JUNE, 1951

Radio-Television SERVICE DEALER

The Professional Radio-TVman's Magazine

IN THIS ISSUE:

AM-FM-TV-SOUND

Total Distribution Of This Issue Over: 30,000

Don't take chances with misfits!

In a field survey of servicemen on the subject of desirable volume control features, by far the most comments concerned easy adaptability and installation. If you want a control that is tailored for the job . . . and one that will deliver thousands of hours of smooth, quiet performance . . .

Make Sure! Make it Mallory!

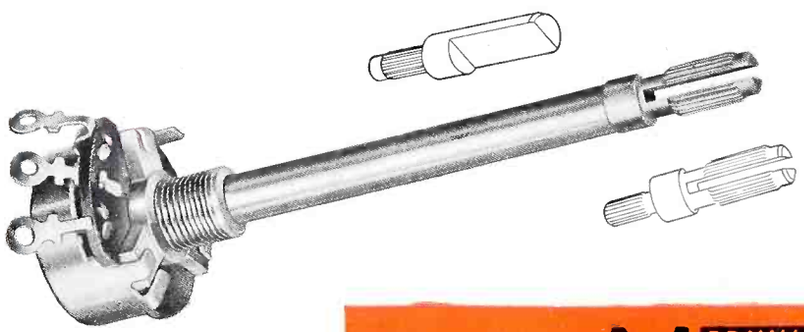
When you use the Mallory Midgetrol* you are using a control designed to make your job easier and at the same time give your customer outstanding performance. Here is the unbeatable combination of Midgetrol features:

First, you get a permanently fixed, tubular brass shaft that can be adapted for split-knurl or flatted type knobs in a few seconds by inserting one of the steel shaft ends supplied in every package. This means utmost convenience without sacrificing the stability of permanent, two-point shaft suspension.

Second, you get the convenience of AC switch design that permits secure attachment, without removing the control housing. Positive indexing assures proper position.

Third, you get exceptionally accurate resistance values and taper curves.

Fourth, you can be sure of years of quiet, satisfactory service life through extremes of humidity and temperature.



In addition to single controls, dual concentric Mallory Midgetrols can be made up easily by combining factory-assembled front and rear sections of desired resistance values. Ask your Mallory Distributor for details!

Make it Mallory and make sure! Ask your distributor to show you the time-proved Mallory Midgetrol with the new features that make installation faster and simpler than ever.

P.R. MALLORY & CO. Inc

MALLORY

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS • RECTIFIERS • VIBRAPACK* POWER SUPPLIES • FILTERS

*Reg. U.S. Pat. Off.

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

*Reg. U.S. Pat. Off.

The RCA "TV Duo"...

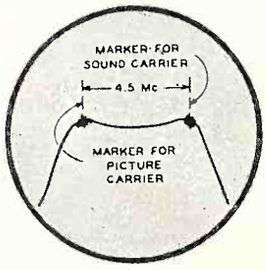
...the last word in *precision* and *versatility*

RCA WR-59B Television Sweep Generator

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

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

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



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

RCA WR-39C Television Calibrator

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

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

For complete details ask your RCA Test Equipment Distributor for Bulletin 2F751-R2.

Available from your RCA Test Equipment Distributor

RADIO CORPORATION of AMERICA

TEST EQUIPMENT **HARRISON, N.J.**

EDITORIAL

by S. R. COWAN

W-U Enters TV Service Field

Recent publicity to the effect that Western Union decided to become a TV Service Contractor in a limited section of New Jersey did not even cause a ripple of excitement in the trade. Experience has taught old-timers that big-name firms cannot put independents out of business. True, the public likes to do business with giant utilities and nationally known names—but in the long run, as the employees of such firms do not have any more know-how than ordinary small shop operators, everything levels off and the small local service firm not only gets its share of business, but more important. by proper shop operation, wins hosts of recommendation business too. Although W-U is "big business" in every sense of the word, and thus should be presumed to have "a sure thing" in its new TV Service idea, don't be surprised if they get in and out again before too many moons have changed. TV Service is a fine business for independents, not for utilities.

N. Y.'s License Bill

The first two drafts of N.Y.C. Councilmen Keegan and Sussman for Bills requiring TVmen to be licensed were not put to a vote in early May as minor last-minute revisions were deemed necessary. So, in this issue, we cannot publish what will be New York's City's License Law effective June 1st. Such a Bill, substantially like that reviewed in our April issue will undoubtedly be passed in late May and as soon as possible thereafter will be reprinted here, with comments.

Radio's Job in Civilian Defense

New York State's Office of Civilian Defense has issued orhers to all Zone and Sector Commanders covering the educational program which must be instituted as quickly as possible. One Directive is particularly noteworthy. In effect it strongly urges every family to have available at all times at least one, and preferably two, battery operated condition. Likewise it is suggested that there be available several flashlights at all times. This OCD directive is laudable for should an emergency arrive and power lines go out battery operated receivers might possibly be the only immediate means of communications in vast sections of any metropolis. All cities should follow N.Y.'s lead. All Service Dealers should carry on a strong campaign to get their neighbors and customers battery-set and flashlight conscious.

We Break More Records

Several months ago the paid circulation of this journal passed the 27,000 mark—the first time in the radio industry's history that any service magazine ever won such a vast following of the nation's better full-time service firms. Now our paid circulation is getting close to the 30,000 mark. It's a grand feeling to know that you fellows out there like what we're doing. Thanks!

Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
MANAGING EDITOR

COWAN PUBLISHING CORP.
67 WEST 44TH ST.
NEW YORK 18, N. Y.

MEMBER AUDIT BUREAU OF CIRCULATIONS

VOL. 12, No. 6 **JUNE, 1951**

SANFORD L. CAHN, Advertising Director HARRY N. REIZES, Advertising Manager
DAVID SALTMAN, Production Mgr. CHARLES LO CICERO, Circulation Mgr.
BRANCHES: H. A. METZGER, 230 S. Wells St., Chicago, Ill., WEbster 9-2666
A. H. ELSNER, 560 S. San Pedro St., Los Angeles 13, Cal., MIchigan 4352

RADIO-TELEVISION SERVICE DEALER is published Monthly by Cowan Pub. Corp., 67 West 44th St., New York 18, N. Y. Subscription price: $2 per year in the United States, U.S. Poss. & Canada; elsewhere $3. Single Copies: 25c. Reentered as second class matter Sept. 25, 1950 at the Post Office at New York, N. Y. under the Act of Mar. 3, 1879.

TRADE FLASHES

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

Air King Announces Color Television Receiver

D. H. Cogan, President of Air King Products Co., Inc., has today announced that Air King has completed the design of a Color Television Receiver which will also receive standard black and white television pictures.

"With the uncertainties about color resolved by the Supreme Court," Mr. Cogan stated, "we will immediately prepare for production of this model and we expect the first sets will become available to the public during the summer. We intend to demonstrate a prototype of this combination color and black and white receiver at the Furniture Show in Chicago in June.

"We also expect to make color companion pieces for those who already own black and white receivers. In addition, we will make available to the public internally adapted receivers which will produce black and white pictures from either color transmissions or standard black and white transmissions."

TV Cutbacks Mount

Amid increasing reports of radio and television set production cutbacks, the Radio-Television Manufacturers Association reported that the output of radio and TV sets increased 27 and 37 percent, respectively, in the first quarter of this year over the corresponding 1950 period. RTMA pointed out, however, that preliminary figures for the second quarter indicate set production is declining and that the greatest proportion of last year's record TV output was manufactured in the third and fourth quarters.

RCA Guarantees TV Prices

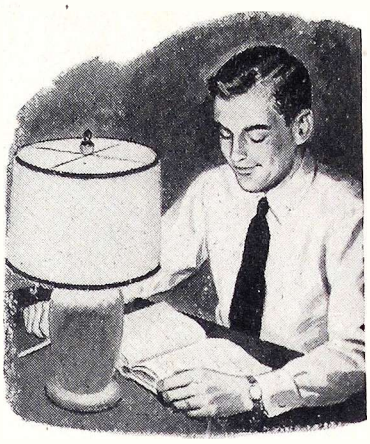
In a dramatic step to strengthen and stabilize market conditions in the television industry, RCA Victor recently informed its distributors at a series of meetings in all TV areas

Golden Opportunity

for men in radio-electronics

to prepare for better pay jobs in

Television Servicing



No vocational field offers more opportunities for "career" jobs and good pay than television—America's fastest growing industry. The demand for TRAINED and EXPERIENCED TV SERVICEMEN is growing. There is a big shortage of such men now and will be for several years to come.

PLENTY OF GOOD JOBS OPEN TODAY

Radio-Television jobbers, dealers and service companies offer lifelong opportunities with excellent salaries for qualified service technicians. Manufacturers of television receivers are looking for men with good service training as inspectors, testers and trouble-shooters. Many experienced servicemen go into business for themselves. Others hold their regular jobs and earn extra money servicing TV receivers in their spare time.

Radio-electronics manufacturers busy with defense equipment contracts offer excellent job opportunities for men with a television technician background. Servicemen called into military service are further reducing the supply of skilled TV servicemen available for civilian activities. Think what television servicing offers *you* in terms of a lifetime career and financial security.

RCA INSTITUTES Home Study Course in TELEVISION SERVICING—

A Service to the Industry

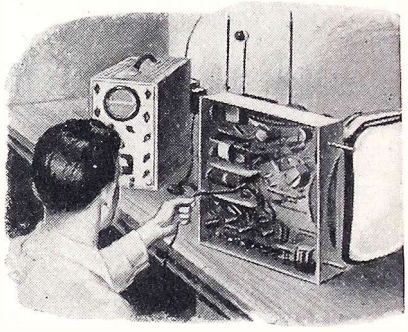
Because of the critical shortage of TRAINED and EXPERIENCED TV SERVICEMEN, RCA Institutes is offering this highly specialized and practical home study course as a service to the working members of the radio-television-electronics industry. Its object is to train more *good* servicemen and to help make good servicemen *better*.

Never before has this course been available to anyone outside of RCA. It is now offered to *you*, through RCA Institutes, one of America's oldest and most respected technical training schools. The course covers most major makes and types of TV receivers. Available exclusively to men in the radio-television-electronics field. Not offered to the general public, or under G.I. Bill.

The cost is low . . . only $9 a unit for 10 units or $90 total, on an easy pay-as-you-learn plan. At successful completion of the course you earn an RCA Institutes certificate that can lead straight to a better job at higher pay.

YOU STUDY AT HOME

In your spare time, you learn pre-tested "How-to-do-it" techniques with "How-it-works" information in easy-to-study lessons. The course is based on the experience of the RCA Service Company in servicing thousands of home television receivers.

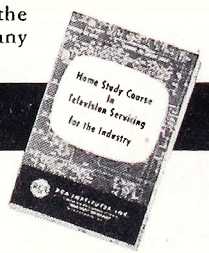


YOU KEEP WORKING ON YOUR JOB

Because you work in the radio-television-electronics industry, your job provides the laboratory work of the course. There are no kits, parts or equipment to buy. Self-employed independent radio and television servicemen are eligible for enrollment.

★ **LOWER RATES FOR GROUPS!** Employers in the radio-electronics industry who desire to enroll six or more of their employees for this course, may do so at lower rates for the group. A special group application form is available for employers desiring to take advantage of this offer. ★

SEND FOR *FREE* BOOKLET. Find out complete details of the RCA INSTITUTES Home Study Course in TELEVISION SERVICING. Don't pass up this opportunity to prepare yourself for a money-making career in the television industry. Illustrated booklet explains all the features of the course. Mail coupon in an envelope or paste on a penny postcard—NOW!



MAIL COUPON NOW!

RCA INSTITUTES, INC.
Home Study Department, RSD-651
350 West Fourth Street, New York 14, N.Y.

Without obligation on my part, please send me copy of booklet "RCA INSTITUTES Home Study Course in TELEVISION SERVICING." (No salesman will call.)

Name_____
(Please Print)

Address_____

City_____ Zone_____ State_____

RCA

RCA INSTITUTES, INC.
A SERVICE OF RADIO CORPORATION of AMERICA
350 WEST FOURTH STREET, NEW YORK 14, N.Y.

throughout the country that it is guaranteeing its current factory prices of TV receivers until August 1.

At the same time, company representatives at each of the meetings assured the distributors that RCA Victor will introduce no new television receiver models prior to August 1.

The price guarantee, first of its kind that RCA Victor has made since the introduction of television, and the assurance that present models will be continued without change, are the main points in a comprehensive program presented to the distributors as the RCA Victor Market Stabilization Plan.

The introduction of this plan was described by Joseph B. Elliott, Vice President in Charge of RCA Victor Consumer Products, as "a positive move to stabilize the dealer's investment in RCA Victor inventories in the face of the current slump in the television receiver market."

Standards Committee Appointed

Five leading retailers have been appointed to the National Advisory Committee of Standardization Policies of the National Appliance and Radio Dealers Association, it was announced today by George Hiebing, Davenport, Iowa, chairman of the committee.

The dealers appointed include: Max Rhodes, Prospect Heights Appliances, Prospect Heights, Ill.; George H. Nicholson, Nicholson's, Hollywood, Calif.; Robert Dowd, Dowd's Radio & Electric Co., Washington, D. C.; Robert L. Painter, Chester, Pa.; and Edward M. Loveday, Loveday's, Brockton, Mass.

The committee is a development of the NARDA TV Standardization Committee. Its purpose is to recommend to the appliance, radio and television industry, standardization of replacement parts, sizes of various products, and installation of TV receivers and other appliances.

Webster-Chicago Displays New Phono Replacement Units

Webster-Chicago Corporation displayed the four automatic phonograph replacement units and phonograph plug-in units now featured in its line at the 1951 Parts Distributors Conference and Show at the Stevens Hotel, Chicago, May 21-23.

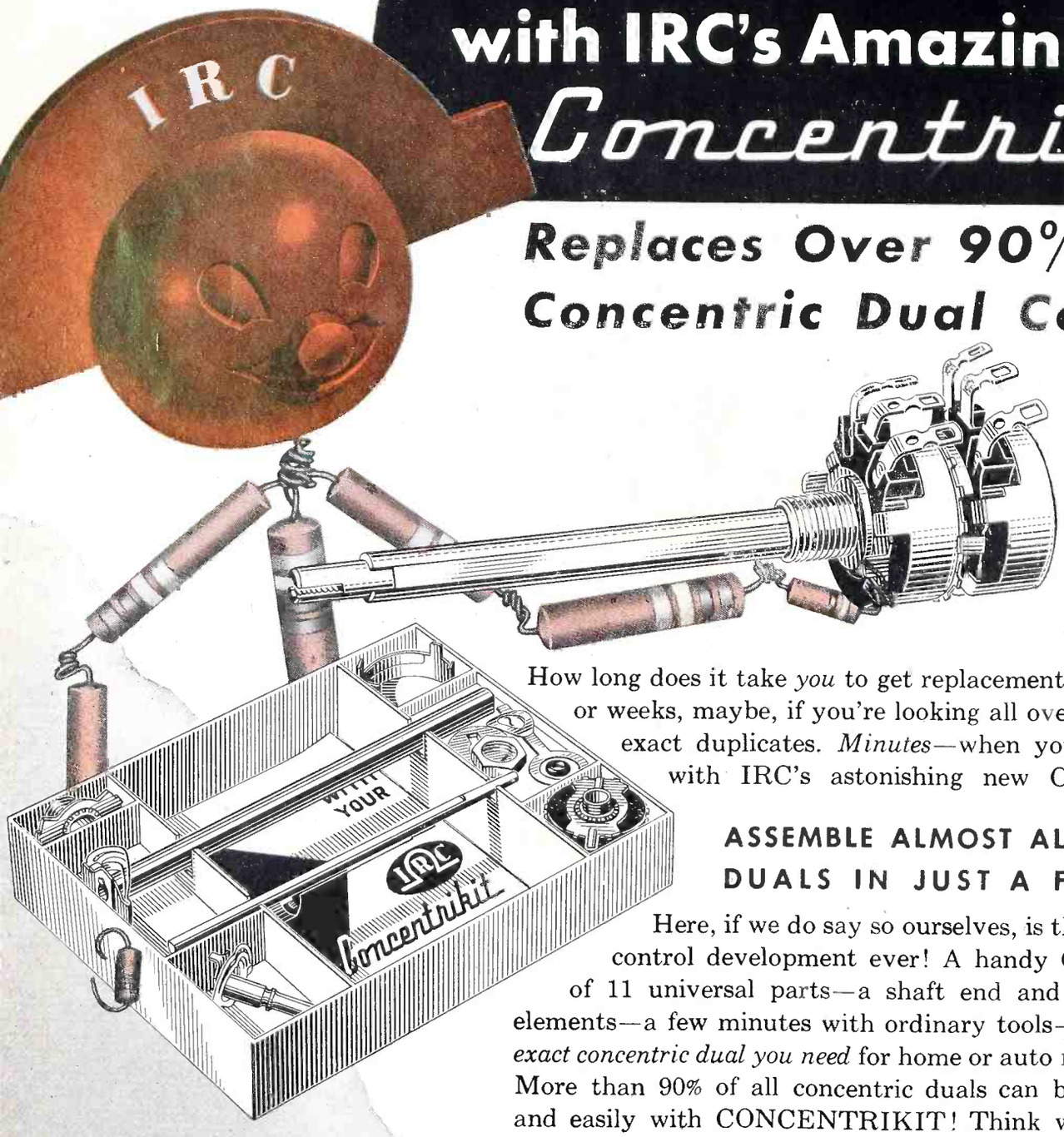
The main emphasis in the Webster-Chicago display was on its new recently introduced. The 106 is an Models 106 and 107 record changers, automatic, three-speed changer for custom installations and replacement. It has the Webster-Chicago velocity-

[*Continued on page 10*]

REPLACEMENT CONCENTRICS?

"Roll Your Own" with IRC's Amazing New *Concentrikit*

Replaces Over 90% of ALL Concentric Dual Controls!



How long does it take *you* to get replacement concentrics? Days or weeks, maybe, if you're looking all over the landscape for exact duplicates. *Minutes*—when you "roll your own" with IRC's astonishing new CONCENTRIKIT!

ASSEMBLE ALMOST ALL CONCENTRIC DUALS IN JUST A FEW MINUTES

Here, if we do say so ourselves, is the most sensational control development ever! A handy CONCENTRIKIT of 11 universal parts—a shaft end and a couple of base-elements—a few minutes with ordinary tools—and you have the *exact concentric dual you need* for home or auto radio as well as TV. More than 90% of all concentric duals can be replaced quickly and easily with CONCENTRIKIT! Think what this means in time-and-inventory savings.

EASY, FOOL-PROOF CONCENTRIC REPLACEMENT

Step-by-step instructions, furnished with every CONCENTRIKIT, make concentric dual assembly simple and easy. And IRC's comprehensive new TV Replacement Manual gives full data on concentrics from the earliest home and auto radio sets to modern TV. Be sure to get your copy from your IRC Distributor.

IRC *Concentrikit*

Stock Assortment Covers over 500 TV Models

ONLY **$24.78** DEALER NET COST

With this compact CONCENTRIKIT Stock Assortment on your bench, you're ready for all TV concentric dual requirements. Handsome, durable metal cabinet contains all you need to assemble any of 144 different concentric duals. Parts cover over 500 different TV models . . . RCA, Admiral, Air King, Belmont, Emerson, General Electric, Motorola, Philco, Westinghouse, Zenith, and many more. Order from your IRC Distributor now—or clip coupon for more information. International Resistance Company, 401 N. Broad St., Philadelphia 8, Pa.

This Complete Assortment AND METAL CABINET at Only the Price of the Parts!

	Quantity
Complete Concentrikits	4
Base Elements	
B11-108	1
B11-114	1
B11-115	1
B11-116	1
B17-116	1
B11-119	1
B11-120	1
B11-121	1
B11-123	2
B11-128	2
B11-130	1
B13-130	2
B13-130X	1
B18-130X	1
B18-132X	1
B11-133	2
B13-133	2
B13-133X	1
B18-133X	1
B19-133X	1
B11-137	3
B13-137	2
B13-137X	1
B18-137XX	1
B19-137X	1
B11-139	2
B13-139	1
B13-139X	1
Inner Shaft Ends	
E-187	3
E-190	1
E-202	2
Sleeve Bushings	
S-4	1
S-5	1
Resilient Retainer Rings	10
Switches	
76-1	3

This handsome, enamelled all-metal cabinet keeps your CONCENTRIKIT Stock Assortment safe and handy. Four drawers with individual compartments keep parts in order. Cabinets may be stacked with IRC Resist-o-Cabinets for convenience and good looks in the shop. ALL-METAL CABINET IS SUPPLIED AT NO EXTRA CHARGE—You pay only the regular price of the parts—$24.78.

ORDER YOURS TODAY!

INTERNATIONAL RESISTANCE COMPANY
401 N. Broad Street, Philadelphia 8, Pa.
Wherever the Circuit Says

In Canada: International Resistance Co., Ltd., Toronto, Licensee

INTERNATIONAL RESISTANCE COMPANY
413 N. Broad Street, Phila. 8, Pa.

☐ I'm interested in saving time and inventory investment with CONCENTRIKIT. Send Catalogs DC1B and DC2A with full information on CONCENTRIKIT and Dealer Stock Assortment.

☐ Enclosed find 25c in stamps or coin for my copy of IRC's new TV Replacement Manual.

NAME .....

COMPANY .....

ADDRESS .....

.....

J. F. ARNOT & CO., ADV. AGENCY

trip mechanism and an automatic needle set-down point controlled by the position of the record push-off shelf, as well as an automatic stop that shuts off the motor and returns the pickup arm to rest position when the last record has been played. This model also features a muting switch that silences the amplifier during the record-changing process.

The Model 106 replaces the Model 356 record changer in the Webster-Chicago line.

In the same series is the Model 107, a plug-in unit on a base pan that features the same advancements.

Also included in the Webster Chicago display was the Model 100 record changer, the unit many outside phonograph manufacturers have for some time installed in their sets, and the Model 551, a plug-in model of this changer on a base pan.

NETSDA Meets In Trenton

At a meeting held by the National Electronic Technicians & Service Dealers Assiciations (NETSDA) at the Stacy-Trent Hotel in Trenton, N.J. on Sunday, May 6, 1951, the national group voted in favor of a resolution taking issue with Western Union entering the TV service and installation business, and the DuMont Company's sponsorship of such action.

Another measure voted on was that annual "Oscars" be awarded to the set manufacturers whose products best exemplify facility and ease of servicing. Four categories will be considered: television receivers, automobile receivers, TV-phono-radio combinations, and phono-radio combinations.

The next meeting will be held on June 3, 1951 in Washington, D. C.

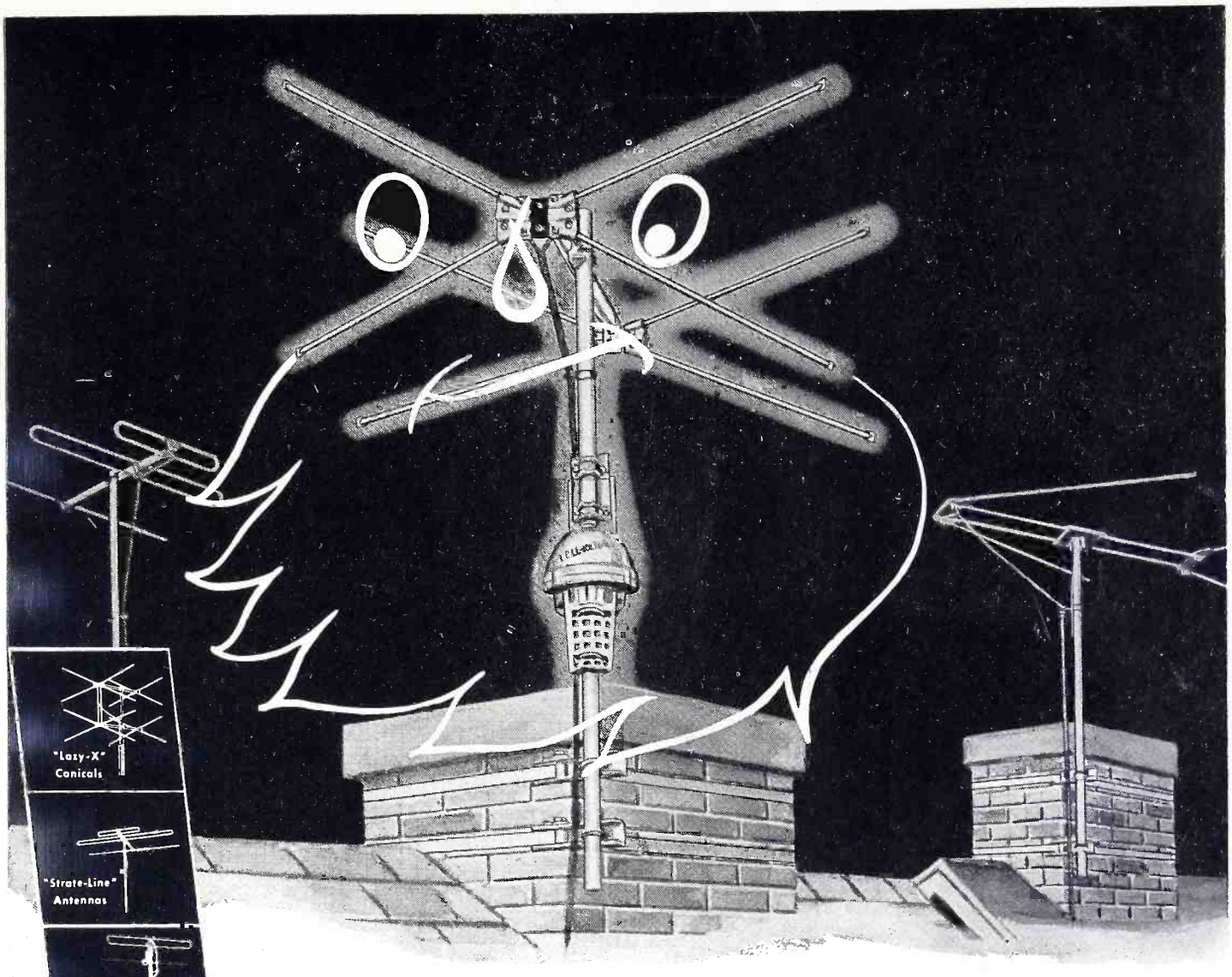
Circle-X Gets Improved Coverage

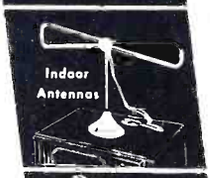
The Circle-X Antenna Corporation continues to grow; its production increases daily and consequently, it is able to safely expand its sales activities. Mr. W. F. Hickson, President of Circle-X, announces that the Burt C. Porter Company, 729 Securities Bldg., Seattle, Washington has been appointed to cover Washington, Montana, Oregon, and Idaho and The Herbert Sierk Company, 2705 Canton Street, Dallas, Texas to cover Mississippi, Texas, Oklahoma, Arkansas, and Louisiana.

A. J. Olsen Passes Away-Message From Permo Board

"It is with deepest sorrow that we inform you that our beloved founder-President, Arthur J. Olsen, passed away March 8, 1951.

[*Continued on page 14*]





When It's Needed the Most...

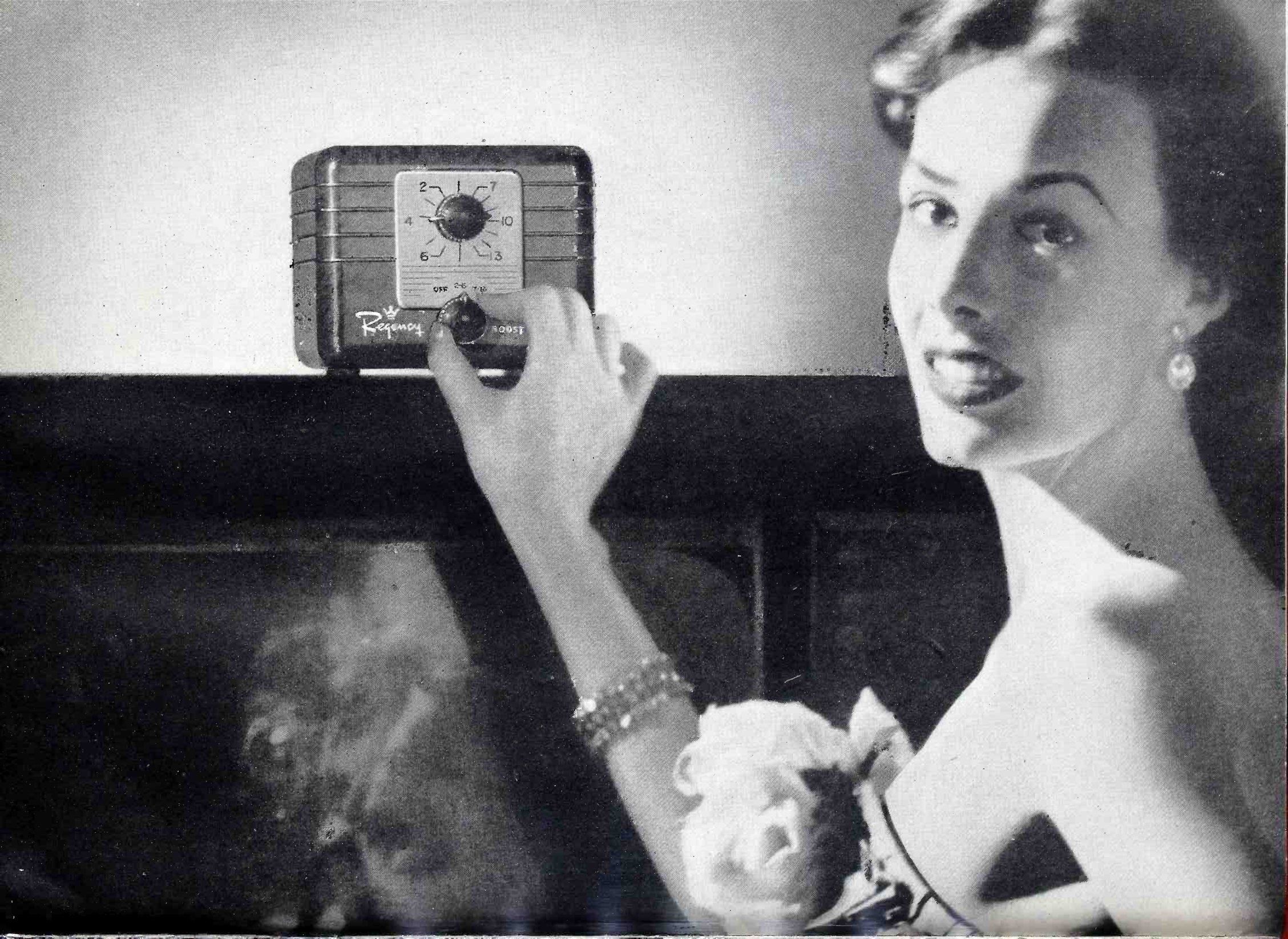
RADIART Quality Meets the Challenge

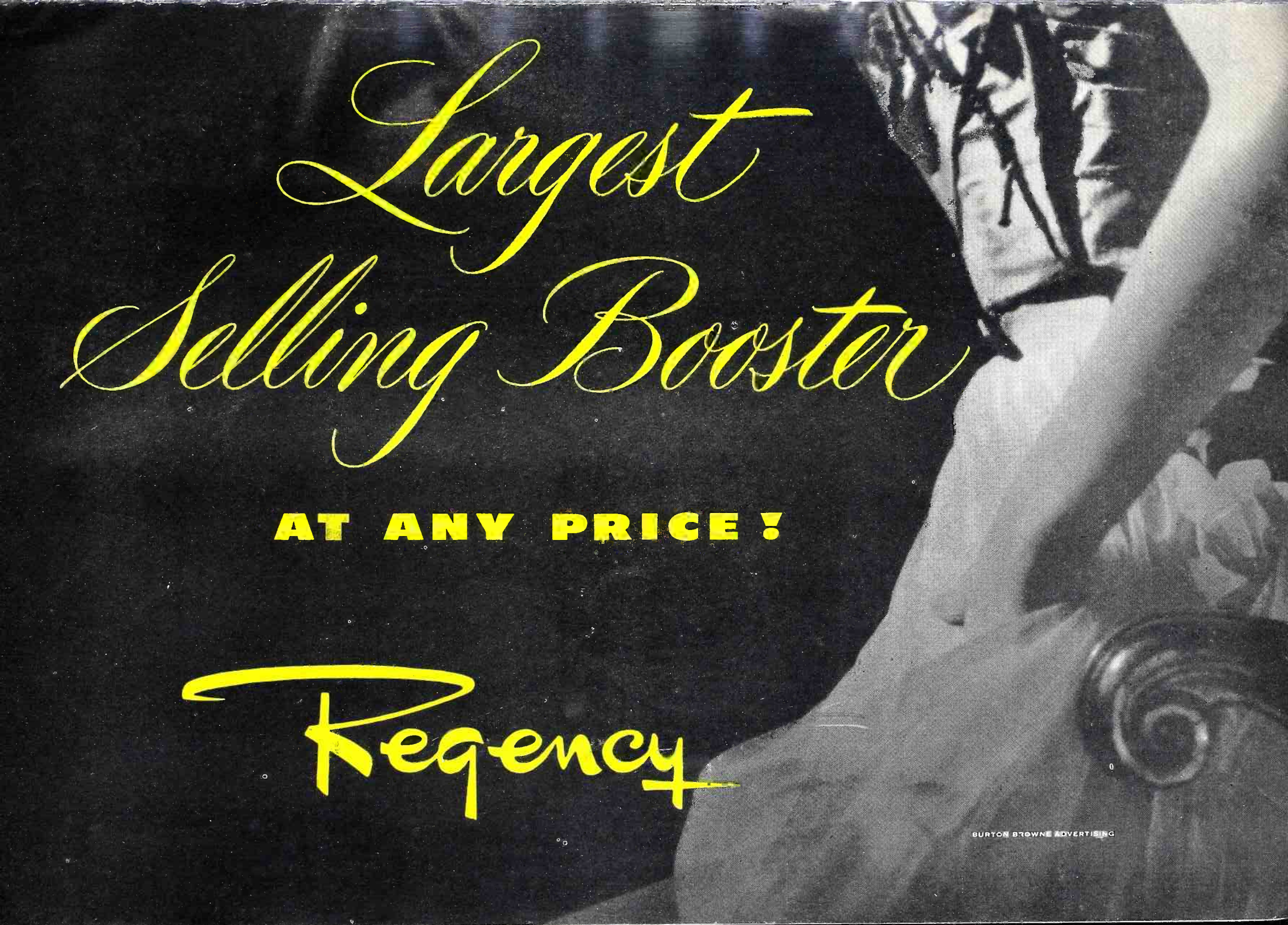
IF it were possible for antennas, like men, to grow beards, RADIART ANTENNAS would have them. Because they're designed to last and last, in fact, to grow "old enough to shave". This length of service is one of the invisible features of RADIART design and construction that have helped establish leadership in the antenna field. When an installation of a RADIART antenna is completed, the serviceman and his customer KNOW that *that* antenna is up to stay and will perform in the manner of a true champion. No shorting out . . . no bending or twisting in wind, rain or snow . . . no rusting away of the elements — they're built to last. When it comes to durability, too . . . again, RADIART quality meets the challenge.

SUBSIDIARY OF

THE RADIART CORPORATION CLEVELAND 2, OHIO

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


2
4
7
10
6
13
OFF
Regency
BOOST


Largest
Selling Booster
AT ANY PRICE!
Regency
BURTON BROWNE ADVERTISING

"Occasion is taken to inform you that there is no basic change in the ownership of Permo, Incorporated or its subsidiary, Fidelitone, Incorporated. Both corporations will continue all their operations under the same policies and practices which were established by Mr. Olsen.

"The financial stability and productive capacity of Permo, Incorporated and Fidelitone, Incorporated are not effected. The sound fiscal policy under which our companies have functioned in the past included provisions for continuation of our operations in any event or emergency.

"In anticipation of retirement from business activities during the past several years, Mr. Olsen had delegated to his executive staff the actual management of both corporations. These executive officers are experienced and trained to carry on the same basic policies and principles upon which Art Olsen founded and built Permo.

"We pledge you to maintain the same Permo that Art Olsen has made outstanding."

Built-In Automatic Focus CRT Announced by Du Mont

Development of a new cathode-ray picture tube incorporating 100% built-in automatic focus was announced at the Clifton, New Jersey headquarters of the cathode-ray tube division, Allen B. Du Mont Laboratories, Inc. The new tube eliminates the need for a focus coil, a focus control or other focusing mechanisms presently used in all existing types of magnetic and high voltage electrostatic cathode-ray picture tubes.

What makes this new tube possible, Du Mont engineers stated, is the development of a new type electron gun which eliminates external focus attachments. The electron gun is the operating part of the cathode-ray picture tube which shoots electrons to the phospher face of the tube.

Du Mont tube officials also pointed out that this new tube is the forerunner of a complete line of Du Mont cathode-ray picture tubes, all incorporating the automatic-focus feature. Tubes of the 17-inch type will be able to replace all 17-inch glass rectangular tubes on the market today. Pilot production of the automatic-focus type is underway now, they declared.

Thomas Test Equipment Bonus Plan

When Robert E. Burrows, newly appointed general sales manager for Thomas Electronics, Inc. announced a plan for promotion of the "Thomas Phototron". He explained that in the inevitable replacement boom, service

[Continued on page 36]

With every $2.00 purchase of WALSCO products or $10.00 worth of antennas . . .

it's FREE!

WALSCO 12th ANNIVERSARY GIFT package

. . . all YOURS!

- WALSCO LUBRICATOR
- WALSCO CONTACTENE INJECTOR
- WALSCO TUNERLUB
- WALSCO NO-OX
- WALSCO CEMENT

A TERRIFIC FREE OFFER!

Each item in this attractive GIFT package will be useful to you. And it's yours at *no extra cost!* All 5 handy items in this package are from the famous line of WALSCO quality products. Every radio and TV service man will want one. Get yours today!

$2.00 value FREE

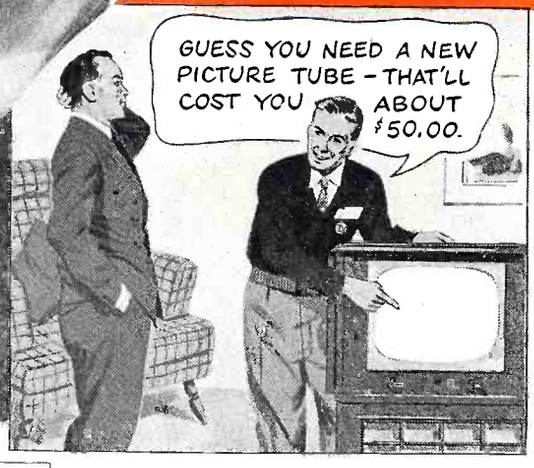
with every $2.00 purchase of WALSCO products . . . or $10.00 worth of WALSCO antennas.

FREE GIFT PACKAGE *available at your local parts jobber. Get yours today!*

WALSCO

WALTER L. SCHOTT CO.
Los Angeles 18, Calif. • Chicago 6, Ill.

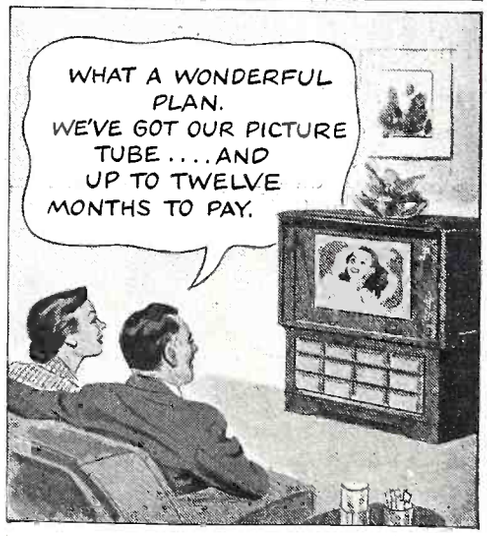
Here's how YOU can sell more Picture Tubes WITH HYTRON'S NEW EASY BUDGET PLAN!



ANOTHER HYTRON FIRST FOR YOU!

No need to miss that profitable picture-tube sale — just because the customer doesn't have the cash. The original Hytron Easy Budget Plan saves the sale. Gives you a competitive edge. Hytron has arranged the details for you. A national credit organization, with facilities in all TV areas, stands ready to serve you.

Find out how *you* can put this wonderful, timely Hytron plan to work right now! Write for complete information today.



ANOTHER HELPFUL SERVICE FOR YOU FROM . . .

MANUFACTURERS OF RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

SCOPE ANALYSIS of TV SWEEP DEFECTS

by **MATTHEW MANDL**

(Technical Institute, Temple University)

Scope analysis techniques of sync and sweep circuits are described in this article. Normal patterns are indicated, following which an analysis is made of how various types of defects alter these normal patterns to produce distorted waveforms. The serviceman will find this article a valuable aid in tracing down those elusive troubles that always seem to crop up in sync and sweep circuits.

WHEN linearity defects or loss of sweep synchronization occurs in either the vertical or horizontal system of a television receiver, the oscilloscope proves a ready means for signal tracing and trouble localization. Once the tubes and controls have been checked, the next logical step is a pattern analysis of the input and output circuits of the entire sweep system from sync separator to deflection coils. Deviations from normal patterns, or lack of the pattern which should exist at a given terminal, are immediate indications of the faulty circuit. After that, a check of the component parts associated with the defective circuit is the final step for correcting the trouble.

Inasmuch as most of the servicing notes for the receivers indicate the oscilloscope patterns which are to be found during *normal* conditions, the technician must understand *how* defects alter normal patterns. It is only by this manner that he can evaluate patterns which deviate from normal, for it is virtually impossible to memorize every conceivable variation the pattern can assume under various defect conditions. It will be the purpose of this article to show typical normal patterns for the vertical and horizontal sweep systems; then analyze *how* several defects alter normal patterns. By application of such knowledge to other abnormalities, the technician will be enabled to better utilize the oscilloscope for waveform analysis.

Sync & Sweep Scope Analysis

Figure 1 shows a block diagram of a typical television sweep system with the horizontal control circuit consisting of the modern "synchroguide" frequency control. The waveforms which are to be observed from the places designated by letters "A" to "I" are shown in *Fig. 2*. While such waveforms vary from one receiver to another, these typical ones are shown here in order that a discussion of the manner in which they are secured may be facilitated. In the sync separator-amplifier circuits, particularly, the type of waveform which is secured depends critically on the choice of either a low or high horizontal scope sweep, for both line and field patterns are present in these circuits. In the synchroguide system, on the other hand, the technician often fails to realize that several waveforms are present around a single socket connection. Since, however, both the control tube and the oscillator are contained in a single 6SN7 tube, trouble-shooting with the scope requires that both input and output waveforms be observed.

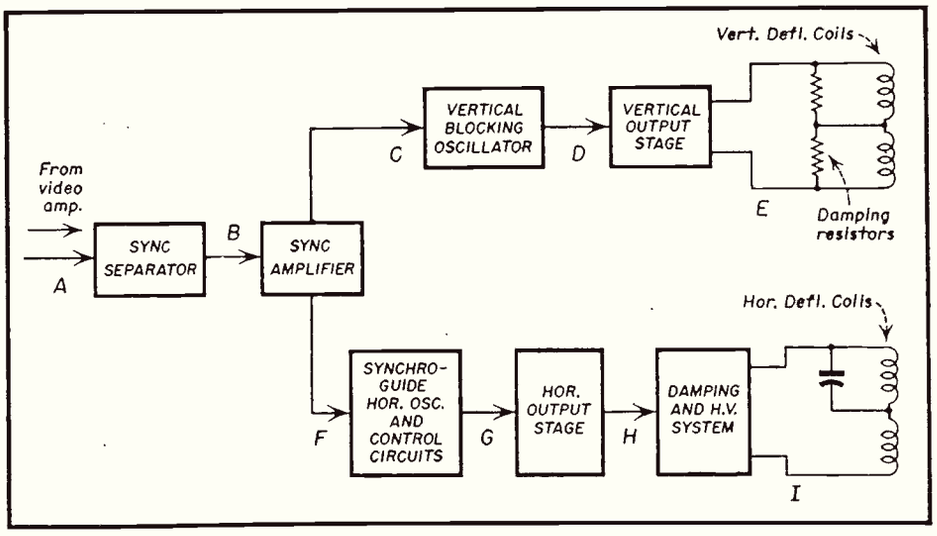


Fig. 1. Identification points for checking typical television receiver.

The waveform shown at *A* of *Fig. 2* is secured by connecting the vertical input of the oscilloscope to the grid of the sync separator tube and ground. The horizontal sweep rate of the scope was advanced to where the 15,750 horizontal sync of the incoming signal became stationary. The hash lines

between the positive-going sync and blanking pulses represents the repetitive picture information tracing across the screen. With some receivers this image may be inverted, depending on the number of sync amplifier stages and their design.

Fig. 2B shows the output waveform of the sync separator, and inasmuch as the latter has removed the signal information below blanking, only the amplifier horizontal sync pulses appear here. Again, the oscilloscope sweep has been advanced to receive the stationary 15,750 pulse-per-second picture. If the scope sweep were reduced (lowest setting of coarse frequency control) similar negative-going pulses would appear representative of vertical sync tips. Relative amplitudes are measured in terms of peak-to-peak voltages and these values are usually given in the service notes if scope patterns are shown. Absence of signal in the sync separator or amplifier stages would, of course, result in loss of *both* vertical and horizontal synchronization.

At "C" of *Fig. 2* is shown the usual grid signal waveform (60 cps) of a blocking oscillator. The sharp tips represent the conduction level and the negative spike denotes tube cut-off. A discharge circuit (series capacitor —resistor to ground or to low plus B) follows any sweep oscillator in order to form a sawtooth. Some of the older receivers used a separate tube for this purpose, and in either case a modified sawtooth appears at the grid of the sweep output stage. This modified sawtooth is characterized by a negative-spike decline necessary for magnetic deflection. The waveform is shown at "D" and is secured by attaching the scope between grid and ground of the output tube and setting the oscilloscope to lock in at the vertical sweep rate.

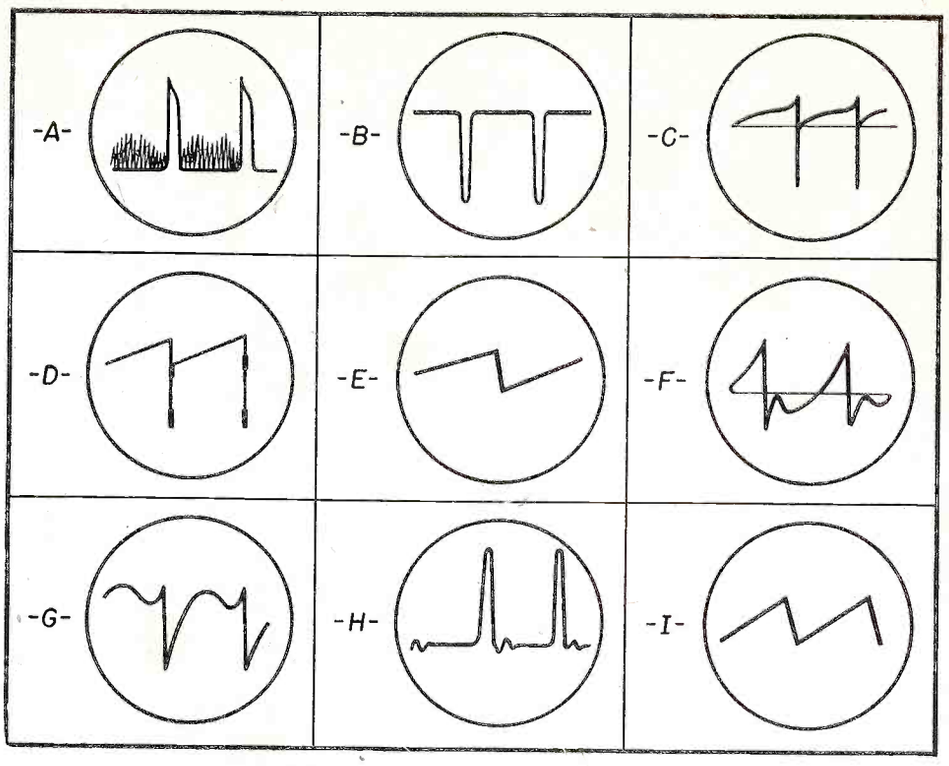


Fig. 2. Typical scope pattern for sections designated in Fig. 1.

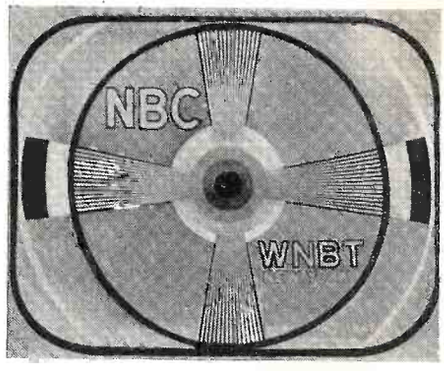


Fig. 4. Test pattern with good linearity.

The sawtooth shown at "E" is the linear rise and sharp decline of the current in the deflection coils. This sawtooth of current is produced by the modified voltage shown at "D" which is amplified by the output tube and impressed across the vertical coils. In order to see the voltage equivalent of the waveform shown at "E" it would be necessary to insert a small resistor (between 15 and 20 ohms) in series with the deflection coils. The sawtooth of current flowing through the resistor will produce a similarly shaped voltage which can be observed on the scope by placing the vertical input probes across the series resistor.

The signal shown at "F" of *Fig. 2* is that produced when the scope is placed across the input grid of the control tube (15,750 cps). The exact place at which the vertical input of the scope is placed may be seen from an inspection of the schematic shown in *Fig. 3*. The complete horizontal lock system plus output is shown in skeleton form to simplify identification of test points.

At "G" of *Fig. 3*, the waveform shown for the corresponding letter shown in *Fig. 2* may be observed. The broad peak of this waveform should be level with the sharp peak for proper operation of the synchroguide system. Unequal amplitudes between broad and narrow peaks will result in slow synchronization when changing stations, as well as poor noise immunity and general sync instability.

The same modified sawtooth waveform shown in "D" of *Fig. 2* will be visible at the grid of the horizontal input except in this instance the os-

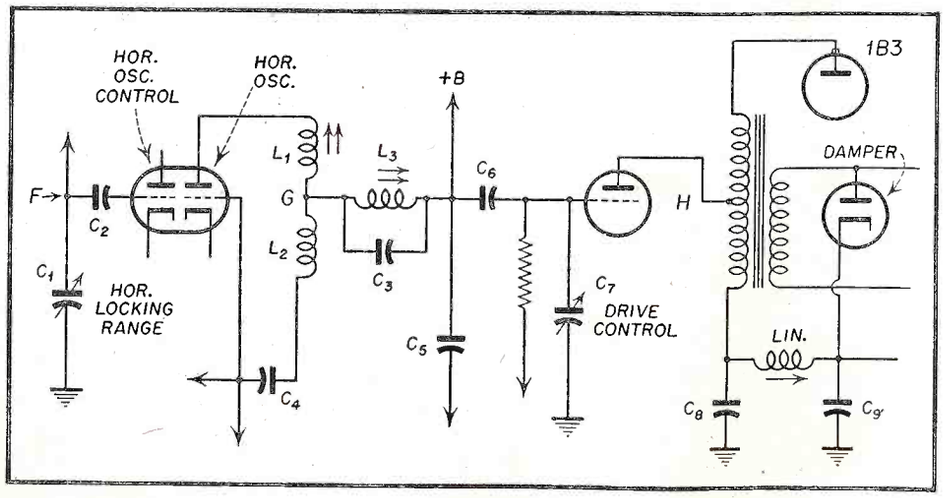


Fig. 3. Location of test points in Synchroguide horizontal system.

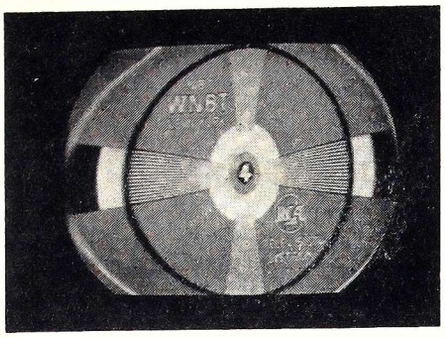


Fig. 5. Defects due to non-linearity of horizontal sweep sawtooth.

cilloscope sweep will have to be set for the higher 15,750 rate.

At "H" the sharp positive pulse which is kicked back during retrace is shown. Inasmuch as this pulse has a peak to peak value in excess of 6,000 volts special precautions must be taken to protect the oscilloscope input if it becomes necessary to observe this pattern. A bank of series paper capacitors can be used to reduce the voltage to a value that is safe for the particular oscilloscope used.

The waveform of *Fig. 2-I* is again the sawtooth of current in the deflection coils which forms the linear magnetic sweep. Observation of this waveform entails opening the lead to either end of the horizontal deflection coils and inserting a resistor (10 to 15 ohms) in series in similar manner to that discussed for the vertical coils.

When all the waveforms are correct for both vertical and horizontal sweep, both the vertical down trace and the horizontal across trace will be at a constant rate to form a linear pattern on the picture tube screen as shown in *Fig.4*. Here the inner circle has a well-rounded shape without excessive extensions in any vertical or horizontal plane thus denoting good linearity in both vertical and horizontal sweep systems.

Non-linear Waveshapes

Deviations from the previously discussed waveforms will result in deviations from true in the test pattern of the screen. A typical case is that shown in *Fig. 5*. Note the excessive pull toward the left, the crowded center as shown by the vertically-elongated center circle and the small inner circles. If a linearity pattern generator were applied to this receiver, the vertical and horizontal cross-lines would appear as shown in *Fig. 6*.

The sawtooth waveform producing such a pattern is shown in *Fig. 7*. Note the fast initial rise-time which will pull the left hand horizontal trace across the screen more rapidly than normal. This results in the picture information being spread over a greater area as shown in *Fig. 5* and also *Fig. 6*, where the vertical lines are spaced more widely apart. Since the spacing of the vertical lines depends on the horizontal sweep across the screen, the linearity of horizontal sweep determines the spacing of the vertical cross-hatch lines.

The dip at the center of the sawtooth waveform of *Fig. 7* causes the beam to slow up (as the voltage declines momentarily) then speed up as the voltage rises again. This slowing up and speeding later causes crowding at the equivalent place on the picture tube and is also apt to cause a lighter area in this section of the pattern. This white (vertical) streak is obscured in *Fig. 5* due to the presence of the vertical wedges, but it can be noticed that the vertical wedges are not only thinner than the horizontal, but also lighter in shading.

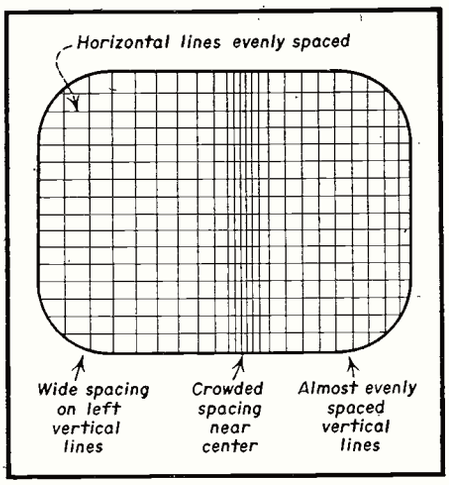


Fig. 6. Type of cross-hatch pattern produced by linearity pattern generator for defects shown in Figures 5 and 7.

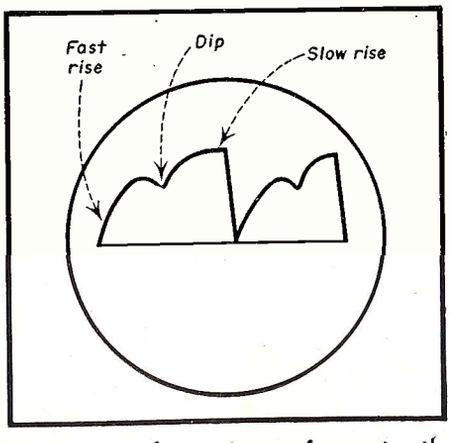


Fig. 7. Deformation of sawtooth waveform sweep for defect shown in Fig. 5.

At the top of the sawtooth of *Fig. 7* the amplitude of the waveform does not rise as rapidly as it should, and this causes crowding at the right-hand side of the picture—depending on how level this portion of the sawtooth becomes. When the sawtooth levels off instead of rising, the beam trace is slowed up and more picture information is crowded on the screen during this time.

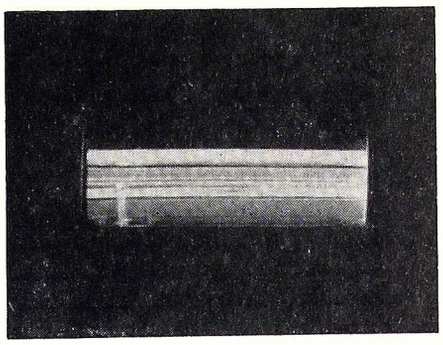


Fig. 8. Loss of height due to degeneration in vertical system.

For finding this, or other waveform defects, the oscilloscope proves useful for ascertaining *where* the distortion first occurs. If the non-linearity is noticed at the grid of the horizontal output tube, the probable cause would be in the drive. If the drive control cannot correct the condition (See *Fig. 3*) the value of all capacitors and resistors between the horizontal oscillator and the grid of the horizontal output should be checked. If, however, the sawtooth appears normal up to and including the horizontal output, the probable trouble would lie in an incorrect value of *C9* (voltage boost first filter capacitor) for if this capacitor is defective or off value it will have a pronounced affect on linearity. Shorted turns of the filter coil between *C8* and *C9* can also contribute to this non-linear condition, as could defective components in the damper circuit. Again, waveform analysis for the various places indicated earlier will aid in trouble localization.

Non-linearity in the vertical system, as well as other defects, can be found in the same manner by waveform analysis and evaluation. If, for instance, the picture is compressed vertically as shown in *Fig. 8*, the fault may be due to poor oscillator output, degeneration in the horizontal output stage (such as caused by an open cathode by-pass capacitor) or shorted turns in the output transformer. If a scope check shows subnormal peak-to-peak voltages for a certain waveform, the offending stage will again have been localized. The same, of course, holds true for horizontal sweep if picture width is below

[*Continud on page 42*]

U. H. F. TUBES
for higher power

by **Allan Lytel**

With the imminent advent of U.H.F. transmission and reception on a commercial scale every bit of knowledge pertaining to this branch of the industry is well worth absorbing. In this article the author discusses some basic principles of U.H.F. tubes and circuits which should prove of interest to all technicians.

ALL UHF vacuum tubes exhibit some special design features peculiar to their high frequency range. However, it is the higher powered tubes which are more pronounced in their designed specialty. A low frequency tube, for example, can be relatively inefficient and still be adequate for the purpose since the total power it handles is not great. However, where a tube works with any considerable amount of radio frequency energy, its efficiency becomes increasingly important. It is our purpose here to discuss UHF Vacuum tubes of the higher powered variety, particularly to illustrate the special design features.

Figure 1 illustrates the tuned plate, tuned-grid oscillator made up of conventional circuit elements. This circuit will adequately perform at low frequencies, however there are serious defects in its operation in the UHF band, for example, the wire connecting the plate of the tube to its tank circuit contains a definite amount of inductive reactance which is L_1 in the figure. In a similar manner, the grid lead has inductance L_2, and the cathode lead has inductance L_3. Any straight wire has inductance in the UHF band and these connecting

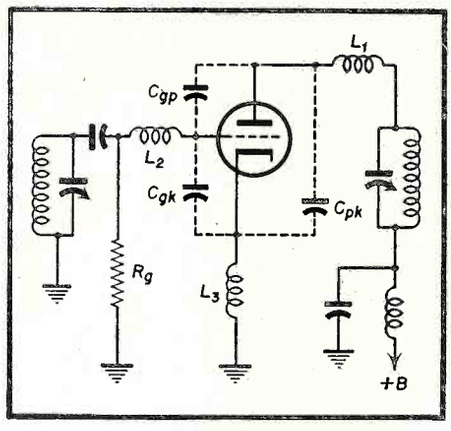


Fig. 1. Tuned plate-tuned grid oscillator with conventional circuit elements.

leads develop a sufficient value of inductive reactance to become virtually radio frequency chokes; this action obviously inhibits the flow of signal energy and reduces the efficiency of this circuit as an oscillator, until at a sufficiently high frequency, it will no longer oscillate.

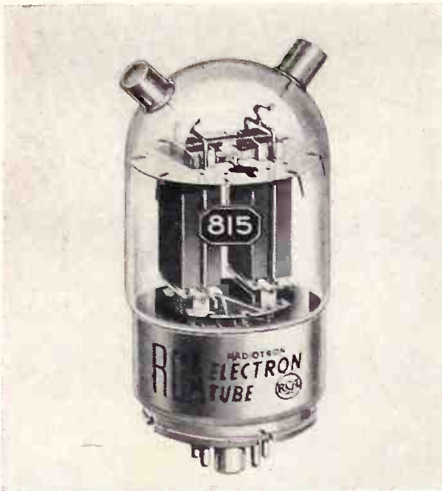
In addition, to the lead inductance, there are several other factors. Fundamentally a capacitor consists of any two conducting materials separated by a dielectric. Hence, there is the distributed capacity between the wires and the chassis which must be taken into account in calculating the frequency of operation. Interelectrode capacitance between the tube elements also plays an effective part in UHF. The capacitance from grid to plate is necessary to sustain oscillations in this type of oscillator, however the capacity between grid and cathode where its reactance is a low value, can effectively act as a by-pass for the grid lead and seriously hamper the operation of the tube. At sufficiently high frequencies, the interelectrode capacitance must necessarily be included in calculating the resonant frequency of operation.

Transit time is the time necessary for an electron (considering a single electron) to travel from cathode to plate. It is usually considered that electrons go from cathode to plate virtually instantaneously, actually it takes a finite time for electrons to travel this short distance. When the period of time required for a grid cycle begins to approach the period of time necessary for electrons to go from cathode to plate transit time is important and the efficiency of the tube drops off seriously because of the phase shift between plate voltage and plate current. This transit time acts as an upper frequency limitation for most receiving type tubes in the neighborhood of approximately 200 megacycles.

In addition to these losses, there are several other important factors. Energy is directly radiated from the circuit elements as the frequency is increased; at the same time the glass portions of the tube create a dielectric loss because they become almost semi-

FREQUENCY	BAND NAME	ABBREVIATION	WAVELENGTH IN FEET	WAVELENGTH IN METERS
10 KC. to 30 KC.	VERY LOW	VLF	98,424 – 32,808	30,000 – 10,000
30 KC. to 300 KC.	LOW	LF	32,808 – 3281	10,000 – 1000
300 KC. to 3000 KC.	MEDIUM	MF	3281 – 328	1000 – 100
3 MC. to 30 MC.	HIGH	HF	328 – 32.8	100 – 10
30 MC. to 300 MC.	VERY HIGH	VHF	32.8 – 3.28	10 – 1
300 MC. to 3000 MC.	ULTRA HIGH	UHF	3.28 – 0.33	1 – 0.1
3000 MC. to 30,000 MC.	SUPER HIGH	SHF	0.33 – 0.03	0.1 – 0.01

Fig. 2. Radio Frequency Classification based on F.C.C. designation of March 2, 1943.



(Courtesy of RCA Tube Dept.)

Fig. 3. RCA dual beam power, 815

conductors rather than pure insulators. The skin effect which causes current to flow on the thin outer surface layer of conductors, increases the radio frequency resistance of both the circuit components and the tube elements.

In order to establish the frequency range under discussion, *Fig. 2* has been included which lists the Radio Frequency Classifications, based upon the official FCC designation of March 2, 1943. The most important band pertaining to our discussion are the VHF which is from 30 megacycles to 300 megacycles and the UHF which is from 300 megacycles to 3000 megacycles.

Figure 3 illustrates a high frequency dual beam power tube, the RCA-815 type. This tube contains two separate beam power structures with the plates connected to the caps as shown. There is a total dissipation of 25 watts: this tube represents a transition in our discussion since it will operate up to and including 200 megacycles. An ordinary 8 prong octal socket is used for the remainder of the tube elements and the very high frequency output of this tube depends on the close electrode spacing and the relatively short leads which reduce the inductance.

Figure 4 is the manufacturer's recommended circuit when using this tube in the vicinity of 100 megacycles. A parallel wire short circuited transmission line, ¼ of a wave length long is used for both the plate tuned circuit, which is L_3, and the grid tuned circuit L_2. Actually these tuned circuits are pure inductances, resonating with the interelectrode capacitance of the tube and the trimmer capacitors. These fine tuning trimmers C_5 for the plate circuit and C_2 for the grid circuit, are used to add small amounts of capacity to the resonant circuit and hence act as tuning devices. The midpoint of the heater is directly grounded by means of a center tap and the circuit is connected for plate modulation. It will be seen that the driver tubes which are also connected in push-pull, use a transmission line tank circuit for the plate resonant circuit.

Figure 5 illustrates the RCA-829B UHF double beam power radio frequency amplifier. This tube may be considered to be also a transition between VHF tubes and UHF tubes. It is sometimes known as the doorknob type because of its shape. No tube base is used but the tube elements go directly to pins which fit a special ceramic socket. The absence of tube pins make short and direct connections more feasible. A large glass envelope is necessary because of the greater power dissipation required from a tube of this type. Experimentally, tubes of this type have been operated by the author in transmission line tuned circuits as high as 400 megacycles.

(Courtesy of RCA Tube Dept.)

Fig. 5. RCA Doorknob 829-B

A natural result of the development of UHF tubes is the reduction in size of elements and the decreasing spacing between tube elements. Decreasing spacing, of course, increases the transconductance; reduction in element size, decreases the interelectrode capacitance. The Bell Telephone Laboratories have pioneered in the development of the tube type 416-A which is being used in the television relay link designed to connect New York and Chicago and eventually to become part of a nation-wide group of stations for relaying television programs. This highly unusual tube has the grid spaced closer to the cathode than the thickness of the ordinary oxide coating on a receiving type cathode. *Fig. 6* shows a machine developed by the Western Electric Company and the Bell telephone Laboratories for winding this exceedingly fine and precise grid structure. It would take 60 of these wires to equal the thickness of a single human hair and there are *1000* turns per inch. The hypodermic needle shown in the photograph is used to apply a single drop of cement to hold the first and last turns of the wire in place. After the grid structure has been wound and placed on its frame, the wires are brazed to the gold plating of the grid frame. *Fig. 7* shows the circular grid disc and the grid structure of this tube. These wires are closely mounted $\frac{7}{10000}$ of an inch apart. Notice that the operator shown in the photograph is using Nylon

[Continued on page 44]

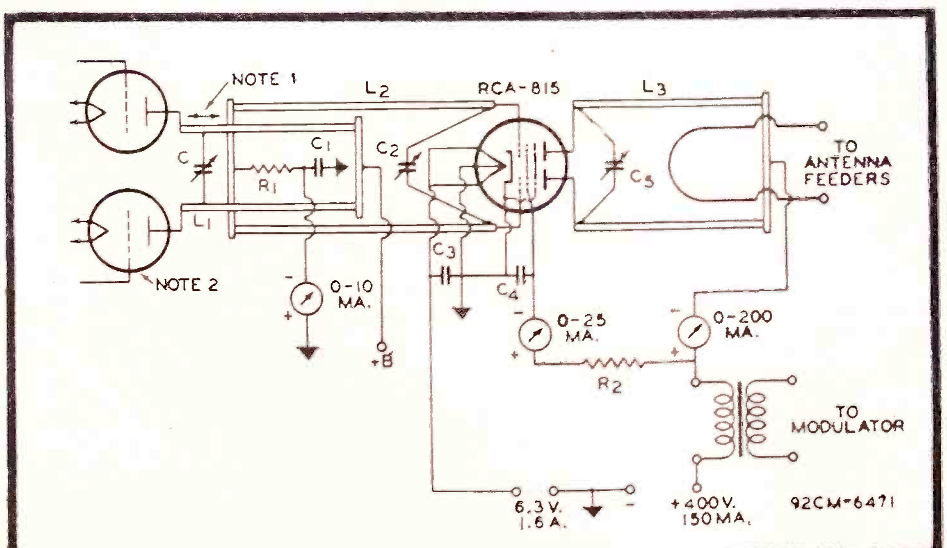


Fig. 4. Recommended circuit for 815 tube when being used in vicinity of 100 mc.

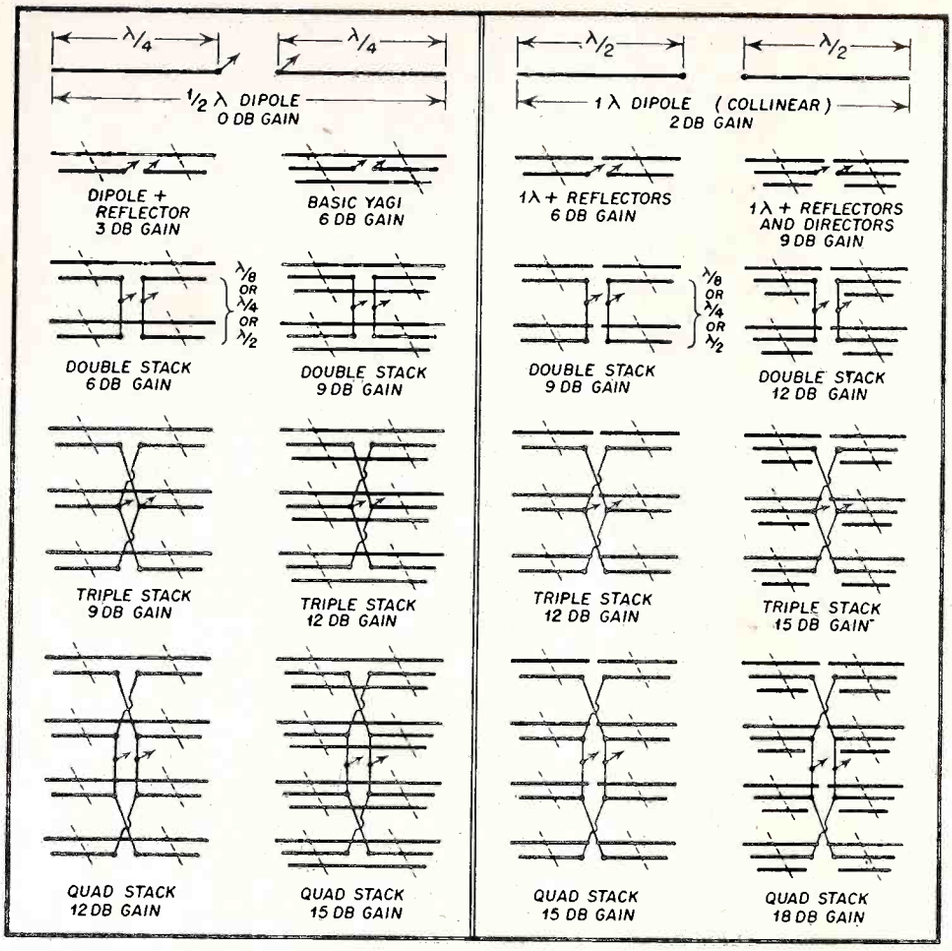


Fig. 1. Possible arrangement of elements into arrays.

Effective SHOP-BUILT ANTENNAS *for* TV

by RANSOM BEERS

PART 1

TV reception in acute fringe areas offers problems which must often be solved by custom installations. This series deals with these problems and their solutions.

NORMALLY T.V. servicemen should purchase a manufactured TV antenna for installation in a customer's home. Occasions do arise in weak signal locations where the progressive serviceman may need a type of antenna not available on the market. In the future should certain materials become scarce, a shop built antenna may be quite necessary to temporarily or even permanently complete an installation. Most servicemen have an experimental turn of mind and may want an elaborate installation for their own home or shop to enhance their own personal satisfaction or their professional standing as technicians in the eyes of the public. Through the techniques described here, it should also be quite convenient to combine more basic manufactured arrays into almost any complicated multi-element array desired.

The most basic antenna is the half-wave dipole consisting of two rods λ/4 long with a reference gain of O DB. If a reflector 1.05(λ/2) long, is placed approximately λ/4 behind the dipole the gain increases about 3 db. If a director .95(λ/2) long, is added in front, the gain goes up about 6 db. The dipoles may be stacked with or without reflectors or the Yagi (reflectors & directors) can be stacked with increased gain. (See *Fig. 1*). The most desirable stacking is with λ/2 spacing between stacks although λ/4 or λ/8 stacking can be employed with decreased gain.

The full wave dipole (or Collinear) has a gain of about 2 db and reflectors and directors can be added, as was done with the λ/2 dipole. Each λ/2 leg has separate reflectors and direc-

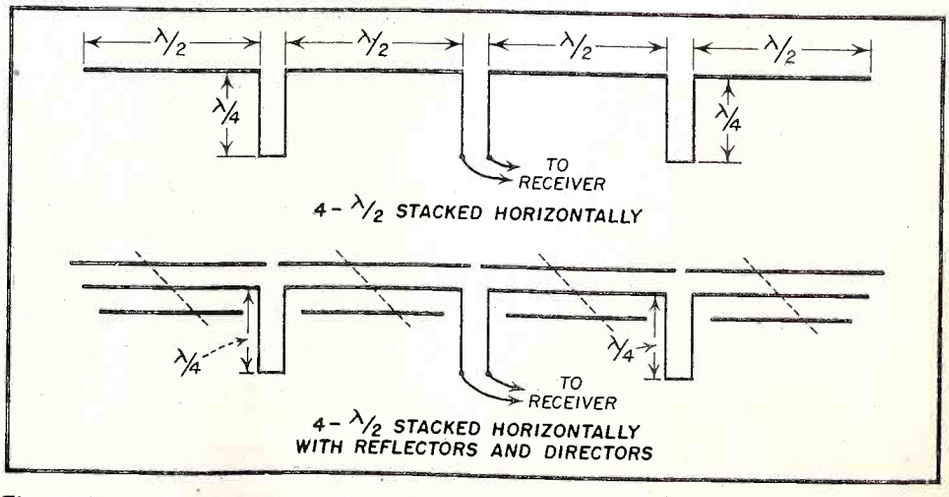
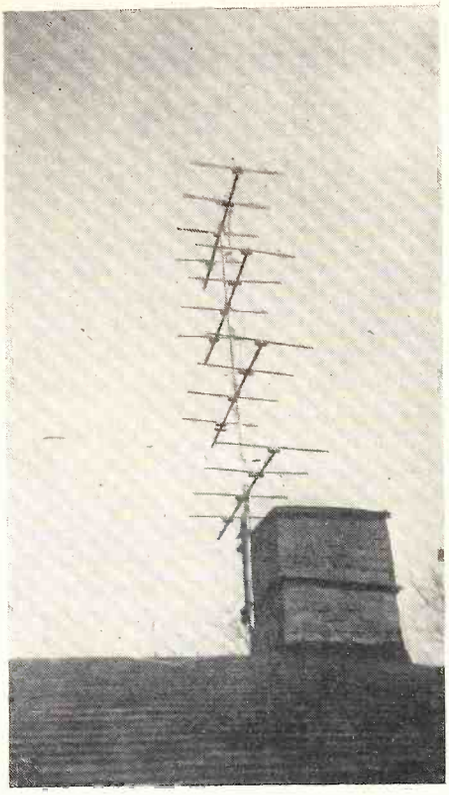


Fig. 2. Examples of horizontal stacking with driven elements and with reflectors and directors.



Stacked Yagi installation.

tors. Stacking can be employed with this antenna even more successfully than with the antenna using λ/2 dipoles. The limit to the amount of stacking possible with both types is determined by the impedence of the array. As reflectors or directors are added and as the stacks are increased, the impedence goes down. The basic λ/2 dipole has an impedence of about 75Ω while the basic full wave dipole (Collinear) has an impedence of about 1500Ω. Since most T.V. sets have never less than 75Ω input impedence and usually not over 300Ω, it is obvious that stacked arrays using the λ/2 dipole as a basis are very limited because of the drop in impedence with so many stacks and, or, so many directors and reflectors. For complicated arrays the full wave dipole (Collinear) should be the basis. For example four 1500Ω dipoles stacked gives an impedence of about 375Ω while four 75Ω dipoles stacked gives about 20Ω impedance. To match a 300Ω receiver to the antenna, the best match would be the four full wave dipoles stacked, and most important the gain would be much greater. Obviously where small gain and compactness is desired the λ/2 dipole is the answer. A single full wave dipole would be such a serious mismatch, that the extra gain would be completely offset. More specific information on matching antennas to receivers follows in the discussion on the design and construction of the two high gain Yagis using steel frames.

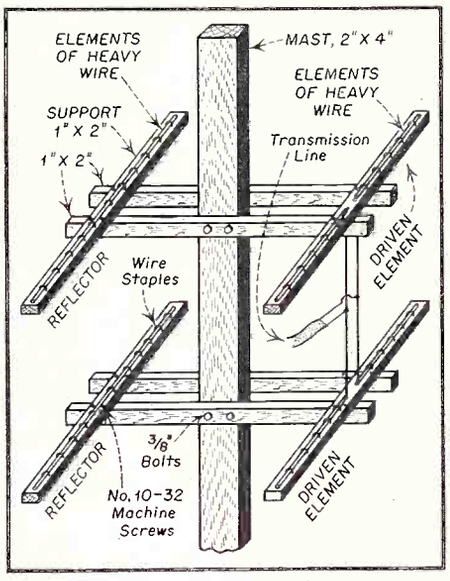


Fig. 4. Antenna construction using wooden framework.

Antennas do not necessarily need be stacked vertically. Stacking vertically increases vertical gain and directivity. Horizonal stacking increases gain and directivity horizonally (See *Fig. 2*). The folded wires joining adjacent λ/2 sections are to keep the currents in all sections in phase. *Fig. 3* shows a combination of vertical and horizonal stacking for both vertical and horizonal directivity.

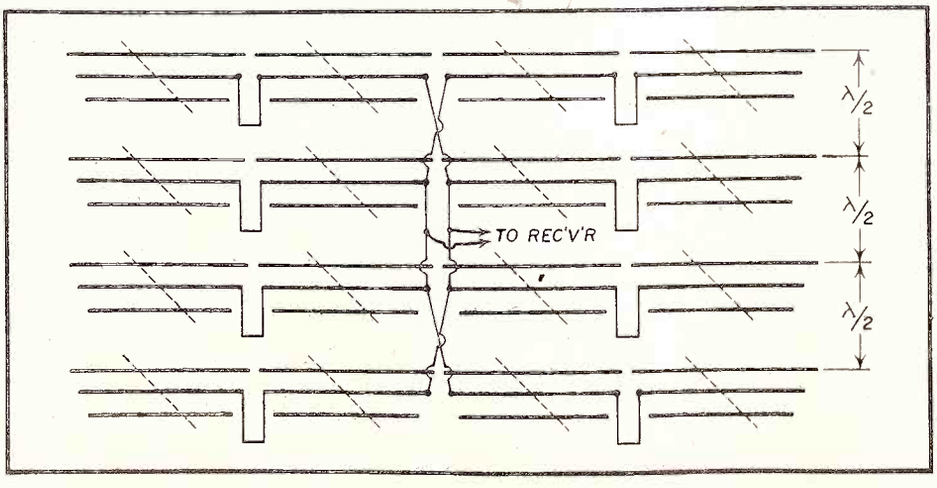


Fig. 3. Example of array combining horizontal and vertical stacking.

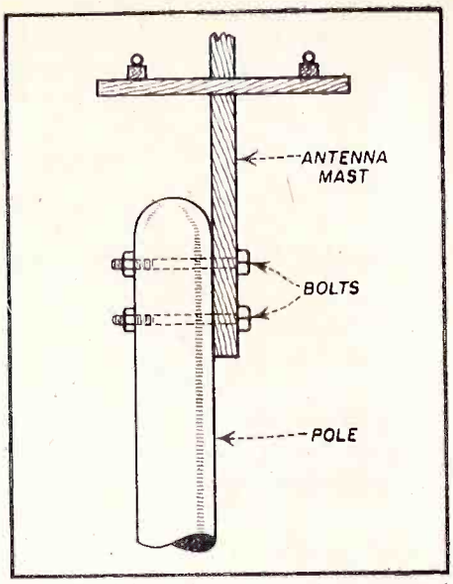


Fig. 5. Mounting an antenna mast on a pole.

Wood Frame Construction

Possibly the simplest construction is of wood. The construction in *Fig. 4* can be applied to any of the designs discussed. The mast can be of 1" x 1" or 2" x 4" or even larger depending on the channel to be received. The cross supports can be of 1" x 2", of length suitable to the channel to be received. Heavy copper wire or small copper tubing can be tacked on the wooden element supports with small staples, as wood is a good insulator. Stacked arrays of excellent performance can be constructed of wood very inexpensively.

The wood mast can be bolted to a discarded telephone or light pole as shown in *Fig. 5*. A block and tackle or winch can raise the whole assembly into position. sing a tall pole, a more elaborate array can be had than would normally be possible on roof tops. For approximate lengths of the wires for the elements see *Table 1*. It is im-

TABLE I
LENGTH OF WIRES
FOR WOOD FRAME ANTENNAS

CHANNEL	$(\lambda/2)$	$(\frac{\lambda}{2}+.05\,\frac{\lambda}{2})$	$(\frac{\lambda}{2}-.05\,\frac{\lambda}{2})$
2	97.2	102.1	92.2
3	87.8	92.2	87.3
4	80.3	84.7	76.1
5	70.2	73.7	66.7
6	65.2	68.5	61.9
7	31.4	33.0	29.8
8	30.3	31.8	28.8
9	29.3	30.8	27.8
10	28.4	29.8	27.0
11	27.6	29.0	26.2
12	26.8	28.1	25.5
13	26.0	27.3	24.7

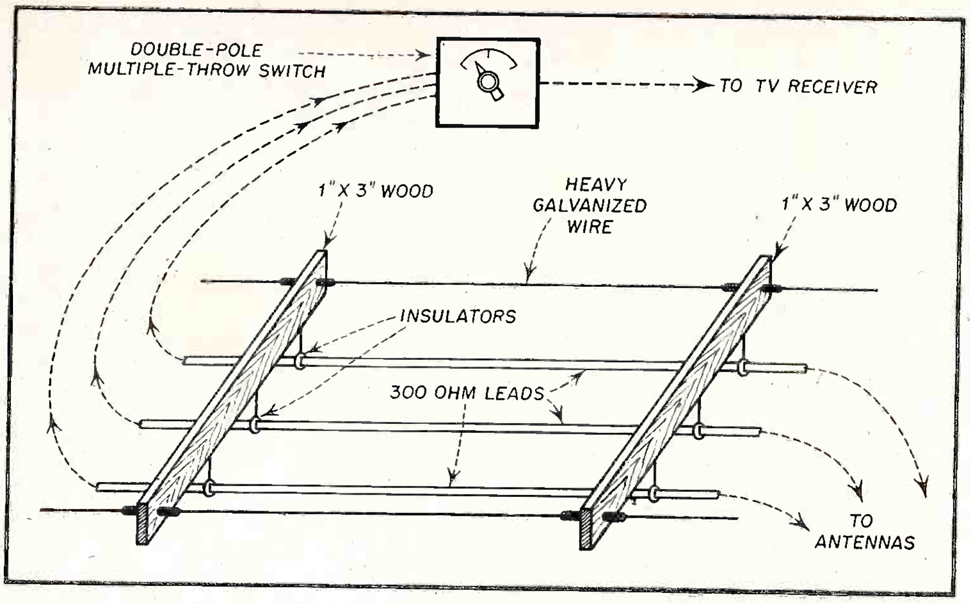


Fig. 7. Carrying multiple leads into receiver.

portant that the wires between stacks be phased properly.

If a windmill tower or other large tower is available several large arrays can be mounted on the sides as shown in *Fig. 6*. The individual downlead can be carried to the receiving location on a frame as shown in *Fig. 7*, and switched at the receiver by a double pole multiple throw switch.

The arrays with directors in front of the driven elements are single channel antennas only, while the other arrays can be used over a much wider band width. Of course any antenna will perform best at the resonant frequency to which the elements are cut with decreasing pick-up to each side. In extreme weak signal areas, a stacked array for each channel to be received could be quite desirable. The conical antenna has excellent pick-up over a wide range of frequency. If it is desired to receive one distant station strong and all other stations are close enough not to require a high gain array, the following plan is quite effective. (See *Figs. 8A* and *8B*). Extra elements to form a conical can be added to a stacked Yagi to produce a broadband response and yet a peak on the desired weak channel.

To Be Continued

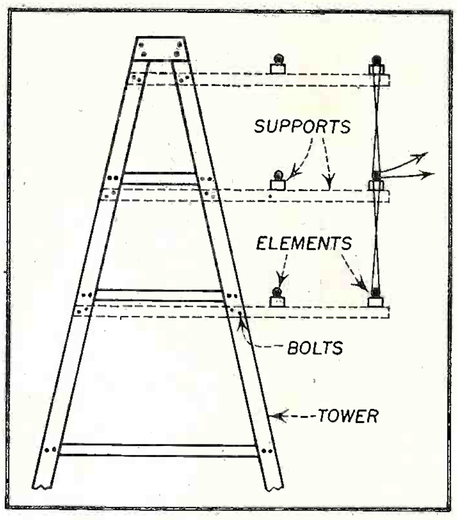


Fig. 6. Mounting arrays on side of a large tower.

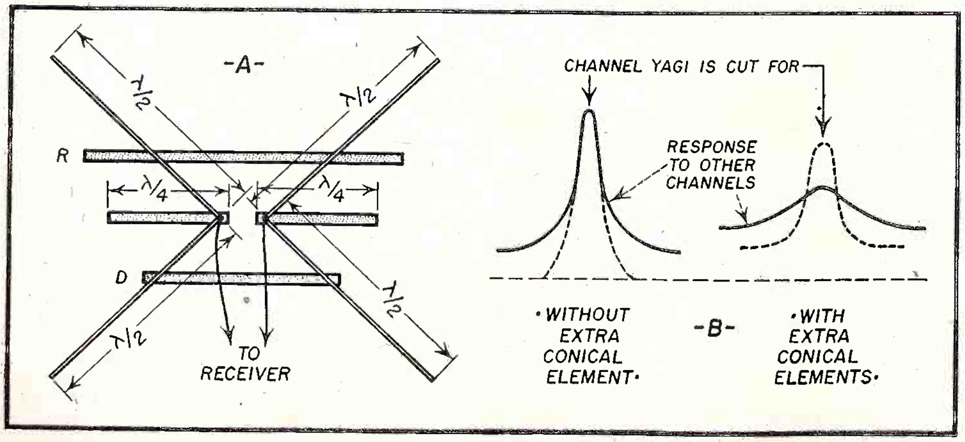


Fig. 8. Adding extra conical elements to an array for broadband response with a peak on one channel.

TRADE LITERATURE

John F. Rider Publisher, Inc., 480 Canal St., New York, announces that *Rider's Television Manual Volume 6*, the latest volume in the series of television data, is now available at the organization's distributors.

66 manufacturers contributed their factory-authorized servicing data for the inclusive period August 1950 - January 1951. 637 models are incorporated into this 12" x 15" manual. To enable the service technician to use it immediately, all pages, the equivalent of 2,320 (8½"x11"), are filed in their proper places. All information is accessible instantly through the use of the accompanying cumulative index for TV Manuals Volumes 1 through 6.

TV 6 contains schematics, chassis views, tube layouts, voltages and resistance readings, alignment procedures, test patterns, waveforms, parts lists and parts values, listings of up-to-date changes for previously published data, boosters, tuners, etc. It is priced at $24.00.

* * *

How to prevent screen damage by ion burns are described in an important new brochure just issued by *Sheldon Electric Co.*, division of *Allied Electric Products* Inc.

Of interest to television service technicians, dealers, jobbers and set manufacturers alike, this pamphlet known as Bulletin T-2, describes the ion trap, how ion burns occur and what can be done to prevent this trouble.

It also specifies the five basic points to remember when adjusting the ion trap to prevent screen damage by ions.

The pamphlet, entitled Bulletin T-2, *"Ion Burns and How to Prevent Them!"*, may be obtained by writing Sheldon Electric Co., Irvington 11, New Jersey.

* * *

A new *booklet* specially written for the hobbyist, experimenter and model-maker in which twenty four applications of germanium crystal diodes are described in a simple, straight-forward manner has been announced by the *Electronics Division, Sylvania Electric Products Inc.*

The booklet, which is generously illustrated, tells how to build an in-

[*Continued on page 38*]

MEN OF RADIO

PART 1

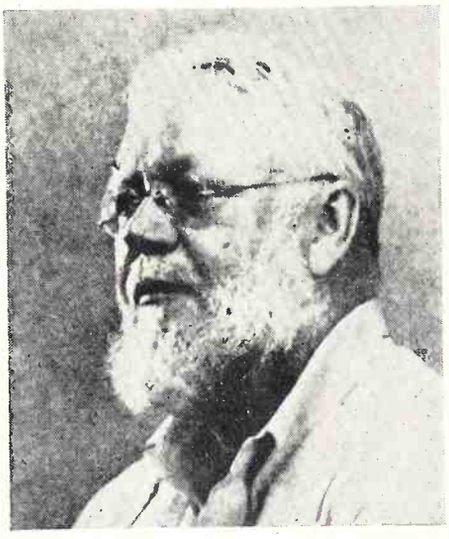
by WILLIAM R. WELLMAN

In this installment the contributions of Fessenden, Alexanderson, and Poulsen are detailed, together with the historical developments that resulted in tremendous strides given radio by their inventions.

JUST about the time that Marconi wireless was beginning to assume a position of supremacy in the commercial field, two new methods of generating radio waves were developed that threatened to displace the spark transmitter: the arc converter and the high-frequency alternator. Eventually, they did relegate the spark to the scrap heap; legislation against the interference created by the spark was the final blow. But the history of radio is a story of rapid change and development; for a while the arc and the alternator were in keen competition, and during that period it should be noted that they afforded the first really reliable communication between America and Europe. Finally, both were themselves forced into obsolescence by the vacuum tube transmitter.

The high-frequency alternator was originally conceived by Professor Regional A. Fessenden, prolific wireless inventor and the father of wireless telephony, and was designed, built and perfected by E.F.W. Alexanderson of General Electric. The arc transmitter was invented by Valdemar Poulsen.

The Marconi Company had established what was intended to be a direct link between the United States and England through the medium of stations located at Cape Cod, Massachusetts and Poldhu, Cornwall, only to discover that contact became difficult, if not impossible during the summer months because of static. The distance to Europe had to be shortened by the use of a station in Nova Scotia. That might have been an appropriate time for reconsideration of the prophetic statements made by Sir William Crookes, some years before Marconi began his experiments: "What remains to be discovered is . . . . firstly, a simpler and more certain means of generating electrical waves . . . . secondly, more delicate receivers, which will respond to wavelengths between certain limits and be silent to all others. . . . " The more sensitive receivers, in the form of the coherer



(Courtesy of Harper & Brothers)

Reginald Aubrey Fessenden

and the new Marconi magnetic detector had appeared, and Sir Oliver Lodge had developed methods of tuning that helped to exclude undesired signals; the wireless race had taken on some of the aspects of the ancient race between heavy armor and bigger guns. The time had arrived for the development of "more certain means of generating electrical waves. . . . "

Reginald A. Fessenden

Professor Reginald A. Fessenden began his career in the employ of Thomas A. Edison, while Edison was engaged in laying underground conduits for the lighting of New York's streets. Later, he became one of Edison's assistants at the Llewellyn Park laboratory, and eventually advanced to the position of chief chemist. He was attracted by the then new field of wireless and left Edison's employ to take up the duties of director of wireless research with the United States Weather Bureau. It is interesting to note that, even as early as 1901 the Bureau was aware of the future possibilities of radio in studying meteorological conditions.

Fessenden was stationed at Cobb Island, Maryland with his three assistants and was given considerable latitude in his choice of avenues of investigation. An important feature of his arrangement with the government was the granting to him of full rights to any inventions he might develop while in government service.

Soon after starting work at Cobb Island, he became convinced that transmission of the human voice by wireless offered unusual possibilities. Two points need emphasis here: at that time there existed no apparatus for the generation of continuous, or undamped waves, so essential to radio telephone work. The second point is that during his entire career in wireless, Fessenden seems to have been motivated primarily by the desire to develop wireless telephony. With the crude and unsuitable apparatus at his command, he made a test that was successful over a distance of about a mile. The test was far from perfect, but he was more than ever convinced that it would work over longer distances, if only he had a method of producing a continuous wave. When he eventually resigned from government service, he continued his experiments and although DeForest and others made very valuable contributions, Fessenden achieved the distinction of being the first to attempt wireless telephone communication.

The Electrolytic Detector

By 1902 he had gained recognition through the invention of a new, more sensitive detector. It consisted of a

very fine, silver-coated platinum wire, the tip of which just barely dipped below the surface of a cup of nitric or sulphuric acid. One form of this detector is illustrated in *Fig. 1.* When the silver-coated platinum wire, known as Wollaston wire, was allowed to dip below the surface of the acid, the silver was dissolved, leaving an extremely fine contact between platinum core and acid. Fessenden called his new receiving device a "liquid barreter", but it soon became known as the electrolytic detector. It was an immediate success, and a new corporation, the National Electric Signaling Company, was organized to exploit it, along with his other inventions. The National company was one of the earliest American wireless firms, but it entered a field already partially controlled by the Marconi Company.

Very soon after the formation of the National company, it became evident that commercial message handling was to become an extremely lucrative field and plans were drawn up for the construction of stations in Europe and America; the first U.S. station was located at Old Point Comfort, near historic Fortress Monroe, Virginia. Helen Fessenden, the inventor's biographer, relates some interesting stories concerning the tests carried out at this station. Rivalry between companies was keen, and at times ruthless. In an attempt to ruin Fessenden's tests, the rival company instructed its operator to keep his key closed whenever Fessenden's station was on the air, but apparently Fessenden's associates learned of this plot and also found a method of obstructing it. The method was simple: just as long as the rival operator was supplied with whiskey he would stay off the air. During one important test, the operator ran out of beverages and threatened to begin "jamming" again until he was placated by a new supply.

Rotary Gap

In 1905 the National company's permanent station was completed at Brant Rock, Massachusetts. The equipment installed in this station included a significant improvement. In place of the usual open, fixed type spark gap, Brant Rock used a rotary gap, consisting of a motor-driven wheel with contact studs arranged equally distant around its periphery. The wheel rotated between two fixed contacts, the result being that the spark discharge passed from one fixed contact to the wheel, then to the stationary contact on the opposite side of the wheel. The effect of using this gap was a signal that was much easier to copy; where the ordinary fixed gap gave a ragged note, often difficult to distinguish from static, the rotary gap afforded a musical note. Soon after the introduction of this gap, operators found that they could identify a station even before hearing its call letters; this was because each transmitter was designed to emit a distinctive note.

The European terminus of the National Electric Signaling Company's trans-Atlantic link was to be at Marihanish, Scotland, but the opening of that station was delayed until well after Brant Rock was in full operation. In January, 1906, with the opening of Marihanish, Fessenden became the first to accomplish regular two-way service across the Atlantic.

(Courtesy of General Electric Co.)

Dr. E. F. W. Alexanderson

Prof. Fessenden, although pleased with the tests at Brant Rock, still felt that much beter resuls could be obained if he had a method of generating continuous high-frequency impulses. Taking a rather direct approach to the problem, he decided that such waves could best be produced by a rotating machine - a high-frequency alternator. The fact that such machines were limited to possibly a few hundred cycles per second did not deter him. He turned the idea over in his mind finally took it to the firm that seemed best equipped to develop it: General Electric Company, largest producer of electrical machinery.

E. F. W. Alexanderson

The possibility of building a generator to develop a hundred thousand cycles per second would have seemed ridiculous to most engineers of that day, but not to the young man Fessenden met at General Electric - E.F.W. Alexanderson. Alexanderson, a Swedish engineer, had started as a draftsman at G-E only a few years earlier. He tackled what seemed to be an impossible task, but in time delivered the first unit to the Brant Rock station - an alternator intended to generate one kilowatt of high frequency energy. Fessenden's biographer suggests that the professor was not satisfied with the completed machine, that it did not deliver a frequency as high as expected, and that he took it to his own shops and rebuilt it, after which it delivered about 80,000 cycles. More important is the fact that Alexanderson designed and built the machine, carried it to the high degree of perfection that made it one of the two most important sources of radio waves and gave Fessenden the instrument that enabled him to make the first radio broadcast in history.

First Radio Broadcast

Fessenden's earlier tests of wireless telephony had been point-to-point tests. The obvious method of testing his new equipment would have been to transport a receiver to selected points and listen for the signals from his transmitter. This seemed to be slow and expensive. Wireless had progressed to the point where there were numerous shore stations along the Atlantic coast, not to mention the many ship receivers. Why not use these in a test? He went ahead with plans to send speech and music to all stations within listening range of his transmitter, and with this in mind he carried out the first radio broadcast on Christmas Eve, 1906.

Fessenden opened the program by sending the "CQ" or general call to all stations, and announced the purpose of the test. The first number was a phonograph recording of Handel's "Largo". This selection was followed by what would today be called "live" entertainment. When arrangements were being made for the test, it was learned that no one at the station, with the exception of Fessenden, had any musical talent. He could, and did play the violin, and his rendition of Gounod's "O Holy Night" established him as radio's very first performer. Reception of the broadcast was reported from as far south as Norfolk, Virginia and when the program was repeated a week later on New Year's Eve, results were even better; reports came in from all along the Atlantic Coast from Massaschusetts to the West Indies.

During his career, Prof. Fessenden produced a number of very important inventions in addition to the electrolytic detector and the original idea of the high-frequency alterna-

tor. One of the greatest of these was the heterodyne receiver, ancestor of the superheterodyne. It was modestly described by the inventor as "undoubtedly the most efficient form of receiver in existence. . . . " In considering this invention, it must be remembered that Fessenden arrived at the idea of mixing the incoming signals with a second source of energy, all without benefit of vacuum tubes.

Fessenden's optimism concerning the Alexanderson alternator was soon justified; by 1909 Alexanderson had designed and built a successful 2-kilowatt machine and had applied for patents on the idea. That same year, radio dramatically demonstrated its value as a life-saving device in the collision between the White Star liner Republic and the steamship Florida. Through the heroic efforts of operator Jack Binns of the Republic, the loss of life in the accident was remarkably low.

A week after the Republic collision the Navy department asked for bids on the construction of a powerful station to be located near Washington, D.C. the new station was to be capable of maintaining contact with ships 3,000 miles at sea. Seven bids were received, and the most satisfactory was the one offered by Fessenden's National Electric Signaling Company.

Valdemar Poulsen

Meanwhile, there had been important developments abroad. Valdemar Poulsen, a Dane, had developed another new source of radio waves, based upon the operation of the direct current arc. The arc had been widely used in street lighting, prior to Edison's invention of the incandescent lamp, and in investigating its properties, W. Duddell had learned that when an inductance and a capacitance were connected in parallel with an arc it produced a "singing" effect. This was found to be due to generation of a high-frequency alternating current by the arc, despite the fact that it was supplied with direct current. Duddell had been able to produce only a high-frequency audio note with the arc; Poulsen gave the matter intensive study and was able to generate radio-frequency currents, thus opening the way to an entirely new method of radio transmission.

In his study of the arc converter, Poulsen also solved several other pressing problems. First of these was the rapid erosion of the arc carbons. This was overcome by the introduction of powerful electromagnets to pull the arc into a curved path, thus causing it to strike from the side, rather than the end of the carbon. Still later, a motor drive was added to turn the carbon on its own axis, thus constantly presenting a new striking area. Conduction of the intense heat of the arc from the arc chamber was solved by using copper, in place of carbon as one of the electrodes; copper of course, offered a much higher

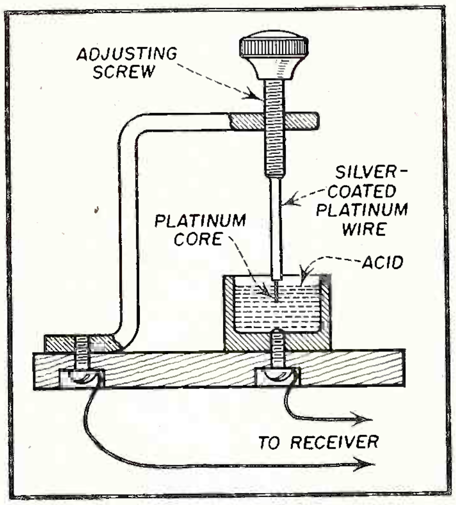


Fig. 1. Electrolytic detector

rate of heat conduction than carbon. A further development was the use of a hollow copper electrode with circulating water for cooling. The efficiency of the transmitter was tremendously increased by burning the arc in an atmosphere of hydrogen instead of air. *Fig. 2* illustrates the principle of the arc converter.

Within a few years, Poulsen had designed and built a powerful transmitter, using his arc converter, at

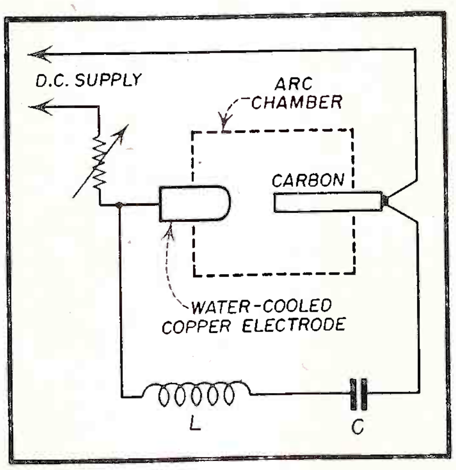


Fig. 2. Poulsen arc converter

Lynby, near Copenhagen, Denmark. It was not long thereafter that the arc transmitter was offering the Alexanderson alternator some serious competition. The Federal Telegraph Company became the leading manufacturer of arc transmitters in this country, and several long-distance links between continental United States and overseas points had been set up.

With the development of the arc and the alternator, it soon became evident that the old spark transmitter was rapidly becoming obsolete. At this point it might be well to consider the relative merits of the two new systems, in order that later developments may be fully understood. The alternator, of course, produced the desired radio frequency directly, without conversion and for that reason was the more efficient. However, in order to maintain an absolutely constant radio frequency, which was highly essential, the speed of the alternator had to be kept constant within very close limits. The arc was somewhat more compact; it had the disadvantage of requiring considerable attention in the way of carbon replacement and cleaning, but this was offset by the fact that most repairs to an arc transmitter could be performed by the station staff, whereas the alternator required specialized attention.

European versions of the alternator soon entered the field; the basic principle was about the same as in the Alexanderson machine, except that the method of producing the desired radio frequency was somewhat different. French systems used several alternators mounted on one shaft, thus reducing the number of poles needed in a single machine. German high-power stations used the Goldschmidt alternator which depended upon the utilization of the principle of resonance to build up large currents within the machine as well as the multiplication of frequencies through the interaction of currents in the rotor and stator windings.

At the beginning of World War 1, there were two German companies operating trans-Atlantic circuits. One used the Goldschmidt alternator, while the second used a machine developed by the German General Electric Company. Powerful stations had been built at Nauen, Germany; Sayville, Long Island and Tuckerton, New Jersey operating at 10,000 meters. About the same time, the Marconi system established two new links operating between Carnavon, Wales and New Brunswick, New Jersey and Stavanger, Norway to Marion, Massachusetts.

By 1915, Alexanderson had built a successful 50-kilowatt alternator, and Guglielmo Marconi made a special trip from Europe to Schnectady, New York to witness the test. A duplicate

[*Continued on page 45*]

TUBE TOPICS

by James Corey

THE television tube design engineers have come up with a new and improved design for electrostatically-focussed picture tubes which are being referred to as low-voltage types. These new tubes have been so designed that they require a sufficiently low value of focusing voltage that it can be supplied from the regular B supply of the TV set.

This permits a marked simplification in set design as compared with that reported in "Tube Topics" for March wherein a separate 2500-volts focusing-electrode supply was shown.

Conversion Simple

Use of the regular B plus supply means that an existing design of TV set using electromagnetic focusing can be adapted to the new low-voltage type of electrostatically-focused tubes with the addition only of a 1 megohm focussing voltage control potentiometer and magnetic centering device. Two of the new types bear the designations 17HP4 and 20HP4. Other than for the electrostatic focussing feature, these tubes are similar to the types 17BP4A and 20CP4 which employ magnetic focussing.

The development of these electrostatically focussed tubes requiring low voltage creates the possibility that they can be used to replace electromagnetically-focussed tubes in sets incorporating the latter types. If such works out in practice, it would mean sometime in the future that the wholesale distributors, dealers, and servicemen could get away with stocking one tube type in each envelope—as for example, the 17HP4 to take care of replacements for the 17BP4A, 16KP4, 16TP4 and the 17FP4 (high voltage electrostatic). Also difficulties with proper adjustment of the focussing coil for centering and elimination of shadowing and interaction with the ion-trap magnet would be a thing of the past.

Cylindrical Face Plates For Picture Tubes

Up to now all television picture tubes have had a face plate that is described as spherical. This means that the face is a portion of a sphere. This shape, an outgrowth of the time when bulbs were blown from thin glass rather than pressed in heavy glass, has been considered necessary to obtain the required amount of strength. This spherical surface, on the other hand, has been a source of trouble in use, principally because it will pick up and reflect light originating from any and all locations in front of the tube. These light reflections have been a source of annoyance to viewers and to reduce them the picture tube industry went to neutral gray filter glass in the face plate. A further step which has not been universally accepted has been the use of a face plate that is frosted on the outside. While the use of frosted face plates achieved a marked reduction in the reflected light, these face plates are just as subject to scratching in manufacture and in handling as the non-frosted. But shallow scratches cannot satisfactorily be buffed off as in the case of a bulb having a smooth surface, for the buffing also removed the frosting.

The new cylindrical-face picture tubes (see *Fig.1*) are being brought out chiefly because they provide a means for eliminating the effects of reflected light on the face. The faceplate on these types takes the form of the side wall of a very large cylinder, the axis of which is vertical when the tube is in position, i.e. the axis of the cylinder runs parallel to the height of the picture. By properly positioning the picture tube at a slight angle, it is possible to eliminate any light reflections that would normally disturb the viewer. The principal of this is similar to that first employed in "invisible" show windows having curved glass that created a sensation some fifteen years ago when first introduced. At the moment only 21-inch tubes are available—the 21EP4 which is electrostatically focussed and the 21FP4 with magnetic focus.

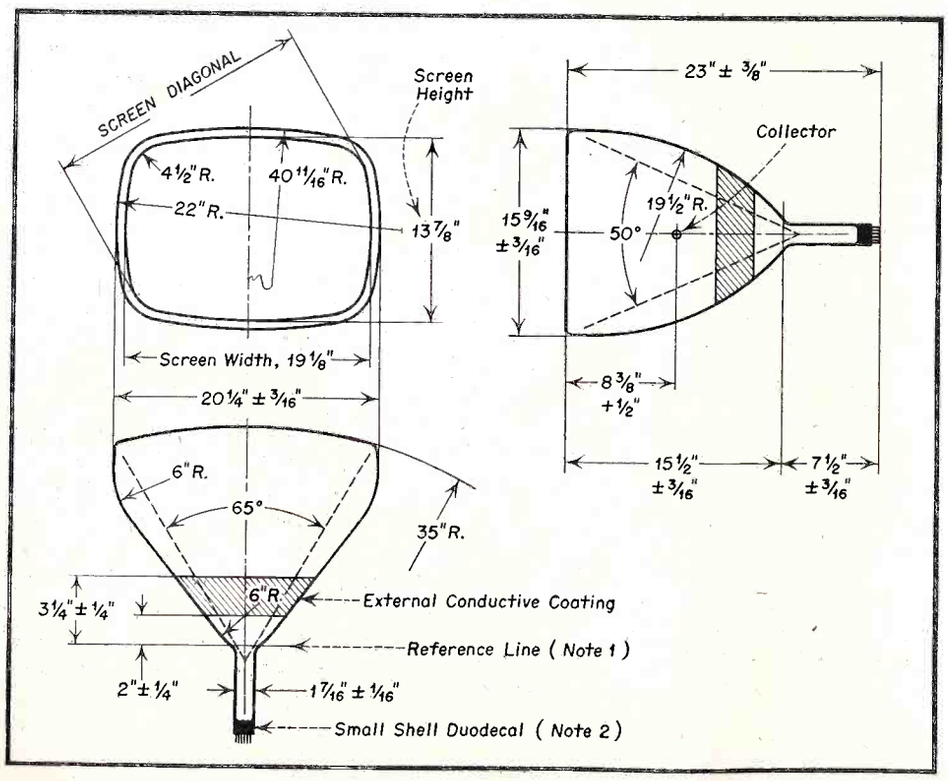


Fig. 1. New type cylindrical-face picture tube designed to eliminate reflections.

Tube Availability On Increase

At this writing many of the TV and recent radio types of tubes have become readily available; in fact, some of the "surplus" operators who were selling scarce tubes at close to list price, are now offering the same types at drastic cut prices. Shipments of receiving tubes to the renewal field reached a new high in the first quarter of 1951, totally over 25 million. This compares with 69 million for the entire year 1950. As a result for most types there is no shortage now. But this is expected to be a temporary situation as curtailments in produc-

[*Continud on page 42*]

SHOP NOTES

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

Focus Coil Spring Repairs

A number of television receivers provide four adjusting bolts which are under spring tension for changing the position and tilt of the focus coil unit. If several turns of any one of these bolts fails to make an appreciable difference in picture positioning or corner shadowing, the trouble may lie in a spring with insufficient tension or in a broken spring. Inasmuch as adjustments on this unit are often

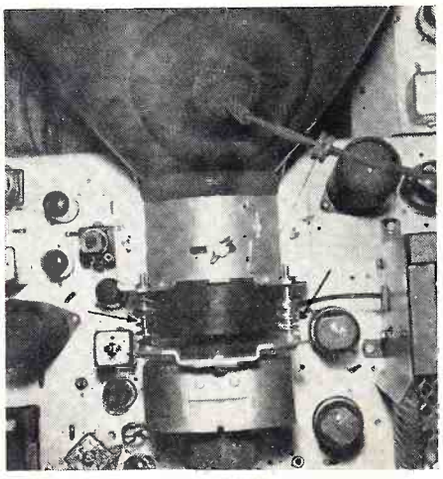


Fig. 1. Springs which may break are shown in the photograph above by black arrows.

made from the back of the set while the chassis is still in the cabinet, it is not always possible to see by visual inspection whether or not spring tension is at fault. For this reason the bolt under question must be removed entirely so that the spring is released for inspection. See *Fig. 1.*

A spring with insufficient tension can often be stretched to give the desired results, though a broken spring will of course necessitate replacement.

Submitted by
Matthew Mandl
Trenton, N. J.

Checking Ion Trap Positioning

Here is a quick check for the positioning of an ion trap magnet without moving the magnet. This is assuming the set is operating properly, but the serviceman would like to know if the magnet is properly set, and yet not take the trouble to reset it.

Take a magnetized screw driver and hold it across the poles of the magnet. Repeat on other side of neck. If magnet is properly set, brightness will *decrease* as the screw driver approaches neck of tube regardless of direction of approach. If even the slightest increase in brightness is noted on approach from any direction, magnet needs resetting. This is actually much quicker to do than to read about.

Submitted by
Water J. Swontek
Bedford, Ohio

Self Heating Solder Pot From Soldering Iron

Very often a small solder pot is needed around the service shop for tinnig ends of wires and dip-soldering certain items. A simple one can be made as shown in *Fig. 3.* It consists of a soldering iron having a pipe el-

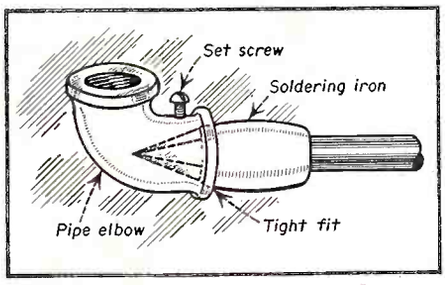


Fig. 2. Solder pot made from pipe elbow which can be used for tinning wire ends.

bow fitted tightly over the end of the copper—a set of screws being used to lock it in place. Simply fill the elbow with solder and when iron is turned on, solder will soon be melted.

Submitted by:
Marion L. Rhodes
Knightstown, Ind.

Light For Dark Corners

A light for dark corners in radio or TV work can be made by inserting a 120 volt 7 watt bulb into the socket of an Ungar, pencil type soldering iron. A drop of solder should be put on the center terminal of the bulb because of the iron's deep socket.

Submitted by
Paul W. Jacobs
Philadelphia, Pa.

Discarded Clock Case Utilized

Bakelite or plastic clock cases—whose mechanism no longer operates are useful as cases for indicating meters.

The ammeter shown, is mounted in such a case, which is about 5 inches in diameter. See *Fig. 3.*

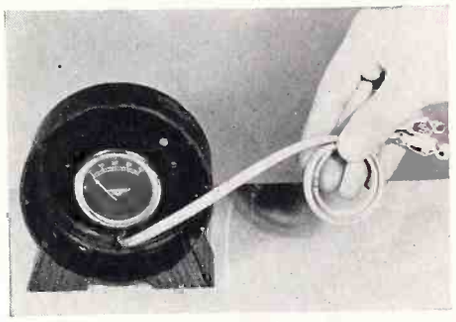


Fig. 3. Utilizing old clock case as meter mount.

Holes in the back of the case, originally used for clock adjustments are now utilized for test leads having clips on the ends.

Such a d-c ammeter is useful in checking current taken by auto radios when on the test bench.

Submitted by
H. Leeper
Canton, Ohio

Zenith 12HO90—Dim 6AL7GT

The "seeing eye dog" tube or 6AL7*gt* tube becomes very dim. A new tube does not help it any. But by replacing a new 5Y3*gt* rectifier tube it will bring the sensitivity of the 6AL7*gt* tube up to brilliancy. The 5Y3*gt* tube is gassy but the the radio plays perfectly.

Submitted by
Homer L. Davidson
Fort Dodge, Iowa

Removing Old Condensers

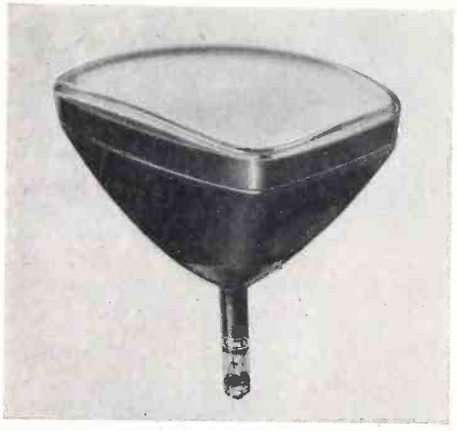
When replacing can type condensers with tubular type many servicemen leave old condensers in the circuit for a tie point. This is a poor practice as old condenser can easily become shorted. Also I have had cases where internal coupling between sections of condenser in the can will cause steady or intermittent hum alfter the set has been used for a while.

Submitted by
Glen A. Brink
Boulder, Colo.

NEW PRODUCTS

17-INCH RECTANGULAR GLASS PICTURE TUBE

Tube Department, Radio Corporation of America, Harrison, N. J. announces the 17BP4-A, a short, directly viewed rectangular picture tube having a picture area 14⅜" x 11-1/16". Its design incorporates a high-efficiency, white fluorescent screen on a face made of Filter-



glass to provide increased picture contrast; employs magnetic focus and magnetic deflection; has an in-built capacitor formed by the internal and external conductive coatings to serve as a supplementary filter capacitor for the high-voltage supply; and utilizes an ion-trap gun requiring only a single-field, external magnet. The 17EP4-A has a diagonal deflection angle of 70° and a horizontal deflection angle of 65°.

MULTIMETER-WIRED OR KIT

The new 20,000 ohms/volt Multimeter Model 555, just released by the Electronic Instrument Co., 276 Newport Street, Brooklyn 12, N.Y., announces the Model 555 which incorporates 31 different ranges.

The 4½" meter has a 50 ua D'Arsonval movement for dependable accuracy. All resistors have 1% or better accuracy. The integral rectifier is hand-calibrated and hand tested. Ruggedly constructed, the instrument is housed in a beautiful, durable high-impact Bakelite case and panel, into which all figures and symbols are imbeded for extra-long wear and readability.

Ranges: DC Voltage: 0-2.5, 10, 50, 250, 1000, 5000, at 20,000 ohms/volt. AC Voltage: same ranges, at 1,000 ohms/volt. Output Voltage: same ranges, with 0.1 mfd internal series condenser. Decibels: -12 db to -55 db, in 5 ranges. DC Resistance: Rx1, Rx100, Rx10,000. DC Current: 0-100 ua, 10 ma, 100 ma, 500 ma, 10 A, (250 millivolts).

DC Accuracy: -3% of full scale. AC accuracy: -5% of full scale.

Complete with batteries, Model 555-K, Kit, is $29.95; and Model 555, factory wired, is $34.95. Dimensions: 6¾ x 5¼ x 3".

SHURE MICROPHONES

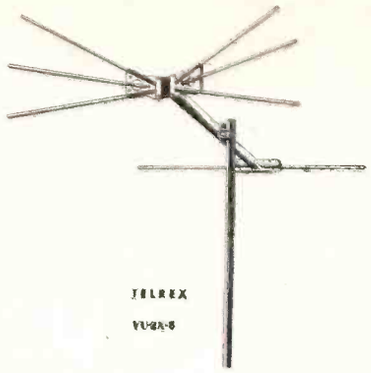
The petite version of the famous Shure Unidyne microphone makes its bow at the 1951 Parts Distributors Show in Chicago. Shown (right) in the photo, the new small Unidyne, Model 558, is an ultra-cardioid microphone approximately one-half as large as its companion in the Shure line, the world-famous standard Unidyne Model 55. The small version

retains all the important directional qualities of the Model 55, and is offered as the only small-size uni-directional moving-coil dynamic microphone. The moving coil system has a high overall efficiency and smooth frequency response, according to Shure Brothers, Inc., the maker. A large air-gap clearance and a rugged coil construction provide immunity of the moving coil system to abnormal atmospheric conditions and severe mechanical shock.

NEW CONICAL ANTENNAS

Telrex, Inc., Asbury Park, N. J., introduces its new, low cost "Vanguard" series of "Conical-V-Beams", it was announced recently by Ralph Ercolino, Sales Manager of the Company.

The low priced "Vanguards" incorporate all the essential structural and design features of standard Telrex models and will make available to installation specialists and other economy-conscious volume users, genuine "Conical-V-Beams" combining top performance, long service life and lowest initial cost.



The "Vanguard" series is expressly designed for city and suburban area service and is available in 4 models to answer varying sensitivity requirements.

Bulletin V-2 describing the Telrex "Vanguard" series of "Conical-V-Beams" is available on request.

ION TRAP

A new Ion Trap called the "E-ZEE-ON" has been announced by the The Indiana Steel Products Company.

The "E-Zee-On" Ion Trap possesses a uniform field pattern and can be adjusted in a matter of seconds with one hand. It's a slip-

on, grip-snug beam bender made of one piece, permanently magnetized Cunife that can't be put on backward and requires no manual clamping. According to the manufacturer, the "E-Zee-On" provides a more uniform magnetic field pattern, resulting in brighter, more uniform definition easily attained by sliding the "E-Zee-On" forward or backward on the tube neck. Because of its uniform weight distribution, it will not jar loose or slip, nor come out of adjustment.

For descriptive folder, write The Indiana Steel Products Company, Valparaiso, Indiana.

TUBE TESTER

A New Triplett Tube Tester with improved testing flexibility permitting checking any type radio receiving tube, miniature hearing aid tubes, pilot lamps, flashlight bulbs and TV picture tubes. The tester gives both "short" and "open" circuit check of each

element of every tube—an accurate analysis of the condition of all tube elements, connections, taps, etc. TV picture tubes are checked without removing them from the re-

Yours for the asking...

radio and TV data you can't get elsewhere...

You're missing a lot when you miss an issue of RCA Service News. Every copy is crammed with authoritative, hard-to-get information vital to your business. And it's available, free, to all dealers and servicemen —through your RCA DISTRIBUTOR.

RCA Service News is published bimonthly by the RCA Tube Department, and contains helpful tips on the radio and TV business . . . technical articles on servicing . . . announcements about RCA literature and the newest promotions . . . sales and business aids . . . the latest, most *authoritative* information, direct from headquarters. Reading "RCA Service News" is the easiest, quickest way to keep up-to-date on news that counts.

★ ★ ★

Exclusive! **Articles on TV Servicing by John Meagher, RCA TV Specialist**

Mr. Meagher, author of the famous *RCA Television Pict-O-Guides,* and numerous other publications, and lecturer on practical servicing problems, is recognized as one of the country's foremost authorities on modern television servicing. His concise articles on every phase of TV troubleshooting appear regularly in RCA Service News. You can't afford to miss them.

How to get RCA Radio Service News Regularly

RCA Radio Service News is distributed free of charge to radio-TV dealers and servicemen through the courtesy of RCA DISTRIBUTORS of tubes, batteries, test equipment and electronic components. It is given out by RCA DISTRIBUTORS either by mail or over the counter. Ask *your* RCA DISTRIBUTOR to include your name on his mailing list . . . or to set aside a copy for you in his store. Hams: Ask him also about "RCA Ham Tips."

Keep informed . . . keep in touch with your RCA Distributor.

RADIO CORPORATION of AMERICA

TUBE DEPARTMENT **HARRISON, N. J.**

ceiver, by use of an adapter that may be purchased separately. "Continuity" test is provided for checking electrical appliances, motors, etc.

Model 3413-A has flexible 3-position lever switches for complete coverage of present and future tube connections. RMA pin numbering of tube element levers makes for quick reference of tube base connections. Illuminated, easy-to-read roll type tube chart is built into the tester. Simplified test procedure makes it possible for user to add new tube data to chart when desired.

Line Voltage indication on center of meter dial permits observation and adjustment for line fluctuations. Filament Voltage: 0.63 volts to 110 volts in 14 steps.

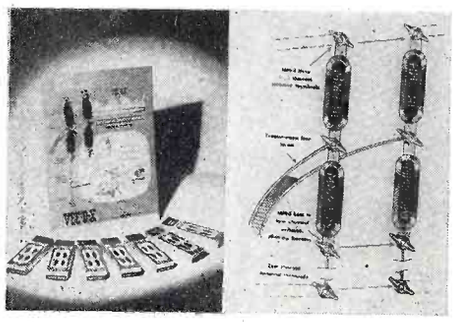
Large 6" meter, Red-Dot Lifetime guaranteed, has 3-color easy-to-read GOOD-?-BAD scale.

Portable metal case, 16-11/32" x 11-1/32" x 6-1/8", black satin wrinkle finish, with removable, hinged cover and leather handle. Panel attractively etched in black, silver and red.

Complete instructions supplied. Power: 115 volt, 50-60 cycle A.C. Weight: 20 lbs. For further information write: The Triplett Electrical Instrument Co., Bluffton, Ohio.

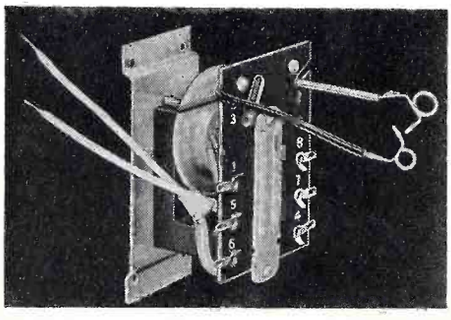
MATCHING TV ANTENNA

Vee-D-X Mighty Match, which permits the use of a single transmission line between separate high and low channel antennas mounted on the same mast, is now being manufactured of hi-dielectric plastic. The availability of this new material has resulted in increased production and improved delivery. Left photo - Along with a new package design for the Mighty Match, a display card with a unit attached is now available to all distributors. Right photo - New Vee-D-X Mighty Match now manufactured of hi-dielectric plastic.



HORIZONTAL FLYBACK TRANSFORMER

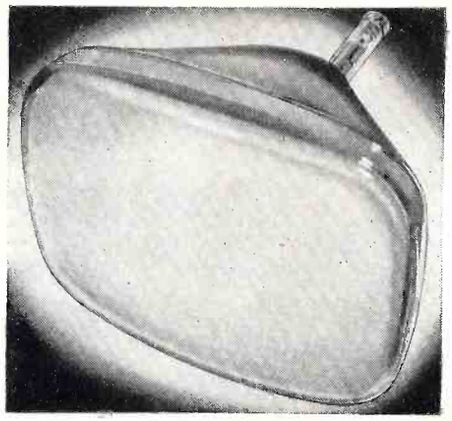
The RAM new Model XO53 Flyback Transformer,has just been released by RAM Electronics, Inc., South Buckhout Street, Irvington-on-Hudson, N. Y.



Specially pattern-wound and constructed to RAM's high quality standards, the XO53 generates 16 KV for both the regular deflection and the new electrostatic deflection picture tubes - up to and including the 20" size. When used with the RAM Y7OF10 Cosine Deflection Yoke, the horizontal sweep far exceeds the needs for all types 20" tubes. The XO53 is built to take up 23,000 volts without breakdown! Further, the XO53 has excellent regulation and linearity control, and needs no special width and linearity coils.

ELECTROSTATIC FOCUS PIX TUBE

The Cathode-ray Tube Division of Allen B. Du Mont Laboratories, Inc., announces two rectangular Teletrons, Types 17FP4 and 20GP4, employing electrostatic-focus.



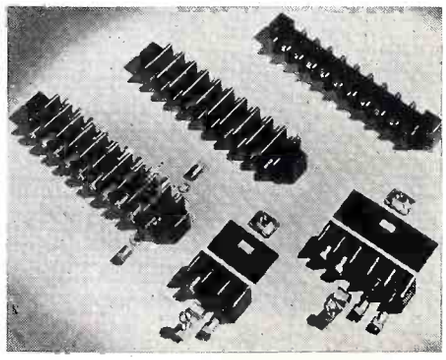
The new electrostatic-focus Bent-Gun provides pictures which are comparable in all respects to the quality of pictures produced by popular magnetic-focus Teletrons.

The elimination of magnetic focusing components effects an appreciable saving of critical material. Thus, by reducing the amount of copper or cobalt required in the television receiver, increased production is facilitated under current defense restrictions.

Focusing voltages required for both the 17FP4 and 20GP4 are approximately 23% of anode voltages. These electrostatic-focus Teletrons are similar to the popular Du Mont Types 17BP4A and 20CP4.

TERMINAL BLOCK

A new Shaw Insulator Company terminal block, originally developed for the Navy, is now available to manufacturers. Made of maximum strength molded phenolic plastic, it is



designed for high voltage insulation. It completely eliminates non-functional materials and its compactness takes advantage of the smallest operating space. Segregated, individually accessible connections make installation and service fast and efficient. Comes with or without related hardware. Send for free descriptive literature, specifications and prices today. Shaw Insulator Company, 160 Coit Street, Irvington, New Jersey.

4-ELEMENT YAGI BEAM

A new series of 4-Element Yagi Television Antennas has been added to the "Long-Ranger" Yagi line, it was announced by Mr. Ed Finkel, sales manager, of the JFD Manufacturing Company, Brooklyn, New York.

Incorporating twin directors, collector and reflector elements, cut to exact channel wavelength, the new JFD Yagi affords excellent forward gain, sharp horizontal directivity and reduced interference. Exclusive JFD "Quik-Rig" construction cuts installation time to minutes. Elements are snapped into place and tightened for immediate assembly. A stepped-up driven element provides a direct match to 300 ohm impedance. Sturdy aluminum construction assures extra strength and permanent corrosion resistance.

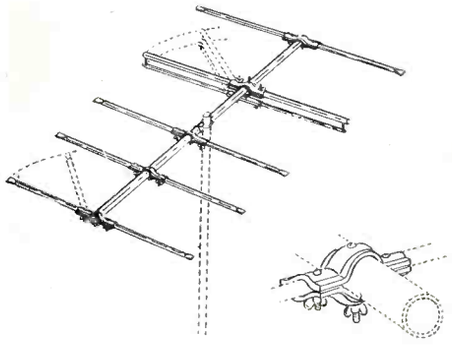
The JFD No. 4Y "Long-Ranger" series is available for both high and low band channel reception. In addition, stacked and double stacked arrays can be supplied cut to any high band channel. Jumper bars are available for stacking of low- band 4-Element Yagi arrays.

Illustrated literature describing a complete JFD Yagi line is available from the manufacturer.

LOW-BAND YAGI

Design of a new low-band Yagi television antenna has been announced by Radio Merchandise Sales, Inc., 1165 Southern Blvd., New York.

High gain together with sharp directivity, it is claimed, is assured with the new unit which features complete preassembly with snap-out construction for ease of installation.



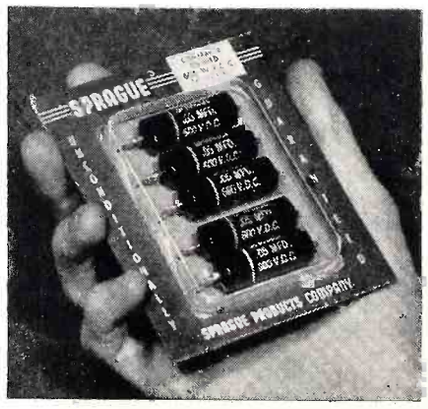
Examination of the RMS construction discloses rib re-enforcemtns, with double brackets to provide sturdy, stress-proof performance. Both sides of each element are locked in the clamp support, in three positions.

RMS low-band Yagis are available with ½" or ⅜" elements. Complete details can be obtained from the manufacturer.

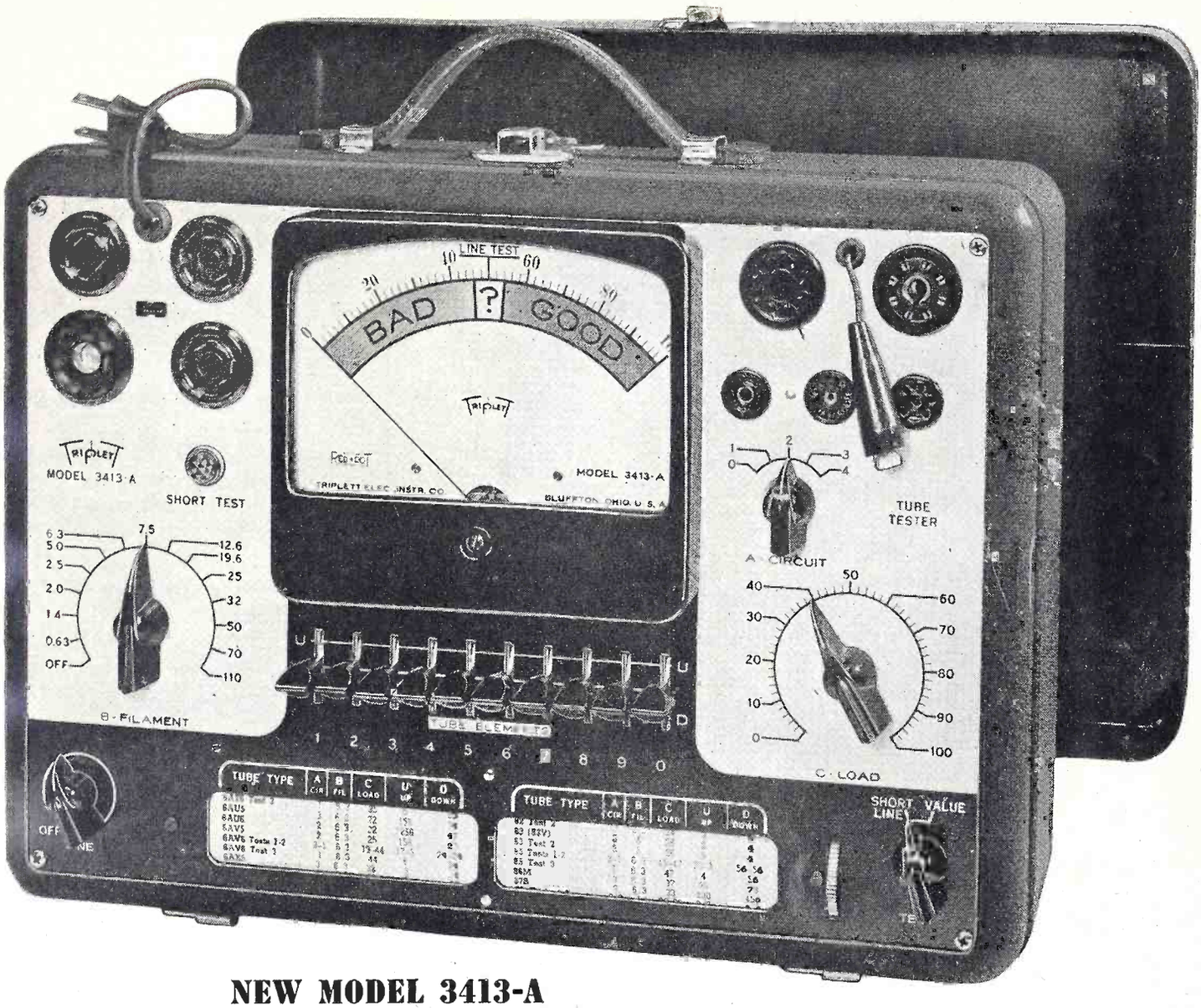
PLASTIC CONDENSER CONTAINER

Sprague Domepak, a handy double-purpose package containing 5 Telecap molded tubular capcitors of the same value has been introduced by the Sprague Products Company, North Adams, Mass. Attractively decorated in blue, white and orange, Domepak consists of a clear plastic protective dome container mounted on heavy cardboard backing. The capacitors are thus kept in clean, factory-fresh condition.

Domepak looks good in the service shop, makes capacitors easy to handle, easy to find and easy to stock. If desired, the packs can



be hung from hooks. Five different values of famous 600-volt Sprague Telecap molded tubulars—.005 - .02 - .05 and .1 mfd available in Domepak cover a high percentage of modern radio and television replacement requirements.



NEW MODEL 3413-A

THE FLEXIBLE, FAST WORK HORSE OF TUBE TESTERS

New Model 3413-A gives you complete flexibility and the accuracy needed for testing all tubes, including TV—*yet the test procedure is simple and fast.*

With it you have all the advanced features needed to cope with the rush of day-to-day servicing. It will make you money in the testing time saved—and you will like its economical price, too.

GREATER METER SENSITIVITY for the new type tubes with low cathode current.

ILLUMINATED SPEED-ROLL CHART, with test settings for over 700 tubes at the flick of a finger. New tube settings promptly available. Easy to keep up-to-date.

BV ADAPTER permits testing picture tubes *without removing tube from receiver.*

POSITIVE individual test of each filament.

SPECIAL CIRCUIT feature accurately compensates to provide correct voltage on each tube test.

IMPROVED LEVER SWITCHING (originated by Triplett) for complete control of each tube element.

A FLIP OF A SWITCH tests each element for shorts.

BIG SIX-INCH METER, with exclusive Triplett Red Dot Life-time guarantee.

A "SHOW PIECE" with handsome 3-color etched panel, for counter or portable use.

Many other practical up-to-the-minute features have been incorporated in this new Tube Tester. Be sure and see it soon.

Now on display at your distributor's.

This BV Adapter for Model 3413-A enables you to check TV picture tubes without removing them from receivers.

FOR THE MAN WHO TAKES PRIDE IN HIS WORK

Triplett

TRIPLETT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO, U. S. A.

TRADE FLASHES

[*from page 14*]

men who buy Thomas tubes will get an added bonus in the form of a certificate which has a currency value when purchasing test equipment.

The test equipment chosen for this promotion is that of the Simpson Electric Company of Chicago who make a complete and very much in demand line of instruments for television and FM servicing including the Model 260 AC-DC Volt-Ohm-Milliameter.

Krylon Now Labeled For TV Service Use

Krylon, Inc., of Philadelphia, is now packaging Krylon, an acrylic plastic with scores of uses, under a special label for use in the television service field.

Bill Scales Heads Du Mont Tube Division Sales

Wm. C. Scales has been appointed to the position of General Sales Manager of the Cathode-ray Tube Division, Allen B. Du Mont Laboratories, Inc., announces Irving G. Rosenberg, General Manager of the Division.

In his new capacity Mr. Scales will direct the sale of Du Mont Cathode-ray Tubes to both Manufacturers and

Wm. C. Scales

Parts Distributors throughout the world. Mr. Scales, who has been with the Du Mont organization since September, 1949, was southwestern regional sales manager for the Receiver Sales Division, with headquarters in Dallas, Texas. He has been active in television circles since the

ADMIRAL
PART 1 - PAGE 1
CHANGERS BY MODEL NUMBERS OF COMPLETE EQUIPMENT

PERMO *long-life* PHONOGRAPH AND NEEDLE FACTS

PERMO

ADMIRAL LISTING

CHANGERS BY MODEL NUMBERS OF COMPLETE SETS, PLAYERS, ETC.

FIND NEEDLE NUMBER BY LOOKING UP CHANGER NUMBER IN PART 2

ADMIRAL MODEL NO. OF SET	MODEL NUMBER OF RECORD CHANGER OR CHANGERS USED
4H15A or B	—Nos. RC221 or RC321.
4H15S or SN	—Nos. RC210, RC211, RC212, RC221 or
4H16A or B	—Nos. RC221 or RC321.
4H16S or SN	—Nos. RC210, RC211, RC212, RC221 or
4H17A or B	—Nos. RC221 or RC321.
4H17S or SN	—Nos. RC210, RC211, RC212, RC221 or
4H18C	—Nos. RC221 or RC321.
4H18S or SN	—Nos. RC210, RC211, RC212, RC221
4H19C	—Nos. RC221 or RC321.
4H19S or SN	—Nos. RC210, RC211, RC212, RC221 o
4H115S or SN	—Nos. RC210, RC211, RC212, RC221
4H116S or SN	—Nos. RC210, RC211, RC212, RC221
4H117S or SN	—Nos. RC210, RC211, RC212, RC221
4H126A or B	—Nos. RC221 or RC321.
4H126C or CN	—Nos. RC221 or RC321.
4H126S or SN	—Nos. RC210, RC211, RC212, RC221
4H137A or B	—Nos. RC221 or RC321.
4H137S or SN	—Nos. RC210, RC211, RC212, RC221
4H145A or B	Nos. RC221 or RC321.
4H145C	RC211 12, RC221
4H	RC22

RC210, RC211, RC212	For 33⅓ & 78 R.P.M.	A-300, C-320
RC150, RC160, RC160A, RC200	For 78 R.P.M.	C-323 or C-325
RC182	For 33⅓ R.P.M.	A-311
RC221, RC222, RC321, RC322	For 33⅓, 45 & 78 R.P.M.	A-300, C-320
RC500, RC550	For 33⅓, 45 & 78 R.P.M.	B-306
C500, 550	For 33⅓, 45 & 78 R.P.M.	B-307
RC400	For 45 R.P.M.	A-300
RC400	For 45 R.P.M.	A-305

Save Your Time

use complete authentic

PERMO "FACTS"

TO MAKE HIGH-PROFIT PHONO-NEEDLE SALES

ADMIRAL • PHILCO • COLUMBIA

SECTIONS OF PERMO *long-life* PHONO AND NEEDLE FACTS

NOW AVAILABLE—OTHERS FOLLOW IN '51

PERMO, INCORPORATED

PERMO

Champion of Perfection

6401-33 N. RAVENSWOOD AVE.
CHICAGO 26, ILLINOIS

SEND FOR YOUR FREE "FACTS" NOW!

Permo, Inc.,—Dept. E
6401-33 N. Ravenswood Ave.,
Chicago 26, Illinois

date _____

Gentlemen:

Please send me the FREE sections of Permo Long-Life Phonograph and Needle Facts I have checked below:

☐ Admiral ☐ Philco ☐ Columbia

Name _____

Address _____

City _____ Zone ____ State _____

Name of Jobber from whom you usually order.

end of World War II, and prominent in electrical merchandising and sales circles since 1936, taking time out for military service in the Pacific Theatre as a captain in military intelligence from 1941-1946.

Haydu Bros. Co. Awarded Prime Contracts

Haydu Brothers Co. has just been awarded three prime contracts from the Army Signal Corps for special purpose receiving and transmitting tubes announced George K. Haydu, President and Joseph T. Bozzelli, General Sales Manager. The company is presently filling several Air Force sub contracts for aviation precision metal parts. An extensive program is now underway to produce heat induction units, advised Mr. Haydu, and large orders have already been received for headed wires and high frequency crystals. This is in keeping with Haydu Brothers expansion policy during the national emergency, a policy based on the experiences of World War II.

Utah Radio Prod. Formed in Indiana

Utah Radio Products Company, Inc. has been formed in Huntington, Indiana and has begun the manufacture and sale of radio speakers and allied products. The new corporation is a wholly owned subsidiary of Newport Steel Corporation and its president is A. H. Schenkel. Announcement was made recently by Mr. F. S. Gibson Jr. President of Newport Steel Corporation and Secretary-Treasurer of Gibson Refrigerator Company.

Other officers of Utah are: E. V. Norfleet, Secretary and Treasurer; F. W. Tower, General Sales Manager; and M. G. Wike, Sales Manager of the Jobber and Industrial Division. All of these men have been associated with the manufacture of Utah radio speakers for many years. Mr. Schenkel was first associated with the original company thirty years ago.

TRADE LIT.

[*from page 26*]

terval timer; polarity checker; polarity reversal alarm; spark quenchers; charger for small dry batteries; low-current relay circuit; door chime "pepper"; photoelectric relay; crystal radio receiver; electronic metronome; radio-controlled relay; wired radio control transmitter; wired radio control receiver; radio control for model railroads; pocket type stroboscope; light-duty electroplater; low current power supply; radio garage door opener; a-c ammeter-wattmeter for appliance testing; d-c to a-c converter; and an electronic door lock.

The 54-page booklet, which measures 6" x 9" may be obtained from the Advertising Department, *Sylvania Electric Products Inc.*, Emporium, Pennsylvania for twenty five cents a copy, postpaid.

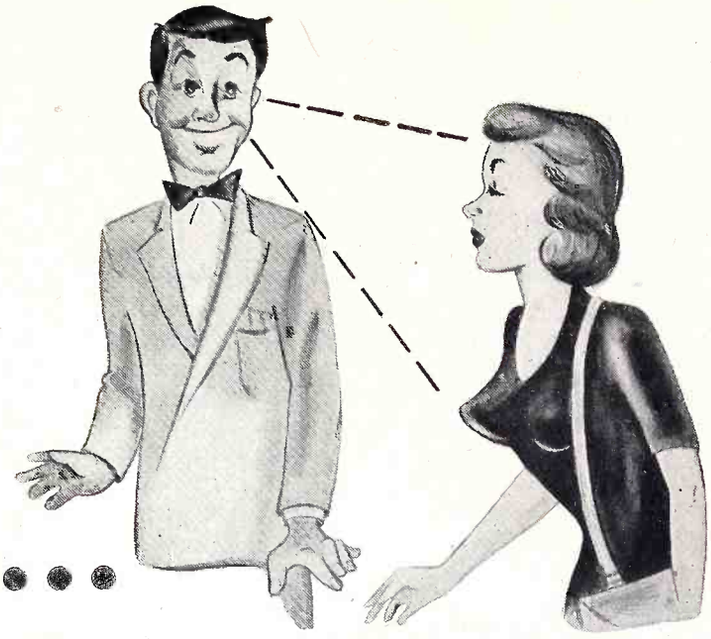
* * *

A new *Engineering Bulletin* is now being offered by *Technical Appliance Corporation*, Sherburne, N. Y., covering the application of the Taco Special Twin-Driven Yagi overcoming the problem of co-channel interference.

The new antenna has a front-to-back ratio of at least twice that of the usual yagi-type antenna. This feature marks this antenna as ideal for areas effected by co-channel interference. The unwanted signals from the rear are rejected, while the terrific gain of the Twin-Driven design is concentrated in a very small receptive angle.

Engineering Bulletin No. 65 is available through Taco Jobbers, or from Taco directly. Complete technical information as to gain and directivity is given in curves and graphs, while other electrical charac-

NO EYE STRAIN . . .



WITH A Sheldon "Telegenic" Picture Tube

where

BLACK IS BLACK - WHITE IS WHITE -

and between

ALL THE NATURAL INTERMEDIATE SHADING!

PLEASANT, visual-comfort, continuous viewing without eyestrain can only be had on a picture tube screen that has neither "tints" nor color to befog the picture. A "yellow" or a "blue" screen tube compels the viewer's eyes to compensate for the inequalities and exaggerations in picture tone values, such as muddy "off" blacks and glarey or tinted highlights. Anyway you look at it, this causes eyestrain.

That is why SHELDON was the first to standardize on a "black and white" screen. Its picture tube screens cause NO EYESTRAIN and NO GLARE . . . they give the utmost in picture quality.

To You in the Television Industry,
TRY A SHELDON TUBE IN YOUR OWN SET FOR SEVEN DAYS
— and BE CONVINCED!

MAIL COUPON TODAY

SHELDON ELECTRIC CO.

A Division of ALLIED ELECTRIC PRODUCTS INC.
68-98 Coit Street, Irvington 11, N. J.

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

SHELDON ELECTRIC CO., 68 Coit Street, Irvington 11, N. J. 6

Send Me FREE

- ☐ Booklet, Visual Proof of Sheldon Picture Quality
- ☐ "Television Mis-Information", Sheldon's Famous Trade Magazine
- ☐ "Tube Specifications Wall Chart"—June Edition
- ☐ "ION BURNS—and How to Prevent Them" Folder

Name..... Position.....

Company .....

ADDRESS TO WHICH THIS SHOULD BE MAILED

Street .....

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

SHELDON TELEVISION PICTURE TUBES • CATHODE RAY TUBES • FLUORESCENT STARTERS AND LAMPHOLDERS • SHELDON REFLECTOR & INFRA-RED LAMPS
PHOTOFLOOD & PHOTOSPOT LAMPS • SPRING-ACTION PLUGS • TAPMASTER EXTENSION CORD SETS & CUBE TAPS • RECTIFIER BULBS

teristics are written up in the accompanying copy. This information is helpful to the servicemen making installations in very noisy areas, as well as in co-channel areas.

* * *

A handy, complete Phono-Cartridge Replacement Chart has just been published by *Electro-Voice* Buchanan, Michigan.

More than just a chart, it includes unique new features that should prove valuable to both the Distributor and his Service-Dealers. Not only does it provide a comprehensive up-to-date replacement listing covering the products of other manufacturers, but it also tells *when* to replace a phonocartridge, *what* tests to make, and *what* type of cartridge to use. It explains the difference between old-style and modern cartridges and shows how to get cartridge replacement business.

Size of the Chart is 11" x 16½". You can hang it up, or fold it to 8½" x 11" for counter or binder use. Printed in 2 colors.

A free copy of the Phono-Cartridge Replacement Chart No. 161 can be obtained from E-V Distributors or by writing to *Electro-Voice, Inc.*, Buchanan, Michigan.

* * *

A catalog sheet describing the new *General Electric Civil Defense* receiver, for application wherever two-way radio systems exist, is now available from the Advertising Distribution Section of the *G-E Electronics Department* at Electronics Park, Syracuse, N. Y.

The new sheet gives complete specifications and features of the new receiver, which is available in two models for low and high band operation.

The receiver can be used to alert key agencies and personnel in a community-wide Civil Defense radio communications system, and for remotely controlling air raid sirens and other warning devices.

* * *

Several new equipment bulletins are available from the *Television Transmitter Division of Allen B. Du Mont Laboratories, Inc.*, 1000 Main Ave., Clifton, N. J., to any one interested in telecasting operations or plans. These bulletins describe in detail the latest products of the division, including operational features, engineering data, illustrations and digrams of interest to the station manager, engineers and planning personnel.

Among these new Du Mont bulletins are: The Universal Color Scanner, Master Control Switch Unit and Master Control Mixer Amplifier, Universal Console, Linearity Bar Generator, and several others covering a wide range of TV transmitting equipment and accessories.

* * *

Workshop Associates is making available a new pamphlet describing the Dubl-Vee antenna in non-technical terms. This pamphlet is designed for use as a giveaway or a mail stuffer, and is attractively styled in two colors. The pamphlet was primarily designed for dealers to use in presenting the DUBL-VEE antenna to their customers.

* * *

Merit Transformer Corporation, 4427 North Clark Street, Chicago 40, Illinois, has prepared several sources of information on TV replacements. Now available is their new 1951 Transformer Catalog No. 5111 which replaces Catalog No. 4911. This brand new catalog shows specifications on the complete line of Television, Radio, Amateur and Industrial Transformers and includes TV Replacements.

Merit has also made available to Radio and Television Parts Jobbers, Servicemen and Set Dealers, their valuable *TV "REPL" Guide and Catalog* which lists replacement parts for over 800 models with over 80 manufacturers.

* * *

The *Greylock Electronics Supply Co.*, 115 Liberty Street, New York 6, N. Y. announces their new *Catalog Supplement No. 15.*

This new supplement brings their regular catalog up to date through the inclusion of all of the latest parts and accessories, including latest prices, for the radio and TV field.

Copies can be secured by writing directly to the company.

* * *

A new, attractive and very informative catalog is now available on Hudson Lamp Bulbs. This was announced through *Oxford Electric Corporation*, 3911 So. Michigan Avenue, Chicago, parent firm of the Hudson Lamp Company of Arlington, New Jersey.

The catalog in bright orange and deep blue gives dimensions and diagrams of the various bulbs. Other information includes the lamp number, list price, candle power, bulb, base and type of service or utility.

* * *

The *Crest Transformer Corp.* of Chicago, Illinois, makers of Crestran transformer equipment have just issued their new 1951 Crestran catalog.

Featured in the 1951 Crestran catalog is a modern line of newly engineered transformers for radio and electronic circuits. Also featured is the Crestrol line of line voltage fluctation control transformers.

The 1951 Crestran catalog can be obtained free of charge by writing to Crest Transformer Corp. 1834-36 W.

* * *

A new 12-page 6 x 9 *catalog,* featuring a series of long-play reference tape recording-playback instruments, designed for government and commercial use in telephone monitoring, training programs, message storage, accident investigation, etc. has been issued by *Amplifier Corp. of America,* New York City.

The nine basic models include units which will provide continuous operation up to 24 hours without changing reels. Other available models have up to 8 recording monitoring and playback channels. All units are metal rack-mounted, with all operating controls and levers on the front panel. Rear doors are supplied for easy accessibility to all major electrical and mechanical components.

Complete descriptive information, including technical specifications, can be obtained by writing for Circular No. 5303 to Amplifier Corp. of America, 398-9 Broadway, New York 13, N. Y.

* * *

A new 130-page *catalog* of radio—television—electronic components is now being offered by *Sun Radio & Electronics Co.,* Inc., 122-124 Duane Street, New York City, distributors. Designed particularly for industrial purchasing agents, research labs, universities, trade schools and service-dealers, this new type catalog, page size 8½ x 11", has been compiled in such manner that full technical information is given on all items listed as well as illustrations and drawings on many. Copies may be had by writing or visiting the Sun Radio establishment on Duane Street, New York City.

* * *

Minnesota Mining & Mfg. Co., St. Paul 6, Minn., makes available a *catalogue* describing the applications of Scotch electrical tapes for TV and other electronic applications.

* * *

Oelrich Publications, 4135 N. Lawler Ave., Chicago 41, Ill., makes available a catalogue which describes its forms for TV service reports. These forms are designed to facilitate record keeping of TV service companies. In addition abook of standard service contracts for TV service firms, radio work sheets, a standard rate book, and other service forms are also described in this catalogue.

* * *

A *catalogue* describing TV transmission lines is available by writing *JFD Mfg. Co., Inc.,* 6101 - 16th Ave. B'klyn 4, N. Y.

* * *

The *Duotone Co., Inc.,* Keyport, N. J. announces a new *Replacement Needle Guide* in chart form which

illustrates various cartridges and their correct replacement needles as used in record players of various manufacturers.

* * *

A *catalogue* describing TV transmission lines is available by writing *JFD Mfg. Co., Inc.,* 6101 - 16th Ave. B'klyn 4, N. Y.

* * *

General Electric Co., Receiver Division, Electronics Park, Syracuse, New York, has just issued a *booklet* entitled, *"TV Sweep Circuit,* and *Service Application Notes.* This booklet contains information on high-efficiency circuits, service hints, basic theory application data sheets and replacement guide and other sweep circuit data. Copies may be purchased for 15c.

Also available is a *catalog* entitled *TV Service Components* No. R78-123 which describes and illustrates CRT sweep and control components and wave traps.

TUBE TOPICS

[*from page 30*]

tion for civilians are expected because of curtailed allotments of strategic materials and because the present low level of TV set production will not continue indefinitely.

Many of the older types, however, continue to be short in supply, as well as the so-called "all-America five" used in AC-DC sets. The older types just aren't being produced, while the total production on the AC-DC types are not enough to satisfy the combined demands of the set mfgrs. and the renewal market.

SCOPE ANALYSIS

[*from page 19*]

normal. Excessive horizontal sweep loss will, however, result in loss of raster in those receivers using the kick-back type of high voltage system.

Other waveform defects are shown in *Fig. 9,* where the linear trace shown at "A" is distorted at "B" due to loss of its high frequency components. Here, the curvature of the upper amplitude of the sawtooth will cause picture fold-over to the degree by which the top is rounded. This occurs because the rounded top of the sawtooth causes the beam to start to retrace before it is blanked out. If the horizontal sweep sawtooth is thus affected, such fold-over shows up as a faint vertical light area on the right of the picture, and in severe cases double-image effects result around the fold-over area. The beginning of such

fold-over can be seen in *Fig. 10* where slight loss of highs is accompanied by misadjustment of drive, linearity and width controls to give the distortion shown. After the defect has been corrected, the controls will have to be adjusted for proper picture masking. This is applicable to the distortion illustrated by *Fig. 5* also.

Excessive loss of highs will cause the start of the trace to be slower in which case crowding at the left-hand side of the picture will also occur. Poor high frequency response may be the result of changed tube characteristics, and tube replacement should be tried first. Excessive inter-electrode capacity (or circuit capacity) causes a shunting of high frequency com-

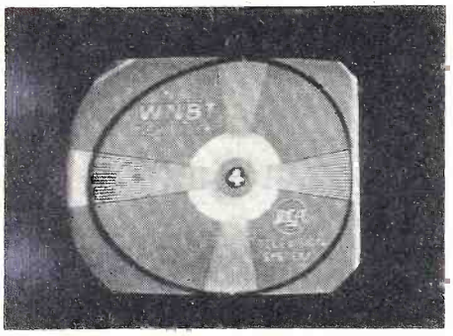


Fig. 10. Defects due to non-linearity of horizontal sweep sawtooth.

ponents and prevents proper linear waveshape. Identical crowding, fold-over, and non-linearity will occur for defects in the vertical system, except that picture expansion or compression occurs at top and bottom of pattern.

If the circuits through which the sawtooth must pass have poor low fre-

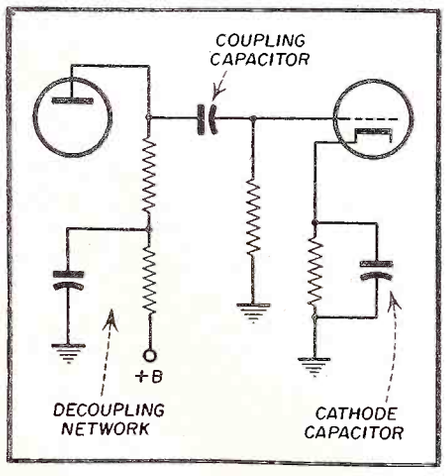


Fig. 11. Circuit capacitors which are likely causes of poor low frequency response.

quency response, the loss of low frequencies in the sawtooth will curve the linear trace as shown in *Fig. 9C*.

Again, linearity is affected, whether

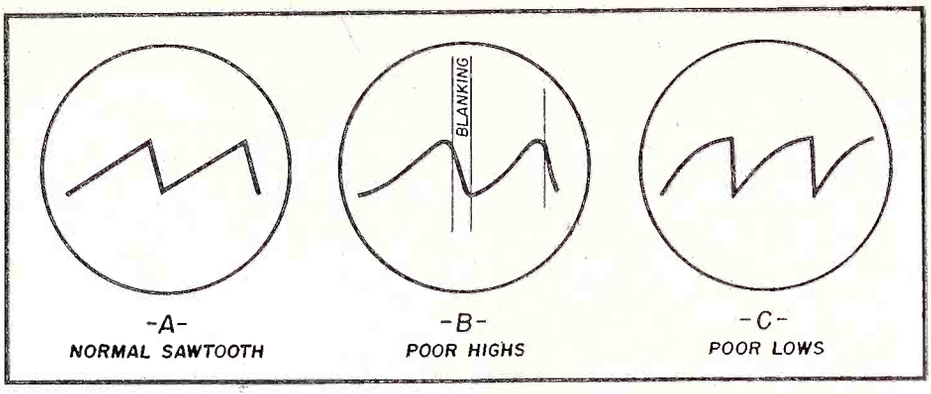


Fig. 9. Effects of poor frequency response circuits on sawtooth linearity.

this waveshape is distorted in the vertical or horizontal system. Loss of lows usually occurs because of an open decoupling capacitor below the load resistance as shown in *Fig. 11.* A change in value of coupling or cathode capacitors will also cause loss of lows, inasmuch as good low frequency response is dependent on a fairly large value of coupling and cathode capacitors. Again, as with loss of highs, the oscilloscope can be used to find the circuit in which the distortion first occurs. Finally, a check of component parts (or direct substitution) will correct the trouble.

U.H.F. TUBES

[*from page 23*]

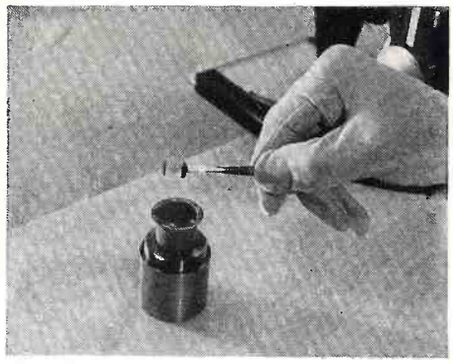
gloves to prevent any contamination of dirt or dust on the grid structure which would seriously affect its operation. It will be seen that construction

(Courtesy of Bell Telephone Labs.)

Fig. 6. Winding the grid of the 416A tube. The machine shown above has been developed by the Western Electric Company and the Bell Telephone Laboratories for winding the fine grid structure.

of this type means necessarily that the final complete tube must be expensive and beyond ordinary receiver applications. However, it is indicative of the trend which is the important feature.

Another wrinkle in UHF tube design is the planar or rocket type triode type 2C37 shown in *Fig. 8.* The tube elements are exceedingly small and they have direct connections to external cylindrical connectors. As in the figure from the top down, the first disk connects to the plate, the middle disk connects to the grid, and the bot-



(Courtesy of Bell Telephone Labs.)

Fig. 7. Grid structure of 416A.

tom is the cathode. While the size of the tube may be seen from the figure, in actuality, the elements are extremely small and concentrated in the center. The diameter of these individual elements is not greater than the dia-

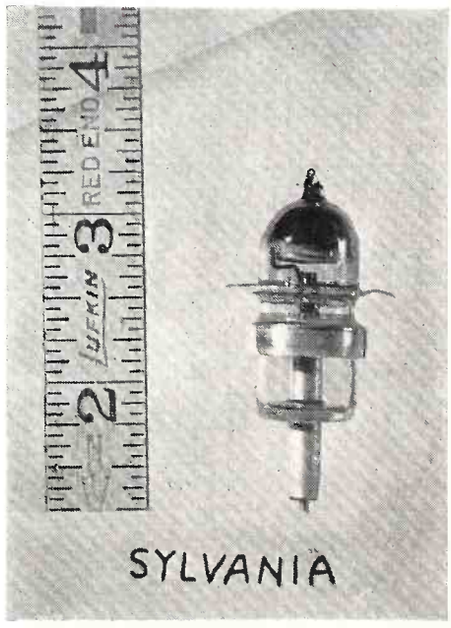


Fig. 8. Sylvania rocket tube 2C37.

meter of the cathode line. Circular disks connecting to the elements in this manner allow for coaxial transmission lines to be used for tuned circuits. For example, three different diameter coaxial lines can be used. The

smallest would connect to the cathode, the intermediate would connect to the grid, while the larger would connect to the plate. While this tube is primarily designed to be used as- an oscillator at frequencies up to 300 megacycles, it may also be used as a radio amplifier or a frequency multiplier. It represents specialized tube construction which becomes a part of the UHF tuned circuit with which it is used.

MEN OF RADIO

[*from page 29*]

50-kilowatt machine was later installed in the Marconi station at New Brunswick. The largest arc transmitter of that period was about 30-kilowatts.

The great Navy station at Arlington had commenced operations in 1912. As mentioned earlier, Fessenden's company had obtained a contract for some of the construction work at Arlington. It was to be expected that he and Poulsen, as the advocates of the advocates of the two leading systems of wireless transmission, might become rivals. This rivalry did indeed crop up; Fessenden pressed for installation of Alexanderson alternators at Arlington, While Poulsen insisted that arcs be used. Nothing was settled by the controversy, for the Navy Department wisely decided to install both systems.

Long Distance Transmission

At this point it might be interesting to digress from a discussion of the arc and alternator to review the interesting events that transpired at Arlington during 1915. On July 28, engineers of the American Telephone and Telegraph Company effected radiotelephone communication between the Arlington station and Honolulu, Hawaii a distance of 5000 miles. During the same tests, contact was made with Darien, Panama. Fessenden's dream of long-distance radiophone communication had been realized and the popular fancy had been directed toward the future of radio. Some readers may remember a song hit of 1915, inspired by the Arlington tests: "Hello, Hawaii". Later that year on October 26, radiophone signals from Arlington were heard at the Eiffel Tower in Paris.

With the American declaration of war in 1917, all foreign-owned radio stations were taken over by the Navy Department. All commercial interests were submerged, and the tangled patent litigation was halted. Under pressure of the conflict, tremendous advances were made. A 200-kilowatt Alexanderson alternator was installed at New Brunswick and afforded the most reliable trans-Atlantic communication thus far. The station's call, NEF, was regularly heard on portable field receivers with the forces in France. At the same time, many capital battleships of the U.S. Navy used arc transmitters. By 1918, the world's most powerful transmitter was in full operation at Bordeaux, France. Built by the Navy Department, it was designed to maintain regular, direct communication between the American military command in Washington and the expeditionary forces in France. The transmitter was a 1000-kilowatt arc.

With the return of peace, the Alexanderson alternator had definitely emerged as the victor in the battle between transmitting systems. Worldwide attention had been focused on the work of Dr. Alexanderson through a series of events. The Marconi station at New Brunskick, using his alternator, had carried Woodrow Wilson's ultimatum to Germany on October 20, 1918. Wilson and Secretary of State Lansing had been in constant communication with Washington while aboard the S.S. George Washington enroute to the Peace Conference, and radiotelephone communication was already in effect between New Brunswick and Brest, France.

Foreign-owned radio stations, including those of the Marconi Wireless Telegraph Company, were still temporarily in the hands of the gov-

ernment. Marconi had already initiated negotiations for exclusive use of the alternator, and was the only firm in a position to handle trans-Atlantic radio communications, hence the only organization interested in acquiring the alternator. Marconi stations here were controlled by the American Marconi Company, but this was an offshoot of the British Marconi Company and was owned almost entirely by English interests.

U.S. government officials, aware of the negotiations between Marconi and General Electric, felt that control of the important alternator rights and consequent control of U.S. radio communications should not pass to foreign firms, especially in view of the fact that cable service were already in the hands of foreign companies. in April, 1919, Acting Secretary of the Navy Franklin D Roosevelt wrote to General Electric suggesting that negotiations with Marconi be suspended until conferences with the Navy Department could be held.

Birth of RCA

The conferences resulted in a plan to form a new company to take over the American Marconi interests, and on November 20, 1919 the Marconi business was taken over by the new company - Radio Corporation of America. Dr. Alexanderson was chief engineer of the new company. A few months later, a patent stalemate between AT&T and Western Electric on the one hand, and GE on the other was solved by a licensing arrangement between these companies. Later, Westinghouse entered the picture. Westinghouse had interests in International Radio Telegraph Company which owned Fessenden patents acquired from National Electric Signaling Company. Another cross-licensing agreement was made between RCA, GE and Westinghouse in 1921. Finally, GE acquired an interest in Wireless Specialty Apparatus Company, which manufactured equipment for Tropical Radio Company, a subsidiary of the United Fruit Company.

Thus, as we have seen, the science of radio advanced several long strides through the efforts of three pioneers; Fessenden, Alexanderson and Poulsen. Although their right to niches in radio's hall of fame were well earned by reason of the discoveries already described, the total of their contributions could not possibly be detailed here. Poulsen, for example, was really the father of the modern wire recorder, for his telegraphone was the ancestor of that device. And Alexanderson went on to make im-

portant discoveries in such widely diversified fields as television, motors, generators, ship propulsion and electric traction. During a period of almost fifty years he averaged one patent each seven weeks for a total of more than three hundred inventions.

TAPE RECORDERS

[*from page 21*]

With the machine running, slightly loosen the nut that holds the rear cone point assembly to the casting. Then using a ½" wrench, slightly rotate the assembly so as to align the motor shaft with the capstan shaft. The shafts are parallel when the running belt does not touch either flange on the motor pulley or when a very slight adjustment causes the belt to shift from one flange to the opposite flange. Finally tighten the nut securely being careful not to disturb the correct adjustment.

Lubrication

Lubrication should never be to excess. Its periodic requirement depends upon continuance of operation. Too frequent oiling will create an excess seepage along the capstan. The tape, heads, stabilizer and belts must be

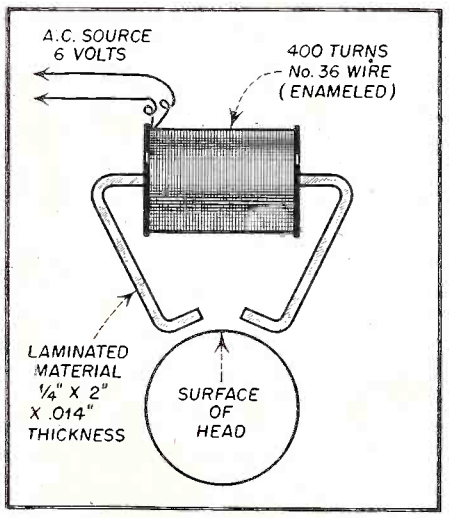


Fig. 3. Construction of demagnetizer for tape heads.

kept free from oil and dirt at all times. The use of SAE 10 and SAE 30 machine oil is recommended for lubrication of the RCA type RT-11A mechanism described in this article. Reference to *Fig. 2* will prove helpful.

Head Demagnetization

Alignment and magnetization of magnetic heads appears in another section. One simply constructed de-

magnetizer is shown in *Fig. 3.* To construct and use it proceed as follows:

1. Use a silicon steel transformer lamination ¼"x2" and at least .014" thick.

2. Wrap insulating tape or paper around the center portion and wind 400 turns of #36 enameled wire in layers over the insulation.

3. Bend the lamination into an open-ended quadrilateral as shown in *Fig. 3.* Place the open ends in contact with the pole faces of the head.

4. Connect a 6 volt a-c source to the demagnetizer winding.

5. Very slowly remove the lamination from the head. Take several seconds to move it completely away. Repeat this action several times being very careful not to scratch the pole faces of the head.

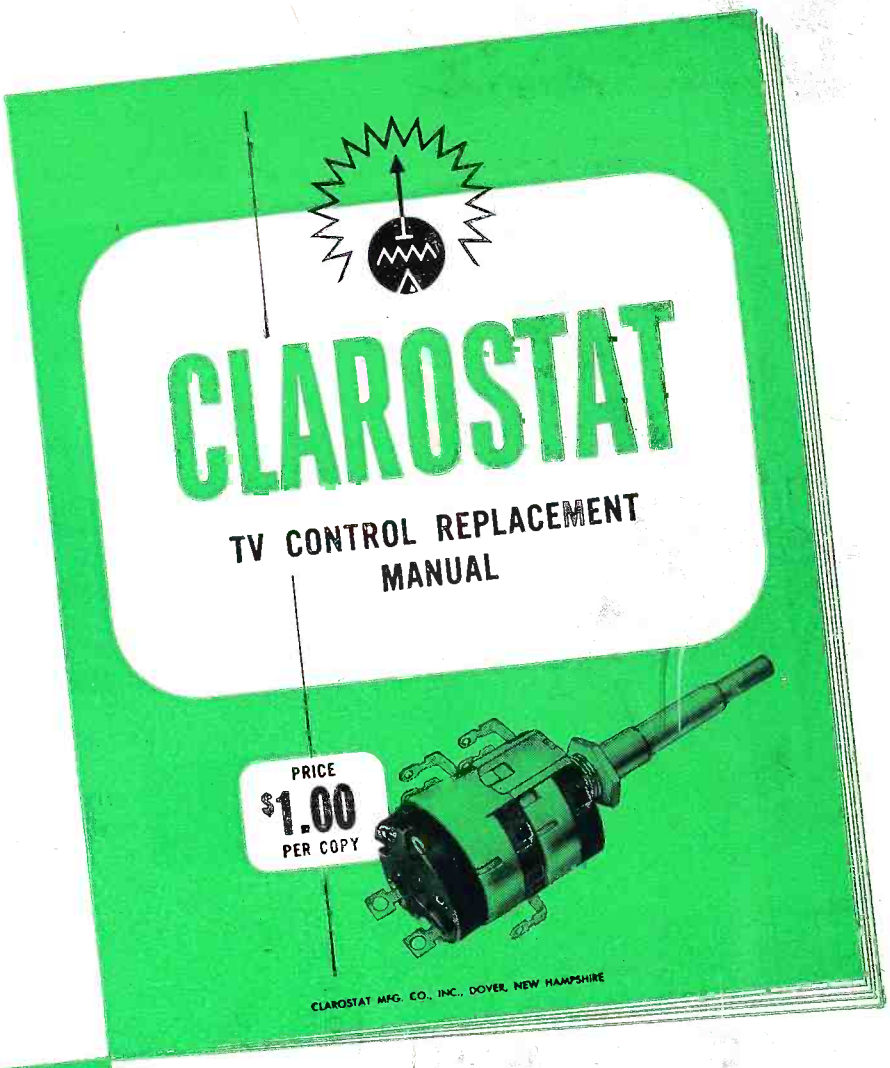
Another scheme can be devised from the stator of a four pole shaded pole phonograph motor.

Commercial demagnetizers are now available.

A recorder in fairly constant use should be demagnetized periodically.

AD INDEX

THE MOST COMPLETE tv control replacement manual



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

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

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

Save Time, Trouble, Money!

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

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

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

NAME _____

ADDRESS _____

CITY _____ Zone _____ STATE _____

Let's talk about you...

You're the radio and television serviceman up the street or around the corner who helps the show go on. The full importance of your services is not recognized until somebody's receiver goes bad. Then you're needed . . . just as a policeman or a doctor or a fireman is needed when the occasion arises. You're that important to your community.

We think people ought to be told about you. So, we decided to talk about you in a full-color display you can place in your window and on your counter . . . to remind folks that you—the radio and television technician—recognize and live up to your responsibilities as a member of the community.

We owe it to you—and you owe it to yourself—to sell your community on your services. Your local RCA Tube Distributor has a complete packaged promotion built around the Community Service theme. See him today.

Keep informed—keep in touch with your RCA Tube Distributor.

RADIO CORPORATION of AMERICA
ELECTRON TUBES HARRISON, N.J.