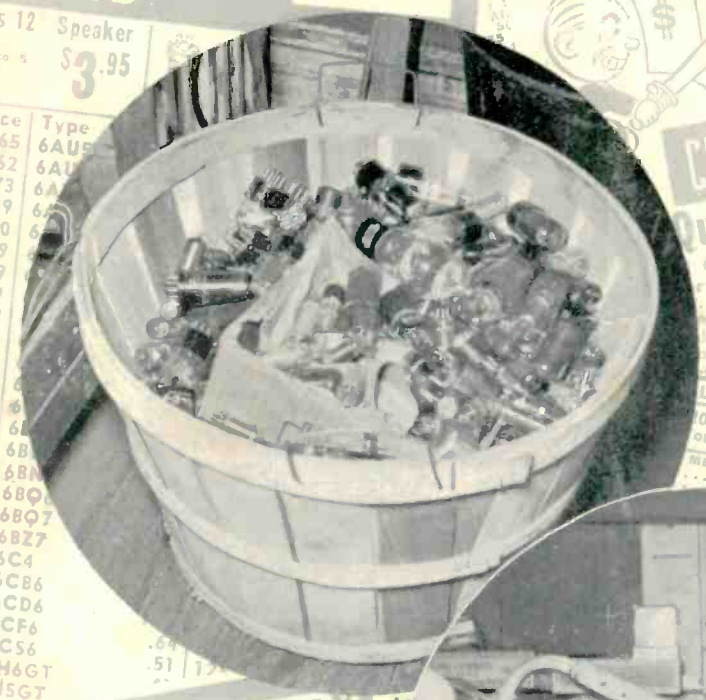
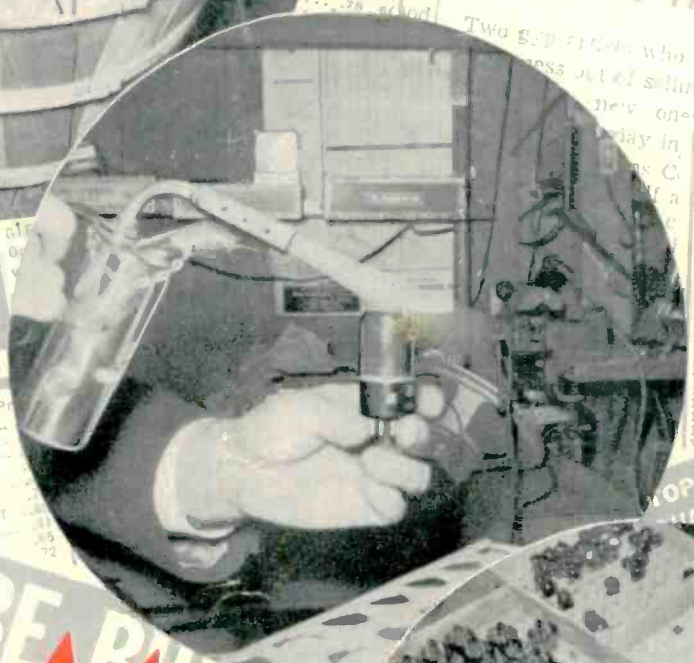
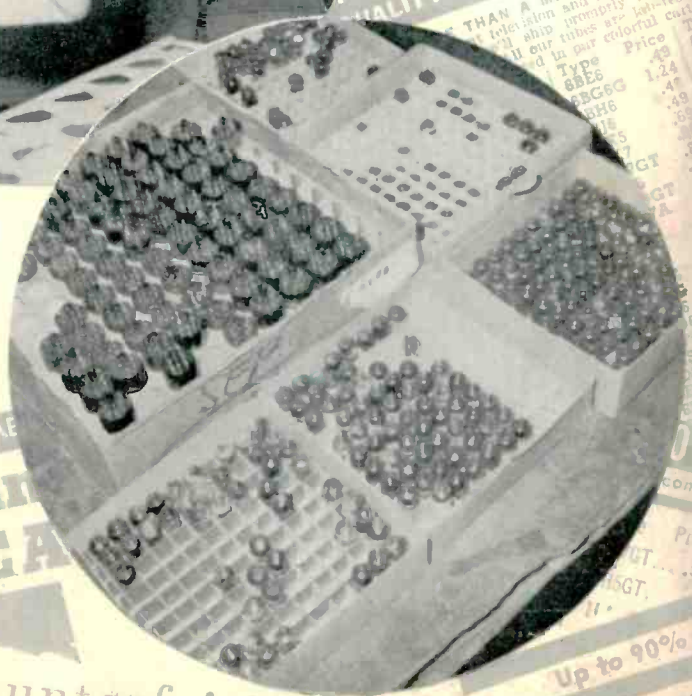
TECHNICIAN

& Circuit Digests



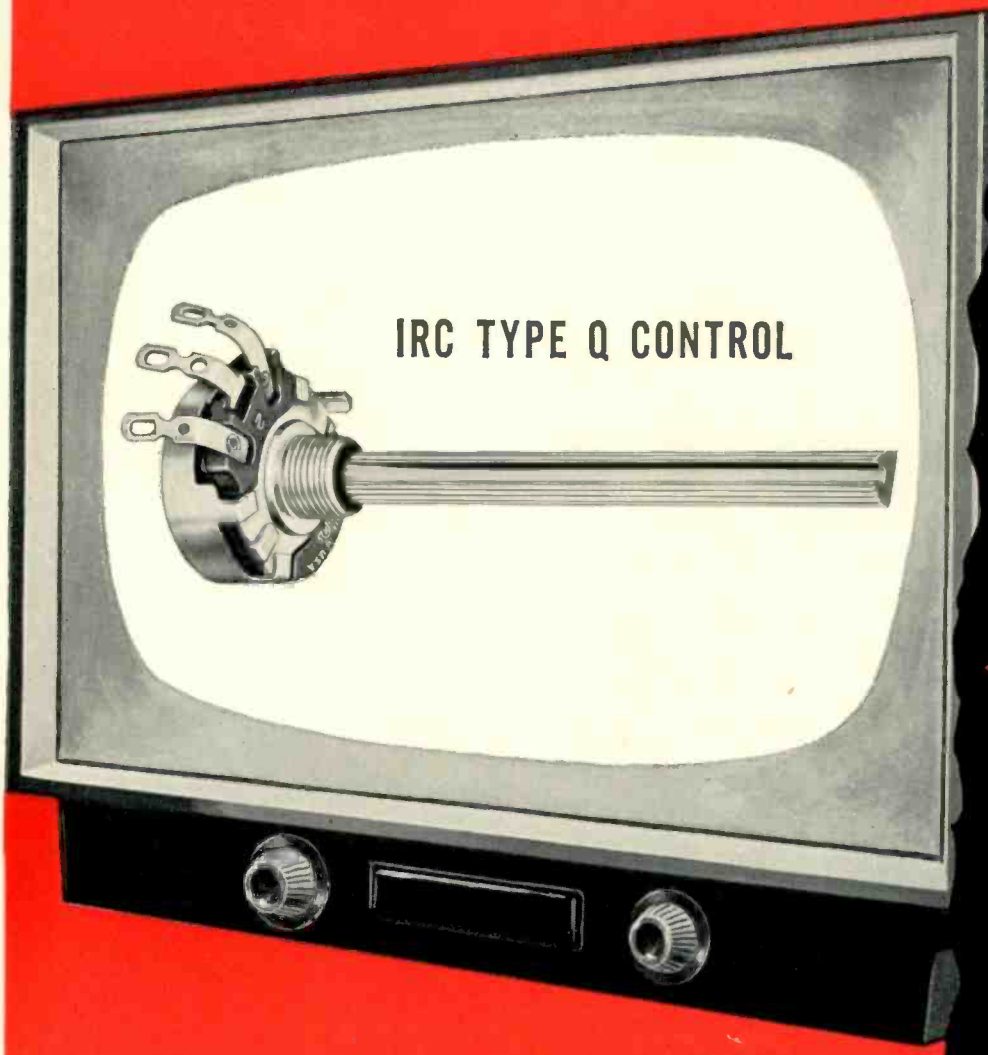




INSIDE STORY...
of REPROCESSED TUBE RACKET
SEE Page 12

JULY • 1955
Caldwell-Clements, Inc.

Preferred for modern set servicing



KNOBMASTER FIXED SHAFT
Q Control standard shaft is knurled, flatted and slotted —fits most knobs without alteration.

INTERCHANGEABLE FIXED SHAFTS
Exclusive IRC convenience feature—provides fast conversion to "specials", with FIXED shaft security. 15 types available.

1/4" LONG BUSHING
Accommodates all small sets, yet handles large set needs perfectly.

7 STANDARD TAPERS
Full coverage of all taper requirements is provided in the Q Control.

94 RESISTANCE VALUES
For TV, AM and FM coverage, 94 values of plain and tapped controls are furnished.

QUALITY APPEARANCE
The handsome professional appearance of IRC Q Controls lets you point to your work with pride.

CUSHIONED TURN
The smooth, quality of "feel" of a Q Control contributes to customer confidence.

TYPE 76 SWITCHES
Either of two type IRC switches attached as quickly and easily as a control cover—meets all your requirements.

Service technicians get greater coverage with less investment; more practical service features; and easier, faster installation with the IRC Type Q Control. Here's a dependable, basic control that is directly designed for modern set servicing. For appearance, performance and price . . . there's none better. So why settle for less? Tell your Distributor you want Q Controls . . . most servicemen do.

This 8 page catalog gives you all the facts . . . Send for your free copy now—

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IRC

Wherever the Circuit Says ↓

TECHNICIAN
& Circuit Digests

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE

TECHNICIAN & CIRCUIT DIGESTS, July 1955, Vol. 62, No. 1, $.50 a copy. Published monthly by Caldwell-Clements, Inc. Publishers also of MART including Price-Fax, and TELE-TECH & ELECTRONIC INDUSTRIES. Publication office, Emmett St., Bristol, Conn. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone PLaza 9-7880. M. Clements, President; M. H. Newton, Assistant to President; John J. Borghi, Vice President and Treasurer; M. B. Clements, Secretary.

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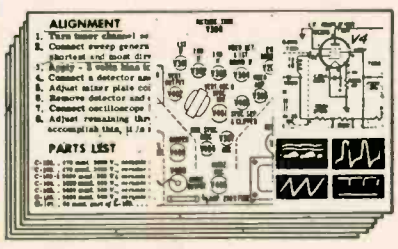
JULY, 1955

FRONT COVER Pictured against the background of assorted cut-rate tube advertisements are the three stages in the "reprocessing" of receiving tubes—from the trash basket in the TV service shop, to the "reprocessing" firm, and finally, into the packing boxes ("nestings") in which they are shipped all over the country. The whole story, with the details, will be found in "The Reprocessed Tube Racket," beginning on p. 12 of this issue.

FEATURES AND ARTICLES

DEPARTMENTS

CIRCUIT DIGESTS



IN THIS ISSUE

ADMIRAL: TV Chassis 18XP4BZ
EMERSON: Transistor Pocket Radio
GENERAL ELECTRIC: Hi-Fi Amplifier
HOFFMAN: TV Chassis 306-21, etc.
PHILCO: TV Chassis TV-300, 301
WESTINGHOUSE: Portable Radio

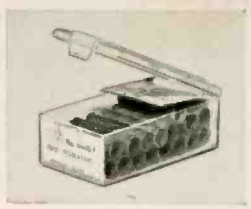
G-C TV LINE SEAL
Prevents corrosion on wires, etc.
No. 17-2 NET $0.39

G-C SCRATCH REPAIR KIT
Remove cabinet scratches.
No. 915 NET $0.99

G-C REAR SPEAKER BAFFLE KIT
Has 3-way switch, bronze grille.
No. 9180 NET $2.70

G-C 7.5 OHM FUSE RESISTOR
For series-wired TV sets.
No. 9207 NET $0.33

G-C BAKELITE CEMENT
Repairs cabinets, knobs, panels.
No. 32-2 NET $0.51



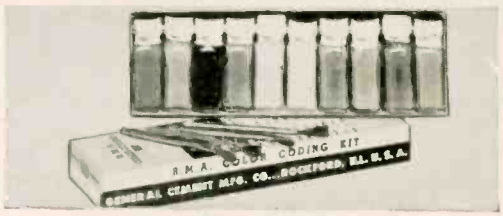
G-C AUTO FUSE INSULATOR SLEEVES
Box of 16; 1⅛" long x ¼" I.D.
No. H640-F NET $0.30

G-C RUBBER GROMMETS
Box of 15 assorted grommets.
No. H025-F NET $0.30

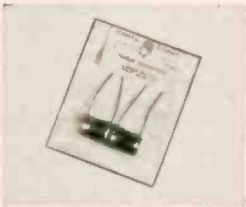
G-C MAG-NETIK HEAD CLEANER
Remove oxide from tape heads.
No. 53-1 NET $0.51

G-C CARBON-X
Quiet noisy carbon volume controls.
No. 1205 NET $0.72

G-C REK-O-DOPE
All-purpose recording lubricant.
No. 126-2 NET $0.39



G-C COLOR CODING KIT
Includes 10 standard colors, brushes.
No. 677 NET $1.29



G-C GLO-BAR THERMISTORS
Resistors for series heater tubes.
No. 9135 NET $1.44

GENERAL

G-C

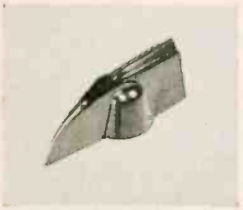
CEMENT

Ask For These

RADIO-TV SERVICE AIDS

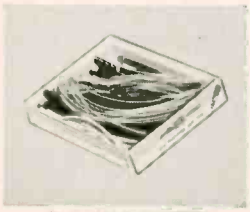
...at Your Jobber

G-C LIQUID NON-SLIP
Prevent slipping on drive cables.
No. 1211 NET $0.21



G-C STREAMLINE POINTER
Black 2" long; also red, ivory, etc.
No. 1171 NET $0.25

G-C AC-DC INDOOR ANTENNA WIRE
Flexible copper; insulated.
No. 840 NET $0.27

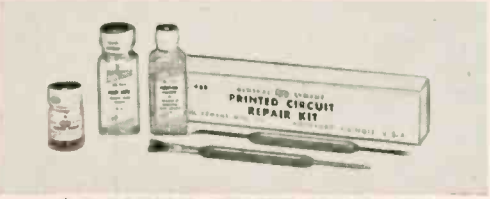


G-C SPAGHETTI ASSORTMENT
Variety of sizes and colors.
No. 551 NET $0.84

G-C ASSORTED SPACERS, BUSHINGS
Kit in jar; many chassis uses.
No. 6617 NET $0.51

G-C FAHNESTOCK CLIPS
Box of 12 assorted plated clips.
No. H590-F NET $0.30

G-C AUTO STATIC CHASER KIT
Injector and tire static powder.
No. 5606 NET $1.65

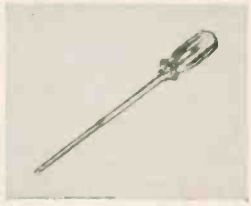


G-C PRINTED CIRCUIT REPAIR KIT
Contains Silver Print, Silicone Resin, Solvent and all tools.
No. 680 NET $5.85

G-C TV CORONA DOPE
Prevent corona shorts in TV sets.
No. 47-2 NET $0.72

G-C 300-OHM WALL PLATE
Brown plate and plug.
No. 8595 NET $0.75

G-C WESTINGHOUSE TV ALIGNER
Fits openings in West'hse coils.
No. 9089 NET $0.54



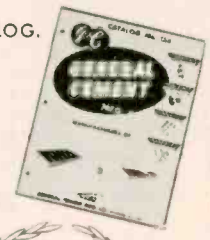
G-C SLUG RETRIEVER TOOL
For Standard Coil tuner slugs.
No. 9096 NET $2.22

G-C TELEVISION ALIGNING WRENCH
Socket ¼" square; 6" long.
No. 5080 NET $0.51

G-C NON-MAGNETIC ALIGNER
Tough, heat-treated beryllium.
No. 9105 NET $0.75

G-C ADJUSTABLE SHORTY
Adjusts from 1½" to 2"
No. 9090 NET $0.42

FREE! Send postcard for your big G-C CATALOG.



G-C

GENERAL CEMENT MFG. CO.

902 Taylor Avenue
Rockford, Illinois

1930 1955
25th Anniversary
GENERAL CEMENT MANUFACTURING COMPANY
G-C TELCO

ASK YOUR JOBBER FOR THESE G-C SPECIALS OF THE MONTH

G-C 3-for-2 CHEMICAL SPECIAL
No. B-1 Pack of 3 NET $0.69

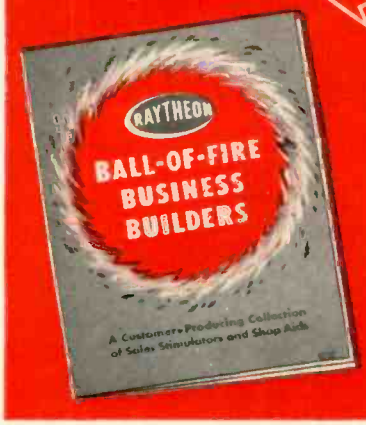
TELCO 6-PACK LIGHTNING ARRESTORS
No. 8642-6P Pack of 6 NET $2.25

G-C SPRA-KLEEN
No. 8666 6-oz. can
NET $1.00

TELCO HINGED ROOF MOUNT
No. 9021 NET $1.17

SERVICE DEALERS:

ask your RAYTHEON Tube Distributor for these wonderful sales helps...



Tube and Toal Carrying Cases
Two sizes — hald both tubes and repair tools

Cardboard Cutout Trucks
With your name — give them to the children

Aluminum Snap-Out-Form Packet Case
Protects forms, looks businesslike

Triplicate Invoice Sets
Provides 3 copies of each bill

14-Point Check-Up Card
Hang on set to show adjustments made

Drop Cloth
To show customers you care

Illuminated Outdoor Sign
A real traffic stopper

Go-Getter
Picks up small parts where hands can't reach

Window Streamer
Sells check-up service

Window Displays
To sell your service to passersby

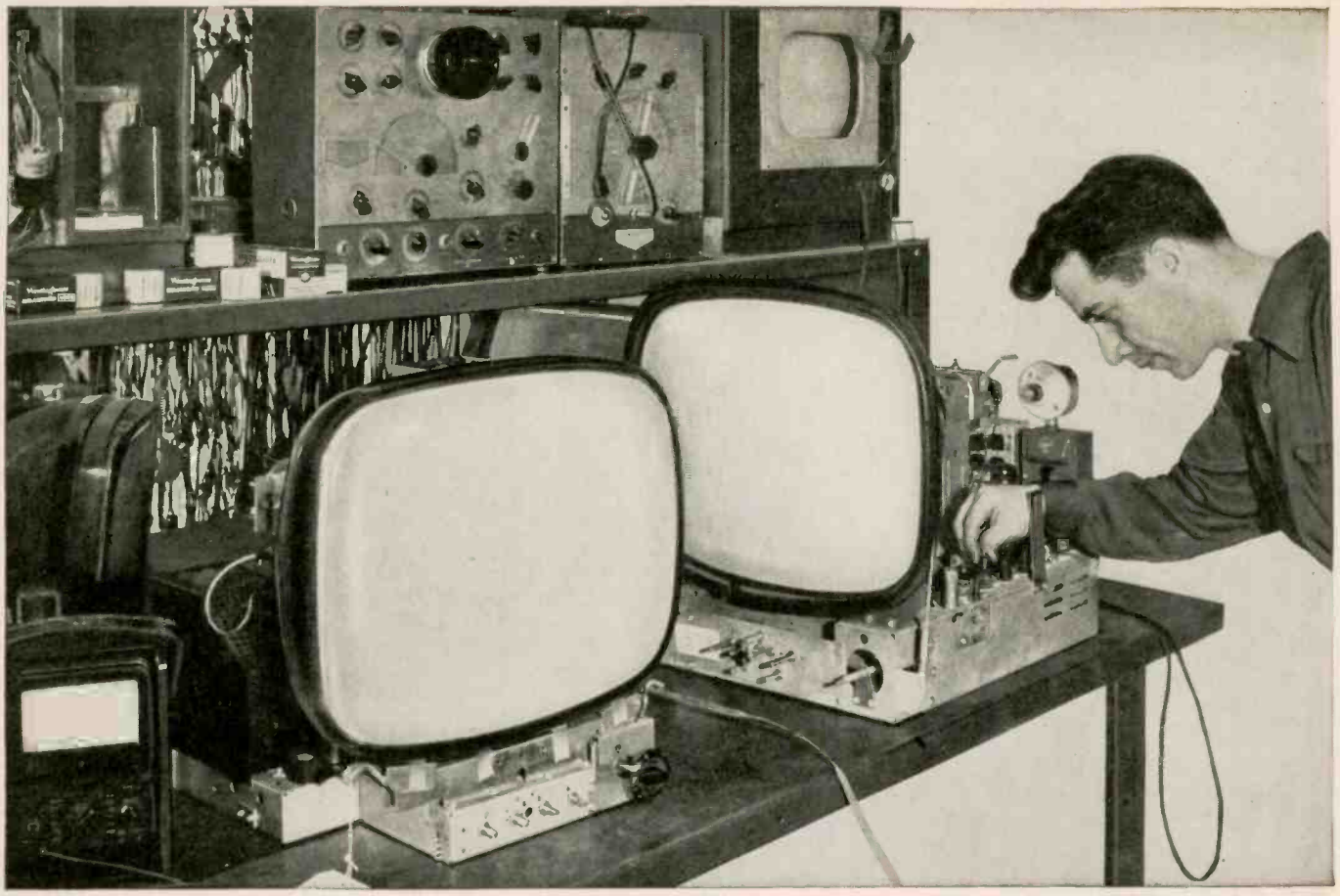
You ain't seen nuthin', until you see the sensational collection of sales and shop aids in the new Raytheon BALL-OF-FIRE BUSINESS BUILDERS booklet. Pictured are a few of the new additions to Raytheon's already famous collection of tried and tested promotion items. For years, Service Dealers from coast-to-coast have been relying on Raytheon sales aids to help them get more than their share of business, using Raytheon Shop Aids to help them work more efficiently, and effectively.

Many items are free, the rest are 'way below normal cost. Ask your Raytheon Tube Distributor for a free copy of the new Raytheon Booklet or write to Department C, Raytheon Manufacturing Company, Receiving and Cathode Ray Tube Operations, Newton 58, Mass.

RAYTHEON MANUFACTURING COMPANY
Receiving and Cathode Ray Tube Operations
Newton, Mass. • Chicago • Atlanta, Ga. • Los Angeles, Calif.

Raytheon makes all these: Receiving and Picture Tubes • Reliable Subminiature and Miniature Tubes • Semiconductor Diodes and Transistors • Nucleonic Tubes • Microwave Tubes

RAYTHEON®
Excellence in Electronics



2 chassis, like the one pictured above (left) were used by Planet TV, B'klyn TV Service Center, to make their fact-finding call-back tests. The results? Planet says:

"Westinghouse Receiving Tubes Cut Our Call-Backs by More Than 30%!"

One of the oldest and largest TV service organizations in New York—Planet TV—submitted Westinghouse Receiving Tubes and the tubes of other manufacturers to a rigorous, factual "call-back" test.

The test was set up by equipping two identical chassis; one with all Westinghouse types and the other with identical tubes of other manufacturers. The sets were turned on and operated 8 hours per day for 5 consecutive days, the average period during which Planet TV's records show that call-backs normally occur after renewal tube installation.

The chassis equipped with Westinghouse tubes showed no failures. The other chassis showed 3 tube failures—3 potentially costly Planet call-backs.

Why don't you make this simple, profitable call-back test in *your* shop. Prove to yourself, too, that Westinghouse Receiving Tubes can drastically reduce your call-back problems—and increase your profits! See your Westinghouse distributor today! Start using Westinghouse Reliatron® Tubes *right away!*

BREAKDOWNS: SET A (WESTINGHOUSE TUBES ONLY)		BREAKDOWNS: SET B (THREE COMPETITIVE BRANDS)
Monday	None	None
Tuesday	None	5U4G defective
Wednesday	None	None
Thursday	None	6AU6 defective, 5U4G soft
Friday	None	None

ET-95070

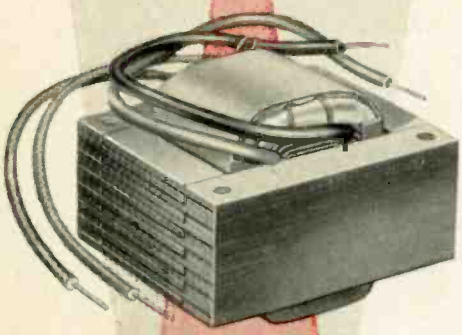
YOU CAN BE SURE...IF IT'S Westinghouse

RELIATRON® TUBES

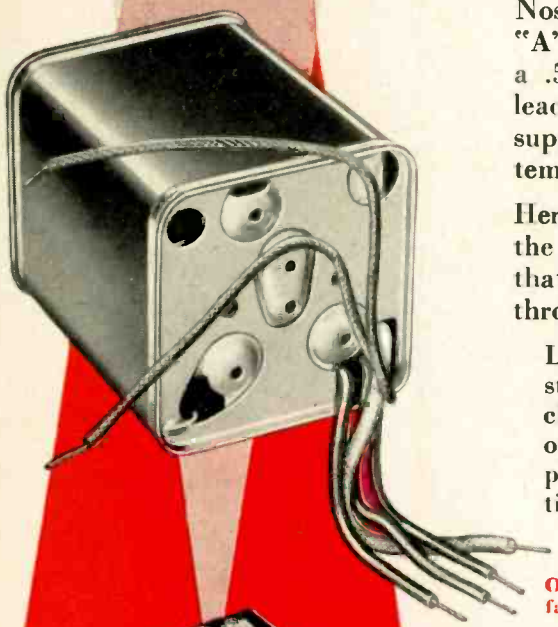
WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, N. Y.

from DELCO RADIO...

High-Quality
POWER TRANSFORMERS
for Car Radios



UNCASED MODEL 6055, ABOVE
BELOW, CASED MODEL 6060.



This is the newly developed package for Delco transformers and other electronics parts . . . brighter, stronger, easier-to-find.

Developed by Delco Radio and General Motors electronics specialists, and built under a strict quality control, Delco Universal Vibrator transformers have the kind of built-in customer satisfaction that can do a lot for your business.

And there's a model to replace the vibrator transformer in just about every model of car radio.

Three—Model Nos. 6055, 6065 and 6067—are *uncased* and *do not* include a filter network. Three others—Model Nos. 6060, 6064 and 6066—*are cased* and *do include* an "A" line filter network consisting of an "A" choke and a .5 mfd. capacitor. All six models have long-enough leads for universal application, and cased models are supplied with three self-tapping screws and a drilling template for easy mounting.

Here are some more of the features that prove this is the power transformer line to fill your needs . . . one that's competitively priced all the way, quality-made through and through . . . the Delco line:

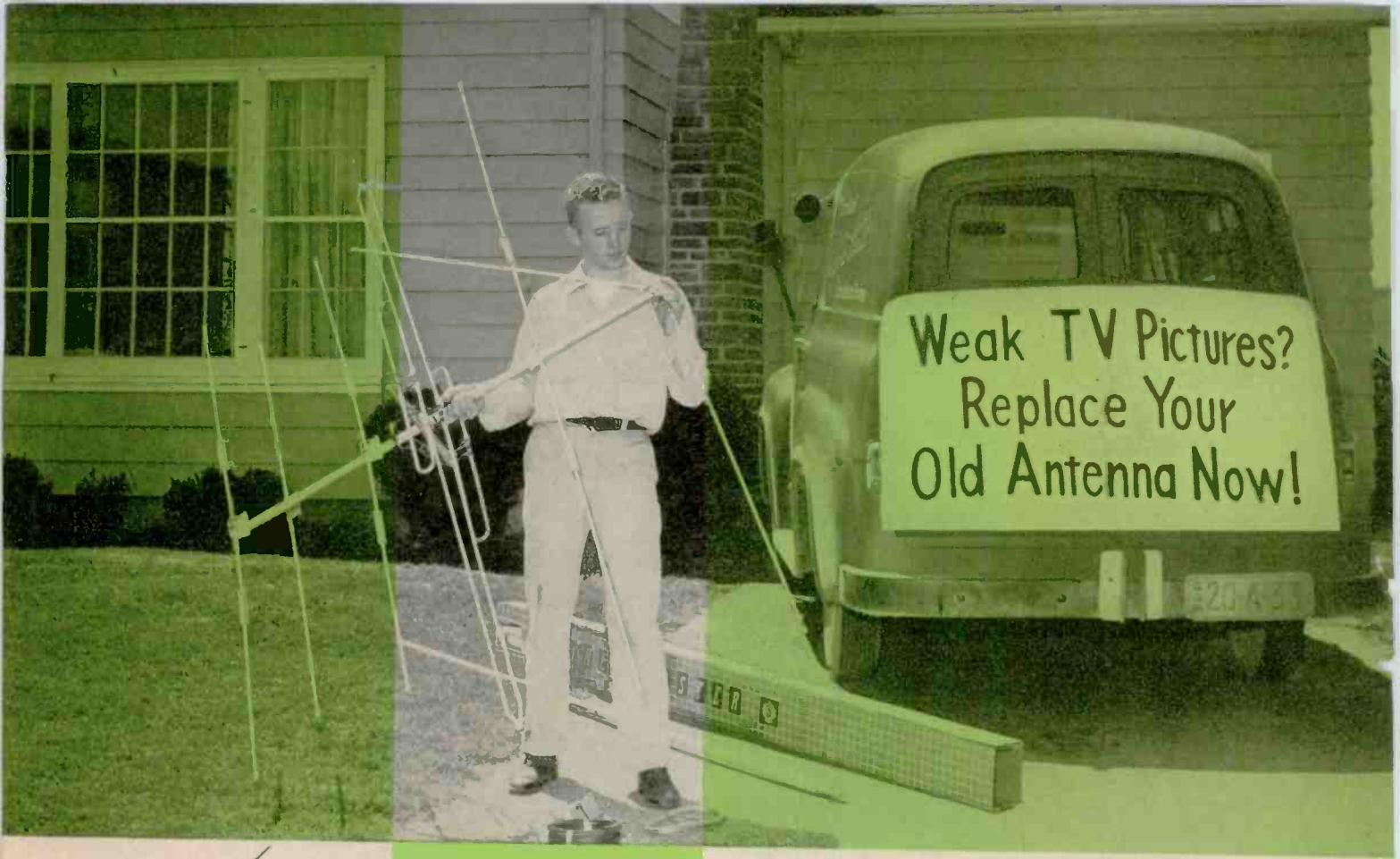
Laminated core inserts stamped out of low-loss silicon steel and heat-treated so magnetic properties will not change • Primary and secondary coils wound by skilled operators using special machines • Hot asphalt compound poured into cased models to hold components in position, transfer heat and protect quality and performance.

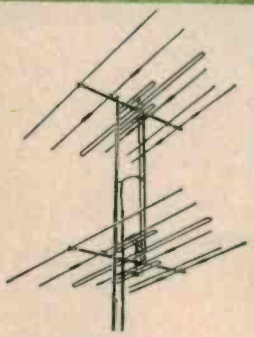
Order these quality products of a volume electronics manufacturer through your UMS Electronics Parts Distributor today.

DELCO RADIO
DIVISION OF GENERAL MOTORS, KOKOMO, INDIANA

A GENERAL MOTORS PRODUCT — A UNITED MOTORS LINE

DISTRIBUTED BY ELECTRONICS DISTRIBUTORS EVERYWHERE





NEW!
Narrow-space stacking!

Channel Master's RAINBOW and SUPER RAINBOW can now be stacked only 60" apart. These new, extremely efficient, 2-stage, impedance-matching stacking rods permit easier installations with an absolute minimum sacrifice of gain.

model no. 331-7

Champion Rainbow
330 series
Super Rainbow
331 series
Challenger Rainbow
332 series

Warm weather is profit weather!

The weather's warmer! Days are longer! *This* is the time of year to go after that gold mine in your own backyard: the replacement of the antennas in your area that are damaged, worn, and obsolete.

Channel Master's RAINBOW is the favorite replacement antenna of America's TV installation men — and here's why:

- There's a RAINBOW model for every installation . . . for every signal area . . . for every budget.
- Regardless of competitive claims—Channel Master's RAINBOW antennas are *still* the most powerful antenna series available today! Advanced engineering and the exclusive Tri-Pole make the difference!
- Featuring the fastest and strongest of all preassemblies: trigger-fast "Snap-Lock" action, Channel Master's fabulous preassembly that *snaps* open, *locks* open, without hardware or tightening.
- All-aluminum construction. Rugged, durable, reinforced at all stress points.

Today's greatest all-channel antenna value — bar none!

CHANNEL MASTER'S RAINBOW*

the ideal replacement antenna

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.
The World's Largest Manufacturer of Television Antennas

TECHNICIAN
& Circuit Digests

CALDWELL-CLEMENTS, INC., 480 LEXINGTON AVENUE, NEW YORK 17, N. Y.

Why Service Technicians Are Whipping Boys

All too often, the accusing finger and snide remark are directed at the conscientious service technicians who are responsible for maintaining the nation's 132,000,000 radios, 35,000,000 TV sets and other electronic equipment. They are unjustifiably maligned and attacked.

Why?

The first reaction might be to put the entire blame on that tiny filth fringe of the servicing industry—the gyp operator. There is no doubt that this unsavory specimen has harmed the reputation of honest technicians, and deserves to be put out of business. However, the gyp operator is not the complete answer. There are probably as few hustlers in the radio-TV field as there are in, say, plumbing and carpentry. Yet it's the electronic tech who bears the brunt of attacks.

To understand the reason for this—and to develop a focal point for corrective action in the process—we must examine a number of industry-wide factors which combine, in addition to the gyp label, to make service technicians national whipping boys.

INNOVATION: TV, Hi-Fi, electronic controls and similar devices are relatively recent innovations to the public. Their novelty and bewildering complexity confuse the layman, and make him suspicious of anyone who comes into his home prepared to do battle with an enigmatic electronic monster. In short, you know a great deal about a subject of which he is ignorant. Another aspect of innovation is the glamour associated with it. TV is an inviting subject for newspapers and politicians to play up. In time this problem will diminish, but we must continue to educate the customers in friendly conversations, and support our associations in their educational programs.

FRAUDULENT PRACTICES: Nothing hurts an industry more than continued reports of frauds and dishonesty. We must exert every effort to combat these activities. For example, in this issue you will find the "Inside Story of the Reprocessed Tube Racket." This exposé is being published not as an attention getting sensation (TECHNICIAN already has the largest paid circulation among service technicians in the entire field), but as a means of showing you where your efforts can clean up a situation that is adversely affecting your reputation and your hard earned income. Back in 1937, Caldwell-Clements, publishers of TECHNICIAN, exposed a dummy-tube radio fraud. The results of that report are existing regulations which specify that a manufacturer must make an honest statement as to how many functioning tubes his set contains.

DISTRIBUTION: Distributors who sell to the public at wholesale prices rob technicians of prestige as well as dollar profits. The fact that consumers can buy parts at the same price in the same place as you, lowers their estimation of your professional status. Older and more stable industries generally do not allow this situation to arise, nor do the customers have access to wholesale prices. The solution to this problem is quite straightforward. Don't patronize offending distributors!

PUBLIC RELATIONS: Not enough technicians realize that good relations with customers are almost equivalent to dollar income. Dress to make a snappy appearance, clean up the shop front, don't leave dirt on the customer's rug, make promotional mailings—to mention just a few worthwhile suggestions. It never hurts to use a little psychology, such as patting junior on the head or admiring a painting on the customer's wall. Closely tied to the problem of innovation discussed previously is the explanation of why you charge a certain amount. Don't forget, that bill for $30 might be 20% of the complete cost of the set. Indicate your test equipment, explain the precision engineering that goes into an electronic component, etc. Failure to maintain good public relations cuts your prestige, and makes you more subject to unwarranted attacks.

MANUFACTURER POLICY: The competitive positions of the various set makers have been partly responsible for fostering a cut-throat pricing policy, which a number of discount dealers have been quite eager to adopt. The overall effect has contributed to encouraging the public to look for the same cut-pricing in servicing. Another phase of manufacturer policy is corner cutting in set design, which in some cases leads to inferior performance—and the technician bears the brunt of consumer displeasure for this shortcoming. We should not hesitate to write directly to the manufacturers to make them realize how their actions affect technicians. Make them understand that the technician can not be ignored, that he is the expert in the customer's home, and the right word from him can make or break the manufacturer's reputation.

There you have the big picture of why service technicians are whipping boys, taking the blame for problems that are usually not of their own making. Follow the various suggestions made here—do so aggressively! —and help to make your chosen profession one that people will look up to.

Tuning In the

UNEXPECTED URANIUM FINDS in Illinois and Maine are being used by manufacturers of popular-priced Geiger-Muller counters to push the "find-it-yourself" fad all over the country. More and more inexpensive locating instruments are popping up. Many vacationers this year, particularly those who will be touring the country by auto, will carry these instruments with them in the hope of getting rich quick. Selling or repairing the counters may be a way of picking up extra trade this year.

RAILROAD USE OF 2-WAY RADIO is considerable now and still increasing. Some uses to which mobile communication set-ups are put: car inspection, yard and terminal operations, dispatch line control, maintenance of roads, and supervisory operations. Electronic "impact recorders" are also being employed in freight operations to clear up arguments over damaged goods and point the way to better packaging and loading.

ACUTE PRICE-CUTTING CONDITIONS in many of the big-city areas are causing some shops to cut down on service personnel—and to do so reluctantly. A significant trend is seen in the movement by some of the very large discount-houses to set up service departments to combat competitive talk to the effect that such outlets do not offer after-sale maintenance and repair facilities.

TRANSISTORIZED POCKET CLOCK was demonstrated by D. E. Noble, v. p. of Motorola's communications and electronics division. It is really a 6-transistor receiver fixed-tuned to the Naval Observatory in Virginia, that gives the time every other hour. The sturdy, hermetically sealed unit can be boiled in water without suffering damage. It will operate 5 hrs. a day for 25 days on a pair of penlight batteries . . . Also demonstrated was an electronic golf ball (built-in-transmitter) that can't get lost. A direction-finding pocket receiver picks up its signal.

DID YOU KNOW that the parts jobber with whom you do business may regularly carry as many as 10,000 items in stock? What's more, each "item" so considered may itself consist of many others. For example, one of the 10,000 items is "capacitors." It may be necessary to stock 700 to 800 different combinations of values, types and tolerances of this one "item."

TECHNICIAN EDITORS "GUESSTIMATE" that the delivery and pick-up rate by customers themselves on serviced sets is at least 50% less than it was in the immediate pre-war period. . . . That the average shop renders call-back service (often free) on one out of twelve TV sets repaired within 30 days of time original work was done.

REMEMBER 'WAY BACK WHEN TV servicers had to make house calls coincide with periods during which programs or patterns were on the air? . . . And bub, you're getting along in years if you remember that radio "ground" antenna which was driven into the earth and filled with water. The lower part of the rod was filled with a chemical compound said to "increase radio energy" (1932).

"Okay, you've got a thousand million ohms—so what?"

AUTOMOTIVE ELECTRONICS on the march: Time was when the only electronic device inside the family car was the AM radio. Add these to the growing list: headlight dimmers, FM radios, car telephones and garage-door openers. For the future, count on: transistorized radios, TV sets and Hi-Fi installations. RCA and Philco, among others, are showing the transistorized radios. The Philco unit will be special equipment on Chrysler and Imperial cars this fall. Universal Broadcasting System of Boston has developed a 14-in. TV set, to be mounted in the back of the front seat, for General Motors. Jensen's 2-way Hi-Fi speaker system for cars, illustrated in this space last month, may be introduced in the high-priced Ford line.

JULY 1955 NETWORK COLOR TV SCHEDULE

Sun.	July 3	6:00—7:00 PM (EDT) DuMont*	"Sunday Supplement" (Film)
Sun.	July 10	6:00—7:00 PM (EDT) DuMont*	"Sunday Supplement" (Film)
Sun.	July 17	6:00—7:00 PM (EDT) DuMont*	"Sunday Supplement" (Film)
Sun.	July 24	6:00—7:00 PM (EDT) DuMont*	"Sunday Supplement" (Film)
Mon.	July 25	8:00—9:30 PM (EDT) NBC	"Producers' Showcase" (Live)
Sun.	July 31	6:00—7:00 PM (EDT) DuMont*	"Sunday Supplement" (Film)

*DuMont color film series over WABD.

Picture.....

MUSIC BY THE MILE: If you could lift the groove from a long-playing record and pull it out straight, you'd be surprised at how far you'd have to walk with it. Just a half-capacity load of microgroove discs on your automatic changer during one home-listening session holds well over a mile of grooves. Compare this to the "maximum load" (one disc) of the old-type phonographs with the old-type records, where you only had a couple of hundred feet of groove. Yet, where you had to change the needle after each play in the past, a single high-quality stylus will nowadays hold out for thousands of discs.

TECHNICIAN RHYME—You Hate the Work, Hey, Bub?

Though plenty gripe about the grief, and swear that they would just as lief dig ditches, drive a bus, raise bees, as fixing customer's TV's, the guys who bellyache this way don't mean a word of what they say. The technician's wife can testify to where such a guy's affections lie. She'll tell you that her honey bee is also wed to circuitry. So when you hear TV men claim that they are fed up with this game, remember, they love their careers like Davey Crockett loved frontiers. And bank on this, the true technician, is a happy guy with his position.

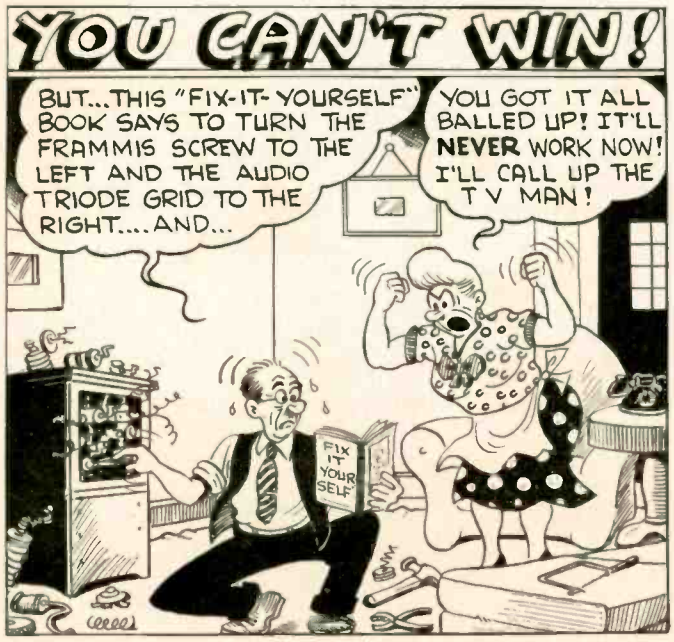
GROWING NUMBER OF TECHNICIANS in big midwestern city have exhausted their patience with large parts distributor who insists on discounting to the public. When this distrib's salesmen come around to service shops, they're greeted with: "You're from ———? Get out!" As more techs start using this clear-cut approach, jobbers will learn that a strict "Wholesale to Trade" policy is the only way of earning technician support.

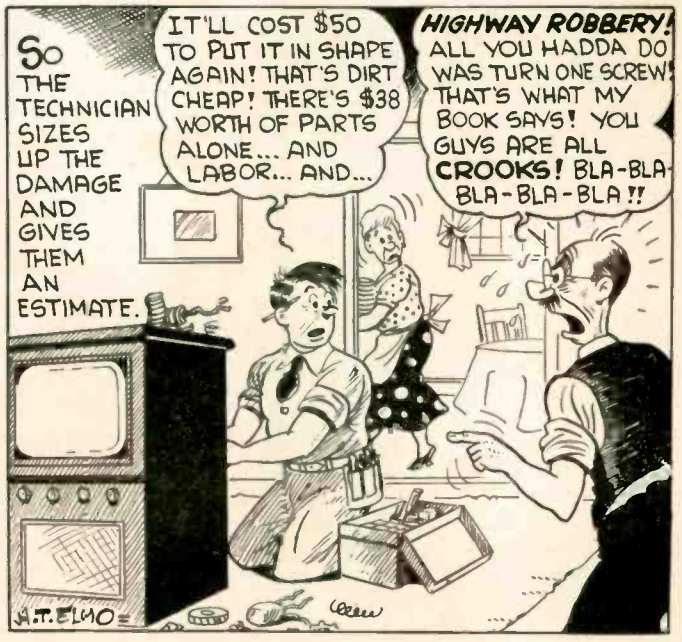
CALENDAR OF COMING EVENTS

Aug. 19-21:	National Alliance of Television & Electronic Service Assoc. National Service Show, Hotel Morrison, Chicago.
Aug. 24-26:	Western Electronic Show, Fairmont Hotel, San Francisco, Calif.
Sept. 30-Oct. 2:	1955 Hi-Fidelity Show, Palmer House, Chicago, Ill.
Oct. 3-5:	Eleventh National Electronics Conference, Hotel Sherman, Chicago, Ill.
Oct. 12-15:	1955 Convention, Audio Engineering Society, Hotel New Yorker, New York, N. Y.

THAT TECHNICIAN'S DUMB GIRL FRIEND is still gooning in the picture. She thinks a chassis-yanker is a guy who kidnaps dames; that a hex nut is a bewitched moron, and she's almost certain that TVI is impaired vision of sorts. . . She believes that sync clatter is a kitchen noise, and that Ike is a DC restorer because he brought the Republicans back to the White House. . . This frail swears that her technician cousin once was arrested for violating Ohm's Law. . . In her opinion, i-f trimmers are window dressers.

WATCH FOR BIG PUSH BEHIND COLOR-TV within the next few months, with more and more manufacturers getting on the color "brandwagon" with new sets. Smart shop owners are getting themselves set for the "new era" in TV broadcasting by setting themselves up as headquarters for Color-TV in their respective communities.





By Creighton M. Marcott, Assistant Editor, TECHNICIAN

• An unscrupulous element in the electronics industry has turned the hundreds of thousands of old, worn out receiving tubes discarded by TV technicians into a multi-million dollar annual business. These firms, a number of whom are trading on the respectability of old established names, are reprocessing these tubes and selling them back as "first quality" tubes to unsuspecting servicemen at fantastic profits. These are the facts turned up by an investigation recently completed by TECHNICIAN.

In many cases, TECHNICIAN found that the old tubes had been purchased for 1¢, 2¢ or 3¢ apiece, and then, after "reprocessing," and insertion in a new carton, with a private name, had been sold back to the trade at prices ranging from 30¢ to $1.50. They were advertised as "first quality," "peak performance," and similar impressive but meaningless titles.

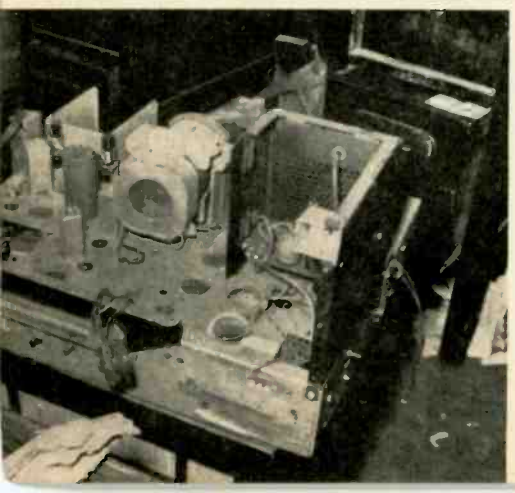
The actual amount of business done by these firms could not be pinned down, but unofficial sources estimated that "reprocessed" tubes account for close to 10% of the replacement tube market. Reasonable substantiation was found in TECHNICIAN's findings.

One firm in New Jersey, from all indications the largest in the country, does its business through legitimate jobbers, as well as mail-order. A constant supply of old tubes is provided by a network of "commission agents," each of whom makes the rounds of the TV technicians in his own community. While the number of tubes "reprocessed" by this firm can only be conjectured, something of a clue can be gained by the fact that in a recent court case purchase orders were introduced which showed a transaction involving many thousands of tubes between this New Jersey firm and two other companies in the electronic field.

Another firm, which has been quite active in Brooklyn, N. Y., has now, according to latest information, moved all its equipment to Florida. This was just one of the signs that indicated that the "reprocessing" business, which until quite recently had been centered around the New York-New Jersey area, is now becoming widespread.

The racket came to light when TECHNICIAN editors became suspicious of the ridiculously low prices at which tubes were being hawked in mail order advertisements and decided to go "shopping." The itemized account of the tubes purchased and the number found unusable will be found elsewhere in this article. But more important than the number of defective tubes is the fact that so many of the tubes showed signs of having been tampered with in order to restore them to usable status. Remember, these are receiving tubes being discussed, not picture tubes.

Tubes being discarded by TV service shops (above) are purchased for 1¢, 2¢ or 3¢ apiece



"Pull-outs" are tubes removed from electronic equipment, usually old TV receivers like this

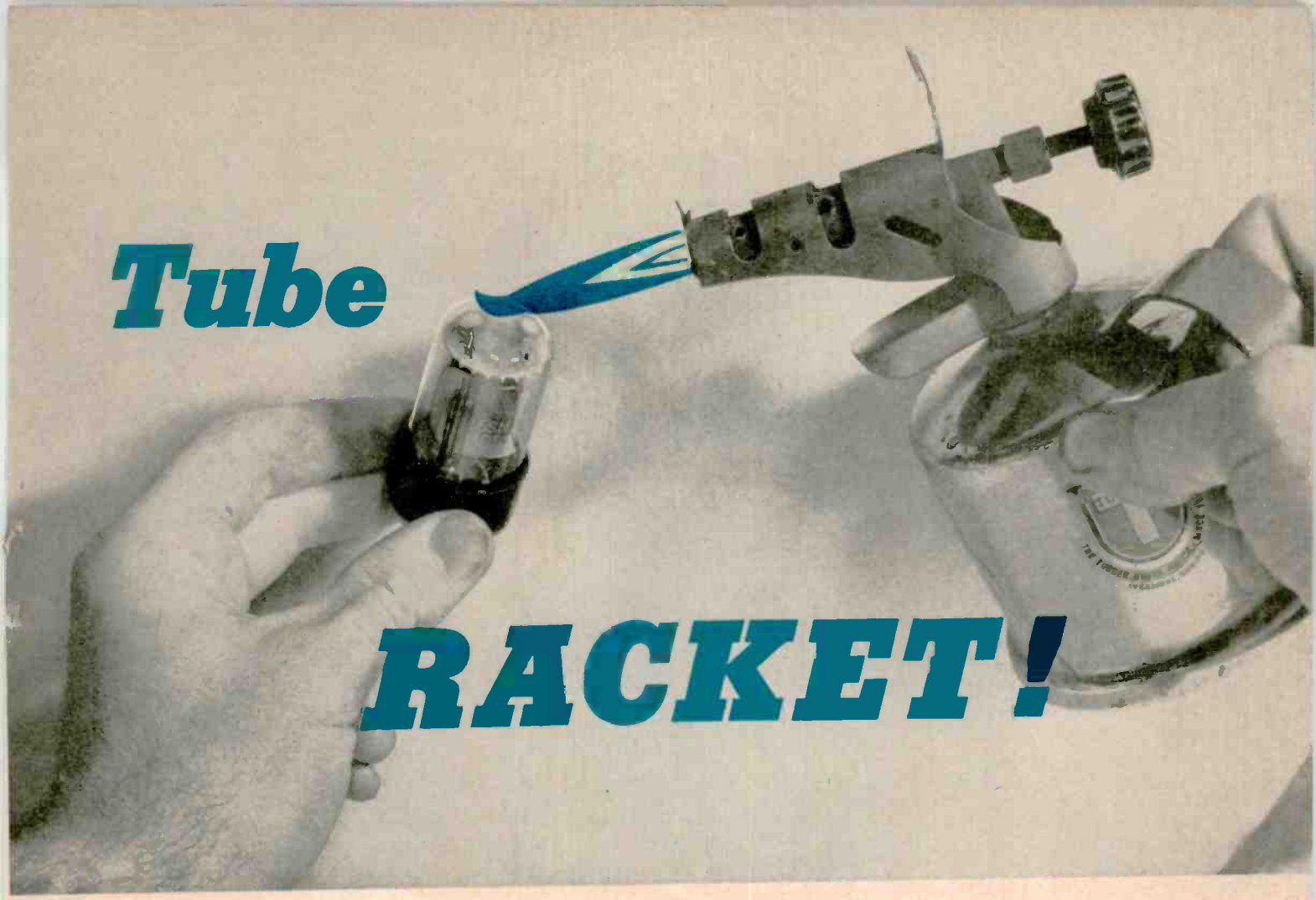
Tube Industry Operation

To understand how such a business is allowed to exist, it must first be understood how the tube business is organized.

The first run, brand new, in-warranty tubes come from two sources. The first, the tube manufacturer himself, is, of course, the prime supplier. In this case the channel of distribution is tube mfr.-to-distributor (jobber)-to-dealer, or service technician.

The next source for new tubes is the equipment manufacturer. Since he buys a great many tubes he gets a substantial discount below the distributor when buying from the original tube manufacturer. Not infrequently he will find himself overstocked, or with an excess of obsolete tubes (for instance, in the change from 5U4G to 5U4GA/GB). The tube maker is ready, in most cases, to buy back the tubes at cost, but on the other side is the distributor (or jobber) who is ready to pay the equipment manufacturer more than he originally paid for the tubes.

Tube RACKET!



Human nature being what it is, a great many of these tubes find their way into the market, as the familiar "bulk" tubes. The practice is frowned upon, naturally, by the tube manufacturer and strenuous efforts are made to minimize the practice.

When buying "bulk" tubes, which, as you know, do not come in a carton, you will have to rely on the distributor to stand behind the warranty indicated by the date on the tube. Incidentally, there are differences in the markings on the tube which will indicate to the tube manufacturer whether the tube was originally sold to be used in equipment or as a replacement tube.

"Seconds and Rejects"

For the "seconds," "rejects," "used" and "reprocessed" tubes, which experienced tube manufacturers estimate comprise approximately 20% of replacement tube sales, there are many sources.

The first is the original tube manufacturer. Some of the tube manufacturers destroy their rejected tubes, but a few sell them under different names, or sell them to other individuals or firms which brand them with their own name. These may be very fine tubes—or very poor. If tube makers destroyed all their rejects, a major source for the "bargain" outlet would be cut off.

The "second" or "reject" is the best bet in the "bargain tube" field—if you are sure that it is truly a new tube. TECHNICIAN found in the course of the investigation, however, that even experienced tube men hesitate to identify a tube as "brand new, never used." "Reprocessing" has become such an "art" that sometimes only a top-notch tube engineer can be relied upon to distinguish the new from the "reprocessed" tube. Information on how the tubes are processed—and tips on recognizing them—will be found in a later section of this article.

One Philadelphia company is representative of a legitimate phase of the bargain tube field. Many of its tubes are purchased new from prime tube manufacturers, directly or indirectly, with no brand name im-

"Bulk" tubes (below left) come from equipment manufacturers in 100-tube boxes (nestings). Radio and TV receivers being "cannibalized" (below right) are chief source of "used" tubes

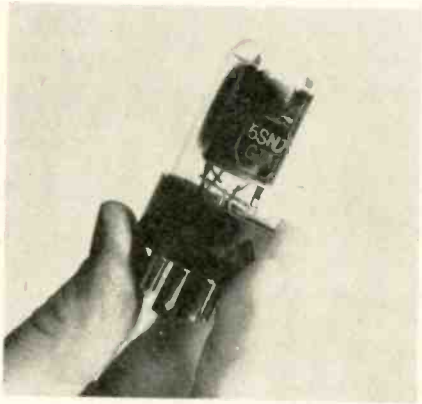
This old 6SN7, rescued from trash, was made originally by a prime tube manufacturer

printed. This company then puts its own brand on the tubes, but does not do any washing or reprocessing, and sells them through established jobbers. Tubes obtained from other sources are tested to see if they meet the firm's specifications before they are sold.

The high business mortality rate among equipment manufacturers in the past few years is responsible for another type of tube available in large quantities. These are the new, but out-of-warranty tubes bearing names of defunct organizations. These tubes were originally scheduled for use in the TV receivers manufactured by these firms. When the firms' assets were auctioned off due to the bankruptcy proceedings many thousands of these tubes were made available to the market. These are top quality tubes which can be picked up for a fraction of the cost of in-warranty tubes, but obviously, there is no guarantee on their performance.

The "in-warranty" or "out-of-warranty" factor has top priority in establishing the tube price. For that very reason, as soon as a tube goes out of date, its value takes a sharp drop. This opens the door to very considerable savings for the serviceman, if he can find a source of such tubes. These tubes, like the tubes above, become available to the market when the stocks of bankrupt firms are auctioned off.

Well-advertised in the cut-rate ads but without any substantial basis in fact that TECHNICIAN could find are the "pull-outs," tubes removed from electronic equipment. The ads make a point of stating that they are removed from government equipment, which is quite impressive, if true, since the tubes used by the military are often superior to those available through other channels. But little substantiation was found for the statement. TECHNICIAN found only a handful of tubes which could be definitely traced to government sources.



First step in "reprocessing." Tube is washed and name and code removed with oil-abrasive.

The majority of "pull-outs" which TECHNICIAN investigated were found to come from other TV sets which were "cannibalized" for parts. When we take into consideration the number of sets estimated to be "junked" each year we can see that the number of tubes contributed by this source is not negligible.

The life expectancy of tubes purchased from these sources is, of course, speculative. It will depend completely on the past history of the tube; how, and for how long it was used.

Now, despite the rather questionable life expectancy of these four classes of tubes, and their hazy past history, these tubes are "legitimate." If the tubes are advertised as removed from electronic equipment, and the tube comes from an 8-yr. old 630TS—or worse, a pre-war radio—it is still an honest transaction in that the buyer knew, or should have known, what he was getting.

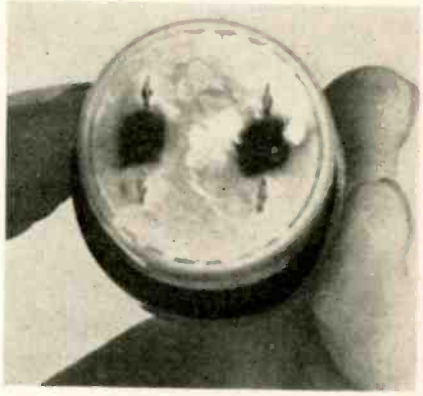
The point is that these millions of usable tubes drifting around in the industry do have a value, but that value can be determined only on the basis of their past history.

So much for the "legitimate" tubes. While some of them are of questionable origin, and it may be hard to condone their use, they stand on their own merits. We will now take up the case of a very different phase of the tube industry—the tube "reprocessors."

Tube Reprocessors

Tube "reprocessors" fall into one of two groups, depending upon whether they treat the tubes electrically, in addition to restoring their outside appearance. The first, and most vicious group, are firms which generally buy up old tubes from TV service shops, for 1¢ to 3¢ apiece, clean and polish them, buff off the manufacturer's name and other pertinent information, and resell them. The only requisites in most cases are that the filaments are intact (that the tubes light up), and that some deflection be shown in a tube checker.

For supplementary information on this racket, TECHNICIAN went to District Attorney Edward S. Silver of Brooklyn, N. Y., who had just finished a successful prosecution of an electronics firm on counts of counterfeiting receiving tubes. D. A. Silver, and his aides, assistant district attorneys Albert DeMeo and Jerome Ditore, who had prepared the case, revealed that this company had been buying old defective tubes from TV service firms, rebranding them with top name brand identification and "in-warranty" date codes. They were then sold to local distributors for 80% of the market price. No reprocessing had been done. The tubes were simply the choice tubes selected from those being discarded by service shops.



Tube appears new but internal "burn" marks are tip-off that it has seen heavy usage

"A DANGEROUS WEAKENING OF MORALITY AND ETHICAL STANDARDS" . . . . Herbert Hoover

Former President Herbert Hoover recently told Congress that "in the last analysis, no law will substitute for ethical standards applied as a matter of course by individuals in their daily conduct of public business."

An identical concept is found in Caldwell-Clements rules on the acceptability of advertising. Based on the ethical needs of the industry, these rules require that advertisements shall give all essential information about a product so that the purchaser will know what he is getting.

A similar operation is being conducted today by Company A of this survey who, incidentally, advertises the lowest prices in the industry. TECHNICIAN shopped this mail order firm twice; once as a private individual, and once as an established, and rated, TV service firm. In the first order of 21 tubes, 14 were found unusable. (The check was made on an emission-type tube checker with "Good" reading as the standard. Life tests and g_m measurements were not made, giving the tubes the benefit of any doubt.) In the second batch of tubes from this firm, which was ordered for TECHNICIAN by a long-established service firm, 17 of 20 tubes were found unusable. (Contrast this failure percentage with that of brand new tubes which commonly run about one unsatisfactory tube out of 100, according to one prime manufacturer.) All 3 usable tubes, strangely enough, were 12-AU7's—the only 12AU7's ordered!

"Hot-Shot" Tubes

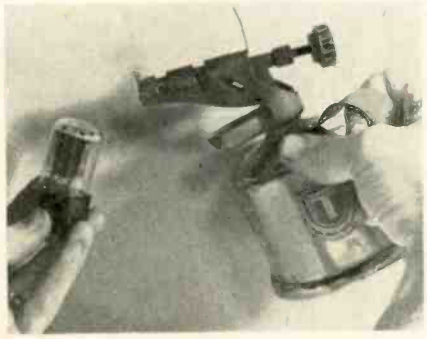
The first order of 21 tubes turned up 6 tubes which could be positively identified as "reprocessed" or "hot-shot" tubes. It should be borne in mind that it is often very difficult to say for certain whether a tube has been restored, and that, almost certainly, many more of those tubes had been treated.

To pin the operation down, TECHNICIAN returned the defective tubes for refund, pointing out the guarantee promised in the advertisement. Not long afterward a check was received for the full amount due for the returned tubes. This is apparently a standard practice with these firms. In another case, with Company B, a refund was also quickly forthcoming, and from checking with other quarters it seems reasonably safe to say that there is, as a rule, no quibbling over refunds.

Misleading Advertising

One firm has an address only a few doors from one of the top tube manufacturers. Another one makes a point of mentioning that he is located in the home town of one of the largest tube manufacturers in the country. This may give some servicemen the impression that they are getting "seconds" or "rejects" right out of the factory. Absolutely no facts were found by TECHNICIAN to support any such theory. Tubes, even with the manufacturer's name buffed off, can usually be traced to the original manufacturer through the manner in which the tube designation is applied to the tube. Among the tubes ordered from the latter firm, the percentage of tubes from the manufacturer with whom the firm may be assumed to have an "in" did not exceed that of his competitors in the bargain tube business. And, in no case, were there more than would be expected with a random sampling of the industry's receiving tubes.

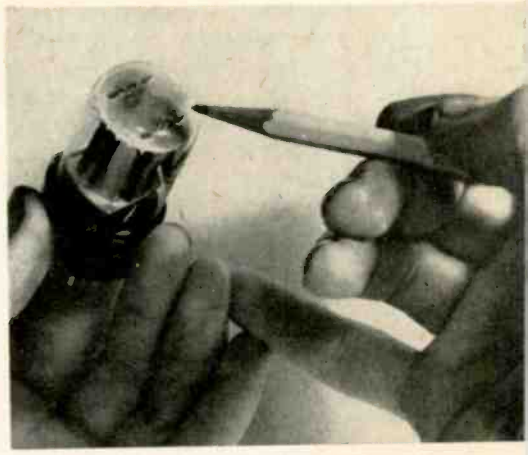
Reputable tube wholesalers, having brand new first quality tubes to offer, are finding it next to impossible to compete in the open market because of this fraudulent advertising. One firm whose prices on standard brand tubes are comparable to



Flame of torch brushed over top of the glass envelope removes all traces of "burn."

those offered by parts jobbers, but almost twice those offered by his lowest-priced competitors in the mail-order field, finds it necessary to justify his prices with this explanation: "Latest dating —. No private label, electrical or mechanical rejects. No rebrands or 'rewashed' bargains."

There can be absolutely no defense of the firms picking up discarded tubes and reselling them as "quality, 1 yr. guaranteed" tubes. This is so misleading that it can only be wondered that the practice has endured for so long. This point was brought up in talks with District Attorney Silver. Why, TECHNICIAN asked, was this practice, which he and his staff also had become

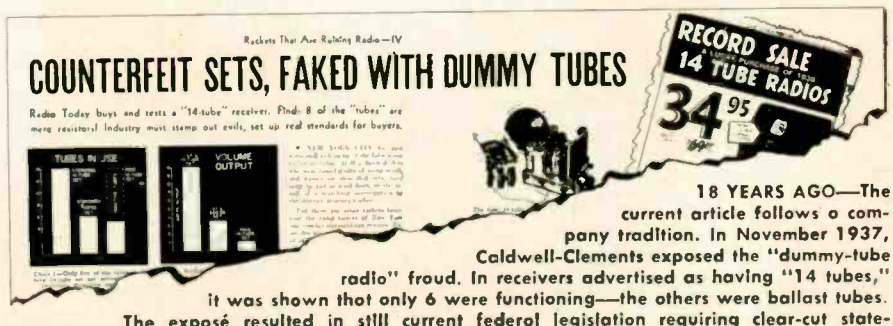


"Reprocessed" tube, with clean base and shiny glass envelope, is ready for re-branding.

aware of in their investigation, not made a part of his case? He pointed out that at no time were the tubes referred to, or advertised as "new." The only claim was that they were "peak performance" tubes. Since such a phrase has no standard connotation, it was felt that there was no basis for his staff to work on. He subsequently submitted the case to government authorities for prosecution as mail fraud, but no prosecution resulted.

Service technicians should bear in mind that they run a double risk when they make replacements with used tubes. First, the chance of subsequent tube failure in a short time can incur much customer displeasure and annoying callbacks. Second, there may be unhappy legal implications for the technician who charges brand new list price for a tube he knows to be used or reprocessed.

There seems little reason to believe that this phase of the "reprocessing" business—that of picking up discarded tubes, washing, sometimes rebranding, and reselling them without trying to improve performance—is widespread. It may flourish on a local basis in some communities, and, as with Company A, in isolated mail order operations, but on the whole, it is spurned by most firms in the cut-rate field. The reasons are two-fold; first, it is a messy business,



18 YEARS AGO—The current article follows a company tradition. In November 1937, Caldwell-Clements exposed the "dummy-tube radio" fraud. In receivers advertised as having "14 tubes," it was shown that only 6 were functioning—the others were ballast tubes. The exposé resulted in still current federal legislation requiring clear-cut statements by manufacturers as to the exact number of "working" tubes used in their equipment.

and second, it is so much easier, once the equipment is set up, to do a real "reprocessing" job on the tubes.

The firm selling washed, discarded tubes is a nuisance, but at least you can usually recognize his product. The real "reprocessor" is something else again. This firm takes an old tube and restores it so that both outwardly and electrically it appears to perform as well as brand new tubes. This represents a true menace.

Reprocessing, or "toasting," or "hot-shot-ing," as it is sometimes referred to, is almost as old as the tube business. Tube engineers have long been aware that even when tube emission has fallen below the point where it is usable, the application of certain methods will restore emission, at least temporarily.

Tube emission is dependent, mainly, upon the amount of free barium on the surface of the cathode. When the barium is depleted, the tube emission fails. Now, although, the "free" barium is depleted, there is still some left in the cathode material which has not come to the surface; the result, in most cases, of improper "aging" during the manufacturing process.

Heating The Cathode

The tube reprocessor takes over where the tube manufacturer left off. With the tube whose emission has failed due to depletion of the free barium, he simply heats the cathode to a temperature in excess of that to which it is normally exposed. This additional heating liberates barium which did not come to the surface in the course of the original "aging" and would not normally come to the surface at the usual operating temperature of the cathode. This fact brought out an interesting observation by one veteran tube engineer. He pointed out that while this reprocessing would, indeed, restore emission temporarily, it would endure only until this new supply of barium was exhausted. No more barium would be liberated at the ordinary operating temperature of the cathode.

In talks with other tube engineers, TECHNICIAN tried to pin down estimates of the average tube life which could be expected of these "hot-shot" tubes. There was a general reluctance to make a firm statement because, to a very great extent, the future tube life will depend upon the past history of the tube—whether it was used as an amplifier, oscillator or detector—and for how long it was used. This, of course, is not known. However, one old line tube engineer whom TECHNICIAN questioned on this subject would commit himself to this extent: "Of this we can be sure. The tube life, on the average, will be *much less* than that of new tubes."

A dead give-away, so far as determining whether a tube has been used or not, would seem to be the burn mark (old barium) opposite the cathode in the top of the glass envelope. But the tube "reprocessors" have licked that one, too. They found that by simply applying the flame of a torch to the glass at that point the barium disintegrated, leaving nothing to indicate that the tube had been used. The glass envelope is absolutely as clean as that of a brand new tube. All that is needed then is to buff off the old name, substitute their own private brand and they have, apparently, "out of warranty, brand new tubes." If the pins are a little discolored from usage, inserting the tube in a metal pin straightener a few times will often do wonders.

Even tubes with open filaments can be "reprocessed" by these firms. Special machines vibrate the tube while high voltage is applied to the external filament connections. When the broken ends within the tube touch together, the arc-over "welds" the joint.

It would appear from the description above that there is no defense against the tube "reprocessor." Actually, this is not so. Despite all the pains they take to camouflage the fact that their tubes have been used, there are a number of almost certain indications which give them away. While no one of these signs is convincing in itself, a combination of these symptoms should arouse suspicion.

First, when you buy anything but a brand new, boxed tube, check it immediately in a tube tester. And when you check it, make sure that you do it in this manner. With the checker on, and the correct settings made, insert the tube in the socket and immediately depress the "Merit" button. In this way you will have a picture of the emission as it builds up. If the tube is a "reprocessed" tube the swing of the needle will be erratic. It will swing up rapidly, then hesitate at one or several points, then continue moving up again. If you want a comparison, try a brand new tube. You will notice that the deflection is rapid, and positive, with no hesitation. The reason that the deflection with the "reprocessed" tube is irregular is that the cathode has been damaged; as the temperature increases, additional areas are activated.

Loose Particles

A second, but less trustworthy symptom, is the presence of particles in the glass envelope. In "reprocessing" parts of the tube elements are often flaked off.

A third symptom is the burned mica spacer. This quite commonly results from the heating of the glass envelope to remove the "burn" marks. To recognize burned mica, the technician will have to become more conscious of the appearance of new, undamaged mica. This is quite an important test of "reprocessed" tubes. Discolored pins are another symptom. If the tube you are buying is advertised as "brand new, out of warranty" there is no reason for the pins to show signs of wear.

There is one obvious sign. If the tube designation is barely decipherable, and you are supposedly buying an unused tube, you should immediately become suspicious. There is absolutely no reason for the printing to fade, other than constant use.

One more tip: check the tube base for an oily film. Brand names are usually buffed off with an oil-base abrasive.

Those are the ways that you can protect yourself. But more important is the way that you can protect everybody in the industry. Don't sell your old tubes! Scrap Them! The couple of pennies you make are probably costing some other poor serviceman dollars. •

RESULTS OF TECHNICIAN "BARGAIN" TUBE SHOPPING SURVEY

The names of the following companies are being sent to the proper agencies, along with other data turned up in this investigation. Pending subsequent action by the authorities, these names are not being revealed publicly for the present.

FIRM	NO. OF TUBES PURCHASED	NO. OF TUBES UNUSABLE	PERCENTAGE
Co. A	41	31	75.6 %
Co. B	20	5	25.0
Co. C	18	3	16.7
Co. D	7	3	42.9
Co. E	12	3	25.0
Co. F	10	1	10.0
Co. G	11	2	18.2
Co. H	14*	10	71.4
Co. I	8	5	62.5
Co. J	20	4	20.0
	161	67	Avg. 41.6

*** Seven of these tubes carried the brand name of Co. A. Five of the 10 bad tubes bore Co. A's brand name.**

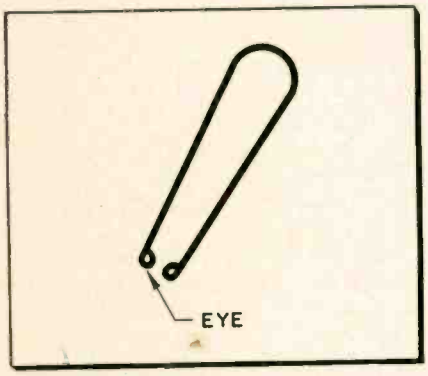
Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

"Tweezers" for Bearings

In replacing elusive, small ball bearings, like those used in variable tuning condensers, the tiny bearings are more easily handled with a pair of "tweezers" fashioned from a 10-in. length of no. 14 bare copper wire.

Form a small eye in each end of the wire (as in the accompanying illustration), then bend the wire in a U-shape so that the two eyes line up when the tweezer is pinched together. In use, the eyes fit against the curved surfaces of the balls and grip them far more positively than fingers can.—*Henry Josephs, Gardenville, Pennsylvania.*



Home-made tweezer lifts ball bearings easily.

Plastic Cabinet Repair

This hint saved me quite a few dollars. I had just finished fixing a clock-radio that was still on the bench, and I went on to clean a TV tuner. Some of the cleaner fluid was accidentally sprayed on the radio's plastic cabinet. Well, you would have to see what happened to believe it. The fluid just ate right into the finish of the cabinet, and it seemed as though all were lost. I tried everything I could think of to restore the cabinet's finish, but to no avail.

It occurred to me that an abrasive would help, but it should not be so coarse as to create damage itself. I finally tried some fine scouring cleanser—Bab-O, specifically. I rubbed the damaged spot with the cleanser and a damp rag for about 10 minutes, after which the cabinet was as shiny and bright as though it were new.—*George W. Fischer, Elmhurst, Illinois.*

Pix-Tube Seat

When it becomes necessary to carry a crt, the top surface of a baby's bathinette makes an excellent seat. It will absolutely protect the face from being scratched.

If such a seat is not available, one can be made up easily by stretching some light canvas material over a wooden frame and tacking it down on all four sides. The actual size of the canvas used is 32 in. by 22 in. The wooden frame, which is 30 in. by 20 in., is made up of lumber 3 in. wide. With the full weight of the picture tube on this cradle, there will be no contact between the canvas and any flat surface on which the cradle is placed.—*George E. Mancini, Methuen, Massachusetts.*

Pilot Bulb Removal

Extracting hard-to-reach pilot lamps, particularly those recessed in panels, is easier than it looks. Simply push a short piece of rubber tubing over the bulb. Choose tubing of such a diameter that it makes a snug fit over the bulb. The latter may then be manipulated out of its socket easily.—*Stanley Clark, East Bradenton, Florida.*

Smooth Chassis Holes

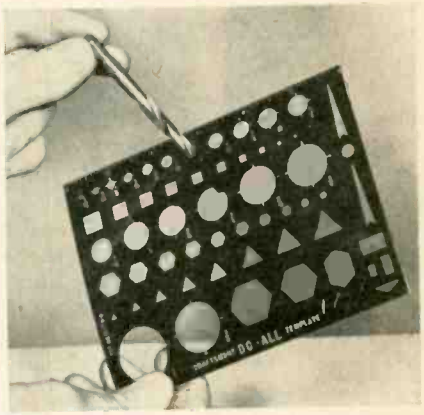
A round file serves as an effective reamer when it becomes necessary to make or enlarge holes in metal chassis, without introducing the danger of tearing the metal. To get a clean hole of the right size, drill a hole just large enough to admit the small end of the file. Next, chuck the file in a brace, and turn it *counterclockwise* into the hole, with a light feed. Turning it in this direction prevents the right-handed cut of the file teeth from binding in the hole.—*Harvey Muller, Danboro, Pennsylvania.*

Salvage Handy Connectors

Small 45 and 67½ volt batteries are usually provided with one male and one female snap connector. When these batteries are discarded, I remove the fiber strip holding these connectors and save it. A pair of these make a very good connector for speaker leads or other two-wire arrangements. They are heavy and make excellent contact.—*Hyman Herman, Flushing, New York.*

Versatile Draftsman's Aid

A template of the kind used by draftsmen, made of heavy celluloid and containing openings of various sizes and shapes (as shown in the photograph) has many uses in the service shop. The template illustrated here is about 4 by 5 in. and has circular openings that are very close to common drill sizes. These openings are very convenient for accurately checking drill points. While the circles were not intended for this purpose, they provide an additional function for an already useful aid. These templates may be purchased from any office supply stores.—*H. Leeper, Canton, Ohio.*



Draftsman's template checks drill sizes.

Quick AC Outlet Test

For testing ac lines in the customers' homes, technicians can easily carry along one of the small 2-watt neon "Nite-Lites," available at all dime stores, that plugs directly into the ac outlet. When the complaint is total inoperation, one of these units, which can be carried in a vest pocket, will give an instantaneous indication as to whether the ac circuit is alive. It's better than asking the customer for a bridge lamp.—*Joseph Amorose, Richmond, Virginia.*

SHOP HINTS WANTED

TECHNICIAN will pay $5 for acceptable shop hints. Unacceptable items will be returned. Send your hints to "Shop Hints" Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., N. Y. 17, N. Y.

The Small Shop's Service

Flat Rate or By-the-Job? What's Fair in the Customer's Eyes? A

L. Doyle Peck

There is no single solution to the problem of pricing TV repairs that will work for all service technicians in all parts of the country. This article does not pretend to supply such a solution. However, this detailed account of a carefully worked out approach that filled the bill for one man will be the full answer for many, supply a starting point to others.—Ed.

• There is no magic formula by which the independent TV serviceman can arbitrarily price his services. He must guarantee himself a fair margin on each job while paying his actual expenses and overhead. At the same time, he must convince his service customers that they are paying only a fair charge for actual materials used and services rendered.

That's why Frank H. Gross, operator of Frank's Television & Appliance Company in Springfield, Ohio, chooses an "individual job" method of pricing his work. Ninety percent of his firm's volume is done in television servicing, with a small line of electric housewares for sale.

"The independent technician has a pricing problem completely different from large service companies, who can work on long-range averages and use pre-set service charges for specific repairs, adjustments or replacements," he points out.

"Yet he must have some answer for the customer who calls and asks 'How much will you charge for a house call?' That's why I set up a definite house call charge, when the set can be fixed in the customer's home. I have another standard rate for pick-up and delivery if I must bring the set into the shop. But from then on, it's strictly what every job is worth in labor and parts."

Each in-shop repair is figured individually.

Gross justifies his position in this manner: The one-man or small-staffed service company cannot have "specialists" in certain repair jobs, or for certain makes of TV sets. He must be prepared to tackle every repair or adjustment on any brand of chassis. Even with the best of training and years of experience, he'll run onto the "toughies"—sets which may take many hours to analyze and repair.

When this happens, he can't compare notes with other technicians. He must test methodically until the trouble is spotted. A larger TV service firm, using pre-fixed labor charges for every repair operation, can let the tough jobs average out with the easy ones.

Weighing the Cost

"I look at it this way," explains Gross: "When I finally spot the trouble in a troublesome set, I decide, on the basis of what the source actually was, whether it would have taken any average technician the same length of time to find the trouble. If the trouble was something relatively simple which I overlooked because of unfamiliarity with the set, I cut the actual analysis time charge in proportion. But if the reason for the long analysis was because the faulty component actually was difficult to spot for anybody, I allow full time involved in analysis."

Gross admits that he sometimes is shortchanged on an actual dollars-per-hour basis when unfamiliarity with a certain brand lengthens the analysis time, but feels that this is worthwhile because he has learned something in the process which will enable him to handle the next such job that much easier.

Here's how he figures home call, pick-up and delivery, parts and in-shop labor prices:

1. Home calls—$4.50, plus list price of parts used. This, he finds, is enough to offset transportation costs, and allow 30 minutes actual repair time in the customer's home.

2. Pick-up and delivery—If a cursory analysis indicates the need for further testing in the shop to determine the trouble, $4.00 will be added to the final repair bill for pickup and delivery of a console model, $2.00 for a table model. Gross favors removing the chassis from the cabinet in all cases right in the home, taking only the chassis to his shop. This lightens the load. The $4.50 home call charge does not apply, of course, in this case.

3. Price of parts—The job of parts pricing is simplified by buying them already price-marked with the list price from the jobber. This guarantees a fair markup, saves bookkeeping, price-marking trouble.

Defective parts are returned to customer, who also sees cost of replacements on price list.

4. In-shop labor—$4.00 per hour for actual time spent in analyzing and repairing the set. This figure, he feels, allows a fair labor charge with sufficient margin for overhead and depreciation of equipment.

"I have posted a manufacturer's suggested pricing list for all repair operations, and find that my charges generally do not vary far from the list," he reports. "But I refuse to be governed by it, because an unusual string of tough analysis jobs on seldom-encountered brands of TV, or sets with several faulty components which compound the analysis, could hurt the small service operation if

Charges: One Man's Policy

Small But Successful Operator Answers These and Other Questions

Part pricing on bill is simplified by helpful jobber, who tags parts with list price.

it is governed strictly by long-range averages."

Customers' reactions to Mr. Gross' pricing method are favorable in most instances, he reports. Many of them report his charges for replacing certain tubes actually range under that charged by larger firms using preset repair tables. He has several rules for assuring the customer that his prices are fair.

With every job, he returns the old tubes or other parts replaced, along with cartons from the new tubes with the list price tag attached. If an unusually long analysis time was necessary, he briefly explains the reasons to the customer.

On a set in which his analysis shows need for picture tube or other expensive replacement, he'll call the customer before completing the work, outline the charges, and invite him to call another service company to get comparable figures. He stresses that if the customer instructs, he'll actually deliver the chassis to another service company, charging only for pick-up and analysis time involved.

This doesn't take long and the customer appreciates it. Even though some have actually called other service companies for price quotations, none has ever instructed Gross to take the set to another technician, he reports. What is more, it helps to insure the technician that the customer will be prepared to pay the bill when the set is delivered—something vital to a one-man or small TV service operation working with limited resources.

"The subject of TV pricing has always been controversial. Our Springfield TV Servicemen's Association is contemplating agreements among members to help standardize it, which will be helpful if it takes the position of the independent serviceman into consideration," Gross believes.

His insistence on an "individual job" method of pricing is not to protect incompetence. A graduate of the DeForest Correspondence Course in Television in 1941, Mr. Gross then entered the armed forces

Charges for house calls, also for pick-up and delivery of sets, are fixed in advance.

and worked in electronics. He then graduated from the American Television Institute in Chicago with a bachelor of science degree in television engineering. He has been an independent TV technician for six years, five of them in Springfield. In his years as a serviceman, he has repaired practically every brand of set marketed.

"I don't care how competent a serviceman is, he'll hit toughies occasionally. If he's an independent and there aren't other technicians working beside him on easier jobs which are priced to make up for the time lost on the difficult ones, he has no alternative—he must price each job for exactly what it is worth," Gross sums up. •

Universal High-Voltage Meter Probe

J. Richard Johnson

Ever since the advent of TV, the technician has been faced with the problem of checking the values of high 2nd-anode voltages, beyond the direct range of his meter. The most practical instrument for this purpose is a high-voltage probe connected to a vtvm, v-o-m or simple voltmeter.

Conventional high-voltage probes contain a single high-voltage type resistor, acting as a meter multiplier. This resistor, in series with the input resistance of the meter with which it is used, forms a voltage divider. The voltage to be measured is normally applied across the combination of both; the drop across the relatively low meter resistance is kept within range of the meter alone. The reading on the meter scale is multiplied by a fixed factor to determine the total voltage being measured.

Ordinarily, probe resistance must be matched to the instrument with which it is used. A conventional probe with only one resistor operates only with the instrument for which it is intended, or with a limited group of instruments having the same input resistance. A recently designed probe, however, is flexible enough for use with a vtvm, v-o-m or any voltage-measuring instrument whose sensitivity is 10,000 ohms per volt or better and can measure up to 60,000 volts.

The four resistors supplied with the instrument can be used in a group of 1, 2, or 3 at a time, depending on requirements. Also included are three conductive slugs and a specially designed shunt insert holder. The various parts and various combinations in which they may be inserted in the probe body are shown in the accompanying illustration. In all, there are 10 different arrangements possible, to match the probe to any type of meter.

With the specially designed shunt insert holder, one of the resistive

(*Continued on page* 39)

Calibrating Your Own

High Accuracy Can Be Established and

M. G. Goldberg

• One piece of equipment that has been with us almost from the beginnings of radio, along with the volt-ohmmeter and tube checker, is the AM signal generator. It is also one most likely to be taken for granted from the standpoint of accuracy.

The user often fails to realize that, after many months of use and bench vibration, its accuracy is bound to be affected. Add to this the fact that it is not a laboratory instrument to begin with, and we can understand why its calibrations will be less than accurate—nor are they claimed to be by the manufacturer. Even in the case of individually calibrated instruments, when an oscillator tube burns out, several replacements may have to be tried to restore original accuracy.

In short, the technician cannot be certain his scale readings are reliable unless he checks his instrument periodically. He can have an outside laboratory do the job for him—which costs money and deprives him of the generator for a while—or he can do an accurate job in his own shop.

For the sake of illustration, let's assume a standard generator with coverage from 100 kc to 30 mc, in six ranges. Starting with the lowest range (100 kc to 265 kc), we prepare a sheet of graph paper as in Fig. 1. All six charts can be prepared on a single sheet or, for better readability, a separate sheet may be used for each range.

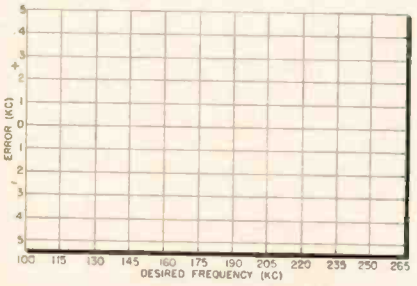


Fig. 1—Graph paper prepared for calibration.

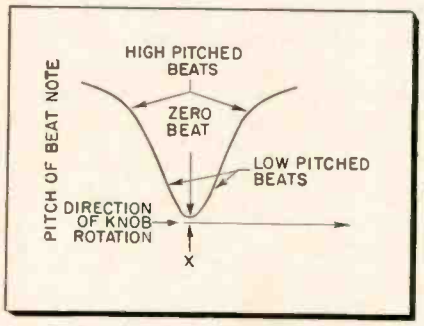


Fig. 2—Location of exact point of zero beat.

An AM receiver (any type will do) is set up a foot or two from the generator and both are permitted to warm up for 15 min. or so until all circuits are stabilized. Generator output leads may be left lying near the radio's antenna. On the radio, tune in a station whose frequency is 1000 kc or, if one is not available, the closest one to that frequency available in the area. Then, leaving the receiver tuned exactly to this station, slowly tune the generator through its lowest range, starting with its lowest frequency (100 kc), while using an unmodulated signal. At certain points on the dial of the generator, "beat" whistles will be heard in the receiver. These indicate that some harmonic of the generator frequency is the same as the station signal frequency (1000 kc assumed, in this case).

If the generator is set to 100 kc, then its 10th harmonic is producing the beat whistle with the transmitted signal; when the generator is tuned to 111 kc, its 9th harmonic gives the same result. On a separate sheet of paper, mark down the actual frequency to which the generator is tuned in order to produce this beat and also, in another column, the dial scale reading that is observed. The amount of error (the difference between these two) may be recorded in the final column, as shown in Table A of Fig. 3.

(To obtain the maximum number of points, for the greatest accuracy, divide the station frequency by several successive numbers. For instance, dividing 1000 kc by 4, 5, 6, 7, 8, 9, and 10 gives us generator settings whose 4th, 5th, 6th . . . 10th harmonics will beat with 1000 kc.

Fig. 3—Table of readings and finished graph for the first scale.

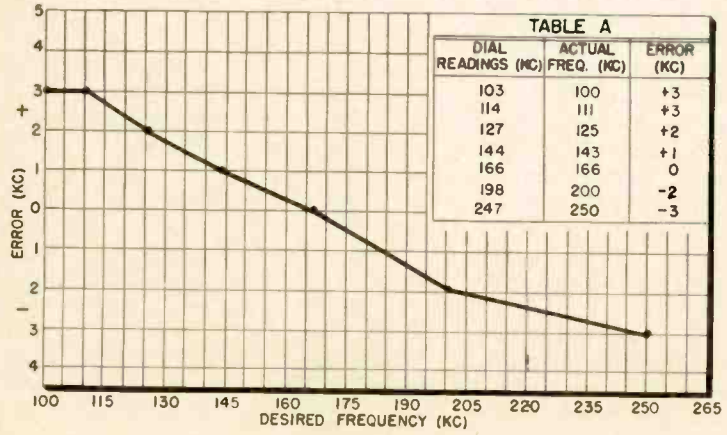
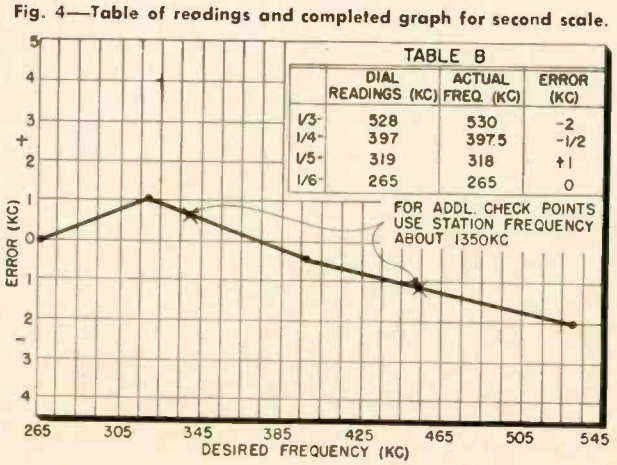


Fig. 4—Table of readings and completed graph for second scale.



AM Signal Generator

Maintained without Special Equipment

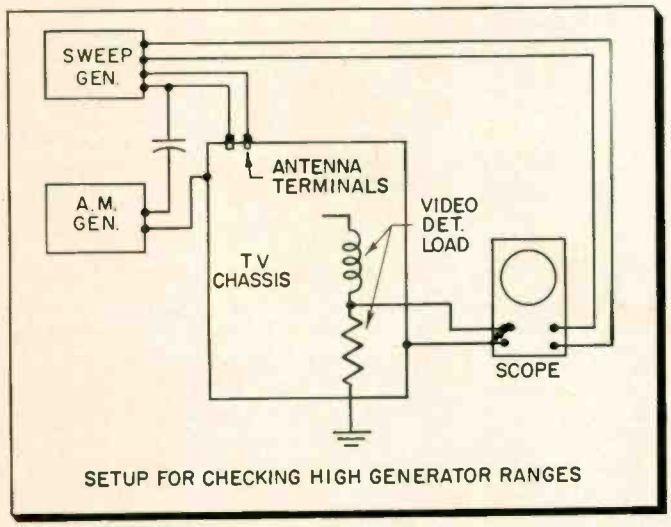
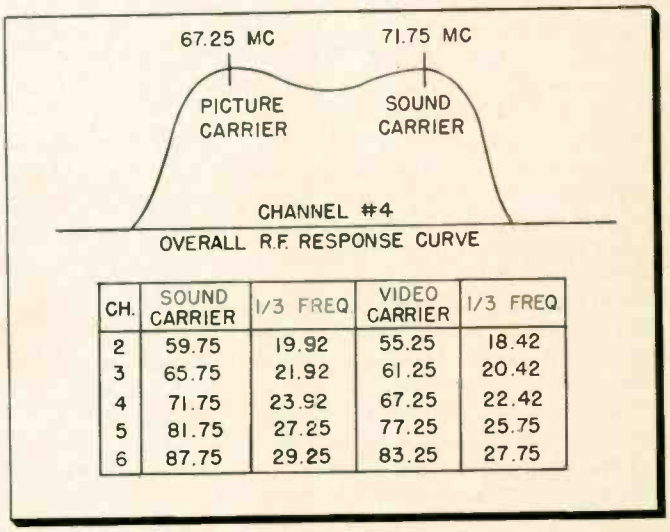


Fig. 5—Set-up for calibrating generator against TV station signal.



CH.	SOUND CARRIER	1/3 FREQ.	VIDEO CARRIER	1/3 FREQ.
2	59.75	19.92	55.25	18.42
3	65.75	21.92	61.25	20.42
4	71.75	23.92	67.25	22.42
5	81.75	27.25	77.25	25.75
6	87.75	29.25	83.25	27.75

Fig. 6—Carrier pips in Channel-4 response; table for other channels.

The corresponding settings, obtained from the arithmetic division, are 250, 200, 167, 143, 125, 111 and 100 kc, as shown in the table.—Ed.)

For greatest accuracy, the dial must be tuned to "zero beat," which is actually inaudible, but may be found in this manner: As the frequency of the station is approached from one side by tuning the generator knob, a high pitched whistle is first heard. As the tuning of the knob is slowly continued, pitch drops until the beat becomes inaudible. (See Fig. 2.) Continued movement of the knob in the same direction will cause the whistle to come up out of the "valley," this time rising in pitch until it is too high to be heard. The point where no sound is heard (point X in Fig. 2) is the zero-beat point to which the generator dial should be adjusted.

Transfer the individual points and errors listed in the table to the already prepared chart of Fig. 1 and draw connecting lines through all the points recorded. This gives us the calibration chart of Fig. 3. In subsequent use, if we wish an accurate test signal of 200 kc, reference to the chart shows the dial must be set to 200 minus 2, or 198 kc. This procedure holds for all other points on this chart, and for the charts prepared for the other generator scales.

One caution should be observed in drawing connecting lines. If any one point is way off to one side, it should be rechecked or discarded entirely. It is probable that a beat between the receiver *oscillator* and the generator has been picked up and recorded. (If a TRF receiver is available for the calibration procedure, this possibility can be avoided.—Ed.)

Higher Ranges

As the calibration proceeds to the higher ranges, the left hand scale (error in kc) will have to be increased to allow for greater deviation. Errors may occur in the range of 20 or 25 kc, for example. This does not signify an increase in percentage of error. 20 kc deviation, for instance, is only 1 percent off at 20 mc.

In checking range 2 (approx. 260 to 550 kc), set the receiver to a station near 1600 kc. If the transmitter broadcasts, say, on 1590 kc, its frequency will be the 6th harmonic of 265 kc. If actual zero beat occurs with the generator set to 262 kc, this fact is recorded in Table B of Fig. 4. Do the same for generator frequencies that are ⅕, ¼ and ⅓ the station frequency; then again transfer all points to the chart (Fig. 4).

The third scale generally covers the broadcast band. Here you can beat the generator fundamental directly against any and all stations that can be picked up across the entire band. These commercial transmitters are controlled to an accuracy so high as to be greater than the accuracy that can be read on the dial of most generators.

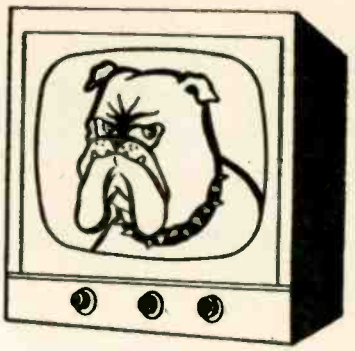
For the 4th range (approx. 1600 to 4500 kc), the simplest procedure makes use of any conventional short-wave or communication-type receiver that is available or comes into the shop for repair. Pick up WWV (The Bureau of Standards transmitter) on either 10 or 15 mc, and beat harmonics of the unmodulated signal generator output against either frequency. This gives four accurate points with 10 mc (1667, 2000, 2500, and 3333 kc) or six points with 15 mc (1667, 1875, 2143, 2500, 3000, and 3750 kc). Between the two, eight calibration points can be used that will cover the range quite thoroughly except at its high end.

At the high end of this scale, we have 4500 kc (or 4.5 mc), which is so important in checking or aligning sound i-f and discriminator circuits in all intercarrier TV receivers. Accurately pinpointing this reading provides a valuable tool in TV sound alignment. This can be done

(*Continued on page* 41)

"Tough Dog" Corner

Difficult Service Jobs Described by Readers



$10 For Your "Tough Dog Story"

Have you tangled with a difficult or obscure service problem recently? Write it up, telling us how you licked it, and send it to "Tough Dog" Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., N. Y. 17, N. Y.

Detector Oscillates

Though this one looked easy at first, it turned out to be quite perplexing. The symptom was violent oscillation visible on the picture tube, obviously at 4.5 mc or thereabouts. The fault persisted with or without a signal. Removal of the pix detector left the fault still there, but removal of the 12AT7 first video amplifier stopped it. Presumably the trouble was in the first video stage.

First suspected, of course, was the 4.5-mc trap in the cathode of the video amplifier (see accompanying illustration). The trap was shorted across and the oscillation stopped; however the coil and the condenser were both okay. Something was apparently resonating with the trap.

Shunting components in the plate circuit had no effect; but as each peaking coil in the grid circuit was shorted in turn, the trouble stopped. The peaking coils and the 4700-ohm resistor were checked and found normal. The 5-mmfd condenser at the plate of the pix detector was unhooked, and again the oscillation stopped. A check on the bridge showed that the condenser was not 5 mmfd at all—but 500! Investigation with a grid-dip meter showed, sure enough, that the 500-mmfd value resonated with the coils in the grid circuit very near 4.5 mc. Inserting the proper value restored the stage to normal operation.

The set had come to us from another dealer who had been working on it to eliminate some other oscillation in the i-f strip. Apparently he put in the wrong-value part. Either he had misread the color code, or he had been fighting the set on the afternoon of the last day of the week! —*R. Eldridge, Vancouver, Canada.*

High-Voltage Arcing

Fruitless hours were spent finding the cause of this unusual arcing problem in the high voltage. The symptoms on this Admiral 22Y1 were intermittent blooming of the raster accompanied by streaks across the picture and a weak sizzling sound that appeared to come from the vicinity of the 1B3 rectifier socket.

The condenser mounted to this tube socket and the resistor in series with the 2nd anode lead were first suspected. After replacing these and re-soldering and re-dressing all leads and connections on the 1B3 socket, the trouble persisted. The horizontal output transformer was cleared of suspicion by substitution. After these and other measures failed, a new picture tube was tried as a last resort. The trouble disappeared.

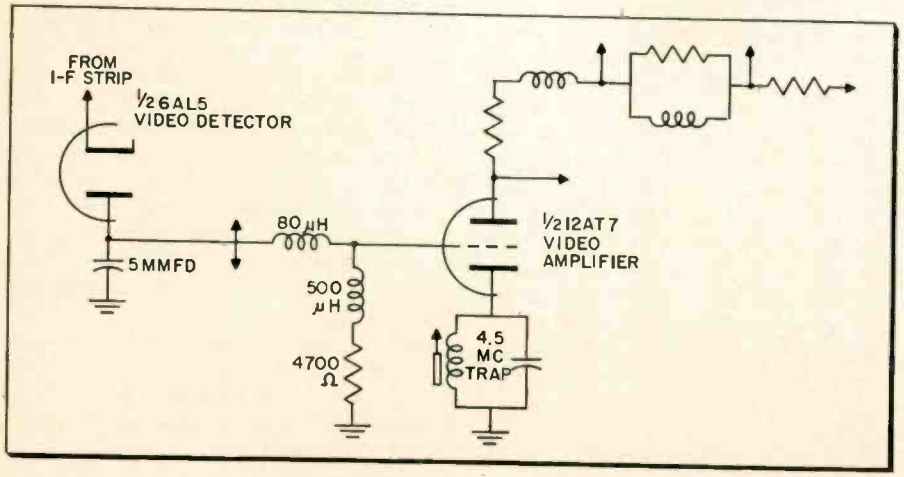
A careful inspection of the old picture tube, a 21EP4, revealed a defect in the manufacturing process that had caused the inside of the aquadag coating inside the glass shell, adjacent to the 2nd anode connector, to be missing or very sparsely deposited. Arcing over this area resulted inside the tube. The arcing could only be seen by peering into the inside of the tube along the edge of the screen. Even when the arcing was observed, the sizzling noise seemed to originate anywhere but from the tube. This was the false indication that concealed the trouble in the first place.—*David A. Young, South Amboy, New Jersey.*

"Key" to the Problem

While working on a set which I service regularly, I noted that there was multiple keying of the horizontal oscillator; that is, one of the two raster fields (every other scanning line) was displaced from the other field by about half an inch. Since this was not the trouble for which it had been brought to the shop and since closing the door on the h-v compartment eliminated the symptom, the set was returned without further attention to this problem.

About a month later, the set was back in the shop, the complaint being "no raster." Replacing the inoperative 6W4 damper brought back the raster, but this time the multiple keying was also back, and closing the h-v compartment door did not stop it. All waveforms and voltages in the horizontal circuits were correct, and I could obtain a normal picture by touching the plate cap of the 6BQ6 with a screwriver blade. Checking condensers for leakage showed nothing. As I was about to put the set aside, I happened to touch my probing tool to the cathode of the 6BQ6. This resulted in a normal picture. Apparently hand capacitance through the handle of the probe was bypassing the cathode. If this were true, then the cathode bypass condenser must be open. Sure enough, replacing this capacitor cleared up the trouble for good. —*Donald Anglin, Groom, Tex.*

Incorrect replacement of the condenser at the detector plate set up a strong oscillation.



Mountain Antenna Installation

Capturing "Nonexistent" Signal Pays Off in Profit, Prestige

JACK DARR

• The customer lived at the bottom of a deep valley, in the Ouachita mountains; the customer wanted TV very badly. Signals at the house itself were nonexistent, so there we were. At the time, two stations were available in the area, Channel 6 (to the south) and Channel 4 (east), both blocked off by high mountains. After considering the situation, we decided the only approach possible was to go up one of the mountains until sufficient signal was found.

The mountain behind the house appeared to offer the most height with the least distance, so it was checked. The antenna was mounted on a 'topped' pine tree, about 500 ft. from the house. Channel 6 came in, with medium signal strength, and Channel 4 was very poor. Customer pleased with progress but wanted better pix, for which we couldn't blame him. Therefore, more experiments were in order.

Fig. 1—Open-wire strung between trees on way down. Slack allows for tree movement.

Fig. 2—Small tree cut off about 4 ft. high. Standoff screwed into top supports lead-in.

Since mountaintops are a long way from any source of power, we were forced to build a battery power supply for our field strength meter. Armed with this, and a pair of 5-element yagis, we roamed the woods until a location was found where signals were good from both directions. This was almost to the top of the mountain, directly behind the house. Signals were checked here on several different days, and found to be very consistent.

Now, we faced the problem of getting the signal down to the receiver. We used 300-ohm open-wire line because of its low loss and durability.

Trees Provide Support

After clearing a 'right-of-way' down the mountain, the line was installed, on very short standoff insulators, using trees for supports. On large trees, the insulators were screwed into the trunks, about 6 feet from the ground. On the runs between large trees, smaller trees were cut off at a height of about 5-6 ft., and the standoff was screwed into the top of the stump. If the open-wire line used is fairly rigid, runs of up to 75 ft. may be made with no support. Soft-drawn copper lines require support at shorter intervals. When stringing between trees, allow plenty of slack to permit movement of the trees in a wind, otherwise breakage of the line may result. See Figs. 1 and 2.

The field strength appeared to be quite uniform over a large area of the mountaintop. Therefore, the antennas were mounted on 10-ft. standard mast-sections, on the ground. Experiments showed us no apparent height-effect. We had as much signal ten feet off the ground as at thirty, so the shorter masts were used, for greater strength. When possible, the masts were set on the stumps of small trees, cut off about four inches high. One was tied to a small stump, about three feet high. (See Fig. 3.) If hardwood is involved, the system will last for quite a long time, as it's almost impossible to kill the things. Ask anyone who has ever tried to grub a stump out of his yard!

Fig. 3—Antenna wired tightly to 4-ft. stump.

Fig. 4—The antenna couplers were mounted on separate mast not far from antenna site.

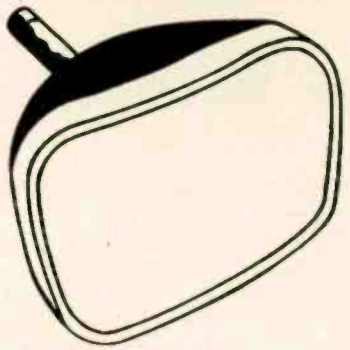
We used from five to seven guy wires on each mast, fastened to adjacent stumps, trees, etc. In addition, and the most important, a 'tail-guy' was used on each antenna. This is just a wire tied to the back end of the boom, fastened to a tree, to prevent the antenna from being blown out of line by winds. While this might sound like an excessive amount of guying, it is not. One point which must be observed in the construction of an installation like this is durability. This outfit *must* sit out in the weather for a long time. Therefore, unless you want to find yourself climbing the mountain every week or so for repairs, take every precaution possible when constructing it! We increased our normal safety-factors to two or three times on everything, just for luck, and it has paid off: both systems recently weathered one of the worst

Renecked Picture Tubes

• Occasionally, television viewers or servicemen notice the presence of slight bulges or indentations in the necks of picture tubes. Worriedly, they ask if this indicates that the bulbs have at some time had new necks or portions of necks installed.

"Renecking," as the process is called, is entirely normal to the manufacturer of first quality picture tubes, and is necessary for several reasons.

Renecking begins with the glass manufacturer. Since different characteristics of the glass are required in different parts of the bulb, the glass used in the neck, for instance, must be of different composition



than that used in the face plate. Otherwise, when the neck is heated to seal in the mount, impurities may be given off which could contaminate the tube. Thus, renecking is necessary right at the start, to provide a bulb of suitable characteristics.

Bulbs of finished tubes which do not meet with electrical and screen quality standards are saved and sent through the complete manufacturing process again. Briefly, this includes cutting off the neck to remove the base and gun, and cleaning off the old screen and internal coating. A new length of neck is then sealed to the bulb in order to provide a standard length neck for the sealing in operation. The renecked bulb is carefully inspected by the same

(*Continued on page* 47)

Mountain Antenna Installations

(*Continued from preceding page*)

ice storms in years with no damage!

Now we had the signals, we had the line built, and we had a good picture at the house, but here came the worst headache of the whole job; coupling the antennas to the transmission line! Our first attempt resulted in a dismal failure. We tied the two antennas together. Our 100-microvolt signals promptly dropped to a loud 5 microvolts! Attempts were made to match lead-ins, by cutting to length, but no help was found. Tying one antenna to the line, we went back down for more experimenting.

An old antenna-booster was converted to a mixer, for one try. Removing the 6AK5 pentode, we installed a 6J6 dual-triode. Tying the plates together, we applied one input to each grid, taking the output off the cathode to obtain a better match to the transmission line. This system worked very well. We weren't interested in any additional gain, only in comparatively loss-free mixing and matching. Everything was fine, until another station came on the air, on Channel 7, and the customer wanted to receive it. Away we went again!

Fortunately, about this time, a leading antenna manufacturer came out with a flexible coupling system, for tying different low-band and high-band antennas together. An appropriate set of these units, as shown in Fig. 4, was installed to connect the three antennas, with excellent results. We had good clear pix on all three channels, and the customer was very well pleased. So well did it work, in fact, that we immediately got a contract to install an identical system for a neighbor who lived just around the end of the same mountain. Another set of antennas was erected, just a few feet up the hill from the first, and another transmission line run down the other side of the mountain, with equally good results.

In the miscellaneous department, for clearing brush and trimming trees, of which there are a great deal on this kind of job, try using a pair of 'pruning-hooks': a pruning cutter

Fig. 5—View of the antennas for Channel 4 and Channel 7, on the top of the mountain.

with blades about 3 in. long, with handles about 30 in. This tool will do a much better job on small sprouts, and even trees, than anything else. It will also save much time. As to the time required, it should take the technician and one helper something like a day and a half to install the antennas and run the transmission line. Possibly two days of unskilled labor will clear the right of way for the line and also clear the antenna site; use young fellows, as we did; both the clearing and the packing of materials can be handled by them.

As to losses in the transmission line, we took measurements at top and bottom of the line, during a period of fairly constant signals, and found none apparent. While this is theoretically impossible, the actual loss will be so small as to be negligible, in a correctly constructed line. If the uninsulated type of open-wire is used, be sure that enough tension is maintained on the line to prevent shorts. If an insulated type is used, this is not so much of a problem.

When clearing the right of way, be sure that all the tall, slender trees are cleared away from each side; this is the kind that will load up with ice and fall across the line. Overhanging branches may be pulled down with a loop of rope, and trimmed.

If a very long unsupported run must be made, install a 'messenger-cable' of guy wire, and sling the lead-in underneath it, using long standoff insulators. When installing the line, use short standoff insulators; the longer types will not hold up under wind and icing conditions. In other words, pay a lot of attention to even the smallest details on the whole job, and you will be more than repaid by the performance and the customer satisfaction.

A well-built job of this kind can be very remunerative, both financially and in a prestige way. If the customer wants TV badly enough, he is usually willing to pay what the job's worth. One installation of this kind will usually bring in several more. Once the techniques are learned, the job seems a lot easier.

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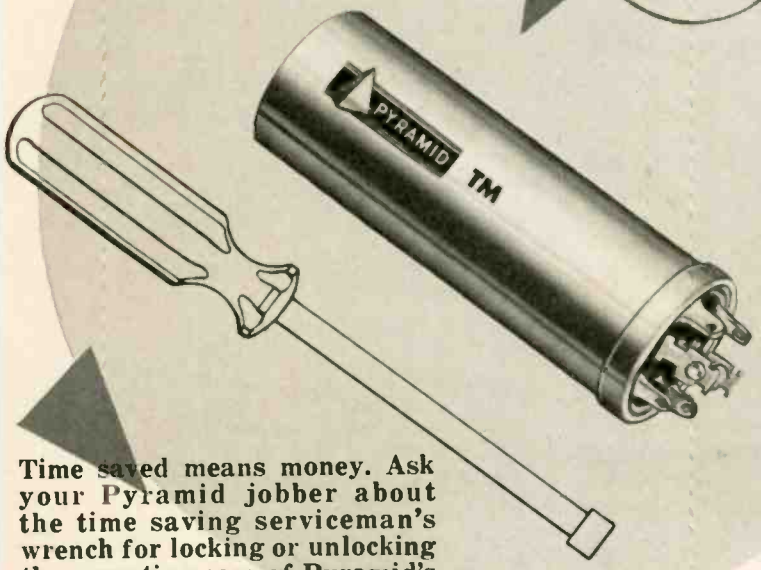

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Vibrator Power Supplies

Part I: Basic Types; How They Work; Circuit Arrangements

By Kenneth Backman,
Sr. Communications Engr.,
Motorola, Inc.

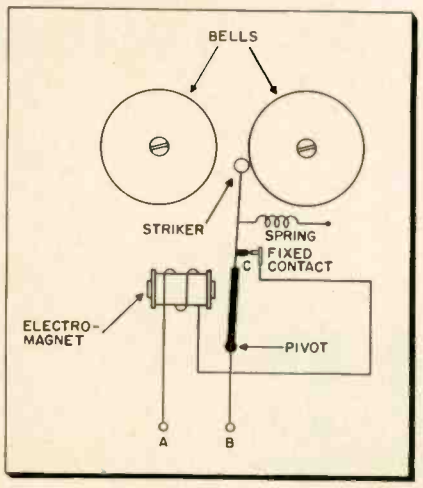
• The power supply can truly be considered the heart of the mobile communications system for it is the purpose of this unit to supply the necessary energy for the system to function as a coordinated body. As with a weak heart, a weak or run-down power supply means poor performance—poor reception and poor transmission.

With the advent of the new 12-volt automobiles, the power supply has become increasingly more important because it is primarily this part of the radio set that determines its flexibility or interchangeability.

There are basically two types of mobile power supplies in use today, the vibrator type and the dynamotor. (A third, but infrequently used system, consists of an alternator installed in the vehicle and the use of a standard 115-volt ac power supply.) The most common of these two, found in practically every piece of mobile radio equipment, standard auto broadcast receivers as well as communications equipment, is the vibrator power supply.

The simplest example of a vibrator would be an ordinary door buzzer or bell (Fig. 1). When a dc voltage is applied at points "A" and "B," a current will flow through the completed circuit consisting of the coil of the electro-magnet, the closed contacts at "C" and through the reed or armature back to the source. However, as the current begins to flow in the coil, the core will become magnetized and will attract the reed. As the reed starts to move toward the magnet, the contact at "C" will be opened, the current flow will cease, and the magnetic field will collapse allowing the reed to return to its original position with the contact "C" closed.

Fig. 1—Vibrator action is like that of bell.



This cycle will, of course, repeat itself and at a rate and amplitude determined by the electrical and physical constants of the system such as the strength of the magnet, the mass of the reed, and the spring constants of the reed. When the reed has reached its full amplitude, inertia carries the striker far enough to hit both bells.

Converts DC to AC

Now, if the striker and the bells were replaced with electrical contacts, we would have a basic form of vibrator. The primary purpose of a vibrator is to provide an alternating voltage, or convert dc voltage to ac voltage. Once converted to ac, the voltage can be stepped up through a transformer and then rectified for use as a high voltage dc source for the plate supply of vacuum tubes, or it may be stepped down and used "as is" to supply the filaments of the tubes.

Let's consider now the manner in which the vibrator produces an ac voltage. For purposes of explanation, the vibrator may be compared to a rapidly actuated single-pole—double-throw switch (Fig. 2). Assume that the fixed contacts of the vibrator or "switch" are connected to the outer leads of a center tapped primary winding of a transformer and the moving arm (or reed) connected to ground, or reference potential. If, while the switch is being actuated, a battery source is connected between the primary center tap of the transformer and ground, a current

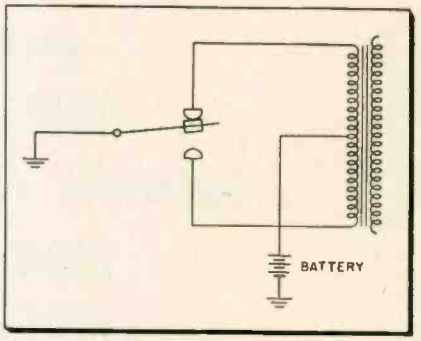


Fig. 2—Switch action makes ac of battery dc.

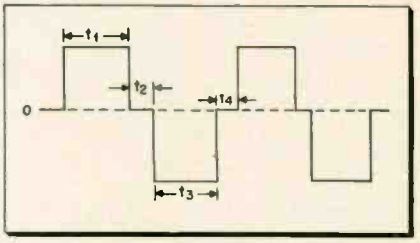


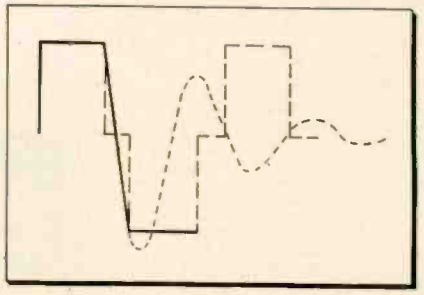
Fig. 3—Theoretical waveform traces action.

will flow alternately through each half of the center tapped primary winding.

This current flow will produce a voltage drop across the primary winding which will have the waveform shown in Fig. 3. Times t_1 and t_3 represent the time during which the contacts are closed and current is flowing respectively through each half of the transformer winding. Times t_2 and t_4 represent the "open" time, or the time elapsed during the travel of the reed from one contact to the other. The sum of the times t_1 and t_3 is normally referred to as the "closure" time and the sum of t_2

(*Continued on page 28*)

Fig. 4—Buffer condenser helps shape output.



and t_4, the "open" or "off-contact" time. As the sum of t_1 and t_3 represent the time during which current is actually flowing in the circuit, the ratio of this sum (t_1+t_3) to the time of one cycle is normally referred to as the *time efficiency* of the vibrator.

The waveform of Fig. 3 is in it's ideal form, and would not be encountered in actual practice. This is primarily true because the transformer represents an inductive load. Making and breaking an inductive load is, of course, going to result in current transients and high induced voltages. Were this condition not corrected, severe arcing would occur in the contacts which would materially reduce the life of the vibrator. Also, the induced voltages could be of sufficient magnitude to damage the transformer through the breakdown of the insulation.

This is where the timing (buffer) condenser becomes of importance. This condenser is used in conjunction with the inductance of one of the windings of the transformer to form a resonant circuit at a frequency which will tend to bring the voltage across the vibrator contacts to a zero potential at the time the contacts close (Fig. 4). The value of the timing condenser is, therefore, determined by the inductance of the winding and the timing characteristics of the vibrator.

The dotted line in Fig. 4 indicates the dampened path the voltage across the tuned circuit would have followed had the contacts opened on one side and not closed on the other. The timing condenser may be used on either the primary or the secondary of the transformer but its ratings will depend upon its location. If it is to be used across the primary, its voltage rating may be low, but it will have to be of relatively large capacity as it will ordinarily have to resonate with a small amount of inductance. The high-voltage secondary will appear as an appreciably greater inductance and, therefore, a timing capacitor across this winding will have only a low value of capacity. On the other hand, it must withstand extremely high peak voltages and will have a rating upwards of 1200 and 1600 volts.

Rectification Methods

If the vibrator circuit is to function as a dc high-voltage vacuum tube plate supply, the square wave output of the transformer will have to be rectified. This may be done in a conventional manner, with vacuum tube rectifiers or dry disc rectifiers.

A second basic type of vibrator circuit, which produces an output requiring no rectification, is commonly referred to as a "synchronous" or "self-rectifying" vibrator. In this circuit, rectification is accomplished through a second set of contacts which are virtually identical to those found in the interrupter vibrator just discussed. The second set of contacts (Fig. 5A) is connected to the secondary of the transformer and "commutates" the output of this winding in "synchronism" with the primary contacts so as to produce a unidirectional flow of current. Each time the current reverses direction in the primary, a similar reversal takes place in the secondary. As a result, the polarity of the output voltage is always the same. This voltage would have the appearance

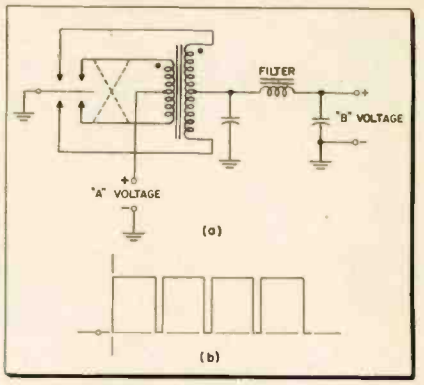


Fig. 5A—Circuit of synchronous or self-rectifying vibrator. B—Pulsed output waveform.

(*Continued on page* 45)

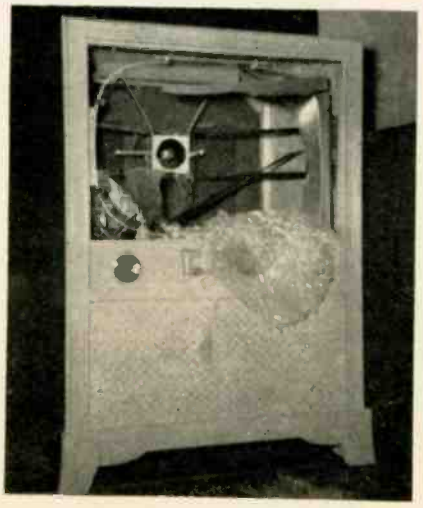
Is Safety Glass Safe in Implosions?

L. H. Wilson

• We have all seen pictures of a television set picture-tube implosion, but the one illustrated here brings out a point that is overlooked by many people. The point is this: the safety glass in front of the crt may not be so safe after all.

In this instance, the implosion took place while the set was still in its original packing case, sitting on the warehouse floor. The case was undamaged externally. In fact, after the implosion was heard, several cases had to be opened before the damaged set could be located. The automobile-type double-thick sheet of safety glass, while it was essentially intact, was completely shattered. So were the decorative mask and most of the other tubes in the set. The sheet of safety glass was blown completely out of the cabinet. It was found, along with the other pulverized glass, at the bottom of the case. It was placed back in the cabinet, for purposes of illustration, before the accompanying picture was taken.

Implosion on this set blew out safety glass.



It appears, from what happened, that it was not the safety glass itself that was defective. The shattering is apparently normal, provided that the sheet remains in one piece. Rather, the existing hazard is the result of poor cabinet design. In this case, if the implosion had occurred while the set was in use, the flying sheet of safety glass would have been as much a danger to people present as anything else would have been. The cabinet should have been designed so that the glass was held better at the edges. Then, even though it shattered, the sheet of glass would be safe as long as it stayed in place and confined the high-speed glass particles from the imploded tube. One wonders in how many current sets the effect of good safety glass is thus being wasted. •

Practical Approach to

Part 2

Troubleshooting TV Tuners

Examining the Construction of the 3 Basic Types of Tuners

By W. J. Williams

• Excessive interference pickup is a not-too-common complaint in most tuners, but bears brief mention here. A constant, shifting r-f beat pattern visible on several channels probably means that a strong carrier at some frequency below the regular TV r-f frequencies is getting into the tuner's r-f amplifier, and through double-conversion or many other means, into the video circuits, and showing up on the screen as a series of diagonal lines or "hash" in the pix.

The average well-designed tuner has some means of pre-selection ahead of the r-f stage to attenuate the unwanted signals outside the TV band. This usually consists of a series of one or several traps, high-pass filters, and matching transformers, at the input to the tuner. If certain of these inductances open up, the only effect may be such interference pick-up.

Some of the earlier tuners had no provision built in to reject these unwanted r-f frequencies, and in these cases one of the commercially-built high-pass filters should be tried, connecting it as close as possible to the tuner itself, and grounding its case well. Incidentally, the FCC will have no sympathy with any complaints filed due to interference pick-up outside the TV spectrum on sets without a certain amount of preselection or traps, especially anything near the i-f range, which is close to several important services.

Typical Construction

The following specific tuners, which we will go into now in more detail, are typical of each group.

In the turret class, consider the Standard Coil Co.'s cascode series. It has the familiar drum assembly coupled directly to the tuning shaft. Snapped into retaining clips around the circumference of the drum are individual coils securely mounted on low-loss insulating strips, and the terminals of these coils are brought out to silver-plated rivet-head contacts projecting from the outer side of the strips. There are two sets of these channel-strips. The set nearest the front of the tuner contains the local-osc., mixer, and r-f amplifier output tuned circuits, all three of which are mutually-coupled. These front coil-forms also contain the tuning slugs for the individual osc. frequencies.

The rear set of strips contains the antenna coupling and the r-f amplifier input tuning coils. These sets of coils are all physically moved by the drum in unison to engage a set of stationary contact-springs connected to the various circuits involved. Thus, when a channel is changed, a new set of coils is moved into position to contact these springs.

Detent

A detent-spring assembly on the side, which is a roller-cam, engages a notched gear built into the center of the drum, to "lock" the drum on each channel securely. The entire drum may be removed to gain access to the wiring under the tube sockets.

The only noteworthy trouble common to this tuner, other than routine cleaning of the contacts, is the burned 1000 ohm plate-resistor in the cascode amplifier plate circuit described earlier. A number of cases of the small feed-thru capacitors in the B+ leads shorting have also been encountered. It is worth remembering, too, when faced with a broken tuning strip, that it is usually possible to tune in the damaged channel on either of the adjacent-channel strips. The inserts may then be switched so that the channel numbers will be correct.

In the wafer-switch category, let us consider the RCA type KRK-8 series tuner used in a large number of TV chassis starting in 1950. See Fig. 5.

This tuner uses a 6J6 as combination local osc.-mixer stage, and a 6CB6 as the pentode r-f amp. In this unit, as with most switch-types, the tuning inductances are all wired in series, starting with Chan. 13 and ending with Chan. 2. The selector switch rotor taps off increments along this series of inductances at each channel, and therefore imposes the necessity of starting osc. slug alignment at Chan. 13, and working downward. This tuner has separate slugs for each channel, accessible through holes around the front plate. There is also a master osc. slug located on the top of the unit, directly to the side of the fine-tuning capacitor slug. This last-mentioned slug, which is actuated by the fine-tuning rocker-arm assembly, will set the amount of actual frequency-variation possible by the rotation of the fine-tuning shaft, and hence, its "range"; e.g., if fine tuning appears too critical or "sharp," turn the F.T. slug a trifle counter-clockwise, then, with tuning control at its mid-position, re-tune the master osc. slug.

Intermittents are the most common troubles encountered in this type tuner, and very frequently they

(*Continued on page* 32)

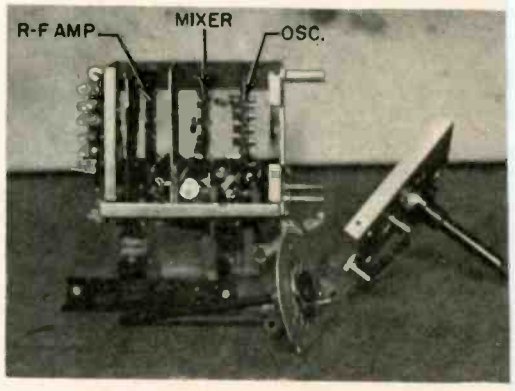
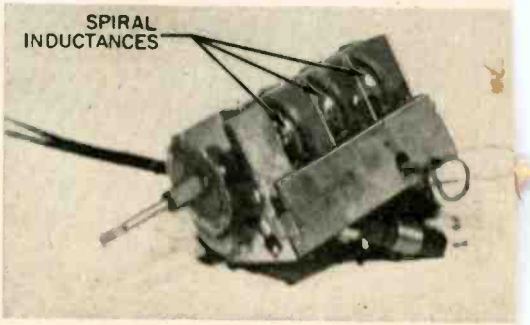


Fig. 5—RCA type KRK-8, shown disassembled, is an "incremental inductance" tuner.

Fig. 6—Mallory Inductuner, used in early DuMont receivers, has 3 spirally wound coils.



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are not caused by dirty contacts. Cleaning, of course, should be tried first; then a careful probing with an insulated stick, especially around the osc. sector. If rocking the osc. tube in its socket causes a large jump in frequency after the contacts have been tightened, it usually means a failure of the small 39 mmf. ceramic cap. connected from pin #6 of the 6J6

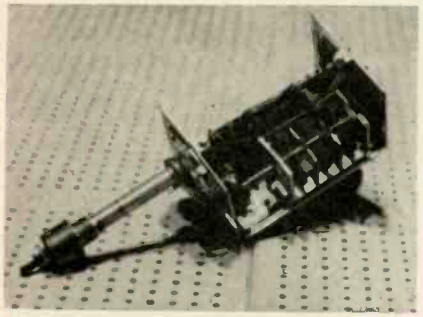


Fig. 7—Variable capacity type tuner has inductances, for low and high bands.

socket to ground. Mechanical stress causes a crack in the ceramic body, and therefore an intermittent shift in osc. freq. Replace with exactly the same type cap., (an RCA stock #75196). The osc. section wiring may be made accessible in this unit by removing the front stator (wafer) segment. This is done by removing the front plate, detent, and the two fiber insulating strips on the tuner sides, and unsoldering the three connections to the stator.

Pay TV, Pro-and-Con

Subscription TV proponents have received several refusals from TV networks to place commercials for fee-TV on the air. However, both CBS and NBC have offered to provide free air time for discussion of the pros and cons of the subject. In a recent debate over CBS, W. Theodore Pierson, Washington counsel for Zenith Radio Corp. stated: "It is technically possible for television to regularly bring the audience many more programs and events than it now does . . . The industry thus far has relied only upon the advertiser for revenue . . . Subscription television proposes to supplement television advertising revenue by giving the public a chance to pay the broadcaster direct a lower price . . ." In opposition, V. Sholis, Director of WHAS, Louisville, Ky., stated: "What these proponents of box office television suggest, in effect, is that the cost of television be shifted from the advertiser to the public . . . (they) are now asking the government to give them a slice of this scarce public resource free of any responsibility of serving the broad public interest."

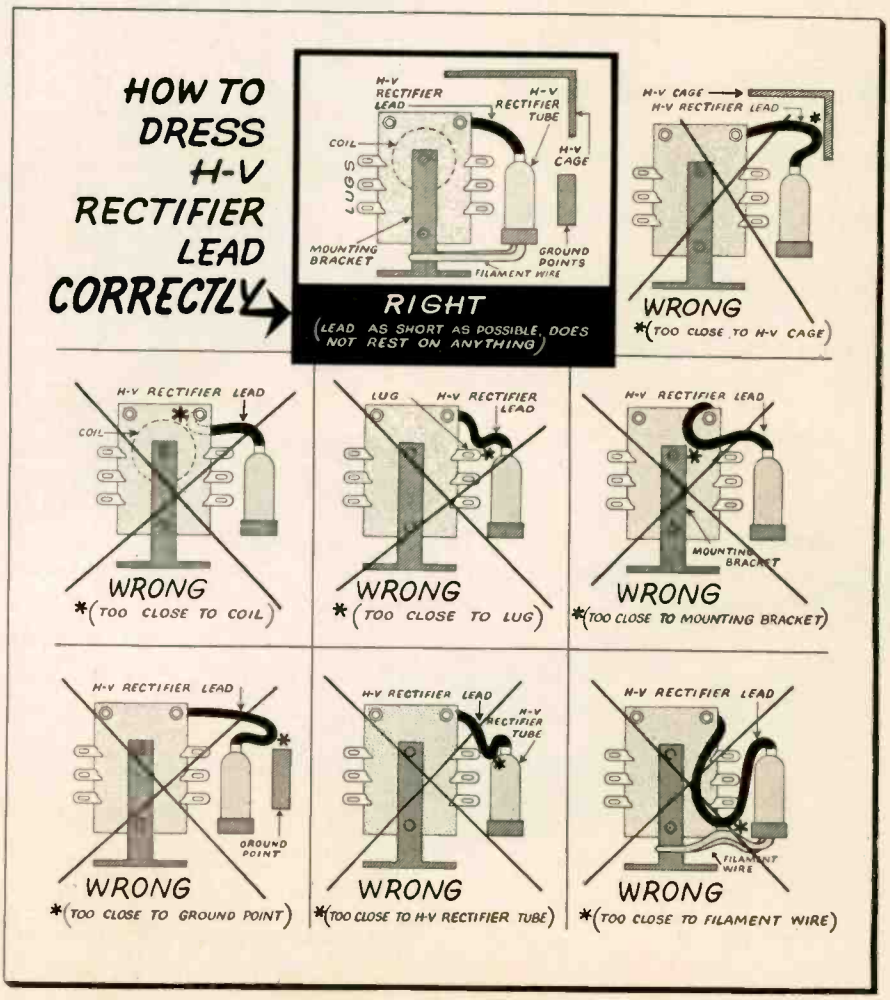
The Mallory Inductuner and its variations, used in most earlier DuMont receivers, and many others, is our illustration of the continuous-type tuner. (Fig. 6.) This unit employs three sets of coils wound on ceramic spools, ganged by a common tuning shaft. Electrical contact with the coils is made by wiper contacts which press on rings at each coil end. Also, one contact shoe rides on the bottom of each coil in a track, contacting a single turn, and moving as the coil turns, in feed-screw fashion. This action changes the amount of effective inductance in the circuit, thereby tuning each stage continuously, instead of in steps. A big advantage of this system is removal of the need for separate osc. slugs, and very rarely are there any tracking problems. No fine tuning is necessary, as one shaft does the work.

Noisy tuning will rear its ugly head, however. If routine cleaning of all the aforementioned moving contact points fails to quiet the unit, it often means that one or more of the lower sliders has lost its spring tension, or may have "jumped the track." In such case, if careful inspection proves this fact, attempt the following procedure only if you have a steady hand and lots of patience.

Loosen the rear set-screw pivot for the shaft, and carefully lift up on the rear of the shaft, so that the offending shoe contact may be removed, bent to increase tension, and re-inserted. Be sure all three shoes are properly seated, and touching the correct turn on their coils. Caution: be careful not to allow the ball-bearings in the front bearing race to drop out! If they should fall out, a service kink is to put plenty of thick paste lubricant in the bearing race, then, the re-inserted ball-bearings will stick in place.

The bottom cover of the Inputuner is removable, leaving clear access to all the wiring. However, circuit component failures are comparatively rare in this unit. •

H-V Lead Dress Guide



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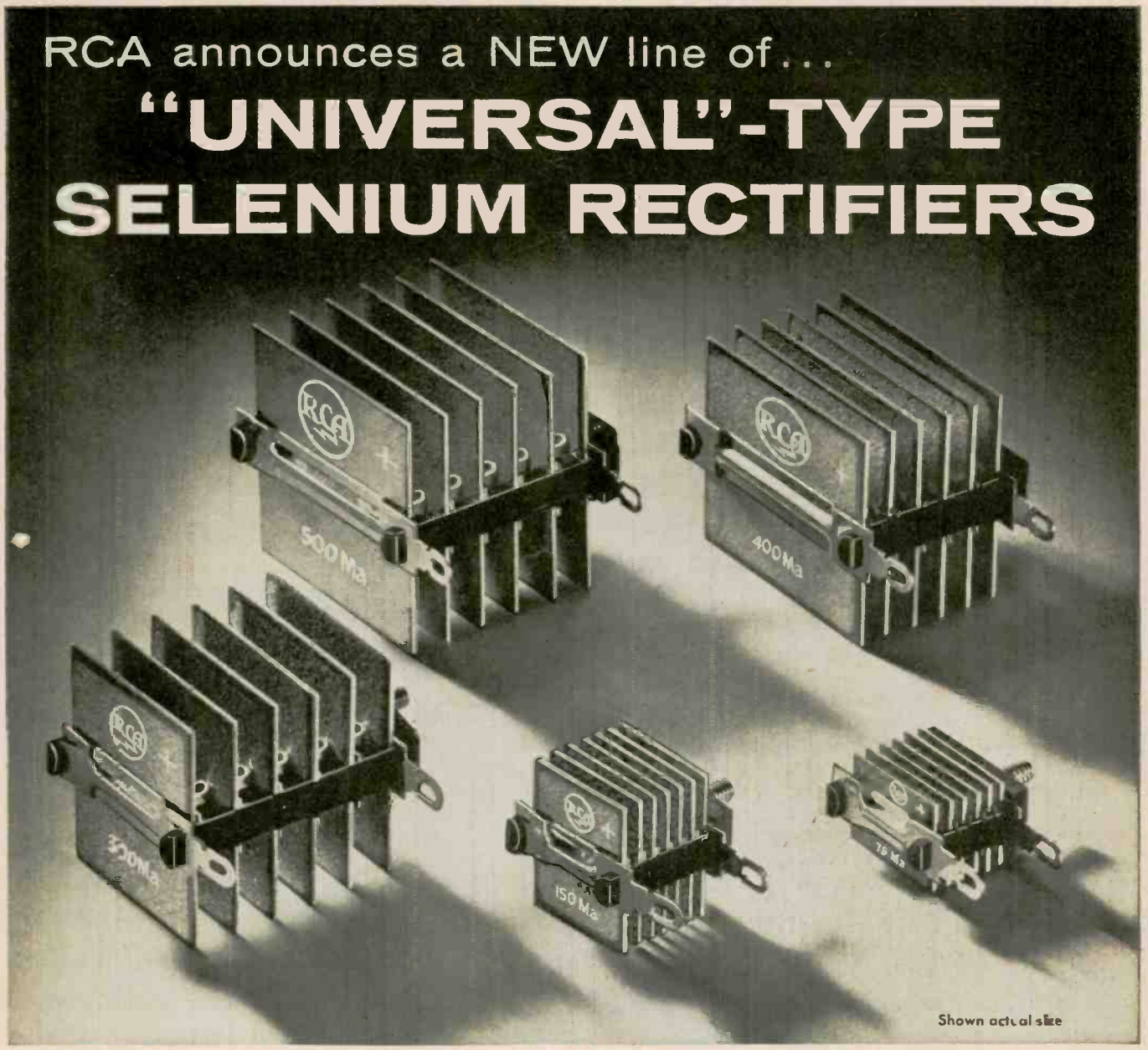

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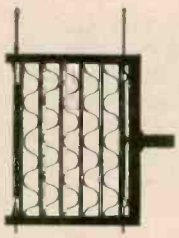

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Let's Look At Circuits

No. 3: The Basic Multivibrator Put to Work in TV

SIDNEY C. SILVER
MANAGING EDITOR, TECHNICIAN

• In our last installment we managed to get the multivibrator stage, shown in Fig. 1, working. We then left our oscillator see-sawing away in mid-air, with no rhyme, no reason, and no relation to the rest of the TV set. Some mention was made of the possibility of controlling frequency or locking the oscillator to another frequency by applying a controlling pulse or voltage to the grid of the 1st triode. To understand how this is accomplished and also to get an additional picture of operation, examine the waveforms of Fig. 2.

Waveform 1 (during time A-B) shows the condition of the 1st triode's grid when it has swung positive, above the cut-off point (C. O. in the figure), as a result of the charging up of its grid capacitor, C2. As a result of the ensuing conduction in this 1st triode, plate voltage (waveform 2, time A-B) is very low or relatively negative.

With plate voltage thus reduced with respect to B-plus, capacitor C1, formerly charged up to B-plus, correspondingly discharges. (See waveform 3, time A-B). This action drops the voltage on the 2nd triode's grid below the cut-off point. The plate of this stage, with no current flowing to it, is at the full B-plus value (waveform 4, time A-B).

During the next cycle, conditions are reversed in the two triodes. Waveforms for the grid and plate of each triode, it will be noted, are identical except for their occurrence along the time axis. What holds true for the 1st triode (waveforms 1 and 2) during time A-B is also characteristic of the 2nd triode (waveforms 3 and 4) during time B-C.

Plate waveforms do not follow grid waveforms exactly. Discharge action of the capacitors in waveforms 1 and 3 occurs below the cut-off point. Since the plates are inactive during such periods, the discharge curves do not have any effect on plate action, and are missing from the plate output waveforms. The latter (waveforms 2 and 4) are pulsed outputs that closely resemble square waves.

Assume that a sharp pulse rides in through the V1 grid, our input section shown in broken lines, while C2 is discharging (waveform 1, time B-C) to the point where it will permit plate conduction. If this sharp pulse occurs at about the point indicated by the arrow, it will instantaneously drive the grid up out of the cut-off region. In other words, the tube will be driven into conduction sooner than if it had to wait for the completion of the C2 discharge cycle.

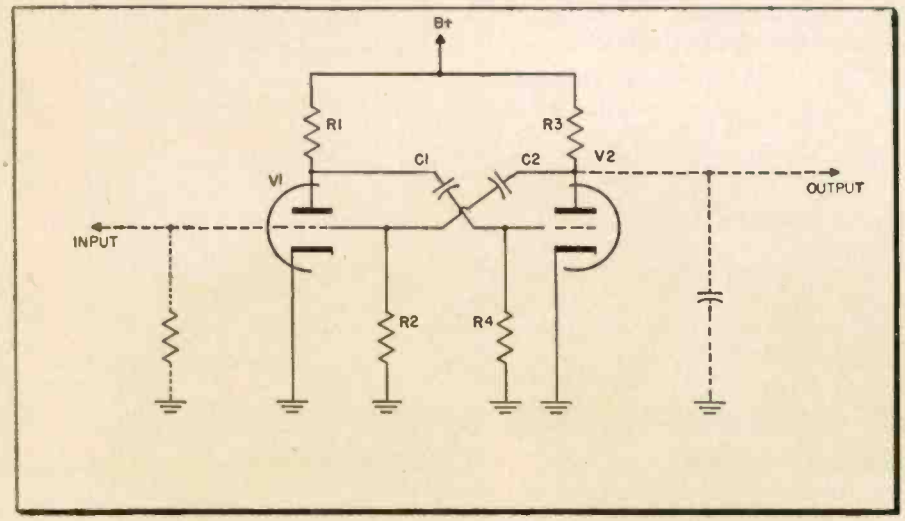
When the multivibrator is used as a vertical oscillator, this is exactly what happens. The service technician or the customer has manipulated the hold control (R4, which we have made variable) so that the see-saw is running at a slightly lower rate than 60 cps. The sharp pulse, at 60 cps, is the output of the vertical integrating network. It hastens the flop-over action in the manner just described to lock in the oscillator.

Another way of altering the frequency of oscillation is by applying a small dc voltage, rather than a pulse, to the 1st grid. This will, depending on whether it is positive or negative, raise or lower tube bias slightly above or below the cut-off point (C. O. in waveform 1). This hastens or retards triggering of the tube, and may thus be said to increase or decrease the frequency of oscillation. This method is generally used when the multivibrator appears as a horizontal oscillator. The dc control voltage is usually the output of the phase detector described in *Let's Look At Circuits, No. 1* (May 1955 TECHNICIAN).

While we have shown the V2 output as a squarish pulse, this shape is generally altered. The insertion of the plate-to-ground charge-discharge condenser, shown in the broken-line output circuit, re-forms the pulse into the sawtooth shape needed to produce deflection. The sawtooth may then be fed directly to the grid of a deflection output

(*Continued on page 44*)

Fig. 1—The basic multivibrator circuit, in which 2 triodes alternately cut each other off.



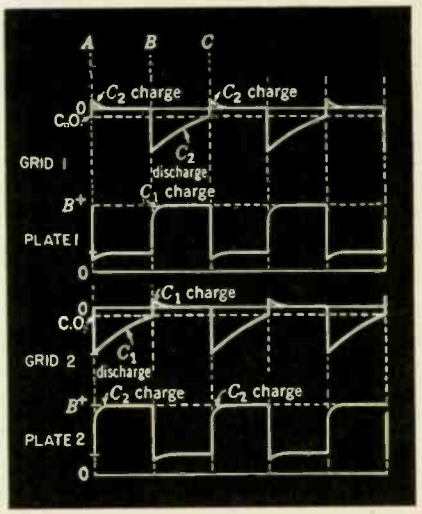


Fig. 2—Grid and plate waveforms for both triodes of a normally operating multivibrator.

Ask "The Man on the Roof" why he prefers South River

Take CHIMNEY BANDING for instance...

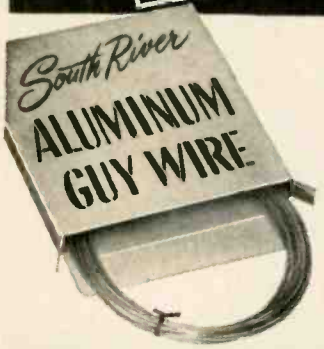
Why take this?

The troublesome watchspring effect —Some servicemen have to put up with banding that has a tight spiral "set". Bands of this kind can easily be spotted by their reluctance to stay put. Placement around the chimney is difficult and time consuming.

You can have this?

This is the "free-opening" South River Band. Remove the retaining tape and you'll see it naturally unwinds for easy placement around the chimney. That's South River's way of making things easier for the man-on-the-roof.

NEW! **Hi-Strength Aluminum Guy Cable Equivalent to 6-18 Steel Wire**
Highly Resistant to Atmospheric Corrosion



This 7-strand aluminum guy cable of 17 ga. Alclad 56S alloy is specially made for TV guying purposes. It should not be confused with converted clothesline types of cable. Our particular cable has a "tight" twist that gives maximum strength, minimum wind resistance and ice load, does not "basket" when bent. Grey Alclad finish.

Available in 100 ft. coils individually boxed, or ten 100 ft. coils, interconnected and packed 1000 ft. to the box.

Also . . . for Lightning Protection; our EC Aluminum Ground Wire. High conductivity #8 gauge. Packaged 100 ft. per coil.

South River METAL PRODUCTS CO., INC.
South River, New Jersey

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WRITE FOR OUR 1955 CATALOG

LETTERS
To the Editors

Night Crawlers—Pro & Con

EDITORS, TECHNICIAN:

In answer to Mr. Arthur M. Vikla's letter in your May issue about "Night Crawlers"—perhaps I come under that bracket. I have had a part-time legitimate radio repair business since the late twenties in which I turn out several hundred dollars in service work each year, nights and week ends. I have a clientele of which I am proud . . . many will allow no other serviceman to touch their sets.

I have all the work I want. It comes from honest, hard work, good work, prices fair to both me and the customer and generally practising the golden rule.

It requires something besides a nice shop, some test equipment and a new sign over the door to get started in the radio and TV service business. My advice to anyone planning to start in it is to start as a "Night Crawler."

C. W. BLATCHLEY
East Freehold, New Jersey

EDITORS, TECHNICIAN:

Agreed with Mr. Arthur Vikla that the "Night Crawlers" are more harmful than the need for new blood. We need not worry about the so-called "expanding service industries." Where an area having 75,000 to 100,000 sets in use cannot supply more than 12 to 15 sets for repair to a firm in business 20 years, do we need to worry about new blood and expanding TV service?

LUCH RADIO & TELEVISION
Allentown, Pennsylvania

EDITORS, TECHNICIAN:

In this business, as in any business, underhanded methods are sometimes used by the undesirables. Without a determination to strike out against them, competition would be at a low level. I work part time because I want to. The security that my regular job holds makes me think twice before giving it up. The television profession fluctuates but, due to my main love, I am in it on a part time basis. Mr. Vikla has no basis to prove this is what drove him out of it. We render honest, efficient service at a normal price. I do not believe in trying to entice people into so-called service bargains.

GEORGE E. FOGLEMAN
Washington, D. C.

More on "2-Fisted Action"

EDITORS, TECHNICIAN:

I am in perfect accord with your editorial "Two-Fisted Action." However, not understanding the law in such matters, the average technician is reluctant to

(*Continued on page 42*)

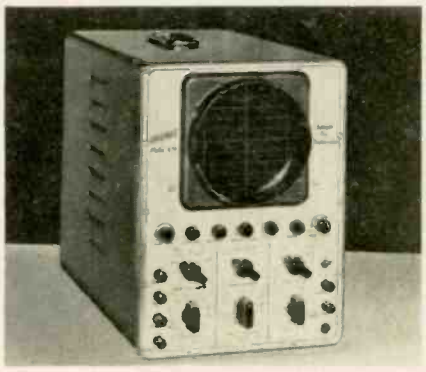
New Test Equipment

C-D ANALYZER

New deluxe Model BF-70 Capacitance-Resistance Analyzer quickly and accurately measures the important characteristics of essentially all types of capacitors and resistors. Locates capacitor opens, shorts and intermittents; high and low capacities; also detects high leakage and high power factor in electrolytics. Reads voltage measurements to 750 v. and current measurements to 75 ma. $71.50 Cornell-Dubilier Electric Corp., S. Plainfield, N.J.—TECHNICIAN (Ask for No. 7-23)

Hickok OSCILLOSCOPE

Model 675, designed for both color and b & w TV servicing, features a calibrated and illuminated scale with a green filter to reduce reflections caused by incidental illumination and astigmatic focus control. Scope has a frequency response of 1 cps to 4.5 mc (within 3 db) and is flat through the color burst frequency of 3.58 mc. Sensitivity is 20 mv rms/in. Hickok Electrical Instr. Co., 10523 Dupont Ave., Cleveland 8—TECHNICIAN (Ask for No. 7-24)

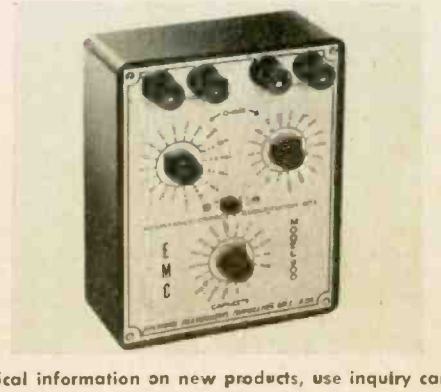


Eico BATTERY TESTER

Model 584 Battery Tester accurately tests all "A" and "B" portable radio batteries and equivalent types under actual receiver conditions without requiring them to be installed in the equipment. Rotary switch selection of the exact voltage of the battery under test inserts the proper dropping resistor in series with the meter and proper shunt resistor. Kit—$9.95; wired, $12.95. Electronic Instr. Co., Inc., 84 Withers St., Brooklyn 11—TECHNICIAN (Ask for No. 7-21)

EMC SUBSTITUTION BOX

Model 900 Resistance-Capacity Substitution Box provides, within 10% accuracy, 36 standard RETMA resistor values from 15 ohms to 10 megohms and 18 standard RETMA capacitance values from .001 mfd. to .22 mfd. Simplifies determining the proper values of resistance and capacity in RC time circuits. Available wired and tested for $17.90, and in kit form for $10.25. Electronic Measurements Corp., 280 Lafayette St., N.Y. 12—TECHNICIAN (Ask for No. 7-22)



RCA MODIFICATION KIT

RCA WO-88A oscilloscopes can be adapted to color TV testing with the addition of the components contained in the WG-388A Wide-Band Modification Kit. After modification, the scopes may be used for trouble-shooting chrominance circuits, and for observing and measuring color-burst signals. The modified scope will provide both narrow-band and wide-band operation at frequencies from zero (dc) to 4.5 mc. and sensitivity of 700 mv, peak-to-peak, per inch. $5.95. Tube Div., R.C.A., Harrison, N.J.—TECHNICIAN (Ask for No. 7-25)

Jones R-F WATTMETER

Model 641N calorimetric type r-f wattmeter measures r-f power with the precision of a primary standard, according to mfr. It can be used to check the accuracy of other types of r-f wattmeters and to determine the actual output of an r-f power source, the approximate magnitude of which is known. Instrument has an accuracy of better than ± 2% over the entire frequency range of 0 to 3000 mc. It measures power in the range from 0 to 300 watts. M. C. Jones Electronics Co., Inc., Bristol, Conn.—TECHNICIAN (Ask for No. 7-27)

Telectro BRIDGE

Designed to measure flutter and wow in turntables and tape recorders, the "Flutter Bridge" consists of a sensitive bridge circuit and a band-pass filter to eliminate hum. Portable, no external power source needed. Two ranges: 0-0.5% and 0-2%. Telectro Industries Corp., 35-18 37th St., L.I.C., N.Y.—TECHNICIAN (Ask for No. 7-80)

Authorized CRT CHECKER

New Cathode-Rejuvenator-Cathode Ray Tube Tester, Model 101F, features the exclusive "Rejuvindicator" which tells automatically when the rejuvenation process is sufficient, giving positive indication of cathode decontamination and aging. The rejuvenation process has been engineered to provide safer and greater assurance of rejuvenation accuracy, with grid structures positively unharmed during processing. Also features an indication of true beam current, including second anode condition, and the ability to test shorts and high resistance leakage in "hot" as well as "cold" cathode ray tubes. Measures 8 x 8 x 3 in. Gray hammertone steel case, as well as in a portable luggage-type instrument case which has space for leads. $54.95. Authorized Mfg. Co., 919 Wyckoff Ave., Brooklyn 27, N. Y.—TECHNICIAN (Ask for No. 7-17)

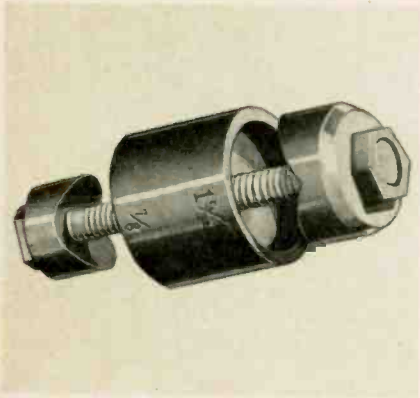
For more technical information on new products, use inquiry card on page 38

New Service Aids

Chassis Punch, Hand Drill, Soldering Gun; Roof Mount

G-C METAL PUNCH

New "G-C Dual Sheet Metal Punch" punches tube socket and capacitor holes easily and quickly, taking metal up to



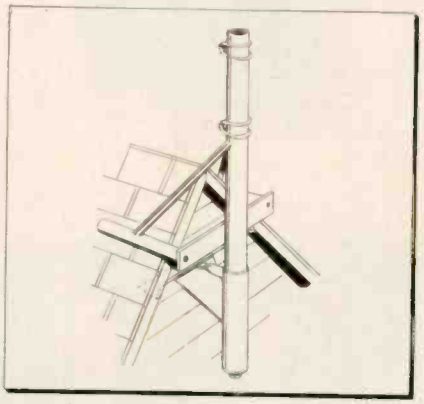
$\frac{3}{32}$ in. thick without burrs. (Hole sizes punched are $\frac{7}{8}$ in. and $1\frac{13}{32}$ in.) Net price, $3.50. General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.—TECHNICIAN (Ask for No. 7-15)

Lynmar BALUN

Developed to provide a better and more economical means of matching TV receivers in critical community television work, this balun unit has been found to be ideally suited for impedance matching. In addition the inherent "block effect" of the longitudinal impedance of the unit has been found to have exceptional characteristics for reducing spurious signals originating on a 300 ohm ribbon lead or on the shielding of coaxial cable. Such problems as noise pick-up, ghosts and reflections, can be greatly reduced or eliminated. Lynmar Engineers, Inc., 1432 N. Carlisle St., Philadelphia 21, Pa.—TECHNICIAN (Ask for No. 7-3)

Rohn ROOF MOUNT

Unique gable mount is designed to quickly attach to any gable roof for a secure, durable antenna mounting.



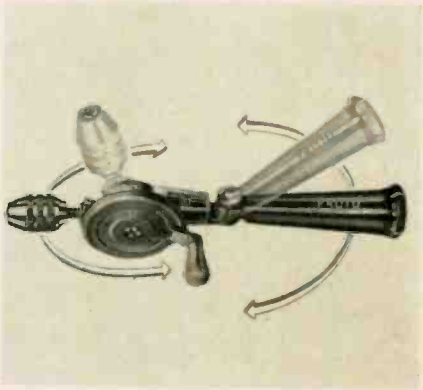
Simply loosen bottom bolt, slip mount into place, and then tighten bolt. Accommodates tubing up to $1\frac{1}{2}$ in. in diameter. Rohn Mfg. Co., 116 Limestone, Bellevue, Peoria, Ill.—TECHNICIAN (Ask for No. 7-11)

B-T COUPLERS

Low cost directional couplers for master TV lines and TV outlets, Models, MDC-2 for two outlets, and MDC-4 for four outlets, supply effective reverse isolation ranging from 14 to 30 db over the entire VHF band. This permits direct TV outlets as well as branch cables from which tapoffs may be made. Splitting loss is only 3 db for MDC-2 and 6 db for MDC-4. The units require no power and may be mast or pole mounted with the convenient bracket and strap. The two-outlet coupler lists for $12.50 and the four-outlet unit lists for $22.50. Blonder-Tongue Labs., Inc., 526-536 North Avenue., Westfield, N. J. —TECHNICIAN (Ask for No. 7-2)

Proto DRILL

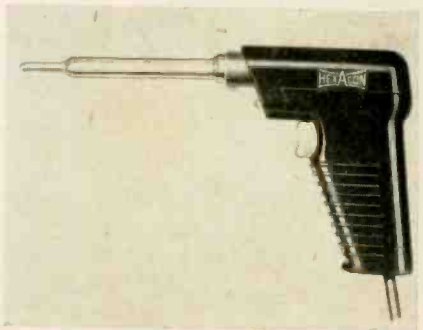
"Proto" all-angle drill solves difficult drilling problems for both professional tool users and home mechanics. Both



chuck and handle are adjustable to various angles, so that the drill will reach around obstructions, work close to floors and walls, and operate in close quarters: The 0 to ½ in. capacity chuck swings in a 270° arc, and has a spring lock that enables the user to change angles with a flip of the thumb. The handle turns in a 180° arc at right angles to the chuck movement path. Plomb Tool Company, Los Angeles, Calif.—TECHNICIAN (Ask for No. 7-4)

Hexacon SOLDER GUN

New instant solder gun is claimed to be soldering-hot in a few seconds, without the use of transformer or thermostats. Weighs 8 oz. Special alloy "Lifetime Tip" cannot wear, corrode or bend —thus eliminating tip maintenance. Trigger control gives any degree of



heat required without danger of overheating. Has more heat capacity than size indicates and tiny ¼ in. tip for finest soldering, but will do heavier work because heating element is right in the tip. $7.95. Hexacon Electric Co., 180W, Clay Avenue, Roselle Park, N. J. —TECHNICIAN (Ask for No. 7-70)

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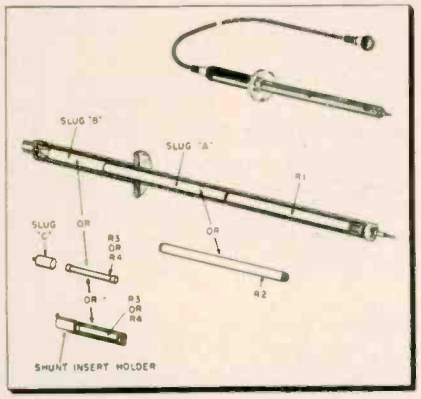
High-Voltage Probe

(*Continued from page 19*)



The h-v probe (upper right) and its component parts, showing various arrangements possible.

elements can be placed in parallel with the meter resistance, while other elements are in series. This permits flexibility in obtaining simple multiplication factors to be used in conjunction with the direct meter readings.

The manufacturer supplies convenient charts and graphs to cover the arrangement of resistors for almost every input resistance in which meters of various types are available. The probe will be particularly appreciated in shops where a single probe is needed to work with all meters available in the shop when, as is so often the case, two or more instruments of different types are in regular use.

Manufacturer of the probe is Boland & Boyce, 236 Washington Avenue, Belleville, New Jersey.

NEW 17-IN. PORTABLE TV

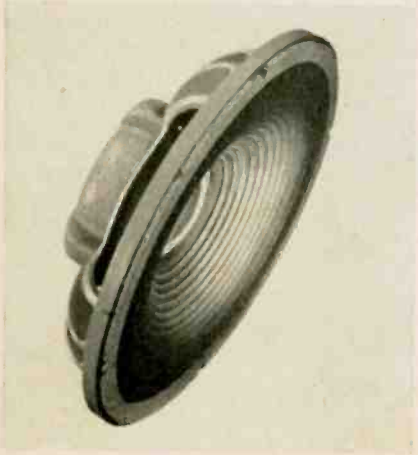
Newest in the line of Setchell-Carlson's "Unitized" TV receivers, this portable version has all-aluminum construction of both chassis and cabinet. Weighs less than 40 lbs., yet boasts power transformer, keyed AGC, cascode tuner, 6-in. speaker and 90° aluminized 17-in. crt

New Hi-Fi Gear

Speakers, Amplifiers, Pre-Amps; Intercom, Recorder

Lansing SPEAKER

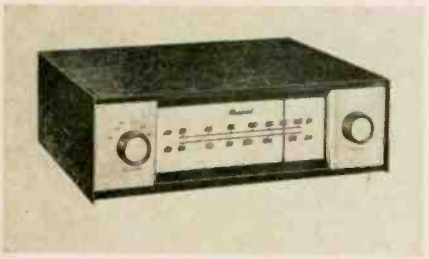
Model 123 is a 12 in. extended range speaker, compact enough to mount in enclosures which previously required a unit of smaller diameter. Depth of only 3⅝ in. permits the new speaker



to be mounted between studding, flush with the surface of any standard wall or partition. The unit is not limited to wall mounting; performance improves when enclosed in a reflex cabinet or loaded with a horn. Usable frequency response range, when used as a direct radiator and enclosed with an adequate baffle, extends from 30 to 15,000 cps. Power input is 20 watts and impedance is 16 ohms. James B. Lansing Sound, Inc., 2439 Fletcher Dr., Los Angeles—TECHNICIAN (Ask for No. 7-90)

R-B AM-FM TUNER

"Golden Gate" AM-FM tuner (Model HF 155) features high fidelity performance in compact design. Outstanding features include: FM section with Armstrong circuitry; response, ± .5 db, 20 to 20,000 cycles; sensitivity, 5 μv for 30 db of quieting; tuned RF stage, Foster-



Seeley discriminator with dual limiters; cathode follower with two outputs; AFC with defeat on function switch; drift-compensated circuits; built-in dipole antenna. Rauland-Borg Corp., 3515 W. Addison St., Chicago 18, Ill.—TECHNICIAN (Ask for No. 7-91)

Berlant TAPE RECORDER

The new "Concertone 20/20," for home and semi-professional use, features a head mount with provision for 5 heads, 3 heavy duty motors, including a 2-speed induction direct drive motor, frequency response of 20-20,000 cps, 4½ in. signal meter, 2-channel line and microphone mixer and fast forward and rewind at 2400 ft. in less than 1 min. Available with speeds of 7½ and 15, or 3¾ and 7½ ips., and in portable carrying cases or for rack mounting. $445.00. Berlant-Concertone, 4917 W. Jefferson Blvd., Los Angeles 16, Calif. TECHNICIAN (Ask for No. 7-92)

Precise PRE-AMP

Model UPA-1, ultra preamp, has separate controls for bass boost, volume, record compensation (including the latest AES Curves) and separate treble boost and roll off. The main selector switch connects to phone, microphone, radio, TV and an auxiliary position. Four separate input jacks are mounted on the rear chassis. A separate on-off

switch also operates the convenience outlet at the rear of the instrument. Model UPA-1P, kit, with its own transformer operating directly from the 110 v. ac line, is $25.95 and wired, as UPA-1PW, at $39.95. Also, there is Model UPA-1N, kit, without separate power supply, operating directly from the main amplifier, at $19.95; and wired, as UPA-1NW, $34.95. Precise Development Corp., Oceanside, L. I., N.Y.—TECHNICIAN (Ask for No. 7-93)

Robins PHONO ACCESSORY

"Atomic Jewel," SE-9, is a new radioactive device for making records dust-resistant. Clips on the tone arm of any record player. Consists of a small ball of pearlescent plastic; is only 9 mm. in diameter, and weighs less than 0.02 oz. Contains a small amount of radio-active material compounded with pure gold and silver. Robins Industries Corp., 41-08 Bell Blvd., Bayside 61, N. Y.—TECHNICIAN (Ask for No. 7-94)

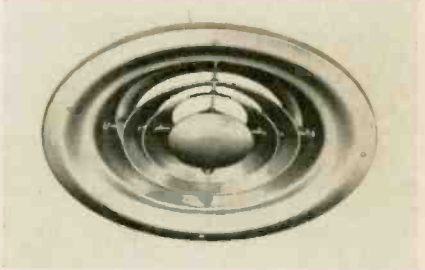
Masco INTERCOM

Completely portable intercom, the "Wireless-Talk," for home and office, provides contact between any two stations even in nearby homes and adjacent buildings without any cables. Fea-

tures include a noise silencing control that reduces noise normally present on power lines, and a pilot light on-off indicator. "Dictate" position of the Talk-Listen Switch permits use for baby-sitting, dictation and similar applications. Set of two units, $95.00. Mark Simpson Mfg. Co., Inc., 32-29 49 St., Long Island City 3, N. Y.—TECHNICIAN (Ask for No. 7-95)

Lowell BAFFLES

STL baffles are constructed of a series of attractive louvres with an exclusive conical sound diffuser to provide controlled 360° dispersion of even, undistorted low-level sound. Specifically designed for low ceiling areas such as restaurants, offices, schools, railway



cars and wired music installations, they accommodate 6 in. to 12 in. speakers and mount to a variety of recessed protective speaker enclosures. Exclusive "floating conical action" eliminates metallic resonance. Lowell Mfg. Co., 3030 Laclede Station Road, St. Louis 17, Mo.—TECHNICIAN (Ask for No. 7-96)

MORE TECHNICAL INFORMATION

on new products may be obtained by using the inquiry coupon on page 38. List the code numbers given at the end of each item of interest.

Signal Generator

(*Continued from page 21*)

with any operating TV set. Simply clip the generator output cable to the insulation on the lead to the grid of the 1st or 2nd sound i-f stage, and rock the generator dial back and forth slowly in the vicinity of 4500 kc while a TV channel is being received. A distinct but "mushy" sound will be heard in the receiver when the setting is exactly 4500 kc. Note that inaccuracies in receiver alignment will not throw this reading off, since the 4.5 mc signal is the result of the beat between transmitted video and sound carriers, which are accurately spaced 4.5 mc apart.

Scale 5 (approx. 4500 to 12,000 kc. or 4.5 to 12 mc), covers several short-wave bands and the i-f amplifier frequencies for FM receivers. Two accurate points (5 and 10 mc) can be determined by beating against WWV on its 10-mc transmission; while an additional point (7500 kc) can be recorded by beating against the WWV 15-mc transmission.

Scale 6, which covers TV intermediate frequencies, is called upon to provide accurate marker pips during alignment. Calibration is accomplished by beating against TV transmissions. The next time a TV set is on the bench for alignment or check of response, connect a *sweep* generator to its antenna posts, and connect a scope to the video detector output, just as is done in regular alignment (see Fig. 5). Couple the signal or marker generator output to one of the antenna posts through a 100-mmfd capacitor and set the generator to its highest band.

Before turning the generator on, tune the operating receiver to a local channel, and note on the scope the pips produced on the response curve by the video and sound carriers. These are shown for Channel 4 in Fig. 6. In this particular case, the sound carrier will be 71.75 mc and the video carrier will be 67.25 mc. The signal generator is turned on and tuned through the range of 22 to 24 mc. At 23.92 mc and 22.42 mc, third harmonic output will produce pips that coincide exactly with the carrier pips on the response curve. If the generator's modulation switch is turned on during this step, the baseline of the curve will "come to life" or begin to wiggle when the pips coincide exactly, giving a positive identification. As indicated in the table of Fig. 6, other calibration points can be worked out. •

(*Continued from page 36*)

act for fear of violating some legal statute; such as restraint of trade, price fixing, or naming an individual or company.

ALBERT C. W. SAUNDERS
Educational Director
Radio-TV Technicians Guild, New England
Belmont, Mass.

• *A legal authority whom the editors have consulted says, "I have examined your "Two Fisted" editorial with great interest. First, let me say I thoroughly approve of the basic idea. I disagree with those who are concerned about the legality of the program as a whole. . . . As a matter of law, a dealer is free to trade or not to trade with anyone he chooses, for any reason he chooses, including a dislike of the distributors' or manufacturers' price policy. . . ." Other aspects of the problem will be considered in forthcoming issues of TECHNICIAN.—Ed.*

Color TV Response

EDITORS, TECHNICIAN:

I read with much interest your editorial, "Get Started in Color Tv Now" in the June issue. Would you please send the data that I need to obtain a color TV set wholesale? I intend to take your advice and start color TV now. We are surrounded by wealthy homes and people should be interested.

PAUL G. MATHEWS
Mathews Radio & TV Service
Bloomingdale, N. J.

EDITORS, TECHNICIAN:

I am interested in obtaining information on where to get a color TV set wholesale. There seem to be many problems involved. Most prominent is the question of whether the present standards will be continued. Color broadcasts are few at this time.

WILLIAM TURNER
Esan Electronic Labs.
Brooklyn, N. Y.

• Messrs. Mathews and Turner, as well as other readers who wrote for color TV information, have been referred to the proper sources, wherever such sources exist. We are attempting to work out a more extensive program with manufacturers to make color sets readily available to technicians. Although set designs may change, as they have done for the past nine years, FCC color standards will remain the same, according to all indications. Color programs are expected to increase this fall, but now is the time to get started in color.—Ed.

Get It Off Your Chest

Do you have any gripes that fellow technicians might be interested in? Let us know about them. Another reader might have the answer you've been looking for.

Service Ass'n Reports

Weapon Against Retailing Distribs?

Radio Television Guild of Long Island, Box 87, Bethpage, N. Y., is contemplating a test legal action that may have considerable impact in the matter of distributors who sell to the public at the same price they charge legitimate service technicians. If the action goes forward, it cannot be launched directly against the jobber. However, if successful, it would have the desired final result.

In a recent issue of its *News*, the Guild asks: "Can a manufacturer engaged in interstate commerce 'discriminate in price between different purchasers of commodities of like grade and quality?' . . . or, to put it another way . . . is it lawful under the provisions of the Robinson-Patman Antidiscrimination Act for a manufacturer to sell his product to a 'distributor' who sells directly to the public, at a better price than to the retail service dealer against whom (the distributor) is competing?"

If the Guild's premise is correct, there is no basis for action against the jobber, since no law prevents him from selling to whom he chooses. The *manufacturer* who sells to the distributor, however, could be found to be discriminating in favor of the jobber—who is in competition with the dealer. Manufacturers would then have to ask the same price from such jobbers that they would get from the technician-dealer.

A recent FTC decision solidifying the antidiscrimination provisions of the Robinson-Patman Act may have considerable bearing on the case. According to this ruling, extra discounts given on the basis of large orders would have to meet 2 requirements to be legal: (1) The same discounts must be available to *all* who buy in comparable quantities and (2) the extra discount may *only* reflect the actual savings to the manufacturer resulting from the size of the order. Several cases in other fields of activity, based on this decision, are now pending.

RSA Sponsors Color Lecture

The Radio Servicemen's Assoc. of Trenton, N. J. held an open house color TV demonstration recently which was attended by more than 150 TV technicians and service dealers. M. E. Heath, Westinghouse color TV engineer, conducted the proceedings.

(*Assoc. News contd. on page* 45)

Catalogs & Bulletins

BATTERIES: Copies of the new 1955 NEDA Battery Index, with a 3-line imprint, suitable for distribution by battery manufacturers and private label companies, are now available from the NEDA office at 4704 W. Irving Park Rd., Chicago 41, Ill. @ $38.00 per 1,000. (Ask for No. B7-1)

HEAT DETECTORS: New 4-page illustrated brochure describes 3 types of remote detectors of infra-red energy designed for use in heat detection, measurement or control systems. Write Servo Corp. of America, 2020 Jericho Turnpike, New Hyde Park, N.Y. (Ask for No. B7-2)

PHOTOELECTRIC SYSTEMS: Bulletin No. 1252, 15 pp., describes a line of photoelectric cells, and associated equipment, relays, time delay units and burglar alarms with typical applications. Worner Electronic Devices, Rankin, Ill. (Ask for No. B7-3)

HERMETIC SEALS: Complete technical data and drawings on the line of Vac-Tite compression single terminal feed-thru's and stand-offs is contained in a 4-page brochure available from Hermetic Seal Products Co., 29-37 S. Sixth St., Newark, 4. (Ask for No. B7-4)

CONTROLS: Spring 1955 pocket edition of the "Centralab" Control Guide cross-indexes manufacturers part no. with equivalent Centralab replacement for all standard radios, TV's, auto radios and audio equipment. 20¢. Centralab, Div. of Globe-Union Inc., 900 E. Keefe Ave., Milwaukee, 1. (Ask for No. B7-5)

TEST EQUIPMENT: New 8-page booklet on TV alignment equipment contains reprinted articles on the use of the Model 691 Marker Adder and the Model 690 Marker Generator. Write Hickok Electr. Instr. Co., 10606 Dupont Ave., Cleveland 8 (Ask for No. B7-6)

RESISTORS AND HARDWARE: Catalog "D-55" describes the Erie line of Teflon electronic components, including stand-off and feed-thru insulators, sockets and spaghetti, also various types of capacitors and resistors. Erie Resistor Corp., Dept. S, Erie, Pa. (Ask for No. B7-7)

CAPACITORS, RESISTORS: Distributor catalog D.C. 359, available through jobbers only, describes a full line of paper, mica, ceramic and eletrolytic capacitors, also filters, resistors and printed circuit units. Aerovox Corp., New Bedford, Mass. (Ask for No. B7-8)

SPRAY KIT: Catalog sheet describes the new "Crown" Spray Line utility kit, containing individual cans of lubricating oil, penetrating oil, rust inhibitor and clear plastic. Crown Industrial Prods. Co. 724 Amsterdam St., Woodstock, Ill. (Ask for No. B7-9)

PRINTED CIRCUITS: Bulletin M-1 contains technical specifications on the Type MCR molded printed electronic circuits, including their construction, dimensions, lead connections and applications. International Resistance Co., 401 N. Broad St., Phila. 8. (Ask for No. B7-11)

OBTAIN THE BULLETINS

described here by writing on company letterhead to Bulletins Editor, TECHNICIAN, 480 Lexington Ave., New York 17, N. Y., listing numbers given at end of each item of interest. Please mention title of position held. Use coupon on page 38.

New Books

ELEMENTS OF PHYSICS. *2nd Edition. By George Shortley and Dudley Williams. Published by Prentice Hall Inc., 70 Fifth Ave., New York, N.Y., 880 pp. Hard cover. $10.60.*

The first edition of this book, which appeared 2 years ago, proved so popular that the publishers decided to follow it up with this new revised edition to incorporate the many constructive criticisms and suggestions made by users of the text.

The book is intended for use in an introductory course for the student of science or engineering. Mathematics is used as a tool, but no attempt is made to teach math for its own sake. Plane trigonometry is used extensively, and calculus is introduced gradually in the latter sections of the book.

Emphasis, in the first part of the book, is on the fundamental principles which describe all physical phenomena. Later sections deal with specific applications. An exceptionally comprehensive section, almost 400 pages, deals with electricity and magnetism. Subjects covered include: transistors, vacuum tubes, ac and dc voltmeters, Kirchhoff's Laws, ac circuits and transformers.

THE NEW HIGH FIDELITY HANDBOOK. *By Irving Greene and James R. Radcliffe. Published by Crown Publishers, Inc., 419 Fourth Ave., New York City 16, N.Y. 193 pp. Hard cover. $4.95.*

This volume, written on an intermediate technical level, provides a comprehensive practical education in high fidelity. It is liberally illustrated with 250 pictures and drawings, and includes descriptions of numerous products commercially available from various manufacturers.

The first six chapters discuss hi-fi system performance, component functions, recorded sound, FM radio, sound amplification and reproduction. The section on home recording covers recording techniques, tape performance and care. Hi-Fi installation planning and styling, and how to make hi-fi furniture are explained. One chapter presents basic servicing and maintenance, describing some of the most common symptoms. An informative glossary, buying guide and instructions for making a crossover network are among the book's many features.

Rohn Exhibit Highlighted

The engineering, production and testing procedures used by Rohn Mfg. Co. in the manufacture of their line of towers, masts and accessories were depicted in their "Towerama" presentation at the Electronic Parts

Scene from "Towerama" presentation

Show in Chicago. A series of twenty-one 3-dimensional film slides in full color vividly presented the processes performed in their hot-dipped galvanizing plant.

Let's Look at Circuits

(*Continued from page* 34)

tube. In some designs, the plate-to-ground condenser is omitted; the pulsed output is just as has been shown in waveform 4; and the succeeding stage is a separate charge-discharge tube.

Twin triodes lend themselves very well to use in multivibrator circuits. Commonly used types are the 6SN7, 12AU7, and 12BH7. As a point of recognition, the garden-variety multivibrator described here is not the most common type used in TV receivers. It was chosen because it best lends itself to the explanation of how circuits of this sort work overall. The cathode-coupled multivibrator is most often encountered in practice. Its distinctive feature is the fact that both cathodes, tied together, are returned to ground through the same resistor. This common path provides the needed feedback between the two triodes, which has been accounted for by means of the coupling capacitors in the general circuit described here. Other refinements may include a stabilizing coil in the circuit. These are points, however, which are best left to a separate discussion of the cathode-coupled multivibrator at some future time. •

(*Assoc. News contd. from p. 43*)

New Addition to FRSAP

New release from the Federation of Radio Servicemen's Associations of Pennsylvania reports induction ceremonies in which the TV Service Dealers Assoc. of Chester, Pa. Inc. became affiliated with FRSAP. Same release commends TECHNICIAN & Circuit Digests for editorial (See May, 1955) on the evils of wholesale selling on a retail basis by parts distributors.

New Michigan Associations

The new South Oakland County TV Association, P.O. Box 267, Royal Oak, Michigan, includes 22 service shops in the S. Oakland County area. Officers are: pres., F. S. Mosier; vice-pres., D. DeMezlo; secy., A. N. Pallota; treas., R. Miller. The association's efforts are now directed at promoting a state licensing bill.

The Television Service Dealers Assoc., 3956 S. Division Ave., Grand Rapids, Mich. was recently formed, and elected the following officers; pres., Mort Binder; vice-pres., Floyd Snip; secy., Chas. La Roche; and treas., Al Matson.

Blasts Tube Coding

S.T.T.A. News, published by the Syracuse TV Technician Assoc. Inc., lashes out at the new industry practice of coding receiving tubes with incomprehensible date codes. How, asks the News, can technicians rotate their stock so as to use the oldest tubes first, if there is no indication as to which tubes actually are the oldest? After pointing out that their experience shows that failures among first run tubes are running exceptionally high, they suggest the possibility that the tube manufacturers "are adopting the new code date system in order to confuse the service industry so they will be cheated out of their warranty."

Vibrator Power Supplies

(*Continued from page 28*)

of the waveform in Fig. 5B. The pulsating dc voltage can then be filtered to the desired degree through conventional filter circuits.

One might note that, if the positive terminal of the battery were grounded and the negative terminal connected to the center tap of the transformer (this is a common connection, as many automobiles have a positive ground), the primary current would be reversed and the output voltage would be negative. To overcome this, most "self-rectifying" vibrators have their base pins arranged symmetrically such that the vibrator is actually "reversible" in the socket. This effectively reverses the primary winding connections as indicated by the dashed-lines in Fig. 5A. The pin connections to the secondary contacts are cross connected on the socket so that the secondary will not be reversed also.

Another characteristic of the self-rectifying vibrator is that the primary or "interrupter" contacts and the secondary or "rectifier" contacts have different time efficiencies. The contacts are actually adjusted such that the interrupter contacts will always close first, with the rectifier contacts lagging slightly behind. This is done so that the commutation will take place at a high-voltage, low-current level rather than at a low-voltage, high-current level. This, in turn, permits handling of greater loads as less heating results in the contacts. However, commutation of a high voltage naturally results in a good deal of sparking which is occasionally difficult to overcome. •

News of the Industry

DAN D. HALPIN has been appointed asst. gen. mgr. in charge of marketing and gen. sales mgr. of the Westinghouse Corp.'s TV-Radio Div. Mr. Halpin was formerly gen. sales mgr. of DuMont's Receiver Div. and has also been previously with RCA Victor and Dictograph Products Co., Inc.

COMMUNITY TV CABLE SERVICE SECTION has been created at Federal Tel. & Radio, Clifton, N.J. to provide technical information and associated services to Community TV operators.

JERROLD ELECTRONICS CORP. has broken ground for its new 5,700 sq. ft. lab. The 1-story cinder block building is expected to be in use by Fall 1955.

W. P. READY has been appointed gen. sales mgr. for WALLACE'S TELAIDES, INC., Jamaica Plain, Mass.

OXFORD ELECTRIC CORP. has expanded their transformer facilities to include the manufacture of power and/or filament transformers as well as ballast and vibrator types of transformers.

SIDNEY HERBTSMAN has assumed the presidency of G & H WOOD PRODUCTS CO., INC., manufacturers of hi-fi cabinets.

FRANK VAN GILDER has been named asst. sales mgr., Merchandise Division, of International Resistance Co., Phila. He will assist in distributor sales promotion and merchandising.

HOWARD GOLENPAUL, son of Aerovox distributor sales mgr., CHARLEY GOLENPAUL, has joined Simberkoff Sales Co., Hoboken, N.J. firm of manufacturers' reps.

TV IN A "CAGE"

Engineers working on color research at Motorola found that near-perfect conditions for studying color reception could be achieved by employing this screened-in booth which screens out everything but the pure test signal.

JACK L. HOBBY has been named manager of publicity and institutional advertising for Raytheon Mfg. Co., Waltham, Mass.

DANIEL NEWMAN was named Director of Product Service at CBS-Columbia.

Reps & Distributors

CHARLES W. LIENAU & CO., mfrs. rep, announces two new additions to its staff: **SPENCER H. GULICK** and **ALBERT FURMAN.**

ARCO ELECTRONICS INC., N.Y.C., has named **LEBAN & GRAHAM** their rep for the Mid-Atlantic area, and **HAROLD A. CHAMBERLIN** for the New England area.

PERFECTION MICA CO., 20 N. Wacker Dr., Chicago, manufacturers of magnetic shielding material, has appointed **PRECISION SALES, INC.** of Utica, N. Y. to handle their products in upper N. Y. state, and the rep firm of **WHITE & CO.,** Palo Alto, Calif. for Northern Calif. and portions of Oregon and Washington.

R. B. BARNHILL & ASSOC. of Baltimore, Md. has been named representative of PYRAMID ELECTRIC CO. for industrial and manufacturing accounts in Del., Md., Washington, D. C., Va. and N. C.

ARTHUR J. SCHUBERT has been named rep for the greater Chicago area for the GENERAL TRANSFORMER CO.

I. R. STERN will handle the MASCO line of sound equipment in Southern Calif., Ariz. and part of Nevada.

SYLVANIA ELECTRIC PRODUCTS, INC. has named five new distributors for its line of electronic tube products: **CAL-TEL SUPPLY CO.,** 4553 Van Nuys Blvd., Sherman Oaks, Calif.; **TAG'S RADIO & TV SUPPLY,** 14350 Calvert St., Van Nuys, Calif.; **PACIFIC TV SUPPLY,** 4032 Figueroa St., Los Angeles, Calif.; **MID-STATE WHOLESALE ELECTRONIC SUPPLY CO.,** 1445 Monterey St., San Luis Obispo, Calif.; and **CERTIFIED ELECTRONICS, INC.,** Albany Ave., Extension, Kingston, N. Y.

WALSCO ELECTRONICS CORP. has been named the exclusive distributor for all products manufactured by CHASE MFG. CO. Among the products are the "Pioneer" chassis punches, the "Ham-R-Press," and "Knurl-Tite" wrenches.

SOUTHERN ELECTRIC CORP., Staunton, Va. has been appointed a distributor for the new line of STROMBERG-CARLSON TV and radio products.

MANIS RADIO & ELECTRIC SUPPLY CO., INC., Montreal, Can., was appointed a distributor for ARCO ELECTRONICS INC.

Renecked Picture Tubes

(*Continued from page 24*)

standards. A new screen and new internal conductive coating are then applied. A new gun is sealed in and the tube is exhausted. The tube is thus completely new in every respect.

The exact percentage of renecks attributable to each cause will vary, but each bulb runs a hazardous course, starting with the bulb manufacturer. As a result (and with some variation from time to time and among tube types) it is likely that many picture tubes have been renecked at some stage, in addition to the renecking necessary to provide the special glass neck required on all tubes.

Renecking is performed in a special glass lathe. The bulb with its foreshortened neck and a new length of neck are heated and sealed together. Care is taken to assure that any irregularities in the glass fall well within specifications. This means the tube will accommodate standard size accessories, such as coils, ion traps or focusing devices.

A picture tube has one primary purpose—to present a good picture for a long period of time. Renecking is of no consequence to the overall quality, performance or life.

It is interesting to note that a manufacturer with high final performance quality standards may reject many finished tubes and, therefore, have an even higher number of renecked bulbs among his finished products than a manufacturer whose standards are not as high. •

Reprinted from "The Capehart Tech-Flash," Vol. 4, Issue 2—Mar.-Apr., 1955

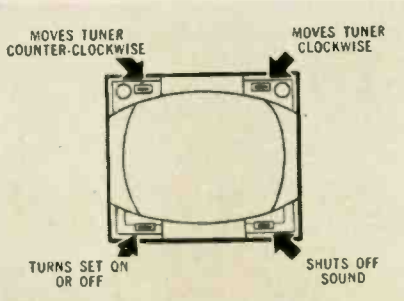
ADVERTISERS INDEX
JULY 1955

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index .

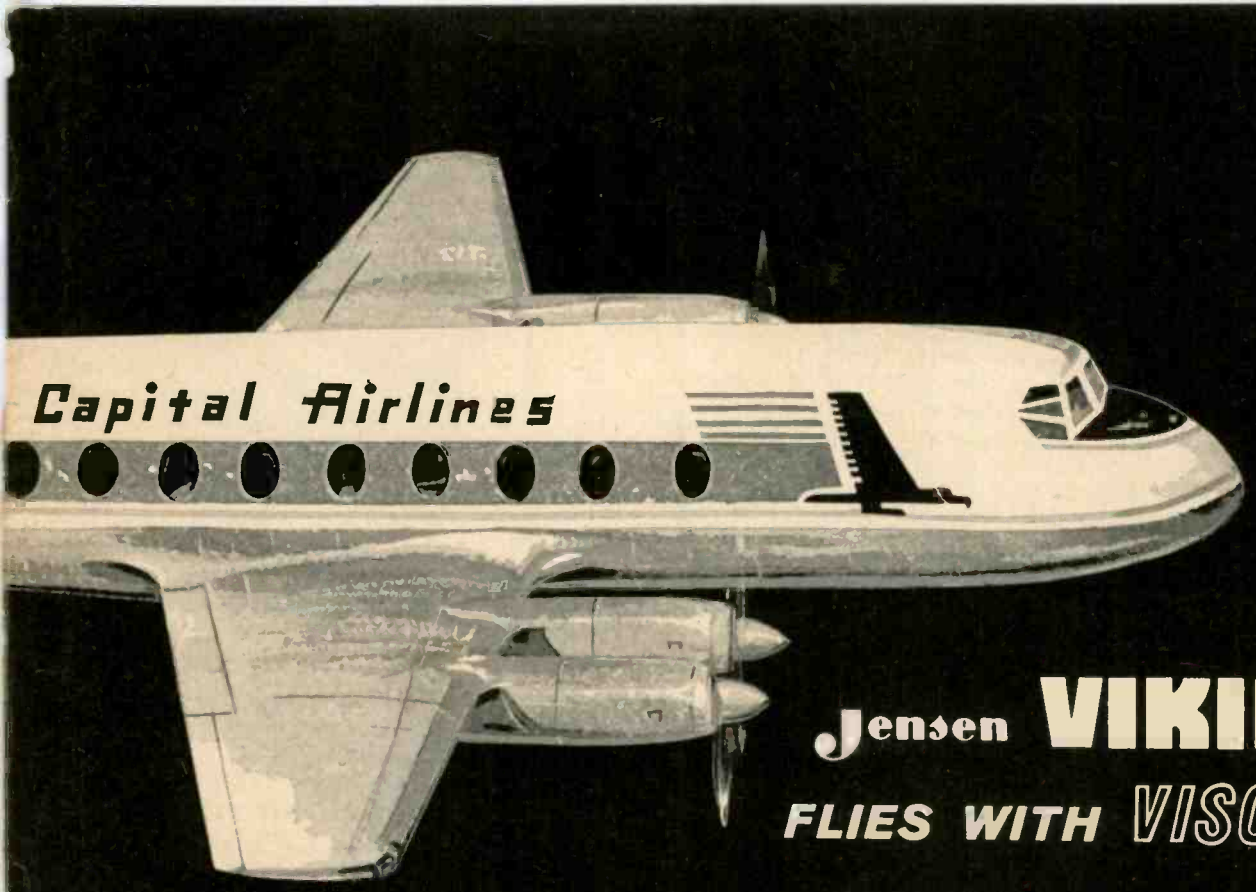
CIRCUIT DIGEST cumulative index will be published in a forthcoming issue. Last index begins on p. 60 of Apr.

FLASH-GUN REMOTE CONTROL

Four models in the new Zenith line are featuring "Flash-Matic," a light operated



remote control system which permits the customer to change channels, turn the set on and off, or turn down the volume, just by hitting the appropriate photo-electric cell with the beam from the flash-gun provided.



Jensen VIKING FLIES WITH VISCOUNT

AN OUTSTANDING AVIATION ACHIEVEMENT!

With the purchase of forty Vickers Viscounts, Capital Airlines culminates an extended search for the type of aircraft to best serve its millions of loyal passengers. These outstanding four propeller turbine engine aircraft will add new and important pages to aviation history.

AN OUTSTANDING SPEAKER ACHIEVEMENT!

Jensen Manufacturing Company is proud of Capital's selection of Viking Speakers for the audio system of this new modern aircraft. This system makes use of 22 Jensen Viking 4J6 type speakers mounted in the thin cabin walls between the windows on both sides of the cabin.

Leading parts distributors and service dealers know VIKING by Jensen as a stand-out economical replacement speaker line with compactness and efficient performance that universally qualifies VIKING for all radio and TV speaker replacements. And when you sell or install a VIKING, you get the same locked-in alignment, the same precision construction and the same dependability that led Capital to specify them for their Viscount fleet.

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WORLD'S QUALITY STANDARD FOR MORE THAN A QUARTER CENTURY

capacitor replacements

FOR SETS OF THE MONTH

ADMIRAL CHASSIS 18XP4BZ

Symbol No.	Rating µF @ WVDC	Admiral Part No.	Sprague Replacement
C-206	4@50	67B27-3	TVA-1303
C-213A (Includes C319, C411)	60+20+5 MF	—	TVL-3640
C-214	40 MF	—	TVA-1611
C-410	10@475	—	TVA-1802
C-501	100+60 MF	—	TVL-3645[1]
C-401—C-403 } R-401—R-403 }	Vertical Integrator	63B6-9[2]	V-1

[1] Parallel 40 MF and 20 MF Sections. [2] May also be 63C9-1

G. E. MODEL A1 300 AMPLIFIER

Symbol No.	Rating µF @ WVDC	G. E. Part No.	Sprague Replacement
C-1	20+20@350	RCE-041	TVL-2626
C-3	30+30+15@450/30@50	RCE-070	TVL-4742

PHILCO CHASSIS TV-300, TV-301

Symbol No.	Rating µF @ WVDC	Philco Part No.	Sprague Replacement
E-1	40@400/80@350/100@200/25@50	30-2584-47	R-2042
E-3	20@475/10@350/5@150	30-2584-50	R-2043

HOFFMAN CHASSIS 306-21, 307-17, 308-21, 309-21, 310-21

Symbol No.	Rating µF @ WVDC	Hoffman Part No.	Sprague Replacement
C-103	5@50	4209	TVA-1303
C-109	5@50	4209	TVA-1303
C-801	100@300/200+40@200	4204A	R-2041
Z-501	Vertical Integrator	9695	V-1

EMERSON CHASSIS 120274 (Transistor Radio)

Symbol No.	Rating µF @ WVDC	Emerson Part No.	Sprague Replacement
C-19	8@50	925238	TVA-1304
C-21	50@6	925310	TE-1100
C-15 } C-16 } C-17 } C-18 }	Coupling Plate	923029	R-9167

WESTINGHOUSE CHASSIS V-2237-2

Symbol No.	Rating µF @ WVDC	Westinghouse Part No.	Sprague Replacement
C-6	10@90	V-6321-1	TVA-1406
C-9	Multiple Capacitor Plate	V-9703-1	34C4

Sprague makes more capacitors . . . in more types . . . in more ratings . . . than any other capacitor manufacturer. Send 10¢ for the 65-page giant seventh edition TV Replacement Manual to Sprague Products Co., 65 Marshall St., North Adams, Mass., or get it FREE from your Sprague distributor.

Beware the Service Bargain..

You'll never see your doctor advertise a special sale on appendectomies . . .

You'll never see your lawyer announce cut-rates for divorce cases . . .

You'll never see your dentist hold a "2-for-1" sale on extractions . . .

AND You'll never see the day when you can take your TV set in for a service "bargain" and be sure you're getting a square deal!

"Bargains" in home electronic service are as scarce as the proverbial hen's teeth! Here's why—

The expert service technician, just like other professional people, must undergo years of study and apprenticeship to learn the fundamentals of his skill. And a minimum investment of from $3000 to $6000 per shop technician is required for the necessary equipment to test today's highly complex sets. Finally, through manufacturer's training courses and his own technical journals, he must keep up with changes that are developing as fast as they ever did in medicine, law, or dentistry. Those best equipped to apply modern scientific methods are almost certain to be most economical for you and definitely more satisfactory in the long run.

Unfortunately, as in any business, there will always be a few fly-by-night operators. But patients, clients, and TV set owners who recognize that you get only what you pay for, will never get gypped. "There just ARE no service bargains"...but there is GOOD SERVICE awaiting you at FAIR PRICES!

Harry Kalber
PRESIDENT

SPRAGUE PRODUCTS COMPANY
North Adams, Mass.

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SPRAGUE

(Distributors' Div. of the Sprague Electric Co.)

Here it is—the *new, improved* RCA "Treasure Chest"! Use it to carry a full selection of receiving tubes with you on your service calls. Use it to carry small tools. Use it to display the world-famous brand name—RCA—and let it work for you to build your business by instilling customer confidence.

STARTING NOW . . . For each RCA Picture Tube, or every 25 RCA Receiving Tubes you purchase, your RCA Tube Distributor will give you one RCA "Treasure Note." Save 20 "Treasure Notes" and your RCA Tube Distributor will trade them for the *NEW* RCA "TREASURE CHEST." This rugged, custom-built tube-carrying case is *not for sale* anywhere, at any price!

Here's more treasure . . . the **RCA "MULTICORD"!**

It's an all-in-one power cord with two popular types of "cheater" receptacles; a hard-rubber, 3-way power outlet for test equipment, soldering gun, etc.; and a clamp-on work light. A real time-saver for busy service technicians! It's yours FREE of extra cost for only 5 RCA "Treasure Notes."

These offers expire at midnight, August 31, 1955 so act promptly. Don't miss out . . . Order your RCA Picture Tubes and RCA Receiving Tubes and start collecting valuable "Treasure Notes" now!

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RADIO CORPORATION of AMERICA

TUBE DIVISION HARRISON, N.J.