

# SERVICE

**12BE6**

Osc. - Conv.

**12BA6**

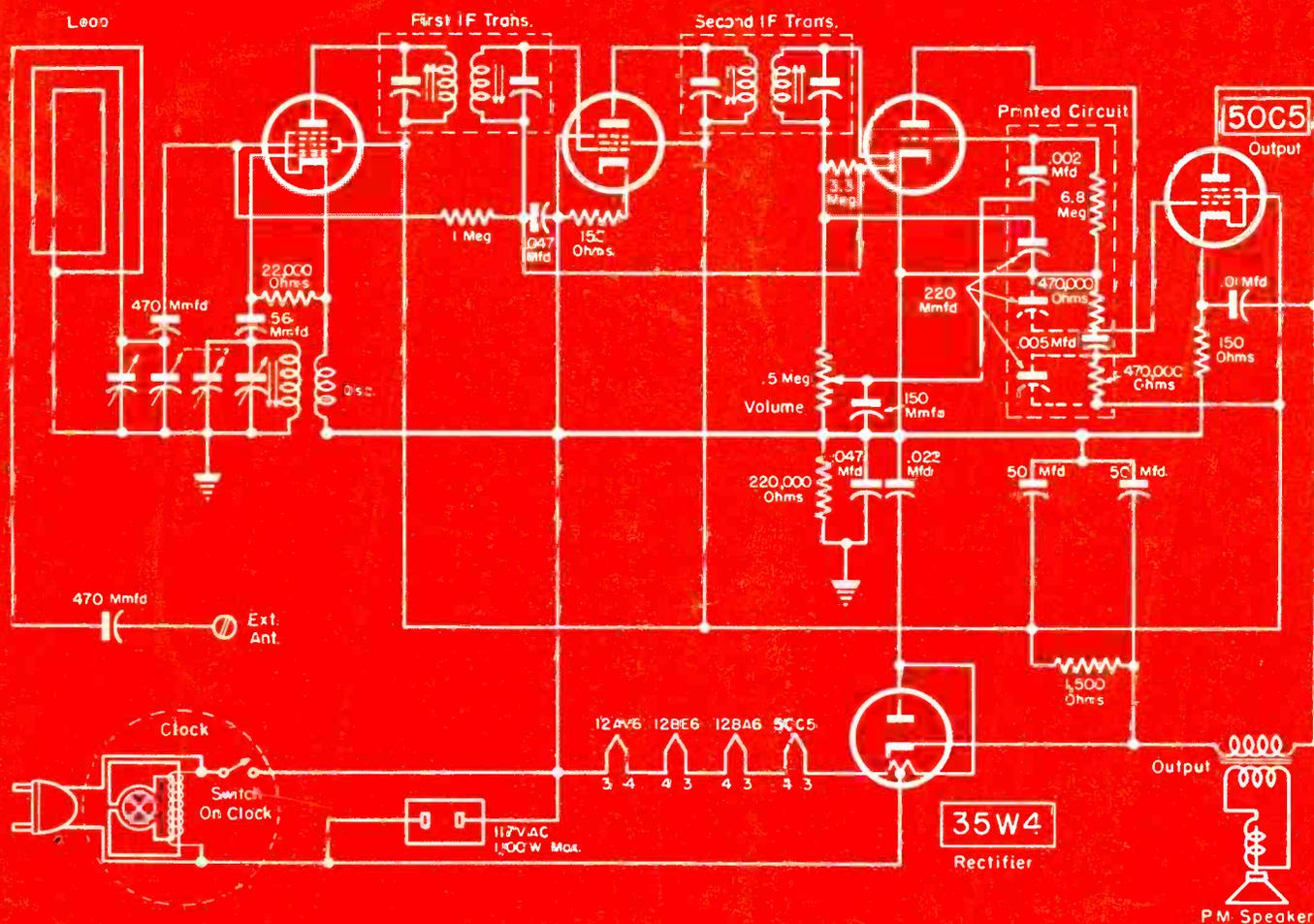
IF Amp.

**12AV6**

Det. AVC - First Audio

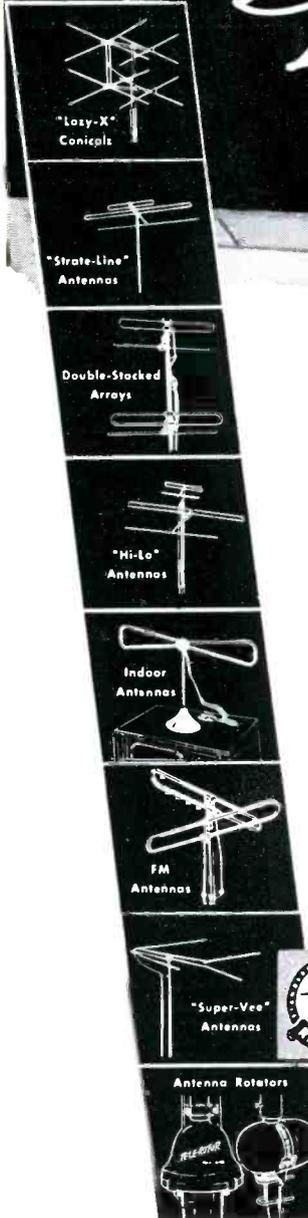
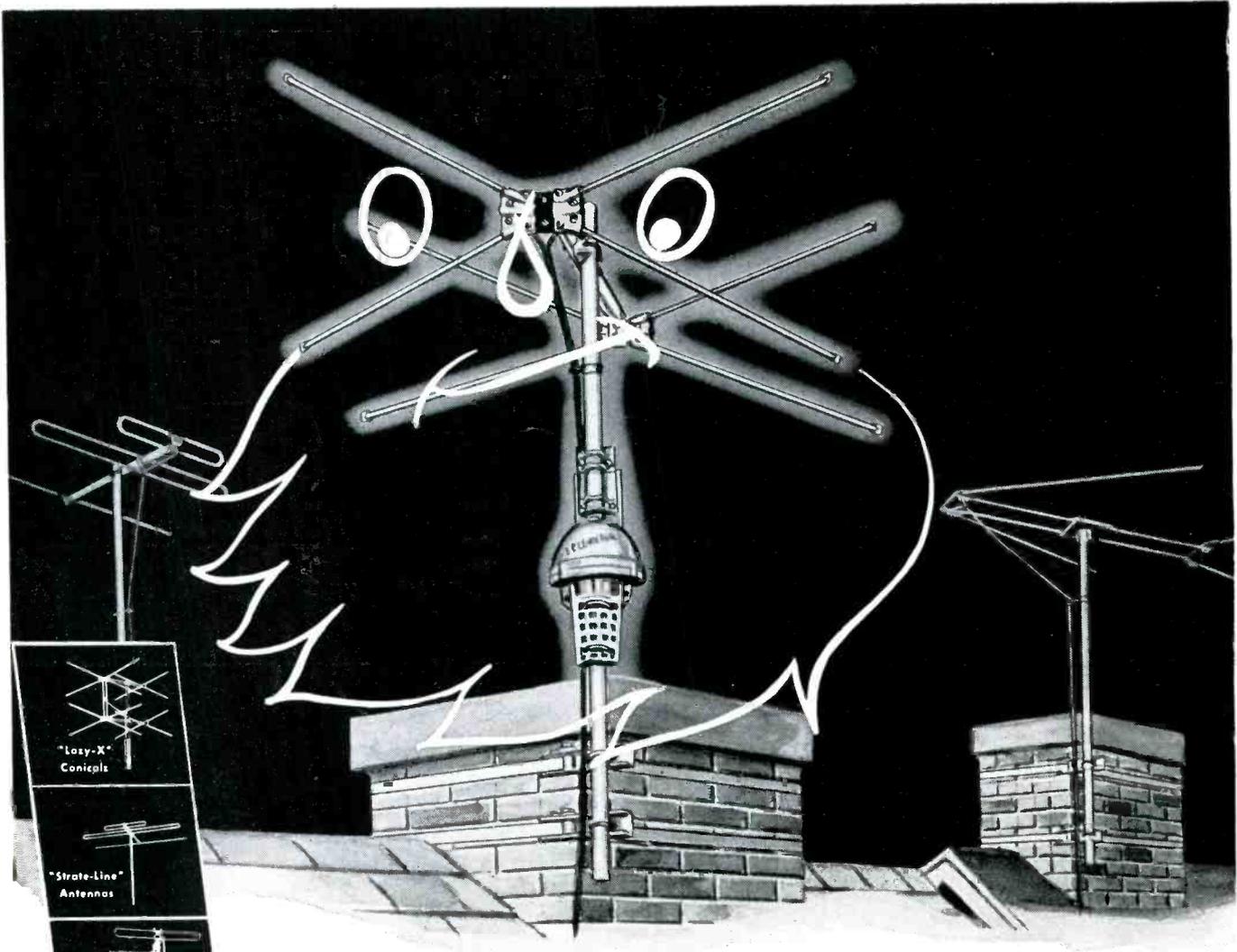
**MAY**

**1951**



Clock radio receiver with printed-circuit audio coupling assembly.

[See page 2]



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GENERAL  ELECTRIC

181-KAS

SERVICE, MAY, 1951 • 1

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Vol. 20, No. 5

RADIO · TELEVISION · ELECTRONIC  
**SERVICE**

May, 1951

**LEWIS WINNER**  
Editor

**F. WALEN**  
Assistant Editor

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

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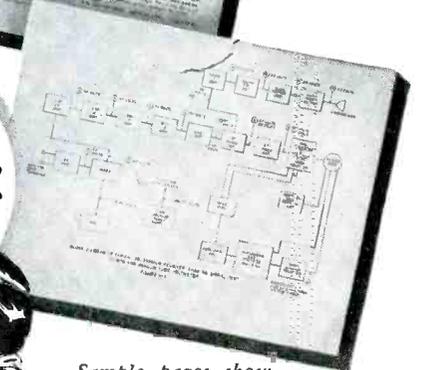
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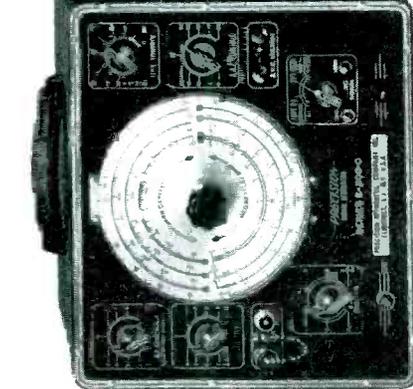
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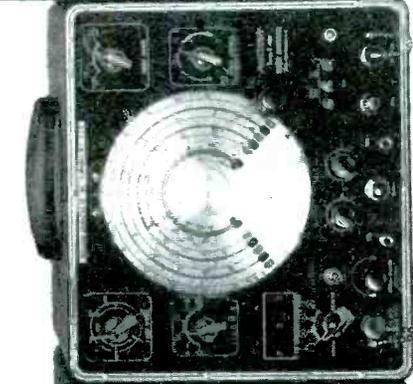
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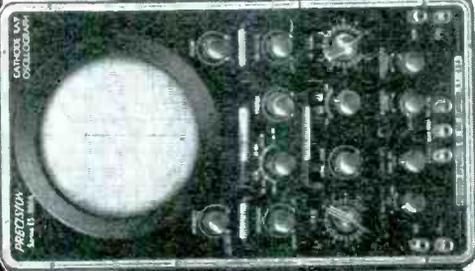
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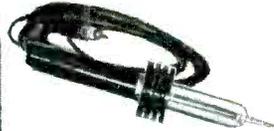
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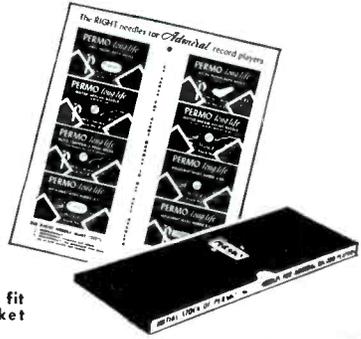
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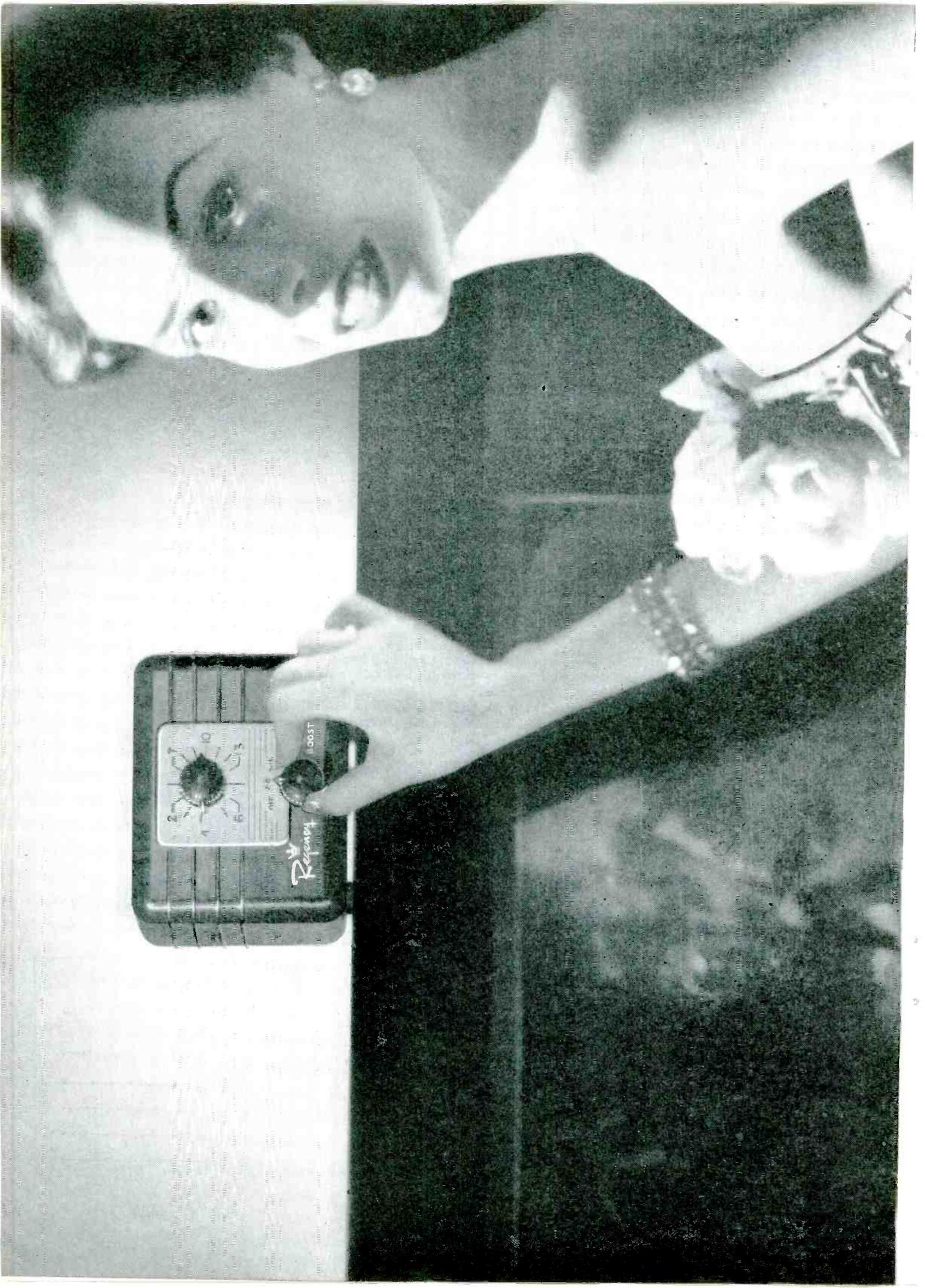
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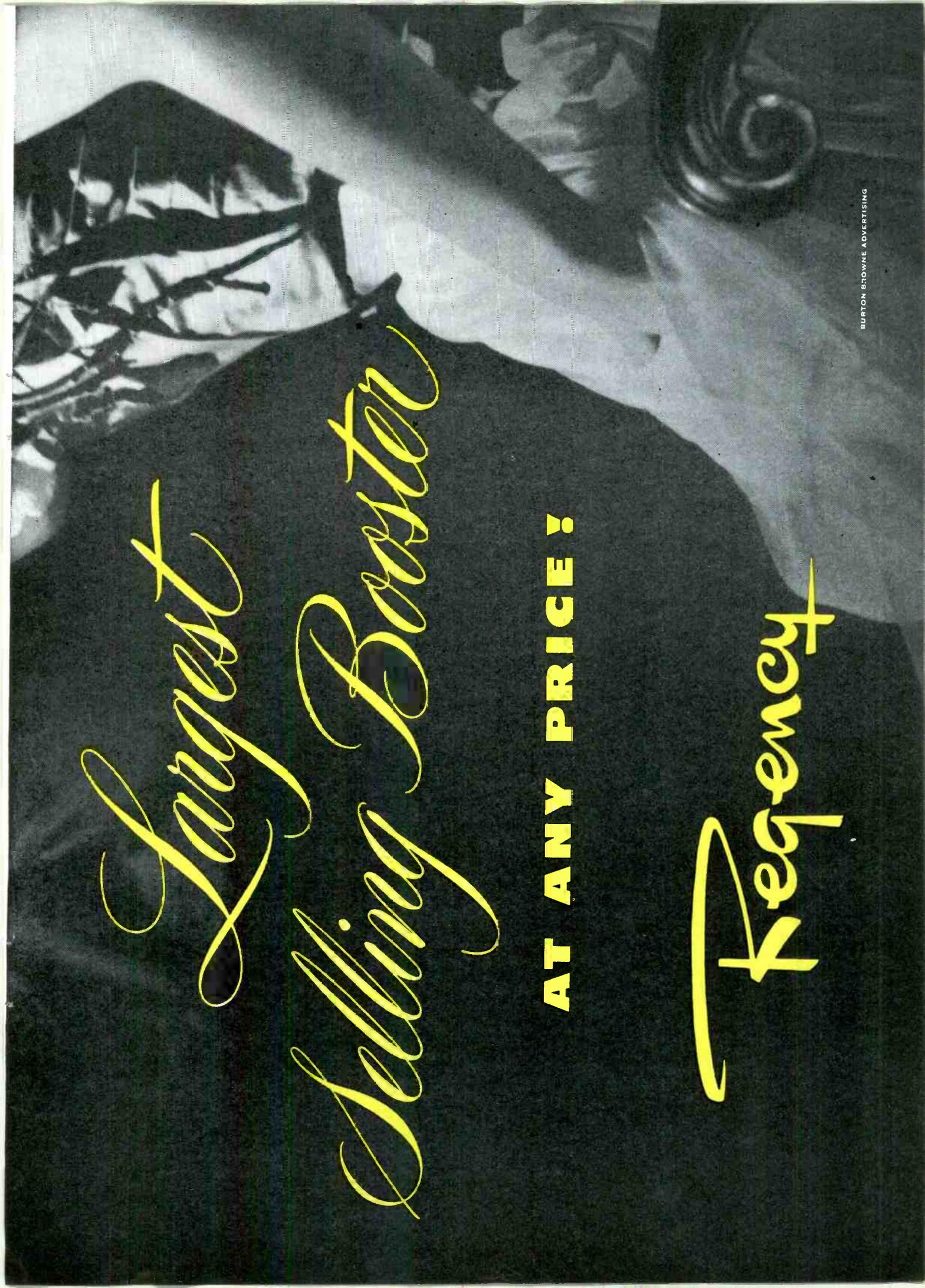
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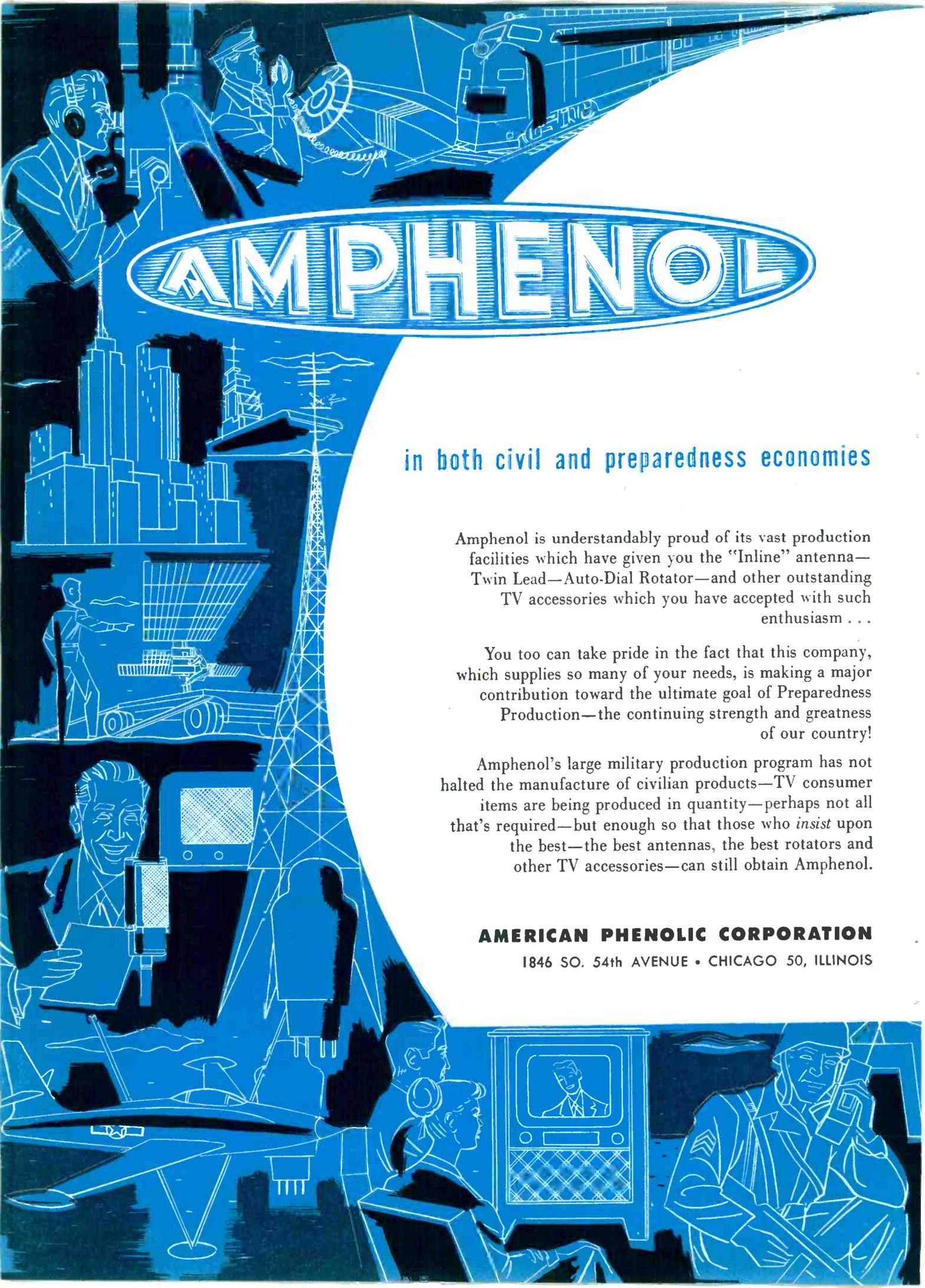




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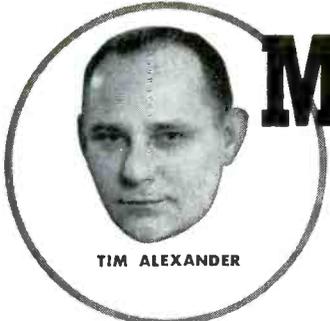
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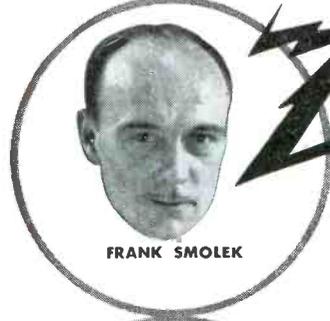
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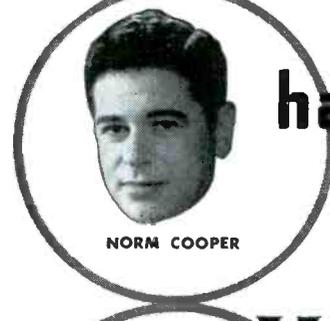
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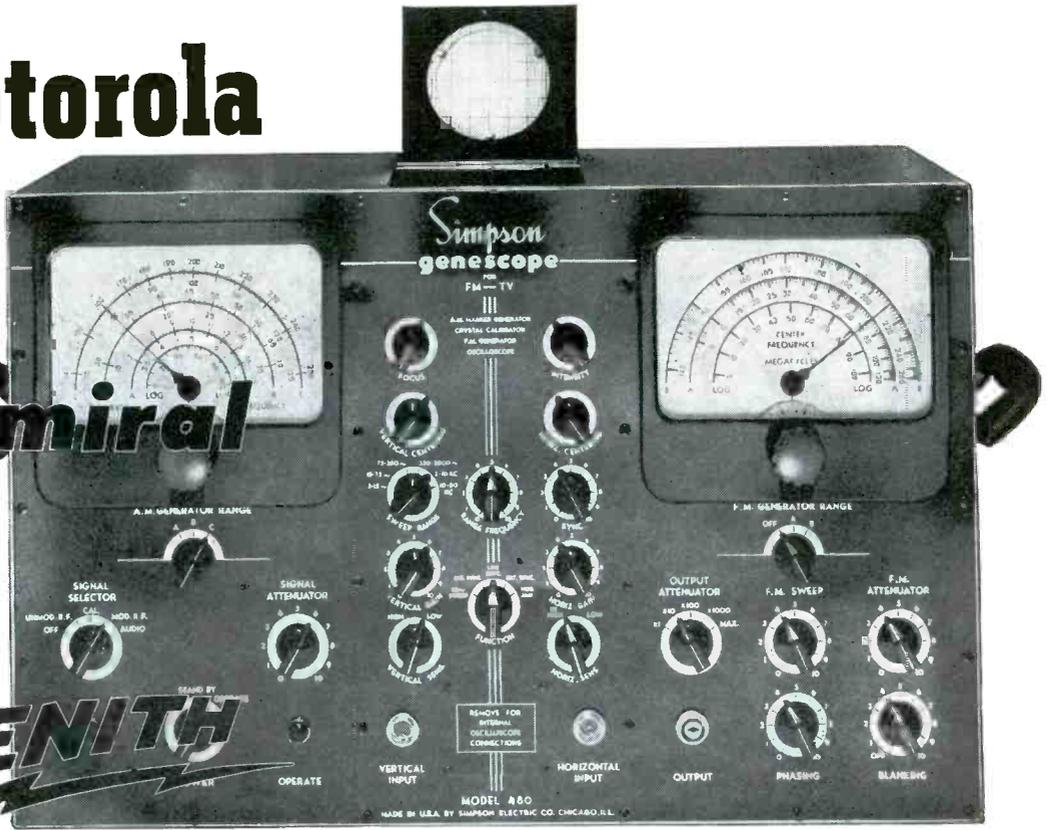
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Tilted Offset Gun

Indicator Ion Trap

Luxide (Black) Screen

Reflection-Proof Screen

Aluminized Tube



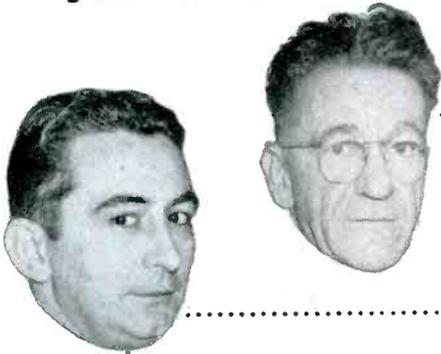


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Thomas **P**hoto-tron

the **Exact** original equipment!"

These executives, heading six of the biggest TV service organizations in the United States, represent the experience gained through hundreds of thousands of house calls and shop jobs. As presidents of companies employing hundreds of technicians they know the value of replacing picture tubes with the exact original equipment. Their experience proves that this exact replacement saves them money because it means fewer call-backs, longer set life and more satisfied customers.

THOMAS PHOTO-TRON Picture Tubes are the exact original equipment used by the 20 famous TV set makers listed below. Servicemen everywhere know you take no chance when you replace with Thomas because you replace with the exact tube you are taking out. If the set is not listed in the 20 famous brands listed below you make the set perform better by using a THOMAS PHOTO-TRON picture tube!



**TEST EQUIPMENT**

**BONUS PLAN**

Ask your THOMAS distributor for complete details on how you can obtain any Test Equipment *without cost*.



Thomas **P**hoto-tron

PICTURE  
TUBE



**THOMAS ELECTRONICS, Inc.**  
Passaic, New Jersey

*"I want to see  
Americans save . . ."*



**JOHN L. COLLYER**  
President, The B. F. Goodrich Company

*"I want to see Americans save for their own personal security, and I want to see them, as stockholders in our government, urge economy in all phases of our national life in order to provide national security against aggression."*

By their rapidly mounting participation in the Payroll Savings Plan, Americans *are* saving for their personal security, fighting the menace of inflation and making a major contribution to America's defense against aggression. In Mr. Collyer's own company 80% of the 38,000 employees throughout the company have already enrolled in the Plan, with two large divisions still to report.

As Chairman of the Ohio Payroll Savings Advisory Committee, Mr. Collyer knows what is being accomplished by leaders of industry, top management and labor in their joint effort to step up the Payroll Savings Plan. A few recent figures should be interesting to those not so familiar with the national picture:

- In the steel industry campaign, Carnegie-Illinois Steel Corporation (now U. S. Steel Company) recently raised its payroll participation from 18% of 100,000 employees to 77% . . . Columbia Steel Company of California went from 7.9% to 85.2% . . . American Bridge Company signed 92.8% of the workers in the large Ambridge plant . . . 87%

of Allegheny-Ludlum Steel Corporation's 14,000 employees are now on the Payroll Savings Plan . . . Crucible Steel Company of America, reinstating its plan, signed up 65% of its 14,500 employees.

- In the aviation industry, Hughes Aircraft Company went from 36% to 76%; Boeing Aircraft enrolled 10,000 new names before Christmas.

Some dollars and cents figures? In the last quarter of 1950, sales of \$25 E Bonds—the denomination so popular with payroll savers—increased 2.5% by 245,000 bonds more—over the last quarter of 1949.

If you do not have The Plan That Protects the personal security of your employees, the national economy and our country's defense, phone, write or wire to U. S. Treasury Department, Savings Bonds Division, Washington Building, Washington, D. C. Your State Director is ready to help you install a Payroll Savings Plan or step-up your employee participation.

*The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

**S E R V I C E**



# Everybody's Tuning it!

## "THE STANDARD BOOSTER"



Model B-51

## *in tune with the tuner*

The new and improved "Standard TV Booster" is daily winning greater acceptance by dealers and customers alike in every Television market.

Here is the booster that gives real customer satisfaction, superior performance, trouble-free operation. The Model B-51 is engineered by a company that has demonstrated the greatest TV tuner know-how in the business.

Have your local distributor show you the outstanding features and money-making possibilities of this great new "Standard TV Booster."

*Standard* COIL PRODUCTS CO. INC.

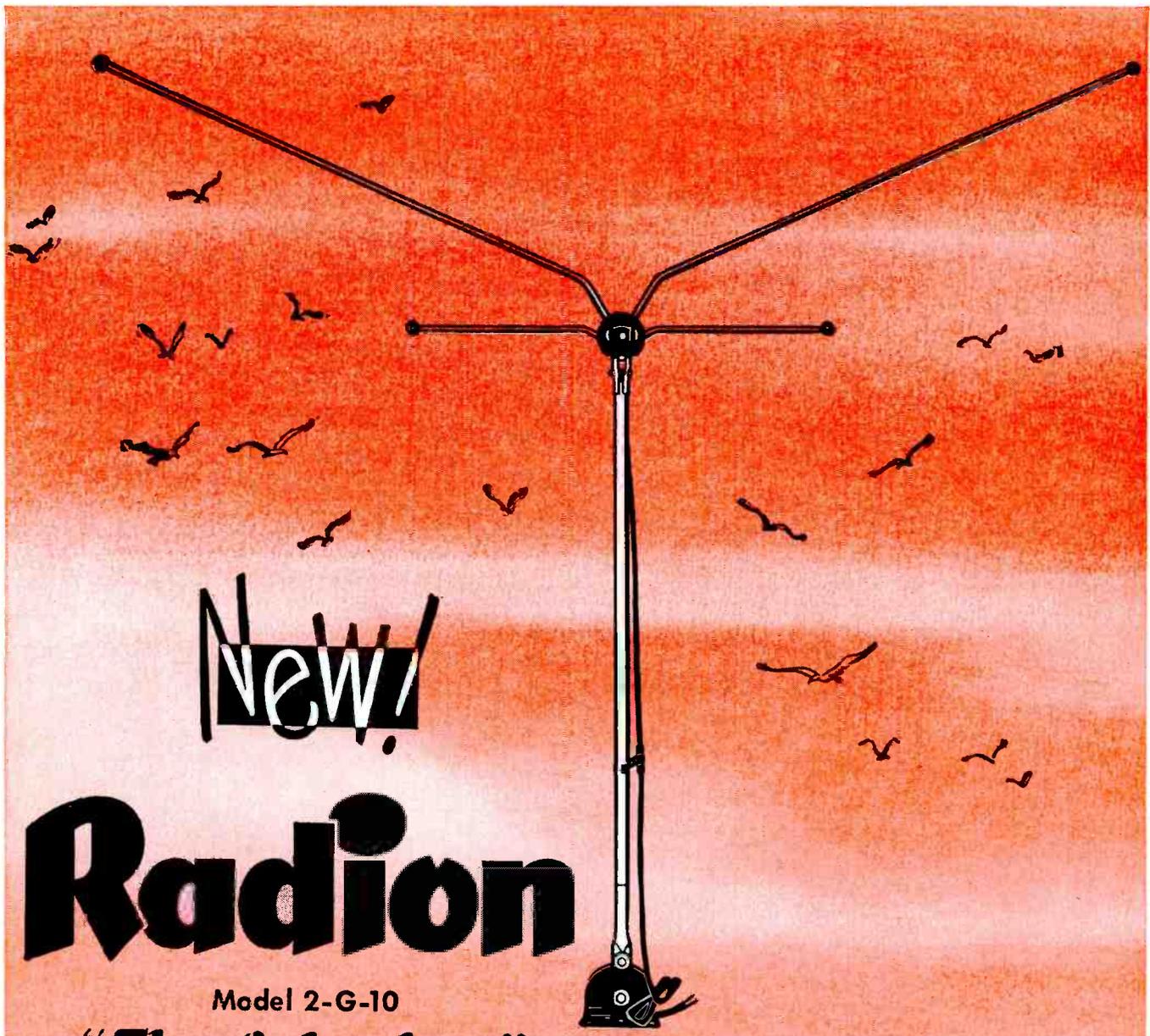
CHICAGO • LOS ANGELES • BANGOR, MICHIGAN



Millions of  
"Standard Tuners"  
now in use.

The "Standard Tuner" is used by over 75 TV set manufacturers. Nearly 50% of the TV sets made today are equipped with this outstanding front-end.

SEE US AT BOOTH 680  
PARTS SHOW—STEVENS HOTEL



**New!**

# Radion

Model 2-G-10

## "The Suburban"

Again, as so often in the past, *Radion* provides a terrifically effective "shot in the arm" for your TV set-sales! "*The Suburban*" cinches those outlying prospects for you as fast as close-in orders are cinched by that old established standard of the industry, *Radion* Model TA-49, "The Metropolitan."

*Radion* cuts installations from hours to minutes—kills that "high cost" bugaboo that slows up sales

—saves you time and money, helps build your sales volume. Ask your jobber! Or write direct. **TODAY!**

*The Suburban*—Model 2-G-10—Gull-wing conical antenna for up to 25 miles from transmitter, all channels. Copper coated steel with silver-gray baked enamel finish; plated hardware; universal mounting base for speedy installation on wall, roof, window or in the attic, with no tools needed except pliers and screwdriver.

Completely factory assembled with 300-ohm lead-in and necessary mounting hardware. Individually packaged. Packed six to a master carton; shipping weight, 28¼ lbs. List, \$12.50.

**2,000,000 RADIONS**

HAVE PAID GOOD PROFITS TO DEALERS!

*Write:*

THE RADION CORPORATION, 1137 MILWAUKEE AVE., CHICAGO 22, ILLINOIS

RADIO · TELEVISION · ELECTRONIC  
**SERVICE**

### Operation Confusion

WHEN THE FCC issued its highband plan, which also suggested some reshuffling of the veryhigh stations, the release was described as a proposal which industry was to study and discuss in a series of public hearings in Washington. There was no finality to the new channel assignments or to any of the allied band allocations prescribed. In short, the plan was offered as a possible solution to the freeze-ultrahigh problem . . . a blueprint, subject to modification or revision.

Unfortunately, there have been a few who have seen fit to blandly dismiss this interpretation, adopt the plan as one which will stand in its entirety, and apply this reasoning as the basis of sensational advertising campaigns, which have completely muddled all of the issues involved in this complex situation. The extravagant claims of one set manufacturer, in particular, have been extremely disturbing. In one series of ads, copy has *shouted* that the FCC has announced plans for 10 stations in that area . . . "3 in the new ultrahigh frequency channels!" The fact that the area involved has had 7 stations in operation for years was discounted. Nor was there any mention of the fact that the area might never ever have those three extra stations, or two extra stations, or even one. As a result of these ads, which incidentally were full-page size, Service Men were besieged by set owners, puzzled over what they should do or could do to receive these 10 stations as advertised.

Countless authorities have pointed out that a year or possibly two may pass before ultrahigh stations will go on the air. There is no immediacy in the program, and accordingly, any intimation that a host of new stations on the higher bands are coming on the air within a matter of months is simply misleading information.

There is no denying that there will be a national expansion of television, through the operation of perhaps up to 2,000 ultrahigh stations and many more veryhigh stations, too. However, even if the nation were not involved in a heavy defense program, and even if all manufacturers were able to ship transmitters promptly upon the issu-

ance of an allocation plan, months and months would pass before stations could begin operating, because of the legal and technical paper work required for processing applications for new stations, and the work involved in building transmitter houses, installing towers and the gear itself, and conducting extensive tests to insure maximum coverage. Since we are involved in a defense program which is restricting all-out civilian production, and since ultrahigh transmitters and accessories are not in warehouses ready for shipment, nor are there many even built, we, of course, can not expect a really early widespread inauguration of highband schedules.

According to the time estimates of those closely concerned with transmission equipment, the Spring of '52 might see the beginning of some ultrahigh operation, probably in those cities where there are no stations at present.

The new allocation plan in its full form will introduce a new era in TV, an era which will be resplendent with opportunities for everyone, particularly Service Men. It would be grand to be able to report that that era will begin tomorrow, but it will not. *Planning* for that era *can begin now* in a careful methodical manner, unaccompanied by flamboyant promises. Service Men can be of inestimable help to present and future set owners by offering an explanation of the time cycle situation, and also the accompanying problems existing now and destined to be with us for awhile.

It is hoped that set makers will avoid teaser, hippodrome type of *uhf* advertising in the future, which can only result in *operation confusion*.

### Advertising with Sterling Copy

THE SERVICE COMMITTEE of RTMA, some time ago, decided to prepare a series of advertisements which would explain to Mr. and Mrs. Consumer why there are ghosts, why some people have to have stacked antennas, why there is more interference in some areas than others, and so on, and what the Service Man could and could not do to overcome the problems involved. Recently these advertisements were completed, with messages which every Service Man will cheer.

In one of these ads, for instance, en-

titled . . . "Time to give up the ghost," and attractively illustrated with a ghost cartoon, the reader is told that here . . . "is a new kind of ghost. Different from Banquo's. . . Different from the game we used to play . . . in fact like no ghost we've ever known before. . . It's the TV ghost . . . that improper, that annoying double image you sometimes get on your television screen. It can all be explained technically . . . but you're more interested in chasing the ghost than in discovering from whence he comes. . . . So, here's the pitch. If plagued by ghosts . . . notify your Service Man. It may be due to the location of your antenna or to the erection of new buildings or bridges that are deflecting the TV signal being sent to you. . . . Sometimes, minor adjustments in your antenna will turn the trick or sometimes low and high frequency antennas are required. In some locations, however, it is almost impossible to filter out all reflections . . . so don't blame the station or Service Man if this be the case. . . . But keep in mind . . . your TV technician can analyze these problems best. So if you're seeing ghosts these days . . . ask his advice about chasing them."

Other advertisements in this series, which incidentally are available for publication in any newspaper without cost to RTMA, describe antennas, boosters, tuning situations, etc.

The Philadelphia *Bulletin* carried the series recently and the response was excellent. It is hoped that these striking messages will appear in many newspapers throughout the land.

Congratulations to E. W. Merriam, chairman of the committee, and his group for producing these outstanding public service advertisements!

### Next Month . . . Sound

SOUND, that perennial year-round friend of all Service Men, will once more be featured, through a special series of comprehensive articles, in the annual *Sound* issue of SERVICE, in June. There'll be articles on magnetic recording, musical-system amplifiers, cartridges, changers, *pa* and standard amplifier circuitry, motor mechanisms, etc.

For the latest in *sound*, be sure to see the June issue of SERVICE.—L. W.

# "This Seal means a 'Good Deal' to me!"

"My Television and Radio sets are pretty big investments to me. That's why I insist that they be serviced by a Raytheon Bonded Electronic Technician — a technician whose work is backed by a cash bond — whose skill and integrity are above reproach."

The RAYTHEON Bonded Electronic Technician Program means a *good deal* to you, too. If you can qualify for this important honor, your 90-day guarantee on TV and Radio repairs is cash-protected up to \$400.00 by a *bond*. You receive a Registered Certificate, Identification Cards, Creed Displays and Decals and a host of other sales helps and shop aids — all designed to tell the world you're a completely capable, thoroughly reliable service dealer—a dealer with whom customers can deal with complete confidence. And yet, this great sales stimulator *costs you nothing* — it's Raytheon's investment in your future.

If you're interested in getting head and shoulders above your competitors, better ask your Raytheon Tube Distributor if you can qualify for this exclusive sales asset.



RIGHT ... for  
SOUND and SIGHT.

**RAYTHEON MANUFACTURING COMPANY**

Receiving Tube Division

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

RADIO AND TELEVISION RECEIVING TUBES, CATHODE RAY TUBES, SPECIAL PURPOSE TUBES, SUBMINIATURE TUBES, MICROWAVE TUBES



*Excellence in Electronics*

COPYRIGHT 1951

# SERVICE... *The National Scene*

PARTS PRIORITY USABLE ONLY ON SHOP AND BUSINESS EQUIPMENT REPAIR--A note from Washington, clarifying the application of the DO-97 replacement rating, has revealed that the priority can only be applied by a shop for maintenance, repair and operating supply items which the shop itself uses in the upkeep of its own equipment. In addition, a business firm, government agency, or a public or private institution can also use the rating to get repair parts for a radio or TV set, if the organization uses these facilities as a part of its operation. An example of this is a taxicab company, which employs radio to direct its cars. In this instance, that organization can present to the service shop a DO-97 rating for the necessary repair parts, and the shop can use the rating to obtain these required items as stock replacements. However, a service shop can not use the rating in advance; it can only be applied after a rated order has been received. The priority can not be used to secure replacement parts for the repair of home receivers. According to NPA, DO-97 was established primarily to help civilian industry maintain as high a level of operation as possible, by providing a means of keeping its equipment in operating order.

INDUSTRY GROUPS SUBMIT REPLACEMENT PARTS SUPPLY PLAN--A series of recommendations, designed to provide parts to keep a maximum number of receivers and accessories operating with a minimum demand upon critical materials, has been submitted to the NPA by an advisory committee of NEDA. The distributors recommended that component makers use, from their total allocations of raw materials, sufficient quantities to make and sell at least 150 per cent of the number of units sold for replacement purposes in a base period, or a full year. It was also suggested that distributors receive a priority sufficiently high to permit the stocking of sufficient parts, which could only be used for the repair and maintenance of existing equipment.

SET MAKERS TOLD HOW TO RELIEVE LOCAL PARTS SHORTAGES--Chassis makers have received a memo from the BBB bureaus in New York and Washington, and the RTMA, declaring that they can be of substantial help in removing possible component shortages by adopting a program which would . . . minimize circuit changes with due consideration to availability of replacement parts; avoid shipping sets without complete complement of tubes; set up a provision for supplying set owners with replacement parts and tubes on an adequate quota basis related to production; expand the use of non-critical material; and provide a continual flow of substitution data covering tubes and parts.

NEW TV LICENSING PLAN FOR NEW YORK--There's a new proposal for regulating TV servicing on the desks of the City Council of New York City. In the new plan, service shops would be required to apply for a certificate, costing about \$25.00 a year, and a city bureau would serve as a bookkeeping clearing house on contracts for the shop, forwarding installation fees to the shop, upon receipt of a contract. After the initial payment, the service shop would receive every month money pro-rated over a year, on the basis of the total cost of the service contract. No attempt would be made to fix contract rates, according to the program, but there would be about a \$1.00 charge for the contract service, payable by the customer.

'SCOPE SALES MOUNT--'Scopes, particularly 5-inch types, have become the favorite unit in service shops and are scheduled to grow in their applications, according to sales reports from instrument makers. In '50, test equipment producers reported that they sold over one-million dollars worth of 5-inch 'scopes, and nearly a quarter-of-a-million dollars were spent for 3-inch 'scopes. It is estimated that in '51 'scope sales will reach a new high of close to two-million dollars.

# *SERVICE...The National Scene*

IDEAL TYPE OF SERVICE SHOP DESIGNED--In Upper Darby, Pa., there's a new service center that appears to have features that may set a pattern for TV service shops of the future. There's a wall that is mirror-lined to facilitate picture alignment. Above the mirror is a shelf for the storing of manuals and service notes. There's also a master antenna distribution system feeding into a pad which permits the simulation of conditions under which receivers may be operated, involving strong, medium, or weak incoming signals. The owners of this new shop declare that they hope to develop a large business in cash and carry TV servicing. They say that they are going to tell customers to . . . "Bring your TV set to the shop on the way to work, and pick it up on the way home."

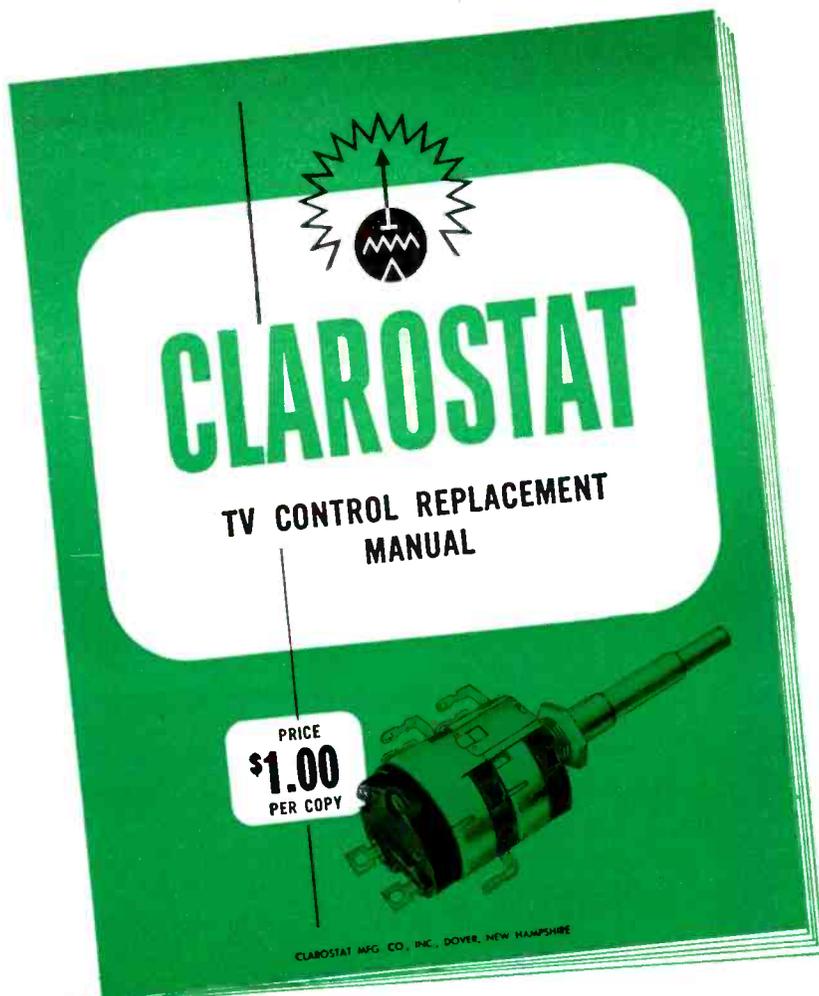
FIFTEEN KEY SUBJECTS TO BE REVIEWED AT PARTS DISTRIBUTORS SHOW--All phases of material availability, inventory control, financing, management and merchandising as applied to distributors' business, will be covered by fifteen speakers and panel members during three morning sessions at the '51 Parts Show, at the Hotel Stevens in Chicago. A talk by Indiana Steel prexy, A. D. Plamondon, Jr., will detail material available for the production of replacements parts, and the industry program now underway for the conservation of strategic materials. The effect of the military procurement program on the replacement parts' market will be reviewed by RTMA's board chairman, Robert C. Sprague. Alex Brodsky, of Allied Radio, will analyze inventory control. The important topic of replacement part sales will be covered by three speakers: Roy S. Laird, vice prexy of Ohmite; Sidney Harman, general manager, David Bogen; and Charles Golenpaul, Aerovox distributor sales manager. Highlights of these interesting talks will appear in the next issue of SERVICE.

WESTERN UNION NOW IN SERVICE BUSINESS--In three counties in New Jersey, a new affiliate of Western Union has begun to service DuMont sets, a move which has irked many, but also has been soundly defended by many. On the Association News page (p. 46) of this issue there's quite a report on these opinions, with a special letter from DuMont explaining their views.

DEAD BATTERIES CAN NOT BE REJUVENATED--A recently completed series of extensive tests at the Bureau of Standards have revealed that battery additive preparations, frequently sold with claims that they will rejuvenate dead batteries, have no effect on life or performance. Tests with scores of solutions (consisting of sulfuric acid, sometimes with the additions of sodium sulfate, magnesium sulfate, or coloring matter) provided no improvement results. The report disclosed that in practically every case, after treatment with the additives, the capacity of the treated cells at the normal discharge rate decreased more than that of a cell in which no solution was introduced. The Bureau stated that these results indicated that the use of these preparations did not improve cell performance, nor did it remove sulfates from the plates, as had been claimed. In an early issue of SERVICE will appear the complete report on this interesting survey, with a detailed review of the various additives tested.

MEMO FROM A SUBSCRIBER--From one of our readers in Arkansas has come a letter of which we're very proud. Reports this reader: "This magazine is one of our best friends, for it helps us keep up with the times. Articles have been helpful, especially in the way they provide the benefits of the experience of men working on actual projects. These men are doing important jobs for us, doing all of the experimental work and getting all the kinks ironed out. Thanks to a journal like SERVICE, we're learning things about all phases of radio, TV, audio and auto repair which we could never find out for ourselves. . . . Ye editor is doing quite a job of giving the information we want and need to do a better job in our daily work." Thanks sincerely, old man, for those complimentary comments.--L. W.

**THE  
MOST COMPLETE  
tv control  
replacement  
manual**



almost 3000 control listings  
350 different TV set models and chassis  
produced by 75 different manufacturers  
alphabetically and numerically listed  
replaced by 327 different controls...  
222 RTV or Exact-Duplicate numbers and  
105 Standard numbers

**Save Time, Trouble, Money!**

Start using this sure-shot manual without delay. Just pin a dollar bill on this coupon, and mail to us. Or if you prefer, get your copy from your Clarostat jobber.

Clarostat's done it again! Here's the outstanding compilation of TV control replacements. In a jiffy, without guessing or taking chances, you can spot the right replacement for any wornout or defective TV control. And it's as simple as ABC—like this:

1. Look up particular TV set manufacturer listed alphabetically.
2. Find given TV set model or chassis, arranged in numerical order.
3. Identify defective or wornout control and/or description or function.
4. Note Clarostat Standard or RTV (Exact-Duplicate) replacement available. As a double check, listing includes manufacturer's stock and part numbers.
5. Order Clarostat replacement from nearest or favorite Clarostat distributor who stocks those replacements for your convenience.

**CLAROSTAT MFG. CO., INC.,  
DOVER, NEW HAMPSHIRE.**

Here's my dollar. Send me that big Clarostat TV Control Replacement Manual so I can start saving time, trouble, money on TV servicing.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

Zone \_\_\_\_\_

STATE \_\_\_\_\_

# Simplified AF Amplification

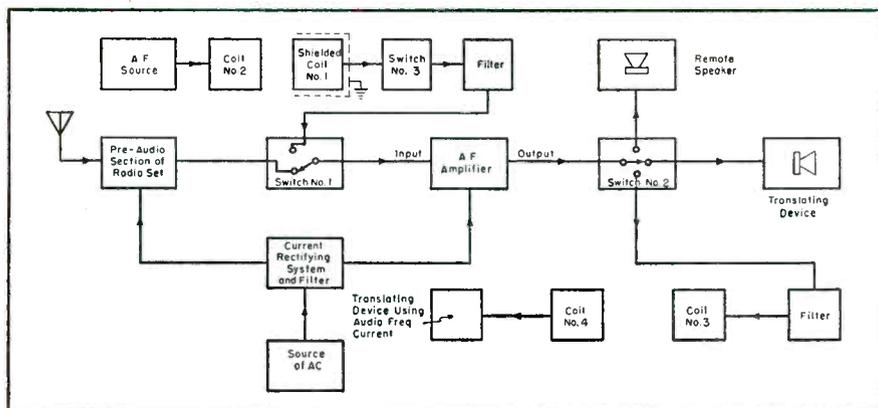


Fig. 1.  
Block diagram illustrating principle of system.

## Recently Developed Method Makes it Possible to Adapt AF Amplifier for PA, Phono or General Amplification Without Any Major Changes in Circuitry.

IT HAS LONG BEEN believed that the radio set can be made to serve a wide variety of entertainment and utility purposes in the home and that at the present time, less than ten per cent of its potentialities are being utilized. To find some method which might provide a practical answer to this situation, a series of experiments were initiated some years ago. In '47 a solution was evolved and a patent was filed, and in November, '50, a patent\*\* on the system was granted.

### Features of Invention

Briefly, the invention permits the utilization of the audio amplifier within the radio set for a variety of auxiliary purposes without requiring any physical attachment to the set. Moreover, no skill or knowledge is required on the part of the user of the receiver. By means of the new method, the set may be adapted for use as a public address system. It can be used with a recording head to record radio programs, telephone conversations or any sound picked up by a microphone. It may also be used to amplify telephone conversations through the loudspeaker. Other applications include the addition of remote speakers, or the use of a phono attachment in conjunction with the receiver.

To apply the new idea, the radio set is equipped with two special coils,

mounted beneath recesses under the top of the cabinet. One of these coils is connected through a microswitch to the input of the audio amplifier. The other coil is similarly connected to the output of the audio amplifier. The various auxiliaries are equipped with coils marked *input* and *output* which fit into the *input* and *output* recesses on top of the cabinet.

### PA Applications

Thus, to use the radio as an address system, the *input* coil, which is connected in series with the microphone, is dropped into the recess marked *input*. This automatically disconnects the *rf* portion of the radio from the audio amplifier and makes the audio amplifier and speaker instantly available for home broadcasting with the microphone. Removal of the microphone coil from the recess immediately restores the radio program.

### Telephone Amplification

If telephone conversations are to be amplified, the earpiece of the handset can be inserted in the *input* recess and the set becomes available as an amplifier for telephone conversations. To use the radio with a phono attachment, the *input* coil, in series with the phono attachment, is dropped into the *input*

recess on the set; this promptly converts the radio into an electric phono.

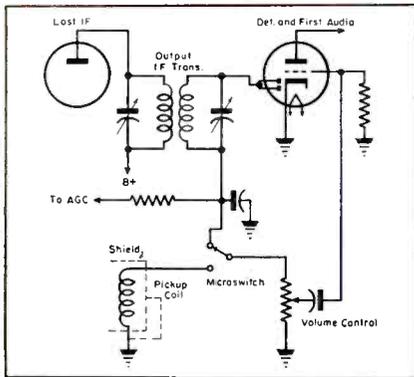
### Basic Principle of Invention

The basic principle of the method is illustrated in Fig. 1. Starting at the antenna, it will be noted that the conventional chassis is indicated by three blocks, namely, the pre-audio section, the *af* amplifier and the translating device or speaker. The power supply is indicated by two blocks, which include the *ac* source and the current rectifying system and filter. After rectification and filtering, the *dc* operating voltages are supplied to the pre-audio section of the set and the *af* amplifier, as indicated by the arrows.

A single-pole, double-throw switch is provided between the pre-audio section and the *af* amplifier input and a single-pole triple-throw switch is used between the *af* amplifier output and the speaker. These may be microswitches.

Switch 1 is normally in the position shown, so that the pre-audio section of the receiver is connected to the audio section. Switch 2 is also normally held in the position shown, so that the speaker of the set is connected to the output of the audio section. With the two switches in these positions, the radio set functions the same as any other receiver. When switch 1 is actuated by the weight of coil 2, the position of the arm is automatically shifted, so that the pre-audio section is disconnected from the audio section, and instead coil 1 is connected to the input of the audio amplifier. Coil 2 is now electromagnetically coupled to coil 1. Any source of *af* current connected to coil 2 will therefore be transmitted by transformer action from coil 2 to coil 1 and thence to the *af* amplifier,

# Auxiliary Application System



by H. G. CISIN\*

Consulting Engineer

(Left)

Fig. 2. Method used to connect stationary pickup coil in circuit of receiver.

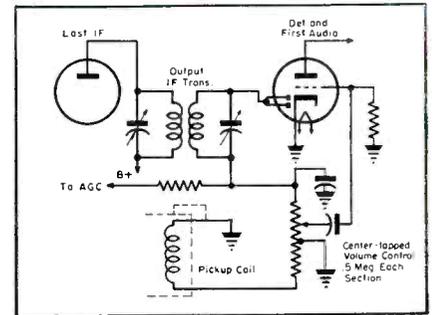


Fig. 3. How to eliminate the microswitch in the circuit.

where it will be amplified. Since a loudspeaker is connected to the output of the amplifier, the amplified sound will be heard coming from the loudspeaker.

It will be noted that coil 1 is shielded (see dotted line), with shield connected to ground. This serves to prevent feedback between this coil and the loudspeaker. It will also be noted that switch 3 and a filter are interposed between coil 1 and the input to the *af* amplifier. The purpose of the filter is also to prevent or limit feedback, in this case which ordinarily would take place between the *af* source and the loudspeaker.

## Operation

As an example of the operation of this system, let us assume that the *af* is a crystal microphone, which is connected in series with coil 2. Coil 1 may be concealed at any convenient point in the radio cabinet, preferably beneath a recess marked *input*, so that coil 2 connected to the auxiliary apparatus, in this case the crystal microphone, may be brought in inductive relationship with it. When this is done, the microswitch (switch 1) is actuated, so that the microphone is now connected (by transformer action) to the input of the *af* amplifier. Consequently, when anyone talks into the microphone, the amplified sound will be heard coming from the loudspeaker of the radio set. Switch 3 provides a means of increasing or decreasing the filtering action of the filter. The latter may be a simple low-pass filter utilizing a capacitor in combination with the inductance of coil 1 or it may consist of a suitably designed network of

impedances forming a bandpass filter. Incidentally, this patented method of preventing feedback provides a means of using a microphone in the immediate vicinity of a loudspeaker. The amplified sound from the loudspeaker comes back into the microphone and is fed from coil 2 to coil 1 by transformer action. However, the filter between coil 1 and the input to the amplifier shorts out the undesired frequencies, thus effectually preventing the spiraling feedback howl so familiar to those who operate public-address systems.

When coil 4 is placed in the recess above coil 3, switch 2 is actuated, automatically disconnecting the loudspeaker of the radio set from the output of the *af* amplifier and connecting stationary coil 3 in its place. Coil 4 may be a part of any desired auxiliary translating device. For example, it may be connected in series with a suitable recording head. When in place in the recess marked *output* it would then utilize the audio amplifier of the radio set and would permit the recording of radio programs (with switch 1 in normal position), or recording from an external *af* source (with switch 1 actuated by means of coil 2). Any type of translating device capable of utilizing *af* current could be connected to coil 4.

## Application to Existing Radio Sets

Let us suppose it is desired to convert an *ac-dc* set so that its owner may use it with a phono attachment as an electric phono. Only three com-

ponents are required for this conversion. These consist of a single-pole double-throw microswitch and two pickup coils. The coils should not use an iron core. Field coils of old-style dynamic speakers, wound with many turns of fine wire and measuring about 2,500 ohms (*dc* measurement) have been found to be ideal for this purpose. One of the coils should be connected in series with the two leads from the phono attachment. The other coil is connected as shown in Fig. 2. The coil of Fig. 2 may be concealed inside the top of the cabinet, being held in place by a piece of metal which also acts as a shield. It is necessary to provide a receptacle for the coil connected to the phono attachment, and this should be placed directly above the stationary coil, with the microswitch arranged so that the weight of the movable coil will actuate the switch.

## Microswitch Can Be Omitted

If desired, the microswitch may be dispensed with, thus making it unnecessary to provide a receptacle for the coil connected to the phono attachment. In this case, the volume control of the radio set must be replaced by a center-tapped volume control, as indicated in Fig. 3. The stationary coil can be concealed inside the top of the cabinet. Should one wish to play the phono, the movable coil need only be placed on top of the cabinet above the other coil and the volume control turned to its full counter-clockwise position. The radio program then will

(Continued on page 72)

\*Author and Publisher of *Rapid TV Trouble Shooting Method*.

\*\*U. S. Patent 2,528,636, issued to H. G. Cisín, Nov. 7, 1950.

# METALLIC RECTIFIER

## Design and Application

by JULIAN LOEBENSTEIN

Manager, Rectifier Division  
Radio Receptor Co., Inc.

ALTHOUGH METALLIC RECTIFIERS have now been in general use for a period of ten or fifteen years, it is only within the past few years that the field of application has broadened to the extent that their use is being considered by many, who, until recently were scarcely aware that they were available. This trend has been due to their general application in radio and television, and their assembly in units capable of delivering many kilowatts. As a result, there have appeared an assortment of data covering various phases of the rectifiers' characteristics. However, there still remain some elementary matters which appear to be puzzling to the new metallic-rectifier user, and even engineers experienced in electronic circuits occasionally overlook some factor in their application.

### Fundamental Assembly

The fundamental building block of metallic rectifiers is a single cell or plate. This, when placed in an *ac* circuit, causes half-wave rectification in the same manner as a check valve placed in a water line would permit the

water to flow in one direction only, if water were pulsing back and forth in the pipe. As each cell is capable of withstanding only a given voltage before puncturing, it is necessary to put more cells in series as the voltage increases. This would be the same as an increase in the thickness of the metal of the flapper of the valve to enable it to withstand a higher water pressure.

In Figs. 1 and 2, these assemblies are illustrated. Schematic diagrams of rectifier circuits do not as a rule indicate a multiplicity of plates but merely show the conventional rectifier symbol, regardless of the voltage. Current in the conventional sense, i.e., not electron flow, is considered to be in the direction in which the symbol points. Fig. 3 shows the half-wave rectification obtained in this manner.

### Reverse Voltage

The voltage mentioned above, which the cell is capable of withstanding before puncturing, is sometimes considered as the reverse voltage. Actually it does not correspond with the reverse

voltage rating which the manufacturer gives to the cell, as will be evident from the following explanation.

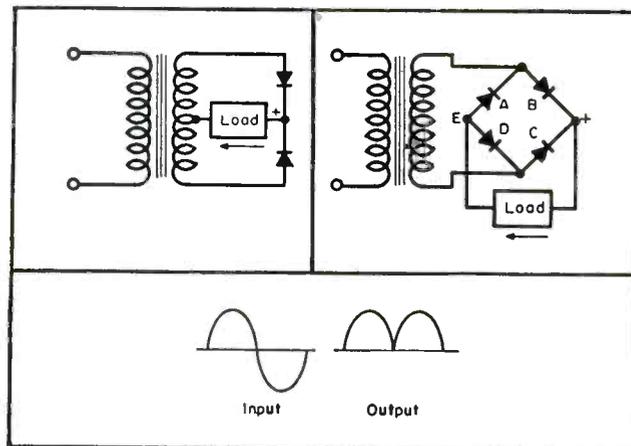
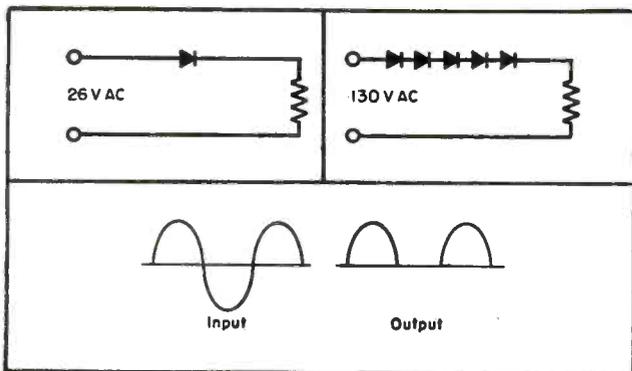
### Reverse Current

The reverse voltage of a rectifier cell is associated with the reverse current. The reverse voltage, as has already been explained, corresponds to the pressure against the flapper of the valve when it is closed. The reverse current may be considered as similar to the back leakage through a check valve which would occur when the flapper does not seat perfectly.

All metallic rectifiers permit some reverse current to flow. This reverse current is influential in determining the reverse voltage rating of the cell. The reason for this is that heat is generated both by the forward and by the reverse current. Accordingly, the reverse voltage is set at such a value as to limit the amount of reverse current and correspondingly, the heat loss incident to its flow. In all cases the cell can withstand a higher voltage if puncture alone is considered. For instance, if a selenium cell, rated at 26 volts

(Below)

Figs. 1, 2 and 3. Fundamental circuits of half-wave metallic rectifier assemblies appear in Figs. 1 and 2. Fig. 3 illustrates a half-wave rectification waveform.



Figs. 4, 5 and 6. Center-tap and bridge circuit systems, shown in Figs. 4 and 5, illustrating that current flows first through one-half of the rectifier and then through the other half, resulting in full wave rectification. Fig. 6 shows input and output waveforms.

# Characteristics of Fundamental Assemblies . . . Properties of Parallel Assemblies, Center-Tap and Bridge Circuits, Doubler Arrangements, Capacitive Setups . . . Definitions of Terms.

reverse, were carrying no forward current, it would suffer no corresponding heating effect. It could therefore be subjected to a higher reverse voltage of possibly 30 or more volts. It can thus be seen that momentary surges within reasonable limits will not puncture the cell.

### Half-Wave Assemblies

The half-wave element may be assembled in various combinations to give full-wave rectification which in single phase may be either a center tap circuit or a bridge circuit. The bridge is often designated as a full-wave bridge, but either the center tap circuit or the bridge circuit yields full-wave rectification and the addition of *full-wave* to either term is not necessary. Similarly the half-wave element may be used in three-phase or other multi-phase rectification in various circuits.

It is not difficult to see that in either the center-tap circuit or the bridge circuit, current is permitted to flow first through one-half of the rectifier and then through the other half of the rectifier giving full-wave rectification. Figs. 4 and 5 and 6 illustrate this point. Often, however, many wonder how the mechanical assembly of cells or plates on a stud corresponds to the schematic of the bridge shown in Fig. 5. This may be easily understood if the bridge in Fig. 5 is considered to be opened at point *E*, and arranged in a straight line resulting in an assembly shown in Fig. 7A and B in which the individual elements are marked to correspond

with those in Fig. 5. When a stack is so assembled the *ac* terminals are color coded yellow, or marked *ac*, whereas the *dc* terminals are respectively color coded red (positive) and black (negative), or marked respectively + and -.

A rectifier stack, as illustrated in Fig. 7A, need not be limited to four cells, but that this could represent any number of cells in series for each element *A*, *B*, *C* and *D* up to the number beyond which the assembly would become cumbersome. After that point it would be necessary to break the stack into a group of stacks which might, for example be two stacks, each consisting respectively of *A* and *B* combined, and *C* and *D* combined. On the other hand it might consist of four separate stacks with the elements *A*, *B*, *C* and *D* each assembled on its own stud. This breakdown could be carried out further if the total cells should require it.

### Cells in Parallel

Rectifier cells are available in different sizes whose current rating increases with the size of the cell. However, the amperes per square inch of cell area remain approximately the same regardless of the size of the cell. It is more economical as current requirements increase to go to larger cells than to use additional cells in parallel. However, when the current desired is greater than the current carrying capacity of the largest available cell, there is nothing left but to use as many cells in parallel as may be needed to carry the current. This

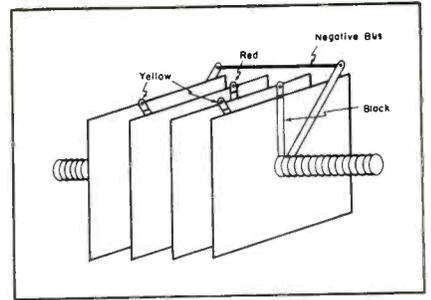
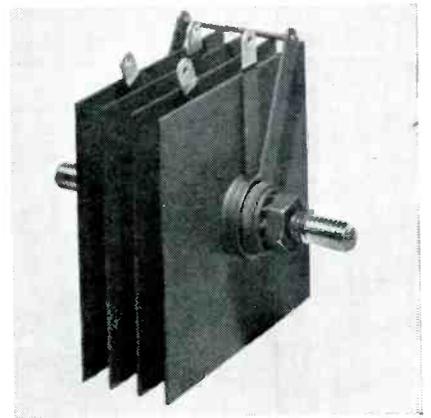
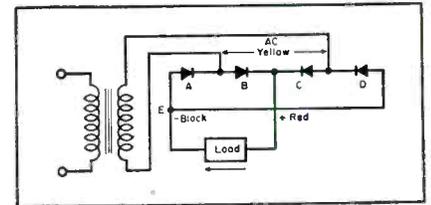


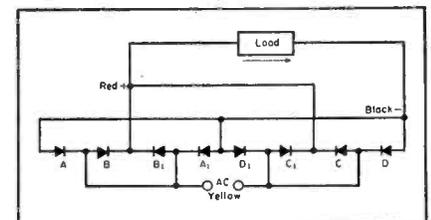
Fig. 7A. Drawing (above) and photo (below) of typical assembly of plates, arranged to correspond to the schematic shown in Fig. 5.



(Below)  
Fig. 7B. Electrical representation of arrangement shown above in Fig. 7A.



Below: Fig. 8B



(Above)

Fig. 8B. Schematic of arrangement shown in Fig. 8A.

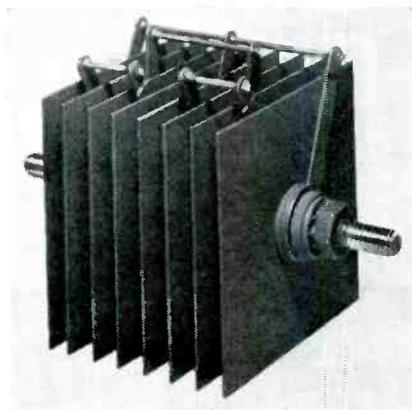
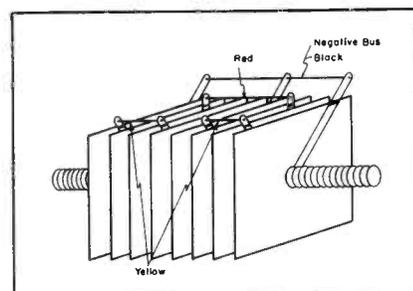
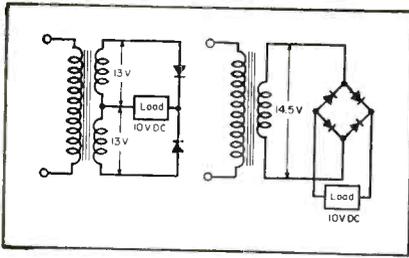


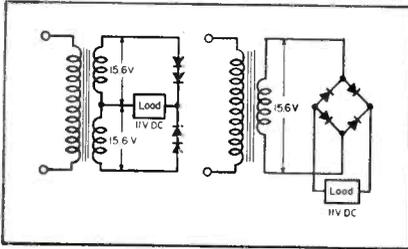
Fig. 8A. Photo (left) and drawing (below) of assembly of two sets of parallel plates set up for dual bridge-circuit use, as illustrated at right, Fig. 8B.





(Above)

Fig. 9. Bridge and center-tapped circuits with typical voltage values.



(Above)

Fig. 10. To secure slightly higher output voltage this arrangement is used; two cells in series in each element of the center tap circuit, or a total of four cells.

current often runs into thousands of amperes.

In the previous description it was shown how cells could be assembled in series. It is not at first glance obvious how the cells may be assembled in parallel. Actually, however, it is a simple matter. If, for instance, a bridge circuit is being considered, it involves merely connection of two or more individual bridge circuits in parallel. This is shown schematically in Fig. 8B and in the illustrations of Fig. 8A, which shows two parallel plates and thus calls for two bridge circuits. The elements *A*, *B*, *C* and *D* constitute one bridge and the elements *A*<sub>1</sub>, *B*<sub>1</sub>, *C*<sub>1</sub>, and *D*<sub>1</sub> constitute another. It will be noticed that the elements *A* and *B* are separated from the elements *C* and *D*. By arranging the cells in this manner, the connecting bus arrangement is simpler than it would be if two bridge stacks were assembled side by side. Cell *A* is connected in parallel with cell *A*<sub>1</sub> and cell *B* with cell *B*<sub>1</sub>, etc. Such a stack could however also be

made of a combination of series and parallel cells, or in turn of a group of stacks as might be required to carry the particular load.

#### Center Tap Versus Bridge Circuits

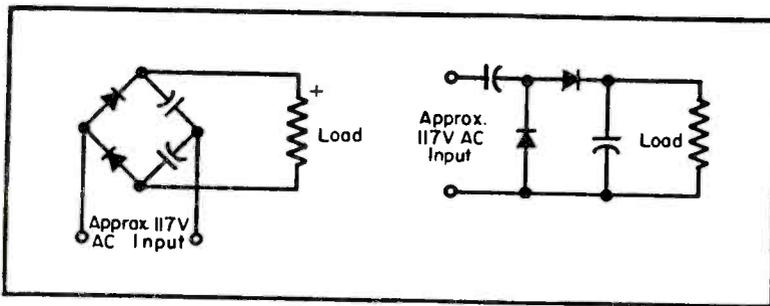
Reference has been made to center tap circuits and bridge circuits. The question naturally arises as to their relative advantages and when each should be used. The choice revolves around the input voltage involved. At low voltage the center tap circuit offers economy in both space and cost since it is necessary to use only half the number of cells which would be required in a bridge circuit. This may be seen from an examination of Fig. 9, in which typical voltage values are given. It is evident that to achieve the same output voltage only two cells are required for the center tap circuit, while four cells would be needed for the bridge circuit. However, if a slightly higher output voltage is needed (Fig. 10), it would be necessary to have two cells in series in each element of the center tap circuit or a total of four cells, or the same as is used in the bridge.

#### Center-Tap Disadvantage

In practice the center-tap circuit loses advantage when the total voltage across the rectifier, i.e., the full secondary voltage exceeds the voltage for which an individual cell is rated. In the foregoing example this is 26 volts.

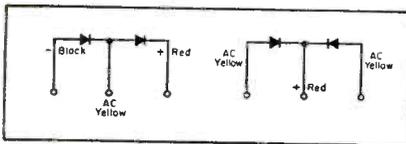
This question has been dwelt on at length for two reasons; a bridge cir-

(Continued on page 93)



(Above)

Figs. 11 and 12. A symmetrical voltage doubler (left) and series line-feed doubler system.

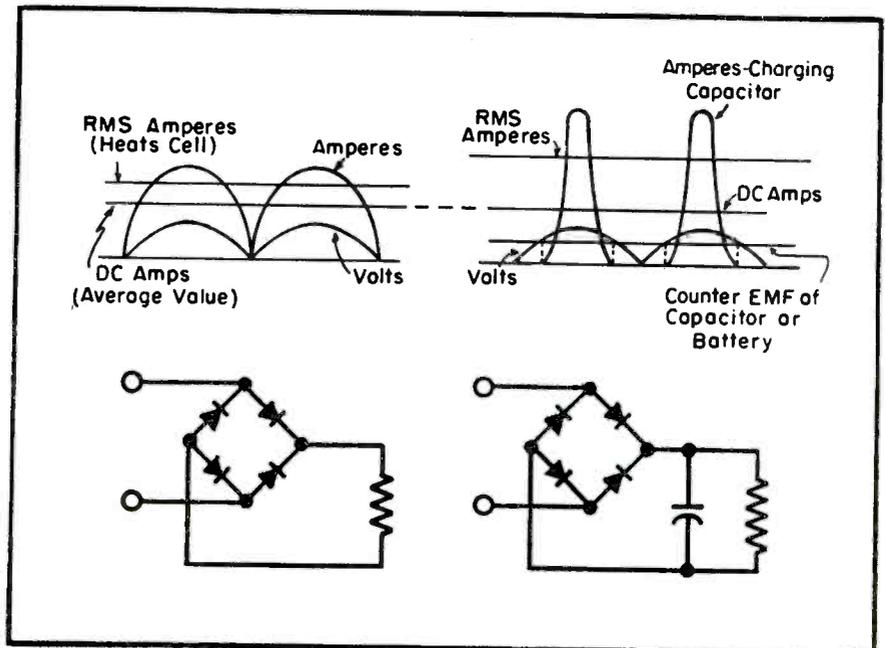
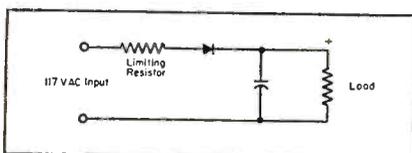


(Above)

Figs. 13 and 14. At left we have a doubler system often referred to as half-wave center-tap arrangement. A center-tap or full-wave circuit is shown at right.

(Below)

Fig. 15. Half-wave rectification setup which feeds into a capacitive system; used in three-way portables and table-model sets.



(Above)

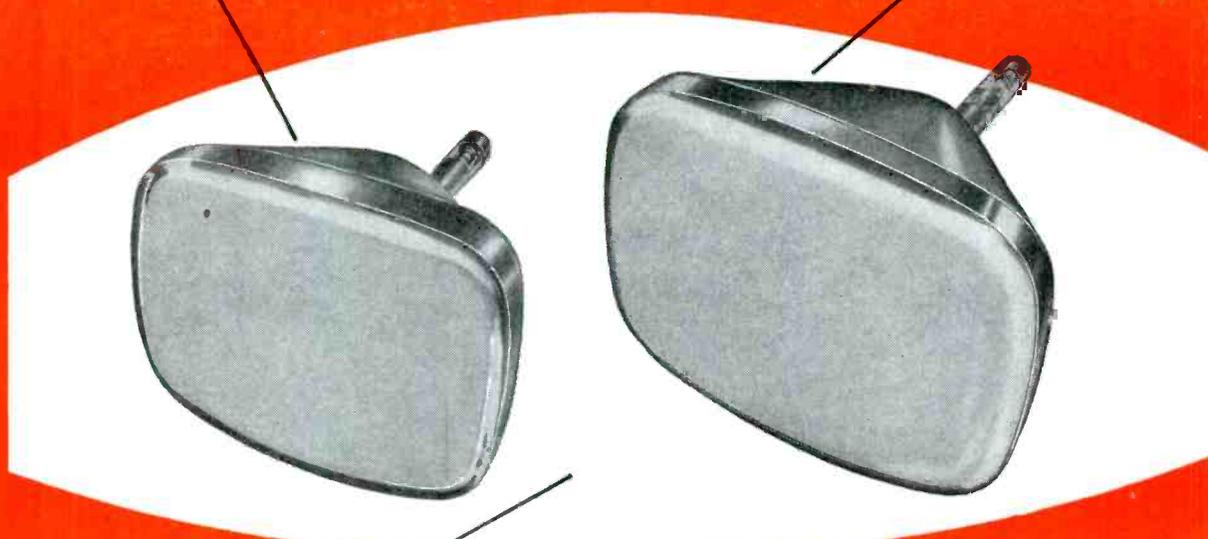
Figs. 16 and 17. In Fig. 16 is illustrated the relationship between current and voltage when feeding rectified current into a resistive load. Fig. 17 shows the capacitive-load circuit and relationship between current and voltage; the rms (amperes) is greater than that appearing in Fig. 16. The dc amperes (average value), however, are similar to those of the resistive-load arrangement.

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# PRINTED CIRCUITS

## In TV and Radio Chassis

by WYN MARTIN

[See Front Cover]

PRINTED CIRCUIT UNITS, not too long ago a rather specialized type of assembly employed only in military and industrial equipment, has become a basic part of many TV and radio chassis. Today, there are a variety of printed-circuit combinations available.

One type, known as a *triode couplate*,\* features three capacitors and two resistors bonded to a Steatite ceramic plate, connected by metallic silver paths printed and fired on the base plate.

### Couplate Applications

The triode couplate can be used in place of some resistor-capacitor combinations. For instance, in audio circuits, when one tube is coupled to the grid of a following stage, it can serve as the plate load resistor, grid resistor, coupling capacitor and plate *rf* bypass capacitor.

Two series of couplates are available, the standard type offering higher capacities.

In the standard triode couplate, which is  $1\frac{3}{32}'' \times 1\frac{13}{16}'' \times \frac{7}{64}''$  thick, are capacitors with ratings of 450 volts *dc* working, 800 *v dc* flash test. One unit (Fig. 1) consists of a pair of 250-mmfd capacitors ( $C_2$  and  $C_3$ ) and a .01-mfd unit ( $C_1$ ), and a pair of  $\frac{1}{2}$ -megohm resistors ( $R_1$  and  $R_2$ ). In another couplate the  $R_1$  value is 250,000 ohms.

### Pentode Couplate\*

Available, too, is a pentode couplate\* (Fig. 3) designed to serve as a screen resistor, plate resistor, grid resistor, screen bypass capacitor, plate

*rf* bypass capacitor and coupling capacitor. The size of this unit is  $1\frac{17}{64}'' \times \frac{7}{8}'' \times .045''$  thick.

Two types have been designed. One contains three capacitors with values of .005 mfd ( $C_1$ ), 50 mmfd ( $C_2$ ), 2,000 mmfd ( $C_3$ ), and three resistors with values of 4.7, 1 and 2.2 megohms ( $R_1$ ,  $R_2$  and  $R_3$ ). In the second type  $C_2$  and  $C_3$  are 100-mmfd and .005-mfd units, with no change in resistors.

### Vertical Integrator Plates\*

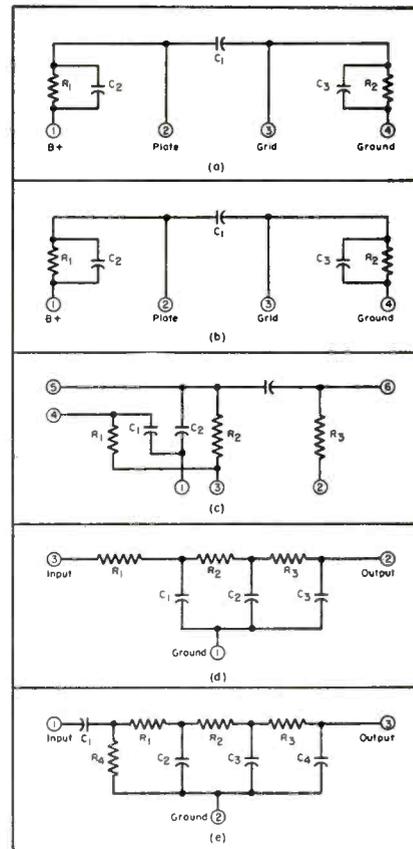
Printed circuits are also being used in television vertical integrator networks. Two forms are available; Figs. 4 and 5. Either one has three external leads.

Model in Fig. 4 consists of three capacitors with values of .002 and .005 mfd ( $C_1$ ,  $C_2$  and  $C_3$  respectively), and three resistors, two of which are 8,200-ohm units ( $R_2$  and  $R_3$ ) and another a 22,000-ohm affair ( $R_1$ ).

In the Fig. 5 unit there are four capacitors and four resistors. Capacitors are .01, .002, and .005-mfd types ( $C_1$ ,  $C_2$ ,  $C_3$ ,  $C_4$ ) and resistors are of 22,000 and 8,200 ohms.  $R_1$  and  $R_4$  having the higher value and  $R_2$  and  $R_3$  the lower resistances.

Also produced are simple resistor-capacitor\* combinations as well as a unit which can be used as a balanced dioded load filter.\* Both of these types are illustrated in Figs. 6 and 7. Fig. 6 illustrates the resistor-capacitor combination consisting of a 100,000-ohm resistor and a 100-mmfd capacitor. These capacitors are 150 *v dc* work-

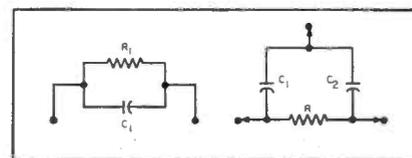
\*Centralab.



Figs. 1 (b), 2(a), 3(c), 4(d) and 5(e). Printed circuit assemblies. In (a) is a midget triode couplate circuit; (b) standard triode couplate; (c) couplate circuit for a pentode (in Fig. 3, capacitor between terminals 5 and 6 is  $C_3$ ); (d) and (e) units for vertical integrator network used in TV. (Courtesy Centralab)

(Below)

Figs. 6 and 7. In Fig. 6 (left) appears a resistor-capacitor *pc* assembly. Unit illustrated in Fig. 7 is a *pc* balanced dioded load filter. (Courtesy Centralab)



ing types, while the resistors have a rating of 1/5 watt. In the load filter, resistor is a 47,000-ohm type and the capacitors of either 100-mmfd or 150-mmfd values, rated at 100 *v dc* working.

### Printed-Circuit Clock Receiver

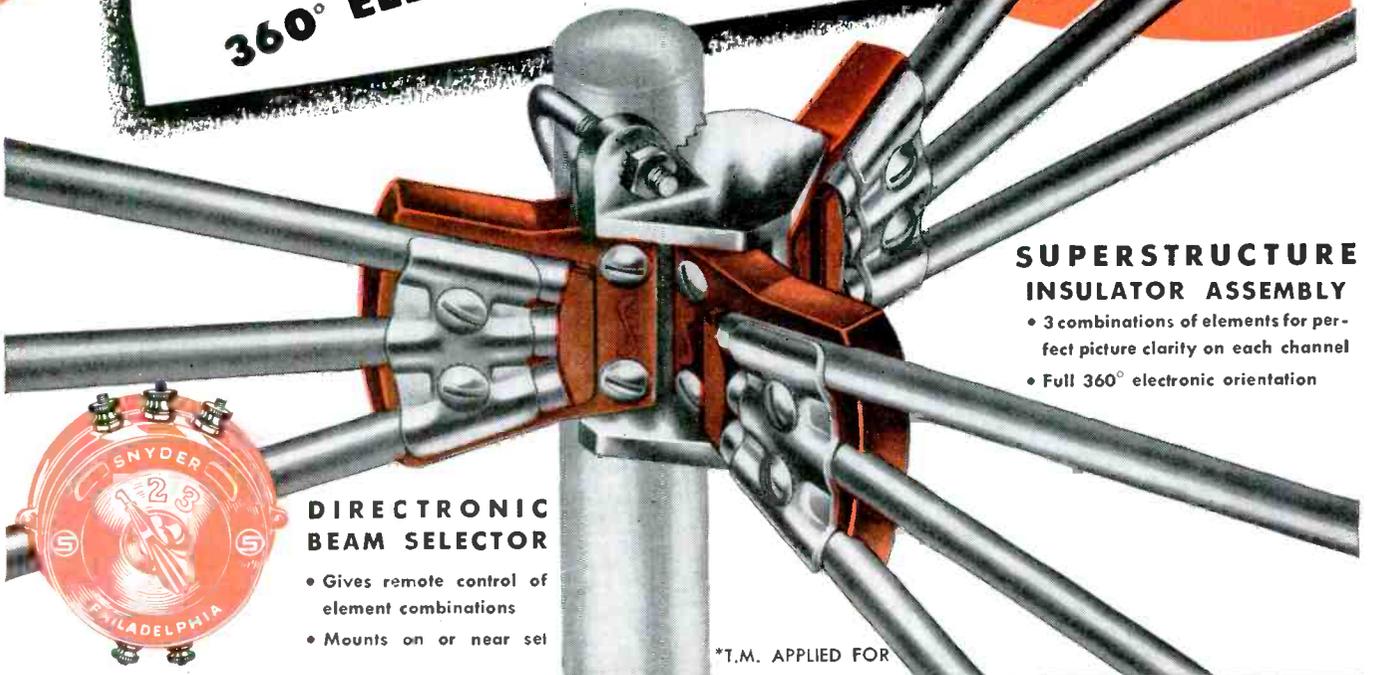
An interesting illustration of the use of printed circuitry in receivers ap-

(Continued on page 62)

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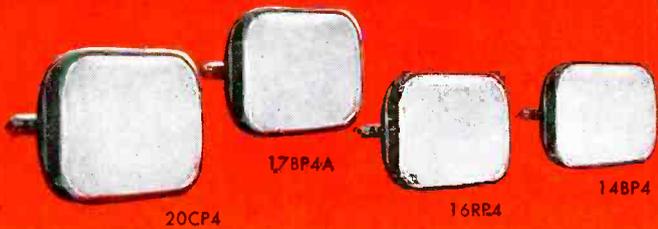
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# TUBE

## News

by L. M. ALLEN

### Deflection Systems for Large Screen Picture Tubes\* . . . Rating Interpretations . . . Electrostatic Tube Developments.

A DEFLECTION SYSTEM using a new ferrite-core transformer<sup>1</sup> has been developed to supply horizontal deflection and an anode voltage of 16 kv for 17- and 20-inch picture tubes such as the 17CP4 and 20CP4 with horizontal-deflection angles of about 66°. The tubes required for the horizontal-deflection and high voltage circuit are one 6BQ6GT or 6AU5GT beam power amplifier, one 6W4GT damper diode, and one 1B3GT high-voltage rectifier. The transformer has been so designed that the power for the vertical-deflection circuit may be obtained from the boosted B-voltage supply. The power input required for the horizontal-deflection and high voltage and vertical-deflection circuits totals approximately 29 watts from a 280-volt *B* supply, when a 6BQ6GT is used, or 31 watts from a 300-volt *B* supply when a 6AU5GT is used.

#### Width Control

An inductive width control with an inductance range of 1.5 to 13 millihenries may be used. The maximum width reduction is approximately 12

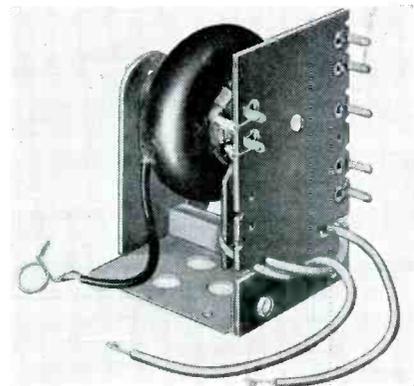
per cent and the corresponding high-voltage reduction approximately 400 volts.

#### Lead Dress

The step-up ratio of the ferrite transformer is such that a picture tube anode voltage of 16 kv may be obtained. Because of this step-up ratio any capacitance between the 1B3GT plate and the chassis has a 30 times greater effective value at the yoke. If this effective capacitance is excessive, horizontal-retrace time is increased and the high voltage is decreased. Consequently, it is important the 1B3GT plate lead must be kept short and the 1B3GT mounted in such a manner that stray capacitance from plate to chassis is minimized.

#### Drive Requirements

To obtain adequate deflection and high-voltage output from any horizontal-deflection circuit without excessive power input and excessive dissipation in the horizontal-output tube, a sawtooth voltage of proper amplitude and waveform must be applied to the grid of the horizontal-output tube. The proper amplitude is that which results



Horizontal deflection output and *h<sub>v</sub>* transformer, featuring ferrite core, developed for wide-angle picture tubes. (Courtesy RCA)

in near class *B* operation. Insufficient sawtooth voltage yields more nearly class *A* operation, and therefore results in reduced efficiency and a consequent reduction in the deflection voltage and high-voltage output. Excessive sawtooth voltage produces class *C* operation, which causes a localized cramping and resultant white line near the center of the raster. The desired sawtooth amplitude can be determined by adjusting the drive control to increase the amplitude until a white line appears near the center of the raster and then reducing the drive until the white line just disappears.

The waveform of the driving sawtooth voltage is determined in the design of the horizontal-oscillator circuit

(Continued on page 62)

<sup>1</sup>RCA-225T1.

\*From copyrighted data prepared by the RCA tube department.



# MAGNETIC RECORDING

by L. S. HICKS

Webster-Chicago Corp.

Left: Tape recording at home. (Courtesy Webster-Chicago)

## Construction and Operating Characteristics of Wire and Tape Recorders . . . Recording Techniques Which Have Been Found to Provide the Best Results

MAGNETIC RECORDING, for quite a while a rather meek member of the audio industry, has zoomed in popularity during the past months. Many general Service Men and *pa* specialists have begun to find that this new medium offers many, many possibilities in sales, installation, service and renting, too. There have been predictions that magnetic instruments will become as much a part of the American home as the

camera, and current activities indicate that this era may not be too far away.

### Components in Magnetic Recorders

Basically all magnetic recorders consist of five components:

- (1) A recording head which usually consists of an *erase* coil, a *bias* coil and a recording and play-

back *voice coil*. This is usually referred to as *the head*.

- (2) A mechanism to move the wire or tape past the recording head at the proper speed.
- (3) An audio amplifier capable of delivering a signal to the recording coil of the head for recording.
- (4) A special oscillator circuit to supply a high-frequency voltage to erase the previous recordings and supply bias for the new recording.
- (5) An audio amplifier to amplify the output of the head for playback of the recording.

Amplifiers cited in (3) and (5) often use the same tubes to save space and permit the construction of a portable recorder. Special switches are used to change from one function to another.

Two other necessary components are the microphone and the loudspeaker.

### Recording Mechanism Features

Two recording mediums are available, wire and tape. Both operate on the same principles.

There are three basic wire recording

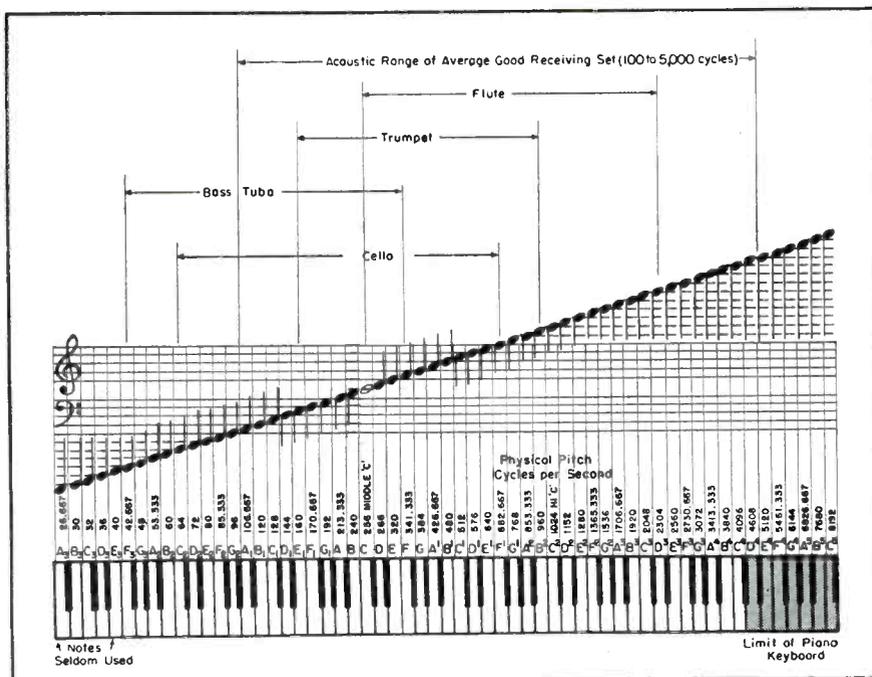


Fig. 1. Piano keyboard with key frequencies and typical instruments which fall within some of the frequency ranges.



Proper placement of a group of microphones around a conference table; in this instance, mikes are in the United States Court of Appeals conference room, connected to a recorder on table in rear of room. (Microphones are Electro-Voice type 630)



Microphones set up for interview during a Voice of America recording session. (Mikes in use are Shure model 55 super-cardioid dynamics).

mechanisms in use today. Two motors are used in one system.<sup>1</sup>

In another version<sup>2</sup> one motor is employed. Both are characterized by the large takeup drum, which is often used as a 78 rpm phono turntable. The third mechanism<sup>3</sup> has the takeup drum on the right-hand side, instead of the left.

Several tape transport mechanisms are in use.<sup>4</sup>

Wire recorders have been standardized with a wire speed of 2 feet per second. Tape recorders use three different speeds. Some move the tape 3.75 inches per second, some 7.5 inches per second and some 15 inches.

The slowest tape speed has been found adequate for speech and home music. Recorders using this speed claim fair frequency response out to about 4,500 cps.

The 7.5 inches-second speed is most often used. Good response to at least 7,500 cps can be had at this speed. Some recorders, with unusually good amplifiers and speakers, claim a range out to 10,000 cps.

The 15 inches-second speed will be found only in professional recorders where the best possible response is desired. This equipment is used in broadcast stations, motion pictures, etc.

### Frequency Response

Everyone desires that the playback of any recording should sound as near

like the original as possible; in other words, have *true fidelity*. Fidelity is, of course, related to *frequency response*.

### Characteristics of Sound

Each sound has three characteristics: (1) pitch or tone, (2) timbre or quality, and (3) volume or intensity.

Pitch is measured in vibrations per second. Certain tones have their frequencies, 1,000 cps or 500 cps, etc. Fig. 1 graphically illustrates this point in terms of a piano keyboard, the better known musical instruments and the range of the average radio receiver.

### Tone Quality

The timbre or quality of a tone is the characteristic that makes, let us say, a violin sound like a violin, a trombone like a trombone, or makes voices sound different.

Generally speaking, the wider the frequency range that can be reproduced *with the original dynamic range of intensity*, the higher the fidelity. If the microphone, the recording medium, the head, the amplifier or the speaker *attenuate* or reduce the relative loudness of any frequency or group of frequencies, the response is then noted as being *down* in db at that frequency.

True fidelity also includes the reproduction of the original sound with its original *timbre* or quality. Uneven recording or playback speed introduces slight variations in pitch called wow, or flutter. Wow is often noticed when using wire or low cost tape recorders and is the cause of piano recordings sounding tinny and twangy. Flutter

represents high-speed variations in pitch, truly described by the word. The elimination of these deterrents to true fidelity is expensive and difficult and explains the high cost of professional equipment.

### What Affects Frequency Response

The frequency response obtainable from a recorder depends upon many factors, one of the most important of which is the recording medium itself; the tape or wire.

The natural response of both is poor. Instead of a *flat* response over a considerable portion of the frequency spectrum, the response curve looks more like a hump. This is true of even the best tape or wire, so it is no reflection on its quality, but rather a factor to be considered when designing the head and the recording and playback amplifier.

### Related Response Factors

Another important factor is the recording and playback amplifier itself. There is nothing the user can do regarding its design. The engineers have balanced good reproduction against cost and the resulting compromise appears in the equipment. Two factors actually affect the frequency response. One involves the choice of a recorder with a good amplifier circuit, and the second revolves about the use of the equipment to the best possible advantage. This may mean connection of the recorder to a good radio receiver or other external amplifier and speaker when playing back the recording. It is not practical to boost the bass end of the fre-

<sup>1</sup>Saint George mechanism, now being used by Wire-Way Corp.

<sup>2</sup>Crescent Industries.

<sup>3</sup>Webster-Chicago.

<sup>4</sup>Examples bear trade names such as Revere, Ampro, Crestwood, DuKane (Operadio), Brush, Echotape (Webster Electric Co.), Pentron, Twin-Twax (International Products) and Eicor. Webster-Chicago will soon announce a tape recorder using their own mechanism.



The audio system of a receiver can be used to operate with a tape recorder with relatively few circuit alterations, as illustrated above.



School use of microphones and recording system. (Astatic units at Alexander Graham Bell School in Chicago).

quency spectrum when recording, because it is so easy to *over-record* at these frequencies, with consequent distortion in playback. Therefore both bass and treble equalizations are necessary during playback.

The price of a recorder is normally governed by the quality of its amplifier and speaker. Generally speaking, the recorder with the best tubes can be cited as having the best circuit. Separate bass and treble tone controls, push-pull output circuits and larger speakers are all indications of carefully designed high fidelity amplifiers. The ease with which the recorders can be played back through an external amplifier or a larger external speaker are also important, for better response can be obtained by playing back through such equipment.

#### Wire Versus Tape

The features of wire and tape are often debated. Each has advantages and disadvantages, too.

Wire with a speed of 24 inches per second, inherently has better frequency response than tape. This is especially true when tape speeds of  $3\frac{3}{4}$ " or  $7\frac{1}{2}$ " per second are used. It is also easier to build a good amplifier that is properly equalized for wire.

#### Tape Equipment Features

Tape has a theoretical advantage in its *capstan drive* mechanism. A good capstan drive insures the tape passing the recording head at a uniform speed with a minimum of *wow* or *flutter*. Musical passages recorded at the end of a half hour of recording can be spliced or edited into a position at the beginning of a recording with no

change in pitch. However, one must not expect a general purpose, low-cost tape recorder to give the quality reproduction obtainable from expensive professional tape recorders, which run at 15 inches per second.

#### Use of Wire Takeup Spool

Wire recorders usually *pull* the wire by means of the *takeup spool*. Although the spool shaft may turn at a constant speed, the wire speed past the recording head will increase as more and more wire is wound onto the spool, increasing its effective diameter. This is not a disadvantage if the entire spool is to be played back, for the playback speed will correspond to the recording speed. It is important only in the event of editing musical recordings.

On the other hand a one-hour spool of wire is no larger than the palm of your hand, whereas a half hour of tape (at a speed of  $7\frac{1}{2}$ " per second) is 7" in diameter. Wire recorders are usually smaller and more easily portable. Many feel that wire is easier to handle.

If music is to be recorded more often than speech, a good tape machine will be the choice because of the absence of *wow* in slow musical recordings, a condition which exists during the recording of the piano or organ. Wire will be selected if the recordings are to involve sales training, talks, dramatics, dictation, etc.

#### Making the Recording

Microphone placement is very important in recording work.

*Soloist or Public Speaker Setup:* Trained voices are usually strong and

resonant. The microphone must be placed far enough from the soloist or speaker to permit good recording with the volume control about one-half full. This may be from three to five or even fifteen feet. A *cardioid* type microphone may help if an audience is present.

*Interviews:* Conversation is usually not very loud. The microphone should be held just above waist height so the person being recorded is not too conscious of it, but is still close to it. The person being interviewed is not too likely to get *mike fright*. Also a good signal-to-noise ratio is obtained.

*Surprise Recordings:* A microphone extension cord should be used and the microphone concealed as near to the center of conversation as practical. The volume control of the recorder should be kept high enough to insure a good recording.

*Receptions:* If you plan to record the greetings of everyone, the microphone should be placed at the head of the reception line, where the names are pronounced clearly and accurately. If the reception is large, the recorder and microphone should be set up in a quiet side room and only the voices of those close to the families or important members of the organization recorded.

*Conferences:* In this instance, the microphone can be laid flat on its back for non-directional pickup characteristics. Each member of the group should talk across the top of the microphone. It is advisable to place the microphone on a soft pad of some sort to absorb unwanted jars and vibrations. Some form of mixer and possi-

(Continued on page 64)



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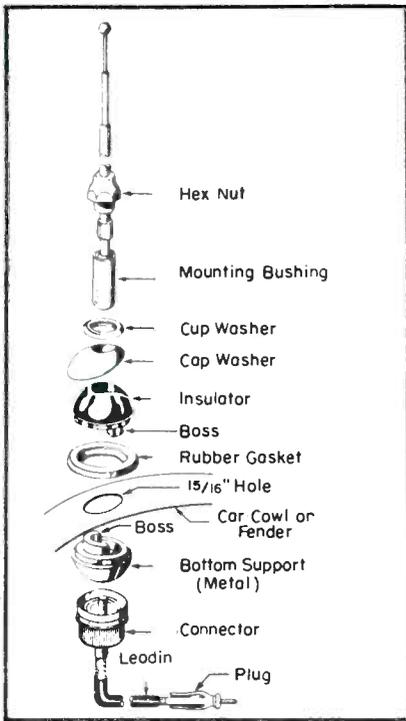
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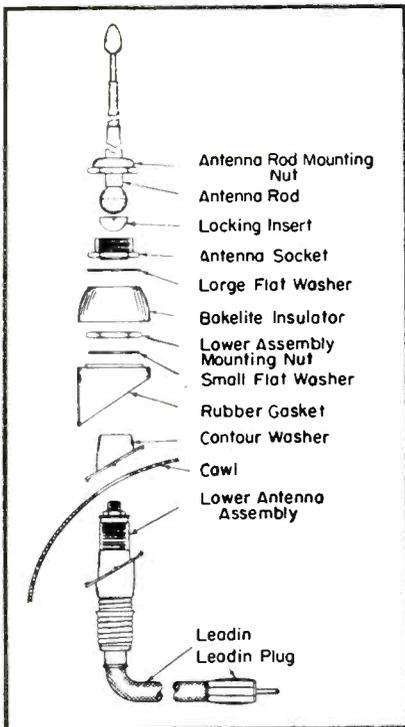
# Auto

(Below)  
Fig. 1. Top cowl or fender mount antenna assembly.



(All illustrations courtesy Motorola)

(Below)  
Fig. 2. Three-section adjustable angle-cowl mount antenna.



(Right)  
Fig. 3. Three-section disappearing fender-mount or top-cowl mount antenna.

## Practical Methods for Installing Cowl and Front-Fender Type Antennas . . . Tools Required and Test Procedures Which Should Be Applied.

AUTO RADIO ANTENNAS, which during the early days were odd inefficient affairs involving chicken-wire lining on fabric car tops and insulated wires on the running boards, have with the advent of the steel-topped cars become strikingly streamlined and highly efficient.

Today, auto antennas are normally found on the cowlings or on the top of the front fenders, the latter type of mounting dictated by the body design, with no space available for cowlings mount.

There are some cars which feature antennas coming out through the center of the top, just above the windshield, but they're in the minority.

The oldest type of the *fishpole* or whip antenna is the two-post or side-

cowl mounted antenna. This type requires two holes for mounting in the body and sufficient vertical space on the cowlings. In addition, the area inside must be clear of obstructions. On the newest cars, it will not be possible to mount this type of antenna. Actually, its usefulness is restricted to older models and pickup trucks. Incidentally, not all of the pickup trucks have the required clearance inside. Cars made by Studebaker, Chevrolet and some others have ventilators in the cowlings. Some have the interiors sealed up with a welded metal sheet, resulting in a double wall which is impossible to cut through. Before beginning the installation of any type antenna, and particularly before drilling any holes in the body, it is wise to

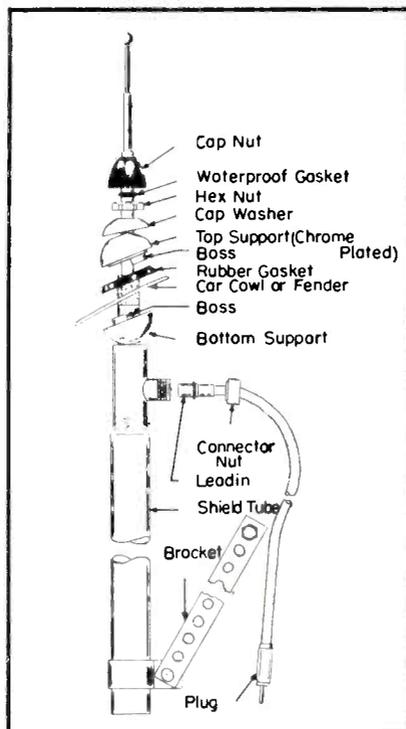
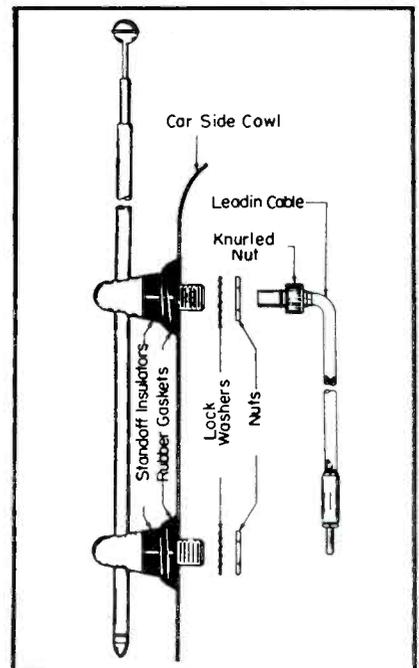


Fig. 4. Three- and four-section side-cowl mount antenna.



# Radio Antenna Installation

by JACK DARR

Ouachita Radio Service

check up to see that the antenna available can be mounted on the car. Often there is no practical way of mounting certain types of rods on a car and a type to fit the body must be substituted.

In installing the side-mount or two-post type antenna, it is necessary to remove the *kick-pad*, on the side where the antenna is to be located. Then an inspection must be conducted within the available space, to see if there will be enough room to allow mounting of the antenna in a vertical position, with the insulators about 6" apart, for those rods up to about 72", and at least 8" apart, for the longer poles, up to 99". The longer antennas naturally require more of a brace than the shorter ones. It is important to be sure that there is sufficient room on the inside to permit

making all connections and tightening of the antenna securely. Nothing is more irritating than to find the leadin connection coming out under a brace with only a work-area clearance of about 1½" available for your hands.

After locating and marking the holes, they can be drilled out to the proper size. Next, the insulation, paint or soundproofing material must be cleaned away from around both holes, on the inside. A small round rotary file, inserted in the drill, will really do a fast job here for you.

Generally, two types of side-mount antennas are used; with separate insulators and with only one large insulator. Both require two holes, however. On the older types and some current models, leadins are terminated

in a *snuff-can* for shielding, and the bolts will be found to be loose.

In mounting this type of antenna, two men are necessary, or one man with extremely long arms and monumental patience. Newer models use a large hollow *bolt*, which is actually the shell of the plug for the leadin, and are considerably easier to install, since the parts are practically all pre-assembled. With either type, it is important to see that the mounting nuts are down snugly to furnish good grounding and in addition, there are no shorts. These connections should not be overtightened; pulling down on the insulator can cause a crack or break, causing premature failure. When installing the

(Continued on page 66)

Fig. 5. Two- and three-section adjustable angle-cowl mount antenna.

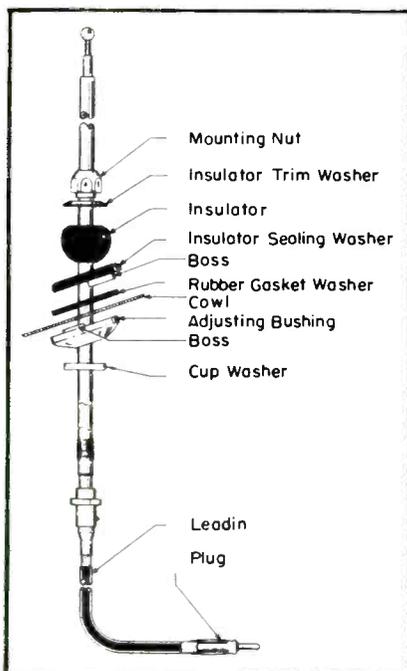


Fig. 6. Three-section adjustable angle cowl mount antenna.

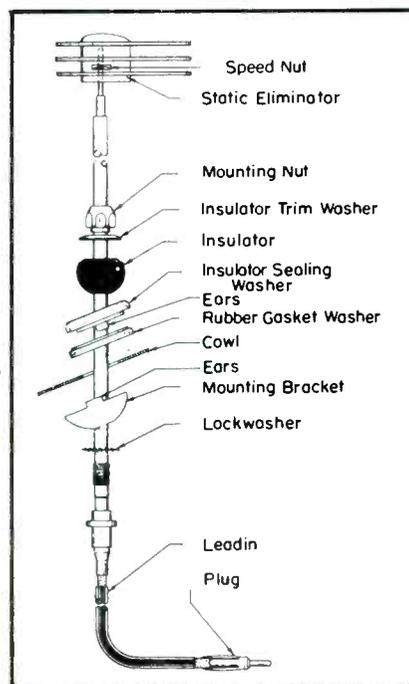
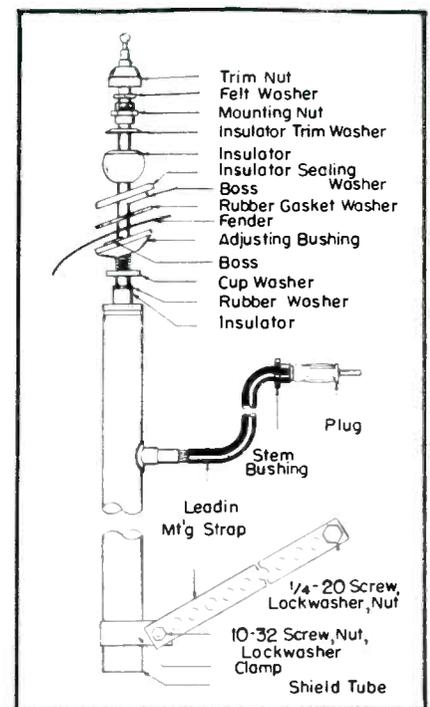


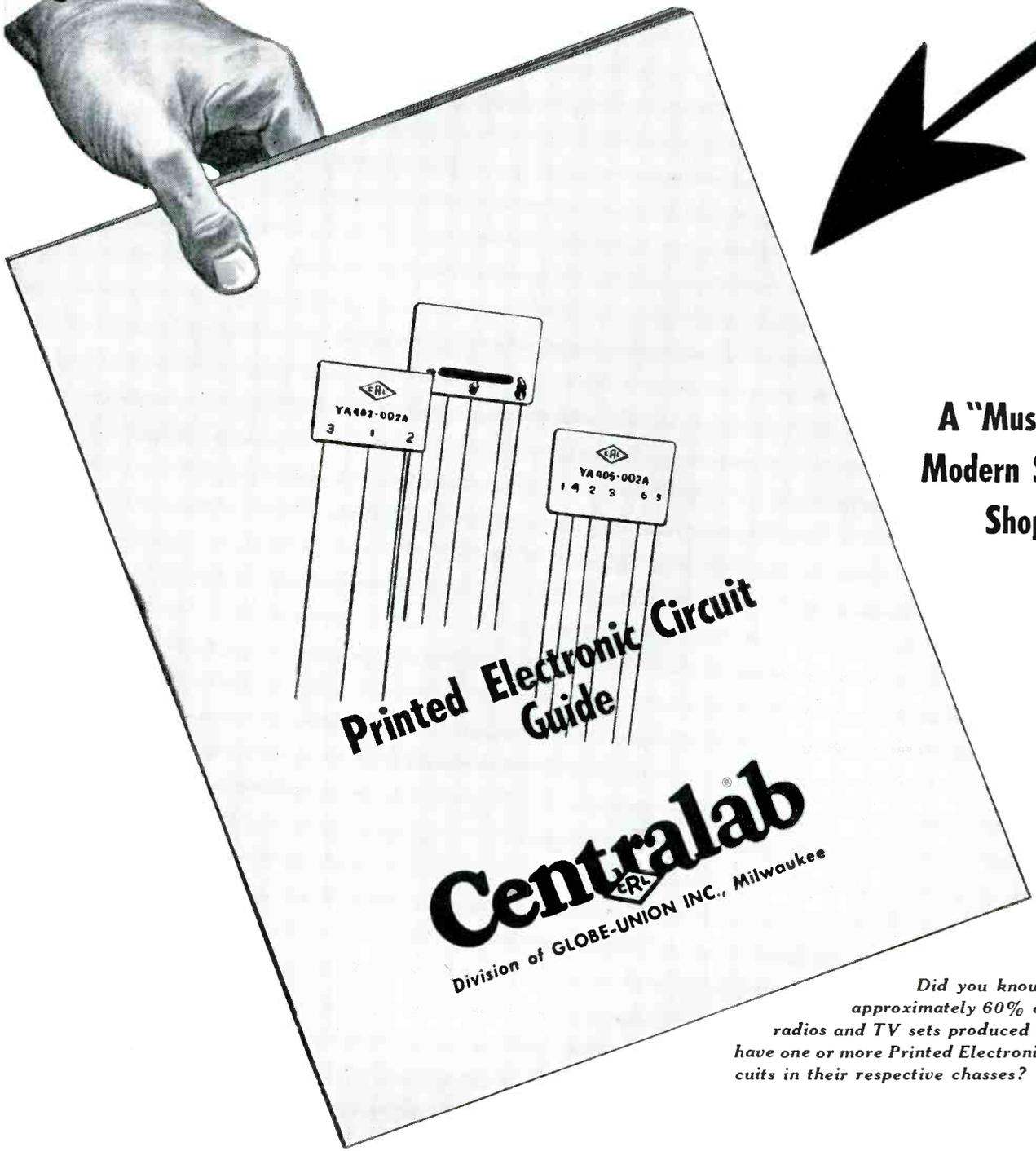
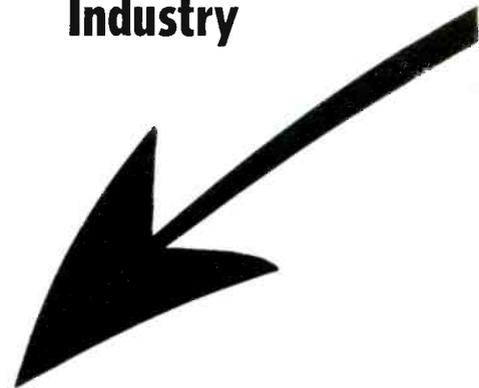
Fig. 7. Three-section adjustable angle disappearing fender-mount antenna.



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# INSTALLING

## Slave-Control Installation Techniques . . . Use of Modified Converter Outputs, Specially-Built Preamp, Altered Volume and Contrast Control Circuitry, and Constructional Modifications in Basic Chassis.



(Left)

Remote unit and preamp for arm-chair control of TV chassis.

Fig. 1. Wiring of 8 or 9-wire power cable and the *if* coax cable. The length of these cables are dependent upon requirements, but they should never be over 100' from TV chassis.

IN PREPARING FOR TV REMOTE tuning, it is important to remember that the introduction of the remote circuitry must in no way interfere with the normal operation of the set. Accordingly, in the system using the cathode follower, the circuit has been so arranged that the output from the preamp (Fig. 4) featured in the setup, provides the same results, as if the original tuner had been retained in the chassis.

### Direct Tie-In for Dual Tuner Operation

In some cases one might desire to have either tuner in operation. If so, then the circuit diagram shown in Fig. 5 can be used.<sup>1</sup> In installing, a non-used channel coil is removed and all parts disassembled, leaving a shell only. After this operation, the blank shells

<sup>1</sup>See April issue of SERVICE for data on cathode-follower circuit used in system.

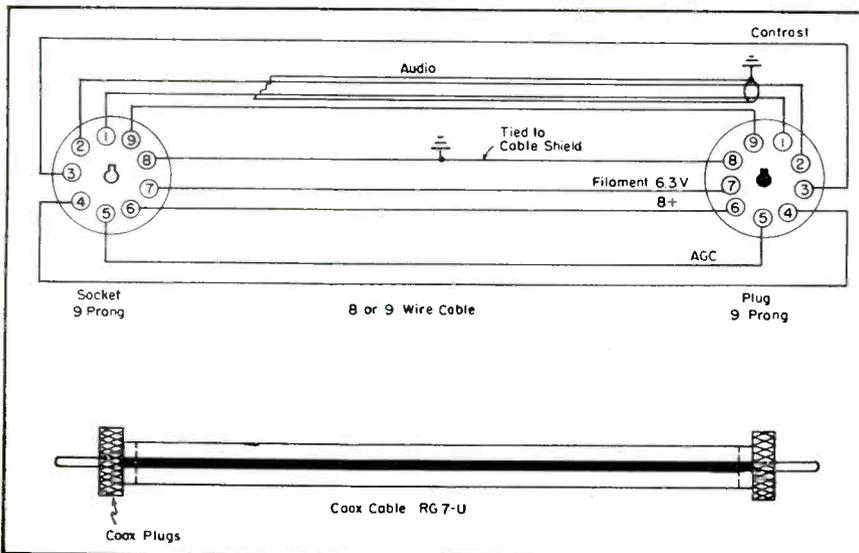
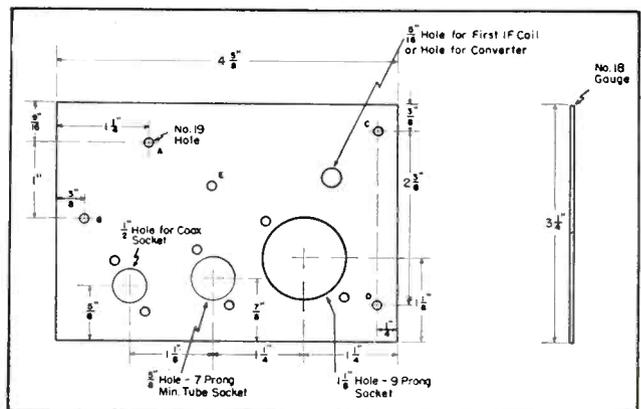
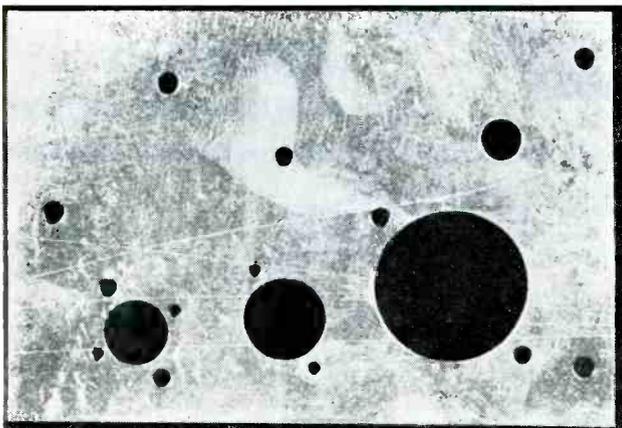


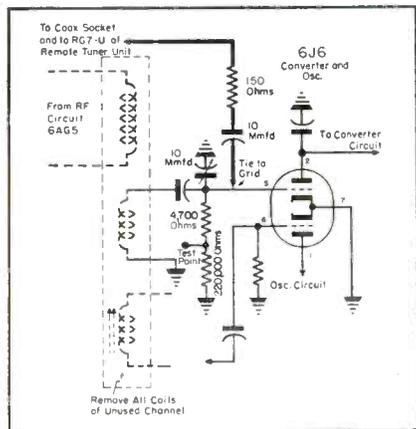
Fig. 2. Preamp chassis layout.

Fig. 3. View of preamp chassis.



# A TV REMOTE TUNER\*

by JAY H. PRAGER



(both *rf/osc-antenna* coils) should be reinstalled in the tuner. Then the coax cable can be wired in through a 150 ohm-10 mmfd combination to the grid of the converter of the tuner.

In this manner either tuner can be used, by tuning to the off channel station, and then operating the remote unit. The remote unit should be operated with a switch in the *B+* section, so that when the tuner is not in use, it can be turned off.

When using this type of remote unit, the tuner in the television set should be first turned to the *off* channel, then the *B+* of the remote tuner turned on. In this way the remote unit will be fed directly into the grid of the converter tube and will not cause interference between oscillators, due to the blank shell.

An additional antenna lead from the television set will be required for the remote tuner unit and should be a balanced 300-ohm line.

Power for the remote is of course required. Thus, a suitable bracket should be made to fit in the rear of the tuner of the TV set in such a way as to enable the power cable and coax cable to fit in properly. A suitable type bracket that can be used appears in Fig. 7.

## Volume and Contrast Controls

After the contrast and volume controls have been located in the remote tuner unit, it will be necessary in most cases to remove the old connections

\*Standard tuners were used in both arrangements.

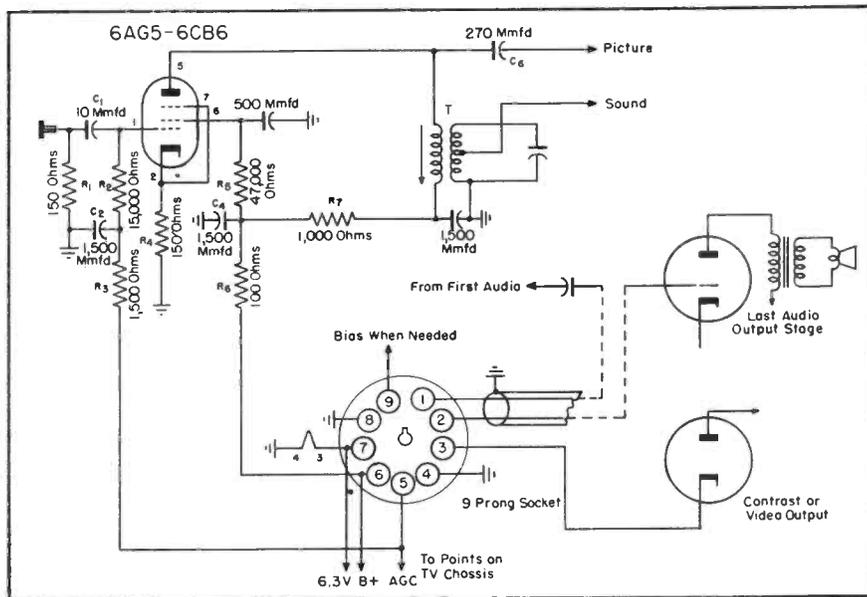
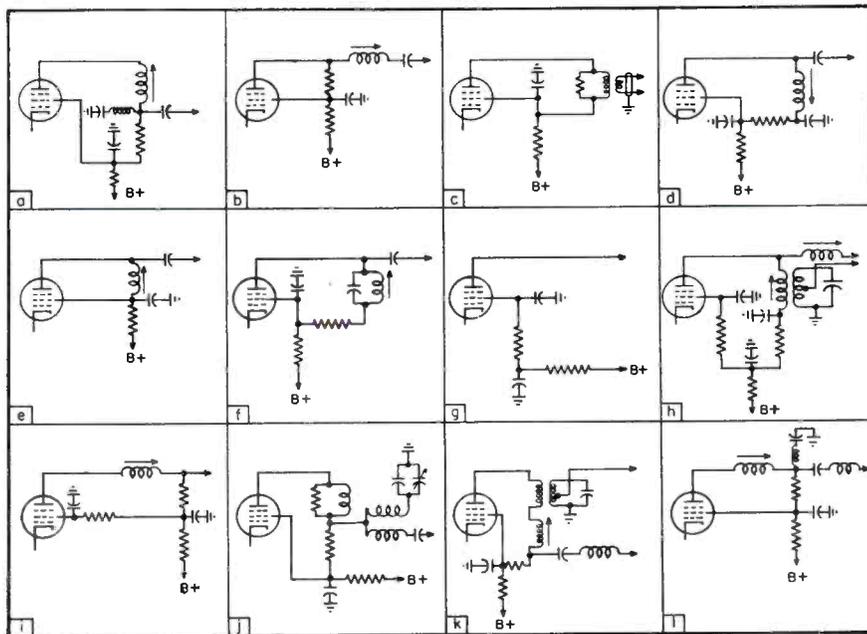


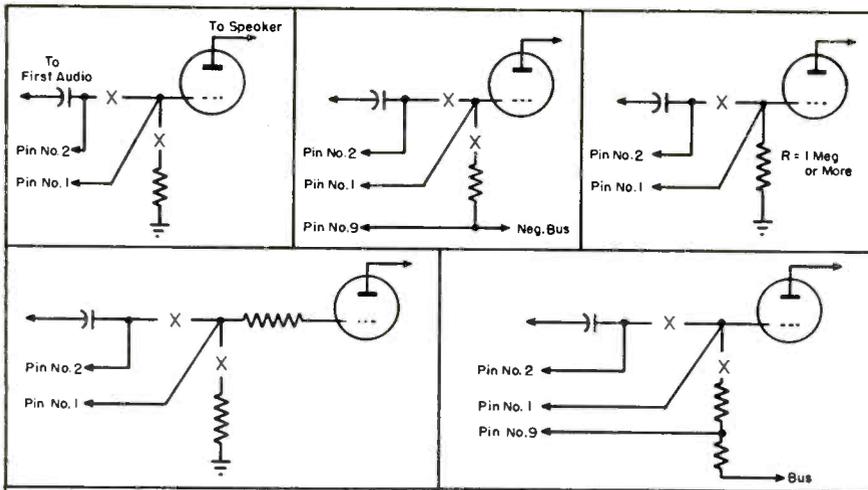
Fig. 4. Circuit of preamp.

(Left)

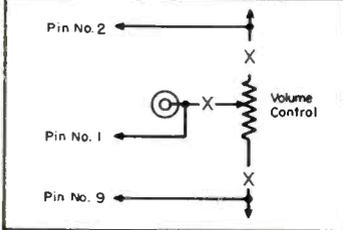
Fig. 5. Circuit which permits either remote or fixed tuner to be used.

Fig. 6. Converter outputs of typical chassis for preamp use: (a) Admiral, Packard-Bell, Calbest; (b) Admiral, Sears, Stewart-Warner, Westinghouse; (c) RCA; (d) G.E., (e) Admiral; (f) Philco; (g) Crosley, Hallicrafters, Westinghouse, Philco, Scott; (h) Admiral; (i) Zenith; (j) G.B.; (k and l) Hoffman.

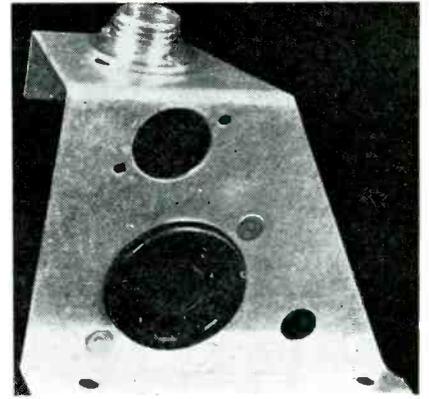




(Right)  
Fig. 7. Bracket which can be used for cable and coax.



(Left)  
Fig. 8. Circuitry of volume controls, in last audio stage, X indicating point of connection.



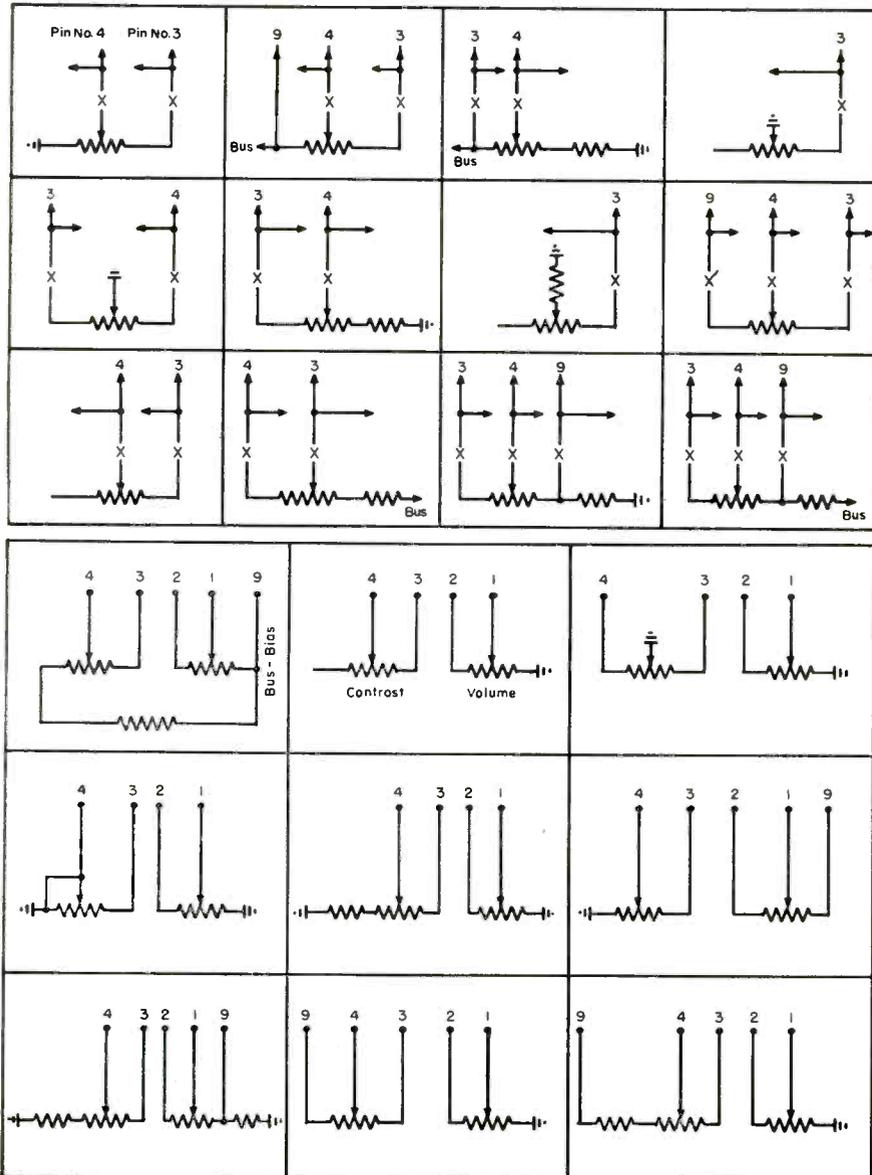
from the control circuits in the TV chassis.

On the 9-prong socket, mounted on the preamp chassis there are the two pairs of wires, connected in the television chassis, as shown in Figs. 4, 8 and 9.

By removing the two wires now connected to the contrast control and running them to a tie point, you will note that the connections are similar to those used in the remote contrast control wiring: The center lead of the control is connected to pin 4, and the other lead of the high end is connected to pin 3. In some sets a bias is required for either the volume or contrast control to complete the circuit. In this case pin 9 is used for this purpose.

A pair of shielded wires from pins 1 and 2 go to the last audio output stage as shown in the cover diagram last month. The coupling capacitor and grid resistor from the last audio output stage should be removed and the coupling capacitor tied to a free point. The lead from pin 1 should then be connected to the open grid. (If a grid resistor of 1 megohm or more is used, it should be left in the circuit). Then the lead from pin 2 should be brought to the free coupling capacitor, which had been removed from the grid circuit, and soldered to the tie point. The circuit will show a volume control inserted in the grid circuit of the last audio stage. When the grid resistors go to a negative bus line, pin 9 can be used to complete these circuits.

In many cases two volume controls can be used; the original one in the TV set which is located in the first audio stage, and the remote volume  
(Continued on page 62)



(Center, left)  
Fig. 9. Contrast-control circuits.

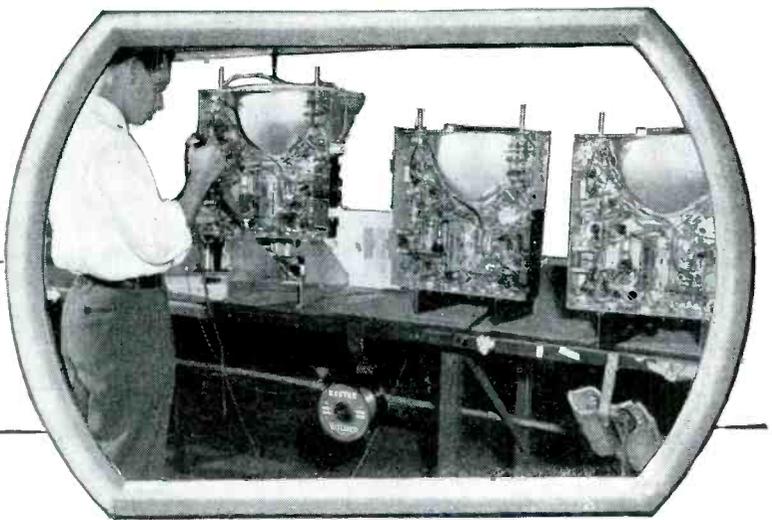
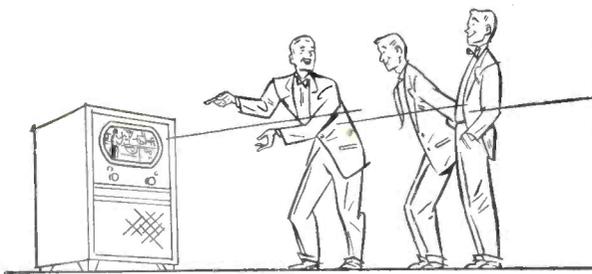
(Left)  
Fig. 10. How volume and contrast remotes are wired into 9-prong plug mounted on front panel.

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# ASSOCIATIONS



## The DuMont-W. U. Plan

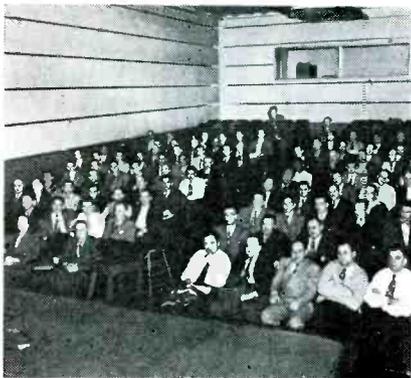
A TV INSTALLATION-SERVICE program involving the use of the facilities of a new Western Union Telegraph Co. subsidiary, Western Union Services, Inc., by DuMont, has become a seething topic of debate among national and local association members.

The plan, authorizing Western Union to install and service DuMont receivers in Essex, Passaic and Union counties in New Jersey, on a trial basis, was patterned on the premise that W. U. could provide adequate and reliable service, according to Thomas F. McMains, vice president and assistant to the president at Western Union.

In one resolution, one association group, PRSMA, declared that such an alliance might be harmful to the independent service technician. The National Alliance of Television Service Associations pointed out that the move was a "severe blow" to TV service contractors.

## DuMont's Views

Commenting on these sharp criticisms in a letter to ye editor, Harold J. Schulman, director of service of the Teleset service control department of DuMont said . . . "We are sorry to learn of the hue and cry being raised by service companies in some parts of the country because of our action in authorizing the Western Union Service Company to install DuMont Telesets in three counties in New Jersey. . . . We feel that no legitimate service company need fear the honest competition that the Western Union Service Company will give. . . . Any fears that presently authorized service companies



## TEN YEARS AGO From the Association News Page of SERVICE, May, 1941

J. L. SHEPLEY reviewed the subject of distortion in audio amplifiers during a meeting of the Radio Technicians Guild, Whaling City Chapter, New Bedford, Mass. An Atwater Kent receiver was used to conduct the demonstration. In one test a milliammeter was inserted in the plate circuit to disclose the plate current applied to the tubes, sine-waves voltages were fed to the input of the tube and a 'scope connected across the output to illustrate bias and distortion. A record player was also utilized, connected to the input, to provide an aural check on distortion. . . . A service group in Fort Wayne began using the studios of WOWO-GL for monthly meetings. During a meeting held in late April, about 140 were in attendance.

may lose their franchise because of Western Union's entering into the service field are completely unfounded. Our only standard now, as in the past, is the ability to perform intelligent and efficient service on DuMont Telesets. . . . We sincerely hope that our many friends in the service business will recognize that honest competition has never hurt any business."

What are *your* views on this plan? Send them to ye editor.

## SARTA

APPROXIMATELY 100 TV SERVICE MEN have enrolled in a special TV training course sponsored by the San Antonio Radio and Television Association and the G. E. tube divisions.

The course, scheduled to be conducted on the second and fourth Tuesday of each month, will continue for 18 sessions. Chief instructors will be Elmo Bohman and Ora Fretz.

At a JFD antenna forum conducted during a meeting of PRSMA in the studios of KYW, Philadelphia, JFD engineer G. Mazel conducted the meeting.

## LBRTA

A SERIES of extremely interesting meetings, conducted recently by the Long Beach Radio Technicians Association, Inc., Long Beach, Calif., featured talks by Charles H. Borgers, field engineer for Hoffman Radio, and Glenn Tillock, field service manager of Packard-Bell.

## OPS Form Talks

According to Harry E. Ward, who is in charge of public relations for the group, recently announced OPS regulations have been set up as a basis of several talks. During one of the talks, form-filing procedures were explained in detail. To simplify this operation, the group has prepared a price schedule and an OPS pricing chart.

The pricing chart describes the category of the equipment, the net cost per unit, offering price per unit, per cent markup on cost and supporting invoice. Copies of these forms are being circulated among Service Men in this area.

## PRSMA

TOM MIDDLETON has resigned his post as president of the Philadelphia Radio Servicemen's Association and opened a shop in Miami, Florida, where he will specialize in the sale and maintenance of communications equipment.

## TCA

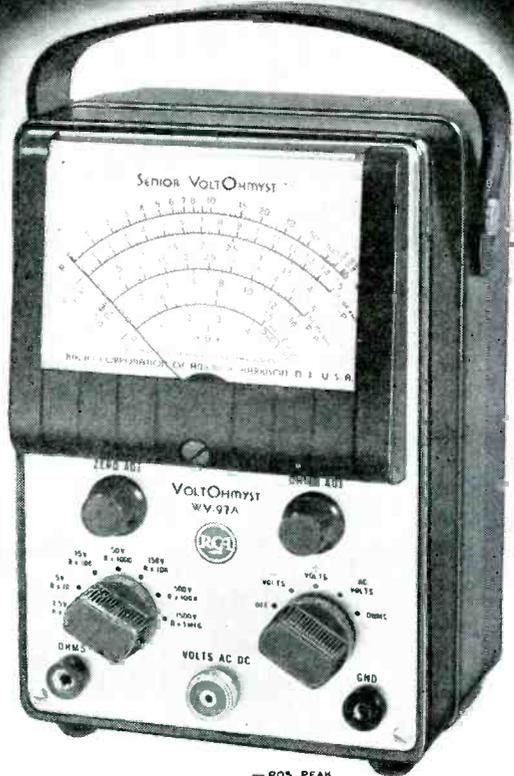
TWO MEMBERS of the Television Contractors Association of Philadelphia exhibited during the recent Philadelphia (Continued on page 75)

Peggy Buckley and Joseph F. Griffin of Joseph F. Griffin and Co., Inc., Philadelphia TV service shop, manning the firm's booth at the recent Philadelphia Home Show.



# The **NEW** RCA WV-97A Senior VoltOhmyst\* reading peak-to-peak voltages ONLY \$67.50 Suggested User Price

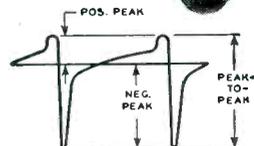
Includes direct probe and cable,  
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9. Fully enclosed metal case shields sensitive electronic-bridge from rf fields.
10. More convenient to use because of smaller size and new slip-on probes.

The WV-97A measures peak-to-peak voltages directly. Hence, it quickly provides information essential for servicing TV receivers with their pulse-type waveforms.



The WV-97A has a range of usefulness extending beyond that of any other instrument in the field. Its quality, dependability, and accuracy make it a true laboratory instrument; it is exactly what is needed for television in the design laboratory, factory, and service shop.

The new Senior VoltOhmyst measures dc voltages in high-impedance circuits, even with ac present. It reads the rms values of sine waves and the peak-to-peak values of complex waves or recurrent pulses, even in the presence of dc. Its electronic ohmmeter has a range of ten billion to one.

Like all RCA VoltOhmysts, it features high input resistance, electronic protection from meter burn-out, zero-center scale for discriminator alignment, molded-plastic meter case, a 1-megohm isolating resistor in the dc probe, and sturdy metal case for good rf shielding.

An outstanding feature is its usefulness as a television signal tracer . . . made possible by its high input resistance, wide frequency range, and direct reading of peak-to-peak voltages.

For complete information on the new RCA WV-97A Senior VoltOhmyst, see your RCA Test Equipment Distributor, or write RCA, Commercial Engineering, Section 56EX, Harrison, New Jersey.

\*Reg. U. S. Pat. Off.

## SPECIFICATIONS

### DC VOLTMETER:

Seven continuous ranges . . . . . 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts

Input resistance (including 1 megohm in dc probe):

All ranges . . . . . 11 megohms

Sensitivity for the 1.5 volt range . . . . . 7.3 megohms-per-volt

Over-all Accuracy . . . . .  $\pm 3\%$  of full scale

### AC VOLTMETER—Fourteen continuous ranges:

Peak-to-peak ranges . . . . . 0 to 4, 14, 42, 140, 420, 1400, 4200 volts

Maximum peak-to-peak input voltage for complex waves, 2000 volts

RMS ranges (for sine waves) . . . . . 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts

Input Resistance and Capacitance with WG-218 Direct

Probe and Cable:

1.5, 5, 15, 50, 150-volt ranges . . . . . 0.83 megohm shunted by 70  $\mu\text{F}$

500-volt range . . . . . 1.3 megohms shunted by 60  $\mu\text{F}$

1500-volt range . . . . . 1.5 megohms shunted by 60  $\mu\text{F}$

Frequency Response with WG-218 Direct Probe and Cable:

1.5, 5, 15, 50, 150, 500-volt ranges flat from 30 cps to 3 Mc for

voltage source having 100-ohm impedance

Overall Accuracy:

1.5, 15, 50, 150, 500, 1500-volt ranges . . . . .  $\pm 5\%$  of full scale

### OHMMETER:

Seven continuous ranges . . . . . 0.2 ohm to 1000 megohms

Center scale values . . . . . 10, 100, 1000, 10,000 ohms;

0.1, 1, 10 megohms

DIMENSIONS: 7 $\frac{1}{4}$ " high; 5 $\frac{3}{4}$ " wide, 4 $\frac{1}{2}$ " deep

### AVAILABLE ACCESSORIES:

WG-264 Crystal Diode Probe. Extends range to 250 Mc

(\$7.75 suggested user price)

WG-289 High-Voltage Probe and WG-206 Resistor to extend range to

50,000 volts. (\$9.95 suggested user price)



Available from your RCA Test Equipment Distributor  
**RADIO CORPORATION of AMERICA**  
TEST EQUIPMENT HARRISON, N. J.

# AUDIO installation and service

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

by KENNETH STEWART

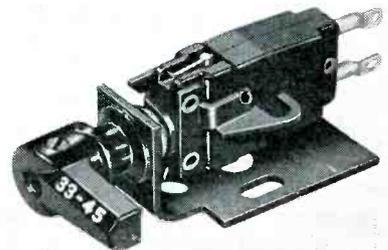


(Left)

One of final acoustical and electrical tests of completed microphones on the assembly line. (Courtesy, Shure Brothers, Inc.)

(Below)

Two-needle, three-speed cartridge replacement. Supplied as a complete unit, including twist mechanism cartridge, needles and instructions for installation. Twist mechanism can be removed when cartridge is to be installed in tone arms in which twist mechanism is integral. Protected against moisture by a *dri-pack* package and *dri-seal* crystal. Cartridge is expected to be available around June 15th. (Model AX, Webster Electric Co.)



### Eliminating Groove Skipping, Erratic Trip Action, and Record Slipping on 45s\* . . . Remedies for Common Problems in Three-Speed Changers . . . Changes Required When Substituting Variable Reluctance Pickups for Crystal Pickups.

ALTHOUGH THE SERVICING of three-speed phonos normally involves simple adjustments, on occasions there are situations which can be quite taxing. Sometimes the difficulty is due to a production or assembly error, and in other instances, there are just stubborn operational problems which appear to defy solution.

#### Groove Skipping

Groove skipping often is one of the annoying hard-to-solve troublemakers. This can be contributed, in part, to the variety of conditions which can cause the skip. Anything that can cause a

drag on the tone arm will contribute to groove-skipping. For example, a worn needle will tend to skip grooves. Another possibility is that the Lubriplate (lubricant) between a gear engagement pawl and trip motion arm becomes excessively tacky after the changer has been in use for some time. Lubriplate is usually applied between these two parts, strictly as a safety measure, to insure a friction load if the friction washer becomes loose. If the trip-friction washer has the correct tension, the changer will function properly with the Lubriplate removed. In this case, it is suggested that all of the Lubriplate be removed from between

these two parts and allowed to dry. It may be necessary to bend the trip-friction washer to get proper friction, but too much tension should not be added. Lubricant should not be removed from any other place in the changer.

#### Erratic Trip Action

Erratic trip action is another puzzling problem. This may be caused by failure of the trip slider return spring to return the trip slider to proper position as the changer goes through its cycle.

#### Record Slipping

In the 45 position, record slipping is quite common. This may be due to several factors. The adaptor nibs may be deformed, may not fit tight enough in the record, or may be cocked. Replacement of the plastic adaptor with one which will fit in the

\*Based on notes for the RC550 changer, supplied by the service division of Admiral Corp.

record better and have sharper ribs will usually help eliminate the trouble.

Needle force may be too great for this type of record. Removal of a tone arm weight used in some models has helped.

### Cause-Remedy Tabulation

Other problems often encountered involve thumping, rumble or roar, clicks, etc. In a study of the causes and remedies for most of these troubles, it was found that there were an assortment of possible solutions available. Accordingly a chart was prepared, as shown in Fig. 1, citing the symptom, cause and remedy. In preparing the data, a changer using a single pickup arm, with a single-spindle three-speed unit,<sup>1</sup> served as the basis for the tabulation.

Other features of this mechanism included a pickup arm designed to use a two-position knob-controlled dual stylus pickup with a variable reluctance cartridge. A special spring coupling system makes it impossible for the changer mechanism to be jammed or damaged by accidentally moving the pickup arm during the change cycle. The 45 records are adapted to the single spindle of this changer by inserting a bushing in the large center hole of each record.

Indexing of the tone arm for different sizes of records is automatically controlled by two feeler levers, making unnecessary the usual manipulation of the record shelf by the operator.

While the remedies suggested, in the main, are quite simple, there are some cases, as cited earlier, where the repair required may be more involved. For instance, stylus checking requires several operations. Dust on and around the stylus may cause easily corrected complaints. A soft bristled brush should be used to clean these parts.

The small rubber-like damper block may become loose at one end, causing distortion. A tiny drop of thin nail polish may be used to re-cement the damper block. It is important to be sure that the whole block does not become coated with the cement.

Stylus should ride equidistant between the pole pieces, with only the stylus tip protruding down below the poles. Low pickup output has been often traced to a stylus lever bent down below the field of the poles. Normally, a slight extra pressure on the pickup arm causes the stylus to be forced up between the poles, which then support most of the pressure, protecting the stylus.

The tiny microgroove stylus may

Symptom	Cause	Remedy
<i>Too slow, stalls</i>	Dirt or oil on motor pulleys and turntable rim	Clean with carbon tet
	Speed pulley unsnapped from retaining ring	Snap back in place
	Large idler wheel mounting bent, idler tire not making firm contact with pulley	Straighten mounting
	Voltage too low	Check line voltage; should be at least 105
	Changer too cold	Test changer at room temperature, 70°
	New oil or grease too heavy	Use only light oil and grease. Many points must have no oil. (See discussion on lubrication)
<i>Noises: Wow</i>	Oil on pulleys causing slippage	Clean with carbon tet
	Warped records	Use flat records for testing
<i>Click</i>	Trip lever friction assembly too stiff	Clean, adjust spring by bending for minimum friction required to move pawl lever
<i>Rumble, roar</i>	Changer not floating on mounting springs	Loosen mounting bolts under turntable
<i>Thumping</i>	Dent in rubber tire on idler wheel, caused by storing changer in 33-45 position or allowing motor to run when changer is stalled	May disappear after running the changer a few minutes; otherwise replace the idler wheel. To prevent reoccurrence, leave speed control knob between 78 and 45 when not in use
<i>Dead motor or pickup</i>	Open circuit	Both circuits are simple series type and can be easily checked with an ohmmeter: Pickup, 340 ohms; motor, 15 ohms, approximately
<i>Poor tone . . . Jumps grooves</i>	Broken or dirty stylus	See stylus and pickup data
	Stylus pressure too light	
	Pickup arm bearings stiff	Remove all grease, burrs
	Substandard records	Check for scratches, shallow grooves
	Changer not level or not floating on springs	Level changer; loosen mounting bolts
	<i>Doesn't drop records</i>	Spindle mechanism bent or dirty Record holes too small
<i>Drops two records</i>	Record holes too big	Use other records
	Record guide in spindle may be stuck	Record guide must drop freely by gravity
<i>Fails to cycle, or cycles too soon</i>	Check trip link, trip lever, pawl lever and trip pawl for easy operation. Check spring friction coupling between trip lever and pawl lever	Straighten bent trip link; wash off main gear levers; <i>do not oil</i>

Fig. 1. Three-speed changer troubleshooting chart.\*\*

be easily broken, causing distortion, groove-jumping, and rapid record wear. Such a defect is almost impossible to see with the naked eye, especially since the sharp outline of a break would be worn round by the time the Service Man was called. A jeweler's eyeglass, known as a loupe, is very

useful when inspecting styli and damper blocks.

Early stylus wear, though distinguishable by the ear, is almost impossible to determine by sight, unless a high-powered microscope is used. For this reason the listening test for stylus  
(Continued on page 72)

<sup>1</sup>G.E. P16. \*\*Prepared by G.E.

### KRAMPF NOW AEROVOX EXECUTIVE VICE PRESIDENT

Charles E. Krampf has been elected executive vice president of Aerovox Corp., New Bedford, Mass. Krampf succeeds Bert Conway of Detroit, who has resigned, but who will remain on a consulting basis and as a member of the board of directors.

Krampf will also continue as president of Electrical Reactance Corp., ceramic division of Aerovox Corp. He will be in charge of the overall operation of Aerovox.

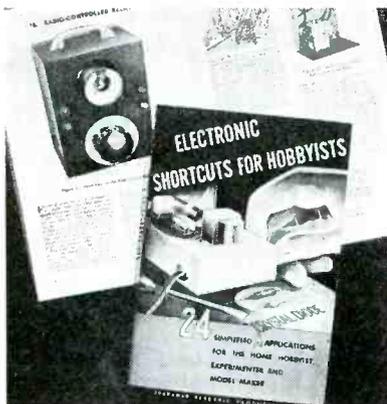
\* \* \*

### SYLVANIA ELECTRONIC-SHORTCUT BOOKLET

A 54-page booklet detailing twenty-four popular applications of germanium crystal diodes has been announced by the electronics division, Sylvania Electric Products, Inc., Emporium, Penna.

Booklet tells how to build an interval timer, polarity checker, polarity reversal alarm, spark quenchers, charger for small dry batteries, low-current relay circuit, door chime *pepper*, photoelectric relay, crystal receiver, electronic metronome, radio-controlled relay, wired radio-control transmitter, wired radio control receiver, radio control for model railroads, pocket type stroboscope, light-duty electroplater, low-current power supply, radio garage door opener, *ac* ammeter-wattmeter for appliance testing, *dc* to *ac* converter and an electronic door lock.

Booklet is priced at twenty-five cents.



\* \* \*

### NEDA AND REP INDUSTRY DINNER

The Yankee chapter of NEDA and New England chapter of *The Reps* were hosts recently to industry at an industry dinner in Boston during which about 400 distributors, reps, manufacturers, sales managers and their guests attended. Speakers included Robert A. Water, president of the New England chapter of *The Reps*, A. C. Stallman, president of NEDA, Joseph DeMambro of NEDA, and Louis B. Calamaras, executive secretary of NEDA.

Guest speaker of the evening was John B. Hynes, mayor of the city of Boston.

### SCHAUER EXPANDING

Construction of a new plant has been announced by the Schauer Manufacturing Corp., 2060 Reading Road, Cincinnati, Ohio. Structure will be of the one-floor plan type and will be located on 10 acres of ground.



A. J. Kohn, proxy of Schauer Mfg. Corp.

\* \* \*

### MINNESOTA MINING TAPE BOOKLET

An eight-page booklet, *Tapes for Television*, is now available from Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

Booklet contains production uses for the tapes, technical data on seven electrical tapes and one filament tape, ten different design and installation-maintenance problems and their solutions. Included are uses, showing deflection yokes, focus coils, flyback coils, electrolytic capacitors, and antennas being constructed and serviced.

\* \* \*

### PMs WITHOUT CRITICAL MATERIAL ANNOUNCED BY SYLVANIA

Permanent magnets containing only non-critical material for applications in radio and television receivers have been announced by the metallurgical laboratories of Sylvania Electric Products, Inc., Bayside, N. Y.

\* \* \*

### BLOOM AND FRIEDMAN BECOME MANUFACTURERS REPS

Hy Bloom, who recently headed sales for Radio Merchandise Sales, Inc., and Al Friedman, who was also associated with RMS as chief design and sales engineer, have formed a rep agency, B-F Associates, at 521 Fifth Avenue, N. Y. C.

They will cover Pennsylvania, West Virginia, Maryland, New Jersey and Metropolitan New York.



H. Bloom



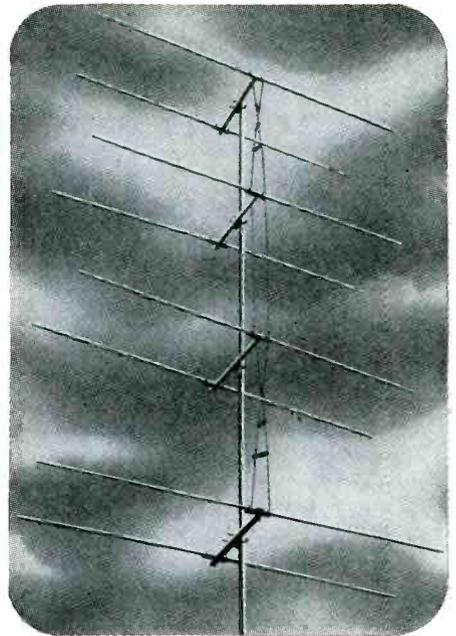
A. Friedman

\* \* \*

[Additional news on pages 76, 77, 78, 79, 80 and 81.]

# POWERFUL

## All Channel



## VEE-D-X COLINEAR

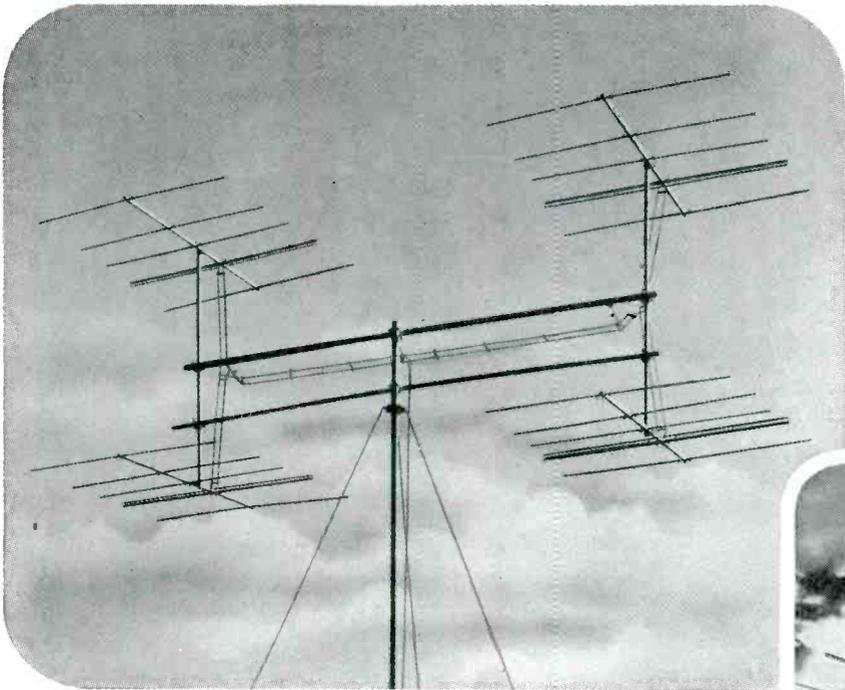
This exclusive VEE-D-X antenna was developed to fill the need for more powerful all-channel reception in primary as well as fringe areas. Besides producing higher gain throughout the TV spectrum, the Colinear may be cut to any single high channel for sharp directivity, yet will resonate on low channels regardless of high channel selected. Like the VEE-D-X JC Yagi, the Colinear is completely pre-assembled. It is also the lowest priced four-bay array ever manufactured. The LaPointe-Plascomold Corporation, Windsor Locks, Conn.

Another great

# VEE-D-X

*first*

# NEW STACKED ARRAYS



*Four Stacked Side-by-side JC Array — a radically new type of array developed for highest gain in hilly and mountainous terrain. Provides powerful long distance reception.*

OF THE **JC** YAGI

**PRODUCE SHARP,  
CLEAR PICTURES  
AT AMAZING DISTANCES**

## **SUPER POWERFUL**

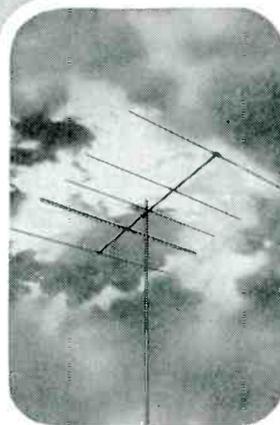
*For Single Channel Performance*

VEE-D-X — largest producer of Yagis — brings you new stacked arrays that provide still higher gain and further reduce noise interference. Perfected by VEE-D-X engineers in collaboration with a foremost authority on wave propagation, these stacked arrays make a world of difference in picture quality. In addition to the already popular double stacked array with half-wave spacing, you can employ double stacked arrays with full-wave spacing and half-wave four stacked, either vertical or side-by-side. Choice of array depends on area terrain and reception conditions.

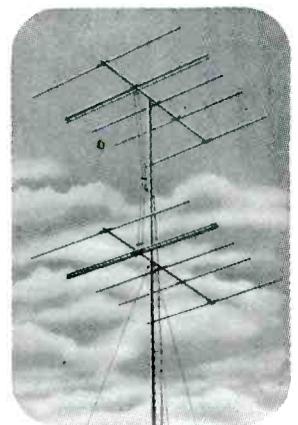
THE LAPOINTE PLASCOMOLD CORPORATION  
Windsor Locks, Connecticut

CHICAGO SHOW  
BOOTH NO. 691  
DISPLAY ROOM 660

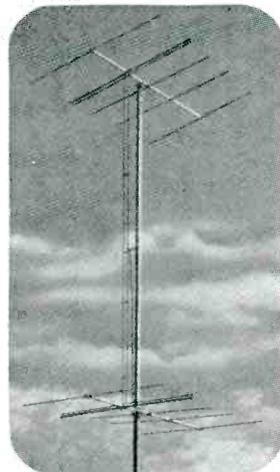
# VEE-D-X



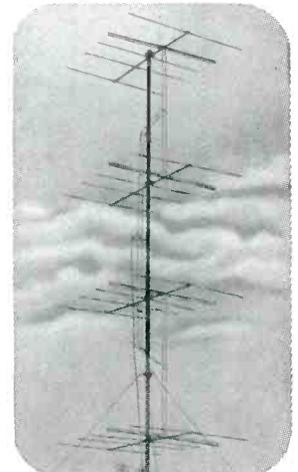
*Standard JC Yagi Array — unsurpassed for all normal single-channel requirements.*



*Double Stacked JC Array with half-wave spacing. Provides added gain and better signal-to-noise ratio.*



*Double Stacked JC Array with full-wave spacing. Provides highest possible gain in low noise areas.*



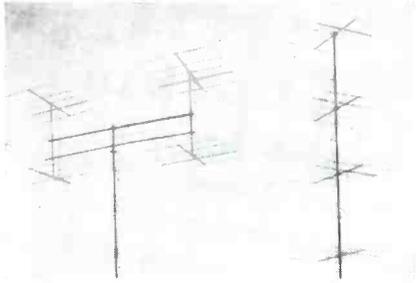
*Four Stacked Vertical JC Array provides extremely high gain and excellent improvement of signal-to-noise ratio. Ideal for long distance reception areas with relatively flat terrain.*

**BUILDERS OF THE WORLD'S MOST POWERFUL ANTENNAS**

# New TV Parts...Accessories

## VEE-D-X YAGI STACKING HARNESSES

Phasing harnesses to convert the regular Vee-D-X JC yagi into horizontal or vertical 4-stacked systems, have been developed by The La Pointe-Plascomold Corp., Windsor Locks, Conn. Vertical type has been found effective in flat terrain country and horizontal in hilly and mountainous areas.



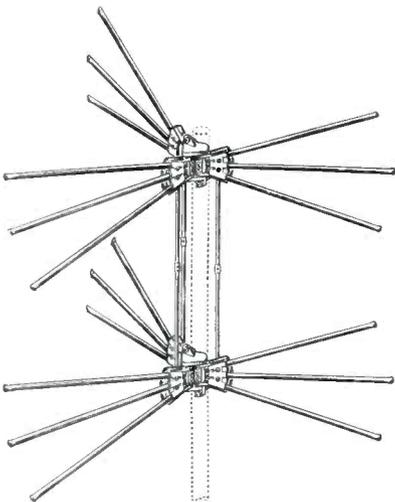
\* \* \*

## SNYDER BEAM AND YAGI ANTENNAS

Two TV antennas have been announced by the Snyder Manufacturing Co., 22 and Ontario Streets, Philadelphia, Pa.

One, the *directronic*, is said to be a motorless system with a 360° electronically-switched beam. Featured is a beam selector which is claimed to provide remote control of element combinations in a single line installation.

Another antenna, the yagi, has been incorporated into both the *Redi-Mount* and *Head-Line* series. Both high and low band models are preassembled.



Snyder directronic system.

\* \* \*

## COLUMBIA 4-WAY CONDUCTOR ROTATOR WIRE

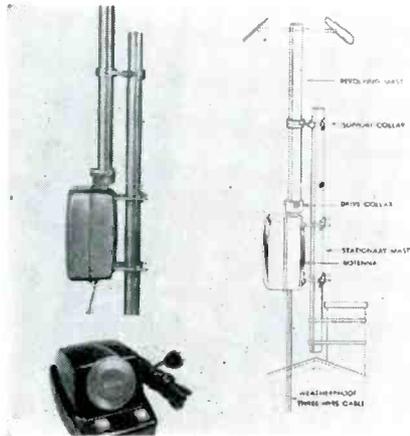
A 4-way conductor rotator wire has been announced by the Columbia Wire and Supply Co., 2850 Irving Park Rd., Chicago, Ill. Featured are twisted conductors, available in four or five-conductor units.

## WALCO ANTENNA ROTATOR

An antenna rotator, the *Walco Rotenna*, which is claimed to supply a minimum of 50 inch-pounds of starting torque from a motor weighing less than 3½ pounds and measuring 4" by 4" by 7½" has been designed by Walco Products, Inc., 60 Franklin St., East Orange, N. J. It is equipped with a selsyn motor type dial indicator which shows the position of the antenna.

Uses a stainless steel drive shaft, bronze bearings, nylon drive gear, plated (rust-proof) hardware.

Motor is gasketed and sealed in from weather. When not in use, the motor and mast are locked so the antenna cannot turn, nor can it coast when power is turned off. Accommodates mast sizes from 1" through 1½". Uses a six-conductor rotor lead.



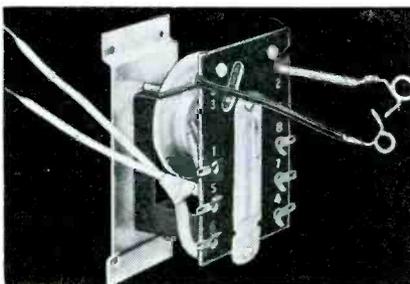
\* \* \*

## RAM 16-KV FLYBACK TRANSFORMER

A flyback transformer, X053, which is said to generate 16 kv for both the regular deflection and the electrostatic deflection picture tubes, up to and including the 20" size, is now available from Ram Electronics, Inc., South Buckhout Street, Irvington-on-Hudson, N. Y.

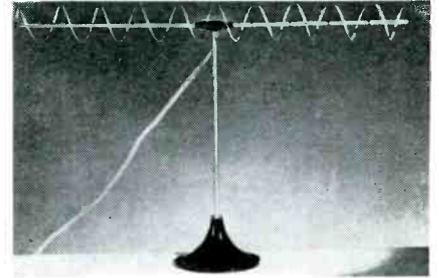
According to the manufacturer, no Barkhausen oscillations, ringing, whistle or corona are produced by the transformer.

Transformer is said to eliminate need for one *hv* doubler, one rectifier tube, one 2-meg resistor, two 3.3-ohm resistors, and two *hv* capacitors.



## HI-LO TV SPIRAL ANTENNA

An indoor floor model TV spiral antenna has been announced by the Hi-Lo TV Antenna Corp., 3540 N. Ravenswood Ave., Chicago 13, Ill. Antenna is 20" high and 32" wide.

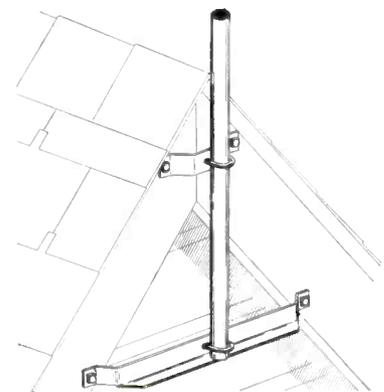


\* \* \*

## KENCO EAVE MOUNT

An antenna eave mount which can be installed at the apex of the eave, has been announced by the Kenwood Engineering Co., Inc., 265 Colfax Ave., Kenilworth, N. J. Mounts on the hanging rafter or trim board of the eave and is said to eliminate the need for drilling on brick, masonry or asbestos shingled walls, and the use of sidewall brackets required on buildings with extended eaves.

Installation with four lag screws are required. U-bolt slots in the long lower member are said to permit vertical alignment of the mast after the mount has been secured to the eave. A reinforcing step in the long lower member, foots the mast for orientation of the antenna. Mount of galvanized steel takes masts up to 1½" in diameter.



\* \* \*

## TELEMATIC MAST COVERS

TV antenna mast covers to cap the open top of mastings have been announced by Telematic Industries, Inc., 1 Joralemon St., Brooklyn, N. Y.

Mast cover snaps into place to close off the open end of the mast. It is said to prevent mast howl and to eliminate rust streaking on side of house.



**DON'T LET HIM "PITCH" YOU**

**BLACK  
IS  
WHITE...**

**INSIST ON**

**Sheldon "Telegenic" Picture Tubes**

*where* **BLACK IS BLACK-**

**WHITE IS WHITE-** *and between*

**ALL THE NATURAL**

**INTERMEDIATE SHADING!**

This FULL RANGE of picture tones seen only on Sheldon "Telegenic" Picture Tubes, makes possible MAXIMUM CONTRAST with CLARITY . . . with NO EYE STRAIN and NO GLARE . . . whether on a Velour Black or clear face screen . . . whether viewed in daylight or under artificial light.

Superior picture quality is the reason why Sheldon Picture Tube production has been stepped up to 5,000 daily! This production increase is made possible by another recent installation of the most modern in-line exhaust unit in the industry.

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CATHODE RAY TUBES • FLUORESCENT  
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**WRITE FOR VISUAL PROOF  
OF SHELDON'S SUPERIOR PICTURE QUALITY!**

**MAIL COUPON TODAY**

Sheldon Electric Co., 68 Coit St., Irvington 11, N. J. B

- Send  Proof of Picture Quality  
 "Characteristics and Dimensions" Wall Chart  
 "Television Mis-Information"  
 "Ion Burns—How to Prevent Them" Brochure  
(They're free — but PLEASE PRINT)

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

VISIT BOOTH NO. 201, PARTS DISTRIBUTOR SHOW, STEVENS HOTEL, CHICAGO, MAY 21-23.

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# Before Any Other Consideration

## Integrity of Circulation



**O**F THE several factors that enter into the use of published media, the distribution of the advertisers' sales messages, as governed by the selection of media, can of itself decide the success or failure of the advertising investment. That is why integrity of circulation is the first consideration with experienced space buyers.

The emblem shown above stands for the **FACTS** that make it possible for advertisers to select the right media and to know what they get for their money when they invest in publication advertising. It is the emblem of membership in the Audit Bureau of Circulations, a cooperative and nonprofit association of 3300 advertisers, agencies and publishers.

Working together, these buyers and sellers of advertising have established standards for circulation

values and a definition for paid circulation, just as there are standards of weight and measure for purchasing agents to use in selecting merchandise and equipment. In other words, A.B.C. is a bureau of standards for the advertising and publishing industry.

A.B.C. maintains a staff of specially trained auditors who make annual audits of the circulations of the publisher members. Information thus obtained is issued in A.B.C. reports for use in buying and selling space. All advertising in printed media should be bought on the basis of facts in these reports.

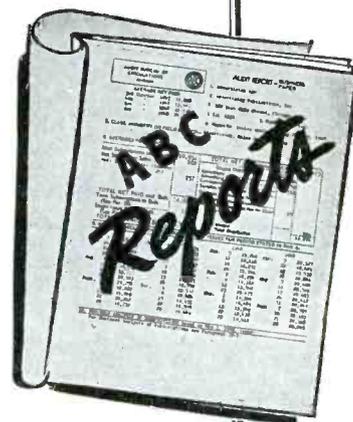
This business paper is a member of the Audit Bureau of Circulations because we want our advertisers to know what they get for their money when they advertise in these pages. Our A.B.C. report gives the facts. Ask for a copy and then study it.

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Paid subscriptions and renewals, as defined by A.B.C. standards, indicate a reader audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

- How much paid circulation.
- How much unpaid circulation.
- Prices paid by subscribers.
- How the circulation was obtained.
- Whether or not premiums were used as circulation inducements.
- Where the circulation goes.
- A breakdown of subscribers by occupation or business.
- How many subscribers renewed.
- How many are in arrears.

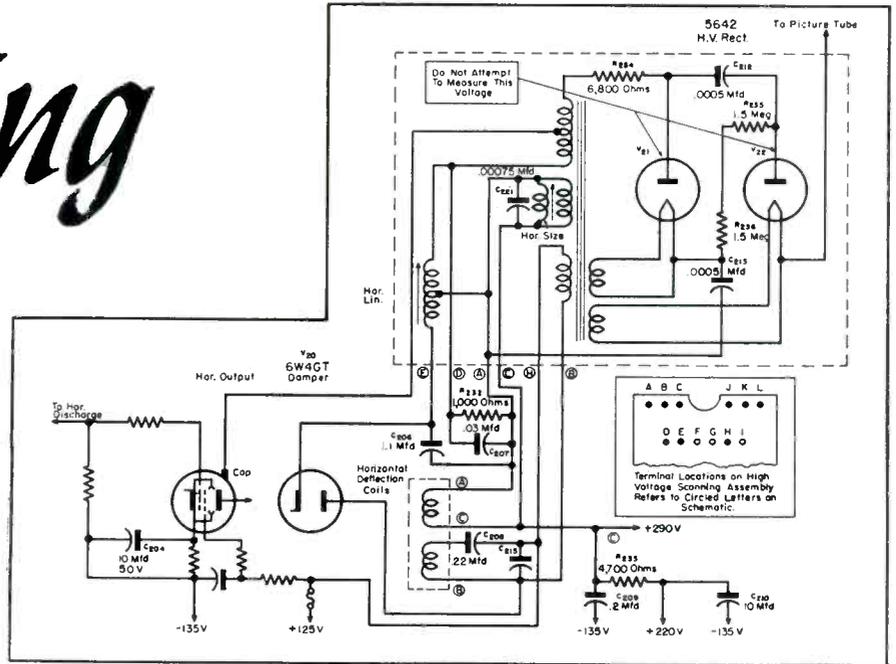


## SERVICE

**A.B.C. REPORTS — FACTS AS THE BASIC MEASURE OF ADVERTISING VALUE**

# Servicing Helps

Fig. 1. Sylvania (1-290 chassis) horizontal scan and high-voltage circuit modified to eliminate need for filament isolating transformer for 6W4GT damper tube. This revision is not simple and should not be attempted unless the correct replacement parts are available, the necessary test equipment is used and all measurements can be made accurately.



by M. A. MARWELL

IN DEFLECTION CIRCUITS, the accumulative effect of minor variations in the individual tube and component characteristics can cause various scanning imperfections. This may be particularly noticeable when replacing major components in the deflection system.

Among the various troubles that can be caused by variations in component characteristics are insufficient width and height, excessive width, etc. Recently Westinghouse conducted an analysis of these problems and evolved a series of solutions, based on the V-2170 series chassis.

When both the width and height are insufficient, the low potential lead of the high-voltage filter capacitor in this model should be connected to chassis ground rather than to its normal connection at pin 7 of the horizontal output transformer. This will reduce the picture tube second anode potential approximately 800 volts, providing increased deflection.

## Increasing Picture Width

To increase the picture width, the value of the capacitor in the return lead of the deflection yoke horizontal winding should be changed from .25 to .1 mfd. This will reduce the overall reactance in the horizontal deflection

**Westinghouse TV Service Hints: Eliminating Deflection Circuit Troubles Caused by Variations in Component Characteristics . . . Curing White Horizontal Line Troubles . . . Removing Tunable Beat Patterns . . . Improving Vertical Hold . . . Minimizing BC Interference. Admiral Service Helps: Improving Reception in Weak Signal Areas . . . Securing Additional Picture Contrast . . . Increasing Sensitivity . . . Removing Vertical Bars . . . Eliminating Horizontal Sync Instability. Sylvania TV Chassis Service Notes: Removing Shock Hazard in 16-Inch Sets . . . Preventing Arcing at 1B3GT Cap . . . 6AG5 Replacements . . . Adjustments of Focus, Ion Trap and Centering Magnets.**

circuit, allowing greater horizontal deflection current to flow.

The height of the picture can be increased by connecting a 1-megohm resistor in parallel with the height control.

## Reducing Width

Excessive width of a picture can be reduced by inserting a reactance network in series with the horizontal winding of the deflection yoke. In this series, the network consists of a reactor in parallel with a 5,600-ohm resistor, and it is inserted in the line

that runs between the horizontal winding of the deflection yoke and a capacitor.

Another method of reducing the width is to connect a resistor (110 ohms, 5 watts) across the primary of the width control. This resistor should be mounted outside the high voltage can. A lead extends from terminal  $\delta$  of the horizontal output transformer to the terminal board located adjacent to the high voltage supply. The resistor should be connected between this tie-point and the B+ tie-point on the other terminal board. The effect of

the resistor is to cause a greater reduction in width on the left side of the picture than on the right side.

Chassis in which the horizontal linearity is such that a vertical line appears approximately three inches or more from the left side of the picture can be treated by applying cathode bias to the horizontal output tube. This can be accomplished by inserting a 33-ohm resistor in parallel with a .1-mfd capacitor between the cathode of the tube and ground. In some chassis a 68-ohm resistor is used along with the same .1-mfd capacitor, but this value of assistance may occasionally produce a slight compression at the extreme right of the picture.

#### White Horizontal Line Problem

A white horizontal line extending across the middle or lower section of the picture in Westinghouse B-2170 sets has been found to be caused by a spurious oscillation in the vertical output tube. This oscillation appears to be at a very high frequency and is apparently generated within the tube itself. In most cases, the trouble can be eliminated by placing a tube shield around the vertical output tube. It may be necessary in more stubborn cases, however, to try other tubes of the same type until one that performs satisfactorily is located.

#### Removal of Tunable Beat Pattern

When a beat pattern that can be changed by using the fine tuning control appears on the picture, it can usually be assumed that the interfering beat is developed within the receiver itself. Interfering beat signals that develop within the receiver are sometimes called *rf tweets*.

In the Westinghouse V-2170 sets, it has been found that one type of *rf* tweet develops as a result of coupling through the heater network. To eliminate this effect, a reactor should be inserted in series with the heater string immediately ahead of the 6T8 ratio detector and first audio amplifier tube, so that the 6T8 and the tubes that follow in the string are isolated (at *rf*) from the other tubes in the string. The reactor has been included in later production chassis.

#### Coupling Type of RF Tweet

Another type of *rf* tweet has been found to be produced by coupling of the *if* signal voltage back into the antenna circuit. This coupling can

usually be eliminated by dressing the line, that runs from the antenna terminals to the tuner, away from the *if* chassis.

#### Fluctuations in Vertical Size

Small, rapid fluctuations in the *ac* line voltage can cause a corresponding vertical expansion and contraction (bounce) of the picture. This effect is more noticeable with receivers that contain a large picture tube.

In cases where the effect is objectionable, the time constant of the decoupling network in the vertical multi-vibrator plate supply can be increased to compensate for the line voltage variations. This can be accomplished in Westinghouse V-2170 chassis by changing  $C_{440}$ , located on the  $B+$  supply line that runs to the height control, from .25 to 10 mfd, 450 *v* electrolytic.

If more picture height is required after making this change,  $R_{365}$  in the same  $B+$  supply line should be changed to 47,000 ohms, and a 1-megohm resistor should be connected across the height control.

These changes have been incorporated in some later chassis.

#### Improving Vertical Hold

A poor vertical-hold characteristic in the Westinghouse H-603C12 and H-608C12 models has been found to be due to radiation of the horizontal sweep signal into the red and orange leads that extend between the *uhf* adapter plug and the wafer switch. To eliminate the pickup on these leads,

both the red and orange leads should be disconnected from the wafer switch, the leads run out over the top of the chassis and down through a hole near the wafer switch, and the wires reconnected to the wafer switch.

#### Elimination of BC Interference\*

Under certain conditions, interference to broadcast reception can be caused by a nearby television receiver. The interference will in most cases consist of rough signals spaced at 15,750-kc intervals across the broadcast band. These interfering signals are harmonics of the horizontal sweep signal in the television receiver, and the source of the interference is the horizontal deflection circuit of the TV receiver. Receivers that employ high-impedance type deflection yokes are more likely to cause interference, than those receivers using a low-impedance yoke because of the greater tendency toward radiation from a high impedance circuit. The interference can be transmitted by direct radiation from the TV receiver or by conduction through the *ac* power line.

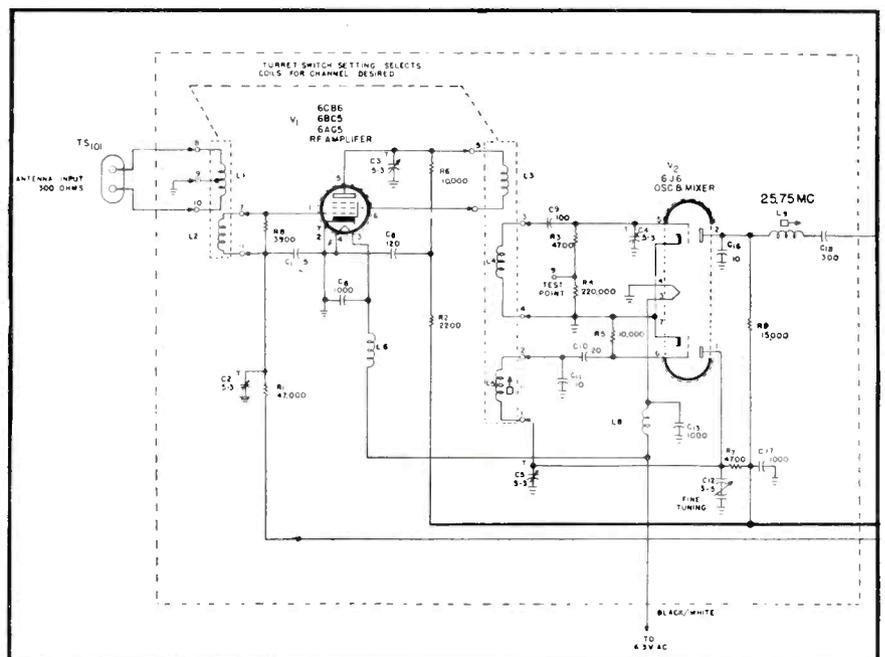
#### Direct Radiation Cures

In cases where the interference is transmitted by direct radiation, corrective measures may involve a complete shielding of the TV receiver. This can be accomplished by using low resistance metallic foil to enclose the

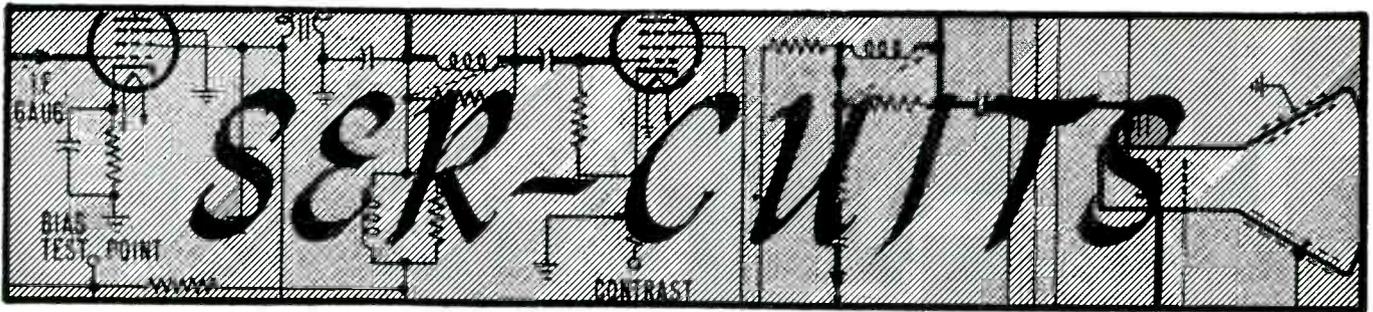
(Continued on page 82)

\*Based on notes prepared by Westinghouse.

Fig. 2a. Tuner used in model 800 Hallicrafters TV chassis shown at right.







by M. W. PERCY

THE TWENTY-INCH TV chassis, which during the past few months has become one of the most popular types of sight and sound sets, have been found to include quite an assortment of circuit improvements required for increased-area viewing.

In some of these models, such as the Raytheon 20AY21 series chassis (which uses a 20-inch rectangular) illustrated in Fig. 1, the modifications appear in several sections of the circuit; vertical deflection being one.

#### Circuit Features

This circuit consists of the twin-triode 6SN7, one-half being used as a blocking oscillator and the other half as a buffer, and a 6V6 beam power amplifier as a vertical output tube.

A 100,000-ohm vertical hold control ( $R_{74}$ ) varies the amount of *dc* voltage applied to the grid of the oscillator and thus controls the oscillator's operating point, which in turn provides an adjustment for synchronization.

The signal from the blocking oscillator is taken from the cathode through a 100,000-ohm resistor and .2-mfd capacitor ( $R_{88}$  and  $C_{150}$ ) and coupled through a .05-mfd capacitor and a pair of resistors with values of 1 megohm and 2 megohms, the latter being the vertical size control ( $C_{151}$ ,  $R_{90}$  and  $R_{70}$ ) to the grid of the buffer. Varying the vertical size control changes the amplitude of the pulse to the grid, which in turn changes the amount of vertical deflection.

#### Bass-Boosting

A 220-mmfd mica, and two resistors, valued at 100,000 ohms and 1 megohm, the latter being a vertical linearity control ( $C_{152}$ ,  $R_{87}$  and  $R_{90}$ ) provides a bass boost arrangement for proper pulse shaping. Varying the vertical linearity control changes the shape of the buf-

## Features of Raytheon Twenty-Five Tube 20-Inch Rectangular Tube Chassis . . . Design and Operational Characteristics of Philco Tuner With Twin Triode.

fers grid pulse to provide the necessary pulse shape for the output tube, to obtain a linear sawtooth through the deflection yoke.

A 22-ohm resistor ( $R_{87}$ ) serves as the ground return for the vertical winding of the deflection yoke and is in the cathode circuit of the buffer. The voltage developed across this resistor opposes the voltage at the grid of the buffer which is a type of negative voltage feedback. This negative voltage feedback arrangement makes the vertical linearity control independent of the vertical size control. Adjustment of the vertical size control does not require readjustment of the linearity control to maintain a linear picture.

#### Bias Network

Two capacitors, with values of .05 and .2 mfd, and a 1-megohm resistor ( $C_{153}$ ,  $C_{159}$  and  $R_{84}$ ) represent a bias network for the grid of the buffer. There is a constant negative voltage of approximately 20 volts at the grids of the horizontal pulse amplifiers and a portion of this voltage is tapped off across a 390,000-ohm resistor,  $R_{80}$ , for the buffer's bias.

To eliminate vertical retrace lines at high brightness levels, an *rc* net is

used; .05-mfd and .02-mfd capacitors, and 10,000 and 2,200-ohm resistors ( $C_{142}$ ,  $C_{143}$ ,  $R_{140}$ ,  $R_{141}$ ).

#### AFC Discriminator

The automatic frequency control section utilizes a 6AL5 twin diode. The horizontal sync pulses from the sync separator are coupled to the *afc* tube through a 470-nmfd capacitor,  $C_{125}$ . At the same time two feedback voltages of opposite polarity are intergrated and applied to the plates of the *afc* discriminator. The two feedback voltages are obtained from the *agc* winding (terminals 7 and 9) of the *hv* deflection transformer and are of the same frequency as the horizontal multivibrator.

Any phase shift between the horizontal sync pulses and the horizontal multivibrator signal will cause one diode section to conduct more than that of the other, which will result in a *dc* bias voltage applied to the grid of the multivibrator and change the operating frequency. The output of the *afc* discriminator thus synchronizes the horizontal multivibrator to the incoming horizontal sync pulse.

#### Horizontal Multivibrator

The horizontal multivibrator uses a 6SN7 and is of the conventional cathode-coupled type. The core-tuned parallel-resonant circuit ( $L_{23}$  and  $C_{107}$ ; 3,900-mmfd mica) is used as a hold adjustment to stabilize the frequency of oscillation. Because of the wide pull-in range of the automatic frequency control tube, a fine hold control is not necessary.

A 80-480 mmfd trimmer ( $C_{108}$ ) serves as the horizontal drive control in the plate circuit to control the amount of drive voltage applied to the pulse amplifier. Increasing the capacity decreases the drive voltage. To aid in cutting off the pulse amplifier tube at the proper time, a negative peaking

(Continued on page 60)



device, a 68-mmfd ceramic ( $C_{110}$ ) is used.

### Pulse Amplifier

A pulse amplifier is used in this chassis. It employs two 6BQ6 beam pentodes connected in parallel (functions as one tube) and is used to develop the necessary power for the fly-back pulse and the horizontal winding of the deflection yoke.

### Damper

A 6W4 is used as the damper. It performs three functions: aids in horizontal scanning, suppresses oscillations which occur over part of the horizontal scanning cycle and affords an increase in plate supply voltage for the vertical oscillator, buffer, sync amplifier and the first anode of the picture tube.

A horizontal linearity coil ( $L_{26}$ ) is a parallel resonant circuit in the damper cathode. Varying the inductance of the coil changes the damper tube's operating point and thus controls the linearity of the horizontal sweep.

A horizontal size coil ( $L_{24}$ ) shunts a portion of the horizontal deflection transformer winding. Varying the inductance of the horizontal size coil varies the coupling to the yoke which in turn controls the size of the picture.

Because of the high potential at the cathode of the damper, the filaments must be isolated from ground. This is accomplished by the filament transformer,  $T_{10}$ .

### High Voltage Supply

High voltage is obtained from an autotransformer type primary winding of the horizontal deflection transformer. When the plate current of the pulse amplifier tube is cut off, the field built up in the primary winding collapses and induces a high voltage surge which is rectified by the 1B3, filtered by a 500-mmfd capacitor,  $C_{158}$ , and then applied to the second anode of the picture tube.

### Automatic Gain Control

A 6AU6 pentode is used for gated *agc*. Plate voltage for this tube is obtained from a separate secondary winding (terminal 9) on the horizontal deflection transformer. The plate voltage is applied at a horizontal rate while the grid signal is obtained from the plate of the first video amplifier.

Due to the  $B+$  voltage on the cathode and grid, the bias voltage of approximately 35 volts keeps the tube cut off. The tube will only conduct

Wire Color	Where Used
Black	B- or ground leads
Brown	Filament leads
Red	B+ leads
Orange	Screen leads
Yellow	Cathode leads
Green	Grid or control leads
Blue	Plate leads
Violet	Not used
Gray	AC leads
White	Bias leads

Fig. 2. RTMA wire color-coding chart.

when the plate is pulsed from the *agc* winding and a positive sync pulse appears at the grid.

The *agc* voltage is developed across a pair of resistors, 68,000 and 33,000 ohms ( $R_{11}$  and  $R_{51}$ ), and applied to the first three *if* amplifiers. Due to the divider network of these resistors only a portion of this voltage is fed to the *rf* amplifier. The *agc* voltage will vary considerably according to the strength of the received signal, but should be proportional to the voltage developed at the grid of the first video amplifier.

### Filament Isolation Winding

Due to the high potential between cathode and filament a separate winding of the power transformer ( $x$  and  $y$ ) is used to isolate the tube's filament which prevents cathode to filament breakdown.

### Defective AGC Checks

A defective *agc* system may not affect the sound but overload the video amplifier circuit and the result will be a loss of both horizontal and vertical sync and very weak video. This condition can be noticed and checked by measuring the *agc* voltage and the voltage at pin 7 of the 12AT7 first video amplifier. Under normal operating conditions these two voltages will be approximately the same. A defective *agc* system will cause a large increase in voltage at pin 7 of this tube and a decrease in *agc* voltage.

### Video IF Amplifiers

The *if* amplifiers, video detector and *dc* restorer stages are all mounted on a sub-chassis. The *if* amplifier section consists of four stagger-tuned stages using 6AU6 pentodes with self-resonant core tuned coils. The receiver is of the intercarrier type; therefore both the video and sound *if* frequencies are amplified simultaneously. The signal is then detected by one-half of a 6AL5 twin diode and coupled to the video

amplifier. The other half of the 6AL5 is used as a *dc* restorer.

### Sound Section

The sound section is also mounted on a sub-chassis and consists of a 6AU6 *if* amplifier, 6AL5 detector, 6AU6 audio amplifier and a 6V6 output tube. Due to the heterodyne action between the video and sound *if* frequencies, a 4.5-mc signal is obtained containing the audio information. After the video detector, the audio information is separated from the video signal by a pick-off coil,  $T_8$ . The signal is then amplified, detected and further amplified by the 6AU6 and 6V6 tubes.

### Video Amplifier

The video amplifier section is a conventional two-stage amplifier using one-half of a 12AT7 twin triode as the first amplifier and a 6V6 as the second video amplifier. The other half of the 12AT7 tube is not utilized. A parallel resonant video trap coil is tuned to 4.5-mc to separate the audio from the video. A combination of shunt and series peaking coils are used with a degenerative picture control to vary the signal to the grid of the picture tube.

### DC Restorer

As indicated, one-half of the 6AL5 is used as the *dc* restorer. The video is coupled to the grid of the picture tube by a .1-mfd capacitor. Thus the *dc* component of video signal will not be passed; therefore, the background level of the picture will vary. A bias voltage proportional to the average video signal level will be developed across a 1-megohm resistor,  $R_{31}$ , and maintain the proper brightness level.

### Sync Separator and Vertical Sync Amplifier

The sync pulses from the plate of the first video amplifier are coupled to the sync separator tube ( $\frac{1}{2}$  of 6SN7) through a 470-mmfd capacitor,  $C_{101}$ . The sync pulses are then separated from the blanking pedestal and due to the low plate voltage, sync clipping is accomplished. The horizontal pulses are coupled to the *afc* discriminator through another 470-mmfd capacitor,  $C_{125}$ , and the vertical pulses are amplified by the other half of the 6SN7 before being fed to the intergrating network of the vertical deflection circuit.

To aid in circuit tracing RTMA color-coded cables are used, with leads

connected as indicated in Fig. 2. (Due to procurement difficulties there may be some slight deviations.)

### Triode-Type Tuner

On occasion, efforts have been made to use triodes, as *rf* amplifiers, in tuners because they generate a much smaller amount of noise and have a higher input impedance than most pentodes. However, the advantages of the triode have been offset by its higher grid-to-plate capacity making it difficult to use an *rf* amplifier with useful gain without running into regeneration and instability. Thus, most *rf* amplifiers have employed pentodes with their low grid-to-plate capacity such as the 6AG5, 6BC5, and 6CB6, even though their input impedance is lower and the noise generated within the tube is higher.

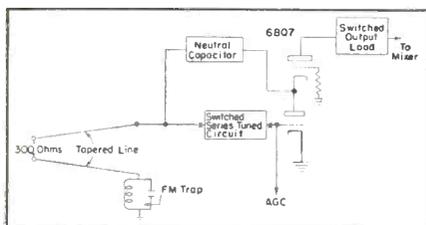
In a study of the problem at Philco, it was found that the triode problem could be overcome with a dual-triode system, one serving as an impedance transformer matching the relatively high impedance of the tuned circuit to the low impedance of the cathode of the second triode, in a grounded-grid voltage amplifier stage. A simplified diagram of the tuner is shown in Fig. 3. In spite of the shielding provided by the grounded grid, and the low cathode impedance of the second triode (approximately 240 ohms) it was found necessary to use some neutralization to prevent feedback which would reduce the input impedance of the first triode. Therefore neutralization was included and fixed by the value of a neutralizing capacitor,  $C_n$ , Fig. 4. The neutralization is not required to prevent instability but does serve to materially improve the signal-to-noise ratio of the amplifier system.

### First Stage Power Amplifier

The first stage is effectively a power amplifier having a gain of approximately 1. Under these conditions this stage is entirely stable. The power gain of this first stage working into the low impedance of the grounded-grid second triode gives an overall gain which is approximately equivalent to that of a single, well designed,

(Continued on page 70)

Fig. 3. Simplified diagram of the twin-triode Philco tuner system.



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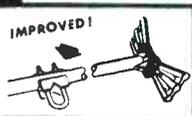
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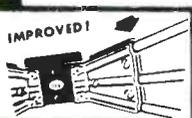
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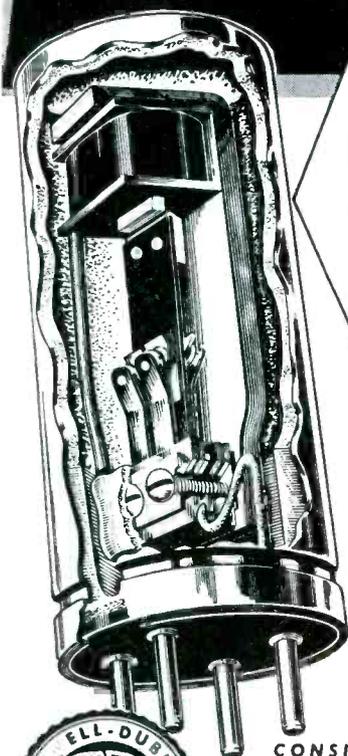
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### Printed Circuits

(Continued from page 30)

pears on the cover. In this model, a clock-radio developed by Capelhart-Farnsworth (TC-20), the printed circuit is used as a coupler between first audio and output stage.

#### Tube Complement

Tubes used are 12BE6 oscillator-converter; 12BA6 *if* amplifier; 12AV6 detector, *avc* and first audio amplifier; 50C5 power output, and 35W4 rectifier.

### Remote Tuner

(Continued from page 44)

control in the last audio stage. In either case, one or the other must be in a maximum position.

#### Volume-Contrast Circuitry

In wiring up the remote volume-contrast controls it is essential to know the correct circuit that is to be used. The many combinations that can be used are illustrated in Fig. 9, p. 44.

## Tube News

(Continued from page 33)

and no service adjustment is needed. The criterion for proper sawtooth waveform is circuit efficiency. The shape of the sawtooth voltage waveform on a 'scope is not a satisfactory criterion for waveform adjustment. Significant changes in circuit efficiency can be obtained with such subtle changes in sawtooth waveform that the effects on the 'scope waveform are not readily perceptible.

#### Vertical Deflection

The vertical-deflection circuits can be operated from the boosted *B* supply, provided the current drain is not more than 12 milliamperes. Any larger current drain reduces the scanning amplitude and the high-voltage output. The relatively high boosted voltage permits the design of a vertical-deflection circuit of good efficiency. When a 6S4 vertical-output tube, a ferrite-core magnetic-deflecting yoke,<sup>2</sup> and a vertical-output transformer having an 18:1 turns ratio are used, adequate vertical deflection can be obtained with a 6S4 plate current of approximately 11 milliamperes.

#### Rating Interpretations\*\*

In tube note data, there often appears reference to class *A* or *B* amplifiers, screen ratings, etc. Usually this information is based on the RTMA system of design center maximums and should be interpreted as outlined in the following paragraphs.

**Class A Amplifiers:** The maximum plate dissipation occurs at the zero-signal condition. The maximum screen dissipation usually occurs at the condition where the peak-input signal voltage is equal to the bias voltage.

**Class B Amplifiers:** The maximum plate dissipation theoretically occurs at approximately 63 per cent of the maximum-signal condition, but practically may occur at any signal-voltage value.

#### Screen Ratings

The maximum screen voltage rating may be exceeded provided all of the following conditions are satisfied:

- (1) At any operating condition the screen voltage does not exceed the maximum plate voltage rating.
- (2) At any operating condition the

<sup>2</sup>RCA 209D1.

average screen dissipation does not exceed the maximum rating.

(3) At the operating condition which results in maximum screen current, the screen voltage does not exceed the value required for maximum screen dissipation. This condition, however, may not represent the maximum dissipation condition.

#### Typical Operation

For many receiving tubes, the data show typical operating conditions in particular services. These typical operating values are given to show concisely some guiding information for the use of each type. They are not to be considered as ratings, because the tube can be used under any suitable conditions within its rating limitations.

Pin 1 on metal receiving tubes is usually connected to the outer shell of the tube. Certain glass tubes with octal bases have internal shields connected to this pin. To obtain correct operation of octal-based tubes, Pin 1 should never be used as a terminal for any voltage or portion of the electrical circuit, but should be connected to ground whenever possible.

#### Electrostatic Focus TV Tubes

Electrostatic focus picture tubes, in 14, 17 and 20-inch types, have been announced. The 14 and 17-inch tubes, 14GP4 and 17FP4, have been produced by the television picture tube division of Sylvania Electric Products, Inc.

Mechanical specifications of the 14GP4 are: overall length approximately 16 $\frac{3}{4}$ "", diagonal bulb dimension 13 $\frac{1}{8}$ "", height 9 $\frac{3}{8}$ "", width 12 $\frac{3}{8}$ ". Useful screen area is 8 $\frac{3}{4}$ " x 11 $\frac{5}{8}$ ". The 17FP4 has an overall length of approximately 19 $\frac{3}{4}$ "", diagonal bulb dimension 16 $\frac{5}{8}$ "", height 12 $\frac{1}{4}$ "", width 15 $\frac{3}{8}$ "", and a useful screen area of 10 $\frac{3}{4}$ " x 14 $\frac{1}{4}$ ".

Both tubes supplied with 6.3 v, 0.6 amp heaters. Require 12,000 volts *dc* on collector; approximately 2,600 volts for focus; and an ion trap magnet with field strength of 35 to 40 gauss. Gray filter face plates are said to provide 66% light transmission. Magnetic deflection of 65° horizontal and 70° diagonal may be obtained. Collector in both type tubes is provided by internal connection between number 3 and 5 grids.

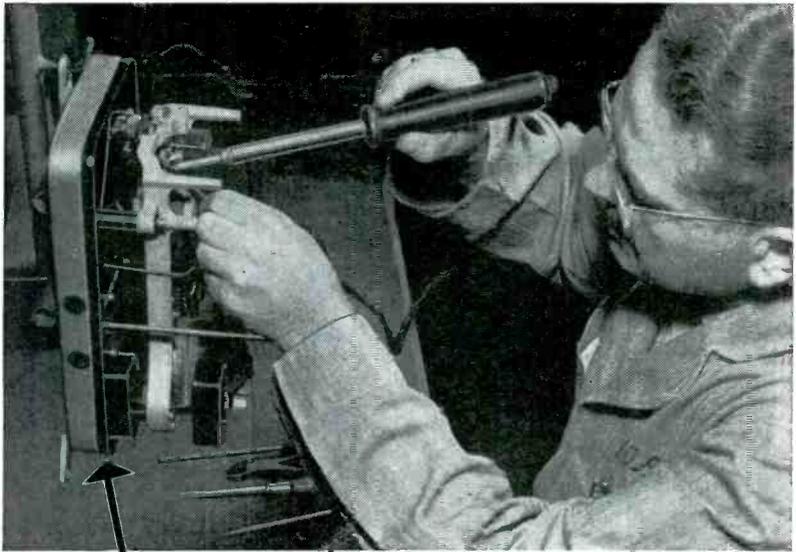
The cathode-ray tube division of Allen B. Du Mont Labs has also designed a 17-incher and a 20-inch model with rectangular envelopes, types 17FP4 and 20GP4.

Focusing voltages required for both tubes are approximately 23% of anode voltages. These electrostatic-focus tubes are said to be similar to the 17BP4A and 20CP4 types.

#### British Power Amplifier Tetrode

A high-slope indirectly-heated beam tetrode suitable for single or pp audio, KT66, is now available through British Industries Corp., 164 Duane St., New York 13, N. Y. It is said to be interchangeable with the 6L6. It may be used as a triode with screen connected through a 100-ohm resistance to the plate.

\*\*From G.E. tube handbook on *Essential Characteristics*.



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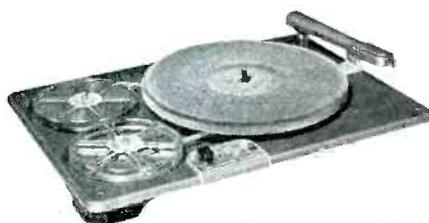
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**Magnetic Recording**

(Continued from page 36)

bly a preamp are often desirable when recording larger groups.

*Church:* The pastor's voice is usually well trained and resonant. The microphone can be placed two or three feet away from the pulpit for better results. A single microphone can usually pick up the sermon as well as the choir and other music. You will be surprised at the low volume setting required to make a good recording of choir music. In fact it is unusually

easy to over-record. Complex harmonics are set up because of the blending of many voices, each slightly different from the other.

It may be necessary to *ride gain*, using the volume level indicator to insure recording of the voice and music at the same level. They will then sound balanced as to volume when played back.

*Weddings:* Weddings usually require a microphone extension in order

to place the mike near the participants and yet hide the recorder. The microphone should be as near the bride and groom as possible, be it in a church, a hotel or a home.

*Music Groups:* The microphone should be kept far enough away from the musical group to secure a proper blending of the various instruments or voice parts. A cardioid type microphone may be advisable if there is an audience. Again, it is important to remember to avoid over-recording, especially when voice groups are involved.

*Piano:* Piano is perhaps the most difficult musical instrument to record. Not only are there long, sustained chords and single tones, held even longer by means of the pedal, but there are strong, strident sounds. The piano seems to *echo* and *bounce* in the average room. Drapes and other sound absorbing materials are especially important. The best microphone placement will depend upon the acoustics of the room in which the recording is being made. Some recording engineers place the microphone directly behind the player. Others favor the right hand or *treble* side of the keyboard. Some cover the face of the microphone with a light cloth to further break up echoes and reverberations. Some dent in the top of a felt hat and lay the microphone in it. Others cover the microphone entirely with a felt hat, placing both near the edge of a table so the hat projects over the edge a little.

**General Recording Suggestions**

The ability to make a clear, professional sounding recording improves with practice. Watching professionals doing similar work often generates many ideas.

While watching a radio broadcast, you may have noticed that the performers *play the microphone*. They back away when they are going to sing the very loud high notes and they come up very close to it when they are crooning softly. Following their example will greatly improve your recordings. The ability to get the best results with a microphone improves with practice.

Some people pronounce *B's* and *P's* with an explosive puff which overloads the microphone, others speak with sharp sibilants which are over-accentuated when the recording is played back. In such cases, the microphone should be held sideways, at right angles to the mouth.

There are, however, many variations in individual speech, and it is advisable to make a few practice recordings to

discover the best microphone distance and volume setting for a particular recording situation. The usual tendency is to talk too loudly and too close to the microphone.

In recording work it's best to keep the volume control at *zero* until the mechanism has been started, then quickly and smoothly *fading in* the program makes for smooth introductions and avoids clicks and noises.

When recording wind instruments such as trumpet, clarinet, trombone, etc., recording should be across the face of the microphone, not directly into it.

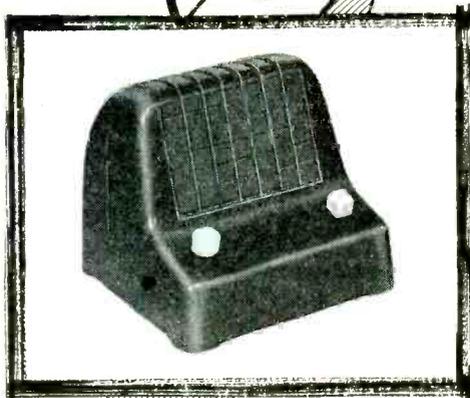
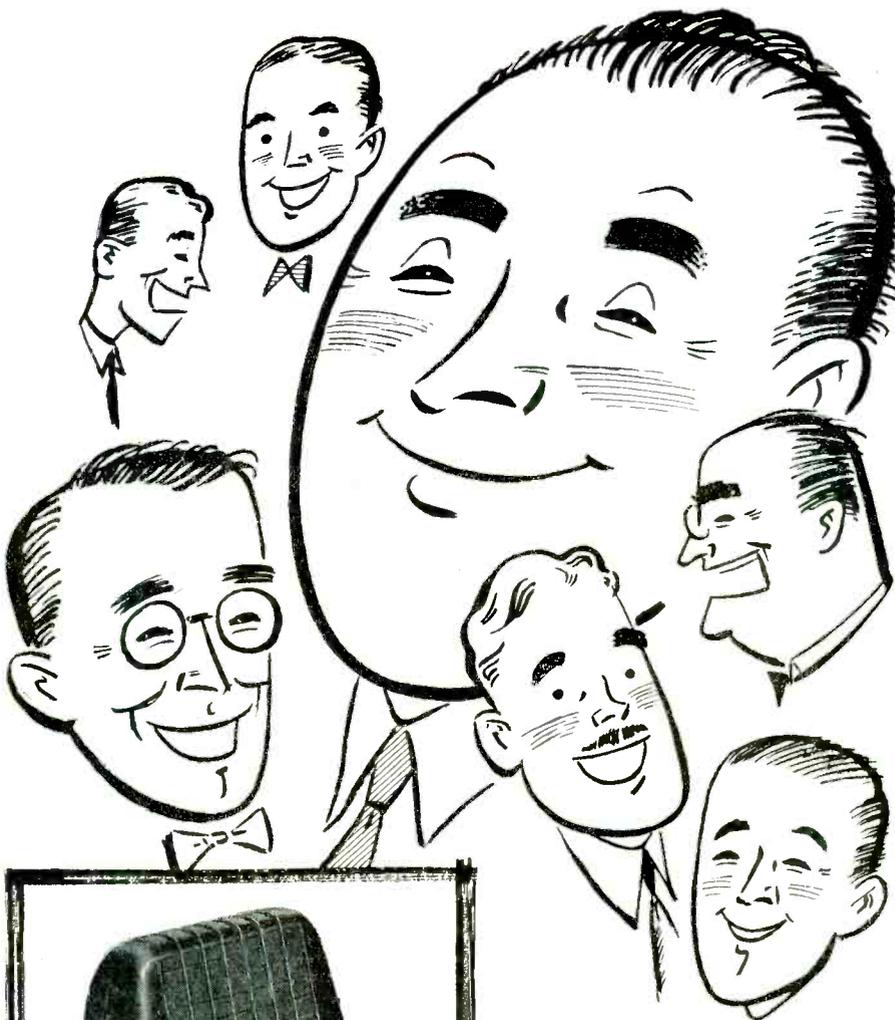
#### Absorption Control

You may have noticed that there are few echoes in the usual broadcast studio. This is accomplished by the use of drapes or special sound absorbing coverings. In the home best results will prevail when there are drapes at the windows and if there is considerable overstuffed furniture in the room. Anything that will break up unwanted echoes and soften the harshness of the sound will aid in this respect. It is especially helpful if a drape or some soft, sound-absorbing material is directly behind the one being recorded. When recording in a large auditorium or in a rather bare room, using the standard crystal microphone received with your recorder, better results can often be obtained by laying the microphone on a large pile of loosely padded cloth, a folded coat for example. The cloth absorbs unwanted echoes around the microphone and prevents any jars or vibrations from reaching the microphone. This is an especially good practice when recording a piano. Incidentally, the presence of an audience in an auditorium or chapel absorbs many echoes and gives a more natural recording.

#### Auditorium Recording

When recording a speech in a large auditorium, it is sometimes difficult to place the microphone and recorder near the rostrum. A satisfactory, and often an excellent recording, can be made by placing the microphone just in front of one of the loudspeakers used in the public-address system. Often the speakers are mounted on a balcony overlooking the main auditorium floor. The recorder operator can conveniently place his equipment on the balcony and thus watch the rostrum and know how to adjust the con-

(Continued on page 66)



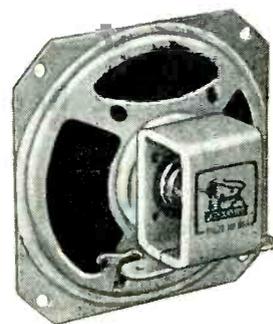
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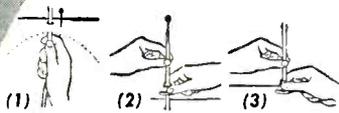
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## Magnetic Recording

(Continued from page 65)

trols. This method is not good when recording music unless the public address amplifier and speaker system is unusually good and has unusually wide frequency response.

[In a subsequent issue will appear a report on the types of microphones which can be used in magnetic recording, auxiliary equipment required, how to record directly from receivers and phono systems, techniques, used for editing and splicing, rerecording tricks, etc.]

### IRE SHELDON EXHIBIT



At the Sheldon Electric booth during the recent IRE show at Grand Central Palace in New York. Among those at the booth were, left to right: M. Kligman, E. Rodriguez, I. Gaines, D. Quinn, R. Leader and R. Harris (Sheldon's Philadelphia reps.); Charles Penk, Sheldon vice president; H. Metzendorf of Corbin Advertising Agency; Nathan Chirelstein, Sheldon president; M. Henowitz, E. Frenchman, F. Ferdinand, H. Martin, D. Ravitz and P. Bonano.

## Auto Antennas

(Continued from page 39)

leadin, if it is of the plug-in type, the gland-nut should be run down by hand as tightly as possible, and then tightened with just a fraction of a turn with pliers. With these, and all other types, the leadin wire should be dressed up and over the emergency brake ratchet, the cowl-ventilator lift mechanism, etc., so that it will not be caught and cut in the gears, etc.

A favorite antenna of many Service Men and auto manufacturers appears to be the vertically-mounted single-hole type of antenna, which is installed either on the top of the cowl, just in front of the windshield, or on one of the front fenders. This type is simple to install. It is waterproof and easy to maintain.

### Typical Installation Procedure

In installing the usual type of vertical single-hole antenna, the first step involves the location of a clear space on the top of the cowl, just in front of the windshield post. This may be on either side of the car, depending on the driver's preference. Most of the sets can be reached with the leadin from either side, especially the custom sets, which are mounted in the center of the car. It is important to be certain that the space chosen has no obstruction underneath. The best place will usually be found at the point where the cowl begins to bend over the side of the car. Incidentally, all of these antennas have provision for mounting on either a sloping or level surface, with adjustable insulators. After the hole has been spotted, you can center-punch and drill the hole. A very handy tool for this operation is the Bruno cutter. The hole required is usually 1½". In cutting the hole, the cutter is set for this dimension, and the pilot hole is drilled using very light pressure, as the pilot drill begins to penetrate the surface. Now, the drill should be held very firmly, and the cutter-bar gently lowered until it just scores the surface. The drill should be set so that the point touches all the way around, making a circle. This tool should not be crowded or it may jam, causing a bad gouge in the car body, a broken tool, or even a sprained wrist. The drill should be gripped firmly and both elbows braced into your body. The cutter should be held

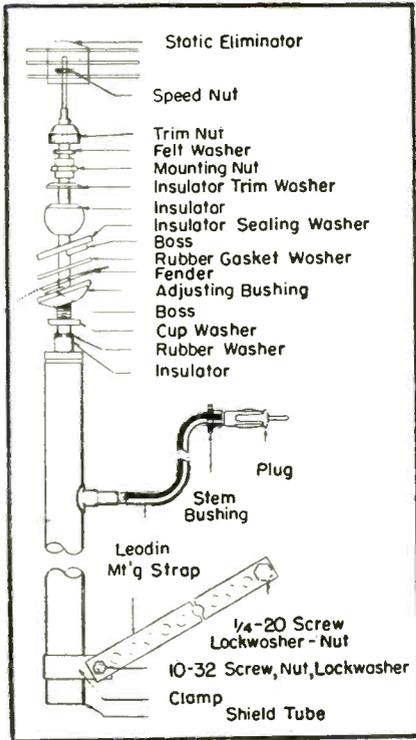


Fig. 8. Another type of three-section adjustable angle disappearing fender-mount antenna.

tightly as it goes through the last little bit of metal, so that it doesn't jam here, too.

#### Preparing Leadin

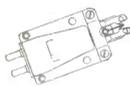
After the hole is cut, the leadin can be prepared for contact to the antenna; the lower metal half of the spacer should be dropped on it and the top of the rod inserted into the hole, from the inside of the car. Then, reaching over the door, the rod should be pulled up through the hole, until the boss on the spacer is through the hole. Then the rest of the parts can be dropped on; first the rubber ring-washer, then the black, insulator half of the spacer, the eccentric washer next, followed by the other washer, and finally the nut. On the bottom of the insulator is a boss to match the other one. These should be properly set and the nut can be started. The assembly should then be run up finger-tight, and the whole assembly turned around until the antenna rod is vertical. You'll have to back up about five steps to check the position, since it's usually difficult to judge this detail when you're standing close to the car. After this rod is set, you'll have to tighten it down with a smooth-jawed Crescent wrench, until the rubber washer just begins to squeeze out. Over-tightening should be avoided,

(Continued on page 68)



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## Auto Antennas

(Continued from page 67)

since too much tension will cause failure of the insulator and possibly water leakage.

### Leadin Lengths

When installing this type of antenna on a fender, it should be checked for leadin length. Most of the assemblies have two types of leadin, the fender-mount being about 12" to 15" longer, to take care of the extra distance it must travel. In the installation, the procedure is identical to that used in cowl installation. In most instances, the rods can be mounted behind the splash-guard in the front fender-well. If they do not, you can modify the mount-area, by making a piece of sheet metal about 4" wide and 10" long, and cutting a hole of the same size as the antenna mounting hole, close to one end. This can be slipped over the antenna before installing, so that the long piece is toward the front or wheel side. After tightening the antenna down, you should reach up and bend this sheet down, so that it will protect the antenna base and leadin from flying stones, mud, etc.

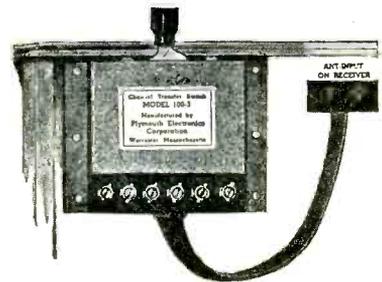
### The Top Antenna

Buicks, Fords and a few others use antennas mounted just above the center of the windshield. These usually have some sort of control from the inside, either to rotate them down over the hood or slide them down, to permit entry into low garages, etc. On some of the cars, the leadin is conventional, coming down the side post of the windshield, usually the left one. On the '42-'45, '46 Fords, the antenna is telescopic, with the slider coming out straight down the center post of the windshield. This is a bare chromium plated rod, and remains bare until it disappears into the set.

### Replacement Suggestions

It has been found very difficult to obtain replacement parts and antennas for these cars. Usually replacements have been made by installing a cowl-

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mount antenna, and changing the set's antenna socket to match, if necessary.

To install a new antenna of this type, the template found in the box is mounted very carefully in the indicated

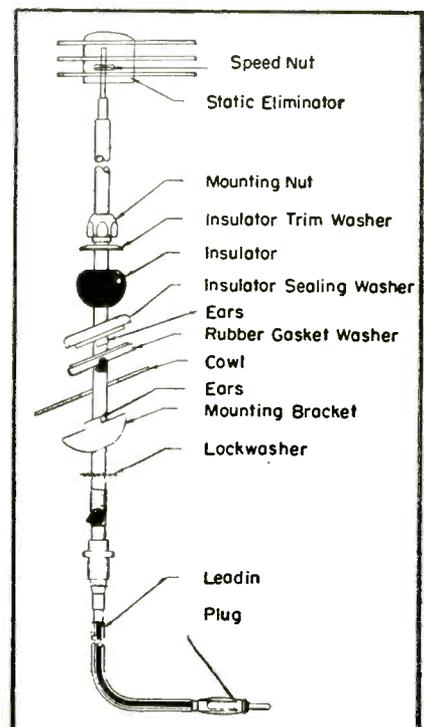


Fig. 9. Two section adjustable angle-cowl mount antenna.

location. Since these are all custom-built antennas they are usually made for one particular make and model of car. The template should be fastened down well, using Scotch or masking tape, and the hole drilled. When going through the metal, you should be sure that you can stop your drill. Otherwise, you'll have a large and ragged piece of headlining. After cutting the hole in the top, an X-shaped hole should be cut carefully in the headlining and the rest of the antenna assembled. These are usually held together with Allen set-screws. The leadin cable on these models goes down the left-hand windshield post. If the passage is obstructed, a long piece of small diameter welding rod with a small hook on one end can be used. The hook end should be pushed up through the post until visible from the top, and the antenna plug attached to it, with wire or tape. Then the leadin can be pulled down the post with no trouble. Some of these leadin cables have a lug or ear attached to the shielding, which comes out at the bottom of the post. This should be fastened to the body with a metal-screw, cleaning the paint from beneath it. This will furnish a good ground for the long leadin cable.

#### Final Tests

After the job has been completed, and *before* any kick-pads are replaced, a bit of testing should be applied, using a portable ohmmeter. There are three tests that must be made: (1) Check from the antenna rod to the tip of the plug: 0 to 3 or 4 ohms will be correct. You may have the 3-4 ohm reading, because of the very fine wire used in some leadin cables, which has that much resistance even on so short a run. (2) Check from antenna rod to the body of the car, being sure to get your ground probe on a clean place. Use the highest scale available, and keep your fingers off the probe-tips. This should read absolutely open; no reading at all. (3) Check from the shell of the plug to ground. This should be a dead short, no ohms at all. Shake the leadin cable vigorously while making each of these tests, to check for possible intermittents.

#### The Last Step

If you get the proper indications on each of these tests, you can put the kick-pads back on. If there is any engine noise when the radio is turned on, you can be fairly certain that it isn't the fault of the antenna installation!

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**Ser-Cuits**

(Continued from page 61)

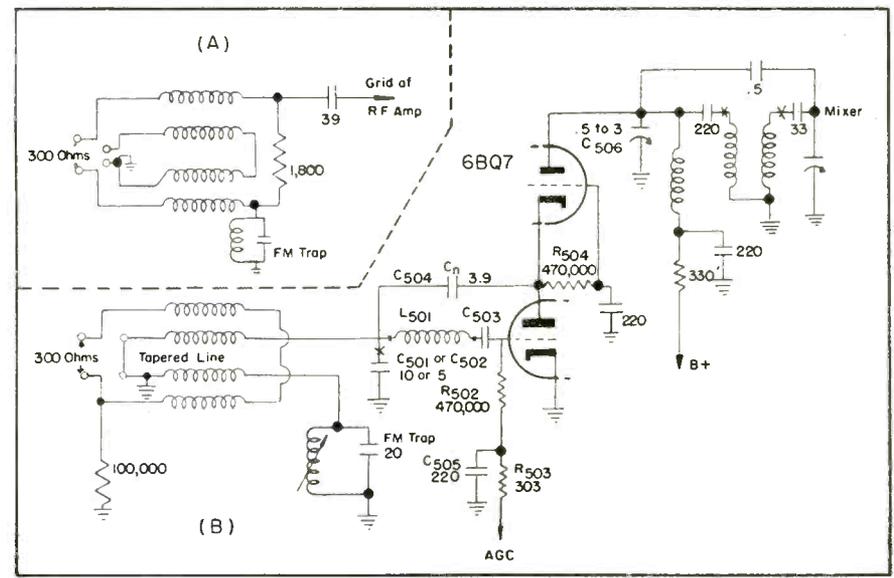
pentode *rf* stage, and yet the noise generated is equivalent to that of a triode stage. The low noise generated in this system is reported to show up in fringe areas where signal-to-noise ratio is of prime importance.

The *rf* section of the tuner\* uses a twin triode, 6BQ7, developed by Philco. The triode sections have very low interelectrode capacities and are isolated from each other by a shield connected to one of the tube pins. This pin is normally grounded.

In this tuner, the antenna signal is applied to a tapered-line matching transformer. The transformer provides a voltage stepup of approximately 1.4 to 1 over the TV band. The output of the tapered line is applied to the series-tuned circuit, represented by  $C_{501-502}$ ,  $L_{501}$ ,  $C_{503}$ , and the input capacity of the first triode. On the high channels  $C_{501}$  and  $C_{502}$  are not used. An *agc* voltage is applied to the first grid through a decoupling network consisting of  $R_{501}$ ,  $C_{505}$  and  $R_{502}$ . Variations in the plate capacity of different tubes are compensated by  $C_{506}$  on the plate of the second triode section. The signal developed on the plate of the first triode is connected directly to the cathode of the second tube which represents a low impedance of approximately 240 ohms; thus the first triode serves to apply the voltage on its high impedance circuit to the much lower cathode impedance of the second sec-

\*Colorado tuner.

Fig. 4. Normal (A) and modified (B) connections of tapered-line matching transformer setup, used in Philco tuner, the new circuit arrangements retaining the balancing feature of the circuit; that is, cancellation of signals induced in the leadin, as well as the matching provisions which permit use of 300 or 72-ohm lines. The X in circuit indicates switchable unit.



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tion. The second section in turn amplifies the signal applied to the cathode and the amplified voltage appears across the higher impedance of the plate circuit from where it is applied to the grid of the mixer; 1/2 of a 12AV7.

Recently, as a result of field experience, the *rf* circuit was changed to im-



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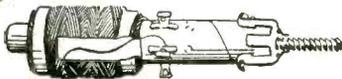
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## Simplified AF System

(Continued from page 25)

fade out and the phono selection will be heard coming from the set's loudspeaker.

### AF-System Checks

Obviously similar coils may be used with crystal microphones and many other auxiliaries, thus adding a fascinating new interest to the present prosaic radio set. Incidentally, the foregoing arrangement, wherein the fixed coil is connected to the input of the audio amplifier of the radio set, provides the Service Man with a rapid overall check of the entire audio system. He merely has to attach a similar coil to the output leads of his audio oscillator and place this near the coil in the set. If the audio system of the set is functioning properly, the note from the oscillator will be heard coming from the speaker.

## Audio

(Continued from page 49)

wear is recommended: if a new stylus sounds better, the old one must be defective. Almost new records with critical high frequency passages should be used for listening tests.

It is suggested that whenever the changer is not in use the larger standard stylus be left in the playing position, since the tiny microgroove stylus is much more easily damaged in case of accidental shock.

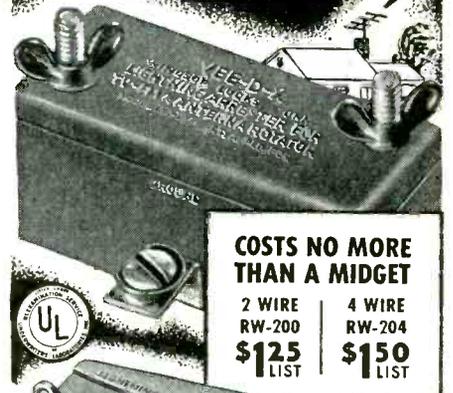
Scratch and surface noise are also special problems. Scratch can be reduced by connecting a 15,000-ohm resistor across the pickup leads, either at the amplifier, or under the changer. Lower values of resistors will increase the effect. This procedure will reduce the high-frequency response and may be noticed by a lack of *brilliance* in classical music, if the resistor value is not carefully chosen to suit the customer.

### Pickup Coil Tests

The variable-reluctance unit can also be tested by checking the pickup coil which should measure about 340 ohms. Output measured with a vacuum-tube voltmeter and a Columbia 10003M standard test record should be about .01 volt at 1,000 cycles. Distortion originating at the pickup other than by worn or broken styli is usually due to

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2 WIRE RW-200	4 WIRE RW-204
<b>\$125</b> LIST	<b>\$150</b> LIST



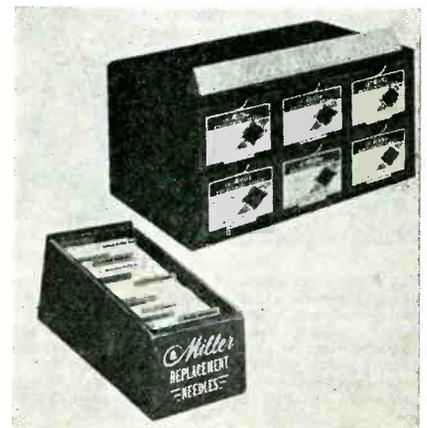
**2-WIRE RW-300 \$200**  
LIST

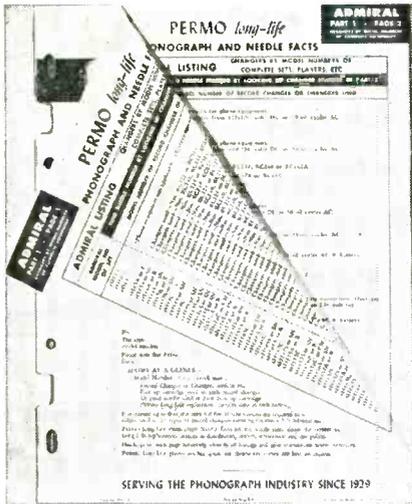
For extra heavy duty. An air gap plus resistors provide double protection.

THE LaPOINTE-PLASCOMOLD CORP.  
Windsor Locks, Conn.

improper spacing of the pole pieces, or bits of dust, especially iron filings, accumulating between the stylus and the pole pieces. Pole pieces should be parallel to each other, and .012" from the stylus. Increasing this clearance lowers the voltage output, but tends to lessen distortion and scratch pickup. Though decreasing the clearance increases the output, the stylus becomes

Needle counter dispensers, with six boxes, each holding 48 to 60 individually carded needles, and transparent acetate covers to protect the needles. Display boxes are of lightweight wood construction, with a bright enamel finish. (M. A. Miller Manufacturing Co.)





Section of a twelve-page manual, *Phonograph and Needle Facts*, with data on 21 changers, 10 types of cartridges and 8 needle styles used by Admiral in 320 postwar chasses. Booklet is divided into four parts: Part one, comprising seven pages, provides information on the model numbers of the 320 different sets; part two provides the correct needle number; part three is keyed to Admiral cartridge numbers, illustrations of which are supplied, along with the replacement needles necessary to fit each individual cartridge. Also supplied with this section is the number of record changers in which each particular cartridge is used. In part four of the listing is a cross reference by needles, Admiral needle numbers are listed as are changer and cartridge numbers. These are indexed with record speeds and the correct number of replacement needles which can be used. (Published by Permo, Inc.)

more easily clogged with dust, and there is danger that the stylus may actually touch the pole pieces causing unpardonable distortion.

#### Use of Variable Reluctance Pickups<sup>2</sup>

The most common difficulty encountered in attempting the substitution of variable reluctance pickups in place of crystal pickups is excessive hum.

This hum is primarily due to induction from the magnetic field of the drive motor. A crystal pickup is unaffected by this magnetic field. The output of variable reluctance pickups, being much lower than crystal pickups, must be provided with greater amplification (usually with a preamp) to obtain the equivalent output from the speaker. The hum is also amplified.

Shielding must be provided and can be accomplished by either of two methods:

- (1) Shielding of the motor with a metal box preferably of .020" steel. An inner box of non-magnetic metal will provide additional shielding. *Note:* When such a box shield is added, it will also raise the impedance of

(Continued on page 74)

<sup>2</sup>From RCA service notes.

# Attention ALL SERVICEMEN

announcing the entirely NEW

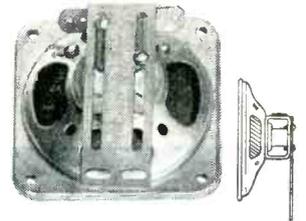
## Permoflux "CHAMPION" SPEAKERS



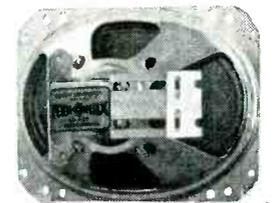
**GREATER PROFITS!  
PROMPT DELIVERY!  
TOP QUALITY!**

#### AVAILABLE IN ALL THESE SIZES:

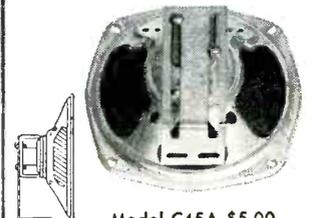
- 2 1/4" Sq., 4" Sq., 4" x 6" Ellip., 5" Round,
- 5" P.C., 5" x 7" Ellip., 6" P.C., 6" Auto, 6" x 9" Auto, 7" Auto, 8" P.C., 10" Round, 12" Round



Model C4A \$5.00



Model C46A \$5.50



Model C45A \$5.00

From one of America's leading manufacturers of quality speakers for original equipment comes the announcement of the new Permoflux line of "Champion" permanent magnetic speakers.

"Champion" speakers are equipped with unique universal mounting brackets and tapped yokes for ease of installation in any position. Mounting holes and transformer mountings are standard RTMA. Voice coil impedance 3.2 ohm on all "Champion" speakers.

For greater profits... quick delivery... top quality, order your Permoflux "Champion" speakers from your distributor today.



Inquire about Permoflux's Complete Royal Blue Line 6" to 12" Speakers and send for the new attractively illustrated catalog "Permoflux Royal Lines No. J202."

PERMOFLUX<sup>®</sup>  
"SOUND IN DESIGN"

PERMOFLUX CORPORATION

4904 W. GRAND AVE., CHICAGO 39, U.S.A. • 263 S. VENDUGO RD., GLENDALE 5, CALIF.

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# ATLAS Built to take it!



ATLAS DR PROJECTORS, non resonant, uniform response, sturdy, storm proof, compact, demountable.

Regardless of the application Atlas Sound speakers are built to "take it." In the Armed Forces . . . Industrial plants . . . public gatherings . . . under any climatical conditions, Atlas Sound speakers stand up.

Over twenty years' experience in the manufacture of sound equipment goes into every Atlas product.

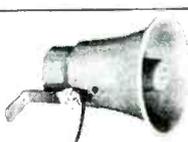
Years of diligent research in Electro Acoustics and constant experimentation in mechanical developments guarantees quality, complete and lasting satisfaction.



ATLAS PAGING AND TALK BACK SPEAKERS with ATLAS "Alnico-V-Plus" driver unit. A medium size speaker ruggedly constructed 12 watt input power.



Dual speaker excellent for industrial and talk back applications, simplifies installation in long corridors, hallways, etc.



A super efficient sub-miniature speaker produces clear intelligible speech at a minimum input power.



ATLAS De-Luxe "Alnico-V-Plus" Driver Units with built in "uni-match" transformers. 30 watt input.



ATLAS "FULL GRIP VELVET ACTION" MICROPHONE STANDS. No slipping - No noise - No rattle - No scratching - No wear.

Write for new No. 551 catalog

**ATLAS SOUND CORP.**  
1442 - 39th STREET, BROOKLYN 18, N. Y.  
in Canada, Atlas Radio Corp., Ltd., Toronto, Ont.



## Audio

(Continued from page 73)

the motor and reduce its torque. To overcome this difficulty, it will be necessary to raise the voltage applied to the motor. The power consumption of the motor should be measured before and after adding such a box shield.

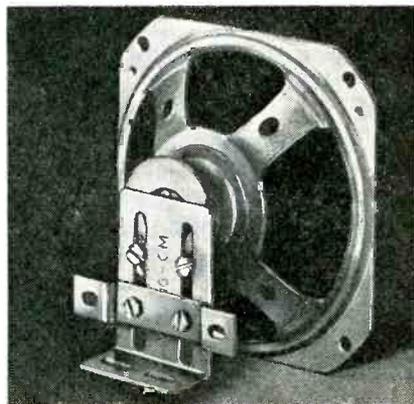
- (2) Addition of a steel plate approximately 1/8" thick between the mechanism and the motor-board.

There are several other matters



Record changers designed for use in custom installations, as replacement or as plug-in units. Three models are available, all of which feature a push-off type record changing system. Key unit in the line\* automatically plays all three speeds of records in all three sizes. No adapter is needed for the seven-inch records. Uses a velocity-trip mechanism. Unit has an automatic needle-set down point controlled by the position of the record push-off shelf and an automatic stop that shuts off the motor and returns the pickup arm to rest position when the last record has been played. A muting switch that silences the amplifier during the record changing process is also featured. Another model\*\* is similar to the key unit, but designed for the use of the variable reluctance pickup. In the third model\*\*\* the plug-in idea is featured. The unit can be plugged into a radio or TV set for sound reproduction through that unit's speaker. It has a base with rubber feet for portability and use on any cabinet or shelf. (\*Model 106, \*\*model 106-27, \*\*\*model 107; Webster-Chicago Corp.)

Set of brackets developed for Viking line of speaker models, from 3 1/2" to 6", for mounting speakers to chassis in small radio repair work. Can also be used as a transformer mounting. A metal clamp strip with channels holds the speaker in position at any predetermined height above the chassis. The transformer mounting bracket is a separate piece which can be attached in a variety of ways to solve space problems. (Viking CTM Universal Bracket Set; Jensen Manufacturing Co.)



Highest FIDELITY Known!

# AMPEX MAGNETIC TAPE RECORDERS

Precision  Performance  


STANDARD OF THE GREAT RADIO SHOWS

AMPEX ELECTRIC CORPORATION

San Carlos . . . California

which must be given attention.

- (1) In most all applications, a pre-amp must be used to provide amplification and equalization.
- (2) The pickup arm must be changed to accommodate the difference in mounting centers.
- (3) The counterbalance spring must provide the correct stylus force (approximately 5 grams).

## Association News

(Continued from page 46)

delphia Home Show; Whittingham Bros., Inc., and J. F. Griffin, Inc.

In the Whittingham booth was a display of master antenna system facilities, while Griffin showed a variety of test equipment used in his operations.

### ESFETA

THE EMPIRE STATE Federation of Electronic Technicians Associations, during a recent meeting, decided to join the national federation, the National Electronic Technicians and Service Dealer Association.

The meeting also featured an announcement on the results of the elections for '51, which disclosed that Wayne Shaw is the new president; Sid Gent, vice president; Ed Fisk, secretary; Don Lissow, corresponding secretary, and Ben de Young, treasurer.

### BCRSE

THE BLAIR COUNTY (Altoona, Pa.) Radio Service Engineers have organized a radio and TV school, and set up a one-year course under the supervision of the organization's president, K. R. Brubaker.

Fees are \$5.00 a month, which include monthly dues for organization membership, too.

### REGENCY BOOSTER PLANT EXPANSION



Corwin Alexander, Jr., production manager for I.D.E.A., outlining to I.D.E.A. proxy Ed Tudor, how the recently completed 25,000 square feet of additional floor space will be used to expand production of Regency boosters.



**This man is your  
MOST VALUABLE  
BUSINESS ASSET!**

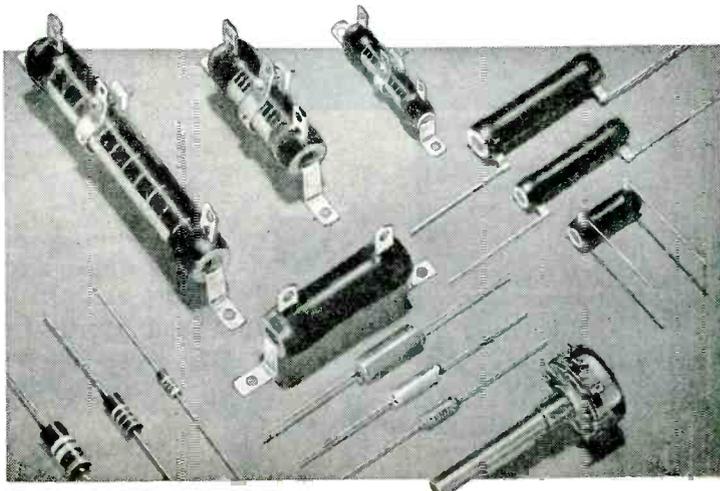
*A satisfied customer*—the keystone of any successful business! You endanger customer good will when you use "just-as-good" replacement parts on your repair jobs. Use quality OHMITE components—known the world over for dependability among servicemen, amateurs, and design engineers—and you can be sure of customer satisfaction every time. It's just good business!

**OHMITE MANUFACTURING COMPANY**  
4879 Floumoy St., Chicago 44, Ill.

Be Right with **OHMITE**<sup>®</sup>  
RHEOSTATS • RESISTORS • TAP SWITCHES



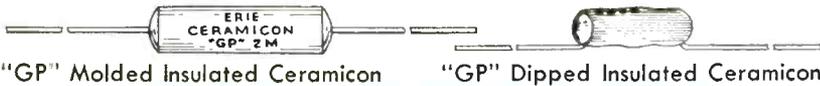
Write  
FOR  
STOCK  
CATALOG



*It's To Your Advantage To Use*  
**ERIE CERAMICONS®**

*because...*

- They are compact in size . . .  
 Impervious to humidity . . .  
 Rugged in construction . . .  
 100% tested to assure highest quality  
 Conservatively rated
- A wide range of capacitance values  
 and temperature characteristics avail-  
 able in molded and dipped insulated  
 types . . . Especially adaptable to  
 replace paper and molded micas . . .
- Economically priced . . . Available  
 through distributors everywhere



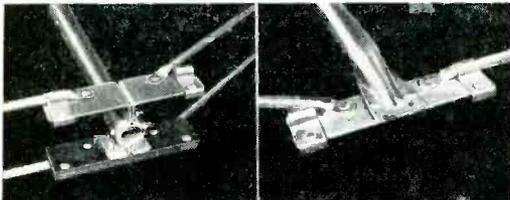
"GP" Molded Insulated Ceramicon

"GP" Dipped Insulated Ceramicon

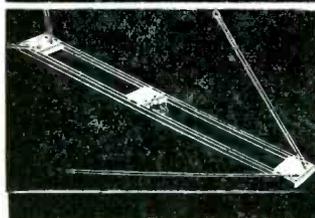
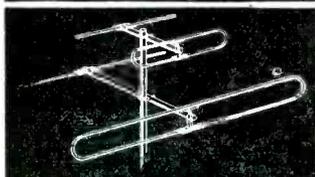
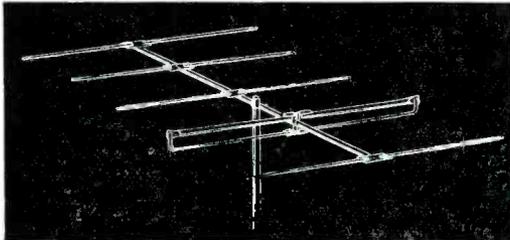
*Electronics Division*

**ERIE RESISTOR CORP., ERIE, PA.**  
 LONDON, ENGLAND . . . TORONTO, CANADA

**"QUICK-AS-A-WINK"**



JUST OPEN—SNAP . . . IT'S LOCKED



**ASSEMBLY**

IS THE TERRIFIC NEW  
 FEATURE OF OUR

— YAGI —

— SUPER "V" —

—STRAIGHT AND FOLDED DIPOLE—  
 AND IN-A-LINE ANTENNAS

REVOLUTIONARY! AMAZINGLY FAST!  
 SUPERBLY DESIGNED! There aren't enough  
 superlatives to describe this newest of new,  
 fastest of fast assembly methods on the market  
 today! Take the antenna out of the box and in  
 a matter of seconds it's ready to use "Quick  
 as a Wink"—it's up. No screws—no wing nuts  
 —no screw drivers—no needless loss of time.  
 AND THAT'S NOT ALL! Look at the photo  
 at the top and note the rear end of the boom  
 . . . clamped shut, but with no weak point  
 as in others. Note the sturdy construction in  
 the front end—built to withstand all kinds of  
 weather for a long, long time. These are only  
 a few of the many reasons T-V Products Com-  
 pany Antennas are your top buy today.

"Hot off the Press"—our new catalog showing  
 the complete Conical, Yagi, straight and folded  
 Dipole, In-A-Line, and Super "V" antenna  
 lines along with the many fine antenna mounts  
 and accessories—yours for the asking.



← THIS TRADE MARK MEANS  
 TOPS IN VIDEO • LOOK FOR IT!

WRITE • WIRE • PHONE DEPT. TVS

**T-V PRODUCTS**  
 COMPANY  
 152 Sandford St., Bklyn 5, N. Y.

**News**

(Continued from page 50)

**ADDITIONAL PLANT ACQUIRED BY  
 JFD**

A site for the construction of a new  
 120,000 square foot plant has been ac-  
 quired by the JFD Manufacturing Co.,  
 Brooklyn, N. Y. The additional manu-  
 facturing space will be used to double the  
 present rate of production.

A factory for the specific manufacture  
 of electrical plugs and other components  
 has also been added to the company's  
 floor area.

With this addition the number of JFD  
 plants will be increased to three, for a  
 total floor area of approximately 200,000  
 square feet.



Left to right: Julius Finkel, Albert Finkel and  
 Edward Finkel, JFD president, vice president  
 and secretary, respectively.

Present JFD facilities (right) and additional  
 plant (left).



\* \* \*

**NATIONAL UNION FLUORESCENT  
 SIGN**

An indoor fluorescent sign, hung by  
 chains, and sprayed in a gold-bronze fin-  
 ish, is now available from the National  
 Union Radio Corp., Orange, N. J. Let-  
 tering is white on an opaque green back-  
 ground, readable either with the sign  
 illuminated or off. An opening in the  
 bottom of the sign is said to permit light  
 to shine on the area below.

Sign measures 8" high and 25½" long  
 and is provided with rubber feet so that  
 it can also be used on a counter or shelf.  
 Available from N. Y. distributors for  
 \$8.95 plus shipping charges.



**at the CHICAGO SHOW**  
**it's BOOTH 108**

for

**GUY STRAND**  
**GROUND WIRE**  
**ANTENNA WIRE**  
**GROUND RODS and CLAMPS**

**COPPERWELD STEEL CO.**  
 GLASSPORT PENNSYLVANIA

**RAYTHEON TUBE IDENTIFICATION LABELS**

A tube shelf identification labeling system has been announced by the receiving tube division of the Raytheon Manufacturing Co., Newton, Mass.

Printed on labels are over 480 radio and television receiving tube type designations. Each label can be detached from a book and affixed by the distributor or dealer to his stock shelves. Labels are said to be removable and replaced anywhere else without damaging them.

\* \* \*

**SHELDON PAMPHLET ON ION-BURN PREVENTION**

A 4-page pamphlet, bulletin T-2, entitled *Ion Burns*, has been released by Sheldon Electric Co., Irvington 11, N. J. Described are the ion trap, how ion burns occur, what can be done to prevent this trouble, and five basic points to remember when adjusting the ion trap to prevent screen damage by ions.

\* \* \*

**ADELMAN JOINS MILO RADIO**

Harry Adelman has been appointed advertising manager of Milo Radio and Electronics Corp., 200 Greenwich St., New York 7, N. Y.

\* \* \*

**WALSCO ANNIVERSARY GIFT PACKAGE**

A gift package, in celebration of their 12th anniversary, has been announced by the Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif. Included in the package are contact cleaning fluid, lubricants, cement, and contact chemicals for volume controls and switches. Gift package available with purchases of WalSCO hardware chemicals, accessories or antennas.



Above: View of WalSCO's 12th Anniversary gift package being offered free at parts jobbers during June and July. Below: Walter L. Schott, president of WalSCO lending a hand to Millicent Deming, Hollywood TV star and fashion columnist during anniversary celebration. Looking on are Lawrence Des Jardin, vice president; Frank Hurd, vice president, and Jack Carter, WalSCO sales manager.



**MOSLEY Low Loss TV Accessories . . .**



provide **BETTER TV PICTURES**  
through more efficient installation!

**HANDY, EFFICIENT PLUGS, SOCKETS AND CONNECTORS FOR 300 OHM FLAT TRANSMISSION LINE**

**MOSLEY Transmission Line Plug, No. 301.** The Plug of 1,000 Uses! FM and TV installations, Factory test benches, Experimental labs, Ham shacks, Dealer demonstrations, Mobile and field equipment, etc. Use indoors or out. Fits all MOSLEY sockets as well as 1/2" crystal holder and octal tube sockets. Low loss acrylic plastic with large non-rusting screws. Solderless. List \$48.

**MOSLEY Transmission Line Socket, No. 311.** Mates with No. 301 above for constant impedance connection. List \$48.

**MOSLEY Polarized Connector No. 321.** Made of same material and similar in construction to No. 301 and 311 but designed so that 2 conductor line cannot be reversed. Use in pairs. List (per pair) \$.92.

**MOSLEY Transmission Line Splicer, No. 27-S.** A convenient splicer for connecting pieces of standard 300 ohm transmission line without use of solder. Maintains proper line impedance. List \$.18.

**ROTATOR CONTROL CABLE PLUGS AND SOCKETS**

**MOSLEY multi-wire plugs and sockets** provide efficient and neat connections for 4 and 5 wire antenna rotator cables. Their precision design and rugged construction make them suitable for many other applications in ham shack, experimental lab, etc. Made of high quality acrylic resin plastic with non-rusting metal parts, these plugs and sockets provide excellent electrical and mechanical connections and are easily installed without the use of solder.

**MOSLEY 4 Conductor Plug and Base Socket Combination.** Polarized connection for up to four wires. Plug is acrylic plastic. Four extra large non-ferrous set screws hold cable wires firmly. Will also fit MOSLEY F-14 Flush Socket. Base Socket is made of same material and mounts to wall or base-board with three wood screws furnished. Solderless connections to strip type terminal. Catalog No. C-124 (Plug and Base Socket). List \$2.00.

**MOSLEY 4 Conductor Polarized Plug only.** Cat. No. C-104. List \$.84.

**MOSLEY 4 Conductor Base Socket only.** Cat. No. C-114. List \$1.16.

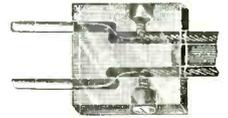
**MOSLEY 5 Conductor Plug and Base Socket Combination.** Same as C-124 illustrated right but designed for 5 wire cable connections. Cat. No. C-125 (Plug and Base Socket). List \$2.50.

**MOSLEY 5 Conductor Polarized Plug only.** Cat. C-105. List \$1.09.

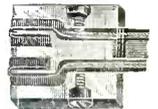
**MOSLEY 5 Conductor Base Socket only.** Cat. No. C-115. List \$1.42.

**MOSLEY 4 Conductor Line Socket.** Use with C-104 plug above to extend 4 wire cable. May be used in place of C-114 if base mounting is impractical. Cat. No. C-134. List \$.84.

**MOSLEY 5 Conductor Line Socket.** Same as C-134 but for 5 wire cable connections. Cat. No. C-135. List \$1.09.



301



311



321



27-S



C-124



C-134

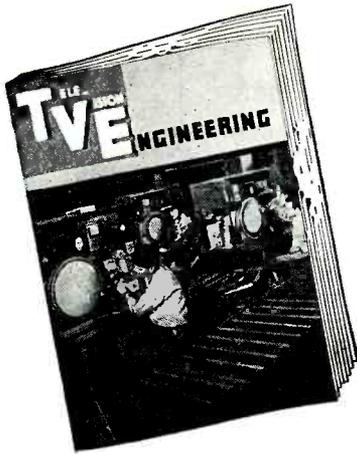
**MOSLEY**  
W O F Q Y *Electronics*

2126 LACKLAND OVERLAND, MISSOURI

**A SINGLE SOURCE OF SUPPLY**

MOSLEY ELECTRONICS manufacturers the only complete line of antenna transmission line connectors, plugs, sockets and other accessories. MOSLEY products are solderless and designed for maximum electrical efficiency. Install MOSLEY accessories with complete confidence. Write for new Catalog No. 50-51.

... 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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### MAIL COUPON

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.**

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Department in which employed

Operation       Production       Research

Employed by .....

Nature of Business.....

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

### IRC CATALOG BULLETINS

Four catalog bulletins featuring charts and graphs have been released by the International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Bulletin *A-2* covers a 2-watt rheostat potentiometer, type W, which is equivalent in size to Jan-R-19 style RA20. Insulated wire-wound resistors, type BW, are featured in bulletin *B-5*. In bulletin *D-2*, sealed voltmeter multipliers are covered. A four-page bulletin, *F-2*, covers high frequency-high power resistors for TV, FM, and dielectric heating applications. Included are details on operation, frequency characteristics, mechanical design, resistance and installation.

\* \* \*

### DORF JOINS BRACH

Richard H. Dorf has been appointed electronics project engineer in the Brach Manufacturing Division of General Bronze Corp. Dorf will be in charge of the company's government electronics projects. He will initially be responsible for research work on electronic servo systems.



R. H. Dorf

\* \* \*

### AMPLIFIER CORP. MAGNETIC TAPE CATALOG

A 12-page catalog, 5303, featuring long-playing tape recording-playback instruments, has been issued by Amplifier Corp., 398-3 Broadway, New York 13, N. Y.

Detailed are nine basic models which will provide continuous operation up to 24 hours without changing reels. Tape speed of units described is 3" per second; frequency response range of 50 to 5000 cycles. Standard 1/4" wide tape is used, wound on reels up to 15" in diameter.

Auxiliary equipment described includes semi-portable and portable playback units, high-speed shuttler, and a tape demagnetizer.

\* \* \*

### OXFORD DISPLAY SPEAKER BOXES

Speaker boxes, gold and blue in color, have been announced by Oxford Electric Corp., 3911 South Michigan Ave., Chicago 15, Ill. Can be used for point-of-sale display.



\* \* \*

### PICKERING NAMES LINDENBERG CHIEF DESIGN ENGINEER

Theodore Lindenberg has been appointed chief design engineer of Pickering and Co., Oceanside, Long Island.

Lindenberg was formerly with the Fairchild Recording Equipment Corp., in charge of engineering for the instrument and disc recording division.

**THOMAS ELECTRONICS APPOINTS BURROWS GENERAL SALES MGR.**

Robert E. Burrows is now general sales manager of Thomas Electronics, Inc., Passaic, N. J.

Burrows was formerly with the Meissner Manufacturing Division of Maguire Industries, Inc., as general sales and advertising manager.



R. E. Burrows

\* \* \*

**RIDER'S REVISED VTVM BOOK NOW AVAILABLE**

The second edition of *Vacuum-Tube Voltmeters* by John F. Rider has been published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

Featured are new chapters on *dc* and *rf* probes. A chapter is devoted to more than 40 commercial vacuum-tube voltmeters. Each is listed by manufacturer and model number with accompanying schematic and parts values.

Review questions at the end of each chapter are also included.

Book, with 432 pages and 215 illustrations, is priced at \$4.50.

\* \* \*

**G.E. 12-INCH PROMOTION PLAN**

A national picture tube promotion, aimed at the 12-inch replacement market, has been launched by G. E. Program will feature full-page ads in national magazines.

Included in the plan are open-end television film commercials, 40 and 12 seconds in length, for tie-in with local TV stations, radio commercials, local cooperative ads for distributors and dealers, window streamers, new illuminated displays and identification decals, sterling silver picture tube tie clasps and the servicing-help magazine *Tele-Clues*.



G. A. Bradford, left, manager of the G.E. tube divisions, and John T. Thompson, right, sales manager of replacement tubes, inspecting a 16mm sound film consisting of 40-second and 12-second TV commercials to be used in the picture-tube promotion campaign.

\* \* \*

**G-I APPOINTS SAFTLER EASTERN REP**

Perry Saftler, 53 Park Place, New York 57, N. Y., has been named eastern rep for General Industries. Associated with Saftler are Norman Leeb, George Marron, and Arthur W. Saftler.

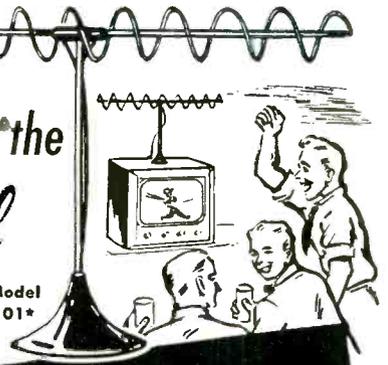


**Hi-Lo at the BALL GAME**

Score a "hit" every time with the

**Hi-Lo TV Spiral ANTENNA**

Model 101\*



**...the finest for indoor TV reception!**

You'll bat "1000" when you feature Hi-Lo, the indoor TV Spiral antenna which has everything . . . high fidelity, low cost, peak reception, gleaming gold appearance, revolutionary design.

Your profits will place you in the major leagues when you SELL HI-LO.

**ORDER TODAY!**

**Don't forget . . . the HI-LO OUTDOOR TV SPIRAL ANTENNA!**

\*U. S. Patent No. 2,495,579  
Canadian patents 1951

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Hi-Lo TV Spiral Antennas are sold through recognized jobbers.



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**MAGINOT JOINS C-D AS AD  
MANAGER**

Emil J. Maginot, formerly sales manager, distributor division, of National Union Radio Corp., has been appointed manager of advertising of Cornell-Dubilier Electric Corp., South Plainfield, N. J.

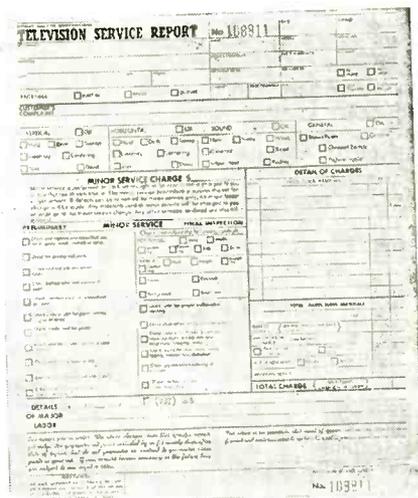


\* \* \*

**OELRICH SERVICE REPORT FORMS**

Television service report forms which permit entry of all pertinent service-operation data are now available from Oelrich Publications, 4135 N. Lawler Ave., Chicago 41, Ill.

A four-page catalog describing the report sheets and other guide and business forms has been published by Oelrich.



\* \* \*

**SELETRON SELENIUM CATALOG**

A 16-page catalog covering selenium rectifiers is now available from the seletron division sales department, Radio Receptor Co., Inc., 251 West 19th St., New York 11, N. Y. Catalog includes listings of dimensions and ratings for all miniature selenium rectifiers, as well as power stacks, and background material on selenium rectifiers.

**SOUND will be FEATURED  
in the JUNE issue of SERVICE!**

An advertising "MUST" for every manufacturer of speakers, microphones, amplifiers, pickups, cartridges, tape and wire recorders, needles, etc.

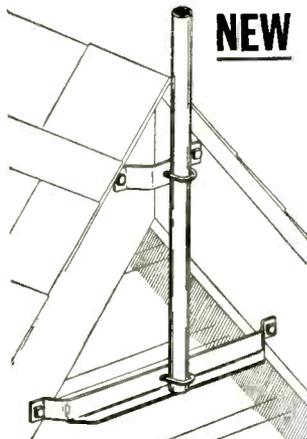
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**For Easy, Low Cost TV Antenna Installations . . . It's KENCO MOUNTS**

**NEW KENCO EAVE MOUNT**

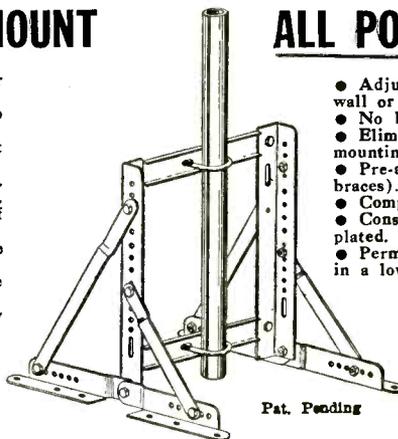


- Mounts on trim boards or hanging rafters.
- Eliminates drilling into brick or masonry.
- Antenna mounts at highest point of building.
- Quick, easy installation. Only 4 lag screws required.
- Eliminates costly stand-off wall brackets.
- Installation clears attic louvers and windows.
- Constructed of heavy gage galvanized steel.
- Mast is footed for easy orientation of antenna.

**MODEL No. 135**  
 List Price . . . . . \$3.95  
 (Includes all hardware and lag screws)

Pat. Pending

**ALL POSITION MOUNT**



- Adjusts to ANY position on roof, side wall or corner of building.
- No blocking or shimming necessary.
- Eliminates excessive lead-in wire by mounting antenna at a point near TV set.
- Pre-assembled (except for positioning braces).
- Compactly packaged for easy handling.
- Constructed of heavy-gage steel, zinc plated.
- Permits fastening of antenna mast while in a lowered position.

**MODEL 105**  
 Standard size takes up to 1 1/2" OD Mast. Offset up to 8"  
 List \$6.55

**MODEL 101**  
 Large size takes up to 2" OD Mast. Offset up to 12"  
 List \$9.85

**KENWOOD ENGINEERING CO., INC., KENILWORTH, N. J.**

**BILL SCALES NOW DUMONT CRT  
DIVISION GSM**

Bill C. Scales has been appointed general sales manager of the cathode-ray tube division of Allen B. DuMont Laboratories, Inc. Scales, who has been with DuMont since September, 1949, was southwestern regional sales manager for the receiver sales division, with headquarters in Dallas, Texas. He will be among the DuMont executives at the Parts Distributor Show in Chicago.



Bill C. Scales

\* \* \*

**ATR N.Y. REP. MOVES**

Lee Rocke, ATR representative for the New Jersey and New York City territory, is now located at 6 E. 39 St., New York 16, N. Y.

\* \* \*

**REEVES SOUNDCRAFT BUYS BERGEN  
WIRE ROPE CO.**

The Bergen Wire Rope Co., Lodi, N. J., has been purchased by Reeves Soundcraft Corp., 10 E. 52 St., N. Y. 22, N. Y.

Reeves Soundcraft and its subsidiaries manufacture picture tubes, recording blanks, metal stampings, transformers, magnetic film and magnetic tape. The Bergen company makes various types of industrial cables including twisted leadin for television.

\* \* \*

**FERROXCUBE PLANT IN SAUGERTIES,  
N. Y.**

Ferroxcube ferrite-core parts are now being manufactured in a 60,000 square-foot plant at Saugerties, N. Y. Operation and management of Ferroxcube, a joint affiliate of the Sprague Electric Co., North Adams, Mass., and Phillips Industries, Inc., Hartford, Conn., is under the direction of Sprague.

\* \* \*

**CARTER NAMES RAY SIMON  
CHIEF ENGINEER**

Ray Simon, formerly chief engineer for Eicor, Inc., has been appointed chief engineer of Carter Motor Co.

**OLSON'S THIRD WAREHOUSE**

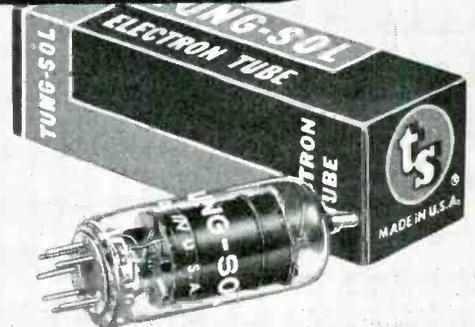


Interior of Olson's Radio Warehouse recently opened at 623 W. Randolph St., Chicago, occupying 12,000 feet of floor space, in two buildings.

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Optical comparator is used to check mica disc specifications to thousandth-inch accuracy.

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**NEWS BRIEFS**

NINETY-SIX PER CENT of all picture tubes sold to TV set manufacturers during the past months have been 16 inches in size or larger, according to RTMA. The association's picture tube statistics also showed that over 80 per cent of the units sold were rectangular types. . . Joseph Y. Resnick is now chairman of the board of Channel Master Corp., Ellenville, N. Y. Harry Resnick has been named president and general manager and Harold Harris is now vice president in charge of sales and engineering. . . An application booklet for the autobooster and multibooster has been released by Industrial Television, Inc., 359 Lexington Ave., Clifton, N. J. . . An engineering bulletin de-

scribing the application of twin-driven yagi antennas is now available from Technical Appliance Corp., Sherburne, N. Y. . . An extensive defense production program has been inaugurated at Brach. Among the products that will be made are radar antennas, radar direction finders, radio whip antennas, etc. . . Volume 6, of Rider's Television Manuals, is now available. Over 600 receiver models are detailed in this new addition which contains over 2,000 pages. Manual is priced at \$24. . . A 1,050-page catalog has been published by Milo Radio and Electronics Corp., 200 Greenwich St., New York 7. Copies are available to authorized purchasing agents, addressing request on company letterheads. Requests should be directed to department FM.

# GET RID OF B. O.\* in TV Pictures!



## \*BARKHAUSEN OSCILLATION

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

## PERFECTION B.O.\* ELIMINATOR



B.O. ELIMINATOR (Actual Size)



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

Order Today from Your Supplier!

**PERFECTION ELECTRIC CO**  
2641 South Wabash Ave., Chicago 16, Illinois  
Makers of Perfection Speakers, Ion Traps and BeamJuster TV Picture Centering Controls

This compact device fits over the horizontal sweep output tube, and because it brings a concentrated magnetic field near the source of the Barkhausen Oscillation—namely the screen grid—it usually eliminates the oscillation and the black lines on the face of the picture tube. Service men who have used the B.O. Eliminator say it is the simplest and most positive method of getting rid of the vertical bars that they have ever known. They see a big demand by service men in maintaining the 10,000,000 TV sets now on the market.

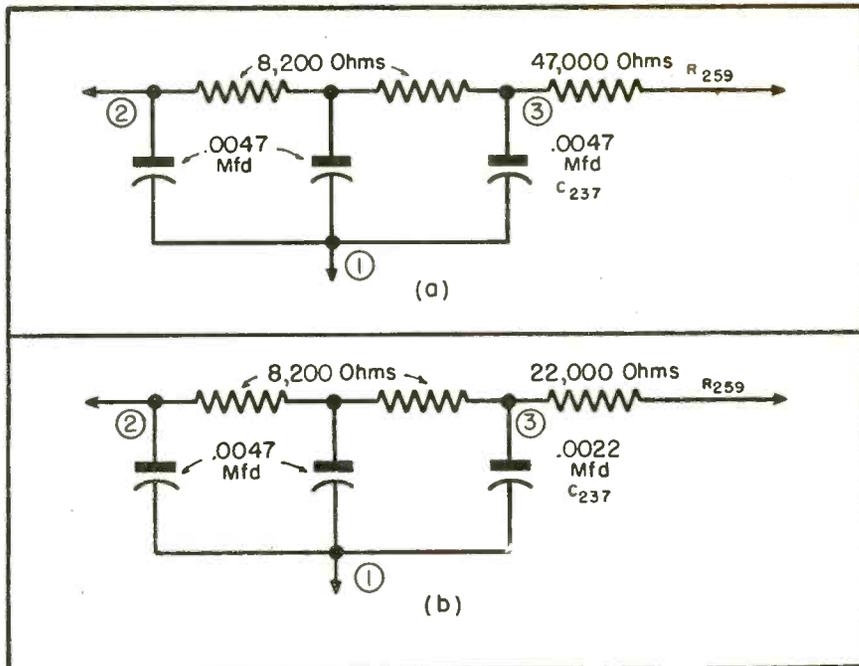


Fig. 3. Modified circuits (b) of Farnsworth TV chassis which reduces attenuation and increases the vertical hold range. In (a) appears the original circuit.

## Servicing Helps

(Continued from page 56)

chassis. The shield material and the chassis should be grounded. The chief source of the radiation is usually the deflection yoke leads. However, the relatively high voltages on these leads, along with the fact that too much capacitance between the leads and ground will alter the linearity, makes shielding of the leads somewhat impractical.

Cases where the interference is transmitted along the ac power line are usually easier to cure. Most cases of this type can be cured by connecting two .01-mfd, 600-volt capacitors, in series, across the ac input to the receiver and grounding the center point

to the chassis. The chassis should be connected to a good external ground.

### Vertical Hold—Improved Interlace

To reduce attenuation and increase the vertical hold range in Farnsworth chassis,  $C_{237}$  (.0047 mfd) is now being omitted and a 2200-ohm resistor ( $R_{259}$ ) and a .0022-mfd capacitor ( $C_{237}$ ) have been substituted, as indicated in Fig. 3. Removal of  $C_{237}$  should be followed by a check of interlace conditions.

Interlace may be checked by means of station pattern. You should look for a ripple effect in horizontal wedges, which indicate poor interlace.

To check for other conditions causing faulty interlace, besides removal of  $C_{237}$ , a 'scope connected to output of integrating network should show a clean, sharp waveform free from jitter. Each section can be checked to determine location of faulty component.

### Improving Reception in Weak Signal Areas<sup>1</sup>

Correct receiver alignment becomes an important factor when receivers are operated in low signal strength areas. It is possible for a receiver to have a good over-all response curve, even though the rf and if stages are not perfectly aligned, since the rf alignment can be off in one direction and

<sup>1</sup>From Admiral service notes.

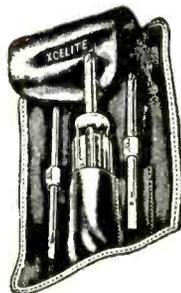
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LOOK TO **XCELITE**

## Good TIPS on Screwdriving

1. A screwdriver works best and lasts longest when used as a screwdriver—not as a chisel, punch or lever.
2. Be sure to use an insulated screwdriver when probing or working with live circuits.

Right—XCELITE No. CK-3 Combination Set with 3 Phillips and 3 standard screwdriver blades.



**PARK METALWARE CO., INC.**  
Dept. V Orchard Park, N. Y.

the *if* stages off in the other direction. With this type of alignment, excessive snow may show on the picture when receiving weak signals.

The *rf* tuner should always be aligned to produce maximum amplitude on the 'scope. Correct shape of the *rf* curve will be automatic if the amplitude is at a maximum. If the *if* curve is also similar to that shown in the manuals, the receiver signal-to-noise ratio will be good and there will be a minimum amount of snow in the picture.

If you find it difficult to get the right curve during *if* alignment, it will be necessary to see whether the set uses three 6AG5s in the *if* amplifier. If it does, alignment will be found easier if a 6AU6 is installed in the first and possibly in the second *if* stage. To do this, a short ground lead should be connected to pin 2 of the tube sockets and the tubes changed.

#### Additional Picture Contrast

Additional contrast can be obtained on Admiral 21B1 chassis by increasing the value of the video detector and video amplifier load resistances. This change will result in a loss of high frequency response (definition) and should not be used unless the signals are too weak to provide enough contrast. However, when the signals are weak, the change will often improve reception due to the fact that high frequency noise pulses do not appear on the picture.

The change can be made by connecting a 3,900-ohm 1-watt resistor in series with  $R_{315}$ , and a 3,900-ohm 1-watt resistor in series with  $R_{322}$ , at the junction of  $R_{322}$  and  $R_{324}$ .

#### Increasing Sensitivity of Admiral 21B1

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

#### Removing Vertical Bars

Shadow type vertical bars on Admiral chassis 20T1, 20V1, 21B1, 21C1, 21D1, 21H1 and 21J1, usually at the left of the raster, can be minimized by being certain the horizontal drive and width controls are adjusted properly. A common cause of vertical bars in the picture is the picture tube cathode lead (yellow) being too close to the horizontal output tube. This lead

(Continued on page 84)

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needle will restore  
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FREE: This attractive display, measuring eight inches in width and eleven inches in height, is available through your distributor or by writing to Jensen Industries, Inc.

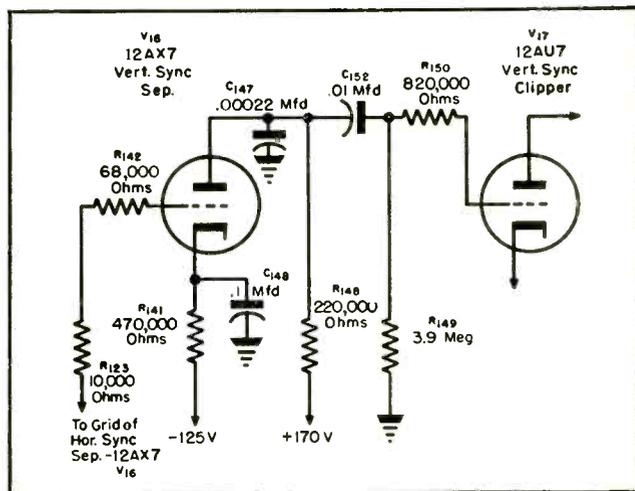
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Jensen NEEDLES  
... Preferred by  
leading phonograph manufacturers.  
A complete price selection  
from 50¢ to \$2.50

Fig. 4. Revised Sylvania TV circuit, which will stop vertical roll. This has been accomplished with changes in the resistor values in the vertical sync separator circuit: the 1-megohm resistor  $R_{141}$  changed to 470,000 ohms, 1/2 watt; grid resistor  $R_{142}$  changed from 10,000 to 68,000 ohms, 1/2 watt, and the plate resistor  $R_{148}$  changed from a 820,000-ohm unit to 220,000 ohms, 1/2 watt.



## BRAND NEW PROFIT MAKER



**FOR  
RADIO  
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Model AR-3  
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# New ELECTROX

## VIBRATOR ANALYZER AND POWER SUPPLY

Here's a new Electrox test unit that's indispensable for shops servicing auto radios, 2-way mobile communication systems or other equipment using 6-volt vibrators.

**TWO VALUABLE TEST UNITS IN ONE!** This instrument combines an adjustable POWER SUPPLY that provides smooth, hum-free direct current in any voltage needed to test auto radios, with a VIBRATOR ANALYZER that thoroughly tests practically all synchronous and non-synchronous vibrators found in auto radios today!

**TESTS OVER-ALL VIBRATOR PERFORMANCE!** Vibrator Analyzer accurately determines shorted and otherwise defective vibrators and predicts vibrator failures before they occur. It measures starting voltage, current consumption, output voltage and indicates irregular operation. Subjects vibrator to voltage conditions normally encountered when connected to the electrical system of the car. Over-voltage is available for starting vibrators with oxidized contacts. A standard oscilloscope can be attached for wave form observation.

It's a top quality test instrument—a must for every service shop. It safeguards your auto radio repairs—increases your parts sales—steps-up your efficiency and earnings. **ORDER NOW FROM YOUR DISTRIBUTOR.**

Write for Free Bulletin No. 1466, Giving Full Details

Rectifier Division  
**SCHAUER MANUFACTURING CORP.**

2078 Reading Road • Cincinnati 2, Ohio

## Servicing Helps

(Continued from page 83)

should be dressed so that it will not come near the horizontal output tube.

### Long Warm-Up Time

A 6BQ6GT horizontal output tube is used in all 1950 Admiral chassis of the 20T1 and 21B1 series, *excepting the 21D1 chassis.*

A poor connection between the plate cap lead and the plate cap to the 6BQ6GT tube may cause an excessively long *warm-up* period before the raster appears. Touching a hot soldering iron to the solder joint inside the plate cap will often correct the trouble.

### Horizontal Instability

Horizontal instability or *jitter* in some Admiral 24D1 sets may be caused by a horizontal signal being fed to the grids of the first and second *if* stages with the *agc* voltage. This signal, which has shifted in phase with respect to the horizontal oscillator, will modulate the video signal and cause horizontal instability when fed back through the sync circuits. This condition can be corrected by connecting a .1-mfd capacitor from the junction of  $R_{434}$  and  $R_{435}$  to ground.

### Horizontal Sync Instability

Horizontal sync instability in Admiral 21B1 and 20T1 series as indicated by *tearing* or *bending* of the picture may be caused by loss of sync pulses at the video amplifier. This may be the result of improper *agc* action. The *if* amplifier and the *if* amplifier tubes should be checked for leakage between control grid and other elements. A high resistance leak between control grid and screen or cathode

## ALUMINUM TUBING

### Butt-seam and Lock-seam

Immediate shipment from  
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### BUTT-SEAM TUBING

3/8"—7/16"—1/2" O.D. x  
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Specific lengths 3 to 30 ft.

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FILTERS



NO HERRINGBONE  
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This New TV HIGH-PASS FILTER will reduce interference which may be picked up by the i-f. amplifier of your tv. receiver.

The Miller No. 6168 High-Pass Filter diminishes spurious signals which arise from strong, local fields generated by:

1. Amateur radio transmitters.
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Filter is designed to attenuate all signals to 40 megacycles. All television channels passed with minimum loss. Installed easily in antenna lead-in. No tuning required. Dim. 1-7/16" by 1-7/8" by 3-1/2" high.



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6168 For 300-ohm line \$5.00  
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Speakers are hard to obtain. Recone with Waldom cones.

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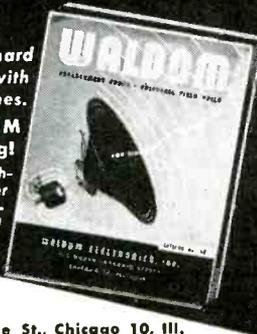
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Finer Tone  
a Waldom Cone



will cause incorrect *agc* voltage and probably result in overloading at the video amplifier.

### Removing Shock Hazard in 16-Inch Chassis

On some early Sylvania model 090 16-inch receivers the polystyrene twin lead from the built-in antenna to the antenna terminal board may come in contact with the 6BQ6 tube. The heat generated by the 6BQ6 tube will melt the polystyrene insulation on the twin lead. When this occurs, the bare wire may come in contact with the exposed portion of the 6BQ6 cap. This will put 305 volts on the antenna lead. If the built-in antenna is connected to the antenna terminal board, the receiver will not operate. However, if an external antenna is used and the built-in antenna disconnected, the exposed terminals of the built-in antenna will be hot to ground. To remedy, the twin lead should be tacked or stapled to the side of the cabinet so that it cannot come in contact with the 6BQ6 tube. If it is necessary to unfasten the lead from the cabinet to remove the chassis, be sure to re-tack after the chassis has been replaced.

### Arcing of 1B3GT to Shield Can

To prevent arcing of the 1B3GT cap to the *hv* supply shield can in Sylvania chassis a disc of armita paper (approximately 1/64" thick) 5" in diameter should be cut out and spotted with rubber cement to the inside top of the *hv* supply shield can. This item is used in present production.

### 6AG5 Replacements

When replacing 6AG5s in the first and second *rf* amplifiers in Sylvania tuners, the 6BC5 should be used if available in fringe areas, as it has somewhat better gain than the 6AG5. The 6BC5 should not be used in place of the 6AG5 in the fourth video *if*, as this will alter the band-pass characteristics of the *if* circuits.

### Adjustments of Focus, Ion Trap and Centering Magnets<sup>2</sup>

The magnetic fields produced by the focus, ion trap and centering magnets interact to produce a total field which acts on the electron beam to perform certain functions. Therefore, if an adjustment is made of any one of these units it will effect the total magnetic

(Continued on page 86)

<sup>2</sup>From Sylvania service notes.



# C-D's Sealpup

"class" will tell!

You don't need a pedigree to know that SEALPUP comes from a long line of winners! It's the finest metallized capacitor made. Just developed by C-D for ultra-compact military and commercial equipment. Hermetically sealed, brass case, glass-to-metal bonded, it's impervious to humidity!



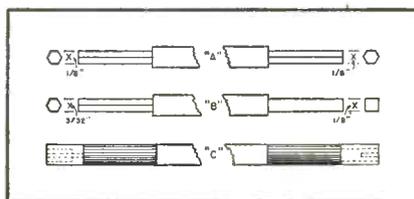
Write for Bulletin NB143 S-52  
Cornell-Dubilier Electric Corp.  
South Plainfield, N. J.

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## CONSISTENTLY DEPENDABLE CORNELL-DUBILIER CAPACITORS

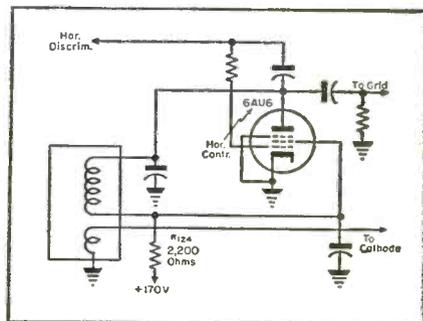
Plants in South Plainfield, N. J., New Bedford, Worcester and Cambridge, Mass.; Providence, R. I.; Indianapolis, Indiana; Fuquay Springs, North Carolina, and subsidiary, The Radiant Corporation, Cleveland, Ohio.

Fig. 5. Alignment tools\* for ratio detector, *if* and horizontal-hold core adjustments. Tools *A* and *B* can be used for *rd* core control. Tool *C* has a brass stud, which is slotted for *if* core adjustments at one end, and a steel blade at the other for horizontal-hold core adjustments. All tools are approximately 6" in length and 3/8" in diameter.



\*Available from Belmont Radio service department.

Fig. 6. If the horizontal oscillator in the Sylvania 1-108 chassis does not oscillate, the value of  $R_{124}$  should be changed to a 2200-ohm unit, as illustrated in this schematic. This alteration will drop the +170  $v$  for both the plate and screen of the 6AU6 horizontal control tube.



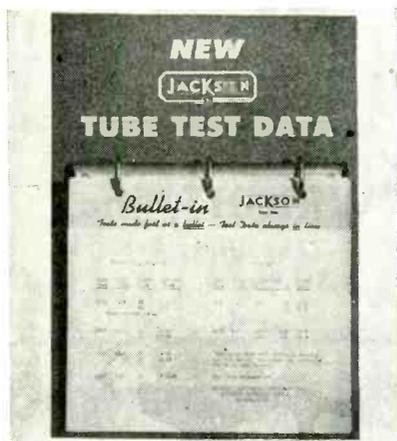


# New Parts . . Instruments . Tools . . . . .

## JACKSON TUBE-DATA HOLDER

A *Bullet-in* tube-data holder is now available from the Jackson Electrical Instrument Co., 18 S. Patterson Blvd., Dayton 2, Ohio.

Holder permits display of test data on new tubes, prior to release of revised roll charts. *Bullet-in* holder can also be used to announce when a revised roll chart will be ready.



\* \* \*

## ROCHESTER DECADE RESISTOR

A decade resistor, *model 2*, using 10% series resistors, affording a total of 72 resistance values, is now available from Rochester Electronics Co., Inc., Box 227, Penfield, N. Y.

Range is 10 ohms to 8.2 megohms, 12 values per decade: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82. It is said to have an accuracy of  $\pm 2.5\%$  for any value.

\* \* \*

## UNGAR COMBINATION KNIFE-SOLDERING TIP

A combination knife-soldering tip, No. 540, for cutting, stripping and marking plastics and insulation materials, has been announced by the Ungar Electric Tool Co., Inc., 615 Ducommun St., Los Angeles 12, Calif. Tip is interchangeable with others in the Ungar handle and cord set.

Brass tip, which threads onto the heating unit to become the combination knife, is said to permit cutting and stripping vinyl plastic insulation from wire, cutting and marking various other plastics and wood, and cutting and sealing woven plastic materials.



# Announcing the Sensational Low Cost



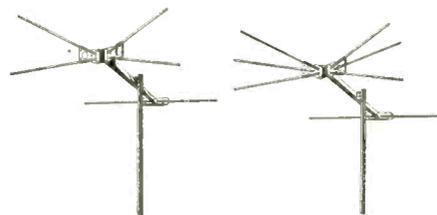
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**DESIGNED** for results and profits! High performance, extra low priced, the VANGUARD will outperform and outsell any comparably priced TV antenna anywhere. Vanguard Conical-V-Beams have engineered design that guarantees finest reception, conservative ratings that assure top performance and super-rugged construction that means long, trouble-free service life. The next time you need antennas, order Vanguard by Telrex. Don't settle for less than the best—particularly when the price is right. Call or write for complete illustrated catalog and prices, now!

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MODEL VM-2X  
Uni-directional, Conical-V-  
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MODEL VU-2X  
Uni-directional, Modified  
Conical-V-Beam with re-  
flectors.

MODEL VM-4X  
Uni-directional, Stacked  
Conical-V-Beam with re-  
flectors.

MODEL VU-4X  
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Modified Conical-V-Beam  
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Be sure it's a "CONICAL-V-BEAM"  
—Look for the TELREX\* Trademark



\* REGISTERED TRADE MARK

# telrex INC.

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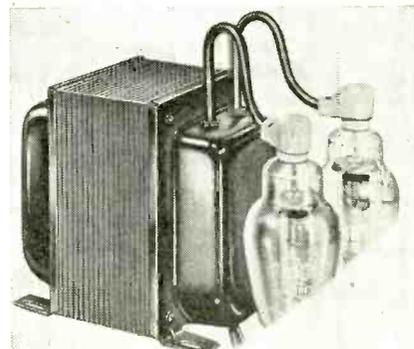
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AMERICA'S  
STANDARD OF  
COMPARISON

## STANCOR PLATE TRANSFORMERS

Five transformers in the PT series and six in the PC series have been announced by the Standard Transformer Corp., 3588 Elston Ave., Chicago 18, Ill. Featured are insulated leads that are said to provide protected routing to circuit.

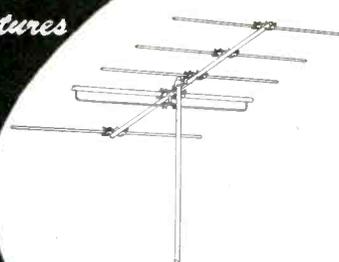
PT mounting is said to offer a direct protected path to the anodes of rectifier tubes with heavily insulated *hw* leads out of the top of the transformer and primary brought out of the bottom for concealed subchassis wiring. PC mounting is for units requiring single-ended rectifiers with all leads brought out the bottom of the transformer for subchassis wiring.



Right: Stancor plate transformer.

# PHOENIX YAGI

5-Star Features



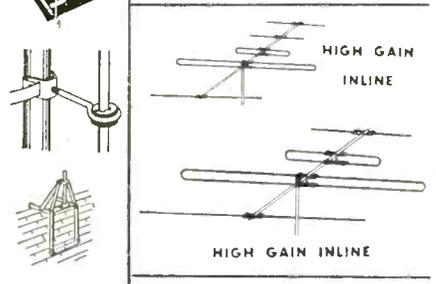
**NEW! SENSATIONAL GAIN!**

- \* FAST, EASY QUICK RIG!
- \* 300 OHM IMPEDANCE!
- \* EXCLUSIVE MAST CLAMP DESIGN!
- \* LICKS INTERFERENCE FROM GHOSTS AND NOISE!
- \* CUTS THE CALL-BACK NUISANCE!

SEE US IN BOOTH 110

**PHOENIX**

- \* Speed-Tennas
- \* Speed-Mounts
- \* Hardware



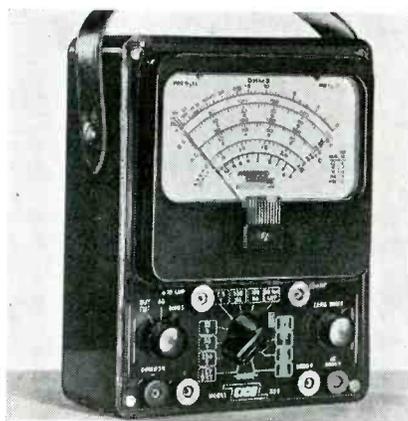
**PHOENIX ELECTRONICS INC.**  
LAWRENCE, MASS.

### EICO MULTIMETER KIT

A 20,000 ohms-volt multimeter kit, model 555, is now available from the Electronic Instrument Co., Inc., 276 Newport St., Brooklyn 12, N. Y. Included are thirty-one ranges and a 4½" meter that has a 50-microampere D'Arsonval movement.

Ranges are: *dc* voltage, 0-2.5, 10, 50, 250, 1,000, 5,000, at 20,000 ohms/volt; *ac* voltage, same as *dc* ranges, at 1,000 ohms/volt; output voltage, same as *ac* and *dc* ranges, with .1 mfd-internal series capacitor; db, -12 to -55 db, in 5 ranges; *dc* resistance, R x 1, R x 100, R x 10,000; *dc*... 0-100 microamperes, 10 ma, 100 ma, 500 ma, 10 a.

Meter is 6¾" x 5½" x 3".



\* \* \*

### C-D SILVERED MICAS

Silvered-mica capacitors, *Silver Mike*, 22R, ½" x ⅜" x ⅜", have been designed by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Units are wax-sealed against humidity. Ruby mica dielectric is silvered on both sides, and contact foils connected to the leads. Capacitors are said to withstand an operating temperature of 100° C. Ratings are 300 *v dc* working from 5 to 510 mmfd, and 500 *v dc* working from 5 to 420 mmfd. The standard capacity tolerance is ±5%. It also is available in ±20%, ±10%, ±3%, and ±2%, or ±1 mmfd, whichever is closer.

## WHAT A SPEAKER

Look at These Specifications

- 51.2 Oz. (3.2 Lbs.)
- Alnico Five Magnet
- Two Inch Voice Coil
- Power Handling Capacity
- 30 Watts—Continuous

Certainly the Model NP-12100 is in a class by itself

High in Quality  
Moderate in Price

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## WRIGHT, Inc.

2237 Univ. Ave.  
St. Paul 4, Minn.

First Time Advertised!

## NEW PRECISION WIRE CUTTER

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

Only \$2<sup>95</sup>

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

Patent Applied For



Television tube caddy

- Holds normal stock of 162 tubes, 221 total
- Compartments for fuses, small tools, etc.
- Designed especially for service technicians
- Everything in its place—Inventory at a glance
- Neat—Sturdy—Attractive—Businesslike
- Removable cover with space for mirror

**\$13<sup>50</sup>** DEALER NET AT YOUR FAVORITE JOBBER

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The C and G SALES CO.  
P. O. BOX 1525 COLUMBUS, OHIO

**CITY TOOL INDOOR BOOSTER ANTENNA**

An indoor booster antenna, Tele-Tune, that can be used individually or with another indoor or built-in antenna, with an outdoor antenna, or in pairs, has been announced by the City Tool Accessories, Corp., 3831 W. Lake St., Chicago 24, Ill.



**PLYMOUTH CHIMNEY MOUNT ANTENNA ASSEMBLY**

A chimney mount antenna assembly featuring stranded galvanized cable which can be used in place of steel strapping has been developed by Plymouth Electronics Corp., 50 Kingsbury St., Worcester 3, Mass. Metal corner pieces are said to prevent the cable from scoring the joints of the brick. Cable is attached with a sleeve connector.

**JAVEX REMOTE EXTENSION WALL PLATE**

An antenna wall plate providing more than one point at which a TV set can be plugged in, has been produced by Javex, Garland, Texas. Constant impedance is claimed to be a feature of the TV outlet plate, that can be flush mounted.

Plates can be had in ivory or brown.

**SUPER SONIC TV BOOSTER**

A new model Super Sonic booster, IT-7, has been developed by Sonic Industries, Inc., 221 West 17th Street, N. Y. C.

**KRYLON NOW LABELED FOR TV SERVICE USE**

Krylon, the acrylic plastic which can be sprayed by finger tip control from a pressurized can, to form a transparent coating to protect the TV antenna against rust, corrosion, etc., is now being packaged under a special label for use in the TV service field.

**TV OPEN LINE LEADIN INSTALLATION**

The illustration of the T. V. Wire Products open-line leadin, which appeared in the April issue, was reversed. The correct position of the leadin is shown below.



**RCP MINIATURE AM/FM SIGNAL GENERATOR**

A pocket size combined FM signal generator, rf signal generator, and audio oscillator, has been announced by Radio City Products Co., 152 W. 25th St., New York 1, N. Y.

Unit has four FM fixed frequencies, FM modulated for use with ratio detectors. Has 10.7 and 9.1 mc switch positions to permit alignment of the *if* sections.

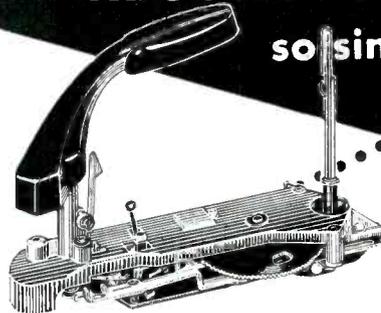
Ends of the broadcast band can be aligned at 1,500 and 550-kc switch positions. Intermediate frequency alignment is provided by fixed frequency switch positions of 456 and 465 kc.

An audio outlet terminal is provided for supplying a 400-cycle signal externally.

Trimmers are provided for recalibrating both the *rf* and FM frequencies. Instru-

**V-M 950 tri-o-matic RECORD CHANGERS**

so simple . . .



**IN DESIGN**

This one compact unit is the complete basic mechanism of the V-M tri-o-matic! The patented tri-o-matic Spindle does away with push-off arms, gives records positive protection.

**IN OPERATION**

One-knob control for turntable speed and "On-Off-Rej"—that's all!



Yet . . .

**Completely Automatic for ALL Records!**

The V-M tri-o-matic is simplest to operate — and service — of any 3-speed changer on the market. Intermixes automatically 10" and 12" records of same speed, also twelve 7" 33 1/2 rpm. or twelve 7" 45 rpm. **SHUTS OFF COMPLETELY AND AUTOMATICALLY** after last record has played. Velvet-action velocity trip; dual-needle, reversible, cartridge; quick, quiet change cycle. Minimum mounting space—13 3/16" wide x 1 1/8" depth, overall height 7 1/4"

\*registered, spindle design patented

**V-M CORPORATION**

Benton Harbor, Michigan



ment can be used on either *ac* or *dc* lines. Size: 7" x 2 7/8" x 2 3/8". Weight, 2 pounds.

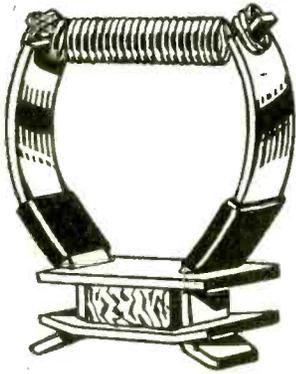
**HUNTER HAND TOOL**

A single hand tool that fits smaller size, standard socket head screws and bolts has been developed by the H. D. Hunter Company, 3499 E. 14th Street, Los Angeles 23.

A smaller copy of the standard *Smitty* 5-in-1 hand tool, this tool, *Smitty Jr.*, has six individual socket wrenches, sizes (0.50", 1/8", 5/64", 3/32", 1/8", and 3/32") that fold knife-like into a single handle.

When the ends of the wrenches become worn, the worn ends can be ground. When it is no longer possible to grind the individual wrenches they can be replaced by removing the end bolt and inserting a new wrench of the same size.

# FOR TOP QUALITY PICTURES



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## PERFECTION ION TRAPS

- Simplest to Install
- Stay Put—No Wobble
- Standard on All Leading TV Sets Including

ADMIRAL CORP.  
AIB KING  
AMERICAN  
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MOTOROLA  
MUNTZ  
OLYMPIC

PHILCO  
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ELECTRONICS  
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Makers of Perfection Speakers and  
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### GENUINE TWIN LEAD 300 OHM WIRE ALSO ROTOR 3-4-6 WIRE

All wire made with 7 strands of copper covered with virgin polyethylene.

Buy direct from manufacturer.  
Samples and prices on request.

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### 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



### SPRAGUE PLASTIC PACKAGE FOR MOLDED TUBULARS

A clear plastic protective dome container, mounted on heavy cardboard backing, *Domepak*, with five *Telecap* molded tubular capacitors of the same value, has been introduced by the Sprague Products Company, North Adams, Mass.

If desired, the packs can be hung from hooks. Five different values of 600-volt Sprague *Telecap* molded tubulars (.005-.01-.02-.05 and .1 mfd) are available in the *Domepak* cover.



\* \* \*

### BUSS TWIN-CLIPS

Twin clips, for replacement of pigtail fuses, are now being made by the Bussmann Manufacturing Co., University at Jefferson, St. Louis 7, Mo.

Clips can be rotated around pigtail fuse to get maximum clearance against grounding. They are made of spring bronze, nickel plated. Take 1/4" x 1 1/4" fuses.

\* \* \*

### G.E. SPEAKER CONE AND VOICE COIL KITS

Kits for drive-in theater speaker cones and voice coils now are available from G. E.

The kits available are: ROC-004 (cone, gasket, and dust cover for 400C22 speaker); ROC-005 (cone, gasket, and dust cover for 525C18 speaker), and ROX-002 (voice coil and spider assembly for 400C22 and 525C-18 speakers). Each includes 10 sets of parts. \* \* \*

### IRC VARIABLE LOUDNESS CONTROL

A continuously variable loudness control, *type LCI*, has been produced by International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Unit, requiring three connections, is said to be adjustable to any desired level from a whisper to a shout.

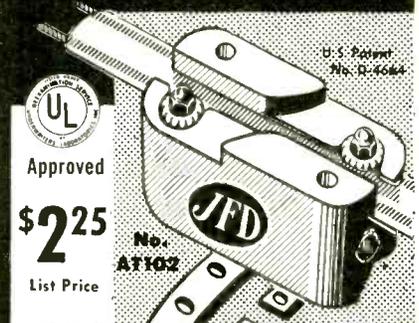
It is available to distributors and from the I R C Industrial Department. Comes individually packed with complete information as to installation, performance and specifications in a 14-page leaflet, with full charts and graphs. \* \* \*

### G.E. DC CAPACITORS

A line of 100-volt *dc* capacitors has been announced by the G.E. transformer and allied product divisions at Pittsfield, Mass.

Capacitors are thin-paper, tinfoil type said to be comparable with previously offered paper dielectric units and in addition, are smaller in size and lighter in weight. They will not introduce noise into the system and will pass signal voltages approaching zero. While primarily intended for *dc* application with ripple voltages, in accordance with JAN-C-25, they will withstand occasional heavy discharges. Can also be used in low-voltage *ac* circuits under many conditions.

## THE WORLD'S LEADING TWIN LEAD TELEVISION LIGHTNING ARRESTER



Approved

\$2.25

List Price

No. AT102

completely waterproof



### SAFE TV GUARD

Protects television sets against lightning and static charges. Simple to install everywhere and anywhere... no stripping, cutting or spreading of wires. More than 500,000 in use today!

See your jobber or write to —



MANUFACTURING CO., INC.

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FIRST in Television Antennas and Accessories

## AT THE SHOW IT'S BOOTH 26

for

## FRETCO ANTENNAS

"The practical antenna line with exclusive, appealing and saleable features."

If not at the Show, write for our interesting booklet "TV Facts." It's Free.

## FRETCO TELEVISION CO.

1041 Forbes St., Pittsburgh, Pa.

We also manufacture open wire transmission line

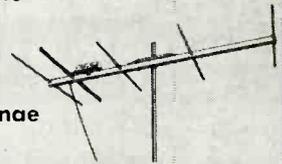
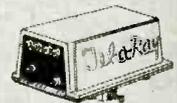
# Rep Talk

ARNOLD P. CLOUGH has been named district manager for National Union in the New England states. He will headquarter at Winslow Road, Sharon, Mass. . . . *Leon Aldelman*, 25 Chittenden Ave., New York 33, N. Y. (metropolitan New York), *Albert Levine*, Alco Sales Co., 11 Jonquil Pl., Pittsburgh 34, Penna. (western Penna. and West Virginia), *H. P. Segel*, 143 Newbury St., Boston 16, Mass. (New England), *Charles D. Southern* and *Paul Southern*, 1605 Lincoln Bank Tower, Fort Wayne 2, Ind. (Indiana, Ohio and Kentucky), and *A. R. Thibau*, 402 Manufacturers Exchange Bldg., Kansas City 6, Mo., have been appointed sales reps for Abner-Hull Manufacturing Co., Boston 16, Mass. . . . *Charles E. Scholl*, 67 Ash St., Bridgeport 5, Conn., has been named sales rep for Cornish Wire Co., New York City, covering New England with the exception of Conn. . . . *Walter C. Hustis*, Florida Road, Ridgefield, Conn., is now sales rep for the electronics parts division of the Allen B. Du Mont Labs., Inc., East Paterson, N. J., for the New England territory. . . . *Ted Powell*, P. O. Box 21, Normandy 21, Mo., has been appointed sales rep for jobber and manufacturing sales in central and eastern Missouri and in southern Illinois for the Centralab electronics division. . . . *W. C. Hitt*, 1169 South Broadway, Los Angeles 15, Calif., has been named sales jobbers rep for DuMont Teletrons. . . . *Henry P. Segel and Co.* (New England and western New York), *Arthur H. Baier and Co.*, 1306 War Center Rd., Cleveland 21, Ohio (Ohio and western Penna.), and *George Harris*, Administration Bldg., Municipal Airport, Wichita, Kansas (Nebraska, Iowa, Oklahoma, Kansas, all of Missouri except St. Louis) have been appointed sales reps for Ram Electronics, Inc., Irvington-on-the-Hudson, N. Y. . . . *Cartwright Sales Agency*, 4030 Club Dr., N.E., Atlanta, Ga. (southeastern states), *Leonard D. Allen*, 2401 S. State St., Syracuse, N. Y. (upper New York state), *Walter J. Brauer*, 15631 Lakewood Hts. Blvd., Cleveland, Ohio (Ohio, Kentucky, Indiana), and *William A. Meiley*, 805 Pennsylvania Ave., Plymouth, Ind. (Michigan) have been appointed sales reps for Anchor Metal Co., New York City. . . . *C. L. Pugh* and *Jack Moore*, 1670 Doone Rd., Columbus 12, Ohio (Ohio, West Virginia and western Pennsylvania) and *Perlmuth-Coleman and Associates*, 1335 S. Flower St., Los Angeles 15, Calif. (southern California), have been named sales reps for the Oxford Electric Corp., Chicago, Ill. . . . *E. V. Roberts and Associates*, Los Angeles, Calif., will cover a 4-state area for Air Marine Motors, Inc., Seaford, L. I., N. Y. . . . *Gordon S. Marshall*, Pasadena, Calif., has been appointed sales rep for Reeves Instrument Corp., New York. . . . *J. T. Hill Sales*

# FIRST BECAUSE THEY LAST

**TEL-A-RAY** — the antenna of unquestioned quality — eliminates "antenna shopping." Skillfully engineered to meet every TV need, the TEL-A-RAY antenna system insures outstanding fringe area performance the first time. The Reception Master antenna coupled with the new antenna mounted Pre-Amplifier brings strong, clear pictures to the weakest areas. One call . . . one installation is all that's needed. Replacement is eliminated. Reception Master antennae are built of the finest dural to resist corrosive weather damage. The element ends are sealed by the exclusive Tel-A-Roll process.

**TEL-A-RAY is right the first time!**



*Tel-a-Ray* ENTERPRISES INCORPORATED  
BOX 332 • HENDERSON • KENTUCKY



Co., Los Angeles, Calif., has been named rep for Vectron, Inc., Waltham, Mass., in California and Arizona. . . . *H. A. Kittleson*, Los Angeles, Calif., will represent Polarad Electronic Corp., Brooklyn, N. Y., in three western states. . . . *Edward Braddock*, Western Savings Fund Society Bldg., Philadelphia 7, Pa., has been appointed sales rep for Gertsch Products, Inc., Los Angeles, Calif., in New Jersey and Penna. . . . *Kenneth A. Hathaway*, manager of the distribu-

tor division of Ward Leonard Electric Co., 53 W. Jackson Blvd., Chicago 4, Ill., has been unanimously elected as the first honorary lifetime member of *The Reps*. Hathaway, one of the original organizers of the group of industry sales reps is the first non-representative to be accorded all benefits and privileges of membership. The honor was bestowed on him in recognition of his constructive thinking and diligent efforts as trade show manager from '36 to '42.

J. J. Perlmuth

C. L. Pugh

Jack Moore

E. J. Coleman

Ken Hathaway



JOE B. HIGGINBOTHAM, JR.

Nuberg, Ga.

**THANKS,  
Mr. Higginbotham!**

Radio Receptor Co., Inc.  
West 19th Street  
New York 11, N.Y.

Gentlemen:

Please send me your pamphlet on the design, application and servicing of selenium rectifiers.

Although I have serviced many receivers which have selenium rectifiers I have very little information on them and believe your pamphlet would be a valuable asset to my shop.

I use your rectifiers, supplied by Southeastern Radio Parts Co. and Specialty Distributing Co. of Atlanta, Ga., and like them very much. Also I appreciate your consideration of the radio repairman in that you supply a data sheet with each rectifier and the trouble taken to print the servicing information.

Yours Truly

*Joe B. Higginbotham Jr.*  
Joe B. Higginbotham Jr.



**SELETRON RECTIFIERS**

... And our thanks go as well to the other thousands of servicemen and hams who insist upon top performing SELETRON Selenium Rectifiers in electronic circuits and as replacements in Radio and TV sets.

You can depend on SELETRON all ways. Full technical information is always available without obligation. Look for Howard W. Sam's Red Book Supplement listing SELETRON replacements, and write us for Bulletin No. SE-8.



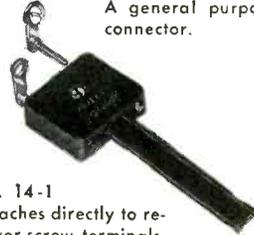
**RR RADIO RECEPTOR COMPANY, INC. RR**

SELETRON DIVISION  
Since 1922 in Radio and Electronics  
Factory: 84 North 9th St., Brooklyn 11, N. Y. • Sales Department: 251 West 19th St., New York 11, N. Y.

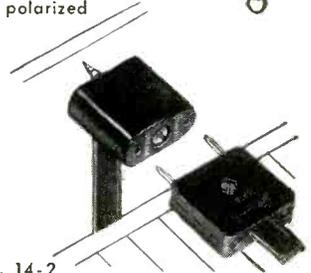
**THREE TYPES OF  
TWIN LINE CONNECTORS GIVE  
YOU A CHOICE FOR ANY  
INSTALLATION  
PROBLEM!**



No. 14-0  
A general purpose polarized connector.



No. 14-1  
Attaches directly to receiver screw terminals. Eliminates cutting line to install a connector.



No. 14-2  
A baseboard connector; serves as junction for antenna lead-in and inside lead to set. Mount them in parallel to accommodate the receiver in various locations.

**Grayhill**

4532 W. Madison Street

GET DETAILS—Write for the Grayhill Catalog NOW

Chicago 24, Illinois

**RCA BATTERY PROMOTION PLANS**

A battery promotion for the '51 season, designed for use by Service Men and including schedules of consumer advertising on six radio and television shows, has been announced by the RCA tube department.

Timed for the opening of the spring and summer portable-radio season, but designed also for year-round merchandising, the promotion consists of six sales and servicing aids for the Service Man. These include electrical window and store dis-

plays, a basic sales aid kit, an interchangeable types pencil, and a Factfinder.

The battery fact-finder is a mechanical index which automatically provides essential battery information, including interchangeability data, prices, and technical information. By setting the index pointer and pressing a release button, there is available battery replacement data on more than 500 portable radios of 32 different manufacturers.

The basic sales aid kit includes the '51 battery catalog, current price list and an 8" x 22" window streamer.

**G.E. BATON STYLUS FOLDER**

A folder describing diamond-tipped Baton styli is now available from G. E.

Folder discloses that a wearing stylus may go unnoticed until the record is badly worn, because the reduction in quality of reproduction occurs gradually. The diamond stylus is claimed to lessen this danger because it resists wear. Booklet also reveals that the life expectancy of the diamond stylus has been reported to be about 20 times that of a sapphire stylus.

**HOW YOUR SHOP SHOULD AND SHOULD NOT LOOK**



Your face should be red if your shop appears as at right . . . untidy, with complete confusion in every corner, causing slow, crude repairs which can only add to service costs and call backs. But if yours is like the one at left, and it is hoped it is, with plenty of good test equipment, reference manuals and a substantial stock of parts and accessories, you can always be assured of . . . more satisfied customers, more sales, lower operating costs, and particularly a pride in having done the job right. (Courtesy Capehart)

## Metallic Rectifiers

(Continued from page 28)

cuit is sometimes specified when a center tap circuit would be more advantageous and vice versa. In some cases, engineers who have been using rectifier tubes which carry a considerably higher voltage rating than the individual rectifier cell, have properly been using center-tap circuits. However, when they consider metallic rectifiers they sometimes overlook the critical values. Either circuit would be equally satisfactory, but when a center-tap circuit is specified where a bridge circuit would suffice, there is involved an additional transformer terminal and a somewhat larger transformer.

### Doubler Circuits

Possibly the widest application of the selenium rectifier is in the doubler circuit used by many manufacturers of television sets. This circuit, by the use of two rectifier elements and two capacitors, provides an output voltage approximately double that of the voltage input. There are two such types of circuit, shown respectively in Figs. 11 and 12, in simplified circuits without protective resistors or filters. Of these, the circuit shown in Fig. 12 is in wider use.

### Doubler Versus Center Tap

It will be noted that the two rectifier elements in each of Figs. 11 and 12 have the same relationships as the two elements *A* and *B* shown in Fig. 5, and constitute half of a bridge circuit. This arrangement of the two elements, shown in Fig. 13, is usually called a doubler, but it is also sometimes known as a half-wave center tap. It is frequently confused with the full-wave center tap shown in Fig. 14. It has appeared with the incorrect designation even in government specifications. It is for this reason that attention has been called to the ease with which one circuit may be confused with the other.

### Capacitive Circuits

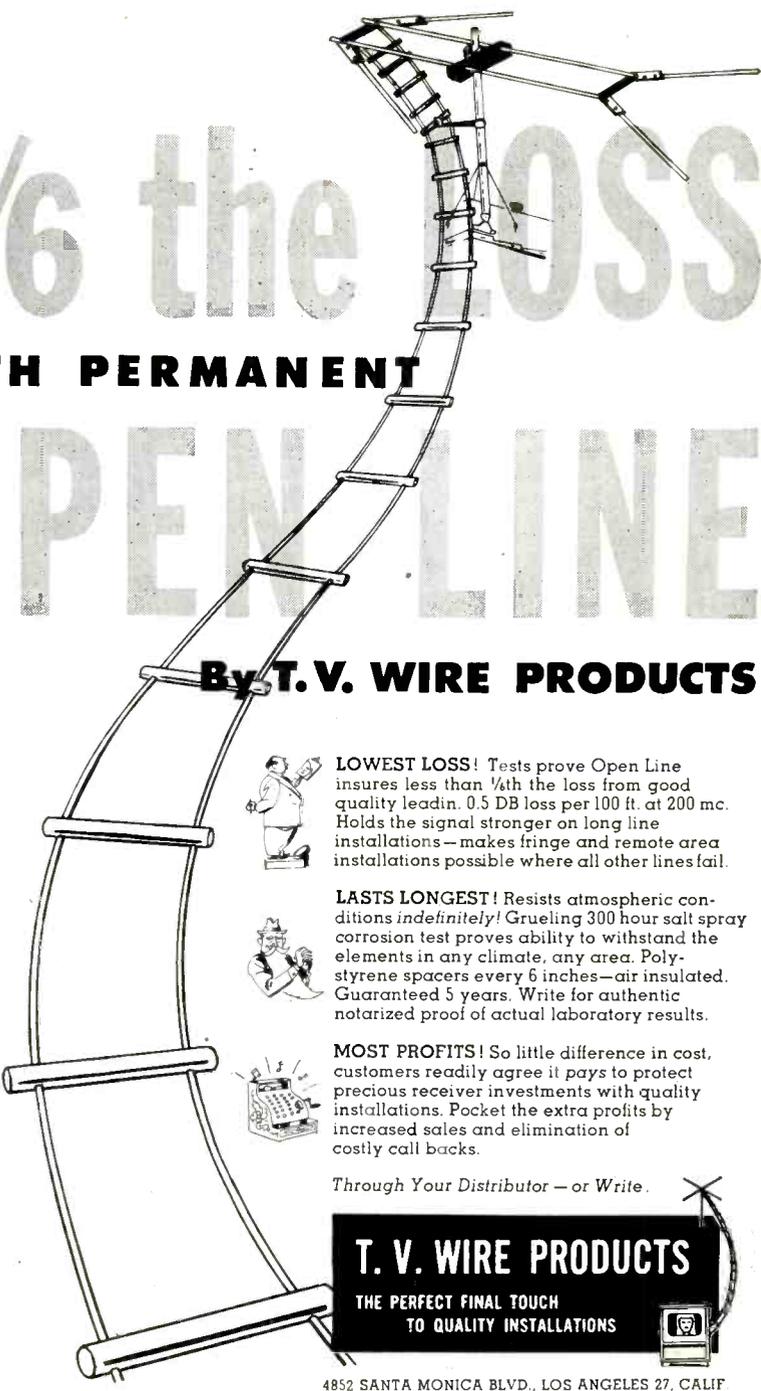
It has already been indicated that one of the most popular applications for selenium rectifiers is the doubler circuit which involves a capacitive circuit. Another circuit, in general use in portable three-way (*ac-dc-battery*) and in small table-model radio

# 1/6 the LOSS

# WITH PERMANENT

# OPEN LINE

## By T. V. WIRE PRODUCTS





**LOWEST LOSS!** Tests prove Open Line insures less than 1/6th the loss from good quality lead-in. 0.5 DB loss per 100 ft. at 200 mc. Holds the signal stronger on long line installations—makes fringe and remote area installations possible where all other lines fail.



**LASTS LONGEST!** Resists atmospheric conditions indefinitely! Grueling 300 hour salt spray corrosion test proves ability to withstand the elements in any climate, any area. Polystyrene spacers every 6 inches—air insulated. Guaranteed 5 years. Write for authentic notarized proof of actual laboratory results.



**MOST PROFITS!** So little difference in cost, customers readily agree it pays to protect precious receiver investments with quality installations. Pocket the extra profits by increased sales and elimination of costly call backs.

Through Your Distributor — or Write.

## T. V. WIRE PRODUCTS

THE PERFECT FINAL TOUCH  
TO QUALITY INSTALLATIONS

4852 SANTA MONICA BLVD., LOS ANGELES 27, CALIF

sets, involves half-wave rectification into a capacitive circuit, as shown in Fig. 15. This circuit, as well as the doubler circuits previously described, requires a limiting resistor. Before probing the need for this resistor, let us consider the general conditions existing in a rectifier circuit with a capacitive load.

### Resistive-Capacitive Loads

In a circuit feeding rectified current into a resistive load, the relationship between the current and the voltage is as shown in Fig. 16. However, when

a voltage is impressed across a capacitor, the capacitor builds up a counter electromotive force. It is only when the impressed voltage exceeds the counter electromotive force that current will flow. This is shown in Fig. 17. Since there is little or no resistance between the rectifier and the capacitor, the current flowing into the capacitor can reach rather high peak values. An examination of Figs. 16 and 17 discloses that for the same average value of current, which is the useful *dc* ampere output of the rectifier, the *rms* or heating value of the current

(Continued on page 94)

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132-Page  
Sun Radio  
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Of Electronic  
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For Industry, Schools, Laboratories, Broadcast Stations, Service-Dealers, Engineers and Experimenters — the complete electronic components catalog. 132 easy-to-read, easy-to-use, easy-to-file, 8½" x 11" pages. Be sure you have this important new catalog handy at all times. For your Free copy simply paste this coupon on your company or personal letterhead.

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## SHOOT TV TROUBLE FAST!

### With H. G. CISIN'S RAPID "TV TROUBLE SHOOTING METHOD"

EARN more money! Locate television troubles by this quick, entirely new method. Rapid checks enable you to locate all faults in record breaking time regardless of make or model! 160 Picture, Raster, Sound trouble symptoms. Over 100 Rapid Checks including over-all alignment checks. 26 illustrations; simplified step-by-step directions!

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

INCREASE your earning power with the most valuable aid to TV servicing ever written!

SEND YOUR NAME AND ADDRESS TODAY WITH ONLY FOR YOUR POSTPAID COPY



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## Metallic Rectifiers

(Continued from page 93)

in the rectifier will be greater in the circuit shown in Fig. 17, than in that shown in Fig. 16. Since it is essential that the rectifier not be overheated, it is desirable to have the same rms current for any given size of cell regardless of the type of load, and so for a capacitive load it becomes necessary to reduce the dc value. Therefore, the dc current rating of any given cell is considered for a capacitive load to be only 80% that of the current rating for a resistive load. In rating the half-wave miniature rectifiers for use in radio and television, this factor has been taken into account by stack manufacturers. These same conditions prevail in battery charging where a similar condition of counter electromotive force exists.

In Fig. 17 the counter emf of the capacitor is shown as a straight line. It would actually be a jagged or sawtooth line due to the charging and discharging of the capacitor.

However, since it is the principle involved rather than the detail, and also because when a battery is present a straight line accurately represents the counter emf, the straight line may be considered as satisfactorily illustrating what occurs in the circuit.

### Use of Large Capacitors

In the case of voltage doubler and half-wave rectifiers (Figs. 11, 12 and 15) operating directly from the 117-volt ac lines, it is desirable from the standpoint of capacitor life to use as high a value of capacitance as is economically feasible. This usually results in excessive rms current through the rectifier and also gives rise to a very high instantaneous charging current, whenever the circuit happens to be switched on the line at the positive peak of the ac wave.

### Series Resistors for Surge-Current Control

The introduction of a series resistor effectively reduces the rms value of the current and at the same time limits the maximum instantaneous surge current. In practice, this resistor is of a comparatively low value, ranging from 47 ohms for a 25-milliampererectifier to 5 ohms for 250 milliamperes and higher.

### Transformer as Limiter

Half-wave and doubler rectifiers supplied from a transformer ordinarily do not require the series resistor, since

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the transformer usually has enough impedance to limit both the *rms* and peak values of current. This also applies to a center-tap rectifier operating into a capacitive load. It might be advisable however to check the protective value of the transformer impedance.

### Bridge Rectifier Connections

Frequently, bridge rectifiers with capacitive input filters are connected directly to the *ac* supply line without a transformer. It might be possible, under certain extreme conditions, to encounter abnormally high *rms* and surge currents in this type of application. However, as a general rule the series resistor is not required.

### Definitions of Terms

There are many terms employed in metallic-rectifier design and application, the exact definitions of which have been found to be confusing to many. Accordingly, these terms have been defined as follows:

**Metallic Rectifier Cell**...A metallic rectifier cell is an elementary rectifying device having one positive, one negative electrode and one rectifying junction. It has the characteristic of conducting current effectively in only one direction. In the past this has been called a disc, plate or junction.

**Rectifying Element**\*...“A rectifying element is a circuit element which has the property of conducting current effectively in one direction only.”—*NEMA*. (A single-phase bridge circuit, for instance, has four elements. In the past elements have been referred to as arms or legs. A rectifying element may consist of a single cell or of a multiplicity of cells in series, in parallel or in series-parallel.)

**Metallic Rectifier Stack**...A metallic rectifier stack is a single structure of one or more metallic rectifier cells. (These cells in turn may constitute one or more elements.)

**Metallic Rectifier Stack Assembly**...A metallic rectifier stack assembly is an assembly of two or more stacks.

**Rectifier**\*...“A rectifier is an integral assembly of one or more devices, each of which conducts current effectively in only one direction.”—*NEMA*.

\*From Standards for Metallic Rectifiers of the National Electrical Manufacturers Association.

**Metallic Rectifier Unit**\*...“A rectifier unit is an operable arrangement of a rectifier and essential auxiliaries such as transformers, filters, switch-gears, etc.—*NEMA*.”

**Cell Combination**\*...“The cell combination in a metallic rectifier is the arrangement of cells in a stack, stack assembly or rectifier unit. The cell combination is described by a sequence of three numbers, written *a-b-c*, with the following significances:

(a) Number of rectifying elements.

(b) Number of cells in series in each rectifying element.  
(c) Number of cells in parallel in each rectifying element.

*Note:* The total number of cells in the rectifier is the product of these three numbers.—*NEMA*.

[In a subsequent issue there will appear data on polarity designations, reverse voltage ratings, life aging, voltage ratios *ac-dc* relative advantages of different types of stacks, and the relative merits of metallic rectifiers; copper oxide, magnesium sulphide and selenium.]

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## JOTS AND FLASHES

THE ULTRAHIGH converter-builtin provision issue, which became quite a rousing item when the FCC released its proposal for more stations on the high bands, recently received an interesting analysis from the RCA-NBC gentlemen who have been running ultrahigh station tests in Bridgeport, Conn. In the opinion of W. A. Buck, RCA Victor vice prexy and general manager, the converter provides the best means of picking up ultrahigh reception on existing receivers. In addition, it was pointed out that a special outdoor antenna will be required. He also indicated that the time cycle required for construction and installation of transmitting equipment and antennas is such that no large scale telecasts on the high bands can begin until late '52 or early '53. . . . Past officers of NEDA were honored recently with plaques, in appreciation of their generous donation of time and effort to the association. Among those who

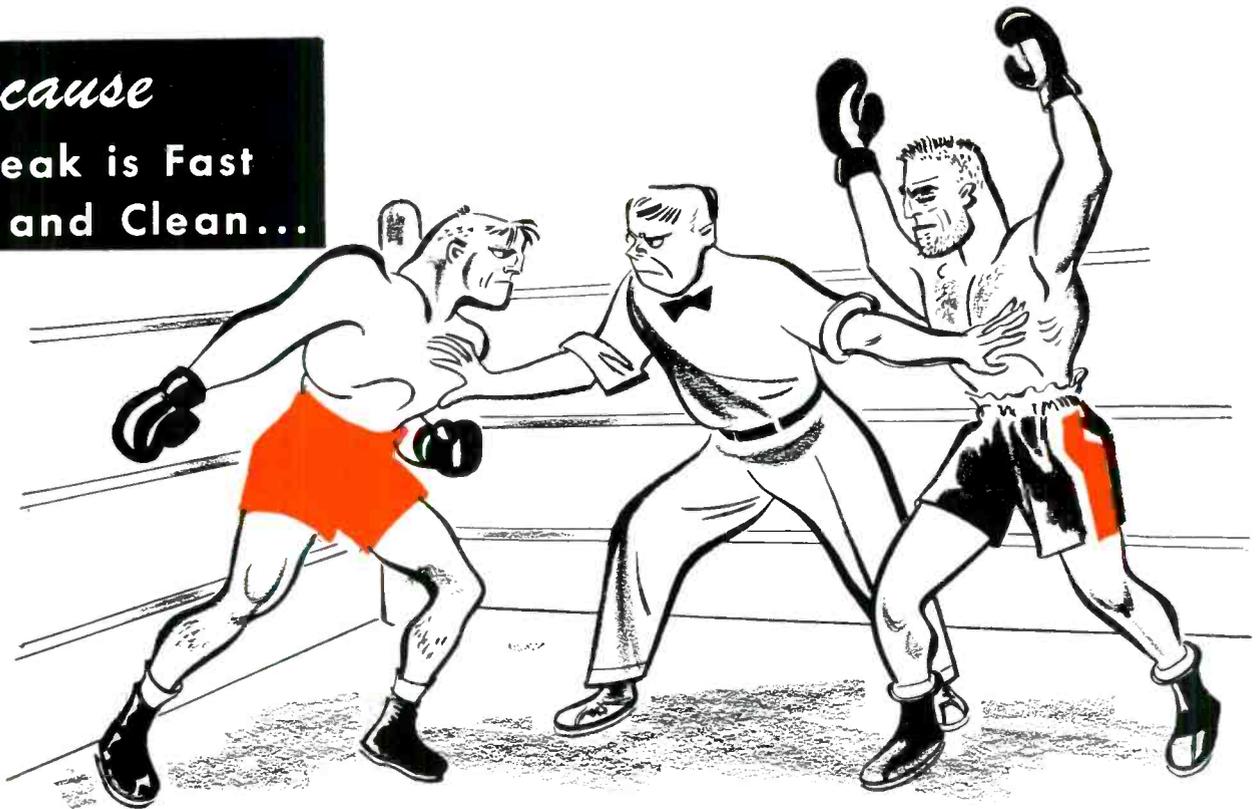
received the awards were Aaron Lippman, Louis W. Hatry, Arthur C. Stallman, Lealis L. Hale, Guy B. Paine, Carl C. Brown, A. W. Greeson, Jr., A. D. Davis, R. V. Weatherford, Dahl W. Mack, Hoyt C. Crabtree, Max I. Epstein and W. D. Jenkins. . . . Anthony Dillon is now field sales manager of Air King Products Co., Inc. . . . The James Vibrapow Co. advertising program is now being handled by Frank C. Nahser, Inc., and Paul J. Steffen of the Nahser agency is serving as account executive. . . . A catalog No. 15, has been released by the Greylock Electronics Supply Co., 115 Liberty St., New York 6. . . . A 16-page catalog has been released by the Crest Transformer Corp., 1834-36 W. North Ave., Chicago 32, Ill. . . . John Kuneau, director of public relations of Philco, has been promoted to vice president of the executive staff. . . . Telrex has received a reissue on their patent 2,518,297, the reissue patent bearing the number 23,346 and containing seven claims on conical antenna design.

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