate at 0. The tube will conduct only when the positive pulse from the horizontal circuit is applied to the plate and the positive sync pulse applied to the grid simultaneously. The current through the tube charges up a .0047-mfd capacitor (C_{313}) in a negative direction. Further *rc* filtering is provided by R_{313} (100,000 ohms), C_{65} (2 mfd), and R_{75} (100,000 ohms). This negative voltage, which is proportional to the strength of the incoming signal, is applied as gain control bias through decoupling *rc* filters to the *rf* amplifiers, and the first three common *if* stages.

Brightness and Focus Controls

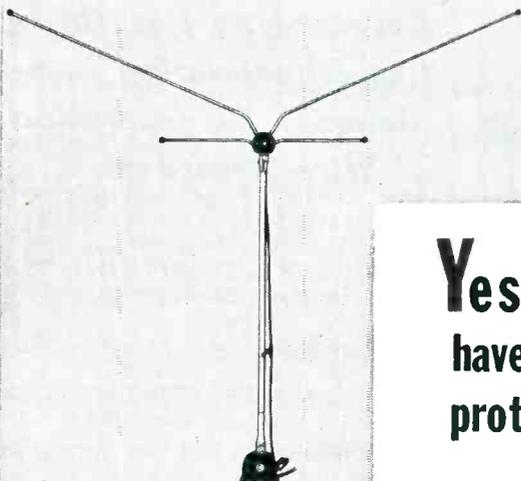
Brightness of the picture tube is varied by a pot in the cathode circuit, which is part of a voltage dividing net across $B+$. A positive pulse is fed to the cathode from the vertical sawtooth output to provide blanking during the vertical retrace period.

Focusing is accomplished by a combined permanent and electromagnet. Focus is varied by a pot in parallel with the focus coil, which controls the current through the coil. Both are connected in the main voltage dividing network across $B+$.

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S-7

MAGNETIC RECORDING

by L. S. HICKS

Webster-Chicago Corp.



Tape recorder in the home of Kenneth C. DeGroff, South Bend, Indiana, a professional photographer who frequently records his favorite radio programs. DeGroff, has at times, maintained a second recorder in his professional photographic studios where the music he has recorded at home is replayed as background music during sittings. (Microphone used is an E-V 630; loudspeaker an E-V SP-15).

Part III . . . Editing and Splicing . . . Playing Back Magnetic Recordings . . . Rerecording Possibilities . . . Equalization Techniques . . . DC Operation of Wire Recorders . . . Magnetic Recording Business Opportunities.

IN MAGNETIC RECORDING, there are two unique and particularly practical features which have played quite a role in popularizing the new art: *editing* and *splicing*.

Often only part of a recording will be important enough to keep. This part should be cut off and stored on an empty spool for later use or spliced onto a spool of similar subject matter. This editing, as it is called, smooths out a program and is important.

Editing is easy with tape. An unwanted section can be cut out with a pair of scissors and the wanted sections joined by means of scotch tape. The splicing tape can be applied to the sleek or uncoated side of the plastic tape or the grey or uncoated side of paper tape. One must be careful not to use magnetized scissors for trimming the splice or part of the program may be erased.

Wire is spliced by tying the ends of the wire together with a square knot: If long sections of either wire or tape are to be omitted from a final *copy* the unused part should be saved for later use. Several spare reels should be available. The wire or tape should be run past the unwanted part. Then it should be cut at the beginning of the second *wanted* section and the unwanted part rewound on an empty spool. Then it should be cut again at the end of the first wanted section and the two wanted parts spliced together.

Wire moves at a speed of 2 feet per second; thus even six inches of wire used for a splice would not contain

sufficient sound to be noticeable. Tape can be butt spliced so that not even a fraction of a second of a program is lost.

Playing Back Magnetic Recordings

Auxiliary equipment can often be used to improve the frequency response of the recorder. This is because compact size and high fidelity call for opposite design considerations. For instance, a console type radio always sounds richer than a table model, especially on the bass tones. Even a larger table model receiver sounds better than a *midget*. This is because the bass notes are reinforced and reproduced more naturally by a *well baffled* loudspeaker. One must make a choice between portability on one hand and tone quality on the other.

The same consideration holds true with a recorder. One with a large speaker would not be portable, while a portable model should not be expected to sound like a custom built phono-radio combination. Fortunately, it is easy to secure quality reproduction and still retain the feature of portability. It has been pointed out that direct recording is possible by connecting a length of microphone cable across the volume control of the receiver, and the volume control was called the gate or input to the audio amplifier. Recorders with a *high impedance* output, or recorders with a 500-ohm output, can be connected to this position. If the only *external output* is designed for an external

speaker, an 8-ohm resistor should be connected across the output leads that go to the volume control. Most recorders have a low output rating, and thus a 2-watt resistor will be large enough.

Many recorder enthusiasts have occasion to play back their recordings through separate amplifiers and speakers, not a part of the radios. The amplifier of a sound-on-film movie projector would be one example. Recorders with a *high impedance* or a 500-ohm output can be connected direct to the phono *input* of the amplifier. Those with voice-coil impedances should *load* the output with an 8-ohm 5-watt resistor, as explained previously. The connections are the same in both cases, except that the 8-ohm resistor is added across the output cord connections at the recorder.

Custom Hi-Fi Installations

With custom-built high fidelity tuner-amplifier-speaker combinations it will be necessary to take off the recording signal and feed in the playback signal across the volume control of the tuner, unless the volume from the speaker is controlled by a control on the amplifier itself. This may be true if a phono record changer is part of the installation. The important point is that the recorder should be connected at a point where the signal from the loudspeaker of the installation is controlled.

The average room requires a little less than one watt of audio power to

give adequate volume. Consequently, the audio amplifier of a recorder is sufficient to drive a good external 8" to 12" permanent-magnet dynamic speaker in a good baffle or cabinet. The use of an auxiliary speaker will improve the frequency response and still maintain the portability of the recorder. Most recorders have an output receptacle marked *Ext. Speaker* or the equivalent. A speaker cord can be soldered to a suitable plug and the plug inserted in the output socket of the recorder for the extra speaker.

Rerecording Possibilities

Some recordings are so good that friends or business associates want copies. It is comparatively easy to make them if a second recorder is available.

Recording From One Recorder to Another: The output of the master recorder should be connected to the phono input of recorder 2. The master recorder switch should be in the *listen* position and the switch on recorder 2 in the *record* position. As explained previously recorders with only an *External Speaker* output should have the output loaded by connecting an 8-ohm resistor across the output when making any rerecordings.

Recording From Wire or Tape to Disc: Often one might want to rerecord part of a long recording on a phono record. If you are just recording for fun the phono recorder owned by one of your friends might be used. If the recording is more important, a professional type disc recorder should be used. Most radio broadcast stations can either make such a recording or help you find a company specializing in this work.

It may be necessary to loan your recorder to the recording studio and you may have to help them make a *patch cord* to feed the output of the recorder to the phono input of their recording amplifier.

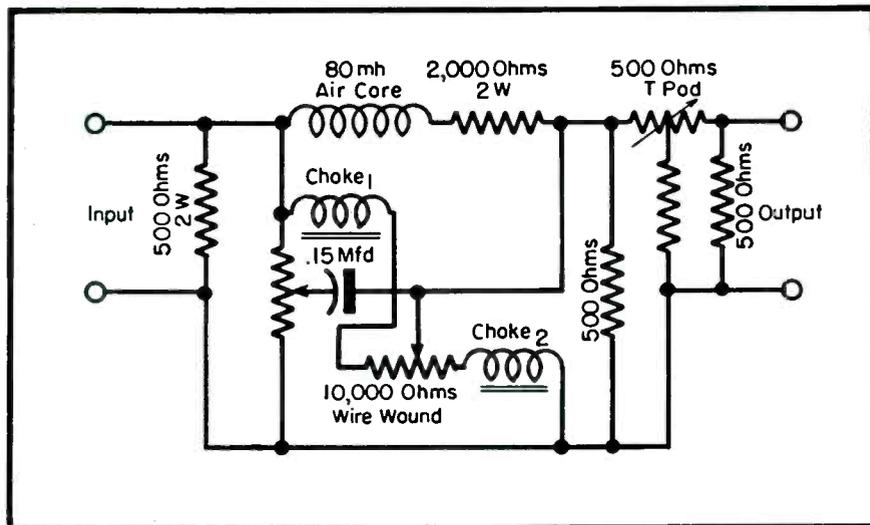
Equalization

When rerecording, the *copy* often lacks the brilliance and tone quality of the original, unless some form of tone control circuit is connected between the two recorders to boost the bass and treble frequencies.

If a loss of the higher or treble frequencies is noticed when recording from one recorder to another a bass and treble-boost tone control circuit may be inserted between the two recorders. A circuit using a tube is preferred to avoid any loss of volume.¹ A circuit that has proved satisfactory appears in Figure 1. This circuit has a high *insertion loss*, but the output of

Fig. 1. Dual-tone control circuit for use when rerecording from a master recorder to a bank of recorders. (In the original model a variable inductor* was used for Ch_1 and another type** for Ch_2 . The tone controls were turned full on for maximum accentuation of both the bass and treble and the inductors tuned for the exact amount of boost desired. This was a control of -7 to $+15$ db at 60 cycles and -14 to $+19$ db at 10,000 cycles.) (The input pot is a 2-megohm wire-wound unit.) As many recorders are desired may be connected to the output with no need for impedance matching. Voltage, not power, is involved. Since the output is 500 ohms, no special shielding precautions are necessary. When rerecording from the 3.2-ohm voice coil tap of a recorder, a 3.2-ohm to 500-ohm matching transformer should be used to couple the master recorder to the tone control circuit or the 500-ohm 2-watt input resistor should be replaced with one rated at 3.2 ohms, 2 watt. The circuit is not suitable when only a high impedance output is available from the master recorder.

*UTC V1-C11. **V1-C7.



recorder 1 and the gain of recorder 2 is certain to be high enough to work effectively with a *loss* type of tone control.

DC Operation of Wire Recorders and Record Changers

Recorders can be operated from direct current by using a suitable converter. This is true whether the *dc* source be 6, 12 or 110 volts. Two types of converters are in general use. Each has advantages and disadvantages.

The rotary-converter or motor-generator type,² uses a *dc* motor to operate an *ac* generator. This type converter generates less hum and hash which might be transmitted to the recording through the power lines. On the other hand, there is a mechanical whine set up by the motor generator which can be picked up by the microphone unless the converter can be placed far enough away from the microphone, so that the sound is inaudible.

The vibrator type converters,³ use a vibrating reed to break up the direct current into 60-cycle pulsations. The vibrator can usually be effectively isolated by rubber to deaden any objectionable mechanical noise, so that it sounds quieter in a room. However, some vibrators have been found to

generate more hum and hash which is transmitted to the recording through the power cord, despite careful filtering, but some have been found to be unusually quiet.

With either type converter, the hum and hash can be effectively eliminated or at least reduced below an objectionable level if the signal-to-noise ratio is good. The microphone should be kept near enough to the sound source to permit recording, with the volume control to the left of approximately 2 to 3 o'clock. The hum and hash are not objectionable until the control passes this point. Recordings made at such a level will usually playback with the control at about 9 to 12 o'clock, and thus the hum would not be objectionable.

It will be necessary to balance the consideration of low mechanical noise, audible to the microphone, and low hum and hash recorded through the power leads. Each individual installation will differ somewhat and it will be necessary to decide which type is best fitted for a particular use.

Most recorders draw approximately 65 watts of power. This means that a recorder can be operated about 1½ hours on a fully charged 6-volt battery or from 5 to 6 hours if the car generator is charging while you are recording.

When using a converter in an automobile, it is necessary to be certain the conductors from the battery to the converter are very large. A recorder

(Continued on page 37)

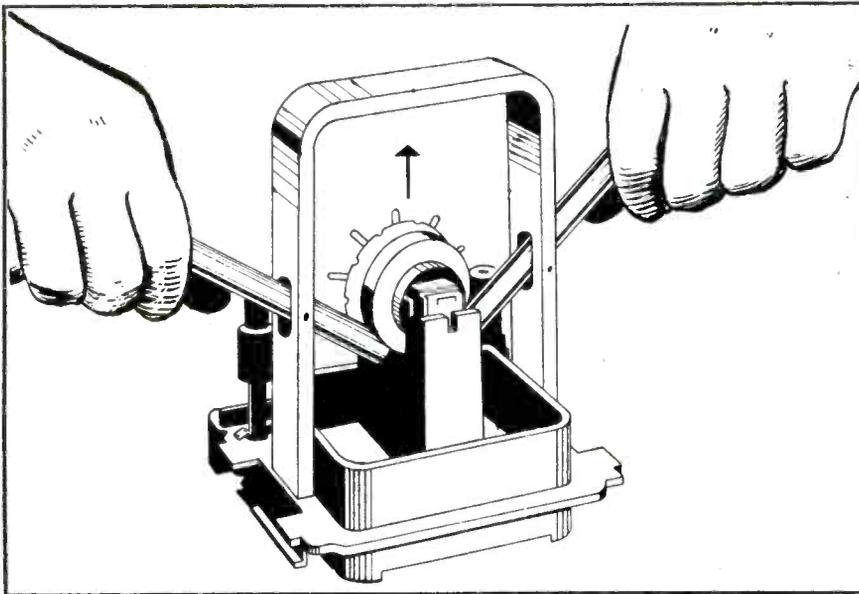
¹Such a circuit is described in the *Amplifier Manual*, available from the Thordarson Electric Mfg. Div. Maguire Industries, Inc., 500 W. Huron, Chicago, Illinois.

²Such as Carter Motor Company type 1060 CW.

³C-D R and WR models; ATR RSC type.

Servicing

Fig. 1. Sylvania horizontal scanning coil puller.



Helps

by M. A. MARWELL

Application of Horizontal Scanning Coil Puller... Increasing Gain In DuMont Chassis . . . Test Pattern Facts .

IN SYLVANIA TV receivers the horizontal scanning transformer is mounted on a plastic sub-chassis and held in place by brass spring clips and a screw. Should it become necessary to remove this transformer, a special coil puller can be used. In the removal, all leads to the transformer terminal board must be unsoldered, and then the screw removed. Now, with the horizontal scanning coil puller¹ in place, with the ends of the levers under the coil, as shown in Fig. 1, the levers are pressed down, and it will be found possible to remove the coil and core assembly without damage to the plastic sub-chassis.

Increasing Gain on DuMont Chassis

In weak signal locations it is sometimes impossible to obtain a satisfactory picture with even the most elaborate antenna installation. However, it has been found possible to provide a usable picture by modifying the circuit to secure more gain. Such gain, in DuMont chassis, becomes available through an increase in the plate load resistance of the video amplifier; Fig. 2. The increased plate resistance reduces the bandwidth of

the stage necessitating additional high-frequency peaking. While the additional peaking partially compensates for the loss in bandwidth, some reduction occurs as a result of the increase in the video amplifier plate-load resistor.

Since noise is always the factor which limits resolution when receiving weak signals, the loss of potential reso-

lution resulting from the reduction in bandwidth has no effect.

When the receiver is tuned to a strong signal, the narrower bandwidth will reduce the resolution of the picture. To overcome this difficulty the *local-distant* switch must be rewired so that the additional components are inserted when the switch is placed in the *distant* position, and are removed when the switch is placed in the *local* position.

The switch must only be in the *distant* position when a very weak signal is being received.

Test Pattern Facts*

Many Service Men are reluctant to use test patterns for checking the efficiency of the TV chassis, since they are not too familiar with the meaning of the various lines in the drawing. Actually each of the lines offers a definite clue to receiver operation. The shaded wedge, for instance, can be used to adjust properly brightness and contrast control. Inability to obtain distinct shades from black to white indicates non-linear distortion in receiver.

The vertical and horizontal wedges can be used to check horizontal and vertical resolution, respectively. Resolution is indicated by the number of lines of equal thickness with equal spaces of the same thickness that can be seen in correct picture width or height. The number of lines for these wedges is indicated by the numbers. For horizontal resolution, the number

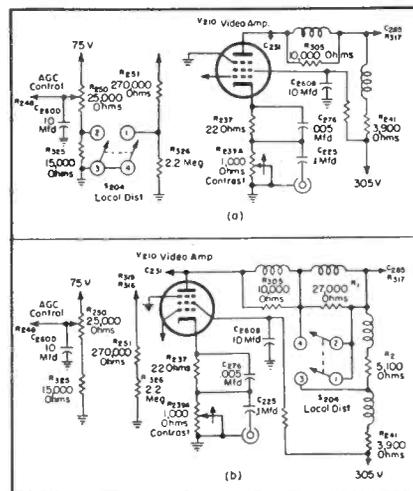


Fig. 2. Present (above) and modified video amp circuit (below) in DuMont RA-112A, RA-113 and RA-117, which provides more gain in fringe areas.

*Based on notes supplied by Sylvania.

¹Sylvania part 898-0013.

of lines that can be seen is an indication of the bandpass of the receiver. In other words, 100 lines is equivalent to 1.25 mc; 200 lines, 2.5 mc; 250 lines, 3.12 mc; 300 lines, 3.75 mc; 350 lines, 4.37 mc; 400 lines, 5.00 mc.

Corner circles can be used to check focus and resolution at the edges of the picture. Diagonal lines can be used to check interlace; poor interlace is indicated when these lines become jagged. This sometimes can be corrected by a touch-up adjustment of the vertical hold control. Bars serve as a check on low-frequency response; they should be well defined and without variation in intensity.

Magnetic Recording

(Continued from page 35)

draws approximately 28 amperes, so that a voltage drop of even $\frac{1}{2}$ volt is important.

Magnetic Recording Business Opportunities

There are many profitable opportunities available to the Service Man in the magnetic-recording field. Aside from selling recorders, the recorder can be rented or special recordings can be made available. There is always a demand for recordings of weddings, conferences, special church services, etc. Often the original recording plus additional copies can be sold. At other times, disc copies can be provided.

Several organizations are renting recorders for special occasions. Typical rates in a medium large city have been: \$5.00 per day, plus a \$2.50 installation charge, or \$25.00 per week. This charge includes any wire used, but returned in good condition. A \$25.00 deposit is normally required, plus references.

Some schools have been found to prefer to rent equipment for special events, rather than buy recorders.

Sound truck operators often record both the voice and music, eliminating the trouble of shock mounting a phono turntable and watching a record.

Recorders have been used in airplanes to cover large areas, such as beaches and amusement parks.

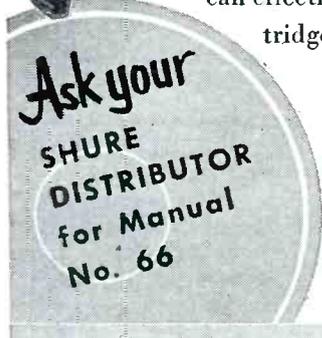
Many high-fidelity custom installations now include provisions for a recorder, to record and play back radio programs and play back prerecorded music now commercially available.

Above all, it is important not to overlook the profits which can be gained by selling wire and tape and accessories, for use with recorders.



SHURE

Replacement Manual



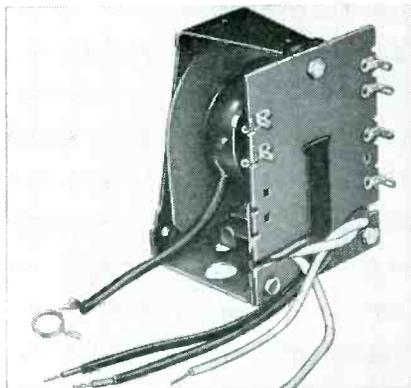
LISTS OVER 1,500 PHONOGRAPHS and phonograph combinations which are equipped with, or which can effectively use, Shure crystal and ceramic pickup cartridges. Shure cartridges are equal to or superior (in most cases) to the units they replace. This Replacement Manual covers the period from 1938 to 1951—and lists models made by over 120 manufacturers.



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TUBE News

by L. M. ALLEN



Horizontal-deflection output and *h_v* transformer* (14 kv) for electrostatic-focus picture tubes.

THE ADVENT OF THE electrostatic type tubes has prompted the development of many new components required in the circuits. There are now available, for instance, specially-designed horizontal-deflection-output and high-voltage transformers¹ for use with electrostatic-focus picture tubes having a horizontal-deflection angle of about 66°. Utilizing a ferrite core for high-efficiency operation, these transformers are designed for use with a single, horizontal-deflection amplifier tube; a single rectifier tube such as the 1B3GT for the high-voltage supply; a single rectifier tube, such as the 1V2 for the focusing-voltage supply; and a magnetic deflecting yoke² which also has a ferrite core.

One transformer* has been developed to provide a high-voltage supply of 14 kv at no load whereas another** can provide 16 kv. Both will provide a focusing-voltage supply adequate for the 17GP4. For 14-kv operation, ample deflection for the 17GP4 is provided* in a horizontal-deflection system having a single 6BQ6GT output tube and operating with a dc power

Application Features of Horizontal Deflection Output and HV Transformers Designed for Electrostatic Picture Tubes, Rectangular-Tube Deflecting Yokes and Automatic-Focusing Picture Tubes.

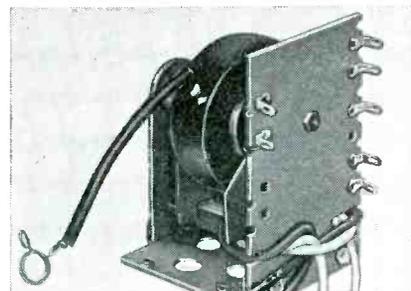
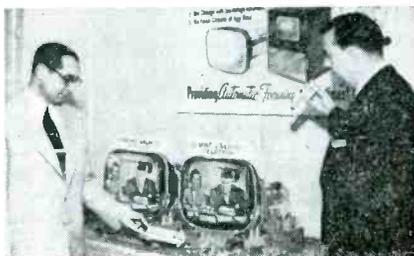
supply of 250 volts. For 16-kv operation, deflection for the 17GP4 is provided** in a horizontal-deflection system having either a single 6BQ6GT or a single 6AU5GT output tube.

Deflecting Yokes

For use with the new rectangular twenty and twenty-one picture tubes (66° horizontal-deflecting angle and 70° diagonal-deflecting angle), there have also been developed magnetic deflecting yokes.³

The deflecting yokes, designed for use with rectangulars having neck

Irving Rosenberg, general manager of the Du Mont Cathode-Ray Tube Division, and Bill Scales, sales manager, reviewing the Du Mont selfocus picture tube.



Horizontal-deflection output and *h_v* transformer** (16 kv) for electrostatic picture tubes.

*RCA 227T1. **RCA 228T1.

diameters of $1\frac{7}{8}$ "', utilize a ferrite core.

This yoke must be installed so that the capped end is toward the base of the picture tube. The start and finish of each of the four coils are brought out to individual terminals to facilitate circuit connections.

Automatic-Focusing TV Picture Tube

A TV picture tube that is said to eliminate focusing controls, coils, mechanical focusing devices and maintain an edge-to-edge focus regardless of line-voltage fluctuations, contrast or brightness settings, has been announced by the Cathode-Ray Tube Division of the Allen B. Du Mont Laboratories, Inc., Clifton, N. J. The feature is now being included in 17-inch rectangulars, and other sizes, it is said, will be announced shortly. The present size is claimed to be a direct replacement for 17-inch all-glass rectangulars of electromagnetic or electrostatic focusing design. The base is a standard 5-pin duodecal type.

Further details are available from Irving Rosenberg, at the Clifton plant.

¹RCA 227T1* and RCA 228T1.** ²RCA 209D1. ³RCA 211D1.

Rep Talk

DUIZEND, FAIN, AND LEVIN, New Orleans, La., have been appointed factory sales reps for Steelman Phonograph and Radio Co., Inc., Mt. Vernon, N. Y. covering Oklahoma, Arkansas, Louisiana, Mississippi, Alabama and Texas. . . . *William F. Swinke*, 541 Diversey Parkway, Chicago, Ill., has been named rep for Astron Corp., East Newark, N. J., in Illinois. . . . *James H. Podolny*, 4616 Coleridge St., Pittsburgh 1, Pa., has been appointed rep for Standard Wood Products Corp., Long Island City, N. Y., for the western section of Pennsylvania, and Ohio and West Virginia. . . . *Thomas B. Jacocks*, headquartering in Washington, D. C., has been appointed special rep for the G. E. tube divisions. He will supervise government and service agency activities in the Washington area. . . . *Felix Simon*, P. O. Box 64, Denver, Colo., has been named rep for The Workshop Associates, Needham Heights, Mass., covering Colorado, Utah, Wyoming, Eastern Montana and eastern Idaho. . . . *J. Hochberger*, *S. W. Mosebrook*, and *J. Krenzer*, of York Radio and Refrigeration Parts, York, Pa., recently visited the Technical Appliance Corp plant in Sherburne, N. Y. . . . The 1951 national membership roster of the *The Representatives* 600 S. Michigan Ave., Chicago 5, Ill., has been published. . . . *Edwards and Lohse*, formerly the Edwards Sales Co., Cleveland, O., representing Cinema Engineering Co., Burbank, Cal., have expanded their territory to include Kentucky, West Virginia, Ohio and Western Pennsylvania. . . . *A. J. Warner*, 5022 29th Ave., S., Minneapolis 17, Minn., has been appointed factory rep for the Cinema Engineering Co., for Minn., N. and S. Dakotas, Neb., Iowa and northwest Wisc. . . . General Transformer Corp., Chicago, has appointed *Marshall Sales Co.*, Los Angeles, to represent it in California, Arizona and Nevada.



Harry Ehle, IRC vice president, presenting IRC Chicago reps S. B. Darmstader, A. G. Ostrand and James E. Keagan, with sterling silver cigarette lighters for their top sales work in '50. Darmstader also received an engraved sterling silver cigarette case as a memento of his twenty-five years' continuous service as sales rep for IRC.

Triplett reps who were honored for their quarter-century of service at a sales meeting in Chicago, and presented with 25-year watches. Left to right: H. C. Sanderson, Pittsburgh; B. W. Heuvelman, Chicago; R. L. Triplett, prexy, and H. M. Saul, Los Angeles.



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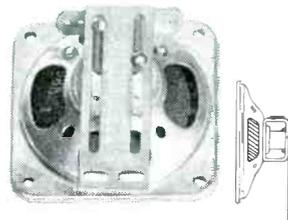
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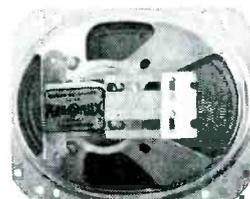
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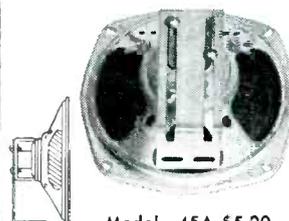
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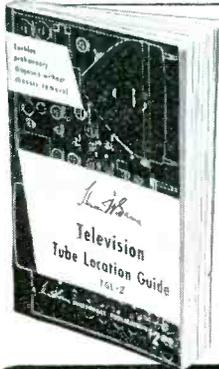
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* * *

MIKE ROTH ON TRIP TO COAST

Milton Roth, jobber sales manager of Radiart, Inc., Cleveland, Ohio, is now on an extended trip to the Pacific Coast calling on distributors with his representatives: Denver and Salt Lake City, Cliff McCloud; Spokane and Seattle, Dave Lee and Joe Belusko; Los Angeles and Southern California, Bert Knight; San Francisco, Oakland and Northern California, Bob Hardy. He will also attend the Pacific Electronic Exhibition at San Francisco.

* * *

TURNER NAMES H. M. MURDOCK S-M

Hubert M. Murdock, formerly vice-president in charge of sales of Cedar Rapids Engineering, has been named sales manager of the Turner Co.



H. M. Murdock



G. L. Chapman

CHAPMAN NAMED MAGNAVOX ASSISTANT SERVICE MANAGER

George L. Chapman, formerly Magnavox district service manager in the Boston territory, has been appointed assistant service manager of the Magnavox Co.

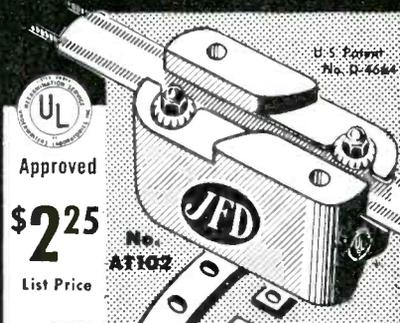
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RAY MORRIS NOW I.D.E.A. CHIEF ENGINEER

Ray A. Morris, formerly assistant sales manager of I.D.E.A., 55 North New Jersey St., Indianapolis, Ind., has been appointed chief engineer of the company.

Morris has served with the engineering departments of Meissner, Ferrocart and E. I. Guthman & Co.

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RAYTHEON PICTURE TUBE WARRANTY PLAN

A registered six-month picture tube warranty, which eliminates code dating, has been announced by the replacement tube department of the Raytheon Manufacturing Co., Newton, Mass. Tubes are guaranteed for six months' service from time of purchase by the customer. Included in each tube carton is a single return stamped card for the customer to mail back to Raytheon, where registration is made and a six months warranty certificate is forwarded to the set owner.

* * *

RICHARD A. GRAVER RECEIVES McMURDO SILVER MEMORIAL AWARD

Richard A. Graver, vice president in charge of sales for the Admiral Corp., received, during the recent Chicago Parts Show, the first annual McMurdo Silver Memorial award, an engraved sterling silver cigarette box, for the outstanding merchandising job in the electronics industry, during '50, from the Silver-Marshall Alumni Association.



At the Silver-Marshall champagne breakfast at the Stevens Hotel during which Graver received the award. Left to right: Burton Browne, Burton Browne Advertising; Dick Graver and W. J. Halligan, president of Hallicrafters Co.

* * *

SPRAGUE TV REPLACEMENT CAPACITOR MANUAL

The third edition of the Sprague TV replacement capacitor manual, listing correct capacitor replacements for 964 television sets of more than 60 brand names, has been published by Sprague Products Company, North Adams, Mass.

Television receivers are listed alphabetically. Listings include the manufacturers' original part numbers as well as the suggested replacement capacitor number and its list price. Also presented is a 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.

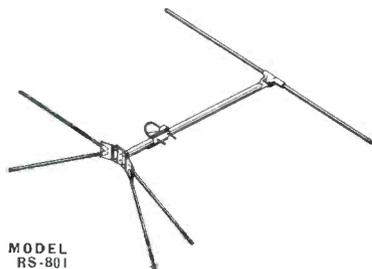
Available from Sprague upon receipt of 10 cents to cover the cost of handling and mailing.



THESE TWO RADELCO MODELS WERE THE TALK OF THE CHICAGO SHOW . . .



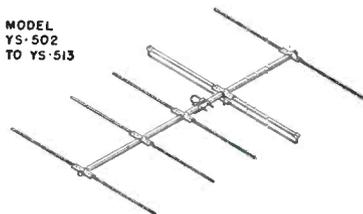
. . . NOW THEY'RE THE TALK OF SERVICEMEN THRUOUT THE NATION!



RADELCO "ACE" CONICAL A SENSATION AT \$5.45 LIST

Servicemen everywhere look to RADELCO for the finest in aerials at the lowest in cost . . . and again RADELCO comes up with an ace! The new RS-801 ACE CONICAL is a typical RADELCO high quality product. It's constructed of the finest materials, engineered to exacting specifications . . . but popularly priced to satisfy the demands of the most demanding buyer. This fine aerial consists of an x-type conical with a single reflector. Its elements are of tight butt-seam aluminum, reinforced with wooden dowels to eliminate vibration and breakage. Ends of elements are closed to eliminate whistle. Its cross boom is of galvanized steel with U-bolt mast mounting. All steel fittings are heavily zinc plated. It's an ACE in quality, but at \$5.45 List it's a deuce in cost! Get 'em from your nearest Parts Jobber now!

MODEL YS-502 TO YS-513



RADELCO 5 ELEMENT YAGI PRICED AS LOW AS \$7.50 LIST

This is the ideal aerial for extreme fringe areas. It really reaches out and brings 'em in! Compare it with any Yagi on the market. Compare it for performance, for construction and for price . . . and the more you compare it, the better you'll like it! Its five elements are of aluminum tubing with steel boom. It is pre-assembled for easy and quick installation to save time. It provides a quality picture. No side band cutting. Exact 300 ohm center impedance. And, of course, each aerial is custom cut and laboratory tested by RADELCO to assure finest reception. You'll really like this aerial . . . and you'll be tickled pink with its low list prices.

Model	Channel	List
YS-502	2	\$15.00
YS-503	3	14.25
YS-504	4	13.50
YS-505	5	12.75
YS-506	6	12.00
YS-507 thru YS-513		7.50

* * *

WRITE, WIRE OR PHONE YOUR NEAREST PARTS JOBBER FOR THESE AMAZING VALUES in RADELCO QUALITY AERIALS!



7580 GARFIELD BLVD. CLEVELAND 25, OHIO

NOW!
 another great VEE-D-X
Single Channel
 sensation

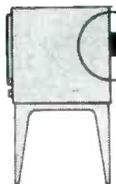
AND
 ONLY
\$1995
 LIST



it's the

VEE-D-X
Outboard
BOOSTER

Here is the greatest development to improved single channel TV reception since the VEE-D-X "J" Series Yagi. Pre-set for any desired channel, the VEE-D-X Outboard costs much less than any tuned booster, yet delivers 18 db gain with full 5 megacycle band width. Individual slug tuned grid and plate coils assure perfect alignment — 6J6 push-pull cross-neutralized amplifier will not oscillate — unique RF assembly is compact and precision engineered — plus many more outstanding features that revolutionize single channel reception. For complete information contact your local supply source or write direct to The LaPointe-Plascomold Corporation, Windsor Locks, Connecticut.



**OUT OF SIGHT!
 OUT OF THE WAY!**

Fits snugly against back panel of any TV set. No wires, no knobs exposed to TV viewers.

INSTALL IT! — FORGET IT!

Bothersome tuning completely eliminated. Turns on and off with set automatically.

RAULAND PICTURE-TUBE PRIZE PLAN

A prize incentive promotion to help boost the sale of TV picture tubes has been inaugurated by the Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.

Warranty cards, three being included with each tube, represent the focal item in the plan. For every copy of this warranty returned, the Service Man receives a prize certificate worth from one to three hundred prize points, depending on the size of the tube. There's a choice of over three hundred nationally-advertised prizes.

* * *

IDEA BUILDING SUBURBAN PLANT

A third 2-story plant, located in Lawrence, Ind., is under construction by the Industrial Development Engineering Associates, 55 N. New Jersey St., Indianapolis, Ind.



* * *

DAVE HARRIS VISITING WEST

Dave Harris, jobber sales manager of Cleveland Electronics, Inc., Cleveland, Ohio, is now on a five-weeks trip to the far west, calling on distributors with his representatives: Bill Connors, Denver; C. B. Parsons, Seattle; Les Logan, San Francisco; Harry Lasure, Los Angeles. Before returning he will attend the Pacific Electronic Exhibit.

* * *

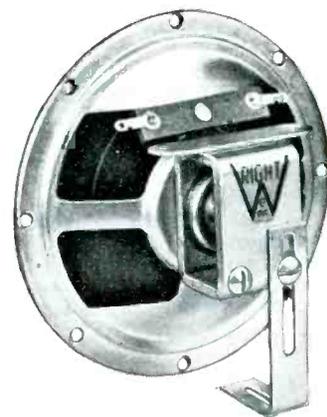
STANCOR TV REPLACEMENT CATALOG

A 28-page television catalog and replacement guide, listing more than 1500 models and chassis built under seventy-nine brand names, has been published by Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill.

In addition to listing all replacement items by model number, the catalog details the manufacturer's part number and Stancor stock number and identifies each by a 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.

At the Raytheon meeting: Allied's Jack P. Lizars, sales manager of dealer division; Al Brodsky, purchasing agent; Sandy Levey, general sales manager; J. Rubin, advertising manager; and Raytheon's F. E. Anderson, replacement tube sales manager; D. F. Reed, credit manager; J. A. Hickey, distributor sales engineer, and E. R. Haines, Chicago tube rep.



NP-510

WRIGHT

Verified Speakers

"The Serviceman's Friend"

Its multiple Adjustable Mounting Bracket makes the installation a cinch.

When it is installed it "stays put" and operates efficiently which pleases the radio set owner.

There is no better advertisement than a satisfied customer.

Write for literature

WRIGHT, Inc.

2235 University Ave., St. Paul 4, Minn.

SPECIFY BLACO
 (formerly BLACKBURN)

A-1 Ground Clamps

Fit 3/8" to 1 1/4" Pipe

ASK YOUR JOBBER
BLACO MANUFACTURING CO.
 (Formerly Blackburn Specialty Co.)

6525 EUCLID AVE., CLEVELAND 3, OHIO



RAYTHEON CHICAGO BONDED DEALER DINNER

At a recent Raytheon bonded-dealer dinner at the Hotel Stevens, Chicago, sponsored by the dealer division of Allied Radio Corp., a film, *Inside Straight*, was presented before an audience of over 200. The dinner was highlighted by a talk by E. I. Montague, Raytheon tube sales promotion manager, who described the bonded Service Man program as an effective means of assuring shop reliability and responsibility.

HYTRON BUDGET PLAN FOR PICTURE TUBES

An easy-budget plan providing for consumer purchases of picture tubes on a budget arrangement has been announced by the Hytron Radio and Electronics Co., Salem, Mass.

In the plan a national finance company with offices in all leading TV areas, will handle all the financial details. According to Hytron, there is no financial recourse . . . or protective hold-back of part of the budget loan for the Service Man or the distributor. The Service Man can get his cash in full, at once. The customer (under present government regulations) does not have to make a down payment. Service work may also be included in the budget loan for the purchase of a picture tube.

An extensive promotional and national advertising campaign to help the Service Man gain full value from this plan is now being formulated. Details on the budget plan are available from Hytron's advertising department.

* * *

WALSCO NOW IN NEW L.A. PLANT

A 31,000-square foot plant at 3225 Exposition Place, Los Angeles, was recently opened by Walsco.

Production facilities are said to include the newest fabricating, molding and packaging equipment for the Walsco line of radio, TV parts and antennas.



* * *

BOOKER AND BERKOWITZ NAMED VEE-D-X DIRECTORS

Dr. Henry G. Booker, professor of engineering at Cornell University, and recently appointed chairman of the U. S. Navy advisory board on antennas, and John M. Berkowitz, have been appointed to the board of directors of The LaPointe Plascomold Corp., Windsor Locks, Conn.



Dr. H. G. Booker

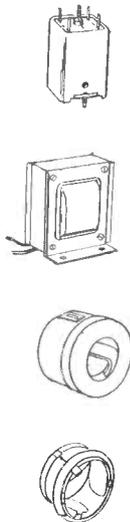
J. M. Berkowitz

* * *

SYLVANIA REPLACEMENT PICTURE-TUBE PROMOTION

Until September 1, Service Men who purchase three Sylvania picture tubes through authorized distributors, will receive a 40' extension and trouble light free. Extension cord and trouble light is molded of soft rubber and includes off-on switch and two outlets for plugging-in of radio or TV sets; test equipment; soldering iron or other electrical accessory.

It takes an RCA Original... to insure top TV performance



Performance-proved in millions of television receivers of many makes—RCA "original" TV components will cut your service call-backs and insure customer satisfaction. That's because RCA TV components are designed to work perfectly with the tube types and circuits used in the top television receivers . . . and rated to withstand abnormally high peak voltages.

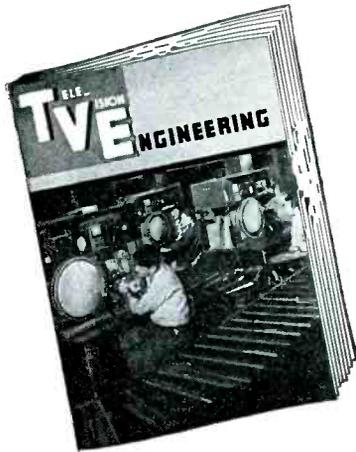
When replacements are called for . . . play safe . . . use genuine RCA television components . . . they cost no more than substitutes.

SEE YOUR LOCAL RCA PARTS DISTRIBUTOR
FOR "ORIGINAL" RCA TV COMPONENTS



RADIO CORPORATION of AMERICA
ELECTRONIC COMPONENTS HARRISON, N. J.

... if you are commercially or professionally interested in TV, you must read



TELEVISION ENGINEERING every month!

Devoted exclusively to TV Research . . . Design . . . Production . . . Operation . . . Instrumentation

TELEVISION ENGINEERING is the *only* trade publication which directs its *entire* editorial content to executives and engineers who design, manufacture, operate and maintain television receiving and transmitting equipment—both commercial and educational.

Every issue is chock full of timely and thorough TV articles, authored by outstanding specialists. You'll find practical, carefully prepared reports and papers on such vital subjects as . . .

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

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TeleVision Engineering
52 Vanderbilt Ave., New York 17, N. Y.

Here is my remittance for my subscription to TeleVision Engineering at the **SPECIAL RATE . . . 3 years (36 issues) only \$5.**

(1 year subscription \$3.)

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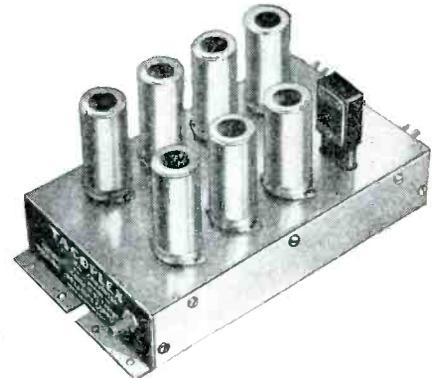
Nature of Business.....

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

TV Parts

TACO ISOLATION BOX

A non-powered isolation box for use with the Tacoplex antenna distribution system has been announced by Technical Appliance Corp., Sherburne, N. Y. Contains a matching network of resistors which provides an isolation factor between receivers of at least 30 db, with a minimum signal drop across the outlet. No power is said to be required as in the case of the cathode-follower-type of isolation box. Terminals are provided for 300-ohm twin-lead to the receiver.



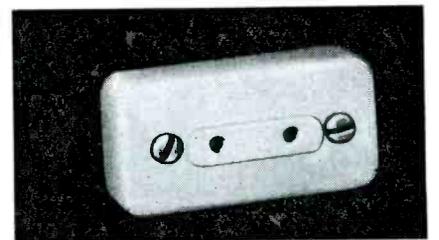
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MOSLEY UNIVERSAL TRANSMISSION LINE SOCKET

A universal socket, 343, that is said to provide a connection for standard 300-ohm transmission line, has been introduced by Mosley Electronics, 2125 Lackland Rd., Overland, Missouri.

Socket has a molded base of polystyrene and a plastic cover. Requires 1 3/4" x 7/8" mounting space, extending out 5/8" from the surface. Transmission line may enter the socket from any direction or may pass straight through.

Mounts with two wood screws or directly to a metal chassis without further insulation by substituting two 4/40 round head machine screws.



* * *

COLORTONE ADAPTER

A CBS field-sequential adapter providing conversion of the sweep frequency to higher frequencies, 144 cycles vertical and 29,160 cycles horizontal, for black and white reproduction of colorcasts has been announced by Colortone Television Co., Inc., 238 William St., New York 38, N. Y.

Three models are available: Model X-101 for 630 syncrolock; model X-202 for horizontal syncroguide; and model X-303 for horizontal multivibrator type chassis.

HICKOK TELEVISION VIDEOMETER

A video generator, model 650, designed as a test instrument to visually identify and localize trouble in any section of a TV receiver, independent of station operation, has been developed by the Hickok Electrical Instrument Co., 10521 Dupont Ave., Cleveland 8, Ohio.

Features crystal control and has output directly calibrated in microvolts. Contains line voltage scale and horizontal and vertical sawtooth voltages which can be directly substituted for vertical and horizontal oscillator in a TV receiver. Amplitude is said 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.

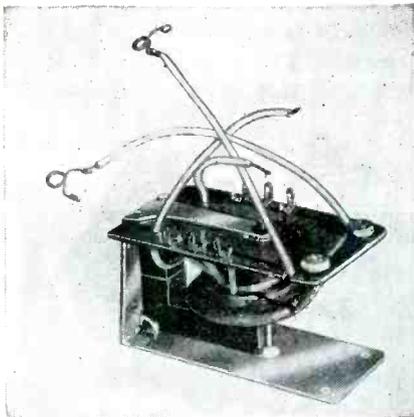
Instrument is also said to be suitable as a TV transmitter to simultaneously transfer a program to any number of TV receivers on any desired channel.

* * *

DUMONT HORIZONTAL DEFLECTION OUTPUT AND HV TRANSFORMER

A horizontal deflection output and high voltage transformer, type H1A1, is now available from the Allen B. DuMont Laboratories, Inc., 35 Market St., East Paterson, N. J.

Features a ferrite core and windings capable of supplying 12 to 13 kv to a 70° tube. May be mounted, in either horizontal or vertical position. Holes are provided for the use of No. 8 self-tapping screws.

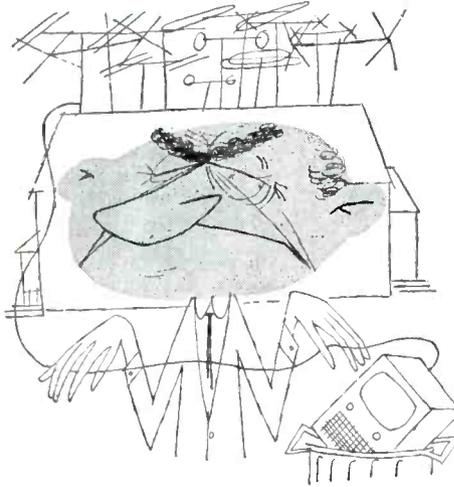
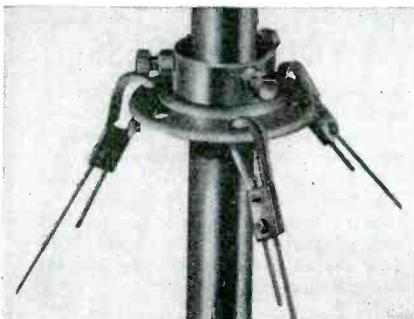


* * *

EASY-UP POLE RING

A rotating pole ring, model EZ-10, which mounts on the antenna pole as an anchor for guy wires, and is adjustable to fit from 1" to 2" poles, is now available from the Easy-Up Tower Co., Racine, Wis.

Inner ring clamps on the pole by three 3/8" bolts. Three thimbles to seat the guy wires, are provided, with choice of six locations on the ring for inserting them.



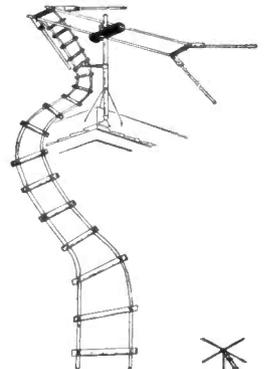
***@!\$* Hundreds of dollars for antennas and I lost all the signal in the \$*!%! lead-in!**

Don't nullify the advantages of costly antenna-receiver installations by loss of signal in the line. Specify the lead-in that's acclaimed everywhere; the line that guarantees lowest loss . . . holds the signal stronger on short or long runs (1/2 mile to mile with minimum loss) . . . resists disastrous atmospheric conditions indefinitely!

Next Time play safe with Permanent

OPEN LINE
and be assured of only
1/6 the LOSS

NOW AT A NEW LOW PRICE: Since its introduction, Open Line has taken the country by storm! Now, as the nation's lowest loss Open Line TV Wire, the tremendously increased production and demand has enabled us to reduce the list price substantially. Ask your rep to give you the good news!



Through Your Distributor - or Write:



Now in Our New Home: 102 PROSPECT AVE., BURBANK, CAL., ROckwell 9-2562

DUOTONE COLOR SCREEN

A tricolor screen, *Kolorvision*, that is claimed to provide color to black and white images has been developed by the Duotone Co., Locust St., Keyport, N. J. Screens are said to be available for all picture-tube sizes.

* * *

CELOMAT COLOR CONVERTER KIT

A color converter kit, the *Vue Scope*, designed to receive CBS color television, has been announced by the Celomat Corp., 521 W. 23 St., New York City.

Kit consists of a color disc made of red, blue and green Fibestos plastic sheeting, a manual synchronization unit, fractional horse power motor, assembly brackets, and instructions for assembling.

STANLEY BOOSTER

A 6J6 tuned-circuit TV booster, 16B, SEC, has been announced by Stanley Sales, 600 West Third St., Owensboro, Ky. Input and output, 75-300 ohms. Height 4 1/2", width 6", depth 4".



D ANDEE FOR THE TIGHT SPOTS

**Tight spot?
Especially for a
multiple-section
electrolytic?
And the job's got
to stand up,
regardless?**



Your best bet is the new SMALLER Type PRS Dandee. Metal-can electrolytic. Single, dual, triple and quad combinations. Stranded-wire leads and safety sleeves. High-purity aluminum. Vented. Ask your Aerovox jobber for PRS Dandeeds!



FOR RADIO-ELECTRONIC INDUSTRIAL APPLICATIONS

**AEROVOX CORPORATION
NEW BEDFORD, MASS., U. S. A.
Export: 41 E. 42nd St., New York, N. Y.
Cable Address: AEROCAP, N. Y.
In Canada: AEROVOX CANADA LTD.
Hamilton, Ont.**

NATIONAL UNION PORTABLE PICTURE TUBE CHECKER

A portable checker for picture tubes has been announced by the National Union Radio Corp., 350 Scotland Road, Orange, New Jersey.

Checker is designed for use not only in the shop but also in the customer's home. Checker tests independently of the set, and thus it is not necessary that the TV set be in an operative condition. Picture tubes can be tested in the carton without removal.

Instrument utilizes a beam current test which is proportional to the light output capability of the tube. It provides also for continuity and short checking of the electron gun.

Checks magnetically-deflected tubes, both electrostatically and magnetically focused; electrostatically-deflected tubes. Also checks for control grid continuity, control grid-to-cathode and heater-to-cathode shorts and for air tubes (leakers commonly called gassy).



* * *

JAVEX RF HV INDICATOR

A pocket-size instrument which is said to provide a check for high-voltage presence has been announced by the Javex Co., Garland, Texas. In application the unit is probed through the back of the set into the immediate vicinity of the high voltage power supply.



* * *

TURNER BOOSTER

A TV booster, TV-1, has been announced by the Turner Company, Cedar Rapids, Iowa.

Booster employs the *Cascode* circuit. Supplied complete with twin-lead lines. Terminal strip accommodates either 75-ohm coaxial or 300-ohm twin-lead transmission lines.



D RAKE Pee Wee

the mighty mite with
a PROFITABLE future



**FITS INTO A
TOOL KIT!**

ACTUAL SIZE
7 1/2 IN.

Yes sir! PeeWee in your kit means saved time—extra profits. A full 35 watts, with 3/16" tip, the Drake PeeWee gets right into those tight corners—has baffle plates to keep handle cool. Order from your distributor now.

**DRAKE ELECTRIC WORKS, INC.
3656 LINCOLN AVE. CHICAGO 13**

**big FREE
GIFT offer**

**SEE
PAGE**

27

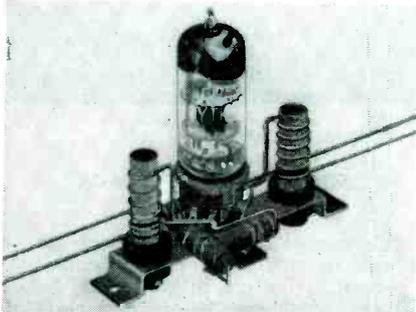
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Be sure to notify the Subscription Department of SERVICE at 52 Vanderbilt Avenue, New York 17, N. Y., giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

VEE-D-X TV OUTBOARD BOOSTER

A TV outboard booster that is said to increase the strength of incoming signals automatically without use of manual tuning controls, has been developed by The La Pointe Plascomold Corp., Windsor Locks, Conn.

Unit is claimed to provide signal strength on specific channels as much as 18 db, with full 5-mc bandwidth. Employs a push-pull cross-neutralized triode amplifier, which is said to prevent oscillation. Turns off automatically with the set.



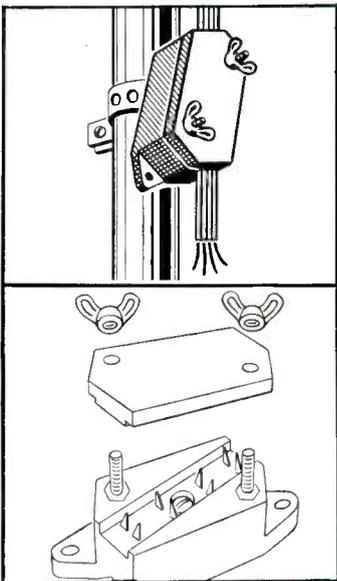
Vee-D-X single-channel outboard booster rf assembly.

* * *

JFD LIGHTNING ARRESTER FOR ROTATOR LEADIN

A 4-wire, 8-contact lightning arrester, model AT104, designed for television antenna rotator installations, has been developed by the JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y.

Unit has eight teeth which maintain double contact with each of four leadin wires. No wire cuttings, stripping or spreading of wires is said to be necessary. Lead is slipped in and the cover tightened down by means of two wing nuts. Balanced bleeder and gap electrical design grounds lightning charges.



* * *

TELERON INTERFERENCE ABSORBER

An interference absorber that is said to eliminate television interference, wave patterns, wavy lines, flickering, fading, negative pictures, static, etc., has been developed by the Teleron Co., 4996 Broadway, New York 34, N. Y.

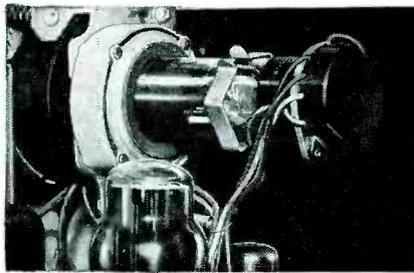
E-ZEE-ON

A NEW AND BETTER ION TRAP

"E-ZEE-ON" Already Standard on Many New TV Sets



Indiana's "E-ZEE-ON" Ion Traps. Four points of contact with tube neck provide positive grip. Easy to adjust — stays put! Instructions for use included in attractive protective package.



Here's another important development from the world's largest producer of permanent magnets — a slip-on, grip-snug Ion Trap that outperforms them all. It permits precise, ONE-HAND ADJUSTMENT . . . stays put and in adjustment because its weight is uniformly distributed. It's made of one piece permanently magnetized Cunife and can't be put on backward . . . requires no manual clamping . . . can't damage tube neck . . . eliminates danger of over-tightening.

"E-ZEE-ON" MORE EFFICIENT

Provides more uniform magnetic field pattern. This evenness of field pattern results in brighter, more uniform definition — easily attained by sliding "E-ZEE-ON" forward or backward on the tube neck. It's the essence of simplicity — one piece of Cunife, formed into an ingenious hexagonal "spring." Fits all tubes. Complete directions furnished with each "E-ZEE-ON" Trap.

Here-to-fore available only to manufacturers, "E-ZEE-ON" will now be stocked by your jobber.

Write for Descriptive Folder

"E-ZEE-ON" ADVANTAGES

- More Efficient, Uniform Field Pattern
- Brighter — More Even Tube Definition
- Easiest to Install and Adjust
- Won't Jar Loose or Slip

THE INDIANA STEEL PRODUCTS COMPANY

VALPARAISO, INDIANA

RMS YAGI ANTENNAS

A line of yagi antennas has been announced by Radio Merchandise Sales Inc., 1165 Southern Blvd., New York 59, N. Y. Featured are a snap-out construction, rib-reinforcement with double brackets, and the use of alloy aluminum.

Available are six models: SY, $\frac{3}{8}$ " elements, low band, 2 directors, 1 reflector; STY, $\frac{3}{8}$ " elements, low band, 3 directors, 1 reflector; SHY, $\frac{1}{2}$ " elements, low band, 2 directors, 1 reflector; SVY, $\frac{1}{2}$ " elements, low band, 3 directors, 1 reflector; Y, $\frac{3}{8}$ " elements, high band, 2 directors, 1 reflector; and TY, $\frac{3}{8}$ " elements, high band, 3 directors, 1 reflector.

GOODLINE COLOR AIRLEADS

Spaced airlead in bright red, pink, bright blue, baby blue, pastel green, chrome yellow, ivory, soft white, in addition to standard clear and brown for product identification is now available from Don Good, Inc., 1014 Fair Oaks Ave., South Pasadena, Calif.

Available in dimensions of .375" x .083", on reels of 100', 250', 500', 1000' and 2500'.

* * *

COLOR-VIDEO TRANSFORMER

A universal transformer which is said to enable a television receiver to be adapted to receive both standard black and white transmissions and the color transmissions in black and white with a flip of a switch, has been announced by Color-Video, Inc., 135 Broadway, New York, N. Y.

**a model
to fit any
application**

the antenna job hasn't
been found that a C-D SKYHAWK
ANTENNA can't handle.

Skyhawk
TV ANTENNAS



CORNELL-DUBILIER offers you,
the discriminating serviceman, a line of
antennas unequalled in completeness.
Regardless of the application, regardless
of the situation, there is a C-D SKY-
HAWK ANTENNA to fill the bill.
Don't risk inferior substitutes when you
can be sure of the painstaking
construction and outstanding performance
of CORNELL-DUBILIER antennas.

CORNELL-DUBILIER
ELECTRIC CORP.
SOUTH PLAINFIELD, N. J.



MARKEM TV SERVICE PAPER SYSTEM

A service system that is said to eliminate duplicate and nuisance calls, and provide field Service Men and telephone operators with complete case histories, has been released by the Markem Printing Co., 145 Hudson St., New York 13, N. Y.

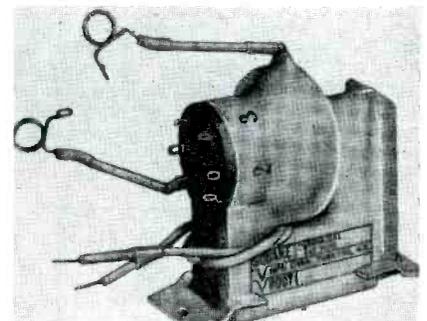


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SQUARE ROOT FLYBACK TRANSFORMERS

A series of ferrite-core flyback transformers encased in a plastic compound, *Coronaseal*, for use in conversion work, has been developed by the Square Root Manufacturing Corp., 391 Saw Mill River Road, Yonkers, N. Y. The encased transformer are said to eliminate corona and suppress ultrasonic singing at the horizontal sweep frequencies.

HV transformers *SR-11* for use in place of G. E. *77J1*, and *HTA* for RCA *223-T1*, are said to provide up to 14 kv at deflection angles from 52° to 72°. Type *SR-T1* may be used to replace RCA type *211-T1* in humid areas.



* * *

ELECTRO-VOICE TV DISTRIBUTION SYSTEM

A TV distribution system model 3100, that permits simultaneous operation of up to four receivers from a common antenna, has been announced by Electro-Voice, Inc., Buchanan, Michigan.

Unit is said to provide isolation between receivers to prevent interference from local oscillation. Six coax sockets are provided for four receiver outlets, the signal input and output.



RCA INDOOR-OUTDOOR LIGHTNING ARRESTER

A lightning arrester, type 215X1, designed for outdoor as well as indoor use has been developed and is now being marketed by the RCA tube department. Arrester is listed by the Underwriters Labs for both indoor and outdoor mounting.

A plastic and metal device, arrester is designed to match 300-ohm transmission lines. To install, transmission line is placed in an open slot in the plastic body, and the plastic cap is screwed down firmly, causing four prongs in the device to pierce the insulation and contact the wires.



Color TV

(Continued from page 17)

cently-announced tricolor tube might be adaptable to the system.

The RCA System

The RCA system breaks each scanning line up into a number of points and transmits the color information about each point in the proper sequence. For this reason it is called the dot-sequential system. The picture is actually broken up into millions of dots, the color scene being reproduced by progression of colored dots appearing on the receiver screen. In addition to having a large number of dots, the dots overlap each other by about 50%, insuring complete coverage of the scene in color. Because the dots are so small and because they are on the screen at the rate of 10.8 million dots per second, the flicker problems have been reduced to the point where they are imperceptible.

The RCA system has another feature designed to improve the definition of the system. The fine detail of a picture such as points, sharp edges and outlines are transmitted by the high-frequency components of the video signal. In this system the high-frequency components from 2 to 4 mc are filtered out and then they are added together. The result is called the mixed highs. The mixed highs are then added to the color video resulting in equal proportions of red, green and blue. This effect sharpens the contrast between adjacent areas, with the result that the picture has improved detail.

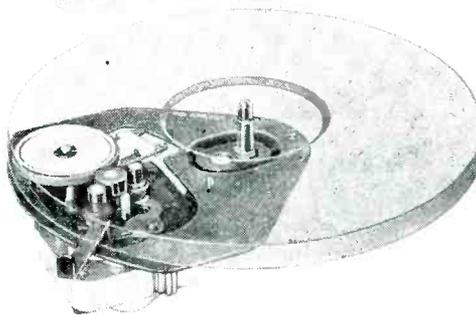
The CBS Method

In the CBS color system, vertical interlace is employed, just as in a black and white receiver, with the odd-numbered lines being transmitted in the first field and the even numbered lines being transmitted in the second field. As the camera scans the scene, a disc which is divided into six parts and alternately filled with red, blue, and green filters, rotates in front of the camera. As the odd lines are scanned, a red filter passes before the camera and the red coloring on the odd lines passes through the filter to the camera and is transmitted as red. When the next field then starts to scan the even lines, the blue filter passes before the camera, to be followed again by a green filter when the odd lines are again scanned in the third field. Thus, six fields are required to scan completely the odd and even lines in all three colors. The odd lines are scanned in red during the first field,

TOPS

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IN LONG LIFE**

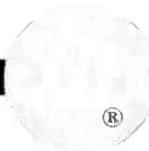
... in the 3-speed field



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Compact . . . foolproof . . . dependable . . . by every standard of comparison, the leader among all popularly-priced turntable units. It's General Industries' turret-type 3-speed phonomotor, available in manual type, as illustrated, and also to record-changer manufacturers.

Write today for complete information about this and General Industries' complete line of three-speed, dual-speed and single speed phonomotors, and the popular new GI Tape-Disc Recorder Assembly. Quantity price quotations furnished promptly upon request.



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in green during the third field and in blue during the fifth field. The even lines are scanned in blue during the second field, in red during the fourth field and in green during the sixth field.

At the receiver the process is reversed. A color wheel passes before the receiving tube in synchronization with the color fields being presented. That is, red passes before the tube as the red field is presented, green as the green field is presented and so on. The fields flash past the eye so quickly

that they seem to merge with the colors combining to give the original color scene.

Since the CBS system uses a slow color switching rate (144 fields a second), it does not have any registry problems. It takes six fields to make a color frame just as in the CTI system, but 144 fields a second, must be transmitted by CBS to provide 24 color frames per second instead of the 10 frames per second obtained in the CTI system. The vertical scanning

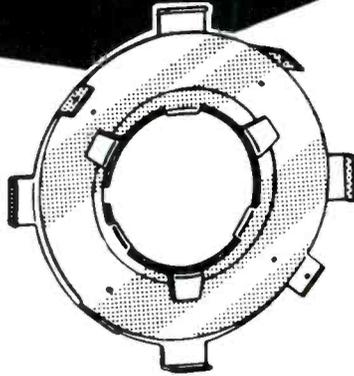
(Continued on page 50)

CENTER TV PICTURES in 3 seconds

with the NEW *BeamaJuster*

This efficient and easily installed Perfection centering device makes possible the centering of TV pictures in 3 seconds instead of 20 to 30 minutes. The BeamaJuster eliminates costly and complicated centering controls of the resistor type.

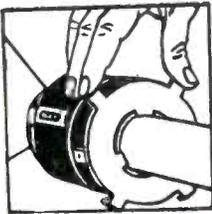
It also replaces mechanical centering controls which tilt the focus coil to center the picture and require numerous springs, wing



nuts and special brackets. No drifting of picture. Perfect for conversions from small to large size tubes. Easily installed.

1. Snap BeamaJuster on back cover of tube yoke. (Fits any size tube.)
2. Rotate BeamaJuster as shown here for approximate centering of picture.
3. Make final adjustment by sliding outer plate of BeamaJuster vertically or horizontally.

Order today from your supplier!



PERFECTION ELECTRIC COMPANY
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MAKERS OF PERFECTION SPEAKERS AND TELEVISION COMPONENTS



Color TV

(Continued from page 49)

frequency must, therefore, be changed. Also, to keep within a 6-megacycle bandwidth with 24 frames per second, it has been found necessary to cut the scanning lines down from 525 to 405 lines per picture. Therefore, internal modifications of the scanning frequencies are required on present receivers. The color wheel required at the receiver, must necessarily be quite large. Currently the wheels are recommended for ten-inch picture tubes. Employed with a magnifier, a 12½-inch image is available.

(In a subsequent discussion on color TV, there will be offered data on conversion circuits required for the CBS system; the color wheel (filters used, mechanical construction and motors to be used); the possibilities of a color drum (mechanical construction and tube mounting); description of a commercial color-TV receiver; the status of tricolor tubes and a review of color TV terminology (color break-up, color fringing, line crawl and color flicker).

Accelerated Testing

(Continued from page 19)

tor values without being seriously affected by usual value resistors and chokes connected in the circuit with the capacitors. A satisfactory impedance meter design is illustrated in Fig. 3. Meter *M* can be an ac type having a low voltage range, preferably from 3 to 8 volts. Resistor *R*, one watt, should have a value of about 160 ohms or of such value as to make the effective resistance of the meter and *R* in parallel about 160 ohms. Transformer *T* may be a bell ringer or universal output type, where a secondary voltage about the same as the maximum meter reading is available.

About half of the electrolytics bad enough to require replacement can be readily found with this test. Certainly capacitors which fail to show their approximate rated capacitance should be rejected, while those that appear to be down only some 10 to 15 per cent may be tagged as doubtful and given a followup check. Speed tests should not be used to find just how bad a part may be, but rather to find unquestionably defective units quickly. Whenever a part fails to pass a simple test, it must be judged unfit for service, and there's little point in making further tests to confirm the fact that the part is bad.

[In a subsequent installment, Greeley will describe the operational features of the leakage tester, and detail, too, how to construct a neon tester for vc trouble shooting, a hv tester for TV, etc.]

Superior's *new* TELEVISION BAR GENERATOR



**THROWS AN
ACTUAL BAR
PATTERN
ON ANY TV
RECEIVER
SCREEN!!**

TWO SIMPLE STEPS

1. Connect Bar Generator to Antenna Post of Any TV Receiver.
2. Plug Line Cord into A.C. Outlet and Throw Switch.

RESULTS—A stable never-shifting vertical or horizontal pattern projected on the screen of the TV receiver under test.

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New Parts . . . Instruments . . . Tools

CLAROSTAT 15/16" CONTROLS WITH ATTACHABLE SWITCH AND SHAFT

Smaller $\frac{15}{16}$ " diameter volume controls with the *Ad-A-Switch* feature, are now available from Clarostat.

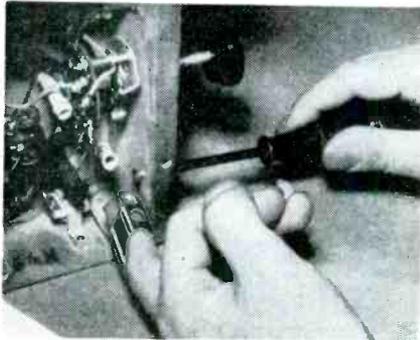
Series *SWB* ($\frac{15}{16}$ " Ad-A-Switch) is obtainable in *spst*, *three-way no off position spdt*, and *dpst*. To install switch a T-shaped section of the control's dust cap is pryed off, turned 90° and taken off, exposing the switch-throwing mechanism.

* * *

RCA FINGERTIP WRENCHES

A set of finger-tip wrenches is now being offered as part of the RCA tube department's promotion campaign.

Wrenches are worn on the finger and used to steady the nut or bolt as it is tightened or loosened. Each set consists of five wrenches for the most commonly used nut and bolt sizes ($\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", $\frac{11}{32}$ ", and $\frac{3}{8}$ ") and are adjustable for individual finger size. Available from local RCA tube distributors.



* * *

C-D TUBULAR CAPACITORS

A metallized-paper tubular line of capacitors, the *Pup*, *Scalpu* and *Metapu*, that feature self-healing characteristics, have been introduced by the Cornell-Dubilier Electric Corp., South Plainfield, N. J.

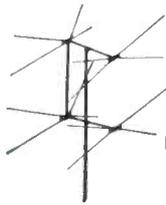
Pup is a metallized paper capacitor, with metal-end caps and enclosed in a wax-impregnated paper tube, and may be used over a temperature range from -40° to +60° C. Available in a range of nine capacities from .01 to 2 mfd at 200, 400, and 600 volts *d.c.w.*, with tube dimensions ranging from $\frac{3}{8}$ " x $\frac{3}{8}$ " to $\frac{11}{8}$ " x $2\frac{1}{8}$ " diameter and length.

*Scalpu*s are sealed against moisture. They range in size from .175" x $\frac{1}{8}$ " to .750" x $2\frac{3}{8}$ " diameter and length. Available from .01 to 2 mfd at 200, 400, and 600 volts *d.c.w.*

*Metapu*s are hermetically sealed metallized paper capacitors enclosed in a one-piece metal tubular case, pressure sealed, and available from .01 to 6 mfd at working voltages up to 600 volts *d.c.w.* Size ranges are from $\frac{3}{8}$ " x $\frac{1}{8}$ " to $1\frac{1}{4}$ " x $2\frac{1}{8}$ " diameter and length.

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Don't be sold an imitation OF THE "CONICAL-V-BEAM"*

BE BRAND CONSCIOUS — DEMAND a genuine TELREX for the ultimate in TV reception. Many imitations short cut and cheapen the product so that results are often disappointing.

The genuine TELREX "CONICAL-V-BEAM" is manufactured in 24 models—one to meet every TV reception problem, whether in a primary, secondary, fringe, or extreme fringe area.

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Millions of installations all over the Americas' attest to the Telrex claim that NO OTHER antenna can perform as well as a "Conical-V-Beam."

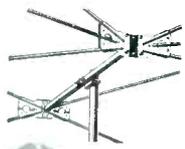
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SEE AND HEAR THE DIFFERENCE.

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"TELREX NEWS" can be mailed direct to your place of business. This timely service periodical contains the most authentic antenna technical data available. It's FREE — Write on your Company letterhead or post card with Company stamp.

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THE ABILITY
TO DELIVER**

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ASBURY PARK 4, NEW JERSEY

MULTIPLE-ANTENNA TEST SETUP



Scotte Gray, president of Scotte Gray, Inc., 111 North Lacienege Boulevard, Beverly Hills, Calif., and test gear used during recent installation of multiple antenna system in Taft, Calif., which will ultimately feed TV signals to a probable 1000 sets. Installation featured use of Simpson field strength signal meter to evaluate reception.

JEWELLED BOOSTER DISPLAY



At the I.D.E.A. (Regency booster) booth at the recent Parts Show where jewels from C. D. Peacock, valued at \$38,400.00 were on display. Gems were delivered each morning and removed each night by armed guards from Brinks Inc. On duty all day was a Pinkerton guard.



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... fill the need for all today's ceramic capacitor requirements in AM-FM Radio and TV ... plus — their ability to better replace paper and molded mica capacitors in a multitude of applications, such as by-passing, coupling, tone compensation, and as AVC filter.



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New 1951 Catalog
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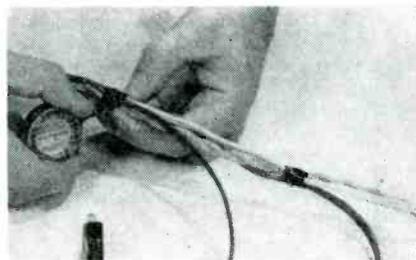
Electronics Division
ERIE RESISTOR CORP., ERIE, PA.
LONDON, ENGLAND • TORONTO, CANADA

SCOTCH ELECTRICAL TAPE

Electrical tape, 33 *Scotch* brand, that is said to be waterproof, has been introduced by the Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

Tape is black and glossy, with a smooth surface, and is said to have a dielectric strength of 10,000 volts and an insulation resistance of 200,000 megohms.

Tape is described as resistant to water, oil and chemicals, and able to withstand temperatures up to 170°F. It has a stretchy, rubbery backing of vinyl plastic. Available in a 150-inch roll of half-inch wide tape.



* * *

EICO 1000 OHMS/VOLT MULTIMETER

A 1000-ohm/volt multimeter, model 526, in kit or factory wired form, featuring 31 ranges, with a 0 to 1 range in both *ac* and *dc* voltage ranges, is now available from the Electronic Instrument Co., Inc., 276 Newport St., Brooklyn 12, N. Y.

Meter has a 400-ma movement, and resistors are said to have a 1% accuracy. Integral dual rectifier has separate low and high voltage calibration in *ac* ranges. Ranges: *ac* and *dc* voltage ... 0 to 1, 5, 10, 50, 100, 500, 5000, at 1000 ohms/volt; *dc* resistance ... R x 1, R x 10, low ohms; *ac* and *dc* current ... 0-1 ma, 10 ma, 0.1a, 1a; *db* ranges ... -20 to +69 db; *dc* accuracy ... -3% of full scale; *ac* accuracy ... ±5% of full scale.



* * *

CECO VC-CONTACT RESTORER

A volume control and contact restorer, *Ever-Quiet*, which is claimed to restore contact to potentiometers, continuous tuners, switch-type front ends, contact points, record changers, relays etc. has been announced by Chemical Electronics Corp., 521 Fifth Avenue, N. Y. C.

Chemical is a clear liquid which deposits a hard-bonded, dry lubricating surface that does not flake off.

[Additional New-Product news on page 55.]

HEATHKITS OFFER UNMATCHED ADVANTAGES

You'll find unmatched advantages in HEATHKITS—the most complete line of test equipment in kit form. Careful engineering and extensive laboratory testing in the development of each kit, coupled with the use of only highest quality components give you RUGGED, DEPENDABLE, and ACCURATE test equipment.

You SAVE MONEY when you build your own because all expensive factory wiring and construction costs are completely eliminated ... All kits are COMPLETE and a real pleasure to build—Every part necessary is furnished—and the clear, detailed instruction manual makes construction easy and educational. (And, the finished kits are truly professional in appearance.) Order your HEATHKIT today and enjoy these tremendous advantages!

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- Heathkit VACUUM TUBE VOLTMETER KIT \$23.50
- Heathkit TV ALIGNMENT GENERATOR KIT \$39.50
- Heathkit SIGNAL TRACER KIT \$19.50
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- Heathkit AUDIO GENERATOR KIT \$34.50
- Heathkit IMPEDANCE BRIDGE KIT \$69.50
- Heathkit RF SIGNAL GENERATOR KIT \$19.50
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- Heathkit HANDITESTER KIT \$13.50

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Association News

NETSDA

AN EXCELLENT COMMENTARY on the requirements of the service industry was presented by Dave Krantz, during the recent Parts Show in Chicago. Appearing as a representative of the National Electronic Technicians and Service Dealers Association, before the RTMA servicing committee, he outlined many problems now confronting the industry. Discussing education, for instance, Krantz pointed out that there is a need for an overall training program on television, the ultrahighs and color. Such a program, he said, can be carried out successfully with the full cooperation of manufacturers, distributors and local educators, with the assistance of localized technical groups where they exist. It was emphasized that such a program must be a well-planned project and of a continuing nature.

Reviewing the distribution of replacement parts, Krantz declared that it is the manufacturers obligation to see that either a sufficient number of replacement components for all models are available, or that information on suitable replacements can be readily obtained.

It was also pointed out that markings unfortunately have not received the attention they should. Specifically, Krantz said, there is a need for more legible and permanent markings on tubes and parts (replacement numbers and values), and number and value markings, where they can be seen without removing the chassis.

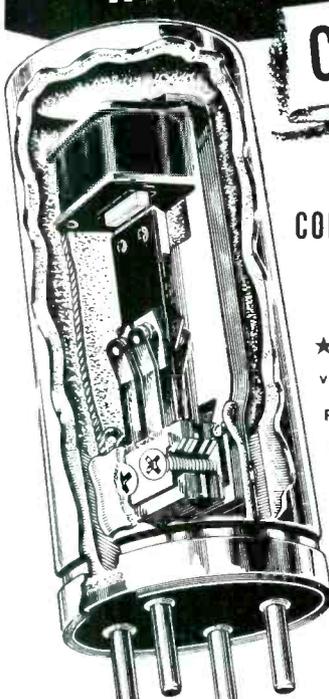
Other production features which NETSDA felt manufacturers should provide are: readily accessible component parts and wiring; standardized couplings for controls; elimination of the mounting of tubes under the chassis; standardized fuse sizes; discontinuance of the placement of tubes under the picture tube or yoke mountings; use of protective covers on all metal picture tubes; installation of fuses in high-voltage cages, and only in removable clips; frequency marking on the *if* and discriminator transformer, etc.

Declaring that national advertising represents another major factor of concern to Service Men, Krantz noted that set makers should avoid exaggerated statements in regard to performance of receivers and ads declaring that . . . "It is so simple that all you need is a screw driver" . . . or the quotation of an approximate cost for service to connect or adapt a unit, etc.

THE Complete

REPLACEMENT VIBRATOR LINE

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COMPLETE because:

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- They are QUIETER in performance.
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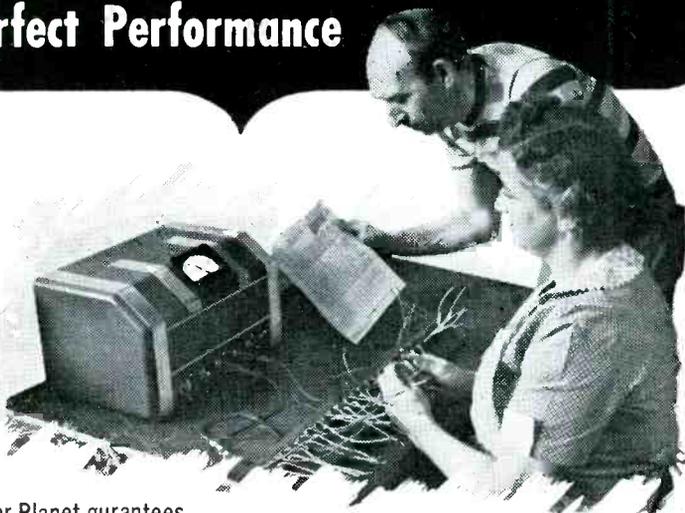
TEN YEARS AGO

From the Association News Page of SERVICE, July, 1941

THIRTEEN MEMBERS of the Danville, Ill., chapter attended the annual RSA convention and radio trade show in Chicago. . . . Suggested minimum prices for car-radio installation and for pushbutton resetting were established by the Duluth chapter of RSA. WEBC presented, on a daily basis, copy describing the facilities of members of the RSA chapter. . . . S. A. Frank was named chairman of the Freeport, Ill., chapter. Dale R. Roy became vice chairman and Winston F. Meyer, secretary-treasurer. . . . The Radio Servicemen's Association of

Pittsburgh held a meeting at the Roosevelt Hotel, which featured a talk on FM by members of Stromberg-Carlson. . . . Donald H. Stover was named national executive secretary of RSA, succeeding Joe Marty, Jr., who resigned to accept a position with a setmaker in Chicago. Kenneth A. Vaughn was elected president for '41-'42, and Edward H. Gordon was named vice president. Others elected included: Calvin W. Stapp, secretary, and Harold W. Cunningham, treasurer. . . . Arthur Sanborn of the Southern New Hampshire chapter, attended the annual RSA meeting in Chicago, and presented a report upon his return.

PLANET'S 100% Testing Guarantees Perfect Performance



No wonder Planet guarantees each capacitor for 1 year! For under the supervision of Planet's inspection and quality control director, a man with over 20-years of electrolytic experience, each unit must be perfect or be rejected. (The fact that less than 1/10 of 1% are rejects proves Planet quality control throughout production.)

Each capacitor is 100% tested for leakage, capacity and mechanical defects, so that when you specify Planet capacitors you are guaranteed perfect performance or we replace.

For complete information send for free catalog C-2

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225 Belleville Avenue, Bloomfield, N. J.



Printed-Circuit AM PORTABLE

by WYN MARTIN

[See Front Cover]

PORTABLE-RECEIVER DESIGN, believed by many to have been completely neglected with the race to make TV chassis, actually has been receiving dominant attention in many plants, with many novel features included in the set lines. An interesting illustration of this trend appears in the Admiral 4W18, 4W19 and 4T11 models, the basic circuit of which is diagrammed on the front cover this month.

One of the most significant innovations in the chassis is a printed circuit assembly which has been installed in the output of the 1U5 detector-*avc*-af amplifier, for coupling to a 3V4 amplifier. Five components are included in this couplet: two capacitors (.005 and 100-mmf) and three resistors (4.7, 1

and 2.2 megohms). Should a replacement be necessary, every effort should be made to duplicate this printed-circuit unit. However, in an emergency, the exact individual components can be used. The latter step may be a bit involved because of limited space and lead-length accommodations in that portion of the chassis.

Another interesting feature is the iron-core input coil, a pickup component which has become quite popular in not only portables, but table models, too. It has been found that these coils provide substantially increased gain over standard loops, which have been a standard for years. Actually, the coil is a ferrite-core rod whose Q is quite high.

Either batteries or line supply can be used. In the latter instance, a selenium rectifier is used in the *ac* or *dc* line, and 120 volts provided in the plus output.

When aligning these chassis, with battery power, batteries should be fresh. When using *ac*, an isolation transformer is recommended. If such a transformer is not available, a .1-mfd capacitor must be connected in series with the signal-generator low side to the *B-* or pin 7 of the 1U5 detector tube. An output meter should be connected across the speaker voice coil, and the lowest setting of the signal generator, capable of producing adequate output meter indication, used.

These models employ an unusual dial mechanism which is operated by a push button, which works a trigger-release bracket. The trigger bracket releases the dial assembly. A thrust of a lever-arm roller against the cam on the back of the dial causes the dial to pop up, while a protruding edge on the lever arm simultaneously trips or turns on the *on-off* switch.

SPRAGUE ELECTRIC 25TH ANNIVERSARY



At recent celebration of the 25th anniversary of the founding of the Sprague Electric Company, North Adams, Mass., which featured presentation of a huge cake, the first slice of which was presented by Sprague prexy Robert Sprague to grandson Robert C. Sprague III, with Robert C. Sprague, Jr. looking on. Also participating in the ceremonies were vice president Julian K. Sprague (second from left) and Miss Mollie Avery, now assistant secretary of the company, and its first employee when the business was founded in Quincy, Mass.

TELREX ANTENNA AIR-SHIPMENT SERVICE



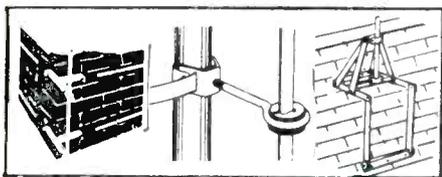
Edward I. Brown (extreme left), Monmouth County Airport owner, and Edward Brodstein, Asbury Park Postmaster, loading a shipment of Telrex antennas aboard inaugural All American Airways DC-3 flight from Asbury Park, N. J., for delivery to W. Dandreta and Co., Providence, R. I.

Scrap Shortage May Cause Mill Restriction In Future

Use Of Steel Strapping
Restricted In Future

DON'T GET CAUGHT!

In 9 out of 10 cases, the present overloaded inventories won't last more than a few weeks when Fall business booms! Smart jobbers and dealers are preparing now to lick the coming squeeze on materials. Protect yourself by ordering today...and don't get caught!



Broader Allocation

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TOMORROW, ORDER
PHOENIX
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TODAY!**

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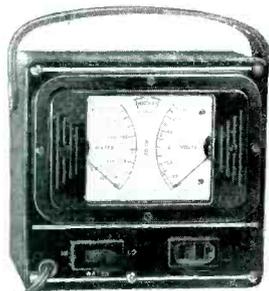
**SEE
PAGE**

27

TRIPLETT LOAD-CHECK METER

A load-check meter, model 660, which provides power consumption measurement in short or open circuits, has been announced by The Triplett Electrical Instrument Co., Bluffton, Ohio.

Ranges, ac or dc, are: watts, 0-500, 0-1000; volts, 0-130. Double meter indication is said to permit simultaneous check of line voltage and power.

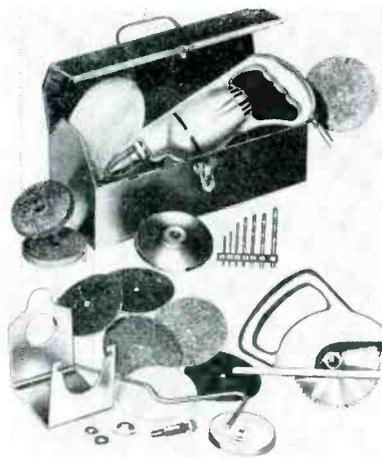


* * *

KAPNER POWER TOOL COMBINATION SET

A 1/4" electric drill with more than twenty attachments has been announced by Kapner Hardware, Inc., 2248 Second Ave., N. Y. 29, N. Y.

Attachments available are: 4" portable electric saw, 4" saw blade, lambs wool bonnet, 6 sanding disks, 7 assorted drills, steel arbor and attachments, cloth buffing wheel, grinding wheel and wire wheel brush, steel paint mixer, steel bench stand and a portable steel carrying case.

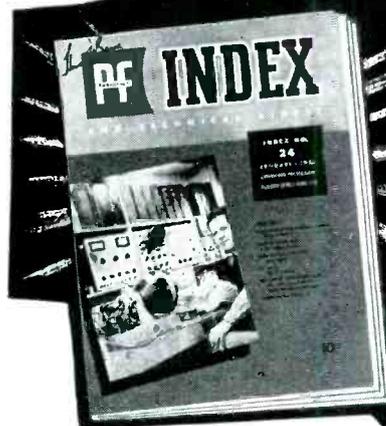


CANADIANS TO MAKE BRACH GEAR



At recent signing of a licensing agreement authorizing the Campbell Manufacturing Co., 45 Sheppard Ave., Lansing, Ontario, Canada, to produce Brach TV antennas and master antenna system products in Canada: Ira Kamen (right), director of TV development and promotion for Brach and Peter Posnikoff (left), manager of the radio division of Campbell.

FREE to Radio-TV Service Technicians



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JOTS AND FLASHES

COLOR TV, which has been quite a headline item since the high-court whirling wheel decision in Washington, was recently described as *legally here now*, but realistically still around a long corner from the marketplace, by *Frank Freimann*, president of Magnavox. Declaring that while the industry as a whole believes in the future of color TV, the Magnavox executive pointed out that the transition to color . . . "will come only after a marketable system and product have been developed and market tested." . . . A practical discussion of the present status of color TV appears in this issue on page 16. . . . At a recent meeting in the Hotel Statler before distributors, dealers and Service Men, *Doug Carpenter*, Vee-D-X engineer, analyzed antenna installations and their effect upon business. Antenna types discussed included the double-V, extended conical and the stacked colinear array, which it was noted is now being used for ultrahigh reception in the Bridgeport, Conn., test area. Also at the meeting were *Ben Joseph*, Vee-D-X metropolitan rep, and *Fred Hess*, Vee-D-X sales manager. . . . *Conti Advertising Agency* have been appointed to handle the advertising of *John F. Rider, Publisher, Inc.*, 480 Canal St., New York 13, N. Y. . . . Recent issues of the *Burlingame-Brujac Digest* have contained discussions of recently announced color-TV instruments, magnetic recording heads, projection scopes, etc. . . . Corner design and yagi antennas, produced by *Taco*, have been used during many official industry tests conducted in Bridgeport. . . . Eighteen supplementary pages to the *G. E.* radio and TV replacement parts catalog have been mailed to distributors, and catalog holders, according to an announcement by *E. A. Malling*, parts sales manager for the receiving division. The pages contain details on all postwar *G. E.* broadcast and television receivers. . . . A subsidiary of *Television Engineers, Inc.*, the *Safeway Service System, Inc.*, located at 28 Ionia S.W., Grand Rapids, Mich., has been announced by *Morton Binder*, TE prexy. . . . The second annual convention and exhibition of *VEDA* will be held in the Cleveland public auditorium, with the exhibition on September 11, 12 and 13, and the educational program on 10, 11 and 12. . . . *Solomon Zimmerman* is now on the development engineering staff of the *JFD Manufacturing Co., Inc.*, 6101 Sixteenth Ave., Brooklyn 4, N. Y.



Mel Buehring (left), sales manager for Simpson Electric Company and Bob Burrows, sales manager for Thomas Electronics Inc., discussing recently announced bonus plan featuring awards of certificates which have cash value and can be used to purchase Simpson test equipment. A certificate is packed in each carton containing a Thomas picture tube. Bonus-plan banner shown is available to distributors from Thomas Electronics.

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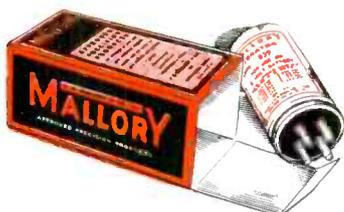
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